Maribyrnong River Flood Event Independent Review

Dr Nerina Di Lorenzo
Managing Director
Melbourne Water

17 July 2023

VICTORIA State Government

Melbourne Water
Enhancing Life and Liveability

Outline

Context of Flooding in Melbourne

- Key contextual information to inform relevant issues

The October 2022 flood event and Melbourne Water's actions

- Actions and important insights in relation to the flood event and Melbourne Water's work

Specific Matters

- Flood Modelling
- Victorian Racing Club flood wall
- Rivervue Development

Subject Matter Experts

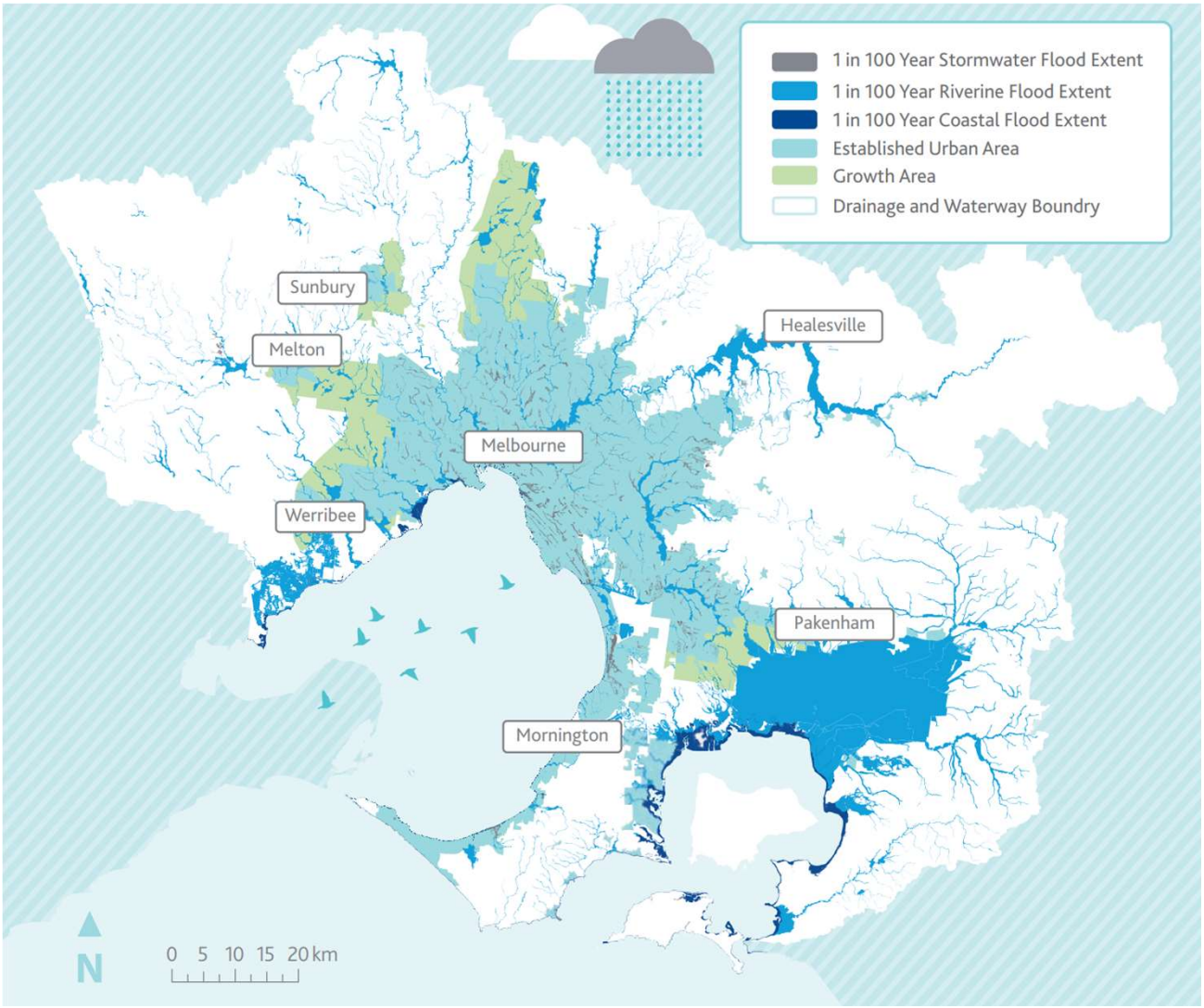
- John Woodland, Head of Waterways & Catchments
- Dr Wendy Smith, Senior Manager, Waterways Catchments & Drainage
- Rachel Lunn, General Manager Urban Planning & Development

Flood risk in Melbourne

There are 25,000 km of waterways in Melbourne

One in one hundred flood is equivalent to "in any given year there is a 1% chance of a flood meeting or exceeding established levels"

Flooding can be caused by stormwater in "**flash flood**" events, waterways expanding into the flood plain in "**riverine flood**" events, and "**coastal flood**" events due to wind and wave surges.



Roles in flood management

Melbourne Water

38 Councils

Bass Coast
Baw Baw
Bayside
Boroondara
Brimbank
Cardinia
Casey
Darebin
Frankston
Glen Eira
Greater Dandenong
Greater Geelong
Hobsons Bay
Hume City
Kingston
Knox
Macedon Ranges
Manningham
Maribyrnong
Maroondah
Melbourne
Melton
Mitchell
Monash
Moonee Valley
Moorabool
Merri-bek
Mornington Peninsula
Nillumbik
Port Phillip
South Gippsland
Stonnington
Whitehorse
Whitehorse
Wyndham
Yarra
Yarra Ranges

