MANNINGHAM STORMWATER MANAGEMENT PLAN MONITORING AND REVIEW PROGRAM

Final Report

Prepared for:

MANNINGHAM CITY COUNCIL

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			Signatures		
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Summary

PROJECT OUTLINE

Purpose of project

Kellogg Brown Root Pty Ltd (KBR) has been commissioned by Manningham City Council to undertake the development of a monitoring and review program of the Manningham Stormwater Management Plan (SWMP), in particular the implementation plan.

The objectives of the monitoring and review program were to:

- review the existing SWMP implementation plan;
- conduct a perceptions audit;
- conduct a review of best practice approaches to the monitoring and review of stormwater management plans;
- develop and update SWMP strategies and actions;
- develop guidelines to monitor and review the effectiveness of the implementation program for five key elements: structural; non-structural; water quality monitoring; community satisfaction; and domestic wastewater program.

Project structure

The project was undertaken in three stages:

- Stage 1 was the Progress Review and involved providing Council with a status report on Councils progress in implementing the existing SWMP.
- Stage 2 involved undertaking a best practice literature review of monitoring tools commonly and readily available in Victoria.
- Stage 3 involved updating the SWMP implementation plan and developing five guidelines to help direct Council in monitoring and reporting on the five key stormwater areas.



Project Steering Committee

A Project Steering Committee was formed by Council and included representatives from the relevant units within Council and representatives from Melbourne Water (Kane Travis) and the Environment Protection Authority (Amanda Bolton). Council's representatives were Dragutin Lijovic (Project Management), Peter Waite (Project Management), Kate Sutherland (Environmental Planning), John O'Brien (Drainage Maintenance) and John Marten (Health & Local Laws). KBR was represented by Fiona Banks and Marianne Robertson.

Timeframe

The project commenced in December 2002 and was finalised in May 2003.

Deliverables

At the end of each stage a report was produced and delivered to the Steering Committee for review. A meeting to discuss any comments from the Steering Committee was held.

The Stage 1 report was presented at the end of January 2003. The progress report summarised the outcomes of the review of the implementation plan, identifying:

- recommendations that have and have not been implemented and why;
- recommendations that will not or should not be implemented and why;
- other initiatives that have been undertaken which may be included in the implementation plan;
- opportunities to rationalise overlapping actions;
- the achievability of actions;
- the appropriateness of the allocated responsibilities for people or units;
- any fundamental changes that have occurred at Council that affects actioning of the implementation plan;
- the level of Council and community awareness of stormwater management.

The Stage 2 report summarised the outcomes of the monitoring and management literature review and identified recent developments in best practice related to stormwater management and opportunities to incorporate these initiatives into the Manningham SWMP. This report highlighted potential changes that could be considered to the SWMP's implementation plan.



Stage 3 involved producing a final report, updating the SWMP implementation plan and developing five guidelines to help direct Council in monitoring and reporting on the five key stormwater management areas.

CONTEXT

Since the late 1990s, local councils throughout metropolitan Melbourne and regional Victoria have been developing stormwater management SWMPs as part of the Victorian Stormwater Action Program. Using a risk analysis process, the plans present councils with a list of actions to address the high and very high priority threats to the stormwater quality within their municipalities.

MANNINGHAM STORMWATER MANAGEMENT PLAN

The Manningham SWMP, Volume 1, was produced in October 2001 and Volume 2 in March 2002. The SWMP is intended to assist Council and other stakeholder groups to manage the environmental quality of urban stormwater runoff to protect and enhance environmental values of waterways. It provides a framework for integrating stormwater management as part of Council's existing management and planning activities.

SWMP implementation plan

The success of the SWMP is reliant on the completion of actions within the implementation plan. The implementation plan addresses two strategy types: management framework strategies and reactive management strategies.

Management framework strategies

Management framework strategies are intended to define a range of management actions that respond to stormwater quality management issues, and improve practices so that future problems are mitigated or avoided. Management strategies can also have the effect of raising the profile of stormwater quality issues.

The management framework strategies consist of six strategies containing a total of thirty-eight actions. These include:

- changes to planning scheme and statutory approval modifications (5 actions)
- changes to specifications for service delivery (9 actions)
- improvements to coordination, communication and internal training (5 actions)
- improvements to coordination with external agencies (6 actions)



- improvements to Council's strategic planning activities (7 actions)
- ongoing management of infrastructure and operations (6 actions).

Reactive management strategies

Reactive management strategies address current threats that relate to priority management issues. As such they react to existing observed situations and will be underpinned by long-term management framework changes.

There are ten reactive management strategies, containing forty-six actions. These include:

- elements common to a number of priority management issues (13 actions)
- impact of septic discharge and sullage—Mullum Mullum and Andersons Creeks (3 actions)
- impact of commercial runoff—Mullum Mullum, Koonung and Ruffey Creeks (5 actions)
- impact of up-stream inflows—Mullum Mullum Creek (2 actions)
- impact of unsealed road and eroding drain runoff—Andersons Creek (4 actions)
- impact of building site runoff—Jumping Creek sub-catchment (5 actions)
- impact of major road runoff—Mullum Mullum, Ruffey and Koonung Creeks (3 actions)
- impact of residential runoff—Mullum Mullum and Andersons Creeks (3 actions)
- impact of road works runoff—Mullum Mullum, Andersons and Jumping Creeks (5 actions)
- impact of residential development—Jumping Creek (3 actions).

METHODOLOGY

KBR used a multidisciplinary approach in researching and preparing the Monitoring and Review Project.

The Stage 1 methodology involved undertaking one on one interviews with Council staff, reviewing Council documents and reviewing the progress of the SWMP's implementation. Staff were asked a number of questions about their understanding of stormwater management and the implementation plan, their perceived successes, what helps or hinders implementing actions and the general corporate attitude to stormwater management.

Discussions were also held with officers from the Victorian Stormwater Action Program (VSAP), Melbourne Water and other Councils.



The Stage 2 methodology involved undertaking a literature review of a range of information on stormwater management monitoring tools sourced from all areas of the industry including: Melbourne Water, EPA, other Councils, Municipal Association of Victoria, academic and research institutions and websites. A summary of major information was provided in a progress report.

The review focussed on what was regarded as best practice monitoring and review techniques, commonly available in Victoria, for the five key elements: structural, non-structural, water quality monitoring, community perception and domestic wastewater.

Stage 3 involved developing Manningham specific guidelines for each of the five key elements based on the information obtained in Stage 2. A final report was also produced that brought together the three stages and presented a clear outline for Manningham on 'where to go from here' with their SWMP implementation plan and monitoring and review.

OUTCOMES

Stage 1

Overall, the understanding of Council staff of the SWMP and the implementation plan was very good. There appeared to be a general awareness of what was happening in other units and at a corporate level. Corporate support of actions and programs was regarded as excellent as long as they were identified in approved annual work programs for a unit.

Many of the actions are currently being implemented, others have been flagged to be implemented if funding occurs and a small percentage will only be implemented if resources become available. There were several actions that will be delayed pending the outcome of projects being undertaken by other Councils and State and local organisations.

The implementation plan contained thirty-eight management framework actions of which 60 per cent (23 actions) have been implemented and forty-six reactive management strategies of which 37 per cent (17 actions) have been implemented. Actions were considered implemented if they were completed or had commenced.

Of the remaining fifteen management framework actions, 37 per cent (14 actions) had not be implemented to date and three per cent (1 actions) would not be implemented. With the remaining thirty reactive management actions, 9 per cent (4 actions) were partly implemented, 50 per cent (23 actions) had not been implemented and 4 per cent (2 actions) will not be implemented. Resources and funding was regarded as the most likely reason an action had not been implemented.



One of the major observations was the lack of follow-up and enforcement resources within Council. Nearly every interviewee commented on the fact that while all these site management plans and permit conditions. were great and raised the community's awareness, they were rarely if ever, monitored, reviewed or enforced.

Stage 2

SWMP review

Manningham City Council has developed a leadership role in their decision to undertake a review of their SWMP, to ensure that it contains best practice recommendations and to develop guidelines to monitor the implementation of the SWMP.

Management review

The Cooperative Research Centre for Catchment Hydrology (CRC) has undertaken a large amount of research in best practice techniques in stormwater management over the last ten years. As a result, this information was a key resource. CRC for Catchment Hydrology is currently developing many tools to help stormwater managers to better make decisions about the type of actions to undertake when addressing stormwater quality issues and how to monitor and evaluate their effectiveness. The Manningham City Council identified five key elements that they wish to focus on to develop monitoring and evaluation guidelines. Using information identified in Stages 1 and 2, these were developed in the final stage. Below is an overview of findings from this review.

An element overview is provided in Table 1.

Future direction

The strategies and recommendations contained in the SWMP generally adhere to best practice philosophy. By using the CRC for Catchment Hydrology models, packages, decision-support-systems and other references identified, it will be possible for Manningham City Council officers to ensure that the final choice of action is based on best practice.

The most obvious gap in the SWMP is the absence of effective monitoring of implemented actions. To be able to monitor implementation of the different recommendations, it is necessary to obtain baseline data prior to commencement of the implementation of actions.

Stage 3 collated the information collected in Stages 1 and 2 to update the SWMP implementation plan and ensure that recommendations contained in the SWMP incorporate best practice philosophy.

The updated implementation plan includes comments from Council officers for possible improvements and directions.



Monitoring and review guidelines were developed for the five key elements identified by Council, these included structural, non-structural, water quality monitoring, community satisfaction and the domestic wastewater program.

Table 1: Element overview

Non-structural	Non-structural techniques involve community education and awareness programs, planning and local laws, some water sensitive urban design (WSUD) options and temporary sediment controls during construction. Research would tend to indicate that compliance with non-structural techniques works best if there is a proper enforcement program also undertaken. Failure to adhere to permit conditions or use techniques to protect stormwater quality is mainly due to lack of knowledge or knowing that there is unlikely to be any follow-up or enforcement of the conditions.
Structural	To meet best practice, structural actions to improve stormwater quality need to be properly designed and sited to suit the location and the type of waste to be collected. Not all gross pollutant traps (GPTs) will suit all locations. Proper design using techniques, modelling tools and guidelines available from CRC for Catchment Hydrology should ensure that GPTs work effectively and efficiently.
Water quality	Water quality monitoring can be an expensive way to collect information that may not produce any meaningful results. Agencies such as the EPA and Melbourne Water have been undertaking water quality monitoring throughout Victoria for decades, including sites on most of the waterways in the municipality. This information is easily available in reports or on relevant websites and would be the Council's best options for accessing such information. Undertaking specific water quality monitoring of septic tank areas, where a small number of parameters are required for a short a short period of time maybe required, but should be undertaken in consultation with experts who can help to correctly design programs to meets the required outcomes.
Community awareness	Community awareness varies considerably in the municipality and generally relates to a persons involvement in an organised group. Part of this project (Stage 3) is to develop a community satisfaction questionnaire about stormwater management. The CRC for Catchment Hydrology has developed some guidelines for monitoring and evaluating non-structural practices, including education programs. These were used to develop the questionnaire.
Domestic Wastewater Management Plan (DWMP)	Manningham City Council is actively involved in a Victorian Stormwater Action Program funded project to develop guidelines and a model plan for improved management of domestic wastewater management systems in Victoria. The Council has developed a DWMP that identified Council's septic tank database and monitoring systems in the municipality to be totally inadequate. The DWMP identifies Park Orchards as a priority area, but does not propose any actions to immediately address the known off-site water quality issues.

Stage 3

Stage 3 consisted of three parts. these being an overall report documenting the entire project, an updated implementation plan and the five key element guidelines.

Final report

The final report brings together the outcomes of the three stages and reproduces the main findings and outcomes of the Stage 1 Progress Report and summaries the main findings of the best practice literature review.



Updated implementation plan

The updated implementation plan identifies the actions that have been completed, are underway, and are yet to be instigated and those actions that will not be implemented. The format has been rearranged to reflect several issues identified during the discussions, which include:

- the management framework and reactive strategies have been combined in to one table;
- all actions that a unit is responsible for are grouped together and categorised into the two different strategy types;
- resource allocation and timelines are estimated where possible.

Key guidelines

Council identified five key elements from their stormwater management they wanted addressed in future monitoring and review programs. These guidelines are:

Guideline No. 1: Monitoring the effectiveness of structural treatment measures

The purpose of Guideline No. 1, Monitoring the effectiveness of structural treatment measures, is to develop a program to monitor the effectiveness of structural treatment measures identified within the Manningham Stormwater Management Plan, in improving stormwater quality. This guideline builds on work already done on current projects within Manningham City Council and will apply to future projects. The guideline:

- identifies the categories of structural treatment measures currently in use or proposed to be installed in waterways within Manningham;
- identifies best practice structural treatment measures monitoring techniques available, including a contacts and reference list to aid Council in preparing a Council specific program;
- provides a suggested structural treatment measure monitoring program;
- identifies any current structural treatment measure monitoring programs being undertaken by Manningham City Council, who the key stakeholders are for Manningham and what Manningham City Council's expectations are of the monitoring program (where available).



Guideline No. 2: Monitoring the effectiveness of non-structural measures

The purpose of Guideline No. 2, Monitoring the effectiveness of non-structural treatment measures, is to develop a program to monitor the effectiveness of non-structural treatment measures identified within the Manningham Stormwater Management Plan, in improving stormwater quality. This guideline is based on best practice within an emphasis on the work carried out by CRC-Hydrology Catchment. The guideline:

- identifies the categories of non-structural treatment measures currently in use or proposed to be installed in waterways within Manningham;
- identifies the current non-structural treatment measure monitoring programs being undertaken by Council including who the key stakeholders are for Manningham and what Council's expectations are of the monitoring program;
- identifies best practice non-structural treatment measures monitoring techniques available, including a contacts and reference list to aid Council in preparing a Council specific program;
- provides a suggested non-structural treatment measure monitoring program.

Guideline No. 3: Monitoring water quality

The purpose of the Guideline No. 3, Monitoring water quality, is to use existing data (collected by Council and external agencies) to develop a reporting program on the water quality of the waterways in the Manningham municipality. The guideline:

- provides an overview of the relevant legislative framework affecting water quality monitoring within Victoria;
- identifies the commonly monitored water quality indicators and their respective targets;
- identifies current water quality monitoring activities being undertaken for waterways within Manningham;
- identifies the range of key stakeholders who have both a general interest and regulatory responsibility for water quality monitoring within Manningham;
- identifies the key considerations in the design of an effective water quality monitoring program;
- provides a suggested water quality monitoring program designed specifically for the waterways within Manningham.



Guideline No. 4: Monitoring stakeholder satisfaction

The purpose of Guideline No. 4, Monitoring stakeholder satisfaction, is to develop a model community survey to ascertain the perceived success or otherwise of the Manningham Stormwater Management Plan. It is intended that the survey would be for informed stakeholders. The guideline:

- identifies the key internal and external stakeholders within Manningham City Council;
- outlines the key considerations in designing a stakeholder survey;
- provides a suggested survey for use when consulting with internal and external informed stakeholders.

Guideline No. 5: Domestic Wastewater Management Plan

The purpose of Guideline No. 5 Domestic Wastewater Management Plan (DWMP), is to develop measures and activities to assess the effectiveness of the DWMP in achieving the aims of the Municipal Public Health Plan and reducing the impacts of domestic wastewater on local and remote receiving environments. The guideline includes spot water quality monitoring and has been developed in consultation with the Manningham Health & Local Laws department. The guideline:

- provides an overview of the relevant legislative framework affecting domestic wastewater within Victoria;
- identifies the commonly monitored indicators related to domestic wastewater;
- provides an overview of Council's approach to domestic wastewater management, including the Municipal Public Health Plan and the Domestic Wastewater Management Plan;
- identifies priority water quality monitoring areas within the City of Manningham with regard to domestic wastewater;
- provides a suggested monitoring program designed specifically for the domestic wastewater issues within Manningham.



REVISED IMPLEMENTATION PLAN BUDGET

Since the preparation of the SWMP and associated implementation plan, Council has implemented a number of action items including installation of gross pollutant traps; training initiatives; conducted an investigation into alternative pavement treatments; delegated responsibility for implementation of the SWMP to a Council officer; undertaken reporting and monitoring activities; and implemented a number of planning framework changes.

The original forecast implementation plan cost was approximately \$2,204,000. To date Council has implemented actions identified within the implementation plan totalling \$380,000.

As part of this project, the implementation plan has been updated in light of actions already implemented. The new implementation plan is to be implemented over a 5-year timeframe commencing in the year 2003/2004 through to 2007/08, at a forecast average budget of approximately \$364,800/year. Therefore the new capital cost of the implementation plan is approximately \$1,824,000, representing the action items that are yet to be implemented. These figures do not include ongoing annual operational costs.

CONCLUSION

The Manningham Monitoring and Review Project is a Council initiative designed to assess the progress of the implementation plan and develop an updated plan, review Council's awareness of stormwater management and develop monitoring guidelines for five key elements based on commonly available best practice techniques.

Improved stormwater management through successful implementation of further actions in the implementation plan will depend on two main items. Firstly, it is important that stormwater management continue to have corporate support from all levels, especially senior management and Councillors. It is well documented that councils with a 'stormwater champion' have been more successful at improving their stormwater management. Secondly, it is critical that stormwater management continue to receive funding and be identified as an objective at a corporate level.

Monitoring the success of the implementation plan requires a long term commitment to all areas of stormwater management, from design and land use planning, to construction and building site management and general community activities.



1 Introduction

Kellogg Brown & Root Pty Ltd (KBR) was commissioned by Manningham City Council (the Council) to undertake the development of a monitoring and review program of the Manningham Stormwater Management Plan (SWMP), in particular the implementation plan. This project builds on KBR's role in preparing the SWMP.

1.1 PURPOSE

The project was undertaken in three stages:

- Stage 1: Progress Review
- Stage 2: Best Practice Review
- Stage 3: Updated Programs.

Stage 1 provided a status report on Council's progress with the implementation part of the existing stormwater management plan and general perception of stormwater management within Council.

Stage 2 provides an update of recent contemporary and best practice approaches to stormwater management that could be incorporated in the SWMP.

Stage 3 provides Council with an updated stormwater implementation plan based on findings for the first two stages and guidelines on monitoring and reporting on five key elements: structural, non-structural, water quality monitoring, community satisfaction and awareness, and domestic wastewater program.

1.2 INTRODUCTION

The preparation of stormwater management plans (SWMPs) in Victoria is guided by the Urban Best Practice Environmental Management Guidelines (Victorian Stormwater Committee 1999). SWMPs identify strategies Council can use to put best practice structural and non-structural techniques in place with the objective of improving the quality of stormwater before it reaches the receiving waterways. The industry normally groups the techniques into the following five strategies:

- Land use planning: the strategic and statutory planning system;
- Urban design: the design of the public area and associated infrastructure;
- Land management: council operations and development of sites;
- Education and awareness: through media, education programs and community involvement;
- Stormwater treatment and flow management: structural treatment measures.



Over the last decade, the approach to managing stormwater has moved significantly from focusing solely on conveyancing and flood prevention to the inclusion of water quality improvements, amenity and flow reduction. As a result, there has been significant input into research of structural options, however until recently the effectiveness of these options has received limited research. Even less research has been undertaken into best practice options and effectiveness of non-structural options.

Organisations such as the Cooperative Research Centre for Catchment Hydrology, Melbourne Water, the Victorian Stormwater Action Program (VSAP) at the Environment Protection Authority Victoria (EPA), the Municipal Association of Victoria (MAV), catchment management authorities (CMA), Stormwater Industry Association Victoria (SIAV), the development industry, landscape architects and others have been supporting or undertaking research and investigations into more environmentally responsible management of urban stormwater. As such, urban stormwater has become a resource not a nuisance waste.

Together with information from interstate and overseas, there is a focus on development of best practice options to manage stormwater (structurally and non-structurally), and more importantly on how to monitor and measure the effectiveness of these options.

1.3 OVERVIEW OF STAGE 1: REVIEW OF IMPLEMENTATION PLAN

Implementation of an action plan can be a simple activity, monitoring and reviewing the effectiveness, to justify activities and expenditure to Council and ratepayers (money spent) or the community (what are Council doing) can be more complicated. This project reviewed Council's progress of its SWMP implementation plan and develop a monitoring and review program through guidelines to assess its success.

The monitoring and review program has several objectives:

- review the existing SWMP implementation plan;
- conduct a perceptions audit;
- conduct a review of best practice approaches to the monitoring and review stormwater management plans;
- develop and update SWMP strategies and actions;
- develop guidelines to monitor and review the effectiveness of the implementation program for five key elements: structural; non-structural; water quality monitoring; community satisfaction; and domestic wastewater program.

It is a key criterion of Council that monitoring the effectiveness of the implementation plan must use existing systems and data where ever possible. Where external information is to be used, (e.g. water quality data from Melbourne Water and EPA), how this is to be undertaken needs to be identified.



1.4 OVERVIEW OF STAGE 2: REVIEW OF SWMPS AND BEST PRACTICE TECHNIQUES

All but two of Victoria's seventy-nine municipalities are currently completing or have completed a SWMP. There were five metropolitan councils involved in the original pilot program for developing a SWMP. Their SWMPs have not used the revised methodology developed in 2000 as a result of their involvement in the pilot program.

During the five years that the development of SWMPs has been occurring, there have been significant changes and acceptance of alternative stormwater management options. Stage 2 of this project:

- reviewed the progress of the five pilot SWMPs and how they have updated their plans;
- identified how these five pilot councils are monitoring the success of their SWMPs.

There has been significant changes and acceptance of alternative options when managing stormwater, from both a quantity and quality perspective. Using softer approaches such as water sensitive urban design (WSUD) or non-structural techniques such as planning mechanisms, education and awareness programs and better urban designed, housing estates, especially in greenfield areas, which are focusing their developments around water features and treatment options, e.g. Caroline Springs, Lyndhurst and Waterways in Mordialloc.

The management review will undertake a review of best practice approaches related to the management of stormwater, including the effectiveness of five key elements (e.g. structural, non-structural, water quality monitoring, community satisfaction and domestic wastewater program). The outcomes of the CRC for Catchment Hydrology studies which evaluate and document the effectiveness of structural and non-structural treatment measures will be used in assessing the appropriateness of some of the recommendations contained in the Manningham SWMP.

The outcomes from Stage 2 of the monitoring and management review identified recent developments in best practice related to stormwater management and opportunities to incorporate their initiatives into the Manningham SWMP. The report provided direction and highlighted potential changes that could be considered to the SWMPs implementation plan.

Best practice approaches to stormwater management are continuing to be developed. The outcomes of various VSAP initiatives has served to enhance knowledge levels across a wide spectrum of stormwater related management issues. Together with research centres such as the CRC for Catchment Hydrology and organisations like Melbourne Water, CMAs and local government, there is a concerted effort to ensure that best practice is used together with identifying opportunities to monitor their effectiveness.



There is no one answer. Best practice options are generally site specific and must take into account a range of variables for each site. For example, for a non-structural option, planning authorities may develop opportunities within State and local planning schemes to support stormwater best practice. There will be local variances to suit local conditions as structural measures are more prone to physical constraints. These could include whether the council area includes coastal, floodplains or mountainous zones, has greenfield or brownfield sites, the topography, rainfall, specific site conditions, accessibility and cost.

Overall, best practice stormwater management requires an integrated approach to ensure its successful implementation. Agencies and authorities need to work together to make improvements and ensure stormwater management plans are implemented. Best practice stormwater management is a catchment based responsibility and very few catchments fall within one authority's responsibility.

1.5 OVERVIEW OF STAGE 3: IMPLEMENTATION PLAN UPDATE AND GUIDELINE DEVELOPMENT

Collating the outcomes of Stage 1, it was possible to update the implementation plan to reflect what Council has achieved to date in their implementation plan and outline what still needs to be completed and expected resource requirements.

The outcomes of the Stage 2 review enabled monitoring and review guidelines to be developed to help direct Manningham City Council in developing monitoring and review program for each of the five key element areas that they had identified. As monitoring programs need to be designed to specifically address the took used and in the case of structural measures the areas that are affected, it is not possible to develop monitoring programs for each individual action, but provide information on how to go about doing so.

1.6 REPORT CONTENTS

This report outlines the outcomes of the three stages of the project and identifies:

Stage 1

- Recommendations that have and have not been implemented and why.
- Recommendations that will not or should not be implemented and why.
- Other initiatives that have been undertaken which may be included in the SWMP's implementation plan.
- Opportunities to rationalise overlapping actions.
- The achievability of actions.
- The appropriateness of the allocated responsibilities for people or units.
- Any fundamental changes that have occurred at Council that affects the implementation of the implementation plan.
- The level of Council and community awareness of stormwater management.



Stage 2

- A summary of activities undertaken by other councils to update their SWMPs.
- Compares Council's leadership position with regard to SWMPs.
- Outlines the most commonly available best practice techniques for monitoring and reviewing stormwater management, based on the five key elements.

Stage 3

- Produced an updated implementation plan that outlined the actions that had been completed to date, still to be completed and those that were currently on hold.
- Outlined the estimated resources (i.e. staff time and financial) and expected completion dates.
- Developed guidelines for the five elements.



2 Background

Since the late 1990s, local councils throughout metropolitan and regional Victoria have been developing stormwater management plans. Using a risk analysis process, the plans present councils with a list of actions to address the high and very high priority threats to the stormwater quality within their municipalities.

2.1 STORMWATER MANAGEMENT PLAN

The Manningham SWMP, Volume 1, was produced in October 2001 and Volume 2 in March 2002. The SWMP is intended to assist Council and other stakeholder groups to manage the environmental quality of urban stormwater runoff to protect and enhance environmental values of waterways. It provides a framework for integrating stormwater management as part of Council's existing management and planning activities.

2.1.1 SWMP Implementation Plan

The success of the SWMP is reliant on the completion of actions within the implementation plan. The implementation plan addresses two strategy types, which include: management framework strategies and reactive management strategies. These actions address priorities associated with different units within Council, e.g. planning, local laws, and infrastructure.

2.1.2 Management framework strategies

Management framework strategies are intended to define a range of management actions that respond to stormwater quality management issues, and improve practices so that future problems are mitigated or avoided. Management strategies can also have the effect of raising the profile of stormwater quality issues.

The management framework strategies consisted of six strategies containing a total of thirty-eight actions. These include:

- changes to planning scheme and statutory approval modifications (5 actions)
- changes to specifications for service delivery (9 actions)
- improvements to coordination and communication and internal; training (5 actions)
- improvement to coordination with external agencies (6 actions)
- improvements to Council's strategic planning activities (7 actions)
- ongoing management of infrastructure and operations (6 actions).



2.1.3 Reactive management strategy

Reactive management strategies address current threats that relate to priority management issues. As such they react to existing observed situations and will be underpinned by long-term management framework changes.

The reactive management strategy consists of ten strategies, containing forty-six actions. These include:

- elements common to a number of priority management issues (13 actions);
- impact of septic discharge and sullage—Mullum Mullum Creek and Andersons Creek (3 actions);
- impact of commercial runoff—Mullum Mullum Creek, Koonung Creek and Ruffey Creek (5 actions);
- impact of up-stream inflows—Mullum Mullum Creek (2 actions);
- impact of unsealed road and eroding drain runoff—Andersons Creek (4 actions);
- impact of building site runoff—Jumping Creek sub-catchment (5 actions);
- impact of major road runoff—Mullum Mullum Creek, Ruffey Creek and Koonung Creek (3 actions);
- impact of residential runoff—Mullum Mullum Creek and Andersons Creek (3 actions);
- impact of road works runoff—Mullum Mullum Creek and Andersons Creek and Jumping Creek (5 actions);
- impact of residential development—Jumping Creek (3 actions).



3 Methodology

The project methodology employs a multidisciplinary approach throughout the three consecutive stages. This report addresses Stage 1: Progress Review which includes a program audit and a perceptions audit, Stage 2: Best Practice Review which involves a literature review of monitoring of SWMPs and stormwater management best practice, and Stage 3: Implementation Plan Update and Guideline Development.

3.1 PROGRAM AUDIT

An internal update of the status of the strategies and actions was undertaken by Council. Interviews were conducted with representatives from each unit within Council with roles in implementing actions. A list of units involved in the interviews is given in Table 3.1.

During the interviews the actions were further reviewed and status confirmed. Follow up telephone calls to confirm details, if unavailable during the interview, were also undertaken.

During discussions, the Council officers were asked several questions about stormwater management and the implementation plan, these included:

- their understanding of the SWMP process and the implementation plan;
- any issues that they had with implementing actions from the plan and ways it could be improved;
- what actions the unit had implemented and not implement and why;
- the perceived success of the actions;
- what helps implementation;
- what hinders implementation;
- what other initiatives Council is currently undertaking related to stormwater management;
- has there been any changes in the corporate systems within Council that they believe will help or hinder the successful implementation of the SWMP;
- what monitoring does the unit undertake to measure a unit's success and the effectiveness of actions.



Table 3.1 Units represented in interviews

Unit represented	Abbreviation
Executive Office	EO
Project Management	PM
Economic and Environmental Planning	EEP
Health and Local Laws	H&LL
Statutory Planning	SP
Building Control	BC
City Works—Manningham Maintenance	MM
City Parks	CP
Cultural and Leisure Services	C&LS

3.2 PERCEPTIONS AUDIT

While undertaking the interviews, Council officers were asked about their understanding of the stormwater management and the SWMP implementation plan, whether they thought that the SWMP was having any affect and how stormwater management was perceived within Council.

Discussions were also held with staff from the Victorian Stormwater Action Program (VSAP) about their understanding of Manningham's stormwater management and stormwater management in general with councils across the State.

3.3 MONITORING REVIEW

The monitoring and review component of Stage 2 involved reviewing Australian commonly available best practice approaches to the monitoring and review of stormwater management plans. While undertaking this review, approaches adopted by several other metropolitan councils, which have recently undertaken similar reviews, were also identified.

The following organisations', publications and websites were reviewed to obtain relevant information:

- Melbourne Water (MW)
- City of Kingston
- Bayside City Council
- Brimbank City Council
- VSAP-EPA.

References and other reports or articles within these sources were also reviewed for information.

Discussions were held with officers from local government, State agencies (e.g. Melbourne Water, EPA) and other specialists in the field to discover what was happening in the area of SWMP review and monitoring.



3.4 BEST PRACTICE MANAGEMENT REVIEW

The management review component of Stage 2 undertook a review of best practice approaches to the management of stormwater, including the effectiveness of various elements (e.g. structural, non-structural, water quality monitoring, community satisfaction and domestic wastewater program). The outcomes of the CRC for Catchment Hydrology studies into the effectiveness of structural and non-structural treatment measures will be used in assessing the appropriateness of some of the recommendations contained in the SWMP.

Using information from organisations and their websites, a review was undertaken of commonly available Australian best practice approaches to the management of stormwater, including the effectiveness of various elements (e.g. structural, non-structural, water quality monitoring, community satisfaction and domestic wastewater program).

The CRC for Catchment Hydrology report, 'Monitoring and Evaluation of Non-structural Protocols, Draft Technical Report July 2002', was reviewed to assess the appropriateness of recommendations contained in the SWMP and identify activities and techniques to successfully monitor implementation actions.

3.5 IMPLEMENTATION PLAN UPDATE

Using the outcomes of Stage 1, Progress Review, Stage 3 involved updating the implementation plan to reflect achievements to date and outline the activities still to be implemented. After the discussions with the staff to identify the status of the actions in the implementation plan, the outstanding actions were costed (estimated) and timelines allocated where appropriate.

Recommendations suggested by the staff on how the implementation should be ordered were included (e.g. categorise by responsible unit) and modifications to any actions or grouping of like actions.

A set timeline has not been provided as there is no requirement to implement certain activities within a set time. The implementation plan is flexible enough to enable Council to choose which actions fit within its Corporate Plan objectives and individual unit work plans to choose appropriate actions within a certain year. Optimally it would be best to aim at implementing the entire implementation within a five year period, with a review every three years.

3.6 GUIDELINE DEVELOPMENT

Based on the five elements outlined by Manningham City Council, the guidelines were developed using best practice monitoring techniques and tools as identified in Stage 2. Each guideline outlines:

- a purpose
- gives a definition of concepts used
- the advantages and disadvantages of certain tools
- types of elements in use in Manningham
- any monitoring programs currently being undertaken



- a contact list
- a reference list relevant to the particular element.

A full reference list is also supplied in the main report.

The monitoring guidelines for each element are presented in a tabulated format that break down each element into workable parts and provides a comprehensive set of information for each part. This includes information on:

- device and item
- target pollutant and objective
- monitoring options
- effectiveness of each monitoring option
- recommended option
- how to report and when
- a reference or hyper link to further information
- rationale
- · responsibility
- budget as a cost to Council.



4 SWMP implementation review

4.1 OVERVIEW

The Manningham SWMP was developed by KBR and adopted by the Council in 2001. Council has been actively involved in implementing and scoping many of the actions. Overall, there are eighty-four actions within the sixteen strategies identified in the implementation plan. The Council's implementation plan status report (adapted from the original SWMP Implementation Plan) has been used as a key reference document. A copy of this is attached in Appendix A. Items 1 to 38 are actions identified in the Management Framework Strategies and Items 100 to 145 are actions from the Reactive Management Strategies. Refer to Appendix B for the original Management Framework Strategies and Appendix C for the Reactive Management Strategies. Table 4.1 outlines the implementation status of actions from the management framework and reactive management strategies.

Table 4.1 Breakdown of the status of the implementation plan actions

	Management framework strategy actions	Reactive management strategy actions
Total no. actions	38	46
Total no. actions implemented	23	17
% of actions implemented	60	37
Total no. actions partly implemented	0	4
% of actions partly implemented	0	9
Total no. actions not implemented	14	23
% of actions not implemented	37	50
Total no. actions that will not be implemented	1	2
% of actions that will not be implemented	3	4

4.2 RECOMMENDATIONS THAT HAVE BEEN IMPLEMENTED

Actions were considered to be implemented if they were completed or had commenced. Sixty per cent of the management framework actions (23 actions) and 37 per cent of the reactive management actions (17 actions) have been implemented by the Council to date, covering a number of responsibility areas within Council. Nine per cent of the reactive management actions (4 actions) were partly completed. These actions are identified in Table 4.2, Management Framework Strategies and Table 4.3, Reactive Management Strategies.



Table 4.2 Management framework actions that are being implemented or have been completed

Item	Action type	Status/expected completion date	Responsible unit
MANAG	EMENT FRAMEWORK STRA TEGIES		
1	Planning scheme amendments— various	Currently taking place as part of review process	EEP
3	Prepare a series of standard planning and building permit conditions	Under investigation	EEP, SP
4	Land Management and Environmental Management Plans	Currently taking place	EEP
5	Source feedback from referral process—best practice	On-going	SP
6	Review of local laws	On-going	H&LL
7	Secure Councillor and Management Committee	Strategy endorsed 2001	Council Stormwater Implementation Committee
9	SWMP issues in stormwater management	On-going	PM
10	Reporting mechanisms	April 2003	MM
11	Technical training	January 2003	EEP
12	Operational benchmarking	April 2003	MM
13	Review contract specifications	On-going	PM
15	SW control measures	On-going	PM
16	Investigate light pavements	December 2002	MM
17	SWMP Implementation Committee	July 2002	Council Stormwater Implementation Committee
18	Identify officer for statutory SWMP enquiries	June 2002	Council Stormwater Implementation Committee
22	Regional liaison	On-goin g	EEP and Council Stormwater Implementation Committee
23	Integrate feedback from relevant authorities	On-going	SP
24	Liaise with community groups	On-going	EEP
25	Identify existing education/community awareness campaigns	On-going	EEP
26	Include reference to SWMP in Corporate Plan	2002	EO
27	Identify opportunities within unit work programs	On-going	All
28	Reference to SWMP in MSS, GreenPrint and EMS	On-going-June 2003	EEP
37	Audit litter collection activities	Undertaken on an ad-hoc basis	PM



Table 4.3 Reactive management actions that are being implemented or have been completed

Item	Action type	Status/expected completion date	Responsible unit
REACTIVE	MANAGEMENT STRATEGIES		
100	Media releases	On-going	Marketing
101	In-house training in BP urban SW	On-going	EEP
109	Audit and inspection of contractors	On-going	Local laws
110	Establish a programme to monitor effectiveness of SW management plan	Currently being undertaken	EEP
111	Targeted literature and guidelines foe septic tank systems	VSAP project—in initial stages	H&LL
113 part	Septic tank upgrade project	Project has started, but financial incentive part will not be implemented	H&LL
115 part	Signage	Drain stencilling completed	PM
		Other signage awaiting funding	
118 part	Develop environmental management plans	Site specific for Doncaster Hill underway	EEP
120	Stability works on Koonung Creek	MW to advise timing	MW, PM
124	Alternative pavement review	2002	PM
131	Stability works on Ruffey Creek	VicRoads to advise on timing	VicRoads, MW
132 part	Targeted literature/guideline development	Partly completed	EEP
134	Constructed wetlands	MW to advise	EEP, MW, PM
135	Rainwater storage tanks	Grant has been obtained June 2004	PM
137	Domestic waste and recycling collection	Active	PM
138	Targeted literature and guidelines for road construction	In progress	PM, EEP and VicRoads
139	Grass swales	As opportunity arises	PM
140	BP demonstration workshops for road construction	In progress	EEP, H&LL, PM
141	In-line measures	Assessed on case by case basis	PM
142	Site management plans	Assessed on case by case basis	PM
143	Targeted literature and guidelines for building contractors and developers	On-going, to be discussed further with PM	EEP

Unit responsibility key

•	C&LS	Cultural and Leisure Services
•	EEP	Economic and Environmental Planning
•	EO	Executive Office
•	EPA	Environment Protection Authority of Victoria
•	H&LL	Health and Local Laws
•	MM	City Works—Manningham Maintenance



- MW Melbourne Water
- OD Organisational Development
- PM Project Management
- SP Statutory Planning.

