Golden Plains Shire

FLOOD EMERGENCY PLAN

A Sub-Plan of the Municipal Emergency Management Plan

For Golden Plains Shire Municipal Emergency Management Planning Committee;
Golden Plains Shire Council
and
VICSES Bannockburn and Ballarat Units

Version 2.1, April 2024

GOLDEN PLAINS SHIRE

VICTORIA State Government

SES

Contents

Distribution of MFEP

Once endorsed and signed, the MFEP should be distributed to all MFEP committee members, MEMPC Chair, council, MEMO, Deputy MEMO, Representatives from; BoM, CMA, DEECA, Parks Victoria, Ambulance Victoria, VicRoads, DH, DFFH, relevant utilities, FRV, MERC, RERC, Local Police stations, VICSES Units, VICSES Regional office, CFA Brigades, CFA Regional office.

Document Transmittal Form / Amendment Certificate

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

Suggestions for amendments to this Plan should be forwarded to VICSES Regional Office via ust.barwon@ses.vic.gov.au.

The VICSES MFEP template 5.3 was used to develop this Plan.

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

Amendment Number	Date of Amendment	Amendment Entered By	Summary of Amendment
0.1	June 2019	Tony Grimme	Draft Version
1	November 2019	Clare Mintern	Rewrite the report.
2	February 2020	Clare Mintern	**Incorporate MEMPC feedback.**
2.1	March 2023	Michael Clarke Jo Kegg Gavin Kelly	Updates to flood study data, review, and update to naming conventions, addition of Catchment Schematics

This Plan will be maintained on the VICSES website at www.ses.vic.gov.au/get-ready/your-local-flood-information and Golden Plains Shire website https://www.goldenplains.vic.gov.au/page/HomePage.aspx

List of Abbreviations & Acronyms

The following abbreviations and acronyms are used in the Plan			
AAR	After Action Review	ICC	Incident Control Centre
AEP	Annual Exceedance Probability	**IEMT**	Incident Emergency Management Team
AHD	Australian Height Datum (the height of a location above mean sea level in metres)	**IIA**	Initial Impact Assessment
AIDR	Australian Institute of Disaster Resilience	**IMS**	Incident Management System
AIIMS	Australasian Inter-service Incident Management System	**IMT**	Incident Management Team
AoCC	Area of Operations Control Centre / Command Centre	**JSOP**	Joint Standard Operations Procedure
ARI	Average Recurrence Interval	**LSIO**	Land Subject to Inundation Overlay
AV	Ambulance Victoria	**MEMO**	Municipal Emergency Management Officer
BoM	Bureau of Meteorology	**MEMP**	Municipal Emergency Management Plan
CEO	Chief Executive Officer	**MEMPC**	Municipal Emergency Management Planning Committee
CERA	Community Emergency Risk Assessment	**MERC**	Municipal Emergency Response Coordinator
CFA	Country Fire Authority	**MFEP**	Municipal Flood Emergency Plan
CMA	Catchment Management Authority	**MFPC**	Municipal Flood Planning Committee
DEECA	Department of Energy, Environment and Climate Action	**MRM**	Municipal Recovery Manager
DFFH	Department of Families, Fairness and Housing	**PMF**	Probable Maximum Flood
DH	Department of Health	**RAC**	Regional Agency Commander
DJSIR	Department of Jobs, Skills, Industry and Regions	**RCC**	Regional Control Centre
DoI	Department of Infrastructure	**RDO**	Regional Duty Officer
DTP	Department of Transport and Planning	**RERC**	Regional Emergency Response Coordinator
EMLO	Emergency Management Liaison Officer	**RERCC**	Regional Emergency Response Coordination Centre
EMV	Emergency Management Victoria	**SBO**	Special Building Overlay
EMT	Emergency Management Team	**SAC**	State Agency Commander
EO	Executive Officer	**SBO**	Special Building Overlay
FO	Floodway Overlay	**SCC**	State Control Centre
FRV	Fire Rescue Victoria	**SDO**	State Duty Officer
FWS	Flood Warning System	**SEMP**	State Emergency Management Plan
FZ	Floodway Zone	**SERP**	State Emergency Response Plan

HESP	Health Emergency Sub-Plan	**SEWS**	Standard Emergency Warning Signal
IC	Incident Controller	**VicPol**	Victoria Police
		VICSES	Victoria State Emergency Service

Part 1. Introduction

1.1 Plan Assurance and Approval

Assurance

A Statement of Assurance has been prepared and submitted to the REMPC pursuant to the EM Act 2013.

Approval

This plan has been approved by the Grampians Regional Emergency Management Planning Committee as a Flood Sub-plan to the Golden Plains Municipal Emergency Management Plan.

This plan comes into effect when it is published and remains in effect until superseded by an approved and published update.

Approval

Nicholas Cowham Date

Assistant Chief Officer

Endorsement

Phil Josipovic Date

Chair – Municipal Emergency Management Planning Committee

1.2 Purpose and Scope of this Flood Emergency Plan

The purpose of this MFEP is to detail arrangements agreed for managing a flood emergency before, during and after it occurs or potentially occurs within the Golden Plains Shire.

As such, the scope of the Plan is to:

- Identify the local flood risk;
- Support the implementation of mitigation and planning measures to minimise the causes and impacts of flooding;
- Detail emergency management arrangements;
- Identify linkages with Local, Regional and State emergency and wider planning arrangements with a specific emphasis on those relevant to flood.

1.3 Municipal Flood Planning Committee (MFPC)

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

- VICSES (i.e. Unit Controller & Regional Officer – Emergency Management) (Chair),
  - Council (i.e. Municipal Emergency Management Officer, Drainage Engineer, Statutory Planning Officer)
- Victoria Police (i.e. Municipal Emergency Response Co-ordinator) (MERC),
- Corangamite Catchment Management Authority (CMA),
- Department of Families, Fairness and Housing (DFFH) as required,
- Department of Energy, Environment and Climate Action (DEECA) as required,
- Barwon Water
- Bureau of Meteorology as required,
- Local community representatives and
- CFA

1.4 Responsibility for Planning, Review & Maintenance of this Plan

This MFEP must be maintained in order to remain effective.

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

The plan should be reviewed following:

- A new flood study;
- A significant change in flood mitigation measures;
- After the occurrence of a significant flood event within the Municipality;
- Or if none of the above occur, every 3 years.

Part 2. BEFORE: Prevention / preparedness arrangements

2.1 Community Engagement and Awareness

Details of this MFEP will be released to the community through; local media, any FloodSafe engagement initiatives and websites (VICSES and the Municipality) upon formal adoption by VICSES and the Municipality

VICSES with the support of the Golden Plains Shire Council and Corangamite CMA will coordinate targeted community flood engagement programs within the council area.

Refer to appendix H (LFG and FloodSafe Information. Attach any broader FloodSafe details).

2.2 Structural Flood Mitigation Measures

Levees have been constructed in Inverleigh and Shelford. The Inverleigh levee is located on the southern side of the Leigh River adjacent to the Inverleigh Tennis Courts in High Street. Two levees in Shelford are located on the eastern side of the Leigh River. Refer to **Appendix C** for more details regarding the location and protection level of these levees.

2.3 Non-structural Flood Mitigation Measures

2.3.1 Exercising the Plan

Arrangements for exercising this Plan will be at the discretion of the MEMPC. It is recommended that the MFEP is exercised on annual basis and reviewed in line with Section 1.4.

2.3.2 Flood Warning

Arrangements for Bureau issued Flood Watch and Flood Warning products are contained within the State Emergency Management Plan – Flood Sub-plan(www.ses.vic.gov.au/em-sector/vicses-emergency-plans) and on the Bureau of Meteorology (BoM) website www.bom.gov.au.

The Bureau is responsible for issuing flood and severe weather warnings. VICSES or other relevant agencies will then undertake messaging.

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

2.3.3 Local Knowledge

Field Observers and Field Observers (Community) provide near real-time local knowledge to VICSES and the Incident Control Centre regarding local insights, providing evidence based situational awareness and the potential impacts and consequences of an incident. Images taken assist to verify intelligence and assist with the dissemination of public information and warnings to community members.

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

Part 3. DURING: Response arrangements

3.1 Introduction

3.1.1 Activation of Response

Flood response arrangements may be activated by the Regional Duty Officer (RDO) VICSES – Grampians Region or Regional Agency Commander (RAC).

The VICSES Incident Controller (IC)/RDO will activate agencies as required as documented in the State Emergency Response Plan - Flood.

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 the Golden Plains Shire. These agencies will be engaged through the IEMT (Incident Emergency Management Team) when enacted or via the RAC when the IEMT is not enacted.

The general roles and responsibilities of supporting agencies are as agreed within the: MEMP, SEMP Roles and Responsibilities section – Response.

3.1.3 Emergency Coordination Centre or equivalent

If established, liaison with the emergency coordination centre will be through the established Division/Sector Command and through Municipal involvement in the IEMT, in particular the Municipal Emergency Response Coordinator (MERC). The VICSES RDO / ICC will liaise with the centre directly if no Division/Sector Command is established.

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

3.1.4 Escalation

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

Regional resourcing and event escalation arrangements are described in the Grampians Regional Emergency Management Plan – Flood Sub-plan

3.2 State Emergency Management Priorities

To provide guidance to the IMT and IEMT, the following State Emergency Management Priorities shall form the basis of incident action planning processes:

1. Protection and preservation of life is paramount, this includes:
    a. Safety of emergency response personnel, and:
    b. Safety of community members including vulnerable community members and visitors/tourists.
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 assets that considers the cultural, biodiversity, and social values of the environment.

3.3 Control

The SEMP identifies VICSES as the Control Agency for flood and as the authority to plan and respond to flood. It identifies DEECA as the Control Agency responsible for “dam safety, water and sewerage asset related incidents” and other emergencies. A more detailed explanation of roles and responsibilities is provided in the Roles and Responsibilities section of the SEMP

All flood response activities within the Golden Plains Shire including those arising from a dam failure or retarding basin / levee bank failure incident will therefore be under the control of the appointed IC, or delegated representative.

3.3.1 Incident Controller (IC)

An Incident Controller (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 IC responsibilities are as defined in the SEMP (Pg 58)

3.3.2 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).

3.3.3 Divisions and Sectors

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

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

Table 1. Divisions and Sectors for the Golden Plains Shire.

Incident Level	ICC / ICP	Division	Division Control Point	Sector	Sector Control Point
Level 2-3	Ballarat ICC	Ballarat	Inverleigh CFA	Inverleigh	TBD as needed
Level 2-3	Ballarat ICC	Ballarat	Bannockburn VICSES Unit	Shelford	TBD as needed

3.3.4 Incident Management Team (IMT)

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

Refer to the SEMP for guidance on IMTs and Incident Management Systems (IMSs).

3.3.5 Incident Emergency Management Team (IEMT)

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

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

Refer to the SEMP (Pg 60) for guidance on IEMTs.

3.3.6 On Receipt of a Flood Watch / Severe Weather Warning

VICSES SOP008 and SOP009 outline in detail the actions to be undertaken upon receipt of a Flood Watch/Flood Warning or Severe Weather Warning. VICSES RDO (until an incident controller is appointed) or IC will undertake actions as defined within the flood intelligence cards (**Appendix C**). General considerations by the IC/VICSES RDO will be as follows:

- Review flood intelligence to assess likely flood consequences
- Monitor weather and flood information – 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 IEMT) and open if required
- Ensure flood warnings and community information is prepared and issued to the community where required
- Flood (Riverine and flash) Warnings are managed by the RDO/RAC
- Severe Weather/ Thunderstorm warnings are managed by SDO/SAC
- Develop media and public information management strategy
- Monitor watercourses and undertake reconnaissance of low-lying areas
- Ensure flood mitigation works are being checked by owners
- Develop and issue incident action plan, if required
- Develop and issue situation report, if required

3.3.7 On Receipt of the First and Subsequent Flood Warnings

VICSES RDO (until an incident controller is appointed) or IC will undertake actions as defined within the flood intelligence cards **(Appendix C).** 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?
  - 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/
- Continue to conduct reconnaissance of low-lying areas

3.4 Initial Impact assessment (IIA)

Initial impact assessments (IIA) can be conducted to assess and record the extent and nature of damage caused by flooding. This information may then be used to provide the basis for further needs assessment and recovery planning by Golden Plains Shire Council, DFFH and recovery agencies.

3.5 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.

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 SEMP Storm Sub-plan.

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 by considering warning time, safe routes, resources available and etc;

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

3. Where it is likely people will become trapped by floodwaters due to limited evacuation options safety advice needs to be provided to people at risk. Advice should be given to not attempt to flee by entering floodwater if they become trapped, it may be safer to seek the highest point within the building and to telephone 000 if they require rescue.

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.

6. Contact the Golden Plains Shire MERC and MEMO at the earliest opportunity to allow for relief preparation to commence.

Due to the rapid development of flash flooding it will often be difficult, to establish relief centres ahead of actually triggering the evacuation. This is normal practice, but this is insufficient justification for not adopting evacuation.

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

3.7 Evacuation

The IC decides whether to warn people to evacuate or if it is recommended to evacuate immediately.

Once the decision is made, VicPol 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.

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

Evacuation operations should be consistent with the Joint Operating Procedure on Evacuation (JSOP3.12).Refer to **Appendix C** of this Plan and the MEMP for additional local evacuation considerations for the municipality.

3.8 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.

Victoria Police Rescue Coordination Centre should be notified of any rescues that occur: (03) 9399 7500

The following resources are available within Golden Plains Shire to assist with rescue operations:

- Flood Rescue boats are located at Ballarat, Bacchus Marsh, and Geelong Units.
- Geelong and South Barwon Units have a land based Swift Rescue Team.
- HEMS 4 Rescue helicopter is located at the Essendon Airport.

3.9 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 SCC will establish priorities.

Suitable airbase facilities are located at:

- Ballarat Aerodrome, off Learmonth Road, Mitchell Park.
- Lethbridge Aerodrome, 3429 Midland Highway, Lethbridge.

3.10 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.

3.1.1 Essential Community Infrastructure and Property Protection

Essential Community Infrastructure and Property (e.g. residences, businesses, roads, power supply etc.) may be affected in the event of a flood.

The Golden Plains Shire Council maintains a limited stock of sandbags that will be made available at community collection points at Inverleigh Bowls Club, Shelford Public Hall, Smythesdale Well and Golden Plains Civic Centre, refer to **Appendix I** for further details. These details will be advertised by both VICSES and Golden Plains Shire Council at appropriate times prior to and during an event. Back-up supplies are available through the 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 Essential Community Infrastructure. Other high priorities may include for example the protection of historical buildings.

Property may be protected by:

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

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

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

Refer to **Appendix C** for further specific details of essential infrastructure requiring protection and location of sandbag collection points.

3.12 Disruption to Services

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

3.13 Road Closures

Golden Plains Shire Council and Regional Roads Victoria will carry out their formal functions of road closures including observation and placement of warning signs, road blocks etc. to its designated local and regional roads, bridges, walking and bike trails. Golden Plains Shire Council staff should also liaise with and advise Regional Roads Victoria as to the need or advisability of erecting warning signs and / or of closing roads and bridges under its jurisdiction. Regional Roads Victoria is responsible for designated main roads and highways and councils are responsible for the designated local and regional road network.

Regional Roads Victoria and the Golden Plains Shire Council will communicate community information regarding road closures. Information will be updated on the VIC Traffic website: https://traffic.vicroads.vic.gov.au/

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

3.14 Dam Spilling/ Failure

DEECA 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.

DEECA have developed Dam Safety Emergency Plans for municipalities where it is applicable.

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

3.15 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 responsible agency for the critical sewerage asset should undertake the following:

Advise VICSES of the security of critical sewerage assets to assist preparedness and response activities in the event of flood;

Maintain or improve the security of critical sewerage assets;

Check and correct where possible the operation of critical sewerage assets in times of flood;

Advise the ICC in the event of inundation of critical sewerage assets.

It is the responsibility of the Golden Plains Shire Council Coordinator Environmental Health is to inspect and report to the MEMO and the ICC on any water quality issues relating to flooding.

The Department of Health provides public health messaging related to potable/drinking water and septic tank safety

3.16 Access to Technical Specialists

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

3.17 After Action Review (AAR)

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. AFTER: Emergency relief and recovery arrangements

4.1 General

Arrangements for recovery from a flood incident within the Golden Plains Shire is detailed in the Golden Plains Shire MEMP.

4.2 Emergency Relief

The decision to recommend the opening of an emergency relief centre sits with the IC. The IC is responsible for ensuring that relief arrangements have been considered and implemented where required under the SEMP.

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.

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

Details of the relief arrangements are available in the MEMP.

4.3 Animal Welfare

Matters relating to the welfare of livestock and companion animals (including feeding and rescue) are to be referred to DEECA

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

Matters relating to the welfare of wildlife are to be referred to DEECA

4.4 Transition from Response to Recovery

VICSES, as the Control Agency, is responsible for ensuring effective transition from response to recovery. This transition will be conducted in accordance with existing arrangements as detailed in the SEMP or location of the transition arrangements are available in the MEMP.

Appendix A: Flood threats for the Golden Plains

This Appendix provides a broad overview of flood risk within the Municipality. Detailed flood risk information for individual communities is detailed in **Appendix C.**

Stormwater and Riverine Flooding

Golden Plains Shire has towns that are subject to stormwater and riverine flooding. Shelford is subject to stormwater flooding.

Golden Plains Shire has a long history of riverine flood events. Towns impacted by riverine flooding include Inverleigh and Shelford.

Flood events within Golden Plains Shire have been frequent over the last decade. The most recent flood event was recorded in 2022, refer to table 2 of significant flood events below.

Table 2. Historic flood events.

Year	Description
October/November 2022	This flood event caused significant damage to buildings and infrastructure throughout the shire. The Barwon River was not in flood however the Leigh River was, as was a number of other creeks and rivers.
September 2016	Minor flood impacts to Inverleigh and Shelford causing access to be cut to minor and major roads.
2012	Minor flooding in the Leigh River impacting rural land and minor roads in Inverleigh and Shelford.
January 2011	This flood event caused significant damage to buildings and infrastructure in Shelford and Inverleigh. Some outbuildings were flooded over 0.5m deep in Cambridge Street, Inverleigh. The Barwon River was not in flood.
2010	Minor flooding in the Leigh River impacting rural land and minor roads in Inverleigh and Shelford.
1995	Minor flood impacts to Shelford and Inverleigh causing access to be cut to minor and major roads.
1978	Minor flood impacts to Shelford causing access to be cut to minor and major roads. The third largest flood in Inverleigh, causing significant damage to buildings and infrastructure. Flooding also occurred along the Barwon River.
1976	Very significant flood event in the Barwon River, only minor flooding in Inverleigh.
1974	Minor flooding in the Leigh River impacting rural land and minor roads in Inverleigh and Shelford.
1973	This was the largest flood event on record on the Leigh River, 185mm fell in less than 48 hours. This flood caused significant damage to buildings and infrastructure in Shelford and Inverleigh.
1965	Flooding in the Leigh River cause minor impacts, flooding the Hamilton Highway west of Inverleigh. No buildings were impacted.
1952	This was the largest flood event on record on the Barwon River and the second largest flood event in living memory in the Leigh River causing significant damage to buildings and infrastructure in Shelford and Inverleigh.

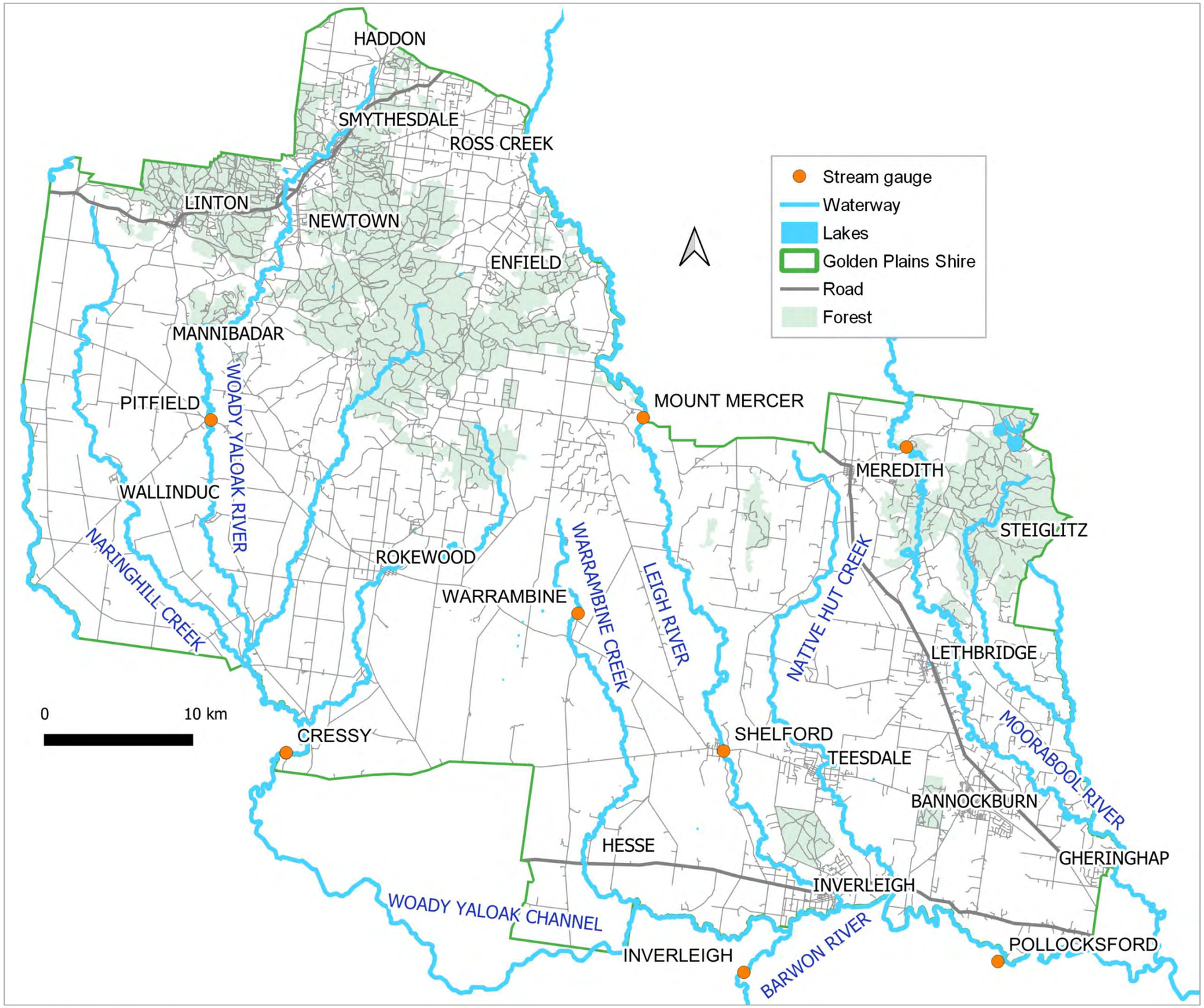

Figure 1. Golden Plains waterways.

Major Waterways

The major waterways within the Golden Plains Shire are listed in the table below.

Waterway	Description
Leigh River	The upper reaches of the Leigh River are located to the north east of Ballarat, begins as the Yarrowee River and flows south through Shelford and Inverleigh before it joins the Barwon River east of Inverleigh. The catchment area of the Leigh River upstream of Inverleigh is approximately 883 km^2. The Leigh River frequently causes flooding in Shelford and Inverleigh. There are two stream gauges along the Leigh River at Mount Mercer and Shelford that provide flood warning to Shelford and Inverleigh. Flooding can occur in Shelford 18 to 28 hours after rainfall in the upper catchment, and in Inverleigh 4 to 8 hours after the flood peak in Shelford.
Barwon River	The upper reaches of the Barwon River drains the eastern Otway Ranges surrounding Forrest, with an approximate catchment area of 1,608 km^2. Barwon River then flows through Birregurra and Winchelsea before intersecting the Leigh River east of Inverleigh. Flooding from the Barwon River is usually a result of prolonged heavy rainfall in the upper catchment in the Otway Ranges. The Barwon River frequently causes flooding in Inverleigh. There are four stream gauges along the Barwon River at Ricketts Marsh, Kildean, Winchelsea and upstream of Inverleigh that provide flood warning to Inverleigh. Flooding can occur in Inverleigh 2.5 to 3 days after rainfall in the upper Barwon River Catchment. The flood peak travel time between the Ricketts Marsh and Inverleigh gauges can range between 18 to 20 hours. In addition to receiving flows from the Leigh River, the Barwon River also receives flows from Woady Yaloak Creek and Warrambine Creek. Warrambine Creek flows into the Barwon River 13km upstream of Inverleigh.
Warrambine Creek	Warrambine Creek drains the southern slopes of Mount Mercer and flows south 56 km where is joins Barwon River. Warrambine Creek flows into the Barwon River 13 km upstream of Inverleigh. Warrambine Creek is a much smaller waterway compared to the Barwon and the Leigh Rivers. Warrambine Creek also receives diversion flows form the Woady Yaloak Diversion Channel, 19 km upstream of the Barwon River confluence. A stream gauge located along the upper Warrambine Creek, north of the Rokewood-Shelford Road provides an indication of flows, however it's not useful for flood warning.
Woady Yaloak Diversion Channel	The upper reach of Woady Yaloak Creek begins in Alfredton, the southern fringe of Ballarat. Woady Yaloak Creek then flows south through Smythesdale, Pitfield and Cressy. Woady Yaloak Creek is then diverted into Warrambine Creek via the Woady Yaloak Diversion Channel north of the Cundare Pool (north of Lake Corangamite). Flows harvested from Woady Yaloak Creek via the Woady Yaloak Diversion Channel contribute to flooding in Inverleigh. This drainage scheme was built following the 1950's floods to protect agricultural land from flooding around Lake Corangamite. The Woady Yaloak Diversion Channel has a capacity of around 490 ML/d. These flows are minor compared to the flows from the Barwon River at Inverleigh during major flood events (100-year ARI peak flow 69,900 ML/d).

Building Damages

Refer to the table below for property and building damages for flood events within the Golden Plains Shire Council. The table also provides an indication of when a Level 2 and 3 Incident Control Centre (ICC) will be required, based on the number of above floor damages.

Table 3. Golden Plains Shire Council building damages.

Average Recurrence Interval (ARI)	Total number of properties flooded (buildings flooded above floor)			Total damages for the Golden Plains Shire Council (Inverleigh Barwon River dominant was not included)
	Inverleigh (Leigh River dominant) (Appendix C1)	Inverleigh (Barwon River dominant) (Appendix C1)	Shelford * (Appendix C2)	
2	83 (0)	89 (0)	6 (0)	89 (0)
5	90 (0)	94 (0)	8 (0)	98 (0)
10	97 (0)	95 (0)	10 (0)	105 (0)
20	110 (0)	100 (0)	12 (2)	122 (0)
50	158 (0)	144 (1)	25 (10)	183 (11)
100	247 (5)	167 (2)	38 (12)	283 (17)
200	273 (33)	231 (9)	41 (15)	314 (48)
500	321 (82)	324 (133)	58 (18)	379 (100)
1000	356 (117)	371 (174)	62 (20)	418 (137)

*Estimated using flood extent mapping (DNRE 2000), Corangamite CMA Flood Response Guide and anecdotal information.

Level 2 ICC

Level 3 ICC

Dams Spill / Failure

Significant dams or lakes that influence flooding within Golden Plains Shire Council area are listed below.

Table 4. Dams and lakes that influence flooding.

Dam	Owner	Full Supply Volume	Comments
West Barwon Reservoir	Barwon Water	21,504 ML	West Barwon Reservoir is located in the Otway Ranges National Park. The catchment which feeds this Reservoir is very small, 51 km² compared with the entire catchment area upstream of Inverleigh is 2,700 km² (Water Technology 2018). Therefore, although the West Barwon Reservoir may contribute spills, it's unlikely to significantly impact flooding in the Barwon River.
Wurdee Boluc Reservoir	Barwon Water	38,100 ML	Given the Wurdiboluc Reservoir is an off-stream storage located south of Winchelsea it is unlikely to significantly impact flooding in the Barwon River.
White Swan Reservoir	Central Highlands Water	14,107 ML	During flood events on the Yarrowee River (Leigh River) the White Swan Reservoir will have very little influence on flooding downstream.
Gong Gong Reservoir	Central Highlands Water	1,909 ML	During flood events on the Yarrowee River (Leigh River) the Gong Gong Reservoir will have very little influence on flooding downstream.

West Barwon and Wurdee Boluc Reservoirs

The most significant regulated storages within the Barwon River Catchment include the West Barwon and Wurdee Boluc Reservoirs. The West Barwon Reservoir is located in the upper Barwon River Catchment within the Otways, south of Forrest, refer to the map below. The reservoir has a catchment area of 51 km² and has a capacity of 21,504 ML. When capacity of the West Barwon Reservoir is reached excess water spills via a concrete spillway to the West Barwon River, refer to photo below.

Water from West Barwon Reservoir is also diverted to Wurdee Boluc Reservoir via a concrete lined diversion channel. Water is stored at Wurdee Boluc for potable water usage for to the greater Geelong area. Given the Wurdee Boluc Reservoir is an off-stream storage, it is unlikely to significantly impact flooding in the Barwon River (Water Technology 2018).

The catchment which feeds the West Barwon Reservoir is very small, 51 km² compared with the entire catchment area upstream of Inverleigh is 2,700 km² (Water Technology 2018). Therefore, although the West Barwon Reservoir may contribute spills, it's unlikely to significantly impact flooding in the Barwon River.

Figure 2. Location of West Barwon and Wurdee Boluc Reservoirs (source Water Technology 2018)

Figure 3. West Barwon Reservoir spillway.

Levees

Levees have been constructed in Inverleigh and Shelford. The Inverleigh levee is located on the southern side of the Leigh River adjacent to the Inverleigh Tennis Courts in High Street. Two levees in Shelford are located on the eastern side of the Leigh River. Refer to Appendix C for more details regarding the location and protection level of these levees.

Appendix B: Typical flood peak travel times

Table 5. Flood peak travel times.

Location From	Location To	Typical Travel Time	Comments	Duration
Shelford (Leigh River)				
Start of rainfall (upper catchment)	Mount Mercer	4 - 6 hours	begin to rise from normal levels	2 days
Start of rainfall (upper catchment)	Mount Mercer	12 - 18 hours	to peak	
Mount Mercer	Shelford	6 - 10 hours	to peak	
Inverleigh (Leigh River)				
Start of rainfall (upper catchment)	Mount Mercer	4 - 6 hours	begin to rise from normal levels	2 days
Start of rainfall (upper catchment)	Mount Mercer	12 - 18 hours	to peak	
Mount Mercer	Inverleigh (town)	10 - 18 hours	to peak	
Inverleigh (Barwon River)				
Start of rainfall (upper catchment)	Ricketts Marsh	18 - 30 hours	begin to rise from normal levels	2 days
Start of rainfall (upper catchment)	Inverleigh (town)	2.5 - 3 days	begin to rise from normal levels	
Ricketts Marsh	Inverleigh (town)	16 - 20 hours	to peak	
Kildean gauge	Inverleigh (town)	12 - 16 hours	to peak	
Winchelsea gauge	Inverleigh (town)	8 - 12 hours	to peak	
Inverleigh (gauge)	Inverleigh (town)	3 - 5 hours	to peak	

Appendix C1: Inverleigh Flood Emergency Plan

Inverleigh is located on junction of the Barwon River and the Leigh River and has experienced extensive and frequent riverine flooding from the Barwon and Leigh Rivers. Flooding from the Barwon and Leigh Rivers can occur at different times due to the large 2,700km^2 combined catchment areas upstream of Inverleigh. Warrambine Creek is tributary of the Barwon River that contributes flows to the Barwon River 13km upstream of Inverleigh. The Barwon River catchment area comprises 46% of the total catchment area, Leigh River 32% and Warrambine Creek 22%. The catchment stretches over 130 km from the Otway Ranges in the south to Ballarat in the north, refer to the map below. Storms can impact different parts of the catchment in isolation.

The majority of Inverleigh is affected by flooding from the Leigh River. Flooding from the Leigh River usually occurs during to prolonged heavy rainfall in the upper catchment around Mount Mercer and Ballarat. Overbank flows from the Leigh River are likely to inundate parts of Inverleigh form the north. Initially flows will enter the Inverleigh via the Leigh River near the Inverleigh Tennis Courts in High Street and over Hamilton Highway. The Inverleigh Primary School is impacted by flooding during a 50-year flood, when the adjacent levee is overtopped. Large sections of Inverleigh should be evacuated during a 100-year flood event (Shelford stream gauge height of 8.44m) given flooding cuts access to a significant number of roads and 5 buildings are flooded over floor. There are two stream gauges along the Leigh River upstream of Inverleigh that provide early flood warning, these include Mount Mercer and Shelford gauges. Refer to the map below. The flood peak can occur in Inverleigh between 22 to 36 hours after rainfall in the upper catchment.

The Barwon River floods Inverleigh during larger flood events, a significant number of properties are flooded, and houses start to be flooded over floor during a 200-year event (Inverleigh gauge height greater than 6.04m). Access to major and minor roads may start to be impacted by flooding during a 20-year flood event. There are four stream gauges along the Barwon River upstream of Inverleigh that provide early flood warning, these include Ricketts Marsh, Kildean, Winchelsea and Inverleigh gauges. Refer to Barwon River Warning Time section below for a stream gauge location map. Rises in streamflow at Inverleigh can occur between 2.5 to 3 days after rainfall in the upper catchment.

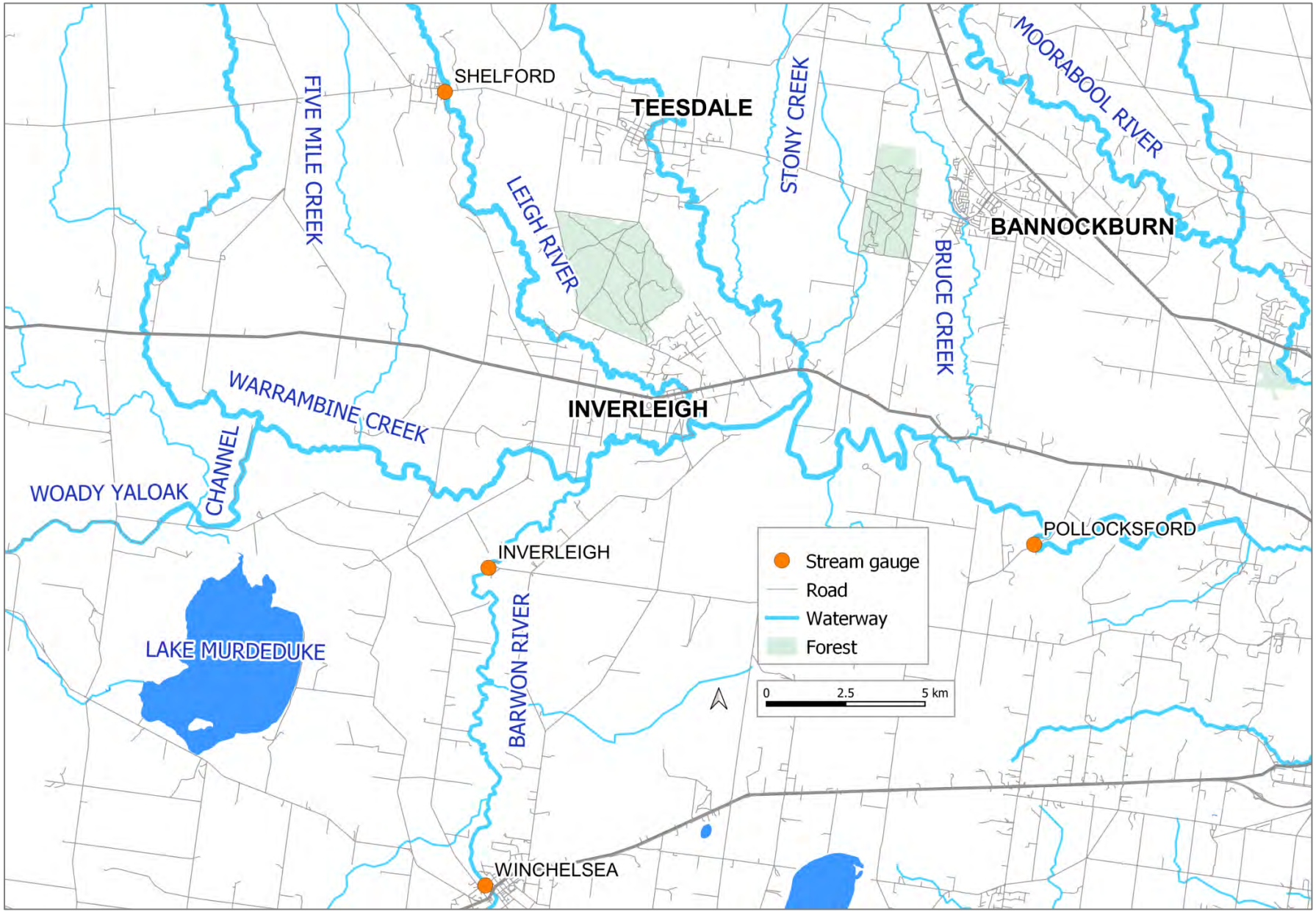

Figure 4. Waterways surrounding Inverleigh.

