



Flood Management Plan

Wyndham City Council

June 2018



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Approval

This Flood Management Plan has been developed in consultation with Wyndham City Council, Melbourne Water and Victoria State Emergency Service. As lead stakeholders for managing flood risks, Melbourne Water and Wyndham City Council will endeavour to implement the recommendations in this plan.

Approved by	Signature	Date
Emily Phillips Manager Regional Services West Melbourne Water		27/9/18
Antoniette Michail Acting Manager – Environment & Water Wyndham City Council		15/10/18

Document control

Version Number	Version 3 (Final)
Date	03/09/18
Frequency of Review	Five yearly or earlier (as required)
Next Review Due	June 2023
Responsible Melbourne Water Officer	Andrew Sheehan Project Manager, Flood Partnerships
Responsible Council Officer	Kuan Yeoh Senior Drainage and Water Engineer

Document history

Version	Date	Comments/changes
Version 1	31/05/18	
Version 2	26/06/18	Address MW+Council Comments
Version 3	03/09/18	Address Additional Council Comments

Monitoring and review

Melbourne Water will initiate annual review meetings to report on progress implementing improvement actions with the Wyndham City Council. The Plan will be revised at least every five years to reflect achievement of objectives and changes to work program priorities.

Executive Summary

The challenges of localised flooding

Floods are a natural occurrence in the Port Phillip and Westernport region. We can't stop flooding from happening, but we can plan for and manage the risk, and reduce the consequences. Melbourne Water (MW), Wyndham City Council (WCC) and the Victoria State Emergency Service (VICSES) are working together to reduce the severity and impacts they cause to people, places and communities. One of the ways this is being achieved is through the development of Flood Management Plans (FMP's).

The municipality faces a number of local flood management and drainage challenges including:

- Rapid population growth, through both greenfield and infill development;
- Substantial riverine flooding issues at a number of Princess Fwy crossings; and
- Climate change impacts including increased rainfall intensity and rising sea levels.

What is a Flood Management Plan?

This FMP outlines roles and responsibilities and describes, at a high level, WCC and MW key flood management activities. It identifies specific actions to improve flood management in the municipality over the next five years.

Flood Management Plan goals and objectives

The overarching goal of the FMP is to contribute to reducing the risk and impacts of flooding on local communities. The objectives in developing and maintaining this FMP are to:

1. Enhance collaboration between agencies and community;
2. Identify existing and emerging hotspots and flood risks;
3. Provide opportunities for information sharing;
4. Identify achievable improvement actions;
5. Clarify contacts at other agencies; and
6. Align with the Port Phillip and Westernport Flood Management Strategy (FMS), 2015.

By enhancing the understanding of flood risks and improving collaboration between MW, WCC and VICSES, flood issues will be managed in an informed and efficient manner. In time, the risk of floods and associated impacts on the community will be reduced.

Summary of key drainage and flood issues/'hotspots'

Through the development of this Plan, a number of known flood issues (hotspots) were collaboratively identified by WCC, MW and VICSES. The key hotspots that were identified are listed in Table 1.

Table 1 Key Hotspots

Drainage / flooding issue	Location
Frequent flash floods at Little River causing localised flooding and ponding of water on roads	Little River
Princes Fwy floods at a number of waterway crossings, cutting off traffic for several hours	Lollypop Ck, Skeleton Ck, Cocoroc River
Cottrel St Werribee River crossing is prone to flooding that prevents traffic movement	Werribee

Further details and additional hotspots are listed in Appendix 2.

Key management actions

A core component of this FMP is the improvement plan. The improvement plan identifies key issues under the following themes:

- Community awareness;
- Flood investigations;
- Policies, procedures and strategies;
- Data collection;
- Planning; and
- Collaboration.

WCC faces some unique challenges due to its geography, demographics and growth ambitions. Stormwater management and climate change/sea level rise impacts are key issues addressed in this plan.

Actions have been developed to address each of the key issues, and are summarised in Table 2. Agency responsibilities for implementation of the actions have been assigned.

Table 2 List of Key Management Actions

Reference no.	Action	Responsibility & Timing
Community Awareness		
1	Develop a forward work plan for the improvement of community access to flood information (considering mediums such as the WCC website, mobile phone apps etc).	June 2019 WCC (CER) MW (TL-FP)
Flood Investigations		
2	Complete joint flood mapping of existing major urban areas, including: <ul style="list-style-type: none"> • Laverton/Laverton North; • Hoppers Crossing; and • Werribee/Werribee South. 	June 2022 MW (TL-FS)
3	Complete joint flood mapping of pilot catchment selected from list in Action #2.	June 2019 MW (TL-FS) WCC (SDE)
Policies, Procedures and Strategies		
4	Develop Little River drainage strategy	June 2019 WCC (SDE)
Data Collection		
5	Undertake gap analysis of council asset management and GIS data/systems and develop a forward work plan for updating drainage GIS data across the municipality.	June 2020 WCC (SDE/AC)
6	Complete pilot drainage data collection exercise for catchment identified in Action #2	December 2018 WCC (SDE)

Reference no.	Action	Responsibility & Timing
Planning		
7	Complete planning scheme amendment, including flood related overlays	June 2023 WCC (CUT)
8	<p>Establish and maintain a council working group for planning and flooding - meet annually to discuss (as a minimum):</p> <ul style="list-style-type: none"> • <i>Status of next 10 yearly planning scheme amendment</i> • <i>Status of any interim special planning scheme amendments</i> • <i>Schedule and progress of flood investigations being completed or that are planned, which will likely to result in updated planning layers</i> • <i>Improve the planning scheme procedures for flood referrals (within WCC and to MW)</i> 	<p>December 2018, repeated annually</p> <p>WCC (CUT)</p>
Collaboration		
9	WCC & MW to meet with VicRoads to discuss Princes Fwy flood risk and explore collaborative opportunities to manage this risk.	June 2020 WCC (SDE)
10	Share information on drainage maintenance regime for the D1 drain and clarify drainage asset maintenance responsibilities across the municipal drainage network.	June 2019 MW (TL-RS)

Responsibilities for actions are given primarily to roles, to account for the fact that individuals may change roles throughout the life of the plan. The roles and current staff member filling each role are listed in Table 3.

Table 3 Roles

Wyndham City Council		
Acronym	Role	Responsible Person
SDE	Senior Water and Drainage Engineer	Kuan Yeoh
AM-E&W	Acting Manager – Environment and Water	Antoniette Michail
AC	Asset Coordinator	Tony Mangiardi
CUT	Coordinator Urban Transformation	Mark Marsden
CER	Coordinator Emergency Resilience	Fiona Swan
Melbourne Water		
TL-FS	Team Leader – Flood Services	Wendy Smith
TL-FP	Team Leader – Flood Preparedness	Paul Rasmussen
TL-RS	Team Leader Regional Services (West Region)	Ben English

A timeline showing the key dates associated with the actions is shown in Figure 1 below.



Figure 1 Annual Action Timeline

The collaborative development of this FMP and the subsequent update of the Flood Emergency Plan (FEP) for WCC provides a basis for improved coordination and collaboration.

Coordination will be further improved with annual meetings between MW, WCC, and VICSES to discuss ongoing operational and improvement opportunities.

1. Background

The Port Philip and Westernport FMS (Melbourne Water, 2015), provides a framework to help guide the work of many organisations who participate in preventing or managing flood risks.

It is recognised no single organisation and no single approach can deliver an effective response to flood management issues. A coordinated and collaborative approach by flood managers and communities is required.

The FMS commits MW as the lead organisation to support updates to municipal FMPs to reflect new information, local priorities and agreed flood management solutions.

2. Introduction

This FMP outlines roles and responsibilities and describes, at a high level, WCC and MW's key flood planning and management activities. It details the flood risks for the municipality, identifying hotspot areas, and contains actions to address key gaps identified when developing the Plan.

WCC is committed to an integrated approach to water management.

Wyndham is celebrated as a water sensitive city with successful urban and rural environments where Council works collaboratively with its community and stakeholders to create healthy ecosystems and liveable communities.

Wyndham's 2040 Vision (WCC, 2017c)

2.1 Scope

This plan outlines key activities, roles and responsibilities for MW and WCC for flooding related to waterways and the drainage system. It considers current and future flood risks. The scope does not include flooding arising from dam failure or tsunami. Emergency response planning is not included in this plan as it is addressed in the FEP.

2.2 Context

Flood management activities are guided by state, regional and local strategies, plans and legislation that operate together to support public health, safety and liveability. These strategies, plans and legislation provide a framework for FMPs and include:

- The Victorian Floodplain Management Strategy (VFMS) 2016. This sets the framework and process for regional floodplain management strategies.
- Emergency Management Act 2013 and Interim Strategic Action Plan. These set out the state's emergency and crisis management arrangements and priority activities for implementation over the near future, focussed on risk assessment and resilience, capability and response, and relief and recovery.

- The Port Phillip and Westernport FMS, 2015. This regional strategy addresses challenges and opportunities to ensure flood management activities across the region provide the best outcomes for communities.

The vision for the FMS is;

Together we are aware, responsive and resilient to flooding

Communities, business and government understand flooding, plan for challenges, and take action to manage risks while making the most of opportunities.

The FMS has three objectives:

1. The right information is available at the right time to people who need it;
2. Flood risks are addressed to reduce impacts and get the best social, economic and environmental outcomes; and
3. Land, water and emergency planning agencies work together to manage flooding

Other related state and regional strategies include:

- Victorian Coastal Strategy
- Victorian Climate Change Adaptation Plan
- Melbourne Stormwater Strategy
- The Metro Framework

Flood management and related policies and strategies:

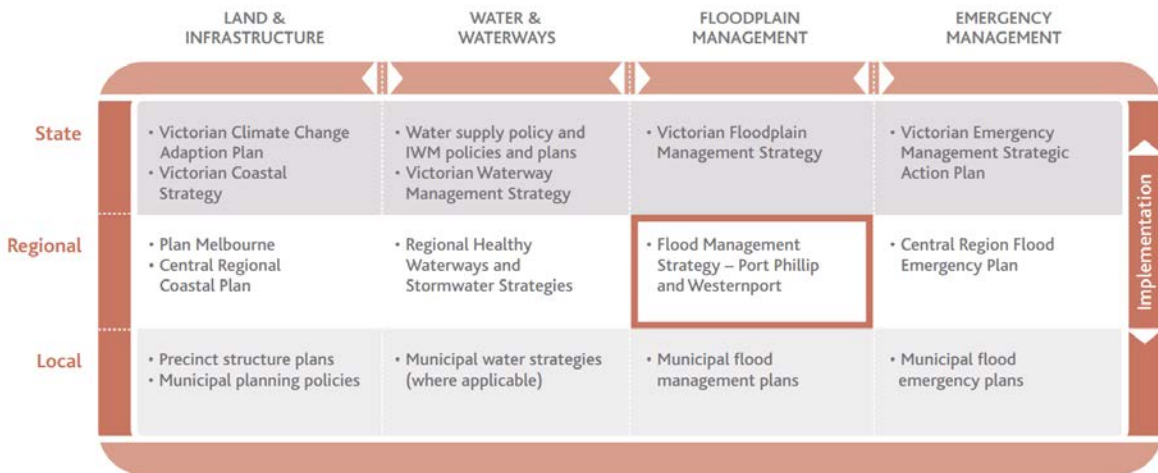


Figure 2 Victorian Flood Management Context

2.3 Target audience

This FMP is a public document and is available on the Council website.

Community consultation

In developing this Plan Council and MW considered whether community consultation was required. It was decided community consultation would not be undertaken as part of the Flood Management Plan process.

However, MW has committed to undertaking community engagement regarding the plan (or aspects at least), post-development and throughout its five year working life.

In addition, MW is committed to embedding community engagement as part of broader flood management activities across Wyndham City Council.

Our proposed engagement approach is about understanding community views, expectations and interest by facilitating discussion, gathering targeted input, and creating buy-in to the process.

Community engagement will be based on principles of the International Association for Public Participation (IAP2) Spectrum. The spectrum is detailed in Appendix 7.