Emergency Management agencies

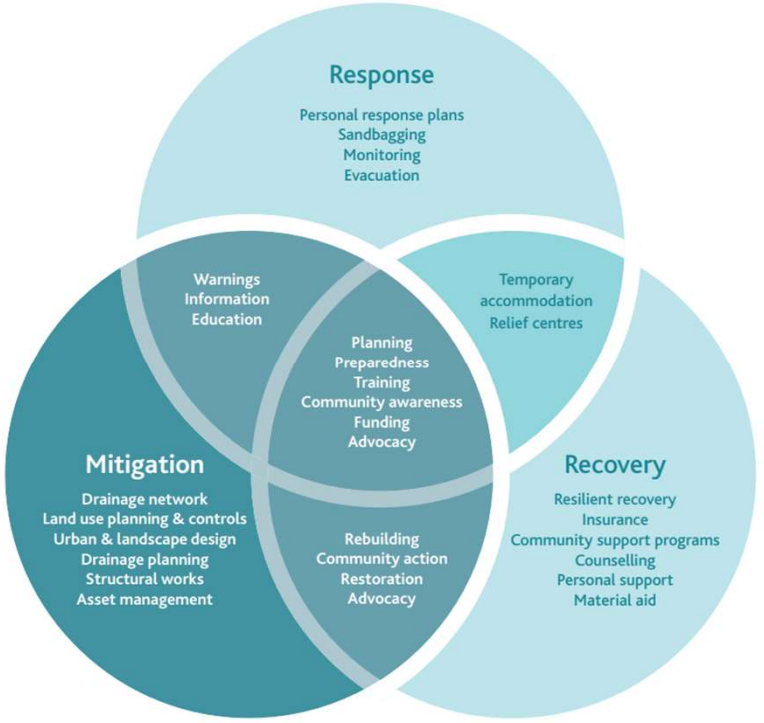
State Emergency Service
Bureau of Meteorology
Emergency Management Victoria

Departments and agencies

Department of Energy, Environment & Climate Action
Department of Transport & Planning
Three retail water corporations
ESC, DH, EPA

Business and community

Insurance Sector
Community Groups
Individuals & businesses



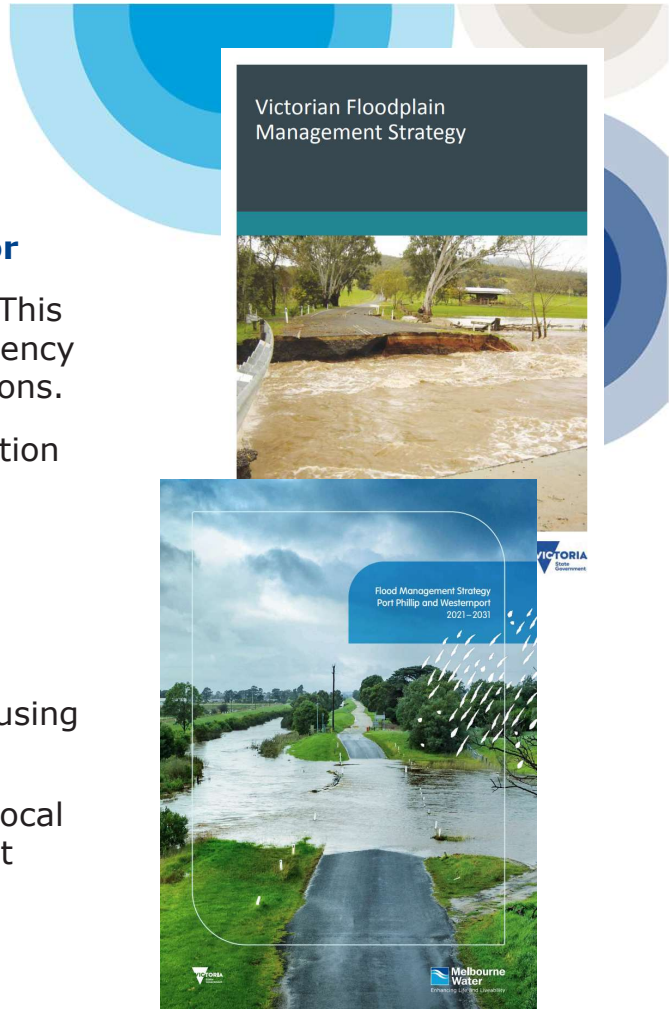
Melbourne Water's role in Flood Management

Melbourne Water as the 'flood plain manager' is responsible for

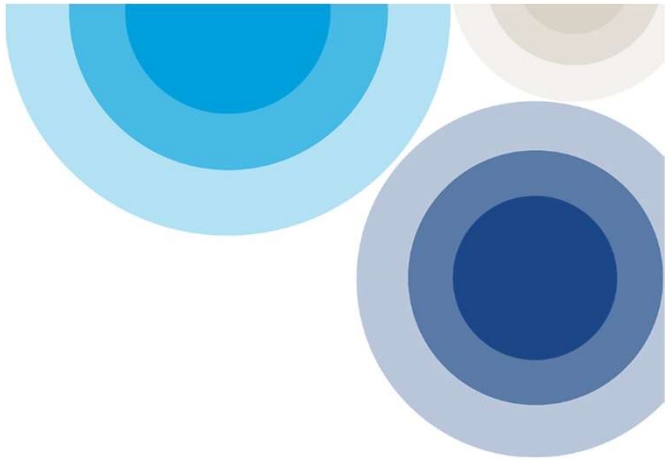
- Catchment level and Coastal flood mapping of 1% AEP flood risk. This is an input into planning controls, Councils' Municipal Flood Emergency Plans, VicSES local flood guides, and in assessing feasible mitigations.
- Being a referral authority for planning and building permits in relation to flood risk.
- Running flood prediction models in real time before and during an event and provide that information to other agencies.

Melbourne Water does not

- Issue warnings to the community - this is done by BoM and SES, using our flood predictions.
- Issue planning or building permits - these decisions are made by local councils or the Minister of Planning and MW makes decisions about supporting/objecting/requiring conditions relating to flood.
- Lead recovery from flood events, except where we own or are responsible for the assets.



Our levers to manage flood risk



Planning & building : Regulation, controls and guides

- Regulating how buildings in the flood plain are built as a referral authority – e.g. floor levels, design. MW makes 10,000+ decisions p.a. where controls exist.

Flood awareness & preparedness

- Work with VicSES on flood awareness and support preparedness, input into VicSES flood management plans/guides & Councils' Municipal Flood Management Plans.
- Guidance for flood proofing and work with VicSES on flood awareness in design.

Infrastructure projects

- Infrastructure that either stores water, moves water or creates barriers between water and property – prioritised across Melbourne based on public safety risk

ALL ACTIONS RELY ON MODELLING & FLOOD INFORMATION

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ALL ACTIONS RELY ON MODELLING & FLOOD INFORMATION

Considerations

Resourcing balanced against community water bills

- $270M over 5 years in pricing determination.

Getting information into Planning & Building regulations & building affordability

- Process to get flood information into regulation and impact on housing.

