Murrindindi Shire Council

Flood Emergency Plan

A Sub-Plan of the Municipal Emergency Management Plan

For Murrindindi Shire Council
And
VICSES North East Region and the Alexandra, Maysville and Kinglake Units

Version 2.3, Dec 2020

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Document Transmittal Form / Amendment Certificate

This Municipal Flood Emergency Plan (MFEP) will be amended, maintained and distributed as required by VICSES in consultation with the Murrindindi Shire Council. Like the MEMP, the MFEP will have a 12 month review cycle and a three year revision process.

Suggestions for amendments to this Plan should be forwarded to VICSES Regional Office.

Regional Manager
North East Region
Victoria State Emergency Service
64 Sydney Road,
Benalla, Victoria 3672

Amendments listed below have been included in this Plan and promulgated to all registered copyholders.

Amendment Number	Date of Amendment	Amendment Entered By	Summary of Amendment
V2.0	August 2018	M Cawood (MCA)	Added flood intel from the 2018 Acheron River Catchment Study to Appendices A, C7, C8, C9 & F. Also added Appendix I.
V2.1	June 2019	M Cawood (MCA)	Minor edits and addition of bridge over-topping tables for the Acheron catchment – Marysville, Narbethong, Buxton, Taggerty.
V2.2	June 2020	M Cawood (HARC)	Added main and summary tables to Appendix C9 for Buxton. Updated intelligence table to be consistent with the property table
V2.3	December 2020	John Newlands VicSES at request of GBCMA J Leister	The reference of the GVW pump station appendix C1, have been removed as more investigation is required to confirm correlation between GVW pump station and Court street Yea gauges.

This Plan is available for download from the www.ses.vic.gov.au and www.murrindindi.vic.gov.au websites.

List of Abbreviations & Acronyms

The following abbreviations and acronyms are used in the Plan:

AEP	Annual Exceedance Probability
AHD	Australian Height Datum (the height of a location above mean sea level in metres)
AIIMS	Australasian Inter-service Incident Management System
AoCC	Area of Operations Control Centre / Command Centre
ARI	Average Recurrence Interval
ARMCANZ	Agricultural & Resource Management Council of Australia & New Zealand
AV	Ambulance Victoria
BoM	Bureau of Meteorology
CEO	Chief Executive Officer
CERA	Community Emergency Risk Assessment
CFA	Country Fire Authority
CMA	Catchment Management Authority
RERC	Regional Emergency Response Coordinator
RERCC	Regional Emergency Response Coordination Centre
DHHS	Department of Health & Human Services
DoI	Department of Infrastructure
DELWP	Department of Environment, Land, Water and Planning
EAWP	Emergency Animal Welfare Plan
EMMV	Emergency Management Manual Victoria
EMT	Emergency Management Team
EO	Executive Officer
ERC	Emergency Relief Centre
FO	Floodway Overlay
FWS	Flood Warning System
FZ	Floodway Zone
FRV	Fire Rescue Victoria
IC	Incident Controller
ICC	Incident Control Centre
IMT	Incident Management Team
IMS	Incident Management System
EMLO	Emergency Management Liaison Officer
LSIO	Land Subject to Inundation Overlay
MECC	Municipal Emergency Coordination Centre
MEMP	Municipal Emergency Management Plan
MEMPC	Municipal Emergency Management Planning Committee
MERC	Municipal Emergency Response Coordinator
MERO	Municipal Emergency Resource Officer
MFB	Metropolitan Fire and Emergency Services Board
MRM	Municipal Recovery Manager
PMF	Probable Maximum Flood
RCC	Regional Control Centre
RDO	Regional Duty Officer
RRC	Relief and Recovery Coordinator
RRP	Relief and Recovery Plan
RRV	Regional Roads Victoria
SBO	Special Building Overlay
SCC	State Control Centre
SERP	State Emergency Response Plan
SERRP	State Emergency Relief and Recovery Plan
SEWS	Standard Emergency Warning System
SFEP	State Flood Emergency Plan
SHERP	State Health Emergency Response Plan
SOP	Standard Operating Procedure
VicPol	Victoria Police
VICSES	Victoria State Emergency Service

Part 1. INTRODUCTION

1.1 Municipal Endorsement

This Municipal Flood Emergency Plan (MFEP) has been prepared by and with the authority of the Murrindindi Shire Council and Lake Mountain Alpine Resort Municipal Emergency Management Planning Committee (MEMPC) pursuant to Section 20 of the *Emergency Management Act 1986* (as amended).

This MFEP, a sub plan of the Murrindindi Shire Council and Lake Mountain Alpine Resort Municipal Emergency Management Plan (MEMP), is consistent with the Emergency Management Manual Victoria (EMMV) and the Victoria Flood Management Strategy (DNRE, 1998a). The MFEP recognises the outcomes of the Community Emergency Risk Management (CERM) process undertaken by the MEMPC.

The MFEP is consistent with the VICSES North East Region Flood Emergency Plan and the State Flood Emergency Plan (SFEP).

This MFEP is a result of the cooperative efforts of the Murrindindi Shire Council and Lake Mountain Alpine Resort MEMPC and its member agencies.

This Plan is endorsed by the Murrindindi Shire Council and Lake Mountain Alpine Resort MEMPC as a sub-plan to the MEMP at their meeting on ? The MFEP has also been adopted by Council as the Flood Emergency Plan for Murrindindi Shire.

Endorsement

……..

Mayor / Councillor Date

…….
…..

Chief Executive Officer Date

-

SES Regional Manager North East (Hume) Date

(Chair - Municipal Emergency Management Planning Committee)

1.2 The Municipality

An outline of Murrindindi Shire Council in terms of its location, demography and other general matters is provided in the MEMP. An outline of the flood threat is provided in Appendix A of this Plan.

1.3 Purpose and Scope of this Flood Emergency Plan

The purpose of this MFEP is to detail arrangements agreed for the planning, preparedness/prevention, response and recovery from flood incidents within the geographical area of Murrindindi Shire.

As such, the scope of the Plan is to:

- Identify the Flood Risk to Murrindindi Shire
- Support the implementation of measures to minimise the causes and impacts of flood incidents within Murrindindi Shire
- Detail Response and Recovery arrangements including preparedness, Incident Management, Command and Control
- Identify linkages with Local, Regional and State emergency and wider planning arrangements with specific emphasis on those relevant to flood

1.4 Municipal Flood Planning Committee (MFPC)

In Murrindindi Shire, the there is no flood planning committee. The role of the flood planning committee has been incorporated into the MEMPC. For a list of members, see the MEMP.

1.5 Responsibility for Planning, Review & Maintenance of this Plan

This MFEP must be maintained in order to remain effective.

VICSES through the Flood Planning Committee has responsibility for preparing, reviewing, maintaining and distributing this plan.

The plans should be reviewed:

- Following any new flood study;
- Change in non-structural and/or structural flood mitigation measures;
- After the occurrence of a significant flood event within the Municipality to review and where necessary amend arrangements and information contained in this Plan
- In accordance with the 3 year MEMP planning cycle (reviewed annually and revised every three years).

1.6 Endorsement of the Plan

The MFEP will be circulated to MEMPC seeking endorsement of the draft plan. If endorsed the MFEP will then be presented to Murrindindi Shire Council for final adoption as a sub-plan of the MEMP. Once adopted, the MFEP will become the Flood Plan for Murrindindi Shire.

Part 2. PREVENTION / PREPAREDNESS ARRANGEMENTS

2.1 Community Awareness for all Types of Flooding

Details of this MFEP will be released to the community through local media, the FloodSafe program, and Council website upon formal adoption by Murrindindi Shire Council.

VICSES with the support of Murrindindi Shire Council and Goulburn Broken Catchment Authority will coordinate community education programs for flooding within the council area. E.g. FloodSafe / StormSafe.

A FloodSafe Community Education/Communication Plan is yet to be developed.

Structural Flood Mitigation Measures

There are no structural flood mitigation measures such as levees and retarding basins in Murrindindi Shire.

2.2 Non-structural Flood Mitigation Measures

2.2.1 Exercising the Plan

Arrangements for exercising this Plan will be at the discretion of the MEMPC. This Plan should be regularly exercised, preferably on an annual basis. Refer to section 4.7 of the EMMV for guidance.

2.2.2 Flood Warning

Arrangements for flood warning are contained within the SFEP and the EMMV (Part 3.7) and on the BoM website.

Specific details of local flood warning system arrangements are provided in appendix E.

2.2.3 Flood Observers

The VICSES Local Knowledge Policy outlines the strategies and principles for ensuring the incorporation of local knowledge in decision making before, during and after incidents.

Specific details of arrangements to capture local knowledge are provided in Appendix G.

Part 3. RESPONSE ARRANGEMENTS

3.1 Introduction

3.1.1 Activation of Response

Flood response arrangements may be activated by the Regional Duty Officer (RDO) North East Region or Incident Controller (IC).

The IC/RDO VICSES will activate agencies as required and documented in the SFEP.

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 within Murrindindi Shire. These agencies will be engaged through the Emergency Management Team (EMT) processes.

The general roles and responsibilities of supporting agencies are as agreed within Part 7 of EMMV, the MEMP, the SFEP and the Regional Flood Emergency Plan.

Agreed roles of supporting agencies **may** be listed/are in a separate appendix to this plan.

3.1.3 Municipal Emergency Coordination Centre (MECC)

Liaison with the MECC if established will be through the established Division/Sector Command and through Municipal involvement in the Incident EMT, in particular the Municipal Emergency Response Coordinator (MERC). The VICSES RDO / ICC will liaise with the MECC / Council directly if no Division/Sector Command is established.

The function, location, establishment and operation of the MECC will be as detailed in the Murrindindi Shire Council MEMP. Please note that legislative has occurred removing the need for Council's to operate a MECC. However Murrindindi Shire Council will still run an operations centre for relief and recovery services after this date. The name is yet to be decided.

3.1.4 Escalation

Most flood 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, initially from neighbouring Municipalities (on a regional basis) escalating to a State-wide basis where required.

Resourcing and event escalation arrangements are described in the EMMV ('State Emergency Response Plan' – section 3.5).

3.2 Strategic Control Priorities

To provide guidance to the Incident Management Team (IMT), the following strategic control priorities shall form the basis of incident action planning processes:

1. Protection and preservation of life is paramount - this includes:

    a. Safety of emergency services personnel, and

    b. Safety of community members including vulnerable community members and visitors/tourist located within the incident area

2. Issuing of community information and community warnings detailing incident information that is timely, relevant and tailored to assist community members make informed decisions about their safety

3. Protection of critical infrastructure and community assets that supports community resilience

4. Protection of residential property as a place of primary residence

5. Protection of assets supporting individual livelihoods and economic production that supports individual and community financial sustainability

6. Protection of environmental and conservation values that considers the cultural, biodiversity, and social values of the environment

Circumstances may arise where the IC is required to vary these priorities, with the exception being that the protection remains the highest. This shall be done in consultation with the State Controller and relevant stakeholders based on sound incident predictions and risk assessments.

3.3 Command, Control & Coordination

The Command, Control and Coordination arrangements in this MFEP are consistent with those detailed in State and Regional Flood Emergency Plans. For further information, refer to sections 3.4, 3.5 and 3.6 of the EMMV.

The specific details of the Command, Control and Coordination arrangements for this plan are to be provided in Appendix C.

3.3.1 Control

Functions 5(a) and 5(c) at Part 2 of *the Victoria State Emergency Service Act 1986 (as amended)* detail the authority for VICSES to plan for and respond to flood.

Part 7.1 of the EMMV prepared under the *Emergency Management Act 1986 and 2013 (as amended)*, identifies VICSES as the Control Agency for flood. It identifies the Department of Environment, Land, Water and Planning (DELWP) as the Control Agency responsible for "*dam safety, water and sewerage asset related incidents*" and other emergencies

All flood response activities within Murrindindi Shire 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 delegate.

3.3.2 Incident Controller (IC)

An IC will be appointed by the VICSES (as the Control Agency) to command and control available resources in response to a flood event on the advice of the Bureau of Meteorology (or other reliable source) that a flood event will occur or is occurring. The Incident Controller responsibilities are as defined in Part 3.5 of the EMMV

3.3.3 Incident Control Centre (ICC)

As required, the IC will establish an Incident Control Centre (ICC) from which to initiate incident response command and control functions. The decision as to if and when the ICC should be activated, rests with the Control Agency (i.e. VICSES).

Pre-determined ICC / Operations centres locations are

Shepparton – CFA District 22, 195-205 Numurkah Road Shepparton

Seymour – CFA District 12, 39 McIntyre St, Seymour 3660

Benalla – SES RHO Benalla, 64 Sydney Road Benalla

And/Or

- Are listed in the North East Regional Flood Emergency Plan.

3.3.4 Divisions and Sectors

To ensure that effective Command and Control are in place, the Incident Controller may establish Divisions and Sectors depending upon the complexity of the event and resource capacities.

The following Divisions and Sectors may be established to assist with the management of flooding within the Municipality:

Division	Sector
Seymour CFA	Marysville SES, Seymour SES, Alexandra CFA/SES

3.3.5 Incident Management Team (IMT)

The IC will form an Incident Management Team (IMT).

Refer to 3.5 of the EMMV for guidance on IMTs and Incident Management Systems (IMSs).

3.3.6 Emergency Management Team (EMT)

The Incident Controller will establish a multi-agency Emergency Management Team (EMT) to assist the flood response. The EMT will consist of key personnel (with appropriate authority) from stakeholder agencies and relevant organisations who need to be informed of strategic issues related to incident control and who are able to provide high level strategic guidance and policy advice to the IC for consideration in developing incident management strategies.

Organisations, including Murrindindi Shire Council, required within the EMT will provide an Emergency Management Liaison Officer (EMLO) to the ICC where practicable and other

staff and / or resources identified as being necessary, within the capacity of the organisation.

Refer to 3.5 of the EMMV for guidance on EMTs.

3.3.7 On Receipt of a Flood Watch / Severe Weather Warning

Incident Controller or VICSES RDO (until an IC is appointed) 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 – www.bom.gov.au
- Assess Command and Control requirements.
- Review local resources and consider needs for further resources regarding personnel, property protection, flood rescue and air support
- 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 EMT) and open if required
- Ensure flood bulletins and community information are prepared and issued in a timely manner to the community
- Monitor watercourses and undertake reconnaissance of low-lying areas
- Develop media and community information management strategy
- Ensure flood mitigation works are being checked by owners
- Develop and issue incident action plan, if required
- Develop and issue a situation report, if required

3.3.8 On Receipt of the First and Subsequent Flood Warnings

IC/VICSES RDO (until an incident controller is appointed) will undertake actions as defined within the flood intelligence cards (appendix C). General considerations by the IC/VICSES RDO will be as follows:

- Develop an appreciation of current flood levels and predicted levels. Are floodwaters, rising, peaking or falling?
- Review flood intelligence to assess likely flood consequences. Consider:
    - What areas may be at risk of inundation?
    - What areas may be at risk of isolation?
    - What areas may be at risk of indirect affects as a consequence of power, gas, water, telephone, sewerage, health, transport or emergency service infrastructure interruption?
    - What are 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 (i.e. water and power utilities);
- Implement response strategies as required based upon flood consequence assessment;
- Continue to monitor the flood situation – www.bom.gov.au/vic/flood/; and
- Continue to conduct reconnaissance of low-lying areas.

3.4 Community Information and Warnings

Guidelines for the distribution of community information and warnings are contained in the State Flood Emergency Plan.

Community information and warnings communication methods available include:

- Emergency Alert
- Phone messages (including SMS)
- Radio and Television
- Two-way radio
- Mobile and fixed public address systems
- Sirens
- Verbal Messages (e.g. Doorknocking)
- Agency Websites
- VICSES Flood Storm Information Line
- Variable Message Signs (i.e. road signs)
- Community meetings
- Newspapers
- Email
- Telephone trees
- Community Flood Wardens
- Fax Stream
- Newsletters
- Letter drops
- Social media and/or social networking sites (i.e. twitter and/or Facebook)

Refer to Appendix C and E for the specific details of how community information and warnings are to be provided.

The release of flood bulletins and information with regard to response activities at the time of a flood event is the responsibility of VICSES, as the Control Agency.

Council has the responsibility to assist VICSES to warn individuals within the community including activation of flood warning systems, where they exist. Responsibility for public information, including media briefings, rest with VICSES as the Control Agency.

Other agencies such as CFA, DELWP and VICPOL may be requested to assist VICSES with the communication of community flood warnings.

In cases where severe flash flooding is predicted, dam failure is likely or flooding necessitating evacuation of communities is predicted, the IC may consider the use of the Emergency Alert System and Standard Emergency Warning System (SEWS).

Department of Health (DH) will coordinate information regarding public health and safety precautions.

3.5 Media Communication

The IC through the Information Unit established at the ICC will manage Media communication. If the ICC is not established the RDO will manage all media communication.

Media regarding local relief and recovery, including Emergency Relief Centres (ERCs) will be coordinated by Murrindindi Shire Council in conjunction with the IC.

3.6 Impact assessment

The Emergency Management Commissioner is responsible for collecting and reporting information on the impact of emergencies in order to inform priorities in consequence management and the provision of relief and recovery services. There are three stages of impact assessment:

- Initial impact assessment is a high level assessment conducted as soon as possible after the impact of the emergency and is managed by controllers during the emergency response.

- Secondary impact assessment is the subsequent assessment of the impact of the emergency on the natural, built, social, economic and agricultural environments and is managed by relief and recovery coordinators/managers.

- Post emergency needs assessment is a longer term, more thorough estimate of the effects and consequences of the emergency on the health and wellbeing of the community, property, the economy and the environment. This is managed by relief and recovery coordinators/managers.

Impact Assessment Guidelines can be obtained from the Emergency Management Portal (login required) at: http://portal.em.vic.gov.au

3.7 Preliminary Deployments

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 might include emergency service personnel, food items and non-food items such as medical supplies, shelter, assembly areas, relief centres etc.

3.8 Response to Flash Flooding

Emergency management response to flash flooding should be consistent with the guideline for the emergency management of flash flooding contained within the SFEP.

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

1. Determine if there are barriers to evacuation. Consider warning time, safe routes, resources available etc.

2. If evacuation is practicable, then evacuation should be considered as a strategy by the IC. Any evacuation must be supported by a public information capability and a rescue contingency plan.

3. Where it is likely people will become trapped by floodwaters due to limited evacuation options, appropriate safety advice needs to be provided. This will include information aimed at people at risk. Predominantly this information will advise them not to attempt to flee by entering floodwater if they become trapped or isolate. Instead it may be safer to seek the highest point within the building or landscape and to telephone 000 if rescue is required. This advice needs to be provided even when evacuation may be possible, due the likelihood that not all community members will or can evacuate.

4. For buildings known to be structurally un-suitable an earlier evacuation trigger will need to be established (return to step 1 of this cycle).

5. If an earlier evacuation is not possible then specific preparations must be made to rescue occupants trapped in structurally unsuitable buildings either pre-emptively or as those people call for help.

During a flash flood it will often be difficult, due the rapid development of flooding, to establish ERCs ahead of actually triggering the evacuation as is normal practice. However this is insufficient justification for not adopting evacuation. Victoria Police are the agency responsible for evacuation (EMMV Part 7, Page 7-86), who will make decisions on evacuation with the controlling agency.

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

3.9 Evacuation

The decision to recommend or warn people to prepare to evacuate or to evacuate immediately rests with the IC who is advised by Victoria Police.

Once the decision is made, Victoria Police are 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.

Victoria Police and / or Australian Red Cross may take on the responsibility of registering people affected by a flood emergency including those who have been evacuated when they present at an ERC.

Refer to section 3.8 of the EMMV and the Evacuation Guidelines for guidance of evacuations for flood emergencies.

Refer to Appendix C of this Plan for detailed evacuation arrangements for the geographical area of Murrindindi Shire.

3.10 Flood Rescue

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.

Resources available for use in rescues to be carried out within the Murrindindi Shire are detailed in Appendix C.

3.11 Aircraft Management

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

Air support operations will be conducted under the control of the IC.

The IC may request aircraft support through the State Air Desk located at the State Control Centre (SCC) will establish priorities.

Suitable airbase facilities are located at:

- Lilydale Airfield
- Mangalore
- Shepparton

Shepparton Airport

IATA: SHT – ICAO: YSHT

Summary	
Airport type	Public
Operator	Greater Shepparton City Council
Location	Shepparton, Victoria
Elevation AMSL	374 ft / 114 m
Coordinates	36°25′44″S 145°23′33″E

Map

Location in Victoria

Runways			
Direction	Length		Surface
	m	ft	
09/27	423	1,388	Gravel
18/36	1,378	4,521	Asphalt

Sources: Australian AIP and aerodrome chart[1]

Lilydale Airport

IATA: *none* – ICAO: YLIL

Summary	
Airport type	Private
Operator	Lilydale Airfield Pty Ltd
Serves	Melbourne
Location	Lilydale
Elevation AMSL	242 ft / 74 m
Coordinates	37°41′30″S 145°22′00″E
Website	http://lilydaleairport.com.au/

Map

Location in Melbourne

Runways			
Direction	Length		Surface
	m	ft	
18/36			

Sources: AIP[1]

Mangalore Airport

IATA: *none* – ICAO: YMNG

Summary	
Airport type	Public
Operator	Mangalore Airport Pty Ltd
Location	Mangalore, Victoria
Elevation AMSL	467 ft / 142 m
Coordinates	36°53′18″S 145°11′03″E

Map

Location in Victoria

Runways			
Direction	Length		Surface
	m	ft	
05/23	2,027	6,650	Asphalt
18/36	1,461	4,793	Asphalt

Sources: Australian AIP and aerodrome chart[1]

3.12 Resupply

Communities, neighbourhoods or households can become isolated during floods 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.

3.13 Essential Community Infrastructure (ECI) and Property Protection

ECI and property (e.g. residences, businesses, roads, power supply etc.) may be affected in the event of a flood.

Murrindindi Shire Council maintains a small stock of sandbags, and back-up supplies are available through VICSES Regional Headquarters. The IC will determine the priorities related the use of sandbags, which will be consistent with the strategic priorities.

If VICSES sandbags are becoming limited in supply, then priority will be given to protection of ECI. 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 ECI are kept advised of the flood situation. ECI providers must keep the IC informed of their status and ongoing ability to provide services.

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

3.14 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 Murrindindi Shire.

3.15 Road Closures

RRV are responsible for designated main roads and highways. Council are responsible for the designated local and regional road network. The Department of Environment, Land Water and Planning (DELWP) are responsible for other government roads not administered by Vic Roads or Council (e.g. Roads in State Forests etc.).

Road closures caused by flooding within the Municipality will be managed by Murrindindi Shire Council and RRV as part of their normal formal functions. This will include necessary observations and the placement of warning signs, road blocks, etc. to local and regional roads, bridges, walking and bike trails, etc. Murrindindi Shire Council staff may also liaise with and advise RRV as to the need or advisability of erecting warning signs and / or of closing roads and bridges under its jurisdiction.

RRV and Murrindindi Shire Council will communicate information regarding road closures to the ICC. The RRV website will be updated and maintains for all current road closures, including Municipal and DELWP closures. These can be viewed at www.RRV.vic.gov.au

3.16 Dam Failure

DELWP is the Control Agency for dam safety incidents (e.g. breach, failure or potential breach / failure of a dam), however VICSES is the Control Agency for any flooding that may result.

3.17 Waste Water 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 responsibility 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.

It is the responsibility of the Murrindindi Shire Council Environmental Health Officer to inspect and report to the MERO and the ICC on any water quality issues relating to flooding.

3.18 After Action Review

VICSES will coordinate the after-action review arrangements of flood operations as soon as practical following an event.