3. Roles and responsibilities

Many agencies share responsibilities for flood prevention, planning, response and recovery. An outline of key responsibilities for flood agencies is included below; noting only those that relate to flood prevention and planning are relevant to this plan.

The Commonwealth Government

- Supports development and implementation of national strategies by providing frameworks for floodplain and emergency management and warning systems
- Regulates flood insurance providers
- Provides natural disaster financial support to state and local governments and agencies (e.g. National Partnership Agreement on Natural Disaster Resilience)
- Through the Bureau of Meteorology, contributes to flood prediction and warning services, and provides research and data on long term climate trends

The Victorian State Government

- Develops state wide policy, standards and frameworks for regional floodplain management and emergency response, and for water resource planning, investment and delivery
- Stores and manages flood data and information
- Develops frameworks and platforms for data sharing and provision of total flood warning (TFWS) systems
- Funding for emergency response and recovery, and some funding for flood management activities
- Develops and maintains land use planning systems and building regulations

Melbourne Water - Regional Floodplain Management Authority

- Prepare and implement regional flood strategies in line with State Government objectives
- Conduct flood risk and mitigation studies

- Prioritise and implement local flood mitigation, floodplain management and TFWS in line with state policy and community needs
- Support emergency response planning and provision of TFWS services
- Advise planning authorities on appropriate land use planning and development for flood prone land through statutory referral functions
- Support coastal adaptation planning by local governments
- Manage regional drainage infrastructure in the Port Phillip and Westernport catchment (for catchment areas greater than 60 hectares)
- Manage the health and environmental function of waterways and floodplains, and consider cultural heritage values during flood mitigation investigations
- Manage flood risks to essential trunk water services

Local Government

- Administer and enforce planning provisions and building regulations in relation to building and development on flood affected land
- Provide for and support the conservation of natural resources and areas of environmental significance through land use planning and asset management
- Contribute to development of local flood management plans and flood emergency management plans
- Participate in flood risk reduction activities and project prioritisation
- Support public awareness and access to flood risk information
- Support delivery of flood warning messages where warning systems are established
- Manage local drainage infrastructure (for catchment areas less than 60 hectares)
- Coordinate flood relief, recovery and clean-up at the local level
- Lead local adaptation processes to prepare for climate change induced flood risks, such as sea level rise

Victoria State Emergency Service

- The control agency for flood, storm, tsunami, landslide and earthquake in Victoria
- Manages responses to emergencies and helps communities to prepare through planning and education

- Engages directly with communities, educating on how to prepare for natural hazards
- Issues warnings and notifications for flood, storm, tsunami, landslide and earthquake
- Work with councils to develop emergency management plans, providing advice, information, education and training
- Conduct audits of Municipal Emergency Management Plans every three years
- VICSES units sandbag to protect property and infrastructure from floods, as well as assisting Victoria Police with evacuations and in search and rescue operations
- Following severe storms, SES units provide temporary repairs – like tarping – to damaged structures, and clear fallen trees and branches so they no longer pose a danger

4. Description of the municipality

4.1 Location and key features

WCC municipality encompasses an area of 542 square kilometres and is surrounded by the municipalities of Melton and Brimbank to the north, Hobsons Bay to the east and Moorabool and Greater Geelong to the west (Department of Environment, Land, Water and Planning [DELWP], 2018).

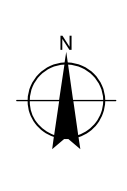
According to the Australian Bureau of Statistics (ABS) the City's resident population grew from 214,872 in June 2015 to 228,088 in June 2016 (6.15%) (profile.id, 2018). The City forecasts this growth trend to continue with an increase to around 303,882 by June 30 2023 and 355,643 persons by 30 June 2028 (forecast.id, 2018). Suburbs that are part of the Urban Growth Boundary include Werribee, Hoppers Crossing, Point Cook, Laverton, Williams Landing, Truganina, Tarneit, and Wyndham Vale. Cultural diversity within the municipality is high with approximately 120 cultural backgrounds and various languages spoken including Chinese, Karenni, Hindi and Punjabi (WCC, 2013).

There are a number of significant rivers and waterways within the municipality including Werribee River, Skeleton Creek, Lollypop Creek, Little River, Dry Creek, and Davis Creek. The Werribee Irrigation District (WID) is located in Werribee South and consists of 3,000 hectares of land. It has been an integral agricultural centre and asset since the early 19th century for which Wyndham is renowned. The WID is an important feature for the local and state economy as it hosts approximately 660 jobs and generates an economic output of over \$183M (WCC, 2017c).

An overview of the municipality is shown in Figure 3.



Paper Size A3
 0 0.85 1.7 2.55 3.4 4.25
 Kilometres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55



- LEGEND**
- Wyndham Local Government Boundary
 - Freeway
 - Main Road
 - Secondary Road
 - Tertiary Road
 - Lake
 - River
 - Stream
 - Drain/Channel/Other
 - Railway



Wyndham City Council
 Wyndham Flood Management Plan
 Overview

Job Number 31-35898
 Revision A
 Date 27/07/2018

Figure 3

4.2 Waterways

The WCC municipality is located on the western plains of Melbourne and borders Port Phillip Bay to the south. Adjoining municipalities include Melton and Brimbank to the north, Hobsons Bay to the east and Moorabool and Greater Geelong to the west. With a catchment area of approximately 1,474 km², the Werribee River is by far the largest river that passes through the municipality. Other significant waterways include Lollypop Creek, Skeleton Creek, Dry Creek, Little River and Davis Creek.

The Werribee River extends north to the Wombat State Forest and Lerderderg Gorge State Parks, with the river flowing through the Moorabool and Melton municipalities upstream. The Werribee Diversion Weir, situated on the Werribee River, is used to harvest and manage flows for irrigation supply purposes. The river also provides a system of open recreational reserves throughout the municipality, including Presidents Park which has been developed with sporting facilities, a regional playground and a lake. The Werribee River is known to be of Indigenous cultural significance, and is recognised as being the east boundary of the Wathaurong registered aboriginal party (RAP). No RAP has been determined for the area east of the river.

With a catchment of 122 km², the Skeleton Creek catchment is much smaller than the Werribee River catchment but is still considered to be significant. It flows from Mt Cottrell in the north to Port Phillip Bay at Cheetham Wetlands.

Lollypop Creek originates in the undulating plains of Mambourin and Wyndham Vale and flows south into the Western Treatment Plant. Little River forms the boundary of the Wyndham municipality to the west and has tributaries that originate in the Brisbane Ranges and You Yangs Regional Park, and the river flows to Port Phillip Bay via the Western Treatment Plant.

4.3 Drainage

There are approximately 1712 km of drains in the Wyndham municipality. Of these, it is estimated that 76 km of underground drains and 217 km of open channel alignments are managed by MW.

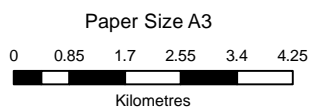
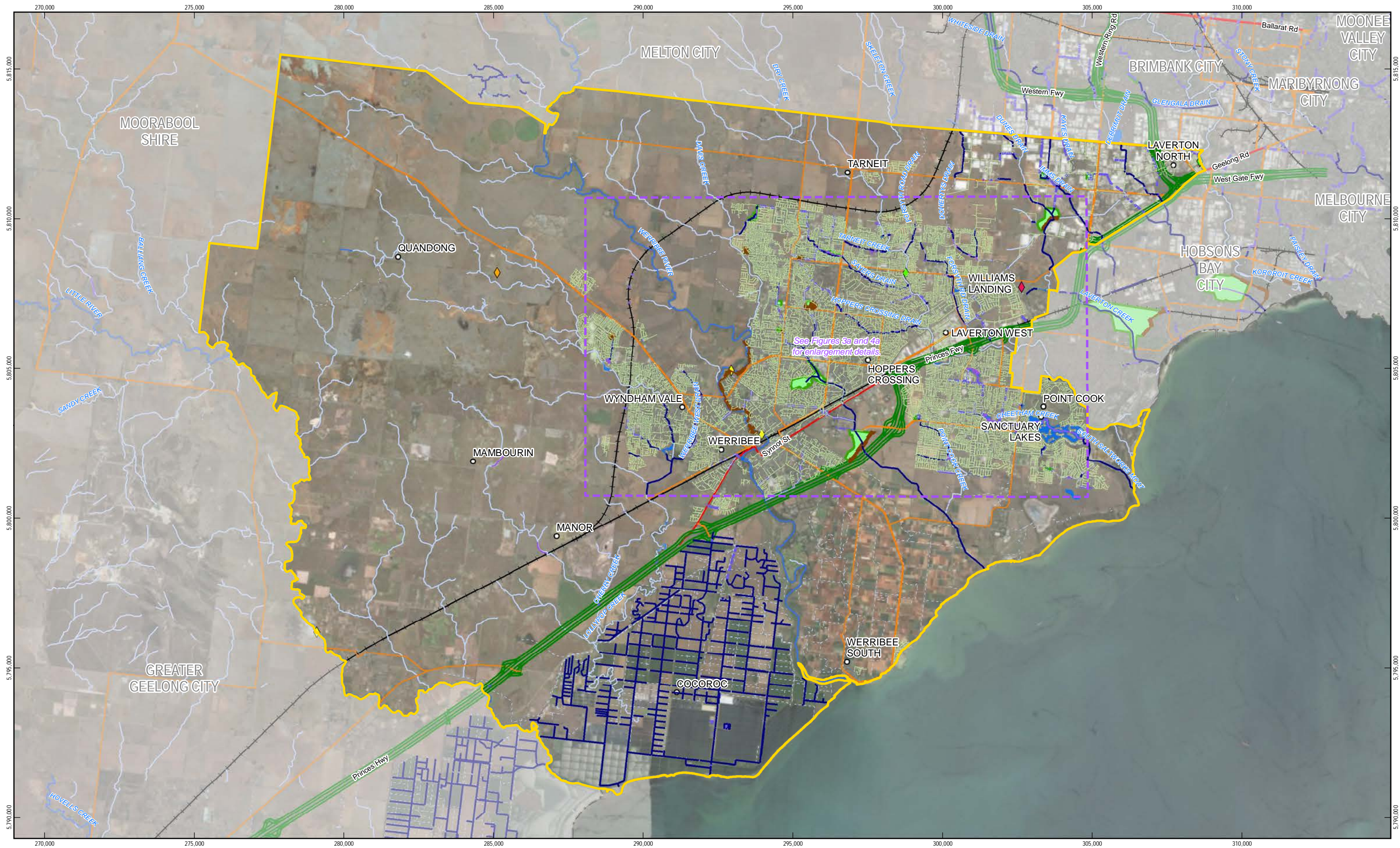
The location and details of each drain and associated infrastructure are available from WCC's Asset Database and is in turn mapped across into its GIS system.

MW is responsible for the installation and maintenance of drainage systems and flood mitigation works, for catchments with an area greater than 60 hectares. Council is responsible for the installation and maintenance of drainage systems and flood mitigation works, for catchments with an area smaller than 60 hectares.

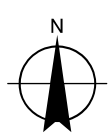
The drains associated with arterial roads are owned and maintained by VicRoads.

Within the WCC municipality, stormwater is collected by a network of underground drains and diverted to rivers and creeks where it makes its way to Port Phillip Bay.

Figure 4 below shows a map of the municipality showing the main drains, waterways and the areas affected by riverine flooding and overland flows associated with the urban drainage system.



