City of Wodonga

Flood and Storm Emergency Plan

A Sub-Plan of the Municipal Emergency Management Plan

For the City of Wodonga
And
VICSES Wodonga Unit

Version 2.0
Reviewed September 2024

VICTORIA
State Government

SES

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Acknowledgment of Traditional Owners

The City of Wodonga Municipal Emergency Management Planning Committee respectfully acknowledges the Traditional Owners of the land and waters of the City of Wodonga. We pay our respects to Elders past, present and emerging.

Authority

The plan has been prepared in accordance with and complies with the requirements of the EM Act 2013 including having regard to the guidelines issued under section 77, *Guidelines for Preparing State, Regional and Municipal Emergency Management Plans* and was endorsed by the City of Wodonga Municipal Emergency Management Planning Committee as a sub-plan to the Municipal Emergency Management Plan.

Authorised and published by

Authorised and published by the Victorian Government Melbourne December 2024.

If you would like to receive this publication in an accessible format please email emergencyplanning@emv.vic.gov.au. This document is also available in PDF format at emv.vic.gov.au.

Document information

Date of REMPC approval 12 December 2024.

Distribution of MFSEP

Once endorsed and signed the, MFSEP should be distributed to all MFSEP committee members, MEMPC Chair, council, MEMO, Deputy MEMO, Representatives from; BoM, CMA, DEECA, Parks Victoria, Ambulance Victoria, Department of Transport and Planning (VicRoads), DFFH, relevant utilities, MERC, RERC, Police station, VICSES Units, VICSES Regional office, FRV district office, FRV stations, CFA brigades, CFA regional office.

Document Transmittal Form / Amendment Certificate

This Municipal Flood and Storm Emergency Plan (MFSEP) will be amended, maintained and distributed as required or every 3 years facilitated by VICSES in consultation with the Municipal Emergency Management Planning Committee (MEMPC)

Suggestions for amendments to this Plan should be forwarded to VICSES Regional Office via VICSES Hume Regional Office 64 Sydney Road, Benalla, Victoria 3672.

Amendments listed below have been included in this Plan and updated as a new version.

Amendment Number	Date of Amendment	Amendment Entered By	Summary of Amendment
0.1	Jan 2016	S. Schneider	Initial draft based on discussions with the council and NECMA
0.2	July 2016	P. Leddy	Update details for the council
0.3	January 2017	C. Sexton	Input VICSES Information
0.4	January 2018	T. Loffler/ C. Sexton	Input Flood intelligence and Flood study data. Albury (union Bridge gauge and Doctors Point gauge comparison data for flood impacts – Gateway Island
0.5	May 2018	P. Leddy	Updates from Julian Skipworth Water Technology and COW
0.6	Oct 2018	C. Sexton	Final draft and Wodonga Unit input to operations
0.7	May 2019	C. Sexton	Inclusion of specific actions, flash flood information and May 2019 Flash flood
1.0	August 2019	P. Leddy/ C. Sexton	SES Amendments
1.1	May 2024	C. Sexton	MFSEP review. Addition of Storm Risk, updated Emergency management arrangements, input data from recent flood events
1.2	August 2024	C Sexton	Amendments & MEMPC submission
2.0	September 2024	S. Richter	Amendments from MEMPC Feedback, update relief facilities, clarify levees on House Creek and Final Version

This Plan will be published on the VICSES website at www.ses.vic.gov.au/get-ready/your-local-flood-information located with the associated local flood guide, and City of Wodonga website.

List of Abbreviations & Acronyms

The following abbreviations and acronyms are used in this Plan			
AAR	After Action Review	**ICC**	Incident Control Centre
AEP	Annual Exceedance Probability	**ICP**	Incident Control Point
AHD	Australian Height Datum (the height of a location above mean sea level in metres)	**IIA**	Initial Impact Assessment
AIDR	Australian Institute of Disaster Resilience	**IMS**	Incident Management System
AIIMS	Australasian Inter-service Incident Management System	**IMT**	Incident Management Team
AoOCC	Area of Operations Control Centre/Command Centre	**JSOP**	Joint Standard Operations Procedure (as issued by the Emergency Management Commissioner)
ARI	Average Recurrence Interval	**LSIO**	Land Subject to Inundation Overlay
ARMCA NZ	Agricultural & Resource Management Council of Australia & New Zealand	**MEMO**	Municipal Emergency Management Officer
AV	Ambulance Victoria	**MEMP**	Municipal Emergency Management Plan
BoM	Bureau of Meteorology	**MEMPC**	Municipal Emergency Management Planning Committee
CEO	Chief Executive Officer	**MERC**	Municipal Emergency Response Coordinator
CERA	Community Emergency Risk Assessment	**MEMO**	Municipal Emergency Management Officer
CFA	Country Fire Authority	**MFSEP**	Municipal Flood and Storm Emergency Plan
CMA	Catchment Management Authority	**MFEPC**	Municipal Flood Emergency Planning Committee
DEECA	Department of Energy, Environment and Climate Change	**MRM**	Municipal Recovery Manager
DFFH	Department of Families, Fairness and Housing	**PMF**	Probable Maximum Flood
DH	Department of Health	**RAC**	Regional Agency Commander
DJSIR	Department of Jobs, Skills, Industry and Regions	**RCC**	Regional Control Centre
EA	Emergency Alert	**RDO**	Regional Duty Officer
EMCOP	Emergency Management Common Operating Picture	**RERC**	Regional Emergency Response Coordinator

EMLO	Emergency Management Liaison Officer	**RERCC**	Regional Emergency Response Coordination Centre
EMT	Emergency Management Team	**REMP**	Regional Emergency Management Plan
EMV	Emergency Management Victoria	**ROC**	Regional Operations Command
ERC	Emergency Relief Centre	**SAC**	State Agency Commander
ERV	Emergency Recovery Victoria	**SBO**	Special Building Overlay
DTP	Department of Transport and Planning	**SCC**	State Control Centre
FO	Floodway Overlay	**SDO**	State Duty Officer
FRV	Fire Rescue Victoria	**SEMP**	State Emergency Management Plan
IEMT	Incident Emergency Management Team	**SEWS**	Standard Emergency Warning Signal
IC	Incident Controller	**SOP**	Standard Operations Procedures

Part 1. Introduction

1.1. Approval and endorsement

The City of Wodonga MEMPC is the owner of this Municipal Flood and Storm Emergency Plan (MFSEP), pursuant to Part 6A of the Emergency Management Act 2013 (as amended).

In accordance with its roles and responsibilities set out in the State Emergency Management Plan (SEMP), the Victoria State Emergency Service (VICSES) has prepared this plan in collaboration with the City of Wodonga MEMPC and partner agencies.

This MFSEP is a sub plan to the City of Wodonga Municipal Emergency Management Plan (MEMP). It is consistent with the SEMP and the Victorian Floodplain Management Strategy (2016).

The plan is also consistent with and subordinate to:

- SEMP Flood Sub-Plan, SEMP Storm sub-plan
- the Hume Region Emergency Management Plan
- The Hume Region Flood Sub-Plan, and Hume Regional Storm Sub-Plan

This MEMPC prepared this plan in alignment with the Guidelines for Preparing State, Regional and Municipal Emergency Management Plans.

It also takes into account the outcomes of the Community Emergency Risk Assessment (CERA) process undertaken by the Municipal Emergency Management Planning Committee (MEMPC).

This MFSEP is a result of the cooperative efforts of the MFSPC and its member agencies.

This Plan is endorsed by the City of Wodonga MEMPC as a sub-plan to the MEMP.

To ensure this plan has both endorsement and approval, refer to the certificate of assurance.

The MFSPC, through the MEMPC has consulted with the following people and organisations about the arrangements contained within this plan:

- The sitting community representatives of the City of Wodonga MEMPC.
- The VICSES Wodonga Unit.
- The North East Catchment Management Authority.
- North East Water
- Agencies represented on the City of Wodonga MEMPC.

1.2. Certificate of assurance

Plan Preparer: The Victoria State Emergency Service prepared this sub-plan on behalf of the Municipal Emergency Management Planning Committee

I certify that the attached sub-plan complies with the requirements of the *Emergency Management Act 2013,* including having regard to any relevant guidelines issued under section 77 of that Act, to the extent outlined in the attached checklist.

The MEMPC last conducted a review of the plan on 26 November 2024.

On behalf of the Municipal Emergency Management Planning Committee:	**On behalf of the Victoria State Emergency Service (VICSES)**
D Vlekkert Dena Vlekkert Chair, Municipal Emergency Management Planning Committee 20/12/2024	 Cameron Rothnie Assistant Chief Officer - Unit Support, Emergency Management, Community Engagement, VICSES Eastern Region 30/09/2024

1.3. Purpose and scope of this flood/storm emergency plan

The purpose of this MFSEP is to detail the arrangements for managing a flood emergency before, during and after it occurs or potentially occurs within the City of Wodonga.

As such, the scope of the Plan is to:

- identify the local flood and storm risk.
- support the implementation of mitigation and planning measures to minimise the causes and impacts of flooding.
- detail emergency management arrangements.
- identify linkages with local, regional and state emergency planning arrangements with a specific emphasis on those relevant to flood.

1.4. How to read this plan

This is a sub-plan and therefore should be read in conjunction with the:

- SEMP, SEMP flood Sub-plan and SEMP Storm Sub-plan
- Hume REMP
- City of Wodonga MEMP

1.4.1. Linkages and hyperlinks

This plan refers to a range of existing resources relating to floods/storms, including documents and websites. This plan does not seek to duplicate the information contained in these resources and instead provides links to where the reader can obtain further information.

For more operational or sensitive information, a log-in may be required, such as for documents saved on the Emergency Management Common Operating Picture (EM-COP), including Joint Standard Operating Procedures (JSOPs).

Documents or resources that are referred to frequently throughout this plan (such as the SEMP) may not hyperlinked in each instance.

All hyperlinks were accurate at time of publication and currency of the linked content remains the responsibility of the host agency.

1.5. Requirements of EMP guidelines

Emergency Management Victoria has published guidelines for preparing emergency management plans including municipal plans. In accordance with section 3.1 (Requirements) this plan has been:

- prepared collaboratively, efficiently and effectively (section 60AA(1))
- is consistent with other existing in force EMPs and where possible not duplicate or conflict with those plans (section 60AC)1
- has adopted an integrated, coordinated and comprehensive approach to emergency management (sections 60AD, 60ADA and 60ADB)
- • contain arrangements for mitigation, response, and recovery plus roles and responsibilities (section 60AE)

- Has been assured, approved and published every three years, or more frequently if required (sections 60AG, 60AH, and 60AI).

1.6. Municipal Flood & Storm Planning Committee (MFSPC)

Membership of the City of Wodonga Flood Planning Committee (MFPC) comprises of the following representatives from the following agencies and organisations:

- chairperson - VICSES Operations Officer Emergency Management
- VICSES Wodonga Unit Controller
- City of Wodonga (Municipal Emergency Management Officer & Emergency Management Coordinator)
- Victoria Police (Municipal Emergency Response Coordinator)
- North East Catchment Management Authority (CMA)
- North East Water
- Agencies represented on the City of Wodonga MEMPC
- NSWSES
- Local community representatives appointed to the City of Wodonga MEMPC

1.7. Responsibility for planning, review & maintenance of this plan

To remain effective and to place the community at centre of its planning, the MEMPC must ensure it maintains the MFSEP.

VICSES through the MFPC has responsibility for facilitating the preparation, review, maintenance and distribution of this plan.

The MFPC will meet at least once per year, Usually through the MEMPC.

The MEMPC will ensure that the MFPC review the plan following:

- a new flood study
- a significant change in flood mitigation measures
- after the occurrence of a significant flood event within the municipality
- three years elapsing after the last review.

1.8. Community consultation in developing or review of the plan

The MEMPC via the MFSPC has undertaken community consultation on this plan via the following mechanisms:

- Direct engagement with specific community groups including:
    - Albury-Wodonga Ethnic Communities Council (AWECC)
    - Volunteer Emergency Service personnel
    - Local community representatives appointed to the City of Wodonga MEMPC

The consultation process occurred between 16 August 2024 and 20 September 2024 and was advertised by the following methods:

- Direct feedback to the draft version of the flood and storm plan to VICSES and the MEMPC.
- Face to face invites and sit down for information and intelligence gathering.

After consulting with the community, the MFSPC received 2 submissions and made 5 amendments to reflect feedback that it received.

Part 2. Before Prevention and preparedness arrangements

2.1. Community engagement and awareness for all types of storms and flooding

Upon formal adoption by the MEMPC the community will have access to the details of this MFSEP via:

- The Victora State Emergency Service (VICSES) website

VICSES with the support of the City of Wodonga and North East CMA will coordinate targeted community flood engagement programs within the council area.

2.2. Structural flood mitigation measures

Structural flood mitigation measures are any physical construction to reduce or avoid possible impacts of flood hazards, or the application of engineering techniques or technology to achieve flood hazard resistance and resilience in structures or systems[1]. The following is a summary of structural flood mitigation measures that exist within the Council area:

- **Levees**
  - Sanctuary Boulevard Levee adjacent House Creek downstream of Yarralumla Drive in Wodonga. - This is an earth levee providing flood protection to 1% AEP level (+freeboard) to low-lying land and associated houses (approximately 26 properties). The levee is owned and maintained by the City of Wodonga. Refer to Appendix F – Maps
  - South Albury (NSW) levee – The majority of the levee (protecting South Albury) has approximately 0.5m freeboard above 1% AEP levels; however, localised sections have lesser freeboard (upgrade under consideration by Albury City Council 2019)
  - Cypress Court and Park Lane contain a small number of houses (approximately 10 in total) exposed to external or above floor flooding. These properties back onto a section of House Creek. Two houses flood above floor in the 1% AEP event on Cypress Court. Levees have been discussed in the past as a possible mitigation measure, however this has not been implemented.
- **Retarding basins**
  - Retention and re-use ponds constructed within Wodonga Racecourse in 2008/2009 provide some flood storage to mitigate peak flows from the White Box Rise development in the 145ha upstream catchment of Jack in the Box Creek. The storage mitigates post-development two year ARI flow to pre-development level. Flows larger than 20% AEP (2 year ARI) bypass the storage ponds. The Bandiana railway embankment downstream of the racecourse also serves as a de-facto retarding basin.
- **Dams**
  - Lake Hume on the Murray River upstream of Albury-Wodonga stores water for irrigation purposes. While the storage alters the seasonality of downstream flows and may impact on the passage of small, frequent floods, it is not principally operated to mitigate downstream flooding and large floods are only partially regulated. Lake Hume can store incoming floodwaters when the

[1] United Nations Office of Disaster Risk Reduction

lake is at a low level; however, when the storage is full or near full, flood inflows must be passed downstream with little attenuation.

Refer to appendix C for detailed information of structural flood mitigation measures.

2.3. Non-structural flood mitigation measures

Non-structural flood mitigation measures re measures not involving physical construction which use knowledge, practice or agreement to reduce disaster risks and impacts, in particular through policies and laws, public awareness raising, training and education. The following are a summary of non-structural flood mitigation measures in the municipality.

2.3.1. Planning controls

City of Wodonga has a Planning Scheme in place to evaluate planning applications for all types of development in the municipality. This is undertaken by the council's Statutory Planning Team.

The Planning Ordinance in place ensures that any development on areas prone to flooding are adequately assessed by the Planning Team:

1.1 To identify waterways, major floodpaths, drainage depressions and high hazard areas which have the greatest risk and frequency of being affected by flooding.
2.1 To ensure that any development maintains the free passage and temporary storage of floodwater, minimises flood damage and is compatible with flood hazard, local drainage conditions and the minimisation of soil erosion, sedimentation and silting.
3.1 To reflect any declarations under Division 4 of Part 10 of the ***Water Act, 1989*** **if a declaration has been made.**
4.1 To protect water quality and waterways as natural resources by managing urban stormwater, protecting water supply catchment areas, and managing saline discharges to minimise the risks to the **environmental quality of water and groundwater.**
5.1 To ensure that development maintains or improves river and wetland health, waterway protection and flood plain health.

City of Wodonga has available mapping systems to provide overlays for Floodways and Land Subject to Inundation to efficiently assess areas at risk.

2.3.2. Exercising the plan

The MEMPC is responsible for arranging for the exercising of this plan, which should occur annually. Ideally, the MEMPC will schedule the exercise shortly prior to the highest risk period for flooding.

2.3.3. Flood intelligence

Flood intelligence supports decision making and planning for flooding by providing reliable and accurate information relating to:

- the expected level, depth, and velocity of floodwater and its consequences

determination of actions to be undertaken in response to the identified consequences.

DELWP maintains the FloodZoom flood intelligence platform. Inquiries regarding FloodZoom access should be directed to accounts@floodzoom.vic.gov.au.

2.3.4. Flood warning

The SEMP Flood Sub Plan (www.ses.vic.gov.au/em-sector/vicses-emergency-plans) and on the Bureau of Meteorology (BoM) website www.bom.gov.au, detail the arrangements for BoM issued Flood Watch and Flood Warning products.

Details on Warnings issued by VICSES through VicEmergency and VICSES channels are outlined in Appendix E.

2.3.5.Local knowledge

Local knowledge is a critical element of planning. The community and other organisations can provide valuable local information about hazards, incidents and how they may evolve. This information is commonly referred to as local knowledge. This plan aims to ensure that planners and responders capture appropriate local knowledge before, during and after incidents.[2]

Field Observers provide local knowledge to VICSES and the Incident Control Centre regarding local insights and the potential impacts and consequences of an incident and may assist with the dissemination of information to community members.

As an incident escalates from local control to a larger incident management structure, it is essential that local knowledge capability is retained within the overall structure. This should include how local subject matter experts are embedded in to divisional and sector command structures.

Refer to Appendix G **– Local knowledge arrangements** for details of the local knowledge arrangements for the municipality.

[2] VICSES Policy 10.02 Local Knowledge V4.0

Part 3. During Response / relief arrangements

3.1. Introduction

3.1.1. Activation of Response

VICSES may be notified of storm and flood incidents through several sources, but the most common source is calls received via 132 500 or if the emergency is life threatening, Triple Zero (000). Other sources are via other emergency management agencies and local government including the Bureau of Meteorology Flood warnings. In most cases, these events are of a small scale (a level 1 incident[3]), which local VICSES units manage without significant outside support.

In the case of more significant level 2 (regional level) or level 3 (an incident that has high complexity and may have statewide implications) Flood and storm response arrangements may be activated by the Regional Duty Officer (RDO) VICSES Hume Region or Regional Agency Commander (RAC).

The VICSES Incident Controller (IC)/RDO/RAC will activate agencies as required as documented in the SEMP Flood sub-plan or SEMP Storm sub-plan.

3.1.2. Responsibilities

There are a number of agencies with specific roles that will act in support of VICSES and provide support to the community in the event of a serious flood or storm within the City of Wodonga. These agencies will be engaged through the IEMT.

The general roles and responsibilities of supporting agencies are as agreed within the: MEMP, SEMP role statement and SEMP Flood sub-plan - and Regional Flood Emergency Plan.

For flood events, agreed roles/actions of supporting agencies are located in Appendix C.

Appendix I lists the roles and capabilities of other agencies when assisting VICSES to respond to storm events.

3.1.3. Municipal Emergency Coordination Centre or equivalent

If established, liaison with the emergency coordination centre will be through the established Division/Sector Command and through Municipal involvement in the IEMT, in particular the Municipal Emergency Response Coordinator (MERC). The VICSES RDO, ROC or ICC will liaise with the centre directly if they have not established division or sector command arrangements.

The function, location, establishment and operation of an emergency coordination centre if relevant will be as detailed in the MEMP.

3.1.4. Escalation

Many flood or storm incidents are of local concern and an appropriate response can usually be coordinated using local resources. However, when these resources are exhausted, the State's arrangements provide for further resources to be made available, firstly from neighbouring municipalities (on a regional basis) and then on a state-wide basis.

Resourcing and event escalation arrangements are described in the SEMP.

[3] For a detailed definition of the levels of incidents, refer to Table 3 Levels of Incidents within the State Emergency Management Plan.

3.2. State emergency management priorities

The State Emergency Management Priorities shall form the basis of incident action planning processes.

3.3. Command control coordination consequences communication and community

Arrangements in this MFSEP must be consistent with the 6 C's detailed in SEMP, the State and Regional Flood Emergency Sub-Plans and the MEMP. For further information, refer to the Emergency management phases in the SEMP and a one page summary on the 6 C's.

Specific details of arrangements for this plan are to be provided in Appendix C.

3.3.1. Control

Sections 5(1)(b) and 5(1)(c) of the *Victoria State Emergency Service Act 2005* detail the authority for VICSES to plan for and respond to storms and floods.

The Role Statement within the SEMP identifies VICSES in its response functions as the Control Agency for flood and storm. It identifies DEECA as the Control Agency responsible for dam safety as well as reticulated water and wastewater (sewerage) service.

All flood and storm response activities within the City of Wodonga including those arising from a dam failure or retarding basin / levee bank failure incident will therefore be under the control of the appointed Incident Controller, or delegated representative.

3.3.2. Incident Controller (IC)

On the advice of the Bureau of Meteorology (BoM) or other reliable source, that a flood or storm event will occur or is occurring, VICSES as the control agency will appoint an Incident Controller (IC). The IC is typically from VICSES but may be from another agency when resources are constrained. The IC will lead and manage incident-tier response control including:

- controlling the operational elements of the response
- providing operational leadership during the incident at a static location or a dynamic incident, including the tactical resolution.

The IC responsibilities are as defined in the SEMP. While providing support to the IC, support agencies retain command of their own people.

3.3.3. Incident Control Centre (ICC)

As required, the IC will establish an Incident Control Centre (ICC). The ICC is where they manage the incident response command and control functions from. The IC will make the decision to activate the ICC and when it should commence operations. The ICC may be activated in advance based on the severity of warnings and in accordance with VICSES readiness arrangements:

VICSES readiness and activation levels - flood

VICSES readiness and activation levels – severe weather

Pre-determined ICC locations are:

Incident Level	Location	ICC Location	Facility owner	Key contact

2	VICSES Hume Region Office - Benalla	64 Sydney Rd, Benalla	VICSES	Benalla SES ICC 9256 7799 or RAC
3	CFA District 23 Headquarters	1 Ely Street, Wangaratta	CFA	Wangaratta ICC 5720 2300 or CFA Duty Officer
3	CFA District 24 Headquarters	55 Moorefield Park Drive, Wodonga	CFA	Wodonga ICC (02) 6043 4400 or CFA Duty officer

3.3.4. Regional Operations Command (ROC)

A ROC is a location where members in the roles of VICSES RDO and VICSES RAC operates for VICSES Control Agency incidents at Readiness and Activation Level 2 or where significant resource support is required in support of another Class 1 or 2 agency/department.

The activation of a ROC is designed to support line of Command including Level 1 Incident Controllers functioning from ICPs.

ROCs are not in Line of Control, but the RAC will keep Line of Control informed of the potential for Transfer of Control.

Dependent on the type of incident, a ROC could be established within the EM Region at:

- A VICSES Office.
- The Regional Control Centre (RCC).
- A suitable VICSES Unit not within the impact area.
- A suitable other agency facility.

It is important to ensure that the location selected for the ROC is safe, suitable for the incident, and has sufficient access and egress.

3.3.5. Divisions and Sectors

To ensure that effective Command and Control arrangements are in place, the IC may establish Divisions and sectors depending upon the complexity of the event and resource capacities.

The location of Divisions and Sectors are chosen based on their suitability for maintaining operations during a flood and may differ from those used in other types of emergencies. The IC may establish Divisions and Sectors at the following locations to assist with the management of flooding within the Municipality:

Division	Sector
VICSES Wodonga LHQ – 172 Victoria Cross Parade, Wodonga	VICSES Wodonga LHQ – 172 Victoria Cross Parade, Wodonga
VICSES Wangaratta LHQ – 36 Handley Street, Wangaratta	VICSES Wangaratta LHQ – 36 Handley Street, Wangaratta

3.3.6. Maintenance of local knowledge and subject matter expertise in Divisions and Sectors

The plan recognises that personnel operating division and sector command points will often be from an agency that is not VICSES (the control agency) and may lack local knowledge associated with the nature of storms or flooding, and what resources are best deployed to certain types of requests for assistance.

3.3.7. Incident Management Team (IMT)

The Incident Controller will form an Incident Management Team (IMT) to support the IC in managing the incident-tier operational response to the emergency. This includes the functional areas of planning, intelligence, public information, operations, investigation, logistics and finance functions. Where possible, the IMT will be joint-agency, pre-planned and include personnel with relevant local knowledge.

For more detail, refer to the SEMP on IMTs and Incident Management Systems (IMSs).

3.3.8. Incident Emergency Management Team (IEMT)

The IC will establish a multi-agency Incident Emergency Management Team (IEMT) to support the IC in managing the effects and consequences of the flood or storm emergency.

The IEMT consists of key personnel (with appropriate authority) from stakeholder agencies and relevant organisations who need to be informed of strategic issues related to incident control. They can provide the IC with high level strategic guidance and policy advice for consideration in developing incident management strategies.

Organisations, including the City of Wodonga required within the IEMT will provide an Emergency Management Liaison Officer (EMLO) to the ICC if and as required as well as other staff and / or resources identified as being necessary, within the capacity of the organisation.

The MERC or the appointed Control Agency Incident Controller can request EMLO's from relevant agencies and organisations as required.

For more detail refer to the SEMP for guidance on IEMTs.

3.3.9. On Receipt of a Flood Watch / Severe Weather Warning

SES SOP008 Severe Weather Notification and Activation Process and SES SOP009 Flood Notification and Activation Process outline in detail the actions that VICSES will undertake upon receipt of a Severe Weather Warning or Flood Watch/Flood Warning.

The following are links to the current VICSES readiness:

VICSES readiness and activation levels - flood

VICSES readiness and activation levels – severe weather

Additionally, the VICSES Regional Duty Officer and Regional Agency Commander (until an incident controller is appointed) or IC will undertake actions as defined within the flood intelligence cards (**Appendix C**). General considerations by the IC/VICSES RDO will be as follows:

- Review flood intelligence to assess likely flood consequences.
- Monitor weather and flood information using the range of intelligence tools including– www.bom.gov.au and Melbourne Water Rainfall and river levels.
- Assess Command and Control requirements.
- Review local resources and consider needs for further resources regarding personnel, property protection, flood rescue and air support. Keeping in mind geographic extent of warning area and the potential for resource constraints if there may be wide-ranging effects across the region or state.
- Notify and brief appropriate officers. This includes Regional Control Centre (RCC) (if established), State Control Centre (SCC) (if established), Council, other emergency services through the EMT.

Assess ICC readiness (including staffing of IMT and IEMT) and open if required.

Ensure flood warnings and community information is prepared and issued to the community where required.

Flood (Riverine and flash) Warnings are managed by the RDO/RAC.

Severe Weather/ Thunderstorm warnings are managed by SDO/SAC.

Develop media and public information management strategy.

Monitor watercourses and undertake reconnaissance of low-lying areas (consider field observers).

Ensure flood mitigation works are being checked by owners.

Develop and issue incident action plan, if required.

Develop and issue situation report, if required.

3.3.10. On Receipt of the First and Subsequent Flood Warnings

VICSES RDO (until an incident controller is appointed) or IC will undertake actions as defined within the flood intelligence cards **(Appendix C).** The IC/VICSES RDO will have general regard for the following considerations:

Develop an appreciation of current flood levels and predicted levels. Are floodwaters rising, steady, peaking or falling?

Review flood intelligence to assess likely flood consequences.

Consider What areas may be at risk of:

- inundation
- isolation
- indirect affects as a consequence of
  - power
  - gas
  - water
  - telephone
  - internet
  - sewerage
  - health
  - transport
  - emergency service infrastructure interruption.

Consider the characteristics of the populations at risk.

Determine what the ‘at-risk’ community need to know and do, as the flood develops.

Warn the ‘at-risk’ community including ensuring that an appropriate warning and community information strategy is implemented including details of:

- the current flood situation
- flood predictions
- what the consequences of predicted levels may be
- public safety advice
- who to contact for further information
- who to contact for emergency assistance

Liaise with relevant asset owners as appropriate (such as water, power utilities, telecommunications)

Implement response strategies as required based upon flood consequence assessment.

Continue to monitor the flood situation – www.bom.gov.au/vic/flood/.

Continue to conduct reconnaissance of low-lying areas.

Liaise with relevant flood mitigation infrastructure managers.

3.4. Community information and warnings including media comms

Guidelines for the distribution of community/public information and warnings are contained in the VICSES Hume Region storm and flood emergency sub-plans and state flood and storm emergency sub-plans.

Refer to **appendix J** for more details on public information and warnings for the municipality.

The IC, through the Public Information Unit established at the ICC, will manage media communication. If the ICC is not established, the VICSES RDO will manage all media communication. The City of Wodonga Council will work with the IC/VICSES RDO to assist with the dissemination of public messaging and/or warnings to ensure that consistent and timely messaging occurs.

3.5. Initial Impact assessment

In accordance with the SEMP and SEMP flood sub-plan (3.6.11 Initial impact assessment), the IC should initiate an initial impact assessment during the first 48 hours of an emergency. It should capture the nature and scale of the flood impact on people, community infrastructure, and the economic, natural, and built environments, in order that emergency relief and early recovery activities can commence. This information may then be used to provide the basis for further needs assessment and recovery planning by Emergency Recovery Victoria (ERV) and recovery agencies.

Agencies that typically support initial impact assessment in the municipality are:

- Fire Rescue Victoria
- The City of Wodonga

3.6. Preliminary deployments to flooding

When flooding is expected to be severe enough to cut access to towns, suburbs and/or communities the IC will consult with relevant agencies to ensure that resources are in place if required to provide emergency response. These resources may include but not limited to emergency service personnel, food items and non-food items such as medical supplies, shelter, assembly areas, relief centres.

3.7. Response to flash flooding

Flash flooding can be defined as flooding that occurs within six hours or less of the flood-producing rainfall within the affected catchment. This may result in isolation of individuals and communities as time to warn and respond to flash flooding is limited[4]. The safest place to be in a flash flood is well away from the affected area. Accordingly, pre-event planning for flash floods should commence with

[4] AFAC Emergency Planning and Response to Protect Life in Flash Flood Events – Guideline v2.0

an assumption that evacuation is the most effective strategy, provided evacuation can be safely implemented.

Emergency management response to flash flooding should be consistent the SEMP Storm Sub-Plan.

When conducting pre-event planning for flash floods the following steps should be followed, and in the order as given:

Determine if there are barriers to evacuation by considering warning time, safe routes and resources available.

If evacuation is possible, then evacuation should be the adopted strategy and it must be supported by a public information capability and a rescue contingency plan.

Where it is likely people will become trapped by floodwaters due to limited evacuation time or options the IC needs to ensure they provide safety advice to people at risk. This advice should advise people not to attempt to flee by entering floodwater. If people become trapped, it may be safer to seek the highest point within the building and to telephone 000 if they require rescue.

where this plan has identified buildings that are known to be structurally unsuitable, the plan needs to provide for an earlier evacuation trigger (return to step 1 of this cycle).

If an earlier evacuation is not possible then the IC must make specific preparations to rescue occupants trapped in structurally unsuitable buildings either pre-emptively or as occupants call for help.

Contact the Wodonga MERC and MEMO at the earliest opportunity to allow for relief preparation to commence.

Due to the rapid development of flash flooding it will often be difficult, to establish relief centres ahead of actually triggering the evacuation. While this is normal practice it should not be used as a reason for not adopting evacuation.

Refer to **Appendix C** for response arrangements for flash flood events.

3.8. Evacuation for all flooding

Where practical, evacuation is the primary strategy for ensuring the safety of at-risk communities. The purpose of evacuation is for people to relocate temporarily from areas at risk of the consequences of flooding, to places of safety. It is essential to assess risks involved in undertaking an evacuation, as evacuation may not always be the most appropriate action. This will ensure that people are not exposed to more hazardous environments because of their evacuation, for example, travelling through deep, fast-flowing floodwater[5].

Under the SEMP, Victoria Police (VicPol) has the responsibility for evacuation (Evacuation Manager) – in consultation with the control agency and other expert advice. EMV has developed a standardised procedure for evacuation under JSOP J03.12.

The IC decides whether to warn people to evacuate within a specified timeframe or whether it is necessary to advise them to evacuate immediately. The IC must make this decision having regard for the requirements of the JSOP.

Once the IC makes a decision to recommend evacuation, VicPol's Evacuation Manager is responsible for the management of the evacuation process where possible. VICSES and other agencies will assist where practical. VICSES is responsible for the development and communication of evacuation warnings.

[5] AUSTRALIAN DISASTER RESILIENCE HANDBOOK COLLECTION Flood Emergency Planning for Disaster Resilience - **First edition 2020**

VicPol and/or Australian Red Cross may take on the responsibility of registering people affected by a flood emergency including those who have been evacuated.

Refer to **Appendix D** of this Plan and the MEMP for additional local evacuation considerations for the municipality.

Except in limited circumstances, evacuation is not compulsory in Victoria[6]. Recent historic floods that were managed under current legislation and emergency management arrangements, demonstrated that some people will choose not to evacuate. Therefore, this plan must consider arrangements for managing these people in the event they require assistance or rescue.

Considerations include:

- Registering persons who intend not to evacuate.
- Providing additional information that may assist them in making a decision to evacuate.
- Identifying vulnerable people who may be willing to evacuate if assisted.

3.9. Flood rescue

Under the SEMP Response table 9 the control agency for rescue from land and water is VicPol, which operates the Rescue Coordination Centre. VICSES is a support agency for search and rescue on land and water evacuations and incidents involving mass casualties.

VICSES may conduct flood rescues. Appropriately trained and equipped VICSES units or other agencies that have appropriate training, equipment and support may carry out rescues.

Rescue operations may be undertaken where voluntary evacuation is not possible, has failed or is considered too dangerous for an at-risk person or community. An assessment of available flood rescue resources (if not already done prior to the event) should be undertaken prior to the commencement of Rescue operations.

Rescue is considered a high-risk strategy to both rescuers and persons requiring rescue and should not be regarded as a preferred emergency management strategy. Rescuers should always undertake a dynamic risk assessment before attempting to undertake a flood rescue.

Victoria Police Rescue Coordination Centre should be notified of any rescues that occur: (03) 9399 7500. On occasion, VicPol may opt to respond a field capability of its rescue coordination centre to a location near the emergency. It may also work with the Triple Zero Victoria to deploy its dispatch capability to the same location to enhance rescue coordination and dispatch. Details in this plan may assist VicPol and Triple Zero Victoria in undertaking this function in the field or from the primary rescue coordination centre.