4.3 RECOMMENDATIONS THAT HAVE NOT BEEN IMPLEMENTED

Table 4.4 lists the actions that have not been implemented. Thirty-seven per cent of the management framework actions and 50 per cent of reactive management actions have not been implemented to date. The main reason given has been the insufficient funding and resources. These actions are listed in Table 4.4 along with status comments and the unit responsible for the actions implementation.

Table 4.4 Actions that have not been implemented to date

Item	Action type	Status	Contact
Manage	EMENT FRAMEWORK STRATEGIES		
2	Draft local policy that defines expectations for development and use of Council land	Still to be finalised	EEP
8	Define roles and responsibilities	Council Stormwater Implementation Committee to advise	Council Stormwater Implementation Committee
19	All Council officers using planning schemes attend in-house workshop/seminar	Council Stormwater Implementation Committee to advise	OD
20	Provide opportunity for exchange of information	Council Stormwater Implementation Committee to discuss	Council Stormwater Implementation Committee & OD
21	Identify opportunities for joint seminars, brochures, etc.	Council Stormwater Implementation Committee to discuss	EEP, H&LL
29	Integration of SWMP actions into Drainage Strategy	To do next time review undertaken	EEP
30	Integration of SWMP actions into Open Space Strategy	At next review of Open Space Strategy 2004	PM
31	Integration of SWMP actions into Waste Management Strategy	Next review 2002–2003	EEP, C&LS
32	Integration of SWMP actions into Arterial Road Improvement Strategy	Next review of Arterial Road Strategy	PM
33	Set up process to monitor drainage clearance activities	Waiting internal allocation of responsibilities	PM, MM
34	Preparation of overall EMP to guide drainage maintenance works	Discussions to occur with MM	PM
35	Review unsealed road and drainage maintenance works	Discussions to occur with MM	PM, MM
36	Review street sweeping procedures	Discussions to occur with MM	MM
38	Prepare overall EMP and site specific EMP for operation and maintenance activities	Discussions to occur with MM	MM



Table 4.4 continued

Item	Action type	Status	Contact
REACTIVE	MANAGEMENT STRATEGIES		
102	Community and interest group consultation	Staff Time	All relevant units
103	Business stakeholder group and Council liaison	Resources	All relevant units
104	Targeted literature and guidelines	No funding allocated	EEP
106	Refer to Item 36		
107	Refer to Item 33		
108	Infringement notices and fines	Discussion with Council Stormwater Implementation Committee	H&LL
112	Extension of sewer system on western side of Mullum Mullum Creek	Review 2004	PM, H&LL
113 part	Financial incentives for septic tank and on-site detention systems	No to incentives, but other options undertaken	H&LL
114	Commercial runoff abatement	Discussion with Council Stormwater Implementation Committee	EEP
115 part	Signage	Awaiting funding	PM
116	In-line traps	Awaiting funding June 2004	PM
117	Unloading and loading areas	Requires resource allocation	PM
118 part	Develop EMP for key commercial areas	Old areas requires resources	EEP
119	Regional consultation	Staff time	PM
121	Circular settling tanks	Awaiting funding June 2004	PM
122	Sediment settling basins	Awaiting funding June 2004	PM
123	Unsealed road maintenance	Discussion with MM	MM
125	Targeted literature/guidelines	Discussion with Council Stormwater Implementation Committee	EEP
126	Best practice demonstration workshops	Discussion with Council Stormwater Implementation Committee	EEP
128	Site Management Plans	Discussion with Council Stormwater Implementation Committee	SP
129	In-line treatment	No funding available	PM, MM
130	In-line treatment	No funding available	VicRoads, MW
132 part	Targeted literature/guidelines	Discussion with Council Stormwater Implementation Committee	EEP
133	Demonstration projects	Discussion with Council Stormwater Implementation Committee	EEP, CLS
136	Roof water diversion	Staff time or grant funding	PM
144	Stormwater management and education workshops	No funding available	EEP
145	Site Management Plans	Discussion with Council Stormwater Implementation Committee	PM



4.4 RECOMMENDATIONS THAT SHOULD NOT BE IMPLEMENTED AND WHY

There were several actions, Items 14, 105 and 132 (part), that were identified by the Council officers where their implementation should be delayed due to other work currently being undertaken by other Councils, (e.g. Casey City Council, the Association of Bayside Municipalities (ABM), Hornsby (NSW)) other organisations (e.g. MAV and VSAP) and State and local agencies (e.g. EPA, Melbourne Water).

Much of this work has come out of the long-term involvement of these organisations with the stormwater movement in Victoria and interstate. The information that will be available after these projects are completed will be freely available for others to use.

Action 127—development of a new local law was identified as the only action that should not be implemented as it was thought that there were already local laws in existence to address all stormwater issues. There were no other actions identified that could not be implemented due to the action being unachievable or unrealistic.

Part of Item 132—development of targeted literature and guidelines to raise awareness of responsible water and waste management practices, was identified as not to be undertaken until other project work by the Municipal Association of Victoria (MAV) was completed during the next twelve months.

The actions that should be delayed indefinitely or not undertaken, are identified in Table 4.5 along with the reason for this.

Table 4.5 Actions that should be delayed or not implemented

Item	Action type	Reason
14	Review contract specifications	LGPro project
105	Demonstration projects	Hornsby CC undertaking similar project work
132 part	Targeted literature/guidelines	MAV Capacity building project
127	Near source treatment—develop a new local law	Enough local laws already exist to cover this issue

4.5 OTHER INITIATIVES RELATED TO STORMWATER

There were no other actions or initiatives identified, not currently listed in the implementation plan, that are being undertaken at Council that that were stormwater related.

4.6 OVERLAPPING OR DUPLICATE ACTIONS

There were numerous actions identified in the interviews where some actions appeared to be duplicates or very close in context to other actions, sometimes with different responsibilities. In many cases, especially the infrastructure actions, it was felt that they could all be grouped together as one action instead of many. It was also commented that it would be more user friendly if actions were grouped into unit responsibility and that the terminology was uniform throughout the plan, especially for site management plans, environmental management plan, and site construction management plan. These changes are shown in the final implementation plan review and report.



4.7 ACHIEVABILITY OF ACTIONS

There were no actions identified by Council officers that would not be achievable given unlimited resources and time.

The absence of funding was regarded as the major reason that an action would not be instigated. Over time some actions would fail to be in instigated due to changes in priorities within Council. This would be due to corporate changes and not due to the achievability of the actions.

4.8 RESPONSIBILITIES

Nearly all responsibilities identified in the implementation plan were confirmed during the interviews. For several actions, the role of primary and secondary responsibilities needed to be reversed, or one of them removed. Overall there were no issues raised by the Council officers with regard to appropriateness of responsibility allocation.

The only responsibility change required was for Item 21.1 in the management framework strategies, where responsibility for the septic waste action was changed to Health and Local Laws (H&LL) and not Economic and Environmental Planning (EEP). The items requiring changes to responsibilities in the management framework strategies are identified in Table 4.6.

Table 4.6 Items from the Management Framework Strategies requiring responsibility changes

Item	Action type	Old responsibility	New responsibility
21.1	Septic waste and on-site detention systems	Economic and Environmental Planning (EEP)	H&LL

In the reactive management strategies there are several changes required for responsibilities, although there were no issues with these changes between the units. The responsibility changes were required on the following items identified in Table 4.7.

Table 4.7 Items from the Reactive Management Strategies requiring responsibility changes

Item	Action type	Old responsibility	New responsibility
105	Best practice Demonstration project	EEP	SP
109	Audit and inspection	PM	H&LL
114	Commercial runoff abatement	EEP, PM	EEP
115	Signage	PM, EEP	PM
118	Environmental management plans	PM, EEP	EEP
127	Near source treatment permits	H&LL	SP
128	Site management plans	BC	SP



5 Corporate awareness and influences

Regardless of the type of initiative or program proposed, the full support of Council executive is pivotal to the successful implementation of the program. When trying to implement a Council wide program such as the SWMP, high level support is essential. A 'champion' needs to be appointed in the organisation to ensure coordination between the varying units and to continually keep the program in everyone's mind.

5.1 COUNCIL STAFF PARTICIPATION

During the development of the SWMP, staff representation from all units within Council was sort and received. This had two main benefits:

- to bring the knowledge about each units' activities to the forum;
- to take back information about what stormwater management is all about and how all areas of Council can be involved.

It was obvious that all staff interviewed were well aware of the stormwater program within Council and their personal and unit's role within it. One staff member had only been employed by Council for three months, yet was still aware of the program and their units' activities and status.

All Council officers commented on the lack of enforcement resources to follow up permit conditions, site management plans and other stormwater management activities. Knowledge about what should be included in a permit condition or on a site management plan was also raised as a concern by several staff to varying degrees.

5.2 EXECUTIVE PARTICIPATION

The requirement for positive participation from executive members of Council can ensure not only support for implementing the program, but is critical to obtaining any funding required to implement actions.

A requirement of 'signing-up' to undertake a SWMP and receive funding was a written letter signed by the Council's CEO and that they were available to give a short speech at the start of the process to show general staff that the program had senior level support. This also ensured that senior level support were aware of what the program involved and its relevance to Council.



From comments received during the interview process it was obvious that there is executive support at Council for the SWMP. The Director City Development is a member of the SWMP Implementation Committee along with other senior officers or managers from various units. The group meets regularly to discuss the implementation plan and review the status of actions being undertaken by each unit.

Funding these actions is also important and a high level funding commitment is important, with broad programs usually identified at a corporate plan level.

5.3 STRUCTURAL CORPORATE CHANGES

The inclusion of specific stormwater objectives and strategies in the Corporate Plan 2002/2005 was regarded by all as a positive corporate change that would give the SWMP and implementation plan more chance of success.

Council shows an excellent commitment to support corporate plan actions and the inclusion of stormwater can only increase the ability of units to gain financial and resource commitment from Council to implement an action.

5.3.1 Manningham's Corporate Plan 2002/2005

During 2002, the Council undertook to renew its Corporate Plan for 2002/2005. As part of this, a new approach was undertaken to identify not only existing programs but to 'give some legs' to other programs and new directions. In each of the ten objectives identified in the Corporate Plan 2002/2005 several strategies were identified and key indicators produced. There are two main objectives that relate to stormwater management, Objective 4 and Objective 7.

5.3.2 Objective 4: Protect, maintain and enhance the natural environment of Manningham

Objective 4, Strategy 4.1, 'Protect and improve our waterway and catchment environments and value the topography, landform and soil resources of Manningham' specifically identifies several items related to stormwater management. These include:

- Council processes (item 4.1.1)
- staff training (item 4.1.2)
- development of a monitoring and review program (this project) (item 4.1.3)
- gross pollutant infrastructure installation (item 4.1.4)
- tertiary infrastructure development (e.g. wetlands) (item 4.1.5).

The indicators identified in Objective 4 to monitor its success are to:

- maintain or improve the abundance of platypus in Manningham's' waterways
- decrease E. coli levels of Mullum Mullum and Ruffey Creek's.



5.3.3 Objective 7: Ensure protection of Council assets and the sustainable use of resources

Objective 7 also relates to stormwater management in a more indirect way through two strategies:

- Strategy 7.1, 'Reduce the amount of waste produced by households and businesses and support the principles of reduce, reuse and recycle' relates to waste and litter management which are key pollutants of stormwater.
- Strategy 7.2, 'Reduce water consumption', item 7.2.2, identifies the need to investigate the capture and reuse of stormwater throughout the municipality as an action, thereby reducing the consumption of potable water.

The relevant stormwater indicators for Objective 7 are:

- maintain or improve the CSS Community rating for 'Waste Management'
- reduce gross and net compositions and quantities of waste going to landfill
- reduce water consumed annually per Manningham household.

5.4 EXTERNAL AGENCY PERCEPTIONS

Interviews were held with officers from the Victorian Stormwater Action Program (VSAP) and Melbourne Water. Both agencies indicated that the success of implementing a SWMP implementation plan in a Council was reliant on a 'champion' within the organisation.

Apart from any specific actions in which they may be asked to participate, such as this project, both officers had little knowledge about Council's specific stormwater management activities.

Some councils are very proactive in implementing actions, especially in the planning areas and gross pollutant traps (GPTs), but other councils, or some sections within councils, appeared to not understand the concept of stormwater management. An example was given of an engineering unit within an eastern suburb council, removing a perfectly working grass swale from a road verge in a fully developed area and replacing it with an underground drain, with no water quality treatment.

Overall, there has been an excellent uptake by all Councils throughout the State. Inhouse training of staff and attendance at seminars and workshops has been encouraging.

The availability of grants to develop SWMPs and implement actions has certainly had a positive affect on the response to the program. During the first round of offers, many grants were one dimensional, e.g. only for installing GPTs, however, subsequent rounds have seen the majority of grant applications include educational information, training and other forms of stormwater management techniques be included along with gross pollutant traps, hence being able to ensure a more holistic approach to urban stormwater quality management.

Several VSAP funded strategic projects are currently underway and the outcomes should address actions identified in stormwater plans, especially capacity building information.



6 SWMP review

In 1999, five metropolitan councils (Kingston City Council, Port Phillip City Council, Monash City Council, Hobsons Bay City Council and Brimbank City Council) supported by Melbourne Water, MAV and EPA, undertook a pilot scheme to develop SWMPs based on the methodology in BPEMG (VSC 1999). As a result of this pilot program, the methodology, commonly referred as Chapter 3, was revised.

As time progressed and consultants and authorities became more proficient at producing SWMPs, there has been a significant change in the research and development of strategies and recommendations provided in a SWMP.

This has seen several of the original pilot councils investigate the need to update their SWMP to bring them inline with current best practice, in particular the reactive management strategies and recommendations. Many other councils are looking at ways to monitor the implementation of their SWMPs to establish if implementing the recommendations has had an effect on stormwater management, including improvements in urban stormwater quality and an increase in awareness of stormwater management issues.

There were no reports identified that specifically looked at how or which councils were reviewing their SWMPs. The one known report that reviewed the quality and contact of SWMPs, undertaken by VSAP, is not yet released. The outcomes of this report is currently not available, but should be included in the final report. Discussions were held with officers from various councils, and their Corporate Plans reviewed to identify organisational monitoring and reviewing.

6.1 REVIEW OF SWMPS

Below is a summary of activities some of the pilots councils have undertaken to update their SWMPs to ensure they are in line with current best practice.

Kingston City Council

Kingston City Council has modified parts of their SWMP and has been actively involved in implementing stormwater best practice projects, directly related to recommendations in their SWMP. These projects include:

- developing a Stormwater Specific Local Law;
- an information kit designed to help you protect stormwater quality from your building site and comply with council regulations (VSAP undated);
- Association of Bayside Municipalities (ABM) Stormwater Implementation Project: Statutory Framework and Standards (ABM 2001b).



Brimbank City Council

Brimbank City Council applied for and received a VSAP grant in 2002 to update their SWMP. To date they have not completed this, however they have been using the SWMP to apply for funding grants and prioritise works.

Hobsons Bay City Council

Hobsons Bay City Council is not planning to update their SWMP, however they are using the SWMP as a reference document for identifying stormwater management options and priorities.

Monitoring of SWMPs

Monitoring of SWMPs within councils is generally undertaken on an ad hoc basis. In many councils, including Kingston, Bayside, Casey, Port Phillip and Manningham, specific items have been included in the latest Corporate Plans. This reflects the importance that stormwater management now has. Not all councils have undertaken this action and there is a great variance in how specific stormwater actions are identified. Some identify stormwater improvement actions specifically, while others provide a more general statement.

Kingston City Council

Under the key council theme of 'Managing a Sustainable Environment' Kingston City Council identified their stormwater plan as a priority in 2002/2003. There are also four strategic actions specifically identified in the Corporate Plan 2002–2005 (Kingston 2002) and several other related actions that include local laws, waste management, litter control, planning and site management for commercial and industrial area.

Bayside City Council

The Bayside City Council, in the area of 'Sustainability & Environment', has identified their SWMP as a commitment to 'implement Stage 3 of the SWMP by June 2003' (Bayside City Council 2002). Improving statutory planning processes by integrating environmental and urban design processes and reviewing the Municipal Strategic Statement are also related to improving stormwater management in the Bayside area.

Port Phillip City Council

The Port Phillip City Council identifies stormwater management once in their Corporate Plan 2002/2003 and identifies 'seeking funding to accelerate the implementation of their SWMP' (City of Port Phillip 2002). Other related issues identified include minimising waste production and improving systems of management and disposal and improving their recycling program.



City of Casey

The City of Casey under the area of 'Casey's Natural Environment' has identified a major 2002–2005 objective as 'Comprehensive catchment management and enhancement of waters and the coastline' (City of Casey 2002). A 2002–2003 commitment to this is to 'implement the stormwater management plans through priority actions'. Other related actions include planning commitments, implementing the waste management strategy and the litter strategy and participation in a Waste Wise program.

6.2 WHAT DOES THIS MEAN TO MANNINGHAM?

The Manningham City Council Corporate Plan (Manningham 2002) specifically identifies stormwater management in two key objectives for the Council:

- Objective 4: Protect, maintain and enhance the natural environment of Manningham.
- Objective 7: Ensure the protection of Council assets and the sustainable use of resource.

Within Objective 4 there are five actions specifically related to stormwater quality improvement and two stormwater related key performance indicators.

Objective 7 contains two stormwater related actions involving capture and reuse of stormwater and rainwater tanks, with a key performance indicator relating to decreasing water consumption.

The inclusion of these stormwater objectives and specific stormwater actions and key indicators in the Manningham Corporate Plan are as advanced as many other councils and indicate the Council's commitment to improving stormwater quality. Manningham was one of the very few councils that actually identified key performance objectives directly related to stormwater.

Manningham City Council is taking a leadership role in reviewing their SWMP to ensure the inclusion of best practice techniques and identifying and establishing guidelines to monitor the SWMP implementation plan at an operational level.



7 Best practice management review

Management of stormwater can be proactive or reactive and are actions that are designed to address issues in stormwater quality management. Reactive actions respond to current threats and relate to priority issues that have been identified. Proactive actions are designed to address management issues and improve management practices so that future problems are mitigated or avoided. Some reactive actions are specific to a particular threat such as a GPT on a stormwater drain at a shopping centre or sediment control basins downstream of subdivision areas. Proactive management actions can include changes to council's planning scheme or planning permits to address stormwater quality issues, or changes to contracts to ensure that best practice techniques are followed. Some actions include both types of actions. Education and awareness programs can be designed to address both a known problem and to prevent future problems.

Manningham City Council has identified five key elements of stormwater management they wish to address in this project and a review of commonly available best practice has been summarised into these area: structural, non-structural, water quality monitoring, community satisfaction and domestic wastewater.

The CRC for Catchment Hydrology has undertaken considerable research in this area over the last eight years and their reports and information have been relied on heavily in this part of the review.

7.1 STRUCTURAL TREATMENT MEASURES

When discussing structural treatment measure options, practitioners usually refer to infrastructure, e.g. litter traps, wetlands, sediment basins. These options tend to be end of pipe solutions, although incorporating them at or near source is the preference.

The CRC for Catchment Hydrology aims to deliver the capability to manage catchments in a totally new way. Their central goal is to produce a decision support system able to predict the movement of water, particulates, and solutes from land to rivers, linking the impact of climate variability, vegetation, soil, and water management together in an integrated package.

For catchment and water managers, this system will enable them to fully evaluate the short and long-term outcomes of policy decisions at regional scales. There are five industry-identified issues to be addressed by the CRC's research program of which urban runoff quality (the opportunity to improve city rivers and bays) is one.



7.1.1 CRC for Catchment Hydrology

Below is a summary of three current CRC for Catchment Hydrology projects related to this review.

CRC Project 1.1: Development of a Catchment Modelling Toolkit (CRC for Catchment Hydrology)

Prediction of catchment behaviour is one with a wide variety of models, many of which are limited in purpose and most are not compatible with other models. The aim of this project is to provide a generic 'toolkit' of compatible models from which land and water practitioners can select components suitable for their particular purposes.

Many models used in catchment prediction have been developed for specific research problems or locations, and are appropriate to particular space and time scales. Many have been developed with software now considered obsolete.

CRC Project 4.1: Stormwater Sources, Pathways and Impacts (CRC-CH)

Currently there is an inability to fully integrate the various disciplines of science and engineering into stormwater management strategies. Project 4.1 aims to develop a suite of models for estimating stormwater pollutant loads from different source areas, defining their impacts on aquatic ecosystems, predicting the performance of stormwater management practices and formulating a decision-support-system for the development of cost-effective strategies.

CRC Project 4.2: Stormwater Best Management Practices (CRC-CH)

There is currently insufficient understanding of the value and effectiveness of many structural stormwater management practices in Australian conditions. This project aims to monitor their performance and to review current non-structural measures. Outcomes include better understanding of factors influencing the performance of structural stormwater management practices and incorporating non-structural stormwater management measures into the decision-support-system in project 4.1.

Economic analysis of the performance of stormwater management practices and consequently urban stormwater quality management cannot be fully integrated into an holistic approach to catchment management. Locally derived data is limited and not of sufficient detail to enable quantitative modelling to different geographic regions.

Urban catchment managers are also implementing a range of non-structural stormwater management practices, principally aimed at achieving longer term outcomes for sustainable reduction in pollutant loads. These include a wide range of community awareness campaigns, water sensitive urban design initiatives, planning controls and legislative controls. The full benefits are yet to be assessed for most initiatives due to insufficient quantitative measurements of their effectiveness and the limited time-frame. As a consequence, data that is non quantitative basis for defining the appropriate relative funding between structural and non-structural initiatives to achieve a balanced urban stormwater management strategy.



7.1.2 CRC

Reports

The following reports are key reports identified for review:

- Non-structural Stormwater Quality Best Management Practices A Literature Review of their Value and Life-cycle Costs. A. C. Taylor November 2002. CRC for Catchment Hydrology.
- Non-structural Stormwater Quality Best Management Practices A Survey Investigating their Use and Value. A. C. Taylor November 2002. CRC for Catchment Hydrology.

7.1.3 Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Version1.00

MUSIC has been designed as an aid to decision-making. It predicts the performance of stormwater quality management systems. It is intended to help organisations plan and design at a conceptual level appropriate, urban stormwater management systems for their catchments.

7.1.4 Stormwater information kit

This kit is a booklet (VSAP undated) and designed to provide practical examples of good building and construction site management to minimise stormwater pollution. It contains a series of practice notes with diagrams and pictures that are provided in an easy to use format.

7.1.5 Structural recommendations

In summary:

- Council should ensure that all relevant staff are trained in and use best practice
 models and other available information when making decisions on siting and type
 of structural measures used to ensure that once operating they are effective and
 efficient:
- there is a need to combine structural measures with non-structural measures to ensure good uptake, education and effectiveness;
- pre- and post-monitoring or surveys should be undertaken to assess the effectiveness of a measure.



7.2 NON-STRUCTURAL TREATMENT MEASURES

Non-structural treatment measure options cover the following areas:

- planning
- local laws
- community education
- industry and practitioner education
- models and decisions support systems
- capacity building
- seminars, workshops and conferences.

7.2.1 The Value of Non-structural Stormwater Quality Best Management Practices, July 2002 (Draft) CRC-CH

This report reviews information from around Australia and internationally on the use on non-structural stormwater quality best management practices. The final document is not yet available to the public and consequently the draft version (working document) is not yet finalised.

The report focuses on the beneficial effects and life-cycle costs of non-structural best management practices (BMP) for improved stormwater quality and waterway health. It identifies common non-structural BMPs (e.g. town planning controls, education programs and enforcement programs) that are widely used throughout Australia.

The report can be used by stormwater managers:

- to use the survey and literature review findings on the value and cost of non-structural BMPs to guide their decisions on the use of non-structural BMPs;
- to collect information on funding profiles of leading stormwater management agencies as benchmark when developing or fine tuning their stormwater management programs;
- can use the proposed evaluation framework, monitoring protocols and data recording sheets to help raise the standard of non-structural BMP monitoring and evaluation.

7.2.2 Planning

'Urban planning provides the pro-active element in facilitating the utilisation of stormwater best management techniques. The selection of appropriate Best Management Practices (BMPs) at a specific site involves an assessment made within a variety of disciplines (drainage engineering, landscape architecture, ecology, etc.). Strategies for the management of non-point source pollutants involve using a catchment-wide combination of structural and non-structural measures in series or concurrently as an integrated treatment train approach. 'Fundamental to the success of this holistic approach to stormwater management is the appropriate prioritisation and positioning of appropriate management measures'. (Wong 2000)



There are several projects being undertaken to investigate and develop stormwater related planning tools that are applicable for all councils. These include changes to planning schemes and Municipal Strategic Statements, permit conditions and other council polic ies. Stormwater related policy statements have also been included in the State Planning Scheme and model local laws are also being developed to support these changes.

7.2.3 Port Phillip Coastal and Marine Planning Program—Stormwater Implementation Project: Statutory Framework and Standards September 2001 Association of Bayside Municipalities.

The goal of Stage 1 of this project is to develop model planning scheme provisions that provide the necessary detail and statutory force to assess development proposals and to guide selection of appropriate best practice stormwater management techniques for different urban sites, conditions and development scenarios.

The ABM project focuses on using land use planning to achieve improved stormwater management. Inherent in the operation of the planning system, this will have links to all of the other techniques. Once planning system modifications are made, the design of new development will incorporate best practice stormwater management measures. This will need to be integrated with urban design, management of development sites, education of developers and their consultants, and environmental improvements to municipal and regional drainage systems. Table 7.1 lists the relationship of best practice stormwater management to council activities.

Table 7.1 Relationship of best practice stormwater management to council activities

	Corresponding council activity			
Best practice stormwater management	Strategic and statutory planning	Infrastructure and operations		
Land use planning	STRATEGIC LAND USE PLANNING	STRATEGIC INFRASTRUCTURE PLANNING		
Higher order spatial land use development decisions informed by opportunities and constraints of stormwater management	MSS and Local Planning Policy, strategic studies; continuous improvement monitoring and upgrade of planning standards	Higher order planning for council physical and community infrastructure		
Urban design	LOCAL AND SITE PLANNING	LOCAL INFRASTRUCTURE PLANNING		
Design and management of the public realm, relationships between public and private land	Structure plans and development plans including subdivision layouts, location of infrastructure and facilities and building locations	Planning of infrastructure and facilities for new developments		

Table 7.1 continued

	Correspond	ding council activity
Best practice stormwater management	Strategic and statutory planning	Infrastructure and operations
Land use planning	COUNCIL/STATUTORY APPROVALS	Infrastructure design
Land use and development approvals	Zoning, development plans, subdivision plans, planning permits—coordination of approvals internally (with reference to council design and operational specifications) and with external authorities; permit conditions or other approval requirements with use of Section 173 agreements	Design of local stormwater system, landscaped and sealed areas including roads associated with development and council engineering standards
STORMWATER TREATMENT AND FLOW MANAGEMENT	SITE DEVELOPMENT AND BUILDING	OPERATIONAL SPECIFICATIONS
Selection of best practice source treatment or structural control, or a combination of measures	Permit conditions or other approval requirement for environmental management/site management plans; council oversight and enforcement	Council maintenance standards, performance requirements for staff, contractors, developers and body corporate
LAND MANAGEMENT	LAND USE ACTIVITY	COUNCIL CONTRACTS
Management of land development and construction activities	Enforcement of permit conditions, environmental management plans and other performance requirements; coordinated enforcement of EPA and similar requirements	Performance requirements for construction contracts
EDUCATION AND AWARENESS		Local law
Education for parties involved with construction of infrastructure and buildings		Local Law for site management requirements with bonds and fines; council oversight and enforcement
LAND MANAGEMENT		COMMUNITY EDUCATION
Ongoing use of land and associated activities		Campaigns for construction companies and builders, distribution of information to new home owners and community reporting
STORMWATER TREATMENT AND FLOW MANAGEMENT		Infrastructure design and operational specifications
Monitoring and maintenance of regional or local elements of the stormwater system (usually public)		Continuous improvement monitoring and upgrade of infrastructure for developed areas—design and implementation and maintenance standards



Table 7.1 continued

	Corresponding council activity				
Best practice stormwater management	Strategic and statutory planning	Infrastructure and operations			
EDUCATION AND AWARENESS		COUNCIL CONTRACTS			
Education for businesses and residents in the community		Performance requirements for council operations (maintenance contracts or in house staff) as per council operational specifications			
		Community education			
		Ongoing or repeat education for residents, business and industry supplemented by targeted campaigns for problem areas			

Source: ABM Stormwater Implementation Project Stage 1: Statutory Framework and Standards.

(ABM 2001a). Environment & Land Management and Ecological Engineering.

7.2.4 Local Laws

Local Laws are allowed under the Part 5, Local Laws Section 111 of the *Local Government Act 1989*. Under Section 112, councils may make local laws through 'incorporation by reference'. This has been undertaken by Kingston City Council by incorporating by reference their 'Building Site Stormwater Code of Practice' into Local Law No. 5. (See below.)

- Section 112. Incorporation by reference:
 - (1) A local law may apply, adopt or incorporate any matter contained in any document, code, standard, rule, specification or method formulated, issued, prescribed or published by any authority or body whether:
 - (a) wholly or partially or as amended by the local law; or
 - (b) as formulated, issued, prescribed or published at the time the local law is made or at any time before then; or
 - (c) as formulated, issued, prescribed or published from time to time.
 - (2) If a local law has applied, adopted or incorporated any matter contained in any document, code, standard, rule, specification or method as formulated, issued, prescribed or published from time to time and that document, code, standard, rule, specification or method is at any time amended, until the council causes notice to be published in the Government Gazette of that amendment, the document, code, standard, rule, specification or method is to be taken to have not been so amended.

Many councils have undertaken some modifications to their local laws and planning schemes to incorporate stormwater management. Many councils are also awaiting the outcomes of various projects currently being undertaken, so that they can simply incorporate that knowledge and information. The MAV/SIAV Capacity Building project is designed to develop the information many councils and other organisations require to help them properly manage stormwater.



Improvement to building site practices for stormwater protection (Kingston City Council)

City of Kingston has commenced a project to reduce the pollution of stormwater from residential building and construction sites. Soil, sand, sediment and litter have been identified as the most common pollutants coming from building sites that damage the stormwater system, creek and bays. Activities of particular concern that will be targeted by Local Laws Officers include: onsite litter, sediment discharges, mud on roads, deliveries and storage of sand, soil or screening and concrete washings, paint and thinners (chemicals). To avoid a fine, operators can use on site bins and netting, confine bricks, tile and concrete cutting to the site, do not wash paint, plaster or concrete washing into stormwater drains, clean vehicle wheels of excess mud on site, place and store all stockpiles of sand, soil and screenings on site and put in place filters/barriers to prevent sediment entering drains.

Local Law 5, Section 10, Building Site Stormwater Code of Practice

The objectives of the 'Building Site Stormwater Code of Practice' (BSSCP) is to:

- reduce stormwater pollution due to building site activities
- improve site safety and amenity
- reduce damage to council assets.

The BSSCP has been incorporated by reference into Council's Local Law Number 5.

Local Law 4, Schedule 4, Protecting Stormwater

The local law requires:

- Application and fee required to use nature strip.
- Application and fee required to use road and provide indemnity.

Useful supplier information

City of Kingston supplies a list of contact details for information only to help direct operators to the type of services available to help prevent stormwater pollution.

7.2.5 Capacity building

Protecting our Bays and Waterways—Capacity Building Project (MAV & SIA Victoria)

This project aims to deliver best practice urban stormwater management capacity building to all councils and stormwater professionals and partitioners across Victoria. It aims to develop skills and knowledge in relation to stormwater management across all work areas and assist in promoting a cooperative culture for effective implementation. The project consists of three stages:

- design and investigation of capacity building needs
- devolvement of knowledge building materials
- delivery of products to all Victorian council, professionals and practitioners.



Capacity building refers to a holistic approach to knowledge building/transfer, identifying issues of relevance and benefit to foster professional skill development, competency, innovation, creativity, confidence, certainty and clarity. Capacity building is also a means to facilitate network building, linkages and training for continuous improvement.

CRC for Catchment Hydrology

A key performance indicator for the CRC for Catchment Hydrology will be the level of adoption of research outcomes.

7.2.6 Non-structural recommendations

In summary, Council should:

- ensure that they continue to be aware of developments in local government planning and local laws and adopt relevant parts;
- become involved in projects that address specific issues to ensure that they are continually at the forefront of stormwater management techniques;
- ensure that all staff are made aware of updates and changes to State and local government legislation to ensure that they are up to date and have a better multidisciplinary understanding of stormwater management.

7.3 WATER QUALITY MONITORING

Although changing over the last couple of years, the lack of quantitative data on the performance and costs of structural and non-structural stormwater quality improvement practices, has limited the ability of best practice options to be fully and openly incorporated.

There are many well known and approved techniques, manuals, laboratories, sampling regimes and other best practice protocols available for water quality monitoring. However, water quality monitoring is usually an expensive and long-term proposition. Organisations such as EPA and Melbourne Water have collected decades of water quality data from waterways all over the state and metropolitan Melbourne and are used primarily to test for temporal trends in water quality.

The following websites were visited to obtain water quality information:

- Victorian Water Resources Data Warehouse
- Environment Protection Authority
- Melbourne Water
- Waterwatch.

7.3.1 Victorian Water Resources Data Warehouse

The Victorian Water Resource Data Warehouse website allows the general public to gain access to water quality data collected by agencies around the State.



7.3.2 Environment Protection Authority

State Environment Protection Policies (SEPPs) are declared by the Governor in Council under Section 16(1) of the *Environment Protection Act 1970*. SEPPs provide a framework for environmental decision-making and a clear set of publicly agreed environmental objectives that all sections of the community must work together to achieve. SEPP (Waters of Victoria) was declared in 1988 to provide a general framework for the protection of beneficial uses of water across Victoria. It addresses both point and diffuse source pollution, and many of the attainment program provisions are relevant for the management of potential sources of contaminants to Port Phillip Bay. The primary goal Schedule F6 Waters of Port Phillip Bay is to protect the beneficial uses of the Scheduled area (Port Phillip Bay) by minimising the adverse impacts of waste discharges and other impacts associated with human activities. This includes nutrient, sediment and stormwater management programs.

The EPA also undertakes an intensive water quality monitoring program across the State, including the metropolitan waterways. This data is available in numerous reports and on the Victorian Water Resource Data Warehouse website.

7.3.3 Melbourne Water

Melbourne Water undertakes biological and physiochemical monitoring of waterways in the Melbourne metropolitan area. A range of parameters are measured at varying frequencies and reported annually against SEPPs objectives. This data is now also available from the Victorian Water Resource Data Warehouse, as well as Melbourne Water's website and their annual environment reports.

7.3.4 Waterwatch

Waterwatch is a community based and council supported water quality monitoring program. It is an important element in the conservation of waterways. Data is collected by monitoring groups using nationally adopted protocols for nine parameters which include macro-invertebrates, dissolved oxygen, temperature, pH, conductivity, turbidity, reactive phosphorus, nitrogen and riparian habitat assessment.

While this monitoring program is excellent in being used to raise the involvement of the community and to provide information to resource managers, it has a minor role in assessing stormwater management.

7.3.5 Constraints to water quality monitoring

The length of time and number of samples taken for a monitoring program will be totally dependant on the expected outcomes. Short intensive programs may be used to gain an understanding of a water body for a particular snapshot in time. It will not tell you what happens tomorrow or what happened last week. Biological monitoring using invertebrates may give an indication of longer term water quality conditions, but is very expensive and time consuming to be undertaken in a scientifically correct way.



Water quality monitoring is usually based on data collected over a long length of time (minimum 5–10 years) and a set frequency of sampling. This involves a strict adherence to monitoring, sampling analysis protocols and is very expensive. No council would have the resources to effectively monitor waterways in the long term (10–20 years). Many small monitoring programs are not correctly designed to collect meaningful data. Constraints to effectively monitoring data include: cost, length of time; frequency; adherence to protocols for sampling and testing; requirement to outsource analysis (although some limited parameters may be undertaken if the correct equipment is purchased and calibrated continuously); statistically sound interpretation of data and sampling frequency.

Financially it is beneficial for council to use existing data collected by agencies and research institutions that is readily available on the public access databases such as the Victorian Water Resources Data Warehouse, Melbourne Water and Waterwatch.

If resources become available to undertake an intensive monitoring program, council should liaise with the CRC for Catchment Hydrology, EPA or other organisation with similar skills in monitoring relevant to their program to ensure that results are meaningful.

7.3.6 Water quality recommendations

In summary:

- Council should make use of the water quality data available from Melbourne Water and the EPA:
- expert advice should be sort when designing any water quality monitoring;
- monitoring programs should be targeted and project specific.

7.4 COMMUNITY SATISFACTION

Community involvement in environmental issues varies between councils. Some community groups are issue based while other are only issues in their small patch. All are equally important for council to meet their community expectations.

The general community may only contact the council if they are directly affected by an incident, even if they contribute to the incident, e.g. septic tank discharges to the waterways and drainage system, rubbish and waste left in streets and blocked stormwater drains.

Many councils, government organisations and private industries undertake various types of community satisfaction surveys for various reasons. These may be for branding, service provision or to identify issues that need to be addressed. They tend to be project driven, although some councils undertake a general survey that covers all service areas.



Community satisfaction with stormwater will vary greatly depending on local climatic conditions. With seven years of low rainfall, stormwater issues tend not to be foremost in the communities' level of importance with regard to key environmental issues. Many people still see stormwater as a flooding issue and not water quality. Visual aspects of water quality are more prominent in peoples' minds as litter is easy to see, while nutrients are not. Sediment and other organic matter are usually seen as something more natural and therefore not an issue unless they block a drain or waterways or cause some other obvious problem.

As part of its work into non-structural stormwater best management practices, the CRC for Catchment Hydrology have developed guidelines for monitoring and evaluation of non-structural BMPs. It identifies different types of monitoring to suit BMPs and suggests where further information may be found.