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



LEGEND

- | | | | |
|-----------------------------------|---------------------|------------------------------|----------------------------------------|
| Wyndham Local Government Boundary | River | MW Levee and Embankment Line | Rainfall Monitoring |
| Freeway | Stream | MW Underground Drain | BoM Automatic Weather Station |
| Main Road | Drain/Channel/Other | Waterway Connector | Level Monitoring |
| Secondary Road | Railway | MW Retarding Basin | Level Monitoring / Rainfall Monitoring |
| Tertiary Road | Council Drains | MW Open Channel | |
| Lake | | | |

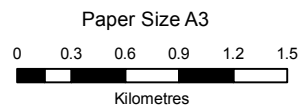
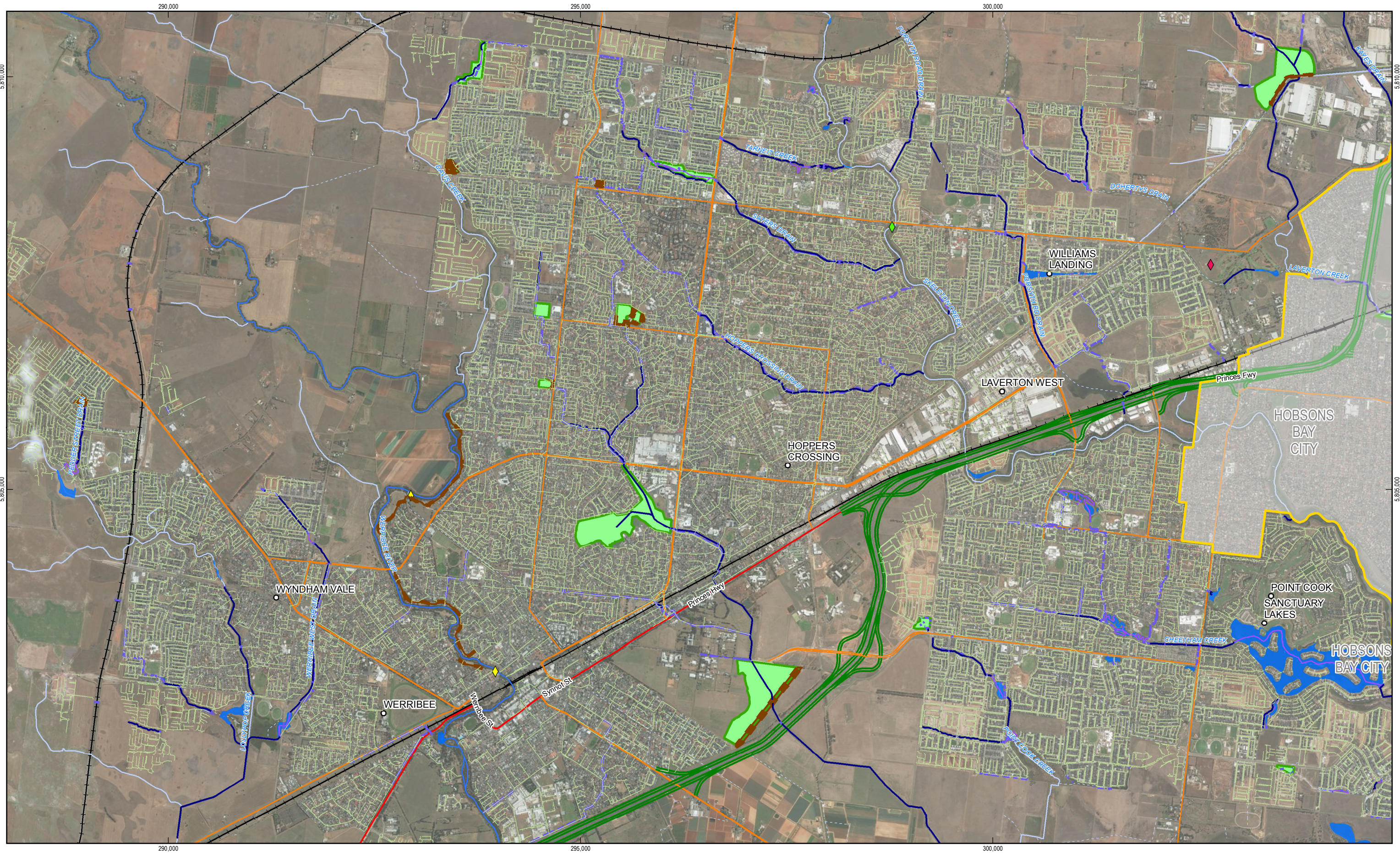


Wyndham City Council
Wyndham Flood Management Plan

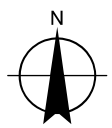
**Wyndham City Council
Drainage Assets**

Job Number 31-35898
Revision A
Date 27/07/2018

Figure 4



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



LEGEND

- Wyndham Local Government Boundary
- Freeway
- Main Road
- Secondary Road
- Tertiary Road
- Lake

- River
- Stream
- Drain/Channel/Other
- Railway
- Council Drains
- MW Open Channel

- MW Levee and Embankment Line
- MW Underground Drain
- Waterway Connector
- MW Retarding Basin

Monitoring Type

- BoM Automatic Weather Station
- Level Monitoring
- Level Monitoring / Rainfall Monitoring



Wyndham City Council
Wyndham Flood Management Plan

**Wyndham City Council
Drainage Assets - Detail**

Job Number 31-35898
Revision A
Date 27/07/2018

Figure 4a

The Victorian Planning Authority document "The Engineering Design and Construction Manual for Subdivision in Growth Areas" sets out the general design requirements for drainage for new subdivisions. Additionally, there are a number of standard drawings and specifications available on the Wyndham City Council website.

A drainage strategy for Werribee city centre was recently produced by Council and is documented in "Wyndham City Council Werribee Drainage Strategy Report (2013)". Council's 100y flood extents cover approximately 5.6% of the municipality, not all of this is included in the planning scheme, with the LSIO and SBO layers covering only 0.4% of the total area of the municipality.

4.4 Flood history and issues

A brief flood history and issues can be found in Appendix 8.

4.5 Flood data and information

A variety of flood information and data is held by Council, MW and VICSES including reports, studies, datasets and spatial information.

Table 4 Flood knowledge for Council

Information	Comments	Custodian
Modelling and mapping studies	Melbourne Water coordinates, in consultation with Wyndham City Council, modelling and mapping studies across the municipality	MW
Monitoring data	Melbourne Water and Bureau of Meteorology maintain a number of monitoring stations, which record rainfall and water level data. Southern Rural Water owns and operates irrigation channels throughout the municipality and collect flow and level data for these assets.	MW, SRW

Information	Comments	Custodian
Historical flood incidents including photos	VICSES maintains an internal register of reported flood incidents	VICSES
Records of drainage/flood complaints	In addition to WCC and VICSES records, MW records drainage/flood complaints in a centralised register. Process of sharing details amongst relevant internal stakeholders could be improved.	MW
GIS information/plans	Both WCC and Melbourne Water maintain their own GIS information. There currently is no formal process for sharing this data.	WCC, MW
Planning scheme overlays	Maps available from DELWP website	WCC, DELWP
Flood Emergency Plan	The Wyndham City Council Flood Emergency Plan is amended, maintained and distributed as required by VICSES in consultation with the Wyndham City Council	VICSES
Customer complaints	Council maintains database of customer complaints, however sharing of this data could be improved	WCC
Flood Location/depth/surveys	Wyndham City Council, Melbourne Water and VICSES all maintain records of individual flood events as they are involved	WCC, MW, VICSES

Information	Comments	Custodian
Melbourne Water Flood Risk Matrix	The flood risk matrix has been superseded by the flood prioritisation tools	MW

5. Flood risk management

This section identifies key issues and improvement actions. The actions outline the agreed approach to managing existing regional flood problems within the municipality. They were identified through a series of workshops held in relation to flood mitigation and management measures.

The key themes are:

- Community Awareness (section 6)
- Flood Investigations (section 1)
- Policies/Procedures/Strategies (section 5.2)
- Data Collection (section 4.5)
- Planning (section 5.2.7)

The actions identified under each section are detailed in Appendix 1, which has a summary of the key issues and actions, responsibilities for implementation, and expected timeframes.

5.1 Flood risks and hotspots

This section describes issues relating to current and future flood risks within the municipality.

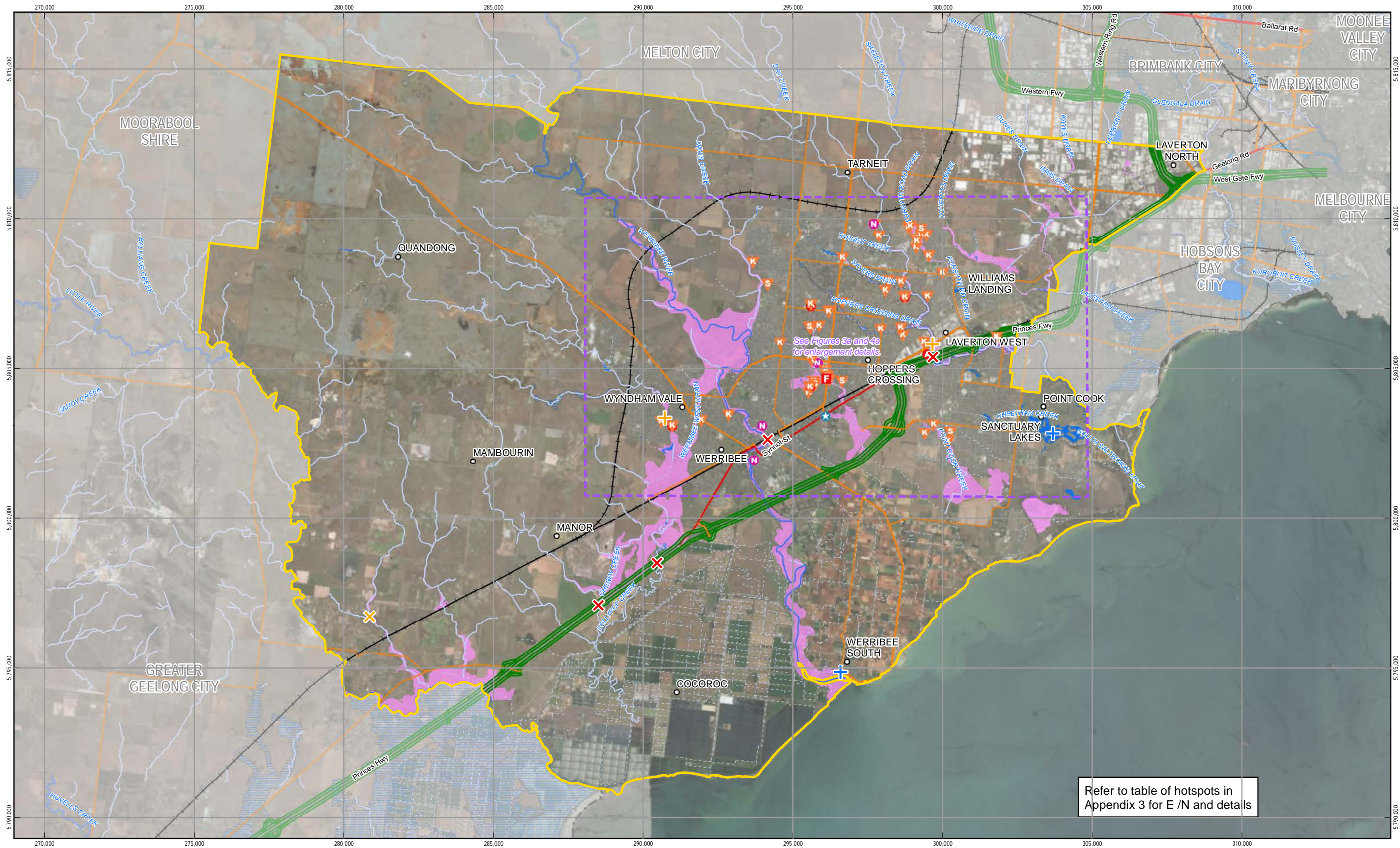
5.1.1 Current flood risks

Current flood risks are identified through a combination of hydraulic modelling and mapping exercises and anecdotal reports provided by individual stakeholders (including those recorded through customer complaints). The hotspots identified throughout the development of this plan are shown on the map below and listed in Appendix 2.

