

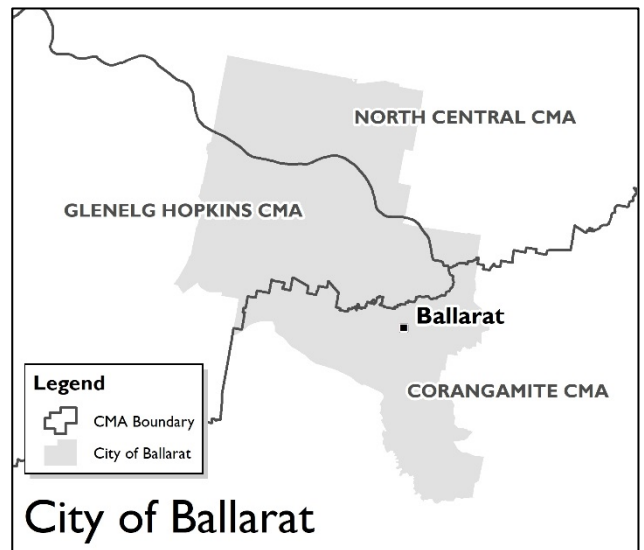
FLOODPLAIN MANAGEMENT IN THE CITY OF BALLARAT

Regional Floodplain Management Strategies

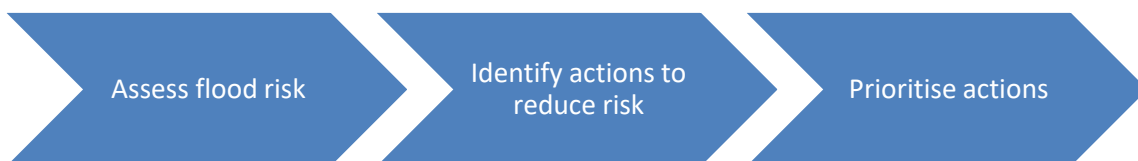
The Victorian Catchment Management Authorities have been working with local communities, Traditional Owners, Councils, the Victorian State Emergency Service (SES) and other regional agencies to prepare regional floodplain management strategies. The strategies respond to outcomes of the 2016 Victorian Floodplain Management Strategy, with the aim to:

- **Build flood resilience** – by sharing information about flood behaviour;
- **Reduce flood risks** – through emergency management, flood mitigation infrastructure works and activities, and risk management;
- **Avoid future flood risks** – through land use planning and building controls;
- **Manage residual flood risks** – through flood insurance, sharing flood risk information, integrated flood emergency management and incident control;
- **Protect floodplains for their ecological and cultural values** – by integrating the management of flood risks with the environmental and cultural values of natural floodplains.

The City of Ballarat extends across the North Central, Corangamite and Glenelg Hopkins Catchment Management Authority regions, and is therefore considered within three regional floodplain management strategies. While the strategies are stand-alone documents, the tools and processes used to develop them have been the same, resulting in a consistent assessment of flood risk and priority actions. This brochure summarises the application of each of these strategies to the City of Ballarat, and is consistent with Council’s intent and capacity to address flooding issues across its entire municipality.



Development of the strategies:



City of Ballarat Flood Risks

The City of Ballarat is located within the upper-most portions of three major river basins - the Loddon, Hopkins and Barwon basins. Major waterways include:

- McCallum Creek, Creswick Creek and Coghills Creek, which lie at the top of the Loddon River catchment, in the North Central CMA region;
- The tributaries of the upper Hopkins River catchment - in particular Burrumbeet Creek drains the central and western parts of the municipality in Glenelg Hopkins CMA region;
- Upper tributaries of the Leigh River (Barwon River Basin), including the Yarrowee River, Gnarr and Canadian Creeks within the Corangamite CMA region. Both Gnarr and Canadian Creeks converge with the Yarrowee River in the central business district of Ballarat.

There are several locations within the City of Ballarat that have been identified as priority flood risk areas:

- Ballarat East
- Ballarat North
- Alfredton
- Mount Helen
- Buninyong
- Redan
- Ballarat Central
- Delacombe
- Miners Rest

Ballarat and the surrounding areas are prone to flash flooding as a result of quick catchment responses to heavy rainfall. Given the urban nature of these areas, flooding impacts are substantial.

Historically, measures were taken to address flooding by channelising waterways. This has led to faster flowing water, which, when the channels overtop, has a greater impact. One example of this is the Bridge Mall in Ballarat (a major shopping precinct). During heavy flooding in 1989 and 1991 along the Gnarr Creek, the Bridge Mall experienced flood depths greater than one metre. This is a considerable flood hazard, one that may occur again in the future (unless rectified).