Historic Flood Events

Inverleigh has experienced frequent and extensive flood events, refer to the graph below. Significant flood events have occurred in 1956, 1973, 1974, 1976, 1978, 1981, 1983, 1984, 1988, 1990, 1992, 1995, 1996, 2001, 2007, 2010, 2011, 2012 and 2022. The Leigh River stream gauge at Mount Mercer was used to indicate historic flood events that have occurred in Inverleigh given there are large gaps in the Shelford stream gauge record.

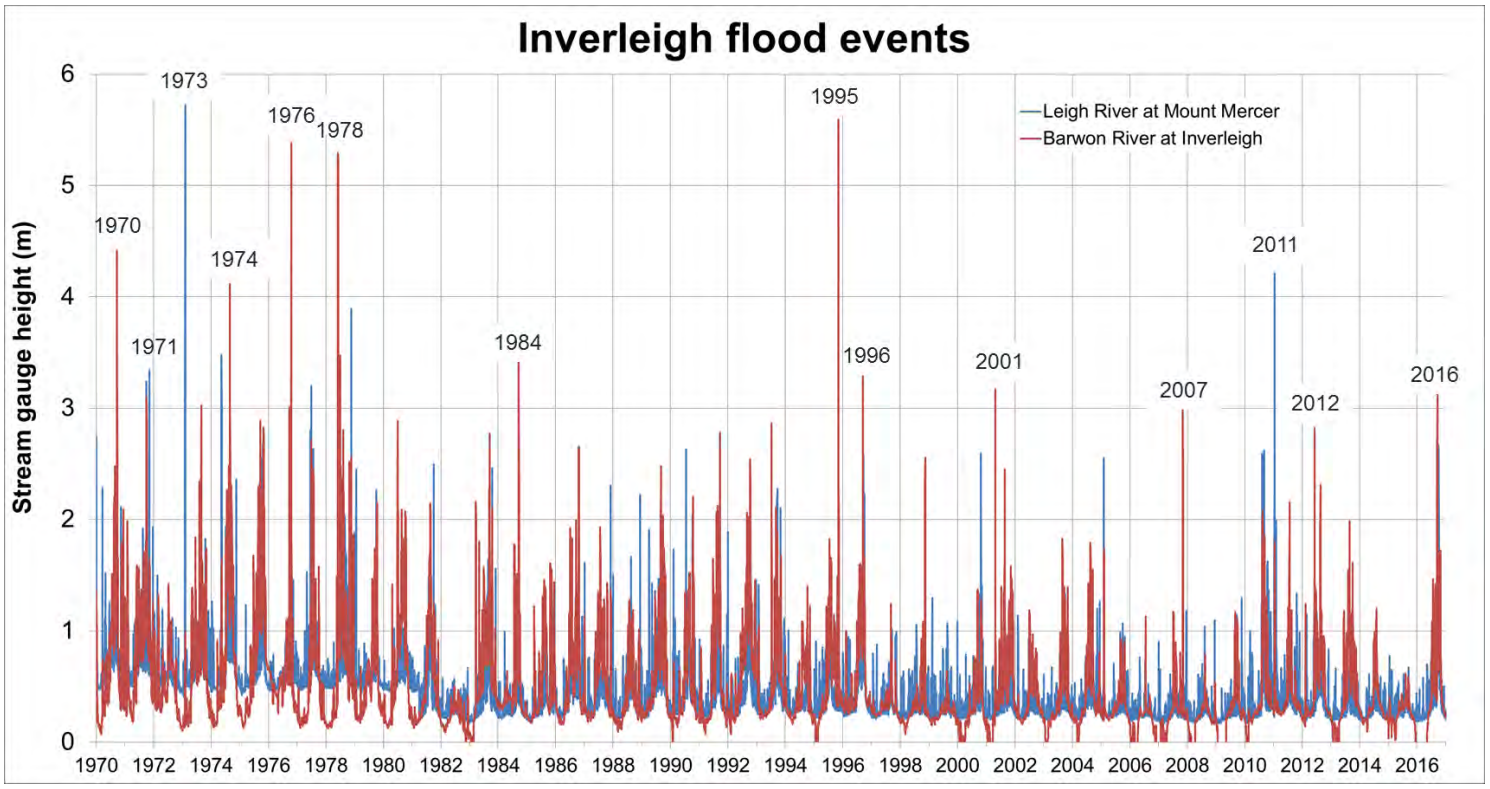

Figure 5. Inverleigh historic flood events.

The 1973 flood is Inverleigh's largest flood event on record, estimated to be between a 100- and 200-year ARI event. Significant rainfall over two days in the upper Leigh River catchment exceeded 200mm. The Mount Mercer gauge recorded 206mm and Ballarat Botanical Gardens 205.5mm. Rainfall totals for the Barwon River catchment were around half of the totals recorded in the Leigh River, with 121mm recorded at Winchelsea.

Peak flow rates recoded of four main waterways that contributed to flooding in Inverleigh include; Leigh River at Shelford 44,000 ML/d, Warrambine River at Warrambine 5,200 ML/d, Barwon River at Inverleigh 600 ML/d, and Woady Yaloak Channel at 7-mile Weir 360 ML/d. Flow rates for the Leigh River and Warrambine Creek were the highest on record with only minor flows in the Barwon River, refer to the graph below.

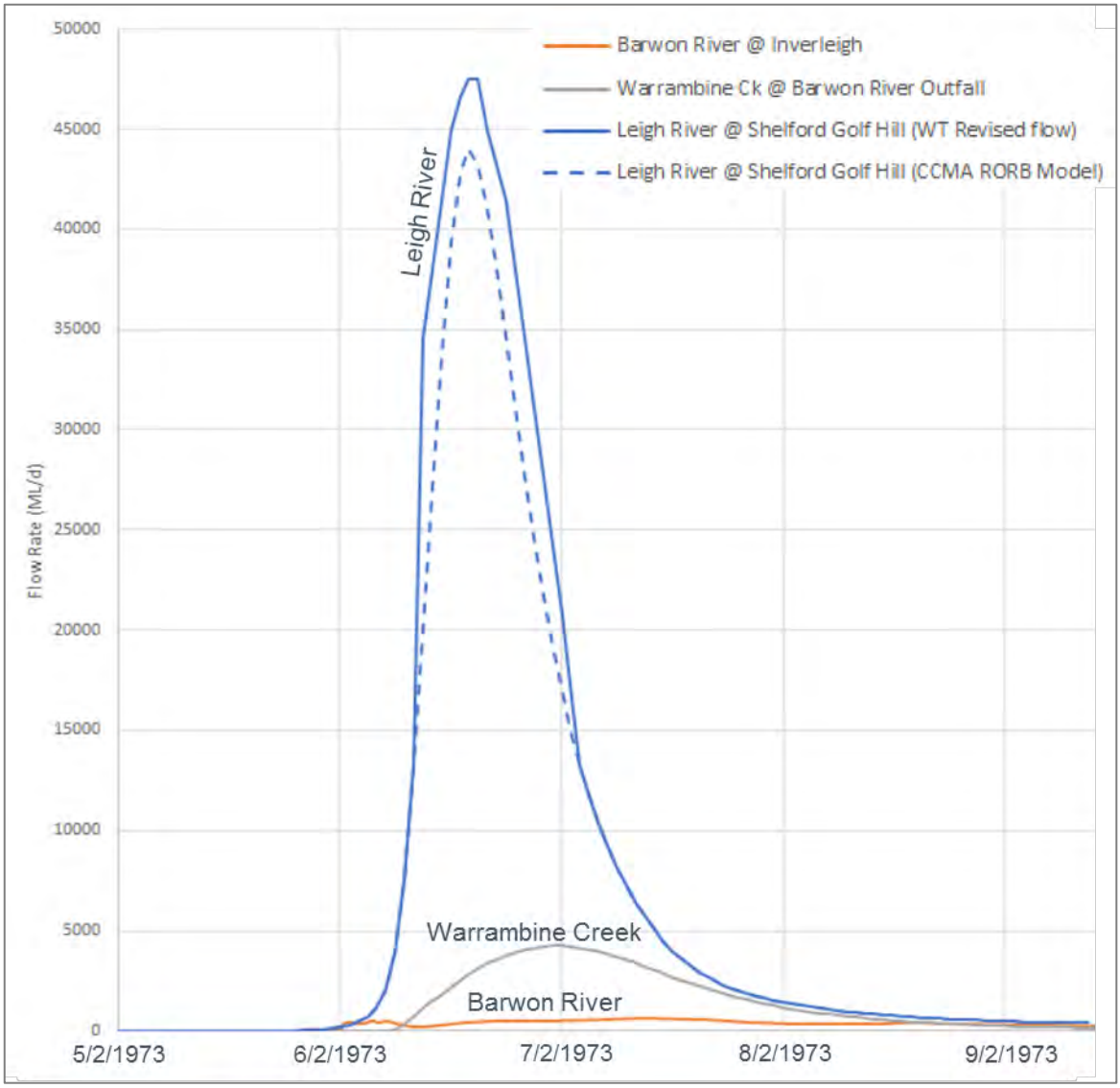

Figure 6. Waterways peak streamflow contributing to flooding in Inverleigh during the 1973 flood event.

This flood event caused considerable damage to buildings, roads, and bridges. 60 buildings were impacted by flooding, including the Inverleigh School, Inverleigh Hotel, and the Inverleigh Petrol Station. Deep flooding impacted a significant number of properties in Inverleigh's main shopping area. 'The Sun' newspaper described flooding at the General Store with 0.6m of flooding running through it. Access was cut to the Hamilton Highway in addition to streets surrounding High Street, Mercer Street and Dundas Street. Refer to the flood photos below.

For more details refer to the Inverleigh Flood Intelligence Cards below pages 51-52.

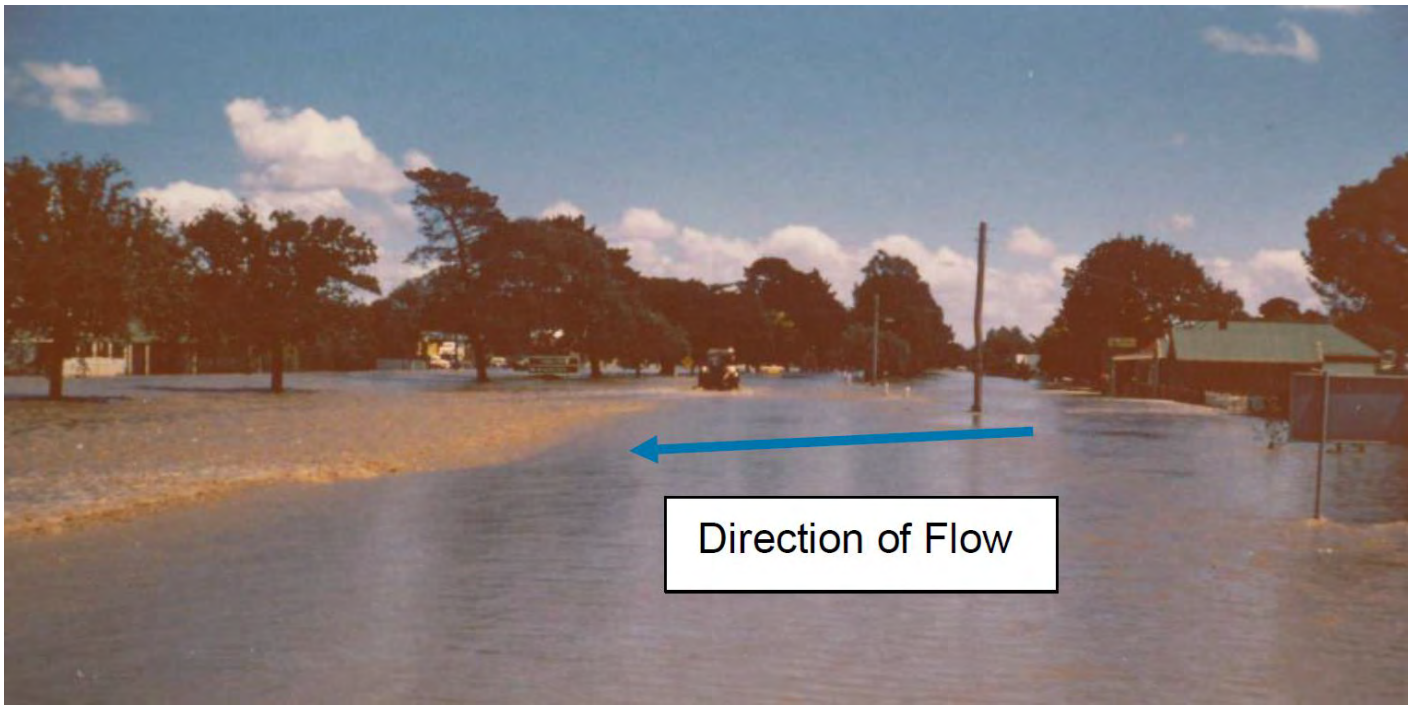

Figure 7. Flooding in High Street (Hamilton Highway) during the 1973 flood event (Water Technology 2018).

Figure 8. Flooding surrounding a house in Dundas Street, Inverleigh during the 1973 flood event.

Figure 9. Flooding impacting the Inverleigh Service Station, 19 High Street during the 1973 flood event.

Figure 10. Flooding impacting a house in Napier Street, Inverleigh during the 1952 flood event.

Figure 11. Flooding impacting the Inverleigh Hotel, 1 High Street during the 1952 flood event.

Figure 12. Flooding southeast of Inverleigh during the 1995 flood event.

Figure 13. Flooding impacting the Hamilton Highway, looking east towards Inverleigh during the 2011 flood event.

Flood Behaviour

The likelihood of the Barwon River and Leigh River flood event peaking in Inverleigh at the same time is extremely unlikely. An analysis of the timing of flood peaks for the Barwon and Leigh Rivers showed that there was little correlation between these waterways, historically flooding of these waterways have not occurred at the same time (Water Technology 2018).

For the final design flood mapping, two events were simulated for each of the ARI design events. A Leigh River dominant flood event and Barwon River dominant flood event. A summary of the design flow rates for the three waterways and the adopted combination of flows for each design event is shown in the tables below.

Inverleigh Flood Intelligence Cards, building damages maps and asset impact maps have been developed for both a Leigh River dominant flood event and a Barwon River dominant flood event. Refer to tables and maps below.

Table 6.Adopted peak flows for design events (Water Technology 2018).

Design Event (ARI)	Barwon River at Inverleigh (ML/d)	Leigh River at Shelford (ML/d)	Warrambine Ck (US of Barwon River) (ML/d)
2	6,700	2,300	2,000
5	13,900	6,200	4,100
10	21,400	10,600	6,100
20	31,500	16,600	9,100
50	50,200	27,800	13,600
100	69,900	39,000	18,200
200	95,900	54,250	23,000
500	143,200	80,400	30,100
1000	192,100	106,300	39,700
Probable Maximum Flood	915,000	740,000	686,000

Table 7.Concurrent flow combinations used for the design event maps (Water Technology 2018).

Design Event on Dominant River	Leigh River Dominant Flood		Barwon River Dominant Flood	
	Probability of concurrent flow for minor tributaries		Probability of concurrent flow for minor tributaries	
	Barwon River	Warrambine Ck	Leigh River	Warrambine Ck
1000	2%	0.2%	1%	1%
500	5%	0.5%	2%	2%
200	10%	0.77%	3.28%	3.28%
100	20%	1.31%	5%	5%
50	28.35%	2.15%	6.89%	6.89%
20	50%	5%	13.31%	13.31%
10	50%	10%	22.12%	22.12%
5	50%	20%	22.12%	22.12%
2	50%	50%	50%	50%

Influence of the Woady Yaloak Diversion Channel

Warrambine Creek is tributary of the Barwon River that contributes flows to the Barwon River upstream of Inverleigh. Warrambine Creek also receives additional flows form the Woady Yaloak Diversion Channel, 13-14km upstream of where the Warrambine Creek flows into the Barwon River. This drainage scheme was build following the 1950's floods to protect agricultural land from flooding around Lake Corangamite. Flows are diverted into the Woady Yaloak Diversion Channel near Cressy before flows enter Lake Corangamite.

The Woady Yaloak Diversion Channel has a capacity of around 490 ML/d. These flows are minor compared to the flows from the Barwon River at Winchelsea during major flood events. An assessment was undertaken of the impact of additional 500 ML/d to the Warrambine Creek inflow for the 10 year and 100-year ARI shows a minimal increase in flood levels.

Inverleigh Levee

An existing earthen levee has been constructed along the Leigh River floodplain adjacent to the Inverleigh Tennis Courts in High Street to protect the Inverleigh Primary School. Refer to the location map below. The protection level of this levee is only up to a 20-year flood event, the levee is overtopped during a 50-year flood event.

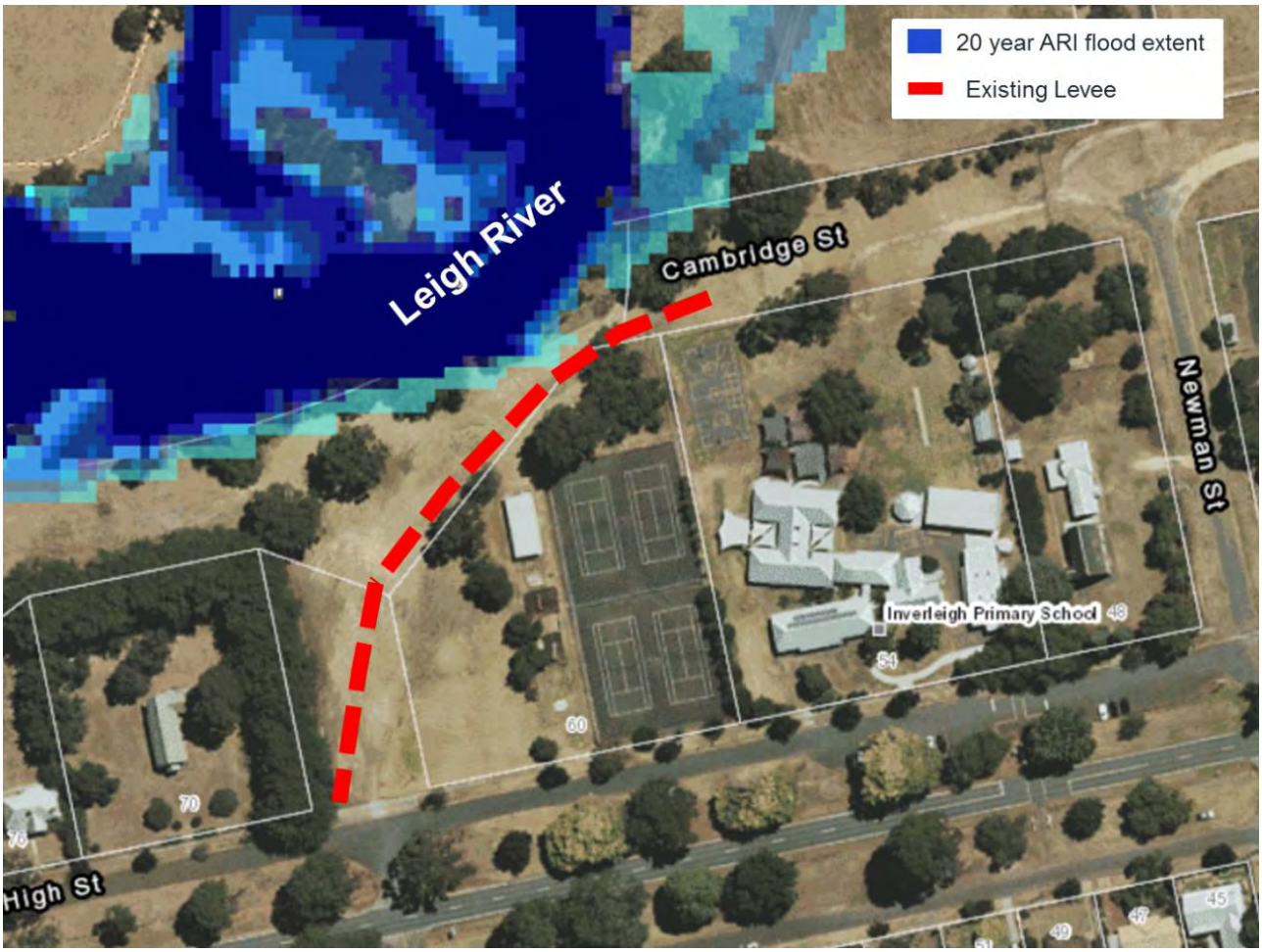

Figure 14. Inverleigh levee.

Two structural mitigation options were assessed to reduce flood impacts in Inverleigh as part of the 2018 Inverleigh Flood Investigation (Water Technology 2018). Flood mitigation option 1 involved increasing the height

of the existing levee to above the 100-year ARI (with 300mm freeboard). Refer to the map below for the proposed location of the levee.

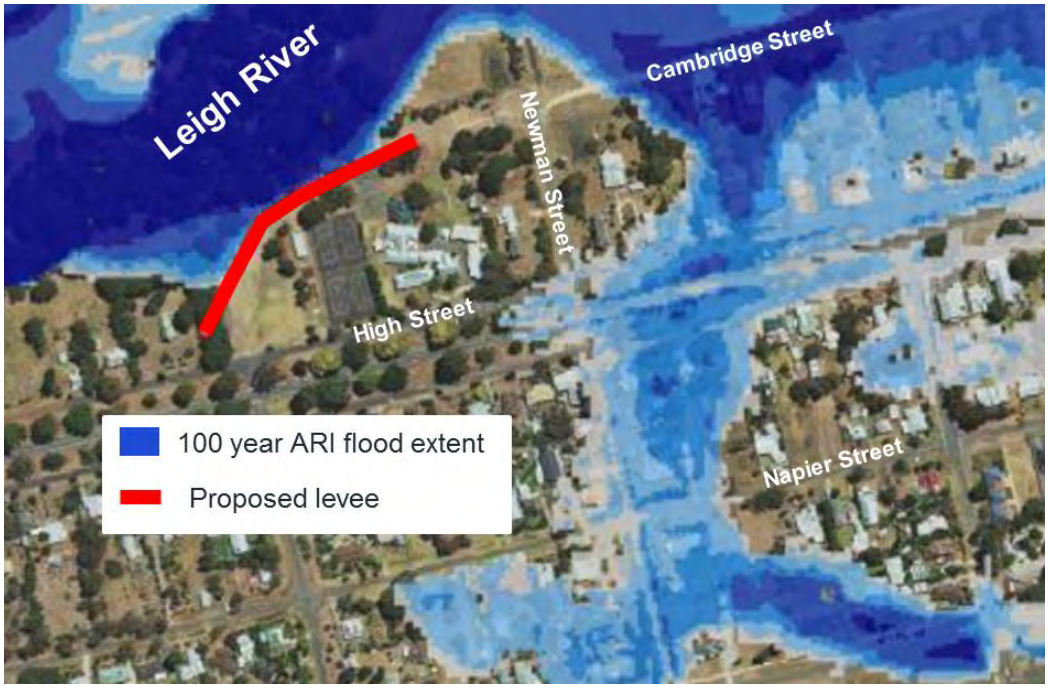

Figure 15. Location of the proposed levee for flood mitigation option 1 (Water Technology 2018).

This mitigation option reduces above floor flooding to 25 buildings and removes 19 parcels of land from the 100-year flood extent. Refer to the map below showing the changes to flood levels as a result of raising the existing levee. This results in a reduction of flood levels (pink and green) with minimal increase in flood levels (yellow orange).

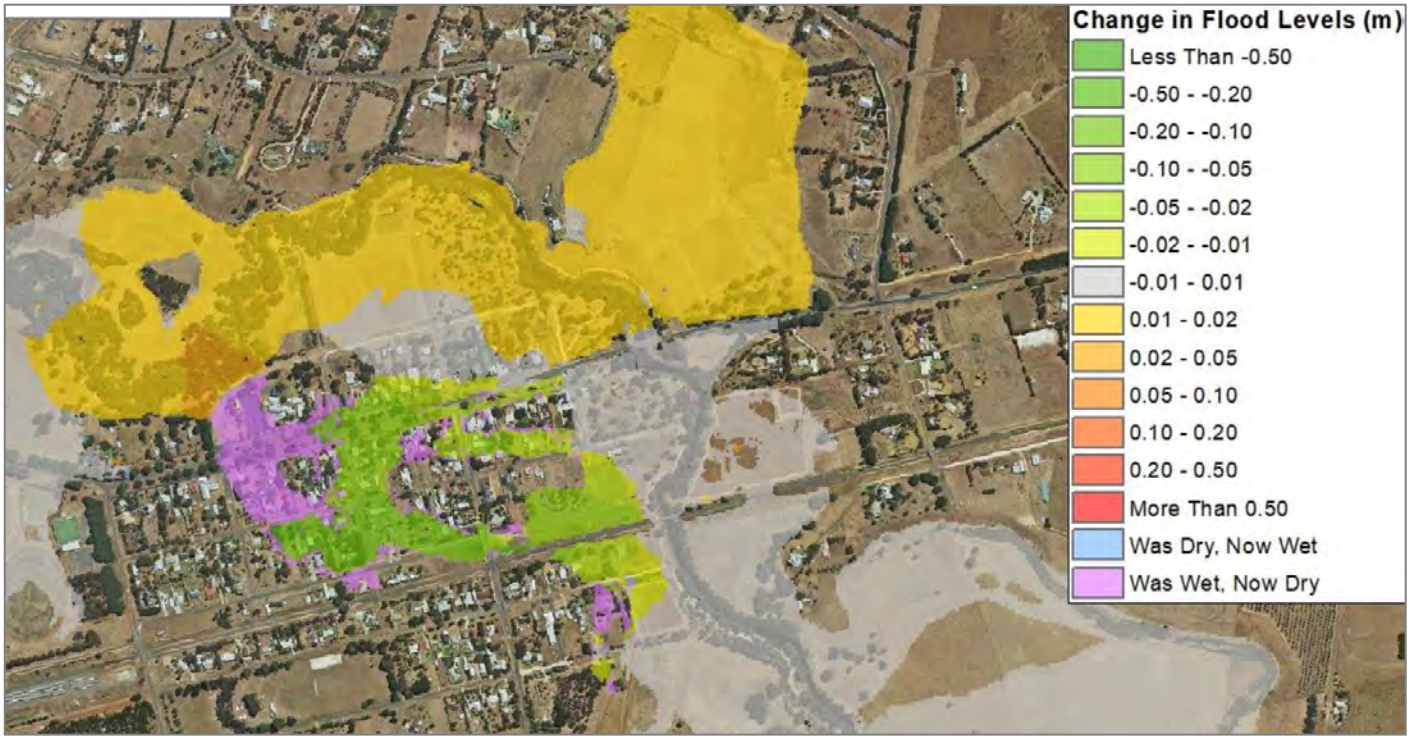

Figure 16. Changes to flood levels for flood mitigation option 1, raising the existing levee (Water Technology 2018).

Flood mitigation option 2 involved increasing the existing levee to above the 100-year ARI level (with 300mm freeboard) and extending the levee east following Cambridge Street to the Hamilton Highway Bridge. Refer to the map below for the proposed location of the levee.

Figure 17. Location of the proposed levee for flood mitigation option 1 (Water Technology 2018).

This mitigation option reduces above floor flooding to 25 buildings and removes 45 parcels of land from the 100-year flood extent. Refer to the map below showing the changes to flood levels as a result of raising the existing levee. This results in a reduction of flood levels (pink and green) with small increase in flood levels (yellow orange). There is an increase in flood levels to 11 parcels showing an increase in flood levels between 0.10-0.20 m, 23 parcels showing an increase of between 0.05- 01.0 m and 32 parcels showing an increase of between 0.02 -0.05 m. These properties are nearly all located north of Cambridge Street. This does not result in the inundation of any properties that were not already inundated, nor does it result in any floor levels being exceeded. There are 6 cases whereby properties that were already inundated above floor level will feature greater magnitude of inundation (1 building at 10cm, 3 at 2cm increase and 2 with a 1 cm increase).

In 2023, Golden Plains Shire Council, together with CMA, have begun community consultation and functional design of Option 1.

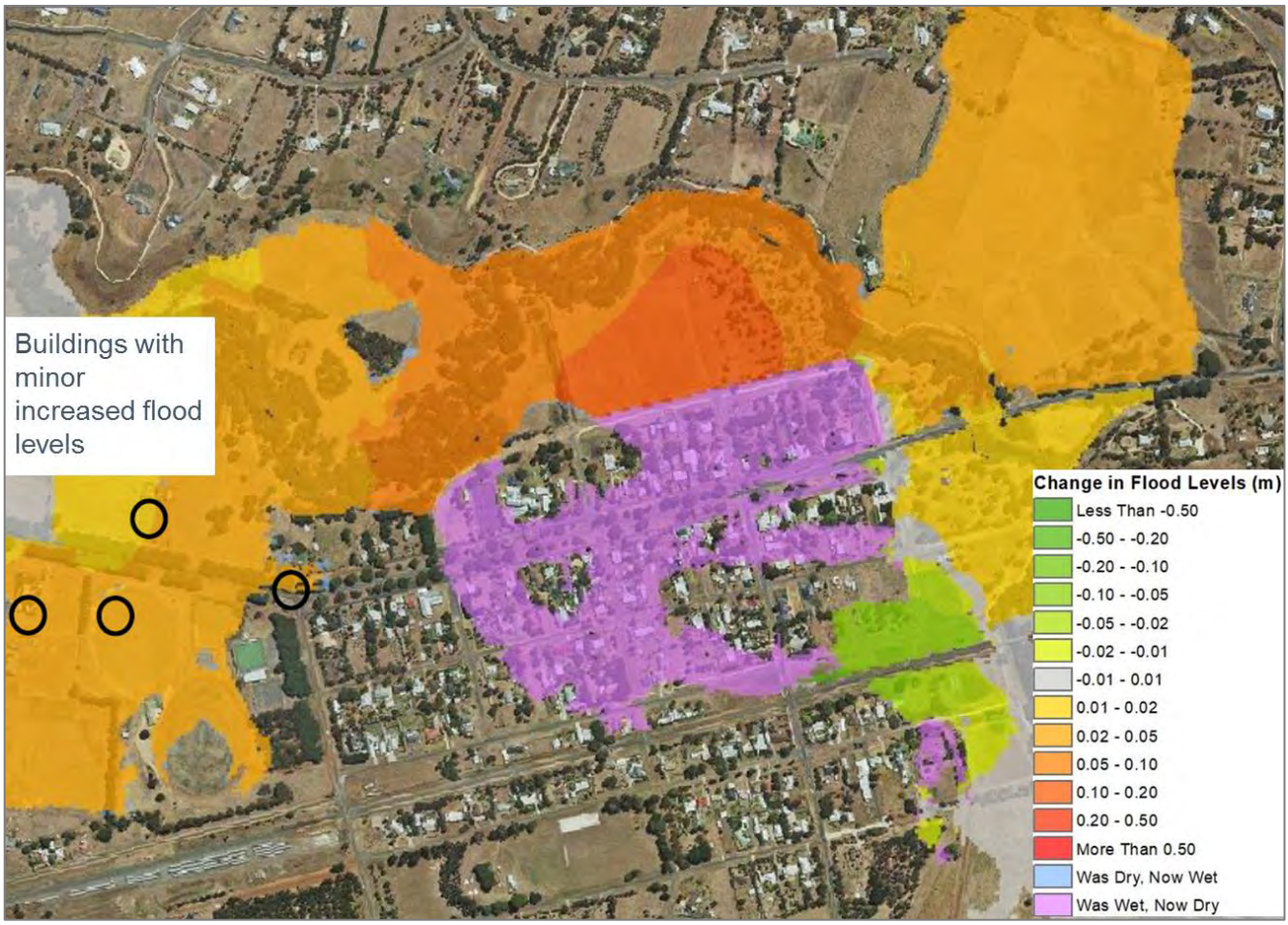

Figure 18. Changes to flood levels for flood mitigation option 2, raising and extending the existing levee (Water Technology 2018).

Leigh River Warning Time

There are two stream gauges along the Leigh River upstream of Inverleigh that provide early flood warning, these include Mount Mercer and Shelford gauges. The time between heavy rainfall in the upper catchment around Ballarat and rise in streamflow at the Mount Mercer gauge is between 4 to 6 hours. The Mount Mercer gauge is expected to peak between 12 to 18 hours after the start of heavy rainfall. The peak travel time between Mount Mercer and the Shelford gauges is approximately between 6 to 10 hours.

The tables and graphs below show there is only a few hours difference in travel time for a small flood event, during 2016 flood (13,685 ML/d) and a large flood event, 100-year ARI (39,000 ML/d). Refer to tables and graphs below for historic and design flood peak travel times.

Table 8. Leigh River flood peak travel times.

Flood event	Mount Mercer gauge peak	Shelford gauge peak	Travel Time (hours)	Inverleigh (modelled) peak	Travel Time (hours)
100-year ARI	5:00	11.30	6.5	16:30	5
September 2016	14/9/2016 11:30	14/9/2016 18:45	7.25	15/9/2016 2:00	7.25

Table 9. Summary of leigh River flood peak travel times.

Streamflow Gauge	Distance to Inverleigh (km)	Travel time (hours)
Leigh River at Mt Mercer	40	10-18
Leigh River at Shelford	14	4-8

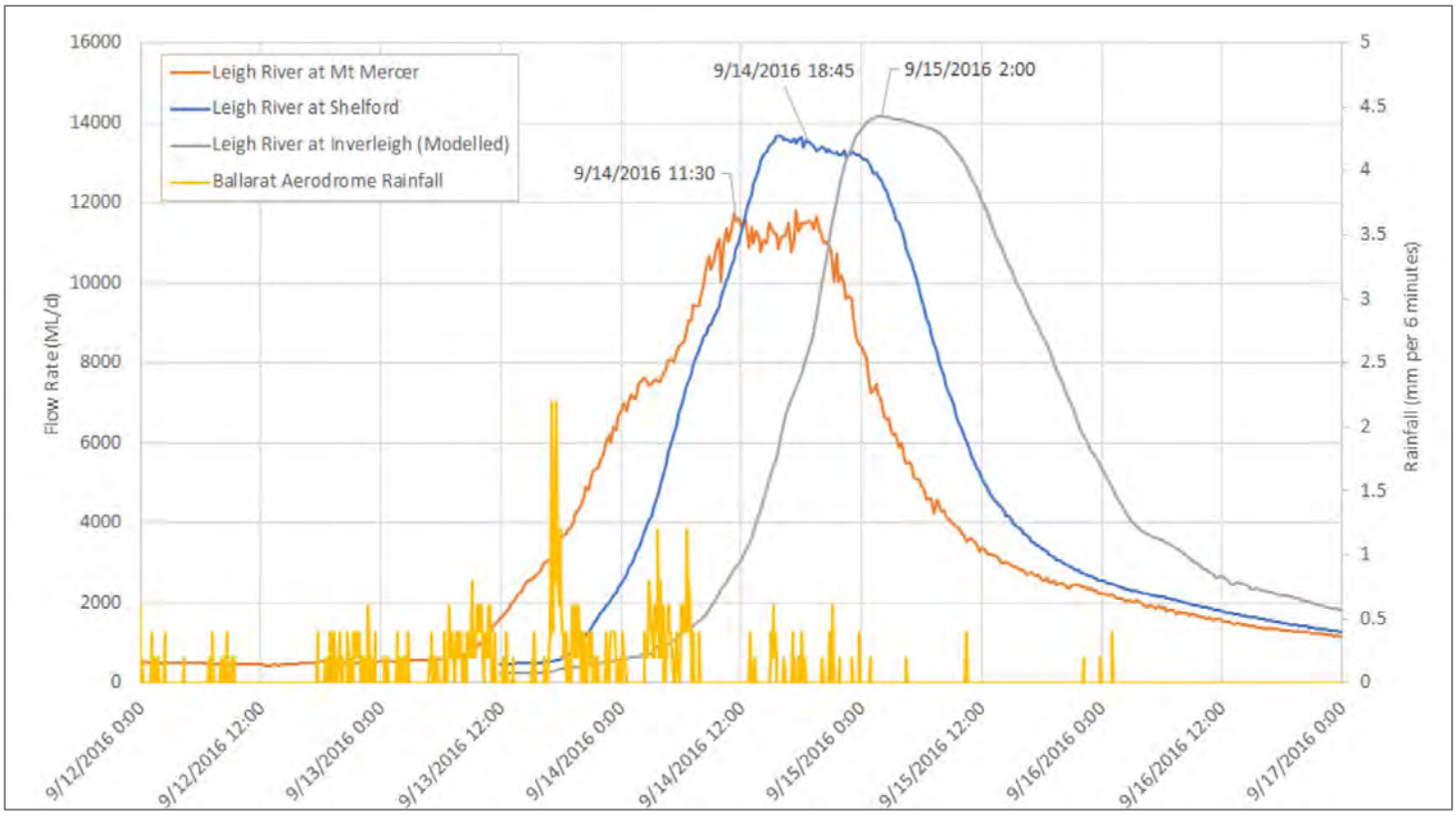

Figure 19. Peak flows in the Leigh River during the September 2016 flood event (Water Technology 2018).