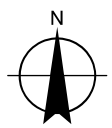
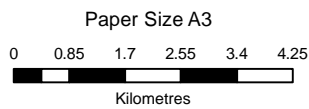
Modelling undertaken by MW to date has identified a number of properties within the municipality that are affected by riverine flooding, overland flows associated with the urban drainage system, tidal inundation and areas at risk of inundation as a result of predicted sea level rise during 1% AEP flood event.

Flood hotspots were identified based on existing flood information and additional input from a workshop held on 2nd October 2017. These hotspots in relation to the 100 yr

ARI flood extents and key social infrastructure are shown in Figure 5 below. Appendix 2 provides a table with descriptions and coordinates of the flood hotspots.



Refer to table of hotspots in Appendix 3 for E /N and details



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

- | | | | | | |
|-----------------------------------|------------------------------------|--------------------------|-------------------|----------------------|------------------------|
| Wyndham Local Government Boundary | River | Special Building Overlay | Hospital | Flash Flood, Medium | Riverine Flood, Medium |
| Freeway | Stream | Aged Care | Police Station | Riverine Flood, High | Storm Surge, Low |
| Main Road | Drain/Channel/Other | Ambulance Station | Schools / College | | |
| Secondary Road | 1 in 100 Year Flood Extent | Child Care | | | |
| Tertiary Road | Land Subject to Inundation Overlay | Fire Station | | | |
| Lake | | | | | |



Wyndham City Council
Wyndham Flood Management Plan

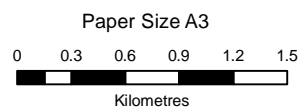
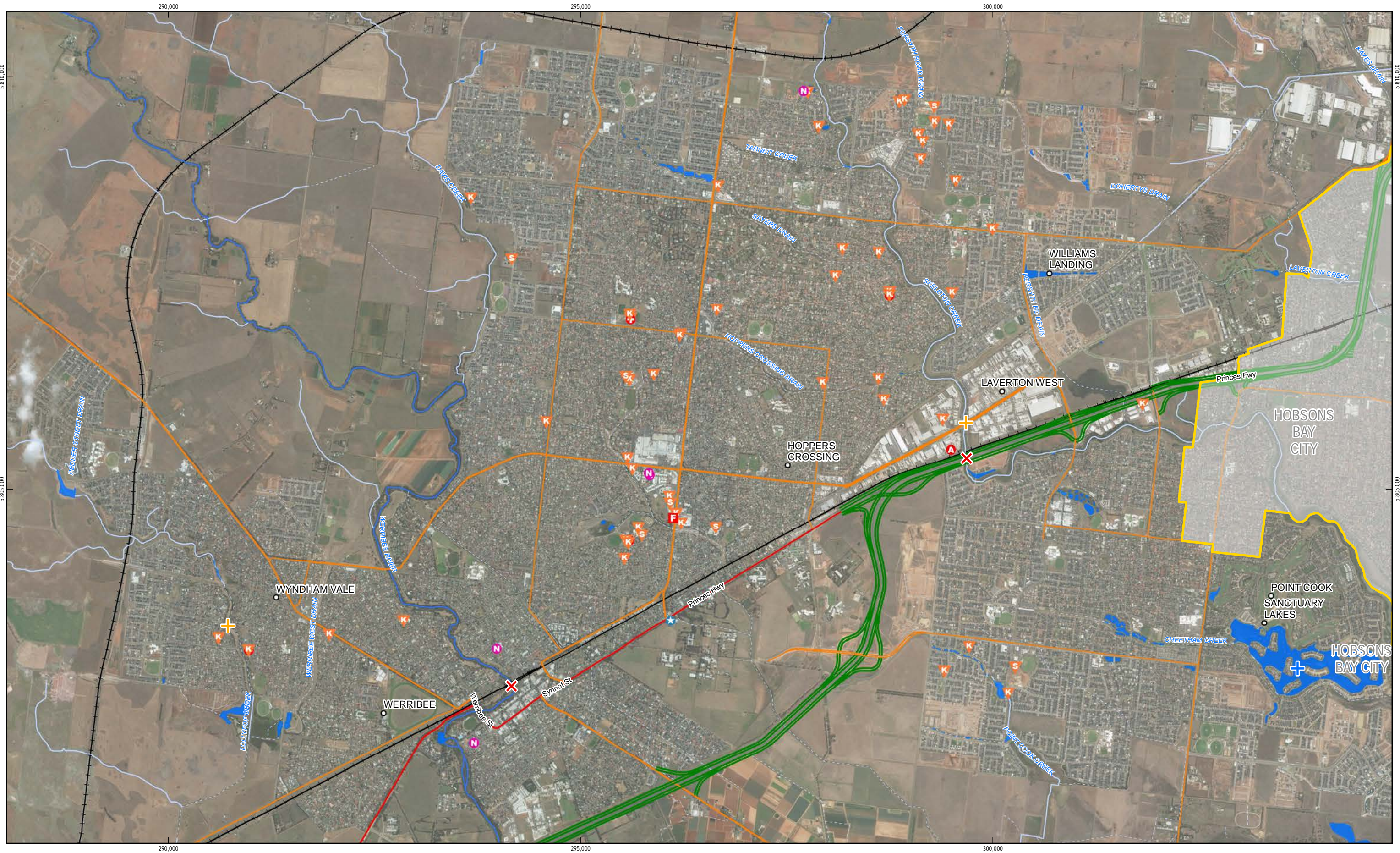
Job Number 31-35898
Revision A
Date 08/08/2018

**Wyndham City Council
Flood Hotspots**

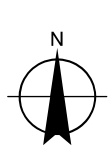
Figure 5

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Data source: DEWLP, VicMap, 2017; Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



LEGEND

- Wyndham Local Government Boundary
- Freeway
- Main Road
- Secondary Road
- Tertiary Road
- Lake

- River
- Stream
- Drain/Channel/Other
- Railway
- Aged Care
- Ambulance Station

- Child Care
- Fire Station
- Hospital
- Police Station
- Schools / College

- Flood Type & Flood Risk**
- Riverine Flood, High
 - Riverine Flood, Medium

- Storm Surge, Low



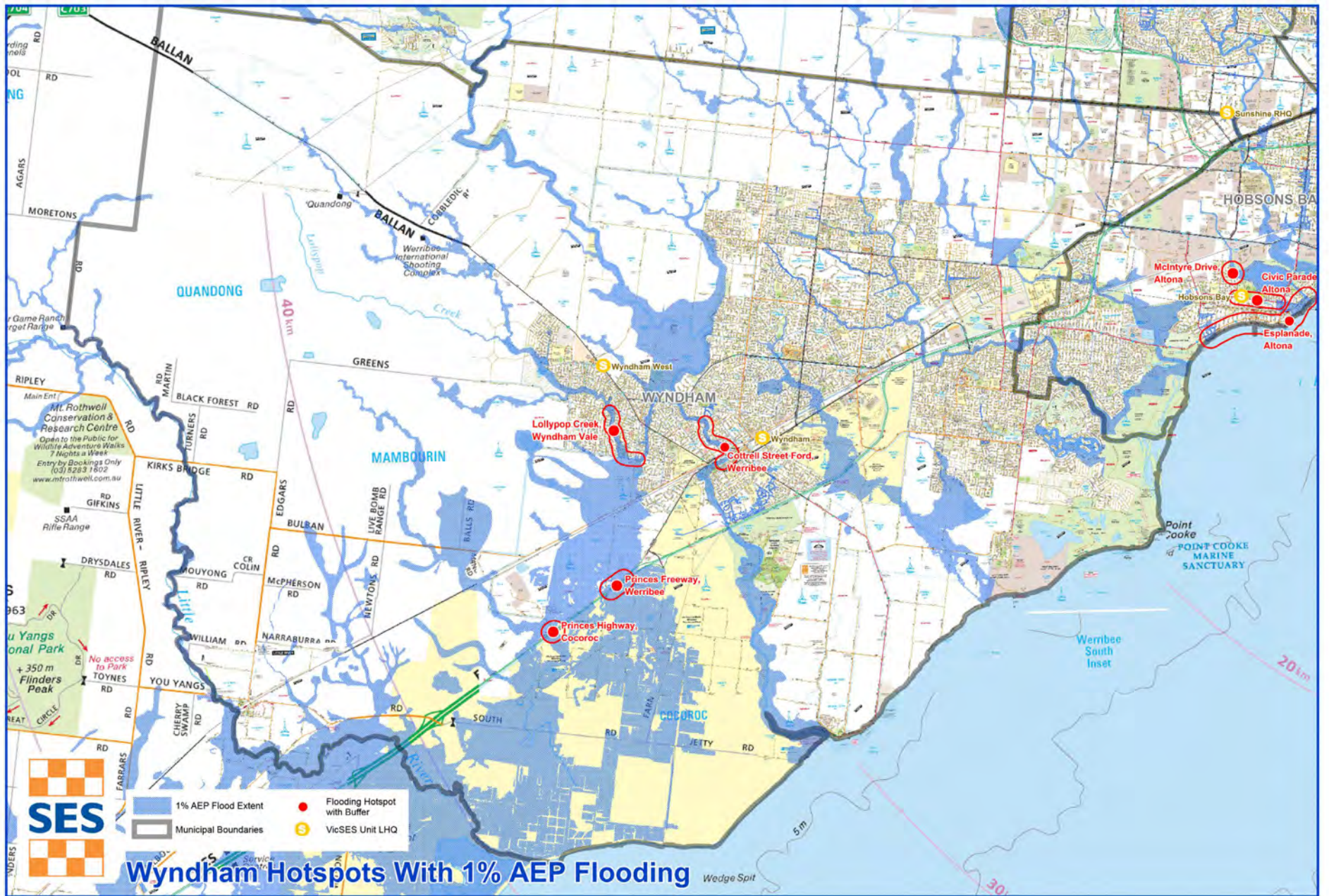
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Wyndham Flood Management Plan

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**Wyndham City Council
Flood Hotspots - Detail**

Figure 5a

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Data source: DEWLP, VicMap, 2017; Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



5.1.2 Flood risk assessment

The Port Phillip and Westernport Flood Management Strategy 2015 identified the need for new tools and processes to better quantify impacts of local-scale floods (for example, an area consisting of a few properties) to ensure all scales of flooding are well understood, and considered together.

The three integrated flood management prioritisation tools aim to help make future flood management decisions more transparent, coordinated and effective across the region. They include:

- **Flood Mapping Prioritisation Tool** - Identifies, compares and prioritises flood modelling and mapping needs for all catchments across Port Phillip and Westernport.
- **Flood Effects Prioritisation Tool** - Quantifies, assesses and compares flood effects in all catchments across Port Phillip and Westernport, and helps to inform the top priority locations for flood management action.
- **Flood Management Options Prioritisation Tool** - Assesses and compares the costs and benefits of different management options at each priority location (or site of interest) and to identify the best combination of options to reduce flood effects.

There are 36 catchments identified in the 2015 Flood Strategy that fall wholly or partially within the Wyndham City Council municipal boundary. Of these, one (D1 drain) has been identified as being of high priority interest to understand and potentially take action to reduce flood effects. The D1 drain is a Melbourne Water Asset and requires focussed ongoing maintenance to maintain its full functionality.

The results of the prioritisation tools are considered in conjunction with other forms of assessment to guide Melbourne Water future investigations.

The remaining catchments are ranked at a low or medium priority.

Significant amounts of data on which this assessment is made remains unavailable. Missing data includes:

- Regional network mapping for the 20% AEP event
- Local network mapping for both the 1% AEP and 20% AEP event

When available, this missing information will likely alter the catchment priorities for flood effects reduction.

It is important to note that the Flood Prioritisation Tools provide a guide to help focus initial analysis of where flood effects reduction works may be required. However, they are based on broad scale, aggregate information. Local information is equally important in guiding MW investments and should be raised directly or at FMP review meetings.

Refer to Appendix 3 map showing outcomes of the flood effects assessment (flood prioritisation tool).

5.1.3 Future flood risks

Increased development and population

As one of the designated metropolitan growth areas, there is an increasing risk of flooding due to urbanisation and expansion of impervious areas (e.g. streets). Wyndham recorded its highest demand for subdivisions in 2016 with over 9000 submitted applications and 6000 housing lots approved (WCC, 2017c).