The following resources are available within the City of Wodonga to assist with rescue operations:

Resource type	Unit / resource name	Location	Activation
		Victorian Resources	

[6] Powers to compel evacuation rely on the Minister making a declaration of a State of Disaster under section 23(2)(e) of the Emergency Management Act 1986. However, section 23(7) prevents these powers be used to compel a person to evacuate if they have a pecuniary interest in the land or building or goods or valuables on the land or in the building.

Boat	Wodonga Rescue Boat - RB507	VICSES Wodonga LHQ - 172 Victoria Cross Parade, Wodonga	Via Triple Zero '000' or VICSES Hume RDO via SES Dispatch 1800 899 927
Boat	Wodonga Rescue Boat - RB583	VICSES Wodonga LHQ - 172 Victoria Cross Parade, Wodonga	Via Triple Zero '000' or VICSES Hume RDO via SES Dispatch 1800 899 927
Land Based Swift Water Rescue Kit	LBSWR Kit – Wodonga	VICSES Wodonga LHQ - 172 Victoria Cross Parade, Wodonga	Via Triple Zero '000' or VICSES Hume RDO via SES Dispatch 1800 899 927
Aircraft	Various	Various	Via Police and State Air Desk
NSW Resources			
Boat	NSWSES Boat – ABX741	NSWSES Albury Unit – 1 Hoffmann Road, Thurgoona NSW	NSWSES Southern Zone Duty Officer – (02) 4247 8098 Heads up to Albury Unit Commander via Wodonga Unit
Boat	NSWSES Boat – H21	NSWSES Albury Unit – 1 Hoffmann Road, Thurgoona NSW	NSWSES Southern Zone Duty Officer – (02) 4247 8098 Heads up to Albury Unit Commander via Wodonga Unit
Boat	NSWSES Boat – M28	NSWSES Albury Unit – 1 Hoffmann Road, Thurgoona NSW	NSWSES Southern Zone Duty Officer – (02) 4247 8098 Heads up to Albury Unit Commander via Wodonga Unit
Land Based and In-Water Rescue Kit	Various Kit including inflatable Ark Angle Rescue Raft	NSWSES Albury Unit – 1 Hoffmann Road, Thurgoona NSW	NSWSES Southern Zone Duty Officer – (02) 4247 8098 Heads up to Albury Unit Commander via Wodonga Unit
Boat	VRA Boat – VRA785	Albury VRA Unit - 398 Kiewa Street, Albury NSW	RFSFCC (Rural Fire Service Fire Control Centre) on 1800 268 747
Boat	VRA Boat – VRA786	Albury VRA Unit - 398 Kiewa Street, Albury NSW	RFSFCC (Rural Fire Service Fire Control Centre) on 1800 268 747
Boat	VRA Boat – VRA787	Albury VRA Unit - 398 Kiewa Street, Albury NSW	RFSFCC (Rural Fire Service Fire Control Centre) on 1800 268 747

NOTE: While NSW resources are listed in the above table, it should be noted that a significant flood event impacting on the Wodonga region will also likely be impacting the NSW side of the Murray River, and consequently the NSW resources listed above may not necessarily be available due to being used in NSW.

Known high-risk areas/communities (such as low-lying islands) where rescues might be required include:

- Gateway Island and the causeway between Albury & Wodonga.
- Richardsons Bend Campground (Murray River), Access off Moss Rd Barnawartha North
- Island Road, Bonegilla, Access via NSW
- Whytes Rd, Bonegilla

3.10. Aircraft management

Aircraft can be used for a variety of purposes during flood operations including evacuation, resupply, reconnaissance, intelligence gathering and emergency travel.

The IC controls the conduct of Air support operations.

The IC may request aircraft support through the State Air Desk located at the SCC. The Air Desk Supervisor will establish priorities.

Suitable airbase facilities are located at:

Airbase name	Type of facility (such as fixed wing/rotary wing capability)	Location
Albury Airport	Wing/rotary wing capability	121 Airport Drive, East Albury, NSW, 2640
Wangaratta Airport	Wing/rotary wing capability	Brian Higgins Drive, Laceby, VIC, 3678

3.11. Resupply

Communities, neighbourhoods or households can become isolated during floods and in some cases, storms. This can be as a consequence of road closures or damage to roads, bridges and causeways. Under such circumstances, the need may arise to resupply isolated communities/properties with essential items.

When predictions/intelligence indicates that communities, neighbourhoods and/or households may become isolated, VICSES will advise businesses and/or households that they should stock up on essential items.

After the impact, VICSES can support isolated communities through assisting with the transport of essential items to isolated communities and assisting with logistics functions.

Resupply operations are to be included as part of the emergency relief arrangements with VICSES working with the relief agencies to service communities that are isolated.

Communities or areas that are known to become isolated and have traditionally required resupply in a prolonged flood are listed in the table below. Generally, this community is self sufficient in times of flood with their own means of access. Intelligence should be sought to confirm this.

Community / locality	Size/number of residences	Location
Island Rd	5 or 6 residences	Island Rd, Bonegilla – Access via Waterworks Rd, Thurgoona, NSW

3.12. Essential community infrastructure and property protection

Essential community infrastructure and property such as residences, businesses, roads and utilities, may be affected in the event of a flood.

The City of Wodonga maintains a small stock of sandbags. The Council will use these sandbags for strategic asset protection. These are primarily for Council use on council assets. The IC can negotiate use of this stock with Council, however they may not be available for Emergency Services to utilise so should not be assumed to be available.

City of Wodonga Council can provide supplies of bulk sand, along with plant to assist with movement of sand, such as a load to top fill a sandbag machine.

Sandbag supplies are available through the VICSES Hume Regional Headquarters. The IC will determine the priorities related the use of sandbags, which will be consistent with the strategic priorities.

When planning for potential flood operations, the IC or Local VICSES Wodonga Unit should engage with the City of Wodonga to confirm stores and access to sandbags that they may have. s

The VICSES Operations Management Manual sets out the principles for sandbag use and allocation to the community. These principles do not apply to the use of sandbags by VICSES to construct and/or alter a levee. Refer to SOP036 Construction, Removal or Altering of Levee and Removal of Debris for further detail.

If VICSES sandbags are becoming limited in supply, then priority will be given to protection of essential community infrastructure. Other high priorities may include for example the protection of historical buildings.

Property may be protected by:

- Sandbagging to minimise entry of water into buildings.
- Encouraging businesses and households to lift or move contents.
- Construction of temporary levees in consultation with the CMA, LGA and VicPol and within appropriate approval frameworks.

The IC will ensure that owners of essential community infrastructure are kept advised of the flood situation. Essential community infrastructure providers must keep the IC informed of their status and ongoing ability to provide services.

Contact your local VICSES representative for the most current sandbag guidelines or download it from IMT Toolbox in EMCOP-Operations.

Refer to **Appendix C** for further specific details of essential infrastructure requiring protection and location of sandbag collection point(s).

3.13. Disruption to services

Disruption to services other than essential community infrastructure and property can occur in flood events. Refer to **Appendix C** for specific details of likely disruption to services and proposed arrangements to respond to service disruptions in the City of Wodonga.

3.14. Road closures

The City of Wodonga and Department of Transport and Planning (DTP/VicRoads) will carry out their formal functions of road closures including observation and placement of warning signs, road-blocks to its designated local and regional roads, bridges, walking/bike/shared trails. The City of Wodonga staff should also liaise with and advise DTP/VicRoads as to the need or advisability of erecting warning signs and/or of closing roads and bridges under its jurisdiction. DTP/VicRoads are responsible for designated main roads and highways and councils are responsible for the designated local and regional road network.

DTP/VicRoads and the City of Wodonga will provide community information direct to the public regarding road closures. Information will be updated on the VIC Traffic website: https://traffic.vicroads.vic.gov.au/

Refer to **Appendix C** for specific details of potential road closures.

3.15. Dam spilling/ failure

The Department of Energy, Environment and Climate Action (DEECA) is the control agency for dam safety incidents. This includes breach, failure or potential breach/failure of a dam. However, VICSES is the control agency for any resultant flooding.

The dam operators have developed dam safety emergency plans where it is applicable, which includes the Hume and Dartmouth Dam Safety Emergency Plans.

Major dams with potential to cause structural and community damage within the municipality are described in **Appendix A**.

3.16. Wastewater related public health issues and critical sewerage assets

Inundation of critical sewerage assets including septic tanks and sewerage pump stations may result in water quality problems within the municipality. Where this is likely to occur or has occurred, the responsible agency for the critical sewerage asset should undertake the following:

- Advise VICSES of the security of critical sewerage assets to assist preparedness and response activities in the event of flood.
- Maintain or improve the security of critical sewerage assets.
- Check and correct where possible the operation of critical sewerage assets in times of flood.
- Advise the ICC in the event of inundation of critical sewerage assets.

The responsible agency/s for critical sewage assets in the municipality are North East Water.

It is the responsibility of the City of Wodonga environmental health officer to inspect and report to the MEMO and the ICC on any water quality issues relating to flooding.

3.17. Access to technical specialists

VICSES manages contracts with private technical specialists who can provide technical assistance in the event of flood operations or geotechnical expertise. Refer to VICSES SOP061 for the procedure to engage these specialists.

3.18. Relief

Relief is the provision of assistance to meet the essential needs of individuals, families and communities during and in the immediate aftermath of an emergency.

As per the role statement for municipal councils within the SEMP, municipal councils are responsible for municipal relief coordination.

3.19. Activation of emergency relief

The IC is responsible for activating relief arrangements through the Municipal Recovery Manager (MRM). The decision to recommend the opening of an emergency relief centre sits with the IC.

The range and type of emergency relief services to be provided in response to a flood event will be dependent upon the size, impact, and scale of the flood or storm.

Refer to the SEMP Roles and Responsibilities - Relief for more detail of services that may be provided and the responsible coordinating agencies.

Suitable relief facilities identified for use during floods are detailed in **Appendix D** and/or the MEMP.

Details of the relief arrangements are available in the MEMP.

3.20. Animal welfare

Matters relating to the welfare of livestock and companion animals (including feeding and rescue) are to be referred to Department of Energy, Environment and Climate Action (DEECA) - Agriculture Victoria.

Requests for emergency supply and/or delivery of fodder to stranded livestock or for livestock rescue are passed to DEECA - Agriculture Victoria.

Matters relating to the welfare of wildlife are also to be referred to DEECA who has developed the Victorian Emergency Animal Welfare Plan.

Wodonga City also maintains a Wodonga Municipal Emergency Animal Welfare Plan that has been developed to achieve the efficient and effective management of animals, and co-ordinate animal welfare agencies before, during and after an emergency event.

Refer to **Appendix D** for animal shelter compound locations.

Part 4. AFTER: Emergency relief and recovery arrangements

4.1. General

As per the role statement for municipal councils within the SEMP, municipal councils are responsible for coordinating local level recovery activities. They are also the lead agency to coordinate post emergency needs assessment to determine long term recovery needs (Post Emergency Needs Assessment).

Arrangements for recovery from a flood and/or storm event within the City of Wodonga is detailed in the City of Wodonga MEMP and/or the Recovery Sub-plan.

4.2. Transition from response to recovery

The SEMP sets out the transition to recovery arrangements. During the response phase, the IC will ensure they develop a plan for transition from response to recovery. The IC at the municipal tier should take a lead role in facilitating transition to recovery, working with the MRM, as it marks the end of the response phase which the Controller leads and manages.

4.3. After action review – Lessons management

Lessons management is the critical process of learning from how we worked before and during an event, to improve the system for next time.

Depending on the size and scale of the flood event, VICSES will normally coordinate a debrief or after action review of flood operations as soon as practical following an event. Under the VicPol SEMP role statement, it is the responsibility of the Municipal Emergency Response Coordinator (MERC) to ensure that this occurs.

When the flood is being managed as a level 3 event, it may be that Emergency Management Victoria in consultation with VICSES assumes responsibility for debriefing.

All agencies involved in the flood incident should be represented at the debrief or after action review.

Appendix A - flood threats for City of Wodonga

Overview

This Appendix is to provide a broad overview of flood risk within the Municipality. Detailed Flood Risk Information for Individual Communities is be detailed in Appendix C.

- C1 – River System overview & Schematics (Kiewa & Murray Rivers)
- C2 – Lower Kiewa, Yackandandah Creek and Middle Creek Flood Emergency Plan
- C3 – Murray River and Gateway Island Flood Emergency Plan
- C4 – Wodonga urban waterways Flood Emergency Plan

General

The City of Wodonga is a major urban centre situated on the Murray River adjacent to what is referred to as the Twin City of Albury, New South Wales. Wodonga is strategically placed between Melbourne and Sydney on the Hume Highway in North East Victoria.

The municipality is 434km2 with the main population centre being Wodonga and adjacent developing urban areas of Killara and Baranduda, and the Bonegilla and Bandiana Military Areas. The Wodonga LGA is primarily urban development with a small fringe area of rural development. The surrounding land use is agricultural.

Wodonga has an annual rainfall of approximately 700mm. The climate experiences extremes of heat in summer and cold temperatures in winter.

Wodonga is located to the south of the Murray River floodplain approximately 20km downstream of Hume Dam. The Wodonga LGA includes the Murray River floodplain from Lake Hume to Barnawartha North approximately 35km (river length approximately 60km). Most of the urban area is located outside of the Murray River floodplain; however, Gateway Island (limited commercial and industrial development) is located within the floodplain and bounded by Wodonga Creek to the south and the Murray River to the north.

The Wodonga LGA also includes the following waterway reaches flowing through predominantly rural areas with limited development:

- The lower reaches of the Kiewa River (extending 24km from the southern boundary of the LGA to the confluence with the Murray River).
- The lower reaches of Yackandandah Creek (extending 7km from the boundary of the LGA to the confluence with the Kiewa River); and,
- The entire length of Middle Creek (approximately 20km length), which enters the Kiewa River a short distance upstream of Killara.

Within the urban area local flood impacts are associated with tributaries of the Murray River:

- Felltimber Creek – with a catchment of approximately 15km2 above the Hume Freeway. Approximately two thirds of the catchment is undeveloped lying to the south and west of the urban area. Within the urban area, Felltimber Creek flows primarily through a golf course and reserves and parks. Felltimber Creek passes beneath the Hume Freeway north of Wodonga TAFE to enter the Murray River floodplain near Sheathers Road.

- House Creek and tributary stream, Huon Creek – with a catchment area of approximately 70km2 extending to the south of the urban area. The upper catchment (approximately 55km2 above the urban area) is steep and rocky. House Creek flows primarily through parks and reserves within the urban area but impacts on dwellings at Cypress Court and Park Lane (between Brockley Street and Melbourne Road). House Creek passes beneath the Hume Freeway at Sumsion Gardens entering Wodonga Creek downstream of the Lincoln Causeway.
- Jack in the Box Creek – drains a small catchment (industrial and military land) south of Bandiana. Creekside reserves are narrow and some flood impacts on private property occur around and downstream of Thomas Mitchell Drive. Downstream of Lawrence Street, industrial land closely abuts the creek and flooding can impact industrial land. Jack in the Box Creek passes beneath the Hume Freeway near the Bandiana Link interchange to enter Wodonga Creek immediately upstream of the Lincoln Causeway.

Figure A1 – City of Wodonga LGA and major waterways (Built up areas in purple)

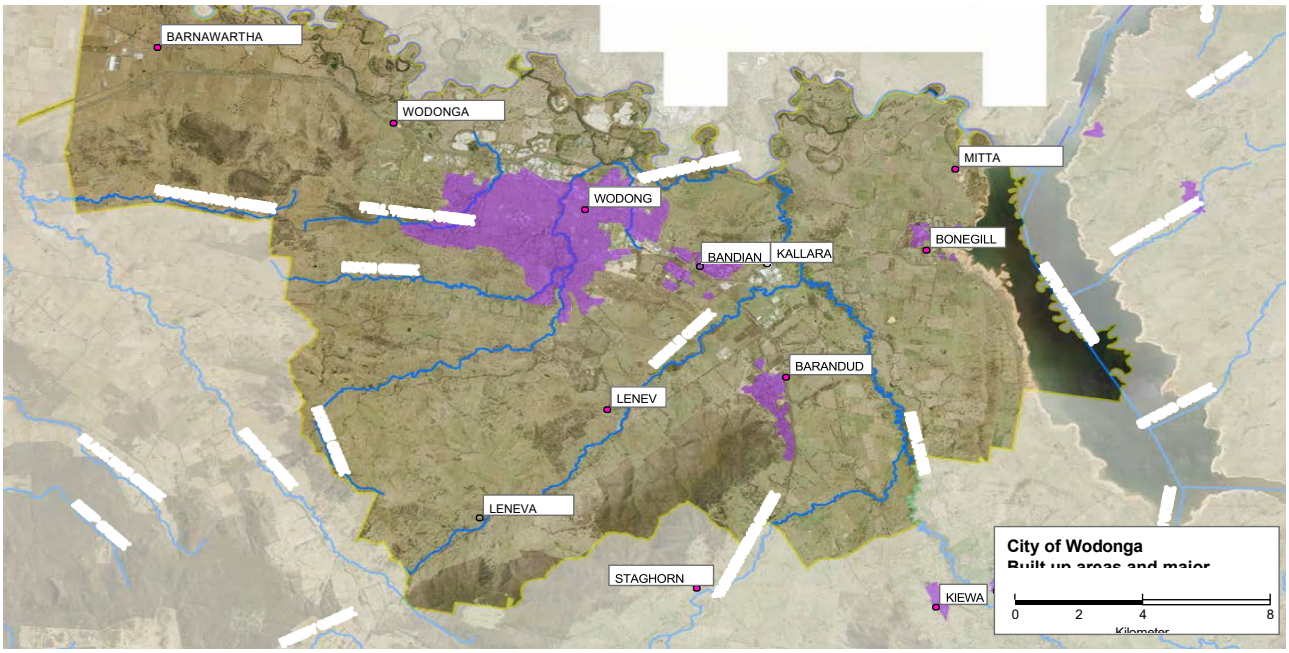


Figure A2 – Murray River Flood plain (1% AEP extent) at Wodonga

Historic Floods

The Following historic flood events of significance are identified from the Wodonga Municipal Emergency Management Plan (2024) and other sources (flood studies and historic records):

Table A1: Historic flood events and detail

Year	Waterway or Drain	Description
Nov 2022	Murray River	After 3 seasons of successive La Nina weather climate affects, wet catchments and full water storages in the Upper Murray and Mitta catchments, a tropical rain event totaling above 85mm at Albury in 48 hrs meant all water was passed through the Hume Dam and flooded the Murray River floodplain. Major level flooding of 5.5m was reached at the Albury Gauge which resulted in a number of businesses closing in Gateway Island, Isolation of rural properties on the Floodplain near Wodonga and sandbagging efforts to reduce impacts.
May 2019	Wodonga urban waterways	Flash flood event in Wodonga and Baranduda from a severe weather event resulting in heavy rainfall and debris flow. Baranduda received 93 mm of rain in the event with a precipitation rate of 19mm/hr at its peak intensity. Flash flooding affected 37 properties including fencing damage, driveways washed away and mud through houses. Seven homes were impacted with 1 determined uninhabitable. These homes were in the Barton Court and Platypus Place area of Baranduda, situated at the foot of the Baranduda Ranges. The terrain close to the homes was steep and had been the subject of recent fuel reduction burns which had cleared the vegetation fuel 90 to 95 % and resulted in debris flow into the properties.
Oct 2016	Murray & Kiewa Rivers	Moderate flood level (Union Bridge gauge) resulting from releases from Lake Hume along with moderate flooding in the Kiewa River. Approximate 10% AEP resulting in flooding over the majority of the width of the Murray River floodplain adjacent Wodonga and isolation of rural properties and local road closures. Sandbagging undertaken to north of Gateway Island buildings. Event resulted in pit instability issues for sand and gravel quarry at Sheathers Road, Wodonga and potential threat to gas main for Albury in neighboring easement. Flood photography available via NECMA
March 2012	Wodonga urban waterways	Significant local event for Wodonga urban waterways (118mm in 30 hours – approximately 2-5% AEP rainfall event, but lower AEP for critical short duration intensity, 247mm total rainfall over seven days).

Dec 2010	Wodonga urban waterways	Major rainfall in surrounding hills causing flooding of local creeks/urban waterways, including Middle Creek which overtopped the Kiewa Valley Highway and was estimated (GHD 2013) to be around 2% AEP in Middle Creek. Murray River flood levels highest since 2000 (at Albury). Record flood levels in Yackandandah Creek
Sep 1998	Kiewa River & Yackandandah Creek	Flooding in Kiewa River (nominal 40 year ARI event – GHD 2000 FDTP) and Yackandandah Creek.
Oct 1996	Murray River	Murray River flooding resulting from releases from Lake Hume to enable repair. Flood photography available via NECMA
Sept 1979	Middle Creek	Middle Creek flood event resulting from rainfall of 92mm over 16 hour period, approximately 5% AEP rainfall intensity, but dry catchment conditions reduced flood magnitude (GHD 2013 – Middle Creek flood study).
Sept/Oct 1975	Middle Creek, Kiewa River, Murray River	Flooding on Middle Creek, Kiewa River and Murray River. October 1975 event in the Murray River approximate 2% AEP. (GHD 2012
May/Oct 1974	Murray River	Flooding on Murray River approximately 30 year ARI in October (GHD 2012), surveyed historic flood marks on Kiewa River. Flood photography available for May event.
Various	Murray River	Numerous other significant events on the Murray River in June 1931, Oct 1917, 1870 & 1867.

Note regarding Average Recurrence Interval (ARI) and Annual Exceedance Probability (AEP)

The ARI and AEP are both a measure of the rarity of a rainfall / flood event.

What is ARI?

ARI is defined as:

"The average, or expected, value of the periods between exceedances of a given rainfall total accumulated over a given duration."

It is implicit in this definition that the periods between exceedances are generally random.

What is AEP?

AEP is defined as:

"The probability that a given rainfall total accumulated over a given duration will be exceeded in any one year."

How does AEP relate to ARI?

With ARI expressed in years, the relationship is:

$$AEP = 1 - \exp\left(\frac{-1}{ARI}\right)$$

which results in the following conversion table:

ARI (years)	AEP
1	0.632
2	0.393
5	0.181
10	0.095
20	0.049

ARI (years)	AEP
50	0.020
100	0.010

ARIs of greater than 10 years are very closely approximated by the reciprocal of the AEP.

Why use AEP instead of ARI?

The use of ARI can lead to confusion, particularly for members of the public, as ARI (for example 1 in 100 year) are sometimes misinterpreted as implying that the associated magnitude is only exceeded at regular intervals, and that they are referring to the elapsed time to the next exceedance. It is preferable, therefore, to express the rarity of a rainfall / flood event in terms of AEP. For example, *a rainfall total of 159mm falling in 3 hours at Wodonga has a 0.010 (i.e. 1%) probability of being equalled or exceeded in any one year,* can be easier to understand than the equivalent statement of *a rainfall total of 159mm in 3 hours has an average recurrence interval of 100 years.*

Within this MFSEP, there are references to both ARI and AEP, with AEP being the preferred convention.

Available flood magnitude and recurrence intervals are summarised in Table 1 and Table 2.

Table A2: Murray River historic flood events

Stream	Event	Flow (Union Bridge / Doctors Point)	Gauge level (Doctors Point)	Gauge level (Albury, Union Bridge)	ARI / AEP%	Source
Murray River	1870	268,000 ML/D	-	5.89	130 years	GHD 2012
Murray River	Oct 1917	241,000 ML/D	-	5.83	95 years	GHD 2012
Murray River	1867	225,000 ML/D	-	5.79	70 years	GHD 2012
Murray River	Oct 1975	200,000 ML/D	7.05	5.66	50 years (2% AEP)	GHD 2012
Murray River	Oct 1974	170,000 ML/D	6.93	5.59	30 years	GHD 2012
Murray River	Nov 2022	101,640 ML/D	6.55	5.51	TBC	Event records / MDBA
Murray River	Oct 1992	126,000 ML/D	6.61	5.4	12 years (10% AEP)	GHD 2012
Murray River	Oct 2016	117,000 ML/D	6.52	5.39	10 years (10% AEP)	Event records
Murray River	Oct 1996	108,000 ML/D	6.44	5.31	9 years (10% AEP)	GHD 2012

Table A3: Kiewa River historic flood events

Stream	Event	Flow Bandiana	Gauge Level Meters (Bandiana)	ARI / AEP%	Source
Kiewa River	Sep 1998	61,540 ML/D	3.58	45 years (2% AEP)	Event records / MDBA
Kiewa River	May 1974	45,200 ML/D	3.42	18 years (5% AEP)	
Kiewa River	Jul 1978	36,100 ML/D	3.32	10 years (10% AEP)	
Kiewa River	Dec 2010	35,300 ML/D	3.32	10 years (10% AEP)	
Kiewa River	Nov 2022	33,500 ML/D	3.33	10 years (10% AEP)	
Kiewa River	Sep 1975	30,900 ML/D	3.25		
Kiewa River	Oct 2016 / Sep 2010	26,800 ML/D	3.23		
Middle Creek	Dec 2010 Oct 2016		No Other Data		Event records

Riverine flooding

Within the municipality, large severe floods generally occur as a result of a moist warm airflow from northern Australia bringing moderate to heavy rainfall over a period of 12 hours or more following a prolonged period of general rainfall. The period of general rainfall “wets up” the catchments and (partially) fills both the on-stream dams and the natural floodplain storage. These combine to increase the runoff generated during the subsequent period of heavy rainfall.

Large but less severe floods result from sequences of cold fronts during winter and spring that progressively wet up the catchments and fill the on-stream dams and the natural floodplain storage. Prolonged moderate to heavy rain leads to major flooding.

Flash flooding and overland flows

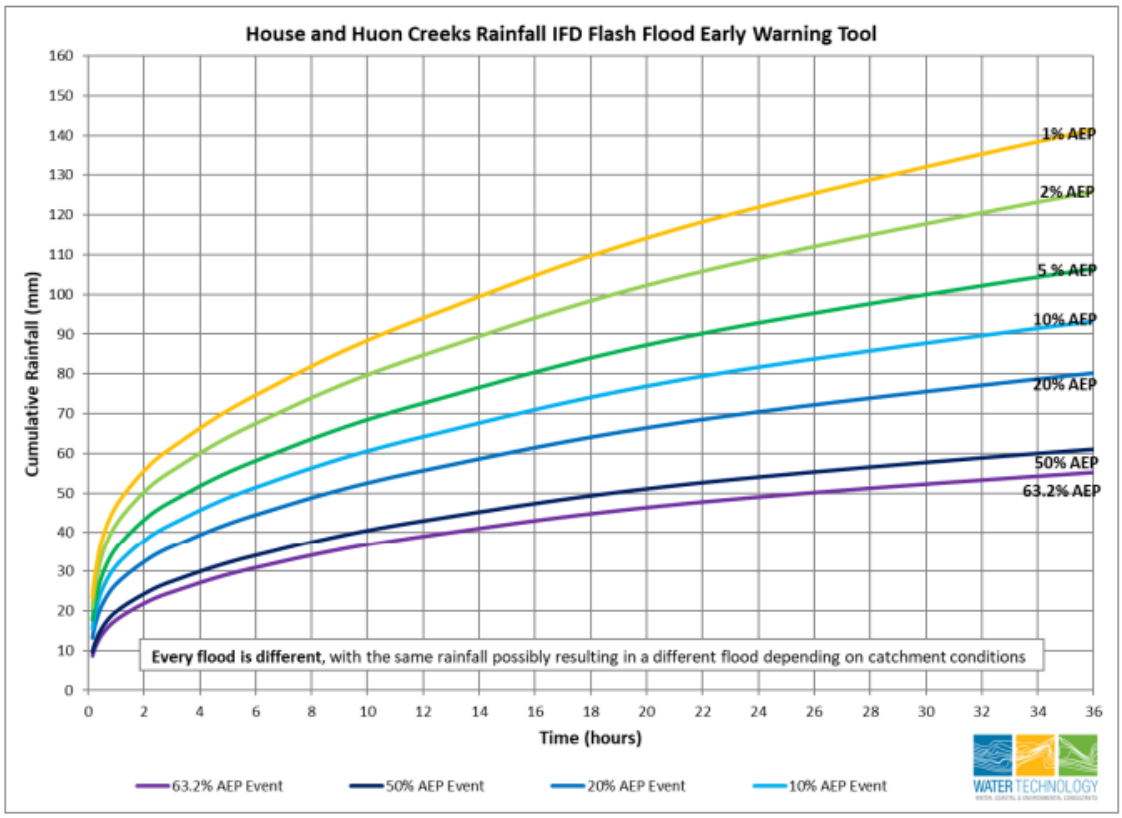
Short Duration, high intensity rainfall (usually associated with thunderstorms) can also cause localised flooding within the municipality, along overland flow paths when the local urban drainage system surcharges. Such events, which are mainly confined to the summer months, do not generally create widespread flooding since they only last for a short time and affect limited areas. Flooding from these storms occurs with little warning and localised damage can be severe.

High intensity rainfall such as associated with thunderstorms giving average rainfall rates of more than 20mm/hour for an hour or more is likely to lead to flash flooding and / or overland flows, across the urbanised parts of the municipality.

Blocked or capacity impaired stormwater drains can also lead to overland flows and associated flooding: the drain surcharges and excess water flows above ground.

The City of Wodonga has a history of flash flood events, surrounded by hills to the East, West and South and increases in housing estates and home in undulating terrain, heavy rainfall can often impact homes and waterways in steep catchments and impact the Wodonga Urban waterways overflowing in low lying areas and onto roads and drains. Data for House and Huon Creeks is below.

Figure A3 – House & Huon Creeks Flash Flood Early Warning Tool



Dam spilling or failure

Flooding resulting from spilling or failure of the following dams is likely to cause significant structural and community damage.

DEECA is the control agency for dam safety incidents (such as breach, failure or potential breach/failure of a dam). VICSES is however the control agency for any resultant flooding.

All major dams are subject to rigorous dam safety management programs implemented by the managing entity and are subject to Individual Dam Safety Emergency Management Plans (DSEPs). DSEPs identify possible dam safety scenarios and provide intelligence and inundation extents to assist in community information, notifications and warnings.

The major dams that may impact the municipality are Lake Hume and Lake Dartmouth. Smaller storages in the upper reaches Kiewa River system may also have localised impacts downstream.

Table A4: Major Dams and storages for the City of Wodonga

Location	Owner	Dam Height	Dam Capacity	Comments
Lake Hume	MDBA (State Water operator)	41.5 m (to FSL)	3,005 GL	Significant impact through Wodonga in the event of dam failure.

Lake Dartmouth	MDBA (GMW operator)	180 m	3,856 GL	Discharges to upper reaches of Lake Hume.
Rocky Valley	AGL Hydro	30.5 m	29.1 GL	Located in the upstream reaches of Kiewa River which enters the Murray River around 5km upstream of Wodonga. Significant attenuation expected upstream of Wodonga LGA.
Pretty Valley	AGL Hydro	8.2 m	350 ML	
Junction Dam (Lake Guy)	AGL Hydro	26 m	1,640 ML	
Clover Dam	AGL Hydro	20 m	250 ML	
Mt Beauty Regulating Storage	AGL Hydro	6.1 m	900 ML	

Quarries

There are significant floodplain quarries (sand and gravel) in operation on the Murray River floodplain adjacent Wodonga – specifically between Lincoln Causeway and Bidstrup Road. Some quarries have limited flood protection in the form of perimeter bunds or levees which restrict inflows typically up to approximately 10% AEP. The location of major quarries is shown below.

The two quarries on the floodplain North of Edwards Road are flooded from 10% AEP. Site WA 497 is approximately 200M south of the Murray River. The site is proposed to extend south towards the Edwards Road Quarry in the future. WA 474 is located on the Murray River Floodplain Adjacent to Edwards Rd, Hume Fwy and the Sydney - Melbourne Railway to the South and Sheathers Rd to the East. Felltimber Creek approaches the site from the South East as it enters the floodplain.

Based on the Murray Floodplain, this site is also exposed to flooding at a 10% AEP flood. The site has the main gas supply line running north/south through an easement between the two pits at the site and has high voltage power lines running East/West at the North of the quarry approximately 50M from the site. The north of the site is exposed to the floodplain and receives water there from a 10% AEP flood.