7.4.1 Community satisfaction recommendations

In summary:

- use the CRC for Catchment Hydrology guidelines to help develop, monitoring and interpret monitoring programs;
- identify information gathered by other councils and agencies to establish if it can be used for baseline and benchmarking.

7.5 DOMESTIC WASTEWATER PROGRAM

Septic tank management is an issue with many municipalities, not just in the rural areas, but also the urban fringes of metropolitan Melbourne, Manningham is one such council. Responsibility for domestic septic tanks rests with local government to issue permits for their installation and operating. However, over the last few decades, previously acceptable practices for septic tanks are not any longer and revoking or reviewing that permit to reflect best practice is generally not possible. Many septic tanks discharge off-site to stormwater drains or road side drains, and in some areas grey water (non-toilet wastes) discharge directly to stormwater without the benefit of septic tanks' 'treatment'.

Septic tanks require regular maintenance (every 3–5 years) to ensure effective and efficient treatment. This fails to happen with many tanks and some home owners being unaware that the property is serviced by a septic tank. Other septic tanks are badly sited or not suitable for the soil type they have been installed in. In the past, councils allowed houses to be built and connected to septic systems with of the understanding that reticulated sewer would be installed through the area in the 'not too distant future'. In many cases this has not happened. Other areas and costs have taken priority.

The Code of Practice—Septic Tanks (EPA 1997), identifies how septic tanks should be installed, the type of situation where they should and shouldn't be installed and other engineering requirements. However, there have been many housing lots built with septic tanks that do not meet these requirements.



Responsible authorities need to identify where they have off-site issues with septic tanks and develop strategies to meet these issues. Waiting for water authorities to install a reticulated sewerage system that could be 10–20 years away is not the answer. While waiting for this to happen waterways and drainage systems are being polluted by off-sites discharges from septic tanks. There is a need for the local community, including council, to identify alternative options and manage the issues now, not wait for decades for someone else to fix the problem.

7.5.1 Municipal On Site Domestic Wastewater Management Project (DWMP), October 2001, MAV

The DWMP was instigated in response to possible changes to EPA legislation regulating septic tanks. These changes involve the requirement to develop a domestic waste management plan which would form part of a range of management activities undertaken by councils in addressing domestic wastewater in their municipality. A comprehensive planning and implementation resource guide is being developed to assist councils in planning for and managing domestic wastewater issues. The guide will provide councils with a range of information to support the process outlined in the Model Plan and showcase a series of case studies and management options based on the experience of other councils that have developed a DWMP. The proposed Plan would provide:

- councils with a strategic planning tool to allow long-term strategies to be developed for septic tank management;
- a framework for making decisions about individual installations;
- a strategic framework for enforcement and compliance options;
- a strategic framework for costing and funding septic management within a municipality;
- a framework for liaison between councils and water and catchment authorities.

7.5.2 Septic tank legislation

Environment Protection Authority

The *Environment Protection Act 1970* (the Act) defines a septic tank system as including any system for the bacterial, biological, chemical or physical treatment of sewage, and includes all tanks, beds, sewers, drains, pipes, fittings and appliances and land in connection with the system. The Act regulates and controls septic tanks systems in Victoria. The EPA administers the Act and the main regulations and codes under the Act. The systems must have a certificate of approval from the EPA and be installed and maintained according to permit conditions and manufactures instructions. At a State level the EPA's responsibilities for the management of domestic wastewater include:

- the declaration of State Environment Protection Policies setting environmental objectives to be achieved;
- establishing standards for discharge to surface water and off-site;



- approving the design and type of septic tank systems which can be installed and for the issue of a permit to install a septic tank system;
- the publication and updating of the Septic Tank Code of Practice and information bulletins;
- receipt and collation of councils annual returns to enable the EPA to identify trends
 impacting on the environment in sensitive areas and to provide a basis for future
 domestic wastewater planning and research;
- the EPA or a delegated agency of the EPA is empowered to serve pollution abatement notices under the Act, where a septic tank is causing or likely to cause pollution or is failing to comply or likely to fail.

Relevant EPA publications include:

- EPA Code of Practice—Septic Tanks (EPA 1996)
- Land Capability Assessment for On-site Domestic Wastewater (EPA 2001).

The documents provide technical information on design and installation of septic tanks systems, and guidelines for the assessment of land for its suitability to contain wastewater onsite.

Council responsibilities

Councils are responsible for the administration and management of septic tanks systems under Part IXB of the *Environment Protection Act 1970* including the approval and supervision of the installation of new septic tank systems, as well as monitoring the operation of existing systems. Given Council's obligations under the *Environment Protection Act 1970* and the Septic Tanks Code of Practice, they should refuse to issue a permit if a proposed system is not of a type approved by the EPA for use in Victoria, or if its use would be contrary to any declared State Environment Protection Policy (SEPP). (MAV 2002b)

Under SEPP (Waters of Victoria), councils are responsible for ensuring new residential subdivisions are provided with reticulated sewerage at the time of subdivision or that the allotments are capable of treating and containing domestic wastewater within the boundaries of each allotment. Council's statutory responsibilities include:

- the issue of permits to install new septic tank systems or alter existing septic tank systems;
- the issue of certificates to use a septic tank system;
- ensuring compliance with conditions on permits and certificates;
- the submission of an annual return to EPA containing information on septic tank system approval and inspection programs;
- ensuring that planning permits are not issued for any unsewered subdivisions, unless wastewater can be contained on-site.



Every septic tank system requires a permit to install the system and a final permit to use the system. For domestic systems and small commercial operations where the daily flow of waste is less than 5,000 L/d, the permits are issued by the local council.

The Environmental Health Officer (EHO) is the council officer responsible for managing the legislation on behalf of council. Council planning staff are responsible for the issuing of permits for siting and use of septic tanks in new developments. A survey undertaken in 2001 by EPA and Australian Institute of Environmental Health (AIEH) identified that of seventy-eight councils in Victoria, sixteen councils had none or very few septic tanks and fifty-five councils had a number of domestic on-site systems, of which 82.5 per cent of these were conventional septic tanks.

Local government policy

Recent legislation emphases that compliance with legislation rests with the property or business owner and with the government or the regulating authority. The approach by government now is that compliance is to be demonstrated by the person being regulated and not by the regulator, and is similar to approaches being taken with other legislation.

The Municipal Association of Victoria (MAV) reports also identify best value and risk management issues with managing septic tank systems. Both identify the need for council to protect the community from disease and injury, and that the requirement is to manage wastewater services effectively.

Two court cases in Victoria and New South Wales clearly identified the need for councils to discharge their statutory responsibilities otherwise they may be held liable if a person is adversely affected. Councils need to 'demonstrate management of their duty of care through carefully established policies and procedures, and the performance of statutory decision-making, particularly when the result of decisions on permits, allows a wastewater management system to operate or continue to operate that ultimately has the potential to harm human and/or environmental health' (MAV 2002b). Arguing a lack of resources is not a defence to support any lack of action.

The Manningham Domestic Wastewater Management Plan June 2002 summarises common adverse issues in relation to wastewater management. The most common issues appear to be inaccurate information and systems problems held by Council on where these wastewater systems are; proper planning requirements not followed either internally or externally and lack of knowledge by home owners of their wastewater systems.

Options and actions identified in the DWMP are limited to developing a database to identify where wastewater systems are located and their need for maintenance, wastewater systems owners' information about septic tanks and their maintenance requirements and lobbying the local water authority (Yarra Valley Water) to backlog sewer, especially the Parks Orchards area. Given that Yarra Valley Water has informed Council backlog sewering in the Manningham area is likely to be in excess of twelve years (Manningham Environmental Health Officer), alternative options need to be considered to stop the human and health threats currently occurring in waterways and drains in the municipality.



7.5.3 Domestic wastewater program recommendations

Many councils have information available on their websites or at council offices about the regulations governing septic tank systems. Issues are now arising regarding the change in environmental thinking regarding off-site discharges from these types of systems. Permits have previously been issued where sullage and/or the treated waste from septic tanks were allowed to discharge to a road side drain or drainage line. This is no longer acceptable practice and with many septic tank systems not maintained correctly. The quality of water in these drains fails to meet water quality and health standards.

Manningham City Council is involved in DWMP project. The Council has several problems areas with septic tanks, some due to the land not being suitable for septic tanks and others due to maintenance issues.

In summary, Council should:

- identify strategies and options to address wastewater issues;
- begin to implement actions to address adverse environmental effects immediately, not just develop a registry of where septic tanks exist;
- ensure compliance and enforcement of permit conditions and other legislation in relation to new and existing wastewater systems;
- inform new and existing land owners of their legal responsibilities and that these will be enforced.



8 Implementation plan update

Updating the implementation plan required a review of what had been achieved by Council to date and the reasons why other actions had not been implemented. SWMPs and their implementation plans are being reviewed every three years and allow Council to reassess the status.

8.1 MANAGEMENT FRAMEWORK AND REACTIVE MANAGEMENT STRATEGIES

There are eighty-four actions within the sixteen strategies identified in the implementation plan. The Council's implementation plan status report (adapted from the original SWMP Implementation Plan) has been used as the reference documents. A copy of this is attached in Appendix A. Items 1 to 38 are actions identified in the Management Framework Strategies and Items 100 to 145 are actions from the Reactive Management Strategies. Refer to Appendix B for the original Management Framework Strategies and Appendix C for the Reactive Management Strategies. Table 8.1 outlines the implementation status of actions from the management framework and reactive management strategies.

Table 8.1 Breakdown of the status of the implementation plan actions

	Management framework strategy actions	Reactive management strategy actions
Total no. actions	38	46
Total no. actions implemented	23	17
% of actions implemented	60	37
Total no. actions partly implemented	0	4
% of actions partly implemented	0	9
Total no. actions not implemented	14	23
% of actions not implemented	37	50
Total no. actions that will not be implemented	1	2
% of actions that will not be implemented	3	4

Actions were considered to be implemented if they were completed or had commenced. Sixty per cent of the management framework actions (23 actions) and 37 per cent of the reactive management actions (17 actions) have been implemented by the Council to date, covering a number of responsibility areas within Council. Nine per cent of the reactive management actions (4 actions) were partly completed. These actions are identified in Table 8.2.



8.2 UPDATED IMPLEMENTATION PLAN

The updated implementation plan identifies the status of all actions in the original plans. Each action has been updated regarding its status and estimated costs. As a result of comments made during the staff interviews in Stage 1, the responsible unit within Council has also been changed in some instances.

Where possible, similar actions were merged together (indicated by the action numbers) and the terminology was refined to ensure uniformity. See Section 4 for further details.

The implementation plan has also been rearranged to merge the two types of strategies (reactive and management framework) into the one table but separated by the identifier in the first column: Management Framework Strategies (MFS) and Reactive Management Strategies (RMS). Actions have also been grouped into their responsible units to make it easier for a unit to quickly identify their actions.

The updated implementation plan is attached in Appendix D. An indicative 5 year implementation plan is provided in Appendix E.

8.3 COSTINGS AND RESOURCE ALLOCATION

The cost of all actions was also reviewed and some changes made or others allocated. Excluding staff time/costs, the updated implementation plan involves capital costs of \$2,204,000 and on-going annual costs of \$452,500. The breakdown is shown below in Table 8.2.

Table 8.2 Breakdown of capital and on-going costs

Item	Capital (\$)	On-going (\$)	Implemented (\$)	Capital new costs (\$)
GPTs	335,000	83,000	0	335,000
Wetlands	404,000	30,000	0	404,000
Other mixed structural	922,000	159,000	250,000	672,000
Stability works	195,000			195,000
Stormwater officer	70,000	60,000	70,000	0
By-law officer and administration	55,000	50,000	0	55,000
Changes to waste collection	5,000	5,000	0	5,000
Education and training	134,000	50,500	15,000	119,000
Reporting and monitoring	60,000	15,000	40,000	20,000
Planning framework changes	24,000	0	5,000	19,000
Total	\$2,204,000	\$452,500	\$380,000	\$1,824,000
Total with savings	\$1,909,000	\$302,500		\$364,800/y over 5 year plan



8.3.1 Possible capital savings

There are some areas where savings can be made by further combining actions or consolidating actions. The stormwater officer role and the by-law development and administration could be merged into one project and savings of up to \$50,000 could be obtained. Depending on timing, actions within the education and training areas could also be consolidated or undertaken jointly to make substantial savings in production of brochures and other literature, possibly saving another \$50,000. The stability works are identified in the plan as being the responsibility of Melbourne Water, therefore a further \$195,000 could be saved.

8.3.2 Possible on-going savings

The on-going annual costs can also be reduced by merging the stormwater officer role and the by-law administration resulting in a possible saving, up to \$50,000. Once fully implemented, the structural treatment measures have estimated annual maintenance costs of \$272,000. This appears to be high and there would seem to be room to make substantial savings within this contract, possibly as much as \$100,000.



9 Guidelines

The guidelines have been developed to guide Council in designing monitoring and reviewing programs for key elements of their implementation plan. Completing the action is the easy part, monitoring the effectiveness of a program is much more involved but just as important.

9.1 INTRODUCTION

The guidelines have produced to assist Manningham City Council design monitoring and review programs for five key elements: structural and non-structural treatment measures, water quality, stakeholder satisfaction and domestic wastewater. Using information gathered during the best practice management review, a range of monitoring options were identified for each element. The effectiveness of each option was assessed and a monitoring option recommended. Notes were provided on when and how to report (generally annually during current reporting regimes) and information was supplied on the rationale and responsibility and estimated budget (where possible) for the recommended option. References (and hyperlinks) were supplied to help Council staff further research required action.

The purpose of information about each guideline is described below. The guidelines are attached in Appendix F.

9.1.1 Guideline No. 1: Monitoring the effectiveness of structural treatment measures

The purpose of Guideline No. 1, Monitoring the effectiveness of structural treatment measures, is to develop a program to monitor the effectiveness of structural treatment measures identified within the Manningham Stormwater Management Plan, in improving stormwater quality. The guideline builds on work already done on current projects within Manningham City Council and will apply to future projects. The guideline:

- identifies the categories of structural treatment measures in use or proposed to be installed in waterways within Manningham;
- identifies best practice structural treatment measures monitoring techniques available, including a contacts and reference list to aid Council in preparing a Council specific program;
- provides a suggested structural treatment measure monitoring program;
- identifies any current structural treatment measure monitoring programs being undertaken by Manningham City Council, who the key stakeholders are for Manningham and what Council's expectations are of the monitoring program (where available).



9.1.2 Guideline No. 2: Monitoring the Effectiveness of Non-structural Measures

The purpose of Guideline No. 2, Monitoring the effectiveness of non-structural treatment measures, is to develop a program to monitor the effectiveness of structural treatment measures identified within the Manningham Stormwater Management Plan, in improving stormwater quality. This guideline is based on best practice within an emphasis on the work carried out by CRC-Hydrology Catchment. The guideline:

- identifies the categories of non-structural treatment measures in use or proposed to be installed in waterways within Manningham;
- identifies the current non-structural treatment measure monitoring programs being undertaken by Council, who the key stakeholders are for Manningham and what Council's expectations are of the monitoring program;
- identifies best practice non-structural treatment measures monitoring techniques available, including a contacts and reference list to aid Council in preparing a Council specific program;
- provides a suggested non-structural treatment measure monitoring program.

9.1.3 Guideline No. 3: Monitoring water quality

The purpose of the Guideline No. 3, Monitoring water quality, is to use existing data (collected by Council and external agencies) to develop a reporting program on the water quality of the waterways in the municipality. The guideline:

- provides an overview of the relevant legislative framework affecting water quality monitoring within Victoria;
- identifies the commonly monitored water quality indicators and their respective targets;
- identifies current water quality monitoring activities being undertaken for waterways within Manningham;
- identifies the range of key stakeholders who have both a general interest and regulatory responsibility for water quality monitoring within Manningham;
- identifies the key considerations in the design of an effective water quality monitoring program;
- provides a suggested water quality monitoring program designed specifically for the waterways within Manningham.

9.1.4 Guideline No. 4: Monitoring stakeholder satisfaction

The purpose of Guideline No. 4, Monitoring stakeholder satisfaction, is to develop a model community survey to ascertain the perceived success or otherwise of the Manningham Stormwater Management Plan. It is intended that the survey would be for informed stakeholders. The guideline:

- identifies the key internal and external stakeholders within Manningham City Council:
- outlines the key considerations in designing a stakeholder survey;



• provides a suggested survey for use when consulting with internal and external informed stakeholders.

9.1.5 Guideline No. 5: Domestic Wastewater Management Plan

The purpose of Guideline No. 5, Domestic Wastewater Management Plan (DWMP), is to develop measures and activities to assess the effectiveness of the DWMP in achieving the aims of the Municipal Public Health Plan and reducing the impacts of domestic wastewater on local and remote receiving environments. The Guideline includes spot water quality monitoring and has been developed in consultation with the Manningham Health & Local Laws department. The guideline:

- provides an overview of the relevant legislative framework affecting domestic wastewater within Victoria;
- identifies the commonly monitored indicators related to domestic wastewater;
- provides an overview of the City of Manningham's approach to domestic wastewater management, including the Municipal Public Health Plan and the Domestic Wastewater Management Plan;
- identifies priority water quality monitoring areas within Manningham with regard to domestic wastewater;
- provides a suggested monitoring program designed specifically for the domestic wastewater issues within Manningham.



10 Conclusion

10.1 STORMWATER AWARENESS

Overall, Council staff's understanding of the SWMP and the implementation plan was very good. There appeared to be a general awareness of what was happening in other units and at a corporate level.

Many of the actions are being implemented, others have been flagged to be implemented (if funding occurs) and a small percentage will only be implemented if resources become available. There were several actions that will be delayed pending the outcome of projects being undertaken by other Councils, State and local organisations.

Corporate support of actions and programs was regarded as excellent as long as they were identified in approved work corporate programs.

The largest criticism of the entire process was the lack of follow-up and enforcement resources. Nearly every interviewee commented on the fact that while all the site management plans and permit conditions. were great and raised the communities awareness, they were rarely if ever, monitored, reviewed or enforced.

Another issue was that some staff still thought that they did not have enough knowledge to enable them to confidentially know what should be included on a permit or site management plan or answer a question if required.

10.2 BEST PRACTICE OPPORTUNITIES

Manningham City Council has developed a leadership role in their decision to undertake a review of their SWMP to ensure that the Plan contains best practice recommendations and to develop guidelines to monitor the implementation of the SWMP.

The CRC for Catchment Hydrology has undertaken a large amount of research in this area over the last ten years. As a result this information was relied on heavily in the review. CRC for Catchment Hydrology is currently developing many tools to help stormwater managers be able to better make decisions about the type of actions to undertake when addressing stormwater quality issues and how to monitor and evaluate their effectiveness. The Manningham City Council identified five key elements that they wish to focus on to develop monitoring and evaluation guidelines.



Non-structural treatment measures

Non-structural techniques involve community education and awareness programs, planning and local laws, some WSUD options and temporary sediment controls measures during construction. Research indicates that compliance with non-structural techniques works best if there is a proper enforcement program also undertaken. Failure to adhere to permit conditions or use techniques to protect stormwater quality is mainly due to lack of knowledge, particularly with regard to the likelihood of there being any follow-up or enforcement of the conditions.

Structural treatment measures

To meet best practice, structural actions to improve stormwater quality need to be properly designed and sited to suit the location and the type of waste to be collected. Not all gross pollutant traps will suit all locations. Proper design using techniques and guidelines available from CRC for Catchment Hydrology should ensure that gross pollutant traps work effectively and efficiently.

Water quality

Water quality monitoring can be an expensive way to collect information that may not produce any meaningful results. Agencies such as EPA and Melbourne Water have been undertaking water quality monitoring throughout Victoria for decades, including sites on most of the waterways in the municipality. This information is easily available in reports or on relevant websites and would be the Council's best options for accessing.

Undertaking some specific water quality monitoring of septic tank area, where a small number of parameters are required for period of time may be required, but should be undertaken in consultation with experts who can help to correctly design programs to meet the required outcomes.

Most importantly, there is a need to develop baseline monitoring before actions are undertaken.

Community awareness

Community awareness varies considerably in the municipality and generally relates to a persons involvement in organised groups. Part of this project (Stage 3), is to develop a community satisfaction questionnaire about stormwater management. The CRC for Catchment Hydrology has developed some guidelines for monitoring and evaluating non-structural practices, including education programs. These will be used when developing the questionnaire.

Domestic wastewater management plan

Manningham City Council is actively involved in a VSAP funded project to develop guidelines and a model plan for improved management of domestic wastewater management systems in Victoria. The Council has developed a DWMP that identifies the Council database and systems on septic tanks in the municipality to be totally inadequate. The DWMP identifies Park Orchards as a priority area, but does not propose any actions immediately address the known off-site water quality issues.



10.3 REVISED IMPLEMENTATION PLAN

The updated implementation plan updates the status of all actions within the plan and reviewed the costs involved. The total estimated costs for implementing the plan, excluding staff time/costs are \$2,204,000 for capital and \$452,500 for annual ongoing. However, as discussed in Section 8, there are opportunities for further cost savings.

The implementation plan is dynamic enough that Council units are able to choose which actions to implement each year and incorporate them into their work plans. By ensuring that all planning framework actions are implemented, reactive actions would then have an appropriate framework to work in and regulatory support.

With full implementation costs of over \$2 million for capital and \$450,000 for ongoing, Council needs to allocate implementation over five years. An indicative five year implementation plan has been developed and is provided in Appendix E. Estimated ongoing annual operational costs have also been included for the five years.

As discussed in Section 8, these costs could be further reduced to \$1,909,000 and \$302,500, respectively with consolidation and/or undertaking actions jointly. As shown in Table 8.2, taking into account projects that have been completed during 2003 or will not be implemented due to priority changes the new cost of the implementation is \$\$1,824,000. Undertaken over a five year program, this equates to approximately \$348,800 per year. Any external funding or grants will further reduce these costs.

Ideally the current remaining actions should be completed within two to three years, at which time another full review of priorities and appropriate actions should be undertaken.

The reference list attached in Section 11 provides a full comprehensive listing of not only documents cited in this report, but also includes a range of other helpful references.

10.3.1 VSAP

EPA Victoria's urban stormwater program, VSAP, is part of the Victorian government's 'Greener Cities' policy, and was launched by the Victorian Government in June 2000. The Victorian Government allocated \$22.5 million over three years to improve the environmental management of urban stormwater in Victoria.

A key component of VSAP is a three-year grant program to assist local government with the development and implementation of their Stormwater Management Plans. Funding assistance is to be matched by local governments on largely a dollar for dollar basis, for priority projects in Stormwater Management Plans.

Only local governments can apply for VSAP funding, although other agencies and stakeholders are strongly encouraged to develop partnership projects with local governments.

VSAP was responsible for funding the Manningham Monitoring and Review Program and played a role on the steering committee and in providing comments.



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Appendix A

COUNCIL MODIFIED IMPLEMENTATION PLAN



Reactive Management Strategies

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Note that Actions relate to specific threats and catchments (refer to SWMP Vol 1, pages 28 - 35 for more details)

Code: Active – Actions currently planned. Inactive – No actions currently planned. Complete – Item is complete, no further action necessary.

				Estir	nate					
Туре	ltem	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
RMS	102	EA- MMC, RC&K C-6	Community and special interest group consultation: raise awareness of the impact of all priority risks amongst the wider community to increase support and understanding of Council initiatives.	Staff time- allow \$5,000	-	All units as relevant	Municipality wide	Very high	Inactive	
RMS	103	EA- MMC, RC&K C-8	Business stakeholder groups and committees: liaise directly with Chamber of Industry and Commerce groups, s hopping centre management, light industry and commercial business operators regarding waste management and stormwater management objectives.	Part of ongoing staff cost.		All units as relevant	Municipality wide	High	Inactive	
RMS	128	SC- JC-52	Site management plans: minimise pollution from construction sites by requiring a site management plan and conduct a site inspection to ensure compliance. The plan should address key issues including sediment and waste management. The best practice guidelines for urban stormwater provide an outline for these types of plans.	Publicise requirements for plan. \$5,000	Staff time to conduct site inspections. \$10,000	BC in consultation with PM, SP & EEP	Municipality wide	Very high	For discussion with Committee on way forward.	



				Estir	mate	•				
Type	ltem	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
RMs	104	EA- MMC& KC-1	Targeted literature/guideline development: preparation and distribution of brochures to address stormwater quality management issues and what residents and businesses can do to assist.	\$10,000- \$12,000 for basic brochures	\$3,000 per year to update	EEP in consultation with HLL & PM, EPA Victoria, YVW, MW, EcoRecycle, YCAC, neighbouring Councils	Municipality wide	High	Inactive Funding currently unavailable	
RMS	135	SC- MMC& AC-36	Rainwater storage and reuse (tanks): encourage in areas with larger blocks and the more rural parts of the municipality. Installation and promotion of tanks should be integrated with existing Water Week programme. Reduces water flor off-site and therefore flow of pollutants.	Cost to residents. Council to advertise and encourage.		EEP & BC to approve structures. Consult with YVW as a possible partner-use their brochure.	Municipality wide	Med.	Active Grant 0203 0084 received for investigation.	June 2004 Subject to funding.
	133	EA- MMC& AC-2a	Demonstration projects showing best practice: set up demonstration model (to scale) of a dwelling that has been designed to meet best practice stormwater management standards. Run school/university competition to build models and award prizes.	\$5,000 for prize and advertising	N/A	EEP & CLS	Municipality wide	High	Inactive For discussion with Committee	
	114	EA- MMC& KC-4	Commercial runoff abatement competition/awards: competition awarding prizes and publicity to winning business and light industries in the municipality who demonstrate practices that improve quality of stormwater runoff from their area.	\$15,000		EEP & PM in consultation with LeastWaste, EPA Victoria, co-sponsorship by local press	Municipality wide	Very high	Inactive For discussion with Committee.	
	125	EA- JC-1	Targeted literature/guideline development: preparation and distribution of brochures to residents, and construction contractors and to local chambers of commerce, industry groups.	\$10,000 to \$12,000 for basic brochure	\$3,000 per year to update	EEP in consultation with EPA Victoria, MW, and Marketing	Municipality wide	Very high	Inactive For discussion with Committee	



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Туре	Item	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
						Unit				
	140	EA- MMC& JC-2	Best practice demonstration workshops: demonstration of key best practice actions with regard to road construction sites.	Allow \$4,000 for preparation of material and staff time for each half- day workshop	Allow \$2,000 per year to up date material	EEP in consultation with H&LL & PM and seek support from DOI, EPA Victoria, MW, EcoRecycle and other municipalities	Municipality wide	High	In active	
	132	EA- MMC & AC	Targeted literature/guideline development: develop and prepare brochures for residents to raise awareness of how typical residential activities on stormwater quality and responsible water and waste management practices. Draw on EPA Victoria and other agencies materials	\$10,000- \$12,000 for basic brochure	\$3,000 per year to update	EEP in consultation with H&LL, PM, EPA Victoria, YVW, MW, EcoRecycle	Municipality wide, (especially MMC &AC)	Very high	Inactive For discussion with Committee	
	144	EA- JC-2a	Stormwater management and education workshops: develop and conduct workshops for developers and targeting development site runoff control measures. Conduct workshops from Council offices.	Allow \$4,000 for each half day workshop	\$2,000 to update material	EEP in consultation with PM, H&LL, DOI, EPA Victoria, MW, EcoRecycle and other municipalities	Municipality wide, especially MMC, JC	High	Inactive	
	126	EA- JC-2	Best practice demonstration workshops: develop and conduct a number of workshops from Council offices and/or at building sites.	Allow \$4,000 for each half day workshop	Allow \$2,000 per year to update material	EEP in consultation with SP, BC, DOI, EPA Victoria, MW, EcoRecycle and other	Municipality wide	Very high	Inactive For discussion with Committee	



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Туре	ltem	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
						municipalities				
	101	EA- MMC,J C&KC- 9	Training of relevant Council officers: train staff in best practice urban stormwater management. This includes training in water sensitive urban design, soil and water management principles, drawing upon available courses. It also includes training in awareness of the SWMP itself.	Staff time	\$6,000	EEP including input from EPA Victoria, MW, YVW, and VicRoads	Municipality wide	Very high	Active EEP conducted course in 2001. Grant 0203 0076 provides for training of outdoor staff.	On-going.
	143	EA- JC-1	Targeted literature/guideline development: preparation and distribution of brochures to building contractors and developers.	\$10,000 to \$12,000	Allow \$3,000 to update	EEP including input from EPA Victoria, MW, YVW, Mar & VicRoads	Municipality wide, especially MMC, AC, JC	Very high	Active New EPA Guidelines for construction sites would be useful for distribution. To be further discussed with PM	On-going
	110	IDC- MMC- 61	Establish a programme to monitor the effectiveness of the stormwater management plan. Key areas to monitor include: effectiveness of structural treatment measures; condition of receiving environment; conduct of and effectiveness of education programmes; and * litter reduction in the municipality.	\$20,000 to set up	\$5000 to undertake an annual review	EEP with the assistance of YVW, MW, EPA Victoria and integrate with the Waterwatch Programme	Municipality wide	Very high	Refer to Action 10.	



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Туре	Item	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
	134	STM- MMC& AC-35	Constructed wetlands: South of Gold Memorial Road, north of Beauty Gully/Husseys Lane and east of Harris Gully Road; Westerfolds Park to address sediment issues; and in Tikalara Park near Cliveden Crescent, west of Mullum Mullum Creek.	\$300,000 to \$404,000	\$20,000 to \$30,000	EEP, MW, Parks Victoria, and PM	Less developed parts of the municipality	Very High	Active Melbourne Water currently pursuing Tikalara Project. Balance to be pursued with	To be advised
	105	EA	Demonstration projects showing best practice: set up demonstration model (to scale) of a dwelling that has been designed to meet best practice stormwater management standards. Run competition to build models and award prizes.	\$5,000 for prize and advertising	N/A	EEP, SP & CLS	Municipality wide	High	Stakeholders Inactive Funding currently unavailable	
	111	EA- MMC& AC-2a	Targeted literature/guideline development: develop and prepare brochures for residents with septic treatment systems regarding their maintenance responsibilities, ongoing monitoring requirements and about responsible water and waste management practices.	\$10,000- \$12,000 for basic brochure	\$3,000 to update	H&LL in consultation with EEP, EPA Victoria, and YVW	Municipality wide, (especially MMC, AC and JC)	Very high	Inactive For discussion with H&LL.	
	108	RE- MMC,J C&KC -64	Infringement notification and fines: on the spot fines of the audit and inspection process for poor stormwater management and waste management. These can be developed and issued in relation to practices on development	\$50,000 to draft and implement the by-law	\$40,000 to administer and review	HLL	Municipality wide	Very high	In-active For discussion with Committee.	



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Type	ltem	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
		,	and building sites, infringements of proper waste management in commercial areas, unsatisfactory septic tank management and any other activity with the potential for negative impact.							
	113	RE- MMC& AC-62	Financial incentives for septic system upgrade and compliance audit certification, completed in the next twelve months. Individual residents on septic systems can install an approved septic system upgrade and undergone a compliance audit concerning responsible onsite waste and water management strategies to receive a rates rebate.	\$50,000 to draft and implement the by-law	\$40,000 to administer and review	HLL	MMC- specifically Park Orchards and Donvale	Very high	Inactive For discussion with Committee.	



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Туре	Item	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
	127	STM- JC-12	Near source treatment: require all building sites to install near source treatment measures.	\$50,000 to develop by- law	\$40,000 to administer	HLL	Municipality wide	High	Active Planning permit requirements for sedimentation pit now standard however needs to be supported by changes to Council policy and guidelines and possibly planning scheme. Does not address non-planning permit sites. Discussion required with Committee on how to capture all sites.	On-going
	100	EA- MMC, RC&K C-5	Media release: use local press opportunistically to advertise the impact of various activities on the environmental values of receiving waterways as a result of stormwater quality. Use the local media to highlight the development of the stormwater management plan, including associated	Staff time	Allow \$5,000 to overview	Marketing Unit	Municipality wide	Very high	In-active For discussion with Committee.	On-going.



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Туре	Item	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
			guidelines and brochures produced as a result of the plan. Also highlight competitions, workshops and periods of consultation planned. Will increase community awareness and advise them of opportunities available to them as individuals, groups or businesses.							
	106	SC- MMC, RC&K C-37	Street sweeping: assess the street cleaning programme and identify 'hot spots' where pollutants accumulate to increase the effectiveness of the street sweeping programme including commercial areas, main roads and construction areas.	\$5,000 for assessmen t		MM	Municipality wide	Very high	Refer to Action 36	
	107	SC- AC-38	Drain maintenance: monitor the accumulation rates of litter, silt and leaves in the drainage system during inspections and cleaning. This will assist in providing feedback on the effectiveness of the measures in place, and in adjusting maintenance practices to maximise effectiveness of treatment.	Staff time	Allow \$5,000 for recording	MM	Municipality wide	Very high	Refer to Action 33	
	123	SC- AC-42	Unsealed road maintenance: schedule grading to coincide with optimum moisture content in road material. Grade shoulders of roads to direct drainage away from tributaries. Review methods of maintaining table drains to minimise sediment and vegetation disturbance.		Incorporat e into existing maintenan ce schedule.	MM	Mostly rural or urban/rural/part s of municipality	Very high	Discussions to occur with MM on current need.	
	120	STM- KC- MW	Stability works. Along creek within Freeway Public Golf Course and Manningham Club and Conference Centre.	\$120,000		MW	Koonung Creek	High	Active Need to ascertain status from Melbourne Water	Melbourne Water to advise.



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Туре	Item	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
	131	STM- KC- MW	Stability works near intersection of Sheahans Road and Templestowe Road.	\$75,000		MW	RC	High	Active Need to discuss with VicRoads to ascertain program	To be advised



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Туре	Item	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
	116	STM- MMC,	In-line traps down stream of commercial			PM	KC &RC	Very high	Active	June 2004
		RC & AC	centres to address threats to Koonung Creek, Ruffey Creek and Yarra River. Possible locations:	# 50.000	#0.000				Projects shown in bold have	Dependant on funding
			Warrigul Bood and Varra Valley Bood	\$50,000	\$9,000				been funded for	
			Warrigul Road and Yarra Valley Road (Bulleen Plaza);	\$25,000	\$5,000				implementation	
			vicinity of Greenaway Light Industrial area; near corner of Seville and Parker Streets	\$45,000	\$7,000				in 2002~03. Further VSAP	
			(Templestowe Village);	\$15,000	\$2,000				applications	
			vicinity of Bulleen Plaza;	\$150,000	\$25,000				required by Oct	
			below ground along nature strip in Tram	ψ130,000	Ψ20,000				2002.	
			Road. (Westfield Shopping Centre); in vicinity of Tunstall Road and Russell	\$42,000	\$7,000				2002.	
			Crescent intersection. Alternatively two							
			smaller in-line traps closer to the Tunstall							
			Square Shopping Centre;	\$85,000	\$14,000					
			on Bullen Road and Calin Cres in the	ψ05,000	Ψ1+,000					
			reserve (Jackson Court Shopping Centre);	\$100,000	\$15,000					
			on Franklin Road and/or the laneway near	ψ100,000	ψ10,000					
			Blackburn Road (Devon Plaza);	\$90,000	\$15,000					
			in reserve near Irene Court and in-line traps	ψ50,000	ψ10,000					
			possibly in the Ted Ajani reserve							
			(underground) (Macedon Square); and	\$90,000	\$15,000					
			Council reserve near corner of Firth Street	ψ50,000	ψ10,000					
			and Beaconsfield Street (commercial and Light							
			industrial area).							
			industrial area).	\$50,000	\$15,000					
			At source control required at The Pines	ψου,σου	ψ.ο,σσσ					
			Shopping Centre as this centre drains to a							
			number of locations.	\$90,000	\$15,000					
				400,000	ψ.ο,οοο					
			At source control in vicinity of shops in George Street.	\$90,000	\$15,000					
			At source control near corner of Springvale							
			Road and Mitcham Road.							



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Type	Item	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
	117	SC- MMC& KC-46	Unloading and loading areas: audit unloading and loading measures to ensure pollution into the stormwater system is not occurring. Ensure pollution risks are accounted for adequately.	\$5,000 for random audit reports		PM	Commercial areas in municipality	High	Inactive	
	119	EA- MMC- 3	Consultation with Maroondah City Council, Melbourne Water , EPA Victoria, YVW and YCC to address management of pollutants originating from outside Manningham.	Officer time		PM	Mullum Mullum Creek	Very high	Inactive	
	121	STM- AC-19	Circular settling tanks: Falconer Road.	\$30,000	\$5,000 per year	PM	Andersons Creek subcatchment	Very high	Active Application to VSAP for funding required by Oct 2002	June 2004 (subject to funding)
	122	STM- AC-18	Sediment settling basins: possible locations include Gold Memorial Drive near but after junction with Husseys Lane.	\$20,000	\$5,000 per year.	PM	Andersons Creek subcatchment	Very high	Active Application to VSAP for funding required by Oct 2002	June 2004 (subject to funding)
	136	BS- MMC& AC-51	Roof water diversion: publicise the benefits of diverting roof water to grassed swales or otherwise pre-treat. Reduces total flows, scouring, sediment and nutrients entering the stormwater system.	Publicity and demonstrate best practice around Council buildings. As opportunities present.		PM	Municipality wide.	Med.	Inactive	



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Туре	Item	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
	137	SC- MMC& AC- 39a	Domestic waste and recycling collection: collection of general garbage, plastics and glass, paper and cardboard could increase to discourage irresponsible disposal.	Extra collection service cost (chargeable to ratepayers). Allow \$5,000		PM	Municipality wide.	Med.	Active Currently under consideration of	
	139	STM- MMC, JC & KC - 28	Grass swales: planning/design of roadworks to incorporate road medians, verges, car park runoff areas, and parks where appropriate. The grass swales should be located work in association with silt fences. For example, Park Road construction activity-review opportunity for use of sections of Alan Morton Reserve for a grass swale. Note: gradient may be a limiting factor.	Individual project cost		PM	MMC	High	Active. Assessed on a case by case basis	On-going.