Flood challenges for future developments exist on the main creeks especially as development progresses southwards towards the lower areas. These areas include the D1 drain in the Point Cook and East Werribee areas. There is an extensive floodplain on the lower sections of Lollypop Creek and future developments are planned in this area. Another large floodplain is located at the junction of the Werribee River and Davis Creek, where some development activity is occurring.

Appendix 9 shows the Development Services Schemes within the Wyndham municipality as well as the 1 in 100 year flood extents for the waterways. The scheme works shown are those for future development areas, which extend to the Urban Growth Boundary.

A priority that was identified by council during the flood management plan workshop process was making sure that growth is planned for and managed properly in regards to flood risk.

Climate Change

Climate change has the potential to increase flood risk within the broader Port Phillip and Westernport region, and across the WCC. While the latest predictions are for a long-term reduction in storage yield (i.e. a reduction in runoff volumes) it is likely the intensity of extreme rainfall events will increase. The change in rainfall patterns is likely to lead to less frequent (but possibly larger) riverine floods and more frequent flash flooding and overland flow events associated with localised storm activity. At the same time, sea levels are expected to rise resulting in additional flooding pressures in some coastal areas (WCC, 2016 & 2017c).

Wyndham City Council have produced a climate change adaptation strategy (WCC, 2016) which outlines council's adaptation priorities for the period of 2016-2020.

One of these priorities is building climate resilient infrastructure. With respect to drainage it notes: "In terms of capacity, unlike some councils in older parts of Melbourne, sections of Wyndham's drainage system are newer and meet the more recent design standards." Although inadequate drainage infrastructure is identified as a risk in the strategy, drainage related adaptation actions were not included in the document.

5.2 Planning, preparation and mitigation

This section describes issues relating to work done within the Municipality to understand, identify and treat flood risks; as well as what is planned to further improve the management of existing, future and residual flood risks. Flood control measures can be structural or non-structural.

5.2.1 Flood investigations

MW's survey and modelling of rivers, creeks and main drains commonly considers flood levels and extents for multiple AEP events up to a 1% probability of occurrence (1% AEP or 100 year ARI). All new flood studies also consider the probable maximum flood (PMF). The 1% AEP event is considered adequate for managing flood risk and associated issues relating to property development and flood mitigation (Melbourne Water, 2017).

Council, in conjunction with MW, jointly works on flood mapping projects aimed at mapping the overland flow paths for nominated storm intervals for all main drain catchments within the Municipality. This is a critical first stage in achieving a safer community and is used to inform emergency response, planning requirements, policy decisions and, frequently, capital investments.

The flood information developed by the individual mapping and modelling exercise is in turn used to give flood advice on properties affected by overland flow and / or flood inundation along MW and Council drains, and to enable MW and WCC to set capital works programs by identifying relative flood risks. The information will also be used to assist in quantifying land development challenges.

MW's flood mapping program for 2018/2019 includes two Wyndham catchments, Laverton MD and Cheetham Creek DS.

A summary of the flood investigations undertaken by WCC and MW in the past 5 years is shown in Table 5.

Table 5 Summary of Flood Investigations in Municipality

Location	Scenarios	ARIs	Date	Report
Werribee City Centre	Existing, future developed, flood mitigation scenarios	10y, 100y	July 2013	Wyndham City Council Werribee Drainage Strategy Report
Western Treatment Plant				Melbourne Water

A key goal identified in the second 2018 Flood Management Plan development workshop held on 21st March 2018, was to complete joint flood investigations of all existing major urban areas in the municipality including Laverton, Hoppers Crossing and Werribee. Initially this will involve undertaking a pilot flood investigation for one of these locations.

5.2.2 Drainage

The drainage network within the Wyndham municipality is a combination of older infrastructure in the established urban areas such as Werribee, and newer drains designed to meet modern standards in the recently constructed developments.

Reduced average rainfall and extended droughts result in reduced drain flushout events leading to drain blockages and localised flooding during severe rainfall events (WCC, 2017c).

Stormwater asset data is an important input for developing accurate flood models and consequently is key to understanding flood risk in the municipality. One of the key goals coming out of the 2018 workshop was to improve the quality of council's stormwater asset data. The following actions were agreed to achieve this goal:

- Undertake gap analysis of council asset management and GIS data and systems.
- Complete a pilot drainage data collection exercise

5.2.3 Flash flooding

Flash flooding in Victoria is defined as flooding that occurs within six hours of the start of the rain that caused it (Comrie, 2011).

A key hotspot associated with flash flooding is Little River Township, which is prone to localised flooding and ponding of water which blocks road access. An action included in the plan is to develop a drainage strategy for Little River Township.

5.2.4 Riverine flooding

Riverine flooding is typically slower in nature than flash flooding or other flooding issues relating to drainage. It also typically lasts longer, with the potential to cut off roads for hours or days. This is of particular concern when it comes to planning for future urban growth around these waterways.

Wyndham, being a very large municipality, contains a number of significant rivers and creeks, and the majority of hotspots identified in the workshop were categorised as riverine flooding. Flooding is known to occur at road crossings, including Princes Freeway which when flooded can cut off traffic for several hours.

High risk riverine flood hotspots include:

- Princes Fwy (Skeleton Ck, Cocoroc River, Lollypop Ck)
- Cottrel St (Werribee River)

5.2.5 Coastal tidal and storm surge flooding

Extreme weather or ocean tides above normal sea levels can flood coastlines and nearby tidal rivers. This type of flooding is usually predictable, but current warning systems do not monitor it. Wyndham municipality encompasses a large length of coastline.

Sea level rise and associated increase in storm surge risk is a significant concern for the municipality. Wyndham City Council will continue to assess the risks to the municipality associated with sea level rise and storm surges.

MW have recently completed flood modelling of Port Phillip Bay, which includes storm surge mapping of low lying areas under current and predicted future sea level conditions. The results indicate limited coastal inundation under the existing water level conditions, however, the inundation extents do increase for the future sea level rise conditions (Melbourne Water, 2017).

Tidal effects can also impact the capacity of the drainage network to discharge stormwater into the bay, creating a 'bathtub' effect that exacerbates existing flooding issues.

The Victorian Coastal Inundation Dataset models the extent of coastal inundation due to projected sea level rise of 20 cm from 2009 to 2040¹. The Dataset also demonstrates the 1 in 100-year storm tide level in 2040 based on a 20 cm sea level rise and 6% increase in storm surge. This data illustrates the impact sea level rise has on Wyndham's coastline in 2040. Areas most impacted are around Cheetham

¹ The Victorian Coastal Inundation Dataset is recommended for use at a scale of approximately 1:75,000 or less detail to reflect the limitations in the modelling and the recommended catchment to regional scale of inundation assessments. The modelled extents are not suitable for assessments of potential risks at property level.

Wetlands and the Point Cook Marine Sanctuary (part of the Port Phillip Bay and Bellarine Peninsula Ramsar site). The RAAF Lake, Spectacle Lake, the mouth of the Werribee River and parts of the Western Treatment plant are also likely to experience impacts by 2040 (WCC, 2017c).

Sanctuary Lakes and Graham's wetland reserve are both areas that have been identified as storm surge hotspots.

5.2.6 Asset management and capital works

Asset management

A list of flood mitigation assets within Wyndham City Council is provided in Appendix 6.

MW drainage assets are managed in accordance with the Asset Management Guidelines and Strategic Asset Management Plans, with a level of service of 'no failure/collapse of significant drains'.

Drainage and flood mitigation assets are maintained to a 'fit for purpose' state to ensure they work as designed during a flood. All MW drainage assets and waterways have an ongoing inspection and maintenance program.

Wyndham City Council manages their assets in accordance with their Stormwater Asset Management Plan (WCC, 2011b). The stated purpose of the plan is "to demonstrate responsible stewardship of infrastructure in delivering Council services" and "to ensure that it has well planned, constructed and maintained infrastructure and establish management strategies and practices which maximise the life and community benefit of its assets".

A number of actions and objectives included in the plan relate to flood management, including flood mapping and asset inspection programs. The plan covers a 10 year period from 2010 to 2020 and is therefore due for renewal within the lifetime of this flood management plan.

The largest drains recorded in council GIS are listed in Appendix 6.

Programmed Maintenance

Waterways have ongoing programs to remove flow restrictions such as dumped rubbish, shopping trolleys and willow trees.

Current MW programmed maintenance activities include desilting of the Bulban Rd culvert at Hapley's estate and desilting of the Waterways Blvd retarding basin at Wyndham waters, both in response to localised inundation issues.

Capital works

Both Melbourne Water and the Wyndham City Council undertake a range of capital works related to drainage and flood management.

Drainage Improvement Capital Works Programs - Melbourne Water

MW has a five year Water Plan that documents its proposed capital works program. The current 2013 Water Plan finishes in 2018; it includes \$105.7 million of proposed expenditure for flood mitigation works and \$56.4 million of works towards retarding basin spillway upgrades in the Port Phillip and Westernport region until that time. MW includes projects into the Water Plan (and onto capital works programs) based on a number of criteria including works to:

- Managing river health
- Managing regional drainage systems; and
- Minimising flood risks.

Drivers for MW's capital works are also guided by four Key Performance Indicators in the 2015 Port Phillip and Western Port Flood Management Strategy, which include:

- A 100% increase in the number of catchments that are flood mapped to understand current and future risks;
- A 40% increase in the number of people, directly affected by flooding, who are aware of their risk;
- A 20% reduction in flood effects; and
- A 100% increase in number of areas for which there are collaboratively developed plans for flood management.

Drainage Improvement Capital Works Programs - Wyndham City Council

The Wyndham City Council has a capital works program that includes drainage assets. The Council City Plan 2017-2021, is the overarching plan and the 2017-18 Integrated Plan & Budget, outlines priorities for the operating, capital and maintenance programs in the 2017-18 financial year.

The primary flood related capital expenditure budgeted for the 2017/2018 financial is Werribee River Drainage Outlet Works at Cottrell St at a cost of \$164,000. Projected drainage capital expenditure for the subsequent three years is \$372,000, \$220,000 and \$198,000. (Wyndham City Council, 2017b). This will be spent on wetland and GPT rectification works.

5.2.7 Planning controls and policy

Melbourne Water policy

MW is the Floodplain Manager and Regional Drainage Authority for the Port Phillip and Westernport region. Applications for subdivision and developments in areas covered by the Land Subject to Inundation Overlay (LSIO), Special Building Overlay (SBO) and Urban Floodway Zone (UFZ) are referred by Council to MW, as the authority responsible for the administration of the Planning Scheme, under Section 55 of the Planning and Environment Act (1987). Interim arrangements may be established by MW and Council to ensure applications for subdivisions and development in areas determined to be liable to flooding referred by Council to MW, under section 52 of the Planning and Environment Act (1987) during planning amendment processes. Some types of minor works are excluded from requiring a planning permit (and referral).

MW comments on development applications and, if necessary, places conditions on planning permits to ensure that the drainage system continues to function properly and any new developments are adequately designed to protect people and property from floods and to protect the health of local waterways (Melbourne Water, 2012).

Council policy

The State Planning and Policy Framework (SPPF) and Local Planning Policy Framework (LPPF) in the Wyndham Planning Scheme include the key strategic planning, land use and development objectives for the municipality, and the strategies and actions for achieving the objectives. The Planning Scheme contains the vision for land use development within the municipality.

Key clauses in the Wyndham Planning Scheme related to flooding include:

- *Clause 13.01 – Climate change impacts*
- *Clause 13.02 – Floodplains*
- *Clause 14.02-1 – Catchment planning and management*
- *Clause 21.04-1 – Sustainability*
- *Clause 21.03-3 – Coastal Areas*
- *Clause 21.04-3 – Floodplains*
- *Clause 21.05-2 – Waterways*
- *Clause 37.03 - UFZ*
- *Clause 44.04-05 – LSIO/SBO*
- *Clause 56.07 – Integrated Water Management*

The flood-related strategies in the Wyndham Planning Scheme will be supported by the development and implementation of this FMP, for example through increased coordination between MW and WCC.