Challenge of building and maintaining awareness to flood, given its variability

- Highly variable events

Feasibility of Infrastructure projects and flow on impacts

- Technical feasibility is often limited; afflux, space, flow on impacts
- Highest community cost and variable community support

Lead up to the October 2022 event

- Worked with the Bureau of Meteorology to understand the forecast of heavy rainfall and storms across the Greater Melbourne catchments
- Stood up all hazard incident teams and ensured 24/7 flood rostering – moved into our preparedness and mitigation activities
- Mobilised crews to inspect drains and ensure removal of any system blockages or issues across the 5 catchments of Greater Melbourne
- Worked through risks to community assets managed by Melbourne Water, including
  - Water supply reservoirs and dam safety – integrity of drinking water
  - Discharge from emergency relief structures in the sewer transfer system to waterways
  - Localised erosion of waterways
  - Impact on retarding basins and related flood mitigation assets

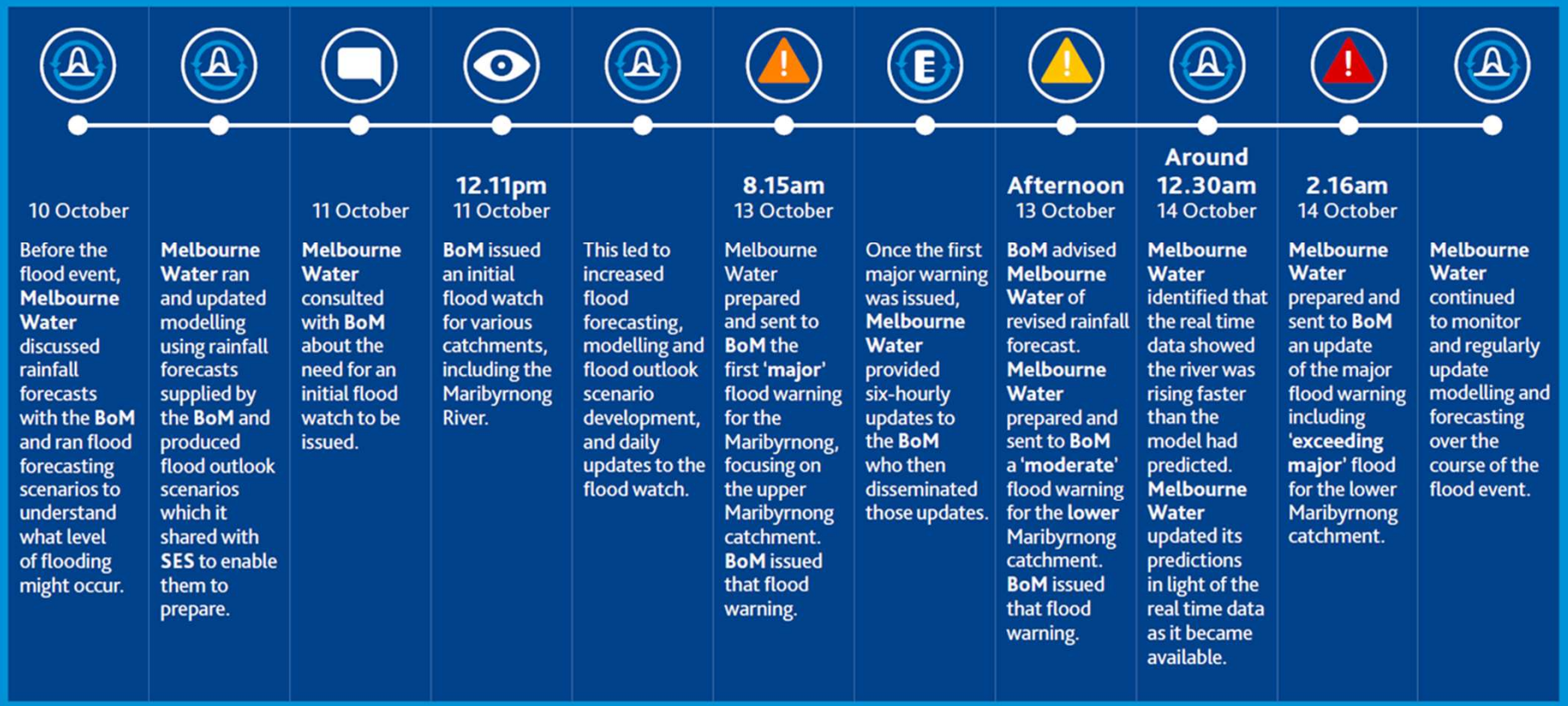
Forecast weather indicated a significant storm event.

Melbourne Water was preparing for potential impacts across multiple catchments: Maribyrnong, Werribee and the Yarra

Melbourne Water was also preparing for impacts across water supply, sewerage, waterways and drainage.

There were elevated inflows into the Eastern Treatment Plant affecting sewerage system.

Flood Warning timeline



10 October

Before the flood event, **Melbourne Water** discussed rainfall forecasts with the **BoM** and ran flood forecasting scenarios to understand what level of flooding might occur.

Melbourne Water ran and updated modelling using rainfall forecasts supplied by the **BoM** and produced flood outlook scenarios which it shared with **SES** to enable them to prepare.

11 October

Melbourne Water consulted with **BoM** about the need for an initial flood watch to be issued.

12.11pm
11 October

BoM issued an initial flood watch for various catchments, including the Maribyrnong River.

This led to increased flood forecasting, modelling and flood outlook scenario development, and daily updates to the flood watch.

8.15am
13 October

Melbourne Water prepared and sent to **BoM** the first '**major**' flood warning for the Maribyrnong, focusing on the upper Maribyrnong catchment. **BoM** issued that flood warning.

Once the first major warning was issued, **Melbourne Water** provided six-hourly updates to the **BoM** who then disseminated those updates.

Afternoon
13 October

BoM advised **Melbourne Water** of revised rainfall forecast. **Melbourne Water** prepared and sent to **BoM** a '**moderate**' flood warning for the **lower** Maribyrnong catchment. **BoM** issued that flood warning.

Around 12.30am
14 October

Melbourne Water identified that the real time data showed the river was rising faster than the model had predicted. **Melbourne Water** updated its predictions in light of the real time data as it became available.

