Risk assessment and draft priority rankings for stakeholder discussion (rural study areas)

Community input is needed to prioritise where flood knowledge needs to be improved through flood studies and flood mapping in rural areas and to determine actions to reduce the risk of flooding.

This summary provides a list of studies for towns in rural areas and draft priorities for flood mitigation actions.

How to read the table below

The column to the left ranks flood risks (1: low, and 5: high), taking into account the possible damage from different sized floods and how often they are expected to happen. The measure of the yearly average cost of floods is known as Annual Average Damage (AAD).

The two columns in the centre of the table show:

- Flood studies that have been (or soon will be) completed for towns in your local government area.
- Recommendations from these studies that have been implemented (or are under way) and other relevant comments or observations.

The columns to the right of the table show DRAFT priority rankings [Low (L), Medium (M), High (H) and No Action (-)] for actions that reduce risk of flooding such as:

- Mitigation works (e.g. levees, retardation basin, and floodways)
- Flood warning systems (e.g. flood watch, flood warning broadcasts and action plans)
- Land use planning (e.g. flood overlay control in planning schemes)
- Municipal flood emergency plans (developed by council, VICSES and other agencies with flood-management responsibilities)

Please review this summary and provide feedback by:

- attending one of the community sessions being held across the catchment during February; or
- completing the feedback form on the website www.gbcma.vic.gov.au

Terminology

Annual Average Damage (AAD), expressed in dollar terms, is the average damage per year that would occur in a particular area from flooding over a very long period of time. This provides a basis for comparing the economic effectiveness of different projects. For more information on risk assessment methodology, please see the Regional Floodplain Management Strategy section of the website.

Annual Exceedance Probability (AEP) is the likelihood of occurrence of a flood of given size or larger occurring in any one year.

FloodSafe is a whole community program designed to prepare and empower the community with the skills and knowledge to appropriately prepare for, respond to, and recover from floods.

Municipal Flood Emergency Plan (MFEP) is a plan prepared and maintained by each municipal council, under the *Emergency Management Act 1986*, which identifies the municipal resources available, and how they are to be used, for flood prevention, response and recovery.

Regional Floodplain Management Strategy (RFMS) (under development) will replace the previous regional strategy (2002) and aims to help manage flood risk by seeking community input to prioritise where flood knowledge needs to be improved. The priorities will be detailed in a rolling three-year regional work plan that can be used by local communities to secure funding for various flood management activities.