Figure A4 – Quarries located on Murray River Flood Plain, Wodonga

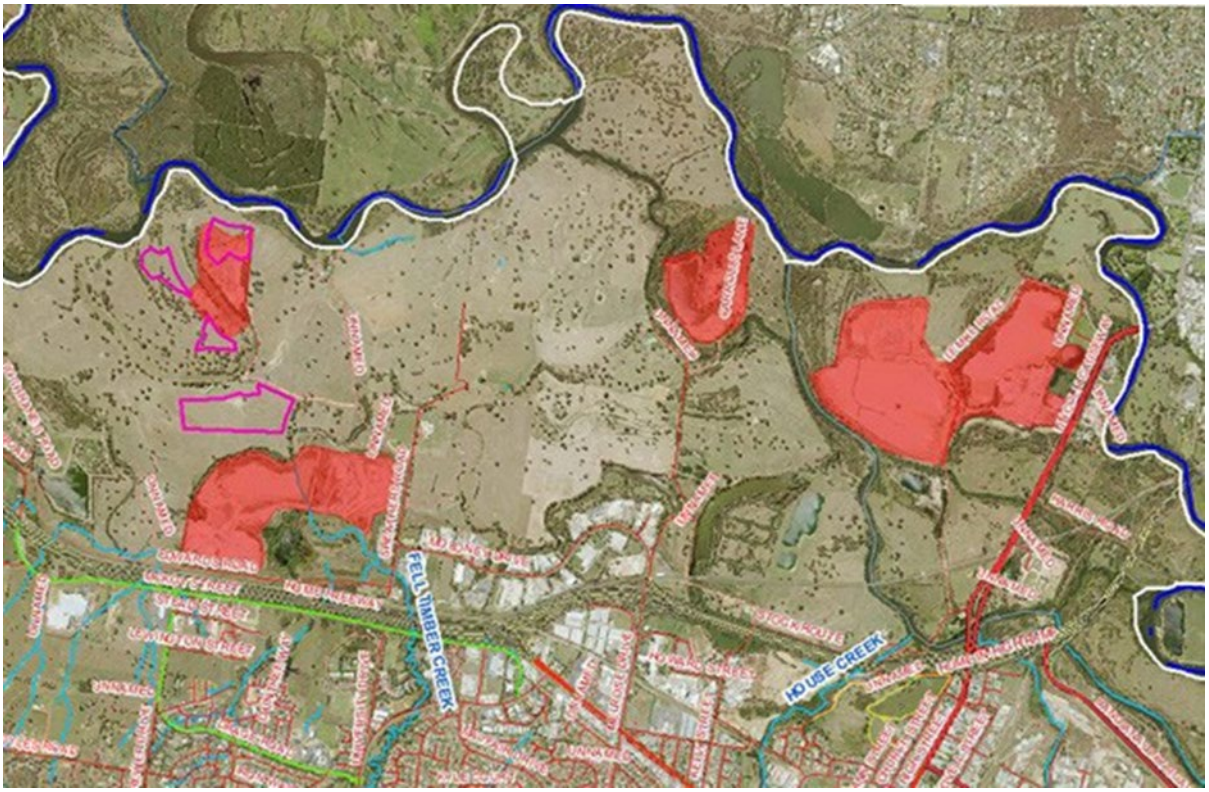


Figure A5 – City of Wodonga 1% AEP flood extent

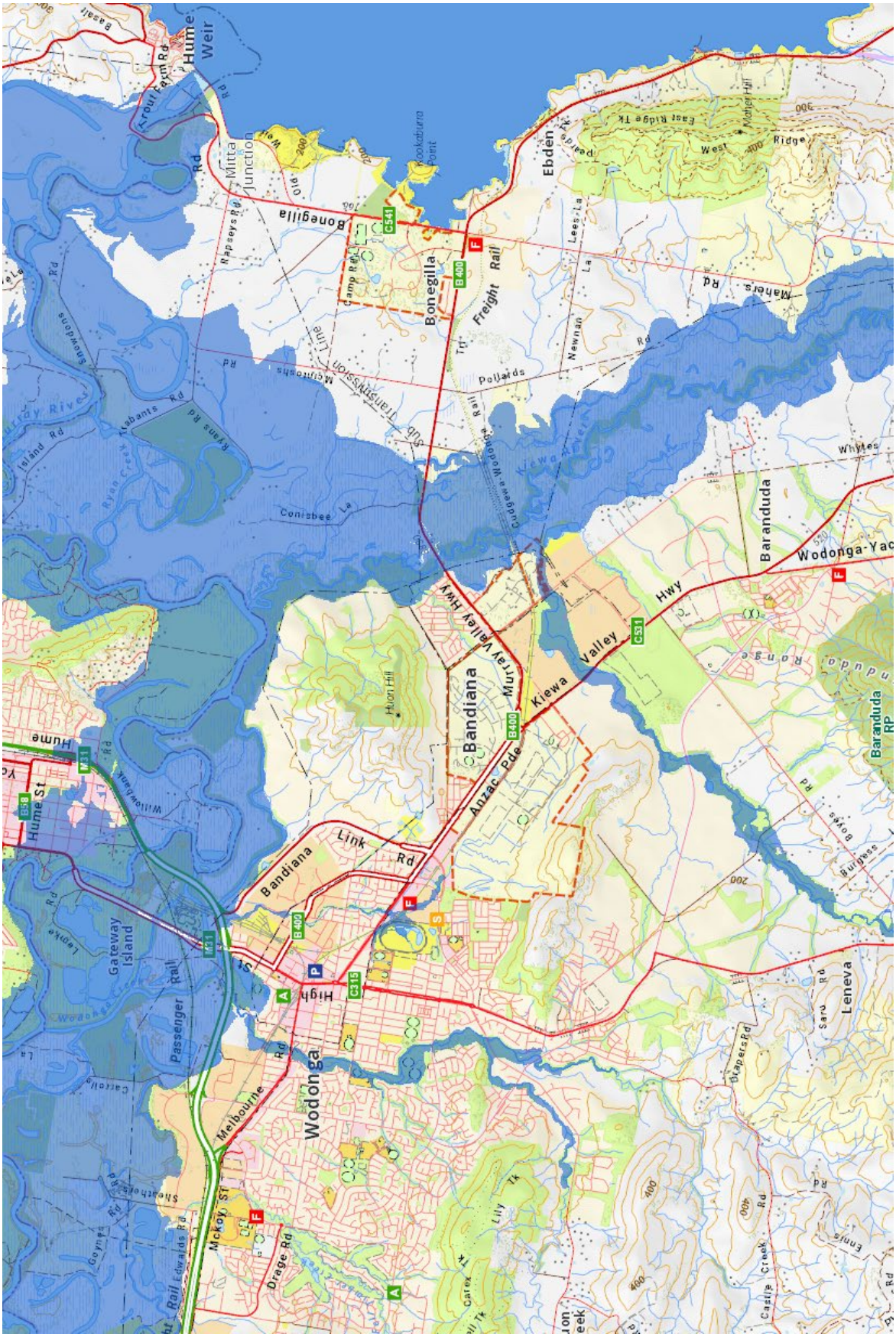


Figure A6 – City of Wodonga Land Subject to Inundation Overlay (LSIO)

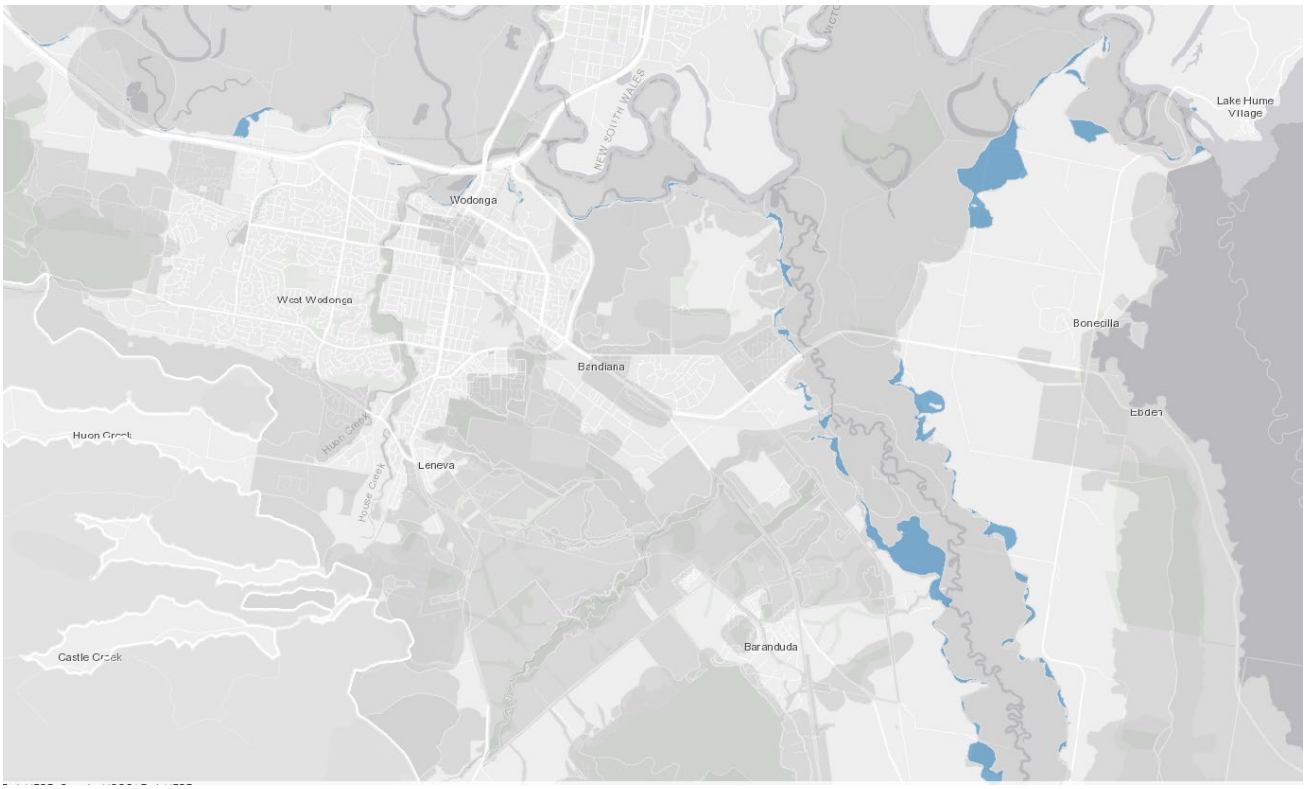


Figure A7 – City of Wodonga Floodway Overlay (FO)

Appendix A1 – Flood threats for the Lower Kiewa River, Yackandandah and Middle Creeks

Description of major waterways and drains

Kiewa River

The Kiewa catchment (approximately 1655km2) extends approximately 100km from the Great Dividing Range around Falls Creek to the Murray River. The Kiewa Hydroelectric Scheme is located in the upper part of the Kiewa catchment, but commands only a small part of the catchment above Wodonga and has little influence on flood magnitudes in the lower reaches of the Kiewa River around Wodonga.

The Kiewa River enters the Murray River at Doctors Point, approximately 16km downstream of Hume Dam and 5km upstream of Wodonga. The lower 24km length of the Kiewa River (approximately 14km floodplain length) is located within the Wodonga LGA.

Yackandandah Creek

Yackandandah Creek is a left bank tributary of the Kiewa River, entering the Kiewa River near the southern limit of the Wodonga LGA. The majority of the catchment and waterway length is located within the Indigo LGA with a length of only approximately 7km lying within the Wodonga LGA. Flood impact from Yackandandah Creek within the Wodonga LGA is therefore restricted to a small length of rural floodplain upstream and downstream of the Kiewa Valley Highway.

Middle Creek

Middle Creek is a left bank tributary of the Kiewa River, entering the Kiewa River approximately 1.5km upstream of the Murray Valley Highway. The entirety of Middle Creek (approximately 20km length) and the entire catchment (approximately 87km2) lies within the Wodonga LGA. The catchment area for Middle Creek encompasses the valley that essentially runs along the Beechworth-Wodonga road to the south of Wodonga, north of the Indigo Valley Road intersection.

Appendix A2 – Flood threats for the Murray River and Gateway Island

Description of major waterways and drains

Murray River

The Murray River floodplain within the Wodonga LGA extends for approximately 32km with a river channel length of approximately 63km. The average flood profile gradient measured in relation to the floodplain is approximately one in 2000.

The Murray River floodplain lies to the north of the Hume Freeway and Bandiana Link Road which together generally mark the northern perimeter of the Wodonga urban/industrial area. The Moloney Drive industrial area (which lies to the north of the Hume Freeway) is also outside of the Murray floodplain. Lincoln Causeway, the Hume Freeway and the Sydney-Wodonga Railway all cross the Murray River floodplain in proximity to Wodonga.

The passage of floodwaters from the Upper Murray catchment (approximately 15,300km2 upstream of Lake Hume, including the Dartmouth River catchment (3560km2)) is influenced by the Lake Hume storage located approximately 20km upstream of Wodonga. Hume Dam's primary function is water storage to secure water availability for downstream demands during wet periods. When the storage level is low flood events may be largely or completely captured within Hume Dam, but at higher storage levels floodwaters from upstream will be passed through with little significant attenuation, and thus the storage should not be assumed to protect downstream communities from flooding. In addition to the passage of floodwaters via Hume Dam, the Kiewa River (1650km2) enters the Murray River between Hume Dam and Wodonga, and thus flooding around Wodonga results from both the Upper Murray River catchment and the Kiewa River.

The Murray River in the reach adjacent Wodonga is described as a laterally migrating, anabranching floodplain river featuring an incised meandering river channel and multiple anabranch channels carrying a variable proportion of flows as flows increase (refer Earth Tech 2005). Flows are generally confined to the main river channel and anabranch channels until the total floodplain flow exceeds 25,000 ML/Day, although floodplain pockets may be inundated at this level. This coincides with approximately high summer flow (irrigation release) conditions.

The dominant anabranch near Wodonga is Wodonga Creek, which follows the southern edge of the floodplain near. The area of land bounded by Wodonga Creek and Flanagans Creek to the south and the Murray River to the north (refer to Figure 3) is known as Gateway Island, and includes sediment extraction industries, limited commercial development and a small number of dwellings. Gateway Island is subject to isolation and flooding in large events and is the most developed part of Wodonga with the greatest exposure to flooding from the Murray River.

Other anabranches include Ryans Creek upstream of Wodonga, and Dights Creek Downstream of Albury.

Figure A8 – Murray River floodplain waterway features adjacent Wodonga (from NSW River Management Plan or the Wodonga Reach Management Zone

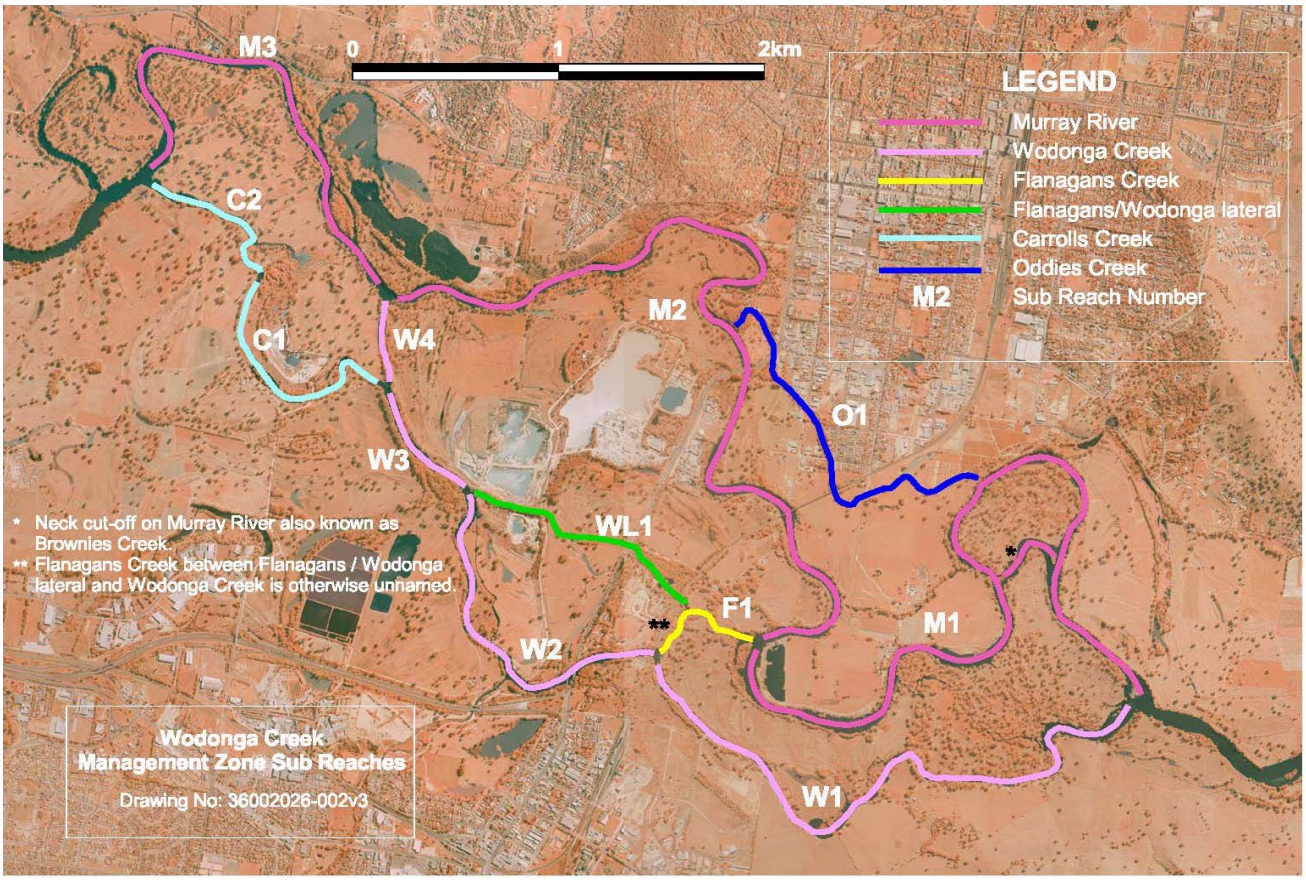
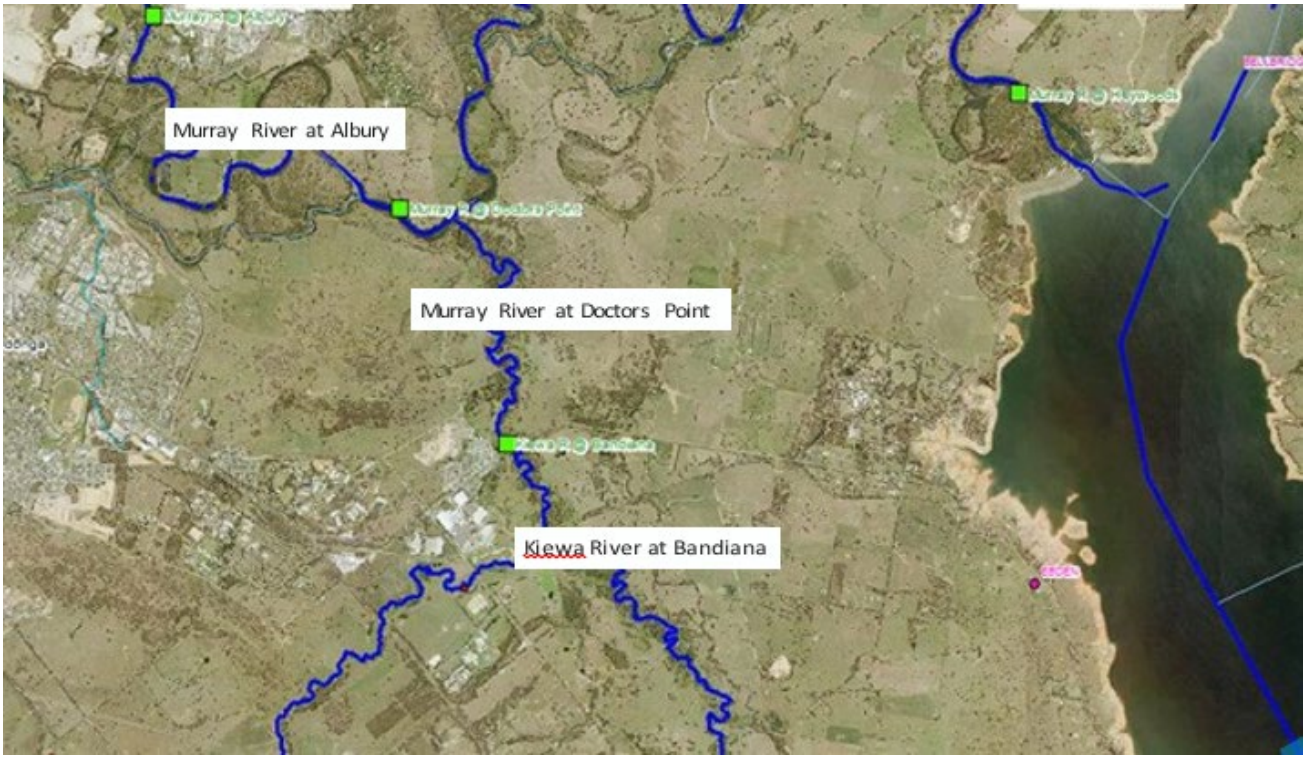


Figure A9 – Murray River gauge locations



Appendix A3 – Flood threats for the Wodonga Urban Waterways

Description of major waterways and drains

House Creek and Huon Creek

House Creek is a tributary of Wodonga Creek (which is itself an anabranch of the Murray River), entering Wodonga Creek adjacent the Hume Freeway. The upper catchment of House Creek is rural/farming land, with the creek running north of, and approximately parallel to, Castle Creek Road upstream of the urban interface, approximately 1.5km upstream of Yarralumla Drive.

The major tributary of House Creek is Huon Creek. Huon Creek runs parallel to Huon Creek Road through rural/ farming land, before entering the urban area approximately 1.3km upstream of Yarralumla Drive. Huon Creek enters House Creek approximately 1km downstream of Yarralumla Drive.

The total catchment area upstream of the Wodonga Creek confluence is approximately 69.4km2 (6940 ha) (Cardno Willing 2002).

Felltimber Creek

Felltimber Creek is a tributary of the Murray River, entering the Murray River floodplain a short distance downstream from the Hume Freeway. The catchment area upstream of the freeway is approximately 1500 ha (Cardno Willing 2004). The catchment area, which extends approximately four kilometres west of the Wodonga urban area, is predominantly rural with steep, cleared farmland and conservation areas, transitioning to Low Density Residential land above Felltimber Creek Road. Between Felltimber Creek Road and Parkers Road/Lawrence Street, the creek flows through Wodonga Golf Course with residential development set back from the waterway. From Parkers Road/Lawrence Street to Moorefield Park Drive the waterway and floodplain lie within public park land; however, there may be areas of potential impact on adjacent residential land. Between Moorefield Park Drive and the Hume Freeway, Felltimber Creek passes through the educational precinct (Latrobe University and former Wodonga TAFE land).

The most recent flood investigation for Felltimber Creek is the Felltimber Creek Flood Study (Cardno Willing 2004). The assessment includes modelled water surface profiles for 20 year, 50 year and 100 year ARI flood events, but no mapping of flood extents. There is no established stream gauge on Felltimber Creek and no known reliable historic flood levels to allow calibration of models.

There are no flood related planning scheme overlays in place along Felltimber Creek.

Jack in the Box Creek

Jack in the Box Creek is a tributary of Wodonga Creek (which is itself an anabranch of the Murray River) entering Wodonga Creek adjacent the Hume Freeway. The catchment (930 ha) is predominantly urbanised. The most recent flood investigation for Jack in the Box Creek is the Jack in the Box Creek Flood Study (Cardno Willing 2006). This investigation provides flood level and extent information for five, 20, 50 and 100 year ARI flood events.

A further hydrologic review was undertaken for the city of Wodonga in 2012 (GHD 2012) to consider the impacts of upstream development and options for stormwater detention.

Land Subject to Inundation Overlay (LSIO) applies along the length of Jack in the Box Creek downstream of Victoria Cross Parade (based on Cardno Willing 2006), but there are known inaccuracies in the flood extent as represented by the overlays.

Appendix B - Typical flood peak travel times

In using the information contained in this appendix, consideration needs to be given to the time of travel of the flood peak. A flood on a 'dry' waterway will generally travel more slowly than a flood on a 'wet' waterway (for example, the first flood after a dry period will travel more slowly than the second flood in a series of floods). Therefore, recent flood history, soil moisture and forecast weather conditions all need to be considered when using the following information to direct flood response activities.

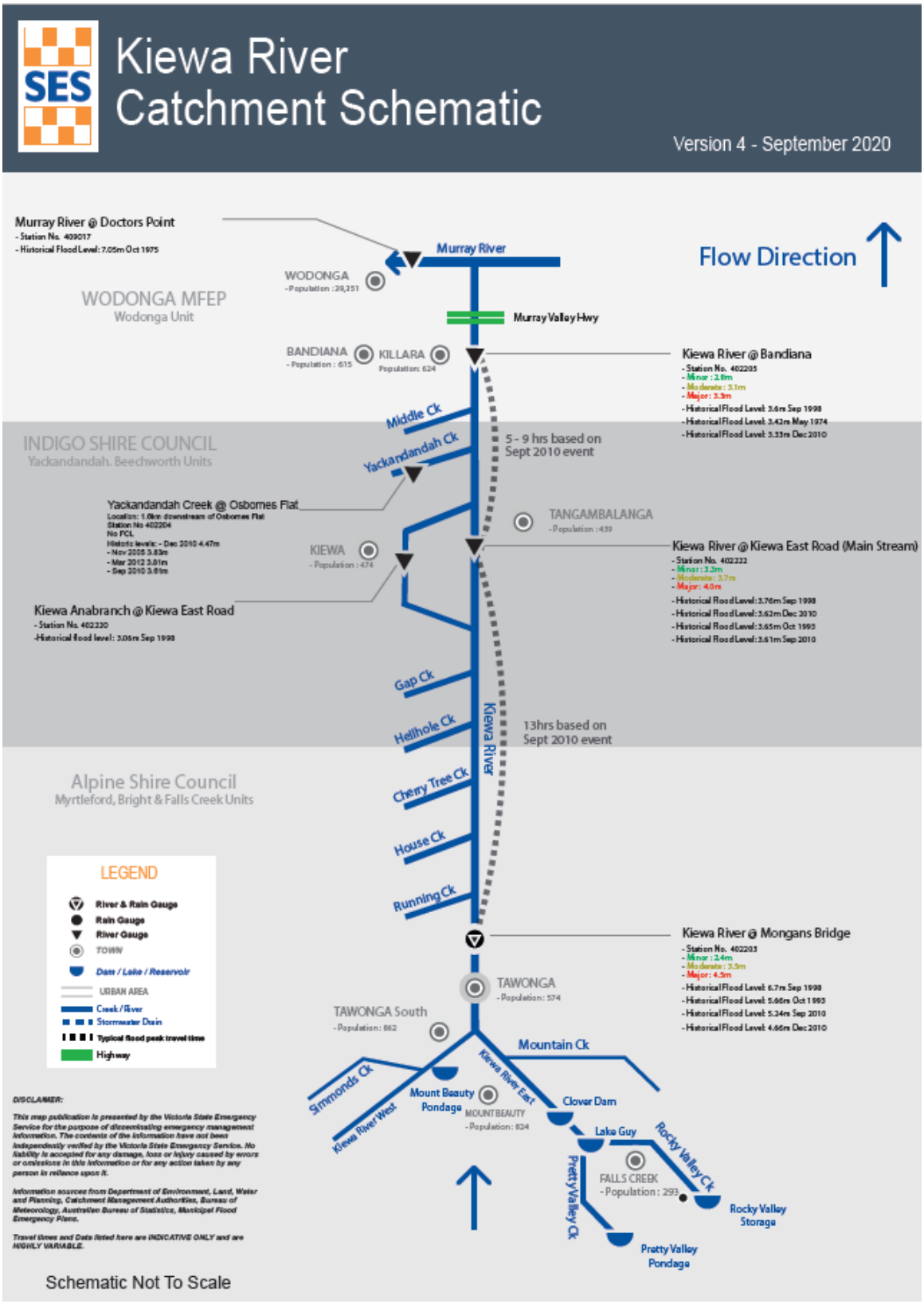
Note that flooding will start some time ahead of the time indicated by the following travel times – these are the time between the flood peaks at respective sites.

Typical travel times have been collated from recorded historical events.

Typical travel times

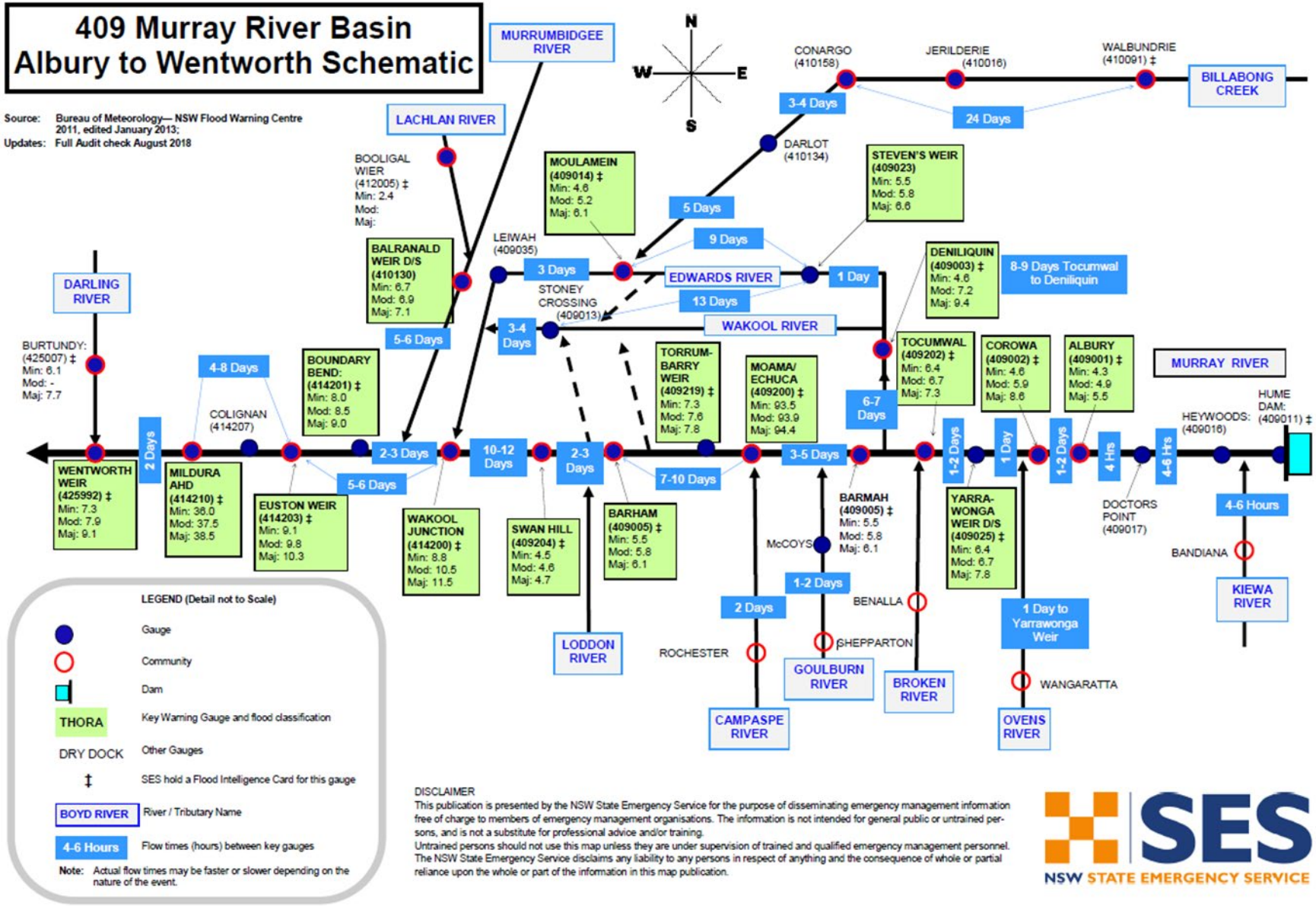
Waterway	Location from	Location to	Typical travel time	Comments
Kiewa River	Mount Beauty	Kiewa	12 hours	Flows between these locations are influenced by Alpine rainfall and AGL Hydro located in Mt Beauty. Local ungauged waterways impact flows and are captured at gauges at Kiewa River at Mongans Bridge downstream of Tawonga and Kiewa Reiver at Kiewa.
Kiewa River	Kiewa	Bandiana	5 hours	Gauges at Kiewa and the Kiewa River at Bandiana capture flows from ungauged locations and Yackandandah Creek. These gauges also indicate potential flows from the Kiewa into the Murray River.
Murray River	Heywoods	Doctors Point	12 Hours	Murray River at Haywoods is located just downstream of the Hume Dam capturing data as releases occur. Murray River at Doctors Point gauge is located downstream of where the Kiewa River intersects with the Murray River to capture data from both waterways.
Murray River	Doctors Point	Albury	4 Hours	Murray River at Albury (Union Bridge) Gauge is located near where the Lincoln Causeway and the Murray River cross between Gateway Island (Vic) and South Albury (NSW). If both the Murray River and Kiewa River are in flood, impacts at Wodonga/Gateway Island will be increased and measured off the Murray River at Union Bridge gauge

Appendix C1 – River Systems Overview & Schematics (Kiewa & Murray Rivers)



409 Murray River Basin
Albury to Wentworth Schematic

Source: Bureau of Meteorology— NSW Flood Warning Centre 2011, edited January 2013;
Updates: Full Audit check August 2018



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NSW STATE EMERGENCY SERVICE

Appendix C2 – Lower Kiewa, Yackandandah Creek and Middle Creek Flood Emergency Plan

Overview of Flooding Consequences

Kiewa River

The Kiewa River floodplain extends for approximately 14km through the Wodonga LGA. The floodplain within this reach is rural farming land, with only a small area of residential development abutting the floodplain around Killara (upstream and downstream of the Murray Valley Highway crossing). There are no known dwellings within the one per cent AEP extent with the exception of two dwellings at the Murray Valley Highway:

- 3718 Murray Valley Highway – near the eastern side of the Kiewa floodplain. A low lying cottage subject to flooding and isolation;
    - This cottage requires sandbagging due to water entering property.
- 3829 Murray Valley Highway – immediately east of the Kiewa River. An elevated structure (above 1% AEP level) but subject to isolation; and,
- A house off Conisbee Lane isolated by flood water.

The Murray Valley Highway at Bandiana was flooded in September 1998 but no other road closures resulting from the Kiewa River are known within the Wodonga LGA (although numerous private access tracks within the floodplain are extensively flooded).
Development adjacent the Kiewa River at Killara (immediately upstream and downstream of the MVH) is restricted to high ground and no impact on dwellings is known (up to events of September 1998 magnitude or approximate one per cent AEP); however, there may be limited flooding of property backyards for houses on the south side of the Murray Valley Highway.
The Cudgewa-Wodonga Rail Trail crosses the Kiewa River floodplain approximately one kilometre south of the Murray Valley Highway and is substantially flood prone in events approaching moderate flood level at Bandiana.
The Kiewa River at Bandiana gauge has a minimum flood class level of 2.8m. The gauge will often maintain a level at or above this for an extended period through winter and spring with no known flood impacts beyond flooding of some grazing land; therefore requiring no emergency management actions.

Yackandandah Creek

Within the short reach of Yackandandah Creek within the Wodonga LGA the floodplain width is around 400-600m but increases significantly near the confluence with the Kiewa River. There are no known flood exposures excluding flooding of grazing properties.

The Kiewa Valley Highway is the only crossing of Yackandandah Creek within the Wodonga LGA. The road is well elevated above historic flood levels; however, piers were undermined and damaged in the December 2010 flood event (largest event on record for Yackandandah Creek) and the bridge was subsequently replaced in 2011. Lindsay Road, which crosses the Yackandandah Creek floodplain at the boundary of the Wodonga LGA, is prone to frequent flooding.

Middle Creek

The area upstream of Leneva the Middle Creek floodplain is predominantly rural with limited assets exposed to flood risk. Upstream of the Wodonga- Beechworth Road, Middle Creek is incised, and the floodplain width is limited; however, there are a number of houses to the north of the creek which rely on low level access routes crossing the creek which may be cut. Further downstream as Middle Creek enters the future urban growth area of Leneva, the floodplain width increases to an average 200m. The dwelling at 188 Frederic

Street Road is on isolated high ground (approximate one per cent AEP level) but is potentially isolated due to flooding over Frederic Street Road and the access driveway to the dwelling.

Whytes Road, the Kiewa Valley Highway and Frederic Street Road are all subject to closure as a result of flooding from Middle Creek. The Whytes Road crossing is a concrete causeway with a threshold for overtopping < 50% AEP. Hazardous conditions exist for vehicles crossing the flooded causeway. Flood depths of approximately two metres are expected in the one per cent AEP event.

A bypass for the Whytes Road crossing is available via the Kiewa Valley Highway, which is estimated to overtop in events >5% AEP (assuming no debris blockage). The most recent overtopping was in October 2016.

The Baranduda Boulevard bridge crossing has capacity >1% AEP. Frederic Street Road (a local road servicing only a few properties) is subject to flooding in events 20% AEP.

Capacity and overtopping information is provided below (Table C1 from the Middle Creek Flood Study, GHD 2014).