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

Part 4. EMERGENCY RELIEF AND RECOVERY ARRANGEMENTS

4.1 General

Arrangements for recovery from a flood incident within Murrindindi Shire Council are detailed in the Murrindindi Shire Council MEMP. Specific information regarding relief and recovery is captured in the Murrindindi Shire Council Relief and Recovery Plan (RRP).

4.2 Emergency Relief

The IC should ensure that the MERC, the Regional Recovery Coordinator (RRC) and the Municipal Recovery Manager (MRM) are kept informed of the need for relief.

The decision to recommend the opening of an emergency relief centre rests with the IC. ICs are responsible for ensuring that relief arrangements have been considered and implemented where required under the State Emergency Relief and Recovery Plan (SERRP) (Part 4 of the EMMV).

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. Refer to Section 4.4 of the EMMV for details of the range of emergency relief services that may be provided.

Suitable relief facilities identified for use during floods, including details of relief arrangements, are detailed in the MEMP and RRP.

4.3 Animal Welfare

Matters relating to the welfare of livestock, companion animals and wildlife (including feeding and rescue) are to be referred to Agriculture Victoria.

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

Matters relating to the welfare of wildlife are to be referred to Agriculture Victoria.

Refer to Murrindindi Shire Council Emergency Animal Welfare Plan (EAWP) for animal shelter compound locations.

4.4 Transition from Response to Recovery

VICSES as the Control Agency is responsible for ensuring effective transition from response to recovery during a flood or storm emergency. The transition to recovery will be conducted in accordance with existing arrangements as detailed in Part 3, Section 3.10 of the EMMV.

APPENDIX A - FLOOD THREATS FOR MURRINDINDI SHIRE

General

The Murrindindi Shire was formed as a result of the State Government review and restructure of Municipalities conducted by the Office of Local Government during 1994. The Murrindindi Shire consists of the former Shire of Alexandra, the former Shire of Yea, the former Shire of Eltham's Kinglake district, the former City of Whittlesea's Kinglake West district, the former Shire of Broadford's King Parrot Creek and Strath Creek districts, the former Shire of Healesville's Toolangi / Castella district and the former Shire of Euroa's Terip Terip district.

The major population centres are Alexandra, Yea and Kinglake. The three main highway links, the Maroondah, the Melba and the Goulburn Valley Highways link the main population centres and provide links to surrounding areas (e.g. Melba Highway provides access to Melbourne from Yea).

The agricultural land throughout the Municipality is basically hilly with some major mountains within the area. The major water course is the Goulburn River. Lake Eildon is a water storage located on the eastern boundary of the Shire. The Shire has approximately 46% forest and public land and has a high to extreme fire risk.

Lake Mountain Alpine Resort, located in the south of the Shire, is a day visitor destination. The resort attracts on average around 200,000 persons annually. The resort's close proximity to Melbourne attracts a diverse range of persons, those interested in cross country skiing and tobogganing during the winter months and adventure sports in the summer, to the peace and tranquillity the resort offers.

The Lake Mountain plateau 120km east-northeast of Melbourne is one of the southernmost sub-alpine areas on the Australian continent. The Lake Mountain massif is an undulating plateau 1330 metres through to 1500 metres, which trends north-northwest from the Great Dividing Range.

Quarries - Floodplain Mining Risks

(Extract from Summary of Jacobs Review of floodplain mining and risk in 2015)

- Homewood (Yea Sand & Gravel, WA45)
- Switzerland (Switzerland Quarry, WA516)

Sand and gravel extraction from the floodplain can have major impacts if, during flooding, the stream creates a new channel through the pit. If the river captures the quarry pit the physical impacts can include river bed degradation and aggradation, bank erosion and channel widening. These physical impacts may extend many kilometres away from the pit. Infrastructure such as bridges, culverts and services that lie within the area of physical impact may also be damaged or destroyed.

Three main risk scenarios have been identified that have the potential to result in pit capture. These are:

- Lateral migration of the river channel into the pit
- Sub-surface piping into pits and subsequent failure of pit walls
- Flow of water into and through the pit

The likelihood of a pit capture occurring via one of these three risk scenarios is a function of a number of variables. Hydrology is a key variable that influences likelihood, as it is the flow of water into a pit from the river that leads to its capture. Local hydraulic effects are also important such as the flow velocity adjacent to erodible floodplain and bank material. Other variables that are important are the proximity of the pit to a waterway and the depth of the pit relative to the channel. Pits in close proximity to a waterway and where extraction has continued to a depth lower than the bed of the adjacent waterway pose a greater risk than pits that are positioned further away from the waterway where extraction does not extend below the bed of the river.

The consequences of pit capture depend on the relative scale of the mining operations and the river and the infrastructure that is located in the impact area. The larger and deeper the captured pit, the greater the potential change is to the river. The physical processes of pit capture have been well documented from case studies, incision upstream and downstream of the pit are expected, with bed adjustments continuing until the river establishes a new equilibrium and grade. Any infrastructure which traverses the impacted area is at risk of being damaged during this period of adjustment.

A number of methods exist to prevent floodplain mining impacting on the river. None of these options can be relied upon, in that even if designed to the highest standard they can still fail. They may also generate problems elsewhere. Levees can be constructed to keep flood waters out of the pit, however by limiting flooding in one area this may result in greater flooding in another area.

Pit capture and associated changes in channel alignment are a genuine concern in the Goulburn Valley. The scale of the operations and their positioning relative to the river and key infrastructure indicate that significant physical and infrastructure impacts will occur in the future.

Historic Floods

The most notable floods of the Goulburn River this century have occurred in 1916, 1917, 1934, 1952, 1974, and 1993.

The flood events of 1916 and 1917 were the largest floods in history. The 1974 event was the largest flood since Lake Eildon filled and ranked the fifth largest of the Goulburn River in this area's history.

The Goulburn River environs between Eildon and Trawool start to experience localised flooding within the areas along the river frontage when the Goulburn River reaches minor flood levels. Also localised flooding may occur in this area along rural roads and on rural properties due to heavy rainfall throughout the year. The flooding of the Yea River also has a significant effect on the township of Yea as was the situation in 1989.

Large floods have also occurred along the Acheron River: in 1870, 1912/3), 1916, 1930 and 1934 (believed to be the flood of record) and more recently (from largest backwards) in September 2010, October 1996, June 1994, May 1974, August 2005, June 1980 and September 1998.

Description of Major Waterways and Drains

Waterway or Drain	Description
Goulburn River	The headwaters of the Goulburn River rise in the western end of the Victorian Alps, near Mt Buller.
Lake Eildon	Water Storage, located on Goulburn River in its Upper Catchment
Acheron River	The Acheron River catchment is located approximately 80km north-east of Melbourne and incorporates the towns of Marysville, Buxton, Taggerty and Acheron. The Acheron township is situated out of the floodplain and roads, houses, golf course, Maroondah Highway, etc are not affected by flooding from either the Acheron River or Connelly Creek. The Acheron River rises on the north east slopes of Mt Richie within the Great Dividing Range and follows the Acheron Way in a generally northerly direction to near the Marysville Road. It passes under the Maroondah Highway near Narbethong and then resumes its south to north flow past Buxton and through Taggerty to join the Goulburn River a short distance downstream from the Acheron township (i.e. around 5.5km upstream of Alexandra and around 8.5km downstream from Thornton or around 4km downstream of where the Rubicon River joins the Goulburn). The Acheron floodplain is approximate 2km wide where it merges with the Goulburn Valley. The largest tributary, the Steavenson River, which rises as a series of small creeks on the northern slopes of the Great Divide near Mt Stinton south of Lake Mountain, passes through Marysville and Buxton before joining the Acheron River immediately downstream from Buxton. The Steavenson River is joined by the Taggerty River, which rises on the north western slopes of Lake Mountain, a short distance downstream from Marysville. The Little River, another significant tributary which rises on the northern slopes of the Cathedral Ranges, joins the Acheron River at Taggerty. There are a multitude of small creeks that join the Acheron along its length with the majority joining around Narbethong, from the range to the west to near Taggerty and from the Cathedral Ranges to the east downstream from Buxton. Similarly, the Steavenson and Taggerty rivers also feature many tributary creeks. Robertson Gully and Wilks Creek in Marysville are the two of most significance within the Steavenson River catchment. The catchment area of the Acheron River to the gauge at Taggerty is 619km^2 and to its confluence with the Goulburn River 725km^2. The catchment area of the Steavenson River is 174km^2. All other tributaries have smaller catchments.

Dam Failure

Flooding resulting from failure of the following dams is likely to cause significant structural and community damage within Murrindindi Shire. Refer to Eildon Flood Safety Plan

Location	Owner	Dam Height	Dam Capacity	Comments
Lake Eildon - Goulburn River 	Goulburn – Murray Water	84.5m Embankment Dam	3,390,000 ML	Has Hydroelectricity operated by AGL

Eildon Dam

A view of the impounded Lake Eildon, in 2011

Location of the Eildon Dam in Victoria

Country	Australia
Location	Victorian Alps, Victoria
Coordinates	37°11′34″S 145°53′49″E[1]
Purpose	Water supply Irrigation Hydroelectricity
Status	Operational
Construction began	1915
Opening date	1929 1935 (modifications) 1955 (enlarged)
Operator(s)	Goulburn–Murray Water

APPENDIX B - TYPICAL FLOOD PEAK TRAVEL TIMES

Flood travel times are yet to be confirmed.

Location From	Location To	Typical Travel Time	Comments
Start of rainfall (upper catchment)	Location 1	xx to xx hours	Begin to rise from normal levels
	Location 2	xx to xx hours	Begin to rise from normal levels
	Location 3	xx to xx hours	Begin to rise from normal levels
Location A	Location B	Around XX hours	Minor flooding
Location C	Location D	Around XX hours	Minor flooding
Location A	Location B	Around XX hours	Moderate flooding
Location C	Location D	Around XX hours	Moderate flooding
Location A	Location B	Around XX hours	Major flooding
Location C	Location D	Around XX hours	Major flooding

ACHERON RIVER CATCHMENT

Because of the many tributaries contributing to flow along the length of the Acheron River, floods tend to rise very quickly once the catchment wets up / runoff becomes established and the initial peaks occur at the key locations within a few hours of each other. There is some oscillation of flood levels around the initial peak with the flood extending somewhere between 12 and 30 hours. A second flood on a wet catchment would occur quicker, rise faster and last longer.

Location	Regional scale event - approximate response times in hours from start of heavy rain						
	20%	10%	5%	2%	1%	0.5%	0.2%
Marysville							
Time to rise	24	24	24	24	24	13	12
Time to out-of-bank flows	27	26	26	27	27	28	28
Once the rise starts, there is a rapid increase to an initial peak at about 30 hours after start of heavy continuing rain							
Duration of out-of-bank flows is ~16 hours for a 20% event and ~20 hours at 1% event. Thereafter, recession is slow.							
Buxton							
Time to rise	26	26	26	26	26	16	14
Time to out-of-bank flows	32	31	31	31	31	28	29
Once the rise starts, there is a rapid rise to an initial peak at about 32 hours after start of heavy continuing rain. Typically a double peak with the 2nd peak a few centimetres higher than the 1st, around 8 hours later.							
Duration of out-of-bank flows is ~25 hours for a 20% event and ~30 hours at 1% event. Thereafter, recession is slow.							
Taggerty							
Time to rise	25	25	26	26	25	20	17
Time to out-of-bank flows	36	36	36	36	36	37	36
Once the rise starts, there is typically a rapid rise to a double peak with the 1st (only present if rain is heavy over the Cathedral Ranges) a lot lower than the 2nd. The much larger main peak occurs at about 36 to 39 hours after start of heavy continuing rain.							
Duration of out-of-bank flows is ~22 hours for a 20% event and ~30 hours at 1% event. Thereafter, recession is slow.							

APPENDIX C1– YEA FLOOD EMERGENCY PLAN

The Bureau of Statistics records 1,586 people living within the Yea Township, which is located approximately 80km north-east of Melbourne. In recent years the town has come under increased pressure for development, with this situation expected to continue in the future. Yea lies adjacent to around 4 km of the Yea River frontage and associated floodplain. The original town subdivision includes small lots within floodplain areas. Significant historical flooding has occurred in 1934, 1974 and 1989.

The catchment area contributing flood flows to the area includes the Murrindindi River and Yea River to Yea (including the Boundary Creek).

Two waterways flow through Yea - the Yea River and Boundary Creek. The Yea River passes along the eastern and northern edge of the Yea Township before entering the Goulburn River approximately 10 kilometres downstream of Yea. Within the area, the Yea River is bordered either side by relatively steep terrain that tends to confine the extent of the floodplain to a width of approximately 500-600 metres. Boundary Creek, a tributary of the Yea River, descends reasonably steeply down the western edge of the Yea Township and outfalls into the Yea River. The features of both these waterways and their interaction influence the nature of flooding within the area.

Overview of Flooding Consequences

- Many riverside caravan parks are at risk of flooding. The Yea Tourist Park in Court Street and its access bridge across the Yea River have often been affected during even moderate floods.
- The Yea and Murrindindi Rivers are fast flowing mountain streams where floodwater can reach Yea in 12 hours making local knowledge about floods and communication vital
- The 1973 storm event saw widespread and dangerous flash flooding impacting upon local business within High Street, Yea.

Flood Mitigation

The Yea River waterway channels are of limited flow capacity and flows across the floodplain occur for events with an ARI approximately greater than 5 years.

Flood Impacts and Required Actions

	Yea Flood Study September 2005					
ARI	**10**	**20**	**50**	**100**	**200**	**500**
Properties Flooded Above Floor	27	28	29	30	30	30
Properties Flooded Below Floor	4	5	5	8	12	15
Total Flooded Properties	**31**	**33**	**34**	**38**	**42**	**45**

Command, Control and Coordination

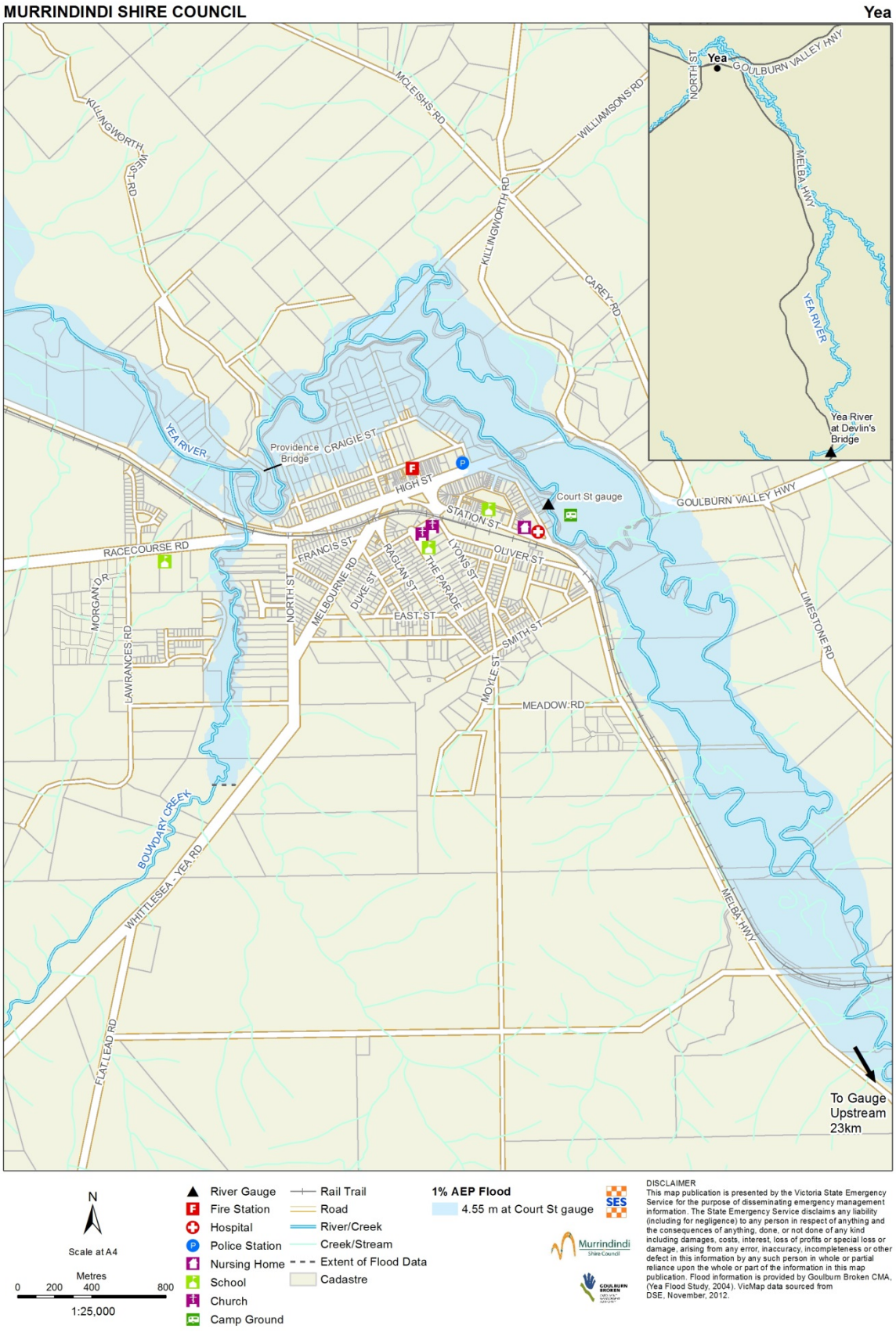
VICSES will assume overall control of the response to flood incidents. Other agencies will be requested to support operations as detailed in this Plan. Control and coordination of a flood incident shall be carried out at the lowest effective level and in accordance with the State Emergency Response Plan (SERP) (EMMV Part 3). During significant events, VICSES will conduct incident management using multi-agency resources.

Gauge Height	Flood behaviour and properties / infrastructure affected							
	Caravan Park	**Craigie Street west of Provenance Bridge**	**Craigie Street east of Provenance Bridge**	**Webster Street**	**Marshbank Street**	**Miller Street**	**Goulburn Valley Hwy west of Boundary Ck confluence (to Seymour)**	**Goulburn Valley Hwy at eastern end of township (to**
MINOR Court St 3.0 m	Flooding occurs in lower parts of the Caravan Park	Possible overtopping of road but very shallow depth.	Possible flooding at low levels of properties close to the river, not threatening any dwellings.	No flooding to properties along Webster Street	Possible flooding at low levels of properties close to the river, not threatening any dwellings.	No flooding to properties along Miller Street	Flooding at low levels of properties close to the river and creek, not threatening dwellings or access.	No flooding
Court St 3.3 m	Flooding occurs in lower parts of the Caravan Park	Possible overtopping of road but very shallow depth.	• Flooding commences across Craigie Street between Nolan and Giffard St, 0.1 m deep. • Private properties flooded along Craigie, Street with flood depths to up 0.2 m. Dwelling at 20-22 Craige St may be flooded above floor.	• Flooding commences across Webster Street, south of Craige St intersection, 0.1 m deep. • Flooding at low levels to private properties along Webster Street but not threatening any dwellings.	Possible flooding at low levels of properties close to the river, not threatening any dwellings.	No flooding to properties along Miller Street	• Flooding at low levels of properties close to the river and creek. • Dwelling to north of Hwy, west of Boundary Creek isolated, with flood depths around 0.2 m on access track.	No flooding
MODERATE Court St 3.6 m	Flooding occurs in lower parts of the Caravan Park, Court Street access not inundated, but within 0.1-0.2 m of bridge deck.	• Road overtopped to depths of around 0.5 m. • 1 dwelling on Old Killingworth Road inundated below floor.	• Flooding across Craigie Street between Recreation Ave and west of Nolan St, 0.3 m deep. • Private properties flooded along Craigie Street with flood depths up to 0.4 m. Dwellings at 20-22 Craige St flooded above floor. • Dwellings north of Craige St and west of Nolan St isolated.	• Flooding across Webster Street with flow path from Craige/Nolan intersection now flowing over Webster St and back to river. Depths of between 0.4 to 0.7 m. • Flooding at low levels to private properties along Webster Street but not threatening any dwellings.	Flooding at low levels of properties close to the river, not threatening any dwellings.	Flooding to low levels in private property along the northern end of Miller St, not threatening any dwellings.	• Flooding at low levels of properties close to the river and creek. • Dwelling to north of Hwy, west of Boundary Creek isolated, with flood depths around 0.4 to 0.5 m on access track.	No flooding
5% AEP Court St	• Caravan Park fully inundated with flood depths up to 0.6 m.	• Inundated with flood depth up to 0.9 m.	• Flooding across Craigie Street between Recreation Ave and	• Flooding across Webster Street, depths of up to 1.1 m.	• Flooding at low levels of properties close to the river, not threatening any	• Dwellings along Miller Street to the north of Court St	• Flooding at low levels of properties close to the river and creek.	No flooding

Gauge Height	Flood behaviour and properties / infrastructure affected							
	Caravan Park	**Craigie Street west of Provenance Bridge**	**Craigie Street east of Provenance Bridge**	**Webster Street**	**Marshbank Street**	**Miller Street**	**Goulburn Valley Hwy west of Boundary Ck confluence (to Seymour)**	**Goulburn Valley Hwy at eastern end of township (to**
4.22 m	• Up to 25 caravans inundated above floor level plus one permanent building in the caravan park. • Court Street Bridge inundated below 0.3 m deep.	• 1 dwelling on Old Killingworth Road inundated potentially above floor.	west of Nolan St, 0.8 m deep. • Private properties flooded along Craigie Street with flood depths up to 0.9 m. Dwellings at 20-22 Craige St flooded above floor. • Dwellings north of Craige St and west of Nolan St isolated.	• Flooding at low levels to private properties along Webster Street but not threatening any dwellings.	dwellings. • Flooding possible across Marshbank Street adjacent to corner with Craigie Street to very low depths below 0.1 m.	inundated below floor level. • Flooding across Miller Street adjacent to corner with High Street with flood depths up to 0.5 m.	• Dwelling to north of Hwy, west of Boundary Creek isolated, with flood depths just under 1 m on access track.	
MAJOR 2% AEP Court St 4.40 m	• Caravan Park fully inundated with flood depths up to 0.7 m. • Up to 25 caravans inundated above floor level plus two permanent buildings in the caravan park • Court Street Bridge inundated up to 0.4 m deep.	• Inundated with flood depth up to 0.9 m. • 1 dwelling on Old Killingworth Road inundated potentially above floor.	• Flooding across Craigie Street between Recreation Ave and west of Nolan St, 0.9 m deep. • Private properties flooded along Craigie Street with flood depths up to 1 m. Dwellings at 20-22 Craige St flooded above floor. • Dwellings north of Craige St and west of Nolan St isolated.	• Flooding across Webster Street, depths of up to 1.2 m. • Flooding at low levels to private properties along Webster Street but not threatening any dwellings.	• Flooding at low levels of properties close to the river, 10 and 12 Marshbank St inundated below floor. • Flooding across Marshbank Street adjacent to corner with Craigie Street to depths below 0.3 m. • Flooding below floor around the Visitor Information Centre.	• Dwellings along Miller Street to the north of Court St inundated below floor level. • Flooding across Miller Street adjacent to corner with High Street with flood depths up to 0.7 m.	• Flooding at low levels of properties close to the river and creek. Dwelling to north of Hwy, west of Boundary Creek isolated, with flood depths around 1.1 m on access track.	Goulburn Valley Highway inundation below 0.1 m deep.
1% AEP Court St 4.55 m	• Caravan Park fully inundated with flood depths up to 0.9 m. • Up to 25 caravans inundated above	• Inundated with flood depth around 1 m. • 1 dwelling on Old Killingworth	• Flooding across Craigie Street between Recreation Ave and west of Nolan St, 1.1 m deep.	• Flooding across Webster Street, depths of up to 1.4 m. • Flooding at low levels to private properties	• Flooding at low levels of properties close to the river, 10 and 12 Marshbank St inundated below floor.	• Dwellings along Miller Street to the north of Court St inundated below floor level, with 9	• Flooding at low levels of properties close to the river and creek. Dwelling to north of Hwy, west of Boundary	Goulburn Valley Highway inundation below 0.25 m deep.