The Stormwater Management Plan (SWMP) (WCC, 2015) and Wyndham Planning Scheme sets out the council's stormwater management policy with respect to land use planning, development and building controls. Planning controls are a key risk minimisation tool for flooding across the municipality, and it is imperative that WCC and MW work closely to achieve accurate and timely planning scheme amendments.

WCC manages development applications on a case by case basis in areas which are likely to be subject to inundation from waterways and stormwater overland flow paths.

MW is the Regional Floodplain and Drainage Authority for the Port Phillip and Westernport region. All applications for subdivision and developments on flood prone land are referred by Council to MW.

At present, Council's flood overlays are dated and only cover a small portion of flood prone areas in the municipality. As a result, referral to MW often follows an informal process based on Council's knowledge of flood prone areas.

Incorporating the 1% AEP flood extents as determined by MW and Council flood mapping projects into Wyndham City Council's Planning Schemes in either Special Building Overlays, Land Subject to Inundation Overlays, Floodway Overlays or Urban Floodway Zones is a key action identified in this flood management plan.

Figure 6 shows planning overlays and flood extents for Wyndham City Council. This map shows that areas of conflict exist between current modelled flood extents and the planning overlays relating to urban flooding. This map highlights the need for revision of planning overlays within the Wyndham municipality as there are multiple instances of mapped flood extents located within residential zones along both Lollypop and Skeleton Creeks. It is recommended that the planning overlays be updated.

The Wyndham City Council Planning Scheme contains three specific planning overlays to control and manage development in areas at risk of flooding (see Figure 6 below):

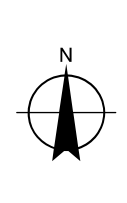
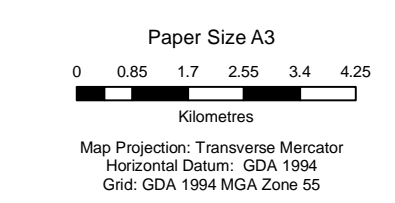
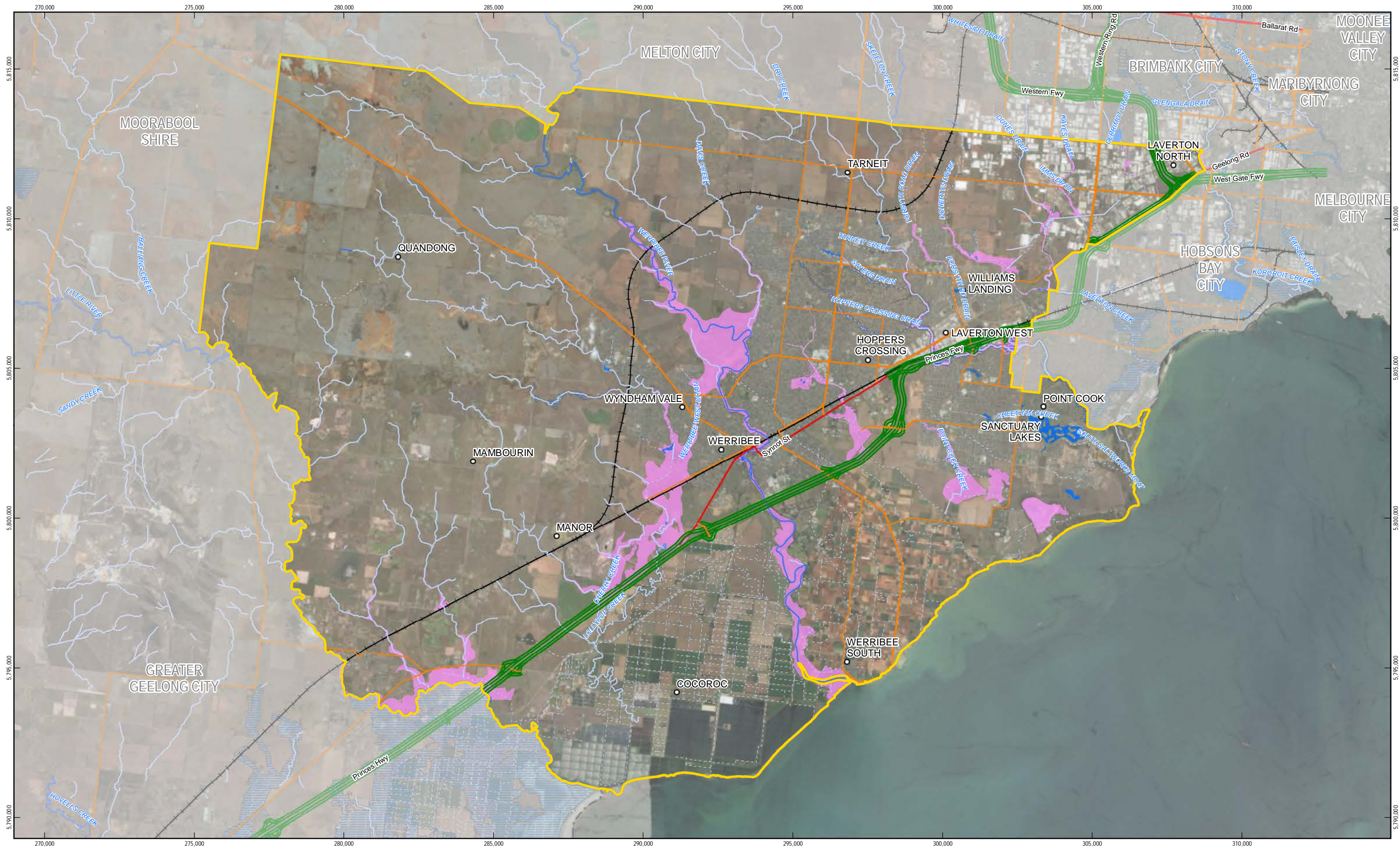
- The Land Subject to Inundation Overlay (LSIO) applies to land in a flood storage or flood fringe area affected by a 1 in 100 year flood event or any other area determined by the floodplain management authority (Wyndham City Council, 2017b); and
- The Special Building Overlay (SBO) applies to land in urban areas liable to inundation by overland flows from the urban drainage system as determined by, or in consultation with, the floodplain management authority (Wyndham City Council, 2017b).

- The Urban Floodway Zone (UFZ) is used to identify waterways, major floodpaths, drainage depressions and high hazard areas within urban areas which have the greatest risk of being affected by flooding.

It is intended that MW will provide new overlay information to council every 10 years. Under some exceptional circumstances, MW will provide this information as required.

One of the key actions arising from the 2018 workshop was to establish a council working group for planning and flooding that meets annually to discuss:

- Status of next 10 yearly planning scheme amendment
- Status of any interim special planning scheme amendments
- Schedule and progress of flood investigations being completed or that are planned, which will likely to result in updated planning layers
- Any interim planning scheme procedures for flood referrals (within WCC and to MW)



LEGEND	
	Wyndham Local Government Boundary
	Freeway
	Main Road
	Secondary Road
	Tertiary Road
	Lake
	River
	Stream
	Drain/Channel/Other
	Railway
	1 in 100 Year Flood Extent
	Land Subject to Inundation Overlay
	Special Building Overlay



Wyndham City Council
Wyndham Flood Management Plan

Job Number 31-35898
Revision A
Date 27/07/2018

**Wyndham City Council
Planning Scheme Overlays Figure 6**

5.2.8 Flood warning

Melbourne Water, Southern Rural Water and the Department of Environment, Land, Water and Planning, in agreement within the Southern Partnership, operate and maintain a network of rainfall and river level stations within the Werribee River catchment.

The purposes of these stations are:

- a) to collect hydrologic data for real-time flood forecasting and warning at key flood warning locations in the catchment;
- b) to provide data for other needs such as planning, design or hydrologic data analyses; and
- c) to collect data for water quality monitoring within the area.

The key flood warning locations are those where the three flood class levels, namely minor, moderate and major flood levels, are defined. During a flood event, if any of the flood class levels is likely to be breached at a particular key location, MW should provide a flood warning to the Bureau of Meteorology (BoM). The Bureau then issues the warning to the public, VICSES, the media, and relevant municipalities. VICSES will issue flood warnings out to the public via the VicEmergency warning platform.

The Southern Rural Water Melton Reservoir Storage Operator on duty is required to notify VICSES when the combined total flow from Melton Reservoir and Toolern Creek is likely to reach specified flood warning levels. A community warning is provided to the Wyndham City Council at 4,000 ML/d as advisory information only, in order for Council to manage vehicle access over some of the lower Werribee River crossings.

In the Wyndham municipality, the key flood warning location is Werribee River at Werribee (Cottrell St Ford) (site number: 231237A).

Other flood warning stations in the municipality include:

- Kororoit Creek at Brooklyn
- Little River at Little River
- Lollypop Creek at Bulban Rd
- Quandong Raing Gauge
- Skeleton Creek at Sayers Rd
- Werribee River at Wyndham vale
- Werribee River D/S Toolern Creek

The flood class levels of this flood warning site are summarised in Table 1 below and are listed on the BoM web page at the following link:

http://www.bom.gov.au/vic/flood/floodclass_south.shtml

5.2.9 Integrated water cycle management

The Wyndham IWCM plan (WCC, 2017c) is a forward looking document that illustrates the need and benefit of IWCM solutions. Its purpose is to link all aspects of supply, treatment, re-use and disposal of water, along with an all-encompassing link between stakeholders. Wyndham's vision for 2040 aims to deliver successful IWCM by achieving the following objectives:

1. Create a resilient and liveable city.
2. Improve the health and amenity of waterways and coastal environments.
3. Improve collaboration and engagement with all stakeholders.

Water Sensitive Urban Design (WSUD) is one component of IWCM, and WCC aims to manage stormwater flows using WSUD as outlined in their SWMP (WCC, 2015). WSUD can have a beneficial impact on flooding through providing flood storage and attenuation as well as reducing impervious area.

Council is responsible for ensuring that IWCM initiatives directly influence water sensitive city outcomes through the implementation of best practice solutions in capital works and management of buildings and open space networks. The City should display leadership in ensuring development activities across the private domain align to the vision and key objectives for IWCM.

A list of existing IWCM initiatives can be found in the [IWCM plan](#).

5.2.10 Flood emergency planning

Flood response and recovery arrangements are as detailed in the Municipal Emergency Management Plan (MEMP) and the Municipal Flood Emergency Plan.

The Municipal Flood Emergency Plan details arrangements agreed for the planning, preparedness/prevention, response and recovery from flood incidents within the Municipality. It is a sub-plan to the Municipal Emergency Management Plan. The plan is consistent with the Emergency Management Manual Victoria (EMMV), which defines VICSES as the control agency for floods.

The Municipal Flood Emergency Plan is developed by the VICSES in conjunction with Council and the MEMP Committee and is maintained by and available from the Municipal Emergency Response Officer (MERO).

Information and intelligence gathered as part of this Flood Management Plan will be made available to the MERO and VICSES (Manager Regional Emergency Management, Central Region) for consideration and incorporation into the Municipal Flood Emergency Plan.

Emergency Management Victoria (EMV) is the state government department responsible for leading emergency management in Victoria by maximising the ability of the emergency management sector to work together and to strengthen the capacity of communities to plan for, withstand, respond to and recover from emergencies. (EMV, 2017)

EMV have a State Emergency Response Plan (Storm Sub-Plan). The objective of the State Emergency Response Plan (Storm Sub-plan) is to provide sources of information and to outline the arrangements for ensuring an integrated and coordinated approach to the State's management of storm events, in order to reduce the impact and consequences of these events on the community, infrastructure and services. (State of Victoria, 2016) EMV also have a Flood Sub-Plan with the same objective, relating to flood events.