The Wodonga Terminal Station (electricity) is on Whytes Road adjacent (south of) Middle Creek; however, it is elevated above 1% AEP flood level for both the Kiewa River and Middle Creek. A high voltage transmission line crosses Middle Creek downstream of Whytes Road. One tower is located close to the creek and is subject to flood depth around 0.9m in the 1% AEP event.

The ford at Whytes Road, Middle Creek Baranduda may become impassable after heavy rain fall.
As Middle Creek is an ungauged waterway with rapid catchment response times it is not possible to generate reliable intel in a timely manner to predict imminent overtopping of the causeway.

The only way to infer overtopping potential is based on the information from the flood study (overtopping < 50% AEP) and intensity-frequency-duration information which would suggest that 3-6 hour rainfall totals of around 30 mm or more would likely result in overtopping.

Given that there is no local pluviograph (rain gauge with sub-daily data) able to identify local storm intensity in the small catchment even this information is insufficient to enable warning of impact.

Table C1: Middle Creek – Roadway overtopping information (from GHD 2012)

Structure	Type/Description	Discharge capacity		Maximum depth 1% AEP road overflows (m)	100 Year ARI Afflux (m)
		Flow (m^3/s)	Equivalent ARI (years)		
Whytes Road	Culvert/causeway. Twin 750mm diameter culverts.	2	<2	2.00	<0.1
Kiewa Valley Highway	Bridge. Span 27m, waterway opening area 35m^2	90	20	0.62	0.9
Cycleway/ Pedestrian Bridge	Bridge. Span 15m, waterway opening 20m^2	5	>2	2.00	0.0
Baranduda Boulevard	Bridge. Span 23m, waterway area 62m^2	>155	>100	Not overtopped	0.8
Private bridge	Bridge. Span 18m, waterway area 71m^2	>153	>100	Not overtopped	0.7
Frederic Street Road	Bridge. Span 21m, waterway area 37m^2	30	<5	1.04	<0.1
Beechworth Wodonga Road	Bridge. Span 20m, waterway area 39m^2	125	100	Not overtopped	0.6

Notes:
1. Discharge capacity is the modelled discharge when the road is on the verge of overtopping
2. Results in Table 4 assume zero waterway structure blockage.

Table C2: Middle Creek – Design flows (from GHD 2012)

Middle Creek location (refer Figure A1)	Catchment area (km^2)	Peak design flow (m^3/s)				
		20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
Beechworth Wodonga Rd	42.6	27	42	65	96	125
Frederic Street Road	56.8	35	52	80	114	146
Baranduda Boulevard	61.3	37	55	84	119	155
Kiewa Valley Highway	72.9	42	62	94	133	172
Whytes Road	74.5	43	63	95	135	174

Summary of Consequences

Table C3 - Consequence Summary of 1% AEP flood along Lower Kiewa River, Yackandandah Creek and Middle Creek

Summary of Consequences in a 1% AEP (100yr ARI) flood along Lower Kiewa River, Yackandandah and Middle Creek in the City of Wodonga					
Property					
Properties	**2**				
Residential	2	2 residential properties on the floodplain of the Kiewa River between Killara and Bonegilla			
Commercial	0				
Industrial	0				
Public Land	0				
Rural	0	Agricultural Flood plain extensively flooded			
Community Infrastructure					
		nil			
Essential Infrastructure					
Major Roads	2	Murray Valley Highway and Kiewa Valley Highway			
Key local roads	5	Whytes Rd, Frederic Street Rd, Gullifer Lane, Smith Rd, Pollards Rd, McIntosh Rd			
Major Rail	0				
Sewerage Facilities	0				
Levees	0				
Tourism / Recreation					
Sports Facilities	0				
Recreation Facilities	1	Picnic area along Kiewa River walking trail at Bandiana			
Government Boundaries					
Local Gov't Areas	1	City of Wodonga	CMA	1	North East CMA
Adjacent LGAs	3	Indigo Shire, Albury City Council, NSW, Towong Shire	CFA District	1	District 24
SES Resp' Boundary	1	Wodonga	FRV District	1	South Eastern FS 76

Warnings and Gauges

The Bureau of Meteorology currently provides flood forecasts for the Kiewa River at Mongans Bridge, Kiewa (Mainbranch) and Bandiana.

Warnings are available for flooding expected along the Kiewa which include areas adjacent to the river between Mounty Beauty and the Murray River. Flood class levels for the Kiewa River gauges are detailed in table C4 and are used in the issuing of a flood warning for the Kiewa River. These and other gauge details within the Kiewa River catchment are contained within table C5.

Table C4 - Gauges with established Flood Class Levels within the Kiewa River Catchment

	River/creek flood class level		
	Minor	Moderate	Major
Kiewa River at Mongans Bridge	2.40m	3.50m	4.50m
Kiewa River at Kiewa (Mainbranch)	3.30m	3.70m	4.00m
Kiewa River at Bandiana	2.80m	3.10m	3.30m

At these sites within the Kiewa River catchment, the Bureau of Meteorology (the BoM) will issue flood warnings if levels reach those classified above. Warnings will be placed on the Bureau's website (bom.gov.au/vic/warnings/index.shtml?ref=hdr) and the VicEmergency website emergency.vic.gov.au.

Properties at Flood Risk

Table C5 – Properties at risk of flooding along Kiewa River in the City of Wodonga

Properties at risk from Flooding within the Kiewa River catchment						
Residential	Commercial	Industrial	Rural	Public Use		
	✓		3829 Murray Valley Highway	Bonegilla	Kiewa River	Riverine
	✓		3718 Murray Valley Highway	Bonegilla	Kiewa River	Riverine
	2					

What areas are affected?

- House off Conisbee Lane isolated by flood water. Consider engaging the landowner prior.
- Properties on Murray Valley Highway Identified in the Table above and Flood intelligence Cards.
- During Flash Flood events, where impacts are confirmed, Units will need to notify the Hume RDO for appropriate warning to the community.

Flood mitigation

There is no flood mitigation infrastructure in this reach of the Kiewa River. Kiewa Hydro storages in the upper Kiewa (above Mt Beauty) are considered to have no impact on flood magnitudes in the lower Kiewa

Flood intelligence card

Gauge location: Kiewa River at Bandiana

Gauge	River Height (m)	River Flow (ML/d)	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Kiewa River at Bandiana	**2.80**	4,100	**Minor Flood Level**	No known impacts of significance – local flooding around gauge site and low lying farmland. A park bench at the Kiewa River Walking track and the Murray Valley Highway at Killara gets wet feet.	BOM will issue and VICSES to publish Minor flood warning to community with tailored information from this plan The Hume Region Duty Officer in conjunction with the Regional Agency Commander will maintain operational awareness and form an appropriate response to suit the level of the incident	
	3.10	13,400	**Moderate Flood Level**		VICSES to consider Base IMT rostered/standby or Base IMT in place depending on forecast BOM will issue and VICSES to publish Moderate flood warning to community VICSES to Consider the use of Snap, Send, Solve Flood observers for Intelligence gathering	
	3.15			• August 2016 – Shallow flooding over significant areas of low-lying farmland and local access routes.		
	3.2	27,500	**20% AEP**	• Access to 217 Conisbee Lane floods off Murray valley Hwy, isolating single dwelling at the end of the road. **Properties at risk: (Below Floor)** • Gullifer Lane • Smith Rd • Pollards Rd • McIntosh Rd	VICSES to respond on a request by request basis VICSES to Consider the use of Snap, Send, Solve Flood observers for Intelligence gathering VICSES Wodonga Unit to determine if risk to properties identified City of Wodonga/RRV to close roads identified	
Gauge	River Height (m)	River Flow (ML/d)	Flood Class Level & Annual Exceedance	Consequence/ Impact	Action	Reference

			Probability (%AEP)		Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	
Kiewa River at Bandiana	**3.23**			• October 2022 Flood Peak Height		BOM
	3.24			• October 1993 Flood Peak Height		
	3.29			• Oct 2016 and Sep 2010 Flood Peak Heights • Extensive floodplain inundation,	City of Wodonga/RRV to close any roads known to be impacted locally	
	3.30	32,760	**Major Flood Level** **10% AEP**	**Water over Road** • Murray Valley Highway, Between Killara and Bonegilla	BOM will issue and VICSES to publish Major flood warning to community. VICSES to consider Base IMT in place or Core in place with observed activity	
	3.32		**10 % AEP**	• July 1978 Flood Peak Height • Dec 2010 Flood Peak Height		
	3.33			• November 2022 Flood Peak Height		
	3.42			• May 1974 Flood Peak Height		
	3.5	52,900	**5% AEP**	**Properties at risk: (Below Floor)** • 3829 Murray Valley Highway, Bonegilla **Properties at risk: (Above Floor)** • 3718 Murray Valley Highway, Bonegilla **Water over Road** • Murray Valley Highway, Bonegilla	VICSES to determine if sandbagging of 3718 Murray Valley Highway required VICSES/VICPOL and City of Wodonga to determine if evacuation or relocation of properties identified required and if relief is required VICSES to respond on a request by request basis	
	3.58			• Sep 1998 Flood Peak Height • Extensive and deep flooding of farmland in the floodplain. **Water over Road** • Pollards Road • private access tracks within the floodplain • Kiewa Valley Highway	VICSES to deploy crew or Snap Send Solve Flood Observers to determine impacts VICSES to respond on a request by request basis City of Wodonga/RRV to close roads identified.	
Gauge	River Height (m)	River Flow (ML/d)	Flood Class Level & Annual Exceedance	Consequence/ Impact	Action	Reference

			Probability (%AEP)		Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	
Kiewa River at Bandiana	**3.6**	62,600	**2% AEP**			
	3.69	75,800	**1% AEP**			

Note: flood intelligence records are approximations. This is because no two floods at a location, even if they peak at the same height, will have identical impacts. Flood intelligence cards detail the relationship between flood magnitude and flood consequences. More details about flood intelligence and its use can be found in the Australian Institute of Disaster Resilience (AIDR) Handbook series on managing the Floodplain.

Appendix C3 – Murray River and Gateway Island Flood Emergency Plan

Overview of Flooding Consequences

The width of the Murray River floodplain inundated in the one per cent AEP flood varies from approximately one kilometre to 4.5km. Much of the floodplain is characterised by a relatively steep floodplain edge. This results in a modest increase in the area inundated when comparing moderate flood events (such as 20-10 % AEP events) with major flood events (5-1 % AEP events).

The most significant flood events in recent years include:

- November 2022 – Heavy rainfall and subsequent La Nina weather cycles lead to wet catchments and releases from Hume Dam and spilling of Dartmouth Dam the first time 30 years.
- October 1996 – Releases from Lake Hume to lower water levels to manage dam safety risks. No significant inflows from the Kiewa River.
- October 2000 – Releases from Hume Dam, combined with flows from the Kiewa River resulted in flooding at the Albury Guage of 5.12m. These releases included approx. 63,000 ML/D from Hume Dame and approx. 16,900 ML/D from the Kiewa.
- December 2010 – First flood release from Lake Hume after the extended low flow period from 2001-2010 during which releases did not exceed approximately 25,000 ML/D (approximate bank full flow); and,
- October 2016 – Highest River level since 1996 (approximately same magnitude). Flooding over the majority of the floodplain width, peripheral impacts on Gateway Island commercial area, impacts on stability of quarries within the floodplain.

Summary of Consequences (Read in conjunction with Intelligence Card)

Roads and Bridges

- Hume Freeway – The Hume Freeway crossing of the Murray River floodplain between Wodonga and Albury is well elevated, approximately two metres above 1% AEP levels and based on GHD 2012 remains above 0.2 % AEP (500 year ARI) level (>7.5m on Doctors Point gauge).
- Lincoln Causeway – Lincoln Causeway is at a lower level than the Hume Freeway bypass which replaced it in 2007, but remains above 1% AEP level. The threshold for overtopping is estimated as 400 year ARI (Doctors Point 7.4m)
- Sydney-Melbourne Railway – The rail bypass is well elevated and remains above 0.2% AEP level (>7.5m on Doctors Point gauge). The old alignment (currently proposed for conversion to a pedestrian path/rail trail) is also above 1% AEP level.
- Heywoods Bridge/Bonegilla Road – With a deck level RL 162.8m AHD, the bridge is perched above 1% AEP level; however approach roads, most significantly on the southern (Bonegilla/Victorian) side are subject to flooding in lesser events, approximately 15 year ARI (Doctors Point).
- Providing access across the Murray River from Albury (Waterworks Road) to Island Road (Victoria). The Bridge is high; however, Island Road to the south of the bridge is inundated in events greater than approximate 20% AEP event (Doctors Point 6.0m).
- Stock Route bridge – The old timber structure (no longer in service) has been replaced by a high level suspension bridge. The bridge is above 1% AEP flood level; however, both approaches are flooded in a 20% AEP event.
- South Albury levee, NSW – The majority of the levee (protecting South Albury) has approximately 0.5m freeboard above 1% AEP levels; however, localised sections have lesser freeboard (upgrade under consideration by Albury City Council).

Gateway Island

- Gateway Island is described in GHD 2012 as experiencing flooding in events >145,000 ML/D (5% AEP, Doctors Point gauge 6.7m) but the depth and extent of overtopping varies across the Island.
- Land around the commercial developments (such as The Lincoln) is identified as experiencing flooding in events of 5% AEP (Doctors Point 6.7m). Peripheral inundation occurred adjacent to buildings in the Northern part of Gateway Island.
- Part of the commercial area (such as La Maison) in October 2016 (Doctors Point 6.53m). This area was sandbagged in October 2016 (although floodwaters would not have impacted buildings in the absence of sandbagging). This approach is not recommended now and local VICSES Unit will engage businesses prior to events to manage flood preparations and potential business closure (June 2024).
- Harris Road, which extends to the east of Lincoln Causeway, is subject to flooding in events of 20% AEP magnitude. Diamond Park (train track, motorbike track etc) were extensively flooded in October 2016 & Oct/Nov 2022.
- Lemke Road to the west of Lincoln Causeway is subject to flooding in events of 20% AEP. magnitude and experienced flooding in October 2016. No Houses on Lemke Road anymore. (June 2024)
- The greatest flooding is on the western side of Gateway Lakes impacting the rowing clubs etc. in this area. Sand bagging of the rowing club in 2022. This should be considered for heights above 5.0m on the Albury Gauge.

Bonegilla

- There are approximately 20 rural residences on the Murray River/Kiewa River floodplain between Lake Hume and the Lincoln Causeway. Most are located on relatively high ground within the floodplain but can be isolated. Available modelling (GHD 2012) indicates that flooding of access roads occurs in events > 20% AEP however the model tends to over-estimate flood extents in this area (dependent on relative flow magnitudes from the Murray and Kiewa Rivers). In October 2016 (approximate 10% AEP at Doctors Point), flooding was restricted to low lying floodplain features with the only known road closure impacts being on Conisbee Lane (Kiewa floodplain north of Murray Valley Highway, no dwellings) and Island Road (from Waterworks Road, Albury).

Lincoln Causeway to Barnawartha North

- In this reach, Carrols Lane, Sheathers Road and Bidstrup Road are the main public roads entering the floodplain (North of the Hume Freeway) while Stock Route Road, Edwards Road and Old Barnawartha Road run parallel to the Hume Freeway. These are all subject to flooding in events larger than 20% AEP and experienced flooding in October 2016 and Oct/Nov 2022.
- There are few dwellings within the floodplain in this reach; however, dwellings at Wright Road (off Lincoln Causeway), Carrols Lane and Sheathers Road (Coynes Lane) were all subject to isolation in October 2016, but no above floor flooding is known to have occurred.
- No flooding occurred in October 2016 in the Moloney Drive industrial area. Shallow flooding of yards is expected to commence in events approaching 2% AEP; however, the area remains accessible.

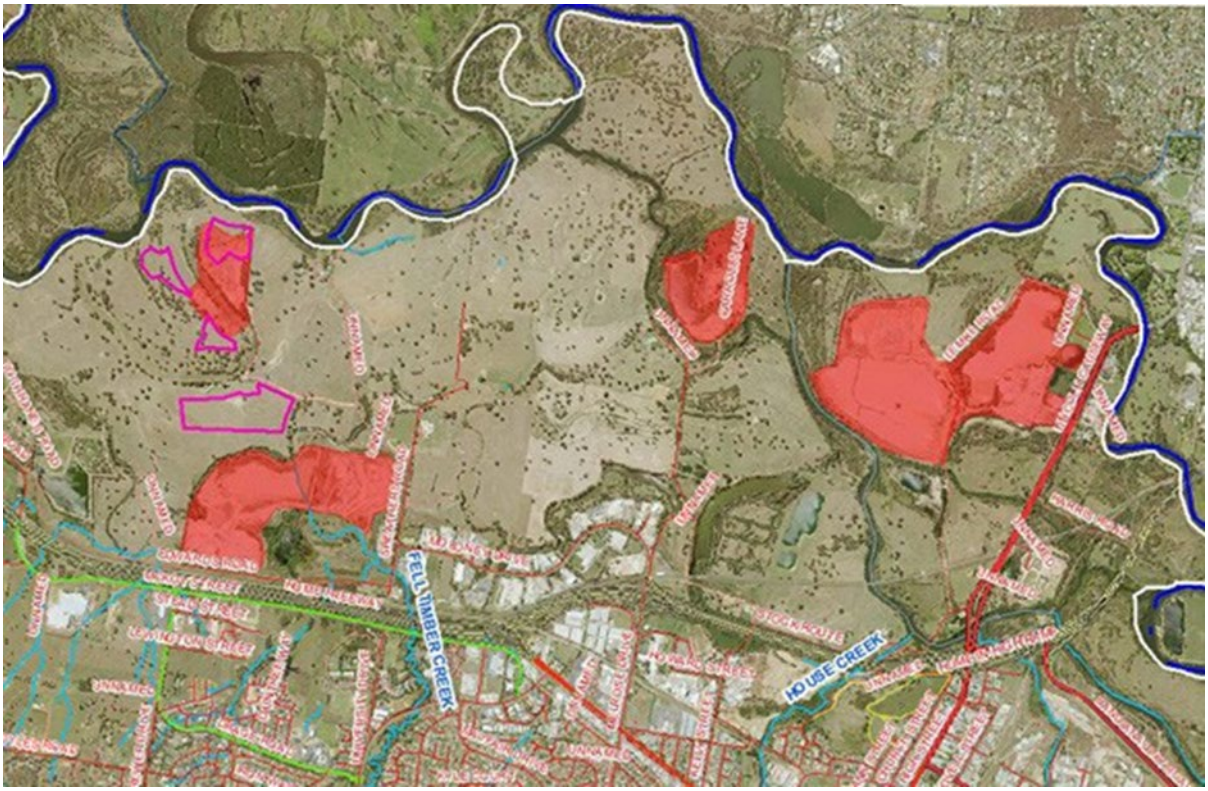
Wodonga Quarries

- There are significant floodplain quarries (sand and gravel) in operation on the Murray River floodplain adjacent Wodonga – specifically between Lincoln Causeway and Bidstrup Road. Some quarries have limited flood protection in the form of perimeter bunds or levees which restrict inflows typically up to approximately 10% AEP. The location of major quarries is shown below.

- The two quarries on the floodplain North of Edwards Road are flooded from 10% AEP. Site WA 497 is approximately 200M south of the Murray River. The site is proposed to extend south towards the Edwards Road Quarry in the future. WA 474 is located on the Murray River Floodplain Adjacent to Edwards Rd, Hume Fwy and the Sydney - Melbourne Railway to the South and Sheathers Rd to the East. Felltimber Creek approaches the site from the South East as it enters the floodplain.

- Based on the Murray Floodplain, this site is also exposed to flooding at a 10% AEP flood. The site has the main gas supply line running north/south through an easement between the two pits at the site and has high voltage power lines running East/West at the North of the quarry approximately 50M from the site. The north of the site is exposed to the floodplain and receives water there from a 10% AEP flood.

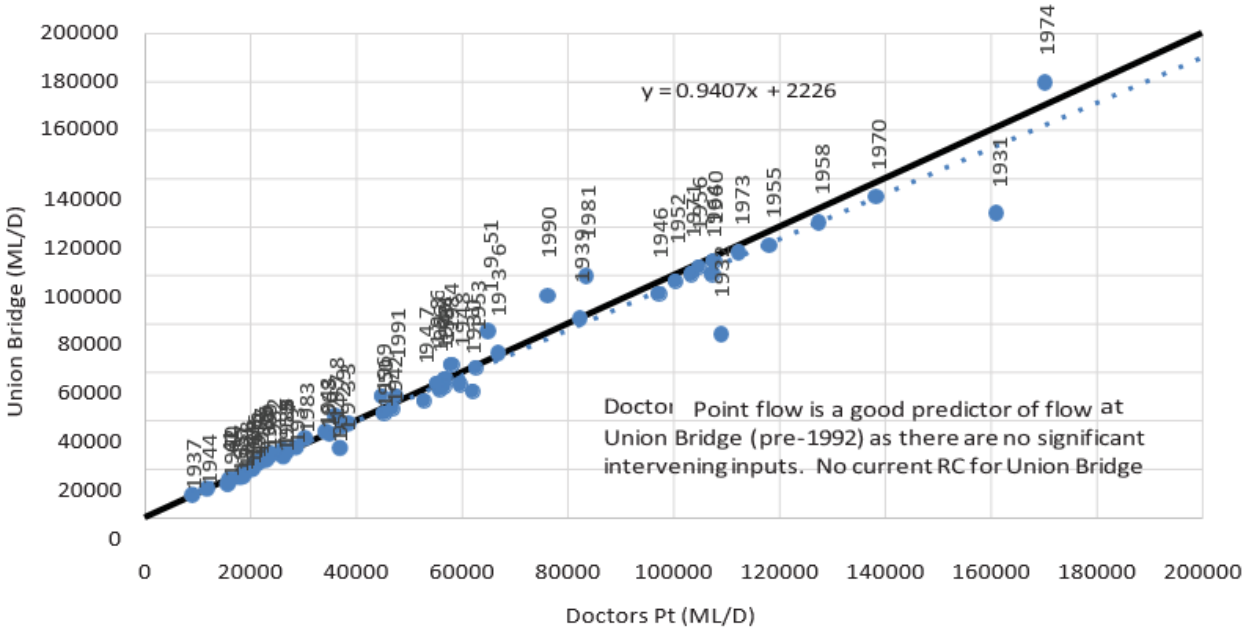
Figure C1 – Quarries located on Murray River Flood Plain, Wodonga



Forecasting Impact at Albury Gauge using Doctors Point Gauge (Gateway Island Impacts)

- Available flood inundation mapping in the Murray River downstream of Lake Hume is presented based on total flow downstream of the Kiewa River confluence (such as releases from Lake Hume and Kiewa River flows).
- The Doctors Point and Albury gauges are both located downstream of the Kiewa River confluence.
- Analysis of flows from the period before 1992 during which there was flow gauging at Albury shows a linear (and close to 1:1 relationship) between flow at Doctors Point and Albury, reflecting the fact that there are no significant tributary inflows and relatively little flow attenuation between Doctors Point and Albury (refer Figure C2).

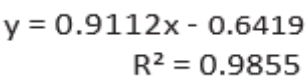
Figure C2 – Relationship between flow at Doctors Point and Union Bridge (Doctors Pt - Union Br flow pre-1992

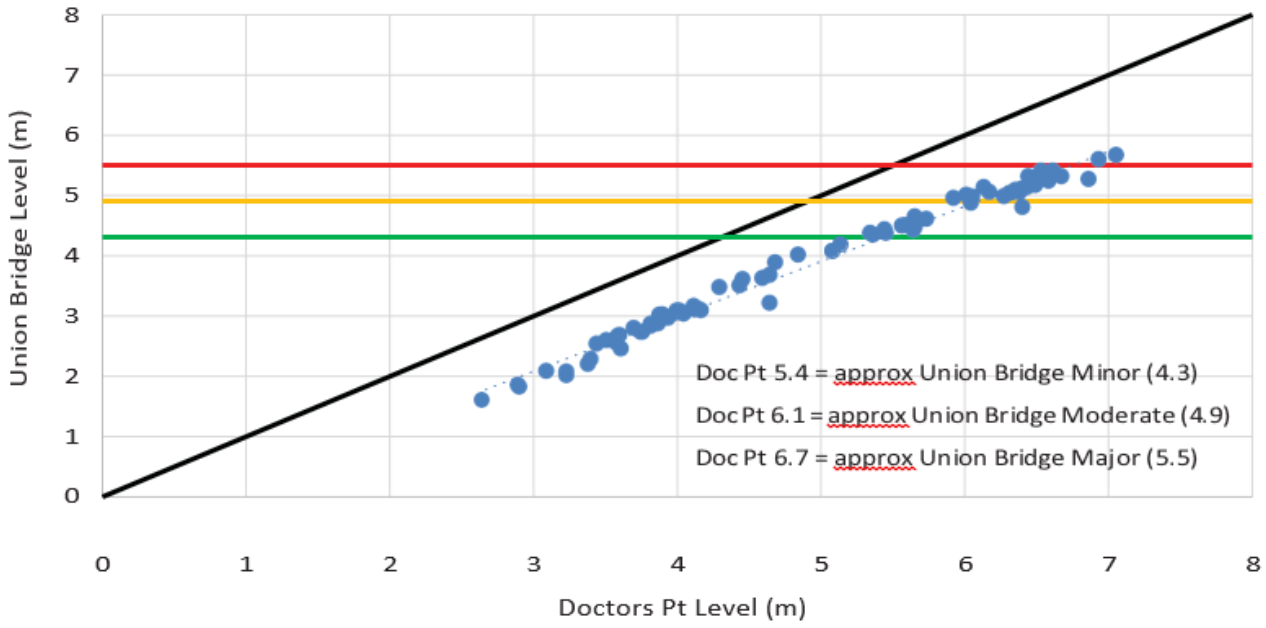


Background

- The Albury gauge (for which forecast levels are issued by BoM) does not have a current rating curve and forecast levels can't be converted to a flow at Albury; thus, it is difficult to establish which flood inundation map to refer to.
- To get around this, the relationship between Albury gauge level and Doctors Point level has been assessed and it is found that Albury gauge level provides a good indication of Doctors Point gauge level (Figure C3).
    - Doctors Point level = (Union Bridge level + 0.6419) / 0.9112
- This relationship tends to over-estimate Doctors Point level by approximately 200mm for Union Bridge levels below approximate 5.1m (low Moderate flood) but is typically within 100mm for larger floods.
- Adopting this relationship allows forecast Union Bridge (Albury) level to be converted to Doctors Point level and then using the Doctors Point rating curve, the total Murray River flow (downstream of the Kiewa confluence) is established.

Figure C3 – Relationship between Doctors Point and Union Bridge gauge levels - Doctors Pt - Union Br level





Doctors Point level is a good indicator of level at Union Bridge (for pre-1992 flows) as there is no significant change in flow and rating curves have similar grade above around 60000 ML/D (say Doc Pt 6.0m). Union Bridge typically 0.8-1.2m below Doctors Point.

The level is seen at Doctors Point (column A in the table below) can be used to estimate what expected level will be seen at the Union Bridge gauge (column B in the table below) to help determine response actions and evacuation of gateway island.

Table C6 – Conversion table: Flood levels at Doctors Point to Union Bridge Gauge, Albury.

Doctors Point (m)	Union Bridge (m)	Flood Class Level
5.09	4	
5.20	4.1	
5.31	4.2	
5.42	4.3	Minor
5.53	4.4	
5.64	4.5	
5.75	4.6	
5.86	4.7	
5.97	4.8	
6.08	4.9	**Moderate**

Doctors Point (m)	Union Bridge (m)	Flood Class Level
6.19	5.0	
6.30	5.1	
6.41	5.2	
6.52	5.3	
6.63	5.4	
6.74	5.5	Major
6.85	5.6	
6.96	5.7	
7.07	5.8	
7.18	5.9	
7.29	6.0	

Flood inundation maps are available in GHD 2012 for five year ARI (approximately Moderate flood level at Albury gauge) to 500 year ARI (600mm above Major flood level at Albury gauge - refer to Table C6).

Table C7 – Available flood inundation mapping for the Murray River near Wodonga

ARI	ML/D	Doctor Point Level (based on rating curve)	Union Bridge Level (based on Doc Pt-Union Br Relationship	Comments
2	40,000	4.9	3.8	No Modelling Available
Minor (Union Bridge)	48,400	5.4	4.3	No Specific Modelling available – Adopt 20% AEP (5 yr ARI) but recognise this overestimates impact
Moderate (Union Bridge)	72,600	6.1	4.9	No specific modelling – Adopt 20 % AEP
5	75,000	6.15	4.965	
10	110,000	6.62	5.39	
Major (Union Bridge)	130,000	6.74	5.5	No Specific Modelling – Adopt 10 % AEP
20	145,000	6.82	5.57	
50	205,000	7.08	5.81	
100	250,000	7.2	5.92	
200	330,000	7.35	6.06	
500	440,000	7.49	6.16	

The flood inundation mapping is considered to over-estimate impacts on the Murray River between Lake Hume and the Kiewa River confluence as the flow adopted in modelling of this reach over-estimates the percentage of total Albury flows typically released from Lake Hume (modelling assumes only 10% of total flow is derived from the Kiewa River).

Historic Gauge Levels

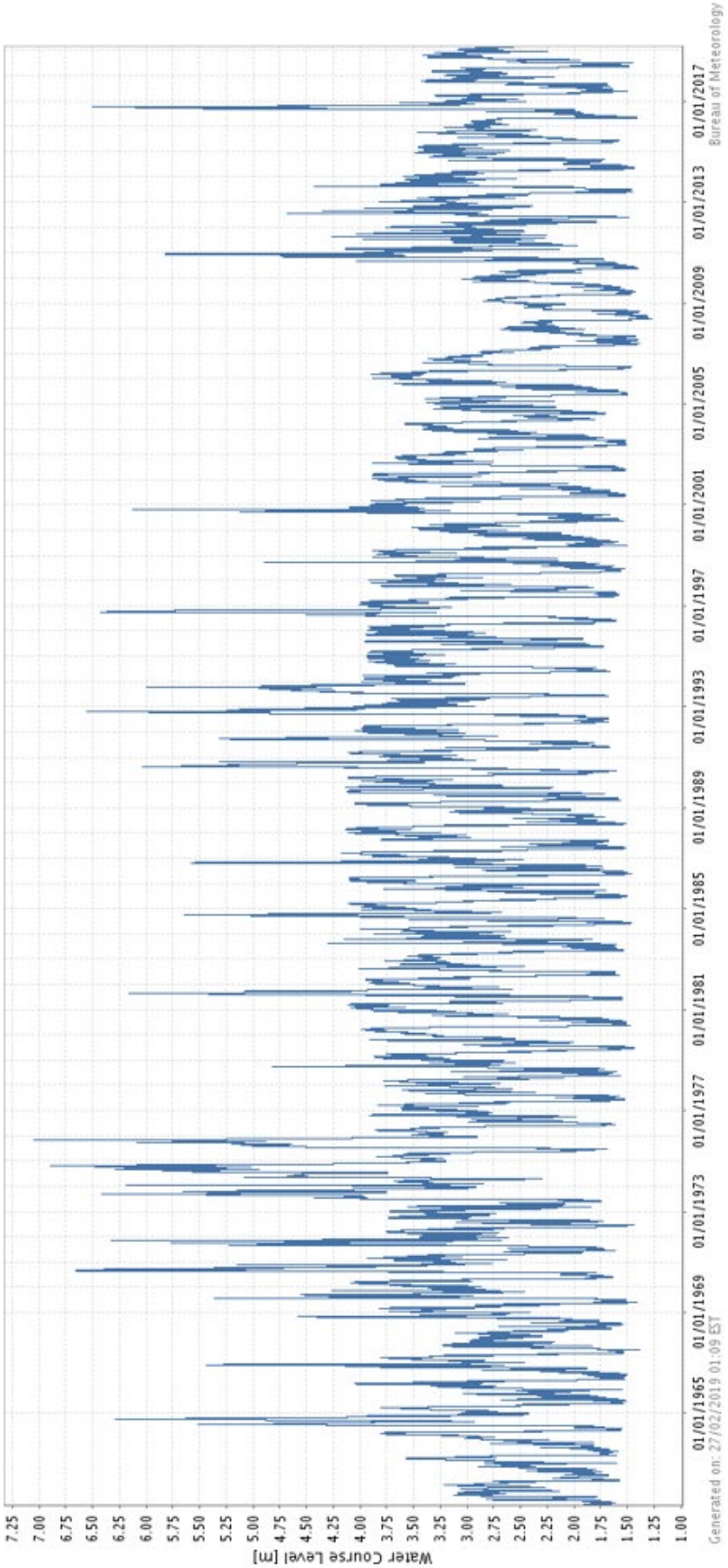
The largest flows on record are summarised in Table C7.

Table C8 – Murray River flood record

Historic Gauge levels: Doctors Point	Doctors Point gauge level (m)	Flow (GHD 2012)	ARI (GHD 2012)
1870		268,000	130
Oct 1917		241,000	95
1867		225.000	70
Oct 1975	7.05	200,000	50
Oct 1974	6.928	170,000	30
Aug 1970	6.672	138,000	18
Oct 1992	6.61		
Nov 2022	6.54		
Oct 2016	6.53		
Sep 1970	6.435		
Oct 1996	6.442		
Sep 1973	6.435		
Nov 1971	6.34		
Oct 1964	6.382		
Sep 1974	6.294		

The period from the mid-1990s onwards has seen relatively few significant flood events (in comparison to previous years as seen in Figure 7).

Figure C4 – Historic gauge levels for Murray River at Doctors Point


Water Course Level [m]
7.25
7.00
6.75
6.50
6.25
6.00
5.75
5.50
5.25
5.00
4.75
4.50
4.25
4.00
3.75
3.50
3.25
3.00
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
01/01/1965
01/01/1969
01/01/1973
01/01/1977
01/01/1981
01/01/1985
01/01/1989
01/01/1993
01/01/1997
01/01/2001
01/01/2005
01/01/2009
01/01/2013
01/01/2017
Generated on: 27/02/2019 01:09 EST
Bureau of Meteorology

Summary of Consequences

Table C9 - Consequence Summary of 1% AEP flood along Murray River and Gateway Island

Summary of Consequences in a 1% AEP (100yr ARI) flood along Murray River in the City of Wodonga					
Property					
Properties	**31**				
Residential	17	Houses located on the Murray River Floodplain most associated with agricultural enterprise			
Commercial	10	Mixed commercial, arts and culture businesses located in Gateway Village, Gateway Island.			
Industrial	4	Sand Quarries on the Murray River Flood Plain North of the Hume Freeway			
Public Land	0				
Rural	0	Agricultural Flood plain extensively flooded, Farms isolated.			
Community Infrastructure					
Essential Infrastructure					
Major Roads	1	Lincoln Causeway			
Key local roads	5	**Gateway Island:** Harris Road, Lemke Road, Island Road. **Wodonga**: Stock Route Road, Goynes Road, Sheathers Road, Carroll's Lane, Wright Road, Trabants Road. **Bonegilla:** Snowdens Road, Reids Road, Ryans Road, McIntosh Road, Rapseys Road. **Wodonga West:** Bidstrupp Road. **Barnawartha North:** Old Barnawartha Road.			
Major Rail	0				
Sewerage Facilities	0				
Levees	0				
Tourism / Recreation					
Sports Facilities	3	Warriors Albury Wodonga Dragon Boat Club, Brave Hearts Dragon Boat Club Albury Wodonga & Albury Wodonga Waterski Club (Lemke Rd, Gateway Island)			
Recreation Facilities	3	Wodonga Radio Control Car Club, Wodonga Creek Miniature Railway, Diamond Park Playground & walking paths along Murray River. (Gateway Island)			
Government Boundaries					
Local Gov't Areas	1	City of Wodonga	CMA	1	North East CMA
Adjacent LGAs	3	Indigo Shire, Albury City Council, NSW, Towong Shire	CFA District	1	District 24
SES Resp' Boundary	1	Wodonga	FRV District	1	South Eastern FS 76

Warnings and Gauges

The Bureau of Meteorology currently provides flood forecasts for the Murray River at Albury (Union Bridge).

