

MAKING THE MOST OF LOCAL FLOOD MANAGEMENT PLANNING IN MELBOURNE'S MUNICIPALITIES AND THE PORT PHILLIP AND WESTERNPORT REGION

E Davie¹, P Hughes²

¹ Melbourne Water, Melbourne, VIC

² Halcrow – a CH2M HILL Company, Melbourne, VIC

Introduction

Melbourne Water and local government are working together to help reduce flood risk in the Port Phillip and Westernport Region in Victoria, Australia. Through the project management and facilitation of a panel of consultants including Halcrow, Melbourne Water and councils are developing Flood Management Plans (FMPs) by municipality, with involvement of Victoria State Emergency Service (VICSES) as a key stakeholder.

This paper will explain the FMP development process, present the benefits of FMPs, and detail some of the challenges and successes in their development. The paper draws on case studies relating to several municipal FMPs developed through the process.

The Port Phillip and Westernport Region and flood risk

The Region

The Port Phillip and Westernport Region in Victoria, Australia covers an area of approximately 13,000 square kilometres and includes nearly all the land that drains to Port Phillip Bay and Western Port. It extends from high up in the Yarra Ranges in the east, across to Ballan in the west, and from the Mornington Peninsula and Phillip Island in the south, to Lancefield and Kinglake in the north. It includes the greater Melbourne metropolitan area and is home to 3.8 million people.



Figure 1 Map of Port Phillip and Westernport Region

Flood Management Agencies

Responsibilities for flood management across the region are shared between all levels of government and the community.

Melbourne Water is the designated drainage and floodplain management authority for the Port Phillip and Westernport Region. It is responsible for the management and maintenance of numerous retarding basins, wetlands, levee banks, pump stations, flood gates and around 1,500 kilometres of underground drains.

Primary flood management functions include:

- undertaking flood studies and flood mapping
- identifying flood affected land
- undertaking flood prevention works such as retarding basins, levees and pipe augmentation
- assisting the Bureau of Meteorology with flood forecasting and warning
- advising planning authorities regarding appropriate land use and development of flood affected areas
- through their role as planning permit referral authorities
- supporting community education and awareness programs.

Melbourne Water is also responsible for:

- planning regional drainage systems to ensure new urban development meets appropriate standards of flood protection and environmental performance
- the ownership and maintenance of drainage assets where the catchment area is greater than 60 hectares
- assessment of planning permit application referrals to subdivide land or develop flood affected land.

There are 38 local councils within the region that manage an estimated 25,000 kilometres of local underground drains and drainage infrastructure.

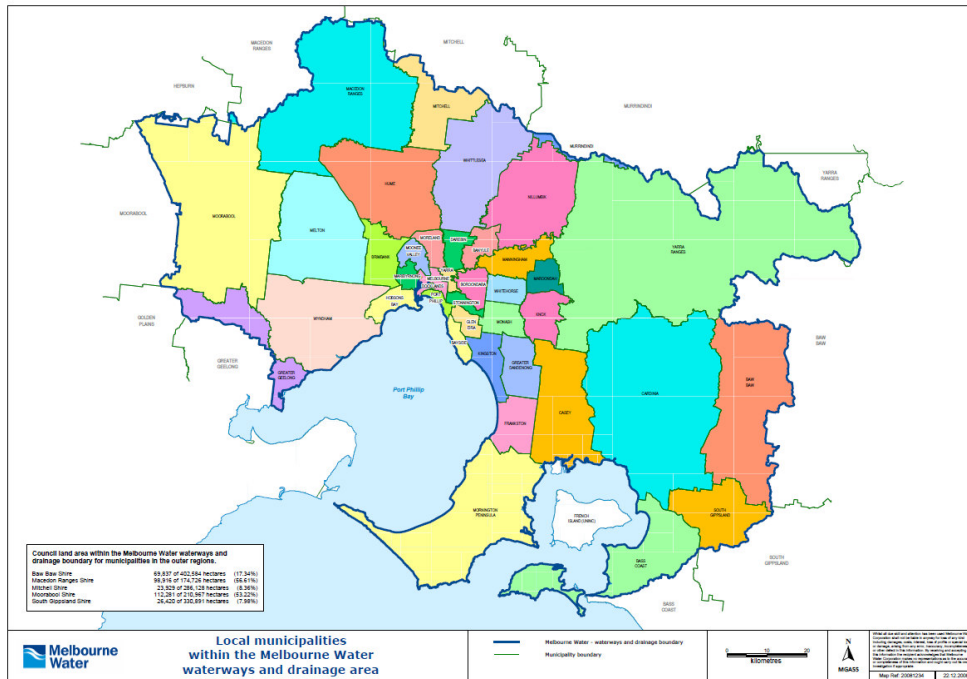


Figure 2 Local municipalities within the Melbourne Water area

In relation to flood management, local councils undertake the following:

- administer and enforce planning provisions and building regulations in relation to building and development on flood affected land
- provide for the conservation of natural resources and areas of environmental significance
- develop flood sub-plans as part of their municipal emergency management plans and participate in risk reduction activities
- provide the public with access to flood information
- provide and manage local drainage infrastructure for catchment areas less than 60 hectares
- support community education and awareness
- manage local level emergency recovery support, clean-up and maintenance.

VICSES is the lead agency responsible for flood emergency planning and community education and its role includes:

- development of Flood Emergency Plans with councils
- implementation of flood and storm education programs (FloodSafe StormSafe).

Flood Risk

The Port Phillip and Westernport Region faces significant flood management and drainage challenges, with over 100,000 properties known to be at risk of flooding, of which 82,000 properties are at risk from overland flow. More than 40,000 of these are at risk of flooding above floor level (Melbourne Water 2007). These challenges are compounded by long term future pressures associated with urban consolidation as well as changing rainfall patterns and rising sea levels from climate change.

The Annual Average Damage (AAD) cost for flooding in the region is estimated to be \$245 Million (Melbourne Water 2007).

A Victorian Auditor General report from 2005 recommended “*Melbourne Water and councils [need] to explore opportunities for working collaboratively to address the management of flood risks.*”

Port Phillip and Westernport Region Flood Management and Drainage Strategy

Melbourne Water’s *Port Phillip and Westernport Region Flood Management and Drainage Strategy* (Melbourne Water 2007) developed in consultation with local government authorities and other stakeholders recognises the need for a more coordinated and integrated approach to dealing with flood risk. One of its objectives is to improve collaboration between flood management agencies. A key way to achieve this at a local level is for Melbourne Water to work in partnership with councils (and the Victoria State Emergency Service as a key stakeholder) to develop FMPs.

The Strategy has five key objectives:

Objective 1: Complete the knowledge base (flood mapping and understanding social impacts)

Objective 2: Potential long-term future pressures on existing drainage systems (understanding and preparing for development and climate change)

Objective 3: An agreed approach to managing existing regional flooding problems (assessing and managing flood risks)

Objective 4: Enhanced community education, flood awareness and preparation (flood education program)

Objective 5: Agreed responsibilities and improved collaboration between flood management agencies

Objective 5 of the Strategy recommends preparation and review of FMPs.

Flood risk assessment

Melbourne Water uses a Flood Risk Assessment Framework (Melbourne Water 2010) to set criteria and processes for assessing flood risks. It uses a triple-bottom line style approach to assess flood consequences, considering the following factors:

- *economic*: the financial cost of flooding to the community (primarily property damage)
- *safety*: the hazardous characteristics of the catchments and floodwaters that may result in injury or death
- *social*: these are ‘intangible’ impacts and involve potential disruption to and vulnerability of the community and its level of concern. It takes into account recent impacts and frequency of flooding.

These criteria are used to assess and prioritise flood risks by catchment and identify those with the most extreme flood risks. Consideration of the extreme flood risk catchments identified within a municipality is important when developing a FMP.

FMP Framework

FMPs are being developed by Melbourne Water with local councils across the region in order to promote improved coordination between flood management agencies, better understand flood risks and identify 'hot spot' areas, clarify roles and responsibilities, and identify gaps in flood risk management activities. The FMPs set out priority improvement actions to address these risks and better prepare for and manage floods in the future.

This is a novel approach which differs in scope to a traditional floodplain management plan. Effective engagement and coordination through the plan development process is critical to improve understanding of flood risk, explore mitigation options, and enhance adaptation to change.