Gauge Height	Flood behaviour and properties / infrastructure affected							
	Caravan Park	**Craigie Street west of Provenance Bridge**	**Craigie Street east of Provenance Bridge**	**Webster Street**	**Marshbank Street**	**Miller Street**	**Goulburn Valley Hwy west of Boundary Ck confluence (to Seymour)**	**Goulburn Valley Hwy at eastern end of township (to**
	floor level plus two permanent buildings in the caravan park • Court Street Bridge inundated up to 0.6 m deep.	Road inundated potentially above floor.	• Private properties flooded along Craigie Street with flood depths up to 1.2 m. Dwellings at 20-22 Craige St flooded above floor. • Dwellings north of Craige St and west of Nolan St isolated, possibly inundated below floor.	along Webster Street but not threatening any dwellings.	• Flooding across Marshbank Street adjacent to corner with Craigie Street to depths below 0.5 m. • Flooding surrounding the Visitor Information Centre, with Hood St inundated to depths below 0.1 m.	Miller St flooded above floor. • Flooding across Miller Street adjacent to corner with High Street with flood depths up to 0.9 m.	Creek isolated, with flood depths around 1.25 m on access track.	
0.2% AEP Court St 4.83 m	• Caravan Park fully inundated with flood depths up to 1.2 m. • Up to 25 caravans inundated above floor level plus two permanent buildings in the caravan park • Court Street Bridge inundated up to 0.9 m deep.	• Inundated with flood depth around 1.35 m. • 1 dwelling on Old Killingworth Road inundated potentially above floor.	• Flooding across Craigie Street between Recreation Ave and west of Nolan St, 1.5 m deep. • Private properties flooded along Craigie Street with flood depths up to 1.6 m. Dwellings at 20-22 Craige St flooded above floor. • Dwellings north of Craige St and west of Nolan St isolated, inundated below floor.	• Flooding across Webster Street, depths of up to 1.8 m. • Flooding at low levels to private properties along Webster Street but not threatening any dwellings.	• Below floor flooding at properties along Marshbank St. • Flooding of northern end of Marshbank Street to depths around 0.9 m. • Flooding surrounding the Visitor Information Centre, with Hood St inundated to depths around 0.3 m. • Breakout across the Goulburn Valley Hwy and through the Foodworks and Rendezvous in Yea café.	• Dwellings along Miller Street to the north of Court St inundated below floor level, with 9 Miller St flooded above floor. • Flooding across Miller Street adjacent to corner with High Street with flood depths up to around 1 m.	• Flooding at low levels of properties close to the river and creek. Dwelling to north of Hwy, west of Boundary Creek isolated, with flood depths around 1.65 m on access track.	Goulburn Valley Highway inundation to just below 0.5 m deep.

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 Emergency Management Manuals flood series.


MURRINDINDI SHIRE COUNCIL
Yea
Yea
GOULBURN VALLEY HWY
NORTH ST
MELBA HWY
YEA RIVER
Yea River at Devlin's Bridge
KILLINGWORTH WEST RD
MCLEISHS RD
WILLIAMSONS RD
KILLINGWORTH RD
CAREY RD
YEA RIVER
Providence Bridge
CRAIGIE ST
HIGH ST
STATION ST
Court St gauge
GOULBURN VALLEY HWY
RACECOURSE RD
MORGAN DR
LAWRANCES RD
FRANCIS ST
NORTH ST
MELBOURNE RD
DUKE ST
RAGLAN ST
THE PARADE
LYONS ST
OLIVER ST
EAST ST
SMITH ST
MOYLE ST
LIMESTONE RD
MEADOW RD
BOUNDARY CREEK
WHITTLESEA - YEA RD
MELBA HWY
FLAT LEAD RD
To Gauge Upstream 23km
N
Scale at A4
Metres
0 200 400 800
1:25,000
River Gauge
Fire Station
Hospital
Police Station
Nursing Home
School
Church
Camp Ground
Rail Trail
Road
River/Creek
Creek/Stream
Extent of Flood Data
Cadastre
1% AEP Flood
4.55 m at Court St gauge
SES
Murrindindi Shire Council
GOULBURN BROKEN
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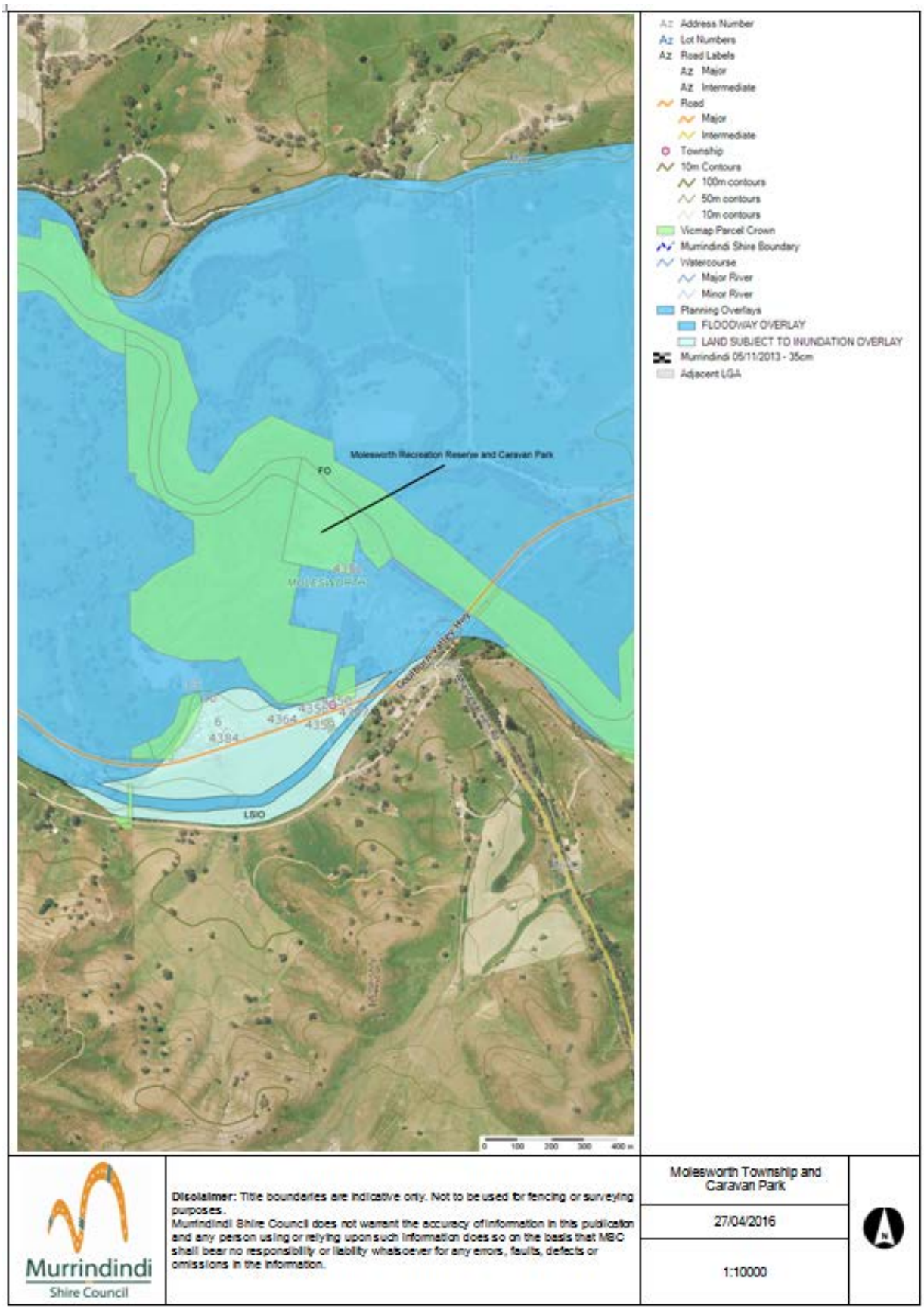
APPENDIX C2 – MOLESWORTH FLOOD EMERGENCY PLAN

Molesworth is a small rural settlement located on the Goulburn Valley Highway, approximately 10 kilometres north east of Yea. It is located in the valley of the Goulburn River, which runs to the north of the main activity area of the district where community facilities and a number of businesses are located.

The landscape setting of the Molesworth district is defined by the steep, rolling hills to the north and south and fertile floodplain in the valley floor. The floodplain is characterised by grazing land interspersed with stands of mature River Red Gum and other native trees. The Goulburn Valley Highway, as it runs through core of the district, contrasts with this landscape setting by being mainly characterised by deciduous trees (Oaks, Ashes and Elms)

Molesworth Recreation Reserve, located on the banks of the Goulburn River, contains a caravan park which is prone to flooding. The reserve is managed by a committee of management. The park contains approximately 85 sites and some general camping areas for tents (map attached).

As can be seen from the map overleaf, the majority of land in and around Molesworth is either in the flood overlay or is subject to inundation.


Address Number
Lot Numbers
Road Labels
Major
Intermediate
Road
Major
Intermediate
Township
10m Contours
100m contours
50m contours
10m contours
Vicmap Parcel Crown
Murrindindi Shire Boundary
Watercourse
Major River
Minor River
Planning Overlays
FLOODWAY OVERLAY
LAND SUBJECT TO INUNDATION OVERLAY
Murrindindi 05/11/2013 - 35cm
Adjacent LGA
Molesworth Recreation Reserve and Caravan Park
FO
LSIO
Goulburn Valley Hwy
0 100 200 300 400 m
Murrindindi
Shire Council
Disclaimer: Title boundaries are indicative only. Not to be used for fencing or surveying purposes.
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Molesworth Township and Caravan Park
27/04/2016
1:10000


MOLESWORTH RECREATION RESERVE
GOULBURN RIVER
NO CAMPING PERMITTED ON RIVER FRONTAGE AREA
CAMPING SITES
CAMPING SITES
CAMPING SITES
CAMPING SITES
MOLESWORTH RECREATION RESERVE & SPORTS OVAL
FIRE ASSEMBLY AREA
COMMUNITY AREA
SPORTS PAVILION KITCHEN
BBQ
MOLESWORTH STATE WILDLIFE RESERVE
MOLESWORTH STATE WILDLIFE RESERVE
RESERVE ROAD
MAIN TOILET & SHOWER BLOCK
TOILET BLOCK 2
FLOOD ASSEMBLY AREA
CARETAKERS RESIDENCE & OFFICE
PRIVATE PROPERTY
PRIVATE PROPERTY
TO YEA
TO GOULBURN VALLEY HWY
TO MANSFIELD, ALEXANDRA & EILDON
EMERGENCY NUMBER
000
EMERGENCY ORDERS
1 Assist any person in immediate danger – if safe to do so
2 Turn off power and gas to your site, close and secure doors and windows
DO NOT MOVE CARAVAN
3 Call the Fire Brigade on 000
4 Attack fire if safe do so
5 Evacuate to nearest ASSEMBLY AREA
6 Notify Park Personnel of your arrival at assembly point and await further instructions
Ex EXTINGUISHER
M MONITOR
FH FIRE HYDRANT
HR HOSE REAL

Overview of Flooding Consequences

Flood Mitigation

There are nil flood mitigation systems in place.

Flood Impacts and Required Actions

Flood impacts are currently not identified for this location and therefore this information will need to be populated, when the data becomes available.

Command, Control and Coordination

VICSES will assume overall control of the response to flood incidents. Other agencies will be requested to support operations as detailed in this Plan. Control and coordination of a flood incident shall be carried out at the lowest effective level and in accordance with the State Emergency Response Plan (EMMV Part 3). During significant events, VICSES will conduct incident management using multi-agency resources.

Gauge Location: [Enter Name] River at Location [Enter Name]

River Height (m) And or River Flow (ML/d)	Annual Exceedance Probability	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
x.xxm	Minor Flood Level x% AEP (xx year ARI)		
x.xxm			
x.xxm			
x.xxm			
x.xxm	Moderate Flood Level x% AEP (xx year ARI)		
x.xxm	5% AEP (20 year ARI)		
x.xxm	Major Flood Level x% AEP (xx year ARI)		
x.xxm	2% AEP (50 year ARI)		
x.xxm	1% AEP (100 year ARI)		
x.xxm	Probable Maximum Flood (PMF)		

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 Emergency Management Manuals flood series.

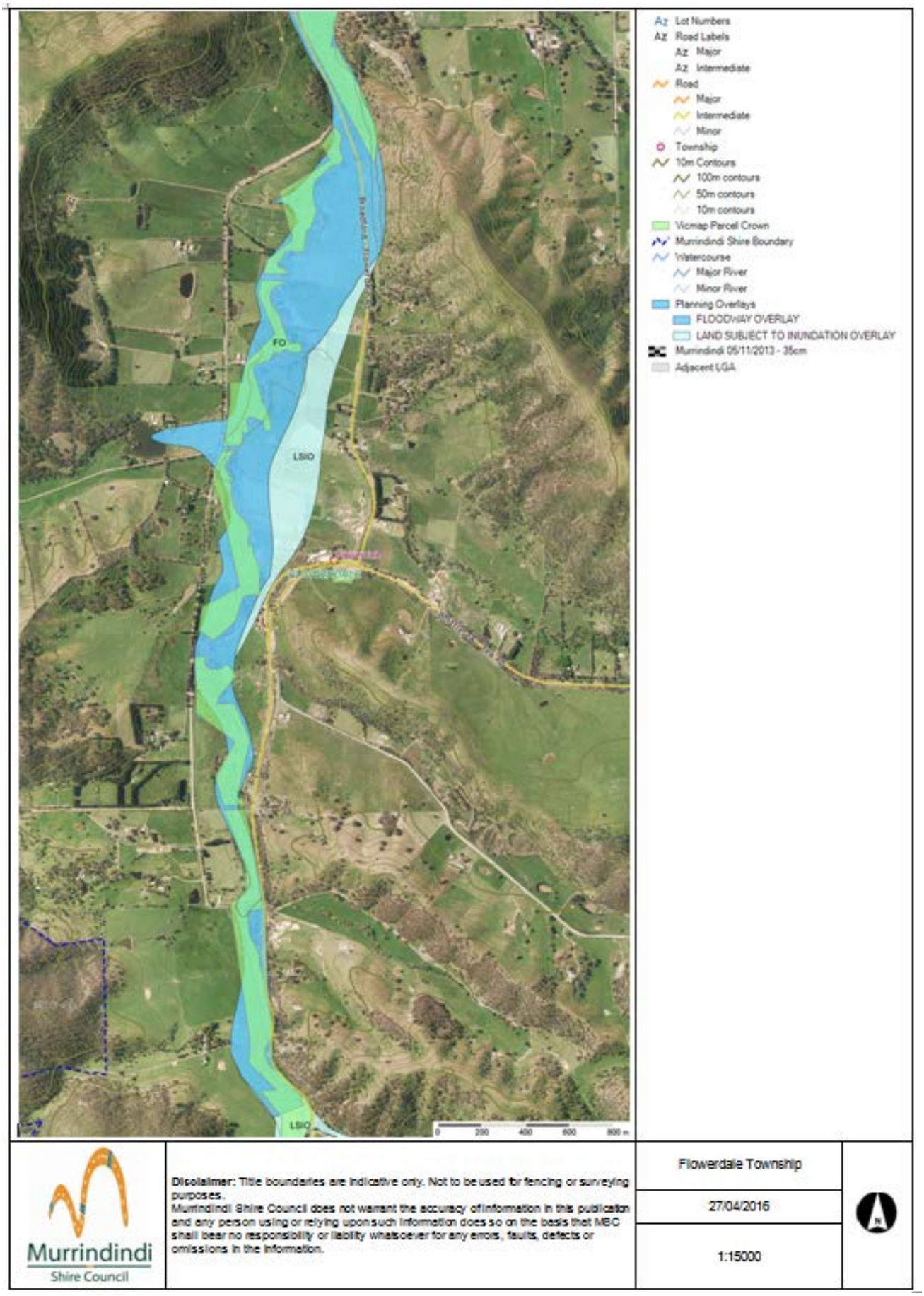
APPENDIX C3 –FLOWERDALE FLOOD EMERGENCY PLAN

Flowerdale is a small town in Murrindindi Shire 95km north east of Melbourne that is characterised by its rural and bushland setting. Flowerdale is in the foothills of the Great Dividing Range and contains the upper catchment of the Goulburn River system. The former location of Hazeldene was merged into the township of Flowerdale in April 2014. The 2001 census records a population in Flowerdale of 429 people. Flowerdale and surrounds was heavily impacted by the February 2009 Bushfires and much of the Ash forest for which it was well known, were decimated. These forests are slowing regenerating.

The main road in Flowerdale is the Yea-Whittlesea Road which runs north-south to the main intersection in Flowerdale with the Broadford-Flowerdale Road. As the Yea-Whittlesea road leaves Flowerdale towards Yea it first turns eastward and then northward.

The King Parrot valley, the main tributary system in Flowerdale, is narrow in the Flowerdale area, only widening to a few hundred metres to just under a kilometre along the settlement on Broadford-Flowerdale Road. It is generally characterised by steep valley walls and a narrow river channel in this area. A number of smaller tributaries also exist in the steeper country surrounding Flowerdale. Large rainfall events in the Flowerdale hills can lead to the King Parrot Creek flooding in Strath Creek and surrounds.

The main risk to Flowerdale is from flash flooding due to prolonged localised heavy rain falls.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Az Road Labels
Az Major
Az Intermediate
Road
Major
Intermediate
Minor
Township
10m Contours
100m contours
50m contours
10m contours
Vicmap Parcel Crown
Murrindindi Shire Boundary
Watercourse
Major River
Minor River
Planning Overlays
FLOODWAY OVERLAY
LAND SUBJECT TO INUNDATION OVERLAY
Murrindindi 05/11/2013 - 35cm
Adjacent LGA
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LSIO
0 200 400 600 800 m
Murrindindi
Shire Council
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Flowerdale Township
27/04/2016
1:15000

Overview of Flooding Consequences

Flood Mitigation

There are nil flood mitigation systems in place.

Flood Impacts and Required Actions

Flood impacts are currently not identified for this location and therefore this information will need to be populated, when the data becomes available.

Command, Control and Coordination

VICSES will assume overall control of the response to flood incidents. Other agencies will be requested to support operations as detailed in this Plan. Control and coordination of a flood incident shall be carried out at the lowest effective level and in accordance with the State Emergency Response Plan (EMMV Part 3). During significant events, VICSES will conduct incident management using multi-agency resources.

Gauge Location: King Parrot Creek at Flowerdale

River Height (m) And or River Flow (ML/d)	Annual Exceedance Probability	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
2.00m 3,750ML/d	Minor Flood Level 25% AEP (4 year ARI)		
2.98m 7,210ML/d	5.8% AEP (17 year ARI)	May 1974	
3.27m 8,170ML/d	4% AEP (25 year ARI)		
3.71m 9,670ML/d	2% AEP (50 year ARI)		
3.78m 9,940ML/d	1.7% AEP (57 year ARI)	June 1989	
4.18m 11,100ML/d	1% AEP (100 year ARI)		
x.xxm	Probable Maximum Flood (PMF)		

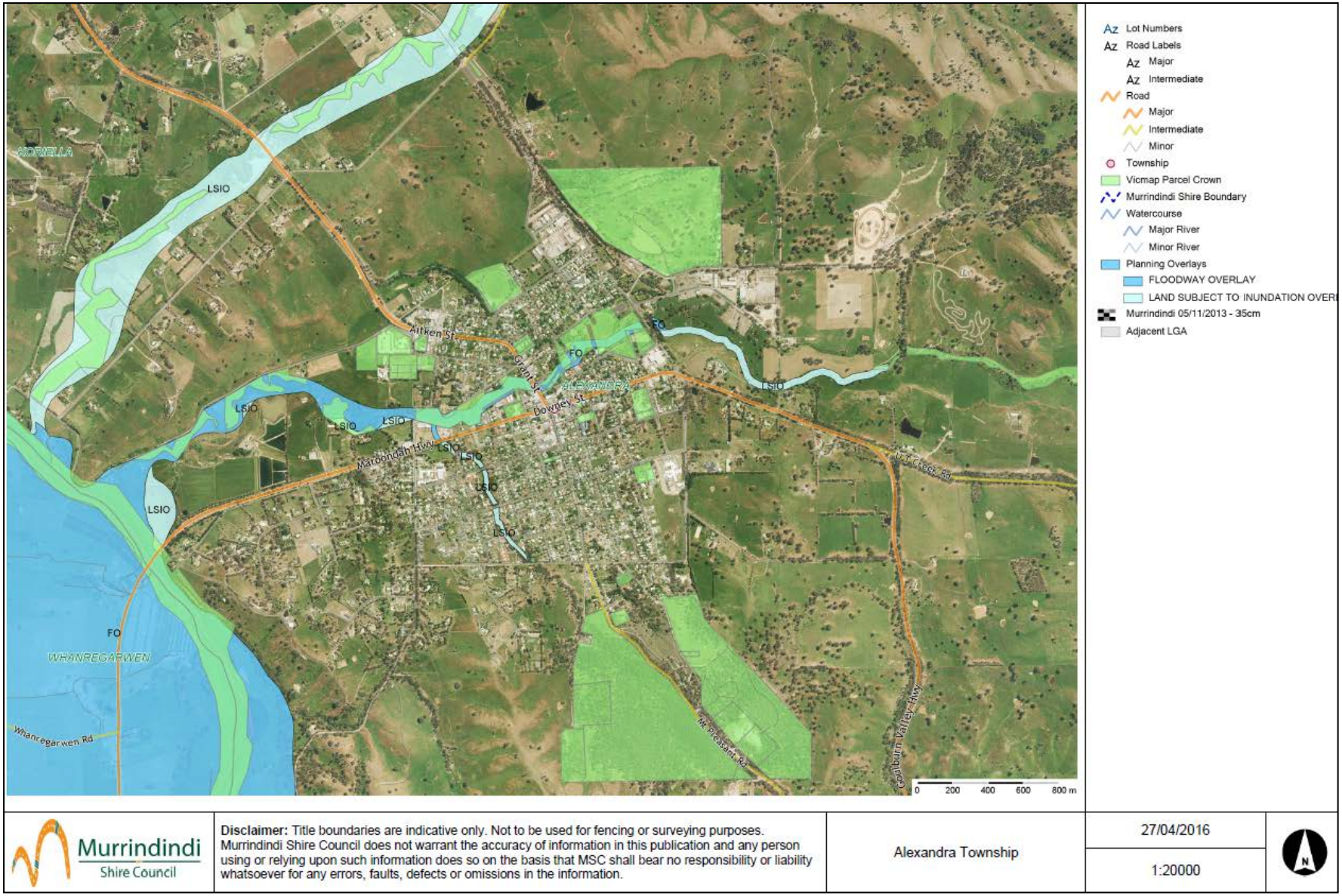
Note: flood intelligence records are approximations. This is because no two floods at a location, even if they peak at the same height, will have identical impacts. Flood intelligence cards detail the relationship between flood magnitude and flood consequences. More details about flood intelligence and its use can be found in the Australian Emergency Management Manuals flood series.

APPENDIX C4 – ALEXANDRA FLOOD EMERGENCY PLAN

The Township of Alexandra is located only a few kilometres from the Goulburn River at the junction of the Goulburn Valley Highway and Maroondah Highways. According to the 2011 Census it has a population of approximately 2,301. The topography of Alexandra is generally flatter than the mountainous areas to the south and east and consists in the main of gently rolling pastoral land, with some smaller areas of native vegetation generally confined to the steeper surrounding hills. The Ultima Thule (UT) Creek, a tributary of the Goulburn River, runs through the centre of the town.