Warnings are available for flooding expected along the Murray River which include areas adjacent to the river between Lake Hume and Corowa, NSW. Flood class levels for the Murray River gauges are detailed in table C6 and are used in the issuing of a flood warning for the Murray River at Albury. These and other gauge details within the Murray River catchment are contained within table C6.

Table C10 - Gauges with established Flood Class Levels for the Murray River in the City of Wodonga

	River/creek flood class level		
	Minor	Moderate	Major
Murray River at Heywoods	N/A	N/A	N/A
Murray River at Doctors Point	N/A	N/A	N/A
Murray River at Albury (Union Bridge)	4.30m	4.90m	5.50m

Only at the Murray River at Albury (Union Bridge) gauge will the Bureau of Meteorology (the BoM) issue flood warnings if levels reach those classified above. Warnings will be placed on the Bureau's website (bom.gov.au/vic/warnings/index.shtml?ref=hdr) and the VicEmergency website emergency.vic.gov.au.

Properties at Flood Risk

Properties listed in the table below are at risk from flooding along the Murray River. As more intelligence becomes available, this list may change.

This Property Flood Risk Table is presented by the Victoria State Emergency Service for the purpose of disseminating emergency management information. The contents of the information have not been independently verified by the Victoria State Emergency Service. No liability is accepted for any damage, loss or injury caused by errors or omissions in this information or for any action taken by any person in reliance upon it.

Table C11 - Properties at risk of flooding along the Murray River in the City of Wodonga

Properties at risk from Flooding within the Murray River catchment								
Residential				Commercial	Industrial	Rural	Public Use	
Street No. at Risk in AEP Event					Address	Suburb	Along Water Watercourse	Flood Risk Type
20% AEP	10% AEP	5% AEP	2% AEP	1% AEP				
BELOW FLOOR								
✓					66 Harris Road	Gateway Island	Murray River	Riverine
✓					6 Stock Route Rd	Wodonga	Murray River	Riverine
✓					105 Lemke Rd	Gateway Island	Murray River	Riverine
✓					138 Lemke Rd	Gateway Island	Murray River	Riverine
	✓				40 Lincoln Causeway	Gateway Island	Murray River	Riverine
	✓				9 Weight Rd	Gateway Island	Murray River	Riverine
	✓				52, 22 & 32 Goynes Rd	Wodonga	Murray River	Riverine
	✓				51 Bidstrupp Rd	Wodonga West	Murray River	Riverine
	✓				60 & 102 Sheathers Rd	Wodonga	Murray River	Riverine
	✓				89 Carrolls Rd	Wodonga	Murray River	Riverine
	✓				1 Stock Route Rd	Wodonga	Murray River	Riverine
	✓				9 Wright Rd	Wodonga	Murray River	Riverine
	✓				17 Trabants Rd	Bonegilla	Murray River	Riverine
	✓				231, 359 & 409 Snowdens Rd	Bonegilla	Murray River	Riverine
	✓				26 & 35 Reids Rd	Bonegilla	Murray River	Riverine
	✓				138 Ryans Rd	Bonegilla	Murray River	Riverine
ABOVE FLOOR								
		✓			9 Weight Rd	Gateway Island	Murray River	Riverine
		✓			40 Lincoln Causeway	Gateway Island	Murray River	Riverine
		✓			1 & 6 Stock Route Rd	Wodonga	Murray River	Riverine
			✓		40 Lincoln Causeway (multiple properties)	Gateway Island	Murray River	Riverine
				✓	40 Lincoln Causeway (multiple properties)	Gateway Island	Murray River	Riverine
4	19	4	3	1				

Table C1.5 asset register

What areas are affected?

- A number of commercial properties within the Gateway Islands Business Park on Gateway Island.

- 31 properties on the Murray River Flood plain of Wodonga, Wodonga West and Bonegilla. Including public use, commercial and businesses on Gateway Island.
- Typically, flood waters would arrive at Gateway Islands 12-16 hours hrs after releases from Hume Dam, not including flows from the Kiewa River.
- North East Water pumping station on Bandiana Link road can be surrounded by flood water from Wodonga Creek during Murray River flooding, however is presently protected up to a 1% AEP (1 in 100 year) flood event. North East Water is undertaking additional mitigation works to increase the levee height around this asset to a 0.5% (1 in 200 year) flood event. North East Water also have additional strategies in place to maintain service continuity at this asset in the event of flooding.
- Properties on Island Road, Bonegilla can be isolated. Many properties use boats to access NSW.
- The Lincoln Causeway closes during Major level flooding however, access to and from Albury and Wodonga is maintained by the Hume Freeway.

Flood mitigation

There are no formal flood mitigation structures providing protection for assets in the Wodonga LGA within this reach. The South Albury levee provides protection to the southern part of Albury up to 1% AEP level (with no freeboard in a few locations).

Lake Hume on the Murray River upstream of Albury-Wodonga stores water for irrigation purposes. While the storage alters the seasonality of downstream flows and may impact on the passage of small, frequent floods, it is not principally operated to mitigate downstream flooding and large floods are only partially regulated.

Lake Hume can store incoming floodwaters when the lake is at a low level; however, when the storage is full or near full, flood inflows must be passed downstream with little attenuation.

Flood impacts and required actions.

Flood intelligence card

Gauge location: Murray River at Albury (Union Bridge)

Gauge	River Height (m)	River Flow (ML/d)	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Murray River at Albury (Union Bridge)	**~2.86**		**Below Minor Flood Level**	▪ 150.295 AHD ▪ Bike paths on Gateway Island overtopped opposite Harvey's Fun Park and south of Harris Road – Flannigan's Creek (western side)	City of Wodonga to close bike paths to the public	
	4.0		**50% AEP**			
	4.3	44,000 approx.	**Minor Flood Level**	5.42m at Doctors Point	BOM will issue and VICSES to publish Minor flood warning to community with tailored information from this plan. The Hume Region Duty Officer in conjunction with the Regional Agency Commander will maintain operational awareness and form an appropriate response to suit the level of the incident	
	4.9	66,000 approx.	**Moderate Flood Level**	• 6.08m on Doctors Point Guage • Providing access across the Murray River from Albury (Waterworks Road) to Island Road (Victoria). The Bridge is high; however, Island Road to the south of the bridge is inundated in events greater than approximate 20% AEP event (Doctors Point 6.0m). Which begins from Moderate flood class level ay Union Bridge. **Water over Road** • Harris Rd, Gateway Island • Island Rd, Bonegilla (Access via Waterworks Rd, Albury, NSW)	VICSES to consider Base IMT rostered/standby or Base IMT in place depending on forecast. BOM will issue and VICSES to publish Moderate flood warning to community. VICSES to Consider the use of Snap, Send, Solve Flood observers for Intelligence gathering Evacuation triggers may be relevant from this height. Refer to Evacuation Trigger table on page 96.	
	4.94			• December 2010 Flood Peak Height		

Gauge	River Height (m)	River Flow (ML/d)	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Murray River at Albury (Union Bridge)	**4.96**		**20% AEP**	• Largest flooding to the west of Gateway Lakes impacting Rowing Clubs on Lemke Road **Properties at risk: (Below Floor)** • 66 Harris Road, Gateway Island • As at April 2019, 64 & 84 Lemke Road have been demolished and do not pose a risk. **Water over Road** • Harris Rd, Gateway Island • Lemke Rd, Gateway Island • Stock Route bridge, Wodonga: Old timber bridge (no longer in service) has been replaced by a high level suspension bridge. The bridge is above 1% AEP flood level; however, both approaches are flooded in a 20% AEP event.	VICSES to consider sand bagging of rowing club VICSES to Consider the use of Snap, Send, Solve Flood observers for Intelligence gathering. VICSES to respond on a request by request basis VICSES to engage residents/holiday house at 66 Harris Road about access issues and flooding predictions and relocation. Council to determine where and when to close roads identified	GHD 2012
	5.07			**Properties at risk: (Below Floor)** • Dragon boat rowing clubs & Albury Waterski Club at Gateway Lakes inundated. • 6 Stock Route Rd, Wodonga **Water over Road** • Stock Route Rd, Wodonga • Old Barnawartha Road, Barnawartha North	VICSES to engage clubs and assist with sand bagging club rooms. VICSES to engage residents at 6 Stock Route Rd about access issues and flooding predictions and potential relocation. VICSES/VICPOL and City of Wodonga to determine if evacuation or relocation of properties identified required and if relief is required. Investigation required to determine if Old Barnawartha Road impacted at this height. City of Wodonga/RRV to close roads identified	
	5.3			• October 1996 Flood Peak Height • 6.52m on Doctors Point Guage		
	5.38		**10% AEP**	• Oct 2016 Flood Peak Height • 6.63m on Doctors Point Guage • Diamond Park, Gateway Island (train track, motorbike track extensively flooded	VICSES to respond on a request by request basis Council to close access to Diamond Park	

Gauge	River Height (m)	River Flow (ML/d)	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Murray River at Albury (Union Bridge)	**5.38**		**10% AEP**	• Gateway Village located on the east side of Lincoln Causeway includes businesses and buildings within the precinct. In 2016 & 2022 Murray River flood events, the buildings to the north experience flood water back flows up the storm water system, into the precinct and into their basements in a 10% AEP flood. • VICSES & the City of Wodonga council sandbagged the north end of the Gateway Village Carpark at La Maison Café in the 2016 & 2022 floods to prevent further flood impacts. Flood water inundates behind this wall via storm water infrastructure and requires 24/7 pumping. • This approach is time & material consuming and requires multi agency response 24/7. Not recommended for future floods. VICSES has engaged business owners to develop and activate flood emergency plans to reduce impacts to businesses. • A number of quarries are located on the floodplain between Wodonga and the Murray River. They are located adjacent to Edwards Rd, Hume Fwy and the Sydney-Melbourne Railway to the South and Sheathers Rd to the East. (See figure C6) • Felltimber Creek approaches the site located on Edwards Road from the South East as it enters the floodplain. The site includes an easement through the middle of four quarry pits which has the main gas supply line running north/south through it into Albury NSW	VICSES to Consider the use of Snap, Send, Solve Flood observers for Intelligence gathering VICSES to engage business owners at La Maison, Musi Kids and Black Duck to engage flood emergency plan and discuss closure of businesses in flood predicted to exceed this height. VICSES should not use mass sandbagging around the northern Gateway Lakes businesses as a strategy, but rather undertake strategic property protection, such as sandbagging of doorways and removal of furniture / raising of furniture etc. VICSES/VICPOL and City of Wodonga to determine if evacuation or relocation of properties identified required and if relief is required. IC to engage Earth Resources section within DEECA to ensure they form part of EMT regarding potential impact to the quarries Council to monitor and determine when to close Island Road prior to inundation. VICSES Unit to engage Black Duck Café to ensure non return valve is engaged on pipe to ponds to reduce flood impact at site prior to reaching this height. VICSES Unit to Engage La Maison to determine if additional trash pump required for basement pumping.	

Gauge	River Height (m)	River Flow (ML/d)	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Murray River at Albury (Union Bridge)	**5.38**		**10% AEP**	• High voltage power lines run East/West at the North of the quarry approximately 50M from the site. The north of the site is exposed to the floodplain and receives water there from a 10% AEP flood. • Baxter Property Holdings quarry site is approximately 200M south of the Murray River and is also impacted by water from a 10% AEP flood. **Properties at risk: (Below Floor)** • La Maison Restaurant, 40 Lincoln Causeway, Gateway Island (Basement floods) • Musikids, 40 Lincoln Causeway, Gateway Island • Black Duck Café/Gypsy Gardens, 9 Weight Road, Gateway Island • 52 Goynes Rd, Wodonga (house above 1%AEP) • 22 & 32 Goynes Rd, Wodonga • 51 Bidstrupp Rd, Wodonga West • 60 & 102 Sheathers Rd, Wodonga • 89 Carrolls Rd, Wodonga • 1 & 6 Stock Route Rd, Wodonga • 9 Wright Rd, Wodonga • 17 Trabants Rd, Bonegilla • 231, 359 & 409 Snowdens Rd, Bonegilla • 26 & 35 Reids Rd, Bonegilla • 138 Ryans Rd, Bonegilla These properties at risk of isolation at this flood height		

Gauge	River Height (m)	River Flow (ML/d)	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Murray River at Albury (Union Bridge)	**5.38**		**10% AEP**	**Water over Road:** • Goynes' Road, Wodonga • Bidstrupp Road, Wodonga West • Sheathers Road, Wodonga • Carroll's Lane, Wodonga • Wright Road, Wodonga • Trabants Road, Wodonga • Snowdens Road, Bonegilla • Reids Road, Bonegilla • Ryans Road, Bonegilla • McIntosh Road, Bonegilla • Rapseys Road, Bonegilla	City of Wodonga/RRV to close roads identified.	
	5.4			• Oct 2016 Flood Peak Height • Oct 1992 Flood Peak Height		
	5.5	140,000 approx.	**Major Flood Level**	• 6.74m on Doctors Point Guage **Water over Road** • Harris Rd, Gateway Island • Lemke Rd, Gateway Island • Harris & Lemke Roads, completely inundated	BOM will issue and VICSES to publish Major flood warning to community. VICSES to consider Base IMT in place or Core in place with observed activity. City of Wodonga/RRV to close identified roads	
	5.51	145,000 approx.	**5% AEP**	November 2022 Flood Peak Height Flooding on Gateway Island experienced		GHD 2012
	5.52			Threshold for access to North East Water Pumping Station on Murray River, Bandiana Link Rd, Wodonga. Site provides drinking water for Wodonga. NEW have alternative pumping station installed to provide water. **Properties at risk: (Above Floor)** • Black Duck Café/Gypsy Gardens, 9 Weight Road, Gateway Island – Access still available via road.	VICSES to respond on a request by request basis IC to engage North East Water to ensure they form part of EMT	VICSES Wodonga Unit Obs

Gauge	River Height (m)	River Flow (ML/d)	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Murray River at Albury (Union Bridge)	**5.52**			• Musikids, 40 Lincoln Causeway, Gateway Island • 1 & 6 Stock Route Rd, Wodonga No other access to Properties on Stock Route Road.	VICSES/VICPOL and City of Wodonga to determine if evacuation or relocation of properties identified required and if relief is required.	
	5.56			October 1974 Flood Peak Height		
	5.67		**2% AEP**	• Shallow Flooding around buildings at 64 Lincoln Causeway, Gateway Island **Properties at risk: (Above Floor)** • La Maison Restaurant, 40 Lincoln Causeway, Gateway Island. • Burraja Indigenous Cultural and Environmental Discovery Centre, 40 Lincoln Causeway, Gateway Island. • Buildings to the South of 'The Lincoln' on the Lincoln Causeway subject to flooding.	VICSES Unit to engage La Maison restaurant to determine business closure. Sandbag Entryways to La Maison. VICSES/VICPOL and City of Wodonga to determine if evacuation or relocation of properties identified required and if relief is required. VICSES to Investigate need to support building south of 'The Lincoln'	
	5.69			• Approx. 6.96m on Doctors Point Guage • December 1975 Flood Peak Height		
	5.75		**1% AEP**	**Properties at risk: (Above Floor)** • Hot House Theatre, 40 Lincoln Causeway, Gateway Island	VICSES Unit to engage Hot House Theatre to determine business closure. Sandbag Entryways to Theatre VICSES/VICPOL and City of Wodonga to determine if evacuation or relocation of properties identified required and if relief is required.	
	5.86	Approx. 220,000		Evacuation by road via the Lincoln Causeway to the north will not be possible safely at this height.	RRV to close Lincoln Causeway	

Gauge	River Height (m)	River Flow (ML/d)	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Murray River at Albury (Union Bridge)	**5.89**			1870 Flood of Record (prior to construction of Hume Dam)		
	7.1			• Evacuation by road via the Lincoln Causeway to the south past the height of 7.365 metres on the Albury Gauge will not be possible safely.	RRV to close Lincoln Causeway	
	8.965		**Probable Maximum Flood (PMF)**	• Depth over floor: 2.8m across flood plain		

Note: flood intelligence records are approximations. This is because no two floods at a location, even if they peak at the same height, will have identical impacts. Flood intelligence cards detail the relationship between flood magnitude and flood consequences. More details about flood intelligence and its use can be found in the Australian Institute of Disaster Resilience (AIDR) Handbook series on managing the Floodplain.

Appendix C4 – Wodonga urban waterways Flood Emergency Plan (House, Huon, Felltimber & Jack in the Box Creeks)

Overview of Flooding Consequences

House Creek and Huon Creek

House Creek is a tributary of Wodonga Creek (which is itself an anabranch of the Murray River), entering Wodonga Creek adjacent the Hume Freeway. The upper catchment of House Creek is rural/farming land, with the creek running north of, and approximately parallel to, Castle Creek Road upstream of the urban interface, approximately 1.5km upstream of Yarralumla Drive, Wodonga.

The major tributary of House Creek is Huon Creek. Huon Creek runs parallel to Huon Creek Road through rural/ farming land, before entering the urban area approximately 1.3km upstream of Yarralumla Drive. Huon Creek enters House Creek approximately 1km downstream of Yarralumla Drive.
The total catchment area upstream of the Wodonga Creek confluence is approximately 69.4km2 (6940 ha) (Cardno Willing 2002).

The majority of the urban reach of House Creek is contained within parkland/reserves with limited flood impac on private assets (beyond flooding of the lower parts of some lots backing onto the creek reserve). Exceptions to this include three residential areas:

- Sanctuary Boulevard – levee protection provided to 25 houses which would otherwise be subject to above floor flooding in events exceeding 5% AEP.
- Cypress Court and Park Lane contain a small number of houses (approximately 10 in total) exposed external or above floor flooding. Two houses flood above floor in the 1% AEP event on Cypress Court. Levees are proposed for future implementation in these areas.

The most recent flood investigation for the House Creek/Huon Creek catchment was undertaken in 2018 (Water Technology). The investigation included a hydraulic analysis of the broader catchment and 2D hydraulic modelling, which provided a range of detailed flood mapping for five, 10, 20, 50, 100 and 200 year ARI events.

There is no long-term established stream gauge on House Creek but a short term gauge operated downstream of Brockley St from August 2000 to 2002 (W&P 2002 Section 4.3.3). Historic flood levels at roac crossings are tabulated below, from W&P with modelled flood levels from Water Technology 2018 also provided.

Figure C5 – House Creek and Huon Creek in the Wodonga urban area

Table C12 - Historic flood levels – House Creek and Huon Creek

Location	August 1970	September 1973	January 1974	August 1983	February 1993	Modelled 20 yr ARI	Modelled 100 yr ARI
Reuss St Bridge		152.57				153.35	153.43
Hume Highway						153.31	153.34
Railway Line	155.52					155.82	156.34
Forest Mars Bridge			155.77			155.46	156.78
Melbourne Road	157.08		157.4	158	158.7	157.58	158.30
Suspension Bridge						157.52	158.23
Lawrence Street	158.23		158.56	159.17	159.88	159.45	160.03
Woodland Bridge						159.96	160.32
Brockley Street			160.43			160.92	161.50
Pearce Street		164.82		165.7		166.45	167.15
Huon Ck Road		169.44				168.93	169.10
Yarralumla Drive						173.12	174.71
Huon Creek Footbridge (near Cambourne Ct)						175.66	175.91
Sanctuary Boulevard (upstream end)						172.88	173.33

Felltimber Creek

Felltimber Creek is a tributary of the Murray River, entering the Murray River floodplain a short distance downstream from the Hume Freeway. The catchment area upstream of the freeway is approximately 1500 ha (Cardno Willing 2004).

The catchment area, which extends approximately four kilometres west of the Wodonga urban area, is predominantly rural with steep, cleared farmland and conservation areas, transitioning to Low Density Residential land above Felltimber Creek Road. Between Felltimber Creek Road and Parkers Road/Lawrence Street, the creek flows through Wodonga Golf Course with residential development set back from the waterway. From Parkers Road/Lawrence Street to Moorefield Park Drive the waterway and floodplain lie within public park land; however, there may be areas of potential impact on adjacent residential land. Between Moorefield Park Drive and the Hume Freeway, Felltimber Creek passes through the educational precinct (Latrobe University and former Wodonga TAFE land).

The most recent flood investigation for Felltimber Creek is the Felltimber Creek Flood Study (Cardno Willing 2004). The assessment includes modelled water surface profiles for 20 year, 50 year and 100 year ARI flood events, but no mapping of flood extents.

There is no established stream gauge on Felltimber Creek and no known reliable historic flood levels to allow calibration of models.

There are no flood related planning scheme overlays in place along Felltimber Creek.

Figure C6 – Felltimber Creek in Wodonga urban area

Jack in the Box Creek

Jack in the Box Creek is a tributary of Wodonga Creek (which is itself an anabranch of the Murray River) entering Wodonga Creek adjacent the Hume Freeway. The catchment (930 ha) is predominantly urbanised.

The most recent flood investigation for Jack in the Box Creek is the Jack in the Box Creek Flood Study (Cardno Willing 2006). This investigation provides flood level and extent information for five, 20, 50 and 100 year ARI flood events.

A further hydrologic review was undertaken for the city of Wodonga in 2012 (GHD 2012) to consider the impacts of upstream development and options for stormwater detention.

Land Subject to Inundation Overlay (LSIO) applies along the length of Jack in the Box Creek downstream of Victoria Cross Parade (based on Cardno Willing 2006), but there are known inaccuracies in the flood extent as represented by the overlays.

Summary of Consequences (Read in conjunction with Intelligence Card)

W & P2002 identifies the largest flood event (prior to the study) as occurring in 1993, resulting in overtopping of Lawrence Street and overtopping of the Sanctuary Blvd levee.

Existing planning scheme overlays (FO) reflect the results of the previous flood study (2002). The results of the current study (Water Technology 2018) have not yet been adopted in the planning scheme.

Critical storm duration from six to 12 hours for the one per cent AEP event (Water Technology 2018).

Upper catchments of Jack in the Box Creek flow from and through the Gaza Ridge Barracks in the Albury Wodonga Military Area upstream of Victoria Cross Parade. Flood impacts within this area are unknown.

Table C13 - Consequence Summary of 1% AEP flood along Wodonga Urban Floodways

Summary of Consequences in a 1% AEP (100yr ARI) flood along Wodonga urban waterways in the City of Wodonga		
Property		
Properties	**55**	
Residential	41	Several residence backing onto the Huon and House creeks (Above & below floor levels)
Commercial	1	Wodonga Golf Club (Course)
Industrial	1	Potential for steel mill to be inundated in flash flood
Public Land	12	A number Parks, Gardens, Walking paths and recreation reserves along the creeks inundated
Rural	0	
Community Infrastructure		
		Walkway access bridges through parks and reserves
Essential Infrastructure		
Major Roads	0	Huon Creek Road, Castle Creek Road, Bandiana Link Rd,
Key local roads	5	Lawrence St, Sangsters Road, Forest Mars Rd, Wilsons Rd, Thomas Mitchell Drive, Many other residential roads.
Major Rail	0	No impact to Sydney/Melb Rail
Sewerage Facilities	0	Nil
Levees	1	Sanctuary Boulevard Levee
Tourism / Recreation		

Summary of Consequences in a 1% AEP (100yr ARI) flood along Wodonga urban waterways in the City of Wodonga					
Sports Facilities	0				
Recreation Facilities	0				
Government Boundaries					
Local Gov't Areas	1	City of Wodonga	CMA	1	North East CMA
Adjacent LGAs	3	Indigo Shire, Albury City Council, NSW, Towong Shire	CFA District	1	District 24
SES Resp' Boundary	1	Wodonga	FRV District	1	South Eastern FS 76

Roads and Bridges

Table C14 - Waterway crossings at risk of flooding – House Creek and Huon Creek

Waterway	Crossing	Impact	Actions	Reference
Huon Creek	Gilberts Road	In rural area, providing access from Huon Creek Road to four dwellings. No information on incidence of overtopping of road/culverts.	City of Wodonga to monitor and determine if roads need to be closed	
	Wilsons Road	In rural area, providing access from Huon Creek Road to one dwelling. Overtopped by 0.1m in 1% AEP event	City of Wodonga to monitor and determine if roads need to be closed	Water Tech (2018)
House Creek	Unnamed track near Elligate Lane (top end of Castle Creek Road)	In rural area, providing access from Castle Creek Road to one dwelling. No information on incidence of overtopping of road/culverts	City of Wodonga to monitor and determine if roads need to be closed	Water Tech (2018)
	Unnamed (private access track) 300m upstream of Loames Street	In rural area, providing access from Castle Creek Road to one dwelling. Overtopped by 0.15m in 2% AEP event	City of Wodonga to monitor and determine if roads need to be closed	
	Yarralumla Drive	No overtopping in 0.5% AEP event and below		Water Tech (2018)
	Huon Creek Road	Overtopped by 0.5-0.1m in 2% AEP event, and by 0.1-0.15m in 1% AEP event. Overtop first occurs 190m west of main bridge.	City of Wodonga to monitor and determine if roads need to be closed	Water Tech (2018)
	Pearce Street	Overtopped by 0.5-0.1m in 0.5% AEP event	City of Wodonga to monitor and determine if roads need to be closed	Water Tech (2018)
	Brockley Street	No overtopping in 0.5% AEP event and below	City of Wodonga to monitor and determine if roads need to be closed	Water Tech (2018)
	Lawrence Street	Overtopped by <0.05m in 5% AEP event, and by 0.56m in 1% AEP event	City of Wodonga to monitor and determine if roads need to be closed	Water Tech (2018)
	Melbourne Road/Elgin Boulevard	No overtopping in 0.5% AEP event and below		Water Tech (2018)
	Forest Mars Avenue	Overtopped by 0.15m-0.2m in 20% AEP event (from flow along Sangsters Road), and by 0.50m in 1% AEP event	City of Wodonga to monitor and determine if roads need to be closed	Water Tech (2018)
	Reuss Road/Sumsion Gardens			
	Hume Freeway	No overtopping in 0.5% AEP event and below		Water Tech (2018)

Waterway	Crossing	Impact	Actions	Reference
Felltimber Creek	Felltimber Creek Road (two crossings upstream of urban area)	unknown		
	Felltimber Creek Road (in urban area)			
	Parkers Road			
	Moorefield Park Drive			
	McKoy Street			
	Hume Freeway			
	Railway line			
	Sheathers Road			
Jack in the Box Creek	Victoria Cross Parade			
	Chapple Street			
	Thomas Mitchell Drive	Flooded in all events exceeding 5% AEP	RRV & City of Wodonga to monitor and determine if roads need to be closed	Cardno Willing 2004 Section 6.1
	Lawrence Street			
	Wigg Street			
	Osburn Street			
	Kendall Street			
	Hume Freeway			

Warnings, Gauges & Rainfall Intensity

All flood response actions must therefore be driven by rainfall observations. A telemetered rain gauge is located at Albury Airport.

Table C15 – Wodonga Rainfall Gauges

Gauge	Station No.	Location	Stream Level & Flow Gauge	Rain Gauge	Map Reference
Albury Airport	72160	Albury Airport		✓	

These Gauges may provide some warning of expected flooding. See the Melbourne Water website for more information on these gauges: http://www.melbournewater.com.au/waterdata/rainfallandriverleveldata/Pages/Rainfall-and-river-level-new.aspx. The Bureau of Meteorology's website also links a number of these gauges at: http://www.bom.gov.au/cgi-bin/wrap_fwo.pl?IDV60201.html. It is advised that residents monitor the Bureau of Meteorology's website http://www.bom.gov.au/vic/warnings/index.shtml?ref=hdr and the VicEmergency website https:/emergency.vic.gov.au/ for any thunderstorm, flood or severe weather warnings present for their area.

There are no active stream gauges in the House Creek, Huon Creek, Felltimber Creek or Jack in the Box Creek systems. All are small catchments with limited warning time. Rapid onset flash flooding (<six hours) is likely to occur as a result of high intensity rainfall events in the local catchment (extending approximately 15km south of Wodonga).

In the absence of stream gauges, rainfall intensity/frequency/duration (IFD) data provides the best indication of event magnitude, but stream response will be heavily dependent on rainfall location, duration (relative to critical duration for catchment) and precedent conditions.

IFD data for Wodonga (Table 10 and Figure 9) has been extracted from: http://www.bom.gov.au/water/designRainfalls/ revised-ifd/?year=2016, described as 2016 IFDs which (relative to the earlier ARR 1987 IFDs) are:

- Based on a more extensive data base, with more than 30 years of additional rainfall data and data from extra rainfall stations;
- More accurate estimates, combining contemporary statistical analysis and techniques with an expanded rainfall database;
- Better estimates of the two per cent and one per cent annual exceedance probability IFDs than the interim 2013 IFDs,' and,
- By combining contemporary statistical analyses and techniques with an expanded database, the new 2016 IFDs provide more accurate design rainfall estimates for Australia.

Note: The 2016 IFDs replace both the ARR87 IFDs and the interim 2013 IFDs.

Table C16 - BOM IFD 2016 for Wodonga

Location								
Label:	Wodonga							
Requestec	Easting	488000	Northing	6002000	Zone	55		
Nearest gi	Latitude	36.1375(S	Longitude	146.8625(E)				
		Annual Exceedance Probability (AEP)						
Duration	Duration in min	63.20%	50%	20%	10%	5%	2%	1%
1 min	1	1.71	1.92	2.61	3.08	3.54	4.16	4.63
2 min	2	2.88	3.24	4.38	5.16	5.91	6.83	7.53
3 min	3	3.92	4.41	5.96	7.01	8.04	9.31	10.3
4 min	4	4.82	5.43	7.34	8.64	9.91	11.5	12.7
5 min	5	5.61	6.32	8.55	10.1	11.6	13.5	15
10 min	10	8.48	9.57	13	15.3	17.7	20.8	23.2
15 min	15	10.4	11.7	15.9	18.8	21.7	25.5	28.5
30 min	30	13.8	15.5	21.1	25	28.8	33.8	37.8
1 hour	60	17.4	19.6	26.4	31.1	35.7	41.8	46.5
2 hour	120	21.5	24	32	37.5	42.9	49.9	55.3
3 hour	180	24.3	27	35.7	41.7	47.5	55.2	61.1
6 hour	360	30.1	33.3	43.5	50.4	57.2	66.5	73.6
12 hour	720	37.6	41.5	53.9	62.3	70.7	82.5	91.7
24 hour	1440	46.9	51.8	67.5	78.4	89.3	105	118
48 hour	2880	57.2	63.5	83.9	98.2	112	134	151
72 hour	4320	63.2	70.3	93.5	110	126	151	171
96 hour	5760	67.1	74.8	99.5	117	134	161	183
120 hour	7200	70	78	103	121	139	166	189
144 hour	8640	72.2	80.3	106	123	141	169	192
168 hour	10080	74	82.1	107	124	141	169	193

Properties at Flood Risk

Properties listed in the table below are at risk from flooding along the House and Huon Creeks. As more intelligence becomes available, this list may change.

This Property Flood Risk Table is presented by the Victoria State Emergency Service for the purpose of disseminating emergency management information. The contents of the information have not been independently verified by the Victoria State Emergency Service. No liability is accepted for any damage, loss or injury caused by errors or omissions in this information or for any action taken by any person in reliance upon it.

Table C17 - Properties at risk of flooding along the Wodonga Urban Waterways

Properties at risk from Flooding within the Wodonga Urban Waterways (House, Huon, Felltimber & Jack in the Box Creeks)									
Residential		Commercial		Industrial		Rural			Public Use
Street No. at Risk in AEP Event RAINFALL RATE %AEP						Address	Suburb	Along Water Watercourse	Flood Risk Type
20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	0.5% AEP				
BELOW FLOOR									
✓						58-62 & 136 Huon Creek Road	Wodonga	Huon Creek	Riverine
✓						32 – 58 Clarendon Avenue	Wodonga	Huon Creek	Riverine
✓						1 – 3 Cambourne Court	Wodonga	Huon Creek	Riverine
✓						3-7 Como Drive	Wodonga	Huon Creek	Riverine
✓						32, 34, 36A, 36B, 40 Huon Creek Road	Wodonga	Huon Creek	Riverine
✓						3-7 Kirribilli Court	Wodonga	Huon Creek	Riverine
✓						2 Uralla Court	Wodonga	House Creek	Riverine
✓						47 Jarrah Street	Wodonga	House Creek	Riverine
✓						23-27 and 11-13 Moonya Drive	Wodonga	House Creek	Riverine
✓						Church Street	Wodonga	House Creek	Riverine
	✓					15 to 21 Moonya Drive	Wodonga	House Creek	Riverine
	✓					39 Huon Creek Road	Wodonga	Huon Creek	Riverine
	✓					1 to 5 Hereford Street	Wodonga	House Creek	Riverine
	✓					6 Cypress Court	Wodonga	House Creek	Riverine
		✓				2 Peterkin Lane	Wodonga	House Creek	Riverine
		✓				5 & 7 Cypress Court	Wodonga	House Creek	Riverine

Properties at risk from Flooding within the Wodonga Urban Waterways (House, Huon, Felltimber & Jack in the Box Creeks)									
Residential				Commercial		Industrial	Rural		Public Use
Street No. at Risk in AEP Event RAINFALL RATE %AEP						Address	Suburb	Along Water Watercourse	Flood Risk Type
20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	0.5% AEP				
			✓			4 Peterkin Lane	Wodonga	House Creek	Riverine
				✓		142 Castle Creek Road	Wodonga	House Creek	Riverine
				✓		7 Hereford Street	Wodonga	House Creek	Riverine
				✓		135 Brockley Street	Wodonga	House Creek	Riverine
				✓		2 Cypress Court	Wodonga	House Creek	Riverine
				✓		3 to 9 Park Lane	Wodonga	House Creek	
ABOVE FLOOR									
	✓					100 Huon Creek Road	Wodonga	Huon Creek	Riverine
	✓					Out buildings at 3 and 5 Hereford Street	Wodonga	House Creek	Riverine
	✓					Out buildings 116 Huon Creek Road	Wodonga	Huon Creek	Riverine
		✓				96 Huon Creek Road	Wodonga	Huon Creek	Riverine
		✓				6 Cypress Court	Wodonga	House Creek	Riverine
		✓				Out buildings at 47 Jarrah Street	Wodonga	House Creek	Riverine
		✓				Out buildings at 1 & 5 Hereford Street	Wodonga	House Creek	Riverine
		✓				Out buildings 64, 94, 96 & 128, Huon Creek Road	Wodonga	Huon Creek	Riverine
			✓			3, 5,& 7 Cypress Court	Wodonga	House Creek	Riverine
				✓		3, 5,& 7 Cypress Court	Wodonga	House Creek	Riverine
				✓		2 Cambourne Court	Wodonga	Huon Creek	Riverine
				✓		135 Brockley Street	Wodonga	House Creek	Riverine
				✓		1 and 3 Hereford Street	Wodonga	House Creek	Riverine
				✓		2 and 4 Cypress Court	Wodonga	House Creek	Riverine
				✓		3 to 7 Park Lane	Wodonga	House Creek	Riverine
				✓		Out Buildings at 142 Castle Creek Road	Wodonga	House Creek	Riverine
				✓		Out Buildings at 4 Peterkin Lane	Wodonga	House Creek	Riverine

Properties at risk from Flooding within the Wodonga Urban Waterways (House, Huon, Felltimber & Jack in the Box Creeks)									
Residential			Commercial		Industrial	Rural		Public Use	
Street No. at Risk in AEP Event RAINFALL RATE %AEP						Address	Suburb	Along Water Watercourse	Flood Risk Type
20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	0.5% AEP				
				✓		Out Buildings at 34 Clarendon Avenue	Wodonga	Huon Creek	Riverine
				✓		Out Buildings at 7 Hereford Street	Wodonga	House Creek	Riverine
					✓	Out buildings at 3 Cambourne Court	Wodonga	Huon Creek	Riverine
TOTAL									
10	7	7	2	14	1				

What areas are affected?