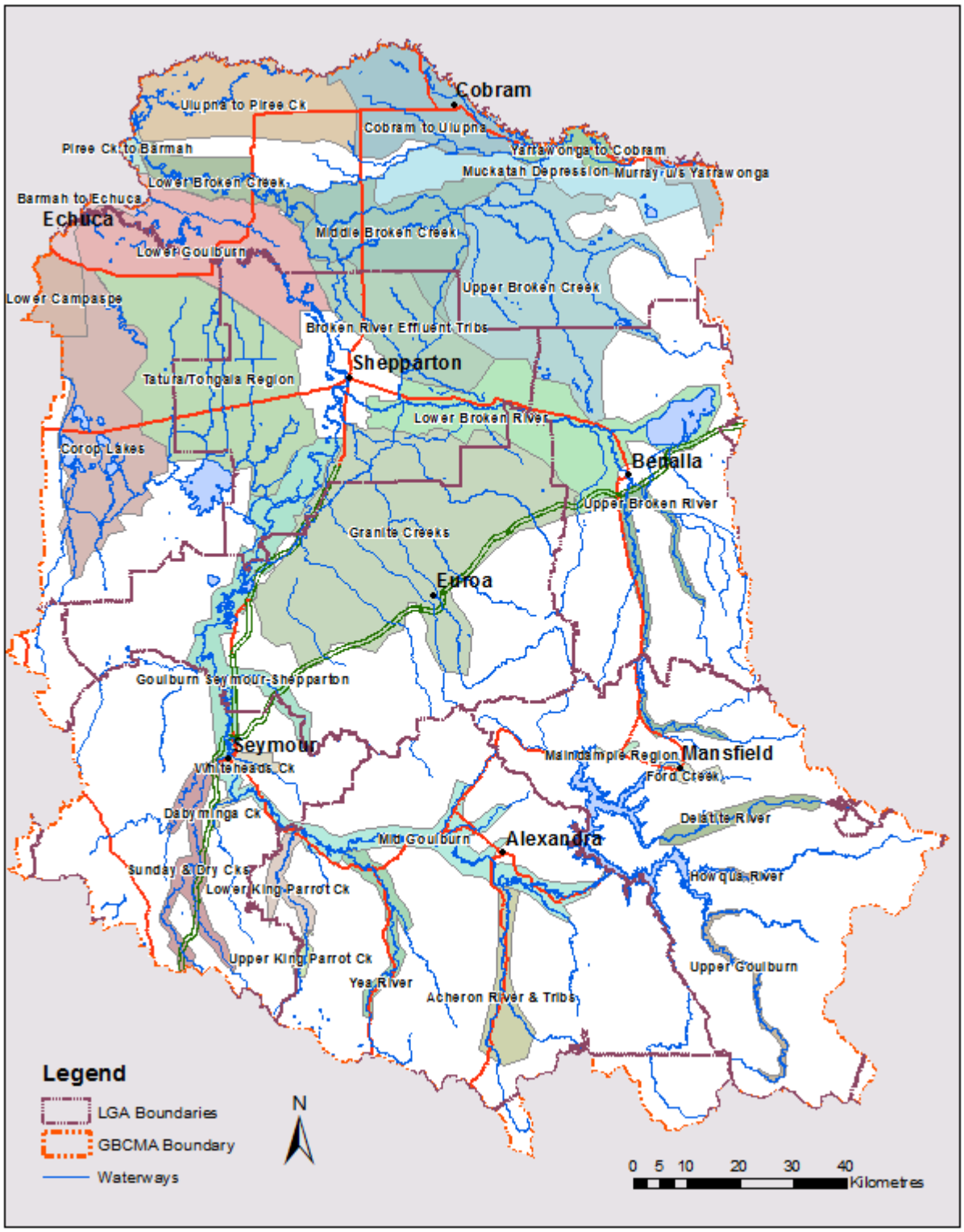

Figure 1. Showing rural study areas

Table 2. Rural study areas risk assessment (ranking 1: low, and 5: high)
Draft priority rankings for stakeholder discussion: Low (L), Medium (M), High (H) and No Action (-)

Name	AAD	Summary of past and existing studies	Summary of implemented study recommendations (Other comments)	Mitigation Works	Total Flood Warning System	Land Use Planning	Municipal Flood Emergency Plans
Broken Creek							
Broken Effluent Tributaries (Pine Lodge, Daintons, Congupna Guilfus & O'Keefe Creek)	5	• Documentation and Review of the 1993 Victorian Floods Volume 4 (Hydro Technology, 1995)	• Flood overlay controls exist in the planning scheme based on flood information from 1993, which is a reference flood for the 1% AEP flood • MFEP updated for towns within the regional area (Congupna and Tallygaroopna) • A regional flood study is unlikely to improve flood knowledge for the 1% AEP type flood. However, it may be warranted to explore flooding patterns for a range for flood magnitudes to improve flood intelligence and mapping warning information	-	M	L	M
Lower Broken Creek	5	• Documentation and Review of the 1993 Victorian Floods Volume 4 (Hydro Technology, 1995) • Broken Creek Management Strategy Part 1 - 2 volumes (Sinclair Knight Merz, 1996) • Broken Creek Management Strategy Part 2 - 2 volumes (Sinclair Knight Merz, 1996) • Nathalia Floodplain Management Plan (SMEC Victoria, 2005) include regional mapping from Walshs Bridge to Narioka • Nathalia Floodplain Management Study (SMEC, 2005)	• New mapping to be incorporated into the planning scheme. • Inventory of levees completed in 2005 as part of Nathalia Floodplain Management Study • Regional mapping between Narioka and the Murray River could be carried out but considered a low priority. • Implication of flood warning to Nathalia will be of a benefit to downstream areas regional areas to the Murray.	-	M	H	H
Mid Broken Creek	5	• Broken Creek Management Strategy Part 1 - 2 volumes (Sinclair Knight Merz, 1996) • Broken Creek Management Strategy Part 2 - 2 volumes (Sinclair Knight Merz, 1996) • Numurkah Floodplain Management Study – Includes regional mapping from Broken Creek Katamatite to Walshs Bridge stream gauges (Water Technology, ongoing)	• Flood overlay controls exist in planning schemes that require updating • New flood height prediction services are currently being explored by the BoM to Numurkah • Draft MFEP has been prepared	H	H	H	H
Muckatah Depression	3	• Documentation and Review of the 1993 Victorian Floods. Volume 4 – Broken River (HydroTechnology, 1995) • Broken Creek Management Strategy Part 1 - 2 volumes (Sinclair Knight Merz, 1996) • Broken Creek Management Strategy Part 2 - 2 volumes (Sinclair Knight Merz, 1996)	• Flood overlay controls exist in planning scheme • Could carry out a rural flood study to better define flood intelligence and mapping • See further comments in the “Upper Broken Creek”	-	L	L	L