Flooding in Alexandra is generally confined to areas adjacent to the UT Creek or can result from flash flooding associated with heavy localised rainfall.

The map overleaf shows that only small areas of Alexandra are in the flood overlay or are subject to inundation. However, further west from Alexandra, the entire area around Whanregarwen lies in the flood overlay



Murrindindi Shire Council

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Alexandra Township

27/04/2016

1:20000

Overview of Flooding Consequences

Flood Mitigation

There are nil flood mitigation systems in place.

Flood Impacts and Required Actions

Flood impacts are currently not identified for this location and therefore this information will need to be populated, when the data becomes available.

Command, Control and Coordination

VICSES will assume overall control of the response to flood incidents. Other agencies will be requested to support operations as detailed in this Plan. Control and coordination of a flood incident shall be carried out at the lowest effective level and in accordance with the State Emergency Response Plan (EMMV Part 3). During significant events, VICSES will conduct incident management using multi-agency resources.

U.T. Creek at Alexandra

River Height (m) And or River Flow (ML/d)	**Annual Exceedance Probability**	**Consequence / Impact**	**Action** **Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible**
x.xxm			
x.xxm	5% AEP (20 year ARI)		
x.xxm	2% AEP (50 year ARI)		
x.xxm	1% AEP (100 year ARI)		
x.xxm	Probable Maximum Flood (PMF)		

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 Emergency Management Manuals flood series.

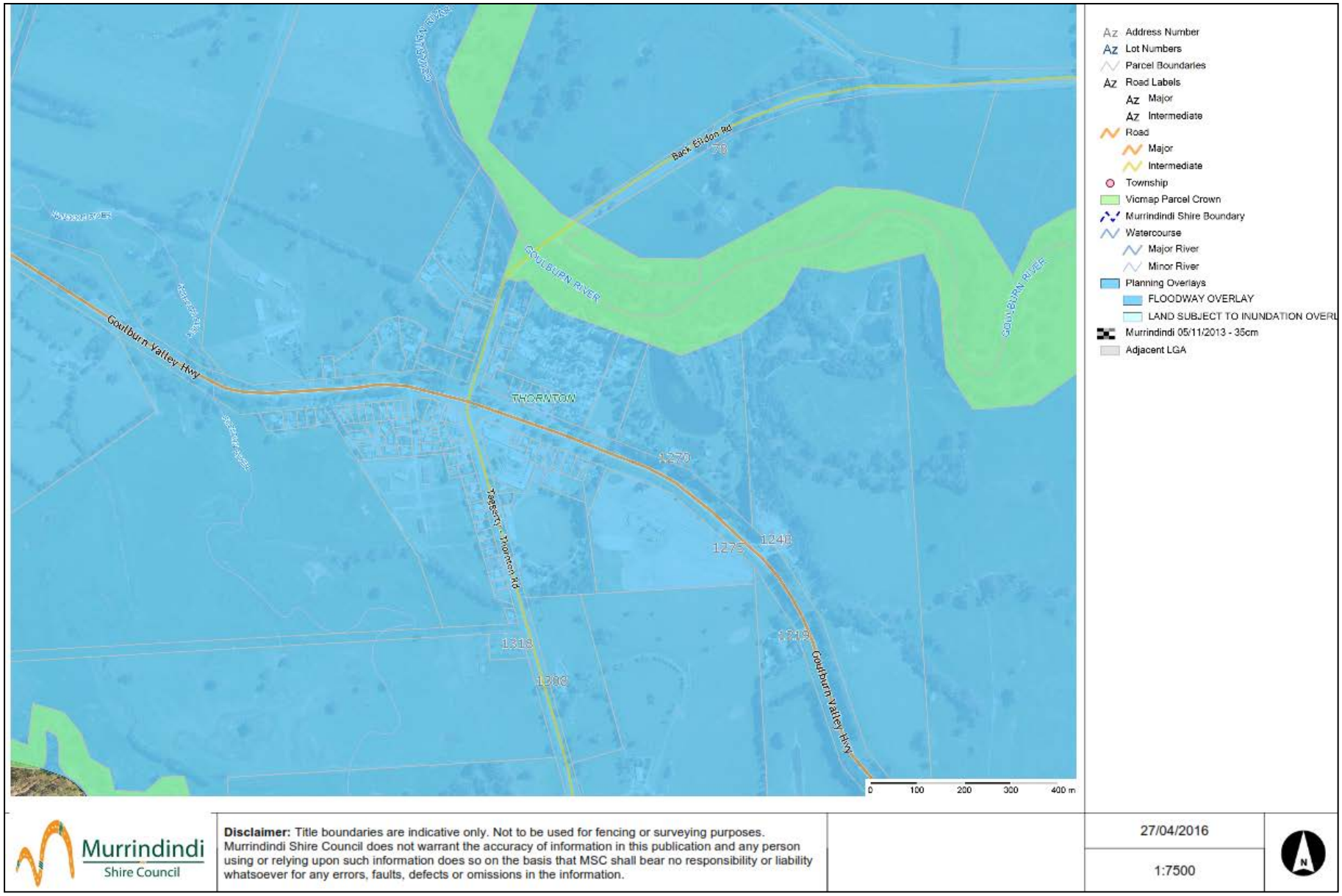
APPENDIX C5 – THORNTON FLOOD EMERGENCY PLAN

Thornton, located on the banks of the Goulburn River, is approximately 12km west of the township of Eildon and 12km east of Alexandra. Much of the traffic heading from Melbourne to Lake Eildon turns off the Maroondah Highway in Taggerty and travels along the Taggerty-Thornton Road that meets the Goulburn Valley Highway in the centre of Thornton.

The Rubicon River flows towards Thornton and joins the Goulburn River a few kilometres west of town. The Rubicon River has fairly consistent flows and runs a small run-of-the-river hydroelectric scheme which predominantly runs during the wetter winter months.

Thornton has an estimated population of 364 persons which increase significantly over the summer and holiday period due to a popular caravan park located on the south side of the Goulburn River.

The land surrounding Thornton is predominantly flat to undulating and is generally pastoral in use. As can be seen on the map overleaf, the entire area around Thornton, including the township, is flood prone.


Address Number
Lot Numbers
Parcel Boundaries
Road Labels
Major
Intermediate
Road
Major
Intermediate
Township
Vicmap Parcel Crown
Murrindindi Shire Boundary
Watercourse
Major River
Minor River
Planning Overlays
FLOODWAY OVERLAY
LAND SUBJECT TO INUNDATION OVERL
Murrindindi 05/11/2013 - 35cm
Adjacent LGA
Back Eildon Rd
GOULBURN RIVER
Goulburn Valley Hwy
THORNTON
Tagserty Thornton Rd
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200
300
400 m
Murrindindi
Shire Council
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27/04/2016
1:7500
N

Overview of Flooding Consequences

Flood Mitigation

There are nil flood mitigation systems in place.

Flood Impacts and Required Actions

Flood impacts are currently not identified for this location and therefore this information will need to be populated, when the data becomes available.

Command, Control and Coordination

VICSES will assume overall control of the response to flood incidents. Other agencies will be requested to support operations as detailed in this Plan. Control and coordination of a flood incident shall be carried out at the lowest effective level and in accordance with the State Emergency Response Plan (EMMV Part 3). During significant events, VICSES will conduct incident management using multi-agency resources.

Gauge Location: Goulburn River at Eildon Township

River Height (m) And or River Flow (ML/d)	Annual Exceedance Probability	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
3.00m 14,700ML/d	Minor Flood Level x% AEP (xx year ARI)		
4.00m 26,000ML/d	Moderate Flood Level 33% AEP (3 year ARI)		
4.96m 38,800ML/d	20% AEP (5 year ARI)		
6.24m 59,700ML/d	10% AEP (10 year ARI)		
8.20m 97,900ML/d	4% AEP (25 year ARI)	Post Eildon	
9.93m 137,000ML/d	2% AEP (50 year ARI)		
189,000ML/d	1% AEP (100 year ARI)		
196,000ML/d	>1% AEP (100 year ARI)	Pre Eildon	
x.xxm	Probable Maximum Flood (PMF)		
3.00m 14,700ML/d	Minor Flood Level x% AEP (xx year ARI)		

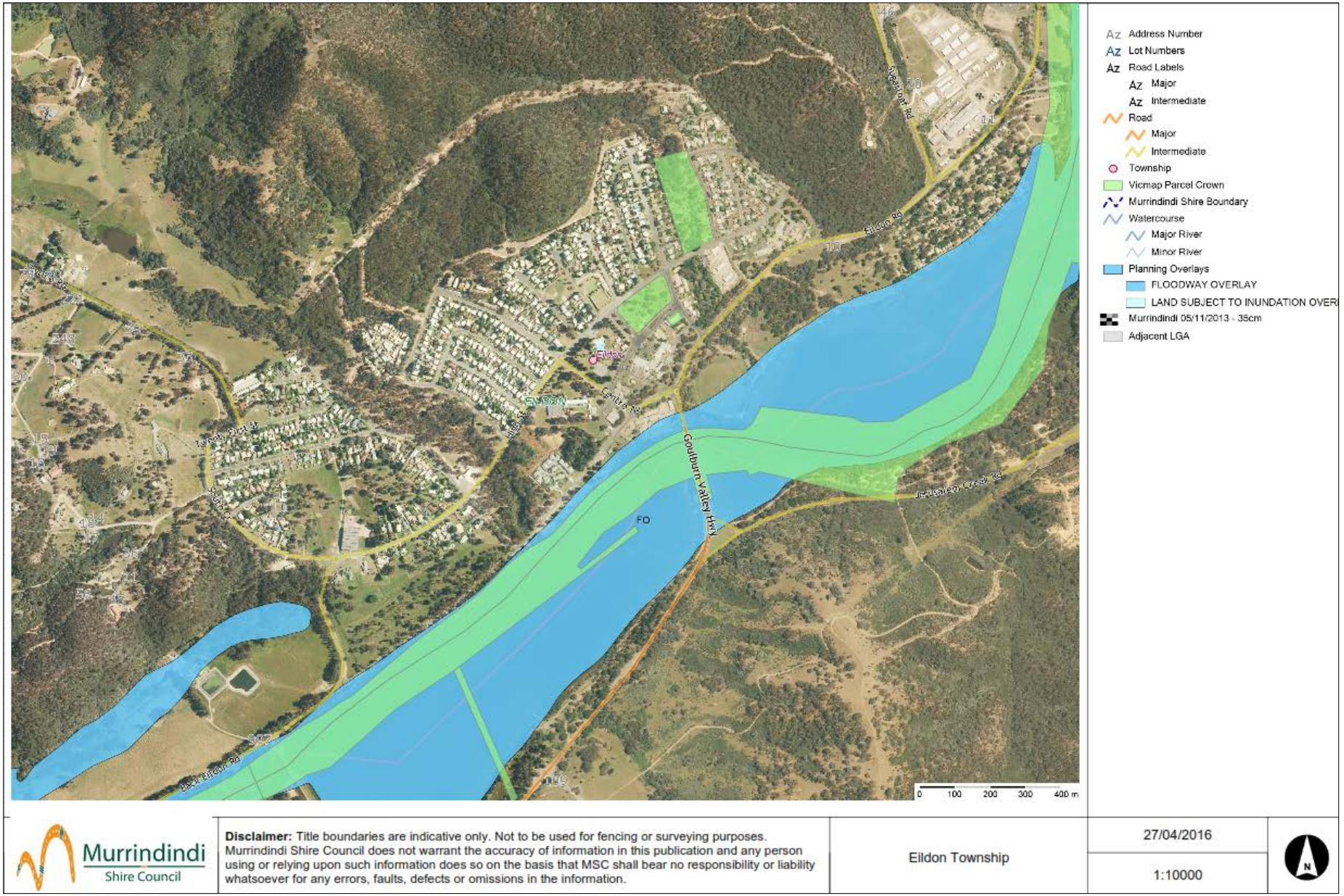
Note: flood intelligence records are approximations. This is because no two floods at a location, even if they peak at the same height, will have identical impacts. Flood intelligence cards detail the relationship between flood magnitude and flood consequences. More details about flood intelligence and its use can be found in the Australian Emergency Management Manuals flood series.

APPENDIX C6 – EILDON FLOOD EMERGENCY PLAN

The township of Eildon is located on the Goulburn River, adjacent to the Lake Eildon weir wall. At the 2011 Census, Eildon had a population of 733. Like many areas of Murrindindi Shire, Eildon has an aging population and is popular with retirees. The Eildon pondage, utilised for storing the water from hydroelectric production and ensuring metered delivery into the Goulburn River, lies directly to the south of town. A caravan park is situated on the north side of the pondage.

Eildon is surrounded by eucalypt forests to the north and south. To the east lies Lake Eildon and predominantly pastoral land follows the Goulburn River as it heads towards Alexandra.

Due to the steep nature of terrain surrounding Eildon, only the areas adjacent to the Goulburn River and Pondage are in the flooding overlay (see map overleaf)


Address Number
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Township
Vicmap Parcel Crown
Murrindindi Shire Boundary
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FLOODWAY OVERLAY
LAND SUBJECT TO INUNDATION OVERL
Murrindindi 05/11/2013 - 35cm
Adjacent LGA
Eildon Rd
Goulburn Valley Hwy
Jerusalem Creek Rd
Eildon
Centre Rd
Twenty First St
Back Eildon Rd
FO
0 100 200 300 400 m
Murrindindi Shire Council
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Eildon Township
27/04/2016
1:10000

Overview of Flooding Consequences

Flood Mitigation

There are nil flood mitigation systems in place.

Flood Impacts and Required Actions

Flood impacts are currently not identified for this location and therefore this information will need to be populated, when the data becomes available.

Command, Control and Coordination

VICSES will assume overall control of the response to flood incidents. Other agencies will be requested to support operations as detailed in this Plan. Control and coordination of a flood incident shall be carried out at the lowest effective level and in accordance with the State Emergency Response Plan (EMMV Part 3). During significant events, VICSES will conduct incident management using multi-agency resources.

Gauge Location: Goulburn River at Eildon Township

River Height (m) And or River Flow (ML/d)	Annual Exceedance Probability	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
3.00m 14,700ML/d	Minor Flood Level x% AEP (xx year ARI)		
4.00m 26,000ML/d	Moderate Flood Level 33% AEP (3 year ARI)		
4.96m 38,800ML/d	20% AEP (5 year ARI)		
6.24m 59,700ML/d	10% AEP (10 year ARI)		
8.20m 97,900ML/d	4% AEP (25 year ARI)	Post Eildon	
9.93m 137,000ML/d	2% AEP (50 year ARI)		
189,000ML/d	1% AEP (100 year ARI)		
196,000ML/d	>1% AEP (100 year ARI)	Pre Eildon	
x.xxm	Probable Maximum Flood (PMF)		

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 Emergency Management Manuals flood series.

APPENDIX C7 – TAGGERTY FLOOD EMERGENCY PLAN

Taggerty, located on the Acheron River, is approximately 18km south of Alexandra. The town is located at the junction of the Maroondah Highway and the Taqgerty-Thornton Road and straddles the Acheron River and the Little River. The 2011 census recorded a population of 330 in Taggerty.

The Acheron River rises on the north east slopes of Mt Richie within the Great Dividing Range and follows the Acheron Way in a generally northerly direction to near the Marysville Road. It passes under the Maroondah Highway near Narbethong and then resumes its south to north flow past Buxton and through Taggerty to join the Goulburn River a short distance downstream from the Acheron township (i.e. around 5.5km upstream of Alexandra and around 8.5km downstream from Thornton or around 4km downstream of where the Rubicon River joins the Goulburn). The Acheron floodplain is approximate 2km wide where it merges with the Goulburn Valley.

The Little River, another significant tributary to the Acheron, rises on the northern slopes of the Cathedral Ranges and joins the Acheron River at Taggerty.

The Acheron River is gauged at Taggerty (ARWC Station No 405209). This station has operated since 1945, although the gauge was moved in 1961. The eight highest floods recorded at the gauge were in September 2010, October 1996, June 1994, May 1974, August 2005, June 1980, September 1993 and September 1998, although notable floods are believed to have occurred in 1870, 1912/3, 1916, 1930 and 1934 with the 1934 event understood to be the flood of record.

The catchment area of the Acheron River to the gauge is 619km^2 and to its confluence with the Goulburn River 725km^2.

The upper parts of the Acheron River catchment are forested (e.g. the Yarra Ranges National Park, the Marysville State Forest, the Black Range State Forest and the Cathedral Range State Park) while the lower lying land is used predominantly for agricultural activities mixed with areas of rural living. Around Taggerty, land use is predominantly pastoral with areas of native vegetation on the higher hills and some small gum plantations nearby.

Overview of Flooding Consequences

Flood Mitigation

There are nil flood mitigation systems in place.

Flood Impacts and Required Actions

Flood risk is assessed as being at the high end of “low” at Taggerty. Flooding occurs around the Acheron River and Little River with around 7 properties subject to inundation beginning from around the 10% AEP (10-year ARI) event and possibly 3 houses flooded over-floor during a 1% AEP (100-year ARI) event. This estimate is based on assumptions about floor levels in the absence of survey data. The Caravan Park remains dry up to around the 1% AEP event. Maroondah Highway is inundated either side of the intersection with the Taggerty-Thornton Road by both the Little River (to the south of the intersection) and the Acheron River (to the north) a little below 1% AEP (100-year ARI) flood conditions.

A number of bridges in the general area of Narbethong, Buxton and Taggerty are overtopped from the 20% AEP (5-year ARI) – see table below. Overtopping depths exceed 300mm from around the

2% AEP (50-year ARI) event.

The Taggerty-Thornton Road, general store, primary school, CFA shed, Taggerty Hall and other facilities within the town all appear to be above flood level and not subject to inundation, even under 0.2% AEP (500-year ARI) event conditions. Similarly, the Taggerty airstrip (off Glendale Road) remains dry but access is likely to be problematic.

The bridge over the Acheron River at Keens Road is wetted by the 2% AEP (50-year ARI) event with water around 20mm deep during a 1% AEP (100-year ARI) event. The majority of Keens Road does not appear to be flooded by the Acheron River but may be more severely affected by large Goulburn River floods.

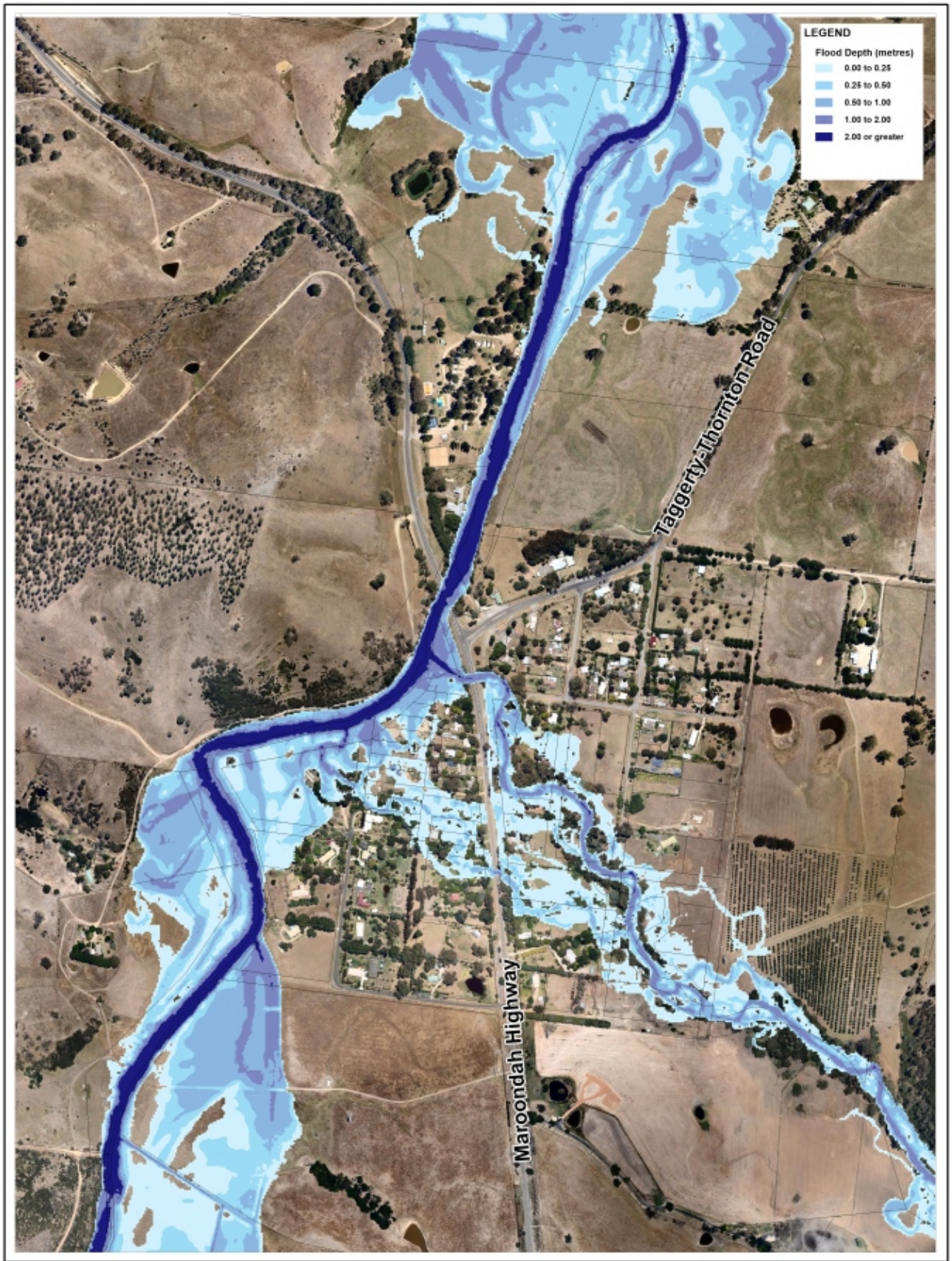
While depths and velocities within the main channels of the rivers do present as high hazard during even frequent events, flood depths and velocities within the overbank floodplain are, in general, low hazard.

In general terms, a big flood at Taggerty usually occurs at the same time as a big flood in the Upper Goulburn catchments and the Rubicon catchment. Just events are usually the result of a regional scale rain event (e.g. September 2010).

Because of the many tributaries contributing to flow along the length of the Acheron River, floods tend to rise very quickly once the catchment wets up / runoff becomes established and the initial peaks occur at the key locations within a few hours of each other. At Taggerty, once the rise starts around 25 hours or so after the start of heavy continuing rain, there is typically a rapid rise to a double peak with the 1st (only present if rain is heavy over the Cathedral Ranges) a lot lower than the 2nd. The much larger main peak occurs at about 36 to 39 hours after start of heavy continuing rain. Out-of-bank flows persist for around 22 hours for a 20% event and around 30 hours during at 1% event (see Appendix B). A second flood on a wet catchment would occur quicker, rise faster and last longer.

Command, Control and Coordination

VICSES will assume overall control of the response to flood incidents. Other agencies will be requested to support operations as detailed in this Plan. Control and coordination of a flood incident shall be carried out at the lowest effective level and in accordance with the State Emergency Response Plan (EMMV Part 3). During significant events, VICSES will conduct incident management using multi-agency resources.