2.16am
14 October

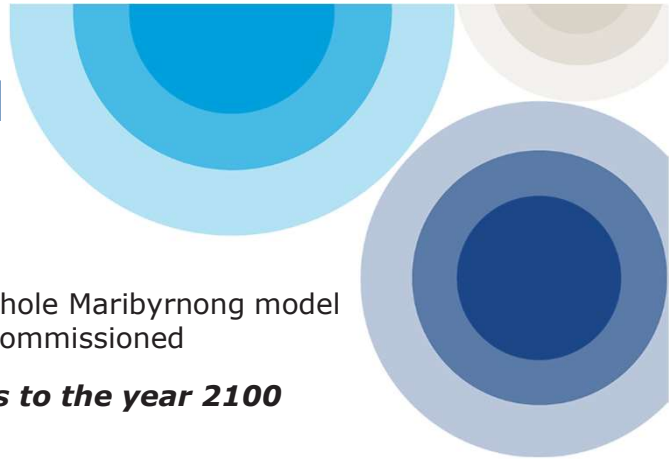
Melbourne Water prepared and sent to **BoM** an update of the major flood warning including '**exceeding major**' flood for the lower Maribyrnong catchment.

Melbourne Water continued to monitor and regularly update modelling and forecasting over the course of the flood event.

Immediately after the event

- With Parks Victoria, Moonee Valley & Maribyrnong Councils: joint inspection of clean up work. MW undertook 850 maintenance works orders for highly impacted areas in terms of litter and debris collection across 40km of impacted waterways.
- Surveys undertaken in the Maribyrnong, Moonee Valley, Brimbank and Macedon Ranges Council areas to collect flood level information
- Detailed external hydrologic analysis of the event
- Inspected over 100 infrastructure and capital projects sites for damage
- Engaged with affected community members and supported recovery agencies
  - Part of the Maribyrnong Council Flood Community meeting held in December 2022
  - MW employees joined Moonee Valley residents at the blitz event to clean up Riverside Park
  - Together with Greater Western Water, provided a one-off $600 bill rebate for flood affected customers.
  - Hosted four in-person and two online community information sessions between January and March 2023: Kensington, Moonee Valley, Keilor, Maribyrnong. These supported access to agencies who also attended (Councils, VicSES, Emergency Recovery Victoria and Red Cross).
  - Established high priority service and advice for flood affected customers on planning and building processes
- Established this independent review

Key systemic actions & looking ahead



Flood models and information

- Initial review of models in lower and mid Maribyrnong complete. Update to whole Maribyrnong model encompassing this most recent flood data and climate projections has been commissioned
- Accelerating our flood modelling program to encompass ***climate projections to the year 2100***
- Working with Councils to bring this into regulatory frameworks

Awareness and preparedness in conjunction with partners

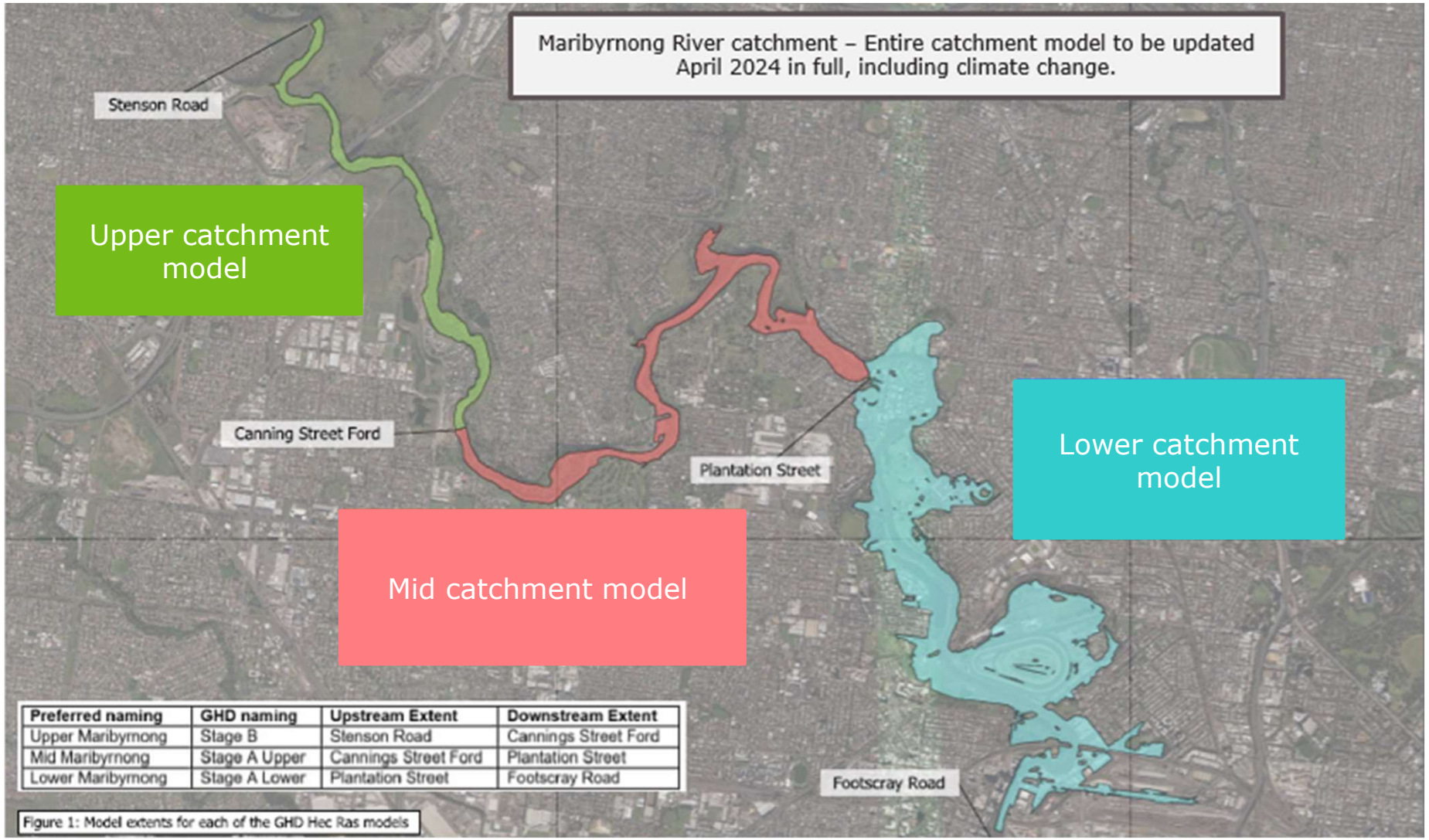
- Further work being planned on flood risk management in the lead into spring
- Further work on more general awareness programs