Name	AAD	Summary of past and existing studies	Summary of implemented study recommendations (Other comments)	Mitigation Works	Total Flood Warning System	Land Use Planning	Municipal Flood Emergency Plans
Broken Creek (cont.)							
Upper Broken Creek	4	• Broken Creek Management Strategy Part 1 - 2 volumes (Sinclair Knight Merz, 1996) • Broken Creek Management Strategy Part 2 - 2 volumes (Sinclair Knight Merz, 1996)	• A regional study is required that will include numerous townships – refer to Moira Shire risk assessment for "urban centres" • Stream gauge exist in Tungamah • The 1996 Study highlights land management practices has altered drainage within the region. Land management practices needs to be managed • Rural drainage plan required to address both drainage and water quality (not necessary part of the floodplain management strategy)	-	M	H	M
Broken River							
Lower Broken River	5	• Documentation and Review of the 1993 Victorian Floods Volume 4 (Hydro Technology, 1995)	• Flood mapping is poor downstream of Benalla to Stewarton • New flood study required to improve flood intelligence and mapping. This would provide information of flow patterns (including flow distribution into both the upper and lower Broken Creek study areas, and provide intelligence for flood warning and emergency management	-	L	H	H
Upper Broken River	2	• Some rural flood mapping and flood level capture • Design Flood Hydrology for the Goulburn and Broken River Catchments (Jacobs, ongoing)	• This rural study area includes Holland Creek • Some flood overlay controls exist in planning schemes • A regional flood intelligence and flood mapping study is required, which can include the towns outlined in the "urban centres" Note the assessment of urban centre at a regional rural scale may provide preliminary insight before deciding to carry out a full flood study	-	M	H	M
Goulburn System							
Acheron River	2	• Acheron River Flood Hydrology Study (BMT WBM, ongoing)	• Some flood overlay controls exist in the planning scheme but based on limited information • Stream gauge is established in Buxton with flood prediction services provided by BoM	-	L	H	L