6. Community education and awareness

The City, MW and VICSES are committed to working together to improve community education and awareness around flood risks. This involves working to ensure the community:

- Are aware of their personal flood risk at their property
- Have access to information on how to protect themselves and their property against flood (e.g. personal flood planning)
- Know the location of evacuation centres or how to find out
- Are aware of the importance of advising police when they make their own decisions to evacuate
- Are able to avail themselves of the MEMP & Municipal Flood Emergency Sub-Plan.

WCC also recognises the need to ensure residents, business owners/operators and visitors in the municipality are aware of the flood risks and the appropriate flood response actions.

VICSES, MW and councils have delivered broad community flood education programs to 12,000 at-risk households. Knowledge gained from delivering and evaluating these programs will be used to develop new education campaigns on flood risks and how to prepare for them. (Melbourne Water, 2015)

One of the key actions arising from the 2018 workshop was to develop a forward work plan for improving community engagement and flood awareness by giving them access to flood information, with consideration given to digital mediums such as the WCC website and mobile apps.

Property information

In addition to the education program, the community are made aware of flood prone properties through flooding zones and overlays in the planning scheme. Planning information, including flooding overlays is disclosed to prospective purchasers through planning certificates issued under Section 199 of the Planning and Environment Act, 1987 and included as a compulsory part of the vendor's statement issued under Section 32 of the Sale of Land Act, 1962.

7. Improved collaboration and communication

MW, Councils and other flood management stakeholders have recognised the need for an integrated approach to managing flood risks. While key agencies have specialised flood management skills in the planning, response and recovery there are opportunities to strengthen regional flood management arrangements through greater collaboration and efficient use of resources.

Objectives to strengthen flood management arrangements and increase communication and collaboration include:

- Raising the profile of Flood Management Plans;
- Improving understanding of MW's and council's role and challenges in flood management;
- Promoting achievements of Council and MW collaboration;
- Aligning flood mitigation objectives/priorities; and
- Aligning of external affairs: Councils and MW have joint responsibility for flood and drainage management in communications with residents, councillors, politicians and media.

Agencies are also required to share information with the public to ensure they have access to information about flooding and flood risk. This is achieved through:

- Responding to requests for Property Information Statements which contain information on land liable to flooding

With the challenges associated with rapid development, climate change and sea level rise becoming more apparent across the municipality, the need for interagency collaboration and community awareness of flood risks is also increasing.

8. How this document was developed

MW, Council, and the Victoria State Emergency Service worked in partnership with a consultancy, GHD, to develop this Flood Management Plan.

The Plan was developed through a series of interviews, file reviews, meetings, site tour and workshops, to gather the background information, identify flood risk management and mitigation activities, and undertook a gap analysis to develop an improvement plan; including a review of the previous FMP.

The significant contribution of employees of Council, VICSES, GHD and MW, in preparing this document should be acknowledged.

Appendix 4 details the names of those who attended the inception meeting and workshops.

9. Abbreviations and Acronyms

The following abbreviations and acronyms are used in this Flood Management Plan:

AEP	Annual Exceedance Probability
ARI	Average Recurrence Interval
FEP	Flood Emergency Plan
FMP	Flood Management Plan (this document)
FMS	Flood Management Strategy
FO	Floodway Overlay
IWM	Integrated Water Management
IWCM	Integrated Water Cycle Management
LSIO	Land Subject to Inundation Overlay
MEMP	Municipal Emergency Management Plan
MERO	Municipal Emergency Resource Officer
MW	Melbourne Water
PMF	Probable Maximum Flood

PMP	Probable Maximum Precipitation
SBO	Special Building Overlay
SWMP	Stormwater Management Plan
UFZ	Urban Floodway Zone
VPP	Victorian Planning Provisions
VICSES	Victoria State Emergency Service
WCC	Wyndham City Council
WSUD	Water Sensitive Urban Design

10. Glossary

Below are terms defined for the purpose of this Plan:

Term	Definition
Drainage system	A series of drains and waterways into which surface and storm water flows. Features of a drainage system can include underground pipe drains, open channels, retarding basins, floodways, waterway improvements, water quality works and environment protection measures. Generally drainage under 60 ha is maintained and operated by Council.
Overland flooding	Inundation by local runoff caused by heavier than usual rainfall. Overland flooding can be caused by local runoff exceeding the capacity of an urban stormwater drainage system or by the backwater effects of mainstream flooding causing urban stormwater drainage system to overflow.
Floodplain	Area of land adjacent to a creek, river, estuary, lake, dam or artificial channel, which is subject to inundation by the probable maximum flood.
Natural drainage systems	Flow-paths which are largely undeveloped by human sources, these include rivers, streams, natural depressions

Term	Definition
	and wetlands. All natural systems greater than 60 ha are managed by Melbourne Water.
Hotspot	A known flood problem area that has a history of repeat flooding of a road, crossing or property, often highlighted through anecdotal information and customer complaints. It is a localised issue which will vary from council to council.
Runoff	The amount of rainfall that enters the stormwater drainage system, (underground pipes, overland flow paths, floodway and waterways) after losses such as infiltration has been taken into account.
Flash flooding	Sudden unexpected flooding caused by local heavy rainfall or rainfall in another area. Often defined as flooding which occurs within six hours of the rain which causes flooding.

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Appendix 1 – Improvement plan (SMART)

Table 6 Improvement plan

Action #	Action (SMAR)	Timing (T)	Lead*	Relevant Hot Spots	Funding
Community Awareness					
1	Develop a forward work plan for the improvement of community access to flood information (considering mediums such as the WCC website, mobile phone apps etc).	June 2019	WCC (CER) MW (TL-FP)		WCC/MW
Flood Investigations					
2	Complete joint flood mapping of existing major urban areas, including: <ul style="list-style-type: none"> • Laverton/Laverton North; • Hoppers Crossing; and • Werribee/Werribee South. 	June 2022	MW (TL-FS)		MW
3	Complete joint flood mapping of pilot catchment selected from <ul style="list-style-type: none"> • Laverton/Laverton North; • Hoppers Crossing; and • Werribee/Werribee South. 	June 2019	MW (TL-FS) WCC (SDE)		MW

Action #	Action (SMAR)	Timing (T)	Lead*	Relevant Hot Spots	Funding
Policies/Procedures/Strategies					
4	Develop Little River drainage strategy	June 2019	WCC (SDE)	Little River	WCC
Data Collection					
5	Undertake gap analysis of council asset management and GIS data/systems and develop a forward work plan for updating drainage GIS data across the municipality.	June 2020	WCC (SDE/AC)		WCC
6	Complete pilot drainage data collection exercise for pilot catchment selected from <ul style="list-style-type: none"> • Laverton/Laverton North; • Hoppers Crossing; and • Werribee/Werribee South. 	Dec 2018	WCC (SDE)		WCC

Action #	Action (SMAR)	Timing (T)	Lead*	Relevant Hot Spots	Funding
Planning					
7	Complete planning scheme amendment, including flood related overlays	June 2023	WCC (CUT)		WCC
8	Establish and maintain a council working group for planning and flooding - meet annually to discuss (as a minimum): <ul style="list-style-type: none"> • <i>Status of next 10 yearly planning scheme amendment</i> • <i>Status of any interim special planning scheme amendments</i> • <i>Schedule and progress of flood investigations being completed or that are planned, which will likely to result in updated planning layers</i> • <i>Any interim planning scheme procedures for flood referrals (within WCC and to MW)</i> 	Dec 2018 and annually thereafter	WCC (SDE)		WCC
Collaboration					
9	WCC to meet with VicRoads to discuss Princes Fwy flood risk and explore collaborative opportunities to mitigate this risk.	June 2020	SCC (SDE)		WCC

*SDE=Senior Drainage Engineer, AC=Asset Coordinator, CUT=Coordinator Urban Transport, CER=Coordinator Emergency Resilience, TL-FS=Team Leader – Flood Services, TL-FP=Team Leader - Flood Preparedness

Appendix 2 – Flood hotspots

Below is a table of flood hotspots identified in the workshop and, listing locations. Refer to Figure 5 for a map of the hotspots.

Table 7 List of flood hotspots

Suburb	Flood Type*	Severity **	Easting	Northing	Description of flood issues/ history
Little River	F	M	281,000	5,797,000	Localised flooding, ponding of water blocking road access.
Sanctuary Lakes	S	L	303,000	5,802,500	Canal surge.
Cocoroc	S	L	296,300	5,795,000	Graeham’s wetland reserve (open space areas).
Laverton West	R	M	299,500	5,806,000	Flooding at Laverton Hwy crossing at Skeleton Creek.
Laverton West	R	H	299,500	5,805,500	Inundation at Princes Fwy (Skeleton Creek) crossing in Hoppers Crossing. A new shared path and sound wall has been constructed.
Werribee	R	H	294,000	5,803,000	Flooding at Cottrel St (Werribee River) crossing during heavy events. Flow coming from Melton floods the road and prevents traffic movement. Street is closed when water level rises to a certain level.
Wyndham Vale	R	M	291,000	5,803,000	Lollypop Creek encroaching in to private properties.

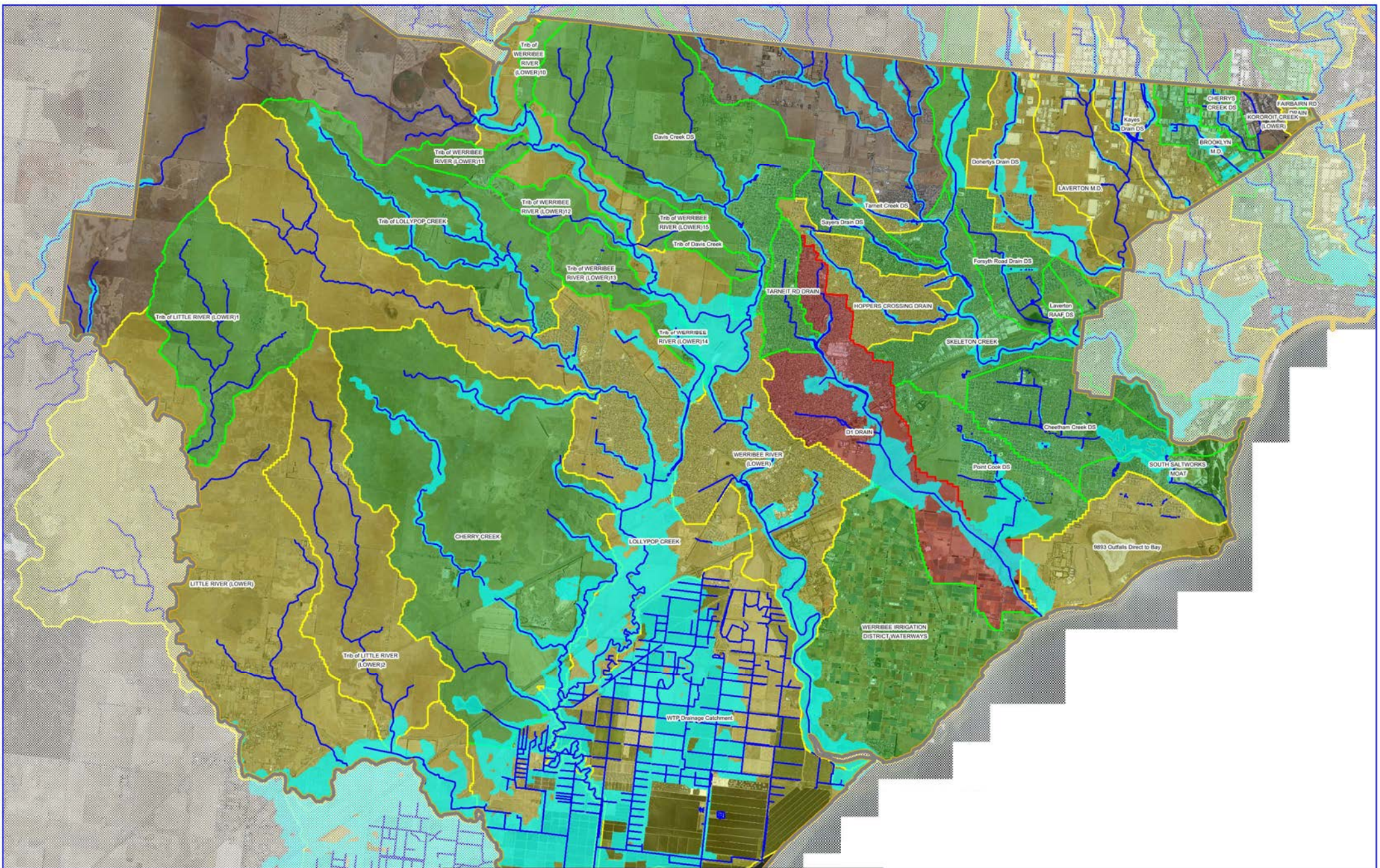
Suburb	Flood Type*	Severity**	Easting	Northing	Description of flood issues/history
Werribee	R	H	288,000	5,797,000	Princes Fwy crossing at Cocoroc River is flooded. Traffic is stopped for several hours.
Werribee	R	H	291,000	5,798,000	Princes Fwy crossing at Lollypop Creek. Traffic is stopped for several hours.