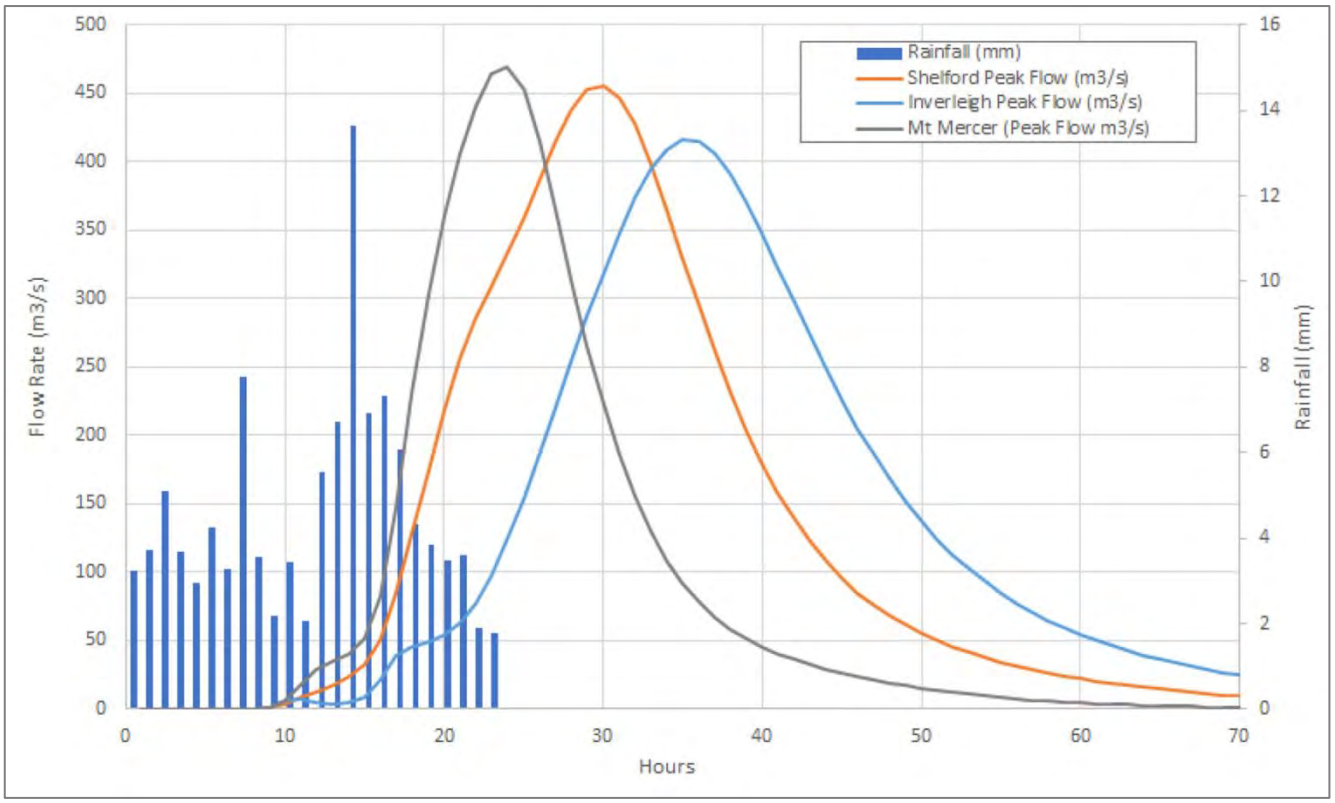

Figure 20. Peak flows in the Leigh River during a 100-year design flood event (Water Technology 2018).

A gauge board has been installed along the Leigh River at Inverleigh, on the upstream (northern) side of the Hamilton Highway. Refer to the map below. This gauge board can be used to undertake flood observations during flood events. Regularly measuring the flood level at this gauge board can be used to track the flood peak along the Leigh River and determine the flood magnitude in Inverleigh. Refer to the Inverleigh Flood Intelligence Card (Leigh River) for the relationship between the gauge board height and flood magnitude.

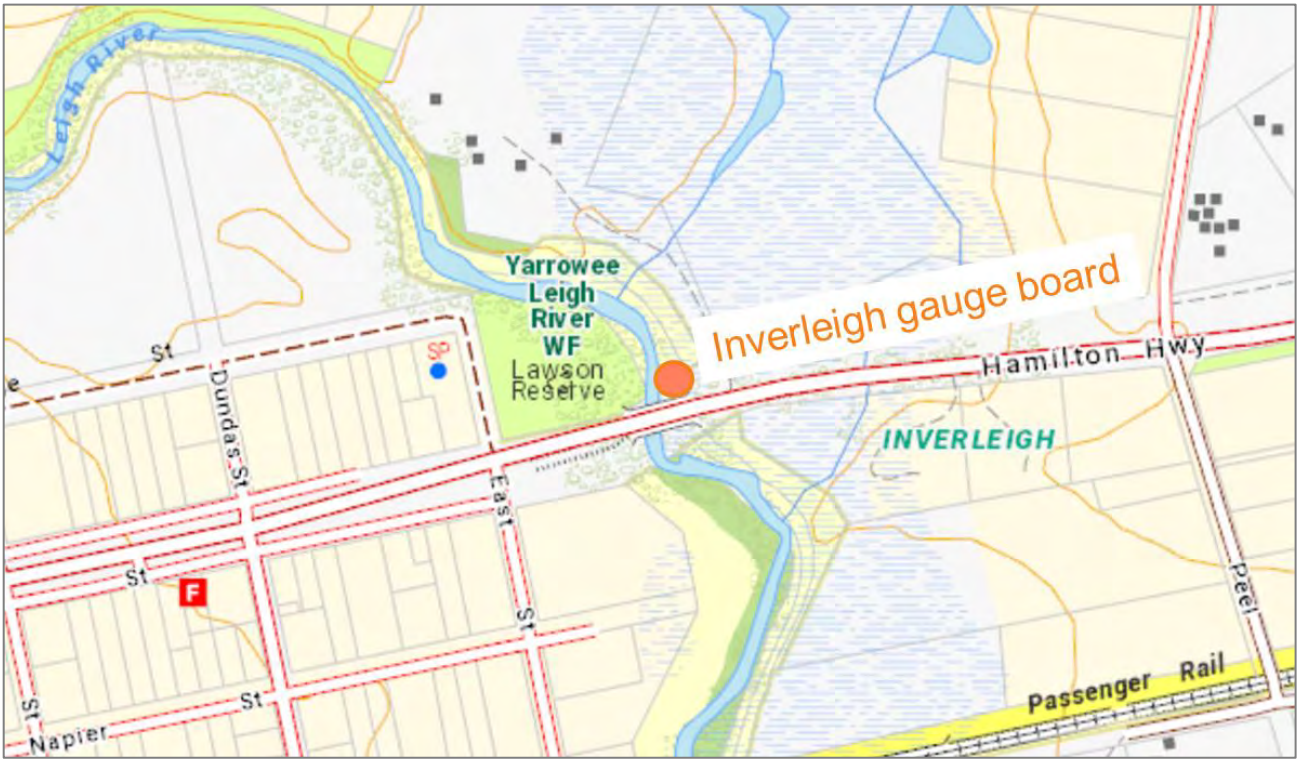

Figure 21. Inverleigh gauge board location.

Barwon River Warning Time

There are four gauges along the Barwon River upstream of Inverleigh that provide early flood warning, these include Ricketts Marsh, Kildean, Winchelsea and Inverleigh gauges. Refer to the map below.

The travel time of historic flood events can be used to provide an indication of expected travel time, refer to the table and graph below.

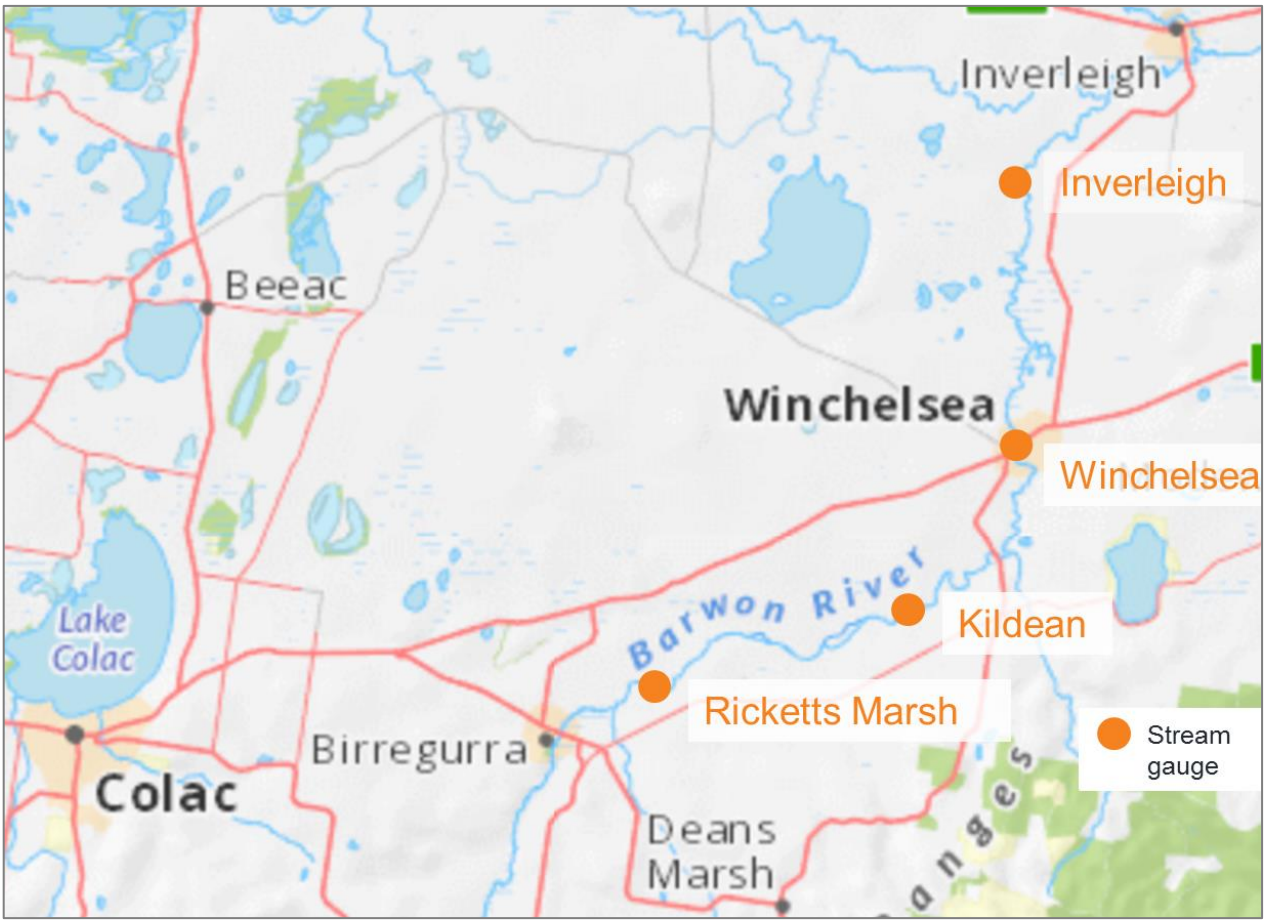

Figure 22. Barwon River stream gauges upstream of Inverleigh.

The Ricketts Marsh stream gauge provides early warning of flooding on the Barwon River. Streamflow rises at Ricketts Marsh can occur between 18-30 hours after the start of heavy rainfall. Rises in streamflow can occur in Inverleigh between 2.5 to 3 days after rainfall. This is largely dependent on the duration of the storm and antecedent conditions of the catchment (saturation). Refer to the table below for flood peak travel times between upstream gauges and Inverleigh. It is important to note that larger floods travel time will be shorter. During the large flood event in 1995, the travel time between Ricketts Marsh and Inverleigh was 18 hours, refer to the graph below.

Table 10. Summary of Barwon River flood peak travel times.

Flood event	Distance to Inverleigh (km)	Travel time (hours)
Barwon River at Ricketts Marsh	45	16-20
Barwon River at Kildean	35	12-16
Barwon River at Winchelsea	25	8-12
Barwon River at Inverleigh	10	3-5

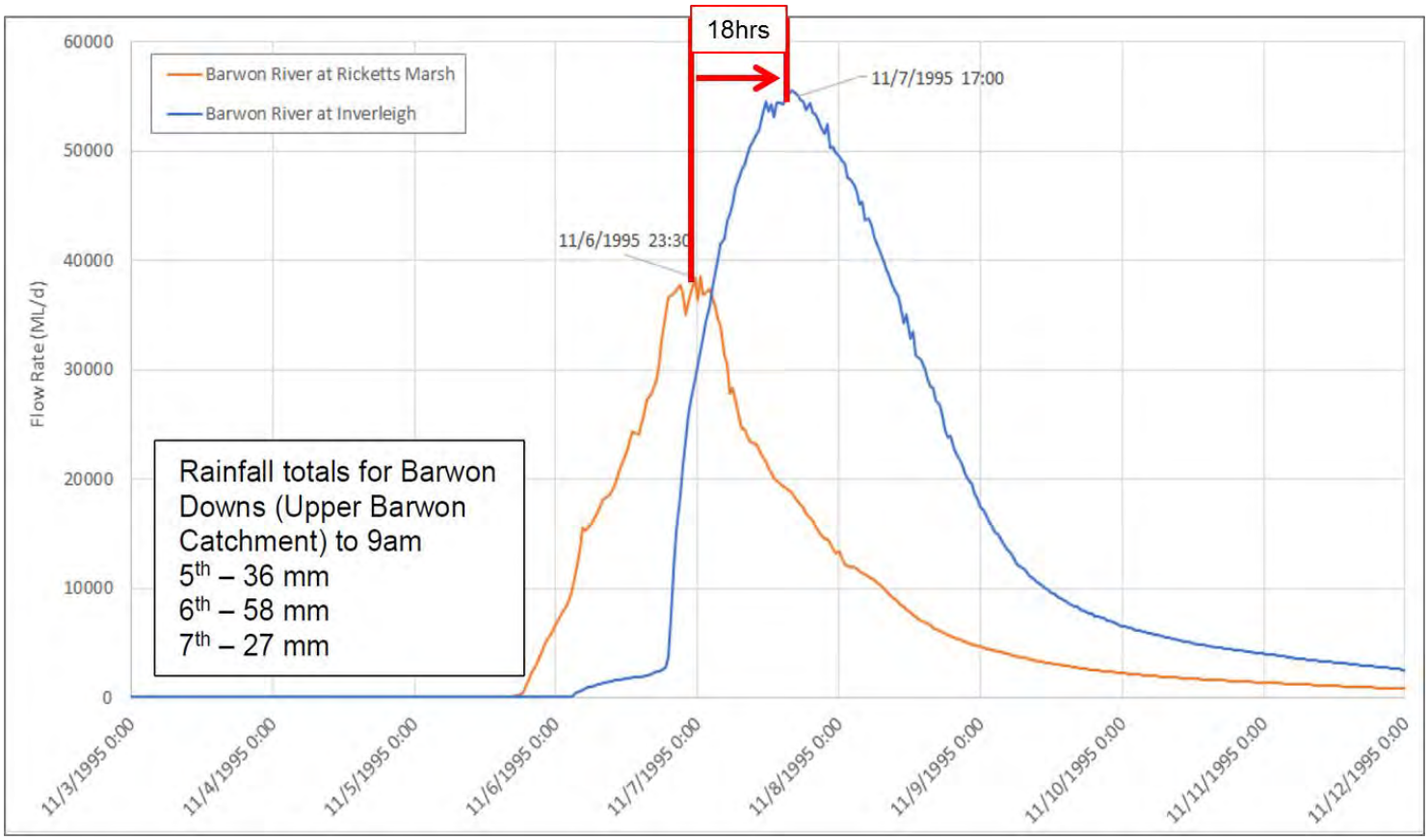

Figure 23. Barwon River flows during the 1995 flood event (Water Technology 2018).

Flood Impacts and Actions Required

Key assets at risk of flooding in Inverleigh from a Leigh River dominant flood are listed in the table below.

Table 11. Key assets at risk of flooding (Leigh River dominant).

Asset register				
Asset Name and location	**Average Recurrence Interval (ARI)**	**Consequence / Impact**	**Mitigation/ Action**	**Lead Agency**
Dawber Road, west of Inverleigh.	20-year flood	Flooding may cut access to Dawber Road during a 20-year flood event, depth 0.29m.	Deploy road closure signs as needed.	Council
Hamilton Highway, west of Inverleigh adjacent to Dawber Road.	50-year flood	Flooding may cut access to the Hamilton Highway during a 50-year flood event, depth 0.50m.	Deploy road closure signs and undertake traffic management as needed.	Regional Roads Victoria
Cambridge Street, Inverleigh.	50-year flood	Flooding may cut access to the Cambridge Street during a 50-year flood event, depth 0.43m.	Evacuate all Cambridge Street buildings that have access cut.	Victoria Police
High Street, Inverleigh.	50-year flood	Flooding may impact High Street in a 50-year flood, depth 0.12m. Access may be cut in a 100-year flood event, flood depth 0.37m.	Evacuate all buildings within Inverleigh along High Street, Napier Street, Dundas Street, and others where access may be cut to buildings during a 100-year flood event.	Victoria Police
Inverleigh Railway Line	100-year flood	The Inverleigh Railway Line starts to be impacted during a 100-year flood event, depth 0.16m. Flooding is very deep in a 200-year flood, depth 0.54m	Request ARTC to close the Inverleigh Railway Line during a 100-year flood event.	ARTC
Inverleigh-Winchelsea Road, south of Inverleigh.	100-year flood	Flooding overtops the Inverleigh-Winchelsea Road in a 100-year flood, depth 0.16m. Access is cut in a 200-year flood, depth 0.88m.	Close the Inverleigh-Winchelsea Road during a 100-year flood event due to potential risk to life when flood levels rise.	Regional Roads Victoria
x5 buildings are flooded over floor in High Street and Cambridge Street, Inverleigh.	100-year flood	X5 buildings are flooded over floor in High Street and Cambridge Street. Refer to building damages map below for the locations.	Sandbag buildings and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh Primary School, 54 High Street, Inverleigh.	100-year flood	Flooding starts to impact the Inverleigh Primary School grounds during a 100-year flood event. Buildings start to be flooded over floor during a 200-year flood.	Notify the School of flooding impacting their school grounds.	VICSES
Inverleigh Presbyterian Church (48 High Street) and St Pauls Church (38 High Street), Inverleigh.	100-year flood	Flooding starts to impact the Inverleigh Presbyterian Church and St Pauls Church during a 100-year flood event. Buildings are flooded over floor during a 500-year flood.	Sandbag buildings and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh General Store and Post Office, 12 High Street, Inverleigh.	100-year flood	Flooding starts to impact the Inverleigh General Store and Post Office during a 100-year flood event. Building is flooded over floor during a 500-year flood.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh Hotel, 1 High Street, Inverleigh.	100-year flood	Flooding starts to impact the Inverleigh Hotel during a 100-year flood event. Building is flooded over floor during a 200-year flood.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh Petrol Station 19 High Street, Inverleigh.	100-year flood	Flooding starts to impact the Inverleigh Petrol Station during a 100-year flood event. Building is flooded over floor during a 200-year flood.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police

Inverleigh Kindergarten, 23 Mercer Street, Inverleigh.	100-year flood	Flooding starts to impact the Inverleigh Kindergarten grounds during a 100-year flood event. Buildings start to be flooded over floor during a 500-year flood.	Notify the Inverleigh Kindergarten of flooding impacting their grounds.	VICSES
Inverleigh Police Station, 90 High Street, Inverleigh.	100-year flood	Flooding starts to impact the Inverleigh Police Station during a 100-year flood event. Building is flooded over floor during a 1000-year flood.	Notify the Police of flooding impacting their Station.	VICSES
Inverleigh CFA Station, 27 High Street, Inverleigh.	100-year flood	Flooding starts to impact the Inverleigh CFA Station during a 100-year flood event. Building is flooded over floor during a 500-year flood.	Notify the Inverleigh CFA Station of flooding impact.	VICSES
Inverleigh RSL, 63 High Street, Inverleigh.	100-year flood	Flooding starts to impact the Inverleigh RSL during a 100-year flood event. Building is flooded over floor during a 200-year flood.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh Recreation Reserve, Inverleigh.	100-year flood	Flooding starts to impact the Inverleigh Recreation Reserve ovals during a 100-year flood event. Building is flooded over floor during a 500-year flood.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh Hall, 71 High Street, Inverleigh.	500-year flood	Flooding starts to impact the Inverleigh Hall during a 500-year flood event. There is no flooding over floor.	None needed	VICSES Victoria Police

Flooding from the Barwon River impacts roads and over floor building damages during larger flood magnitudes compared to flooding from the Leigh River. For example access is cut to the Hamilton Highway by Leigh River flooding during a 50-year event, and by the Barwon River during a 200-year event. Key assets at risk of flooding in Inverleigh from a Barwon River dominant flood are listed in the table below.

Table 12. Key assets at risk of flooding (Barwon River dominant).

Asset register				
Asset Name and location	**Average Recurrence Interval (ARI)**	**Consequence / Impact**	**Mitigation/ Action**	**Lead Agency**
Inverleigh-Winchelsea Road, south of Inverleigh.	20-year flood	Flooding may overtop the Inverleigh-Winchelsea Road in a 20-year flood, depth 0.15m. Access may be cut in a 50-year flood, depth 0.94m.	Close the Inverleigh-Winchelsea Road during a 20-year flood event due to potential risk to life when flood levels rise.	Regional Roads Victoria
Dawber Road, west of Inverleigh.	50-year flood	Flooding may impact Dawber Road in a 50-year flood, depth 0.10m. Access may be cut in a 100-year flood event, flood depth 0.26m.	Deploy road closure signs as needed.	Council
Hamilton Highway, east and west of the Leigh River, Inverleigh	100-year flood	Flooding may overtop the Hamilton Highway in a 100-year flood, depth 0.10m. Access may be cut in a 200-year flood event, flood depth 0.40m.	Deploy road closure signs and undertake traffic management as needed.	Regional Roads Victoria
Cambridge Street, Inverleigh.	100-year flood	Flooding may overtop Cambridge Street during a 100-year flood, depth 0.15m. Access may be cut in a 200-year flood event, flood depth 0.97m.	Evacuate all Cambridge Street buildings that have access cut.	Victoria Police
A house at 23 Weatherboard Road, on corner of River Road, Inverleigh.	100-year flood	A house at may be flooded over floor at 23 Weatherboard Road during a 100-year flood.	Sandbag buildings and undertake evacuations as needed.	VICSES Victoria Police
High Street, Inverleigh.	200-year flood	Flooding may cut access to High Street in a 200-year flood, depth 0.40m.	Evacuate all buildings within Inverleigh along High Street, Napier Street, Dundas Street, and others where access may be cut to buildings during a 200-year flood event.	Victoria Police
X7 buildings are flooded over floor in High Street, Napier Street and Cambridge Street, Inverleigh.	200-year flood	X7 buildings are flooded over floor in High Street, Napier Street and Cambridge Street. Refer to building damages map below for the locations.	Sandbag buildings and undertake evacuations as needed.	VICSES Victoria Police

Inverleigh General Store and Post Office, 12 High Street, Inverleigh.	200-year flood	Flooding starts to impact the Inverleigh General Store and Post Office during a 200-year flood event. Building may be flooded over floor during a 500-year flood.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh Hotel, 1 High Street, Inverleigh.	200-year flood	The Inverleigh Hotel may be flooded over floor during a 200-year flood event.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh Petrol Station 19 High Street, Inverleigh.	200-year flood	Flooding starts to impact the Inverleigh Petrol Station during a 200-year flood event. Building may be flooded over floor during a 500-year flood.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh Kindergarten, 23 Mercer Street, Inverleigh.	200-year flood	Flooding starts to impact the Inverleigh Kindergarten grounds during a 200-year flood event. Buildings start to be flooded over floor during a 500-year flood.	Notify the Inverleigh Kindergarten of flooding impacting their grounds.	VICSES
Inverleigh RSL, 63 High Street, Inverleigh.	200-year flood	Flooding starts to impact the Inverleigh RSL during a 200-year flood event. Building may be flooded over floor during a 500-year flood.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh CFA Station, 27 High Street, Inverleigh.	500-year flood	The Inverleigh CFA Station may be flooded over floor during a 500-year flood event.	Notify the Inverleigh CFA Station of flooding impact.	VICSES
Inverleigh Railway Line	500-year flood	Flooding may significantly impact the Inverleigh Railway Line in a 500-year flood, depth 0.85m	Request ARTC to close the Inverleigh Railway Line during a 100-year flood event.	ARTC
Inverleigh Recreation Reserve, Inverleigh.	500-year flood	The Recreation Reserve Clubroom may be flooded over floor during a 1000-year flood event.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh Primary School, 54 High Street, Inverleigh.	500-year flood	Buildings at the Inverleigh Primary School are flooded over floor during a 500-year flood event.	Notify the School of flooding impacting their school grounds.	VICSES
Inverleigh Presbyterian Church (48 High Street) and St Pauls Church (38 High Street), Inverleigh.	500-year flood	Buildings at the Inverleigh Presbyterian Church and St Pauls Church may be flooded over floor during a 500-year flood.	Sandbag buildings and undertake evacuations as needed.	VICSES Victoria Police
Inverleigh Police Station, 90 High Street, Inverleigh.	1000-year flood	The Inverleigh Police Station may be flooded over floor during a 1000-year flood event.	Notify the Police of flooding impacting their Station.	VICSES
Inverleigh Hall, 71 High Street, Inverleigh.	1000-year flood	The Inverleigh Hall may be flooded over floor during a 1000-year flood event.	Sandbag buildings and undertake evacuations as needed.	VICSES Victoria Police

For more detailed information regarding buildings and roads impacted refer to the Inverleigh Flood Intelligence Cards and flood impact maps below. Also refer to the Inverleigh flood depth maps in **Appendix F,** a list of flood observers in **Appendix H** and community sandbag collection point in **Appendix I**

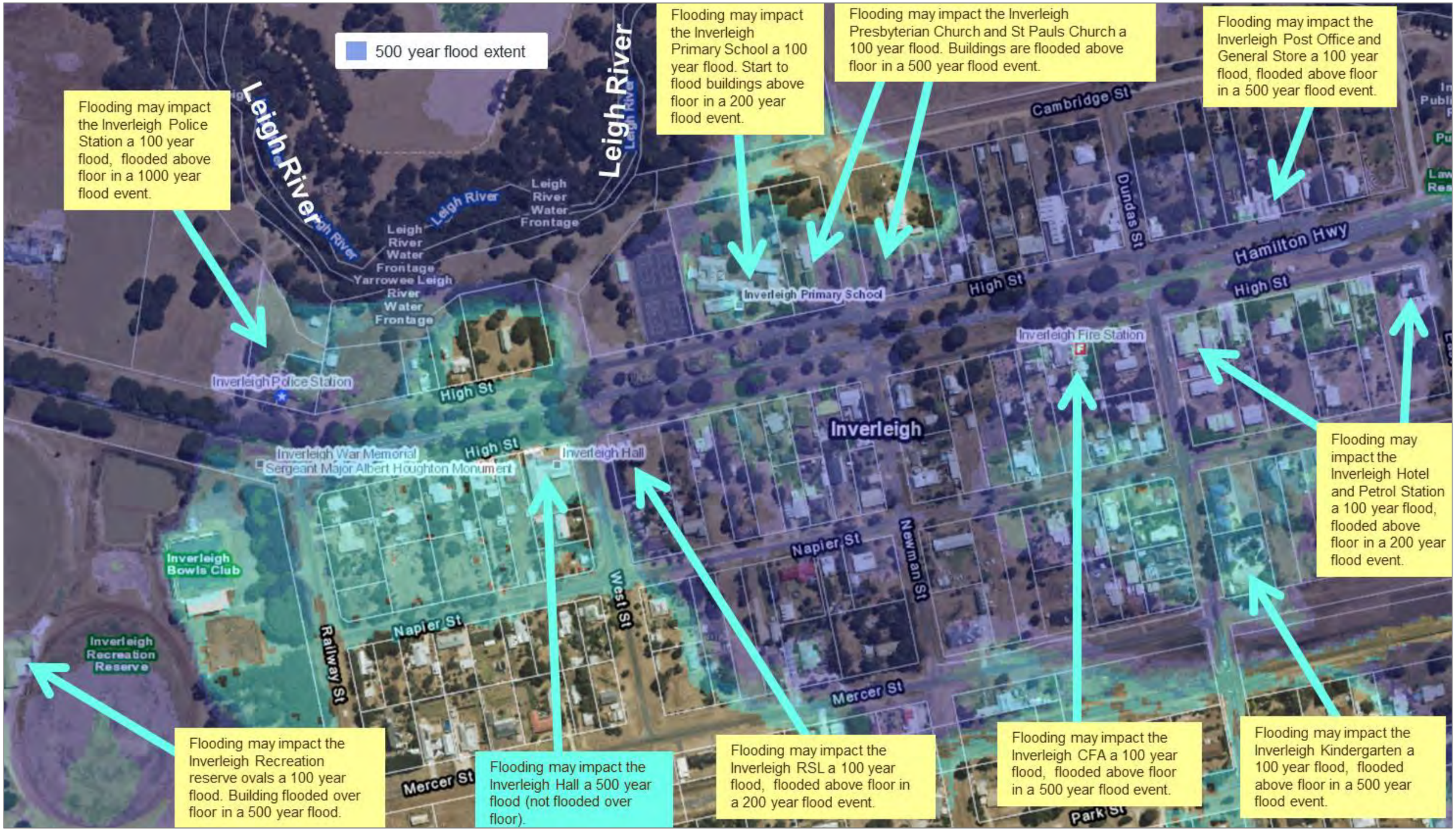

Figure 24. Inverleigh assets impacted by flooding over the 500-year flood extent (Leigh River dominant flood).

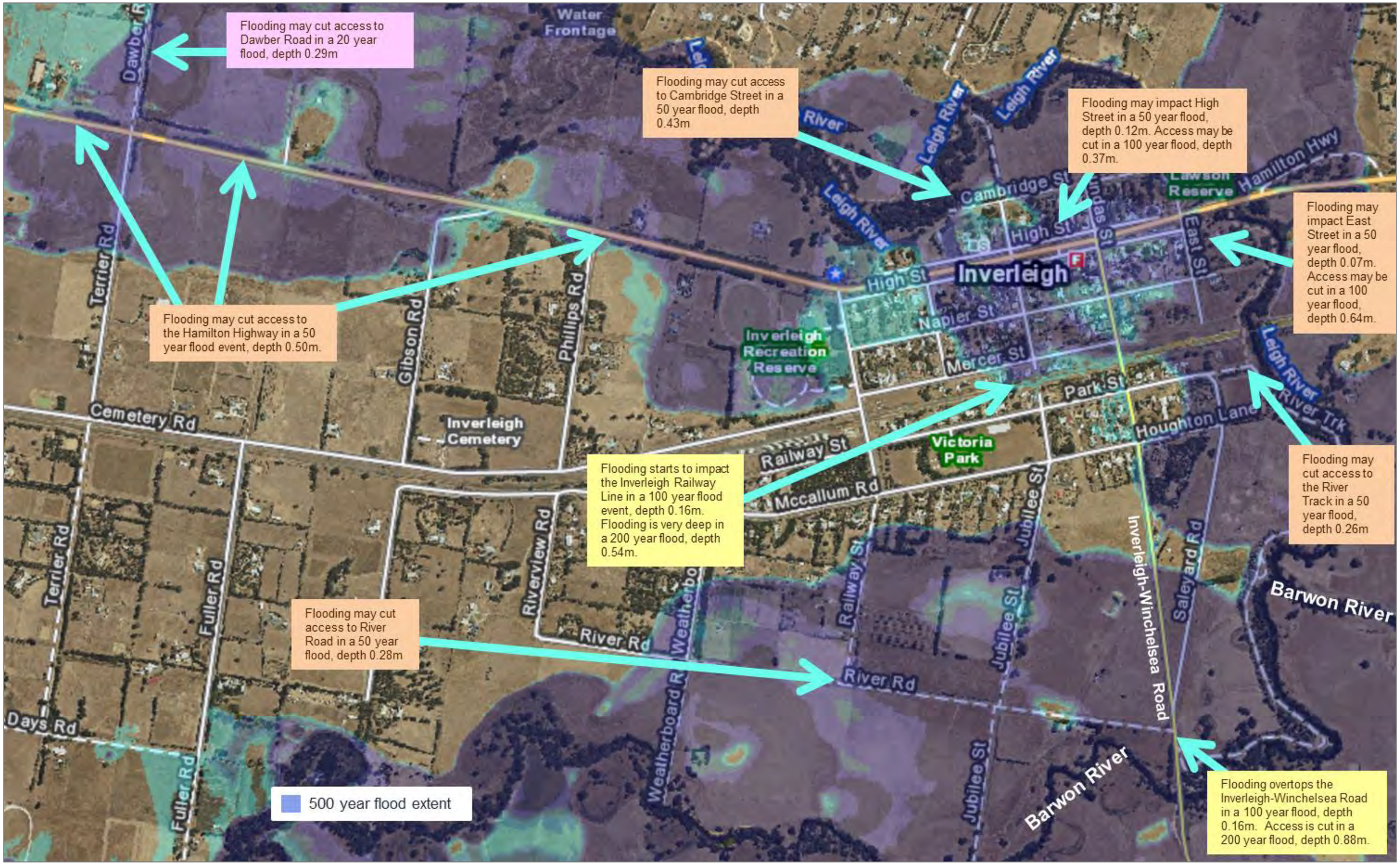

Figure 25. Inverleigh roads impacted by flooding with the 500-year flood extent (Leigh River dominant flood).

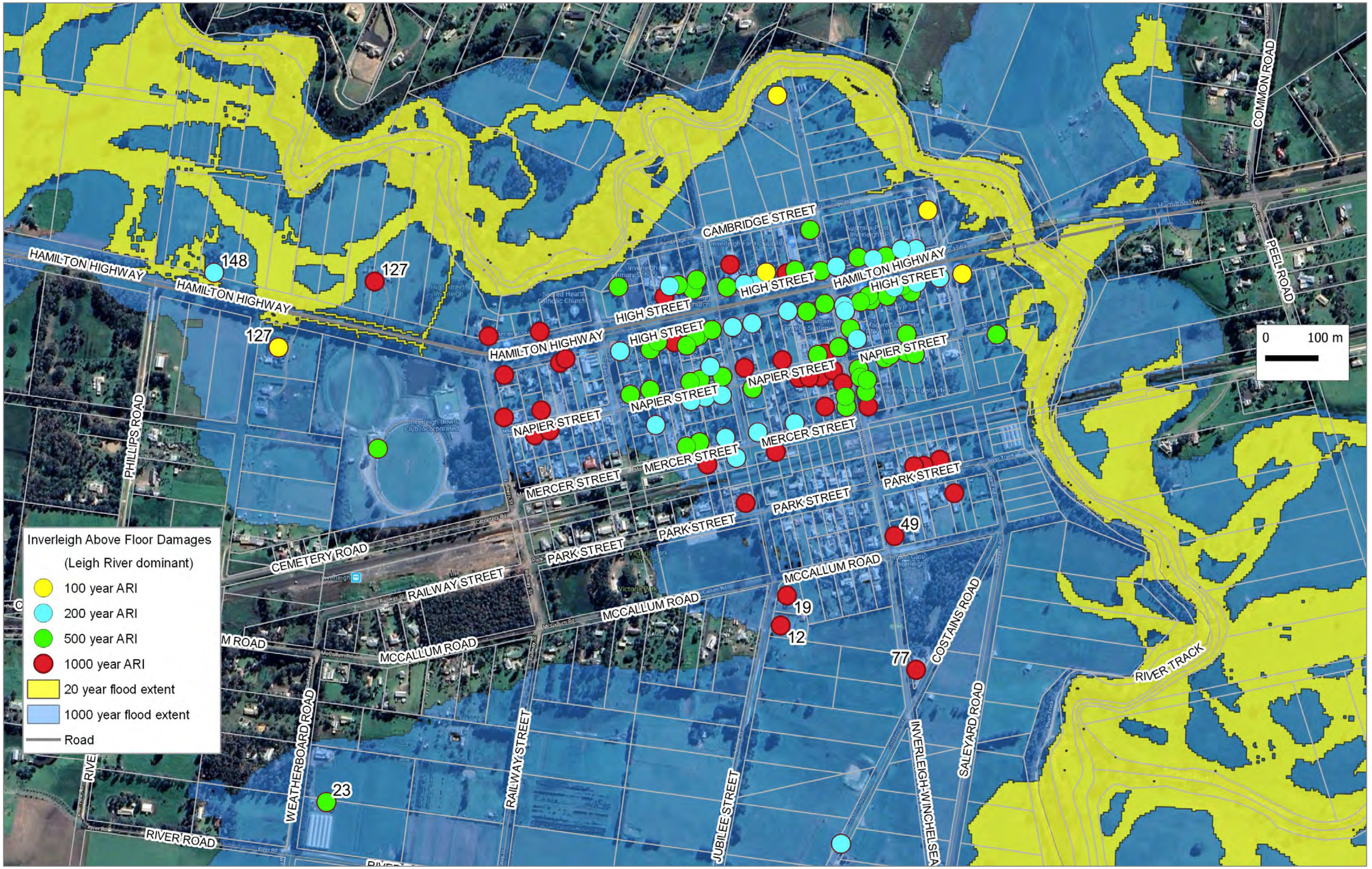

Figure 26. Inverleigh above floor damages over a range of design flood events for a Leigh River dominant flood (Water Technology 2018).