Title:
Acheron Basin Flood Study 1% AEP Modelled Peak Flood Depth - Clear Taggarty

Figure: **B-005**

Rev: **A**

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

N

0 200 400m

Approx. Scale

BMT
www.bmt.org

Filepath: T:\M20483.PP.AcheronHydrology\MI\Drawings\20180719_FloodMaps\ORG_B005_1%_AEP_Depth_CLR.wor

Bridges over-topped

~TAB	Location	Depth of flooding in m						
		20%	10%	5%	2%	1%	0.5%	0.2%
408.96	Steavenson River – Barton Bridge Marysville	0.09	0.24	0.31	0.37	0.40	0.40	0.44
357.20	Taggerty River – Marysville-Buxton Road	Not over-topped						
344.21	Steavenson River – Marysville-Buxton Road	Not over-topped						
327.02	Steavenson River – Maryton Lane	Not over-topped						
315.91	Steavenson River – Marysville-Buxton Road north of Retreat Road	Not over-topped						
260.46	Steavenson River – Maroondah Highway	Not over-topped						
261.41	Little Steavenson River – Maroondah Highway	Not over-topped						
327.32	Acheron River at Marysville Road	Not over-topped						
307.23	Acheron River – Maroondah Highway at Narbethong	0.00	0.00	0.00	0.00	0.00	0.00	0.08
300.00	Bullyard Creek at Tarnpirr Road	0.20	0.24	0.28	0.30	0.31	0.33	0.36
301.27	Bullyard Creek at Parisi Lane	0.10	0.14	0.18	0.20	0.20	0.22	0.25
285.54	Acheron River – Nichols Road	0.10	0.15	0.21	0.24	0.25	0.28	0.34
276.20	Acheron River – Maroondah Highway south of Williams Lane	Not over-topped						
264.49	Acheron River at Project Road						0.07	0.18
257.7	Acheron River at Passings Road				0.05	0.07	0.12	0.19
250.61	Archeron River at Dyes Lane			0.07	0.13	0.17	0.26	0.37
233.95	Archeron River at Cerberus Lane						0.08	0.18
215.44	Acheron River at Glendale Lane	Not over-topped						
204.60	Little River at Maroondah Highway	Not over-topped						
203.70	Acheron River at Maroondah Highway	Not over-topped						
190.20	Acheron River at Keens Road						0.01	0.02
191.10	Acheron River at Acheron Road	Not over-topped						

Gauge Location: Acheron River at Taggerty

River Height (m)	AEP or flood date	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
Note that the character and consequences of flooding at Taggerty are heavily dependent on the spatial (and temporal) distribution of the causal rain. The following description of consequences assumes heavy continuing rain over the whole catchment: upper, middle and lower. If rain is not so heavy over (say) the Cathedral Ranges (i.e. lower catchment), flooding from the Little River will be less pronounced and the 1st peak at Taggerty is unlikely to be evident. If rain is mainly concentrated in the upper catchment, the time to rise is likely to be a little longer, peaks a little lower and the recession a little quicker. **Any blockages at culverts and bridges will result in some changes to flooding characteristics, including flow patterns and inundation depths, in the local area.**			
Using FloodZoom, monitor rain and river data, review flood inundation maps and, using the Layer Plot function, examine likely flooding depths along flood affected roads in order to determine closure needs ahead of flooding.			
Review the Bridges over-topped table above and initiate actions as appropriate.			
2.3m		Minor flood level	
2.6m		Moderate flood level	
2.70m	23 September 1998		
2.77m	2 September 1993		
2.80m	20% AEP (5-year ARI)	Shallow flooding across a number of properties between the Maroondah Highway and Acheron River. Little River also out of bank with some shallow overland flows.	Identify houses likely to flood over-floor and either assist lifting or sandbagging. Update this Flood Intelligence Card for house and property flooding and other flood impacts.
2.90m	30 June 1980		
2.92m	31 August 2005		
3.0m	10% AEP (10-year ARI)	Major flood level. Estimate 7 properties subject to inundation with flows up to 500mm deep in places.	Identify houses likely to flood over-floor and either assist lifting or sandbagging. Update this Flood Intelligence Card for house and property flooding and other flood impacts. Liaise with RRV on signage for and possible closure of Maroondah Highway.

River Height (m)	AEP or flood date	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
			Consider need to close the Primary School – depends on access along Maroondah Highway and other roads that cross the Acheron River.
3.04m	15 May 1974		
3.106m	25 June 1994		
3.11m	5% AEP (20-year ARI)	Water along both sides of the Maroondah Highway at the southern end of town.	Identify houses likely to flood over-floor and either assist lifting or sandbagging. Update this Flood Intelligence Card for house and property flooding and other flood impacts.
3.13	1 October 1996 (approx. 3.3% AEP or 30-year ARI)		
3.24m	5 September 2010 (approx. 2.5% AEP or 40-year ARI)		
3.26m	2% AEP (50-year ARI)	Out of bank flows more established.	Prepare to close the Maroondah Highway at the Caravan Park and at the southern end of town. Monitor water levels at the Maroondah Highway Bridge over the Acheron River at Narbethong. Liaise with RRV regarding signage and possible closure.

River Height (m)	AEP or flood date	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
3.36m	1% AEP (100-year ARI)	The Acheron River has overtopped the Maroondah Highway Bridge at Narbethong – water is around 80mm deep. Around 50% of the properties in the area bounded by the Highway and Acheron River are inundated. Those close to the Little River course are also inundated. Estimate 3 houses flooded over-floor on the west side of Maroondah Highway. Maroondah Highway is inundated either side of the intersection with Taggerty-Thornton Road by both Little River (to the south) and the Acheron (to the north).	In consultation with RRV, close Maroondah Highway at the Caravan Park and at the southern end of town. Liaise with RRV regarding signage and possible closure of the Maroondah Highway Bridge at the Acheron River Bridge at Narbethong.
~3.5m	0.5% AEP (200-year ARI)	Estimate 7 houses flooded over-floor. Water beginning to flow from the north into the Caravan Park (Yarrolyn Holiday Park).	Evacuate the Caravan Park if water still rising. Vehicles should be directed to the north along Maroondah Highway towards Acheron.
~3.65m	0.2% AEP (500-year ARI)	Estimate 8 houses flooded over-floor. Water encroaching onto Maroondah Highway on the south bound lane through town. Most of Caravan Park flooded to around 250mm deep although small areas up to 500mm deep.	
x.xxm	Probable Maximum Flood (PMF)		

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 Emergency Management Manuals flood series.

APPENDIX C8 – MARYSVILLE FLOOD EMERGENCY PLAN

Marysville, with a 2011 census population of 223, is located 34km north-east of Healesville and 41km south of Alexandra. It is surrounded by mountainous terrain, particularly to the east (the Lake Mountain Alpine Resort which peaks at 1433m, is located 19km or a 23 minute drive east of the town) and regenerating Ash forest which make up a large part of the Yarra Ranges National Park and the Marysville State Forest The area was heavily impacted by the February 2009 bushfires and much of the surrounding Ash dominated forests were decimated.

The largest tributary to the Acheron River, the Steavenson River with a catchment area of 174km^2, rises as a series of small creeks on the northern slopes of the Great Divide near Mt Stinton south of Lake Mountain, passes through Marysville (to the east of the town centre) and Buxton (it splits into the main channel and the Little Steavenson River around 2.9km upstream from the Maroondah Highway Bridge) before joining the Acheron River immediately downstream from Buxton. The Steavenson River is joined by the Taggerty River, which rises on the north western slopes of Lake Mountain, a short distance downstream from Marysville. Both the Steavenson and Taggerty rivers feature many tributary creeks. Robertson Gully and Wilks Creek in Marysville are the two of most significance within the Steavenson River catchment.

The landscape opens significantly towards Buxton where it widens into a moderately sized floodplain as the Steavenson and Little Steavenson rivers meet the Acheron River.

While the eight highest floods recorded at the Acheron River at Taggerty gauge since 1945 were in September 2010, October 1996, June 1994, May 1974, August 2005, June 1980, September 1993 and September 1998, there are no recorded flood levels at Marysville. The gauge on the Steavenson River at Falls Road upstream of Marysville (405328) was installed in late 2009. There have been three notable flows since then: the highest on 4th September 2010 and then on 6th March 2010 and 23rd August 2013. It is apparent that the latter two were the result of localised rain over the Steavenson River catchment rather than a regional scale rain event.

Overview of Flooding Consequences

Flood Mitigation

There are nil flood mitigation systems in place.

Flood Impacts and Required Actions

Flood risk at Marysville is characterised as “low”. Watercourses and their floodplains through Marysville are well-defined and hydraulically steep with constrained out-of-bank flows and only a handful of properties subject to inundation.

The Marysville Caravan and Holiday Park is flooded up to 250mm deep from around the 20% AEP (5-year ARI) event as is Gallipoli Park, including the oval. Water depths increase, but not substantially, during larger floods. Barton Bridge has been overtopped with water around 90mm deep.

The 10% AEP (10-year ARI) event inundates the car parking and rear areas of the Foodworks and Pharmacy at 49 & 51 Darwin Street, probably wets the floor of the building between the river and the Crossways Historic Country Inn and is just starting to flood the Buxton-Marysville Road in front of the Caravan Park, immediately downstream of the roundabout. Water is around 240mm deep over the road pavement at Barton Bridge.

The roundabout is flooded to near 250mm deep by a 5% AEP (20-year ARI) event.

Properties backing onto the watercourses flowing through Marysville will experience some inundation. However, very few are likely to experience over-floor flooding. This includes the Golf Course club house, other buildings and the car park. Water edges closer with increasing flood severity but even at the 0.2% AEP (500-year ARI) event, modelling indicates that there is no flooding against or inside the buildings.

The Buxton-Marysville Road becomes impassable at a number of places between the two towns during larger floods This occurred in September 2010 when the road was closed for a period.

The Barton Bridge over the Steavenson River in Marysville is compromised with over-pavement flooding beginning below the 20% AEP (5-year ARI) event and depths of 150mm or more beginning from a little below the 10% AEP (10-year ARI) event. Water is more than 300mm deep from around the 5% AEP (20-year ARI) event. While there are nine (9) other bridges over-topped during various flood events, other important bridges are essentially unaffected by flooding up to the 1% AEP (100-year ARI) event.

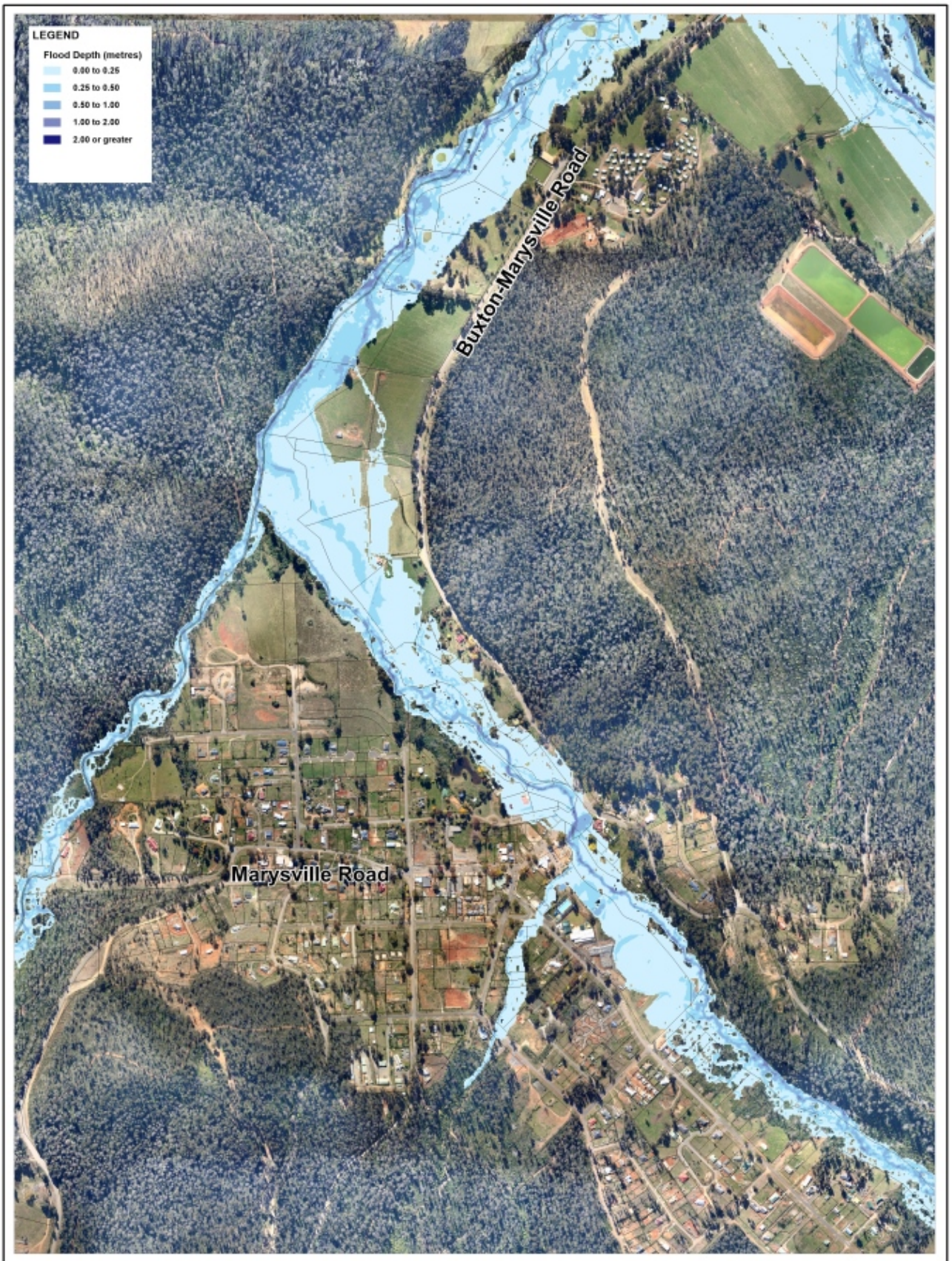
While depths and velocities within the main channels of the watercourses do present as high hazard during even frequent events, flood depths and velocities within the overbank floodplain are, in general, low hazard.

In very general terms, a big flood at Marysville will occur at the same time as a big flood in the Upper Goulburn and Rubicon catchments.

The Steavenson River tends to rise very quickly once the catchment wets up / runoff becomes established. During a regional scale rain event, the initial peak occurs within a few hours of the peaks at Buxton and Taggerty. At Marysville, once the rise starts around 26 hours or so after the start of heavy continuing rain, there is typically a rapid rise to a long flat peak. From start of rise to peak is usually of order 4 hours or so: it occurs around 30 hours after the start of heavy continuing rain. Out-of-bank flows persist for around 16 hours for a 20% event and around 20 hours during at 1% event (see Appendix B). A second flood on a wet catchment would occur quicker and rise faster and may last a little longer.

Command, Control and Coordination

VICSES will assume overall control of the response to flood incidents. Other agencies will be requested to support operations as detailed in this Plan. Control and coordination of a flood incident shall be carried out at the lowest effective level and in accordance with the State Emergency Response Plan (EMMV Part 3). During significant events, VICSES will conduct incident management using multi-agency resources.


LEGEND
Flood Depth (metres)
0.00 to 0.25
0.25 to 0.50
0.50 to 1.00
1.00 to 2.00
2.00 or greater
Buxton-Marysville Road
Marysville Road
Title:
Acheron Basin Flood Study 1% AEP Modelled Peak Flood Depth - Clear
Marysville
Figure:
D-005
Rev:
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BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
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Bridges over-topped

~TAB	Location	Depth of flooding in m						
		20%	10%	5%	2%	1%	0.5%	0.2%
408.96	Steavenson River – Barton Bridge Marysville	0.09	0.24	0.31	0.37	0.40	0.40	0.44
357.20	Taggerty River – Marysville-Buxton Road	Not over-topped						
344.21	Steavenson River – Marysville-Buxton Road	Not over-topped						
327.02	Steavenson River – Maryton Lane	Not over-topped						
315.91	Steavenson River – Marysville-Buxton Road north of Retreat Road	Not over-topped						
260.46	Steavenson River – Maroondah Highway	Not over-topped						
261.41	Little Steavenson River – Maroondah Highway	Not over-topped						
327.32	Acheron River at Marysville Road	Not over-topped						
307.23	Acheron River – Maroondah Highway at Narbethong	0.00	0.00	0.00	0.00	0.00	0.00	0.08
300.00	Bullyard Creek at Tarnpirr Road	0.20	0.24	0.28	0.30	0.31	0.33	0.36
301.27	Bullyard Creek at Parisi Lane	0.10	0.14	0.18	0.20	0.20	0.22	0.25
285.54	Acheron River – Nichols Road	0.10	0.15	0.21	0.24	0.25	0.28	0.34
276.20	Acheron River – Maroondah Highway south of Williams Lane	Not over-topped						
264.49	Acheron River at Project Road						0.07	0.18
257.7	Acheron River at Passings Road				0.05	0.07	0.12	0.19
250.61	Archeron River at Dyes Lane			0.07	0.13	0.17	0.26	0.37
233.95	Archeron River at Cerberus Lane						0.08	0.18
215.44	Acheron River at Glendale Lane	Not over-topped						
204.60	Little River at Maroondah Highway	Not over-topped						
203.70	Acheron River at Maroondah Highway	Not over-topped						
190.20	Acheron River at Keens Road						0.01	0.02
191.10	Acheron River at Acheron Road	Not over-topped						

On the upstream side of Barton Bridge in Marysville

River Height (mAHD)	Annual Exceedance Probability	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
Note that the following description of consequences assumes heavy continuing rain over the whole of the Steavenson River catchment. Any blockages at culverts and bridges will result in some changes to flooding characteristics, including flow patterns and inundation depths, in the immediate local area.			
Using FloodZoom, monitor rain and river data, review flood inundation maps and, using the Layer Plot function, examine likely flooding depths along flood affected roads in order to determine closure needs ahead of flooding.			
Review the Bridges over-topped table above and initiate actions as appropriate.			
408.16	20% AEP (5-year ARI)	Steavenson River has overtopped Barton Bridge – water is around 90mm deep. Most of the golf course is flooded but club rooms, other buildings and the car park remain dry, even in very large events. House at 1064 Marysville-Buxton Road is about to be isolated – water across driveway and around house. Marysville Caravan Park is flooded up to 250mm deep. Likely that water is over Falls Road. Gallipoli Park, including the oval, is flooded – up to 250mm deep. Water beginning to approach the Crossways Historic Country Inn adjacent to the roundabout.	Consider closing Marysville Road at Barton Bridge. Check occupants of 1064 Marysville-Buxton Road and assist as required. Evacuate Caravan Park. As Gallipoli Park is flooded, implement an alternative staging area and evacuation assembly location for the town. Monitor the Falls Road gauge using FloodZoom and populate the Flood Intelligence Card below. Ground-truth and update this Flood Intelligence Card for flood impacts.
408.17	10% AEP (10-year ARI)	Steavenson River has overtopped Barton Bridge – water is around 240mm deep. The car park and rear areas of Foodworks and Pharmacy at 49 & 51 Darwin Street are flooded to about 250mm deep. 3 properties on Marysville-Buxton Road (1112, 1114 and 1120 (Amelina Cottages)) are flooded to 250mm depth. The rear of properties backing onto Wilks Creek getting wet. Marysville-Buxton Road in front of the Caravan Park (immediately downstream from the roundabout) is getting wetted. Building between the river and the Crossways Historic Country Inn is	Closing Marysville Road at Barton Bridge if not already done. Monitor water levels and determine need to close the Marysville-Buxton Road. Assist Foodworks and the Pharmacy secure stock and building from possible flood damage. Close Darwin Street. Assist protection of the building between the river and the Crossways Historic Country Inn.

		estimated to be close to being flooded over-floor.	
408.22	5% AEP (20-year ARI)	Water is around 310mm deep over the Barton Bridge in Marysville. Roundabout flooded to near 250mm deep. River end of Darwin Street is impassable. The Crossways Historic Country Inn has water up against the building. Flooding is generally deeper and little more extensive.	Monitor water levels and determine need to close the Marysville-Buxton Road. Collect and collate flood impact info.
408.31	2% AEP (50-year ARI)	Water is around 370mm deep over the Barton Bridge in Marysville. Water is still around 250mm deep at the roundabout and on the Marysville-Buxton Road in front of the Caravan Park.	Monitor water levels and determine need to close the Marysville-Buxton Road. Assess likelihood of over-floor flooding at 1114 Marysville-Buxton Road. Assist as required..
408.34	1% AEP (100-year ARI)	Water is around 400mm deep over the Barton Bridge in Marysville. Estimate that the house at 1114 Marysville-Buxton Road may be flooded over-floor.	
~408.38	0.5% AEP (200-year ARI)	Water is around 400mm deep over the Barton Bridge in Marysville. Flooding is generally deeper and little more extensive.	Monitor water levels at the Maroondah Highway Bridge over the Acheron River at Narbethong. Liaise with RRV regarding signage and possible closure
408.41	0.2% AEP (500-year ARI)	The Acheron River has overtopped the Maroondah Highway Bridge at Narbethong – water is around 80mm deep. Water is around 440mm deep over the Barton Bridge in Marysville. Flooding is generally deeper and little more extensive.	Liaise with RRV regarding signage and possible closure of the Maroondah Highway Bridge at the Acheron River Bridge at Narbethong.
x.xx	Probable Maximum Flood (PMF)		

APPENDIX C9 – BUXTON FLOOD EMERGENCY PLAN

Buxton is located 104km north-east of Melbourne and 30km south of Alexandra and has a 2011 Census population of 257. The landscape around Buxton was heavily impacted by the 2009 bushfires.

Buxton lies in the Acheron River valley in between the Black Range and the Cathedral Range.

The Acheron River rises on the north east slopes of Mt Richie within the Great Dividing Range and follows the Acheron Way in a generally northerly direction to near the Marysville Road. It passes under the Maroondah Highway near Narbethong and then resumes its south to north flow past Buxton and through Taggerty to join the Goulburn River a short distance downstream from the Acheron township.

The largest tributary to the Acheron River, the Steavenson River with a catchment area of 174km^2, rises as a series of small creeks on the northern slopes of the Great Divide near Mt Stinton south of Lake Mountain, passes through Marysville (to the east of the town centre) and Buxton (it splits into the main channel and the Little Steavenson River around 2.9km upstream from the Maroondah Highway Bridge) before joining the Acheron River immediately downstream from Buxton. The Steavenson River is joined by the Taggerty River, which rises on the north western slopes of Lake Mountain, a short distance downstream from Marysville. Both the Steavenson and Taggerty rivers feature many tributary creeks.

The landscape opens significantly around Buxton where it widens into a moderately sized floodplain as the Steavenson and Little Steavenson rivers meet the Acheron River. Land to the north, south-east and southwest of Buxton is predominantly pastoral with larger “lifestyle” properties becoming the norm closer to town.

While the eight highest floods recorded at the Acheron River at Taggerty gauge since 1945 were in September 2010, October 1996, June 1994, May 1974, August 2005, June 1980, September 1993 and September 1998, flood levels were recorded at Buxton after the October 1996, September 1998 and September 2010 events only.

Overview of Flooding Consequences

Flood Mitigation

There are nil flood mitigation systems in place.

Flood Impacts and Required Actions

Flood risk at Buxton is characterised as “high”. Access roads to residential properties located on the floodplain of the Steavenson and Little Steavenson rivers and up to around 70 properties in that area are subject to inundation from the 20% AEP (5-year ARI) event. Up to around 5 buildings are estimated to be flooded over-floor during a 1% AEP (100-year ARI) event. There is also a significant likelihood of isolation and / or need for evacuation from somewhere between the 5% AEP (20-year ARI) and 2% AEP (50-year ARI) event.