Longer term mitigations

- Ongoing program of longer term mitigations – informed by the new models

Working with partners and system improvements

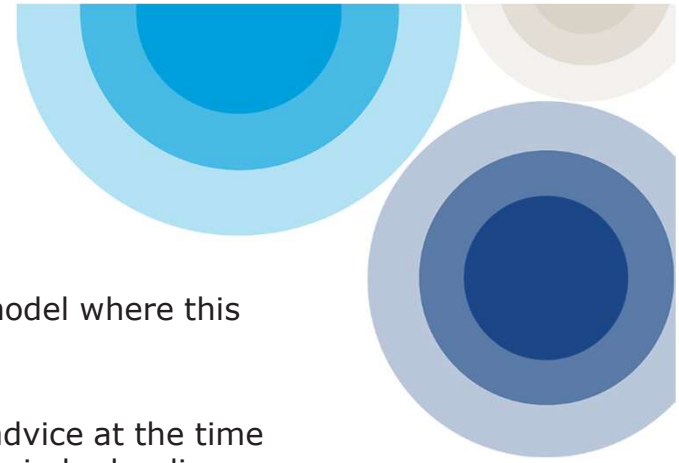
- Consolidating flood warnings with BOM & SES
- Standing up flood leadership committee on an ongoing basis
- Continuing to improve Urban Planning and Land Development policy and apply state guidance to decision making



Preferred naming	GHD naming	Upstream Extent	Downstream Extent
Upper Maribyrnong	Stage B	Stenson Road	Cannings Street Ford
Mid Maribyrnong	Stage A Upper	Cannings Street Ford	Plantation Street
Lower Maribyrnong	Stage A Lower	Plantation Street	Footscray Road

Figure 1: Model extents for each of the GHD Hec Ras models

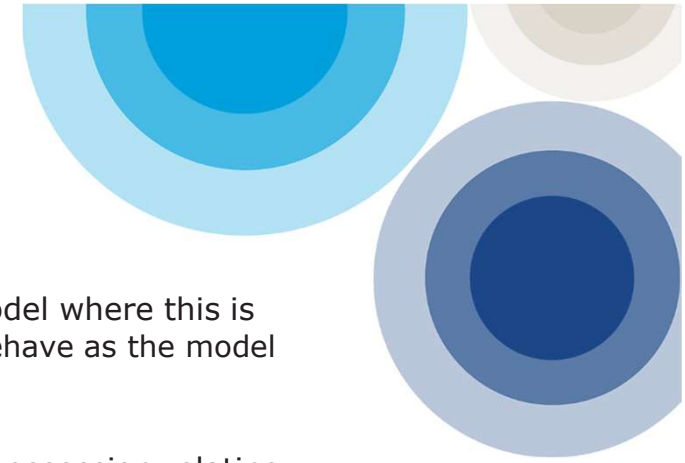
Victorian Racing Club wall



To date:

- We have independently validated the lower Maribyrnong catchment model where this site is located.
- We have been able to source and consider the basis of the technical advice at the time and were able to establish that peer review and independent expertise in hydraulic engineering and modelling were utilised.
- We have been able to establish that, based on the advice and existing modelling at that time, the impacts of the Flemington Wall were to be offset by mitigation works to the Footscray Road Bridge, and the Northern Railway Bridge Culverts.
- We have reviewed the implementation of the mitigation works and have provided the panel with surveys showing the mitigation works were built as designed.
- We have commissioned a fully updated model for the Maribyrnong catchment, which encompasses data from the event. This will be required to conclude how it operated in current conditions and whether the mitigations offset the impacts to the required extent.

Rivervue



To date:

- We have independently validated the mid Maribyrnong catchment model where this is located – we have found that in some areas, the catchment did not behave as the model predicted.
- We have located and provided file information in Melbourne Water's possession relating to the development of the Rivervue site.
- Our investigation is ongoing and we will continue to provide information to the panel as it becomes available.
- But we can establish the Rivervue site as one where there has been a long history of development decisions since the early 2000's, with multiple parties involved in various aspects, including the past and current developer, Melbourne Water, and Council.
- In the short term we will be working with the residents in that location relating to flood risk management plans and actions. The full model update will enable any other further work to be considered.

Flood event

John Woodland

17 July 2023

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Probability of rainfall event and resulting flood event

Rainfall

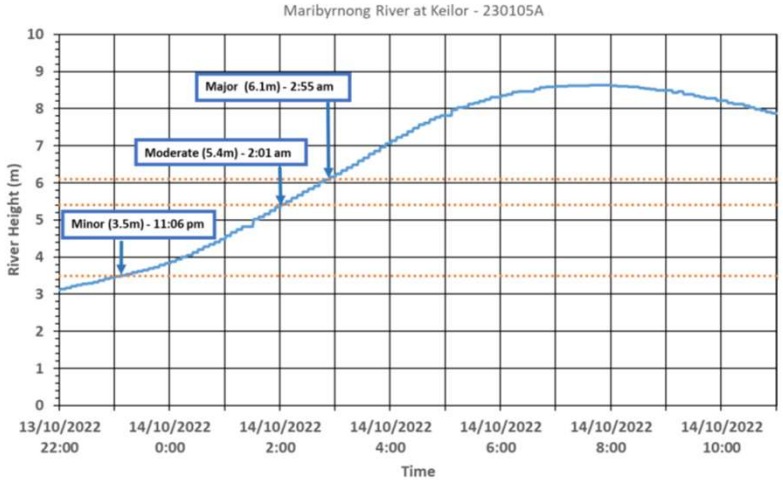
- Upper catchment – 48 hour rainfall event across the 13 and 14 October assessed as between the 2% (1 in 50 year) and 1% (1 in 100 year) Annual Exceedance Probability (AEP) .
- Analysis of antecedent conditions found the Maribyrnong River catchment experienced significantly wetter than average conditions for Spring prior to the storm event on the 13-14th October 2022. There was also a rainfall event of 30-40mm over 6-8 October.
- Preceding rainfall contributed to the catchment being wetter than usual which exacerbated the runoff response of the catchment during the event.