FMP purpose and objectives

The purpose of FMPs is to assist a local council and Melbourne Water undertake their flood management responsibilities and ensure that suitable measures have been (or are being) implemented where possible to manage the existing risks associated with flooding. FMPs are aimed at ensuring the objectives of the *Port Phillip and Westernport Region Flood Management and Drainage Strategy* can be effectively implemented in the nominated municipality in a coordinated and effective manner at a local level, within an integrated flood management framework. It is also aimed at fostering preparedness for flood events and an ability to respond in an informed and appropriate manner within the municipality and its communities.

The objectives of the FMPs project are to:

- promote improved collaboration between councils, Melbourne Water and SES Victoria
- understand flood risks and identify extreme/intolerable flood risks and 'hot spot' areas
- identify gaps and improvement actions that are needed to address these risks and better prepare for and manage floods
- gain clarity of roles and responsibilities
- ensure that the objectives of the *Port Phillip and Westernport Region Flood Management and Drainage Strategy* are met within each municipality

While a FMP has due regard for current flood related legislation and supporting policies and strategies, it recognises that no single organisation and no single approach can deliver an effective response to flood management issues. It also recognises that it is not possible to make any municipality completely free from flooding. A residual risk will remain.

FMP development process

A range of inputs and processes are used to prepare the five year FMPs with an emphasis on information gathering, assessment and engagement. The FMPs are

developed through a series of interviews, file reviews, meetings and workshops, to gather the background information, identify flood risk management/mitigation activities and arrangements and undertake a gap analysis and develop an improvement plan. The focus is on using the process to work together collaboratively.

Broadly, the development of each FMP involves:

- Project inception, information gathering and review
- Meetings with relevant areas of Melbourne Water, Council, and VICSES – to identify and discuss key flood and drainage risks and issues and gather background data about the drainage system, flooding history and related documents
- A site inspection of flood hot spots in the municipality – to gain a better appreciation of local flood risks
- Workshops with relevant stakeholders
 - verify and assess flood risk hot spots
 - review the status of current flood risk management/mitigation activities
 - review future risks
 - clarify roles and responsibilities
 - undertake a gap analysis to identify any improvement opportunities
- Preparation of a draft and final FMP – the draft FMP is circulated for review and comment within each participating organisation to encourage feedback and ownership of actions in the improvement plan
- Melbourne Water and Council signoff – this may be at officer or council level depending on what is to be achieved through the FMP and whether it commits council to expenditure. The most common approach is for the FMP to be presented to council before sign off by a General Manager
- Monthly progress reporting through the life of the project and regular liaison between participating organisations

An important reason for establishing the FMP program was to promote coordination and effective flood management solutions. Therefore it is essential that the process for developing the FMPs is centred on a collaborative and engagement-based approach. As appropriate, involvement is required from engineering, flood planning, mapping, land development, GIS and risk/emergency management areas within Melbourne Water, Council and VICSES.

Melbourne Water has a standard FMP template to be used for each Council. An FMP brings together information about drainage strategies, flood mapping, investigations, current understanding of flood risks and problem areas (hot spots or extreme risks), flood risk management activities, education and awareness programs, flood warning programs and action plans. Each FMP outlines agreed roles and responsibilities, identify risks, set priorities, aims and goals, establishes and aligns mitigation work programs and targets to address flood management objectives. Through the development of the FMP, Melbourne Water, Council and other organisations are able to work together to identify any gaps and proposed improvements for future flood management in the municipality.

A typical table of contents is shown in Appendix 1.

Who is involved?

A cross functional representation of approximately 15 people with flood planning, mapping, land development, operations/maintenance, transport/roads, GIS and risk/emergency management responsibilities, with knowledge/competencies in the

areas of e.g. engineering, town planning, asset management, roads and drainage maintenance, asset information and emergency management (eg the MERO – Municipal Emergency Resource Officer).

The Victorian State Emergency Service will also be involved in development of the FMPs, to address the education and awareness and emergency planning components and to promote improved collaboration between flood management agencies and integrated flood management planning.

Review process

Melbourne Water is responsible for overall management of the FMPs. The FMPs are considered a live document and will instigate review and update on an ongoing basis. The Improvement Plan is to be reviewed annually. An annual meeting will be held between council and Melbourne Water to track and report to each other on progress and status of improvement plan actions. It is intended to have a major review of the whole FMP every five years or earlier as required.