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Туре	ltem	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
	142	SC- MMC,J C&KC -52	Site management plans: require site management plans for all construction activities, in particular to target sedimentation, erosion and waste management. Use Best Practice Guidelines (p. 91) as basis for preparation of plans.	Approx. \$10,000 for site audits		PM	Municipality wide.	Very high	Active. Assessed on a case by case basis	On-going
	145	SC- JC-52	Site management plans: minimise pollution from development sites by requiring a site management plan and conduct a site inspection to ensure compliance. Site management plans should specifically address soil and water management, vegetation retention and waste management.	Publicise requirements for plan. \$5,000	Staff time to conduct site inspections. \$10,000	PM	Municipality wide	Very high	Inactive Relates to Residential development. To be discussed with Committee of proposed action.	
	118	SSSP- MMC& KC-54	Develop Environm ental Management Plans (incorporating stormwater management issues) for key commercial areas or sites.	Contractor or business cost	Council cost in processing and auditing	PM & EEP in consultation with LeastWaste	Municipality wide	Very high	Inactive	
	109	RE- MMC,J C&KC- 63	Audit and inspection: conduct regular audits and inspections of contractors working on road works, building/development sites, residents with septic tanks, commercial operators within the municipality. Publicise audit process to raise awareness.		\$10,000 for 1 day per fortnight/y ear and \$10,000 for admin. support	PM & HLL	Municipality wide	High	Active Audit and Inspection currently undertaken by PM. Other unit practices to be assessed. Publicising of audit results to be discussed	On-going



Type	ltem	Numb	Proposed Action	Capital	Ongoing	Responsibility	Extent of	Priority	Status	Programmed
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Туре	Item	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
	129	STM- AC-23	In-line treatment: circular screens at Williamsons Road; Foote Street.	\$35,000 for smaller, precast unit	\$20,000	PM & MM	ММС	High	Active Application to VSAP for funding required by Oct 2002	June 2004
	141	STM- MMC, JC & KC - 23	In-line measure: sediment control measures required for the duration of construction.	Project based		PM & MM	MMC, JC & KC	Very high	Active. Assessed on a case by case basis	On-going
	115	EA- MMC& KC-7	Signage: in car parking areas regarding waste minimisation objectives (especially strip shopping centres). Locations include Tunstall Square, The Pines Shopping Centre, Westfield Doncaster Shoppingtown and Jackson Court Shopping Centre. Also, revisit drain-stencilling programme and identify outlet pipes with identification codes so that people wanting to report pollution events can easily identify them.	\$2,000 for signs	Allow \$500 for maintenan ce	PM for signage and drain outlet identification. EEP for drain stencilling	Strip shopping centres. Drain stencilling and identification at all appropriate locations	High	Active Currently unfunded. PM to prepare VSAP funding application for 2003~04 by Oct 2002.	June 2004 (Subject to funding)
	138	EA- MMC & KC- 1	Targeted literature/guidelines development: guidelines for road construction contractors regarding management of stormwater. EPA Victoria guidelines for major construction sites could provide a reference. Guidelines can be used to prepare EMPs.	\$10,000 to \$12,000	\$3000 for updating	PM in cons ultation with EEP and VicRoads	Municipality wide	Very High	Active Possibility of using Stormwater Protection Specification currently being developed by LGPro.	
	112	STM- MMC& AC- MW/Y VW	Extension of sewer system on the western side of Mullum Mullum Creek. Review opportunities to extend sewer system either further south of the service unsewered	YVW capital cost		PM, HLL in consultation with YVW	MMC & AC	Very high	Inactive	



				Est	imate					
Туре	Item	Numb er (refer App. C)	Proposed Action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Programmed Completion Date
			Donvale area or extend sewer east across Mullum Mullum Creek to enable sewering of Park Orchards area.							
	124	SC-AC	Alternative pavements: review the possibility of using alternative road sealing methods such as light weight pavements.	\$5000 to undertake study	-	PM, MM	Creek subcatchment	Very high	Council has approved light weight pavement program.	Complete
	130	STM- KC- MW	In-line treatment:			VicRoads and MW	KC	High	Active	To be advised
			* Litter traps, open space area south of Hampshire Road and Brindy Crescent, near	\$140,000	\$23,000				Need to discuss with	
			Wetherby Road, north of Koonung Creek. * Sediment pond (in open space area near	\$90,000	\$15,000				VicRoads to ascertain	
			intersection of High Street and Eastern Freeway). * Sediment pond, within vicinity of TAFE	\$20,000	\$20,000				program	



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Code: Active – Actions currently planned. Inactive – No actions currently planned. Complete – Item is complete, no further action necessary.

Item	Proposed action	Responsible Unit	Priority	Status	Programmed Completion Date
1	The Manningham Planning Scheme—specifically the Municipal Strategic Statement should be amended as follows:	EEP in consultation	High—to be prepared now	EEP to advise	
1.1 1.2	 Clause 21.02-13 Environment—could include reference to areas of significance in terms of waterways. 	with other units of Council to draft policies and amendments to MSS. and implemented at the next planning scheme review, which is due to take place during 2003.	•		
	 Clause 21.03 Drainage and sewerage—could include reference to stormwater quality management issues and that a municipal-wide SWMP has been prepared. 		planning		
1.3	 Framework Plan 7—could include reference to 'hot spot' areas for stormwater quality management, i.e., areas or issues causing greatest level of threat to identified values. 		take place		
1.4	 Under Clause 21.09 Natural Environment, a key issue, objective, strategy and implementation could be drafted for urban stormwater quality management. 				
1.5	 Under Clause 21.09 Non-urban areas —a key issue, objective, strategy and implementation citation could be prepared with regard to stormwater quality management, particularly with regard to unsewered areas, building site runoff etc. 				
1.6	 Under Clause 21.10 Open space—a key issue, objective, strategy and implementation citation could be prepared with regard to litter and waste management in parks and reserves and associated benefits to stormwater quality. 				
1.7	 Under Clause 21.12 Established urban areas —a key issue, objective, strategy and implementation citation could be drafted with regard to residential runoff and associated stormwater quality management issues. 				
1.8	 Under Clause 21.14 Commercial and industrial—a key issue, objective, strategy and implementation citation could be drafted with regard to commercial runoff. 				
1.9	 Under Clause 21.19 Drainage and sewerage—a key issue, objective, strategy and implementation strategy could be drafted in relation to overall stormwater quality management objectives. 				

Item	Proposed action	Responsible Unit	Priority	Status	Programmed Completion Date
2	Draft a local policy under the planning scheme that defines expectations with regard to development and use of land by Council, the private sector and other public authorities. The local policy should specifically refer to the need for current and prospective land owners (residents, commercial operators) to respond to the objectives of the SWMP when managing their properties and planning for future land use and development.	EEP in consultation with other Units to draft policies and amendments to the MSS.	High—to be undertaken no later than the next planning scheme review which is due to take place in 2003.	EEP to advise	
3	Prepare a series of standard planning and building permit conditions that relate specifically to the SWMP and the statements included in the MSS and local policies.	EEP in consultation with SP.	High.	EEP to advise	
4	With regard to the preparation of Land Management Plans and Environmental Management Plans—provide a series of performance objectives that relate to the objectives of the SWMP. These performance objectives can provide a guidelines for proponents or Council when plans are being prepared.	EEP to prepare in consultation in PM.	High.	EEP to advise	
5	As part of the statutory referral process, source feedback from Melbourne Water, Yarra Valley Water, EPA Victoria, Parks Victoria, VicRoads with regard to achieving best practice environmental standards with regard to stormwater management and sensitive urban design. This can be undertaken on a project by project basis or as a standard set of conditions.	SP	High.	Applications referred as appropriate.	On-going
6	During review of Local Laws, identify opportunities to integrate stormwater management outcomes.	H&LL	High—for residential development /building site runoff and litter.	For discussion with H&LL	On-going
7.	Secure Councillor and management commitment with regard to the recommendations of the Manningham SWMP.	Committee	Very high.	Council endorsed strategy 2001. Securing EMT / Management support on- going.	On-going
8. 8.1	Define roles and responsibilities for stormwater management with Council with regard to the following issues areas:	Committee	High.	Discussion required with	
8.2	• Installation and maintenance of structural infrastructure such as litter traps, in-line devices etc.			Committee	
8.3 8.4	 Implementation of sensitive urban design principles through the planning scheme and other statutory controls. 				



Item	Proposed action	Responsible Unit	Priority	Status	Programmed Completion Date
	 Development of community and other stakeholder consultation programmes. Development and implementation of enforcement measures with regard to stormwater quality management. 				
9	Identification of the need to consider the SWMP by tenders for relevant contracts where stormwater quality management is an issue.	PM	Medium.	Risk assessment undertaken for every next new project managed by PM. Need to check for other departments. For discussion with Committee.	On-going
10	Set up an appropriate reporting mechanism for ongoing monitoring of the stormwater system—in terms of litter, pollutant spills, ineffective structural controls (for example, where a device appears to be malfunctioning).	MM, PM	Medium.	To be addressed with Grant 0203 0082	April 2003
11	Provide a programme of technical training for Council officers with regard to implementation of best practice stormwater management guidelines. Opportunities for internal and external training and resources should be identified. Training should be integrates with the existing staff development programme and with EMS training programme.	EEP	High.	For discussion with Committee.	Jan 2003
12 12.1 12.2 12.3 12.4	Establishment of operational benchmarks for Council activities: open space management and maintenance road maintenance street cleaning drainage maintenance.	MM, PM	Medium.	To be addressed with Grant 0203 0082	
13	Review of contract specifications regarding stormwater quality control for construction projects	PM	Medium.	On-going as improvement opportunities identified for projects managed by PM. Need to check for other	On-going



Item	Proposed action	Responsible Unit	Priority	Status	Programmed Completion Date
				units.	
14	Review contract specifications for MM to enable them to implement measures relevant to stormwater quality control in their maintenance activities.	MM	High.	For discussion with MM.	
15	Incorporate stormwater quality control measures in all new drainage design and upgrade drainage designs.	PM	Medium.	Quality measures incorporated as appropriate.	On-going
16	Investigate the use of light weight and alternative pavements to treat unsealed roads to minimise sediment runoff.	MM	High.	Council adopted a 5-year lightweight pavement program in 2001.	Complete
17	Designate a committee responsible for the implementation of the plan throughout Council's Units. The Committee will also be responsible for ensuring that an internal awareness/education campaign is undertaken to inform Council officers of their role in ensuring the effective implementation of the plan.	Committee	High.	Committee to finalise	July 2002
18	Identify a Council officer who is responsible for all enquires particularly those of proponents with regard to statutory requirements of the SWMP.	Committee	Very high.	Res Code Review recently addressed this issue. Roles defined as per Report to Council June 2002	Complete
19	All Council officers who regularly use the planning scheme provisions, should attend an in-house workshop/seminar with regard to the application of the SWMP and how it is reflected in the planning scheme.	OD with the assistance of EEP and the Committee	High.	For discussion with Committee.	
20	Provide an opportunity for exchange of information relating to stormwater management practices. For example, lunchtime forums with guest speakers and presentations by Council officers.	Committee, OD & EEP	Medium.	For discussion with Committee.	
21	Identify opportunities for joint seminars, brochures for specific issues areas. For example:	EEP & H&LL	Medium.	For discussion	
21.1	 workshop / information seminar for residents with on-site sewage treatment systems and off- site sullage disposal—Council, EPA Victoria and Yarra Valley Water; 			with Committee.	
21.2	• review opportunities for a seminar undertaken in association with the Port Phillip CALP board.				
22	Identify opportunities to work with adjoining municipalities in addressing 'regional' stormwater	Committee	Medium.	Current joint	On-going



Item	Proposed action	Responsible Unit	Priority	Status	Programmed Completion Date
	management issues such as commercial runoff; upstream inflows and residential runoff. Adjoining municipalities include: Nillumbik, Maroondah, Whitehorse, Boroondara and Banyule. Possibly review the option of having a working party with representatives from each Council. The group can meet during the year to discuss issues related to stormwater quality management and opportunities for municipalities to work together. Possibly integrate stormwater management issues with existing regional networks.	with the assistance of the EEP Unit.		project is Grant 0203 0076	
23	Where appropriate integrate feedback from relevant authorities into statutory approval process—namely the EPA Victoria, Melbourne Water, Parks Victoria, VicRoads, DNRE and Yarra Valley Water. Opportunities for agency feedback and participation should be clearly identified.	SP	High.	Refer	to Item 5
24	Liaise regularly with community groups who have an interest in environmental management issues—in particular stormwater management.	EEP Unit, H&LL.	Medium.	Opportunities sought when appropriate.	On-going
25	Identify existing education/community awareness campaigns that can be used as part of Council's community education/awareness campaign. Agencies to target include: • LeastWaste • Catchment and Land Protection Boards • EcoRecycle • Parks Victoria • Environment Protection Authority Victoria.	EEP, PM.	Medium.	For discussion with Committee.	
26	Include reference to the Manningham SWMP in the Corporate Plan and where appropriate include reference to capital expenditure on items directly related to the Corporate Plan in the Annual Budget.	OD	Medium.	SWMP action items identified in draft 2002~2004 Corporate Plan.	Complete
27	Each unit should identify opportunities for inclusion of the SWMP in their annual work programmes and annual budgets.	All	Medium.	Complete for 2002~03	On-going
28	Where appropriate, reference to the SWMP should be included in the Municipal Strategic Statement, GreenPrint, and Council's EMS.	EEP	High.	To be considered as part of the next review of these documents.	June 2003
29	Integration of recommendations of the SWMP into the Drainage Strategy (approved by Council on 25 May 1999).	PM	High.	10 year program identified. Still requires review against SWMP.	



Item	Proposed action	Responsible Unit	Priority	Status	Programmed Completion Date
30	Integration of recommendations of the SWMP into the Open Space Strategy where appropriate.	EEP, C&LS	High.	EEP to advise	
31	Integration of recommendations of the SWMP into the Waste Management Strategy.	PM	High.	Review of Waste Management Strategy to commence 2002~03. Will have regard to SWMP in terms of litter control.	June 2004
32	Integration of recommendations of the SWMP into Arterial Road Improvement Strategy.	PM in consultation with VicRoads.	Medium.	Integration will occur with next review of strategy	June 2004
33	Set up a process of monitoring drainage clearance activities undertaken by the MM. In particular set up a database of quantities and contents of material removed from stormwater management devices. This will enable a process of ongoing monitoring to take place.	PM, MM.	High	Item to be reviewed when maintenance responsibilities are determined.	
34	Preparation of an overall EMP to guide drainage maintenance works (procedures for cleaning and dumping of wastes from litter traps etc., procedures for maintenance of unsealed drains etc).	PM, MM.	High	Discussions to occur with MM	
35	Review unsealed road and drainage management practices to minimise sediment runoff.	PM, MM	High	Discussions to occur with MM	
36	Review street sweeping procedures to maximise potential for pollutant collection.	MM.	Medium	Discussions to occur with MM	
37	Audit litter collection activities to ensure that no litter is left uncollected or spilt as required by the contract conditions.	PM	Medium		
38	Preparation of an overall Environmental Management Plan (EMP) and site specific EMPs for operation and maintenance activities in open space areas to address matters such as watering and fertilising regimes, waste disposal, green waste disposal etc.	MM	Medium	Discussions to occur with MM	

Appendix B

ORIGINAL MANAGEMENT FRAMEWORK STRATEGIES

Strategy 1: Changes to Manningham Planning Scheme and modification to statutory approvals process

Proposed action	Relevant Priority Management Issue	Assignment of responsibility for implementation.	Recommended priority
The Manningham Planning Scheme—specifically the Municipal Strategic Statement should be amended to address stormwater quality management objectives.	All.	EEP in consultation with other Units of Council to draft policies and amendments to MSS.	High—to be undertaken before the next planning scheme review which is due to take place during 2003.
Draft a local policy under the planning scheme that defines expectations with regard to development and use of land by Council, the private sector and other public authorities.	All.	EEP in consultation with other Units of Council to draft policies and amendments to the MSS.	High—to be undertaken no later than the next planning scheme review which is due to take place in 2003.
Prepare a series of standard planning and building permit conditions that relate specifically to the SWMP and the statements included in the MSS and local policies.	All.	SP and BC consultation with the EEP.	High.
Provide a series of performance objectives for the preparation of Land Management Plans and Environmental Management Plans.	All.	EEP to prepare in consultation in PM.	High.
Refer projects to MW, EPA, Parks Victoria, VicRoads with regard to achieving best practice environmental standards for stormwater management and sensitive urban design.	All.	SP and EEP.	High.

Strategy 2: Changes to specifications for service delivery

Proposed action	Link to Priority Management Issue	Assignment of responsibility for implementation	Recommended priority
During review of Local Laws, identify opportunities to integrate stormwater management outcomes.	All.	HLL.	High—for residential development/building site runoff and litter.
Secure Councillor and management commitment with regard to the recommendations of the Manningham SWMP.	All.	EMT and stormwater management committee.	Very high.
Define roles and responsibilities for stormwater management within Council.	All.	EMT and stormwater management committee.	High.
Identification of the need to consider the SWMP by tenders for relevant contracts where stormwater quality management is an issue.	Unsealed road runoff; building site runoff; road works runoff.	PM.	Medium.

Strategy 2 continued

Proposed action	Link to Priority Management Issue	Assignment of responsibility for implementation	Recommended priority
Set up an appropriate reporting mechanism for ongoing monitoring of the stormwater system—in terms of litter, pollutant spills, ineffective structural controls (for example, where a device appears to be malfunctioning).	All.	MM and PM.	Medium.
Establishment of operational benchmarks for Council activities in open space management, road maintenance, street cleaning and drain maintenance.	Upstream inflows, Unsealed road, major road, road works and commercial runoff.	CP, PM and MM.	Medium.
Review of contract specifications regarding stormwater quality control for construction projects.	Up-stream inflows; building site runoff; road works runoff.	PM.	Medium.
Review contract specifications for the Manningham Maintenance Unit to enable them to implement measures relevant to stormwater quality control in their maintenance activities.	Up-stream inflows; commercial runoff; unsealed road runoff.	EMT.	High.
Incorporate stormwater quality control measures in all new drainage design and upgrade drainage designs.	Up-stream inflows; unsealed road runoff; residential runoff; major road runoff.	PM.	High.
Investigate the use of lightweight and alternative pavements to treat unsealed roads to minimise sediment runoff.	Unsealed road runoff.	PM.	High.

Strategy 3: Improvements to coordination and communication within Council and provision of internal training

Proposed action	Link to Priority Management Issue	Assignment of responsibility for implementation	Recommended priority
Designate a committee responsible for the implementation of the plan throughout Council's Units.	All.	EMT and committee of management.	High.
Identify a Council officer who is responsible for all enquires particularly those of proponents with regard to statutory requirements of the SWMP.	All.	EMT and committee of management.	Very high.

Strategy 3: cont.

Proposed action	Link to Priority Management Issue	Assignment of responsibility for implementation	Recommended priority
All relevant council offices should attend a short training course which will familiarise them with the SWMP.	All.	Corporate Development.	Very high.
Provide a programme of technical training for Council officers with regard to implementation of best practice stormwater management guidelines.	All.	Corporate Development.	High.
All Council officers who regularly use the planning scheme provisions, should attend an in-house workshop/seminar regarding SWMP requirements.	All.	Corporate Development with the assistance of EEP.	High.
Provide an opportunity for exchange of information relating to stormwater management practices. For example, lunch time forums with guest speakers and presentations by Council officers.	All.	Committee of Management; Corporate Development and EEP.	Medium.

Strategy 4: Improvements in coordination with external agencies

Proposed action	Link to Priority Management Issue	Assignment of responsibility for implementation	Recommended priority
Identify opportunities for joint seminars, brochures for specific issues areas with external agencies eg EPA, YVW, DOI.	All.	EEP and HLL.	Medium.
Identify opportunities to work with adjoining municipalities in addressing 'regional' stormwater management issues such as commercial runoff; upstream inflows and residential runoff.	All.	EMT and Committee of Management with the assistance of EEP.	Medium.
Where appropriate integrate feedback from relevant authorities into statutory approval process.	All.	SP.	High.
Ensure that VicRoads are aware of responsibilities regarding major road and road works runoff. Maintain ongoing consultation regarding these issues.	Road works runoff. Major roads runoff.	PM.	Very high.
Liaise regularly with community groups who have an interest in environmental management issues—in particular stormwater management.	All.	EEP and HLL.	Medium.
Identify existing education/community awareness campaigns that can be used as part of Council's community education/awareness campaign.	All.	EEP and PM.	Medium.

Strategy 5: Improvements to Council's strategic planning activities

Proposed action	Link to Priority Management Issue	Assignment of responsibility for implementation	Recommended priority
Include reference to the Manningham SWMP in the Corporate Plan.	All.	Corporate Development.	Medium.
Each unit should identify opportunities for inclusion of the SWMP in their annual work programmes and annual budgets.	All.	Individual units.	Medium.
Where appropriate, reference to the SWMP should be included in the Municipal Strategic Statement, GreenPrint, and Council's EMS.	All.	EEP.	High.
Integration of recommendations of the SWMP into the Drainage Strategy (approved by Council on 25 May 1999).	All.	PM.	High.
Integration of recommendations of the SWMP into the Open Space Strategy where appropriate.	All.	EEP and CLS	High.
Integration of recommendations of the SWMP into the Waste Management Strategy.	All.	PM.	High.
Integration of recommendations of the SWMP into Arterial Road Improvement Strategy.	Major Road runoff.	PM in consultation with VicRoads.	Medium.

Strategy 6: Ongoing management of infrastructure and operations

Proposed action	Link To Priority Management Issue	Assignment of responsibility for implementation	Recommended priority
Set up a process of monitoring drainage clearance activities undertaken by the Manningham Maintenance Unit.	All except septic discharge and sullage.	MM	High
Preparation of an overall EMP to guide drainage maintenance works.	Commercial runoff; upstream inflows; unsealed road maintenance.	MM.	High.
Review unsealed road and drainage management practices to minimise sediment runoff.	Up-stream inflows; unsealed road runoff.	PM and MM.	High.
Review street sweeping procedures to maximise potential for pollutant collection.	Up-stream inflows; major road runoff	MM.	Medium.
Audit litter collection activities to ensure that no litter is left uncollected or spilt as required by the contract conditions.	Commercial runoff; residential runoff.	PM.	Medium.
Preparation of an overall Environmental Management Plan (EMP) and site specific EMPs for operation and maintenance of open space areas.	Upstream inflows.	CLS, EEP and CP.	Medium.

Appendix C

ORIGINAL REACTIVE MANAGEMENT STRATEGIES

Responsibilities for implementation of each strategy. Council business units responsible for implementation of various strategies are:

• Project Management (PM)

- Health and Local Laws (HLL)
- Economic and Environmental Planning (EEP)
- Statutory Planning (SP)
- Manningham Maintenance (MM)
- Cultural and Leisure Services (CLS)

• Building Control (BC)

• City Parks (CP).

Agencies external to Council with an involvement in implementation of strategies include:

• Melbourne Water (MW)

- Yarra Valley Water (YVW)
- Environment Protection Authority (EPA)
- EcoRecycle
- Yarra Catchment Action Committee (YCAC)
- Least Waste.

Management Strategy 1: Management elements common to a number of priority management issues

This strategy was developed to address a number of common management elements for a range of priority management issues across the Manningham municipality.

Threats: All Values: All

Number Description Capital Ongoing Responsibility Extent of application Priority EA-Media Release. Use local press opportunistically to advertise the impact of various activities on the Marketing Unit Municipality wide Staff time Allow \$5,000 Verv MMC.RC&KC environmental values of receiving waterways as a result of stormwater quality. to overview high -5 EA-Training of relevant Council officers. Train staff in best practice urban stormwater management. \$6,000 EEP including input from EPA. Municipality wide Verv MW, YVW, and VicRoads MMC.JC&KC-This includes training in water sensitive urban design, soil and water management principles, drawing high upon available courses. EA-Community and special interest group consultation. Raise awareness of the impact of all priority Very Stafftime— All units as relevant Municipality wide risks amongst the wider community to increase support and understanding of Council initiatives. MMC.RC&KC allow \$5,000 high EA-MMC. Business stakeholder groups and committees. Liaise directly with Chamber of Industry and Part of ongoing All units as relevant Municipality wide High RC&KC-8 Commerce groups, shopping centre management, light industry and commercial business operators staff cost. regarding waste management and stormwater management objectives. EA-**Targeted literature/guideline development.** Preparation and distribution of brochures to address \$10,000-\$3,000 per EEP in consultation with HLL Municipality wide High MMC&KC-1 stormwater quality management issues and what residents and businesses can do to assist. \$12,000 for year to update & PM. EPA. YVW. MW. basic brochures EcoRecvcle, YCAC. neighbouring Councils \$5,000 for prize EA **Demonstration projects showing best practice.** Set up demonstration model (to scale) of a dwelling N/A EEP & CLS Municipality wide High that has been designed to meet best practice stormwater management standards. Run competition to and advertising build models and award prizes. SC-Street sweeping. Assess the street cleaning programme and identify 'hot spots' where pollutants \$5,000 for MM Municipality wide Very MMC.RC&KC accumulate to increase the effectiveness of the street sweeping programme including commercial assessment high -37 areas, main roads and construction areas. SC-AC-38 **Drain maintenance.** Monitor the accumulation rates of litter, silt and leaves in the drainage system Staff time Allow \$5,000 MM Municipality wide Verv during inspections and cleaning. This will assist in providing feedback on the effectiveness of the for recording high measures in place, and in adjusting maintenance practices to maximise effectiveness of treatment. RE- MMC. **Infringement notification and fines.** On the spot fines of the audit and inspection process for poor \$50,000 to draft \$40,000 to HLL Municipality wide Verv stormwater management and waste management. These can be developed and issued in relation to JC&KC -64 and implement administer high practices on development and building sites, infringements of proper waste management in the by -law and review commercial areas, unsatisfactory septic tank management and any other activity with the potential for negative impact.

Management Strategy 1 cont: Management elements common to a number of priority management issues

Number	Description	Capital	Ongoing	Responsibility	Extent of Application	Priority
RE- MMC,JC&KC- 63	Audit and inspection. Conduct regular audits and inspections of contractors working on road works, building/development sites, residents with septic tanks, commercial operators within the municipality. Publicise audit process to raise awareness.		\$10,000 for 1 day per fortnight/year and \$10,000 for admin. support	PM & HLL	Municipality wide	High
IDC-MMC-61	Establish a programme to monitor the effectiveness of the stormwater management plan. Key areas to monitor include: • effectiveness of structural treatment measures • condition of receiving environment • conduct of and effectiveness of education programmes • litter reduction in the municipality.	\$20,000 to set up	\$5000 to undertake an annual review	EEP with the assistance of YVW, MW, EPA and integrate with the Waterwatch Programme	Municipality wide	very high

Management Strategy 2: Impact of septic discharge and sullage—Mullum Mullum Creek (MMC) and Andersons Creek (AC)

Threats: Septic discharge and sullage Values: In-stream habitat (MMC&AC) Landscape and visual amenity (MMC & AC) Water quality treatment (MMC) Riparian habitat and flora (MMC & AC) Recreational amenity (MMC & AC) Property value (AC) Tourism (AC)								
Number	Description	Capital	Ongoing	Responsibility	Extent of application	Priority		
EA- MMC&AC-2a	Targeted literature/guideline development. Develop and prepare brochures for residents with septic treatment systems regarding their maintenance responsibilities, ongoing monitoring requirements and about responsible water and waste management practices.	\$10,000– \$12,000 for basic brochure	\$3,000 to update	HLL in consultation with EEP, EPA, and YVW	Municipality wide, (especially MMC, AC and JC)	Very high		
STM- MMC&AC- MW/YVW	Extension of sewer system on the western side of Mullum Mullum Creek. Review opportunities to extend sewer system either further so uth of the service unsewered Donvale area or extend sewer east across Mullum Mullum Creek to enable sewering of Park Orchards area.	YVW capital cost		PM, HLL in consultation with YVW	MMC & AC	Very high		
RE- MMC&AC-62	Financial incentives for septic system upgrade and compliance audit certification, completed in the next twelve months. Individual residents on septic systems can install an approved septic system upgrade and undergone a compliance audit concerning responsible on-site waste and water management strategies to receive a rates rebate.	\$50,000 to draft and implement the by -law	\$40,000 to administer and review	HLL	MMC - specifically Park Orchards and Donvale	Very high		

Management Strategy 3: Impact of commercial runoff— Mullum Mullum Creek (MMC), Koonung Creek (KC) and Ruffey Creek (RC)

Threats: Commercial Runoff containing nutrients, sediment, litter, hydrocarbons, pathogens, trace metals and surfactants. Values: In-stream habitat, riparian habitat and flora, landscape and visual amenity, recreational amenity, flood protection and conveyance and water quality treatment Number Description Capital Ongoing Responsibility Extent of application Priority EA-Commercial runoff abatement competition/awards. Competition awarding prizes and publicity to \$15,000 PM in consultation with Least Municip ality wide Verv MMC&KC-4 Waste, EPA. winning business and light industries in the municipality who demonstrate practices that improve high quality of stormwater runoff from their area. co-sponsorship by local press EA-**Signage.** In car parking areas regarding waste minimisation objectives (especially strip shopping \$2,000 for signs Allow \$500 PM for signage and drain outle Strip shopping centres. High centres). Locations include Tunstall Square, The Pines Shopping Centre, Westfield Doncaster identification. EEP for drain MMC&KC-7 for Drain stencilling and Shoppingtown and Jackson Court Shopping Centre. Also, revisit drain-stencilling programme and stencilling identification at all maintenance. identify outlet pipes with identification codes so that people wanting to report pollution events can appropriate locations easily identify them. STM-In-line traps down stream of commercial centres to address threats to Koonung Creek, Ruffey Creek PM KC &RC Verv MMC, RC & and Yarra River. Possible locations: high AC • Warrigal Road and Yarra Valley Road (Bulleen Plaza); \$50,000 \$9,000 vicinity of Greenaway Light Industrial area; \$25,000 \$5,000 • near corner of Seville and Parker Streets (Templestowe Village); \$45,000 \$7,000 vicinity of Bulleen Plaza; \$15,000 \$2,000 • below ground along nature strip in Tram Road. (Westfield Shopping Centre); \$150,000 \$25,000 • in vicinity of Tunstall Road and Russell Crescent intersection. Alternatively two smaller in-line \$42,000 \$7,000 traps closer to the Tunstall Square Shopping Centre; • on Bulleen Road and Calin Court in the reserve (Jackson Court Shopping Centre); \$85,000 \$14,000 • on Franklin Road and/or the laneway near Blackburn Road (Devon Plaza); \$100,000 \$15,000 • in reserve near Irene Court and in -line traps possibly in the Ted Ajani reserve (underground) \$90,000 \$15,000 (Macedon Square): and · Council reserve near corner of Firth Street and Beaconsfield Street (commercial and Light \$90,000 \$15,000 industrial area). At source control required at The Pines Shopping Centre as this centre drains to a number of \$90,000 \$15,000 locations. At source control in vicinity of shops in George Street. \$90,000 \$15,000 At source control near corner of Springvale Road and Mitcham Road. \$90,000 \$15,000

Management Strategy 3 cont.: Impact of commercial runoff— Mullum Mullum Creek (MMC), Koonung Creek (KC) and Ruffey Creek (RC)

Number	Description	Capital	Ongoing	Responsibility	Extent of application	Priority
SC-MMC&KC- 46	Unloading and loading areas. Audit unloading and loading measures to ensure pollution into the stormwater system is not occurring. Ensure pollution risks are accounted for adequately.	\$5,000 for random audit reports		PM	Commercial areas in municipality	High
SSSP - MMC&KC-54	Develop Environmental Management Plans (incorporating stormwater management issues) for key industries or sites.	Contractor or business cost	Council cost in processing and auditing	PM & SP in consultation with Least Waste	Municipality wide.	Very high

Management Strategy 4: Impact of up-stream inflows—Mullum Mullum Creek (MMC)

1								
Number	Description	Capital	Ongoing per annum	Responsibility	Extent of application	Priority		
EA-MMC-3	Consultation with Maroondah City Council and Melbourne Water to address management of pollutants originating from outside Manningham.	Officer time		PM	Mullum Mullum Creek	Very high		
STM-KC-MW	Stability works. Along creek within Freeway Public Golf Course and Manningham Club and Conference Centre.	\$120,000		MW	Koonung Creek	High		

Management Strategy 5: Impact of unsealed road runoff—Andersons Creek (AC)

	6 · · · · · · · · · · · · · · · · · · ·							
Values: In-s	tream habitat, riparian habitat and flora, up-stream habitat, landscape and visual amenity, and tourism		1		I	T		
Number	Description	Capital	Ongoing	Responsibility	Extent of application	Priority		
STM-AC-19	Circular settling tanks. Falconer Road.	\$10,000	\$5,000 per year	PM	Andersons Creek sub- catchment	Very high		
STM-AC-18	Sediment settling basins. Possible locations include Gold Memorial Drive near but after junction with Husseys Lane.	\$20,000	\$5,000 per year.	PM	Andersons Creek sub- catchment	Very high		
SC-AC-42	Unsealed road maintenance. Schedule grading to coincide with optimum moisture content in road material. Grade shoulders of roads to direct drainage away from tributaries. Review methods of maintaining table drains to minimise sediment and vegetation disturbance.		Incorporate into existing maintenance schedule.	MM	Mostly rural or urban/rural/parts of municipality	Very high		
SC-AC	Alternative pavements . Review the possibility of using alternative road sealing methods such as light weight pavements.	\$5000 to undertake study	_	PM	Creek sub-catchment	Very high		

Management Strategy 6: Impact of building site runoff—Jumping Creek Sub catchment (JC)

Threats:	areats: Building Site Runoff containing sediment, litter, hydrocarbons, pathogens, trace metals and surfactants.								
Values: I	Values: In-stream habitat (JC)								
Number	Description	Capital	Ongoing	Responsibility	Extent of Application	Priority			
EA-JC-1	Targeted literature/guideline development. Preparation and distribution of brochures to residents, and construction contractors and to local chambers of commerce, industry groups.	\$10,000 to \$12,000 for basic brochure	\$3,000 per year to update	EEP in consultation with EPA, MW, and Marketing Unit	Municipality wide	Very high			
EA-JC-2	Best practice demonstration workshops. Develop and conduct a number of workshops from Council offices and/or at building sites.	Allow \$4,000 for each half day workshop	Allow \$2,000 per year to update material	EEP in consultation with DOI, EPA, MW, EcoRecycle and other municipalities	Municipality wide	Very high			
STM-JC-12	Near source treatment. Require all building sites to install near source treatment measures.	\$50,000 to develop by-law	\$40,000 to administer	HLL	Municipality wide	High			
SC-JC-52	Site management plans. Minimise pollution from construction sites by requiring a site management plan and conduct a site inspection to ensure compliance. The plan should address key issues including sediment and waste management.	Publicise requirements for plan. \$5,000	Staff time to conduct site inspections. \$10,000	PM, SP & EEP	Municipality wide	Very high			

Management Strategy 7: Impact of major road runoff—Mullum Mullum Creek (MMC), Ruffey Creek (RC) and Koonung Creek (KC)

Threats: Major Road Run-off containing nutrients, sediment, litter, hydrocarbons, pathogens, trace metals and surfactants. Values: In-stream habitat, landscape and visual amenity, recreational amenity, flood protection and conveyance and water quality treatment.							
Number	Description	Capital	Ongoing	Responsibility	Extent of application	Priority	
STM-AC-23	In-line treatment. Circular screens at Williamsons Road; Foote Street.	\$35,000 for smaller, precast unit	\$20,000	PM & MM	MMC	High	
STM-KC-MW	In-line treatment:			VicRoads and MW	KC	High	
	Litter traps, open space area so uth of Hampshire Road and Brindy Crescent, near Wetherby Road,	\$140,000	\$23,000				
	north of Koonung Creek.	\$90,000	\$15,000				
	 Sediment pond (in open space area near intersection of High Street and Eastern Freeway). Sediment pond, within vicinity of TAFE 	\$20,000	\$20,000				
STM-KC-MW	Stability works near intersection of Sheahans Road and Templestowe Road.	\$75,000		MW	RC	High	

Management Strategy 8: Impact of residential runoff—Mullum Mullum Creek (MMC)and Andersons Creek (AC)

Threats: Residential Runoff containing nutrients, sediment, litter, hydrocarbons, oxygen depleting material, pathogens, trace metals, pesticides and surfactants.								
Values: In-stream habitat (MMC&AC) Landscape and visual amenity (MMC & AC) Water quality treatment (MMC) Riparian habitat and flora (MMC & AC) Recreational amenity (MMC & AC) Property value (AC) Tourism & other (AC)								
Number*	Description	Capital	Ongoing	Responsibility	Extent of application	Priority		
EA-MMC & AC	Targeted literature/guideline development. Develop and prepare brochures for residents to raise awareness of how typical residential activities on stormwater quality and responsible water and waste management practices. Draw on EPA and other agencies materials	\$10,000- \$12,000 for basic brochure	\$3,000 per year to update	EEP in consultation with H&LL, PM, EPA, YVW, MW, EcoRecycle	Municipality wide, (especially MMC &AC)	Very high		
EA- MMC&AC-2a	Demonstration projects showing best practice. Set up demonstration model (to scale) of a dwelling that has been designed to meet best practice stormwater management standards. Run school competition to build models and award prizes.	\$5,000 for prize and advertising	N/A	EEP & CLS	Municipality wide	High		
STM- MMC&AC-35	 Constructed wetlands. South of Gold Memorial Road, north of Beauty Gully/Husseys Lane and east of Harris Gully Road. Westerfolds Park to address sediment issues; and in Candlebark Park near Cliveden Crescent, west of Mullum Mullum Creek. 	\$300,000 to \$404,000	\$20,000 to \$30,000	EEP	Less developed parts of the municipality	Very High		

Management Strategy 9: Impact of road works runoff—Mullum Mullum Creek (MMC), Andersons Creek (AC) and Jumping Creek (JC)

Threats: Road works Runoff containing sediment, litter and pollutants.