Figure 27. Inverleigh above floor damages over a range of design flood events for a Leigh River dominant flood (Water Technology 2018).

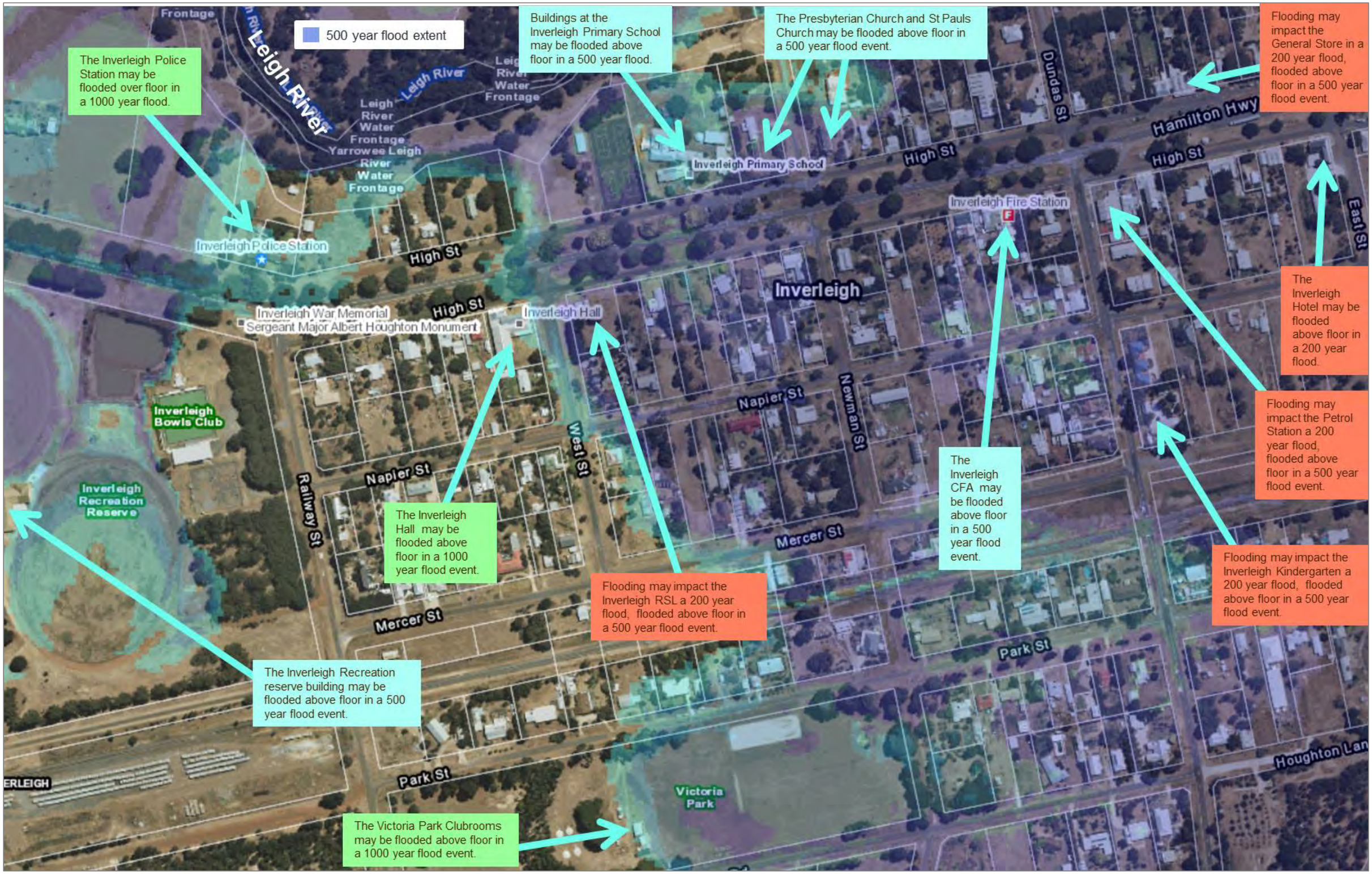

Figure 28. Inverleigh assets impacted by flooding over the 500-year flood extent (Barwon River dominant flood).

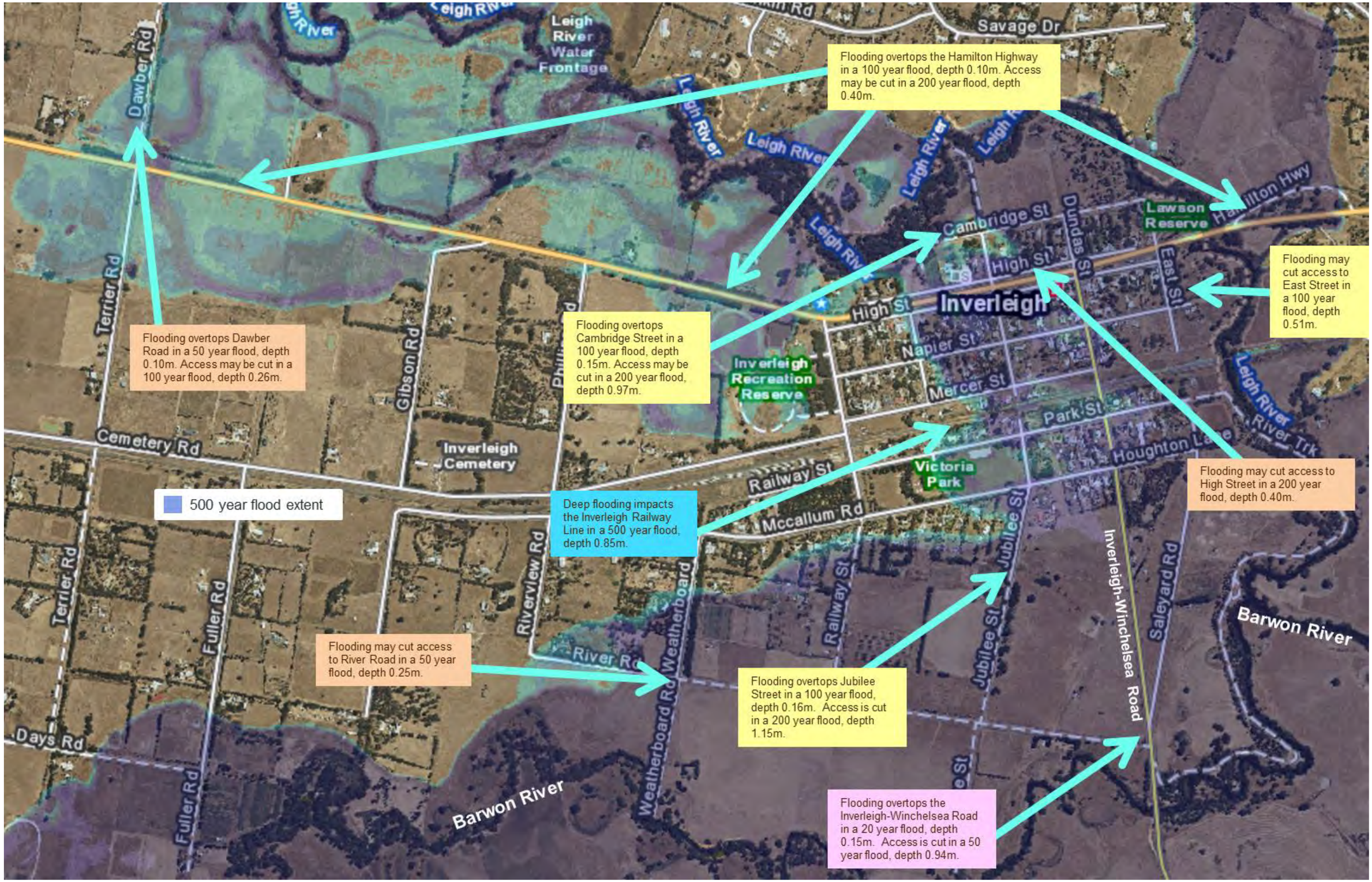

Figure 29. Inverleigh roads impacted by flooding with the 500-year flood extent (Barwon River dominant flood).

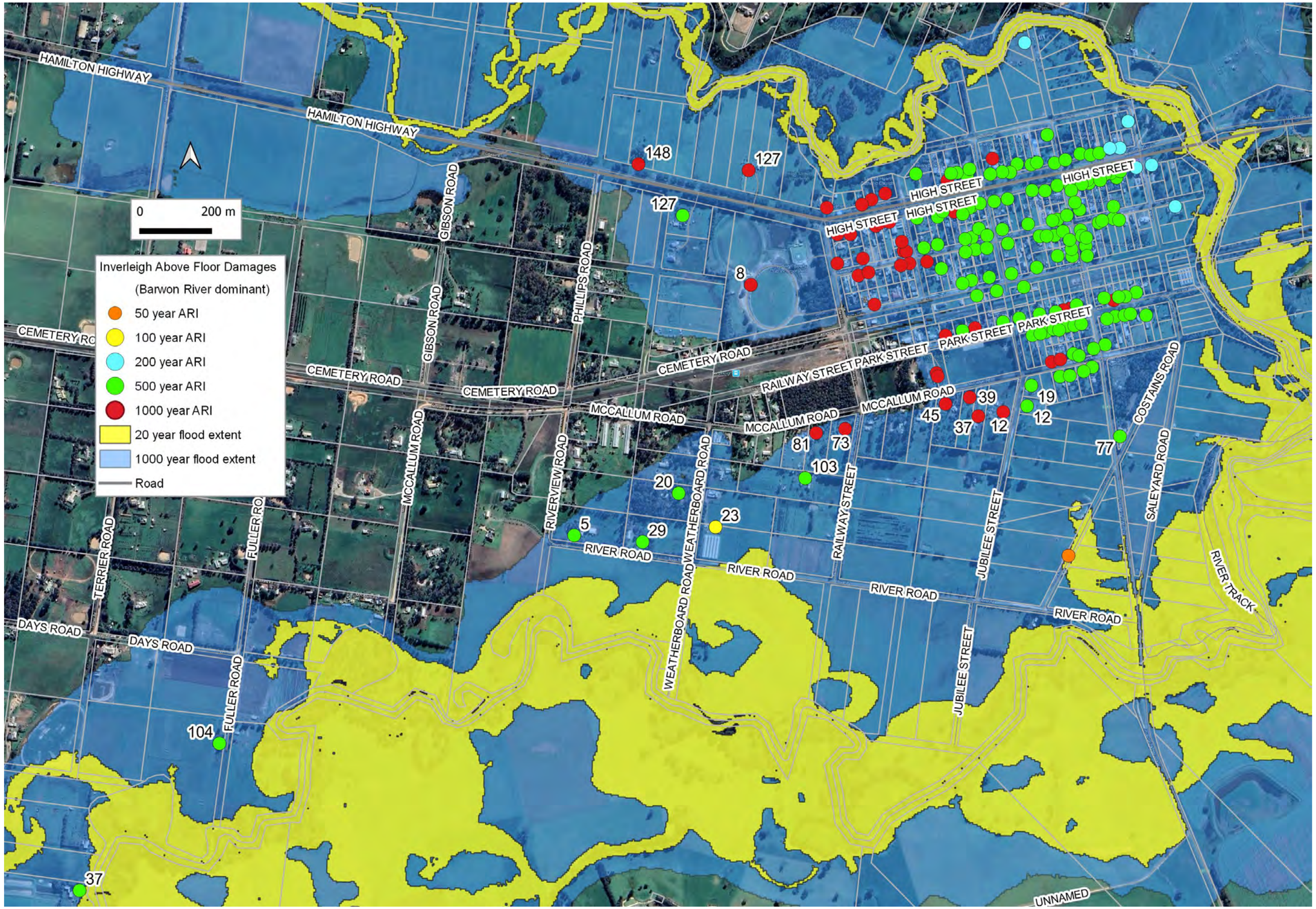

Figure 30. Inverleigh above floor damages over a range of design flood events for a Barwon River dominant flood (Water Technology 2018).

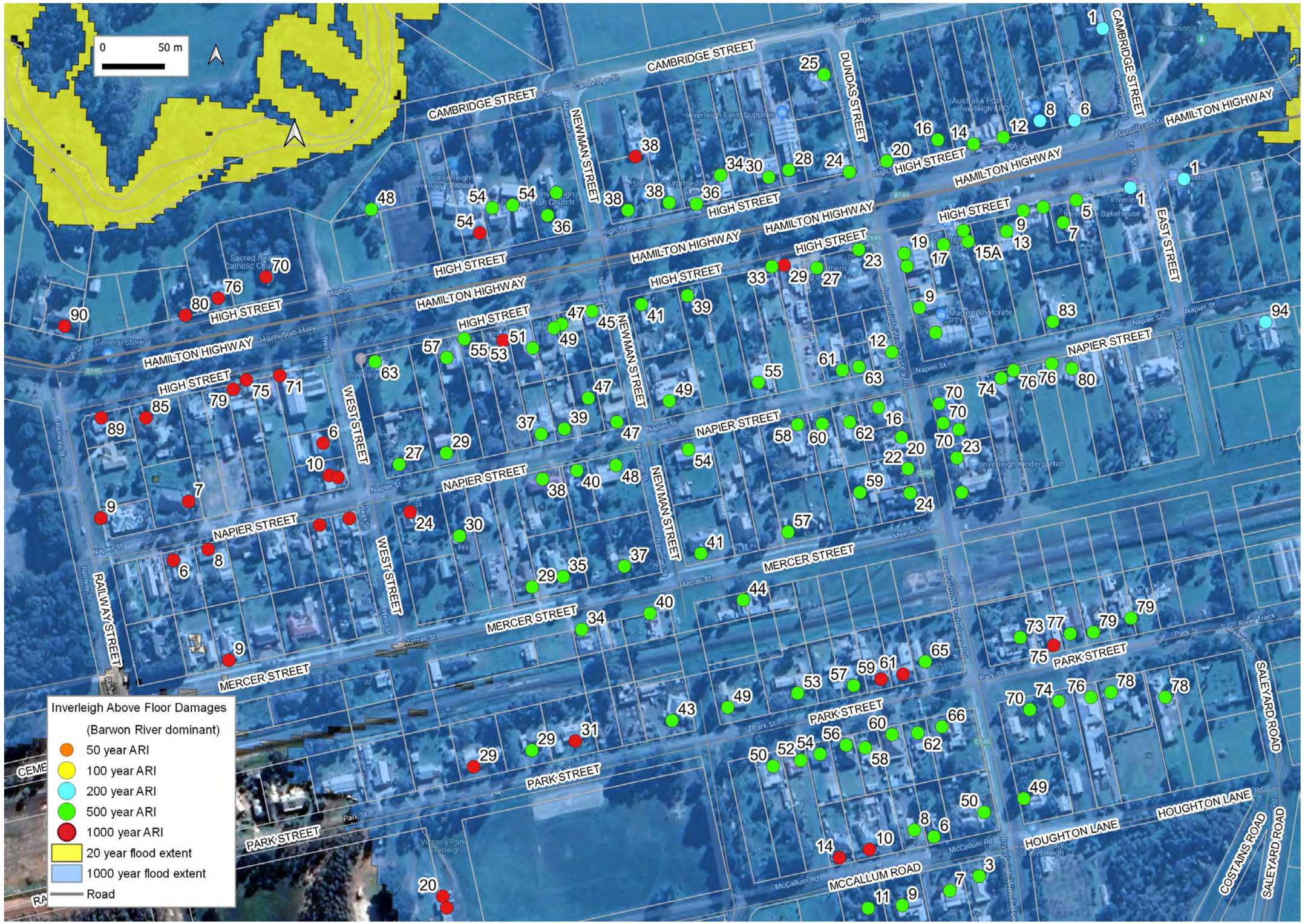

Figure 31. Inverleigh above floor damages over a range of design flood events for a Barwon River dominant flood (Water Technology 2018).

Table 13. Inverleigh Flood Intelligence Card (Leigh River)

Flood travel time	
	Time between rainfall and steep rise in flood levels at Mount Mercer 4 - 6 hours
	Time between rainfall and flood peak at Mount Mercer 12 - 18 hours
	Time between Mount Mercer and Shelford peak 6 - 10 hours
	Time between Mount Mercer and Inverleigh peak 10 - 18 hours
	Riverine flooding duration: 2 days

Leigh River at Mount Mercer gauge height 233215 (m)	Leigh River at Shelford gauge height 233213 (m)	Leigh River at Inverleigh gauge board height (m)	Average Recurrence Interval (ARI)	Leigh River at Shelford Design Flows (ML/d)	Inverleigh damages total number properties flooded (above floor)	Consequence / Impact	Houses/ buildings flooded / isolated	Roads Impacted	Action
	2.00	1.60	2	~2,600	83 (0)	Most floodwater is in channel, only minor flooding breaking out.		Dawber Road depth 0m Cambridge Street depth 0m Hamilton Hwy depth 0m High Street depth 0m East Street depth 0m River Track depth 0m River Road depth 0m Railway Line depth 0m	VICSES activate ground observers to take photos and record flood levels at key crossings.
	5.53	3.00	5	~6,000	90 (0)	Most floodwater is in channel, only minor flooding breaking out. Teesdale – Inverleigh Road overtopped (depth below 0.3 m)		Dawber Road depth 0m Cambridge Street depth 0m Hamilton Hwy depth 0m High Street depth 0m East Street depth 0m River Track depth 0m River Road depth 0m Railway Line depth 0m	Refer to actions listed above.
	5.70		April 2001						
2.00	6.00	3.30	Minor flood level	7,800					
	6.64	3.92	10	~11,000	97 (0)	Most floodwater is in channel, only minor flooding breaking out. Hamilton Hwy culverts west of town begin to flow (potential erosion at old Hwy alignment). Teesdale – Inverleigh Road inundated (depth above 0.3 m). Park and River reserve between township and confluence begin to inundate.		Dawber Road depth 0m Cambridge Street depth 0m Hamilton Hwy depth 0m High Street depth 0m East Street depth 0m River Track depth 0m River Road depth 0m Railway Line depth 0m	Council clear debris from waterway crossings, drains and culvers as needed.
3.00	7.00	4.30	Moderate flood level	12,500					
	7.35		November 1995			This was a major flood in in the Barwon River, Warrambine Creek was also high. Given the Leigh River was low, Inverleigh wasn't significantly impacted.			
	7.63	4.62	20	~17,000	110 (0)	Federation Bridge inaccessible. Dawber Road overtopped (depth below 0.3 m). Burkes Road overtopped (depth below 0.3 m). Shallow flooding inundates the Hamilton Highway to the east and west of Inverleigh.		Dawber Road depth 0.29m Cambridge Street depth 0m Hamilton Hwy depth 0m High Street depth 0m East Street depth 0m River Track depth 0m River Road depth 0m Railway Line depth 0m	Council and Regional Roads Victoria to deploy road closure signs and undertake traffic management as needed.
4.00	8.00	4.76	Major flood level	18,500					
	8.31	5.53	50	~28,000	158 (0)	Access is cut to the Hamilton Highway, west of Inverleigh (adjacent to Dawber Road). Levee located beside the tennis courts and Inverleigh Primary School overtopped. There is significant flooding along Cambridge Street and High Street. The Inverleigh Recreation Reserve northern football oval is inundated. Railway culverts at East Street begin to flow.		Dawber Road depth 0.53m Cambridge Street depth 0.43m Hamilton Hwy depth 0.50m High Street depth 0.12m East Street depth 0.07m River Track depth 0.26m River Road depth 0.28m Railway Line depth 0m	Regional Roads Victoria to deploy road closure signs and undertake traffic management for the Hamilton Highway.

4.21	8.44	6.00	100	~39,000	247 (5)	5 buildings flooded above floor. Flooding overtops the Inverleigh-Winchelsea Road. Although access is not cut, this road should be closed due to risk to life if flood levels rise. Flooding breaks out of the Leigh River floods over 247 properties. The grounds at the Inverleigh Primary School, Inverleigh Kindergarten, Police Station, CFA Station, Inverleigh Hotel, Petrol Station, General Store, Presbyterian Church, St Pauls Church is impacted by flooding. The Inverleigh Railway Line is impacted by flooding and trains should be stopped.	X5 additional buildings may be flooded above floor: X2 HIGH STREET (34, 127), x2 CAMBRIDGE STREET (1), toilet block (High Street).	Inverleigh-Winchelsea Road overtopped (depth below 0.3 m). Dawber Road depth 0.69m Cambridge Street depth 0.96m Hamilton Hwy depth 1.05m High Street depth 0.37m East Street depth 0.64m River Track depth 0.72m River Road depth 0.58m Railway Line depth 0.16m	VICSES sandbag buildings as needed. Access is cut to a significant number of buildings; Victoria Police evacuate buildings as needed. Regional Roads Victoria to deploy road closure signs and undertake traffic management for the Inverleigh-Winchelsea Road.
	8.47	6.20	1973	~48,000		The highest recorded level in the Leigh River at Inverleigh. Approximately 50 buildings were flooded above floor along the Hamilton Highway, Napier Street, West Street, Newman Street, Mercer Street, Dundas Street, Cambridge Street and East Street.			Refer to actions listed above.
	8.50	6.40	200	~54,000	273 (33)	Additional 28 buildings flooded above floor including; Inverleigh Primary School (54 High Street), Inverleigh RSL (63 High Street), Inverleigh Hotel (1 High Street) and Inverleigh Petrol Station (19 High Street).	X28 additional buildings may be flooded above floor: X16 HIGH STREET (1, 5, 6, 8, 9A, 14, 19, 20, 33, 36, 38A, 39, 41, 54, 63, 148), x5 NAPIER STREET (30, 38, 40, 47A, 48), X4 MERCER STREET (37, 40, 41, 57), X2 DUNDAS STREET (sheds beside Service Station), COSTAINS ROAD (shed unknown number).	Dawber Road depth 0.85m Cambridge Street depth 1.30m Hamilton Hwy depth 1.43m High Street depth 0.56m East Street depth 1.12m River Track depth 1.16m River Road depth 1.27m Railway Line depth 0.54m	Refer to actions listed above.
	Above rating curve	6.97	500	~80,000	321 (82)	Additional 49 buildings flooded above floor including; Inverleigh Kindergarten (23 Mercer Street), Recreation Reserve building, Inverleigh CFA Station (27 High Street), General Store (12 High Street), Presbyterian Church (48 High Street) and St Pauls Church (38 High Street).	X49 additional buildings may be flooded above floor: x22 HIGH STREET (7, 9, 12, 13, 15A, 15B, 16, 17, 23, 24, 27, 28, 36A, 38B, 45, 47, 48, 49, 51, 54, 55), x18 NAPIER STREET (27, 29, 35, 37, 39, 47, 54, 57, 61, 1/70, 2/70, 2/70, 74, 76, 78, 80, 83, 94), x5 DUNDAS STREET (9, 12, 22, 23, 24), 29 MERCER STREET, 8 CAMPBELL ROAD, 25 CAMBRIDGE STREET, 23 WEATHERBOARD ROAD	Dawber Road depth 1.14m Cambridge Street depth 1.76m Hamilton Hwy depth 1.88m High Street depth 0.95m East Street depth 1.83m River Track depth 1.93m River Road depth 2.11m Railway Line depth 0.96m	Refer to actions listed above.
			1000		356 (117)	Additional 35 buildings flooded above floor including; Inverleigh Police Station is flooded over floor.	X35 additional buildings may be flooded above floor: x10 HIGH STREET (30, 38, 53, 54, 75, 77, 80, 89, 90, 118), x9 NAPIER STREET (6, 7, 8, 49, 55, 58, 60, 62, 63), x5 DUNDAS STREET (16, 20, 23, 49, 77), x5 PARK STREET (43, 77, 79, 81, 82), x3 MERCER STREET (34, 44, 59), 9 JUBILEE STREET, 19 MCCALLUM ROAD, 9 RAILWAY STREET	Dawber Road depth 1.41m Cambridge Street depth 2.11m Hamilton Hwy depth 2.27m High Street depth 1.42m East Street depth 2.75m River Track depth 2.84m River Road depth 3.00m Railway Line depth 1.35m	Refer to actions listed above.

Table 14. Inverleigh Flood Intelligence Card (Barwon River)

Flood travel time	Time between rainfall and steep rise in flooding at Inverleigh (town) 2.5 -3 days Time between Ricketts Marsh and Inverleigh (town) peak 16 - 20 hours Time between Winchelsea and Inverleigh (town) peak 8 - 12 hours Riverine flooding duration: 2 days

Barwon River at Ricketts Marsh gauge height 233224 (m)	Barwon River at Winchelsea gauge height 233201 (m)	Barwon River U/S Inverleigh gauge height 233218 (m)	Average Recurrence Interval (ARI)	Barwon River at Inverleigh Design Flows (ML/d)	Inverleigh damages total number properties flooded (above floor)	Consequence / Impact	Houses/ buildings flooded / isolated	Roads Impacted	Action
	3.80	1.80	January 2011						
		2.55	2	~6,700	89 (0)	Park and River reserve between Winchelsea-Inverleigh Road and confluence begin to inundate.		Dawber Road depth 0m Cambridge Street depth 0m Hamilton Hwy depth 0m High Street depth 0m East Street depth 0m River Track depth 0 m River Road depth 0m Jubilee Street depth 0m Railway Line depth 0m Inverleigh-Winchelsea Road depth 0m	VICSES activate ground observers to take photos and record flood levels at key crossings.
	4.92	3.20	September 2016						
		3.42	5	~13,900	94 (0)	Anabranches along Barwon floodplain (upstream of confluence) begin to flow.		Dawber Road depth 0m Cambridge Street depth 0m Hamilton Hwy depth 0m High Street depth 0m East Street depth 0m River Track depth 0 m River Road depth 0m Jubilee Street depth 0m Railway Line depth 0m Inverleigh-Winchelsea Road depth 0m	
		3.99	10	~21,400	95 (0)	Floodwater backs up against the Inverleigh – Winchelsea Road and River Road Inundated (depth below 0.5 m).		Dawber Road depth 0m Cambridge Street depth 0m Hamilton Hwy depth 0m High Street depth 0m East Street depth 0m River Track depth 0 m River Road depth 0m Jubilee Street depth 0m Railway Line depth 0m Inverleigh-Winchelsea Road depth 0m	
3.00	6.00	4.00	Minor flood level						
		4.21	1970						
6.00	7.20	4.5	Moderate flood level						
		4.57	20	~31,500	100 (0)	Significant flooding on rural properties south of Inverleigh.		Dawber Road depth 0m Cambridge Street depth 0m Hamilton Hwy depth 0m High Street depth 0m East Street depth 0m River Track depth 0 m River Road depth 0m Jubilee Street depth 0m Railway Line depth 0m Inverleigh-Winchelsea Road depth 0m	Council and Regional Roads Victoria to deploy road closure signs and undertake traffic management as needed.
	7.23	5.06	1978						
6.70	7.80	5.10	Major flood level						Council clear debris from waterway crossings, drains and culvers as needed.

6.99		5.18	1976						
		5.38	50	~50,200	144 (1)	Railway culverts at East Street begin to flow (north towards town). Flooding overtops Dawber Road. Access is cut to the Inverleigh-Winchelsea Road. One shed is flooded over floor in Costains Road. Properties between McCallum Road and River Road inundated.	A shed in Costains Road is flooded above floor.	Dawber Road depth 0.10m Cambridge Street depth 0m Hamilton Hwy depth 0m High Street depth 0m East Street depth 0m River Road depth 0.25m Jubilee Street depth 0m Railway Line depth 0m Inverleigh-Winchelsea Road depth 0.44m	VICSES sandbag buildings as needed. Victoria Police evacuate buildings as needed. Regional Roads Victoria to deploy road closure signs and undertake traffic management for the Inverleigh-Winchelsea Road.
		5.59	1995	~55,600		Inverleigh township cut (Hamilton Highway & Inverleigh – Winchelsea Road).			
		6.04	100	~69,900	164 (2)	One additional building is flooded above floor on the corner of River Road and Weatherboard Road. Minor flooding along Cambridge Street. Shallow flooding overtops the Hamilton Highway west of the Leigh River. Access is cut to Dawber Road and River Road.	One additional building may be flooded above floor: 23 WEATHERBOARD ROAD	Dawber Road depth 0.26m Cambridge Street depth 0.15m Hamilton Hwy depth 0.10m High Street depth 0m East Street depth 0.51m River Road depth 0.46m Jubilee Street depth 0.16m Railway Line depth 0m Inverleigh-Winchelsea Road depth 1.2m	Refer to actions listed above.
			200	~95,900	231 (9)	X7 additional buildings are flooded above floor. Flooding between Houghton Lane and Park Street. Extensive flood damage through the Inverleigh township. Access is cut to the Hamilton Highway east and west of the Leigh River bridge. Access is cut to Cambridge Street, High Street and Jubilee Street.	x7 additional buildings may be flooded above floor: Public Toilet, x3 HIGH STREET (1, 6, 8), x2 CAMBRIDGE STREET (1 and unknown number), 94 NAPIER STREET	Dawber Road depth 0.41m Cambridge Street depth 0.97m Hamilton Hwy depth 0.26m High Street depth 0.40m East Street depth 1.45m River Road depth 1.25m Jubilee Street depth 1.15m Railway Line depth 0m Inverleigh-Winchelsea Road depth 2.2m	Access is cut to a significant number of buildings, Victoria Police evacuate buildings as needed. Regional Roads Victoria to deploy road closure signs and undertake traffic management for the Hamilton Hwy.
			500	~143,200	324 (133)	X124 additional buildings are flooded above floor. Extensive flooding along Park Street. Railway line overtopped.	x124 additional buildings may be flooded above floor: x38 HIGH STREET (5, 7, 9, 9A, 12, 13, 14, 15A, 15B, 16, 17, 19, 20, 23, 24, 27, 28, 30, 33, 34, 36, 36A, 38, 38B, 39, 41, 45, 47, 48, 49, 54, 55, 57, 63, 127), x26 NAPIER STREET (27, 29, 30, 37, 38, 39, 40, 47, 47A, 48, 49, 54, 55, 58, 60, 61, 62, 63, 1/70, 2/70, 3/70, 74, 76, 78, 80, 83), x23 PARK STREET (29, 43, 49, 50, 52, 53, 54, 56, 57, 58, 60, 62, 65, 66, 70, 73, 74, 76, 77, 78, 79, 81, 82), x16 MCCALLUM ROAD (3, 6, 7, 8, 9, 11, 19, 29, 34, 35, 37, 40, 41, 44, 57, 59), x13 DUNDAS STREET (9, 12, 16, 20, 22, 23, 24, 49, 50, 77), X2 RIVER ROAD (5, 29) 76 Railway St, 104 FULLER ROAD, 25 CAMBRIDGE STREET, 37 RAWSON ROAD, 9 JUBILEE STREET, 20 WEATHERBOARD ROAD	Dawber Road depth 0.48m Cambridge Street depth 2.25m Hamilton Hwy depth 1.65m High Street depth 1.71m East Street depth 2.92m River Road depth 2.58m Jubilee Street depth 2.49m Railway Line depth 0.85m Inverleigh-Winchelsea Road depth 3.61m	Refer to actions listed above.
			1000		371 (174)	X41 additional buildings are flooded above floor.	x41 additional buildings may be flooded above floor: x15 HIGH STREET (29, 38, 53, 54, 70, 71, 75, 76, 77, 80, 85, 89, 90, 118, 148), x7 MCCALLUM ROAD (10, 14, 37, 39, 45, 73, 81), x6 NAPIER STREET (6, 7, 8, 18, 20, 24), x5 PARK STREET (27, 31, 59, 61, 75), x3 RAILWAY (9, 20), x2 WEST STREET (6, 10), 9 MERCER STREET, 8 CAMPBELL ROAD, 12 JUBILEE STREET	Dawber Road depth 0.69m Cambridge Street depth 3.58m Hamilton Hwy depth 3m High Street depth 3.07m East Street depth 4.22m River Road depth 3.86m Jubilee Street depth 3.84m Railway Line depth 2.21m Inverleigh-Winchelsea Road depth 5.02m	Refer to actions listed above.

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Table 15. Inverleigh (Leigh River dominant) Property Inundation Table (Water Technology 2017).