Aroona Drive is flooded close to Maroondah Highway to around 130mm deep during a 20% AEP (5-year ARI) event. At this location, depth increases to around 180mm for a 10% AEP (10-year ARI) event, a depth considered unsafe for small cars. Depth exceeds 300mm somewhere between the 5% AEP (20-year ARI) and 2% AEP (50-year ARI) events. Aroona Drive is considered unsafe to travel in a 2% AEP event.

Steavenson Road is also flooded from the 20% AEP (5-year ARI) event. To a depth of around 200mm. This increases to around 350mm under 5% AEP (20-year ARI) event conditions and to near 390mm during a 1% AEP (100-year ARI) flood.

Buxton's community facilities are out of the floodplain with the exception of the CFA station. It is located on the downstream side of Maroondah Highway in between the Steavenson and Little Steavenson rivers and is likely flooded from around the 20% AEP (5-year ARI). During this event the access way is flooded up to 250mm deep. During a 1% event, access is flooded to between 250mm and 500mm.

The Maroondah Highway is first wetted at around the 10% AEP (10-year ARI) event. Depths appear to remain less than 250mm.

The Buxton-Marysville Road becomes impassable at a number of places between the two towns during larger floods. This occurred in September 2010 when the road was closed for a period.

A number of small roads and tracks around and downstream from Buxton are inundated and impassable from around the 20% AEP (5-year ARI) event.

A number of bridges in the general area of Narbethong, Buxton and Taggerty are overtopped from the 20% AEP (5-year ARI) – see table below. Overtopping depths exceed 300mm from around the 2% AEP (50-year ARI) event.

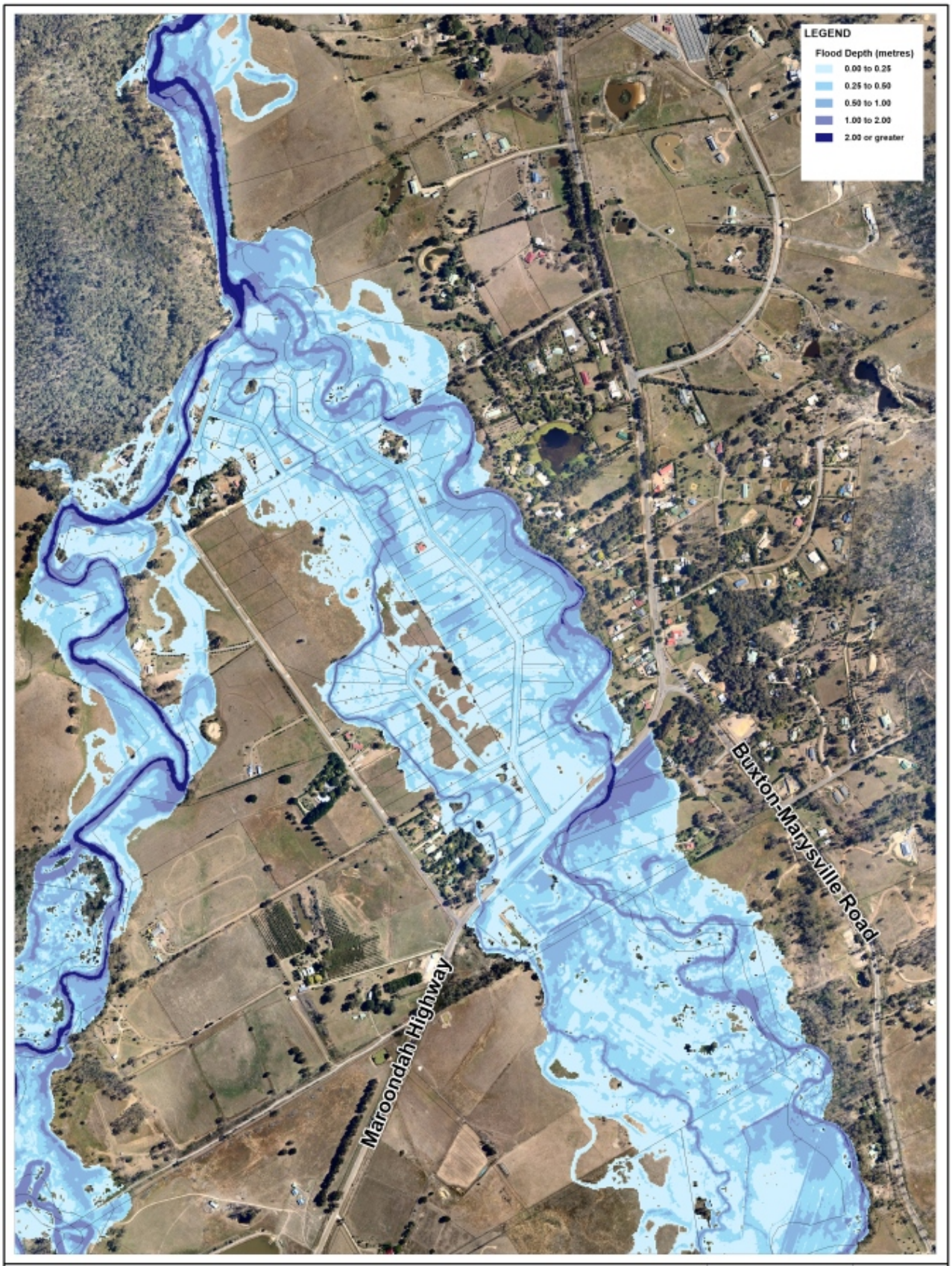
While depths and velocities within the main channels of the watercourses do present as high hazard during even frequent events, flood depths and velocities within the overbank floodplain are, in general, low hazard.

In very general terms, a big flood at Buxton will occur at the same time as a big flood in the Upper Goulburn and Rubicon catchments.

The Steavenson River tends to rise quickly once the catchment wets up / runoff becomes established. During a regional scale rain event, the initial peak occurs within a few hours of the peaks at Marysville and Taggerty. At Buxton, once the rise starts around 26 hours or so after the start of heavy continuing rain, there is typically a sharp rise to a double peak. The 1st peak occurs around 6 hours after the start of rise (i.e. at around 32 hours after the start of heavy rain) with the 2nd peak only a few centimetres higher, around 8 hours later. Out-of-bank flows persist for around 25 hours for a 20% event and around 30 hours during at 1% event (see Appendix B). The recession is significantly slower than the rise. A second flood on a wet catchment would occur quicker and rise faster and may last a little longer.

Command, Control and Coordination

VICSES will assume overall control of the response to flood incidents. Other agencies will be requested to support operations as detailed in this Plan. Control and coordination of a flood incident shall be carried out at the lowest effective level and in accordance with the State Emergency Response Plan (EMMV Part 3). During significant events, VICSES will conduct incident management using multi-agency resources.


LEGEND
Flood Depth (metres)
0.00 to 0.25
0.25 to 0.50
0.50 to 1.00
1.00 to 2.00
2.00 or greater
Buxton-Marysville Road
Maroondah Highway
Title:
Acheron Basin Flood Study 1% AEP Modelled Peak Flood Depth - Clear
Buxton
Figure:
C-005
Rev:
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BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
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Properties Affected

LEGEND		Over-ground flood depth							Over-floor flood depth							Use	Comments
		Within ~100mm of ground being flooded							Within ~100mm of floor being flooded								
Property address		Depth of flooding on the property near building for each ARI							Over-floor flooding depth at property for each ARI								
	ARI	5yr	10yr	20yr	50yr	100yr	200yr	500yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr		
	Marrondah Highway Bridge at Buxton	260.46	260.52	260.6	260.63	260.65	260.66	260.69	260.46	260.52	260.6	260.63	260.65	260.66	260.69		
1 Aroona Drive		-	-	-	-	-	-		-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
2 Aroona Drive		-	-	0.04	0.08	0.10	0.10	0.14	-	-	-	-	-	-	-	Residential	Floor level assumed to be 300 mm above ground level
3 Aroona Drive		-	-	0.01	0.04	0.06	0.07	0.12	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
4 Aroona Drive		-	-	-	0.10	0.11	0.11	0.15	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
5 Aroona Drive		-	-	-	0.14	0.15	0.15	0.17	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
6 Aroona Drive		-	0.26	0.29	0.32	0.33	0.34	0.37	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
7 Aroona Drive		0.14	0.19	0.24	0.27	0.29	0.29	0.34	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
8 Aroona Drive		0.41	0.45	0.48	0.50	0.52	0.52	0.55	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
9A Aroona Drive		0.19	0.24	0.29	0.32	0.34	0.35	0.43	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
9B Aroona Drive		0.07	0.12	0.15	0.19	0.20	0.26	0.34	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
10 Aroona Drive		0.07	0.10	0.12	0.14	0.15	0.16	0.18	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above 1% AEP Flood Level
11 Aroona Drive		-	-	0.06	0.13	0.14	0.21	0.29	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA

LEGEND		Over-ground flood depth							Over-floor flood depth							Use	Comments
		Within ~100mm of ground being flooded							Within ~100mm of floor being flooded								
Property address		Depth of flooding on the property near building for each ARI							Over-floor flooding depth at property for each ARI								
	ARI	5yr	10yr	20yr	50yr	100yr	200yr	500yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr		
	Marrondah Highway Bridge at Buxton	260.46	260.52	260.6	260.63	260.65	260.66	260.69	260.46	260.52	260.6	260.63	260.65	260.66	260.69		
12 Aroona Drive		0.18	0.23	0.27	0.30	0.32	0.32	0.36	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
13 Aroona Drive		-	-	-	-	-	0.34	0.42	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
14 Aroona Drive		0.25	0.31	0.37	0.41	0.43	0.46	0.55	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above 1% AEP Flood Level
15 Aroona Drive		-	-	-	-	-	0.41	0.47	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
16 Aroona Drive		0.09	0.15	0.20	0.24	0.27	0.30	0.39	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
18 Aroona Drive		0.37	0.45	0.51	0.56	0.59	0.68	0.80	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
20 Aroona Drive		0.15	0.19	0.23	0.26	0.28	0.33	0.41	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
1 Ballina Court		-	-	-	-	-	-		-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
2 Ballina Court		0.14	0.17	0.20	0.22	0.23	0.23	0.26	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
4 Ballina Court		0.30	0.32	0.34	0.36	0.37	0.37	0.39	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
5 Ballina Court		0.22	0.29	0.33	0.35	0.37	0.37	0.41	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
6 Ballina Court		0.10	0.13	0.15	0.16	0.17	0.17	0.19	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
7 Ballina Court			0.02	0.06	0.08	0.09	0.09	0.12	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
8 Ballina Court		0.24	0.25	0.27	0.27	0.28	0.28	0.29	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA

LEGEND		Over-ground flood depth							Over-floor flood depth							Use	Comments
		Within ~100mm of ground being flooded							Within ~100mm of floor being flooded								
Property address		Depth of flooding on the property near building for each ARI							Over-floor flooding depth at property for each ARI								
	ARI	5yr	10yr	20yr	50yr	100yr	200yr	500yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr		
	Marrondah Highway Bridge at Buxton	260.46	260.52	260.6	260.63	260.65	260.66	260.69	260.46	260.52	260.6	260.63	260.65	260.66	260.69		
11 Ballina Court		0.33	0.39	0.44	0.48	0.50	0.54	0.62	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above 1% AEP Flood Level
9 Cameron Close		0.41	0.43	0.45	0.46	0.46	0.46	0.48	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
115 Dyes Lane		0.04	0.05	0.09	0.11	0.12	0.15	0.22	-	-	-	-	-	-		Residential	Floor level assumed to be 300 mm above ground level
1 Mareeba Avenue		0.28	0.32	0.35	0.37	0.38	0.39	0.41	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
2 Mareeba Avenue		-	0.17	0.21	0.24	0.26	0.26	0.29	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
3 Mareeba Avenue		0.36	0.44	0.50	0.53	0.56	0.56	0.61	-	-	-	-	-	-		Residential	Survey data provided by GBCMA
5 Mareeba Avenue			0.04	0.11	0.15	0.17	0.17	0.22	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
7 Mareeba Avenue		0.06	0.12	0.18	0.21	0.23	0.23	0.27	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
10 Mareeba Avenue		0.21	0.24	0.27	0.31	0.33	0.33	0.37	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
11 Mareeba Avenue		0.02	0.08	0.14	0.18	0.20	0.20	0.25	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
12 Mareeba Avenue		0.04	0.07	0.10	0.12	0.14	0.14	0.18	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
13 Mareeba Avenue		0.20	0.26	0.31	0.34	0.35	0.35	0.39	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
14 Mareeba Avenue		0.08	0.13	0.15	0.17	0.18	0.18	0.20	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
15 Mareeba Avenue		0.08	0.12	0.15	0.18	0.20	0.20	0.24	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA

LEGEND		Over-ground flood depth							Over-floor flood depth							Use	Comments
		Within ~100mm of ground being flooded							Within ~100mm of floor being flooded								
Property address		Depth of flooding on the property near building for each ARI							Over-floor flooding depth at property for each ARI								
	ARI	5yr	10yr	20yr	50yr	100yr	200yr	500yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr		
	Marrondah Highway Bridge at Buxton	260.46	260.52	260.6	260.63	260.65	260.66	260.69	260.46	260.52	260.6	260.63	260.65	260.66	260.69		
16 Mareeba Avenue		0.21	0.24	0.26	0.27	0.28	0.28	0.29	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
17 Mareeba Avenue		0.15	0.19	0.22	0.24	0.25	0.26	0.29	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
18 Mareeba Avenue		0.08	0.11	0.12	0.13	0.14	0.14	0.15	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
19 Mareeba Avenue		-					0.00	0.03	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
20 Mareeba Avenue		0.12	0.16	0.19	0.21	0.22	0.23	0.25	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
21 Mareeba Avenue		0.14	0.17	0.21	0.23	0.25	0.25	0.28	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
22 Mareeba Avenue		0.29	0.33	0.35	0.36	0.37	0.37	0.39	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
23 Mareeba Avenue		-	-	0.04	0.08	0.11	0.11	0.16	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
24 Mareeba Avenue		0.18	0.22	0.24	0.26	0.26	0.27	0.28	0.30	0.34	0.36	0.38	0.38	0.39	0.40	Residential	Survey data provided by GBCMA
26 Mareeba Avenue				0.01	0.02	0.03	0.03	0.04	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
27 Mareeba Avenue		0.02	0.08	0.13	0.16	0.18	0.18	0.22	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
28 Mareeba Avenue		0.19	0.24	0.27	0.30	0.31	0.31	0.34	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
29 Mareeba Avenue		0.22	0.26	0.30	0.32	0.34	0.34	0.37	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
30 Mareeba Avenue		0.12	0.17	0.20	0.22	0.24	0.24	0.26	0.05	0.10	0.13	0.15	0.17	0.17	0.19	Residential	Survey data provided by GBCMA
31 Mareeba Avenue		0.03	0.08	0.12	0.15	0.16	0.17	0.20	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA

LEGEND		Over-ground flood depth							Over-floor flood depth							Use	Comments
		Within ~100mm of ground being flooded							Within ~100mm of floor being flooded								
Property address		Depth of flooding on the property near building for each ARI							Over-floor flooding depth at property for each ARI								
	ARI	5yr	10yr	20yr	50yr	100yr	200yr	500yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr		
	Marrondah Highway Bridge at Buxton	260.46	260.52	260.6	260.63	260.65	260.66	260.69	260.46	260.52	260.6	260.63	260.65	260.66	260.69		
32 Mareeba Avenue		0.19	0.24	0.27	0.29	0.31	0.31	0.33	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
33 Mareeba Avenue		0.14	0.20	0.24	0.27	0.28	0.29	0.32	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
34 Mareeba Avenue		0.15	0.19	0.21	0.23	0.24	0.24	0.26	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
35 Mareeba Avenue		-	-						-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
36 Mareeba Avenue		0.39	0.41	0.43	0.45	0.45	0.45	0.47	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
37 Mareeba Avenue		-		0.02	0.05	0.06	0.07	0.10	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
38 Mareeba Avenue		0.06	0.09	0.12	0.14	0.15	0.15	0.17	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
40 Mareeba Avenue		0.10	0.12	0.15	0.16	0.17	0.17	0.19	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
41 Mareeba Avenue				0.00	0.03	0.04	0.05	0.09	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
42 Mareeba Avenue		0.01	0.04	0.06	0.08	0.09	0.09	0.11	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
43 Mareeba Avenue		0.14	0.16	0.18	0.19	0.20	0.20	0.23	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
44 Mareeba Avenue		0.36	0.40	0.42	0.44	0.45	0.45	0.47	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
45 Mareeba Avenue		0.22	0.25	0.30	0.33	0.35	0.36	0.40	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above 1% AEP Flood Level
47 Mareeba Avenue		-	0.22	0.24	0.26	0.28	0.28	0.32	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA

LEGEND		Over-ground flood depth							Over-floor flood depth							Use	Comments
		Within ~100mm of ground being flooded							Within ~100mm of floor being flooded								
Property address		Depth of flooding on the property near building for each ARI							Over-floor flooding depth at property for each ARI								
	ARI	5yr	10yr	20yr	50yr	100yr	200yr	500yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr		
	Marrondah Highway Bridge at Buxton	260.46	260.52	260.6	260.63	260.65	260.66	260.69	260.46	260.52	260.6	260.63	260.65	260.66	260.69		
49 Mareeba Avenue		0.07	0.13	0.18	0.21	0.23	0.23	0.27	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
51 Mareeba Avenue		0.37	0.43	0.48	0.51	0.53	0.53	0.57	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
53 Mareeba Avenue		0.39	0.44	0.49	0.51	0.53	0.53	0.57	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
55 Mareeba Avenue		0.21	0.28	0.33	0.37	0.39	0.39	0.43	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
2118 Maroondah Highway		0.29	0.31	0.34	0.35	0.36	0.37	0.39	0.14	0.16	0.19	0.20	0.21	0.22	0.24	Commercial Trout & Salmon Farm	Survey data provided by GBCMA
2118 Maroondah Highway		-	0.08	0.11	0.12	0.13	0.13	0.16	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
2121 Maroondah Highway		-	0.28	0.32	0.34	0.36	0.36	0.39	-	0.01	0.05	0.07	0.09	0.09	0.12	Commercial CFA	Survey data provided by GBCMA
2 Mimosa Court		0.50	0.52	0.54	0.55	0.55	0.55	0.57	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
3 Mimosa Court								0.01	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
4 Mimosa Court		0.32	0.35	0.37	0.38	0.39	0.39	0.41	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
5 Mimosa Court		0.38	0.41	0.42	0.44	0.45	0.45	0.46	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
1 Steavenson Road		0.34	0.40	0.45	0.48	0.50	0.50	0.54	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above 1% AEP Flood Level
2 Steavenson Road		-	-					0.00	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA

LEGEND		Over-ground flood depth							Over-floor flood depth							Use	Comments
			Within ~100mm of ground being flooded							Within ~100mm of floor being flooded							
Property address		Depth of flooding on the property near building for each ARI							Over-floor flooding depth at property for each ARI								
	ARI	5yr	10yr	20yr	50yr	100yr	200yr	500yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr		
	Marrondah Highway Bridge at Buxton	260.46	260.52	260.6	260.63	260.65	260.66	260.69	260.46	260.52	260.6	260.63	260.65	260.66	260.69		
3 Steavenson Road		0.13	0.18	0.22	0.25	0.27	0.27	0.31	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
4 Steavenson Road		0.18	0.22	0.26	0.28	0.30	0.30	0.33	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
5 Steavenson Road		-	-	-	0.27	0.29	0.30	0.35	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
6 Steavenson Road		-	-	-	0.12	0.15	0.15	0.20	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
1 Waters Place		-	-	-					-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
7 Waters Place		-	-	-	-	-	-	0.06	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above ground level
8 Waters Place		-	-	-	-	-	-	0.09	-	-	-	-	-	-	-	Residential	Survey data provided by GBCMA
9 Waters Place		-	0.10	0.13	0.15	0.17	0.17	0.20	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above 1% AEP Flood Level
10 Waters Place		-	0.25	0.30	0.33	0.35	0.35	0.38	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above 1% AEP Flood Level
11 Waters Place		0.26	0.30	0.34	0.36	0.38	0.38	0.42	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above 1% AEP Flood Level
13 Waters Place		0.10	0.13	0.17	0.19	0.20	0.20	0.23	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above 1% AEP Flood Level

LEGEND		Over-ground flood depth						Over-floor flood depth							Use	Comments
		Within ~100mm of ground being flooded						Within ~100mm of floor being flooded								
Property address		Depth of flooding on the property near building for each ARI						Over-floor flooding depth at property for each ARI								
	ARI	5yr	10yr	20yr	50yr	100yr	200yr	500yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr	
	Marrondah Highway Bridge at Buxton	260.46	260.52	260.6	260.63	260.65	260.66	260.69	260.46	260.52	260.6	260.63	260.65	260.66	260.69	
17 Waters Place			0.01	0.05	0.08	0.09	0.09	0.13	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above 1% AEP Flood Level
19 Waters Place		0.06	0.11	0.15	0.17	0.18	0.18	0.21	-	-	-	-	-	-	-	Residential	Vacant. Floor level assumed to be 300 mm above 1% AEP Flood Level
21 Waters Place		-	0.32	0.34	0.37	0.38	0.38	0.41	-	0.04	0.06	0.09	0.10	0.10	0.13	Residential	Survey data provided by GBCMA

Summary

A summary of the number of properties likely to be flooded at Buxton and the number of properties flooded by the 1% AEP event by street are provided below.

Summary of number of flood affected properties in Buxton									
EXISTING CONDITIONS									
ARI	Marrondah Highway Bridge at Buxton (mAHD)	Properties flooded				Buildings flooded over-floor			
		Residential	Commercial	Total	Almost	Residential	Commercial	Total	Almost
5yr	260.46	62	1	63	6	2	1	3	0
10yr	260.52	72	2	74	5	3	2	5	0
20yr	260.6	79	2	81	4	3	2	5	0
50yr	260.63	83	2	85	5	3	2	5	0
100yr	260.65	83	2	85	5	3	2	5	0
200yr	260.66	86	2	88	4	3	2	5	0
500yr	260.69	90	2	92	4	3	2	5	2

Number of properties flooded by the 1% AEP event by street		
	over ground	over floor
Aroona Drive	16	0
Ballina Court	7	0
Cameron Close	1	0
Dyes Lane	1	0
Mareeba Avenue	42	2
Maroondah Highway	3	2
Mimosa Court	3	0
Steavenson Road	5	0
Waters Place	7	1

Detailed List

The table below shows, by street address, typical flood depths across surveyed properties in Buxton along with the likely depth of over-floor flooding for a range of design events. Those properties and floors within 100mm of being flooded are also identified.

It is strongly recommended that the list is used in conjunction with the flood inundation maps and flood intelligence table for Buxton.

The full range of flood inundation and related maps for Buxton and surrounds, produced by BMT in 2018 (Acheron Flood Hydrology Report), is available through FloodZoom and available as GIS layers from the GBCMA. The study report is also available through FloodZoom.