Values: In-stream habitat (KC, MMC & JC)

varues. In s	tream manual (Ne, 1911) e d'Je)					
Number* EA-MMC &	Description Targeted literature/guidelines development. Guidelines for road construction contractors regarding	Capital \$10,000 to	Ongoing per year \$3000 for	Responsibility PM in consultation with EEP	Extent of application Municipality wide	Priority Very
KC-1	management of stormwater. Guidelines can be used to prepare EMPs.	\$12,000	updating	and VicRoads	Withhelpanty wide	High
STM- MMC, JC & KC - 28	Grass swales. Planning/design of road works to incorporate road medians, verges, car park runoff areas, and parks where appropriate. The grass swales should be located work in association with silt fences. For example, Park Road construction activity - review opportunity for use of sections of Alan Morton Reserve for a grass swale. Note - gradient may be a limiting factor.	Individual project cost		PM	MMC	High
EA- MMC&JC-2	Best practice demonstration workshops. Demonstration of key best practice actions with regard to road construction sites.	Allow \$4,000 for preparatio n of material and staff time for each half-day workshop	Allow \$2,000 per year to up date material	EEP in consultation with H&LL & PM & seek support from DOI, EPA, MW, EcoRecycle and other municipalities	Municipality wide	High
STM-MMC, JC & KC - 23	 In-line measure: Circular Screen at the following possible locations where road works are either proposed, taking place or recently completed: Eastern Freeway extension (Springvale Road to municipal boundary) - will be the responsibility of VicRoads. Therefore Council will need to liaise with VicRoads regarding stormwater quality management. Blackburn Road (Reynolds Road to Warrandyte Road). Old Warrandyte Road (Mitcham Road to Springvale Road) - at design stage - therefore able to integrate proposals. 	\$35,000 for smaller, precast unit at each location	Maintenance approx \$20,000 pa	PM & MM	MMC, JC & KC	Very high
SC- MMC, JC&KC -52	Site management plans. Require site management plans for all construction activities, in particular to target sedimentation, erosion and waste management.		Approx. \$10,000 for site audits	PM	Municipality wide.	Very high

Management Strategy 10: Impact of residential development—Jumping Creek (JC)

Threats: Residential Development containing sediment, litter and pollutants, surfactants. Values: In-stream habitat								
EA-JC-1	Targeted literature/guideline development. Preparation and distribution of brochures to building contractors and developers.	\$10,000 to \$12,000	Allow \$3,000 to update	EEP including input from EPA, MW, YVW, Mar &VicRoads	Municipality wide, especially MMC, AC, JC	Very high		
EA-JC-2a	Stormwater management and education workshops. Develop and conduct workshops for developers and targeting development site runoff control measures. Conduct workshops from Council offices.	Allow \$4,000 for each half day workshop	\$2,000 to update material	EEP in consultation with PM, H&LL, DOI, EPA, MW, EcoRecycle and other municipalities	Municipality wide, especially MMC, JC	High		
SC-JC-52	Site management plans. Minimise pollution from development sites by requiring a site management plan and conduct a site inspection to ensure compliance. Site management plans should specifically address soil and water management, vegetation retention and waste management.	Publicise requirements for plan. \$5,000	Staff time to conduct site inspections. \$10,000	PM	Municipality wide	Very high		

 $Appendix\ D$

UPDATED IMPLEMENTATION PLAN

Reactive (RMS – Action Nos. > 100) and Management Framework (MFS Action Nos. < 99) Strategies Updated Implementation Plan

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
MFS	27	Each unit should identify opportunities for inclusion of the SWMP in their annual work programmes and annual budgets.	No additional cost.	No additional cost.	All.	All units within Council.	Medium.	Complete for 2002–03.	On-going at each review.	
MFS	26	Include reference to the Manningham SWMP in the Corporate Plan and where appropriate include reference to capital expenditure items directly related to the Corporate Plan the Annual Budget.	No additional cost.	No additional cost.	Corporate	Executive Planner.	Medium.	SWMP action items identified in draft 2002~2004 Corporate Plan.	Complete.	
MFS	2	Draft a local policy under the planning scheme that defines expectations with regard to development and use of land by Council, the private sector and other public authorities. The local policy should specifically refer to the need for current and prospective land owners (residents, commercial operators) to respond to the objectives of the SWMP when managing their properties and planning for future land use and development.	\$4,000	N/A	EEP in consultation with other Units to draft policies and amendments to the MSS.	Municipality wide	High.	Not currently being implemented.	To be undertaken at next planning scheme review in 2003.	
MFS	3	Prepare a series of standard planning and building permit conditions that relate specifically to the SWMP and the statements included in the MSS and local policies.	\$2,000	N/A	EEP in consultation with SP.	Municipality wide	High.	Currently underway.	2003.	
MFS	4	With regard to the preparation of Site Management Plans and Environmental Management Plans—provide a series of performance objectives that relate to the objectives of the SWMP. These performance objectives can provide a guideline for proponents or Council when plans are being prepared.	\$5,000	N/A	EEP to prepare in consultation in PM.	All staff involved in site management together with other agencies.	High.	Currently underway.	2003.	

Type Ac	ction no. I	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
MFS 1	.1 to 1.9	The Manningham Planning Scheme— specifically the Municipal Strategic Statement should be amended as follows: Clause 21.02-13 Environment—could include reference to areas of significance in terms of waterways. Clause 21.03 Drainage and sewerage—could include reference to stormwater quality management issues and that a municipal-wide SWMP has been prepared. Framework Plan 7—could include reference to 'hot spot' areas for stormwater quality management, i.e., areas or issues causing greatest level of threat to identified values. Under Clause 21.09 Natural Environment, a key issue, objective, strategy and implementation could be drafted for urban stormwater quality management. Under Clause 21.09 Non-urban areas—a key issue, objective, strategy and implementation citation could be prepared with regard to stormwater management, with regard to unsewered areas, building site runoff etc. Under Clause 21.10 Open space—a key issue, objective, strategy and implementation citation could be prepared with regard to litter and waste management in parks and reserves and associated benefits to stormwater quality. Under Clause 21.12 Established urban areas—a key issue, objective, strategy and implementation citation could be drafted with regard to residential runoff and associated stormwater management issues. Under Clause 21.14 Commercial and industrial—a key issue, objective, strategy and implementation citation could be drafted with regard to commercial runoff. Under Clause 21.19 Drainage and sewerage—a key issue, objective, strategy	\$2,000	N/A	Responsibility EEP in consultation with other units of Council to draft policies and amendments to MSS.	application Municipality wide	Priority High.	Currently underway To be prepared now and implemented at the next planning scheme review 2003.	and comments 2003.	SWMP Vol 2)
		and implementation strategy could be drafted in relation to overall stormwater quality								ge 2 of 18

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
MFS	11 & 20	Provide a programme of technical training for Council officers with regard to implementation of best practice stormwater management guidelines. Opportunities for internal and external training and resources should be identified. Training should be integrates with the existing staff development programme and with EMS training programme. Provide an opportunity for exchange of information relating to stormwater management	\$10-15,000	\$5,000	EEP with the assistance of OD and the SW Committee	All relevant staff and planning officers.	High to medium.	For discussion with SW Committee.	January 2003 for training. Exchange of information not currently implemented.	
		practices. For example, lunchtime forums with guest speakers and presentations by Council officers.								
MFS	19	All Council officers who regularly use the planning scheme provisions should attend an inhouse workshop/seminar with regard to the application of the SWMP and how it is reflected in the planning scheme.	\$5,000	\$2,000	EEP	All planning officers.	High.	For discussion with SW Committee.	Not currently being implemented.	
MFS	21	Identify opportunities for joint seminars, brochures for specific issues areas. For example:	N/A	N/A	EEP with H & LL.	All relevant Council staff and other	Medium.	For discussion with SW Committee.	2002-03.	
		 workshop/information seminar for residents with on-site sewage treatment systems and off-site sullage disposal—Council, EPA Victoria and Yarra Valley Water; review opportunities for a seminar undertaken in association with the Port Phillip CALP board. 				organisations.		Health has distributed brochures.		
MFS	24	Liaise regularly with community groups who have an interest in environmental management issues—in particular stormwater management.	No additional cost.	No additional cost.	EEP H & LL.	Staff involved in community liaison.	Medium.	Opportunities sought when appropriate.	On-going.	
MFS	28	Where appropriate, reference to the SWMP should be included in the Municipal Strategic Statement, GreenPrint, and Council's EMS.	\$2,000	N/A	EEP	Municipality wide	High.	Consider as part of the next review of documents.	June 2003.	
MFS	30	Integration of recommendations of the SWMP into the Open Space Strategy where appropriate.	\$2,000	N/A	EEP with C & LS.		High.	Not currently being implemented.	Not currently being implemented.	

Type	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
MFS	25	Identify existing education/community awareness campaigns that can be used as part of Council's community education/awareness campaign. Agencies to target include:	No additional cost.	No additional cost.	EEP with PM.	Staff involved in community liaison with help from	Medium.	For discussion with SW Committee.	On-going.	
		• LeastWaste;				individual units.				
		Catchment and Land Protection Boards;								
		• EcoRecycle;								
		Parks Victoria;								
		Environment Protection Authority Victoria.								
MFS	6	During review of Local Laws, identify opportunities to integrate stormwater management outcomes.	\$2,000	N/A	H & LL	Local Laws.	High	Residential development and building site runoff and litter	On-going.	
MFS	10 & 12 & 33	Set up an appropriate reporting mechanism for ongoing monitoring of the stormwater system—in terms of litter, pollutant spills, ineffective structural controls (for example, where a device appears to be malfunctioning).	\$20,000	Incorporate in existing annual reporting requirements.	MM and PM.	All relevant staff.	Medium to high.	Monitoring requirements to be addressed with Grant 0203 0082. Item to be	April 2003. Drainage clearing monitoring not	
		Establishment of operational benchmarks for Council activities:		-				reviewed when maintenance	currently being implemented.	
		• open space management and maintenance;						responsibilities are determined.		
		 road maintenance; 								
		 street cleaning; 								
		drainage maintenance.								
		Set up a process of monitoring drainage clearance activities undertaken by the MM. In particular set up a database of quantities and contents of material removed from stormwater management devices. This will enable a process of ongoing monitoring to take place.								

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
MFS	38 & 34 36	Preparation of an overall Environmental Management Plan (EMP) and site specific EMPs for operation and maintenance activities in open space areas to address matters such as watering and fertilising regimes, waste disposal, green waste disposal etc. Preparation of an overall EMP to guide drainage maintenance works (procedures for cleaning and dumping of wastes from litter traps etc., procedures for maintenance of unsealed drains etc). Review street sweeping procedures to maximise potential for pollutant collection.	Incorporate costs into individual projects. No additional cost.	No additional cost.	MM and PM	All relevant staff with reference to other developed information.	Medium to high	Discussions to occur with MM.	Not currently being implemented.	
MFS	14	Review contract specifications for MM to enable them to implement measures relevant to stormwater quality control in their maintenance activities.	No additional cost.	No additional cost.	MM.	Maintenance staff.	High.	For discussion with MM. Not expected to be implemented.	LGPro has developed contracts specifications that can be used.	
MFS	16 & 35	Investigate the use of light weight and alternative pavements to treat unsealed roads to minimise sediment runoff. Review unsealed road and drainage management practices to minimise sediment runoff.	Direct swap of costs with existing costs.	Direct swap of costs with existing costs.	MM with PM	Maintenance and Project Management staff.	High.	Council adopted a 5-year lightweight pavement program in 2001.	Complete. Unsealed roads not being implemented. Possibly LGPro or VSAP Project.	
MFS	9 & 13 & 15	Identification of the need to consider the SWMP in relevant tenders where stormwater quality management is an issue. Review of contract specifications regarding stormwater quality control for construction projects Incorporate stormwater quality control measures in all new drainage design and upgrade drainage designs.	Staff time as part of position.	Staff time as part of position.	PM.	Project Management.	Medium.	On-going as improvement opportunities identified for projects managed by PM. Risk assessment to be included in new projects by PM.	Quality measures incorporated as appropriate. Need to check for other units.	

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
MFS	29	Integration of recommendations of the SWMP into the Drainage Strategy (approved by Council on 25 May 1999). Identify opportunities to implement SW management best practice.	No additional cost.	No additional cost.	PM.	Project Management.	High.	10 year program identified. Still requires review against SWMP.	Undertake at next Drainage Strategy Review 2004.	
MFS	31	Integration of recommendations of the SWMP into the Waste Management Strategy.	No additional cost.	No additional cost.	PM.	Project Management.	High.	Review of Waste Management Strategy to commence 2002– 03. Have regard to SWMP.	Review to be done by June 2004.	
MFS	32	Integration of recommendations of the SWMP into Arterial Road Improvement Strategy.	No additional cost.	No additional cost.	PM in consultation with VicRoads.	Project Management.	Medium.	Integration will occur with next review of strategy.	June 2004.	
MFS	37	Audit litter collection activities to ensure that no litter is left uncollected or spilt as required by the contract conditions.	\$5,000	\$5,000	PM.	Project Management.	Medium.	Currently undertaken on an ad hoc basis.		
MFS	5	As part of the statutory referral process, source feedback from Melbourne Water, Yarra Valley Water, EPA Victoria, Parks Victoria, VicRoads with regard to achieving best practice environmental standards with regard to stormwater management and sensitive urban design. This can be undertaken on a project by project basis or as a standard set of conditions.	N/A	N/A	SP.	Planning referral process.	High.	Applications referred as appropriate.	On-going.	
MFS	23	Where appropriate integrate feedback from relevant authorities into statutory approval process—namely the EPA Victoria, Melbourne Water, Parks Victoria, VicRoads, DSE and Yarra Valley Water. Opportunities for agency feedback and participation should be clearly identified.	N/A	N/A	SP.	All relevant planning applications.	High.	On-going. Satisfactory process Refer to Item 5.		

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
MFS	7.	Secure Councillor and management commitment with regard to the recommendations of the Manningham SWMP.	No additional cost.	No additional cost.	SW Committee.	All relevant units.	Very high.	Council endorsed strategy 2001. Securing EMT/Manageme nt support ongoing.	Completed 2002.	
MFS	8 to 8.4	Define roles and responsibilities for stormwater management with Council with regard to the following issues areas:	No additional cost.	No additional cost.	SW Committee.	All relevant units.	High.	Not currently being undertaken.	Discussion required with SW Committee.	
		 installation and maintenance of structural infrastructure such as litter traps, in -line devices etc.; 								
		 implementation of sensitive urban design principles through the planning scheme and other statutory controls; 								
		 development of community and other stakeholder consultation programmes; 								
		 development and implementation of enforcement measures with regard to stormwater quality management. 								
MFS	17	Designate a SW Committee responsible for the implementation of the plan throughout Council's Units. The SW Committee will also be responsible for ensuring that an internal awareness/education campaign is undertaken to inform Council officers of their role in ensuring the effective implementation of the plan.	No additional cost.	No additional cost.	SW Committee.	All relevant staff.	High.	SW Committee to finalise.	July 2002.	
MFS	18	Identify/employ a Council officer who is responsible for all enquires particularly those of proponents with regard to statutory requirements of the SWMP.	\$70,000	\$60,000	SW Committee.	Predominately the planning area	Very high.	Res Code Review recently addressed this issue.	Complete. Roles defined as per Report to Council June 2002.	

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
MFS	22	Identify opportunities to work with adjoining municipalities to address 'regional' SW management issues such as commercial runoff; upstream inflows and residential runoff. Adjoining municipalities include: Nillumbik, Maroondah, Whitehorse, Boroondara and Banyule. Review the option of having a working party with representatives from each Council. The group can meet during the year to discuss issues related to SW quality management and opportunities to work together. Possibly integrate SW management issues with existing regional networks.	No additional cost.	No additional cost.	SW Committee with the assistance of EEP.	All relevant staff throughout Council.	Medium.	Current joint project is Grant 0203 0076.	On-going.	
RMS	102	Community and special interest group consultation: raise awareness of the impact of all priority risks amongst the wider community to increase support and understanding of Council initiatives.	Staff time—allow \$5,000.	-	All units as relevant.	Municipality wide.	Very high.	Inactive.		EA-MMC, RC & KC-6
RMS	103	Business stakeholder groups and SW Committees: liaise directly with Chamber of Industry and Commerce groups, shopping centre management, light industry and commercial business operators regarding waste management and stormwater management objectives.	Part of ongoing staff cost.		All units as relevant.	Municipality wide.	High.	Inactive.		EA-MMC, RC & KC-8
RMS	104	Targeted literature/guideline development: preparation and distribution of brochures to address stormwater quality management issues and what residents and businesses can do to assist.	\$10,000– \$12,000 for basic brochures.	\$3,000 per year to update.	EEP in consultation with H & LL & PM, EPA Victoria, YVW, MW, EcoRecycle, YCAC, neighbouring Councils.	Municipality wide.	High.	Inactive. Funding currently unavailable.		EA-MMC & KC-1

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
RMS	110	Establish a programme to monitor the effectiveness of the stormwater management plan. Key areas to monitor include: • effectiveness of structural treatment measures; • condition of receiving environment; • conduct of and effectiveness of education programmes; • litter reduction in the municipality.		\$5000 to undertake an annual review.	EEP with the assistance of YVW, MW, EPA Victoria and integrate with the Waterwatch Programme.	Municipality wide	Very high	Underway	Refer to MFS No.10. Use of VSAP and CRC work essential.	IDC-MMC- 61
RMS	114	Commercial runoff abatement competition/awards: competition awarding prizes and publicity to winning business and light industries in the municipality who demonstrate practices that improve quality of stormwater runoff from their area.	\$15,000.		EEP with PM in consultation with LeastWaste, EPA Victoria, co-sponsorship by local press	Municipality wide	Very high	Inactive For discussion with SW Committee.		EA-MMC & KC-4
RMS	118	Develop Environmental Management Plans (incorporating stormwater management issues) for key commercial areas or sites.	Contractor or business cost.	Council cost in processing and auditing.	EEP in consultation with PM and LeastWaste	Municipality wide.	Very high.	Inactive.	In conjunction with MFS No. 31 & 37.	
RMS	125	Targeted literature/guideline development: preparation and distribution of brochures to residents, and construction contractors and to local chambers of commerce, industry groups.	\$10,000 to \$12,000 for basic brochure.	\$3,000 per year to update.	EEP in consultation with EPA, MW, and Marketing Unit.	Municipality wide.	Very high.	Inactive. For discussion with SW Committee.		EA-JC-1
RMS	126 & 101	Best practice demonstration workshops: develop and conduct a number of workshops from Council offices and/or at building sites. Training of relevant Council officers: train staff in best practice urban stormwater management. This includes training in water sensitive urban design, soil and water management principles, drawing upon available courses. It also includes training in awareness of the SWMP itself.	for each half day workshop.	Allow \$2–4,000 per year to update material.	in consultation with SP, BC, DOI, EPA, MW, EcoRecycle and other councils and input from EPA, MW, YVW, and VicRoads.	Municipality wide.	Very high.	Limited. For discussion with SW Committee. EEP conducted course in 2001. Grant 0203 0076 provides for training of outdoor staff.	On-going.	EA-JC-2 EA-MMC, JC & KC-9

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
RMS	134	 Constructed wetlands: south of Gold Memorial Road, north of Beauty Gully/Husseys Lane and east of Harris Gully Road (no); Westerfolds Park to address sediment issues; (possible); Tikalara Park near Cliveden Crescent, west of Mullum Mullum Creek (proposed by MW, but MCC does not agree). 		\$20,000 to \$30,000.	EEP MW, Parks Victoria, and PM	Less developed parts of the municipality.	Very high.	Being investigated. Melbourne Water currently pursuing Tikalara Project. Balance to be pursued with Stakeholders.	To be advised.	STM-MMC & AC-35
RMS	132	Targeted literature/guideline development: development and prepare brochures for residents to raise awareness of how typical residential activities on stormwater quality and responsible water and waste management practices. Draw on EPA Victoria and other agencies materials.	\$12,000 for basic	\$3,000 per year to update.	with Health in consultation with H & LL, PM, EPA Victoria, YVW, MW, EcoRecycle.	Municipality wide, (especially MMC & AC).	Very high.	Partly active. For further discussion with SW Committee.	Parts undertaken in different groups Could use SIAV/ MAV Capacity Building project information.	EA-MMC & AC
RMS	133 & 105	Demonstration projects showing best practice: set up demonstration model (to scale) of a dwelling that has been designed to meet best practice stormwater management standards. Run school/university competition to build models and award prizes. Demonstration projects showing best practice: set up demonstration model (to scale) of a dwelling that has been designed to meet best practice stormwater management standards. Run competition to build models and award prizes.	\$5,000 for prize and advertising. \$5,000 for prize and advertising.	N/A.	EEP with CLS, EEP, SP & CLS.	Municipality wide.	High.	Underway. For discussion with SW Committee. Funding currently unavailable.	Look at VSAP & CRC projects currently available for use.	EA-MMC& AC-2a EA
RMS	135 & 136	Rainwater storage and reuse (tanks): encourage in areas with larger blocks and the more rural parts of the municipality. Installation and promotion of tanks should be integrated with existing Water Week programme. Reduces water for-site and therefore flow of pollutants. Roof water diversion: publicise the benefits of diverting roof water to grassed swales or otherwise pre-treat. Reduces total flows, scouring, sediment and nutrients entering the stormwater system.		Media and demonstrate best practice for Council buildings.	with BC to approve structures. Consult with YVW as a possible partner—use their brochure. PM.	Municipality wide.	Medium.	Partly active Grant 0203 0084 received for investigation. Permits already require consideration of rain water tanks.	June 2004. Subject to funding. As opportunities present.	SC-MMC & AC-36 BS-MMC & AC-51

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Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
RMS	140	Best practice demonstration workshops: demonstration of key best practice actions with regard to road construction sites.	Allow \$4,000 for preparation of material and staff time for each half-day workshop.		in consultation with H & LL & PM and seek support from DOI, EPA Victoria, MW, EcoRecycle and other municipalities.	Municipality wide.	High.	Active.	Include MCC staff and contractors.	EA-MMC & JC-2
RMS	144	Stormwater management and education workshops: develop and conduct workshops for developers and targeting development site runoff control measures. Conduct workshops from Council offices.	for each half	\$2,000 to update material	with LL in consultation with PM, H & LL, DOI, EPA Victoria, MW, EcoRecycle and other municipalities.	Municipality wide, especially Mullum Mullum Creek and Jumping Creek.	High.	Inactive.		EA-JC-2a
RMS	108	Infringement notification and fines: on the spot fines of the audit and inspection process for poor stormwater management and waste management. These can be developed and issued in relation to practices on development and building sites, infringements of proper waste management in commercial areas, unsatisfactory septic tank management and any other activity with the potential for negative impact.	\$50,000 to draft and implement the by-law.	\$40,000 to administer and review.	Local Laws.	Municipality wide.	Very high.	In-active. For discussion with SW Committee.		RE- MMC, JC & KC-64
RMS	111	Targeted literature/guideline development: develop and prepare brochures for residents with septic treatment systems regarding their maintenance responsibilities, ongoing monitoring requirements and about responsible water and waste management practices.	\$12,000 for basic brochure.	\$3,000 to update.	H & LL in consultation with EEP, EPA Victoria, and YVW.	Municipality wide, (especially MMC, AC and JC).	Very high	On-going. Use other existing prepared information. DWMP Project.		EA-MMC& AC-2a

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
RMS	100	T TT	Staff time.		Marketing Unit.	Municipality	Very high.	On-going.		EA-MMC,
		advertise the impact of various activities on the environmental values of receiving waterways as a result of stormwater quality. Use the local media to highlight the development of the stormwater management plan, including associated guidelines and brochures produced as a result of the plan. Also highlight competitions, workshops and periods of consultation planned. Will increase community awareness and advise them of opportunities available to them as individuals, groups or businesses.		overview.		wide.		For discussion with SW Committee.		RC & KC-5
RMS	106	Street sweeping: assess the street cleaning programme and identify 'hot spots' where pollutants accumulate to increase the effectiveness of the street sweeping programme including commercial areas, main roads and construction areas.	\$5,000 for assessment.		MM. John O'Brien.	Municipality wide.	Very high.	Refer to MFS No. 36.		SC-MMC, RC & KC-37
RMS	107	Drain maintenance: monitor the accumulation rates of litter, silt and leaves in the drainage system during inspections and cleaning. This will assist in providing feedback on the effectiveness of the measures in place, and in adjusting maintenance practices to maximise effectiveness of treatment.	Staff time.	Allow \$5,000 for recording.	MM. John O'Brien.	Municipality wide.	Very high.	Refer to MFS No. 33.		SC-AC-38
RMS	120 & 131	~	\$120,000.		MW.	Koonung Creek.	High.	Active.	Melbourne Water to	
		Public Golf Course and Manningham Club and Conference Centre.	\$75,000.			Ruffey Creek.		Need to discuss further with MW.	advise. Check Ruffey Creek	MW
		Stability works near intersection of Sheahans Road and Templestowe Road.						Need to discuss further with VicRoads.	outlet	
RMS	123	Unsealed road maintenance: schedule grading to		Incorporate into	MM.	Mostly rural or urban/rural/parts	Very high	Underway.	Discussions to occur	
		coincide with optimum moisture content in road material. Grade shoulders of roads to direct drainage away from tributaries. Review methods of maintaining table drains to minimise sediment and vegetation disturbance.		existing maintenance schedule.		of municipality.		Refer MFS No. 33.	with MM on current need.	

Type	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
RMS	109	Audit and inspection: conduct regular audits and inspections of contractors working on road works, building/development sites, residents with septic tanks, commercial operators within the municipality. Publicise audit process to raise awareness.		\$10,000 for 1 day per fortnight/year and \$10,000 for admin. support.	PM with H & LL.	Municipality wide.	High.	Active—on-going Audit and Inspection currently undertaken by PM. Publicising of audit results to be discussed with SW Committee.	Other unit practices to be assessed, especially planning and H & LL officers	& KC-63
RMS	112 & 113	Extension of sewer system on the western side of Mullum Mullum Creek. Review opportunities to extend sewer system either further south of the service unsewered Donvale area or extend sewer east across Mullum Mullum Creek to enable sewering of Park Orchards area. Financial incentive for septic tank system upgrade and compliance audit certification, completed in eth next twelve months. Individual residents ons septic tanks systems can install an approved septic system upgrade and undergo a compliance audit concerning responsible on-site waste and water management strategies to receive a rates rebate.	:		PM with H & LL in consultation with YVW.	MMC & AC.	Very high.	Inactive. Review complete. DWMP Project underway. No to financial incentives.	Need to involve YVW and possibly MW in discussions Refer MFS No. 21.1 Review 2004.	
RMS	115	Signage: in car parking areas regarding waste minimisation objectives (especially strip shopping centres). Locations include Tunstall Square, The Pines Shopping Centre, Westfield Doncaster Shoppingtown and Jackson Court Shopping Centre. Revisit drain–stencilling programme and identify outlet pipes with identification codes so that people wanting to report pollution events can easily identify them.	\$2,000 for signs.	Allow \$500 for maintenance.	PM for signage and drain outlet identification. EEP for drain stencilling.	Strip shopping centres. Drain stencilling and identification at all appropriate locations.	High.	Partly active. Signage currently unfunded. PM to prepare VSAP funding application for 2003–04 by October 2002.	June 2004 (subject to funding).	EA-MMC& KC-7
RMS	124	Alternative pavements: review the possibility of using alternative road sealing methods such as light weight pavements.	\$5,000 to undertake study.	-	PM and MM.	Creek sub- catchment.	Very high.	Council has approved light weight pavement program.	Complete Refer to MFS No. 16.	SC-AC

Type	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
RMS	138 & 141 142 & 143	Targeted literature/guidelines development: guidelines for road construction contractors regarding management of stormwater. EPA Victoria guidelines for major construction sites could provide a reference. Guidelines can be used to prepare EMPs. In-line measure: sediment control measures required for the duration of construction. Site management plans: require site management plans for all construction activities, in particular to target sedimentation, erosion and waste management. Use Best Practice Guidelines (p. 91) as basis for preparation of plans. Targeted literature/guideline development: preparation and distribution of brochures to building contractors and developers.	\$10,000 to \$12,000. Project based. Approximatel y \$10,000 for site audits.	Allow \$3,000 to update.	o PM in consultation with EEP and VicRoads. PM. MM. EEP including input from EPA Victoria, MW, YVW, Mar and VicRoads.	Municipality wide. MMC, JC & KC. Municipality wide, especially MMC, AC, JC.	Very High.	Active. Possibility of using Stormwater Protection Specification currently being developed by LGPro. Assessed on a case by case basis. New EPA Guidelines for construction sites would be useful for distribution.	On-going. On-going. Not formalised. Refer to MFS No. 38. To be further discussed with PM	EA-MMC & KC-1 STM-MMC, JC & KC-23 SC-MMC, JC & KC-52 EA-JC-1

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
RMS	116	In-line traps down stream of commercial centres to			PM.	KC & RC.	Very high.	Active.	June 2004.	STM-MMC,
		address threats to Koonung Creek, Ruffey Creek and Yarra River. Possible locations:						Projects shown in bold have been	Dependant on funding.	RC & AC
		 Warrigul Road and Yarra Valley Road (Bulleen Plaza); 	\$15–150,000.	\$2-15.000.				funded for implementation in	Need to review size	
		• vicinity of Greenaway Light Industrial area;	Total	Total \$159,000.				2002–03. Further	and priority using MUSIC model.	
		 near corner of Seville and Parker Streets (Templestowe Village); 	\$922,000.	Τοιωί φ10>,000.				VSAP applications required by October	Need to properly	
		• in the vicinity of Bulleen Plaza;						2002.	model catchments before designing	
		 below-ground along nature strip in Tram Road. (Westfield Shopping Centre); 							structural measure to ensure suitable.	•
		 in vicinity of Tunstall Road and Russell Crescent intersection. Alternatively two smaller in -line traps closer to the Tunstall Square Shopping Centre; 							Use CRC work.	
		on Bullen Road and Calin Crescent in the reserve (Jackson Court Shopping Centre);								
		on Franklin Road and/or the laneway near Blackburn Road (Devon Plaza);								
		• in reserve near Irene Court and in -line traps possibly in the Ted Ajani reserve (underground) (Macedon Square); and Council reserve near corner of Firth Street and Beaconsfield Street (commercial and Light industrial area);								
		 at source control required at The Pines Shopping Centre as this centre drains to a number of locations; 								
		 at source control in vicinity of shops in George Street; 								
		at source control near corner of Springvale Road and Mitcham Road								
RMS	117	Unloading and loading areas: audit unloading and loading measures to ensure pollution into the stormwater system is not occurring. Ensure pollution risks are accounted for adequately.	\$5,000 for random audit reports		PM.	Commercial area in municipality.	as High.	Inactive	\$\$ is key to implementation. Waste Education.	SC-MMC KC-46

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Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
RMS	119	Consultation with Maroondah City Council, Melbourne Water, EPA Victoria, YVW and YCC	Officer time.		PM.	Mullum Mullum Creek.	Very high.	Inactive.	Corporate Item.	EA-MMC-3
		to address management of pollutants originating from outside Manningham.				стеек.			Need to set up forum.	
RMS	137	Domestic waste and recycling collection:	Extra service		PM.	Municipality	Medium.	Active.	Part of Waste	SC-MMC &
		collection of general garbage, plastics and glass, paper and cardboard could increase to discourage	cost (chargeable to			wide.		Refer also to MFS Nos. 31 and 37.	Strategy Review 2003.	AC–39a
		irresponsible disposal.	ratepayers). Allow \$5,000.						Combine Waste Management actions.	
RMS	139	Grass swales: planning/design of road works to	Individual		PM.	MMC.	High.	Active.	On-going.	STM-MMC,
		incorporate road medians, verges, car park runoff areas, and parks where appropriate. The grass swales should be located work in association with	project cost.					Land not generally suitable.		JC & KC-28
		silt fences. For example, Park Road construction activity—review opportunity for use of sections of						Assessed on a case by case basis.		
		Alan Morton Reserve for a grass swale. Note: gradient may be a limiting factor.						MCC say Atlantis Pit possible.		
RMS	145	Site management plans: minimise pollution from	Publicise	Staff time to	PM.	Municipality	Very high.	Inactive.	Incorporate changes	SC-JC-52
		development sites by requiring a site management plan and conduct a site inspection to ensure	for plan.	inspections.		wide.		Relates to Residential	in Planning Scheme MFS No. 3.	
		compliance. Site management plans should specifically address soil and water management,	\$5,000.	\$10,000.				development.	Use VSAP Project	
		vegetation retention and waste management.						Discussed with SW Committee.	information.	

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Extent of application	Priority	Status	Estimated completion date and comments	Number (refer App. C– SWMP Vol 2)
RMS	121 & 122 129 & 130	Circular settling tanks: Falconer Road. Sediment settling basins: possible locations include Gold Memorial Drive near but after junction with Husseys Lane. In-line treatment: circular screens at Williamsons	\$30,000. \$20,000. \$35,000 for smaller, precast unit.	\$5,000 per year. \$20,000. \$23,000.	PM. PM & MM. VicRoads and MW.	Andersons Creek sub-catchment. Mullum Mullum Creek. Koonung Creek.	Very high to high.	Application to VSAP for funding required by October 2002.	June 2004. All subject to funding. Some to be advised.	STM-AC-19 STM-AC-18 STM-AC-23 STM-KC-
		Road; Foote Street. Litter traps, open space area south of Hampshire Road and Brindy Crescent, near Wetherby Road, north of Koonung Creek.	\$140,000. \$90,000. \$20,000.	\$15,000. \$20,000.		Ü		Need to discuss with VicRoads to ascertain program.		MW
		Sediment pond (in open space area near intersection of High Street and Eastern Freeway). Sediment pond, within vicinity of TAFE.								
RMS	127 & 128	Site management plans: minimise pollution from construction sites by requiring a site management plan and conduct a site inspection to ensure compliance. The plan should address key issues	Publicise requirements for plan— \$5,000.	Staff time to conduct site inspections. \$10,000.	SP in consultation with PM and EEP. H & LL.	Municipality wide. Municipality wide.	Very high. High.	Partly active. For discussion with SW Committee on way forward.	On-going. Review if new by-law actually required.	SC-JC-52 STM-JC-12
		including sediment and waste management. The best practice guidelines for urban stormwater provide an outline for these types of plans. Near source treatment: require all building sites to install near source treatment measures.	\$50,000 to develop by- law.	\$40,000 to administer.				Planning permit requirements for sedimentation pit now standard but needs to be	H & LL reactive to complaints Does not address non-planning permit sites.	
		Discussion required with SW Committee on how to capture all sites.						supported by changes to Council policy and guidelines.		