No	Address	Depth of building over floor flooding for each ARI event (m)				Building type		
		100	200	500	1000			
1	34 HIGH STREET INVERLEIGH 3321	0.22	0.56	1.01	1.43	Residence	Weatherboard	Stumps
2	CAMBRIDGE STREET INVERLEIGH 3321	0.20	0.55	1.01	1.44	Residence Nth of Dundas intersection	Weatherboard	Stumps
3	127 HIGH STREET INVERLEIGH 3321	0.18	0.56	1.02	1.37	Residence	Weatherboard	Stumps
4	1 CAMBRIDGE STREET INVERLEIGH 3321	0.06	0.43	0.94	1.51	Residence	Bluestone	Slab
5	Public Toilet – I HIGH STREET	0.05	0.45	1.07	1.83	Toilet	Conc	Slab
6	Costains ROAD INVERLEIGH 3321		0.80	1.76	2.79	Shed	Gal iron	No floor
7	38 NAPIER STREET INVERLEIGH 3321		0.37	0.82	1.23	Residence	Brick	Slab
8	39 HIGH STREET INVERLEIGH 3321		0.35	0.79	1.21	Residence	Weatherboard	Stumps
9	57 MERCER STREET INVERLEIGH 3321		0.32	0.75	1.14	Residence	Brick	Stumps
10	41 MERCER STREET INVERLEIGH 3321		0.32	0.76	1.14	Residence	Brick	Slab
11	40 MERCER STREET INVERLEIGH 3321		0.30	0.74	1.13	Residence	Weatherboard	Slab
12	36 HIGH STREET INVERLEIGH 3321		0.30	0.74	1.16	Residence	Weatherboard	Stumps
13	40 NAPIER STREET INVERLEIGH 3321		0.29	0.74	1.15	Residence	Weatherboard	Stumps
14	47A NAPIER STREET INVERLEIGH 3321		0.25	0.70	1.12	Shed	Gal iron	Slab
15	6 HIGH STREET INVERLEIGH 3321		0.25	0.72	1.30	Residence	Weatherboard	Stumps
16	8 HIGH STREET INVERLEIGH 3321		0.25	0.71	1.27	Inverleigh Home Living	Weatherboard	Slab
17	DUNDAS STREET INVERLEIGH 3321		0.23	0.65	1.15	Shed	Gal iron	Slab
18	1 HIGH STREET INVERLEIGH 3321		0.20	0.76	1.46	Hotel	Stone	Slab
19	DUNDAS STREET INVERLEIGH 3321		0.16	0.61	1.08	Shed	Brick	Slab
20	148 HIGH STREET INVERLEIGH 3321		0.15	0.57	0.92	Residence	Weatherboard	Stumps
21	33 HIGH STREET INVERLEIGH 3321		0.14	0.57	0.98	Residence	Alum cladding	Stumps
22	20 HIGH STREET INVERLEIGH 3321		0.13	0.57	1.03	Residence	Plastic cladding	Stumps
23	41 HIGH STREET INVERLEIGH 3321		0.11	0.56	0.98	Residence	Weatherboard	Stumps
24	19 HIGH STREET INVERLEIGH 3321		0.10	0.55	1.03	Inverleigh petrol station	Brick	Slab
25	63 HIGH STREET INVERLEIGH 3321		0.08	0.55	0.97	Returned Service League	Weatherboard	Stumps
26	14 HIGH STREET INVERLEIGH 3321		0.08	0.54	1.05	Gladioli Restaurant	Weatherboard	Slab
27	30 NAPIER STREET INVERLEIGH 3321		0.08	0.53	0.95	Residence	Brick	Slab
28	48 NAPIER STREET INVERLEIGH 3321		0.07	0.52	0.92	Residence	Weatherboard	Stumps
29	54 HIGH STREET INVERLEIGH 3321		0.07	0.40	0.76	School	Hardy Plank	Stumps
30	38A HIGH STREET INVERLEIGH 3321		0.05	0.50	0.92	St Pauls Shop	Weatherboard	Stumps
31	5 HIGH STREET INVERLEIGH 3321		0.04	0.51	1.12	Inverleigh Bakehouse	Brick	Stumps
32	37 MERCER STREET INVERLEIGH 3321		0.02	0.46	0.86	Residence	Weatherboard	Stumps
33	9A HIGH STREET INVERLEIGH 3321		0.00	0.46	1.01	Residence	Weatherboard	Stumps
34	94 NAPIER STREET INVERLEIGH 3321			0.62	1.47	Residence	Weatherboard	Stumps
35	8 CAMPBELL ROAD INVERLEIGH 3321			0.46	0.82	Residence	Brick	Stumps
36	36A HIGH STREET INVERLEIGH 3321			0.45	0.88	Church Sunday School	Bluestone	Slab

No	Address	Depth of building over floor flooding for each ARI event (m)				Building type		
		100	200	500	1000			
37	12 HIGH STREET INVERLEIGH 3321			0.45	0.98	Inverleigh Store	Concrete Render	Slab
38	23 HIGH STREET INVERLEIGH 3321			0.45	0.90	Geelong Landcare Network	Weatherboard	Slab
39	29 MERCER STREET INVERLEIGH 3321			0.43	0.83	Residence	Brick	Slab
40	13 HIGH STREET INVERLEIGH 3321			0.42	0.97	Residence	Cement Sheet	Stumps
41	25 CAMBRIDGE STREET INVERLEIGH 3321			0.42	0.86	Residence	Weatherboard	Stumps
42	23 WEATHERBOARD ROAD INVERLEIGH 3321			0.39	1.41	Shed	Gal iron	Slab
43	48 HIGH STREET INVERLEIGH 3321			0.39	0.76	Tennis Club	Brick	Slab
44	29 NAPIER STREET INVERLEIGH 3321			0.37	0.79	Residence	Weatherboard	Stumps
45	36A HIGH STREET INVERLEIGH 3321			0.37	0.79	Church Sunday School	Bluestone	Slab
46	17 HIGH STREET INVERLEIGH 3321			0.34	0.84	Residence	Weatherboard	Stumps
47	15A HIGH STREET INVERLEIGH 3321			0.34	0.86	Residence	Weatherboard	Stumps
48	47 NAPIER STREET INVERLEIGH 3321			0.33	0.74	Residence	Brick	Slab
49	38B HIGH STREET INVERLEIGH 3321			0.31	0.73	St Pauls Church	Conc block	Slab
50	54 HIGH STREET INVERLEIGH 3321 - School			0.29	0.70	School	Stone block	Slab
51	27 NAPIER STREET INVERLEIGH 3321			0.29	0.72	Residence	Brick	Stumps
52	37 NAPIER STREET INVERLEIGH 3321			0.27	0.69	Residence	Weatherboard	Stumps
53	35 MERCER STREET INVERLEIGH 3321			0.27	0.67	Residence	Brick	Slab
54	24 DUNDAS STREET INVERLEIGH 3321			0.26	0.66	Residence	Brick	Slab
55	9 HIGH STREET INVERLEIGH 3321			0.24	0.81	Residence	Bluestone	Slab
56	39 NAPIER STREET INVERLEIGH 3321			0.24	0.65	Residence	Weatherboard	Stumps
57	16 HIGH STREET INVERLEIGH 3321			0.23	0.71	Residence	Brick	Stumps
58	1/70 NAPIER STREET INVERLEIGH 3321			0.21	0.68	Residence	Brick	Slab
59	54 NAPIER STREET INVERLEIGH 3321			0.21	0.61	Residence	Hardy plank	Stumps
60	76 NAPIER STREET INVERLEIGH 3321			0.21	0.78	Residence	Weatherboard	Slab
61	47 HIGH STREET INVERLEIGH 3321			0.21	0.63	Residence	Brick	Slab
62	7 HIGH STREET INVERLEIGH 3321			0.20	0.79	Telstra	Cement render	Slab
63	2/70 NAPIER STREET INVERLEIGH 3321			0.19	0.65	Residence	Brick	Slab
64	57 HIGH STREET INVERLEIGH 3321			0.19	0.60	Residence	Weatherboard	Stumps
65	83 NAPIER STREET INVERLEIGH 3321			0.19	0.84	Residence	Weatherboard	Stumps
66	80 NAPIER STREET INVERLEIGH 3321			0.17	0.90	Shed	Iron shed	Slab
67	74 NAPIER STREET INVERLEIGH 3321			0.17	0.74	Residence	Brick	Slab
68	23 DUNDAS STREET INVERLEIGH 3321			0.17	0.66	Inverleigh Early Learning	Brick	Slab
69	24 HIGH STREET INVERLEIGH 3321			0.16	0.61	Residence	Hardy plank	Stumps
70	22 DUNDAS STREET INVERLEIGH 3321			0.15	0.56	Residence	Weatherboard	Slab
71	27 HIGH STREET INVERLEIGH 3321			0.14	0.58	CFA	Iron shed	Slab
72	61 NAPIER STREET INVERLEIGH 3321			0.13	0.54	Residence	Stone	Slab
73	45 HIGH STREET INVERLEIGH 3321			0.11	0.53	Residence	Hardy plank	Stumps
74	49 HIGH STREET INVERLEIGH 3321			0.09	0.51	Residence	Brick	Stumps
75	28 HIGH STREET INVERLEIGH 3321			0.09	0.51	Inverleigh Farm Supplies	Cement Sheet	Stumps

No	Address	Depth of building over floor flooding for each ARI event (m)				Building type		
		100	200	500	1000			
76	78 NAPIER STREET INVERLEIGH 3321			0.08	0.73	Residence	Weatherboard	Slab
77	3/70 NAPIER STREET INVERLEIGH 3321			0.07	0.58	Residence	Brick	Slab
78	51 HIGH STREET INVERLEIGH 3321			0.06	0.48	Residence	Brick blocks	Stumps
79	55 HIGH STREET INVERLEIGH 3321			0.06	0.46	Residence	Brick	Stumps
80	15B HIGH STREET INVERLEIGH 3321			0.04	0.54	Sonny Café	Weatherboard	Stumps
81	12 DUNDAS STREET INVERLEIGH 3321			0.00	0.48	Residence	Cement render	Slab
82	9 DUNDAS STREET INVERLEIGH 3321			0.00	0.49	Residence	Weatherboard	Stumps
83	90 HIGH STREET INVERLEIGH 3321				0.21	Police Station	Brick	Stumps
84	118 HIGH STREET INVERLEIGH 3321				0.28	Residence	Brick	Slab
85	59 MERCER STREET INVERLEIGH 3321				0.18	Residence	Hardy plank	Stumps
86	30 HIGH STREET INVERLEIGH 3321				0.28	Residence	Cedar	Stumps
87	49 NAPIER STREET INVERLEIGH 3321				0.24	Residence	Hardy plank	Stumps
88	82 PARK STREET INVERLEIGH 3321				0.62	Residence	Corrugated Iron	Stumps
89	81 PARK STREET INVERLEIGH 3321				0.67	Residence	Weatherboard	Stumps
90	77 DUNDAS STREET INVERLEIGH 3321				0.37	Residence	Concrete Render	Slab
91	9 JUBILEE STREET INVERLEIGH 3321				0.05	Residence	Brick	Slab
92	49 DUNDAS STREET INVERLEIGH 3321				0.03	Residence	Weatherboard	Stumps
93	79 PARK STREET INVERLEIGH 3321				0.09	Residence	Weatherboard	Stumps
94	23 DUNDAS STREET INVERLEIGH 3321				0.42	Inverleigh Early Learning	Hardy plank	Stumps
95	43 PARK STREET INVERLEIGH 3321				0.30	Residence	Brick	Slab
96	77 PARK STREET INVERLEIGH 3321				0.09	Residence	Brick	Slab
97	19 MCCALLUM ROAD INVERLEIGH 3321				0.01	Residence	Brick	Slab
98	20 DUNDAS STREET INVERLEIGH 3321				0.27	Residence	Brick	Slab
99	63 NAPIER STREET INVERLEIGH 3321				0.33	Residence	Weatherboard	Stumps
100	16 DUNDAS STREET INVERLEIGH 3321				0.19	Residence	Weatherboard	Slab
101	58 NAPIER STREET INVERLEIGH 3321				0.29	Residence	Weatherboard	Stumps
102	44 MERCER STREET INVERLEIGH 3321				0.32	Residence	Weatherboard	Slab
103	55 NAPIER STREET INVERLEIGH 3321				0.28	Residence	Weatherboard	Stumps
104	62 NAPIER STREET INVERLEIGH 3321				0.13	Residence	Brick	Stumps
105	60 NAPIER STREET INVERLEIGH 3321				0.16	Residence	Brick	Slab
106	34 MERCER STREET INVERLEIGH 3321				0.21	Residence	Weatherboard	Stumps
107	53 HIGH STREET INVERLEIGH 3321				0.30	Residence	Brick	Stumps
108	38 HIGH STREET INVERLEIGH 3321				0.08	Residence	Cement render	Slab
109	54 HIGH STREET INVERLEIGH 3321				0.03	School	Conc Render	Stumps
110	77 HIGH STREET INVERLEIGH 3321				0.17	Residence	Weatherboard	Slab
111	80 HIGH STREET INVERLEIGH 3321				0.28	Residence	Weatherboard	Stumps
112	75 HIGH STREET INVERLEIGH 3321				0.09	WARES PJ'S	Weatherboard	Slab
113	7 NAPIER STREET INVERLEIGH 3321				0.25	Residence	Weatherboard	Stumps
114	8 NAPIER STREET INVERLEIGH 3321				0.06	Residence	Brick	Slab
115	6 NAPIER STREET INVERLEIGH 3321				0.07	Residence	Brick	Slab
116	9 RAILWAY STREET INVERLEIGH 3321				0.18	Residence	Brick	Slab

No	Address	Depth of building over floor flooding for each ARI event (m)				Building type		
		100	200	500	1000			
117	89 HIGH STREET INVERLEIGH 3321				0.02	Residence	Weatherboard	Stumps

Table 16. Inverleigh (Barwon River dominant) Property Inundation Table (Water Technology 2017)

No	Address	Depth of building over floor flooding for each ARI event (m)					Building type		
		50	100	200	500	1000			
1	Costains ROAD INVERLEIGH 3321	0.47	1.22	2.20	3.61	4.96	Shed	Gal iron	No floor
2	23 WEATHERBOARD ROAD INVERLEIGH 3321		0.12	0.93	2.27	3.61	Shed	Gal iron	Slab
3	Public Toilet - STREET INVERLEIGH 3321			0.69	2.09	3.45	Toilet	Conc	Slab
4	94 NAPIER STREET INVERLEIGH 3321			0.42	1.83	3.19	Residence	Weatherboard	Stumps
5	1 HIGH STREET INVERLEIGH 3321			0.30	1.70	3.05	Residence	Stone	Slab
6	1 CAMBRIDGE STREET INVERLEIGH 3321			0.30	1.63	2.98	Residence	Bluestone	Slab
7	6 HIGH STREET INVERLEIGH 3321			0.09	1.44	2.79	Residence	Weatherboard	Stumps
8	8 HIGH STREET INVERLEIGH 3321			0.03	1.38	2.73	Inverleigh Home Living	Weatherboard	Slab
9	CAMBRIDGE STREET INVERLEIGH 3321			0.01	1.21	2.55	Residence Nth of Dundas Intersection	Weatherboard	Stumps
10	82 PARK STREET INVERLEIGH 3321				1.38	2.74	Residence	Corrugated Iron	Stumps
11	81 PARK STREET INVERLEIGH 3321				1.33	2.70	Residence	Weatherboard	Stumps
12	5 HIGH STREET INVERLEIGH 3321				1.30	2.65	Inverleigh Bakehouse	Brick	Stumps
13	DUNDAS STREET INVERLEIGH 3321				1.25	2.60	Shed beside the servo	Gal iron	Slab
14	80 NAPIER STREET INVERLEIGH 3321				1.24	2.60	Shed	Iron shed	Slab
15	34 HIGH STREET INVERLEIGH 3321				1.23	2.58	Residence	Weatherboard	Stumps
16	77 DUNDAS STREET INVERLEIGH 3321				1.16	2.52	Residence	Concrete Render	Slab
17	9A HIGH STREET INVERLEIGH 3321				1.14	2.49	Residence	Weatherboard	Stumps
18	57 MERCER STREET INVERLEIGH 3321				1.12	2.47	Residence	Brick	Stumps
19	83 NAPIER STREET INVERLEIGH 3321				1.11	2.47	Residence	Weatherboard	Stumps
20	14 HIGH STREET INVERLEIGH 3321				1.11	2.46	Gladioli Restaurant	Weatherboard	Slab
21	13 HIGH STREET INVERLEIGH 3321				1.11	2.46	Residence	Cement Sheet	Stumps
22	DUNDAS STREET INVERLEIGH 3321				1.10	2.45	Shed beside the servo	Brick	Slab
23	12 HIGH STREET INVERLEIGH 3321				1.07	2.42	Inverleigh Store	Concrete Render	Slab
24	76 NAPIER STREET INVERLEIGH 3321				1.03	2.39	Residence	Weatherboard	Slab
25	78 NAPIER STREET INVERLEIGH 3321				1.03	2.39	Residence	Weatherboard	Slab
26	19 HIGH STREET INVERLEIGH 3321				1.03	2.38	Inverleigh petrol station	Brick	Slab
27	39 HIGH STREET INVERLEIGH 3321				1.01	2.35	Residence	Weatherboard	Stumps
28	74 NAPIER STREET INVERLEIGH 3321				0.99	2.35	Residence	Brick	Slab
29	41 MERCER STREET INVERLEIGH 3321				0.99	2.34	Residence	Brick	Slab
30	20 HIGH STREET INVERLEIGH 3321				0.99	2.34	Residence	Plastic cladding	Stumps
31	7 HIGH STREET INVERLEIGH 3321				0.99	2.34	Telstra	Cement render	Slab
32	38 NAPIER STREET INVERLEIGH 3321				0.99	2.33	Residence	Brick	Slab
33	15A HIGH STREET INVERLEIGH 3321				0.96	2.31	Residence	Weatherboard	Stumps
34	36 HIGH STREET INVERLEIGH 3321				0.96	2.30	Residence	Weatherboard	Stumps
35	40 MERCER STREET INVERLEIGH 3321				0.95	2.30	Residence	Weatherboard	Slab

No	Address	Depth of building over floor flooding for each ARI event (m)					Building type		
		50	100	200	500	1000			
36	9 HIGH STREET INVERLEIGH 3321				0.95	2.30	Residence	Bluestone	Slab
37	40 NAPIER STREET INVERLEIGH 3321				0.93	2.27	Residence	Weatherboard	Stumps
38	17 HIGH STREET INVERLEIGH 3321				0.91	2.26	Residence	Weatherboard	Stumps
39	23 DUNDAS STREET INVERLEIGH 3321				0.90	2.26	Inverleigh Early Learning	Brick	Slab
40	47A NAPIER STREET INVERLEIGH 3321				0.90	2.24	Shed	Gal iron	Slab
41	23 HIGH STREET INVERLEIGH 3321				0.88	2.23	Geelong Landcare Network	Weatherboard	Slab
42	1/70 NAPIER STREET INVERLEIGH 3321				0.84	2.19	Residence	Brick	Slab
43	2/70 NAPIER STREET INVERLEIGH 3321				0.83	2.19	Residence	Brick	Slab
44	24 DUNDAS STREET INVERLEIGH 3321				0.83	2.19	Residence	Brick	Slab
45	9 JUBILEE STREET INVERLEIGH 3321				0.83	2.18	Residence	Brick	Slab
46	33 HIGH STREET INVERLEIGH 3321				0.82	2.17	Residence	Alum cladding	Stumps
47	3/70 NAPIER STREET INVERLEIGH 3321				0.81	2.17	Residence	Brick	Slab
48	49 DUNDAS STREET INVERLEIGH 3321				0.80	2.17	Residence	Weatherboard	Stumps
49	104 FULLER ROAD INVERLEIGH 3321				0.79	2.02	Residence	Weatherboard	Stumps
50	41 HIGH STREET INVERLEIGH 3321				0.77	2.11	Residence	Weatherboard	Stumps
51	48 NAPIER STREET INVERLEIGH 3321				0.72	2.07	Residence	Weatherboard	Stumps
52	22 DUNDAS STREET INVERLEIGH 3321				0.72	2.08	Residence	Weatherboard	Slab
53	16 HIGH STREET INVERLEIGH 3321				0.72	2.07	Residence	Brick	Stumps
54	79 PARK STREET INVERLEIGH 3321				0.71	2.08	Residence	Weatherboard	Stumps
55	38A HIGH STREET INVERLEIGH 3321				0.71	2.05	St Pauls Shop	Weatherboard	Stumps
56	23 DUNDAS STREET INVERLEIGH 3321				0.70	2.06	Inverleigh Early Learning	Hardy plank	Stumps
57	25 CAMBRIDGE STREET INVERLEIGH 3321				0.70	2.04	Residence	Weatherboard	Stumps
58	30 NAPIER STREET INVERLEIGH 3321				0.68	2.02	Residence	Brick	Slab
59	37 MERCER STREET INVERLEIGH 3321				0.67	2.02	Residence	Weatherboard	Stumps
60	43 PARK STREET INVERLEIGH 3321				0.66	2.02	Residence	Brick	Slab
61	19 MCCALLUM ROAD INVERLEIGH 3321				0.65	2.01	Residence	Brick	Slab
62	77 PARK STREET INVERLEIGH 3321				0.65	2.02	Residence	Brick	Slab
63	6 MCCALLUM ROAD INVERLEIGH 3321				0.62	1.99	Residence	Weatherboard	Stumps
64	15B HIGH STREET INVERLEIGH 3321				0.62	1.97	Sonny Café	Weatherboard	Stumps
65	29 MERCER STREET INVERLEIGH 3321				0.61	1.95	Residence	Brick	Slab
66	36A HIGH STREET INVERLEIGH 3321				0.60	1.94	Church Sunday School	Bluestone	Slab
67	12 DUNDAS STREET INVERLEIGH 3321				0.57	1.92	Residence	Cement render	Slab
68	9 DUNDAS STREET INVERLEIGH 3321				0.56	1.91	Residence	Weatherboard	Stumps
69	61 NAPIER STREET INVERLEIGH 3321				0.54	1.89	Residence	Stone	Slab
70	47 NAPIER STREET INVERLEIGH 3321				0.53	1.88	Residence	Brick	Slab
71	24 HIGH STREET INVERLEIGH 3321				0.53	1.88	Residence	Hardy plank	Stumps
72	36A HIGH STREET INVERLEIGH 3321				0.52	1.86	Church Sunday School	Bluestone	Slab
73	63 HIGH STREET INVERLEIGH 3321				0.50	1.85	Returned Service League	Weatherboard	Stumps
74	27 HIGH STREET INVERLEIGH 3321				0.50	1.85	CFA	Iron shed	Slab
75	38B HIGH STREET INVERLEIGH 3321				0.50	1.85	St Pauls Church	Conc block	Slab
76	78 PARK STREET INVERLEIGH 3321				0.49	1.86	Residence	Weatherboard	Stumps
77	60 PARK STREET INVERLEIGH 3321				0.49	1.85	Residence	Brick	Slab
78	62 PARK STREET INVERLEIGH 3321				0.47	1.84	Residence	Weatherboard	Stumps
79	35 MERCER STREET INVERLEIGH 3321				0.46	1.81	Residence	Brick	Slab
80	29 NAPIER STREET INVERLEIGH 3321				0.46	1.81	Residence	Weatherboard	Stumps
81	76 Railway St INVERLEIGH 3321				0.45	1.80	Residence	Brick	Slab
82	54 NAPIER STREET INVERLEIGH 3321				0.44	1.79	Residence	Hardy plank	Stumps
83	37 NAPIER STREET INVERLEIGH 3321				0.44	1.78	Residence	Weatherboard	Stumps

No	Address	Depth of building over floor flooding for each ARI event (m)					Building type		
		50	100	200	500	1000			
84	20 DUNDAS STREET INVERLEIGH 3321				0.42	1.78	Residence	Brick	Slab
85	7 MCCALLUM ROAD INVERLEIGH 3321				0.42	1.79	Residence	Hardy plank	Stumps
86	58 PARK STREET INVERLEIGH 3321				0.42	1.78	Residence	Weatherboard	Stumps
87	39 NAPIER STREET INVERLEIGH 3321				0.42	1.76	Residence	Weatherboard	Stumps
88	66 PARK STREET INVERLEIGH 3321				0.41	1.78	Residence	Weatherboard	Stumps
89	56 PARK STREET INVERLEIGH 3321				0.41	1.77	Residence	Brick	Slab
90	3 MCCALLUM ROAD INVERLEIGH 3321				0.40	1.77	Residence	Weatherboard	Stumps
91	50 DUNDAS STREET INVERLEIGH 3321				0.37	1.74	Residence	Weatherboard	Stumps
92	54 HIGH STREET INVERLEIGH 3321				0.37	1.72	School	Stone block	Slab
93	37 RAWSON ROAD INVERLEIGH 3321				0.37	1.47	Residence	Weatherboard	Stumps
94	63 NAPIER STREET INVERLEIGH 3321				0.37	1.72	Residence	Weatherboard	Stumps
95	47 HIGH STREET INVERLEIGH 3321				0.37	1.72	Residence	Brick	Slab
96	54 HIGH STREET INVERLEIGH 3321				0.36	1.71	School	Hardy Plank	Stumps
97	73 PARK STREET INVERLEIGH 3321				0.36	1.73	Residence	Brick	Slab
98	70 PARK STREET INVERLEIGH 3321				0.36	1.73	Residence	Weatherboard	Stumps
99	11 MCCALLUM ROAD INVERLEIGH 3321				0.36	1.72	Residence	Brick	Slab
100	28 HIGH STREET INVERLEIGH 3321				0.36	1.70	Inverleigh Farm Supplies	Cement Sheet	Stumps
101	27 NAPIER STREET INVERLEIGH 3321				0.35	1.70	Residence	Brick	Stumps
102	29 RIVER ROAD INVERLEIGH 3321				0.32	1.66	Residence	Brick	Slab
103	45 HIGH STREET INVERLEIGH 3321				0.30	1.64	Residence	Hardy plank	Stumps
104	16 DUNDAS STREET INVERLEIGH 3321				0.29	1.64	Residence	Weatherboard	Slab
105	49 HIGH STREET INVERLEIGH 3321				0.25	1.60	Residence	Brick	Stumps
106	59 MERCER STREET INVERLEIGH 3321				0.25	1.60	Residence	Hardy plank	Stumps
107	8 MCCALLUM ROAD INVERLEIGH 3321				0.24	1.61	Residence	Weatherboard	Stumps
108	9 MCCALLUM ROAD INVERLEIGH 3321				0.23	1.60	Residence	Hardy plank	Stumps
109	29 PARK STREET INVERLEIGH 3321				0.23	1.59	Residence	Brick	Slab
110	58 NAPIER STREET INVERLEIGH 3321				0.23	1.58	Residence	Weatherboard	Stumps
111	44 MERCER STREET INVERLEIGH 3321				0.22	1.57	Residence	Weatherboard	Slab
112	74 PARK STREET INVERLEIGH 3321				0.21	1.58	Residence	Brick	Slab
113	50 PARK STREET INVERLEIGH 3321				0.21	1.57	Residence	Weatherboard	Stumps
114	54 PARK STREET INVERLEIGH 3321				0.20	1.56	Residence	Brick	Stumps
115	51 HIGH STREET INVERLEIGH 3321				0.20	1.55	Residence	Brick blocks	Stumps
116	65 PARK STREET INVERLEIGH 3321				0.19	1.55	Residence	Brick	Stumps
117	57 HIGH STREET INVERLEIGH 3321				0.18	1.53	Residence	Weatherboard	Stumps
118	49 PARK STREET INVERLEIGH 3321				0.17	1.53	Residence	Hardy plank	Stumps
119	76 PARK STREET INVERLEIGH 3321				0.17	1.54	Residence	Brick blocks	Stumps
120	48 HIGH STREET INVERLEIGH 3321				0.17	1.50	Tennis Club	Brick	Slab
121	55 NAPIER STREET INVERLEIGH 3321				0.15	1.50	Residence	Weatherboard	Stumps
122	62 NAPIER STREET INVERLEIGH 3321				0.15	1.50	Residence	Brick	Stumps
123	127 HIGH STREET INVERLEIGH 3321				0.14	1.42	Residence	Weatherboard	Stumps
124	60 NAPIER STREET INVERLEIGH 3321				0.13	1.48	Residence	Brick	Slab
125	52 PARK STREET INVERLEIGH 3321				0.13	1.49	Residence	Weatherboard	Stumps
126	20 WEATHERBOARD ROAD INVERLEIGH 3321				0.13	1.46	Residence	Brick	Slab
127	57 PARK STREET INVERLEIGH 3321				0.11	1.47	Residence	Weatherboard	Slab
128	30 HIGH STREET INVERLEIGH 3321				0.11	1.45	Residence	Cedar	Stumps
129	5 RIVER ROAD INVERLEIGH 3321				0.08	1.39	Residence	Brick	Slab
130	49 NAPIER STREET INVERLEIGH 3321				0.05	1.40	Residence	Hardy plank	Stumps
131	55 HIGH STREET INVERLEIGH 3321				0.04	1.39	Residence	Brick	Stumps
132	53 PARK STREET INVERLEIGH 3321				0.02	1.38	Residence	Weatherboard	Stumps
133	34 MERCER STREET INVERLEIGH 3321				0.01	1.36	Residence	Weatherboard	Stumps
134	59 PARK STREET INVERLEIGH 3321					1.35	Residence	Cedar	Stumps
135	53 HIGH STREET INVERLEIGH 3321					1.33	Residence	Brick	Stumps
136	20 RAILWAY STREET INVERLEIGH 3321					1.29	Pony Club	Weatherboard	Stumps
137	75 PARK STREET INVERLEIGH 3321					1.29	Residence	Weatherboard	Stumps
138	39 MCCALLUM ROAD INVERLEIGH 3321					1.26	Residence	Cedar	Stumps
139	61 PARK STREET INVERLEIGH 3321					1.25	Residence	Brick	Stumps

No	Address	Depth of building over floor flooding for each ARI event (m)					Building type		
		50	100	200	500	1000			
140	31 PARK STREET INVERLEIGH 3321					1.22	Residence	Weatherboard	Stumps
141	38 HIGH STREET INVERLEIGH 3321					1.20	Residence	Cement render	Slab
142	14 MCCALLUM ROAD INVERLEIGH 3321					1.04	Residence	Weatherboard	Stumps
143	27 PARK STREET INVERLEIGH 3321					1.00	Residence	Weatherboard	Stumps
144	54 HIGH STREET INVERLEIGH 3321 - School					0.98	School	Conc Render	Stumps
145	73 MCCALLUM ROAD INVERLEIGH 3321					0.91	Residence	Weatherboard	Stumps
146	20 RAILWAY STREET INVERLEIGH 3321					0.90	Pony Club	Weatherboard	Stumps
147	8 CAMPBELL ROAD INVERLEIGH 3321					0.90	Residence	Brick	Stumps
148	10 MCCALLUM ROAD INVERLEIGH 3321					0.88	Residence	Brick	Slab
149	148 HIGH STREET INVERLEIGH 3321					0.78	Residence	Weatherboard	Stumps
150	12 JUBILEE STREET INVERLEIGH 3321					0.75	Residence	Weatherboard	Stumps
151	24 NAPIER STREET INVERLEIGH 3321					0.75	Residence	Weatherboard	Stumps
152	77 HIGH STREET INVERLEIGH 3321					0.70	Residence	Weatherboard	Slab
153	80 HIGH STREET INVERLEIGH 3321					0.68	Residence	Weatherboard	Stumps
154	75 HIGH STREET INVERLEIGH 3321					0.67	WARES PJ'S	Weatherboard	Slab
155	7 NAPIER STREET INVERLEIGH 3321					0.58	Residence	Weatherboard	Stumps
156	37 MCCALLUM ROAD INVERLEIGH 3321					0.52	Residence	Cedar	Stumps
157	71 HIGH STREET INVERLEIGH 3321					0.47	Inverleigh Public Hall	Brick	Slab
158	45 MCCALLUM ROAD INVERLEIGH 3321					0.46	Residence	Brick	Slab
159	90 HIGH STREET INVERLEIGH 3321					0.45	Police Station	Brick	Stumps
160	10 WEST STREET INVERLEIGH 3321					0.43	Residence	Weatherboard	Stumps
161	18 Napier Street					0.42	Residence	Weatherboard	Stumps
162	8 NAPIER STREET INVERLEIGH 3321					0.41	Residence	Brick	Slab
163	118 HIGH STREET INVERLEIGH 3321					0.40	Residence	Brick	Slab
164	6 NAPIER STREET INVERLEIGH 3321					0.37	Residence	Brick	Slab
165	81 MCCALLUM ROAD INVERLEIGH 3321					0.37	Residence	Hardy plank	Stumps
166	9 RAILWAY STREET INVERLEIGH 3321					0.37	Residence	Brick	Slab
167	20 Napier St Inverleigh					0.29	Residence	Weatherboard	Stumps
168	89 HIGH STREET INVERLEIGH 3321					0.24	Residence	Weatherboard	Stumps
169	76 HIGH STREET INVERLEIGH 3321					0.22	Residence	Brick blocks	Stumps
170	9 MERCER STREET INVERLEIGH 3321					0.19	Residence	Brick	Slab
171	70 HIGH STREET INVERLEIGH 3321					0.18	Church	Stone	Slab
172	85 HIGH STREET INVERLEIGH 3321					0.14	Residence	Brick	Stumps
173	6 WEST STREET INVERLEIGH 3321					0.09	Residence	Hardy Plank	Stumps
174	29 HIGH STREET INVERLEIGH 3321					0.03	Residence	Brick	Slab

Appendix C2: Shelford Flood Emergency Plan

Shelford has experienced extensive and frequent riverine flooding from the Leigh River. The upper reaches of the Leigh River is located to the northeast of Ballarat, begins as the Yarrowee River and flows south to Shelford. The Leigh River catchment area upstream of Shelford is approximately 820 km^2. In general, the Leigh River north of Shelford is a well-defined valley. The catchment is predominantly cleared land with come pockets of forested area. Most of the Leigh River catchment is comprised of crop and pasture, so when soils are saturated runoff from heavy rainfall leads to rapid flooding. Stream rises in the Leigh River can occur at Mount Mercer between 4 to 6 hours after rainfall.

The Mount Mercer stream gauge, 25 km upstream of Shelford provides 6 to 10 hours warning time for Shelford. Refer to map below.

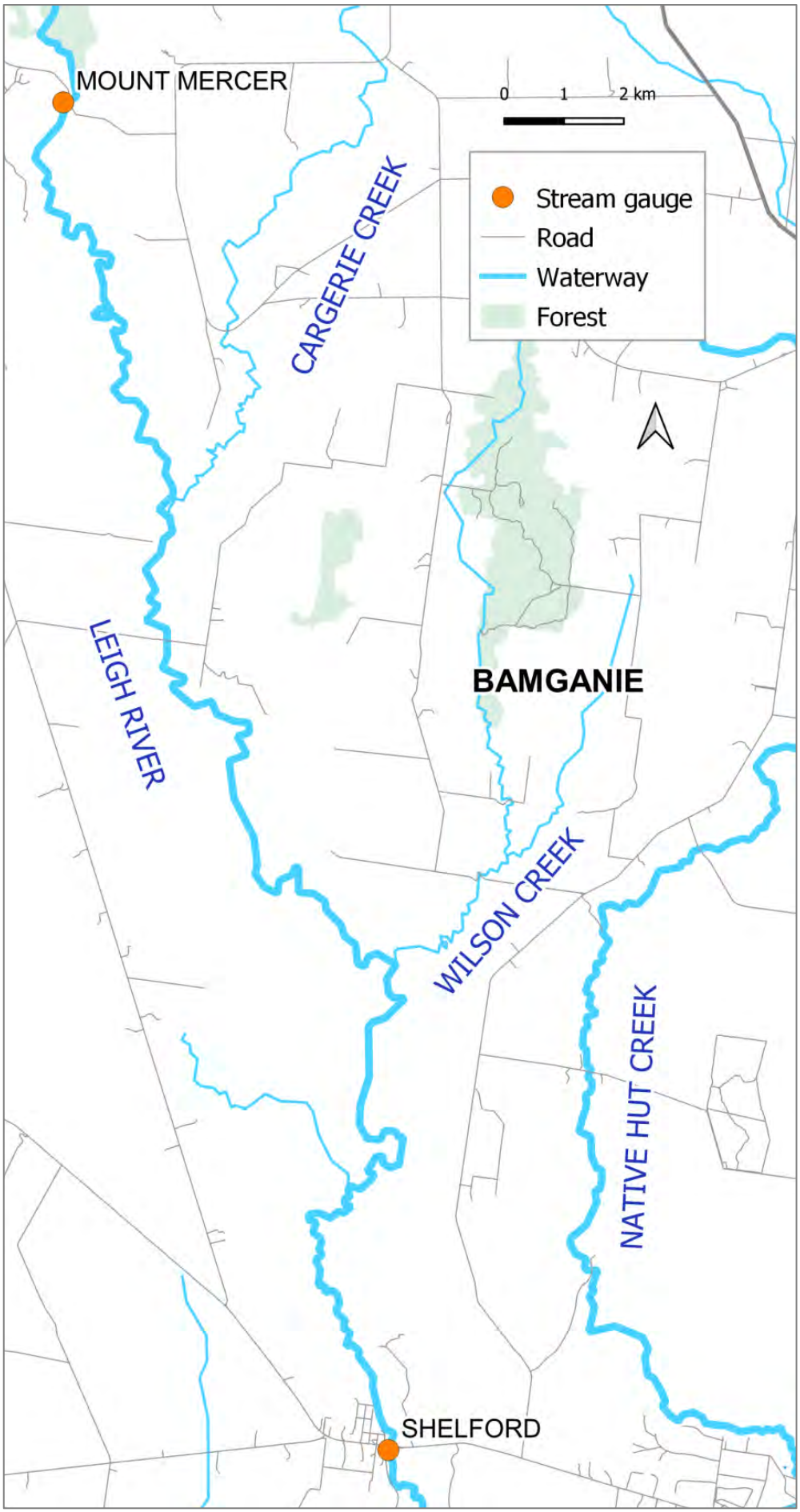

Figure 32. Shelford waterways and stream gauges.

Historic Flood Events

Shelford has been subject to extensive and frequent riverine flood events, significant flood events have occurred in 1952, 1973, 1974, 1977, 1978, 1981, 1983, 1990, 1995, 2000, 2010, 2011, 2012, 2016 and 2022 refer to the graph below. The Mount Mercer stream gauge record was used due to the gaps in the Shelford streamflow record.

The September 2011 flood event was the largest recent flood event. Rainfall records indicate 176 mm fell over four days. This flood event caused considerable damages to buildings, roads, and bridges. Eight houses including the Shelford Primary School and the Shelford Cricket Clubrooms were impacted by over floor flooding. Refer to the flood photos below.