Heavy rainfall on the hills surrounding Wodonga to the South fall into the Wodonga Urban waterway catchments. Parklands, recreation reserves, walking trails and homes adjacent to the waterways are inundated once water over tops the waterways and flows into the floodplain. In 1% AEP rainfall events (75mm in 6 hours, 94mm in 12 hours, 122mm in 24 hours) up to 41 properties can impacted with.

Limited warning times exist as the Wodonga urban waterways are ungauged and rely on field observations or Requests for Assistance from the community for intelligence.

Many main thoroughfare roads and local residential roads can become inundated with floodwater and create access and egress issues for the community and emergency services, although many other residential roads should enable movement of the community and crews to relief centres and for response.

Flood mitigation

Sanctuary Boulevard Levee

Adjacent House Creek downstream of Yarralumla Drive, this is an earth levee providing flood protection to 1% AEP level (+freeboard) to low-lying land and associated houses (approximately 26 properties). The levee is owned and maintained by the City of Wodonga. Refer to Appendix F - Maps.

Retention and re-use ponds constructed within Wodonga Racecourse in 2008/2009 provide some flood storage to mitigate peak flows from the White Box Rise development in the 145 ha upstream catchment of Jack in the Box Creek. The storage mitigates post-development two year ARI flow to pre-development level. Flows larger than five year ARI bypass the storage ponds. The Bandiana railway embankment downstream of the racecourse also serves as a de-facto retarding basin.

Flood impacts and required actions

Flood intelligence card – House & Huon Creeks, Wodonga

Gauge location: Ungauged Location

As there are no set FCL for this gauge, VICSES Hume RDO/IWO to consider issuing “Ungauged Flood warning templates” (Minor to Major) with confirmed impact examples at each level. This table provides guidance on the BoM definitions of each warning category.

Rainfall (mm)	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Indicative Rainfall **44mm in 6 hours** **56mm in 12 hours,** **70mm in 24 hours**	**20% AEP**	• Flood waters break out to public parks and reserves. • A number of private properties that extend on to the lower floodplain are impacted by flood waters however there is minimal impact to private infrastructure • A number of bike and walking tracks inundated. • Identified roads below could see between 300-500mm flood water depth **Properties at risk: (Below Floor).** • 58-62 – 136 Huon Creek Road • 32 – 58 Clarendon Avenue • 1 – 3 Cambourne Court • 3-7 Como Drive • 32, 34, 36A, 36B, 40 Huon Creek Road • 3-7 Kirribilli Court • 2 Uralla Court • 47 Jarrah Street • 23-27 and 11-13 Moonya Drive • Church Street • Pool at 118 Huon Creek Rd **Water over Road:** • Sangsters Street, Wodonga • Forrest Mars Drive, Wodonga	VICSES to Consider the use of Snap, Send, Solve Flood observers for Intelligence gathering. VICSES Hume RDO/RAC or ICC to monitor the situation. If confirmed impacts are received, consideration of a Flash Flood warning or ungauged riverine warning for Advice/Watch & Act to be issued. VICSES to respond on a request by request basis VICSES to engage residents about potential property inundation and access/egress issues Council to monitor and determine if bike/walking paths need to be closed due to flood water City of Wodonga Council to determine where and when to close roads identified	Wodonga Municipal Flood Plan 2019

Gauge	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Indicative Rainfall **51mm in 6 hours** **64mm in 12 hours** **82mm in 24 hours**	**10% AEP**	• Flood depths generally increase by approximately 100mm-200mm. • Flood waters are mainly confined to public parks and reserves along the creeks • Identified roads below could see between 300-1000mm flood water depth **Properties at risk: (Below Floor).** • 15 to 21 Moonya Drive • 39 Huon Creek Road • 1 to 5 Hereford Street • 6 Cypress Court **Properties at risk: (Above Floor).** • 100 Huon Creek Road • Out buildings at 3 and 5 Hereford Street • Out buildings 116 Huon Creek Road	VICSES to Consider the use of Snap, Send, Solve Flood observers for Intelligence gathering. VICSES Hume RDO/RAC or ICC to monitor the situation. If confirmed impacts are received, consideration of a Flash Flood warning or ungauged riverine warning for Advice/Watch & Act to be issued. VICSES to respond on a request by request basis VICSES to engage residents about potential property inundation and access/egress issues. Council to monitor and determine if bike/walking paths need to be closed further due to flood water. City of Wodonga Council to determine where and when to close roads identified.	Wodonga Municipal Flood Plan 2019
Indicative Rainfall **58mm in 6 hours** **73mm in12 hours** **93mmin 24 hours**	**5% AEP**	Flood depths generally increase by approximately 200mm-300mm **Properties at risk: (Below Floor).** • 2 Peterkin Lane • 5 & 7 Cypress Court **Properties at risk: (Above Floor).** • 96 Huon Creek Road • 6 Cypress Court • Out buildings at 47 Jarrah Street • Out buildings at 1 & 5 Hereford Street • Out buildings 64, 94, 96 & 128, Huon Creek Road	VICSES to Consider the use of Snap, Send, Solve Flood observers for Intelligence gathering. VICSES Hume RDO/RAC or ICC to monitor the situation. If confirmed impacts are received, consideration of a Flash Flood warning or ungauged riverine warning for Advice/Watch & Act to be issued. VICSES to respond on a request by request basis	

Gauge	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Indicative Rainfall – **58mm in 6 hours** **73mm in12 hours** **93mmin 24 hours**	**5% AEP**	• Identified roads below could see between 300-1000mm flood water depth. **Water over Road:** • Sangsters Street, Wodonga • Access to 142 Castle Creek Road compromised • Forrest Mars Drive, Wodonga • Lawrence Street	VICSES to engage residents about potential property inundation and access/egress issues. City of Wodonga Council to determine where and when to close roads identified.	Wodonga Municipal Flood Plan 2019
Indicative Rainfall **68mm in 6 hours** **85mm in 12 hours** **109mm in 24 hours**	**2% AEP**	• Flood depths generally increase by approximately 100mm-200mm. • Identified roads below could see between 300-1000mm flood water depth. **Properties at risk: (Below Floor).** • 4 Peterkin Lane **Properties at risk: (Above Floor).** • 3, 5,& 7 Cypress Court **Water over Road:** • Heatherly Court • Cambourne Court • Huon Creek Road • Cyprus Court	VICSES to Consider the use of Snap, Send, Solve Flood observers for Intelligence gathering. VICSES Hume RDO/RAC or ICC to monitor the situation. If confirmed impacts are received, consideration of a Flash Flood warning or ungauged riverine warning for Advice/Watch & Act to be issued. VICSES to respond on a request by request basis VICSES to engage residents about potential property inundation and access/egress issues. City of Wodonga Council to determine where and when to close roads identified.	Wodonga Municipal Flood Plan 2019

Gauge	Flood Class Level & Annual Exceedance Probability (%AEP)	Consequence/ Impact	Action Actions may include: Evacuation, closure of road, sandbagging, issue warning and who is responsible etc.	Reference
Indicative Rainfall **75mm in 6 hours** **94mm in 12 hours** **122mm in 24 hours**	**1% AEP**	• Flood depths generally increase by approximately 100mm-200mm. • Identified roads below could see between 300-1000mm flood water depth. **Properties at risk: (Below Floor).** • 142 Castle Creek Road • 7 Hereford Street • 135 Brockley Street • 2 Cypress Court • 3 to 9 Park Lane **Properties at risk: (Above Floor).** • 3, 5,& 7 Cypress Court2 Cambourne Court • 135 Brockley Street • 1 and 3 Hereford Street • 2 and 4 Cypress Court • 3 to 7 Park Lane • Out Buildings at 142 Castle Creek Road • Out Buildings at 4 Peterkin Lane • Out Buildings at 34 Clarendon Avenue • Out Buildings at 7 Hereford Street	VICSES to Consider the use of Snap, Send, Solve Flood observers for Intelligence gathering. VICSES Hume RDO/RAC or ICC to monitor the situation. If confirmed impacts are received, consideration of a Flash Flood warning or ungauged riverine warning for Advice/Watch & Act to be issued. VICSES to respond on a request by request basis VICSES to engage residents about potential property inundation and access/egress issues. City of Wodonga Council to determine where and when to close roads identified.	Wodonga Municipal Flood Plan 2019
Indicative Rainfall **82mm in 6 hours** **103mm in 12 hours** **134mm in 24 hours**	**0.5% AEP**	• Flood depths generally increase by approximately 100mm-200mm. • Identified roads below could see between 300-1000mm flood water depth. **Properties at risk: (Above Floor).** • Out buildings at 3 Cambourne Court **Water over Road:** • Pearce Street	VICSES to Consider the use of Snap, Send, Solve Flood observers for Intelligence gathering. VICSES Hume RDO/RAC or ICC to monitor the situation. If confirmed impacts are received, consideration of a Flash Flood warning or ungauged riverine warning for Advice/Watch & Act to be issued. VICSES to respond on a request by request basis VICSES to engage residents about potential property inundation and access/egress issues. City of Wodonga Council to determine where and when to close roads identified.	Wodonga Municipal Flood Plan 2019

Flood intelligence card – Felltimber Creek, Wodonga

Gauge location: Ungauged Location

As there are no set FCL for this gauge, VICSES Hume RDO/IWO to consider issuing “Ungauged Flood warning templates” (Minor to Major) with confirmed impact examples at each level. This table provides guidance on the BoM definitions of each warning category.

Waterway	Asset / location	Flood impact	Action	Source of information
Jack in the Box Creek	Bumble Bee Childcare Centre (71 Thomas Mitchell Drive)	Existing floor level 6cm above 1% AEP flood level (based on Cardno Willing 2004 assessment), but playground area is located within the waterway and needs to be evacuated.	VICSES to engage and check Bumble Bee Child Care Centre at 71 Thomas Mitchell Drive for flood inundation around playground area and with Police and predictions determine potential evacuation.	Planning application for extension of development (2006)
	Parkside Produce (13 Osburn Street)		VICSES to engage with Parkside Produce about access issues and flooding predictions	Exposure/damage in 2010 flood events
	Kendall Street (north of 7 Kendall Street)	Shallow flooding over roadways and into industrial lots.	VICSES to seek intelligence on potential impacts of businesses on the waterways in the following locations to determine and record impacts: • Kendall St	March 2012 flood event.

Appendix D - Flood evacuation arrangements

Phase 1 - Decision to Evacuate

Under the SEMP, Victoria Police (VicPol) has the responsibility for evacuation (Evacuation Manager) – in consultation with the control agency and other expert advice. EMV has developed a standardised procedure for evacuation under JSOP J03.12.

The IC decides whether to warn people to evacuate within a specified timeframe or whether it is necessary to advise them to evacuate immediately. The IC must make this decision having regard for the requirements of the JSOP.

Once the IC makes a decision to recommend evacuation, VicPol's Evacuation Manager is responsible for the management of the evacuation process where possible. VICSES and other agencies will assist where practical. VICSES is responsible for the development and communication of evacuation warnings.

VicPol and/or Australian Red Cross may take on the responsibility of registering people affected by a flood emergency including those who have been evacuated.

The Incident Controller may make the decision to evacuate an at-risk community under the following circumstances:

- properties are likely to become inundated
- properties are likely to become isolated and occupants are not suitable for isolated conditions
- public health is at threat because of flooding and the IC considers that evacuation is the most effective risk treatment. The AV Health Commander is responsible for supporting the evacuation of vulnerable people. Refer to the State Health Emergency Response Plan (SHERP) for details)
- essential services have been damaged and are not available to a community, therefore the IC considers evacuation is the most effective risk treatment.

The following should be considered when planning for evacuation:

- anticipated flood consequences and their timing and reliability of predictions
- size and location of the community to be evacuated
- likely duration of evacuation
- forecast weather
- flood models
- predicted timing of flood consequences
- time required and available to conduct the evacuation
- evacuation priorities and evacuation planning arrangements
- access and egress routes available and their potential flood liability
- current and likely future status of essential infrastructure
- is cross border assistance required or evacuation to another municipality relief centre?
- resources required and available to conduct the evacuation

- shelter including emergency relief centres, assembly areas
- vulnerable people and facilities
- transportation
- registration
- people of cultural or linguistically diverse background and transient populations
- safety of emergency service personnel
- different stages of an evacuation process.

The decision to evacuate is to be made by the IC in consultation with the MERC, MEMO, DFFH, Health Commander and other key agencies and expert advice (CMA's and Flood Intelligence specialists).

When planning evacuation, the IC will consider triggers for evacuation. For example, specific flood heights are predicted.

The table below details triggers for evacuation, if these heights are predicted or are likely to occur evacuation should be considered.

Location	Gauge Height/Rain Rate/Trigger	Action
Murray River – Albury Gauge – Gateway Island	4.9M (Moderate Flood Warning Level)	66 Harris Road may require evacuation due to access/egress issues. Investigation required.
	5.39M	All properties on Island Road, Bonegilla (Access from NSW) all experience access issues from this height. Some have boats for access however, Evacuation of other residents may be required.
	5.52M	Lower lying properties in the Gateway Island business park may require evacuation/closure due to flooding
	5.67M	Further properties in the Gateway Island business park may require evacuation/closure due to flooding.
	5.8M	Evacuation by road to the north past the height of 5.865 metres on the Albury Gauge will not be possible safely.
Location	Gauge Height/Rain Rate/Trigger	Action
Wodonga Urban Waterways (House, Huon Creeks)	10% AEP rainfall event	Evacuation and relief maybe required for above floor inundation: 100 Huon Creek Road, Wodonga
	5% AEP Rainfall Event	Evacuation and relief maybe required for above floor inundation:

		96 Huon Creek Road & 6 Cypress Court, Wodonga
	2% AEP Rainfall Event	Evacuation and relief maybe required for above floor inundation: 3, 5,& 7 Cypress Court
	1 % AEP Rainfall Event	Evacuation and relief maybe required for above floor inundation: 3, 5,& 7 Cypress Court, 2 Cambourne Court, 135 Brockley Street, 1 & 3 Hereford Street,
Kiewa River – Bandiana Gauge	3.5m	Visual inspection to determine if evacuation or relocation of properties on the Murray Valley Hwy are required and if relief is needed
Jack in the Box Creek, Wodonga	1% AEP – Heavy Rainfall leading to flash flooding	Visual inspection of Bumble Bee Child Care Centre at 71 Thomas Mitchell Drive for flood inundation from Jack in the Box Creek. Property 60mm above 1%AEP. Playground located in waterway.

The table below details time required to evacuate established areas.

Sector	Likely time required for evacuation (including resource assumptions)
	Not determined

Phase 2 – Warning

Warnings may include a warning to 'prepare to evacuate' and a warning to 'evacuate now'. Once the IC has made the decision to evacuate, the at-risk community will be warned to evacuate. Evacuation warnings should be disseminated via methods listed in Part 3 and Appendix J of this plan.

Phase 3 – Withdrawal

VicPol is the responsible agency for evacuation. In accordance with the JSOP, The VicPol Evacuation Manager will consult with the IC and IEMT on the most appropriate relief options. When preparing the schedule 2 Evacuation Recommendation as per the JSOP, it is important to ensure that the recommended routes and specified relief centres are accessible to the relevant community. This is to ensure a community does not receive advice about a relief centre that may not be accessible to them due to road closures and flooding.

VICSES, CFA, AV and Local Government will provide resources where available to support VicPol/DTP-VicRoads with route control and may assist VicPol in arranging evacuation transportation.

VicPol will control security of evacuated areas.

Evacuees will be encouraged to move using their own transport where possible. Transport for those without vehicles or other means will be arranged by the MEMO.

Possible Evacuation Routes to be used:

Sector	Evacuation Route	Evacuation route closure point and gauge height of closure
Wodonga	Yarralumla Drive, Melrose Drive, Pearce Street, Victoria Cross Parade, High Street, Beechworth Road	Most of these main arterials will maintain access during riverine flood events. All can be impacted in flash flood events.
Gateway Island	Lincoln Causeway	From 5.86 on the Murray River gauge, route Is closed.

Landing zones for helicopters (if possible) are located at:

Primary:

- Albury Airport, 121 Airport Drive, Albury NSW

Secondary / Emergency Options:

Note: Nil formal facilities.

- Wodonga Show Grounds, Hamilton Smith Dr, Wodonga.
- Wodonga Raiders Football Ground, Marshall St, Wodonga.

Vulnerable persons register and people with special needs

The Department of Families Fairness and Housing (DFFH) is responsible for the Vulnerable Persons Register (VPR). It operates across Victoria and provides 24x7 access to data by authorised emergency management agencies. The system can be accessed via most web enabled devices and includes locality aware functions for mobile devices.

DFFH has developed VPRs to store local information about consenting, identified vulnerable people[7], which will be directly entered by funded agencies and locally overseen by municipal councils[8]. The VPRs are cloud-based and directly accessible to authorised representatives from Victoria Police (without having to contact the council or funded agency) to aid emergency planning and response, including potential evacuation.

The information in the VPR can be filtered, mapped, and where necessary exported to reports for authorised purposes, according to the role and access rights of each organisation.

Additionally, special needs groups will be/are identified in Council's 'residents at risk' register. This can be done through community network organisations. Further information on Council's 'residents at risk' register can be obtained from the Wodonga MERC or the MEMO.

[7] Informed consent will be required before identified vulnerable people can be registered in a VPR. In keeping with the definition of a vulnerable person and the additional considerations the VPR should only list a small number of people, as per Diagram 1. More information about the identification and screening process for VPRs is available in Protocol 1: Emergency planning and screening.

8 64 councils covered by the Vulnerable People in Emergencies Policy, November 2012.

Phase 4 – Shelter

Relief Centres and/or assembly areas which cater for people's basic needs for floods may be established to meet the immediate needs of people affected by flooding. The flood relief centres and/or Assembly Areas are listed in the table below. Suitable locations will be designated depending on the flood event and community needs. The below locations are consistent with the MEMP.

Facility	Shelter type (Relief Centre/ Assembly Area (include address)	Comments
Primary Emergency Relief Centre		
Wodonga Exhibition Centre	Wodonga Racecourse, Hamilton Smith Drive, Wodonga	Includes relief facilities for domestic animals
Other Suitable Facilities		
The Cube Wodonga	Hovell St, Wodonga	
Birallee Park clubrooms	Marshall St, Wodonga	
Birallee Park change rooms	Marshall St, Wodonga	
Martin Park clubrooms	Gordon St or Vermont St (two entrances)	
Martin Park players rooms	Gordon St or Vermont St (two entrances)	
Nell Wilson Pavilion	Hamilton Smith Drive	Open land areas at the showgrounds and racecourse with access and egress roads.

VicPol in consultation with VICSES will liaise with Local Government and DFFH (where regional coordination is required) via the relevant control centre to plan for the opening and operation of relief centres. This can best be achieved though the Emergency Management Team (EMT)

Appendix E – storm and flood warning systems

Storm and flood warning

Flood and storm warning products and Flood Class Levels can be found on the BoM and VicEmergency websites. Storm and flood warning products include Severe Thunderstorm Warnings, Severe Weather Warnings, Flood Watches and Flood Warnings. See next page for an example of a BoM Flood Warning on the VicEmergency page.

VICSES uses VicEmergency EMCOP Public Publishing and Emergency Alert Telephone warnings to distribute riverine and flash flood (and other hazards) warnings in Victoria.

The EMCOP platform enables simultaneous publishing to the VicEmergency app, website, hotline (1800 226 226) and Emergency Broadcasters. Communities can also access this information through EMV and VICSES social media channels (VicEmergency, Victoria State Emergency Service on Facebook and VICSES News on X and so forth) and emergency broadcasters, such as Sky News TV, ABC Local ABC radio 106.5 FM and various other local emergency broadcaster radio stations (current list available via the EMV website).

VICSES Regional staff (typically the RDO) or ICCs where established lead the issuing of warnings for riverine flood events when pre-determined triggers are met (issuing of a BOM Flood Watch or Warning) and share locally relevant and tailored information via VicEmergency (all hazards platform hosted by EMV) and standard VICSES communication channels (VICSES social media, traditional media, web and face to face). These activities are coordinated by the VICSES RDO and approved by the VICSES RAC, or the PIO and IC respectively (when an ICC is active).

If verified reports are received of flash flooding posing, or resulting in, a significant threat to life or property, VICSES Regions (or ICCs) will issue a flash flood warning product via EM-COP.

VICSES at the state tier (or SCC Public Information Section) issue all severe weather and thunderstorm warnings as these are rarely confined to a single region or area and also play an important role in sharing riverine and flash flood information via state-based standard communication channels.

During some emergencies, VICSES may alert communities by sounding a local siren (where this exists) or via media broadcasters by the use of SEWS, or by using the Emergency Alert (EA) platform to send an SMS to mobile phones or a voice message to landlines. EMCOP Public Publishing Business Rules for Riverine Flood, Flash Flood and Severe Weather / Thunderstorm are available in the Public Information tab of the IMT Toolbox, providing further guidance on specific triggers, roles and responsibilities. VICSES SOP057 and JSOP 04.01 provide further guidance.

VICSES Flood warning products

VICSES distributes flood emergency information to the media through “Flood Watches and Warnings”. Flood watches and warnings provide BoM flood warning information combined with other relevant sources of intelligence to provide communities information regarding possible flood consequences and safety advice, that is not contained in BoM flood warning products.

The relevant VICSES RDO, in conjunction with the RAC, or the established ICC will normally be responsible for drafting, authorising and issuing flood warnings, using the EMCOP to publish these to the VicEmergency channels.

Flood watch and warning products should refer to the warning title within the Bulletin header, for example Flood Bulletin for Major Flood Warning on Yarra River.

VICSES Flood Warnings should follow the following structure by describing:

- Critical details: including what the current and predicted flood situation is.

- Action Statement: An action statement that is consistent with the Australian Warnings System (AWS) https://www.australianwarningsystem.com.au/
- What you should do: what the community should do in response to flood warnings
- Potential Impacts: what flood consequences are or the likely flood consequences.

More Information: including where the community should go to seek further information and who the community should call if they require emergency assistance.

It is important that the description of the predicted flood situation is consistent with and reflects the relevant BoM Flood Warning and is tailored and made relevant to at risk communities using a range of intelligence sources.

In areas covered by a Total Flood Warning System (TFWS) VICSES Flood Watches should be issued for a whole river catchment. Additionally, VICSES flood Warnings should be issued at the pre-determined sub-catchment level focused on specific gauge reference areas. These are the area in which flood consequences specifically relate to the relevant flood gauge.

There may also be a need to issues warnings for areas not covered by the TFWS using available intelligence. The issue of these warnings is guided by the likely or observed impacts of the floodwater with guidance provided in the VICSES Riverine Flood Business Rules.

VICSES Flood Warnings should be prepared and issued after receipt of each Flood Watch and Flood Warning from the BoM, or after Severe Weather or Thunderstorm Warnings indicating potential for severe flash flooding.

To ensure VICSES flood warnings are released in a timely manner much of the relevant information is built into warnings templates in EMCOP, including a range of pre-development statements that can be ‘dragged and dropped’ into messages as relevant.

Local flood warning system arrangements

There are no local flood warning systems in the City of Wodonga.

BOM flood warning example

IDN36629
Australian Government Bureau of Meteorology

Minor to Major Flood Warning for the Murray and Edward Rivers

at Albury, Corowa, Yarrawonga, Tocumwal, Echuca, Moama, Torrumbarry, Barham, Swan Hill, Wakool Junction, Boundary Bend, Euston, Mildura, Wentworth, Deniliquin, Stevens Weir and Moulamein

Issued at 4:05 pm EDT on Tuesday 22 November 2022
Flood Warning Number: 116

MAJOR FLOODING HIGHER THAN THE 1975 FLOOD OCCURRING AT WAKOOL JUNCTION, BOUNDARY BEND AND EUSTON

MAJOR FLOODING OCCURRING AT MOULAMEIN

Rainfall over the past several weeks has caused renewed and prolonged flooding along the Murray and Edward Rivers and their tributaries.

Along the Murray River, moderate flooding is occurring at Corowa, Yarrawonga and Tocumwal. At Tocumwal the river level peaked on Thursday 17 November with major flooding, slightly higher than the 2016 event.

River levels along the Edward River at Deniliquin peaked near 9.19 metres, with moderate flooding on Tuesday 22 November. River levels at Stevens Weir are expected to peak near the major flood level (6.6 metres) on Wednesday this week. Downstream at Moulamein, renewed rises from the Edward River are combining with rises from Billabong Creek, which have caused major flooding. Further rises to 6.20 metres are likely later this week and river levels are likely to remain near this level during December, with major flooding.

Moderate flooding is occurring at Echuca and Moama, with renewed rises to the major flood level (94.40 metres AHD) possible around Friday as upstream flows from the Goulburn and Murray Rivers arrive. At Torrumbarry and Barham river levels are expected to remain around the major flood level over the next several days. At Swan Hill, the river level is receding with minor flooding.

Significant breakout flows from Torrumbarry have spilled into the Wakool River, where river levels have peaked at Stoney Crossing. These flows, combined with floodwaters from the Murray and Edward rivers, have caused major flooding higher than the 1975 flood at Wakool Junction, where the river level peaked on Sunday 13 November. This flood peak is now at Boundary Bend, where major flooding slightly higher than the 1975 flood is occurring. A moderate flood peak is likely at Euston midweek this week. Moderate flooding is possible at Mildura around 27-29 November. Major flooding is possible at Wentworth around the end of November or early December.

Forecasts will be progressively refined once upstream flood peaks along the Murray River and its tributaries are observed.

Flood operations are being conducted by the Murray-Darling Basin Authority (MDBA) at Hume Dam and Lake Mulwala to manage inflows from the Upper Murray, Mitta Mitta River, Ovens River and other tributaries. MDBA are working closely with the Bureau and WaterNSW to plan release strategies.

Murray River downstream of Hume Dam to Tocumwal:
Minor flooding is occurring at Albury and Moderate flooding is occurring Corowa, Yarrawonga and Tocumwal.

The Murray River at Albury is currently at 4.83 metres and slowly falling, with minor flooding. The Murray River at Albury is likely to remain above the minor flood level (4.30 m) for at least the remainder of the week.

The Murray River at Corowa is currently at 6.97 metres and falling, with moderate flooding. The Murray River at Corowa may remain above the moderate flood level (5.90 m) through to the weekend.

The Murray River at Yarrawonga downstream peaked at 7.79 metres on 16 November, just below the major flood level (7.80 metres). The river is currently at 6.74 metres and steady, with moderate flooding. The Murray River at Yarrawonga Downstream is likely to fall below the moderate flood level (6.70 m) by the end of the week.

The Murray River at Tocumwal peaked at 7.40 metres on 17 November, with major flooding. The river level is currently at 6.85 metres and slowly falling, with moderate flooding. The Murray River at Tocumwal is likely to remain above the moderate flood level (6.70 m) through to the weekend.

Murray River downstream of Tocumwal to Barham:
Major flooding is occurring at Torrumbarry and Barham. Moderate flooding is occurring at Echuca and Moama, with renewed major flooding possible.

The Murray River at Echuca is currently at 94.23 metres AHD and steady, with moderate flooding. Renewed rises to the major flood level (94.40 metres AHD) are possible at Echuca from around Friday.

The Murray River at Torrumbarry Weir is currently at 7.81 metres and steady, with major flooding. The Murray River at Torrumbarry Weir may remain around the major flood level (7.80 metres) through to later this week.

The Murray River at Barham is currently at 6.14 metres and steady, with major flooding. The river level at Barham is likely to remain above the major flood level (6.10 metres) until the end of November.

Murray River downstream of Barham to Wentworth:
Major flooding is occurring at Wakool Junction and Boundary Bend. Moderate flooding is occurring at Euston, Mildura and Wentworth. Minor flooding is occurring at Swan Hill. Major flooding is possible at Wentworth.

The Murray River at Swan Hill is currently at 4.54 metres and falling, with minor flooding. The Murray River at Swan Hill may remain around the moderate flood level (4.60 metres) through to early next week.

The Murray River at Wakool Junction peaked at 11.73 metres on Sunday 13 November and is currently at 11.70 metres and falling slowly, with major flooding. The river level at Wakool Junction may remain above the major flood level (11.50 m) through to the end of November.

The Murray River at Boundary Bend is currently at 9.05 metres and peaking, with major flooding. A prolonged peak is likely at Boundary Bend, with the river level remaining around 9.05 metres through to the end of November.

The Murray River at Euston may peak near 10.10 metres (51.94 metres AHD) around Wednesday, with moderate flooding. A prolonged peak is possible at Euston, with the river level remaining around 10.10 metres (51.94 metres AHD) through early December.

The Murray River at Mildura Weir may peak near 38.30 metres AHD towards the end of November, with moderate flooding.

The Murray River at Wentworth may reach the major flood level (33.88 metres AHD) towards the end of November. Further rises to 34.00 metres AHD are possible from early December, with major flooding.

Edward River:
Major flooding is occurring at Moulamein and possible at Stevens Weir. Moderate flooding is occurring at Deniliquin.

The Edward River at Deniliquin peaked at 9.19 metres around 01:30 am Tuesday and is currently at 9.18 metres and falling, with moderate flooding.

The Edward River at Stevens Weir Downstream is likely to peak near the major flood level (6.60 m) during Wednesday.

The Edward River at Moulamein may peak near 6.20 metres during Thursday with major flooding. River levels are likely to remain steady near this level during December.

Flood Safety Advice:
In life threatening emergencies, call 000 (triple zero) immediately. If you require rescue, assistance to evacuate or other emergency help, ring NSW and VIC SES on 132 500.
* Avoid drowning. Stay out of rising water, seek refuge in the highest available place.
* Prevent damage to your vehicle. Move it under cover, away from areas likely to flood.
* Avoid being swept away. Stay out of fast-flowing creeks and storm drains.
* Never drive, ride or walk through flood water. Flood water can be DECEPTIVE and dangerous.

For more emergency information, advice, and access to the latest river heights and rainfall observations and forecasts:
* NSW SES: www.ses.nsw.gov.au
* VIC SES: www.emergency.vic.gov.au
* RMS Live Traffic: www.livetraffic.com
* VicRoads: www.vicroads.vic.gov.au
* Latest River Heights and Rainfall Observations: www.bom.gov.au/nsw/flood/southwest.shtml
* Latest NSW Warnings: www.bom.gov.au/nsw/warnings/
* Rainfall Forecasts: www.bom.gov.au/australia/meteye/
* BOM NSW Twitter: www.twitter.com/BOM_NSW

Next issue:
The next warning will be issued by 04:00 pm EDT on Wednesday 23 November 2022.