MEN290-001, Rev, 1 26 May 2003

Appendix E

5-YEAR IMPLEMENTATION PLAN

5 year implementation plan and estimated capital and ongoing annual operational costs (structural (C) and non-structural (NC) capital items in bold)

					-		-						
Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05)	Year 2 (05/06) \$	Year 3 (06/07)	Year 4 (07/08) \$	Year 5 (08/09)
MFS	27	Each unit should identify opportunities for inclusion of the SWMP in their annual work programmes and annual budgets.	0	0	All.	Medium							
MFS	26	Include reference to the Manningham SWMP in the Corporate Plan and where appropriate include reference to capital expenditure items directly related to the Corporate Plan the Annual Budget.	0	0	Corporate	Medium.	Complete 2001 Include in 2002-2005 Corporate Plan						
MFS	2	Draft a local policy under the planning scheme that defines expectations with regard to development and use of land by Council, the private sector and other public authorities. The local policy should specifically refer to the need for current and prospective land owners (residents, commercial operators) to respond to the objectives of the SWMP when managing their properties and planning for future land use and development.	\$4,000	0	EEP in consultation with other Units to draft policies and amendment s to the MSS.	High		4000					
MFS	3	Prepare a series of standard planning and building permit conditions that relate specifically to the SWMP and the statements included in the MSS and local policies.	\$2,000	0	EEP in consultation with SP.	High		2000					
MFS	4	With regard to the preparation of Site Management Plans and Environmental Management Plans—provide a series of performance objectives that relate to the objectives of the SWMP. These performance objectives can provide a guideline for proponents or Council when plans are being prepared.	\$5,000	0	EEP to prepare in consultation in PM.	High		5000					

MFS 1 1 to 1.9 1.1 to 1.19 1.				G			D : ::	Comment	Year 0 (03/04)	Year 1 (04/05)	Year 2 (05/06)	Year 3 (06/07)	Year 4 (07/08)	Year 5 (08/09)
management in parks and reserves and associated benefits to stormwater quality.	Type MFS	1	specifically the Municipal Strategic Statement should be amended as follows: Clause 21.02-13 Environment—could include reference to areas of significance along waterways. Clause 21.03 Drainage and sewerage—could include reference to stormwater quality management issues and that a municipal-wide SWMP has been prepared. Framework Plan 7—could include reference to 'hot spot' areas for stormwater quality management, i.e., areas or issues causing greatest level of threat to identified values. Under Clause 21.09 Natural Environment, a key issue, objective, strategy and implementation could be drafted for urban stormwater quality management. Under Clause 21.09 Non-urban areas—a key issue, objective, strategy and implementation citation could be prepared with regard to stormwater management, with regard to unsewered areas, building site runoff etc. Under Clause 21.10 Open space—a key issue, objective, strategy and implementation citation could be prepared with regard to litter and waste management in parks and reserves and associated benefits	Capital \$2,000	Ongoing	in consultation with other units of Council to draft policies and amendment		next planning	\$	(04/05)	(05/06)	(06/07)	(07/08)	(08/09)

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05)	Year 2 (05/06) \$	Year 3 (06/07)	Year 4 (07/08) \$	Year 5 (08/09) \$
MFS	1 1.1 to 1.9 continued	Under Clause 21.12 Established urban areas—a key issue, objective, strategy and implementation citation could be drafted with regard to residential runoff and associated stormwater management issues. Under Clause 21.14 Commercial and industrial—a key issue, objective, strategy and implementation citation could be drafted with regard to commercial runoff. Under Clause 21.19 Drainage and sewerage—a key issue, objective, strategy and implementation strategy could be drafted in relation to overall stormwater quality management objectives.											
MFS	11 & 20	Provide a programme of technical training for Council officers with regard to implementation of best practice stormwater management guidelines. Opportunities for internal and external training and resources should be identified. Training should be integrates with the existing staff development programme and with EMS training programme. Provide an opportunity for exchange of information relating to stormwater management practices. For example, lunchtime forums with guest speakers and presentations by Council officers.	\$15,000	\$5,000	EEP with the assistance of OD and the SW Committee	High to medium.	Complete June 2003- \$15000		5000	5000	5000	5000	5000
MFS	19	All Council officers who regularly use the planning scheme provisions should attend an in-house workshop/seminar with regard to the application of the SWMP and how it is reflected in the planning scheme.	\$5,000	\$2,000	EEP	High			5000	2000	2000	2000	2000

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05) \$	Year 2 (05/06)	Year 3 (06/07) \$	Year 4 (07/08) \$	Year 5 (08/09) \$
MFS	21	Identify opportunities for joint seminars, brochures for specific issues areas. For example: • workshop/information seminar for residents with on-site sewage treatment systems and off-site sullage disposal—Council, EPA Victoria and Yarra Valley Water; • review opportunities for a seminar undertaken in association with the Port Phillip CALP board.	0	0	EEP with H & LL.	Medium							
MFS	24	Liaise regularly with community groups who have an interest in environmental management issues—in particular stormwater management.	0	0	EEP H & LL.	Medium							
MFS	28	Where appropriate, reference to the SWMP should be included in the Municipal Strategic Statement, GreenPrint, and Council's EMS.	\$2,000	0	EEP	High.			2000				
MFS	30	Integration of recommendations of the SWMP into the Open Space Strategy where appropriate.	\$2,000	0	EEP with C& LS.	High.			1000	1000			
MFS	25	Identify existing education/community awareness campaigns that can be used as part of Council's community educatio0wareness campaign. Agencies to target include: • LeastWaste; • Catchment and Land Protection Boards; • EcoRecycle; • Parks Victoria; • Environment Protection Authority Victoria.	0	0	EEP with PM.	Medium.							
MFS	6	During review of Local Laws, identify opportunities to integrate stormwater management outcomes.	\$2,000	0	H & LL	High		2000					

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05)	Year 2 (05/06)	Year 3 (06/07)	Year 4 (07/08) \$	Year 5 (08/09) \$
MFS	10 & 12 & 33	Establishment of operational benchmarks for Council activities: open space management and maintenance; road maintenance; street cleaning; drainage maintenance. Set up a process of monitoring drainage clearance activities undertaken by the MM. In particular set up a database of quantities and contents of material removed from stormwater management devices. This will enable a process of ongoing monitoring to take place.	\$20,000	0	MM and PM.	Medium to high.	Complete June 2003						
MFS	38 & 34 36	Preparation of an overall Environmental Management Plan (EMP) and site specific EMPs for operation and maintenance activities in open space areas to address matters such as watering and fertilising regimes, waste disposal, green waste disposal etc. Preparation of an overall EMP to guide drainage maintenance works (procedures for cleaning and dumping of wastes from litter traps etc., procedures for maintenance of unsealed drains etc). Review street sweeping procedures to maximise potential for pollutant collection.	0	0	MM and PM	Medium to high							
MFS	14	Review contract specifications for MM to enable them to implement measures relevant to stormwater quality control in their maintenance activities.	0	0	MM.	High.							

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05)	Year 2 (05/06) \$	Year 3 (06/07) \$	Year 4 (07/08) \$	Year 5 (08/09) \$
MFS	16 & 35	Investigate the use of light weight and alternative pavements to treat unsealed roads to minimise sediment runoff. Review unsealed road and drainage management practices to minimise sediment runoff.	0	0	MM with PM	High.	Completed. External funding required.						·
MFS	9 & 13 & 15	Identification of the need to consider the SWMP in relevant tenders where stormwater quality management is an issue. Review of contract specifications regarding stormwater quality control for construction projects. Incorporate stormwater quality control measures in all new drainage design and upgrade drainage designs.	0	0	PM.	Medium.							
MFS	29	Integration of recommendations of the SWMP into the Drainage Strategy (approved by Council on 25 May 1999). Identify opportunities to implement SW management best practice.	0	0	PM.	High.	Existing funding						
MFS	31	Integration of recommendations of the SWMP into the Waste Management Strategy.	0	0	PM.	High.	Existing funding						
MFS	32	Integration of recommendations of the SWMP into Arterial Road Improvement Strategy.	0	0	PM in consultation with VicRoads.	Medium.	Existing funding						
MFS	37	Audit litter collection activities to ensure that no litter is left uncollected or spilt as required by the contract conditions.	\$5,000	\$5,000	PM.	Medium.		5000	5000	5000	5000	5000	5000

							Comment	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Deioeity		(03/04) \$	(04/05) \$	(05/06) \$	(06/07) \$	(07/08) \$	(08/09) \$
MFS	5	As part of the statutory referral process, source feedback from Melbourne Water, Yarra Valley Water, EPA Victoria, Parks Victoria, VicRoads with regard to achieving best practice environmental standards with regard to stormwater management and sensitive urban design. This can be undertaken on a project by project basis or as a standard set of conditions.	0	0	SP.	High.		•	, , , , , , , , , , , , , , , , , , ,	<u> </u>	*	*	•
MFS	23	Where appropriate integrate feedback from relevant authorities into statutory approval process—namely the EPA Victoria, Melbourne Water, Parks Victoria, VicRoads, DSE and Yarra Valley Water. Opportunities for agency feedback and participation should be clearly identified.	0	0	SP.	High.							
MFS	7.	Secure Councillor and management commitment with regard to the recommendations of the Manningham SWMP.	0	0	SW Committee.	Very high.	Identified in Corporate Plan						
MFS	8 to 8.4	Define roles and responsibilities for stormwater management with Council with regard to the following issues areas: • installation and maintenance of structural infrastructure such as litter traps, in -line devices etc.; • implementation of sensitive urban design principles through the planning scheme and other statutory controls; • development of community and stakeholder consultation programs; • development and implementation of enforcement measures with regard to stormwater quality management.	0	0	SW Committee.	High.	Identified in Corporate Plan						

Туре	Action no	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05)	Year 2 (05/06) \$	Year 3 (06/07) \$	Year 4 (07/08) \$	Year 5 (08/09) \$
MFS	17	Designate a SW Committee responsible for the implementation of the plan throughout Council's Units. The SW Committee will also be responsible for ensuring that an internal awareness/education campaign is undertaken to inform Council officers of their role in ensuring the effective implementation of the plan.	0	0	SW Committee.	High.	Complete July 2002	*	*	•	<u> </u>		•
MFS	18	Identify/employ a Council officer who is responsible for all enquires particularly those of proponents with regard to statutory requirements of the SWMP.	\$70,000	\$60,000	SW Committee.	Very high.	Position already exists in budget						
MFS	22	Identify opportunities to work with adjoining municipalities to address 'regional' SW management issues such as commercial runoff; upstream inflows and residential runoff. Adjoining municipalities include: Nillumbik, Maroondah, Whitehorse, Boroondara and Banyule. Review the option of having a working party with representatives from each Council. The group can meet during the year to discuss issues related to SW quality management and opportunities to work together. Possibly integrate SW management issues with existing regional networks.	0	0	SW Committee with the assistance of EEP.	Medium.							
Total		Management Framework Costs	\$29,000 (NC)	\$58,000 (OG)				\$20,000 (NC)		\$1,000(NC)	\$0 (NC)	\$0 (NC)	\$0 (NC)
		Capital (C) & On-going (OG)						\$0 (OG)	\$10,000 (OG)	\$12,000 (OG)	\$12,000 (OG)	\$12,000 (OG)	\$12,000 (OG)

Туре	1	Proposed action	Capital	Ongoing	Responsibility		Comment	Year 0 (03/04) \$	Year 1 (04/05) \$	Year 2 (05/06) \$	Year 3 (06/07) \$	Year 4 (07/08) \$	Year 5 (08/09) \$
RMS	102	Community and special interest group consultation: raise awareness of the impact of all priority risks amongst the wider community to increase support and understanding of Council initiatives.	\$5,000	0	All units as relevant.	Very high.				5000			
RMS	103	Business stakeholder groups and SW Committees: liaise directly with Chamber of Industry and Commerce groups, shopping centre management, light industry and commercial business operators regarding waste management and stormwater management objectives.	0	0	All units as relevant.	High.	Dependant on workloads						
RMS	104	Targeted literature/guideline development: preparation and distribution of brochures to address stormwater quality management issues and what residents and businesses can do to assist.	\$12,000	\$3,000	EEP in consultation with H & LL & PM, EPA Victoria, YVW, MW, EcoRecycle, YCAC, other Councils.	High.					12000	3000	3000
RMS	110	Establish a programme to monitor the effectiveness of the stormwater management plan. Key areas to monitor include: • effectiveness of structural treatment measures; • condition of receiving environment • conduct of and effectiveness of education programmes; • litter reduction in the municipality.		\$5000	EEP with the assistance of YVW, MW, EPA Victoria and integrate with the Waterwatch Programme.	Very high	Complete project June 2003 \$20,000		5000	5000	5000	5000	5000
RMS	114	Commercial runoff abatement competitio0wards: competition awarding prizes and publicity to winning business and light industries in the municipality who demonstrate practices that improve quality of stormwater runoff from their area.	\$15,000		EEP with PM in consultation with LeastWaste, EPA Victoria, co-sponsorshi p by local press	Very high						15000	

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05)	Year 2 (05/06)	Year 3 (06/07) \$	Year 4 (07/08) \$	Year 5 (08/09) \$
RMS	118	Develop Environmental Management Plans (incorporating stormwater management issues) for key commercial areas or sites.	0.	0	EEP in consultation with PM and LeastWaste	Very high.				0			
RMS	125	Targeted literature/guideline development: preparation and distribution of brochures to residents, and construction contractors and to local chambers of commerce, industry groups.	\$12,000.	\$3,000	EEP in consultation with EPA, MW, and Marketing Unit.	Very high.				12000	3000	3000	3000
RMS	126 & 101	Best practice demonstration workshops: develop and conduct a number of workshops from Council offices and/or at building sites. Training of relevant Council officers: train staff in best practice urban stormwater management. This includes training in water sensitive urban design, soil and water management principles, drawing upon available courses. It also includes training in awareness of the SWMP itself.	\$4,000	\$4,000	EEP in consultation with SP, BC, DOI, EPA, MW, EcoRecycle and other councils and input from EPA, MW, YVW, and VicRoads.	Very high.			4000	4000	4000	4000	4000
RMS	134	Constructed wetlands: south of Gold Memorial Road, north of Beauty Gully/Husseys Lane and east of Harris Gully Road (no); Westerfolds Park to address sediment issues; (possible); Tikalara P ark near Cliveden Crescent, west of Mullum Mullum Creek (proposed by MW, but MCC does not agree).	\$404,000	\$30,000	EEP MW, Parks Victoria, and PM.	Very high.						270000 30000	134000 30000
RMS	132	Targeted literature/guideline development: develop and prepare brochures for residents to raise awareness of how typical residential activities on stormwater quality and responsible water and waste management practices. Draw on EPA Victoria and other agencies materials.	\$12,000	\$3,000.	EEP with Health in consultation with H & LL, PM, EPA Victoria, YVW, MW, EcoRecycle.	Very high.				12000	3000	3000	3000

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05)	Year 2 (05/06) \$	Year 3 (06/07)	Year 4 (07/08) \$	Year 5 (08/09) \$
RMS	133 & 105	Demonstration projects showing best practice: set up demonstration model (to scale) of a dwelling that has been designed to meet best practice stormwater management standards. Run school/university competition to build models and award prizes. Demonstration projects showing best practice: set up demonstration model (to scale) of a dwelling that has been designed to meet best practice stormwater management standards. Run competition to build models and award prizes.	\$5,000 \$5,000	0	EEP with CLS, EEP, SP & CLS.	High.	Prefer to fund using external grants			5000 5000			
RMS	135 & 136	Rainwater storage and reuse (tanks): encourage in areas with larger blocks and the more rural parts of the municipality. Installation and promotion of tanks should be integrated with existing Water Week programme. Reduces water for-site and therefore flow of pollutants. Roof water diversion: publicise the benefits of diverting roof water to grassed swales or otherwise pre-treat. Reduces total flows, scouring, sediment and nutrients entering the stormwater system.		0	EEP with BC to approve structures. Consult with YVW as a possible partner—use their brochure. PM.	Medium.	Complete June 2003						
RMS	140	Best practice demonstration workshops: demonstration of key best practice actions with regard to road construction sites.		\$2,000.	EEP in consultation with H & LL & PM and seek support from DOI, EPA Victoria, MW, EcoRecycle and other municipalities.				4000	2000	2000	2000	2000

Type	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04)	Year 1 (04/05)	Year 2 (05/06) \$	Year 3 (06/07) \$	Year 4 (07/08) \$	Year 5 (08/09) \$
RMS	144	Stormwater management and education workshops: develop and conduct workshops for developers and targeting development site runoff control measures. Conduct workshops from Council offices.	\$4000	\$2,000	EEP with LL in consultation with PM, H & LL, DOI, EPA Victoria, MW, EcoRecycle and other municipalities.					4000	2000	2000	2000
RMS	108	Infringement notification and fines: on the spot fines of the audit and inspection process for poor stormwater management and waste management. These can be developed and issued in relation to practices on development and building sites, infringements of proper waste management in commercial areas, unsatisfactory septic tank management and any other activity with the potential for negative impact.		\$40,000	Local Laws.	Very high.	Ongoing staff costs for enforcement See RMS 127 & 128						
RMS	111	Targeted literature/guideline development: develop and prepare brochures for residents with septic treatment systems regarding their maintenance responsibilities, ongoing monitoring requirements and about responsible water and waste management practices.	\$12,000	\$3,000	H & LL in consultation with EEP, EPA Victoria, and YVW.	Very high					12000	3000	3000

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05) \$	Year 2 (05/06) \$	Year 3 (06/07)	Year 4 (07/08) \$	Year 5 (08/09) \$
RMS	100	Media release: use local press opportunistically to advertise the impact of various activities on the environmental values of receiving waterways as a result of stormwater quality. Use the local media to highlight the development of the stormwater management plan, including associated guidelines and brochures produced as a result of the plan. Also highlight competitions, workshops and periods of consultation planned. Will increase community awareness and advise them of opportunities available to them as individuals, groups or businesses.		\$5,000	Marketing Unit .	Very high.	Initial start up staff costs			5000	5000	5000	5000
RMS	106	Street sweeping: assess the street cleaning programme and identify 'hot spots' where pollutants accumulate to increase the effectiveness of the street sweeping programme including commercial areas, main roads and construction areas.	\$5,000.	0	MM. John O'Brien.	Very high.			5000				
RMS	107	Drain maintenance: monitor the accumulation rates of litter, silt and leaves in the drainage system during inspections and cleaning. This will assist in providing feedback on the effectiveness of the measures in place, and in adjusting maintenance practices to maximise effectiveness of treatment.	0	\$5,000	MM. John O'Brien.	Very high.			5000	5000	5000	5000	5000
RMS	120 & 131	Stability works. Along creek within Freeway Public Golf Course and Manningham Club and Conference Centre. Stability works near intersection of Sheahans Road and Templestowe Road.	\$120,000 \$75,000	0	MW. may pay for this as part of waterway stabilisation program				120000	75000			

Туре	4	Proposed action	Capital	Ongoing	Responsibility	-	Comment	Year 0 (03/04) \$	Year 1 (04/05)	Year 2 (05/06)	Year 3 (06/07) \$	Year 4 (07/08) \$	Year 5 (08/09) \$
RMS	123	Unsealed road maintenance: schedule grading to coincide with optimum moisture content in road material. Grade shoulders of roads to direct drainage away from tributaries. Review methods of maintaining table drains to minimise sediment and vegetation disturbance.	0	0	MM.	Very high							
0MS	109	Audit and inspection: conduct regular audits and inspections of contractors working on road works, building/development sites, residents with septic tanks, commercial operators within the municipality. Publicise audit process to raise awareness.	0	\$10,000 \$10,000.	PM with H & LL.	High.			20000	20000	20000	20000	20000
RMS	112 & 113	Extension of sewer system on the western side of Mullum Mullum Creek. Review opportunities to extend sewer system either further south of the service unsewered Donvale area or extend sewer east across Mullum Mullum Creek to enable sewering of Park Orchards area. Financial incentive for septic tank system upgrade and compliance audit certification, completed in eth next twelve months. Individual residents ons septic tanks systems can install an approved septic system upgrade and undergo a compliance audit concerning responsible on-site waste and water management strategies to receive a rates rebate.		0	PM with H & LL in consultation with YVW.	Very high.	YVW capital costs Review 2004						

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05)	Year 2 (05/06) \$	Year 3 (06/07) \$	Year 4 (07/08) \$	Year 5 (08/09)
RMS	115	Signage: in car parking areas regarding waste minimisation objectives (especially strip shopping centres). Locations include Tunstall Square, The Pines Shopping Centre, Westfield Doncaster Shoppingtown and Jackson Court Shopping Centre. Revisit drain—stencilling programme and identify outlet pipes with identification codes so that people wanting to report pollution events can easily identify them.	\$2,000	\$500	PM for signage and drain outlet identification. EEP for drain stencilling.	High.	Subject to funding					2000	500
RMS	124	Alternative pavements: review the possibility of using alternative road sealing methods such as light weight pavements.	\$5,000	0	PM and MM.	Very high.	Complete						
RMS	138 & 141 142 & 143	Targeted literature/guidelines development: guidelines for road construction contractors regarding management of stormwater. EPA Victoria guidelines for major construction sites could provide a reference. Guidelines can be used to prepare EMPs. In-line measure: sediment control measures required for the duration of construction. Site management plans: require site management plans for all construction activities, in particular to target sedimentation, erosion and waste management. Use Best Practice Guidelines (p. 91) as basis for preparation of plans. Targeted literature/guideline development: preparation and distribution of brochures to building contractors and developers.	\$12,000 \$10,000	\$3,000	PM in consultation with EEP and VicRoads. PM. MM. EEP including input from EPA Victoria, MW, YVW, Mar and VicRoads.			22000	3000	3000	3000	3000	3000

Туре Ас	ction no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05)	Year 2 (05/06) \$	Year 3 (06/07) \$	Year 4 (07/08) \$	Year 5 (08/09)
*1	16	In-line traps down stream of commercial centres to address threats to Koonung Creek, Ruffey Creek and Yarra River. Possible locations: 1. in the vicinity of Bulleen Plaza; 2. in vicinity of Tunstall Road and Russell Crescent intersection; 3. on Franklin Road or the laneway near Blackburn Road (Devon Plaza); 4. Warrigul Road and Yarra Valley Road (Bulleen Plaza); 5. vicinity of Greenaway Light Industrial area; 6. near corner of Seville and Parker Streets (Templestowe Village); 7. below-ground along nature strip in Tram Road. (Westfield SC); 8. on Bullen Road and Calin Crescent in the reserve (Jackson	Total \$922,000 Completed \$250,000 New Total \$672,000 1. Completed 2. Completed 4. \$50,000 5. \$25,000 6. \$45,000 7. \$125,000 8. \$75,000	Total \$159,000 On-going \$24,000 New Total \$135,000 1. \$2,000 2. \$7,000	PM.	Priority Very high.		, ,		\$ 277000	` ′		

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05)	Year 2 (05/06) \$	Year 3 (06/07) \$	Year 4 (07/08) \$	Year 5 (08/09) \$
RMS	117	Unloading and loading areas: audit unloading and loading measures to ensure pollution into the stormwater system is not occurring. Ensure pollution risks are accounted for adequately. When Actions in 116 installed, review monitoring opportunities.	\$5,000	0	PM.	High.		5000					
RMS	119	Consultation with Maroondah City Council, Melbourne Water, EPA Victoria, YVW and YCC to address management of pollutants originating from outside Manningham.	0.	0	PM.	Very high.							
RMS	137	Domestic waste and recycling collection: collection of general garbage, plastics and glass, paper and cardboard could increase to discourage irresponsible disposal.	\$5,000	0	PM.	Medium.	Initial investigation finished						
RMS	139	Grass swales: planning/design of road works to incorporate road medians, verges, car park runoff areas, and parks where appropriate. The grass swales should be located work in association with silt fences. For example, Park Road construction activity—review opportunity for use of sections of Alan Morton Reserve for a grass swale. Note: gradient may be a limiting factor.	0	0	PM.	High.							
0MS	145	Site management plans: minimise pollution from development sites by requiring a site management plan and conduct a site inspection to ensure compliance. Site management plans should specifically address soil and water management, vegetation retention and waste management.	\$5,000	\$10,000	PM.	Very high.			5000	10000	10000	10000	10000

							Comment	Year 0 (03/04)	Year 1 (04/05)	Year 2 (05/06)	Year 3 (06/07)	Year 4 (07/08)	Year 5 (08/09)
Type	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority		\$	\$	\$	\$	\$	\$
RMS	121 & 122 129 & 130	1 Circular settling tanks: Falconer Road.	1 \$30,000	1. \$5,000	PM. PM & MM.	Very high to high.			30000	5000	5000	5000	5000
		2. Sediment settling basins: possible locations include Gold Memorial Drive	2. \$20,000	2. \$20,000	VicRoads and MW.					20000	5000	5000	5000
		near but after junction with Husseys Lane.	3 \$35,000.	3. \$23,000								35000	6000
		3. In-line treatment: circular screens at Williamsons Road; Foote Street.	4. \$140,000	4. \$15,000							140000	6000 15000	15000
		4. Litter traps, open space area south of Hampshire Road and Brindy Crescent, near Wetherby Road, north of Koonung Creek.	5. \$90,000	5. \$20,000							90000	5000	5000
		5. Sediment pond (in open space area	6. \$20,000	6. \$2,000								20000 2000	2000
		6. Sediment pond, within vicinity of TAFE.											
RMS	127 & 128	Site management plans: minimise pollution from construction sites by requiring a site management plan and conduct a site inspection to ensure compliance. The plan should address key issues including sediment and waste management. The best practice guidelines for urban stormwater provide an outline for these types of plans. Near source treatment: require all building sites to install near source treatment measures. Discussion required with SW Committee on how to capture all sites.	\$5,000 \$50,000	\$10,000 \$40,000	SP in consultation with PM and EEP. H & LL.	Very high . High .	Only if employ staff for inspections Otherwise \$5,000/yr		50000 5000	50000	50000	50000	50000

Туре	Action no.	Proposed action	Capital	Ongoing	Responsibility	Priority	Comment	Year 0 (03/04) \$	Year 1 (04/05) \$	Year 2 (05/06) \$	Year 3 (06/07) \$	Year 4 (07/08) \$	Year 5 (08/09) \$
Total	RMS	Reactive Management Estimated Costs Capital (C) & Non-capital (NC) & On-going (OG) & Staff (ES)	\$55.000 (ES)	\$782,500 (OG) \$200,000 (ES-OG)				\$0 (C) \$27,000 (NC) \$0 (OG)	\$395,000 (C) \$23,000 (NC) \$28,000(OG) \$55,000 (ES)		\$380,000 (C) \$24,000 (NC) \$153,000 (OG) \$50,000 (ES)	\$325,000 (C) \$17,000 (NC) \$244,000 (OG) \$50,000 (ES)	, , ,
Total	MFS	Management Framework Estimated Costs Capital (C) & Non-capital (NC) & On-going (OG) & Staff (ES)	\$29,000 (NC)	\$58,000 (OG)				\$20,000 (NC) \$0 (OG)	\$8,000 (NC) \$10,000 (OG)	\$1,000(NC) \$12,000 (OG)	\$0 (NC) \$12,000 (OG)	\$0 (NC) \$12,000 (OG)	\$0 (NC) \$12,000 (OG)
Total		Combined Total Estimated Costs for Reactive and Management Framework Strategies for 5 year implementation plan Capital (C) & Non-capital (NC) & On-going (OG) & Staff (ES)	\$163,000 \$55,000 (ES)	\$840,500 (OG) \$200,000 (ES-OG)				\$0 (C) \$47,000 (NC) \$0 (OG) \$0 (ES)	\$395,000 (C) \$31,000 (NC) \$38,000 (OG) \$55,000 (ES)	\$125,000 (OG)	\$380,000 (C) \$24,000 (NC) \$165,000 (OG) \$50,000(ES)	\$325,000 (C) \$17,000 (NC) \$256,000 (OG) \$50,000(ES)	\$134,000 (C) \$0 (NC) \$256,500 (OG) \$50,000 (ES)
Total			\$1,824,000	\$1,040,500				\$47,000	\$519,000	\$591,000	\$619,000	\$648,000	\$440,500

Appendix F

GUIDELINES

Guideline No. 1: Monitoring the Effectiveness of Structural Treatment Measures

Purpose of Guideline No. 1: Monitoring the Effectiveness of Structural Treatment Measures

The purpose of Guideline No.1: Monitoring the Effectiveness of Structural Treatment Measures is:

• to develop a program to monitor the effectiveness of structural treatment measures identified within the Manningham Stormwater Management Plan, for improving stormwater quality. This guideline builds on work already undertaken by Council and will also apply to future projects.

The guideline:

- identifies the categories of structural treatment measures currently in use or proposed to be installed in waterways within Manningham;
- identifies the extent and outcome of currently structural treatment measure monitoring programs being undertaken by Manningham City Council; who are the key stakeholders for Manningham; and what Manningham City Council's expectations are of the monitoring program;
- identifies best practice structural treatment measures monitoring techniques available and includes a contacts and reference list to aid Council in preparing a Council specific program; and
- provides a suggested structural treatment measure monitoring program.



Other guidelines in series

This guideline is the first of a five part series of guidelines produced to provide Manningham City Council with some guidance for developing monitoring and reviewing programs for various aspects of stormwater management. The other four guidelines are:

- Guideline No. 2: Monitoring the Effectiveness of Non-structural Treatment Measures
- Guideline No. 3: Monitoring Water Quality
- Guideline No. 4: Monitoring Stakeholder Satisfaction
- Guideline No. 5: Domestic Wastewater Program.

Each guideline is designed to be stand alone, however a more holistic approach can be gained by referring to others in the series. Due to the large amount of information available on stormwater management, an extensive reference list is attached that lists documents that support the guidelines.

2 Definitions

The use of structural stormwater treatment measures can be grouped into three categories:

Primary treatment

This involves physical screening or rapid sedimentation techniques that retain gross pollutants and coarse sediments. There is a wide choice of primary treatment measures available which can vary significantly in size, cost and performance. An example of the types of primary treatment measures include: drainage entry treatments, in-line devices, self-cleaning screens, floating traps and sediment traps.

Secondary treatment

Secondary treatments can remove/retain coarse, medium and fine sediments and have filtration techniques that retain fine particles and attached sediments and are divided into two broad categories: pre-entrance treatments (e.g. filter strips, grass swales, triple interceptor pits and infiltration techniques) and in-transit treatments (e.g. infiltration basins, extended detention basins and sand filters).

Tertiary treatments

Tertiary treatments involve enhanced sedimentation and filtration, biological uptake and adsorption onto sediments. They can retain nutrients and heavy metals that bind to medium and fine sediments. Constructed wetlands are generally the only treatment technique used in the removal or retention of nutrients and fine sediments. Other types of tertiary treatment include sand filters that include a media layer with an adsorption capacity and the provision of reticulated sewerage in septic tanks areas.



3 Types of structural best management practices used within Manningham City Council

The following structural best management practices (BMPs) are in use or are planned to be installed throughout the City of Manningham:

- gross pollutant traps (GPTs), e.g. in-line traps (primary treatment)
- stability works (primary treatment)
- circular settling tanks (primary treatment)
- sediment settling basins (primary treatment)
- roof water diversion (tertiary treatment)
- grass swales (secondary treatment)
- circular screens (primary treatment)
- backlog sewering/sewer extension (tertiary treatment)
- alternative pavements (secondary treatment).

Current monitoring programs being undertaken by Manningham City Council

There is very little monitoring being undertaken of structural treatment measures within Manningham City Council. There is limited monitoring being undertaken for litter traps. Litter traps are emptied collectively with the combined weight of all material taken from all GPTs recorded as one figure. Due to the large costs involved, there is no weighing of individual traps or sorting of litter into components (e.g. plastic, leaf litter, paper, drink containers).

Audience/key stakeholders for results

The primary audience within the City of Manningham for monitoring the effectiveness of structural treatment measures is internal reporting at a unit or corporate level. Structural measures are generally high in capital cost, with on-going maintenance costs.

The ability to monitor structural measures can provide support to on-going expenditure and to provide corporate reporting against key performance indicators (KPIs).

What does Manningham City Council want from the monitoring?

By monitoring the effectiveness of works installed by Manningham City Council, it becomes possible for the Council to justify the resource used and to report environmental improvement as a result of the capital works program.

The Council can then use this data to report at a corporate level and to the community. Experience gained in the initial review and the results obtained can then be used to provide feedback to future capital works (e.g. siting, baseline pre-construction monitoring, design criteria, alternatives). Results may also indicate a need for other internal requirements such as training.



What best practice monitoring techniques are available?

The development of monitoring techniques for stormwater improvement structures are on-going. Organisations such as Melbourne Water, EPA and universities, together with research centres such as the Cooperative Research Centre's (CRC's), are continually developing and investigating better ways to monitor these structures.

Monitoring of structural treatment measures can be affected by a number of factors including: weather variability (e.g. rainfall), resources, existing baseline data, access and design. It is extremely important when installing a structural measure that it has been correctly designed and sited to ensure maximum effectiveness and efficiency. It is important, wherever possible to obtain baseline data or evidence that a water quality issue exists in the first place. This also allows a comparison between pre and post installation, therefore providing information to support works and capital expenditure. As discussed in Guideline No. 3, Monitoring Water Quality, to obtain statistically robust data, it is necessary to obtain at least 5–10 years of pre- and post- construction data.

Guideline No. 3, Monitoring Water Quality, discusses why the design of monitoring programs is also extremely important. The monitoring of structural measures can be expensive and time consuming. Results are usually obtained in a short targeted program, but generally require five years or more to establish realistic data. If not designed properly, the monitoring data may not provide the information required by the audience.

Many manufacturers of treatment measures will supply guidelines for monitoring their product and even include some monitoring and maintenance with the purchase price. These monitoring programs can be tailored to a particular product and not easily transferable between different types or suppliers.

Robust monitoring designs are being developed and new information is continually being brought onto the market. The CRC for Catchment Hydrology is the foremost producer of research and technical reports in Victoria. In other States, agencies and organisations have also been developing guidelines and criteria, generally specific to their requirements, but still provide some guidance.

This Guideline extensively utilises information produced and supplied from CRC for Catchment Hydrology, Melbourne Water, EPA and other Victorian councils. Where water quality monitoring is referred to, it will be necessary to also refer to Guideline No. 3—Monitoring Water Quality. Where a treatment train approach has been undertaken, the use of other guidelines in this series is recommended such as Guideline No. 2—Monitoring the Effectiveness of Non-Structural Treatment Measures and Guideline No. 4—Monitoring Stakeholder Satisfaction.



4 Monitoring guidelines program

Table 3 outlines a program by which the City of Manningham can identify the required information to develop a specific monitoring program for a particular structural measure using best practice techniques.

When designing a monitoring program, it is essential that the program is developed to meet the needs of the audience (internal or external) and produces the results required. It is also important to realise that in most cases, a once off sampling run over a short time period will not produce meaningful results and is a waste of resources.

Table 3 also identifies the necessary resources that will help Council to develop monitoring programs that monitor the effectiveness of their stormwater programs.

Limitations and constraints

The information available to monitor the effectiveness of structural treatment measures is limited. Much of the available information has been undertaken in controlled research situations. New information and reports are continually being produced for Australian conditions. It is important that Council maintains links by subscribing to on-line newsletters and agency updates to ensure that it has access to the latest best practice monitoring procedures. Good examples of this are CRC for Catchment Hydrology, Melbourne Water and Environment Protection Authority.

While up to date at the time of the review, it must be remembered that new reports, models and information are continually being made available. It may be necessary to subscribe to certain organisations that email out updates.

5 Contacts and reference material

Table 1 identifies a number of key contacts for advice with regard to monitoring the effectiveness of structural treatment measures.

Table 2 identifies a number of useful references.

Table 1 Contacts

Name and role	Company	Contact details
David Perry, Communications and Adoption	CRC for Catchment Hydrology	http://www.catchment.crc.org.au/david.perry@eng.monash.edu.au
Chris Chesterfield, Manager East Catchment	Melbourne Water	9235 2100 (phone) chris.chesterfield@melbournewater.com.au
Jacqui White, Project Manager, Capacity Building Project	MAV and Stormwater Industry Association Victoria (SIAV)	9667 5523 (phone) jwhite@mav.asn.au
Peter Cottingham	CRC for Freshwater Ecology	9235 7221 (phone) peter.c@enterprise.canberra.edu.au



Table 2 References

Author/s	Date	Title
Abernethy, Bruce and Rutherford, Ian D.	1999	Guidelines for Stabilising Streambanks with Riparian Vegetation. CRC for Catchment Hydrology. Technical Report 99/10. September 1999.
Allison, R. A, Chiew, F. H. S, McMahon, T. A	1998	A Decision-Support-System for Determining Effective Trapping Strategies for Gross Pollutants. CRC for Catchment Hydrology. Report 98/3. April 1998.
Allison, R. A, Walker, T. A, Chiew, F. H. S, O'Neill, I. C, McMahon, T. A	1998	From Roads to Rivers – Gross Pollutant Removal from Urban Waterways. CRC for Catchment Hydrology. Report 98/6. May 1998.
CRC for Catchment Hydrology	2002	MUSIC - Model for Urban Stormwater Improvement Conceptualisation. Version 1.00. User Manual. May 2002.
Duncan, Hugh	1999	Urban Stormwater Quality: A Statistical Overview. CRC for Catchment Hydrology . March.
Lewis, Justin	2002	Effectiveness of Stormwater Litter Traps for Syringe and Litter Removal. CRC for Catchment Hydrology. Report prepared for Melbourne Water Corporation.
Mitchell, Grace, Mein, Russell and McMahon, Tom.	1999	The Reuse Potential of Urban Stormwater and Wastewater. CRC for Catchment Hydrology. Industry Report. Report 99/14. December 1999.
Mudgway, L. B, Duncan, H. P, McMahon, T. A, Chiew, F. H. S	1997	Best Practice Environmental Management Guidelines for Urban Stormwater. CRC for Catchment Hydrology. Report 97/7. October 1997.
Pamminger, Francis.	2002	Rainwater Tanks in the Context of Sustainable Water Management. Yarra Valley Water.
SIAV and MAV	2002	Stormwater Capacity Building Project - Project Background and Objectives. A VSAP funded project.
Taylor, André	2002	Citywide or Regional Erosion and Sediment Control Programs – What Works, paper by André Taylor, Research Fellow, Urban Stormwater Quality Program, Cooperative Research Centre for Catchment Hydrology (CRC-CH), 2002.
Victorian Stormwater Committee	1999	Urban Stormwater - Best Practice Environmental Management Guidelines.
VSAP et. al.	Undated	Protecting Stormwater Quality from Building and Construction Sites - An information kit designed to help you protect stormwater quality from your building site and comply with council regulations. EPA Victoria.
Wong, T. H. F.	2000	Improving Urban Stormwater Quality - From Theory to Implementation. Water. Nov/Dec 2000.
Wong, Tony H.F and Walker, Tracey	2002	Peer Review and Development of a Stormwater Gross Pollutant Treatment Technology Assessment Methodology. Report prepared for NSW Environment Protection Authority. October 2002.