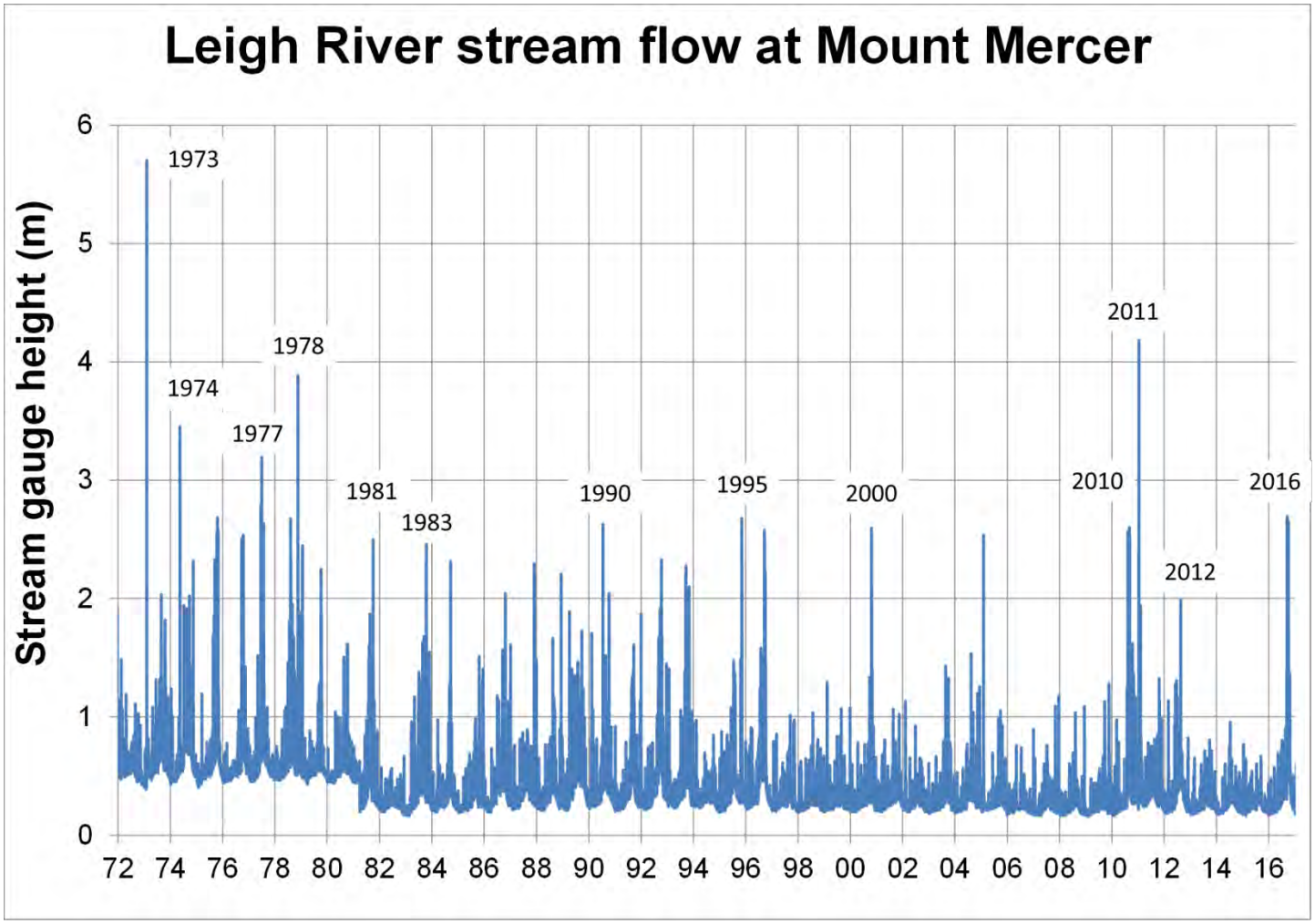

Figure 33. Leigh River stream flow records indicate the frequency of flood events that have occurred in Shelford.

Figure 34.Shelford Recreation Reserve Oval impacted by flooding during the 2011 flood event (source: Jessica Myer).

Figure 35.Shelford gauge boards adjacent to the Bannockburn-Shelford Road bridge during the 2011 flood event (source: Nathan Hansford)

Warning Time

Flooding can develop quickly in Shelford from heavy rainfall in the upper Leigh River catchment. Rapid rises in floodwater within Shelford can occur within 10 hours from rainfall. The time between heavy rainfall in the upper catchment around Ballarat and rise in streamflow at the Mount Mercer gauge is between 4 to 6 hours. The Mount Mercer gauge is expected to peak between 12 to 18 hours after the start of heavy rainfall. The peak travel time between Mount Mercer and the Shelford gauges is approximately between 6 to 10 hours.

It is important to note that all floods are different, and different rainfall patterns falling on dry or wet catchments may respond differently. The streamflow and travel time numbers below should be used as a guide only.

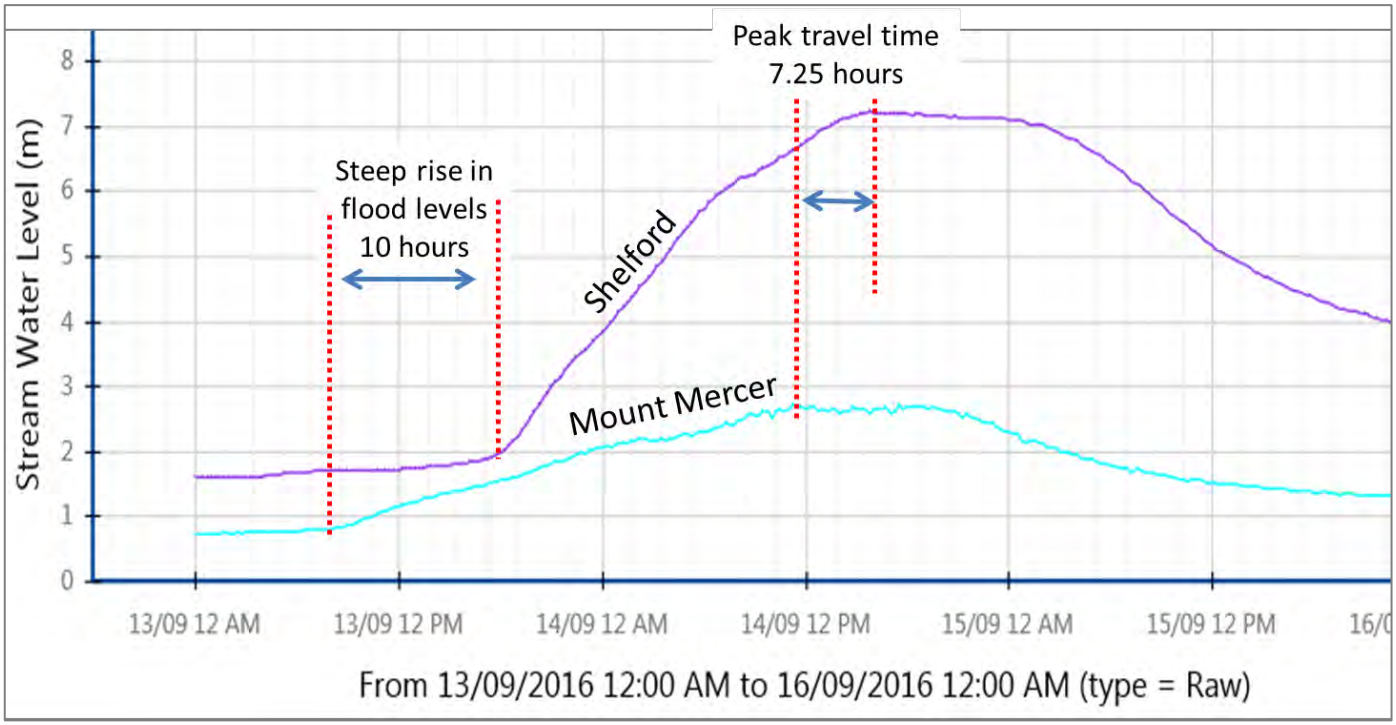

Figure 36. Leigh River stream flows at the Mount Mercer and Shelford gauges during the 2016 flood event.

Shelford levees

Two levees have been constructed in Shelford; both are located along the eastern bank of the Leigh River. These levees were constructed before 1973 to protect buildings and farm land from inundation. During the 1973 flood these levees were overtopped. Since then no repairs have been undertaken to these levees. The protection level of these levees is unknown.

Shelford Overland Flash Flooding

Due to the steep terrain surrounding Shelford, heavy localised rainfall can cause overland flooding. Two houses that are known to be impacted by overland flooding include: 60 Cunningham Street and 20 Russell Street. Overland flooding has also washed away the driveway to 10 Carpenters Road, cutting access/egress to the house. Refer to the map below for the location of these properties.

Minor works can be undertaken to reduce flood risk to these properties. These works can involve the construct drains or a small earthen garden bed (or solid fence) to divert water away from the houses. Any works undertaken need to consider impacts on adjacent properties and should be undertaken in consultation with the Golden Plains Shire Council.

Figure 37. Properties impacted by flash flooding in Shelford.

Shelford Flood Impacts and Required Actions

Given that no floor level survey was undertaken as part of the Regional Flood Mapping Investigation (DELWP 2016), buildings at risk of flooding were estimated using the Regional Flood Mapping Investigation (DELWP 2016) and anecdotal information collected during historic flood events. It's important to note the building damage information below only indicates buildings that may be at risk of above floor flooding and should be used as a guide only. For additional flood risk information refer to the Shelford Flood Intelligence Card, tables, and maps below.

Key assets at risk of flooding in Shelford are listed in the table below.

Table 17. Shelford key assets at risk of flooding.

Asset register				
Asset Name and location	**Average Recurrence Interval (ARI)**	**Consequence / Impact**	**Mitigation/ Action**	**Lead Agency**
Bannockburn-Shelford Road, Shelford.	5-year flood	Flooding may cut access to the Bannockburn-Shelford Road, depth 0.55m.	Deploy road closure signs and undertake traffic management as needed	Regional Roads Victoria
Shelford Primary School, 1717 Bannockburn-Shelford Road, Shelford	5-year flood	The grounds of the Shelford Primary School may be impacted by flooding in a 5-year flood event, depth 0.25m. Buildings may be flooded over floor during a 20-year flood.	Sandbag buildings and undertake evacuations as needed.	VICSES Victoria Police
Old Shelford Presbyterian Church, 1716 Bannockburn-Shelford Road, Shelford	5-year flood	The grounds of the Shelford Presbyterian Church may be impacted by flooding in a 5-year flood event, depth 0.29m. The Church may be flooded over floor during a 20-year flood.	Sandbag buildings and undertake evacuations as needed.	VICSES Victoria Police
The Parade Road, Shelford.	5-year flood	Flooding may cut access to The Parade Road, depth 0.71m.	Deploy road closure signs as needed.	Council
Ormond Street, Shelford.	5-year flood	Flooding may cut access to Ormond Street, depth 0.40m.	Deploy road closure signs as needed.	Council
The Shelford Cricket Club Oval, The Parade Road, Shelford	5-year flood	The Shelford Cricket Club Oval is impacted by flooding, depth 0.34m.	Notify the Shelford Cricket Club managers.	Council
Tolson Street, Shelford.	10-year flood	Flooding may cut access to Tolson Street, depth 0.32m.	Deploy road closure signs as needed.	Council
Shelford Tennis Club, Ormond Street, Shelford.	10-year flood	The Shelford Tennis Courts may be impacted by shallow flooding, depth 0.08m.	Notify the Shelford Tennis Club managers.	Council
Three buildings on the Bannockburn-Shelford Road (1727, 1735, 1737), Shelford	50-year flood	Three buildings may be flooded over floor.	Sandbag buildings and undertake evacuations as needed.	VICSES Victoria Police

For more detailed information regarding buildings and roads impacted refer to the Shelford Flood Intelligence Card and flood damages/impact maps below. Also refer to the Shelford flood depth maps in **Appendix F**, a list of flood observers in **Appendix H** and community sandbag collection point in **Appendix I**.

Figure 38.Shelford buildings subject to above floor flooding (source: Corangamite CMA Flood Response Guide and anecdotal observations).

Figure 39. Shelford roads impacted by flooding with the 100 year ARI flood extent (DELWP 2016).

Table 18. Shelford Flood Intelligence Card (Corangamite CMA Flood Response Guide)

Flood travel time				Time from start of rain to steep rise in floodwater 6 - 10 hours Time between Mount Mercer and Shelford peak 4 - 6 hours Riverine flooding duration: 2 days				
Leigh River at Mount Mercer gauge height 233215 (m) (DELWP 2016)	**Leigh River at Shelford gauge height 233213 (m)**	**Average Recurrence Interval (ARI) (CCMA)**	**^Shelford estimated damages**	**Shelford Flows (ML/d) Water Tech 2018 rating**	**Consequence / Impact (Corangamite CMA Flood Response Guide)**	**Houses/ buildings flooded / isolated**	**Roads Impacted**	**Action**
	3.60	2		2,200				
2.70	5.50	5		6,200	The Shelford Primary School and Presbyterian Church grounds may start to be impacted flooding. Flooding may cut access may to the Bannockburn-Shelford Road, The Parade Road, and Ormond Street.	The Shelford Primary School grounds may be impacted, depth 0.25m. The Shelford Presbyterian Church grounds may be impacted, depth 0.29m. The Shelford Recreational Reserve Oval is impacted by flooding, depth 0.34m.	Bannockburn-Shelford Road depth 0.55m The Parade Road depth 0.71m Tolson Street depth 0.16m Ormond Street depth 0.40m	VICSES activate ground observers to take photos and record flood levels at key crossings. Victoria Police evacuate the Shelford Primary School and buildings on the Bannockburn-Shelford Road as needed. Council and Regional Roads Victoria to deploy road closure signs and undertake traffic management as needed.
	5.70	April 2001						
2.00	6.00 (Proposed)	Minor						
3.25	6.60	10		10,700	Flooding may cut access to Tolson Street.	The Shelford Tennis Courts may be impacted by shallow flooding, depth 0.08m.	Bannockburn-Shelford Road depth 0.80m The Parade Road depth 0.79m Tolson Street depth 0.32m Ormond Street depth 0.50m	Refer to actions listed above.
3.00	7.00 (Proposed)	Moderate		12,500	A levee has been construction on the eastern side of the Leigh River. The protection level is unknown (no flood study). Landholders indicated the levee is quickly overtopped during major floods			Council clear debris from waterway crossings, drains and culvers as needed.
4.00		Major						Refer to actions listed above.
	7.22	September 2016		13,661				
	7.35	November 1995						
	7.40	November 1978		15,200				
3.80	7.40	20	12 (2)^	15,200	Buildings at the Shelford Primary School and Presbyterian Church may start to be impacted by over floor flooding. Hamilton Highway east of Inverleigh-Shelford Road begins to flood.	Two buildings may be flooded over floor; The Shelford Primary School (1717 Bannockburn-Shelford Road) may be impacted above floor, depth 0.37m. The Presbyterian Church (1716 Bannockburn-Shelford Road).	Bannockburn-Shelford Road depth 1.01m The Parade Road depth 0.85m Tolson Street depth 0.44m Ormond Street depth 0.55m	VICSES sandbag buildings as needed.

4.21	7.90	January 2011		16,800	178 mm rainfall fell over 4 days. Eight homes, Shelford Primary School, Presbyterian Church, Shelford Cricket Clubrooms, Tennis Clubrooms and Recreation Reserve were flooded. The main road was impassable. Significant impact to rural properties.			
	8.00 (Proposed)	Major						
4.49	8.25	50	25 (10)^	24,200		Additional buildings may be flooded over floor: Shelford Tennis Clubrooms (Ormond Street), Shelford Cricket Clubrooms (The Parade), x4 Bannockburn-Shelford Road (1727, 1737, 1739), x2 Tolson Street (30, 55) Houses may be isolated at x2 Bannockburn-Shelford Road (1739, 1741).	Bannockburn-Shelford Road depth 1.22m The Parade Road depth 0.88m Tolson Street depth 0.53m Ormond Street depth 0.59m	VICSES sandbag buildings as needed. Victoria Police evacuate buildings as needed.
5.16	8.45	100	38 (12)^	39,300			Bannockburn-Shelford Road depth 1.39m The Parade Road depth 0.90m Tolson Street depth 0.58m Ormond Street depth 0.61m	
	8.50	200		50,000			Bannockburn-Shelford Road depth 1.53m The Parade Road depth 0.92m Tolson Street depth 0.62m Ormond Street depth 0.64m	
5.34		1973 250-year event		45,000	Largest flood on record.			

^Damages have been estimated using information from the Corangamite CMA Flod Response Guide and flood mapping and the Golden Plains Shire Flood Data Transfer Mapping (DNRE 2000

Appendix C3: Teesdale Flood Emergency Plan

1. Context

Teesdale is located less than 100km west of Melbourne. Native Hut Creek Creek flows through the town, entering the town at its north-west corner and meandering through, flowing from the town at its south boundary.

2. Overview of Flooding Consequences at Teesdale

Teesdale is experiencing ongoing growth via a combination of infill and greenfield subdivision.

The *Teesdale Flood Risk Identification Study* (Water Technology, 2023) delivered flood mapping for a range of scenarios and historical events in Teesdale. The mapping shows that out of bank flows occur along Native Hut Creek in all modelled events, with the 50% AEP event being the most frequent (i.e. lowest magnitude) event modelled. Floor level survey and a damages assessment was completed as part of the project. One dwelling is flooded above floor in a 10% event and is the only dwelling to be inundated until the 2% AEP event is reached, when a second dwelling is impacted above floor. No other dwellings are impacted in all other modelled events with the exception of the PMF. Flood mapping and impacts are provided in Section 8 of this appendix.

3. Flooding Hot Spots

A number of flooding hot spots have been identified from the mapping:

- In large events, the north of properties along River Drive/Squires Road is expected to be inundated. No dwellings are within the floodplain in this area.
- First breakouts occur upstream of the Stones Road/Tolson Road bridge. A flood runner along the north side of the bridge conveys flows over Stones Road, requiring closure in most events.
- Pantics Road and Mercer Terrace are inundated in reasonably frequent events.
- Private property is threatened downstream of the Bannockburn-Shelford Road bridge.
- Barker Street is overtopped in most flow events.

4. Waterways and Drains

Native Hut Creek is approximately 55km in length from the headwaters to its confluence with the Barwon River. Native Hut Creek first forms a waterway approximately 3km west of Meredith, which is approximately 20km north of Teesdale. The creek meanders through agricultural land which has largely been cleared historically. Numerous tributaries meet Native Hut Creek as it flows through Teesdale, contributing to flooding in the township. The Native Hut Creek catchment upstream of Teesdale is approximately 110km^2 in area.

There are no stream gauges in the Native Hut Creek catchment.

5. Historic Floods

Historic floods of note include the following:

- 1949 – Significant flood in Native Hut Creek. Little data available.
- February 1973 – Largest flood in recent memory
- April 2001 – Significant overtopping of banks of Native Hut Creek
- January 2011 – Minor flow event, not known to break banks through township

6. FloodZoom and the Availability of Flood Intelligence for Teesdale

Flood mapping, reports, and other outputs from the *Teesdale Flood Risk Identification Study* (Water Technology, 2023) have been loaded to FloodZoom. Current and historic data as well as this MFEP are also available through FloodZoom.

Use of FloodZoom and other tools is encouraged in order to better inform the early heads-up estimate of likely flood severity and consequences and assist response activity planning and implementation. FloodZoom can also be used to determine or confirm flooding depths along roads and across properties and thus inform the need for evacuation and / or closure.

7. Flood Mitigation

There is no formal flood mitigation infrastructure in Teesdale.

8. Flood Intelligence Card, Property and Road Inundation List and Flood / No Flood Guidance Tool

1. Introduction

The BoM does not currently provide flood forecasts for Native Hut Creek or Teesdale. Flood response actions in Teesdale should be driven by rainfall and / or creek water level observations and local intelligence.

There are permanent rain gauges at Sheoaks and Winchelsea (external but close to the Native Hut Creek catchment). No stream gauge exists in the catchment.

Users of the following flood intelligence card should consider rainfall depth and rates at Teesdale and surrounds and use the indicative Flood / No Flood guidance tool in order to better appreciate the likely severity of flooding and its impacts in and around the town. Instructions for use of the tool are provided later in this Appendix.

Notes:

1. While flood intelligence cards provide guidance on the relationship between flood magnitude and flood consequences, 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. Further, the hydrologic and

hydraulic modelling that underpins much of the intel detailed below is informed by a number of assumptions and approximations (including in relation to antecedent conditions) that are unlikely to be replicated exactly during a flood event. Actual impacts under similar rainfall conditions are therefore expected to be similar but may not be exactly the same: there are likely to be some differences. More details about flood intelligence and its use can be found in the Australian Emergency Management Manuals flood series at http://www.ema.gov.au and in particular in Manual 20 "Flood Preparedness".

2. All levels, impacts and actions listed in the following flood intelligence card and indicative flood guidance tools may need to be adjusted over time to better reflect experience.

3. **Consequences are not repeated – i.e. for a 2% AEP event the consequence tables of more frequent (less severe) events should also be read to gain a full understanding of the impact.**

2. Flood Intelligence Card

Gauge Location: N/A (ungauged)

Observed Rainfall (see tool) **Indicative only**	**Flood Event**	**Consequence / Impact**	**Roadways Inundated**	**Action (VicSES to review and complete)** **Actions may include (but not limited to) issue of warnings, door knocking, evacuation / relocation, closure of roads, sandbagging, etc**
USING THIS INTELLIGENCE CARD. Obtain rainfall and use the indicative flood guidance tool to determine the approximate flood severity. Consider the appropriate flood inundation map. Review all consequences and actions in this table, from the first row down to the approximate expected severity of flooding. Initiate all actions in a logical sequence. Note that some actions may need to be initiated in an order that is different from their relative placement in this table. Note also that mapping, reports, data, and other resources are available through FloodZoom.				
Typically and with a wet catchment, peak levels occur around 10 hours after the start of rise. The rate of fall is slower being around 2 to 3 times the rate of rise – slow recessions are typical.				
Heavy rain on wet catchment		o May result in strong runoff and steady rises within the creeks. o If period of rain is short, local flooding likely along roadside and as sheet flows and flooding on flat and in low lying areas. o If period of rain is prolonged, significant creek flooding likely with roads inundated and some impassable, many properties flooded and over-floor flooding of a significant number of buildings. o **Area between Tolson Road and Teesdale-Lethbridge Road (north of Russel Street) likely to be flowing with water over driveways.**	o Potentially Stones Road and Barker Street	o Check antecedent conditions – is catchment wet? Check rainfall from last 30-60 days. o Monitor situation. This includes checking and monitoring forecasts and warnings, weather radar, Winchelsea and Sheoaks gauge rainfall (FloodZoom or WMIS) and local up-catchment rainfall. o Use the indicative flood / no flood tool to develop an appreciation of the likely scale of the flood event. o Consider supplying the sandbag pick-up location – refer to Appendix F.

Observed Rainfall (see tool) Indicative only	Flood Event	Consequence / Impact	Roadways Inundated	Action (VicSES to review and complete) Actions may include (but not limited to) issue of warnings, door knocking, evacuation / relocation, closure of roads, sandbagging, etc
USING THIS INTELLIGENCE CARD. Obtain rainfall and use the indicative flood guidance tool to determine the approximate flood severity. Consider the appropriate flood inundation map. Review all consequences and actions in this table, from the first row down to the approximate expected severity of flooding. Initiate all actions in a logical sequence. Note that some actions may need to be initiated in an order that is different from their relative placement in this table. Note also that mapping, reports, data, and other resources are available through FloodZoom.				
Typically and with a wet catchment, peak levels occur around 10 hours after the start of rise. The rate of fall is slower being around 2 to 3 times the rate of rise – slow recessions are typical.				
~25mm in 6 hours ~30mm in 9 hours ~33mm in 12 hours ~44mm in 24 hours ~51mm in 36 hours	**50% AEP** ~600 ML/d ~7.4 m^3/s 99.99 m AHD at Bannockburn-Shelford Road bridge	o Breakout occurs upstream of Stones Road, flowing along north side of Native Hut Creek and filling local depressions. Re-joins Native Hut Creek at Pantics Road. o 63 properties (total) impacted by floodwater	o Learmonth St (<0.1m) o Stones Road (<0.3m) o Barker Street (<0.3m) o Russel St (<0.1m)	o Monitor situation. This includes checking and monitoring forecasts and warnings, weather radar, Winchelsea and Sheoaks gauge rainfall (FloodZoom or WMIS) and local up-catchment rainfall. o Use the indicative flood / no flood tool to develop an appreciation of the likely scale of the flood event.
~34mm in 6 hours ~40mm in 9 hours ~46mm in 12 hours ~61mm in 24 hours ~72mm in 36 hours	**20% AEP** ~1,950 ML/d ~23 m^3/s 101.05 m AHD at Bannockburn-Shelford Road bridge	o Breakout upstream of Stones Road becomes more significant with deep flows on north side of Native Hut Creek. Breakout from dam at 95 Tolson Road flows over paddocks south of Native Hut Creek, rejoining before Sutherland Street. Stones Road and Barker Street flooded to hazardous depths. o Minor breakouts on west side of Native Hut Creek, north and south of Bannockburn-Shelford Road. o Significant breakouts around and downstream of Barker Street and around Native Hut Drive. o 73 properties (total) impacted by floodwater	o Learmonth St (<0.1m) o Stones Road (>0.5m) o Pantics Road (<0.1m) o Barker Street (>0.5m) o Russel St (~0.1m)	o Monitor situation. This includes checking and monitoring forecasts and warnings, weather radar, Winchelsea and Sheoaks gauge rainfall (FloodZoom or WMIS) and local up-catchment rainfall. o Use the indicative flood / no flood tool to develop an appreciation of the likely scale of the flood event. o Issue warnings as appropriate. o Either supply the sandbag pick-up location or confirm that it has been supplied – refer Appendix F. o If practical, assist sandbagging of at-risk houses and / or lifting of household items. o Deploy “water over road” signs. o Discourage traffic from using flooded roads.
25mm to 40mm in 24 hours 100 to 150mm in four days	**January 2011** ~2,100 ML/d ~24 m^3/s	o Generally contained within bed and banks through main part of town. Little data available.		

Observed Rainfall (see tool) Indicative only	Flood Event	Consequence / Impact	Roadways Inundated	Action (VicSES to review and complete) Actions may include (but not limited to) issue of warnings, door knocking, evacuation / relocation, closure of roads, sandbagging, etc
USING THIS INTELLIGENCE CARD. Obtain rainfall and use the indicative flood guidance tool to determine the approximate flood severity. Consider the appropriate flood inundation map. Review all consequences and actions in this table, from the first row down to the approximate expected severity of flooding. Initiate all actions in a logical sequence. Note that some actions may need to be initiated in an order that is different from their relative placement in this table. Note also that mapping, reports, data, and other resources are available through FloodZoom.				
Typically and with a wet catchment, peak levels occur around 10 hours after the start of rise. The rate of fall is slower being around 2 to 3 times the rate of rise – slow recessions are typical.				
~40mm in 6 hours ~48mm in 9 hours ~54mm in 12 hours ~73mm in 24 hours ~86mm in 36 hours	**10% AEP** ~3,400 ML/d ~40.5 m^3/s 101.53 m AHD at Bannockburn-Shelford Road bridge	o Floodplain fully engaged with breakout flows on both sides of Native Hut Creek throughout the town. o Turtle Bend inundated with isolated islands. o 90 properties (total) impacted by floodwater o **Teesdale Kindergarten driveway and carpark inundated. Access via community hall possible.** o **87 Pantics Road (1 building) inundated above floor.**	o Learmonth St (<0.1m) o Stones Road (>0.5m) o Mercer Tce (~0.5m) o Pantics Road (<0.3m) o Barker Street (>1m) o Sutherland Street (~0.3m) o Russel St (<0.3m)	o Monitor situation. This includes checking and monitoring forecasts and warnings, weather radar, Winchelsea and Sheoaks gauge rainfall (FloodZoom or WMIS) and local up-catchment rainfall. o Use the indicative flood / no flood tool to develop an appreciation of the likely scale of the flood event. o Issue warnings as appropriate. o Confirm that the sandbag pick-up location has been supplied – refer to Appendix F. o If practical, assist sandbagging of at-risk houses and / or lifting of household items. o Deploy "water over road" signs and consider closing roads as appropriate. o Discourage traffic from using flooded roads. o If practical, undertake welfare checks to at-risk properties.
63 to 72 mm in 24 hours 140mm to 150mm over three days	**April 2001** ~4,500 ML/d ~53 m^3/s	o Out of bank flows o Minor inundation of Turtle Bend o Little data available	o No data	
~47mm in 6 hours ~55mm in 9 hours ~63mm in 12 hours ~85mm in 24 hours ~101mm in 36 hours	**5% AEP** ~5,200 ML/d ~60.5 m^3/s 101.78 m AHD at Bannockburn-Shelford Road bridge	o Generally as for the 10% AEP with deeper, faster flowing water. Hazardous depths across floodplain. o 93 properties (total) impacted by floodwater o **Teesdale Kindergarten driveway and carpark inundated to hazardous depths. Access via community hall possible.**	o Learmonth St (<0.1m) o Stones Road (~1m) o Pantics Road (>0.3m) o Mercer Tce (~0.9m) o Barker Street (>1.0m) o Sutherland Street	o Monitor situation. This includes checking and monitoring forecasts and warnings, weather radar, Winchelsea and Sheoaks gauge rainfall (FloodZoom or WMIS) and local up-catchment rainfall. o Use the indicative flood / no flood tool to develop an appreciation of the likely scale of the flood event. o Issue warnings as appropriate. o Confirm that the sandbag pick-up location has been supplied – refer to Appendix F. o If practical, assist sandbagging of at-risk houses and / or

Observed Rainfall (see tool) Indicative only	Flood Event	Consequence / Impact	Roadways Inundated	Action (VicSES to review and complete) Actions may include (but not limited to) issue of warnings, door knocking, evacuation / relocation, closure of roads, sandbagging, etc
USING THIS INTELLIGENCE CARD. Obtain rainfall and use the indicative flood guidance tool to determine the approximate flood severity. Consider the appropriate flood inundation map. Review all consequences and actions in this table, from the first row down to the approximate expected severity of flooding. Initiate all actions in a logical sequence. Note that some actions may need to be initiated in an order that is different from their relative placement in this table. Note also that mapping, reports, data, and other resources are available through FloodZoom.				
Typically and with a wet catchment, peak levels occur around 10 hours after the start of rise. The rate of fall is slower being around 2 to 3 times the rate of rise – slow recessions are typical.				
			(~0.5m) o Teesdale-Inverleigh Road (<0.3m) o Russel St (<0.3m)	lifting of household items. o Deploy "water over road" signs. o Discourage traffic from using flooded roads. o If practical, undertake welfare checks to at-risk properties.
~56mm in 6 hours ~66mm in 9 hours ~75mm in 12 hours ~102mm in 24 hours ~121mm in 36 hours	**2% AEP** ~7,950 ML/d ~92 m^3/s 102.08 m AHD at Bannockburn-Shelford Road bridge	o Generally as for the 5% and 10% with deeper, faster flowing water. Hazardous depths across floodplain. o 102 properties (total) impacted by floodwater o **Bannockburn-Shelford Road overtopped.** o **844 Teesdale-Inverleigh Road inundated above floor in addition to 87 Pantics Road.**	o Learmonth St (~0.1m) o Bannockburn-Shelford Road (<0.1m) o Jollys Road (<0.1m) o Stones Road (>1m) o Pantics Road (>0.5m, ~750m length) o Mercer Tce (>1m) o Barker Street (>1.0m) o Sutherland Street (~0.8m) o Teesdale-Inverleigh Road (~0.4m) o Russel St (<0.3m)	o Monitor situation. This includes checking and monitoring forecasts and warnings, weather radar, Winchelsea and Sheoaks gauge rainfall (FloodZoom or WMIS) and local up-catchment rainfall. o Use the indicative flood / no flood tool to develop an appreciation of the likely scale of the flood event. o Issue warnings as appropriate and discourage traffic from using flooded roads. o Confirm that the sandbag pick-up location has been supplied – refer to Appendix F. o If practical, assist sandbagging of at-risk houses and / or lifting of household items. o Deploy "water over road" signs and consider closing roads as appropriate. o If practical, undertake welfare checks to at-risk properties. o Assist evacuation of properties.
~63mm in 6 hours ~75mm in 9 hours ~85mm in 12 hours ~116mm in 24 hours ~138mm in 36 hours	**1% AEP** ~10,150 ML/d ~118 m^3/s 102.25 m AHD at Bannockburn-	o Generally as above with deeper, faster flowing water. Hazardous depths across floodplain. o 108 properties (total) impacted by floodwater	o Learmonth St (~0.1m) o Bannockburn-Shelford Road (<0.3m) o Jollys Road (<0.1m) o Stones Road (>1m)	o Monitor situation. This includes checking and monitoring forecasts and warnings, weather radar, Winchelsea and Sheoaks gauge rainfall (FloodZoom or WMIS) and local up-catchment rainfall. o Use the indicative flood / no flood tool to develop an appreciation of the likely scale of the flood event. o Issue warnings as appropriate and discourage traffic from

Observed Rainfall (see tool) Indicative only	Flood Event	Consequence / Impact	Roadways Inundated	Action (VicSES to review and complete) Actions may include (but not limited to) issue of warnings, door knocking, evacuation / relocation, closure of roads, sandbagging, etc
USING THIS INTELLIGENCE CARD. Obtain rainfall and use the indicative flood guidance tool to determine the approximate flood severity. Consider the appropriate flood inundation map. Review all consequences and actions in this table, from the first row down to the approximate expected severity of flooding. Initiate all actions in a logical sequence. Note that some actions may need to be initiated in an order that is different from their relative placement in this table. Note also that mapping, reports, data, and other resources are available through FloodZoom.				
Typically and with a wet catchment, peak levels occur around 10 hours after the start of rise. The rate of fall is slower being around 2 to 3 times the rate of rise – slow recessions are typical.				
	Shelford Road bridge		o Pantics Road (>0.5m, ~750m length) o Mercer Tce (>1m) o Barker Street (>1.0m) o Sutherland Street (>1m) o Teesdale-Inverleigh Road (~0.6m) o Russel St (<0.3m)	using flooded roads. o Confirm that the sandbag pick-up location has been supplied – refer to Appendix F. o If practical, assist sandbagging of at-risk houses and / or lifting of household items. o Deploy "water over road" signs and consider closing roads as appropriate. o If practical, undertake welfare checks. o Assist evacuation of properties.
~74mm in 6 hours ~87mm in 9 hours ~99mm in 12 hours ~134mm in 24 hours ~159mm in 36 hours	**0.5% AEP** ~13,100 ML/d ~ 152 m^3/s 102.48 m AHD at Bannockburn-Shelford Road bridge	o **Bannockburn-Shelford Road overtopped to depths greater than 0.3 metres.** o Generally as above with deeper, faster flowing water. Hazardous depths across floodplain. o 111 properties (total) impacted by floodwater	o Learmonth St (~0.1m) o Bannockburn-Shelford Road (>0.3m) o Jollys Road (<0.1m) o Stones Road (>1m) o Pantics Road (>0.5m, ~750m length) o Mercer Tce (>1m) o Barker Street (>1.0m) o Sutherland Street (>1m) o Teesdale-Inverleigh Road (~0.9m) o Russel St (<0.3m) o Teesdale-Lethbridge	o As for the 1% AEP event, noting that flooding is generally deeper, faster flowing and more hazardous. o If practical, undertake welfare checks and assist evacuation of properties.

Observed Rainfall (see tool) Indicative only	Flood Event	Consequence / Impact	Roadways Inundated	Action (VicSES to review and complete) Actions may include (but not limited to) issue of warnings, door knocking, evacuation / relocation, closure of roads, sandbagging, etc
USING THIS INTELLIGENCE CARD. Obtain rainfall and use the indicative flood guidance tool to determine the approximate flood severity. Consider the appropriate flood inundation map. Review all consequences and actions in this table, from the first row down to the approximate expected severity of flooding. Initiate all actions in a logical sequence. Note that some actions may need to be initiated in an order that is different from their relative placement in this table. Note also that mapping, reports, data, and other resources are available through FloodZoom.				
Typically and with a wet catchment, peak levels occur around 10 hours after the start of rise. The rate of fall is slower being around 2 to 3 times the rate of rise – slow recessions are typical.				
			Road (<0.1m)	
105mm to 155mm in 24 hours 160mm to 190mm in 48 hours	**February 1973** ~13,600 ML/d ~ 158 m^3/s	o Widespread inundation. o From The Age newspaper: *swirling floodwaters surged through the township, causing widespread damage and flooding homes. Three new tennis courts were wrecked as the floodwaters peeled back the new malthoid topping on the courts.*	o No records.	
~86mm in 6 hours ~102mm in 9 hours ~116mm in 12 hours ~157mm in 24 hours ~186mm in 36 hours	**0.2% AEP** ~16,000 ML/d ~185 m^3/s 102.67 m AHD at Bannockburn-Shelford Road bridge	o Generally as above with deeper, faster flowing water. Hazardous depths across floodplain. o 112 properties (total) impacted by floodwater	o Learmonth St (~0.1m) o Bannockburn-Shelford Road (<0.5m) o Jollys Road (<0.1m) o Stones Road (>1m) o Pantics Road (>0.5m, ~750m length) o Mercer Tce (>1m) o Barker Street (>1.0m) o Sutherland Street (>1m) o Teesdale-Inverleigh Road (>1m) o Teesdale-Lethbridge Road (<0.1m)	o As for the 0.5% AEP event, noting that flooding is generally deeper, faster flowing and more hazardous. o If practical, undertake welfare checks and assist evacuation of properties.