Latest River Heights:
Murray River at Albury, 4.83, Falling, 02:00 PM TUE 22/11/22
Murray River at Corowa, 6.97, Falling, 02:00 PM TUE 22/11/22
Murray River at Yarrowonga Downstream, 6.74, Falling, 02:00 PM TUE 22/11/22
Murray River at Tocumwal, 6.85, Falling, 02:00 PM TUE 22/11/22
Murray River at Echuca, 94.23, Steady, 02:00 PM TUE 22/11/22
Murray River at Torrumbarry Weir, 7.81, Steady, 02:00 PM TUE 22/11/22
Murray River at Barham, 6.14, Steady, 02:00 PM TUE 22/11/22
Murray River at Swan Hill, 4.54, Falling, 02:00 PM TUE 22/11/22
Murray River at Wakool Junction, 11.70, Falling, 02:00 PM TUE 22/11/22
Murray River at Boundary Bend, 9.05, Rising, 02:00 PM TUE 22/11/22
Murray River at Euston, 51.95, Rising, 02:00 PM TUE 22/11/22
Murray River at Mildura Weir, 37.66, Rising, 12:00 PM TUE 22/11/22
Murray River at Wentworth, 33.63, Rising, 02:00 PM TUE 22/11/22
Edward River at Deniliquin, 9.18, Falling, 02:00 PM TUE 22/11/22
Edward River at Stevens Weir Downstream, 6.58, Steady, 02:00 PM TUE 22/11/22
Edward River at Moulamein, 6.15, Rising, 02:00 PM TUE 22/11/22

This advice is also available by dialling 1300 659 210. Warning, rainfall and river information are available at www.bom.gov.au/nsw/flood. The latest weather forecast is available at w

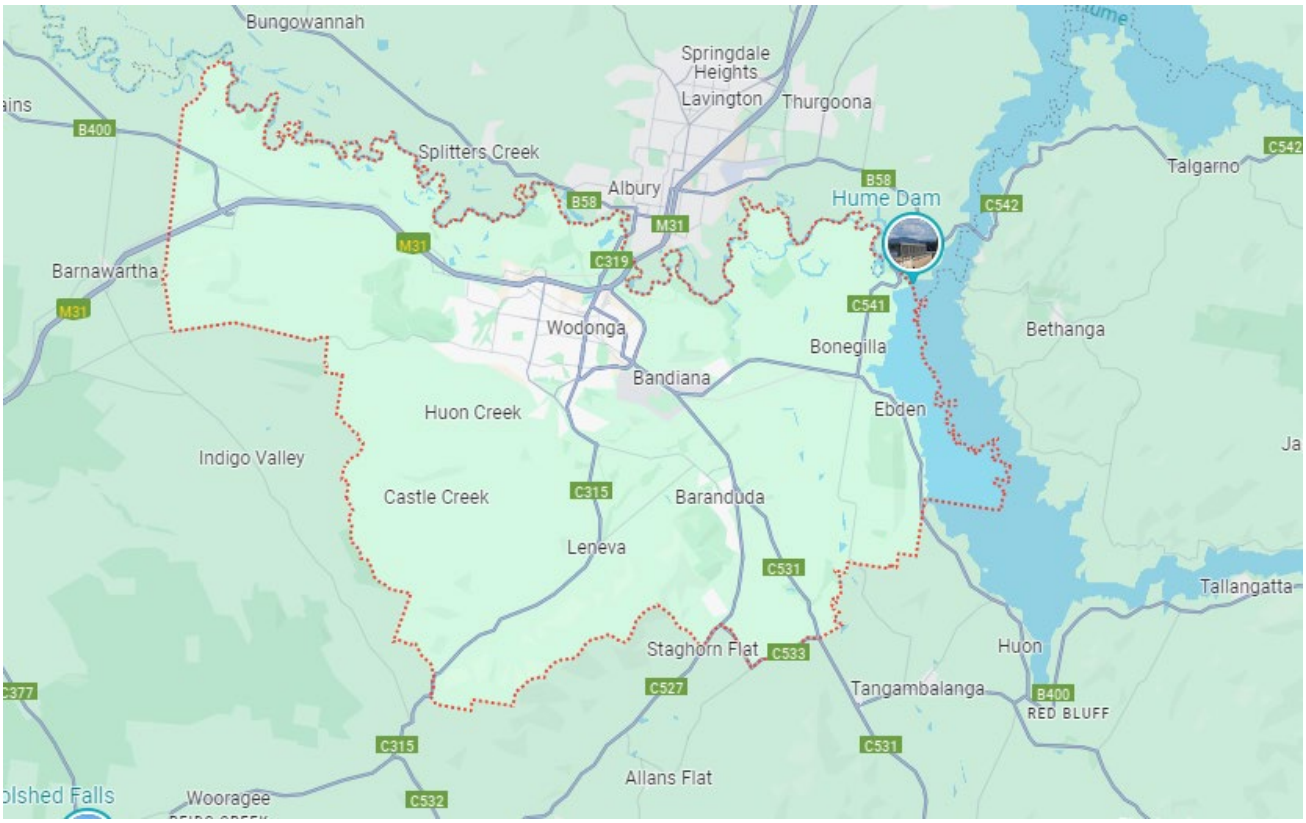
Appendix F - Maps and Schematics

Maps are provided detailing likely affected areas including properties, essential community infrastructure, roads, identification of evacuation routes, likely evacuation route closure locations, assembly areas, emergency relief centres etc. under different flood scenarios.

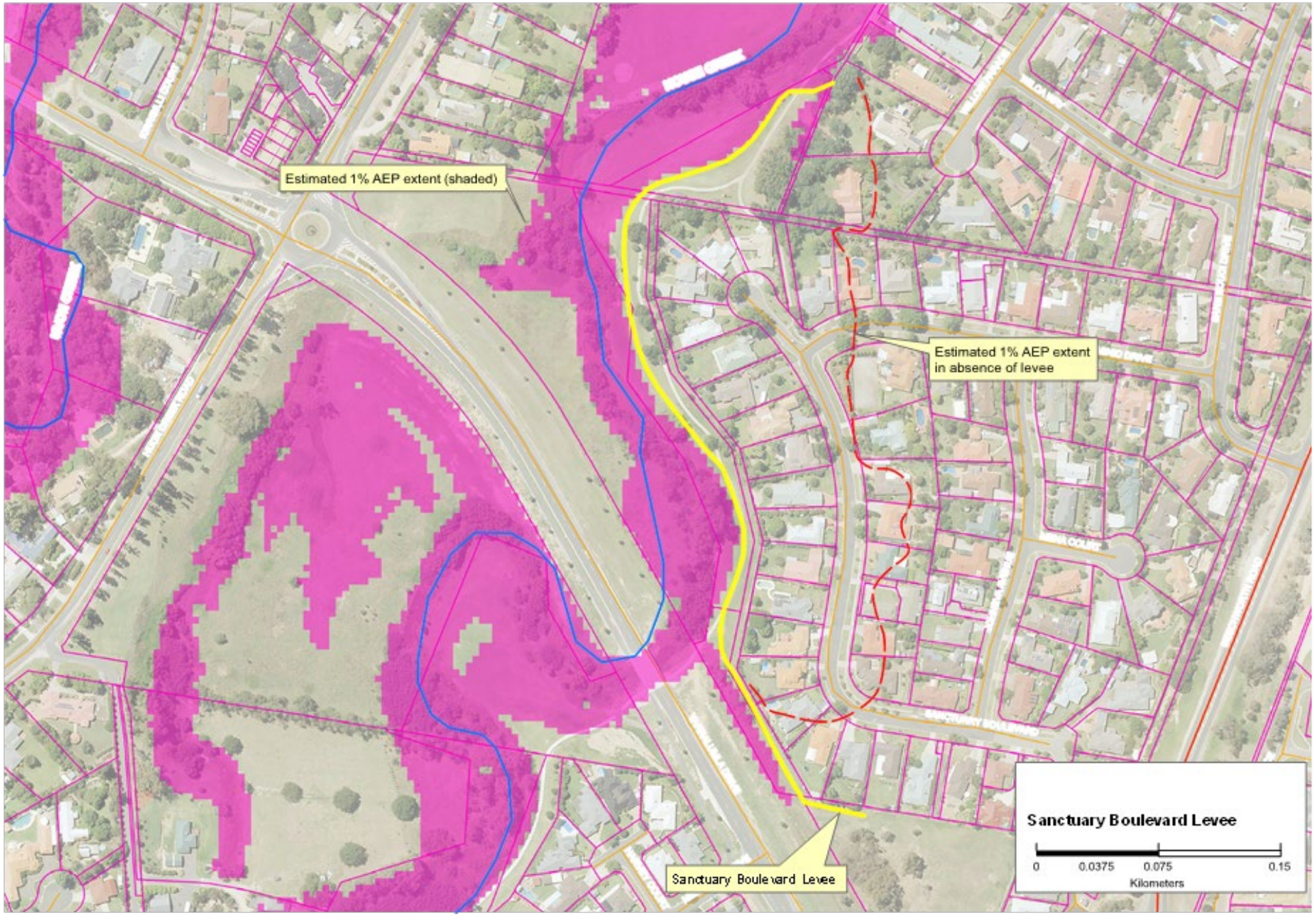
Maps include:

- Council Area Maps
- Catchment Maps
- Inundation Maps.
- Levee Maps
- Floodplain maps
- Property Inundation Maps

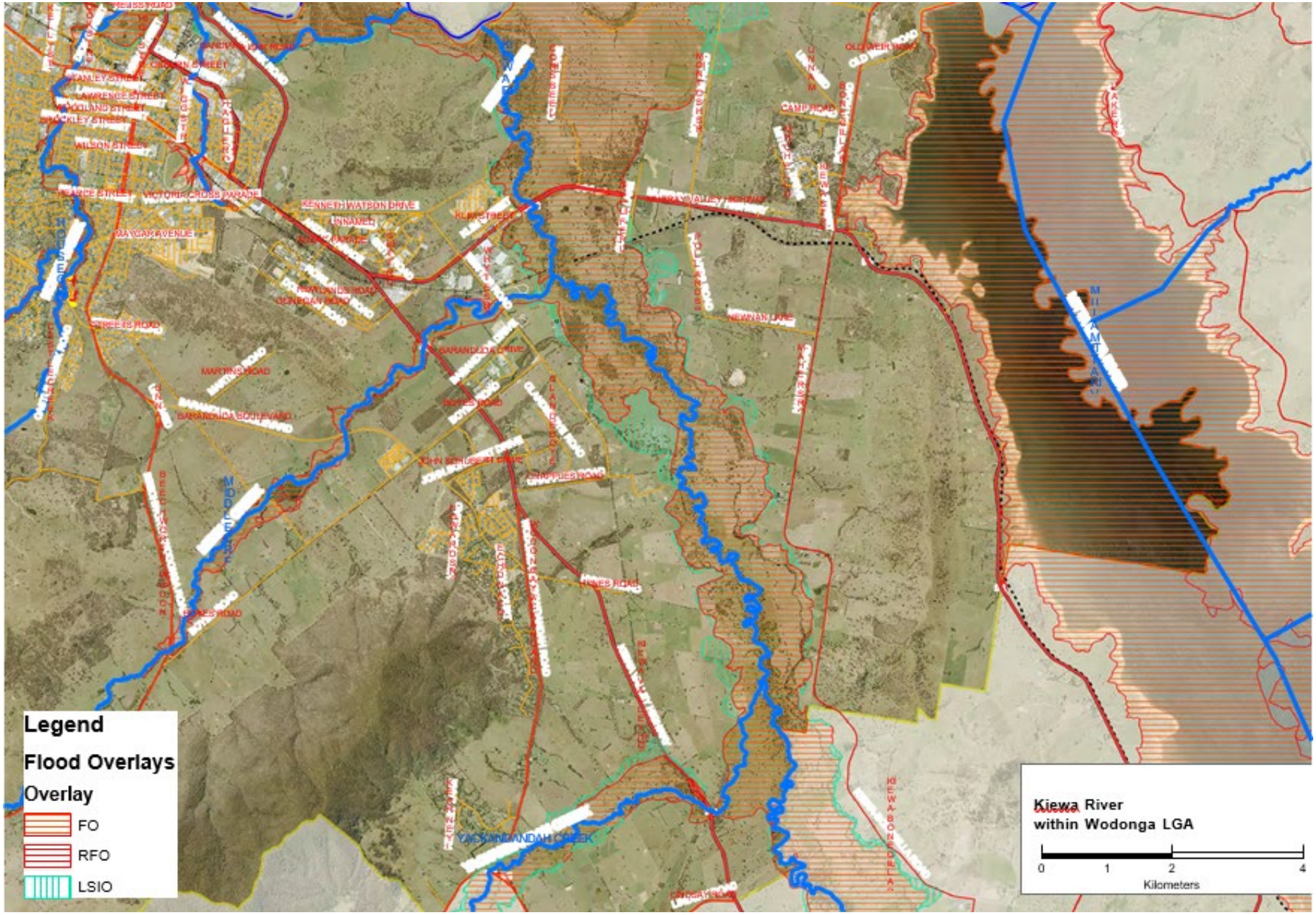
Map 1 – Municipality Map - Wodonga of Wodonga



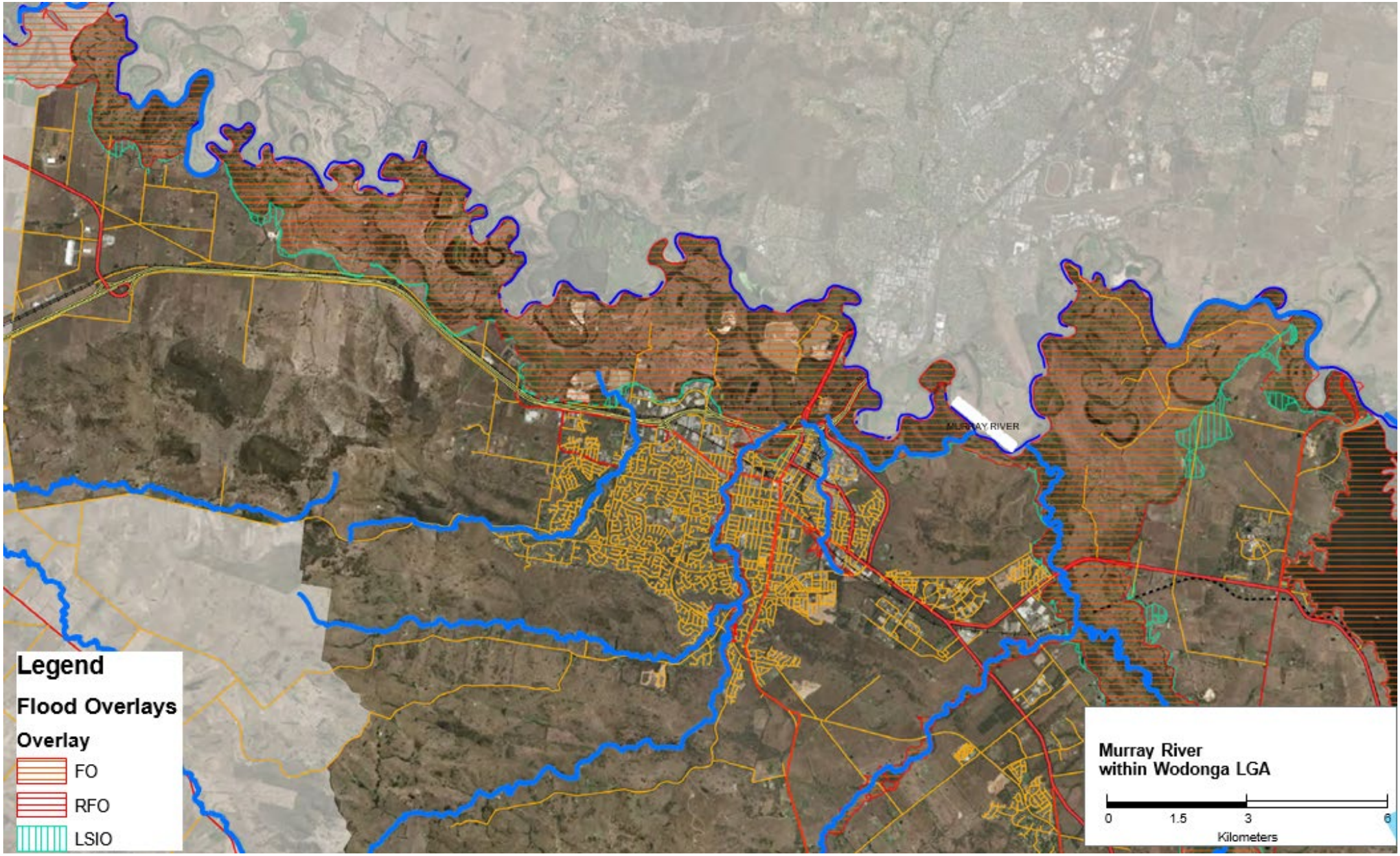
Map 2 - Sanctuary Boulevard levee



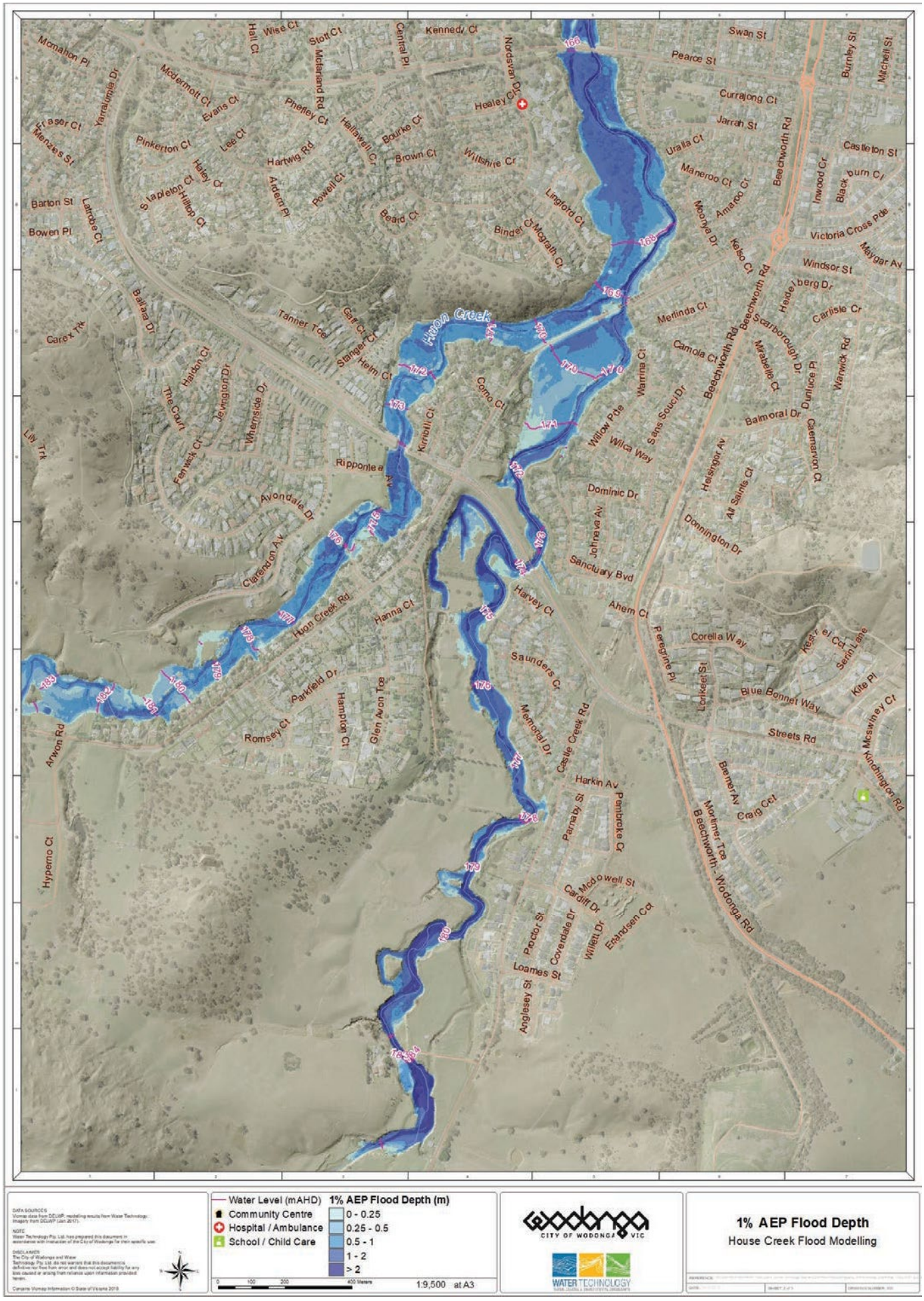
Map 3 – Kiewa River within the Wodonga LGA



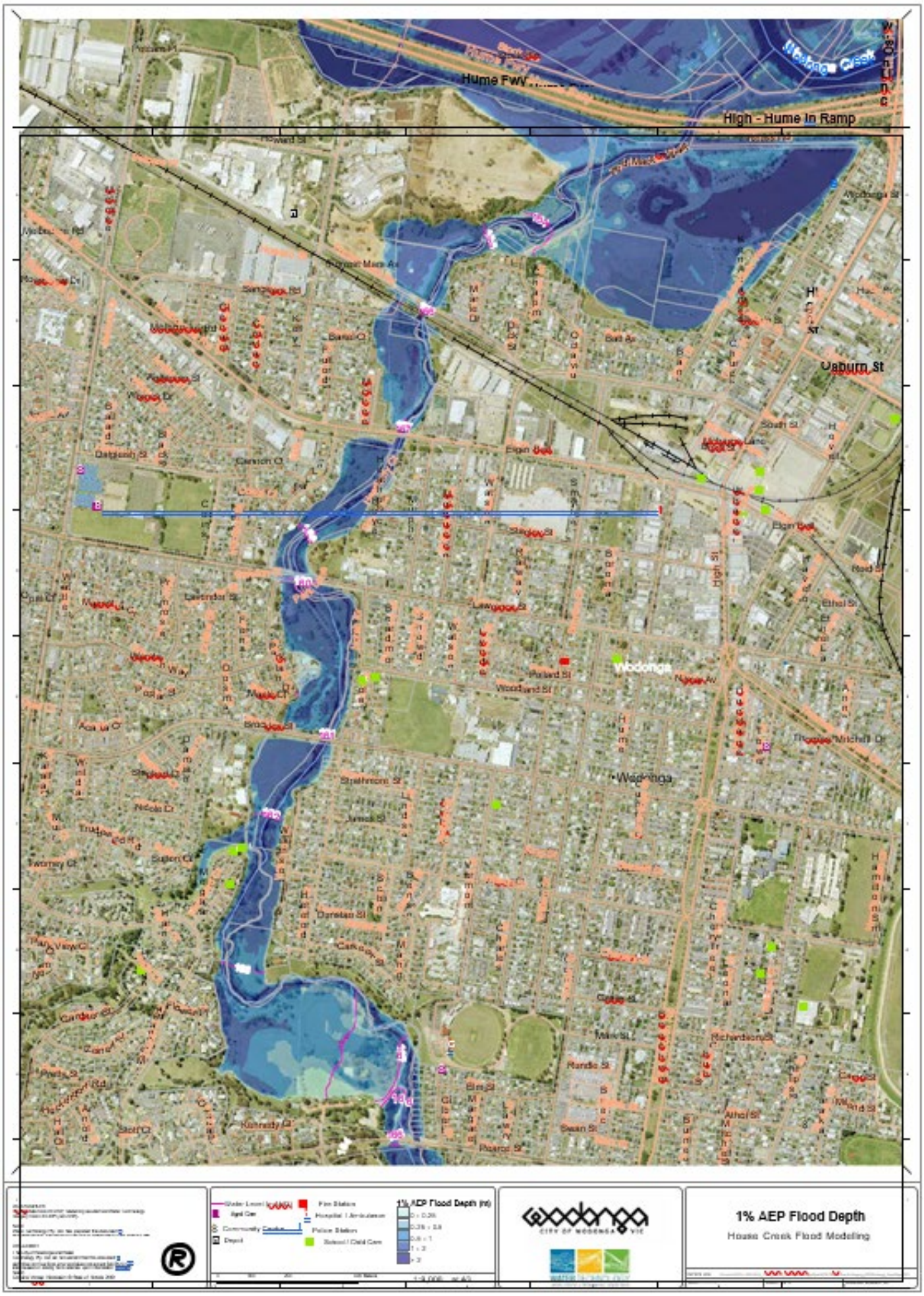
Map 4 – Murray River floodplain within the Wodonga LGA



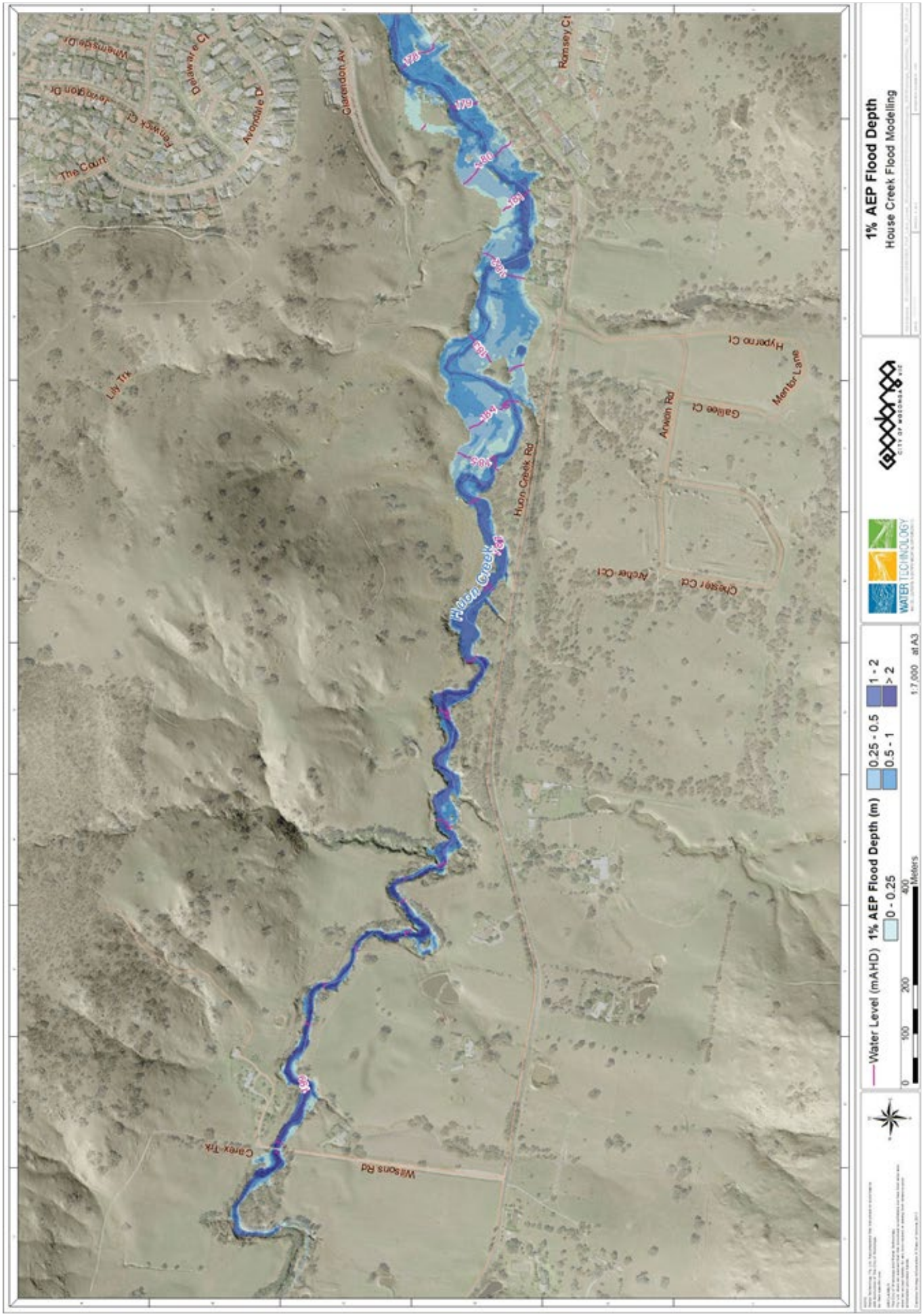
Map 5 – House Creek (upper) one per cent AEP Inundation Map



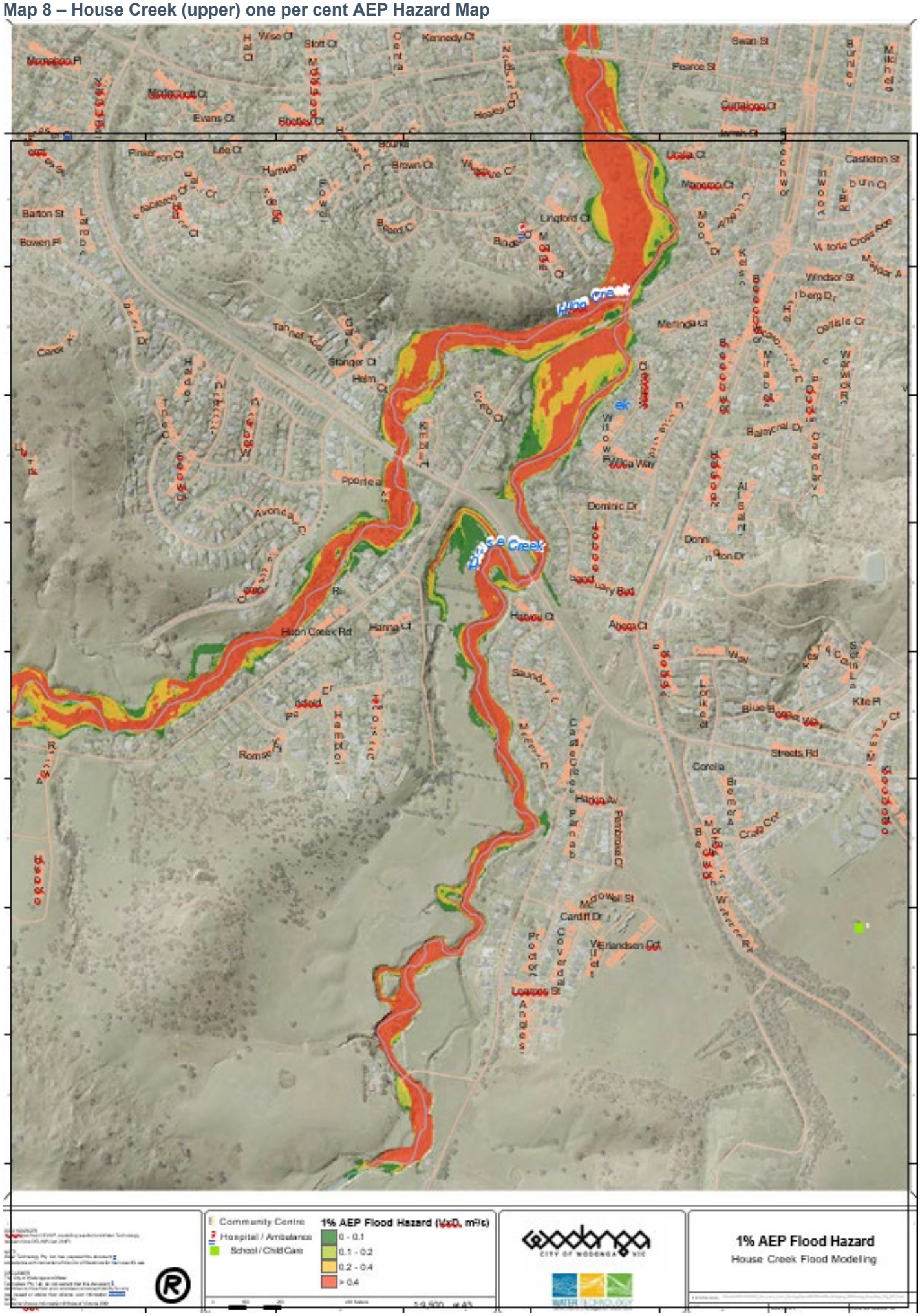
Map 6 – House Creek (lower) one per cent AEP Inundation Map



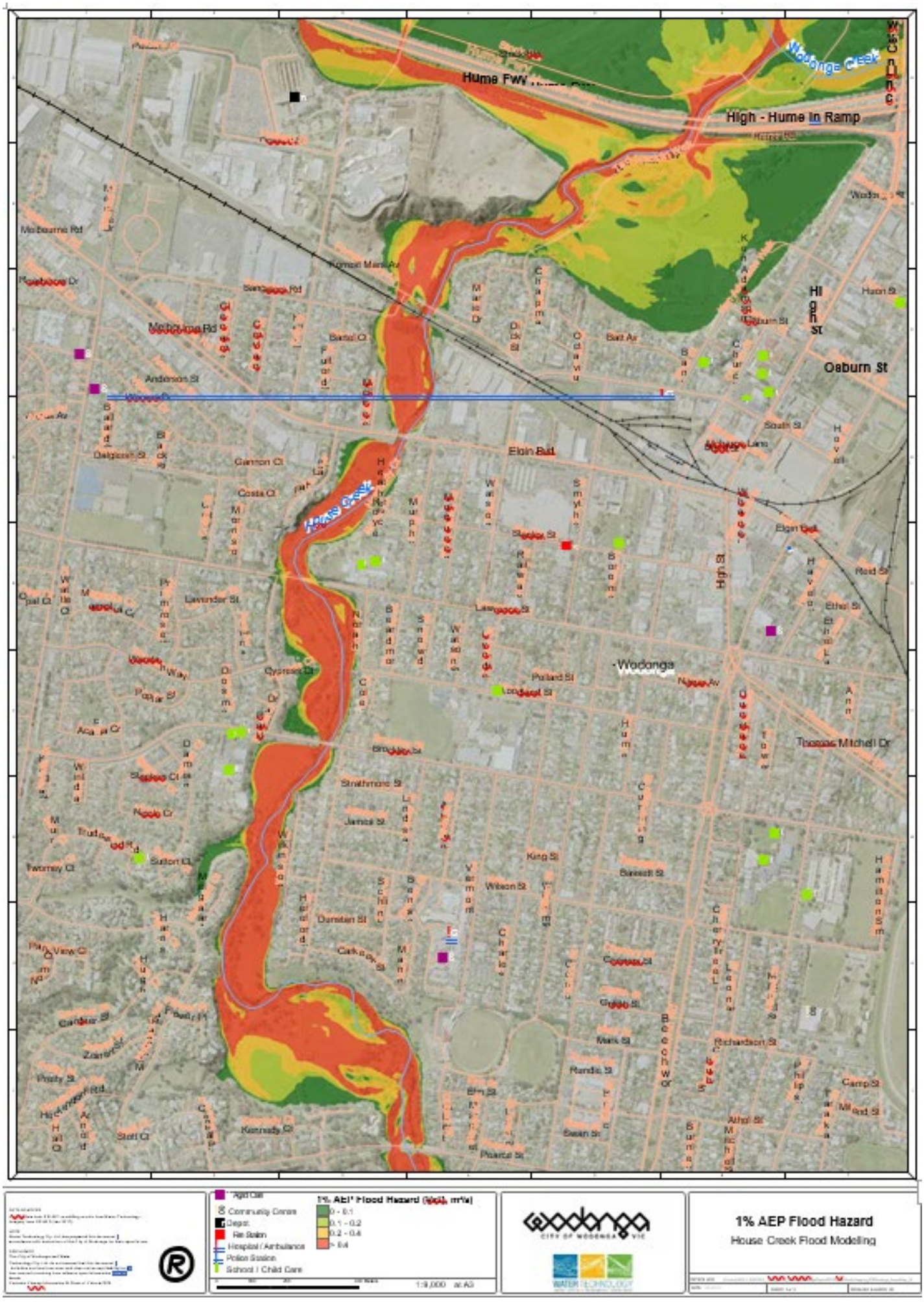
Map 7 – Huon Creek one per cent AEP Inundation Map