Name	AAD	Summary of past and existing studies	Summary of implemented study recommendations (Other comments)	Mitigation Works	Total Flood Warning System	Land Use Planning	Municipal Flood Emergency Plans
Goulburn System (cont.)							
Corop Lakes	5	• Corop Lakes Scoping Study (GHD, 2012)	• Flood overlay controls exist in the planning. Minor improvements could be included east of Colbinabbin. • Flood warning arrangements between GMW and community are in place	-	-	L	L
Dabyminga Creek	1	• Tallarook Flood Study (GB CMA, 2008) extends into this regional area	• Flood mapping required to be updated in the planning scheme • New regional flood study may be carried out but should be extended to include Tyaak and Reedy Creek • No current buildings known to be at risk to over floor flooding	-	L	H	L
Delatite River	2	• Design Flood Hydrology for the Goulburn and Broken River Catchments (Jacobs, ongoing) • Desktop flood mapping completed for 2016 flood overlays using limit recorded peak 2010 flood level and LiDAR ground information	• Regional flood study required to improve flood intelligence and flood mapping utilising hydrologic data from current Jacobs study	-	L	L	M
Ford Creek	1	• Mansfield Flood Intelligence and Mapping Study (GB CMA, 2014) • Design Flood Hydrology for the Goulburn and Broken River Catchments (Jacobs, ongoing)	• Regional flood mapping required to improve flood intelligence and mapping to assist with future long-term growth around Mansfield	-	L	H	M
Seymour to Shepparton	5	• Documentation and Review of the 1993 Victorian Floods. Volume 1 – Summary Report (Hydro Technology, (1995) • Declaration of 1% AEP flood level	• Flood mapping exists in planning schemes but found to be inaccurate in some areas • Requires regional flood study including operations of Nagambie Weir	-	M	M	M
Granite Creeks	5	• Granite Creeks Regional Flood Study (Water Technology, ongoing)	• Flood overlay mapping exist in planning schemes • Planning schemes will need to be updated following completion of the regional flood study	-	L	M	M
Howqua River	1	• Design Flood Hydrology for the Goulburn and Broken River Catchments (Jacobs, ongoing)	• Regional flood modelling required following the completion of design hydrology report	-	L	L	L

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Goulburn System (cont.)							
Lower Goulburn	5	• Inquiry into the Lower Goulburn River (Parliamentary Inquiry, 1968) • Lower Goulburn Floodplain Management Study – 2 volumes (Cameron McNamara (1987) • Documentation and Review of the 1993 Victorian Floods Volume 5 (Hydro Technology, 1995) • Lower Goulburn Waterway and Floodplain Management Plan – 2 volumes (Sinclair Knight Merz, 1996) • Lower Goulburn Levee Audit (SMEC, 1998) • Lower Goulburn Business Case Summary (PricewaterhouseCoopers, 1998) • Lower Goulburn Modified Findlay Scheme (SMEC, 1999) • Lower Goulburn Floodplain Rehabilitation Scheme – 2 Volumes (Water Technology, 2005) • Rural Levee Assessment (Water Technology, 2013)	• Flood mapping products exist that should be integrated into planning schemes. • A flood intelligence map exists relative to the Shepparton and McCoys Bridge river gauges. • The Lower Goulburn Floodplain Rehabilitation Scheme project was abandoned in 2005 following no funding agreement • Requires community workshop to specifically address its willingness to re-examine management options including operation and maintenance costs associated with the lower Goulburn levees • Flood warning arrangements are in place at the Shepparton Gauge that provides adequate warning to the lower Goulburn. Also, Goulburn Murray Water has arrangements in place for those within the Loch Garry Flood Protection District	M	-	H	H
Lower King Parrot Creek	1	• Nil • 1% AEP flood levels has been estimated based on a limited number of recorded peak flood levels. Rural flood.	• Flood overlay controls exist in the planning scheme, based on limited information. • A regional flood study would improve flood intelligence and mapping. Ground LiDAR exists that would be used to carry out such a study • The area is mostly rural in nature with pockets of rural living along the creeks	-	L	L	L
Maindample Region	1	• Nil	• Flood mapping was carried out by on-site inspections around Maindample • Inspection of aerial photograph indicate few buildings within the rural areas that surrounds Maindample • A regional flood study is not considered warranted	-	-	-	-