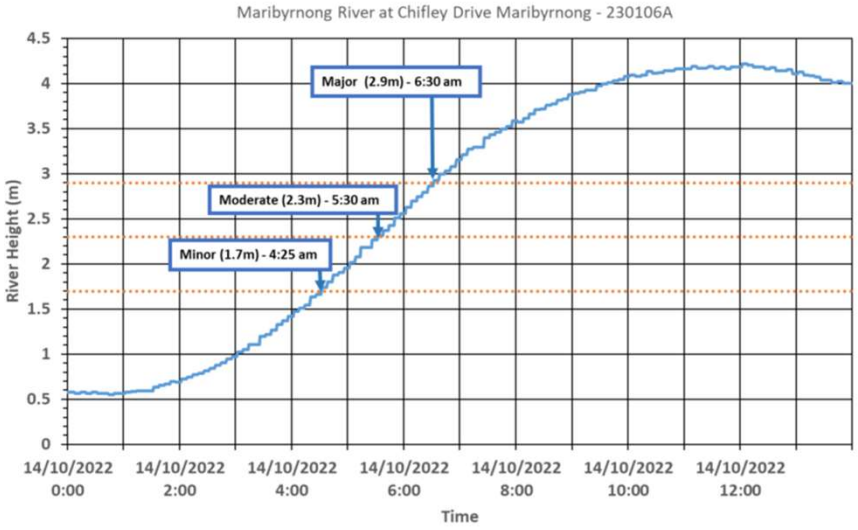
Stream flow

- Deep Creek at Darraweit Guim - reached 7.22 m on 13 October, the highest since records began in 1975. The peak flow of 280 m3/s was close to a 1% AEP event (300 m3/s).
- The Maribyrnong River at Keilor - reached 8.64 m on 14 October, the highest recorded stage since the 1974 event. The peak flow rate of 768 m3/s was just above a 2% AEP (760 m3/s) event
- The Maribyrnong River at Maribyrnong – reached 4.22 m on 14 October, assessed to be the third largest in terms of level.

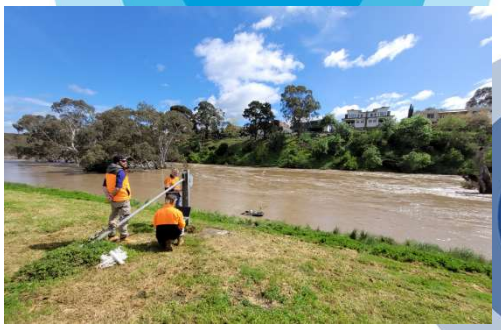
A rainfall AEP event doesn't necessarily match a resultant flood AEP. This is because it depends on catchment conditions.