Table 3 Structural Monitoring Guidelines

		T				T				Τ
Device	Item	Target pollutant and objectives#	Monitoring options	Effectiveness of monitoring	Recommended option	How to report When to report	Reference/link	Rationale	Responsibility	Budget (cost to Council)
	Tem	and objectives	Wontering options	momtoring	option	when to report	Reference/mix	Rationale	Responsibility	(cost to council)
Primary Gross Pollutant Traps	Circular screens	All litter Fine sediments # Stormwater objectives are outlined in Urban Stormwater—Best Practice Environmental Management Guidelines SEPPs outline general waterway water quality	1. Individual weighing and sorting over a length of time or may be storm event triggered, especially if preceded by a long dry spell 2. Visual litter surveys downstream. May be rain event triggered, especially if preceded by a long dry spell by a long dry spell	1. High reliability of results, but very expensive 2. Relative good effectiveness, cheap and easy, susceptible to errors between individuals Can use WaterWatch members	Visual litter surveys undertaken at set time lines (e.g. fortnightly) Could continue current weighing of collected material and compare with surveys and any event monitoring undertaken If funding became available some storm event monitoring would be ideal	Report annually	CRC for Catchment Hydrology http://www.catchment.crc.org.au/index.shtml CRC Determining effective trapping strategies http://www.catchment.crc.org.au/products/models/ r98 03.htm Melbourne Water Litter Trap Effectiveness http://www.melbournewater.com.au/content/library/publications/ reports/waterways reports/Stormwater Litter Traps.pdf www.melbounrewater.com.au EPA www.epa.vic.gov.au EcoRecycle—litter education framework http://www.ecorecycle.vic.gov.au/frames schools.asp http://www.ecorecycle.vic.gov.au/frames litter.asp CDS Evaluation http://www.catchment.crc.org.au/pdfs/technical199902.pdf CRC-Gross Pollutant Removal (General) http://www.catchment.crc.org.au/pdfs/technical199806pt4.pdf http://www.catchment.crc.org.au/pdfs/technical199806pt3.pdf http://www.catchment.crc.org.au/pdfs/technical199806pt2.pdf http://www.catchment.crc.org.au/pdfs/technical199806pt1.pdf	Litter is extremely unsightly and it is what the community see and report Visual litter surveys monitor what the community sees Involve community by using WaterWatch	Council	Minimal costs—staff resources only Use of volunteers. Event monitoring can be funded through grants or in conjunction with suppliers or research groups
Circular	Inline GPTs	Gross pollutants Some sediment and gravel Sediment	Individual weighing and sorting Visual litter survey downstream Downstream monitoring of sediment and any sediment removal maintenance undertaken Downstream monitoring of	High, but expensive Relative effectiveness, cheap and easy, susceptible errors between individuals Results are flow dependant Results are flow	Visual litter surveys undertaken at set time lines (e.g. fortnightly)	Report annually Report annually	As above As above	As above	Council	Minimal costs—staff resources only Cost dependent on
settling tanks		Oil Some floatable and gross pollutants	sediment and any sediment removal maintenance undertaken 2. Manufacturers design recommendations	dependant	investigate for specific sites Investigate sediment removal amounts from maintenance programs	Report annually	115 40010	115 0000	Council	type of monitoring used Est. \$5,000–10,000
Sediment settling basins		Coarse sediments	Downstream monitoring of sediment and any sediment removal maintenance undertaken Manufacturers design recommendations	3 Results are flow dependant	As above	Report annually	As above	As above	Council	Cost dependent on type of monitoring used Est. \$5,000–10,000



Table 3 continued

Device	Item	Target pollutant and objectives#	Monitoring options	Effectiveness of monitoring	Recommended option	How to report When to report	Reference/link	Rationale	Responsibility	Budget (cost to Council)
SECONDARY										
Grass swales		Nutrients Sediments Flow levels further downstream	Difficult to monitor, except for downstream effect	Too many other catchment influences to be able to determine that swales are responsible May work for a small specific project	Further discussion to be held with CRC for Catchment Hydrology and MW Investigate reasons that Council has installed swales. May be able identify what parameter they were trying to address	Report annually Report before and after specific to project Time related	CRC for Catchment Hydrology http://www.catchment.crc.org.au/index.shtml Melbourne Water www.melbounrewater.com.au Urban Stormwater—Best Practice Environmental Management Guidelines	Limited monitoring options available	Council	Maintenance and monitoring can be part of existing program
TERTIARY										
Wetlands		Nutrients Metals Sediments	Targeted upstream and downstream water quality monitoring before and after construction Monitoring during high and low flows	Effective, but requires a long term commitment Requires specific expertise and equipment	Baseline monitoring After construction design a monitoring program using external expertise (e.g. CRC-CH or MW)	Report on a project by project base Annually report any outcomes	CRC for Freshwater Ecology http://enterprise.canberra.edu.au/WWW/www-crcfe.nsf/d87a31d8f4603d1d4a256641000e9021/7e16e5963b714 76b4a25664a004a2493?OpenDocument CRC for Catchment Hydrology http://www.catchment.crc.org.au/index.shtml Water Studies Centre http://www.wsc.monash.edu.au/ Urban Stormwater—Best Practice Environmental Management Guidelines	Monitoring of wetlands is a difficult, expensive and long-term commitment Allow costs within project budget. Post monitoring can be 2–3 years after finished construction	Wetland developer	\$5,000–10,000 est. Allow for in project budget
Sewer system	Backlog sewering	Bacteriological Nutrients Sewage	Before construction undertake monitoring of affected drains and waterways to establish an initial baseline for comparison Monitoring after construction to establish improvement	Specific, targeted monitoring is extremely effective Will provide evidence that the area requires an upgraded sewer system. Will provide evidence that improvement has removed the source of pollutants	Before and after monitoring	Report prior to sewering Report after sewering	EPA www.epa.vic.gov.au Melbourne Water www.melbournewater.com.au Yarra Valley Water www.yarravalleywater.com.au ANZECC Guidelines (for monitoring) http://www.ea.gov.au/water/quality/nwqms/volume2.html Environment Australia http://www.ea.gov.au/water/index.html	To provide evidence of the requirement for the work and establish a baseline To provide evidence of water quality improvement after works	Manningham Council prior to backlog sewering Yarra Valley Water after sewering Melbourne Water StreamWatch	\$1–2,000 for before and after specific targeted monitoring and reporting Refer to Guideline No. 5 DWMP



Table 3 continued

Device	Item	Target pollutant and objectives#	Monitoring options	Effectiveness of monitoring	Recommended option	How to report When to report	Reference/link	Rationale	Responsibility	Budget (cost to Council)
OTHER										
Reuse	Rainwater tanks	Quantity	Monitor number and size of tanks installed Survey usage by community Decrease in overall waterway flows Less flooding	Difficult to determine actual amount collected	Keep record of number of tanks installed and capacity. Identify any sub- catchments where high uptake of tanks to identify any decrease in flow	Annually report number and capacity of tanks installed	CRC for Catchment Hydrology http://www.catchment.crc.org.au/pdfs/industry199914.pdf Melbourne Water www.melbounrewater.com.au Yarra Valley Water www.yarravalleywater.com.au	To decrease flows and runoff to waterways	Council Melbourne Water	Staff resource cost only
Runoff abatement	Roof water diversion	Quantity	Difficult to monitor under normal circumstances Decrease in overall waterway flows Less flooding	Difficult to determine actually amount collected	Monitor peak flows for any decrease	Annually	As above	To decrease flows and runoff to waterways	Council Melbourne Water Yarra Valley Water	Staff resource cost only
	Runoff abatement	Quantity	Difficult to monitor under normal circumstances Decrease in overall waterway flows Less flooding	Difficult to determine actually amount collected	Monitor peak flows for any decrease	Annually	As above	To decrease flows and runoff to waterways	Council Melbourne Water Yarra Valley Water	Staff resource cost only
	Alternative pavement	Quantity and Quality	Difficult to monitor under normal circumstances Decrease in overall waterway flows Less flooding	Difficult to determine actually amount collected	Monitor peak flows for any decrease	Annually	As above	To decrease flows and runoff to waterways	Council Melbourne Water Yarra Valley Water	Staff resource cost only
Projects	Demonstration projects	Quantity and Quality	Monitor uptake of best practice through surveys Incorporation of best practice in planning applications	Before and after surveys may show % increase in usage Has some effect, but works better if specifically targeted	Survey before and after	Report on individual events. Could produce an annually	Capacity Building Project http://www.mav.asn.au/stormwater Melbourne Water www.melbounrewater.com.au	To increase knowledge of best practice techniques to improve stormwater quality		Staff resources to send surveys and report results
Waterways	Stability works	Quality	Difficult to monitor. Visual photos will show before and after	Limited to visual inspections that show stability	Before and after photos	Report annually on improved stability at number of priority sites Establish time records	Capacity Building Project http://www.mav.asn.au/stormwater Melbourne Water www.melbounrewater.com.au Stability Control http://www.catchment.crc.org.au/pdfs/technical199910.pdf	Decrease sediment loads to waterways Improve fauna and flora habitat	Melbourne Water Council	No cost to Council
Council operations	Unsealed road maintenance	Quality	 Minimising sediment movement is difficult to monitor, can monitor sediment on drains and waterways Visual photos will show before and after Storm event monitoring 	Limited to visual inspections that show stability. Highly specialised monitoring and programming required.	Before and after photos	Report annually on improved stability at number of priority sites Establish time and maintenance records	Street Sweeping http://www.catchment.crc.org.au/pdfs/technical199908.pdf WSUD Road Design http://www.catchment.crc.org.au/pdfs/technical200001.pdf CRC for Catchment Hydrology http://www.catchment.crc.org.au/index.shtml	Decrease sediment loads to waterways	Council	Staff resources to send surveys and report results



Guideline No. 2: Monitoring the Effectiveness of Non-structural Treatment Measures

Purpose of Guideline No. 2: Monitoring the Effectiveness of Non-structural Treatment Measures

The purpose of Guideline No. 2: Monitoring the Effectiveness of Non-structural Treatment Measures is:

• to develop a program to monitor the effectiveness of structural treatment measures identified within the Manningham Stormwater Management Plan, in improving stormwater quality. This guideline is based on best practice with an emphasis on the work carried out by the CRC for Catchment Hydrology.

The guideline:

- identifies the categories of non-structural treatment measures in use or proposed to be installed in waterways within Manningham;
- identifies any non-structural treatment measure monitoring programs being undertaken by Manningham City Council, who the key stakeholders are for Manningham and what Council's expectations are of the monitoring program;
- identifies best practice non-structural treatment measure monitoring techniques available, including a contacts and reference list to aid Council in preparing a Council specific program;
- provides a suggested non-structural treatment measure monitoring program.

Other guidelines in series

This guideline is the second of a five part series of guidelines produced to provide Manningham City Council with some guidance for developing monitoring and review programs for various aspects of stormwater management. The other four guidelines are:

- Guideline No. 1: Monitoring the Effectiveness of Structural Treatment Measures
- Guideline No. 3: Monitoring Water Quality
- Guideline No. 4: Monitoring Stakeholder Satisfaction



• Guideline No. 5: Domestic Wastewater Program.

Each guideline is designed to be stand alone. A more holistic approach can be gained by referring to others in the series. Due to the large amount of information available on stormwater management, an extensive reference list is attached that lists documents that support the guidelines. A full reference list is supplied with the main report.

2 Introduction and definitions

What are non-structural stormwater best management practices?

'Non-structural stormwater quality best management practices (non-structural BMPs) are institutional and pollution-prevention practices, designed to prevent α minimise pollutants from entering stormwater runoff and/or reduce the volume of stormwater requiring management. They do not involve fixed, permanent facilities (i.e. GPTs) and they usually work by changing behaviour through government regulation (e.g. planning and environmental laws), persuasion and/or economic instruments' (Taylor 2002).

Types of non-structural BMPs

Non-structural BMPs (categories commonly used by CRC for Catchment Hydrology) include:

- town planning controls
- strategic planning and institutional controls
- pollution prevention procedures
- education and participation programs
- enforcement/regulatory programs.

Since the 1990s, there has been an increase towards source controls for managing urban stormwater quality and achieving a more balanced mix of structural and non-structural urban stormwater strategies. Such controls include water sensitive urban design elements in new developments and non-structural BMPs that can be applied on a city-wide scale.

Benefits of non-structural BMPs

Potential benefits from using non-structural BMPs include:

- *Cost:* some non-structural BMPs are inexpensive when compared to structural options (e.g. educational or enforcement campaigns);
- *Coverage*: non-structural BMPs can cover broad areas compared to structural alternatives (e.g. town planning controls);
- Retro-fit: space constraints make some structural options (e.g. wetlands) difficult;



- *Specific pollutant:* non-structural BMPs can be targeted to specific actions (e.g. picking up dog faeces);
- *Economic incentives*: the 'polluter pays principle' can be applied through the use of regulation or infringement notices;
- Community participation: most non-structural BMPs can be easily modified to take advantage of new opportunities or respond to changing priorities (Taylor 2002).

Disadvantages of non-structural BMPs

While there are many benefits of using non-structural BMPs that are appealing to councils and agencies, there are some significant disadvantages. The most significant of these is the uncertainty over the performance of many practices (i.e. due to the lack of research and solid data), particularly in terms of their ability to change people's behaviour, improve stormwater quality and improve the health of receiving waters.

3 Types of non-structural BMPs used in the City of Manningham

The following non-structural-BMPs that are currently in use throughout the City of Manningham include:

- education programs, literature and guideline development
- stakeholder, community liaison and consultation
- internal staff training
- · local laws, audits and inspections
- standard planning, building permits and conditions
- media releases
- street sweeping and general drain maintenance
- contract management specifications.

Current monitoring programs being undertaken by Manningham City Council

There is currently limited monitoring being undertaken of non-structural BMPs in the City of Manningham. Currently the City of Manningham undertakes random community surveys on an adhoc basis for specific projects or programs (e.g. dog faeces management in public places, education programs).



Key stakeholders

The key stakeholders within the City of Manningham for monitoring the effectiveness of non-structural measures is internal reporting at a unit and/or corporate level. Non-structural measures have generally lower capital cost but require higher on-going staff commitments.

The reference material available to direct the monitoring of non-structural measures is limited. Primarily, monitoring of these measures is used to provide information for corporate reporting against key performance indicators (KPIs).

What does Manningham City Council want from the monitoring?

By monitoring the effectiveness of non-structural programs (e.g. updating planning schemes, education programs, new permit conditions, training for staff) prior to and after introducing a program, Council can establish the effectiveness of a program. This information can then be used to justify the continuation of a program or introducing other targeted programs.

The Council can then use this data to report at a corporate level and to the community. Experience gained in the initial review and the results obtained can then be used to provide feedback to future programs (e.g. results may also indicate a need for other internal requirements such as specialist training).

What best practice monitoring techniques are available?

The need for unbiased robust monitoring design criteria is continually being developed and new information is being brought onto the market. The CRC for Catchment Hydrology is currently the foremost research centre in this area in Victoria. In other States, agencies and organisations have been developing guidelines and criteria, generally specific to their requirements, but will still provide some guidance to the Victorian situation.

Throughout these guidelines, the use of information produced and supplied by CRC for Catchment Hydrology, Melbourne Water, EPA and other Victorian Councils has been used extensively. Where water quality monitoring is referred to it will be necessary to also refer to Guideline No. 3, Water Quality. Where a treatment train approach has been undertaken, the use of the other guidelines in this series is recommended.



4 Monitoring guidelines program

Table 1 identifies a number of key contacts for advice with regard to monitoring the effectiveness of non-structural treatment measures.

Table 2 identifies a number of useful references.

Table 3 outlines a program by which the Manningham City Council can identify the required information to develop a specific monitoring program for a particular non-structural measure using best practice techniques.

When designing a non-structural monitoring program, it is essential that the program is developed to meet the needs of the audience (internal or external) and produces the results required. It is also important to realise that in most cases, a once off sampling run over a short time period will not produce meaningful results and in many cases is a waste of resources.

Table 3 also identifies the necessary resources that will help Council to develop monitoring program that monitor the effectiveness of their stormwater programs.

Limitations and constraints

The information available to monitor the effectiveness of non-structural treatment measures is limited. Much of the available information has been undertaken in controlled research situations. New information and reports are continually being produced for Australian conditions. It is very important that Council maintains links by subscribing to on-line newsletters and agency updates. Good examples of this are CRC for Catchment Hydrology, Melbourne Water and Environment Protection Authority.

While up to date at the time of the review, it must be remembered that new reports, models and information are continually being made available. It may be necessary to subscribe to certain organisations that email out updates.



5 Reference material and contacts

Table 1 Contacts

Name and role	Company	Contact details
David Perry Communications and Adoption Andre Taylor Urban Stormwater Quality Program	CRC for Catchment Hydrology	http://www.catchment.crc.org.au/david.perry@eng.monash.edu.auandretaylor@iprimus.com.au
Chris Chesterfield Manager East Catchments	Melbourne Water	9235 2100 (phone) chris.chesterfield@melbournewater.com.au
Jacqui White Project Manager, Capacity Building	Municipal Association Victoria (MAV) and Stormwater Industry Association Victoria (SIAV)	9667 5523 (phone) jwhite@mav.asn.au
Information Desk	Environment Protection Authority	9695 2700 (phone) www.epa.vic.gov.au
Peter Cottingham	CRC for Freshwater Ecology	9235 7221 (phone) peter.c@enterprise.canberra.edu.au

Table 2 References

Author/s	Date	Title
EPA (Editor)	2002	Protecting Stormwater Quality from Building and Construction Sites: An information kit designed to help you protect stormwater quality from your building site and comply with council regulations. A VSAP funded project.
EPA (Editor)	2002b	Keeping our Stormwater Clean: A Guide for Building Sites. A VSAP funded project.
EPA Victoria et al.	2002a	Protecting our Bays & Waterways - Partnership Agreement between EPA MAV and Melbourne Water for urban stormwater management in the Port Phillip and Westernport catchments.
Jaquet Florence.	2002	Water Sensitive Urban Design - A Landscape Architect's perspective. Laycock and Jaquet Landscape Architects. Proceedings of AWA/SIAV Changing Colours of Water Seminar. October 2002 Melbourne
Kingston City Council	2002b	Improvement to Building Site Practices for Stormwater Protection. Kingston City Council website
Lloyd, Sara D.	2001	Water Sensitive Urban Design in the Australian Context: Synthesis of a conference held 30-31 August 2000, Melbourne, Australia. CRC for Catchment Hydrology. Technical Report 01/7. September 2001.
MAV	2002a	2002 Victorian Local Government Environment Management Survey - Programs Resources and Management Approaches. Main Report.
MAV	2002b	Municipal Domestic Wastewater Management Planning: Issues and Options Paper (Draft for Comment) February 2002.
Melbourne Water	2001a	Infostream: Water quality monitoring, indicators and tests
Mitchell, Grace, Mein, Russell and McMahon, Tom.	1999	The Reuse Potential of Urban Stormwater and Wastewater. CRC for Catchment Hydrology. Industry Report. Report 99/14. December 1999.
Mudgway, L. B, Duncan, H. P, McMahon, T. A, Chiew, F. H. S	1997	Best Practice Environmental Management Guidelines for Urban Stormwater. CRC for Catchment Hydrology. Report 97/7. October 1997.
SIAV and MAV	2002	Stormwater Capacity Building Project - Project Background and Objectives. A VSAP funded project.



Table 2 continued

Author/s	Date	Title
Taylor A. C.	2002a	Non-structural stormwater quality best practice management practices - guidelines for monitoring and evaluation. Working Document 02/6. October. CRC for Catchment Hydrology.
Taylor A. C.	2002b	The value of non-structural stormwater quality best management practices. Draft Technical Report. July. CRC for Catchment Hydrology.
Taylor A. C. and Wong, Tony	2002c	Non-structural stormwater quality best management practices - An overview of their use, value, cost and evaluation. CRC for Catchment Hydrology. Technical Report. Report 02/11. December 2002.
Taylor, A and Wong, T	2000	Non-structural stormwater quality best management practices - An overview of their use, value, cost and evaluation. Technical Report 02/11, December
Victorian Stormwater Committee	1999	Urban Stormwater - Best Practice Environmental Management Guidelines
Victorian Stormwater Committee	1999	Urban Stormwater - Best Practice Environmental Management Guidelines. CSIRO Publisher.
VSAP et. al.	undated	Protecting Stormwater Quality from Building and Construction Sites - An information kit designed to help you protect stormwater quality from your building site and comply with council regulations. EPA Victoria.
Walker, T. A and Wong, T.H.F	1999	Effectiveness of Street Sweeping for Stormwater Pollution Control. CRC for Catchment Hydrology. Technical Report. Report 99/8. December 1999.
Wong T.H.F.	2000	Improving Urban Stormwater Quality - From Theory to Implementation. Water. November/December 2000.
Wong, Tony H. F and Walker, Tracey	2002	Peer Review and Development of a Stormwater Gross Pollutant Treatment Technology Assessment Methodology. Report prepared for NSW Environment Protection Authority. October 2002.



Table 3 Non-structural monitoring guidelines

Device I	Item	Target pollutant and objective	Monitoring options	Effectiveness of monitoring option	Recommended option	How to report When to report	Reference/link	Rationale	Responsibility	Budget (cost to Council)
ORGANISATIONAL STRUCTUR	RE									
Committee		All	Surveys KPIs	Subjective Depends on interpretation questions asked and analysis of results	Surveys KPIs	Report annually	Internal information and feedback Use experts to design appropriate surveys	Honest feedback allows for appropriate direction of training, expenditure and reporting	Council	Staff time
External liaison and Information exchange		All	Monitor improved liaison Feedback surveys	Subjective Depends on interpretation questions asked and analysis of results Improved flow of information	Surveys	Report annually	Internal information and feedback Use experts to design appropriate surveys Capacity Building Project http://www.mav.asn.au/stormwater	Honest feedback allows for appropriate direction of training, expenditure and reporting	Council	Staff time
Training—internal and external		All	Internal surveys	As above Confidence of staff in providing information	Surveys	Report annually	Internal information and feedback Use experts to design appropriate surveys Capacity Building Project http://www.mav.asn.au/stormwater	Honest feedback allows for appropriate direction of training, expenditure and reporting	Council	Staff time
Corporate Plan reporting		All	SOE reporting	As above	Surveys	Report annually	Internal information and feedback Use experts to design appropriate surveys	Honest feedback allows for appropriate direction of training, expenditure and reporting	Council	Staff time
Community liaison		All	External surveys Number of meetings/inform ation sessions	As above	Surveys	Report annually	Internal information and feedback External feedback Use experts to design appropriate surveys	Honest feedback allows for appropriate direction of training, expenditure and reporting	Council	Staff time
PLANNING										
MSS and local policies	N/A	All	How robust is MSS when challenged at VCAT How robust when assessing planning permit applications	Success of decisions contested	Success of decisions contested	Report annually	Victorian Stormwater Action Program www.epa.vic.gov.au Other Councils ABM http://www.abmonline.asn.au/	Improved systems for implementing stormwater policies	Council	Staff time
Standard planning and building permits conditions	N/A	All	Frequency of application Non-compliance	Number of enforcement notices issued for non- compliance	Auditing extent of compliance Survey applications have permit attached	Report annually	WSUD http://www.catchment.crc.org.au/pdfs/technic al200107.pdf Capacity Building Project http://www.mav.asn.au/stormwater	Improved systems for implementing stormwater policies Improved adherence to stormwater policies	Council	Staff time
EMPs 1	N/A	All	Frequency of application Non-compliance	Number of enforcement notices issued for non- compliance	Auditing extent of compliance Survey applications have permit attached	Report annually	Capacity Building Project http://www.mav.asn.au/stormwater	Improved systems for implementing stormwater policies	Council	Staff time
ORGANISATIONAL STRUCTUR	RE									
Statutory referral process and agency feedback		All	Surveys Feedback VCAT upholding decisions	As above	As above	Report annually	CRC-CH (non-structural) http://www.catchment.crc.org.au/pdfs/technic al200211.pdf	Improved success with decisions Better relationships and understanding	Council	Staff time



Table 3 continued

Device	Item	Target pollutant and objective	Monitoring options	Effectiveness of monitoring option	Recommended option	How to report When to report	Reference/link	Rationale	Responsibility	Budget (cost to Council)
Local laws										
Enforcement			Infringement notices issued	Effective as forcing people to conform to regulations	Number of infringement notices issued	Report annually	CRC-CH (non-structural) http://www.catchment.crc.org.au/pdfs/technic al200211.pdf	Long-term better adherence to requirements Improved water quality	Council	Staff time
EDUCATION—INTERNAL	AND EXTERNAL/COMMUN	ITY								
Technical training and information		Improved knowledge Improved transfer of information	Surveys Feedback forms	Subjective	Surveys Feedback forms	Report annually	CRC for Catchment Hydrology http://www.catchment.crc.org.au/pdfs/technic al200211.pdf CRC for Catchment Hydrology http://www.catchment.crc.org.au/index.shtml	Long-term better adherence to requirements Improved water quality	Council	Staff time
Information		Improved transfer of information	Surveys Feedback forms	Subjective	Surveys Feedback forms	Report annually	CRC for Catchment Hydrology http://www.catchment.crc.org.au/pdfs/technic al200211.pdf http://www.catchment.crc.org.au/index.shtml	Long-term better adherence to requirements Improved water quality	Council	Staff time
PROJECT MANAGEMENT										
Contract specifications	Drainage strategy Contracts/tenders Arterial Road Strategy Waste management strategy Unsealed roads Maintenance program and procedures Street Sweeping	Drainage clearance Litter management	Water quality monitoring Contract adherence Survey stormwater knowledge of staff and contractors improved Audits of contractors	WQ effective but long- term commitment Contract auditing effective Improved in staff knowledge can be subjective	Monitoring as part of Guideline 3 Audit Contracts Survey	Report annually	CRC-Non-structural http://www.catchment.crc.org.au/pdfs/technic al200211.pdf Non-structural Monitoring and Evaluation guidelines http://www.catchment.crc.org.au/pdfs/workin gdoc2002061.pdf Street Sweeping http://www.catchment.crc.org.au/pdfs/technic al199908.pdf Capacity Building Project http://www.mav.asn.au/stormwater Roads http://www.catchment.crc.org.au/pdfs/technic al200001.pdf Melbourne Water www.melbounrewater.com.au EPA www.epa.vic.gov.au	Allow annual reporting against industry standards and best practice	Council	Staff time
Operational benchmarks and Specifications		All	Audits	Effective at physical changes within systems	Audits	Report annually	MAV-Benchmarking http://www.mav.asn.au Internal Guidelines for Corporate Reporting and Governance LGPro http://www.lgpro.com/media/final_spec_stor m.pdf	Allow annual reporting against industry standards and best practice	Council	Staff time



Guideline No. 3: Monitoring Water Quality

1 Purpose of Guideline No. 3: Monitoring Water Quality

The purpose of the Guideline No. 3: Monitoring Water Quality is:

• to use existing data (collected by Council and external agencies) to develop a reporting program on the water quality of the waterways in the Manningham municipality.

The guideline:

- provides an overview of the relevant legislative framework affecting water quality monitoring within Victoria;
- identifies any current water quality monitoring activities being undertaken for waterways within Manningham;
- identifies the commonly monitored water quality indicators and their respective targets;
- identifies the key stakeholders and regulatory agencies;
- identifies the key considerations in the design of an effective water quality monitoring program; and
- provides a suggested water quality monitoring program designed specifically for the waterways within Manningham.

Other guidelines in series

This guideline is the third of a five part series of guidelines produced to provide Manningham City Council with some guidance for developing monitoring and review programs for various aspects of stormwater management. The other four guidelines are:

- Guideline No. 1: Monitoring the Effectiveness of Structural Treatment Measures
- Guideline No. 2: Monitoring the Effectiveness of Non-structural Treatment Measures
- Guideline No. 4: Monitoring Stakeholder Satisfaction
- Guideline No. 5: Domestic Wastewater Program.



Each guideline is designed to be stand alone, however to gain a more holistic approach, others in the series can be referred to.

2 Introduction

Water quality monitoring is undertaken by many organisations for a range of reasons. It can be an expensive and time consuming activity. Taking a single or small number of samples in a short period of time can give an excellent snap shot of the water body sampled, however it gives little understanding of the longer term issues affecting the waterway. Long-term data (10–20 years or more) can give a better indication of the long term trend of the water quality of a water body. Organisations such as Melbourne Water and EPA have water quality data over several decades for many waterways in Melbourne, including the waterways within Manningham.

Monitoring of invertebrates (e.g. copepods), vertebrates (e.g. platypus) and aquatic vegetation can give a better indication of a healthy water body over the short or the long term as it monitors the effect of the water quality on the in-stream organisms and plants. Melbourne Water and Environment Protection Authority (EPA) also have invertebrate data for a limited number of sites. Research centres such as the CRC for Freshwater Ecology has also been undertaking invertebrate monitoring.

Water quality monitoring is undertaken for many reasons and by many organisations. It is collected to establish baseline or current levels, to establish the effects of a campaign (e.g. education, advertising) or to monitor changes over time. The data collected can then be used to justify actions or expenditure by organisations (e.g. Traffic Accident Commission (TAC) campaigns, Melbourne Water litter advertising, Council education programs) by assessing the benefit of such expenditure.

In many cases however, the data gathered does not allow the collector to establish the results they are after. This can happen for many reasons, one of which is that the monitoring program is incorrect in its methodology for the expected outcomes. Data collection is expensive and to minimise costs, limitations are placed on what is collected and how often it is sampled, thereby limiting the sample size. This can and does have, a major affect on the results obtained.

3 Legislative context

The EPA has established water quality objectives for all Victorian waterways through State Environment Protection Policies. State Environment Protection Policies (SEPPs) provide the statutory policy framework for environment protection and are made under the *Environment Protection Act 1970*. A SEPP identifies:

• the area to which the policy applies;



- the beneficial uses—those uses of the waters within a catchment that are valued by the community and require protection;
- the segments or areas of common beneficial use;
- environmental quality objectives—water quality objectives set a level to ensure the protection of the beneficial uses.

The waterways of Manningham relate to the segment 'urban waterways' in the SEPP Schedule F7, Waters of the Yarra Catchment.

A SEPP may also include an attainment program to identify and address activities that pose a threat to the beneficial uses.

Commonly monitored water quality indicators and objectives

Table 1 identifies the commonly monitored water quality indicators and their objectives. A review of SEPPs over the past 5 years has seen an increase in the number of biological indicators commonly used for assessing the environmental health of a water body.

Table 1 Water quality indicators

	_
Indicator	SEPP objective
E. coli	< 200 org/100 mL (primary contact)
pH	6.0-8.5
Temperature ('C)	< 2'C change
Dissolved oxygen (DO)	>6.0 mg/L
Turbidity (Tur)	< 30 NTU
Suspended solids (SS)	< 50 mg/L
Nitrate as N (N-N0 ₃)	see TN
Ammonia as N (NH-N ₃)	see TN
Total nitrogen (TN)	< 1.0 mg/L
Total phosphorus (TP)	< 0.1 mg/L
Heavy metals (As, Cd, Cr, Cr, Cu, Pb, Ni)	refer ANZECC
Platypus	
Invertebrates	SIGNAL Score = 5.5 and refer SEPP

Source: SEPP F7, Waters of the Yarra Catchment.

ANZECC 2000 Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

4 Manningham City Council's waterways and key stakeholders

The Manningham municipality has six main waterways and the Yarra River. Melbourne Water monitors these waterways on a monthly basis at the following sites:

Andersons Creek at Everard Drive Bridge, Warrandyte



- Brushy Creek at Lower Homestead Road, Wonga Park
- Jumping Creek at Jumping Creek Road, Wonga Park
- Koonung Creek at Bulleen Road, Bulleen
- Mullum Mullum Creek at Deep Creek Reserve, Warrandyte
- Ruffey Creek at Parker Street, Templestowe
- Yarra River at Warrandyte Road Bridge, Warrandyte.

Existing water quality monitoring

Manningham City Council undertakes limited, project based water quality monitoring. Council actively supports the WaterWatch program which provides good community based information. WaterWatch is fully supported by the State WaterWatch program based at the Department of Sustainability and Environment. Existing monitoring programs being carried out by Council departments include monitoring for septic tank effluent contamination (by Health & Local Laws), litter monitoring of GPTs (by Project Management) and community surveys (by Environmental Planning).

Key stakeholders

There are a number of key stakeholders who would have an interest in the results of water quality monitoring conducted for Manningham's waterways. These stakeholders include the Manningham City Councillors, Council officers, community groups (e.g. Friends of Mullum Mullum, Manningham Conservation Foundation and WaterWatch), EPA, Parks Victoria and educational institutes.

Council has the potential to play a central role in the collation or use of existing data and dissemination of water quality information. This is an important opportunity to increase the use and accessibility to such information.

5 Key considerations in the design of an effective water quality monitoring program

One of the key determinants in establishing a water quality monitoring program is to clearly identify who will be utilising the information/data collected and their expectations. For example, the Waterwatch program which is undertaken by community members is primarily a tool for enhancing community awareness of waterway health. Whilst the data collected by the community is valuable in achieving this objective, its real scientific value to other interest groups such as the EPA is typic ally minimal.

It is clearly unrealistic for all water quality monitoring programs to meet the requirements of all stakeholders in terms of the type of data collected, frequency, cost methodology etc. It is therefore important to be clear about the primary objectives of the water quality monitoring and its constraints and limitations. Possible objectives



may include to enhance community participation and hence awareness of waterway health through waterway monitoring (e.g. the Waterwatch program); or for scientific purposes which requires a rigorous methodology and reporting response possibly associated with a statutory reporting requirement.

Therefore key considerations when designing a water quality monitoring program include:

- why is the monitoring being undertaken i.e. community program, scientific investigation, regulatory reporting? This will also affect the type of data collected including the accuracy of measurement, frequency etc;
- what monitoring is currently being undertaken and how effective has this been i.e. can the new program build on existing data, methodology etc?
- who will be responsible for collecting the data, storing and managing its use?
- what are the budgetary constraints? This will affect the methodology;
- any water quality monitoring plan needs to be carefully planned. As indicated earlier, it can be expensive and generate limited results.

6 Proposed Manningham water quality monitoring program.

Table 2 provides a list of contacts for sourcing water quality data and advice.

Table 3 provides a list of useful references with regard to water quality monitoring.

Table 4 sets out the information required for establishing and reporting on a water quality monitoring framework for the waterways within Manningham. The program identifies the activity options and the activity recommended to be undertaken, the legislative context, the relevant measures and objectives, when and how to report, the rationale for the chosen option, responsibility, budget (capital and on-going), links to relevant data, references, publications and websites.

The monitoring program recommended does not suggest the expenditure of further dollars on additional monitoring. The recommendations suggest the extensive use of existing data sets available freely from Melbourne Water, EPA, the Victorian Water Resources Data Warehouse and CRC for Freshwater Ecology. The program will require staff resources to access the data from agencies and websites and produce annual reports that meet the Council reporting requirements internally and externally.

Limitations and qualifiers

The scope of this project does not allow for individual monitoring programs to be developed for each separate activity and to meet all stakeholder requirements. There is a need to identify resources, program objectives and audience to develop such monitoring programs.

The information supplied in the Table 4 will allow Council to quickly and easily identify where information is held, how to get it and what costs are involved (where



available). The presentation of such data will depend on the objective of the datum use (e.g. community fact sheet, report to Council, internal unit briefing) and therefore the internal formats used.

While up to date at the time of the review, it must be remembered that new reports, models and information are continually being made available. It may be necessary to subscribe to certain organisations that email out updates and what is new.

7 Contacts and references

Table 2 Water quality data and advice contacts

Name	Company	Phone number
Rhys Coleman	Melbourne Water	9235 2100 (phone) rhys.coleman@melbournewater.com.au
Freshwater Sciences	Environment Protection Authority	9695 2700 (phone) www.epa.vic.gov.au
David Perry	CRC-Catchment Hydrology	http://www.catchment.crc.org.au/david.perry@eng.monash.edu.au
Peter Cottingham	CRC-Freshwater Ecology	9235 7221 (phone) peter.c@enterprise.canberra.edu.au
Jane Ryan Project Officer	WaterWatch	9412 4072 (phone) www.vic.waterwatch.org.au jane.f.ryan@nre.vic.gov.au

Table 3 Water quality references

Author/s	Date	Title
EPA Victoria	1988	State Environment Protection Policy (Waters of Victoria)
EPA Victoria	1999	State Environment Protection Policy (Schedule F7, Waters of the Yarra Catchment)
EPA Victoria	2000	Environmental Health of Streams in the Yarra River Catchment. February 2000
ANZECC	2000	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
ANZECC	2000b	Australian Guidelines for Water Quality Monitoring and Reporting – Summary
Melbourne Water	2001	Infostream: Water quality monitoring, indicators and tests
Melbourne Water	2001	Infostream: Yarra River
Websites	Melbourne Water	www.melbournewater.com.au
	EPA	www.epa.vic.gov.au
	CRC-Ch	www.catchment.crc.org.au
	ANZECC	http://www.ea.gov.au/water/quality/nwqms
		http://www.ea.gov.au/water/quality/nwqms/summary/index .html#download
	WaterWatch	http://www.ea.gov.au/water/quality/nwqms/index.html
		http://www.vic.waterwatch.org.au/



Table 4 Water quality monitoring program for waterways within Manningham

Area	Item	Туре	Measure indictors and objectives	Measure options	Recommended option activity	How and when reporting timelines	Reference/link	Rationale	Responsibility	Budget (cost to Council)
LEGISLATION DO	OCUMENTS									
Environment Protection Act 1970	1. SEPP (F7, Waters of the Yarra Catchment) 2. SEPP (Waters of Victoria 3. ANZECC	Segment— Urban Waterways Lowland Rivers	See Table 1 of Guideline No. 3	N/A	N/A	N/A	EPA Publications Link http://www.epa.vic.gov.au/Publications/ ANZECC Link http://www.ea.gov.au/water/quality/nwqms/ volume1.html	Establish indicators to protect the environment Council does not need to develop further legislation as existing legislation provides the framework for enforcement	EPA Council has obligations to make decisions based on objectives and clauses within SEPP and EP Act 1970	Generally no cost to Council for data, although some reports do incur a charge. Many reports can be downloaded free from the internet
EXISTING DATA	T									
	Melbourne Water EPA	Physicochemical Heavy metals Platypus ISC Invertebrates	See Table 1 of Guideline No. 3	Use existing data supplied by Melbourne Water Use existing data supplied by EPA Use existing data sources housed on the Victorian Water Resources Data Warehouse	Use existing data sets from MW Limit the number of indicators to: • E. coli • TP • TN • SS • Platypus Supplement with EPA data sets Use other data sets where required.	Annual figures should be obtained from Melbourne Water (and other data sets as required) Depending on audience the data should include: • water quality objectives • previous annualised figures • explanations and definitions • possible sources of pollutant • effect on waterways and inhabitants EPA are experts in establishing monitoring	Melbourne Water website www.melbournewater.com.au MW—annual WQ data report http://www.melbournewater.com.au/content /library/publications/reports_archive/waterw ays/2001 Waterway Quality_Data.pdf Water Quality Sites http://www.melbournewater.com.au/system/ mainFrameset.asp?path=/water_cycle/water ways/waterways.asp EPA WQ Info http://www.epa.vic.gov.au/water/environme nt/default.asp Yarra River Report http://epanote2.epa.vic.gov.au/EPA/Publicat ions.nsf/d85500a0d7f5f07b4a2565d100226 8f3/7727294fd1a611244a2568b7001ecfb4? OpenDocument	Use of existing data minimises costs and ensures reliability of data Easy to obtain, mostly available on websites Yarra River report has excellent references	Melbourne Water	Generally no cost to Council for the data, although some reports may incur a minor charge Requires some knowledge of websites and MS Word and MW Excel
	WaterWatch	Physicochemical Invertebrates ISC	Limited parameters (temperature, DO, conductivity, turbidity and suspended solids, phosphates and nitrates. Some biological and heavy metal indicators	Use existing data sources	As above	Report annually	Victoria Water Resources Data Warehouse http://www.vicwaterdata.net/ WaterWatch website www.vic.waterwatch.org.au	Excellent for community involvement and awareness Added advantage of community involvement supported by State agency (DSE)	Free community involvement, supported by Councils and DSE. Monitoring kits have set and consumable costs	Generally no cost to Council for the data, although some reports do incur a minor charge
	CRC-Freshwater Ecology	Invertebrates	Extensive list of indicators are monitored at a limited number of sites	Use existing data sources and select a limited number of indicators/organisms suited to the audience	As above	Report annually	CRC-Freshwater Ecology http://enterprise.canberra.edu.au/WWW/www-crcfe.nsf	Use of existing data minimises costs and ensures reliability of data Good source of urban waterways biological and other data Experts in establishing monitoring programs	CRC-Freshwater Ecology	Generally no cost to Council for the data, although some reports do incur a minor charge
Others										
	Melbourne Water	Frogs	Number and dispersal of various species	Use existing data Use volunteers (i.e. WaterWatch)	Use existing data Use volunteers (i.e. WaterWatch)	Report annually	Melbourne Water http://frogs.melbournewater.com.au/	Frogs are an excellent indicator. Excellent for community involvement and awareness	Melbourne Water Volunteers	Staff resource only to access information and write report



Guideline No. 4: Monitoring Stakeholder Satisfaction

Purpose of Guideline No. 4: Monitoring Stakeholder Satisfaction

The purpose of Guideline No. 4: Monitoring Stakeholder Satisfaction is to:

develop a model community survey to ascertain the perceived success or otherwise
of the Manningham Stormwater Management Plan. It is intended that the survey
would be for informed stakeholders.