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Goulburn System (cont.)							
Mid Goulburn	5	• Goulburn Broken Flood Atlas of 1% AEP flood contours (GB CMA, 2005) • Memo - Eildon to Murchison Flood Mapping Project (Water Technology, 2015) • Total Flood Warning System	• Flood overlay controls exist in planning schemes that requires updating • Flood Atlas requires updating • Total Flood Warning System implemented in 2000 with forecasts to Seymour. Community guides were also prepared • Review flood guides to new FloodSafe format	-	M	H	M
Sunday & Dry Creeks	1	• Some rural flood mapping and peak flood level capture • No detailed flood studies	• Some flood overlay control exist in the planning scheme • This regional study area would include the townships of Wandong, Heathcote Junction, Kilmore East, Coulson Crossing, Waterford Park and Broadford	-	H	H	H
Tatura/ Tongala Region	5	• Flooding of Tongala-Stanhope Irrigation District – March 1950	• The nature of flooding is largely contained within a series of depression systems • Flood overlay controls exist in planning schemes • A regional flood study is not warranted as it would be unlikely to provide any significant new flood knowledge	-	L	L	L
Upper Goulburn	1	• Design Flood Hydrology for the Goulburn and Broken River Catchments (Jacobs, ongoing)	• This area is between Jamieson to Woods Point • Regional flood study could be carried out using hydrologic data from study	-	M	M	M
Upper King Parrot Creek	1	• Flowerdale Flood Study – Flood Intelligence and Mapping (GB CMA, 2014)	• Flood overlay controls exist in planning schemes, but should be updated to reflect flood study findings • MFEP should also reflect study findings • Flood warning requirements needs to be explored	-	M	H	H
Whiteheads Creek	1	• Whiteheads Creek Flood Study (Cardno, ongoing)	• Flood mapping controls exist in the planning scheme • The current study includes overland flood mapping • Flood warning is less than 6 hours. A local warning system needs to be explored	-	H	H	H
Yea River	1	• Yea Flood Study (Water Technology, 2005) • 1% AEP flood levels are currently estimated by adding a margin (determined by NRE) to historic profiles of a moderate flood.	• Regional Flood Study would greatly improve flood intelligence and mapping	-	l	M	M

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Murray System							
Barmah to Echuca	4	• Murray River Floodplain Management Study (GHD, 1986) • Lower Goulburn Floodplain Rehabilitation Scheme (Water Technology, 2005) • 1% AEP Flood Contour Atlas available	• Stream gauges are established in Barmah and Echuca with flood class levels • Flood overlay controls exist in planning schemes, but needs to be updated with new mapping from the 2005 study • The regional study area includes Echuca Village and Lower Moira (Woodbine Drive) • Further work around flood warning products would be useful	-	M	L	M
Cobram to Ulupna	5	• Murray River Floodplain Management Study (GHD, 1986) • Murray River Regional Floodplain Study – Dicks/Seppelts levees to downstream of Ulupna Creek Confluence Study Report (Water Technology, 2011) • Rural Levee Assessment (Water Technology, 2013)	• Flood overlay controls exist in the planning scheme, but needs to be updated with new information • A number of stream gauges exist where the BoM will issue flood warnings. Need to review MFEP for regional study area in light of 2016 floods – document weak levees • Require community workshop to specifically address its willingness to examine a project to include operation and maintenance costs of the rural levees	M	M	H	M
Piree Creek to Barmah	1	• Murray River Floodplain Management Study (GHD, 1986) • Barmah-Millewa Hydrodynamic Model (Water Technology 2005) • Rural Levee Assessment (Water Technology, 2013)	• Flood overlay control exists in the planning scheme • Extend the Murray River Regional Floodplain Study from Ulupna to Barmah to improve flood intelligence and mapping • Require community workshop to specifically address its willingness to examine a project to include operation and maintenance costs of the rural levees	-	M	L	M
Ulupna to Piree Creek	3	• Murray River Floodplain Management Study (GHD, 1986) • Rural Levee Assessment (Water Technology, 2013)	• Join this regional study area with Murray Piree Creek to Barmah				
Upstream of Yarrawonga	1	• Murray River Floodplain Management Study (GHD, 1986)	• Flood overlay control exists in planning scheme • This section of the river is mostly within the confines of Lake Mulwala • Regional flood study would be unlikely to bring substantial new flood knowledge	-	L	L	L
Yarrawonga to Cobram	2	• Murray River Floodplain Management Study (GHD, 1986) • No detailed flood study exists	• Flood overlay control exists in the planning scheme • Flooding is largely confined within the Murray Valley until Cobram East • Regional flood study required to gained flood intelligence and mapping	-	H	M	H