Observed Rainfall (see tool) Indicative only	Flood Event	Consequence / Impact	Roadways Inundated	Action (VicSES to review and complete) Actions may include (but not limited to) issue of warnings, door knocking, evacuation / relocation, closure of roads, sandbagging, etc
USING THIS INTELLIGENCE CARD. Obtain rainfall and use the indicative flood guidance tool to determine the approximate flood severity. Consider the appropriate flood inundation map. Review all consequences and actions in this table, from the first row down to the approximate expected severity of flooding. Initiate all actions in a logical sequence. Note that some actions may need to be initiated in an order that is different from their relative placement in this table. Note also that mapping, reports, data, and other resources are available through FloodZoom.				
Typically and with a wet catchment, peak levels occur around 10 hours after the start of rise. The rate of fall is slower being around 2 to 3 times the rate of rise – slow recessions are typical.				
*	PMF	o Extensive flooding with many local roads flooded and closed – see mapping. o Many buildings flooded over-floor.	o Many	o Evacuate entire floodplain.

* Estimates intentionally not included as there is a high degree of uncertainty in such estimates for an event of this magnitude.

3. Roads Flooded

The following table provides an indication of the depth of flooding from Native Hut Creek, on roads in and around Teesdale, that is more than 0mm, 300mm and 500mm deep for each of the design events whole the two maps show where that flooding occurs on those roads.

A map of the 0.2% (1 in 500) AEP event showing road locations is included on the following page.

The table is sorted by the peak depth in the 20% AEP (5-year ARI) event, then each subsequent event up to the PMF. A traffic light system has been adopted as follows:

- Green = <0.3 metres depth
- Orange = 0.3 to 0.5 metres depth
- Red = >0.5 metres depth

	Maximum Flood Depth (m) by Road Segment								
Name	**PMF**	**0.20%**	**0.50%**	**1%**	**2%**	**5%**	**10%**	**20%**	**50%**
Bannockburn-Shelford Road	5.57	0.55	0.4	0.24	0.12				
Barker Street	8.23	2.80	2.53	2.20	1.94	1.55	1.25	0.97	0.18
Bruce Street	1								
Jollys Road	0.28	0.06	0.05	0.03	0.02				
Learmonth Street	0.52	0.15	0.12	0.11	0.11	0.09	0.09	0.07	0.05
Mercer Terrace	6.55	1.66	1.52	1.35	1.19	0.84	0.51		
Pantics Road/Squires Road	5.6	0.96	0.83	0.73	0.63	0.46	0.24	0.03	
Russell Street	0.90	0.26	0.22	0.20	0.18	0.15	0.14	0.11	0.08
Stones Road/Tolson Road	3.64	1.54	1.41	1.25	1.12	0.94	0.82	0.60	0.16
Sutherland Street	4.52	1.36	1.23	1.06	0.90	0.62	0.33		
Teesdale-Inverleigh Road	6.37	1.13	0.90	0.64	0.42	0.14			
Teesdale-Lethbridge Road	0.32	0.06	0.02						

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Contains Vicmap Information © State of Victoria 2023

Data Sources:
Corangamite CMA, Golden Plains Shire, DTP

Road

50% AEP Flood Extent

Depth

<0.3 metres

0.3 to 0.5 metres

>0.5 metres

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE

CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

WATER TECHNOLOGY

SES

Roads Flooded Map - 50% AEP

Teesdale Flood Risk Identification Study

REFERENCE: M:\2021\0384_Final_Risk_Identification_Study_for_Teesdale\Spatial\Workspace\MFEP\2210384_Teesdale_MFEP_Roads_MC.mxd

DATE: [redacted] | SHEET: 1 of 1 | DRAWING NUMBER: ARIPMF

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Data Sources:
Corangamite CMA, Golden Plains Shire, DTP

Road
20% AEP Flood Extent

Depth
- <0.3 metres
- 0.3 to 0.5 metres
- >0.5 metres

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE
CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS
WATER TECHNOLOGY
SES

Roads Flooded Map - 20% AEP

Teesdale Flood Risk Identification Study

REFERENCE: M:\2020\0384_Flood_Risk_Identification_Study_for_Teesdale\GIS\MXD\Maps\MFEP\2020384_Teesdale_MFEP_Roads_MC.mxd
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Data Sources:
Corangamite CMA, Golden Plains Shire, DTP

Road
10% AEP Flood Extent

Depth
- <0.3 metres
- 0.3 to 0.5 metres
- >0.5 metres

0 0.25 0.5 1 Km

1:15,000 at A3

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Roads Flooded Map - 10% AEP

Teesdale Flood Risk Identification Study

REFERENCE: M:\2020\0384_Flood_Risk_Identification_Study_for_Teesdale\GIS\MXD\Maps\MFEP\2020384_Teesdale_MFEP_Roads_MC.mxd
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Data Sources:
Corangamite CMA, Golden Plains Shire, DTP

Road
5% AEP Flood Extent

Depth
- <0.3 metres
- 0.3 to 0.5 metres
- >0.5 metres

0 0.25 0.5 1 Km
1:15,000 at A3

GOLDEN PLAINS SHIRE
CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS
WATER TECHNOLOGY
SES

Roads Flooded Map - 5% AEP

Teesdale Flood Risk Identification Study

REFERENCE: M:\2020\0384_Flood_Risk_Identification_Study_for_Teesdale\Data\MIKEFP\20210384_Teesdale_MIKEFP_Roads_MC.mxd
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Data Sources:
Corangamite CMA, Golden Plains Shire, DTP

Road
2% AEP Flood Extent

Depth
- <0.3 metres
- 0.3 to 0.5 metres
- >0.5 metres

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE
CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS
WATER TECHNOLOGY
SES

Roads Flooded Map - 2% AEP

Teesdale Flood Risk Identification Study

REFERENCE: M:\2021\0384_Flood_Risk_Identification_Study_for_Teesdale\Spatial\Workspace\MFEF\20210384_Teesdale_MFEF_Roads_MC.mxd
DATE: [illegible] | SHEET: 1 of 1 | DRAWING NUMBER: AR/PMF

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Data Sources:
Corangamite CMA, Golden Plains Shire, DTP

Road

1% AEP Flood Extent

Depth

- <0.3 metres
- 0.3 to 0.5 metres
- >0.5 metres

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE

CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

WATER TECHNOLOGY

SES

Roads Flooded Map - 1% AEP

Teesdale Flood Risk Identification Study

REFERENCE: M:\2021\0384_Flood_Risk_Identification_Study_for_Teesdale\Spatial\Workspace\MFEP\20210384_Teesdale_MFEP_Roads_MC.mxd

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Data Sources:
Corangamite CMA, Golden Plains Shire, DTP

Road

0.5% AEP Flood Extent

Depth

- <0.3 metres
- 0.3 to 0.5 metres
- >0.5 metres

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE

CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

WATER TECHNOLOGY

SES

Roads Flooded Map - 0.5% AEP

Teesdale Flood Risk Identification Study

REFERENCE: M:\2201\0384_Flood_Risk_Identification_Study_for_Teesdale\Spatial\Workspace\MFEP\2201384_Teesdale_MFEP_Roads_MC.mxd

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Data Sources:
Corangamite CMA, Golden Plains Shire, DTP

Road

0.2% AEP Flood Extent

Depth

<0.3 metres

0.3 to 0.5 metres

>0.5 metres

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE

CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

WATER TECHNOLOGY

SES

Roads Flooded Map - 0.2% AEP

Teesdale Flood Risk Identification Study

REFERENCE: M:\2021\0384_Flood_Risk_Identification_Study_for_Teesdale\Spatial\Workspace\MFEP\2021\0384_Teesdale_MFEP_Roads_MC.mxd

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Data Sources:
Corangamite CMA, Golden Plains Shire, DTP

Road

PMF Flood Extent

Depth

- <0.3 metres
- 0.3 to 0.5 metres
- >0.5 metres

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE

CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

WATER TECHNOLOGY

SES

Roads Flooded Map - PMF

Teesdale Flood Risk Identification Study

REFERENCE: M:\22\10384_Flood_Risk_Identification_Study_for_Teesdale\Spatial\Workspace\MFEP\22I0384_Teesdale_MFEP_Roads_MC.mxd

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4. Properties Flooded

Summary of number of flood affected properties at Teesdale																	
	Buildings flooded over-floor									Properties flooded over-ground							
ARI	2yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr	PMF	2yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr	PMF
Properties Impacted	0	0	1	1	2	2	2	2	18	63	73	90	93	102	108	111	112	112

Legend			Over-floor flood depth									Maximum flood depth, whole of property								
		Over-flood flooding depth at building for each AEP									Maximum depth of flooding on the property for each AEP									
Address	**Floor Level (mAHD)**	**2yr**	**5yr**	**10yr**	**20yr**	**50yr**	**100yr**	**200yr**	**500yr**	**PMF**	**2yr**	**5yr**	**10yr**	**20yr**	**50yr**	**100yr**	**200yr**	**500yr**	**PMF**
87 Pantics Road	104.301			0.15	0.39	0.56	0.66	0.79	0.90	3.84	0.21	0.34	0.52	0.78	0.96	1.08	1.21	1.31	4.49
75 Pantics Road	104.667				-1.06	-0.84	-0.69	-0.52	-0.40	3.03			0.58	0.85	1.07	1.21	1.38	1.50	4.94
844 Teesdale-Inverleigh Road	101.435					0.15	0.35	0.63	0.86	6.16	3.01	3.92	4.23	4.48	4.84	5.09	5.40	5.66	11.01
1087 Bannockburn-Shelford Road	102.685						-0.92	-0.63	-0.38	4.92	1.88	2.90	3.30	3.49	3.74	3.99	4.29	4.54	9.85
169 Squires Road	105.706							-0.46	-0.36	2.44	0.43	0.48	0.49	0.59	0.72	0.81	0.92	1.02	3.84
27 Pantics Road	103.23								-0.30	4.54						0.04	0.22	0.37	5.21
1109a Bannockburn-Shelford Road	103.162								-0.33	4.58						0.21	0.54	0.72	5.63
1107 Bannockburn-Shelford Road	103.039									4.65			0.71	0.90	1.18	1.40	1.67	1.89	7.14
849 Teesdale-Inverleigh Road	103.617									4.02			0.59	0.78	1.06	1.28	1.55	1.77	7.02
1118 Bannockburn-Shelford Road	104.27									3.47			0.41	0.73	1.09	1.25	1.42	1.57	6.45
35 Pantics Road	104.361									3.42			1.03	1.20	1.46	1.63	1.80	1.92	6.39
59 Pantics Road	104.562									3.30			0.56	0.75	0.91	1.01	1.13	1.23	4.97
756 Teesdale-Inverleigh Road	100.448									3.11	0.26	2.43	2.63	2.85	3.18	3.41	3.71	3.95	7.82
73 Sutherland Street	104.906									3.06	1.66	2.75	3.19	3.27	3.39	3.47	3.59	3.68	7.83
98 Sutherland Street	105.962									2.15	2.45	3.23	3.79	4.01	4.21	4.33	4.48	4.60	7.42

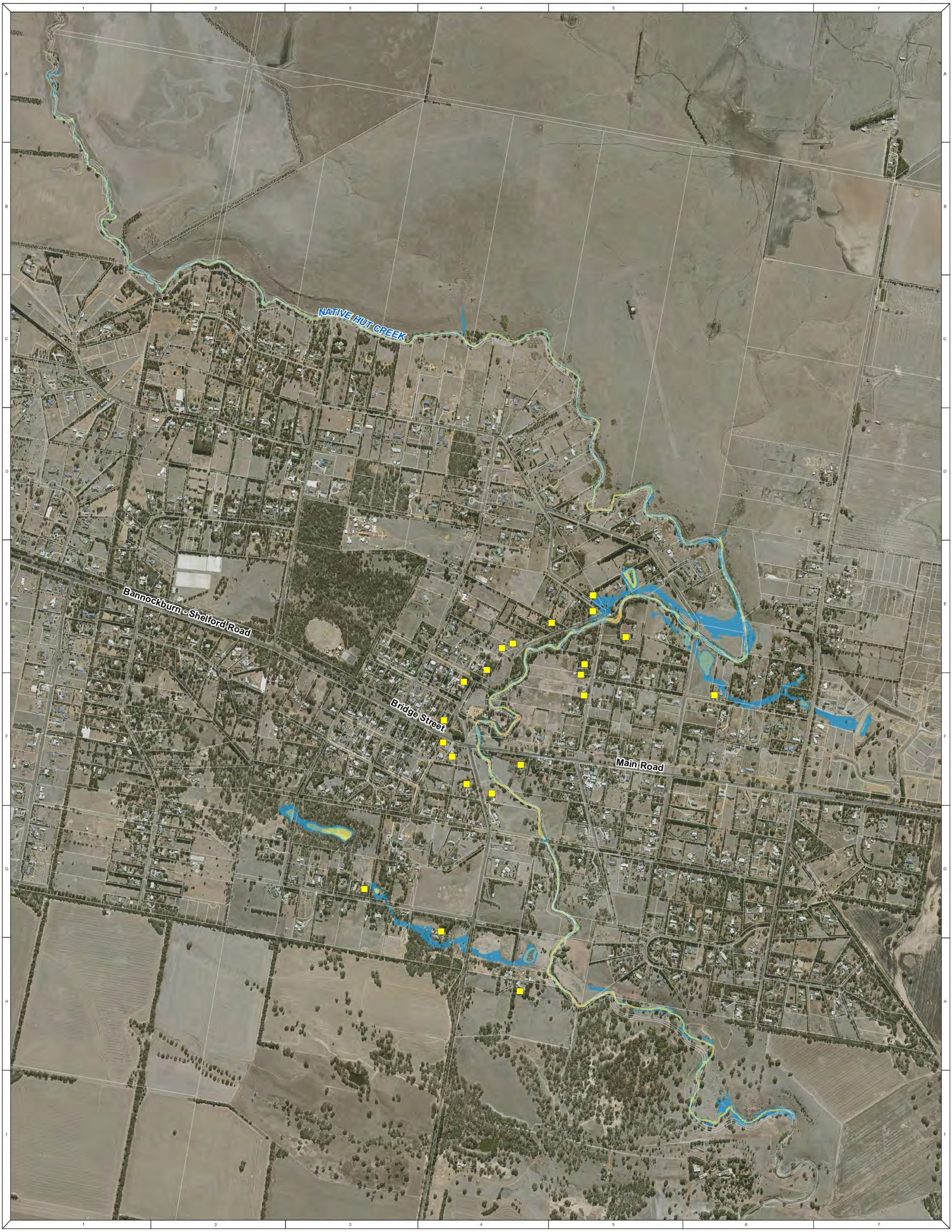
Legend			Over-floor flood depth									Maximum flood depth, whole of property								
	Floor Level (mAHD)	Over-flood flooding depth at building for each AEP									Maximum depth of flooding on the property for each AEP									
Address		2yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr	PMF	2yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr	PMF
67 Sutherland Street	105.851									2.13	1.64	2.73	3.17	3.26	3.37	3.45	3.56	3.65	7.87
53 Pantics Road	105.782									2.03			0.06	0.24	0.39	0.49	0.61	0.71	4.51
75 Sutherland Street	106.078									1.89	1.22	2.22	2.75	2.92	3.09	3.19	3.32	3.43	6.90
7 Jollys Road	104.254									-0.02	0.70	0.72	1.07	1.71	2.32	2.36	2.40	2.45	3.44
824 Teesdale-Inverleigh Road	N/A										3.49	4.26	4.54	4.82	5.20	5.46	5.78	6.05	11.45
1072 Bannockburn-Shelford Road	N/A										3.26	4.33	4.77	4.91	5.03	5.10	5.20	5.30	9.97
82 Stones Road	N/A										2.97	3.89	4.42	4.76	5.10	5.31	5.56	5.74	8.15
9 Sutherland Street	N/A										2.81	3.77	4.09	4.31	4.66	4.91	5.21	5.47	10.81
70 Stones Road	N/A										2.60	3.44	3.92	4.27	4.64	4.87	5.15	5.35	7.45
852 Teesdale-Inverleigh Road	N/A										2.53	3.55	3.95	4.11	4.35	4.55	4.82	5.05	10.31
23 Stones Road	N/A										2.04	2.80	3.40	3.68	3.87	3.99	4.13	4.24	6.81
35 Stones Road	N/A										1.82	1.91	1.94	2.11	2.30	2.43	2.58	2.72	5.57
42 Jollys Road	N/A										1.80	1.84	1.92	2.44	2.81	2.83	2.88	2.90	3.35
58 Stones Road	N/A										1.69	2.32	2.73	3.04	3.41	3.64	3.92	4.12	6.00
70 Native Hut Drive	N/A										1.68	2.25	2.51	2.80	3.16	3.41	3.72	3.97	7.76
30 Russell Street	N/A										1.61	1.89	2.08	2.20	2.32	2.41	2.52	2.62	4.70
85 Teesdale-Lethbridge Road	N/A										1.55	1.77	1.92	2.06	2.24	2.36	2.51	2.61	4.04
95 Tolson Street	N/A										1.50	2.25	2.84	3.12	3.34	3.48	3.64	3.76	6.11
146 Meredith-Shelford Road	N/A										1.36	2.25	2.90	3.34	3.84	4.13	4.43	4.67	7.48
32 Stones Road	N/A										1.35	1.86	2.22	2.53	2.93	3.19	3.50	3.73	6.56
40 Stones Road	N/A										1.32	1.84	2.22	2.54	2.92	3.16	3.46	3.67	5.91
65 Teesdale-Lethbridge Road	N/A										1.32	1.57	1.75	1.87	1.98	2.06	2.17	2.26	4.30
105 Squires Road	N/A										1.25	1.79	2.18	2.49	2.85	3.09	3.36	3.58	7.96
89 Sutherland Street	N/A										1.23	2.19	2.74	2.94	3.09	3.19	3.31	3.42	6.67
103 Squires Road	N/A										1.16	1.71	2.08	2.38	2.74	2.98	3.26	3.48	7.89

Legend			Over-floor flood depth									Maximum flood depth, whole of property								
Address	Floor Level (mAHD)	Over-flood flooding depth at building for each AEP									Maximum depth of flooding on the property for each AEP									
		2yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr	PMF	2yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr	PMF
31 Stones Road	N/A										1.14	1.89	2.51	2.79	2.98	3.10	3.24	3.36	6.05
181 Squires Road	N/A										1.09	1.50	2.09	2.35	2.54	2.67	2.82	2.95	5.64
13 Squires Road	N/A										1.05	1.97	2.50	2.79	3.08	3.24	3.41	3.55	6.85
36a Russell Street	N/A										1.04	1.29	1.44	1.55	1.71	1.82	1.96	2.07	4.20
68 Learmonth Street	N/A										1.00	1.03	1.05	1.06	1.08	1.10	1.12	1.14	1.56
55 Teesdale-Lethbridge Road	N/A										0.84	0.89	0.95	0.97	1.01	1.04	1.07	1.11	1.83
66 Native Hut Drive	N/A										0.76	1.30	1.50	1.76	2.10	2.35	2.64	2.89	6.64
Bannockburn-Shelford Road	N/A										0.71	0.79	0.98	1.01	1.20	1.37	1.66	1.98	2.14
47 Jollys Road	N/A										0.68	0.72	0.78	0.81	0.88	0.91	0.99	1.04	1.83
6 Russell Street	N/A										0.67	0.71	0.76	0.77	0.78	0.78	0.81	0.87	1.63
59 Sutherland Street	N/A										0.64	1.78	2.21	2.28	2.37	2.44	2.53	2.62	6.98
25 Squires Road	N/A										0.59	0.74	1.29	1.56	1.81	1.95	2.11	2.25	5.78
113 Squires Road	N/A										0.58	1.49	2.06	2.38	2.65	2.81	3.00	3.15	5.61
16 Russell Street	N/A										0.55	0.59	0.63	0.65	0.69	0.71	0.74	0.79	1.52
52 Stones Road	N/A										0.54	0.91	1.27	1.59	1.96	2.21	2.50	2.71	4.81
28 Russell Street	N/A										0.51	0.55	0.59	0.60	0.63	0.65	0.68	0.71	1.41
37 Squires Road	N/A										0.44	0.64	1.15	1.40	1.65	1.79	1.95	2.09	5.85
39 Squires Road	N/A										0.44	0.44	1.20	1.45	1.70	1.84	2.00	2.15	5.93
43 Stones Road	N/A										0.42	0.51	0.54	0.71	0.90	1.03	1.56	4.25	6.51
46 Russell Street	N/A										0.40	0.47	0.55	0.57	0.63	0.67	0.71	0.77	2.63
53 Squires Road	N/A										0.40	1.39	1.86	2.07	2.33	2.51	2.74	2.94	7.21
33 Jollys Road	N/A										0.30	0.35	0.46	0.50	0.60	0.63	0.71	0.76	1.50
46 Barker Street	N/A										0.29	1.04	1.39	1.72	2.12	2.40	2.74	3.01	8.45
72 Native Hut Drive	N/A										0.19	0.71	1.03	1.32	1.64	1.85	2.11	2.33	6.24
43 Squires Road	N/A										0.18	0.27	0.78	0.95	1.13	1.26	1.44	1.60	5.77

Legend			Over-floor flood depth									Maximum flood depth, whole of property								
Address	Floor Level (mAHD)	Over-flood flooding depth at building for each AEP									Maximum depth of flooding on the property for each AEP									
		2yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr	PMF	2yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr	PMF
26 Sugar Gum Crescent	N/A										0.17	0.17	0.25	0.28	0.31	0.33	0.34	0.36	0.82
50 Barker Street	N/A										0.16	0.86	1.22	1.58	1.99	2.27	2.61	2.88	8.28
29 Jollys Road	N/A										0.16	0.20	0.28	0.30	0.38	0.41	0.46	0.48	0.93
28 Sugar Gum Crescent	N/A										0.11	0.18	0.30	0.32	0.36	0.37	0.39	0.41	0.87
38 Teesdale-Lethbridge Road	N/A										0.07	0.11	0.23	0.26	0.29	0.31	0.32	0.35	0.80
48 Jollys Road	N/A										0.06	0.18	0.36	0.77	1.14	1.16	1.21	1.23	1.70
20 Sugar Gum Crescent	N/A										0.03	0.12	0.13	0.13	0.13	0.13	0.14	0.14	0.49
20 Barker Street	N/A											2.00	2.33	2.65	3.05	3.32	3.65	3.93	9.35
54 Jollys Road	N/A											0.64	0.82	0.87	1.09	1.11	1.16	1.18	1.64
1073 Bannockburn-Shelford Road	N/A											0.56	0.98	1.29	1.64	1.89	2.19	2.45	7.78
125 Teesdale-Lethbridge Road	N/A											0.55	0.79	0.90	1.09	1.24	1.47	1.68	4.68
76 Stones Road	N/A											0.28	0.76	1.11	1.46	1.69	1.96	2.16	4.31
65 Squires Road	N/A											0.22	0.60	0.85	1.17	1.38	1.64	1.85	6.17
81 Squires Road	N/A											0.07	0.46	0.77	1.11	1.33	1.58	1.79	5.96
25 Russell Street	N/A											0.04	0.08	0.10	0.14	0.16	0.19	0.23	0.90
89 Squires Road	N/A											0.03	0.39	0.66	1.00	1.23	1.48	1.70	6.32
79 Squires Road	N/A											0.02	0.35	0.66	1.02	1.23	1.49	1.69	5.86
96 Russell Street	N/A												0.70	0.99	1.27	1.43	1.60	1.73	4.89
67 Pantics Road	N/A												0.57	0.84	1.06	1.20	1.37	1.49	4.93
140 Shaws Road	N/A												0.44	0.73	1.02	1.18	1.36	1.50	4.79
36 Jollys Road	N/A												0.30	1.08	1.45	1.47	1.51	1.54	1.95
95 Squires Road	N/A												0.29	0.56	0.90	1.13	1.40	1.63	6.23
40 River Drive	N/A												0.27	0.64	0.99	1.18	1.38	1.55	4.38
162 Squires Road	N/A												0.16	0.44	0.68	0.85	1.03	1.15	4.51
42 Teesdale-Lethbridge Road	N/A												0.09	0.16	0.21	0.24	0.26	0.31	0.80

Legend			Over-floor flood depth									Maximum flood depth, whole of property								
Address	Floor Level (mAHD)	Over-flood flooding depth at building for each AEP									Maximum depth of flooding on the property for each AEP									
		2yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr	PMF	2yr	5yr	10yr	20yr	50yr	100yr	200yr	500yr	PMF
83 Squires Road	N/A												0.08	0.30	0.65	0.89	1.16	1.38	5.77
40 Teesdale-Lethbridge Road	N/A												0.06	0.10	0.15	0.32	0.35	0.39	0.87
46 Teesdale-Lethbridge Road	N/A													0.25	0.29	0.31	0.45	0.50	0.87
84 Russell Street	N/A													0.03	0.26	0.42	0.59	0.73	3.92
784 Teesdale-Inverleigh Road	N/A													0.02	0.13	0.31	0.55	0.75	4.53
54 River Drive	N/A														0.54	0.76	0.98	1.16	3.86
4 River Drive	N/A														0.50	0.67	0.85	1.00	4.08
48 River Drive	N/A														0.49	0.69	0.91	1.09	3.78
10 River Drive	N/A														0.38	0.56	0.75	0.89	3.95
24 River Drive	N/A														0.28	0.86	1.06	1.23	4.02
20 River Drive	N/A														0.20	0.38	0.57	0.73	3.63
70 River Drive	N/A														0.18	1.62	1.90	2.06	4.71
814 Teesdale-Inverleigh Road	N/A														0.08	0.34	0.67	0.94	6.36
89 Tolson Street	N/A														0.05	0.22	0.41	0.54	2.73
1109 Bannockburn-Shelford Road	N/A															0.30	0.62	0.80	5.71
76 River Drive	N/A															0.18	0.39	0.56	3.19
810 Teesdale-Inverleigh Road	N/A															0.11	0.33	0.60	6.04
19 Ware Street	N/A															0.04	0.15	0.27	4.73
59 Stones Road	N/A																0.13	0.25	2.72
85 Stones Road	N/A																0.07	0.16	1.71
50 Teesdale-Lethbridge Road	N/A																0.03	0.06	0.38
4 Mercer Terrace	N/A																	0.01	5.04

5. Flood Mapping



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Data Sources:
Corangamite CMA, Golden Plains Shire, DTP

Cadastre

50% AEP Flooded Buildings
- Below Floor Level
- Above Floor Level

50% AEP Flood Depth (m)
- < 0.5 m
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 5
- > 5 m

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE

CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

SES

50% AEP Flood Map

Teesdale Flood Risk Identification Study

REFERENCE: M:\Z\P\10384_Flood_Risk_Identification_Study_for_Teesdale\Spatial\Workspaces\MFEP\210384_Teesdale_MFEP_FloodMaps.qpr

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Cadastre

20% AEP Flooded Buildings
- Below Floor Level
- Above Floor Level

20% AEP Flood Depth (m)
- < 0.5 m
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 5
- > 5 m

0 0.25 0.5 1 Km

1:15,000 at A3

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SES

20% AEP Flood Map

Teesdale Flood Risk Identification Study

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Cadastre

10% AEP Flooded Buildings
- Below Floor Level
- Above Floor Level

10% AEP Flood Depth (m)
- < 0.5 m
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 5
- > 5 m

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE

CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

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SES

10% AEP Flood Map

Teesdale Flood Risk Identification Study

REFERENCE: M:\Z\P11384_Flood_Risk_Identification_Study_for_Teesdale\Spatial\Workspaces\MFEP\210384_Teesdale_MFEP_FloodMaps.mxd

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Data Sources:
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Cadastre

5% AEP Flooded Buildings
- Below Floor Level
- Above Floor Level

5% AEP Flood Depth (m)
- < 0.5 m
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 5
- > 5 m

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE

CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

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SES

5% AEP Flood Map

Teesdale Flood Risk Identification Study

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Data Sources:
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Cadastre

2% AEP Flooded Buildings
- Below Floor Level
- Above Floor Level

2% AEP Flood Depth (m)
- < 0.5 m
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 5
- > 5 m

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE

CORANGAMITE CMA
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SES

2% AEP Flood Map

Teesdale Flood Risk Identification Study

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Data Sources:
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Cadastre

1% AEP Flooded Buildings
- Below Floor Level
- Above Floor Level

1% AEP Flood Depth (m)
- < 0.5 m
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 5
- > 5 m

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE
CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS
WATER TECHNOLOGY
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SES

1% AEP Flood Map

Teesdale Flood Risk Identification Study

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Data Sources:
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Cadastre

0.5% AEP Flooded Buildings
- Below Floor Level
- Above Floor Level

0.5% AEP Flood Depth (m)
- < 0.5 m
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 5
- > 5 m

0 0.25 0.5 1 Km

1:15,000 at A3

GOLDEN PLAINS SHIRE

CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

SES

0.5% AEP Flood Map

Teesdale Flood Risk Identification Study

REFERENCE: M:\Z\#11364_Flood_Risk_Identification_Study_for_Teesdale\Spatial\Workspaces\MFEP\21010361_Teesdale_MFEP_FloodMaps.mxd

DATE: 05/04/2023 | SHEET 1 of 1 | DRAWING NUMBER: AR/PMF

NOTE
Water Technology Pty. Ltd. has prepared this document in accordance with instruction of Golden Plains Shire for their specific use.

DISCLAIMER
The Golden Plains Shire and Water Technology Pty. Ltd. do not warrant that this document is definitive nor free from error and does not accept liability for any loss caused or arising from reliance upon information provided herein.

Data Sources:
Corangamite CMA, Golden Plains Shire, DTP

Cadastre

0.2% AEP Flooded Buildings
- Below Floor Level
- Above Floor Level

0.2% AEP Flood Depth (m)
- < 0.5 m
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 5
- > 5 m

0 0.25 0.5 1 Km

1:15,000 at A3

0.2% AEP Flood Map

Teesdale Flood Risk Identification Study

REFERENCE: M:\Z\#11364_Flood_Risk_Identification_Study_for_Teesdale\Spatial\Workspaces\MFEP\21011364_Teesdale_MFEP_FloodMaps.mxd
DATE: 26/04/2023 | SHEET 1 of 1 | DRAWING NUMBER: AR/PMF

6. Indicative Flood / No flood Guidance Tools for Teesdale

In the lead up to a flood

The indicative flood / no-flood tool provided below give some guidance on the likelihood and severity of expected flooding at Teesdale with an estimated lead time of 7 to 30 hours during moderate floods but as short as 5 hours in extreme rainfall events. Significant rainfall on a saturated catchment may produce very short lead times.

Rainfall recorded at the rain gauge at the Sheoaks or Winchelsea sites, or private gauges upstream in the catchment, should be used to drive the rainfall-based tool. The precautionary principle of using a gauge that delivers the highest rainfall total for the period should be adopted. It should be noted that the tool is indicative only and due to the gross assumptions, that sit behind it, may not always perform to expectations.

Unless there are unusual circumstances, actions as per the Flood Intelligence Card should be initiated as soon as the tool indicates flooding is likely. Response can be escalated if the tool indicates an increase in the expected severity of flooding.

During a flood - using the rainfall-based tool

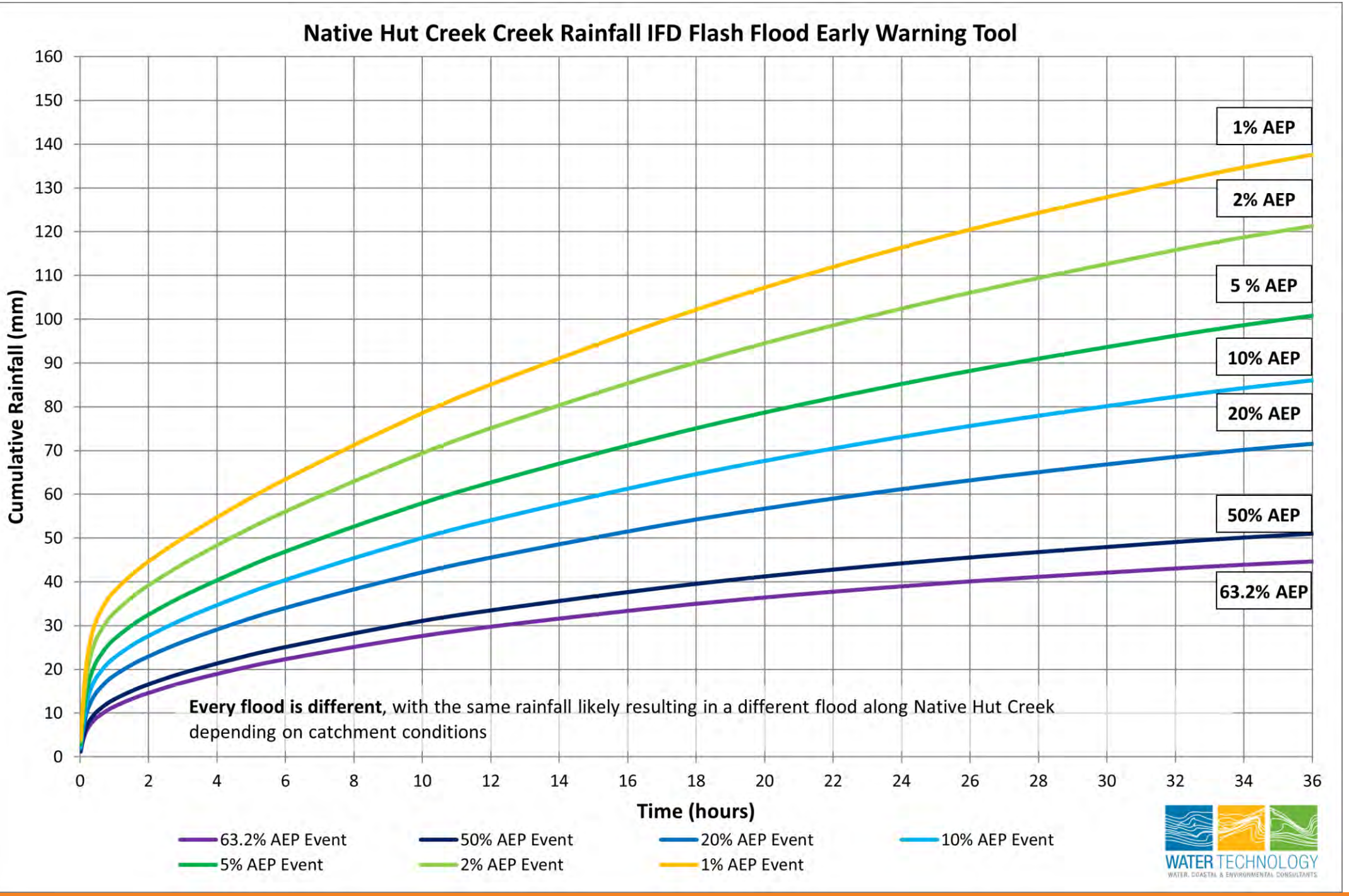
Using the total rainfall depth obtained from the start of the event (do not include early drizzle or very light rain), plot the rainfall depth against elapsed time on a copy of the tool. The plot should be extended as new data becomes available. Assess the likelihood and expected severity of flooding from the curves with due regard for included notes. A crossing of the curves by the plot indicates that flooding of around that severity is likely.

If the catchment is dry and farm dams are (or are close to) empty and / or rain extends over more than 24 hours, the indicative tool will tend to over-estimate the likelihood of flooding. In that case, it may be appropriate to step down one level. For example, if rainfall is on the 50-year curve and the catchment is dry, refer to the 20-year map and the 20-year row in the flood intelligence card at Section **Error! Reference source not found.**, noting that this may still significantly overestimate flooding in the catchment. The exception to this would be if there was very heavy rain on a dry catchment. In that circumstance, adopt a cautious approach and do not step down a level. On the other hand, the tool may underestimate the likelihood of flooding if the catchment is extremely wet and / or rain is particularly heavy (say as the result of extended thunderstorm activity) and / or there has been a flood through Teesdale in the past couple of weeks or so. In such circumstances, it may be prudent to step up one curve.

CAUTION. While a strength of the tool is that it does provide a quick ballpark answer to questions such as “will we flood” and “how bad will it be”, it is based on a number of gross assumptions and generalisations. It is therefore indicative only. The tool is not property specific and does not enable accurate predictions of expected flooding, peak flood heights, the time of flood peak, the severity of expected flooding or specific likely consequences. Further, it will not always indicate the expected severity of flooding correctly although it will usually give a heads-up to severe flooding and thus of likely consequences.

After a flood – updating the tools

After a flood event, plot the event rainfall depth (with date) on the indicative flood tool and include an overview of the event, including antecedent conditions, along with other relevant information into this Appendix.


Native Hut Creek Creek Rainfall IFD Flash Flood Early Warning Tool
Cumulative Rainfall (mm)
Time (hours)
1% AEP
2% AEP
5 % AEP
10% AEP
20% AEP
50% AEP
63.2% AEP
Every flood is different, with the same rainfall likely resulting in a different flood along Native Hut Creek depending on catchment conditions
63.2% AEP Event
50% AEP Event
20% AEP Event
10% AEP Event
5% AEP Event
2% AEP Event
1% AEP Event
WATER TECHNOLOGY

Appendix D: Flood evacuation arrangements

Phase 1 - Decision to Evacuate

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

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

- Properties are likely to become inundated;
- Properties are likely to become isolated and occupants are not suitable for isolated conditions;
- Public health is at threat 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 State Health Emergency Response Plan (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 and available to conduct the evacuation;
- Evacuation priorities and evacuation planning arrangements;
- Access and egress routes available and their potential flood liability;
- Current and likely future status of essential infrastructure;
- Is cross border assistance required or evacuation to another municipality relief centre?;
- Resources required and available to conduct the evacuation;
- Shelter including Emergency Relief Centres, Assembly Areas 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.