* Flood hotspot type classified by workshop participants as either as a result of F = flash flooding, R = riverine flooding or S = storm surge

** Flood severity (L/M/H) allocated by workshop participants based on anecdotal evidence



Appendix 3 – Flood prioritisation assessment



Flood Effects Assessment (Prioritisation Tools)
Wyndham City Council

- High Priority Catchment
- Medium Priority Catchment
- Low Priority Catchment
- Municipal Boundary
- Waterways and Drains
- 1 in 100 year flood extent



Whilst all due skill and attention has been used Melbourne Water Corporation shall not be liable in anyway for loss of any kind including damages, costs, interest, loss of profits or special loss or damage, arising from any error, inaccuracy, incompleteness or other defect in this information. By receiving and accepting this information the recipient acknowledges that Melbourne Water Corporation makes no representations as to the accuracy or completeness of this information and ought carry out its own investigation if appropriate.

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 27/06/2018

Appendix 4 – Meeting and workshop attendees

Table 8 Attendees at inception meeting (05/02/2018)

Name	Organisation
Kuan Yeoh	WCC
Fiona Swan	WCC
Steve Nangle	WCC
Antoinette Michail	WCC
Amritpreet Jabbal	WCC
Andy Sheehan	MW
Erin Davie	MW
Wendy Smith	MW
Nathan Clements	GHD
Philip Joyce	GHD
Timothy Kallady	GHD

Table 9 Attendees at workshop 1 (15/03/2018)

Name	Organisation
Kuan Yeoh	WCC
Fiona Swan	WCC
Marc Cassanet	WCC
Bachir Tanios	WCC
Sue Neale	WCC

Name	Organisation
Amritpreet Jabbal	WCC
Andy Sheehan	MW
Erin Davie	MW
Wendy Smith	MW
Keith Boniface	MW
Jodie Griffin	VICSES
Nathan Clements	GHD
Brooke Maki	GHD
Timoth Kallady	GHD

Table 10 Attendees at workshop 2 (21/03/2018)

Name	Organisation
Kuan Yeoh	WCC
Fiona Swan	WCC
Peter Gordon	WCC
Andy Sheehan	MW
Erin Davie	MW
Jodie Griffin	VICSES
Nathan Clements	GHD
Timothy Kallady	GHD

Appendix 5 – GIS layers

Table 11 GIS layers

Map Number	GIS layers used in this map		VicMap
	Council GIS	Melbourne Water GIS	
1			VM_LGA_Geo94.shp Outside_Melbourne_LGA_Mask.shp VM_Locality_Point_CLIP.shp VM_Rail_MGA55.shp VM_Road_MGA55.shp CBD_Roads.shp
2	SWD_Pipe.shp	DR_Hydrographic_Monitoring_point.shp DR_Retarding_Basin_polygon.shp DR_Levee_and_Embankment_line.shp PumpStation.shp LitterTrap.shp DR_Natural_Waterway_Centreline_line.shp DR_UGround_Centreline_polyline.shp DR_Waterway_Connector_line.shp DR_Channel_Centreline_line.shp DR_Major_Catchment_polygon.shp	VM_LGA_Geo94.shp Outside_Melbourne_LGA_Mask.shp VM_Rail_MGA55.shp VM_Locality_Point_CLIP.shp VM_Road_MGA55.shp CBD_Roads.shp

Map Number	GIS layers used in this map		
	Council GIS	Melbourne Water GIS	VicMap
3			Outside_Melbourne_LGA_Mask.shp VM_LGA_Geo94.shp VM_POI_Point_Flood_200m_Clip_Melb_Clip.shp VM_Locality_Point_CLIP.shp VM_Rail_MGA55 VM_Road_MGA55.shp CBD_Roads.shp
4		Flood_Extent_100yr_Combined.shp Flood_Extent_100yr_UG_Drains_polygon.shp Flood_Extent_100yr_Waterways_polygon.shp	VM_Rail_MGA55.shp VM_LGA_Geo94.shp Outside_Melbourne_LGA_Mask.shp VM_Locality_Point_CLIP.shp VM_Overlay_MGA55.shp VM_Road_MGA55.shp CBD_Roads.shp
5		Flood_Extent_100yr_Combined.shp Flood_Extent_100yr_UG_Drains_polygon.shp Flood_Extent_100yr_Waterways_polygon.shp	VM_Rail_MGA55.shp VM_LGA_Geo94.shp Outside_Melbourne_LGA_Mask.shp VM_Locality_Point_CLIP.shp VM_Overlay_MGA55.shp VM_Road_MGA55.shp CBD_Roads.shp

Appendix 6 – Asset list

Table 12 Major Council Drains

Location	Diameter/Width (mm)	Construction
Forsyth Rd Drain, Hoppers Crossing	975	Reinforced Concrete Pipe (RCP)
Willowgreen Way, Hoppers Crossing	975	RCP
Fitzgerald Rd, Laverton	975	RCP
Princes Fwy (Longitudinal Drain) at Skeleton Ck	975	RCP
Ballan Rd, Wyndham Vale	975	RCP
Wallara Rd, Werribee	975	RCP
Valewood Dr, Wyndham Vale	975	RCP
Pannam Dr, Hoppers Crossing	975	RCP
Railway Ave, Werribee	975	RCP
Tyrone St, Werribee	975	RCP
Goegan St Reserve, South Werribee	975	RCP
S Ring Rd, South Werribee	975	RCP
Alsace Ave, Werribee	975	RCP
Derwent Rd, Werribee	975	RCP
Tarneit Rd, Werribee	975	RCP
Dunlop Rd, Hoppers Crossing	975	RCP
Kirkstone Rd, Sanctuary Lakes	975	RCP

Location	Diameter/Width (mm)	Construction
Foxfield Way, Werribee	975	RCP
Hume Rd, Laverton North	975	RCP
Dohertys Rd, Laverton North	975	RCP
Middle Park Dr, Sanctuary Lakes	975	RCP
Paradise Pde, Featherbrook	975	RCP
Davis Rd, Werribee	975	RCP
Kingsbridge Blvd, Laverton	975	RCP
Yates Ave, Hoppers Crossing	975	RCP
Malibu Blvd, Featherbrook	975	RCP
Honeyblossom St, Manor Lakes	975	RCP

MW Drains

Melbourne Water Drains are listed below:

- CHERRYS M.D.
- D1 DRAIN
- HOPPERS CROSSING DRAIN
- CHEETHAM CREEK
- DUNES DRAIN
- BROOKLYN M.D.
- KAYES DRAIN
- FORSYTH RD DRAIN
- WERRIBEE WEST DRAIN
- LOLLYPOP CREEK
- SHAWS RD DRAIN
- TRIB OF DAVIS CREEK
- SOUTH SALTWORKS MOAT
- IMMS DRAIN
- SKELETON CREEK
- CROPLEYS DRAIN
- PEDDER ST DRAIN
- LAVERTON M.D.
- BLACK FOREST RD DRAIN
- TARNEIT CREEK
- TARNEIT RD DRAIN
- HUMES M.D.
- LEIGH ST DRAIN

- POINT COOK CREEK
- SAYERS DRAIN
- FAIRBAIRN RD DRAIN
- WESTLEIGH DRAIN
- D1 DRAIN (UPPER)
- HOOKER RD DRAIN
- BULBAN RD DRAIN
- BELLBRIDGE DR DRAIN
- SOUTHERN DRAIN
- THOMPSONS DRAIN
- DOHERTYS DRAIN
- 15E OUTLET DRAINAGE AREA
- SNEYDES RD DRAIN
- TARNEIT RISE DRAIN
- MARPLE CRES DRAIN
- SKELETON CREEK (UPPER)
- CAMPBELLS M.D.
- RIVERSIDE AVE DRAIN
- DAVIS CREEK
- CHERRY CREEK

Appendix 7 - International Association for Public Participation (IAP2) Spectrum

The key principles for engagement are:

Values-based: Appreciates that values held by the community form their opinions, concerns and aspirations

Decision-oriented: That participation of the public can affect the decision or outcome

Goal-driven: Specific, purposeful, productive outcomes are to be achieved with the public throughout the phases of the project (e.g. information is communicated, feedback is sought).

Key to the success of this approach will be the selection of the most appropriate engagement methods for the process. We will use a proven outcome-driven method using different engagement methods from the IAP2 spectrum (see Table 1).

Appropriate engagement will assist in building community confidence in the engagement and consultation process.

Table 13 IAP2 Public participation spectrum (adapted from: IAP2, 2014)



	Inform	Consult	Involve	Collaborate	Empower
Public participation goal	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solutions.	To place final decision-making in the hands of the public.
Promise to the public	We will keep you informed.	We will keep you informed, listen to you and acknowledge concerns and aspirations and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.
Example techniques	<ul style="list-style-type: none"> ■ Fact sheets ■ Website ■ Open houses 	<ul style="list-style-type: none"> ■ Public comment ■ Focus group ■ Surveys ■ Public meetings 	<ul style="list-style-type: none"> ■ Workshops ■ Deliberative polling 	<ul style="list-style-type: none"> ■ Citizen advisory committees ■ Consensus-building 	<ul style="list-style-type: none"> ■ Ballots ■ Citizen juries ■ Delegated decision ■ Referendum

Appendix 8 – Flood History and Issues

Since 1891, flooding within the Wyndham municipality has occurred on at least 23 occasions. Recent floods of note have occurred in:

- February 1973
- 1974
- 1978
- October 1983
- October 1985
- July 1987
- December 1987
- October 1990
- February 2004
- November 2010
- January – February 2011

In February 1973, flows originating in the Lollypop Creek Catchment caused overtopping of the Melbourne/Geelong Railway resulting in closure for two days for repairs, closure of the Princes Freeway for several hours, and extensive flooding of rural land (MMBW, 1989).

The October 1983 floods were the result of breakouts from the Werribee River flowing into Lollypop Creek. The Melbourne/Geelong Railway line was closed for repairs, the Princes Freeway was closed due to water depths of up to 300 mm at the flood peak and major damage occurred to the Main Western Sewerage Carrier (MMBW, 1989).

In February 2004, local flooding occurred across Wyndham as a result of a local intense rain event. The Werribee River was not significantly affected; however Lollypop and Skeleton Creeks and the D1 Drain were severely affected. The Melbourne-Geelong Freeway was inundated at Lollypop Creek and at Skeleton Creek. All arterial roads into and out of Wyndham were inundated. The municipality was road-isolated for several hours. Many roads within the municipality were inundated, but local traffic diversions allowed transport within the municipality. Although some property damage occurred, there was no loss of life.

In February 2011, there were severe floods throughout Victoria, including within the Wyndham municipality. There were instances of rain incursion into buildings and several homes evacuated. There was crop damage in the Werribee South market garden area. There were roads inundated but these returned to service as the rain intensity subsided sufficiently to be conveyed by the drainage system. There were no instances of flooding from rising water courses. There was no loss of life. The intensity of the rain is thought to have been greater than 100-year ARI.



Appendix 9 – Development Services Schemes