Bridges flooded

~TAB	Location	Depth of flooding in m						
		20%	10%	5%	2%	1%	0.5%	0.2%
408.96	Steavenson River – Barton Bridge Marysville	0.09	0.24	0.31	0.37	0.40	0.40	0.44
357.20	Taggerty River – Marysville-Buxton Road	Not over-topped						
344.21	Steavenson River – Marysville-Buxton Road	Not over-topped						
327.02	Steavenson River – Maryton Lane	Not over-topped						
315.91	Steavenson River – Marysville-Buxton Road north of Retreat Road	Not over-topped						
260.46	Steavenson River – Maroondah Highway	Not over-topped						
261.41	Little Steavenson River – Maroondah Highway	Not over-topped						
327.32	Acheron River at Marysville Road	Not over-topped						
307.23	Acheron River – Maroondah Highway at Narbethong	0.00	0.00	0.00	0.00	0.00	0.00	0.08
300.00	Bullyard Creek at Tarnpirr Road	0.20	0.24	0.28	0.30	0.31	0.33	0.36
301.27	Bullyard Creek at Parisi Lane	0.10	0.14	0.18	0.20	0.20	0.22	0.25
285.54	Acheron River – Nichols Road	0.10	0.15	0.21	0.24	0.25	0.28	0.34
276.20	Acheron River – Maroondah Highway south of Williams Lane	Not over-topped						
264.49	Acheron River at Project Road						0.07	0.18
257.7	Acheron River at Passings Road				0.05	0.07	0.12	0.19
250.61	Archeron River at Dyes Lane			0.07	0.13	0.17	0.26	0.37
233.95	Archeron River at Cerberus Lane						0.08	0.18
215.44	Acheron River at Glendale Lane	Not over-topped						
204.60	Little River at Maroondah Highway	Not over-topped						
203.70	Acheron River at Maroondah Highway	Not over-topped						

~TAB	Location	Depth of flooding in m						
		20%	10%	5%	2%	1%	0.5%	0.2%
190.20	Acheron River at Keens Road						0.01	0.02
191.10	Acheron River at Acheron Road	Not over-topped						

On the upstream side of the Maroondah Highway Bridge at Buxton

River Height (mAHD)	Annual Exceedance Probability	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
Note that the character and consequences of flooding at Buxton are dependent on the spatial (and temporal) distribution of the causal rain. The following description of consequences assumes heavy continuing rain over the whole Acheron catchment: upper, middle and lower. If rain is mainly concentrated in the upper catchment, the time to rise is likely to be a little longer, peaks a little lower and the recession a little quicker. **Any blockages at culverts and bridges will result in some changes to flooding characteristics, including flow patterns and inundation depths, in the local area.**			
Using FloodZoom, monitor rain and river data, review flood inundation maps and, using the Layer Plot function, examine likely flooding depths along flood affected roads in order to determine closure needs ahead of flooding.			
Review the Bridges over-topped table above and initiate actions as appropriate.			
260.46	20% AEP (5-year ARI)	Up to around 70 properties located on the floodplain of the Steavenson and Little Steavenson rivers likely to be wetted now or very soon. Most properties down Mareeba Avenue, Ballina Court, Steavenson Road and Mimosa Court, on the Little Steavenson River side of Aroona Drive and Water Place are wetted. The roads are also inundated. Water encroaching into the rear of properties along Dyes Road backing onto the Little Steavenson River. 65 Dyes Lane adjacent to the Acheron River has water up to 250mm deep across the driveway and is about to be cut off. Aroona Drive is flooded close to Maroondah Highway to around 130mm deep. Steavenson Road is flooded to a depth of around 200mm and is	Ground-truth and update this Flood Intelligence Card for flood impacts. Monitor the Falls Road gauge upstream of Marysville using FloodZoom and populate the Flood Intelligence Card below. Review the likelihood of isolation for residents on the floodplain of the Steavenson and Little Steavenson rivers at Buxton and act accordingly. Remind residents of the danger of driving through flood waters and provide information for Steavenson Road and Aroona Drive. Extract CFA vehicles and equipment from the shed and relocate to an alternative dry location. Deploy road closed signs for local bridges as per table above.

River Height (mAHD)	Annual Exceedance Probability	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
		unsafe for small cars. Significant risk of isolation for residents near the confluence of the Acheron and Steavenson rivers. 3 houses flooded over-floor. Access to CFA shed is flooded – less than 250mm depth. Buxton Trout and Salmon Farm is flooded. Buxton Recreation Reserve beginning to flood. Properties in Cameron Close (immediately upstream of the Highway Bridge) are beginning to be flooded. No over-floor flooding expected, even as water rises to the 0.2% AEP (500-year ARI) level. Bridge over Bullyard Creek at Tampirr Road flooded to 200mm depth. Bridge over Bullyard Creek at Parisi Lane flooded to 100mm depth. Bridge over Acheron River at Nichols Road flooded to 100mm depth.	
260.52	10% AEP (10-year ARI)	An active flow path is now operating across the Buxton Recreation Reserve. CFA shed is flooded to a depth of around 280mm. 5 houses flooded over-floor. Aroona Drive is flooded close to Maroondah Highway to around 180mm deep and is unsafe for small cars. Steavenson Road is flooded to a depth of around 300mm.	Erect road closed signs at the start of Aroona Drive and advise residents of the closure and of the danger to small cars.

River Height (mAHD)	Annual Exceedance Probability	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
260.60	5% AEP (20-year ARI)	Flooding a little deeper and more extensive. Buxton Recreation Reserve is fully flooded. Significant risk of isolation for residents on the floodplain of the Steavenson and Little Steavenson rivers at Buxton. Aroona Drive is flooded close to Maroondah Highway to around 280mm deep and is unsafe for small cars. Steavenson Road is flooded to a depth of around 350mm. 65 Dyes Lane adjacent to the Acheron River has water up to 500mm deep across the driveway and is probably cut off.	Implement evacuation plan.
260.63	2% AEP (50-year ARI)	Aroona Drive is flooded close to Maroondah Highway to around 350mm deep and is unsafe to travel. Steavenson Road is flooded to a depth of around 380mm.	Remind residents of Aroona Drive closure and advise of the danger to all vehicles. Monitor water levels at the Maroondah Highway Bridge over the Acheron River at Narbethong. Liaise with RRV regarding signage and possible closure.
260.65	1% AEP (100-year ARI)	Estimate up to around 90 houses flooded over-ground. Depth of flooding across a few properties near the confluence approaching 1m. Aroona Drive is flooded close to Maroondah Highway to around 380mm deep and is unsafe for small cars. Deeper at the river end. Steavenson Road is flooded to a depth of around 385mm. CFA shed and access flooded – to be between 250mm and 500mm depth. The Acheron River has overtopped the Maroondah Highway Bridge at Narbethong – water is around 80mm deep.	Liaise with RRV regarding signage and possible closure of the Maroondah Highway Bridge at the Acheron River Bridge at Narbethong.
260.66	0.5% AEP (200-year ARI)	Aroona Drive and Steavenson Road flooded to a depth of around 460mm and 390mm respectively.	

River Height (mAHD)	Annual Exceedance Probability	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
260.69	0.2% AEP (500-year ARI)	Aroona Drive and Steavenson Road flooded to a depth of around 550mm and 400mm respectively. Maroondah Highway still only flooded to less than 250mm deep. Houses in Cameron Close (immediately upstream of the Highway Bridge) remain dry.	
x.xx	Probable Maximum Flood (PMF)		

APPENDIX D - FLOOD EVACUATION ARRANGEMENTS

Phase 1 - Decision to Evacuate

The IC 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 as a consequence of flooding and evacuation is considered the most effective risk treatment. This is the role of the Health Commander of the incident to assess and manage. Refer to the SHERP for details
- Essential services have been damaged and are not available to a community and evacuation is considered 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 to conduct the evacuation
- Time 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
- Resources required to conduct the evacuation
- Resources available to conduct the evacuation
- Shelter including Emergency Relief Centres, Assembly Areas etc.
- Vulnerable people and facilities
- Transportation
- Registration
- People of CALD background and transient populations
- Safety of emergency service personnel
- Different stages of an evacuation process

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

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

Sector	Gauge	Trigger

The table below details time required to evacuate established areas.

Sector	Likely time required for evacuation (including resource assumptions)

Phase 2 – Warning

Messages to the community will comprise either a warning to affected people that they prepare to evacuate or a recommendation that they evacuate immediately.

Evacuation messages can be disseminated via methods listed in Part 3 of this Plan.

Evacuation messages will be developed and issued by the Incident Controller in consultation with the MERO, MERC, DHS and other key agencies and expert advice (GBCMA and flood Intelligence specialists).

The Incident Controller is responsible for authorising and issuing evacuation messages.

Phase 3 – Withdrawal

Withdrawal will be controlled by VICPOL. VICSES will provide advice regarding most appropriate evacuation routes and locations for at-risk communities to evacuate to, etc.

VICSES, CFA, AV and Local Government will provide resources where available to support VICPOL/RRV 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 – refer to the MEMP.

Landing zones for helicopters are located at:

- Alexandra - Adjacent to Leckie Park, Near the corners of Vickery and Station Stra
- Alexandra - DELWP Helipad, Binns McCrae Road, Alexandra
- Yea – Opposite Yea Hospital (Melba Highway) adjacent to Yea Railway Reserve/Yea Skate Park
- Eildon – John Coller Oval adjacent to the Eildon Pondage (Cnr of Goulburn Valley Hwy and Eildon Road)

- Other ovals in most small towns in Murrindindi Shire are also suitable for helicopter landing with appropriate permissions

- Lilydale Airfield

Various ovals and sporting fields – while these may be suitable, encumbrances such as power lines and light towers would need to be logged and an appropriate risk assessment completed before being used.

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 Murrindindi Shire MEMP.

Phase 4 – Shelter

ERCs and / or assembly areas which cater for people's basic needs may be established to meet the immediate needs of people affected by flooding. ERCs and / or Assembly Areas are listed in the MEMP.

Murrindindi Shire Council is responsible for the provision of emergency shelter and for managing ERCs. At Murrindindi Shire Council it is the MRM that oversees and manages ERCs.

The IC is responsible for activating emergency relief services.

VicPol in consultation with VICSES will liaise with Local Government and DHS (where regional coordination is required) via the relevant control centre to plan for the opening and operation of ERCs. This can best be achieved through the EMT.

Animal Shelter

Animal shelter compounds will be established for domestic pets and companion animals of evacuees. These facilities may be located at locations detailed below and coordinated by Murrindindi Shire AEWP.

Caravans

No arrangements exist for the evacuations of caravans. Please refer to caravan evacuation plan that may be available by contacting the caravan park managers or Murrindindi Shire Council.

Phase 5 – Return

Return will be consistent with the Strategic Plan for the Return of Community

The IC in consultation with VicPol will determine when it is safe for evacuees to return to their properties and will arrange for the notification of the community.

VicPol will manage the return of evacuated people with the assistance of other agencies as required.

Considerations for deciding whether to evacuate include:

- Current flood situation

- Status of flood mitigation systems
- Size and location of the community
- Access and egress routes available and their status
- Resources required to coordinate the return
- Special needs groups
- Forecast weather
- Transportation particularly for people without access to transport

Disruption to Services

Disruption to a range of services can occur in the event of a flood. This may include road closures affecting school bus routes, water treatment plant affecting potable water supplies etc.

Essential Community Infrastructure and Property Protection

Essential Community Infrastructure and properties (e.g. residences, businesses, roads, power supply etc.) that require protection are:

Facility	Impact	Trigger Point for action	Strategy/Temporary Measures
Yea Tourist Park (Caravan Park), Yea Township	Flooding	Gauge @ Court Street 3.0m	Sandbagging of Low Lying areas
Craigie Street East of Providence Bridge	Flooding (Minor Flooding of Private Properties)	Gauge @ Court Street 3.3m	
Goulburn Valley Hwy west of Boundary Creek	Flooding to private allotments (not to dwellings) Vehicular access to these dwellings flooded to a depth of 0.5 m	Gauge @ Court Street 3.3m	

Murrindindi Shire Council will, when required, establish a sandbag collection point at a suitable location as determined by SES and MERO.

Rescue

The following resources are available within Murrindindi Shire Council to assist with rescue predations:

Alexandra SES Unit: BOAT RESCUE BOAT

Seymour SES Unit: BOAT RESCUE BOAT

Seymour SES Unit: BOAT SEMI RESCUE BOAT

Known high-risk areas/communities (i.e. low-lying islands) where rescues might be required include:

To be determined.

APPENDIX E - FLOOD WARNING SYSTEMS

Flood Warning

Flood Warning products and Flood Class Levels can be found on the BoM website. Flood Warning Products include Severe Thunderstorm Warnings, Severe Weather Warnings, Flood Watches and Flood Warnings.

Flood Bulletins

VICSES distributes flood emergency information to the media through “Flood Bulletins”. Flood Bulletins provide BoM Flood Warning information as well as information regarding possible flood consequences and safety advice, not contained in BoM Flood Warning products. VICSES uses the title Flood bulletin to ensure emphasis is placed upon BoM Flood Warning product titles.

The relevant VICSES Region Headquarters or the established ICC will normally be responsible for drafting, authorizing and issuing issue Flood Bulletins, using the One Source, One Message system.

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

Flood Bulletins should follow the following structure

- What is the current flood situation;
- What is the predicted flood situation;
- What are the likely flood consequences;
- What should the community do in response to flood warnings;
- Where to seek further information;
- Who to call if emergency assistance is required.

It is important that the description of the predicted flood situation is consistent with and reflects the relevant BoM Flood Warning.

Flood Bulletins should be focused on specific gauge (or in the absence of gauges, catchment) reference areas, that is the area in which flood consequences specifically relate to the relevant flood gauge.

Flood Bulletins 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.

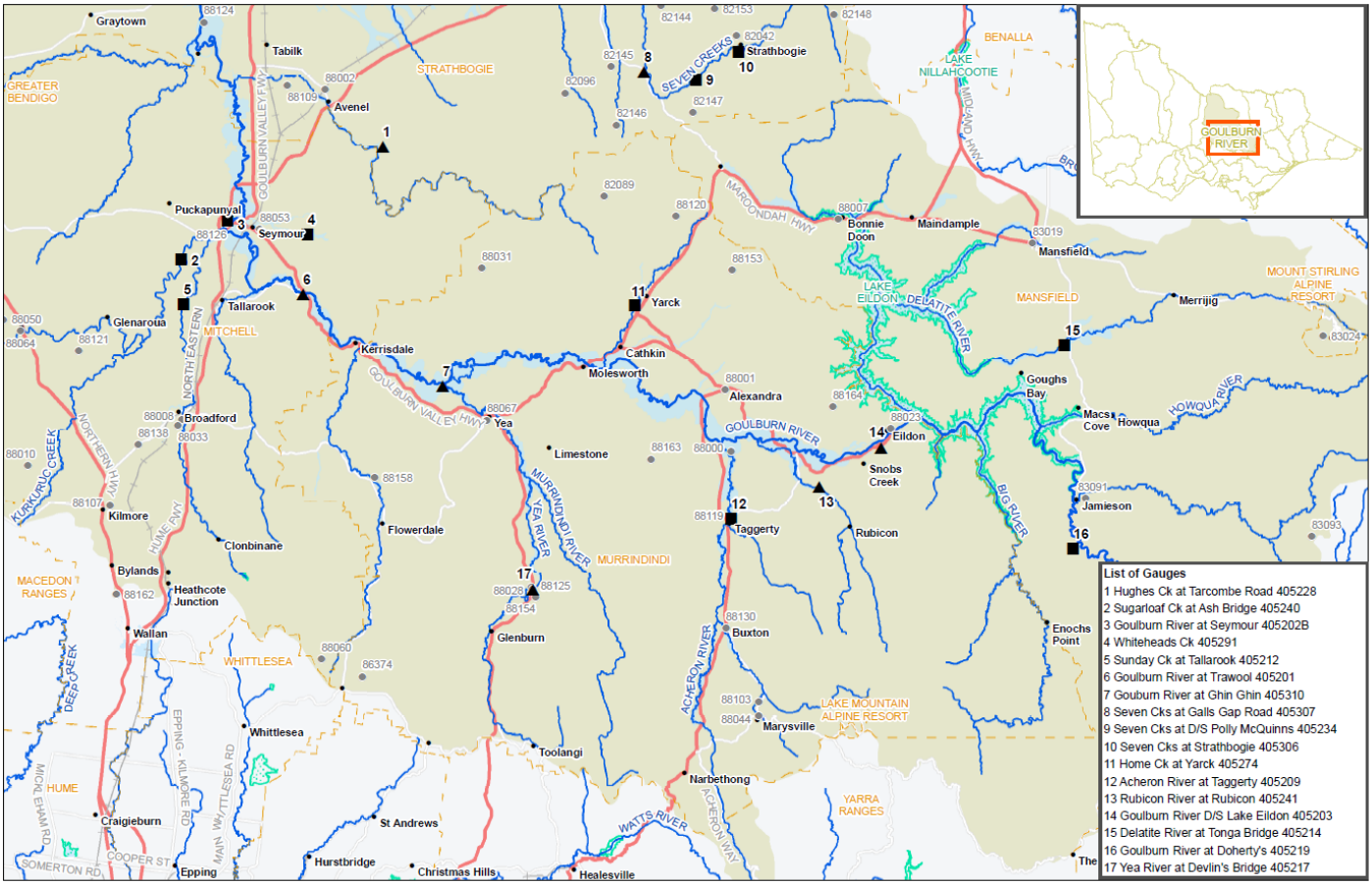
To ensure flood bulletins are released in a timely manner, standardised flood bulletins may be drafted based on different scenarios, prior to events occurring. The standardised flood bulletins can then be adapted to the specifics of the event occurring or predicted to occur.

Local Flood Warning System Arrangements

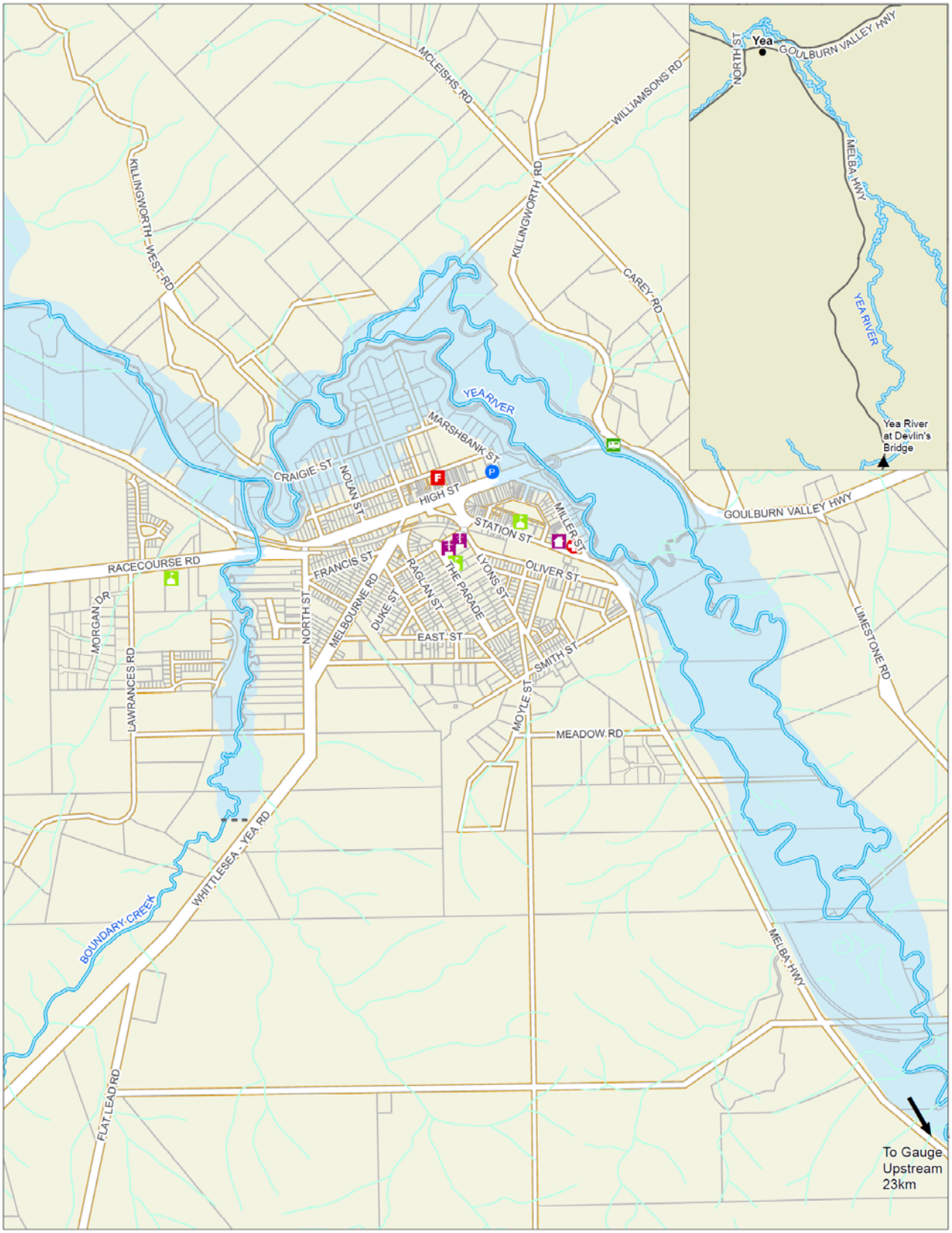
No current local flood warning system is established at the time of writing this plan.