Catchment response times





Rating table



Melbourne Water

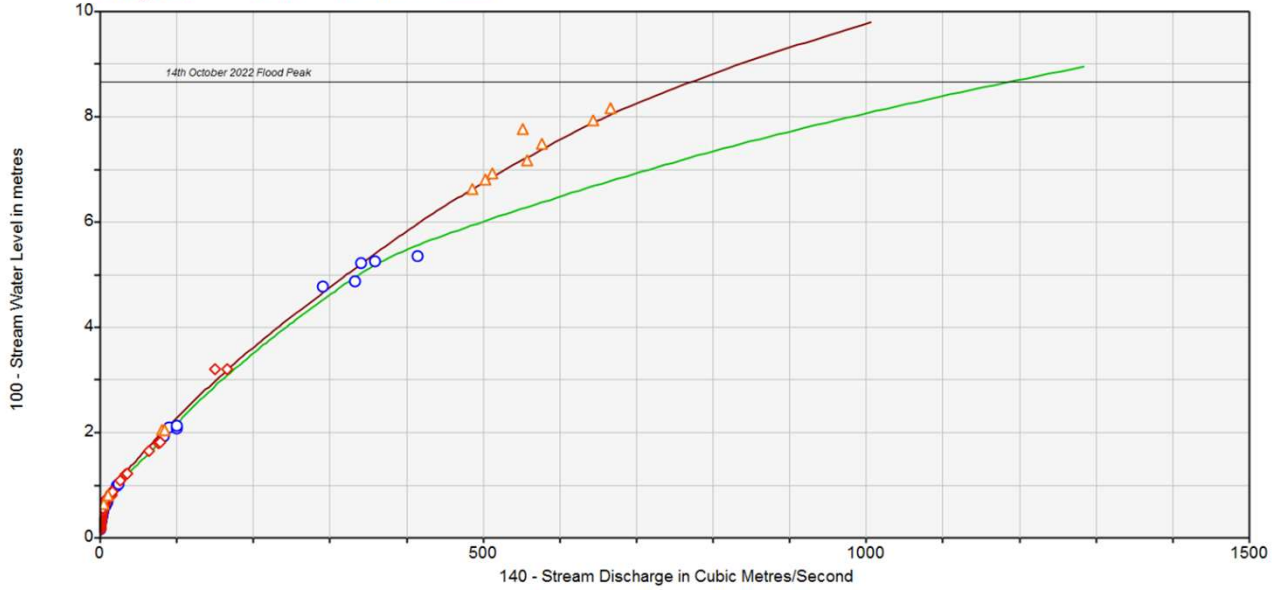
230105A MARIBYRNONG RIVER AT KEILOR

Gaugings from 12/02/1986 to 10/11/2022

○ Up to 01/01/1994 ◇ Up to 01/10/2022 △ Up to 10/11/2022

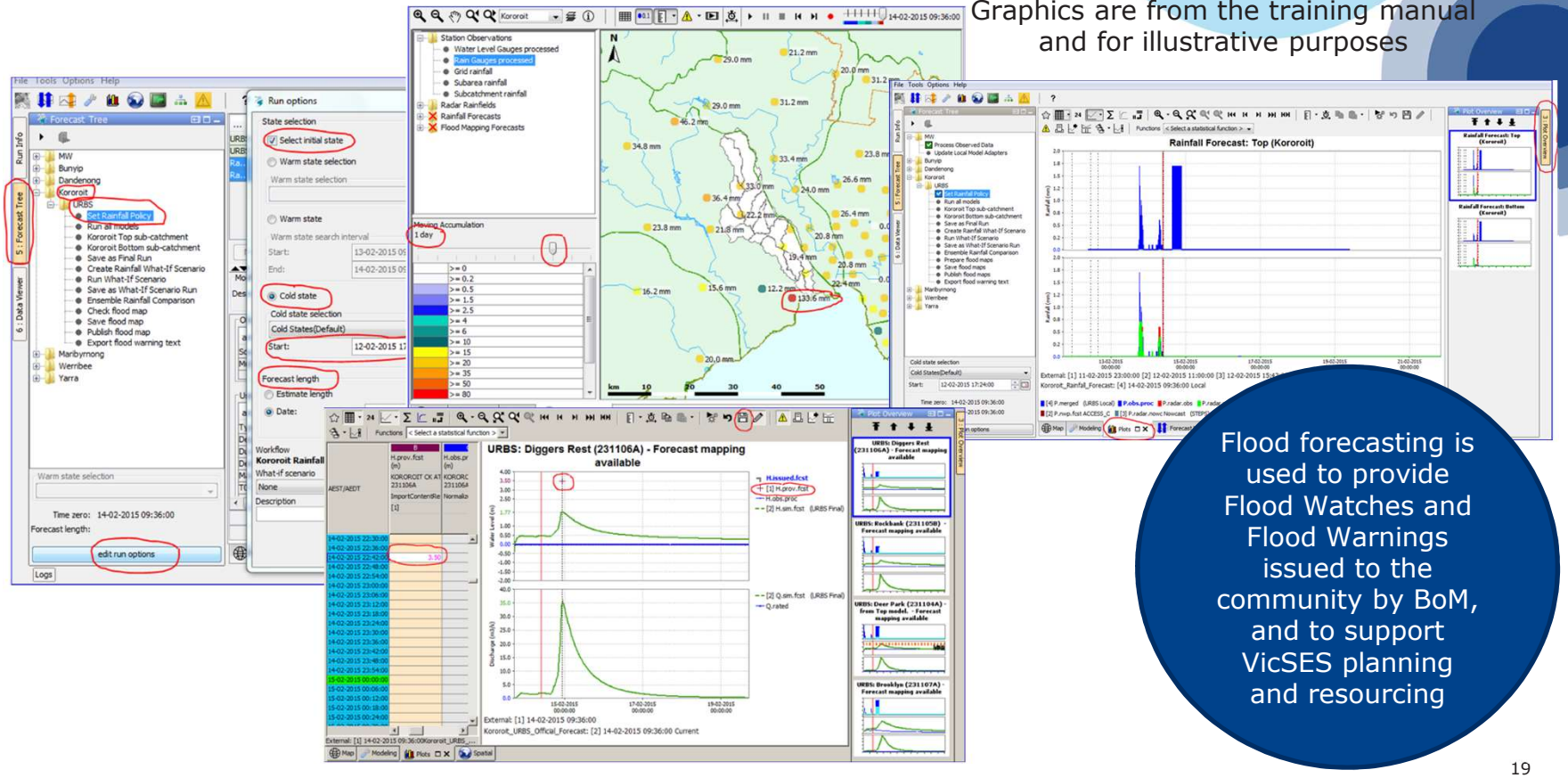
Rating Table 37.01 Issued on 11/10/2022

Rating Table 37.02 Issued on 17/10/2022



Modelling and flood forecasting

Graphics are from the training manual and for illustrative purposes



Flood forecasting is used to provide Flood Watches and Flood Warnings issued to the community by BoM, and to support VicSES planning and resourcing

Flood modelling

Wendy Smith

17 July 2023

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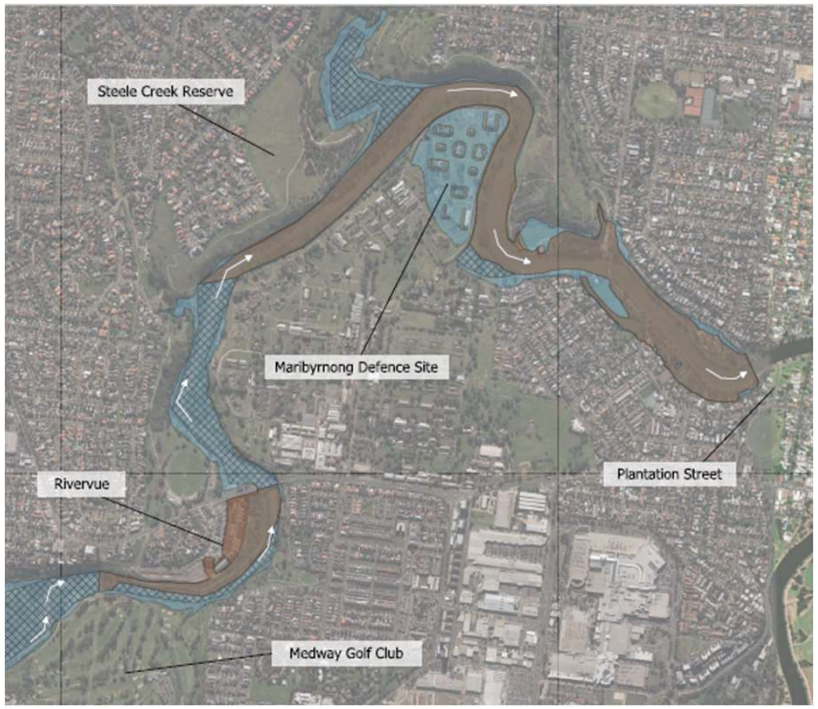
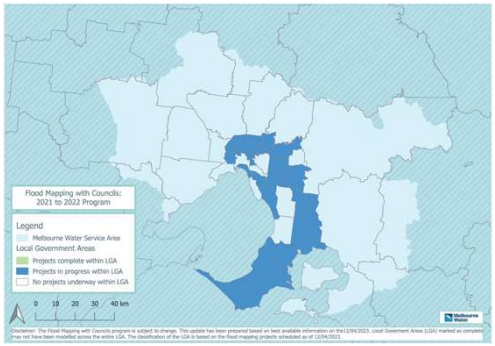
Maribyrnong catchment

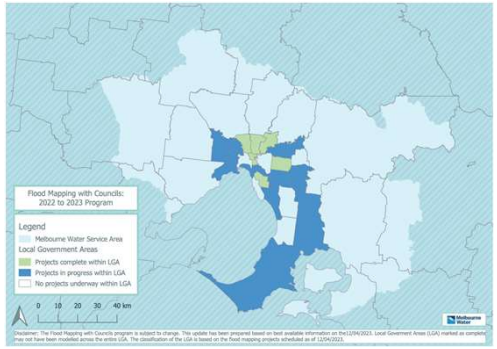
Figure 1. The five major catchments of the Port Phillip and Westernport region