The guideline:

- identifies the key internal and external stakeholders within Manningham City Council;
- outlines the key considerations in designing a stakeholder survey;
- provides a suggested survey for use when consulting with internal and external informed stakeholders.

Other guidelines in series

This guideline is the forth of a five part series of guidelines produced to provide Manningham City Council with some guidance for developing monitoring and review programs for various aspects of stormwater management. The other four guidelines are:

- Guideline No. 1: Monitoring the Effectiveness of Structural Treatment Measures
- Guideline No. 2: Monitoring the Effectiveness of Non-structural Treatment Measures
- Guideline No. 3: Monitoring Water Quality
- Guideline No. 5: Domestic Wastewater Program.

Each guideline is designed to be stand alone, however a more holistic approach can be gained by referring to others in the series. Due to the large amount of information available on stormwater management, an extensive reference list is attached that lists documents that support the guidelines. A full extensive reference list is supplied with the main report.

1



2 Introduction

Community satisfaction is an important part of service quality. Assessing community satisfaction is an important part of planning to meet the community's needs. Levels of community satisfaction regarding particular programs are often linked to the community's ownership of that particular program, which can be ensured through effective consultation.

The development of the Manningham Stormwater Management Plan involved considerable consultation with a range of stakeholders considered to have an interest or responsibility for stormwater management in Manningham.

It has been approximately two years since the Manningham Stormwater Management Plan was prepared in 2001. There is now an opportunity to measure the effectiveness of the Plan in terms of meeting key stakeholder expectations and improving general awareness of stormwater issues within the municipality.

3 Key stakeholders within the City of Manningham

The model community survey will be targeted at informed stakeholders, these include both internal and external stakeholders.

Internal

Internal stakeholders are those groups or individuals within the Manningham City Council that have a responsibility or involvement in stormwater management in Manningham. Their involvement may be:

- direct through initiating/implementing programs for stormwater quality improvement;
- the development/enforcement of policy or regulations that affect stormwater quality (e.g. planning permit conditions),
- indirect through day to day work actions that may impact stormwater management, such as engineering and drainage management or parks and gardens management.

Key internal stakeholders within the City of Manningham are outlined in the following paragraphs, as well as a brief explanation for their inclusion, based on their responsibilities and their impact on stormwater management:

• Executive Office: the executive office guides and influences the introduction of policy and work practices for other units and as such has an impact on the management of stormwater within the City.



- Project Management: the project management unit is responsible for the project management of roads, buildings and drainage, waste management and the provision of technical advice in a referral role to the Statutory Planning Unit. The Project Management Unit is a key stakeholder due to the close relationship between drainage and stormwater management and also the ability of waste management operations and major projects from the roads and buildings areas to impact on stormwater quality. Through its choice of management regime the unit has the ability to influence stormwater quality.
- Economic and Environmental Planning: the Economic and Environmental Planning Unit is responsible for the provision of environmental advice to Council at a policy and strategic level. This includes advice on management of open space areas and planning and building permit conditions, both of which can have a significant impact on stormwater quality.
- Health and Local Laws: the Health and Local Laws Unit is responsible for the enforcement of the City's Local Law, which contains several regulations with the ability to protect the quality of stormwater. The unit is also responsible for taking a proactive approach to enforcement, through provision of education to target audiences. Of particular importance to stormwater quality management, the unit is also responsible for the management of the City's many septic tanks.
- Statutory Planning: this unit is responsible for assessing development applications and hence has the ability to guide the management of stormwater in new developments. The unit works closely with other internal stakeholders such as the Economic and Environmental Planning Unit and Project Management Unit.
- *Building Control:* this unit is responsible for the implementation of controls under the Buildings Control Act, for example issuing of building permits.
- CityWorks—Manningham Maintenance: this unit is responsible for the management of Council assets, including drains. Correct maintenance and monitoring of drains can influence the quality of stormwater.
- *City Parks*: the City Parks Unit is responsible for the management and maintenance of parks within the City. The control of polluted run off from parks, as well as the correct planning of park areas to maximise infiltration and minimise pollution, is important for the overall management of stormwater.
- Cultural and Leisure Services: the main responsibility of the Cultural and Leisure Services Unit relevant to stormwater management is the planning and management of recreational open space areas. As with parks, the management of open space areas can have a large impact on the control of stormwater quality.



External

External stakeholders are members of agencies, community groups or individuals, not linked with the Manningham City Council, that have a responsibility or interest in the management of stormwater for the City:

- Melbourne Water: Melbourne Water is the regional drainage authority for the
 Melbourne Metropolitan area and as such is responsible for all major drains and
 waterways in catchments of 60 ha or greater. As part of this responsibility,
 Melbourne Water directs strategic and operational management of stormwater and
 plays a key role in the development of standards and guidelines for stormwater
 management.
- *EPA/VSAP*: the EPA is responsible for the protection of the quality of Victoria's environment. Through the Victorian Stormwater Action Program, EPA has played a major role in the development of municipal stormwater management plans and continues to play an important role in stormwater management through the provision of funding for implementation of recommendations to come from Stormwater Management Plans. This includes the coordination of strategic projects, as well as providing advice on aspects of best practice management to municipalities.
- *Community groups:* community groups such as Friends of Mullum, Manningham Conservation Foundation and WaterWatch.
- *Primary and secondary schools, TAFE's, universities*: educational institutions are particularly active in programs such as WaterWatch. This stakeholder group also represents an important forum for activities such as the dissemination of information and research projects.
- Yarra Valley Water: Yarra Valley Water's inclusion as a stakeholder stems from its responsibility for sewerage reticulation and treatment and the sewerage backlog program. Pollution from ineffective septic systems was identified by the Manningham Stormwater Management Plan as a priority risk for stormwater quality. Yarra Valley Water's management of the sewerage program will therefore influence stormwater quality within the City.
- *Parks Victoria:* Parks Victoria is responsible for managing some of the major reserves in the City of Manningham, including Westerfolds Park and Warrandyte State Park. Their management of these open space areas has the potential to impact the quality of stormwater run-off from these areas.
- LeastWaste (Eastern Regional Waste Management Group): LeastWaste is focussed on reducing the amount of waste being disposed to landfill. As part of this focus, they are involved in various litter reduction campaigns that have the ability to improve the quality of stormwater.
- *VicRoads:* through their management of major transport routes and major road construction and maintenance, VicRoads plays a role in protecting the quality of stormwater run-off from these potentially highly polluted areas.
- Waterwatch: Waterwatch is a National Community Water Monitoring Program funded by the Natural Heritage Trust and administered by Environment Australia. The program has coordinators to provide technical guidance however it is largely a



volunteer program with many school and community groups are involved in the water quality data collection. Waterwatch groups have a demonstrated interest in local water quality issues and are thus considered to be key stakeholders in stormwater management.

- *Industry and commerce:* local Chamber of Commerce and Industry groups, retailers and industrial premises.
- Land use and development industry: representative of the local industry including builders, architects, planners, plumbers and developers.

4 Key considerations in the design of the stakeholder survey

There are a number of key considerations that influence the design of the stakeholder survey. These might include:

- what is the purpose of undertaking the survey, i.e. to measure changes in community awareness of urban stormwater quality issues?
- who should be consulted as part of the stakeholder survey?
- should the questions be phrased as open ended questions or questions that require a discreet rating (i.e. rate your agreement from 1–5);
- how often will the survey be reviewed?
- who will be accessing the information contained within the survey (i.e. which units within Council)?

Table 1 provides a sample list of potential questions that could be incorporated into a stakeholder survey.

5 Evaluation criteria framework

The following information is taken from VSAP evaluation criteria model for strategic projects and may assist in the development of this guideline.

Scope

The objectives of evaluation should be to enable the project team to:

- measure the performance of project management against the key performance indicators that are nominated;
- report on the barriers and successes of the project. Did they help or hinder changes in stormwater management practices?;



- identify aspects critical to effective implementation of the project and useful for generating ongoing support to the program;
- provide feedback to funding body and project stakeholders that can be used for future program development.

It is recognised that evaluation over a twelve month period will largely address changes in awareness and knowledge. However, the framework should lay the foundations for easier evaluation of behavioural change in later years.

The evaluation program should:

 outline a broad framework that includes evaluation objectives, specific tasks, evaluation tools, outlines roles and responsibilities (internal and external) and resources required. The program should also include the provision of regular feedback to project management which meets the requirements of the funding body and will generate valid and reliable indicators and information.

The evaluation framework may address the following aspects:

- Project management:
 - Have the right audiences been targeted?
 - How can network development and communication initiatives be quantified in relation to a number of issues including diversity of audience, coverage (geography), methods of communication and engagement, level of involvement of individuals, etc?
 - Have the knowledge needs of the target audience been identified? Was this done effectively?
 - Have the target audiences' needs been met with the program development initiatives?
 - Was the delivery of the tailored programs appropriate for the various target audiences in relation to a number of issues including—accessibility, geography, timing, duration, level, ongoing, preferred mode, etc.?
 - Were existing mechanisms (e.g. existing education, awareness, training programs) used in the program? Was maximum benefit derived from those existing resources?

• Project outputs:

- What changes are there in the target audiences' awareness, knowledge and communication networks?
- What changes are there in the target audience's understanding of urban stormwater management in general and this project in particular?
- What is the extent to which the program has facilitated the target audience's understanding of their roles in stormwater management?
- What foundations have been built as a result of the project to facilitate sustainable behavioural change?



– What level of program exposure and profile has been established beyond direct network contacts?

Identify how the tools necessary for conducting the evaluation and gathering information will be developed to address the issues identified in the evaluation framework. The design of the tools should be user friendly for internal project staff including the Steering Committee (where relevant), Project Manager, program attendees, and clerical staff rather than by external consultants.

Tools should be developed with the intention of gaining maximum advantage from available funds, internal resources and building internal evaluation skills while maintaining quality of information collected:

- Outline the coordination of evaluation resources, undertaking evaluation actions identified in the framework.
- Require the provision of a final evaluation written report:
 - describing the design and implementation of the framework
 - identifying information sources and levels of validity of data
 - summarising outcomes from the evaluation
 - identifying achievements from progress reports (where necessary)
 - providing recommendations for future evaluation and program redesign.



Table 1

Question	External	stakeholder	Internal stakeholder	
	Community based Government/agency		_	
Do you work actively with Council to improve stormwater quality issues within the municipality?	Yes	Yes	Yes	
How aware are you of the Manningham Stormwater Management Plan?	Yes	Yes	Yes	
No awareness, some awareness, detailed awareness				
How did you become aware of the Manningham Stormwater Management Plan?	Yes	Yes	Yes	
Direct involvement, internal briefing, internal memo/publication, Council publication, media release, community group involvement, agency involvement, other				
Do you view the development of the Manningham Stormwater Management Plan as having been a successful process?	Only those directly involved in the preparation	Only those directly involved in the preparation of the	Only those directly involved in the preparation of the SWMP	
Yes No	of the SWMP	SWMP		
Do you feel your involvement was:	Only those directly	Only those directly involved	Only those directly involved in the	
a) of an adequate level?	involved in the preparation of the SWMP	in the preparation of the SWMP	preparation of the SWMP	
b) valued by those facilitating the process?	01 010 2 11111	D ((1)11		
c) reflected in the final Plan?				
Yes No				
How would you rate your level of understanding of the objectives and outcomes of the Manningham Stormwater Management Plan?	Yes	Yes	Yes	
0 1 2 3 4 5				
None (0) to Very High (5)				



Table 1 continued

Question	Exte	ernal stakeholder	Internal stakeholder	
	Community based	Government/agency		
Are you aware of any actions carried out as a result of the Manningham Stormwater Management Plan? (If yes describe action)	Yes	Yes	Yes	
Yes No				
Do you believe this action(s) has been successful in improving stormwater quality/raising awareness of stormwater issues?	Yes	Yes	Yes	
0 1 2 3 4 5				
Not at all successful (0) to Very successful (5)				
If unsuccessful—why do you believe the action has not been successful?	Yes	Yes	Yes	
Lack of community support, lack of technical expertise, lack of maintenance/follow-up, wrong action for the problem, other				
Manningham City Council is proactive in addressing environmental issues	Yes	Yes	Yes	
0 1 2 3 4 5				
Strongly Disagree (0) to Strongly Agree (5)				
Manningham City Council is proactive in addressing stormwater quality issues	Yes	Yes	Yes	
0 1 2 3 4 5				
Strongly Disagree (0) to Strongly Agree (5)				
How would you rate your level of understanding with regard to stormwater quality within Manningham City Council?	Yes	Yes	Yes	
0 1 2 3 4 5				
None (0) to Very High (5)				
Where do you source your information with regard to stormwater quality issues wit hin Manningham?	Yes	Yes	No	
Council, government agencies (e.g. Melbourne Water), community groups, media, internet sites, other				



Table 1 continued

Question	Exte	rnal stakeholder	Internal stakeholder	
	Community based	Government/agency		
What would you like to know about stormwater issues within the municipality? Provide a list	Yes	Yes	Yes	
How would you rate the importance of stormwater quality in comparison to the importance of other key environmental issues affecting the municipality?	Yes	Yes	Yes	
0 1 2 3 4 5				
No importance (0) to Highest importance (5)				
What do you see as the key stormwater issues within the Municipality?	Yes	Yes	Yes	
Is Council's current level of communication and consultation with regard to stormwater issues affecting the municipality sufficient?	Yes	Yes	No	
How could current consultation techniques used by Council be improved?	Yes	Yes	Yes	
How aware do you think the community is of stormwater management?	Yes	Yes	Yes	
Have you noticed a change in community awareness?	Yes	Yes	Yes	
What are the main sources of stormwater Pollution in the municipality?	Yes	Yes	Yes	
What do we need to do to raise awareness and prevent the pollution of our waterways?	Yes	Yes	Yes	

Guideline No. 5: Domestic Wastewater Program

Purpose of Guideline No. 5: Domestic Wastewater Program

The purpose of Guideline No. 5: Domestic Wastewater Management Plan (DWMP) is:

• to develop measures and activities to assess the effectiveness of the DWMP in achieving the aims of the Municipal Public Health Plan and reducing the impacts of domestic wastewater on local and remote receiving environments. The guideline includes spot water quality monitoring and is to be developed in consultation with the Manningham Health & Local Laws department.

The guideline:

- provides an overview of the relevant legislative framework affecting domestic wastewater within Victoria;
- identifies the commonly monitored indicators related to domestic wastewater;
- provides an overview of the City of Manningham's approach to domestic wastewater management, including the Municipal Public Health Plan and the Domestic Wastewater Management Plan;
- identifies priority water quality monitoring areas within Manningham with regard to domestic wastewater;
- provides a suggested monitoring program designed specifically for the domestic wastewater issues within Manningham.

Other Guidelines in Series

This guideline is the fifth of a five part series of guidelines produced to provide Manningham City Council with some guidance for developing monitoring and review programs for various aspects of stormwater management. The other four guidelines are:

- Guideline No. 1: Monitoring the Effectiveness of Structural Measures
- Guideline No. 2: Monitoring the Effectiveness of Non-structural Measures

1

• Guideline No. 3: Monitoring Water Quality



• Guideline No. 4: Monitoring Stakeholder Satisfaction

Each guideline is designed to be stand alone. A more holistic approach can be gained by referring to others in the series. Due to the large amount of information available on stormwater management an extensive reference list also attached that lists documents that support the guidelines. A full extensive reference list is supplied with the main report.

2 Background

Over the past twenty years, there has been a general improvement in the Yarra River's (and greater metropolitan Melbourne) water quality resulting from the sewering of catchments and the diversion of industrial discharges into the sewer system.

Domestic waste systems continue to be used and installed in areas of Manningham that do not have access to a reticulated sewerage system. Used and sited within design criteria, septic tanks systems are capable of working exceptionally well. In the past septic tanks systems were licensed, generally to allow the discharge of treated effluent off-site into road-side or stormwater drains or waterways. Over time this approach has changed and in more recent decades septic tank criteria and permits have been directed towards full on-site containment.

Two main issues have arisen as a result of these past practices:

- properties with existing old licences cannot be forced to upgrade their systems to meet current standards;
- many residential housing blocks and subsequent development are unable to meet on-site containment criteria.

As a result of this there are many properties with old septic tanks systems discharging insufficiently treated effluent off-site. There is also an ongoing concern that many of these older systems are not maintained correctly or sufficiently and are therefore discharging partly treated effluent, in breach of their permit/license conditions. Many new developments are occurring that are unable to meet the design criteria. Two common problems include: development of spas and pools, which contribute to septic tank systems being unable to treat through flow correctly; and the poor siting of absorption trenches and lack of absorption trenches which results in off-site discharges.

There are septic tank systems within the City of Manningham that are not maintained correctly, if at all, and therefore fail to meet legal requirements for their discharges. This results in contaminated water being discharged into drains and waterways, increasing the chance of affecting the health of the community not only in Manningham, but in other municipalities downstream and visitors to the area.

The Manningham Municipal Public Health Plan contains objectives to enhance the health and safety of its community. The Domestic Wastewater Management Plan is a tool that has been developed to help the Council meet those objectives.



Manningham City Council and Domestic Waste Management

There are approximately 6,000 septic tank systems on record within the City of Manningham, of which approximately 60 per cent discharge 'treated' toilet wastes and/or sullage from the property into the stormwater drains/open channels/soakage pits. Links have been established between contaminated water contact and the occurrence of illness such as gastrointestinal infections.

Human wastes potentially contain disease producing micro-organisms and septic systems are not always efficient at removing these.

The provision of reticulated sewerage is the preferred option by Manningham City Council, however, backlog sewering program timelines (from Yarra Valley Water) are continually being put back as costs and other priorities are identified. Currently that timeline is greater than twelve years.

The DWMP forms part of a range of management activities undertaken by Council to address domestic wastewater and associated community health and environment issues and addresses key action identified in the Corporate Plan and Manningham Municipal Public Health Plan 2001–2004. The Health and Local Laws unit is responsible for the administration and monitoring of septic tanks.

Manningham Municipal Public Health 2001-2004

The Manningham Municipal Public Health Plan 2001–2004 (MPHP) is a key corporate strategy that contributes to the achievement of the City of Manningham's Corporate Plan. It is designed to enhance the health status of people in the municipality by building upon present strategies and programs as well as introducing new initiatives to address current and emerging health issues. The Plan is devised on the premise that ill-health in a community is primarily influenced by: age, gender, genetics, environment (e.g. air and water), housing, lifestyle, physical activity, services, transport, leisure, social and economic situations, employment, culture and community.

A key result area of the MPHP is 'Environmental Health and Community Safety'. A key goal of this is 'To protect and improve out built and natural environment to enhance the health of the community'. Although septic tanks were specifically mentioned in the 1997–2000 Manningham Municipal Public Health Plan, this does not occur in the 2001–2004 Plan, however references are made to safe environment, environmental pollution investigations and the importance of safe water.

Manningham Domestic Wastewater Management Plan

The Domestic Wastewater Management Plan (DWMP) was developed as part of a VSAP funded, MAV managed project, to develop and trial a Model Domestic Wastewater Management Plan. The DWMP outlines the priorities in domestic wastewater management and the strategies that will be developed to minimise the impact of wastewater on human health and the environment.



Domestic wastewater was identified in the Manningham SWMP (KBR 2001) as the single most important impact on the stormwater environment. Three priority areas have been identified in the DWMP: Park Orchards, Templestowe and Donvale. A three year plan has been developed to further investigate, review and develop information to address the septic tank threats in Manningham.

The DWMP outlines a three year strategy with a primary aim to minimise the risks to public health and the impact of septic tank systems on the environment. The primary objective is to encourage owners to maintain septic tank systems and connect to sewer when available. Reticulated sewer is not likely to be available in the three primary areas in the next 10–15 years.

3 Legislative context

There are several pieces of legislation, regulation and policy that relate to Council's responsibility over septic tank systems within the municipality. They include:

- Part IXB of the Environment Protection Act 1970
- State Environment Protection Policy (Waters of Victoria)
- SEPP Schedule F7—Waters of the Yarra Catchment
- Septic Tanks—Code of Practice
- Land Capability Assessment for Onsite Domestic Wastewater Management.

The EPA has established water quality objectives for all Victorian waterways through State Environment Protection Policies (SEPPs). SEPPs provide the statutory policy framework for environment protection and are made under the *Environment Protection Act 1970*. A SEPP identifies:

- the area to which the policy applies;
- the beneficial uses—those uses of the waters within a catchment that are valued by the community and require protection;
- the segments or areas of common beneficial use;
- environmental quality objectives—water quality objectives set a level to ensure the protection of the beneficial uses.

A SEPP may also include:

• an attainment program to identify and address activities that pose a threat to the beneficial uses.

The waterways of Manningham are covered by the 'urban waterways' segment in the SEPP Schedule F7, Waters of the Yarra catchment.



4 Priority monitoring areas within Manningham City Council

By using a simple risk management approach, three priority areas were identified for action in the DWMP. The DWMP outlines the values and threats used to calculate the risk factor.

The priority areas identified in the DWMP are:

Priority 1: Park Orchards (Anderson Creek and Mullum Mullum Creek subcatchments)

• Rationale:

- raw sullage discharge into stormwater;
- off-site discharge of treated effluent;
- old septic systems (1940s+) have higher probability of untreated effluent from failed systems and pollution of Anderson Creek;
- combination of a concentration of septic systems and normal residential blocks accounting for approximately 70 per cent of total sullage discharge from the municipality;
- Mullum Mullum Creek is one of the most polluted streams in the Yarra River catchment.

Priority 2: Templestowe (Ruffey Creek and Koonung Creek sub-catchments)

- Rationale:
 - raw sullage discharge into stormwater;
 - off-site discharge of treated effluent;
 - old septic systems (1940s+) higher probability of untreated effluent from failed systems and pollution of waterways.

Priority 3: Donvale (Jumping Creek and Brushy Creek sub-catchments)

- Rationale:
 - raw sullage discharge into stormwater;
 - off-site discharge of treated effluent;
 - old septic systems (1940s+) higher probability of untreated effluent from failed systems and pollution of waterways;
 - large blocks with dispersion and distribution of effluent;
 - Wonga Park area.



5 Monitoring guidelines program

Table 1 provides a list of contacts for sourcing water quality data and advice.

Table 2 provides a list of useful references with regard to water quality monitoring.

Table 3 sets out the information required for establishing and reporting on the septic wastewater issues associated with septic tanks within Manningham. The monitoring framework outlines recommended activities and extra monitoring of water quality and systems within Manningham. The program identifies the monitoring options that can be undertaken, the legislative context, the relevant indicators and objectives, when and how to report, the rationale for the chosen option, responsibility, budget (capital and on-going), links to relevant data, references, publications and websites.

The general monitoring of waterways recommended does not suggest the expenditure of further dollars on additional monitoring, but instead identifies staff time required to access data and report. The recommendations suggest the extensive use of existing data sets available freely from Melbourne Water, EPA, the Victorian Water Resources Data Warehouse and CRC for Freshwater Ecology. The program will require staff resources to access the data from agencies and websites and produce annual reports that meet the Council reporting requirements internally and externally. There is a recommendation for targeted monitoring of priority area; however the costs for this would be similar to existing monitoring costs.

Table 3 also suggests activities that could be implemented to monitor the DWMP and its ability to achieve the aims of the MPHP.

Initially there is a need to establish a baseline for the level and extent contamination from the priority areas using key water quality indicators. There is insufficient localised data currently available, so it will be necessary for Council to undertake a properly developed and targeted monitoring program in the three priority areas. It will be necessary to liaise with expert organisations (e.g. EPA, CRC-FE, Health Department) to ensure that the monitoring program will achieve its outcomes. It may be possible that the data collected will be required for evidence in future enforcement of infringement notices or to justify programs.

Water quality indicators

The common water quality indicator used for faecal contamination is *E. coli*. Together physic ochemical parameters such as dissolved oxygen, detergents, turbidity and suspended solids, monitoring septic tank effluent can be undertaken in a targeted and systematic program.

The key water quality indicators for monitoring wastewater discharges include: *E. coli*, suspended solids, biochemical oxygen demand (BOD) and detergents.



Annual performance criteria

The following criteria have been recommended for annual reporting:

- water quality improvement registered against baseline data within twelve months
- inspect at least 25 per cent of septic tank discharges in priority areas per year
- 50 per cent of septic tanks inspected/reported meet discharge requirements
- increase enforcement of septic tanks that fail to meet legal discharge obligations.

6 Limitations and qualifiers

The key priority for monitoring the septic tank discharge, especially in the priority areas, is to establish a baseline of the contamination within local drains and waterways. This will help to justify expenditure and the future direction of monitoring programs.

The information supplied in the Table 3 will allow Council to quickly and easily identify where information is held, how to get it and what costs are involved. The presentation of such data will depend on the objective of the datum use (e.g. community fact sheet, report to Council, internal unit briefing) and therefore the internal formats used. The activities recommended in Table 3 for monitoring the effectiveness of the DWMP cover both water quality and systems. They are not exhaustive and need to be programmed for maximum effect.

While up to date at the time of the review, it must be remembered that new reports, models and information are continually being made available. It may be necessary to subscribe to certain organisations that email out updates and what is new.



7 Contacts and references

Table 1 Contacts

Name	Company	Phone number
Rhys Coleman	Melbourne Water	9235 2100 (phone) rhys.coleman@melbournewater.com.au
Freshwater Sciences	Environment Protection Authority	9695 2700 (phone) www.epa.vic.gov.au
David Perry	CRC–Catchment Hydrology	http://www.catchment.crc.org.au/david.perry@eng.monash.edu.au
Peter Cottingham	CRC–Freshwater Ecology	9235 7221 (phone) peter.c@enterprise.canberra.edu.au
Jane Ryan, Project Officer	WaterWatch	9412 4072 (phone) www.vic.waterwatch.org.au jane.f.ryan@nre.vic.gov.au

Table 2 References

Author/s	Date	Title
ANZECC	2000	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
EPA	1970	Environment Protection Act 1970
EPA	1988	State Environment Protection Policies (Waters of Victoria)
EPA	1997	Code of Practice - Septic Tanks
EPA	2001	Land Capability Assessment for Onsite Domestic Wastewater Management. EPA Publication 746.
EPA	1999	State Environment Protection Policy (Waters of Victoria - Schedule F7 Waters of the Yarra Catchment)
KBR	2001	Manningham Stormwater Management Plan
Manningham CC	August 2001	Manningham's Health 2001—2004: The Manningham Municipal Public Health Plan
Manningham CC	August 2001	Manningham's Health 2001—2004: The Manningham Municipal Public Health Plan
Manningham CC	June 2002	Manningham Domestic Wastewater Management Plan
Melbourne Water	2001	Infostream: Water quality monitoring, indicators and tests
Melbourne Water	2001	Infostream: Yarra River
Websites	Melbourne Water	www.melbournewater.com.au
	EPA	www.epa.vic.gov.au
	CRC-CH	www.catchment.crc.org.au
	ANZECC	http://www.ea.gov.au/water/quality/nwqms
	WaterWatch	http://www.vic.waterwatch.org.au/



Table 3 DWMP monitoring system

Area	Item	Туре	Target indictors and objectives	Monitoring options	Recommended option	How and when reporting timelines	Reference/link	Rationale	Responsibility	Budget (cost to Council)
LEGISLATIO	ON AND WQ GUIDELINES									
	SEPP (F7—Waters of the Yarra Catchment) SEPP (Waters of Victoria Septic Tank Code of Practice ANZECC	2 Segment— Urban Waterways 3 Lowland Rivers		N/A	N/A		EPA Publications Link http://www.epa.vic.gov.a u/Publications/ ANZECC Link http://www.ea.gov.au/wat er/quality/nwqms/volume 1.html	Establish indicators to protect the environment Council does not need to develop further legislation as existing legislation provides the framework for enforcement	EPA	Generally no cost to Council for data, although some reports do incur a charge Many reports can be downloaded free from the internet
EXISTING D	ATA SETS									
	Council	Physicochemical	E. coli BOD Suspended solids	Presently undertaken randomly Undertake targeted program in waterways and drains	Undertake a targeted, spatial and temporal, program to develop a general baseline for whole municipality Use existing data where ever available	Annual reporting of key indicators against objectives	MW—annual WQ data report http://www.melbournewa ter.com.au/content/library/publications/reports_arch ive/waterways/2001_Wat erway_Quality_Data.pdf Water Quality Sites http://www.melbournewa ter.com.au/system/mainFr ameset.asp?path=/water_cycle/waterways/waterways.asp	Use of long term data sets (i.e. MW data) provides a good understanding of long term trends. Data is reliable and free Need to undertake targeted program	Council MW EPA	Staff time to access and report existing data \$2000 to undertake current monitoring program
	Melbourne Water	Physicochemical ISC	E. coli pH Temperature ('C) Dissolved oxygen (DO) Turbidity (Tur) Suspended solids (SS) Nitrate as nitrogen (N-N03) Ammonia as nitrogen (NH-N3) Total nitrogen (TN) Total phosphorus (TP)	Use existing data supplied by Melbourne Water Use existing data supplied by EPA Use existing data sources housed on the Victorian Water Resources Data Warehouse	Use existing data sets from MW Limit the number of indicators to: • E. coli • TP • TN • SS • supplement with EPA data sets • use other data bases where appropriate	As above	As above	As above	As above	As above No cost
	EPA	Physicochemical Heavy metals	As above	Use existing data sources	As above	As above	As above	As above	As above	As above No cost
	WaterWatch	Physicochemical Invertebrates ISC	Limited parameters	Use existing data sources	As above	As above	As above	As above	As above	As above No cost
	CRC–Freshwater Ecology	Invertebrates	Extensive monitoring at limited sites	Use existing data sources	As above	As above	As above	As above	As above	As above No cost



Table 3 continued

Area	Item	Туре	Target indictors and objectives	Monitoring options	Recommended option	How and when reporting timelines	Reference/link	Rationale	Responsibility	Budget (cost to Council)
MONITORING ACTIVITIES	PROGRAM AND									
	Establish baseline data for:	Data Surveys	E. coli BOD Suspended solids Licence compliance	Individual inspection of a % septic tanks (e.g. 25% inspected /year) Monitor key water quality indicators Survey number of septic tanks correctly sited existing (older than 5 years) Survey number of septic tanks correctly sited new and recent (newer than 5 years)	In vidual inspections Survey old and new systems	Report % septic tanks that do not meet to discharge criteria (e.g. against 25% inspected /year) Report number of new and old systems that do not meet siting criteria	Internal data from H&LL	Need to establish a baseline for future reference	Council	Staff time only. Council has employed an officer responsible for septic tanks
	Review number of septic tank systems surveyed for operational effectiveness	System review	N/A	Increase % of septic tanks inspected annually	Increase % of septic tanks inspected annually	Annually report against target and previous results	Internal data from H&LL	Need to increase inspections to obtain baseline information quicker	Council	Staff time only. Council has employed an officer responsible for septic tanks
	Identify local law for enforcement of siting and non- conforming septic tanks	System	Identify the number of infringement notices given out during year Identify number of developments refused due to inability to meet septic tanks siting criteria	Establish Councils legal position to enforce permit conditions and septic tanks provisions and siting criteria Establish licence/permit conditions of all septic tanks in Manningham Increase infringement notices	Establish Councils legal position to enforce permit conditions and septic tanks provisions and siting criteria Establish licence/permit conditions of all septic tanks in Manningham Increase infringement notices	Annually report against initial baseline and previous years results	Internal data from H&LL	Need to define Council legal rights Need to ensure due diligence is followed	Council	Staff time only. Council has employed an officer responsible for septic tanks
	Develop checklist to ensure that planning application are only approved for land that meets the Code of Practice - Septic Tanks (EPA 1997) and the Land Capability Assessment (EPA 2001) criteria	System	N/A	Survey number of septic tank permits that are issued on land that does/does not meet siting criteria	Survey number of septic tank permits that are issued on land that does/does not meet siting criteria	Annually report against initial baseline and previous years results	Internal information	Need to ensure due diligence is followed	Council	Staff time only. Council has employed an officer responsible for septic tanks
	Conduct targeted quarterly water quality monitoring programs on waterways/drains affected by septic tanks in priority areas. Establish range of affect	Data	E. coli Suspended solids Detergents BOD	Undertake regular and targeted monitoring program over 2 years to establish baseline data Liaise with EPA, MW, CRC-FE to	Undertake regular and targeted monitoring program over 2 years to establish baseline data.	Report results annually. Compare to other information collected	Internal information EPA www.epa.vic.gov.au Melbourne Water www.melbounrewater.co m.au	Establish good baseline information to identify changes due to improvement programs	Council	\$2–3000 per year



Table 3 continued

Area	Item	Туре	Target indictors and objectives	Monitoring options	Recommended option	How and when reporting timelines	Reference/link	Rationale	Responsibility	Budget (cost to Council)
	Report on development of communication and information package on septic tanks for existing and new septic tanks users.	System	Correct siting and reporting of septic tanks obligations	Monitor number of septic tanks that meet permit conditions and obligations Number of planning applications that correctly address septic tanks issues	Monitor number of septic tanks that meet permit conditions and obligations Number of planning applications that correctly address septic tanks issues	Report compliance annually	Internal information	Uptake of correct information is important in gaining community understanding and compliance	Council	Staff time to monitor applications and permit conditions
	Report on development of incentive scheme to persuade landowners to improve performance/replace septic tanks	System	Number of septic tanks upgraded or replaced Improvement in water quality	Register number of septic tanks upgraded or replaced Target small catchments	Register number of septic tanks upgraded or replaced	Report annually	Internal formation	Upgrading of systems may alleviate many septic discharge issues	Council	Staff time only. Council has employed an officer responsible for septic tanks
	Investigate and report on the option for Council to obtain funding to connect to nearest sewer line	System	N/A	N/A	Investigate alternative options to extensive septic tanks campaign, including alternative sewering options instead of backlog sewering	Report by December 2003	Internal formation Liaison with external agencies, State government	May be quicker option than long term septic tank program	Council	\$10–15,000 to employ consultant to undertake scoping and feasibility study Staff time for internal study
OTHER	Private funding	System	Investigate options or privately	N/A	Investigate private options	Report by January	Internal formation	Upgrading of	Council	\$10–15,000 to
		2,333	funded scheme for sewer connection.		and private sputing	2004	Liaison with external agencies, State government	systems may alleviate many septic discharge issues May be quicker option than long term septic tank program	Other agencies	employ consultant to undertake scoping and feasibility study

Domestic Wastewater Management Planning—DWMPs and Guidelines for Innovative Management Approaches

This project aims to provide councils across the State with improved capacity to develop Domestic Wastewater Management Plans (DWMPs) with effective management strategies to reduce the negative impacts of domestic wastewater on stormwater quality.

VSAP is funding two strategic projects in Round 3 which will commence July 1 2003. These projects are being coordinated by MAV (Simon Holloway 9667 5567).

Development of Guidelines for Innovative Management Approaches to wastewater management—Methodology

- Establish a diverse project group of expert wastewater management practitioners and relevant authorities.
- Review current management strategies and treatment options for wastewater within Victoria, interstate and abroad.
- Collate existing examples of best practice management for a wide range of scenarios, including both structural and non-structural management strategies.
- Identify a range of case studies of known threats from wastewater.
- Explore options for innovative management solutions to known wastewater threats.
- Consider the outcomes that may be achieved and the practical application of these options