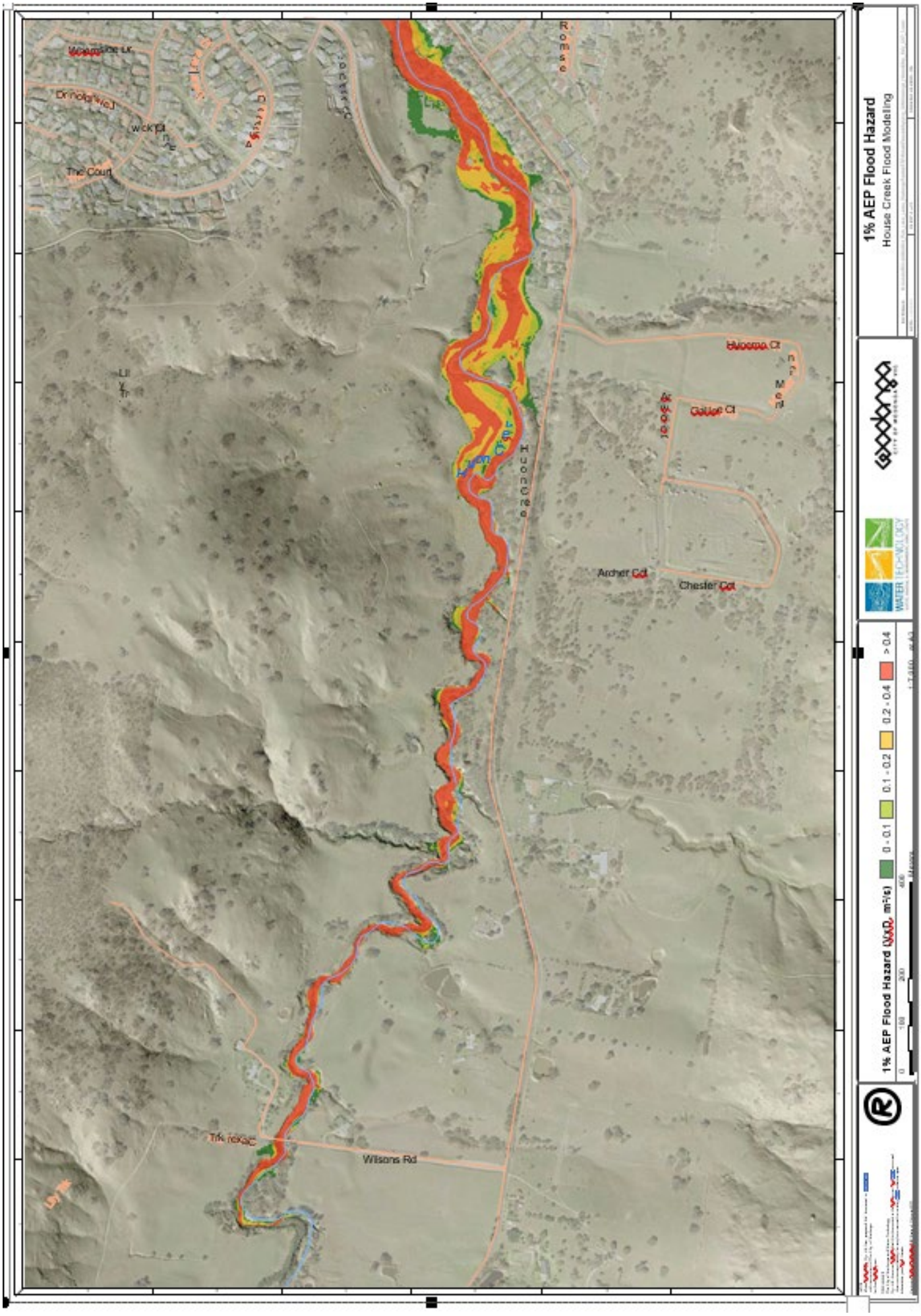
Map 8 – House Creek (upper) one per cent AEP Hazard Map



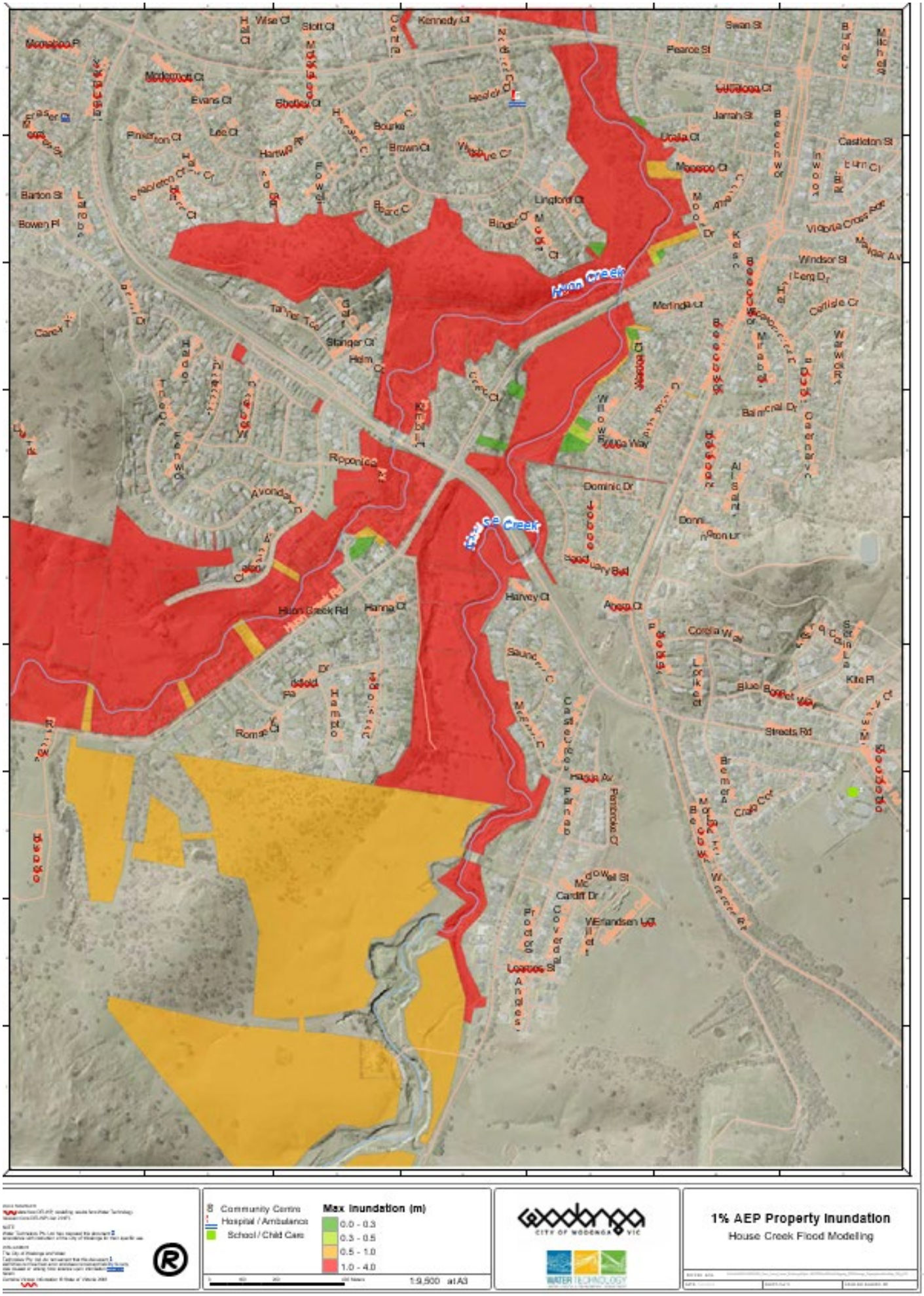
Map 9 - House Creek (lower) one per cent AEP Hazard Map



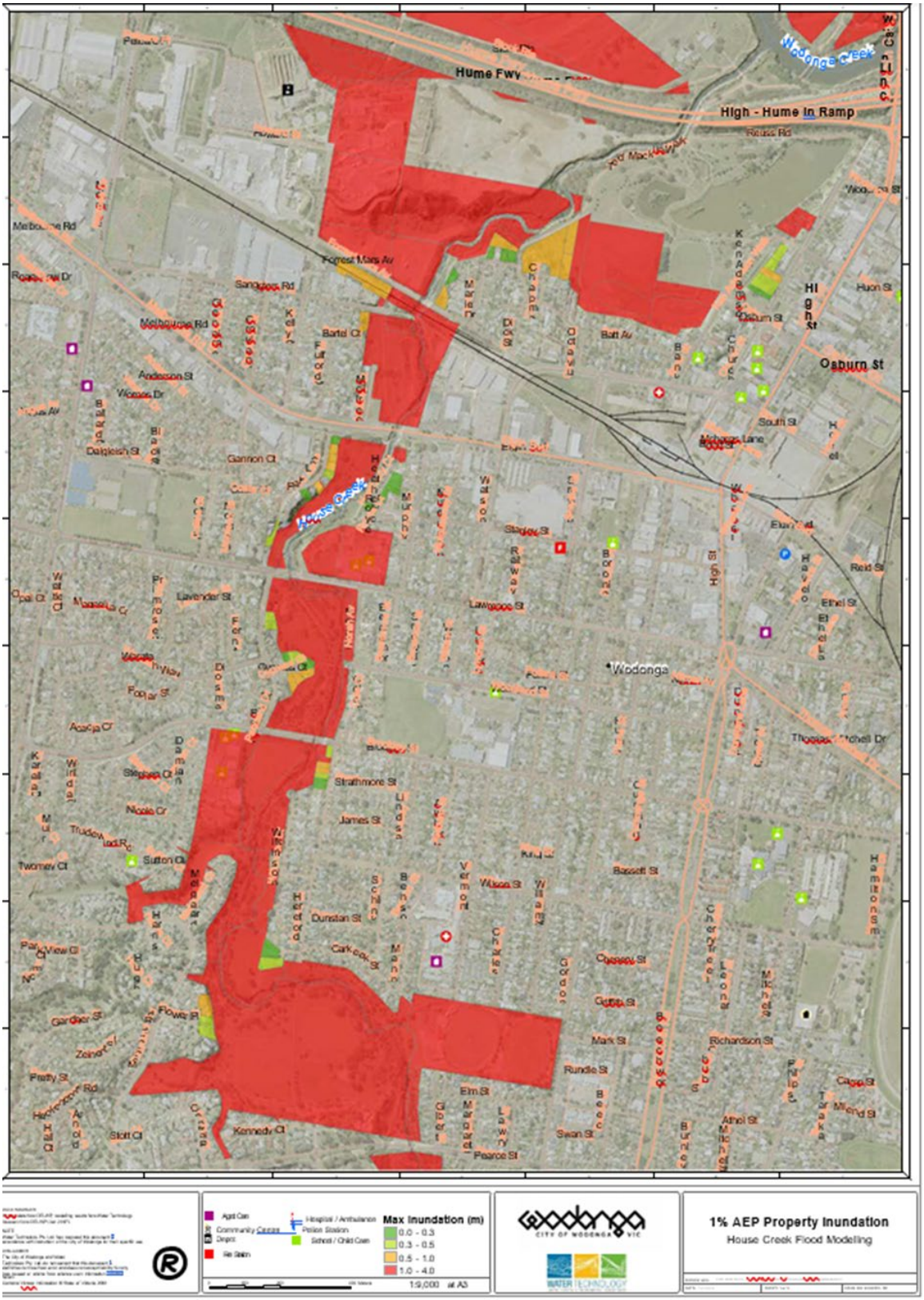
Map 10 – Huon Creek one per cent AEP Hazard Map



Map 11 – House Creek (upper) one per cent AEP Property Inundation Map



Map 12 – House Creek (lower) one per cent AEP Property Inundation Map



Map 13 – Huon Creek one per cent AEP Property Inundation Map

1% AEP Property Inundation
House Creek Flood Modelling
Max Inundation (m)
0.0 - 0.3
0.3 - 0.5
0.5 - 1.0
1.0 - 4.0
Galileo Ct
Archer Ct
Chester Ct
Wilsons Rd
The Court

Appendix G - Local knowledge arrangements

As control agency for flood in Victoria, VICSES is committed to ensuring the incorporation of local knowledge in decision making before, during and after incidents. This is guided by the VICSES policy 10.02 Local Knowledge.

Information from community sources including but not limited to observations, historical information and information about current and possible consequences of an incident may be utilised to help inform the process of incorporating local knowledge into decision making during an incident. Field observers and other agency identified in this plan will help support this process.

Field Observers

Field Observers may support:

- the monitoring and reporting on observations of incidents. For example, during a flood event a Field Observer may be regularly taking photos via mobile app technology of the local stream gauge board if it is safe to do so.
- The provision of local advice regarding the consequences of incidents.
- Establishing linkages with key groups within local communities during emergency management planning and operational response. During operational response, this may be through an LIO or direct to the Intelligence cell. In some circumstances it may also be through a Community Liaison Officer if one is in place within the Public Information Unit or via a Community Field Officer.
- The provision of authorised information to community members where requested.
- Field Observers from with VICSES, CFA and the North East CMA can be requested through the VICSES Hume Regional Duty Officer (RDO) or Regional Agency Commander (RAC) for deployment for field intelligence gathering with the use of visual intelligence gathering or vis the use of Snap Send Solve.

Intelligence gathering system - Snap Send Solve

Historically, the gathering of local flood/storm or other VICSES hazard intelligence during an event has been varied and inefficient. It creates a frustrating and difficult environment for intelligence teams in an Incident Management Team (IMT) to sift through relevant information. VICSES has teamed up with Snap Send Solve to create a flood/storm and other VICSES hazard observation App and Portal.

Snap Send Solve is an existing app currently used by the community to notify local councils and other authorities of issues that need addressing such as cracked pavements, parking problems, dumped rubbish and graffiti.

The existing functionality of the smartphone app has been adapted for VICSES in a well presented and user-friendly way. The app is used to capture field observations during an event such as a flood, by filling in a simple form on a smartphone and using the camera to upload photos. This information is then displayed through an administration portal to collate and view the data.

The app component will be made available to trusted field observers in the community, and their observations will be visible via EMCOP where Intelligence personnel in Incident Management Teams can access them during events. The intent is that better access to local knowledge will add to information sources in order to maximise public information communications and response efforts.

Trusted field observers include both internal and external stakeholders (community members, ESOs such as CFA/VicPol). They can be activated and deployed by the VICSES RDO to use the app during an event and to report on valuable information with a level of accuracy.

The portal has been successfully integrated with EMCOP and eMap, both platforms are available to use in an IMT. The Snap Send Solve logo also appears within the intelligence section on the EM-COP desktop for easy access to the portal.

Important Notes

These arrangements do not give field observers and existing agency networks any responsibility for operational decisions. Nor does it permit field observers and existing agency networks to direct operational activity, including the management of flood levees.

Information provided from sources of local knowledge must be processed and validated before it can become intelligence to inform decision making.

Appendix H: Local flood information

Local Flood Guides

Communities can use local flood guides to identify and better understand their local flood risk. They include information about flood history, how to prepare & respond to floods and who to contact.

The City of Wodonga does not have a Local Flood Guide as of August 2024. Neighbouring localities have Local flood guides which can be found on the VICSES public website below.

https://www.ses.vic.gov.au/plan-and-stay-safe/flood-guides

How to use Sandbags to protect your home

There are a number of things that you can do to make sure you and your property stay safe during flooding.

Sandbags will not stop the water completely but can reduce the amount of water entering your home. During low-level flooding, sandbags placed in the right locations around your home can reduce the impact of flooding.

Further information on Sandbagging can be found on the VICSES website by visiting the 'How to use sandbags to protect your home' section or by visiting the links below:

VICSES sandbag quick reference guide

https://www.ses.vic.gov.au/documents/8655930/8700895/sandbagging+guide.pdf/c1e56ac5-198f-ae1e- 8507-70d8e896afba?t=1621231534359

Sandbagging demonstration video

https://www.youtube.com/watch?v=-_T--I3b-34&t=1s

Storms – Plan and stay safe

There are a number of things that you can do to make sure you and your property stay safe during storms. For information on how to plan to be safe during a storm, what to do during a storm, and recovery after a storm visit the VICSES website on the link below for more information

https://www.ses.vic.gov.au/plan-and-stay-safe/emergencies/storm

Floodplain Management

For information on flood plain management for the City of Wodonga Area and surrounds in Victoria visit the North East Catchment Management Authority Website at www.necma.vic.gov.au

City of Wodonga Emergency Management information

For local information about emergencies thew City of Wodonga website can provide additional localised information for all emergencies including Flood & Storm.
https://www.wodonga.vic.gov.au/Services/Safety-Health-and-Wellbeing/Emergency-management

Appendix I – Storm response

Consequences of severe thunderstorm

Severe thunderstorms and its associated weather conditions such as a tornado or microburst may have the same effect on the community and the natural environment. The difference is likely to be in terms of the geographic expanse. A severe thunderstorm can move over a large part of the land mass whereas in Victoria, a tornado or microburst is likely to be heavily concentrated in a small geographic area affecting one or two localities.

Consequences of storm damage typically involve the following:

- wind damage to residence and buildings
- fallen trees damaging buildings and blocking roadways
- flooding
- road damage and road closures
- power outages
- telecommunications outages
- impacts on a wide range of critical infrastructure.
- Entrapment of people in vehicles or in homes.

Areas most likely to be affected by Storm damage

The City of Wodonga has experienced and is susceptible to severe weather events all year around. The topography and mountains that surround Albury/Wodonga and the movement of weather along the Murray River makes the city susceptible to storm events. A history exists over the last 10 years experiencing a number of microburst events, where rain falls suddenly on a location creating flash flooding and damaging homes, falling trees and creating strong winds.

Description of the area.

- Significant housing increases in water catchments around Wodonga have occurred recent decades. An increase in homes susceptible to storm water while under construction on hilly terrain has increased requests for assistance to VICSES in Wodonga.
- Industrial areas closer to the Wodonga CBD have experienced overland flows from small creeks like Jack in the Box Creek which has seen a number events in excess of 20% AEP in the last 5 years, where sandbagging operations and property protection measures have been required.

Figure I 1 - VICSES Storm and Flood Requests for Assistance (RFA's) by type 2018-2024

Incident Counts

Financial Year

cad_event_type	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
BLD DAMAGE - ROOF - MULTI	-	2	1	2	1	4
BLD DAMAGE - ROOF - SINGLE	-	9	38	35	37	40
FLOOD - ENT. PREMISES	-	4	10	32	20	7
FLOOD - POT TO ENT. PREMISES	-	1	11	22	37	2
FLOODING	66	2	-	1	2	-
LOOSE DEBRIS / OBJECTS	2	1	3	3	2	2
SANDBAG REQUEST	2	-	1	15	58	2
TREE DOWN - ON VEHICLE	-	-	1	-	1	4
TREE DOWN - POWER LINES	-	-	3	6	3	4
TREE DOWN - RESTRICT ACCESS	-	4	6	7	3	14
TREE DOWN - STRUC - SINGLE	-	-	5	15	1	14
TREE DOWN - THREAT TO FALL	-	3	5	11	1	11
TREE DOWN - TRAFFIC HAZ	-	38	45	114	49	65
TREE DOWN TRAFFIC HAZ	30	16	-	-	-	-
WATER RESCUE - INLAND	-	-	-	-	12	4
Grand total	100	80	129	263	227	173

cad_event_type

Locations of historic storm damage

The following map indicates where the hot spots have been for historic storms of significance that have generated a larger than normal number of requests for assistance. Note that while the map is based on historic data, a severe storm can affect any part of the municipality.

Figure I 1 - Strom Related Requests for Assistance (RFA's) attended by VICSES Wodonga Unit 2018-2024 for the City of Wodonga

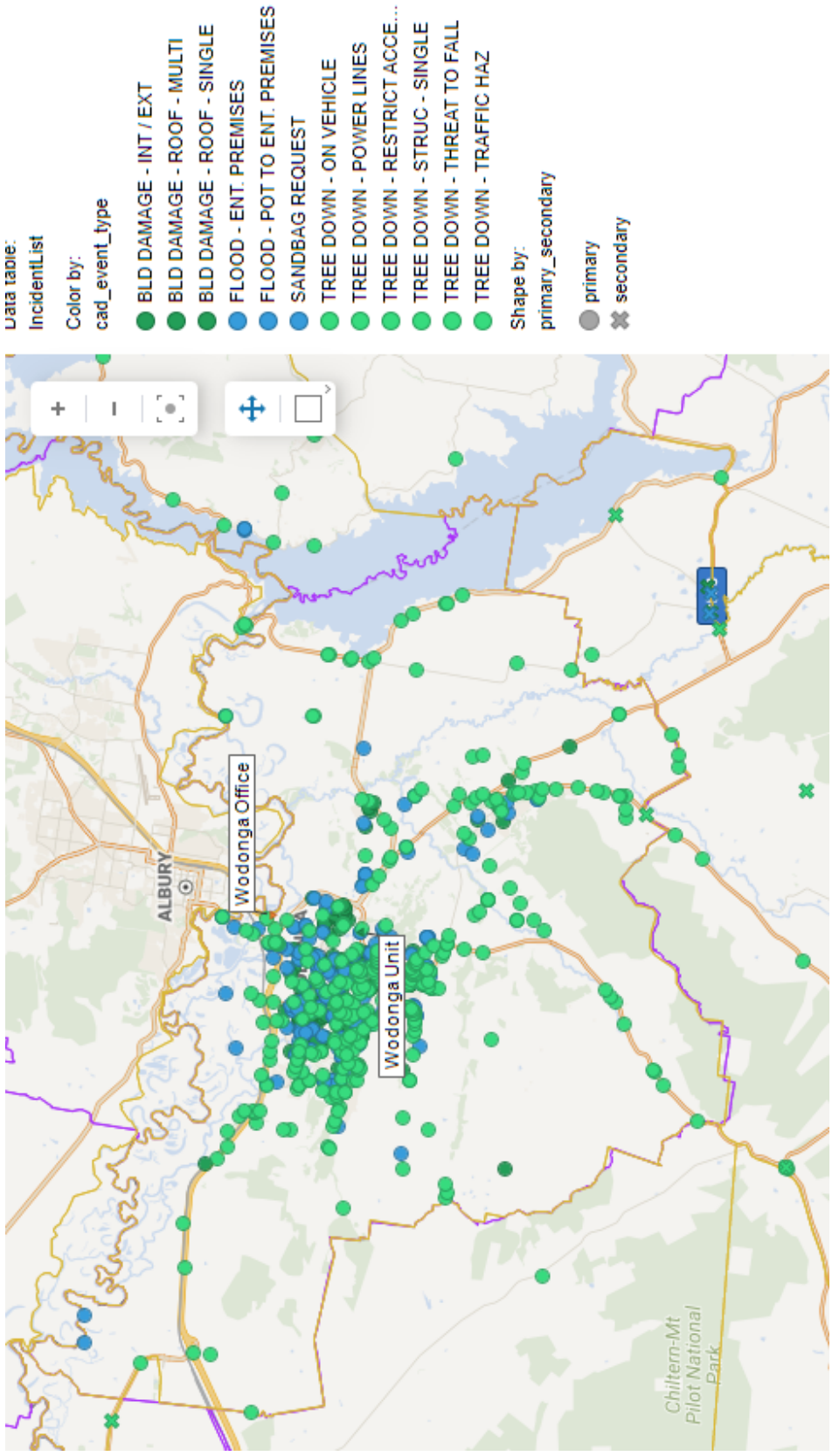
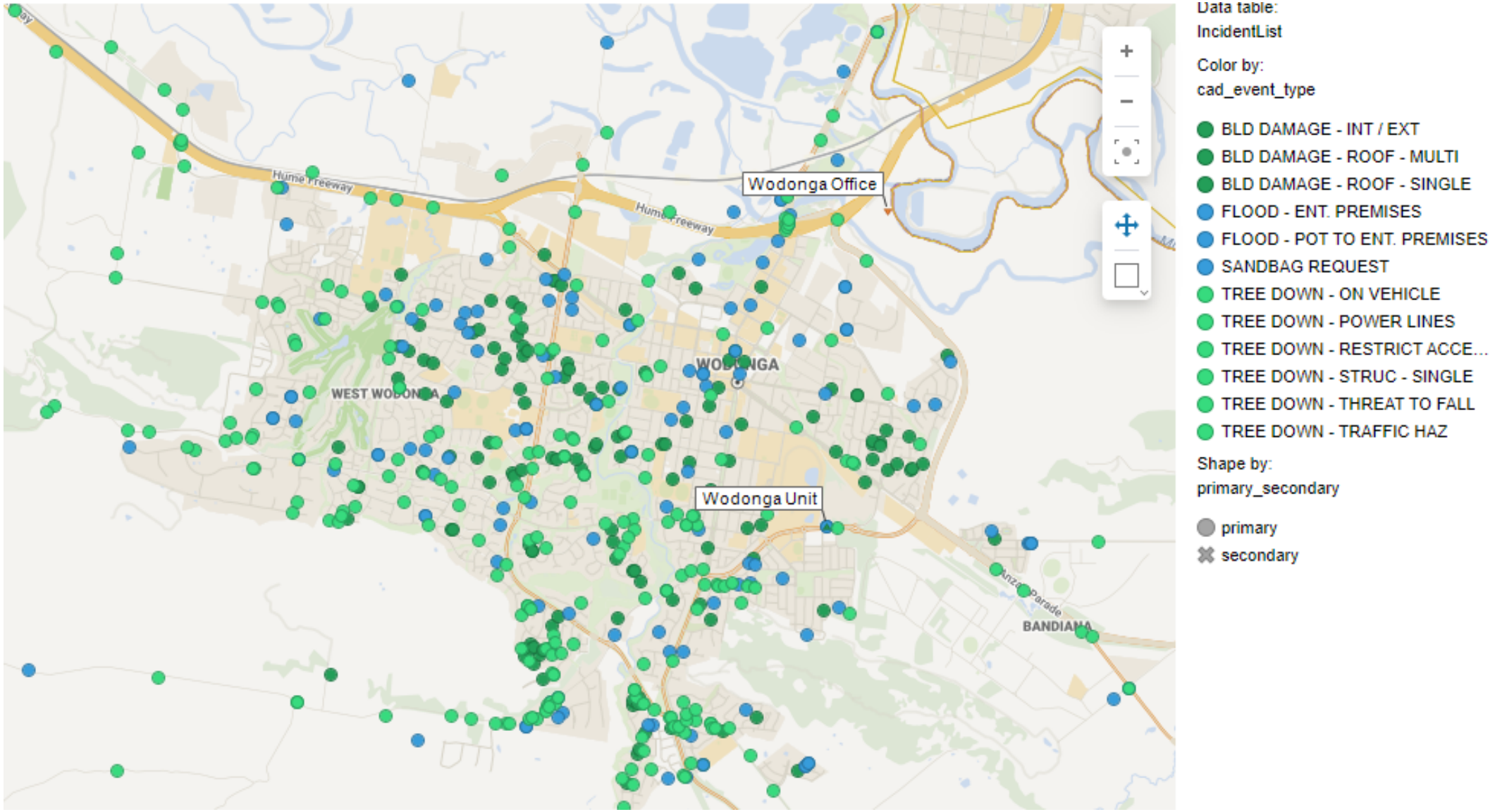


Figure I 1 - Strom Related Requests for Assistance (RFA's) attended by VICSES Wodonga Unit 2018-2024 focus on Wodonga Township



Bureau of Meteorology weather districts

The municipality falls within the Victoria weather district of North East and Borders the Riverina Weather Forecast district in NSW.

Storm specific community education programs

VICSES provides standard community education material on what to do during a storm on its public website. This includes programs on:

- Are you storm ready?
- How to plan and stay safe before a storm hits
- What to do during a storm
- Recovery after a storm

Appendix I2 -Storm damage specific response arrangements

In the initial response phase, managing the response to widespread property damage resulting from a severe thunderstorm involves the coordinated assignment of resources to individual requests for assistance. It is akin to a fire service suddenly having to respond to a widespread outbreak of individual domestic house fires at the same time.

This is different to the approach taken for some other hazards such as riverine flooding or bushfire, where there is more likely to be a need to undertake common tasks around building defensive structures or control lines.

After the initial response phase, and in the most severe cases, relief and recovery may take on a more familiar look to other natural hazards. However, there may be unique aspects that vary from planning associated with riverine flooding.

An example of this may be assisting vulnerable people. In a flood, the plans typically identify the areas subject to inundation, whereas in a storm, the damage may occur anywhere. As such, there may be high risk premises such as aged care or medical facilities that need assistance after a severe storm but are not identified as at risk from riverine flooding.

In the example of the 2021 cyclogenesis windstorm event that affected the Dandenong Ranges, parts of Gippsland, Macedon Ranges and other localities, the effect on the community lasted weeks with access and power restoration taking weeks to achieve. In the aftermath of that event the community gained value from the sector establishing early on, relief centres and community hubs, however, their establishment was hindered due to the consequences of the storm and flood event.

In addition, initial welfare calls made to community members by the Department of Families, Fairness and Housing (DFFH) and AusNet due to being listed as a power dependent customer or experiencing prolonged power outages were generally appreciated.

Incident Control Centres and Divisional/Sector command points

Unless stated otherwise here, the same pre-determined locations are to be used for Incident Control Centres

Each unit local headquarters listed below are suitable for use as a divisional or sector command point.

Unit name and Location/address	Divisional or sector command point suitability	Ability to manage small, medium, or large-scale response
Wodonga Unit 172 Victoria Cross Parade, Wodonga	Divisional Command Point	Ability to manage Large scale responses with ICC support

The nature of severe storm damage may preclude one of the above locations from being used as intended due to factors such as road blockages (trees down), damage to its infrastructure or loss of mains power. In that case.

Response planning and escalation

In the initial response phase, units will receive requests for assistance (RFA's) direct from Triple Zero Victoria and will typically respond in a business-as-usual mode, typically attending events in order of receipt or priority. This is in accordance with the VICSES Operations Management Manual.

As a unit begins to receive a volume of RFAs, it is important that it shifts focus to efficient use of resources through the application of:

- Ensuring it has geographic situational awareness through visualising the location and spread of RFAs via EM-COP situation map or if unable to login, via the public access Emergency.vic.gov.au incidents and warnings page. This will prevent unnecessary travel times and can assist in allocating resources to manage a number of RFAs located in nearby streets.
- Triaging RFAs including call-backs to residents where appropriate to clarify needs and priority
- Seeking support via the RDO and escalation of response arrangements as appropriate (transfer of control from level 1 to level 2 response arrangements).
- Potential deployment of field observers and intelligence gathering via Snap Send Solve to assess areas where the storm impacted as in many cases, there will be unreported cases of damage that requires assistance from the community

Support arrangements – other agencies assistance

While VICSES units provide the initial response to storm damage, this section details the local arrangements for events where VICSES will require support from local emergency services and government departments/agencies to manage a large number of requests for assistance from the community.

For agencies that are likely to provide regular assistance such as CFA brigades and FRV, it is strongly encouraged that these organisations promote to its responders the benefit of completing the E-learn Maintain safety at storm and flood operations. This E-Learn is accessible via the EMV intranet site EM-Learning.

In the municipality, the following agencies typically provide immediate support to assist VICSES units in responding to RFAs.

- City of Wodonga
- CFA
- Forest Fire Management Victoria (DEECA, Parks Victoria)
- NSW State Emergency Service
- NSW Volunteer Rescue Squad - Albury
- FRV
- DTP (Vicroads)
- Panel of contractors

The following headings details each agency, the resources that it typically has within the municipality and operational region within first response distance, and the types of tasks its crews are authorised and trained to be tasked with when supporting VICSES storm operations.

City of Wodonga

The City of Wodonga typically has road and ground crews that support storm response by responding to trees over roads, clearing drains and storm water, supply of machinery and sand.

Council leads the provision of relief services and relief centres.

Callout arrangements are typically through the MEMO.

Country Fire Authority

CFA brigades in the municipality are made up of a mix of urban and rural brigades Urban brigades typically have the capability to respond in a short timeframe, assist through pumping operations, sand bagging and chainsaw response and provide field leadership roles and Safe Work at Heights crews.

Rural brigades typically have the capability to assist through pumping operations, sand bagging and chainsaw response and provide field leadership roles.

Activation of CFA crews to assist should be vis the CFA RAC or Duty Officer. Contact arrangements are available within EMCOP rosters.

Fire Rescue Victoria

Fire Station 76 resides within the Wodonga Township typically with 2 x Fulltime Crews available. FS 76 typically has capability to respond in a short timeframe, assist through pumping operations.

Activation of FRV crews to assist should be vis the FRV RAC or Duty Officer, or 000VIC. Contact arrangements are available within EMCOP rosters.

DEECA

DEECA has a number of offices and Depots in North East Victoria and during summer periods has a larger Project Firefighter base to call on.

DEECA crews are highly skilled in tree operations and come with advanced tree fallers if requested. DEECA crews are generally able assist pending fire operations and can supply chainsaw and falling crews for storm response and clean up, small amounts of machinery including bulldozers and posi-tracks (Bob cats)

Activation of DEECA crews to assist should be vis the DEECA RAC. Contact arrangements are available within EMCOP rosters.

NSWSES

NSWSES can assist with crews from across the border typically in the same capacity as VICSES crews. This includes flood and storm response, chainsaw operators, boat operators, Safe work at heights and other skills.

Activation of NSWSES is via the NSWSES Southern Zone Duty Officer – (02) 4247 8098 with a heads up to Albury Controller via Wodonga Unit.

NSW Volunteer Rescue Squad Albury

VRA can assist with crews from across the border typically in the same capacity as VICSES crews with regards to boating operations, rescue and road crash rescue. They can provide crews to assist with sandbagging operations.

Activation of NSW VRA is via the NSW RFSFCC (Rural Fire Service Fire Control Centre) on 1800 268 747

External panel of contractors (how to access it)

The Victorian Government has established a panel of contractors that are approved to provide services in emergencies without the need for quote or tender processes.

This can include Tree surgeons Bulldozers, excavators and other heavy machinery clearance equipment such as front-end loaders and dump trucks.

The panel is accessible via the Hume Region EMT.

Power utilities

In the event of a severe storm, significant loss of mains electricity/power is highly likely. Ensuring there is effective coordination between the power distribution network operators and the Incident Control Centre will enhance community information and assist with elements of relief such as ensuring vulnerable people that require medical / or other life sustaining equipment remains functional.

Early liaison with the distribution networks may assist in establishing priorities for power restoration, identifying areas of outages and matching this with any known vulnerable premises such as aged care, medical facilities.

The local protocols for establishing coordination and liaison between the distribution networks and the ICC are as follows:

- Ausnet is the service provider for electricity within the City of Wodonga.
- Contact details for Ausnet are available via EMCOP Operational Contacts
- An Ausnet EMLO should be sought ASAP to ensure early communication and planning can be completed

Considerations for operating with other agencies

As other agencies are deployed to assist the IC should consider the following actions:

- Establish a communications plan to enable the tasking of other agency resources. This may include:
  - Use of other agency portable radios at the Sector/Division command point
  - Embedding an CFA member in the comms team so that they can page allocated tasks via EAS/VIPER direct to its brigade resources.
  - Embedding an EMLO from other assisting agencies at the sector/Division command point for comms purposes
  - Use of mobile phones or sat phones to communicate.
- Determining an agreed response to downed powerlines as this is often a predominant hazard for storm events.
- Ensuring other agency personnel who are undertaking EMLO roles have access to EM-COP
- Preparing a briefing, typically an Incident Action Plan (IAP) to support in-coming other agency resources to identify:
  - staging area location and any safety issues with accessing it (closed roads/powerlines down)
  - resources available such as re-supply of consumables (tarps/sandbags)
  - welfare arrangements
  - duty time limitations (these should be consistent with VICSES SOP 003