Until only recently, there were no flood related planning controls in the region to prevent development in flood prone land. This means that there is potentially no planning mechanism in place for regulating development on flood prone land. In July 2017, a Planning Scheme Amendment introduced the first flood controls for the GHGMA region of the City of Ballarat for the Burrumbeet catchment. Updating planning controls for the Corangamite CMA, part of the City of Ballarat's area, has been identified as a major priority.

Addressing Flood Risk

Actions that have the potential to reduce flood risk can generally be grouped into the following four categories:

Flood mitigation infrastructure involves the construction and management of physical works designed to reduce the impacts of flooding, such as levees, floodways and retarding basins. Example actions include managing waterways, developing retarding basins and developing or managing levees.

Flood warning and emergency management involves community education and awareness in support of flood preparedness to reduce existing flood risks. Example actions include the installation of flood

warning systems on roads prone to regular flooding, and developing and sharing detailed flood maps. It also includes emergency management planning to manage residual risks such as updating Flood Emergency Management Plans.

Flood intelligence involves acquiring information about flood behaviour in order to understand the flood risk in more detail. An example action is the development of a flood study for a river reach.

Land use planning relates to tools such as Planning Schemes and building regulations, which manage development in flood-prone areas to reduce risk to life and property associated with new development. An example action is updating Planning Schemes to reflect current flood mapping.

Actions that do the most to reduce risk have been prioritised. All suggested actions are subject to feasibility, which may require further detailed investigation, and the availability of funding. The suggested actions have been prioritised over a regional scale, and may not address some specific localised issues including stormwater flooding. Figure 1 shows the proposed location of the actions and a description of each action. Grouped by theme is shown on the following pages.