Progress with FMPs

The FMP development process commenced in 2008-09 with a pilot program with two councils, followed by a roll out of the program across the region. In developing the program, councils have been prioritised based on the severity of their flood risk and readiness to participate.

By 2013 the goal is to complete FMPs with all 38 councils in our region. Progress as at December 2011 was:

Councils in the region	38
FMPs completed	11
FMPs in final stages	4
FMPs in development	7
FMPs yet to start	16

Table 1 FMP progress

Melbourne Water made a commitment to its regulator, the Victorian Essential Services Commission, to work with the 38 councils in the Port Phillip and Westernport Region to prepare and have FMPs in place by 2013. This is a significant process, which is taking place progressively over the five year period to 2013.

Planned future evaluation

It is very important to maintain the FMPs, particularly to implement the improvement actions identified in their development and evaluate for improvements in the future.

Melbourne Water and councils will track and report to each other on improvement actions on an annual basis. It is also planned that the complete FMPs will be revised every five years to ensure that they continue to accurately reflect flood risks and priorities within the municipality.

Case studies of flood management plans

Two case studies of FMPs for the Kingston and Brimbank municipalities in Melbourne are provided below to briefly outline flood risks, why a FMP was relevant to each Council, key priorities, issues identified through the FMP process, and responses to date.

Kingston City Council

The Kingston municipality is located in the middle and outer southern suburbs of Melbourne adjacent to Port Phillip Bay. Flooding is a significant issue for the Kingston community and creates challenges for both the Kingston City Council and Melbourne Water. Many of Kingston's low lying bayside suburbs experience localised shallow flooding during minor storm events. The Council drainage network is somewhat unique in that it is reliant on a significant number of stormwater pumping stations to convey stormwater from Council drains to Melbourne Water main drains.

Kingston City Council established a *Flood Mitigation Strategy* in 1998 with the aim to identify and prioritise the full range of flooding problems within Kingston, and recommend cost effective maintenance and improvement works. Council has undertaken a series of drainage studies and has increased drainage maintenance expenditure since 2006/07. Council has also sought to improve its understanding of flood risk with a series of local flood mapping projects.

In 2010, Kingston City Council partnered with Melbourne Water and VICSES to complete the Kingston FMP. The Kingston FMP outlines roles and responsibilities and describes, at a high level, Council and Melbourne Water's key flood planning and management activities, and key improvement actions.

Kingston is largely developed but urban consolidation and infill is continuing. While this infill development may not significantly affect flood risk, new residents have increased expectations regarding flood mitigation and the control of "nuisance flooding", and expect a higher level of service. Climate change also has the potential to increase flood risk with potential increases in rainfall intensity likely to impact on Kingston's drainage system, and further contribute to "nuisance flooding". Sea levels are also expected to rise resulting in additional flooding pressures in some coastal locations.

An issue that emerged through the FMP process was how Melbourne Water and Council each considered and assessed flood risk, and especially frequent "nuisance flooding" across roads and below floor level. The FMP process provided a forum for discussion of this issue along with identification of the need for a joint strategic study of options to improve drainage services in the vicinity of the Melbourne Water Centre Swamp (Secondary) Main Drain. This study will inform assessment and planning of combined drainage solutions that are most beneficial to the community.

Key actions in the Kingston FMP to reduce flood risk included:

- Council to undertake further local flood mapping and update and extend Kingston Planning Scheme Flood Overlays
- Melbourne Water and Council to undertake a strategic study of the Centre Swamp (Secondary) Drain: Aspendale to Bonbeach
- Council to review asset management systems and processes including knowledge management and succession planning

- VICSES and Council to develop and implement a Community Flood Education Strategy

The Kingston FMP has enhanced understanding of flood risk and improved integration and communication between Melbourne Water and Kingston City Council. Council has recently commissioned additional flood mapping of priority local catchments with further flood mapping to be undertaken over the next three years. Following the completion of this third stage of flood mapping, Council is likely to propose an amendment to the Planning Scheme with an extension to Flood Overlays. The first of a series of annual coordination and review meetings has also recently been held between Melbourne Water and Council to further discuss flood issues and review progress on implementation of actions identified in the Kingston FMP.