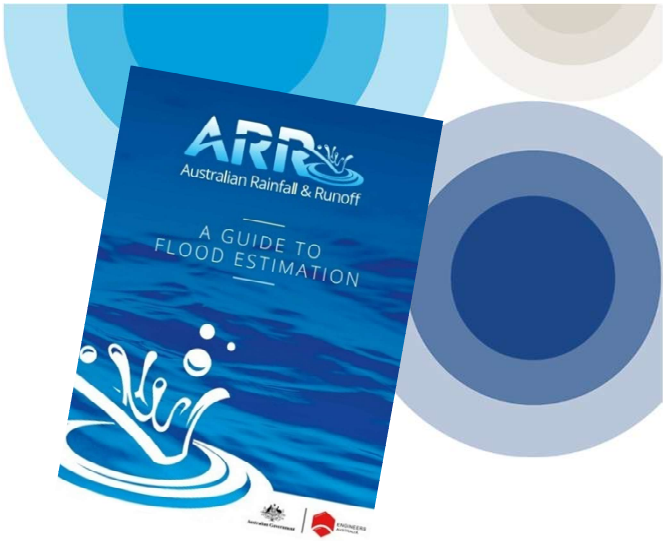
Modelling in the Maribyrnong

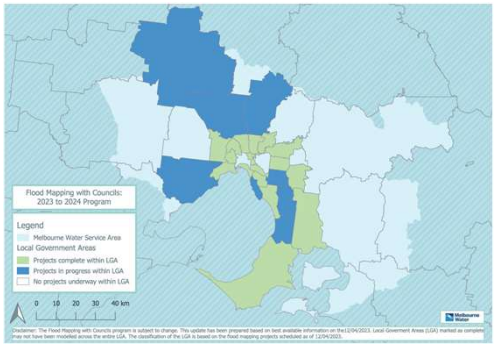


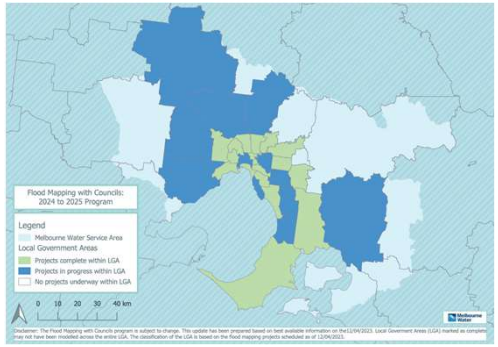
Rollout of the modelling program

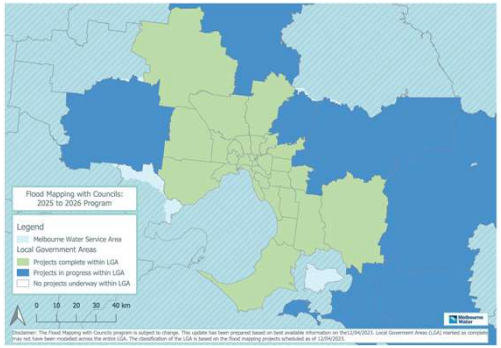












Urban planning and development

Rachel Lunn

17 July 2023

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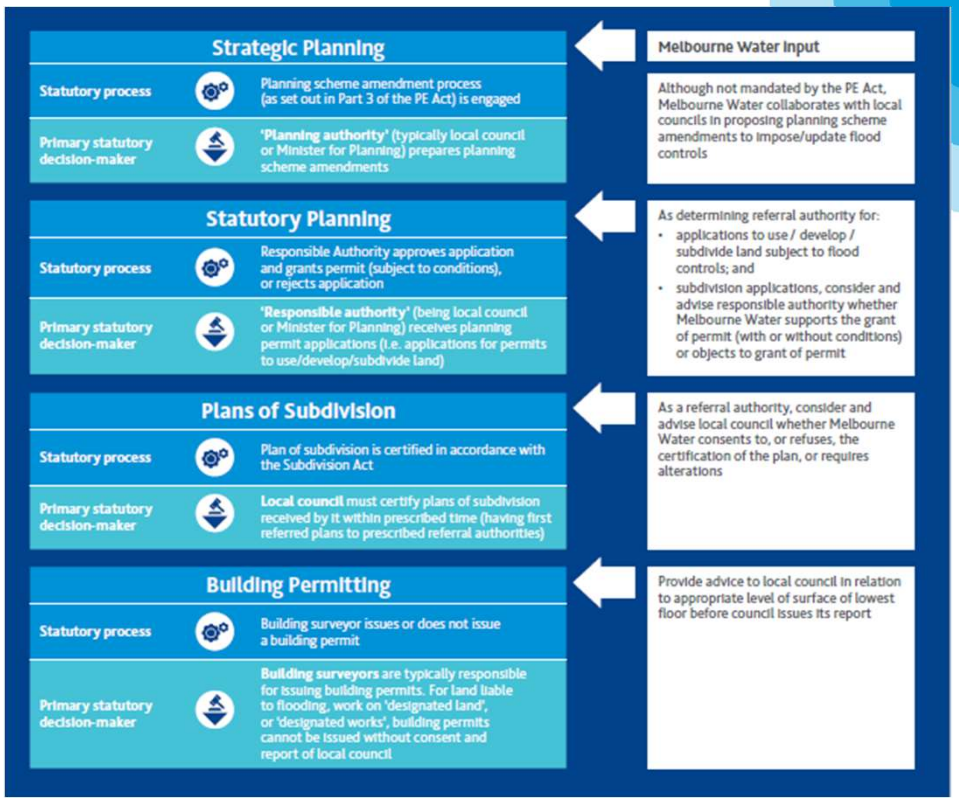
Urban Area Development Control

Land, Water, Planning and Environmental Laws, Regulations and Policies



Flood Modelling Information & Water Act

Development Decision Making
Laws, Regulation, Policies, Practice Notes and
State Guidelines for Development in Flood Affected Areas

Urban Development Control improvements in recent years

- The inputs to our decisions are based on the best Flood Engineering and Scientific Data available from our models, the Water Act and other Urban Planning & Development laws and regulations
- All Urban Planning and Development 'outputs' are made using the 2019 State 'Guidelines for Development in Flood Affected Areas' risk and safety criteria
- New Flood Controls are being rolled out across Melbourne as new data is available
- Additional senior Planning and Flood Engineers were recruited since 2021 to support more complex decisions in Urban areas
- New or improved internal processes and systems for holding flood information and processing Urban Planning applications have been introduced