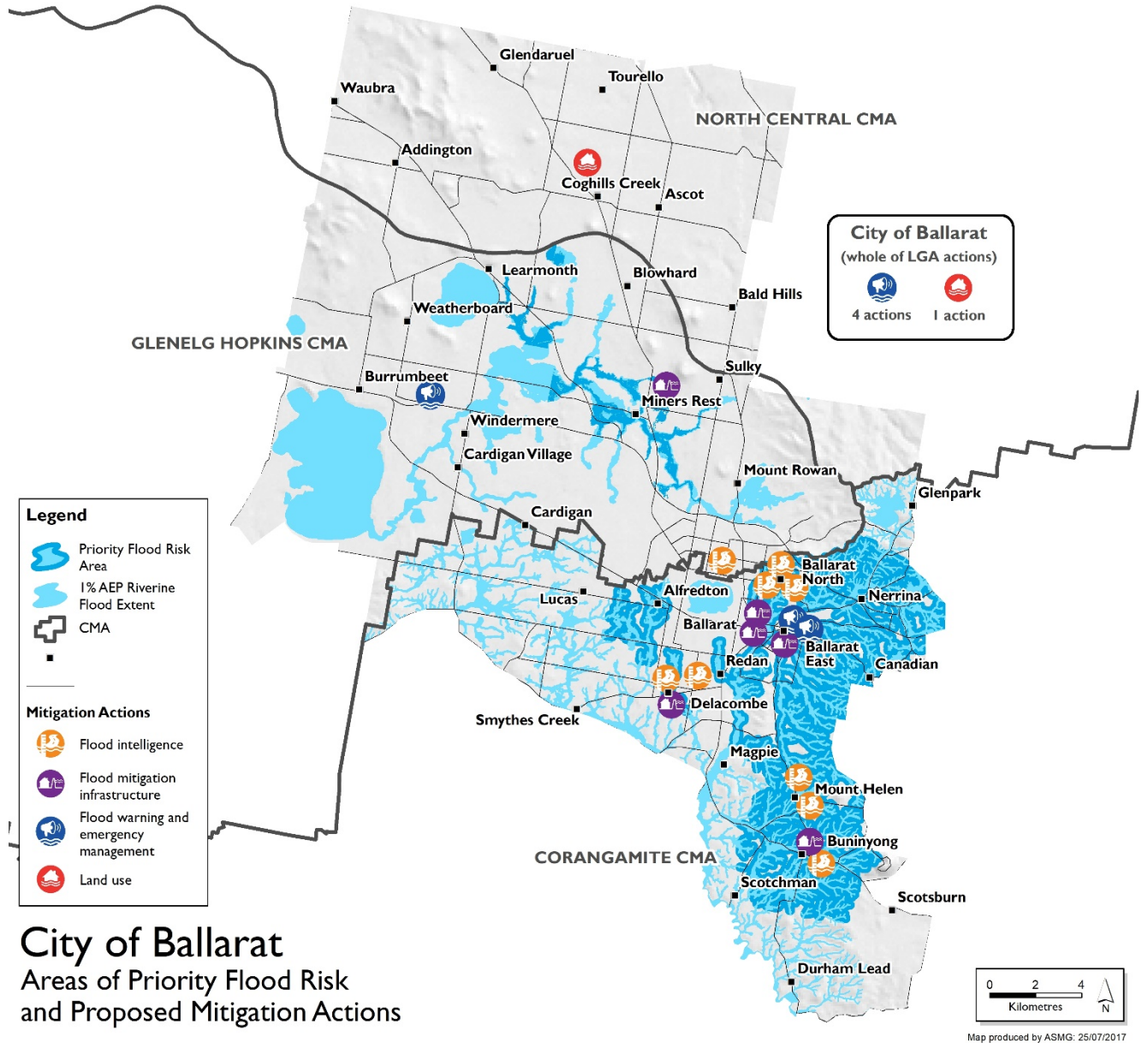


Figure 1. Areas of priority flood risk and proposed mitigation actions for the City of Ballarat region.

Possible Flood Mitigation Actions



Flood Mitigation Infrastructure

- Investigate options to address the risks around the earthen embankment along Charlesworth Street. The Shire is currently investigating this.
- Investigate options to improve management of the Gong dam. The Gong dam has considerable stability and seepage concerns, as well as significant downstream consequences that all present risks to the community.
- Investigate options to improve management of the Gnarr Creek through the CBD, with a focus on including any upgrades in partnership with the \$7 million of VicRoads' upgrades planned for Mair Street.
- Pursue funding for the Burrumbeet Creek high flow bypass channel, which will mitigate flooding of properties in Miners Rest.
- A review of the Bonshaw Creek flood study is being undertaken by Council. Following this, there will be a need to investigate options to improve the flood situation for Banyule Drive and other areas of southern Delacombe. Flood mitigation options will be assessed utilising areas such as Victoria Park, Doug Dean Reserve and the former Saleyards site.
- Investigate options to improve augmentation of Yarrowee River upstream of CBD, as part of Bakery Hill Master Plan.



Flood Warning and Emergency Management

- Develop an evacuation plan for the retirement village downstream of the Charlesworth Street embankment. This needs to be workshopped with VicSES, VicPol and the City. An ANCOLD Assessment / Dam Break has been completed by the City of Ballarat.
- Investigate the viability of a flood warning system for the City of Ballarat. For example, consider methods to turn flood study outputs into tools to assist with flood warning, preparedness and response.
- Undertake community flood education engagement activities and develop flood awareness products for Ballarat, which may include pre-recorded flood education videos, local flood guides, community response plans, community signs and gauge boards.
- Investigate the feasibility of a road inundation assessment (e.g. depth over road flooding) to assist council and VICSES plan for road closures during flood events and to better plan for potential road damages.
- Investigate options for potential flood warning for the Burrumbeet catchment.



Flood Intelligence

- Update Canadian Creek Flood Study, including investigation of Emergency Services Telecommunications Authority (ESTA) facility's proximity to the floodplain.
- A consultant will undertake a review of the Bonshaw Creek Flood Study, which will include the Redan Creek.

- Update Kensington Creek catchment flood study (current mapping: Ballarat West Drainage Scheme Halcrow 2007 & Ballarat Risk & Opp Mapping 2016).
- Update the flood study for the Yarrowee River tributaries (Brown Hill), including “Warrenheip Creek”, “Ryan Street drain” etc. (current mapping: Ballarat Risk & Opp Mapping 2016).
- Update flood study for the little Bendigo Creek catchment including Hit Or Miss Gully (current mapping: Ballarat Risk and Opportunities mapping 2016).
- Upgrade flood modelling for Gnarr Creek catchment upstream from Howitt Street, including Walker Street Drain & Devils Gully (current mapping: Ballarat Urban Waterways Floodplain Mapping Report 2007 & Ballarat Risk & Opp Mapping 2016).
- Update flood study for Buninyong (Union Jack Creek catchment), required to inform the township plan. Council will first organise drainage and culvert data. A flood study will then be completed for the waterways and local drainage network. The flood study will consider emergency management, future flood overlays, and future planning for the Buninyong Township.
- Update flood study for Yarrowee River downstream from Canadian Creek confluence to City of Ballarat boundary (current mapping: DELWP Regional Floodplain Mapping 2016 & Ballarat Urban Waterways Floodplain Mapping Report 2007).
- Investigate undertaking a combined stormwater and riverine flooding investigation for Wendouree.



Land Use Planning

- Update planning scheme to include flood controls for the whole of the City of Ballarat.
- Extend the ESO to all waterways within the North Central CMA region of the City of Ballarat, to manage risks of future growth and development.