Brimbank City Council

The Brimbank municipality is located between 11 and 23 kilometres west and north west of the Melbourne Central Business District. Brimbank has a mix of established and newer suburbs with growth expected to continue, particularly through the redevelopment of older residential and industrial sites. Brimbank has six major rivers and creeks including the Maribyrnong River and Kororoit Creek.

In 2010-11, Brimbank City Council partnered with Melbourne Water to prepare the Brimbank FMP. The preparation of the FMP enabled a range of flood risks to be considered including the condition of local drainage infrastructure, impacts of infill development, and flooding from major waterways.

Preparation of the Brimbank FMP highlighted that with continuing infill development, it will be important for Brimbank City Council to understand the flood risk associated with existing infrastructure and increased stormwater runoff from higher density development. Climate change also has the potential to increase flood risk with increases in rainfall intensity likely to impact on Brimbank's drainage system, and further contribute to localised flooding.

Brimbank City Council has an *Urban Stormwater Management Plan* and is developing a *Stormwater Asset Management Plan*. Council has a standard system in place for managing its drainage asset information but there is a gap in the accuracy and completeness of the information data base, especially for asset condition. Council is seeking to develop a more proactive maintenance program to improve the efficiency and effectiveness of drainage asset management and reduce flood risk. This was identified and prioritised through the FMP.

Key actions in the Brimbank FMP to reduce flood risk included:

- Melbourne Water and Council to work together on flood mapping of priority areas of Brimbank
- Melbourne Water and Council to work together to enhance planning overlays to reflect flood hot spots and mapping of priority areas
- Council to review resourcing required to support efficient and effective drainage maintenance
- Establishment of regular coordination meetings between Melbourne Water and Council
- VICSES and Council to develop key flood education messages and prepare and implement a Community Flood Education Strategy

The Brimbank FMP has improved understanding of flood risk and identified actions to reduce flood risk, and assist communication between Melbourne Water and Brimbank

City Council. Over time, Council can consider the role and value of local flood mapping and improving information on the condition of drainage assets.

Context – what else is happening?

The development of the FMPs is occurring in parallel with other activities and initiatives that complement each other:

- Ongoing flood extent modelling and mapping
- Improved analysis and assessment of flood risks, by catchment
- Research to better understand the social impacts of flooding on the community
- Trialling of flash flood warning systems (to notify residents via SMS)
- Development of an integrated flood management planning framework for Victoria (Office of Emergency Services Commissioner)
- Development of Flood Emergency Plans (sub plans to the Municipal Emergency Management Plan) by Victoria SES and councils
- Victoria SES FloodSafe community flood education program
- Department of Sustainability and Environment climate change and adaptation program.

Discussion

The development and implementation of the FMPs has brought a range of benefits and challenges in terms of progressing flood risk management across Port Phillip and Westernport region.

Benefits of FMPs

The potential benefits to be achieved by flood management agencies working together to develop FMPs are:

Roles and Coordination

- Improved agency collaboration, particularly between councils, Melbourne Water and SES Victoria – there are opportunities to further involve VicRoads and other agencies, such as VicTrack, in the process to also improve collaboration
- Increased understanding and awareness of flood risks and roles (e.g. with local flood mapping)
- Clarifying roles and responsibilities – especially that Councils can have an important role with undertaking local flood mapping, at times, in a joint program with Melbourne Water
- More integrated flood management planning – there are opportunities to further integrate with Water Sensitive Urban Design (WSUD)

Information

- Identifying information gaps – for example, documenting knowledge of local flood impacts, hot spots and drainage asset condition
- Identifying further studies – especially for strategic drainage studies where joint solutions may be more effective and provide better outcomes at least community cost
- Consolidating a ‘road map’ of important flood information into one location – for example, with a flood information portal

Resourcing

- Assisting council to position for future funding – the FMPs raise awareness of flood risk and may assist with funding for flood mitigation

Prioritisation

- Information to help prioritise and complete flood mapping and mitigation programs through whole catchments
- Common understanding of flood ‘hot spot’ areas
- Better flood intelligence to support management of development applications/ controls and government planning tribunal decisions
- Better prioritisation of capital works
- Better flood response (better information for flood emergency plans)
- Identifying the most important areas for community flood education