APPENDIX F – MAPS

Goulburn River Catchment – Upper

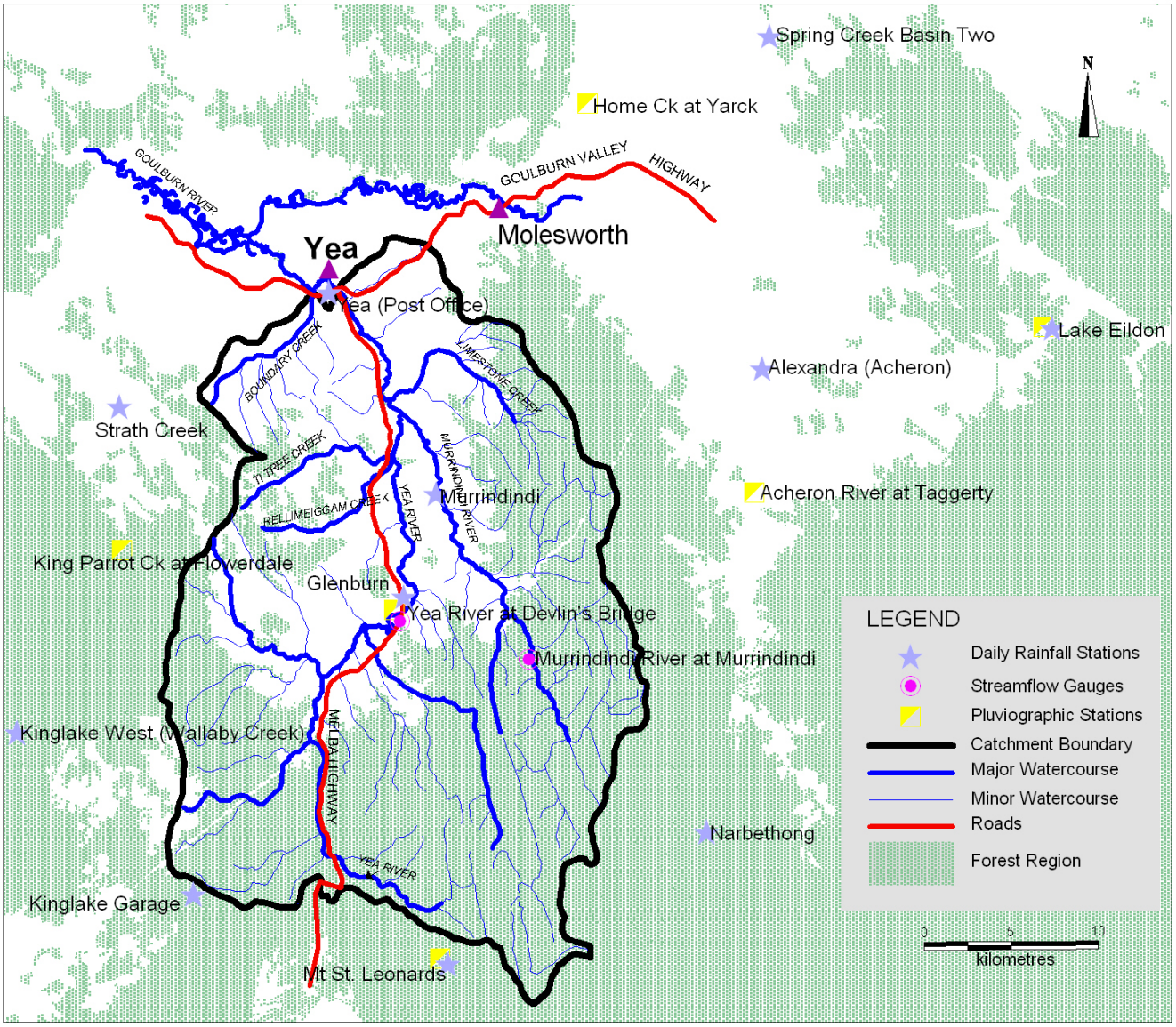


Yea Township

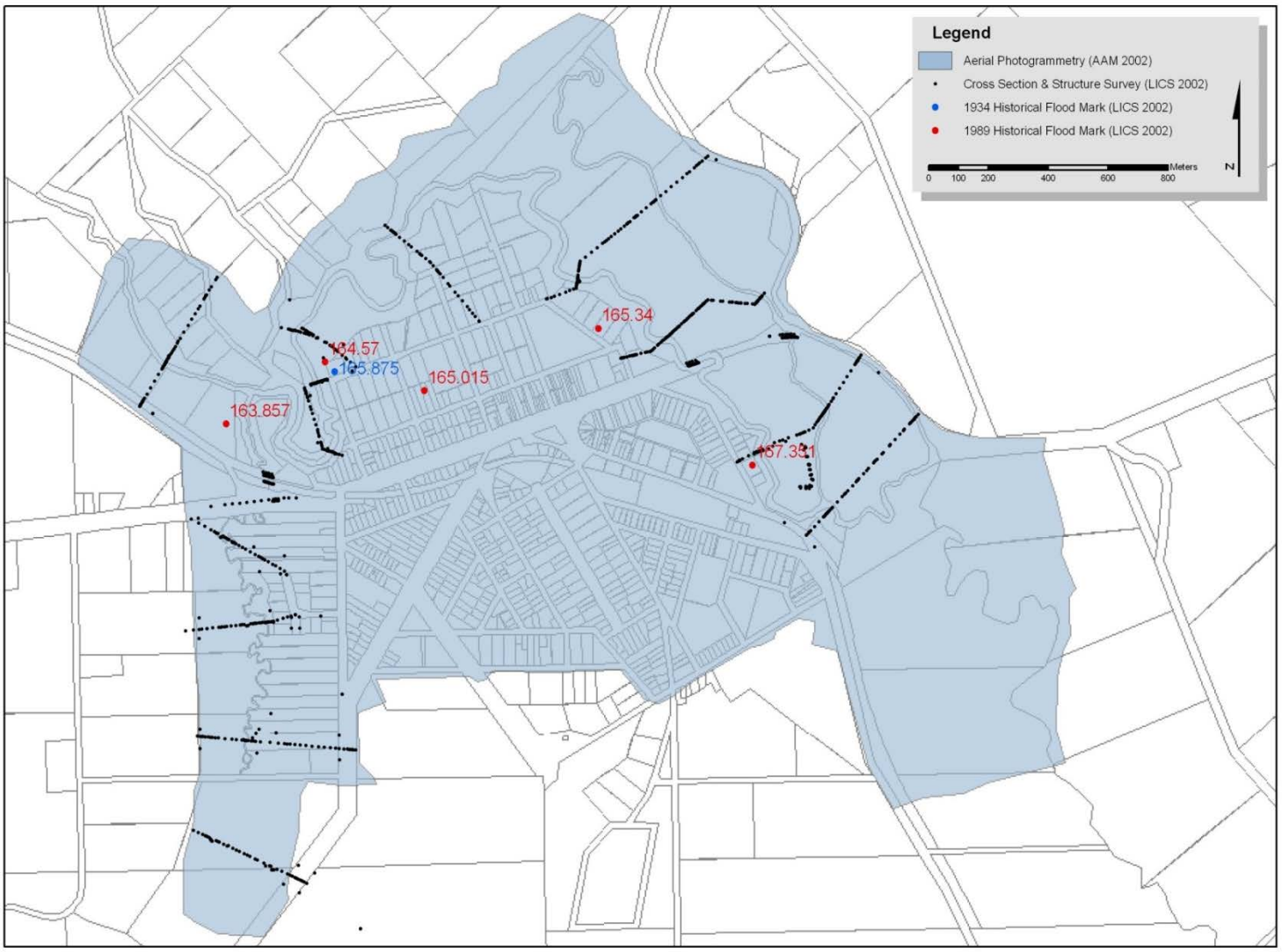


DISCLAIMER
This map publication is presented by the Victoria State Emergency Service for the purpose of disseminating emergency management information. The State Emergency Service disclaims any liability (including for negligence) to any person in respect of anything and the consequences of anything, done, or not done of any kind including damages, costs, interest, loss of profits or special loss or damage, arising from any error, inaccuracy, incompleteness or other defect in this information by any such person in whole or partial reliance upon the whole or part of the information in this map publication. Flood information is provided by Goulburn Broken CMA, (Yea Flood Study, 2004). VicMap data sourced from DSE, November, 2012.

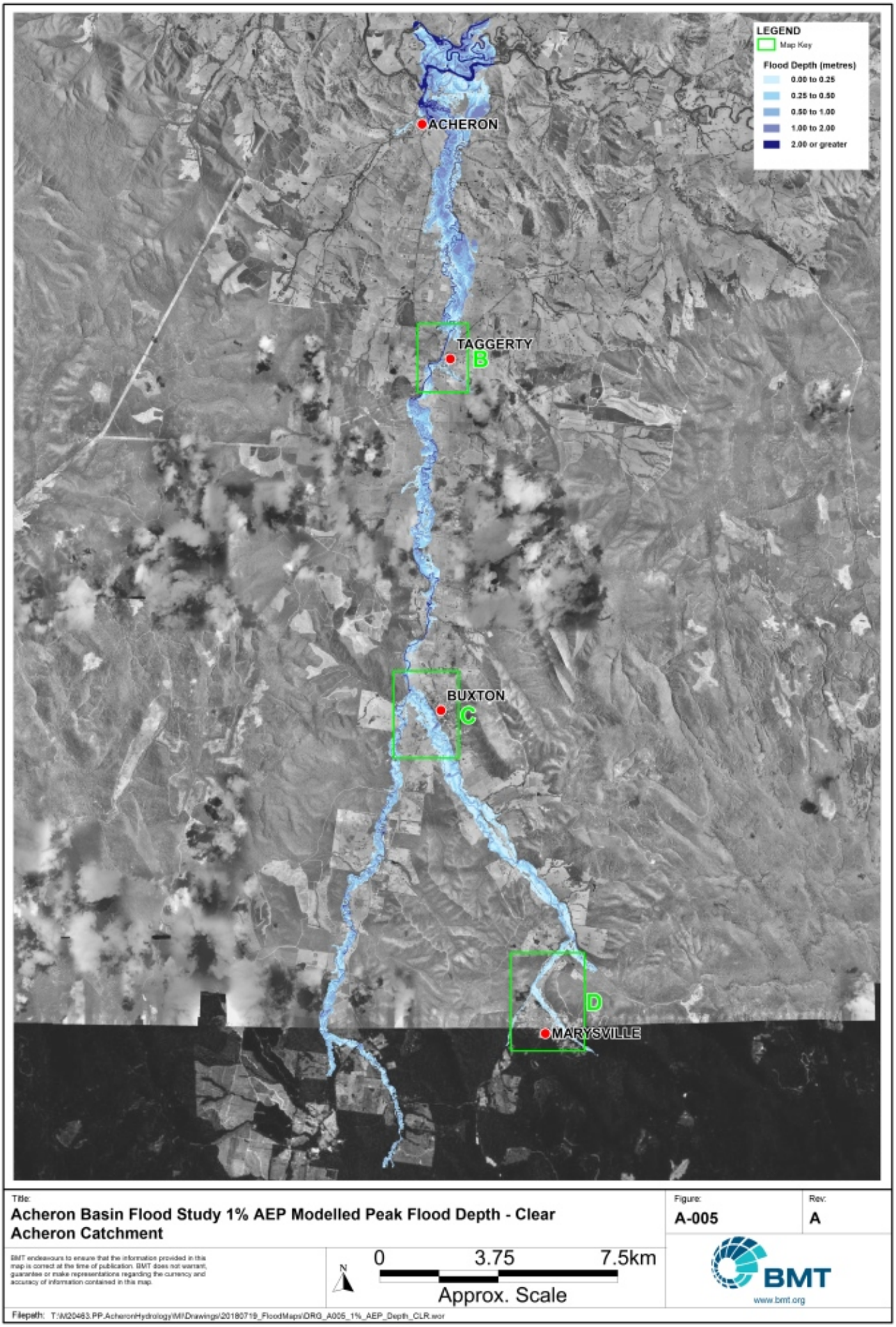
Yea River Catchment – stream flow and rainfall gauging stations



Topographic Survey Extent and Historical Flood Marks



Acheron River Catchment 1% AEP Flood Depths and Extents



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.

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. [Community observers, Local Information Officers (LIOs) and other agency networks] identified in [this plan/xxx register] will help support this process.

LIOs provide a key communication interface to community observers and other sources of local knowledge.

For the [Enter Location - Community/Municipality/River system] community observers identified are:

Community Observer Name	Community Observer contact details	LIO Contact	Key Areas of local knowledge expertise
[Enter Name]	[Enter contact details]	[Enter name of LIO key point of contact]	[Enter key areas of local knowledge expertise that is consistent with the Local Knowledge Policy arrangements]
[Enter Name]	[Enter contact details]	[Enter name of LIO key point of contact]	[Enter key areas of local knowledge expertise that is consistent with the Local Knowledge Policy arrangements]

For the [Enter SES unit location] the Local Information Officer identified is:

LIO Name	LIO contact details	Community Observer contacts
[Enter Name]	[Enter contact details]	[Enter names of Community observer and other key local knowledge points of contact]

For the [Enter Location - Community/Municipality/River system] other agency networks identified are:

- [Enter other relevant agency network details including the capability and management of these networks and the contact details if appropriate]

Important Notes:

These arrangements do not permit community observers and existing agency networks any responsibility for operational decisions and do not permit community 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.

Notes:

[Develop Appendix G as one appendix within the Municipality or develop multiple plans for each location within Appendix G e.g. G1 – Local Knowledge Arrangements for xxx location, G2 – Local Knowledge Arrangements for xxx location etc.]

[It is intended that community observers and LIOs will be contacted and asked to confirm that they are happy for their contact details to be included in this plan. If consent is provided, contact details within this plan may be published to the public. If consent is not provided, contact details will not be published to the public within this plan and will instead will be maintained within a register maintained by the relevant SES regional office].

APPENDIX H – Special Flood Considerations for Quarries

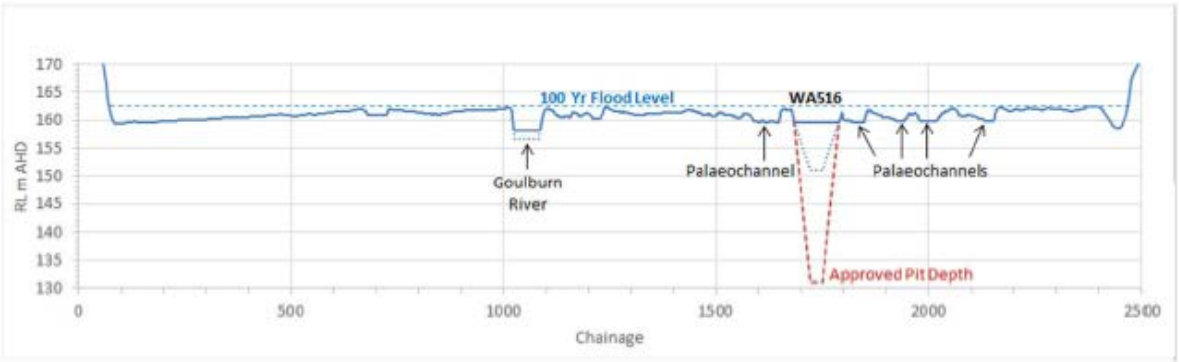
The following extracts for Switzerland Quarry and Yea Sand and Gravel have been taken from the quarry risk assessments completed by Jacobs in 2015.

Switzerland Quarry (WA516)

WA516 is located on the northern floodplain of the Goulburn River. The work authority includes a single pit with a total area of 3.8 hectares. The pit is setback 500 m from the Goulburn River and has a maximum depth of 10 m. It is estimated that the basement of the pit lies 6 m below the invert of the Goulburn River. The final approved plan is for a pit depth of 30 m. The basement of the pit would then lie -26 m below the invert of the Goulburn River.

Figure 3.4 shows an aerial image of the Goulburn Floodplain within the vicinity of WA516. Annotated on this image are arrows showing flow paths and avulsion channels that could form if pit capture were to occur. These arrows generally follow the course of palaeochannels. Figure 3.5 presents a cross-section of the floodplain developed from LiDAR. The approximate level for the 100 year flood is also shown to highlight the extent of flooding across the floodplain. A review of modelling by Water Technology indicates that the 20 year flood would inundate the floodplain and result in flow into the pits.

Figure 3.4: Preferred flow and potential avulsion paths and points of flow entry and exit into WA516 pit.



The outcomes of this risk assessment for WA516 are presented in Table 3.5. Table 3.6 presents a list of infrastructure assets that would be impacted by pit capture, primary failure mechanism, consequence, likelihood and risk rating.

Pit capture would have major consequences to the physical environment, potentially leading to the formation of a new shorter river alignment 3 km in length and abandonment of the existing 3.5 km river alignment. Following pit capture erosion would occur upstream and downstream degrading the physical form of the floodplain and connecting river. Incision and widening along the avulsion would

result in the removal of vegetation and habitat, with trees toppling into the channel. The Goulburn River would be expected to experience high rates of bed and bank erosion for many months and years, impacting on water quality downstream.

Pit capture would have extreme consequences to infrastructure assets and private property. The North-South Pipeline pump station is located on the southern bank of the Goulburn River. The pipeline is to be used in times of water shortage or when needed for local fire fighting. Avulsion pathways will take the water supply away from the pump station. Local access tracks would also be severed, splitting properties, with damages to agricultural assets (i.e. fences) and land capability.

Lateral migration of the river channel into the current pit is assessed as having a rare likelihood. The setback of the pit from the river is sufficient to protect the river from this risk scenario. Sub-surface piping into the pit and subsequent failure of pit walls is assessed as likely. During a flood, palaeochannels that traverse the floodplain will function as preferred flow paths. Sub-surface piping is a likely scenario where these watercourses run close to the pit (within 30 m). Flow of water into and through the pit during a flood and subsequent erosion of the buffer strip between the channel and the pit is assessed as almost certain to occur. Overall, lateral migration of the river channel into the pit is assessed as a low risk. Failure of pit walls as a result of sub-surface piping is assessed as a medium/high risk. Flow of water into and through the pit and subsequent erosion of the buffer strip between the channel and the pit is a critical risk. Potential management options to treat assessed risks are outlined in Table 3.7.

Table 3.5: WA516 Outcomes of risk assessment.

Asset	Risk scenario	Consequence	Likelihood	Risk Rating
Physical environment	1. Lateral migration of the river channel into the pit	Major	Rare	Low
	2. Sub-surface piping into pit and subsequent failure of pit walls	Major	Likely	High
	3. Flow of water into and through the pit and subsequent erosion	Major	Almost certain	Critical
Infrastructure assets	1. Lateral migration of the river channel into the pit	Moderate	Rare	Low
	2. Sub-surface piping into pit and subsequent failure of pit walls	Moderate	Likely	Medium
	3. Flow of water into and through the pit and subsequent erosion	Extreme	Almost certain	Critical

Table 3.6: WA516 List of infrastructure assets at risk.

Infrastructure assets	Primary failure mechanisms	Consequence	Likelihood	Risk Rating
North-South Pipeline Pump Station, local access tracks and fences	Flow of water into and through the pit and subsequent erosion	Extreme	Almost certain	Critical

Table 3.7: WA516 Potential management options to treat risks.

Potential management options
Construction of levee to prevent flow of water into and through the pit
Construction of partial levee and grade control structures that convey flow into and out of the pit
Partial fill of pit to level above the invert of the Goulburn River

Yea Sand and Gravel (WA45)

WA45 is positioned south of the Goulburn River. The work authority includes five pits with a total area of 20 hectares. The pits are setback 800 m from the Goulburn River and have a maximum depth of 23 m. It is estimated that the basement of the pits lie a maximum of 12.8 m below the invert of the Goulburn River. The floodplain is also traversed by a series of palaeochannels, which during floods would act as preferred flow paths.

Figure 3.6 shows an aerial image of the Goulburn Floodplain within the vicinity of WA45. Annotated on this image are arrows showing flow paths and avulsion channels that could form if pit capture were to occur. Many of these arrows follow the course of palaeochannels. Figure 3-7 presents a cross-section of the floodplain developed from LiDAR. The approximate level for the 100 year flood is also shown to highlight the extent of flooding across the floodplain. A review of modelling by Water Technology indicates that the 20 year flood would inundate the floodplain and result in flow into the pits.

Figure 3.6: Preferred flow and potential avulsion paths and points of flow entry and exit into WA45 and WA1443 pits.

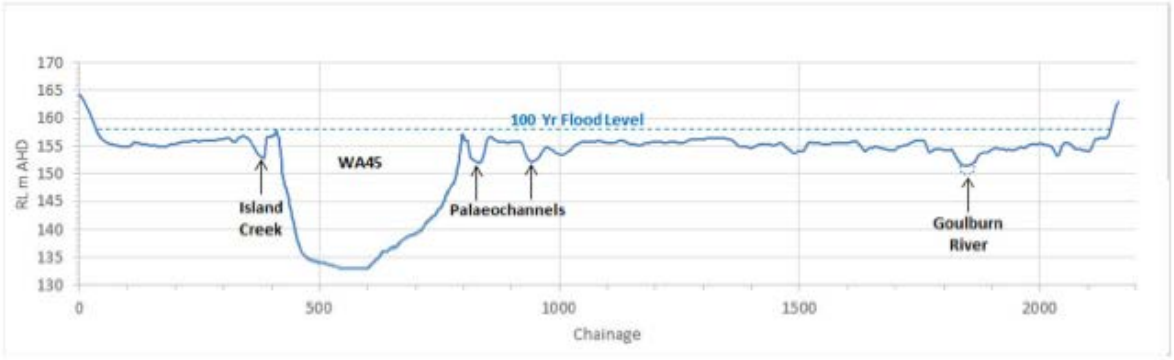


Figure 3-7: Floodplain cross-section from LiDAR showing the relief of the Goulburn River floodplain.

Island Creek is an anabranch of the Yea and Goulburn Rivers. In August 2010, the creek avulsed into one of the pits. This capture was caused by sub-surface piping into the pit and subsequent failure of pit walls (Craigie 2012, Goulburn Broken CMA 2014). The avulsion caused substantial incision and bank erosion along the creek, with an erosion knickpoint progressing 340 m upstream (Craigie 2012), destroying a recently constructed road crossing and riparian vegetation (Figure 2.2).

The outcomes of this risk assessment for WA45 are presented in Table 3.8. Table 3.9 presents a list of infrastructure assets that would be impacted by pit capture, primary failure mechanism, consequence, likelihood and risk rating.

Pit capture would have extreme consequences to the physical environment, potentially leading to the formation of a new river alignment 5 km in length and abandonment of the existing river alignment. There are multiple alternate courses along which pit capture may occur, with erosion progressing upstream and downstream degrading the physical form of the floodplain and connecting river. Incision and widening along the avulsion would result in the removal of vegetation and habitat, with trees toppling into the channel. The Goulburn River would be expected to experience high rates of bed and bank erosion for many months and years, impacting on water quality downstream.

Pit capture would have major consequences to infrastructure assets and private property. The Ghin Ghin Road may be impacted by pit capture, as erosion upstream of the pits could result in severing of the road and damage/failure of the bridge that crosses the Goulburn River. Local access tracks would be severed, splitting properties, with damages to agricultural assets (i.e. fences) and land capability. Lateral migration of the river channel into each pit is assessed as having a rare likelihood.

The setback of the pits from the river is sufficient to protect the river from this risk scenario. Sub-surface piping into one or more pits and subsequent failure of pit walls is assessed as likely. During a flood event, Island Creek and other anabranches/palaeochannels that traverse the floodplain will function as preferred flow paths. Sub-surface piping is a likely scenario where these watercourses run within 30 m of an existing pit of WA45 or WA1443. Flow of water into and through the pits during a flood and subsequent erosion of the buffer strip between the channel and the pit leading to pit capture and consequences outlined is assessed as almost certain to occur. Overall, lateral migration of the river channel into the pits is assessed as a low/medium risk. Failure of pit walls as a result of sub-surface piping and flow of water into and through the pits and subsequent erosion are assessed as critical risks. Potential management options to treat assessed risks are outlined in Table 3.10.

Table 3.8: WA45 Outcomes of risk assessment.

Asset	Risk scenario	Consequence	Likelihood	Risk Rating
Physical environment	1. Lateral migration of the river channel into the pit	Extreme	Rare	Medium
	2. Sub-surface piping into pit and subsequent failure of pit walls	Extreme	Likely	Critical
	3. Flow of water into and through the pit and subsequent erosion	Extreme	Almost certain	Critical
Infrastructure assets	1. Lateral migration of the river channel into the pit	Major	Rare	Low
	2. Sub-surface piping into pit and subsequent failure of pit walls	Major	Likely	Critical
	3. Flow of water into and through the pit and subsequent erosion	Major	Almost certain	Critical

Table 3.9: WA45 List of infrastructure assets at risk.

Infrastructure assets	Primary failure mechanisms	Consequence	Likelihood	Risk Rating
Ghin Ghin Road	Flow of water into and through the pit Sub-surface piping into pit and subsequent failure of pit walls	Major	Almost certain	Critical

Table 3.10: WA45 Potential management options to treat risks.

Potential management options
Construction of levee to prevent flow of water into and through the pits

Potential management options
Construction of partial levee and grade control structures that convey flow into and out of the pits
Partial fill of pits to level above the invert of the Goulburn River
Construction of waterway diversion for section of Island Creek

APPENDIX I – REFERENCES AND INTEL SOURCES

The following studies may be useful in understanding the nature of flooding within the Shire of Murrindindi.

- FLOODZOOM – for all available flood extent, depth and related mapping, studies reports and MFEPs as well as cadastral, infrastructure and related information
- http://planning-schemes.delwp.vic.gov.au/schemes Department of Environment, Land Water & Planning for planning scheme flood maps
- http://www.vicwaterdata.net/vicwaterdata/home.aspx for historical data on water quality, river heights and flows
- http://www.bom.gov.au Bureau of Meteorology for river gauge readings and flood warnings
- http://www.floodvictoria.vic.gov.au for information on historic floods in Victoria
- http://www.ses.vic.gov.au Victoria State Emergency Service
- http://www.ema.gov.au Emergency Management in Australia
- http://www.delwp.vic.gov.au/fire-and-other-emergencies Department of Environment Land Water and Planning emergency management
- https://www.emv.vic.gov.au/ Emergency Management Victoria
- COUNCIL and VICSES Geographical Information System (GIS) – these contain layers showing drainage assets, flooding extents, flood related call-out locations, roads, title boundaries and other useful information.

- BMT (2018): *Acheron Flood Hydrology Report. A report to Goulburn Broken Catchment Management Authority*. July 2018.
- Goulburn Broken Catchment Management Authority (GBCMA) (2018): *Acheron Valley Flood Mapping Report.* April 2018.