Challenges

Development of the FMPs is a significant process. With 11 plans completed and 11 more at different stages of development, some challenges have occurred along the way. These are summarised below:

- Multiple purpose and interests – floodplains and rivers have multiple functions and are important to Melbourne Water and councils for flood mitigation and ecological, recreational and cultural values – all of these values need to be taken into account with a holistic approach to floodplain and river management

Engagement

- Attracting councils to the program
- Having a “Champion” within council and Melbourne Water - critical for promoting responses to flood risk and driving the FMP process
- Role of Council project sponsor and coordinator - the key contact person for each organisation needs to be well connected with other staff in order to gather information and coordinate feedback on the development of the FMP
- Ensuring sufficient and cross-organisational engagement and participation in FMP meetings and workshops
- Require ongoing commitment – development of a FMP is the beginning of a journey

Information

- Quality/extent of flood data and the ability to locate it – the FMP may identify a priority to gather flood data and improve data quality
- How to consider climate change impacts and when to incorporate into drainage design, flood modelling and ultimately into flood overlays and planning controls

Improvement actions

- Agreeing on improvement actions - reviewing the improvement plan takes a few iterations of refinement

Sign off

- Council signoff: scheduling time for councillors to be presented the document

Conclusions

There are significant benefits to be gained through organisations sharing information, forming contacts and working together in a more strategic way to improve flood risk management. The development of FMPs is bringing about benefits for flood management agencies and therefore the community in the Port Phillip and Westernport region. Effective implementation of key improvement actions and ongoing reviews are required to reduce flood risk and identify enhancements to the FMP process.

References

Melbourne Water, 2007, Port Phillip and Westernport Region Flood Management and Drainage Strategy, Melbourne, Australia.

Melbourne Water, 2010, Flood Risk Assessment Framework: Decision making and mitigation prioritisation process

APPENDIX 1 - Typical Table of Contents

Approval

1 Executive Summary

2 Background

3 Purpose

4 Objectives

5 Scope

6 The Municipalities Waterways and Drainage System

6.1 The City of Port Phillip

6.2 Waterways and Drainage Networks

6.3 Flood History and Issues

6.4 Flood Data, Information and Intelligence – The Existing Knowledge Base

7 Flood Risk

7.1 The Tolerability of Existing Flood Risk

7.2 Existing Flood Risks within the Municipality

7.3 Future Flood Risks – Medium to Long-Term Pressures on the Drainage System

8 Flood Management and Mitigation

8.1 Drainage Strategy

8.2 Flood Modelling and Mapping – completing the knowledge base

8.3 Asset Management

8.4 Planning Controls

8.5 Capital Works

8.6 Flood Emergency Response Planning

8.7 Community Education and Awareness

8.8 Flood Warning System

8.9 Flood Proofing

8.10 Drainage studies and guidelines

9 Roles and Responsibilities

10 Improvement Plan

11 Monitoring and Review

12 How this document was developed

13 Acknowledgements

ABBREVIATIONS & ACRONYMS

REFERENCES

APPENDIX A – ROLES AND RESPONSIBILITIES

APPENDIX B - FLOOD RISK ASSESSMENT

APPENDIX C – DATA, DRAINAGE SYSTEM UPGRADES & STUDIES

APPENDIX D – FLOOD HOT SPOTS LIST AND MAP

APPENDIX 2 - Typical Data/Information Inputs

GIS layers

- municipal boundary
- major roads
- aerial photo
- drainage assets including drains, levees, channels, pump stations, retarding basins, hydrographic monitoring station locations (streamflow/rainfall)
- natural waterways
- catchment boundaries
- flood in road risks
- 'areas not flood mapped'
- flood extent: 100 year ARI and where available, other events (eg 5, 10, 20, 50, PMF)
- planning scheme overlays – LSIO, SBO, FO

Other

- flood studies – mapping
- extract from Melbourne Water flood risk matrix (fields include catchment name, # properties, catchment risk scoring fields E1, H1..., S1..., risk ranking)
- flood records/photos
- flood customer complaints
- flood 'hot spot' information – eg anecdotal/records (eg relates to complaints)
- drainage strategies
- Planning Scheme status – currency vs mapping
- asset information – list of drainage assets, information about condition/management/maintenance