Phase 2 – Warning

Warnings may include a warning to 'prepare to evacuate' and a warning to 'evacuate now'. Once the decision to evacuate has been made, the at-risk community will be warned to evacuate. Evacuation warnings should be disseminated via methods listed in section 3.3 of this plan.

Phase 3 – Withdrawal

VicPol is the responsible agency for evacuation. VICSES will provide advice regarding most appropriate evacuation routes and locations for at-risk communities to evacuate to.

VICSES, CFA, AV and Local Government will provide resources where available to support VicPol/ REGIONAL ROADS 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.

Landing zones for helicopters are located at:

- Lethbridge Airport
- Ballarat Airport (if access is not cut by flooding)
- Geelong Base Hospital
- Ballarat Base Hospital

Special needs groups will be/are identified in the 'vulnerable persons register' which can be accessed by Police in an emergency.

Phase 4 – Shelter

Relief Centres and/or assembly areas which cater for people's basic needs for floods may be established to meet the immediate needs of people affected by flooding

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

Animal Shelter

Animal shelter compounds will be established for domestic pets and companion animals of evacuees.

Phase 5 – Return

The Incident Controller 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, truck routes, water treatment plant affecting potable water supplies etc.

Appendix E: Public Information and Warnings

VICSES uses EM-COP Public Publishing to distribute riverine and flash flood warnings in Victoria. The platform enables automatic publishing to the VicEmergency app, website, and hotline (1800 226 226). Communities can also access this information through VICSES social media channels (Victoria State Emergency Service on Facebook and VICSES News on Twitter) and emergency broadcasters, such as Sky News TV and various radio stations (current list available via the EMV website).

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

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

VICSES at the state tier (or SCC Public Information Section) plays an important role in sharing riverine and flash flood information via state-based standard communication channels.

During some emergencies, VICSES may alert communities by sounding a local siren, or by using the Emergency Alert (EA) platform to send an SMS to mobile phones or a voice message to landlines. The use of sirens for higher-end warnings has been pre-determined, and mapped to relevant warning templates in EM-COP.

EM-COP Public Publishing Business Rules for Riverine and Flash Flood are available in the **Public Information tab of the IMT Toolbox,** providing further guidance on specific triggers, roles, and responsibilities. VICSES SOP057 and JSOP 04.01 provide further guidance.

	**EMERGENCY ALERT** As required, subject to individual circumstances, weather conditions, potential impacts, and duration. Refer VICSES SOP057.	As required, based on conditions, changed conditions or impacts of the flood event. Circumstances which warrant the use of EA include: • EA is likely to contribute to saving lives and property • EA is likely to be the most effective way to warn the community in an actual or likely emergency • Alternative channels have been considered and alone may not achieve objectives • Time is of the essence and specific action following the receipt of the warning is required The message is of critical importance and needs to be delivered to a specific geographic area
Pre-populated Golden Plains Shire Emergency Alert key messages for a severe flash flood event High velocity floodwater may cause risk to life for pedestrians and motorist. Access to main roads may be cut. Advise to shelter in place if it is safe to do so. The flood peak is likely to pass within 6 to 12 hours.		

	**EMERGENCY ALERT** As required, subject to individual circumstances, weather conditions, potential impacts, and duration. Refer VICSES SOP057.	As required, based on conditions, changed conditions or impacts of the flood event. Circumstances which warrant the use of EA include: • EA is likely to contribute to saving lives and property • EA is likely to be the most effective way to warn the community in an actual or likely emergency • Alternative channels have been considered and alone may not achieve objectives • Time is of the essence and specific action following the receipt of the warning is required The message is of critical importance and needs to be delivered to a specific geographic area

Pre-populated Golden Plains Shire Emergency Alert key messages for a severe flash flood event
The BOM have issued a Severe Weather Waring: Heavy Rain

Heavy rainfall forecast by the BOM may lead to Flash Flooding ???. Falls are expected to be between ???mm and ???mm. Locally heavier falls are possible due to embedded thunderstorms that could cause severe flooding.

Locations which may be affected include Shelford and Inverleigh.

Widespread flooding may occur.
Keep clear of creeks and storm drains
Stay clear of fast-moving floodwater. Floodwater is expected to rise quickly and will cause risk to life for pedestrians and motorist.
Flooding may cause extensive inundation of buildings.
Properties are likely to be isolated. If your property is impacted by flooding, we advise you to shelter in place if it is safe to do so.
The flood peak is likely to pass quickly, within 6 to 12 hours.
Floodwater may cut access to main roads, avoid driving until the storm and floodwater has subsided.

Waterways likely to be affected include:

- Leigh River
- Barwon River
- Warrambine Creek
- Five Mile Creek
- Woady Yaloak Creek
- Native Hut Creek
- Moorabool River
- Naringhill Creek
- Stony Creek
- Bruce Creek

SES advises that all community members should:
Never walk, ride or drive through floodwater, Never allow children to play in floodwater, Stay away from waterways and stormwater drains during and after heavy rain, Keep well clear of fallen power lines Be aware that in fire affected areas, rainfall run-off into waterways may contain debris such as ash, soil, trees and rocks, and heavy rainfall increases the potential for landslides and debris across roads.

For emergency assistance contact the SES on 132 500.

Current Road and Traffic Information is available at the VicRoads website: http://traffic.vicroads.vic.gov.au

Weather Forecast:

For the latest weather forecast see http://www.bom.gov.au/vic/forecasts/

Appendix F: Flood Maps and Schematics

Figure 40. Inverleigh 10-year ARI (Leigh River dominant) flood depth map (Water Technology 2018).

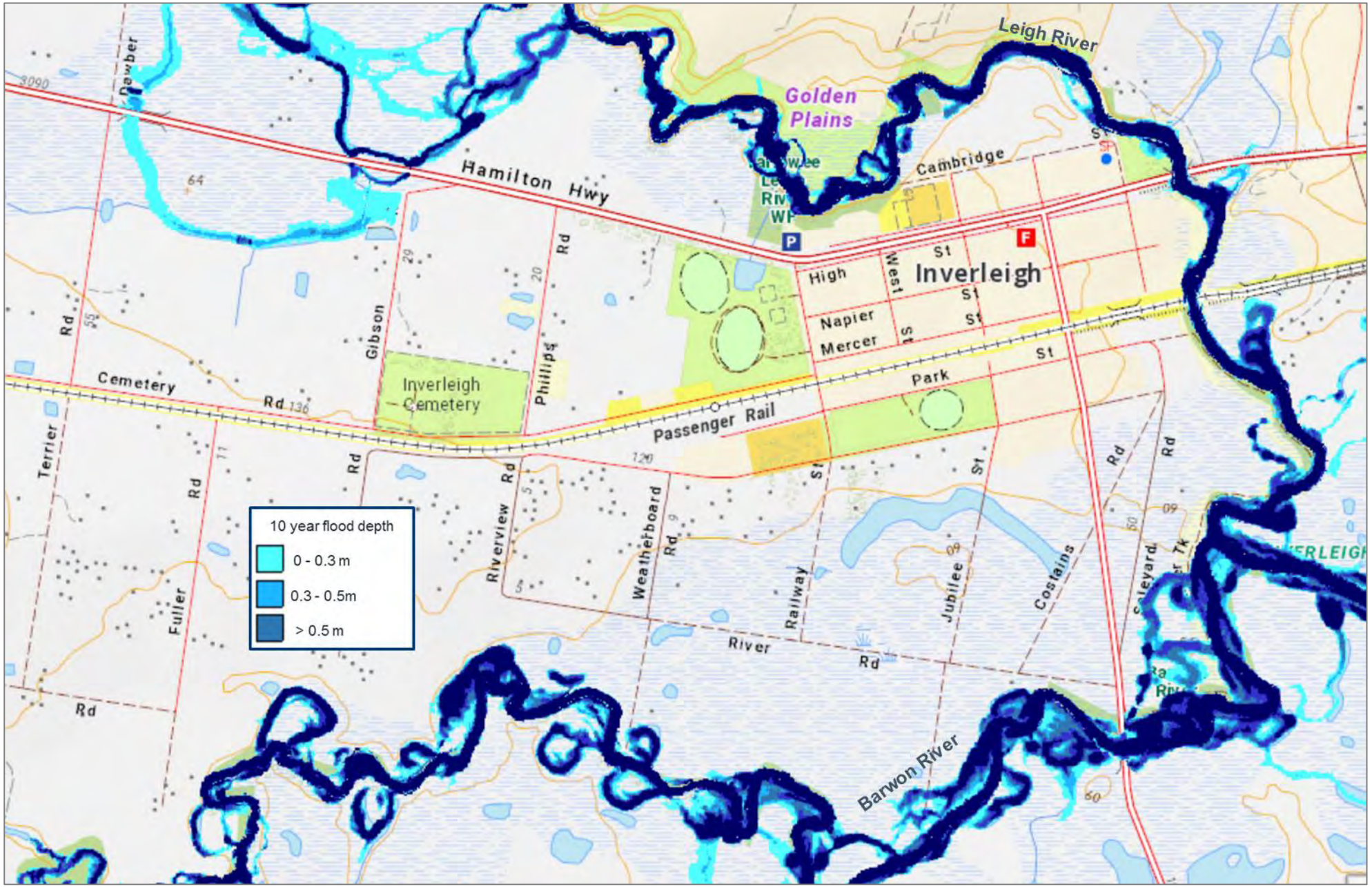


Figure 41. Inverleigh 20-year ARI (Leigh River dominant) flood depth map (Water Technology 2018).

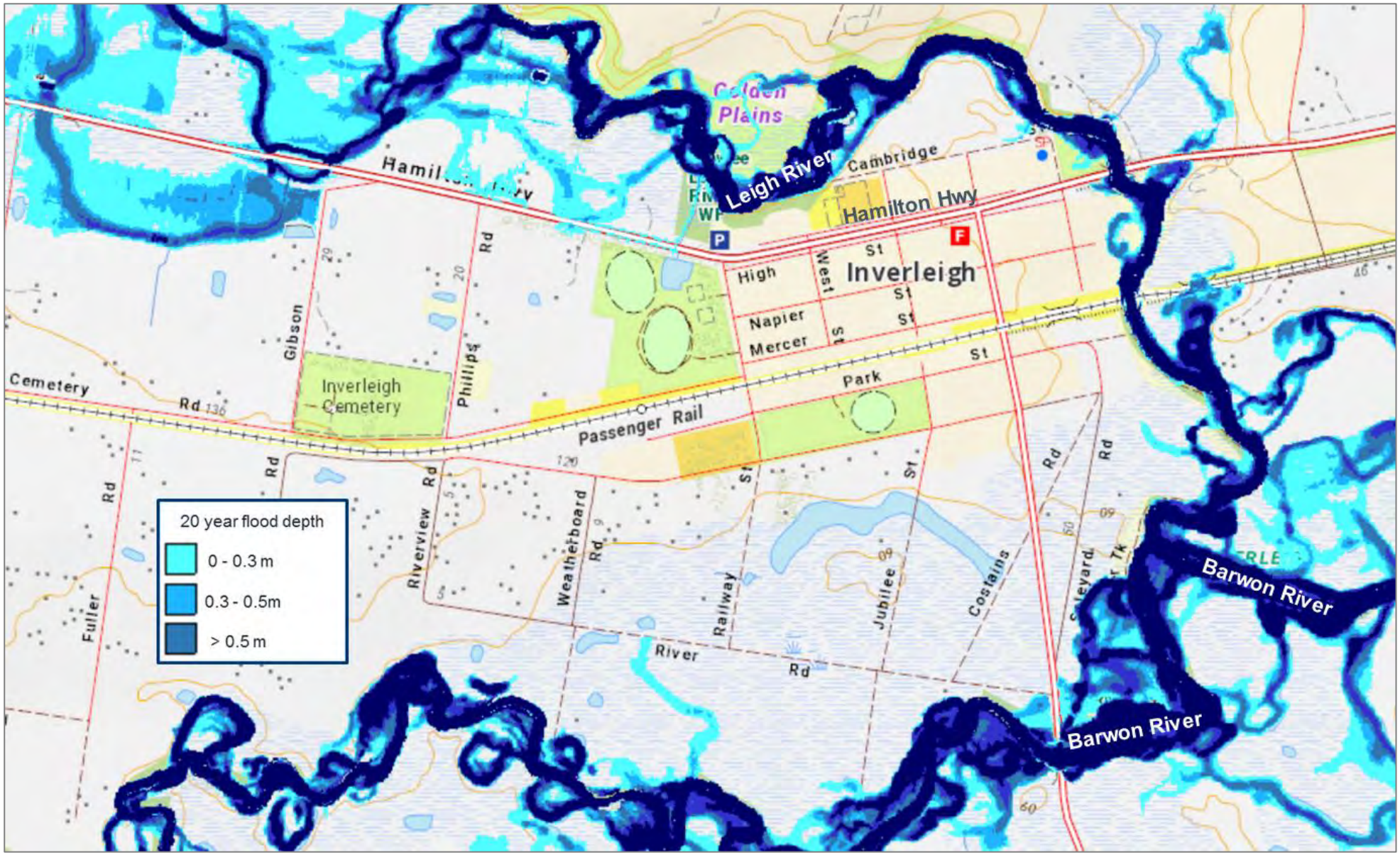


Figure 42. Inverleigh 50-year ARI (Leigh River dominant) flood depth map (Water Technology 2018).

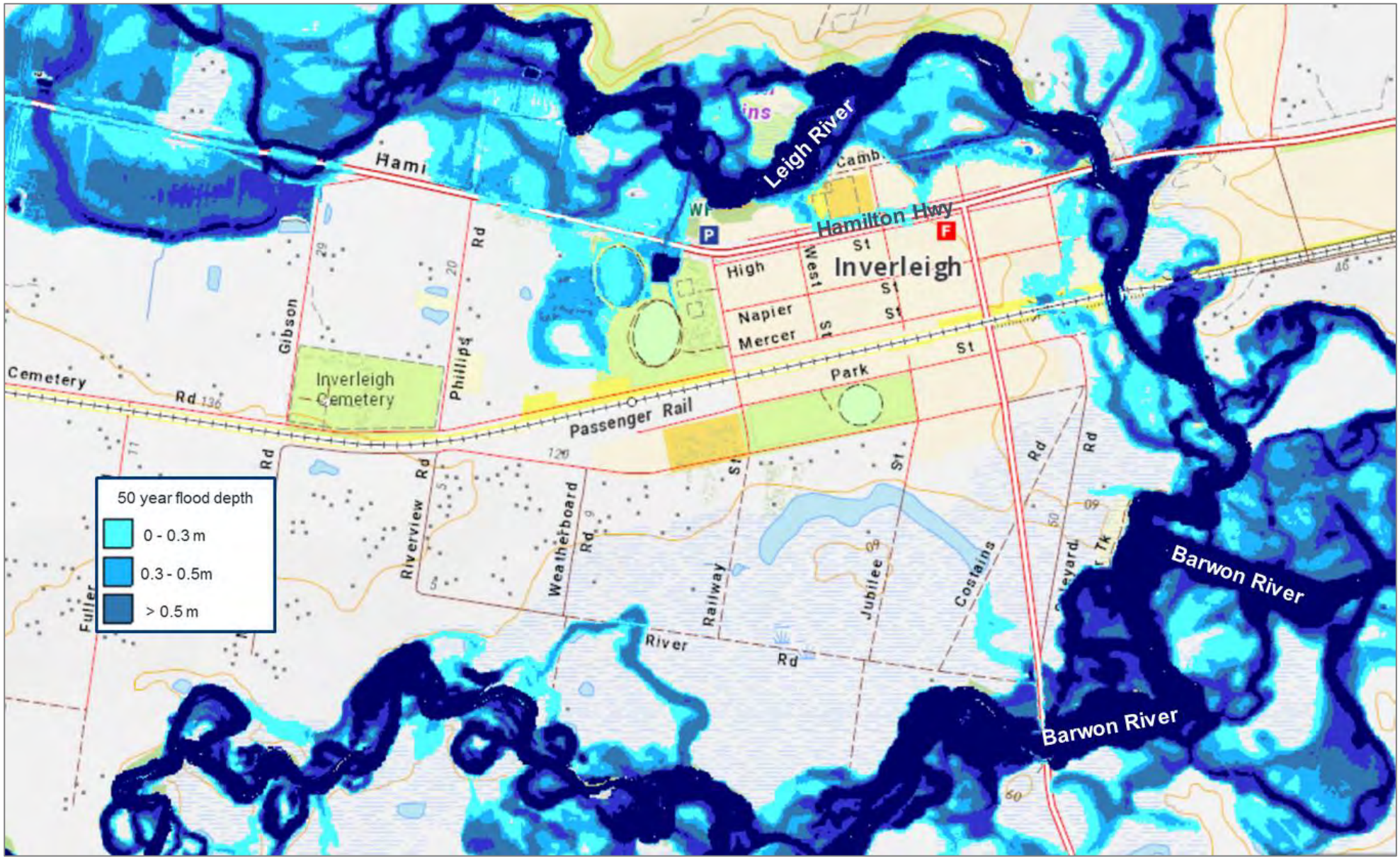


Figure 43. Inverleigh 100-year ARI (Leigh River dominant) flood depth map (Water Technology 2018).

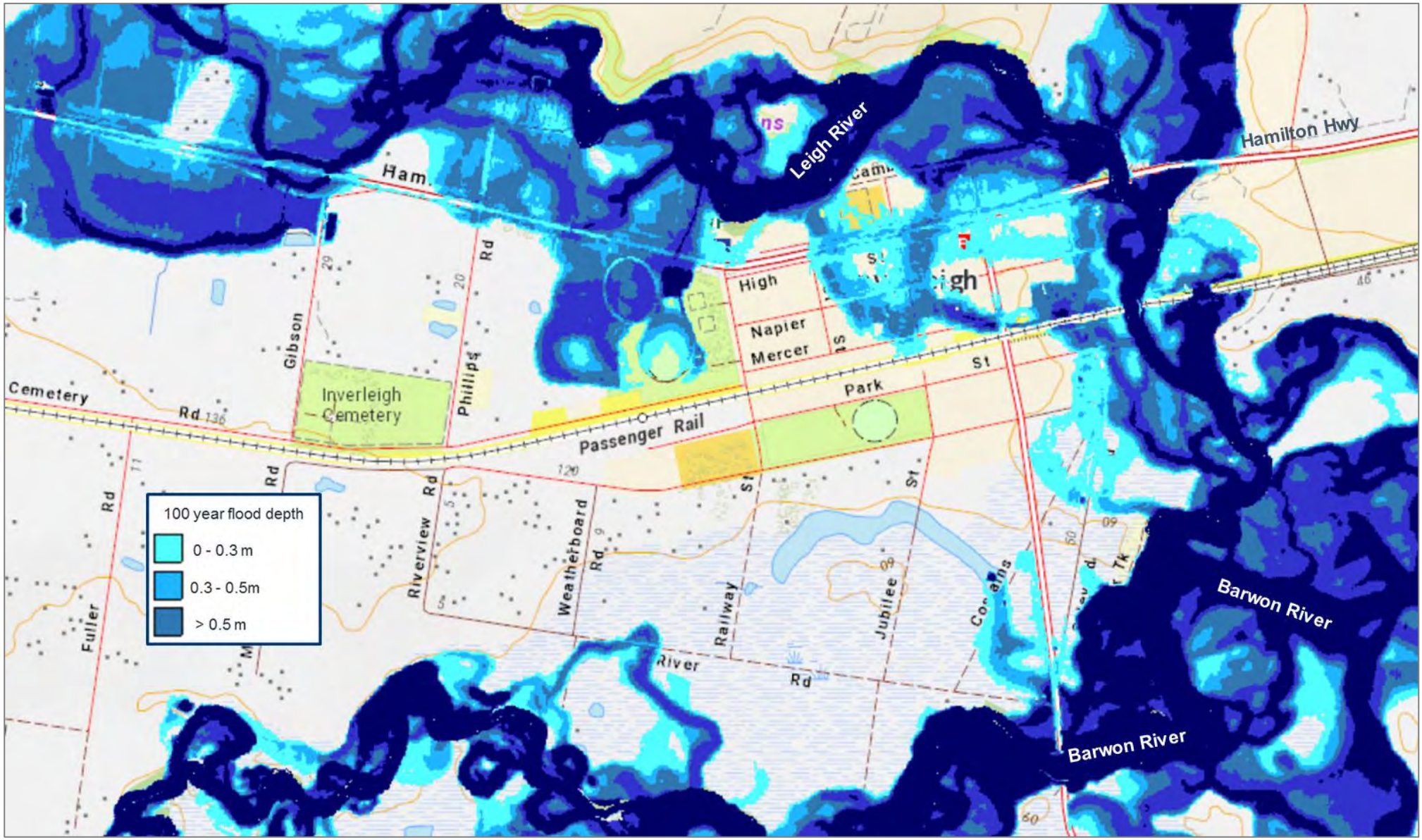


Figure 44. Inverleigh 200-year ARI (Leigh River dominant) flood depth map (Water Technology 2018).

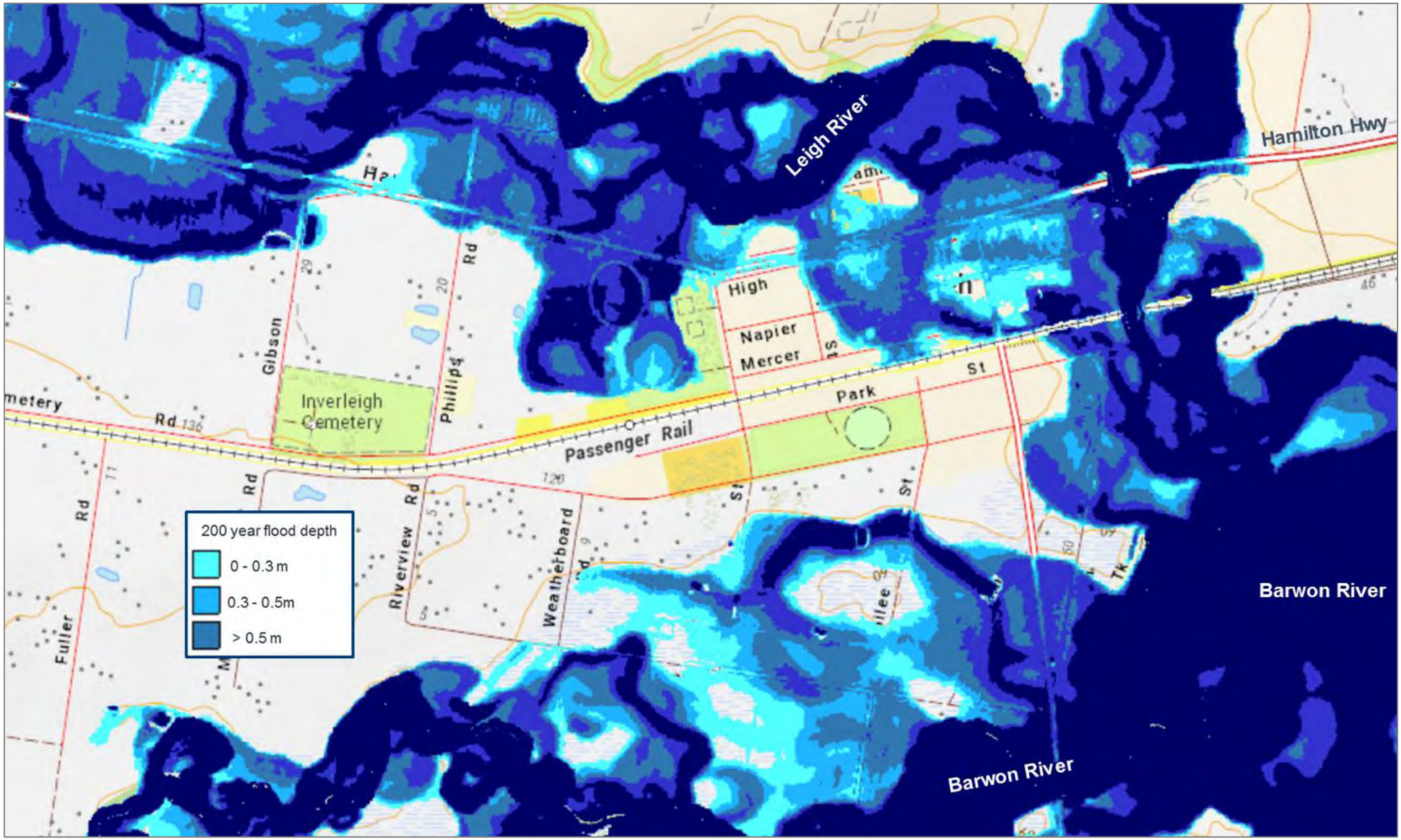


Figure 45. Inverleigh 10-year ARI (Barwon River dominant) flood depth map (Water Technology 2018).

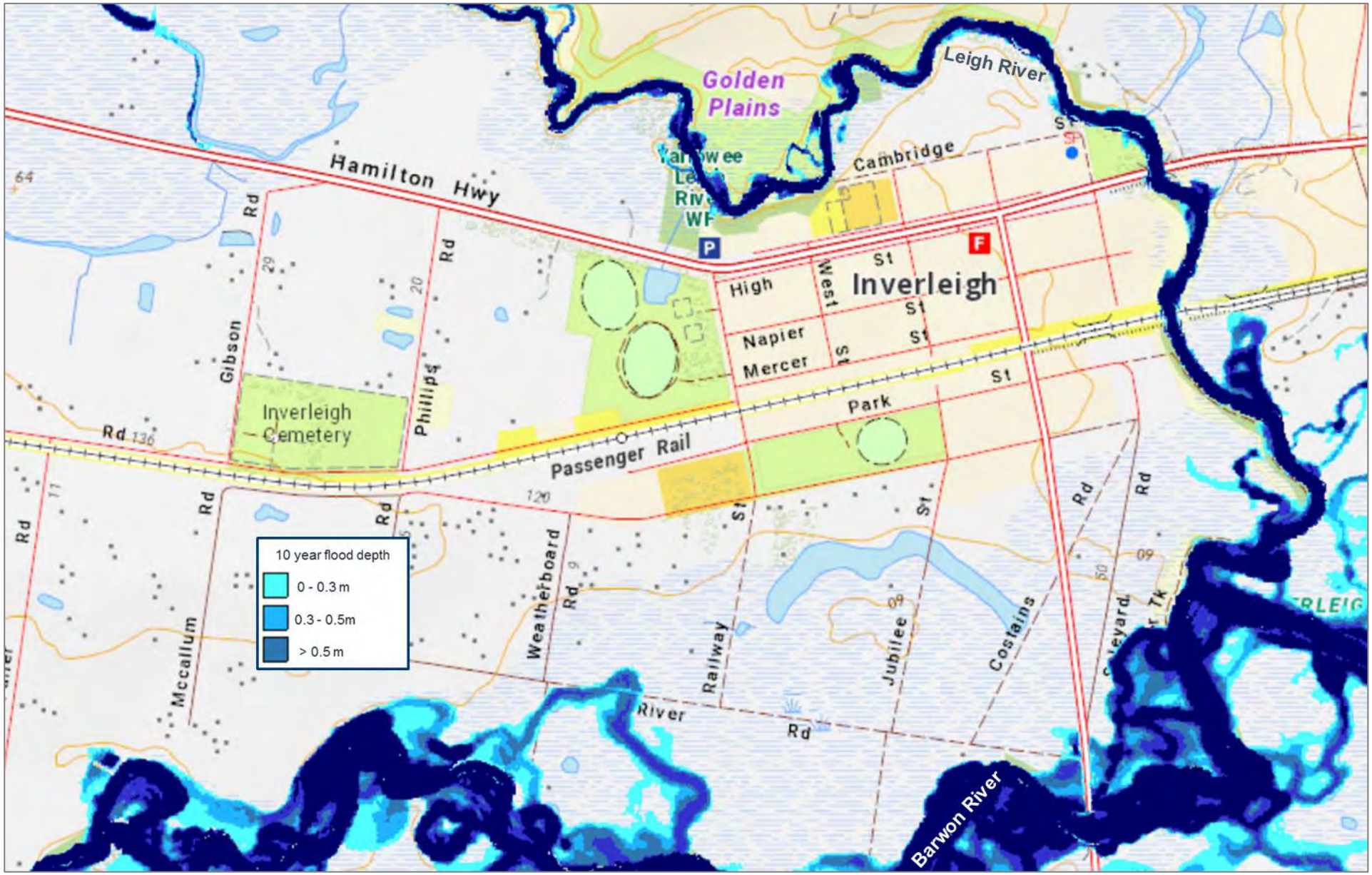


Figure 46. Inverleigh 20-year ARI (Barwon River dominant) flood depth map (Water Technology 2018).

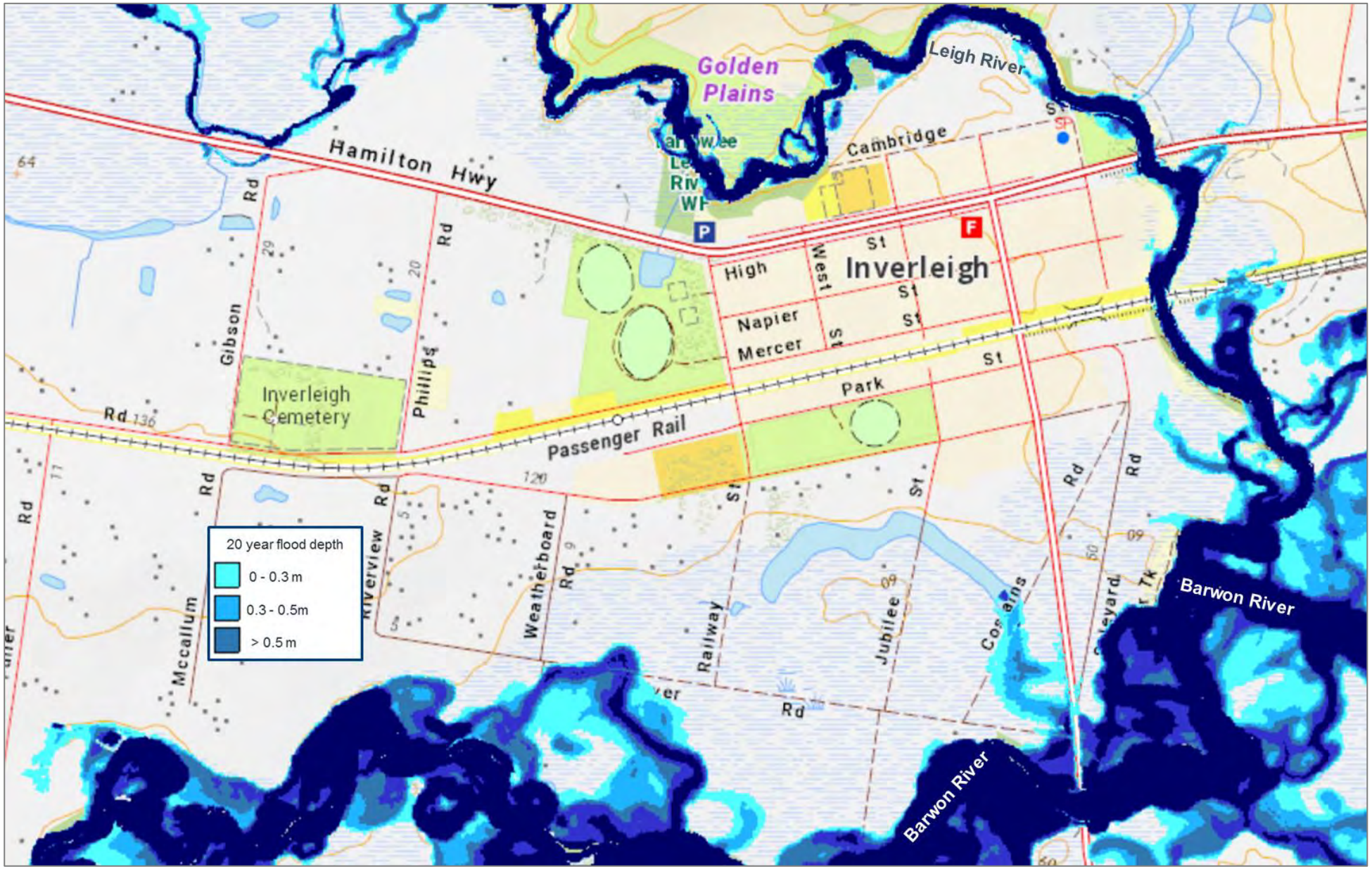


Figure 47. Inverleigh 50-year ARI (Barwon River dominant) flood depth map (Water Technology 2018).

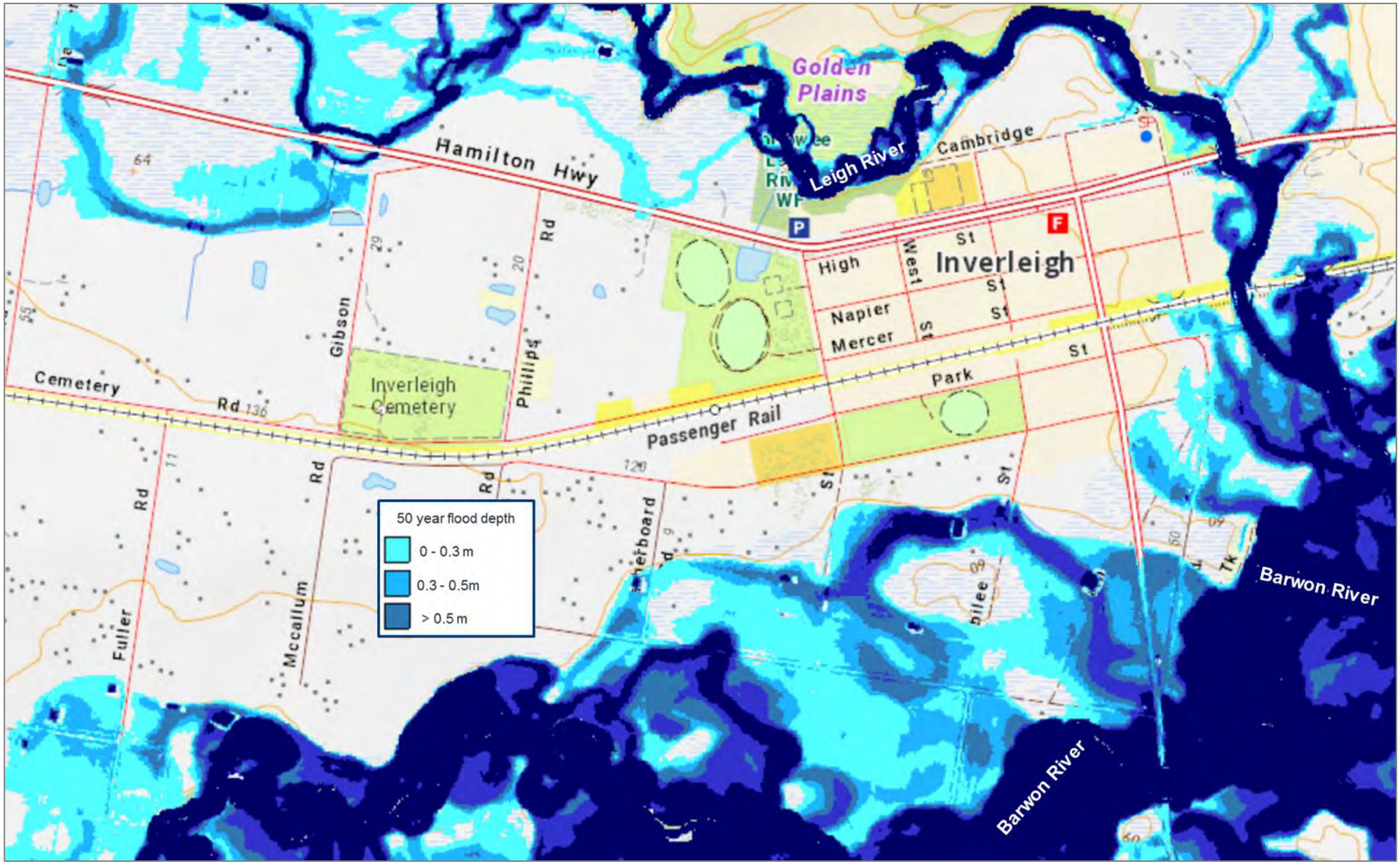


Figure 48. Inverleigh 100-year ARI (Barwon River dominant) flood depth map (Water Technology 2018).

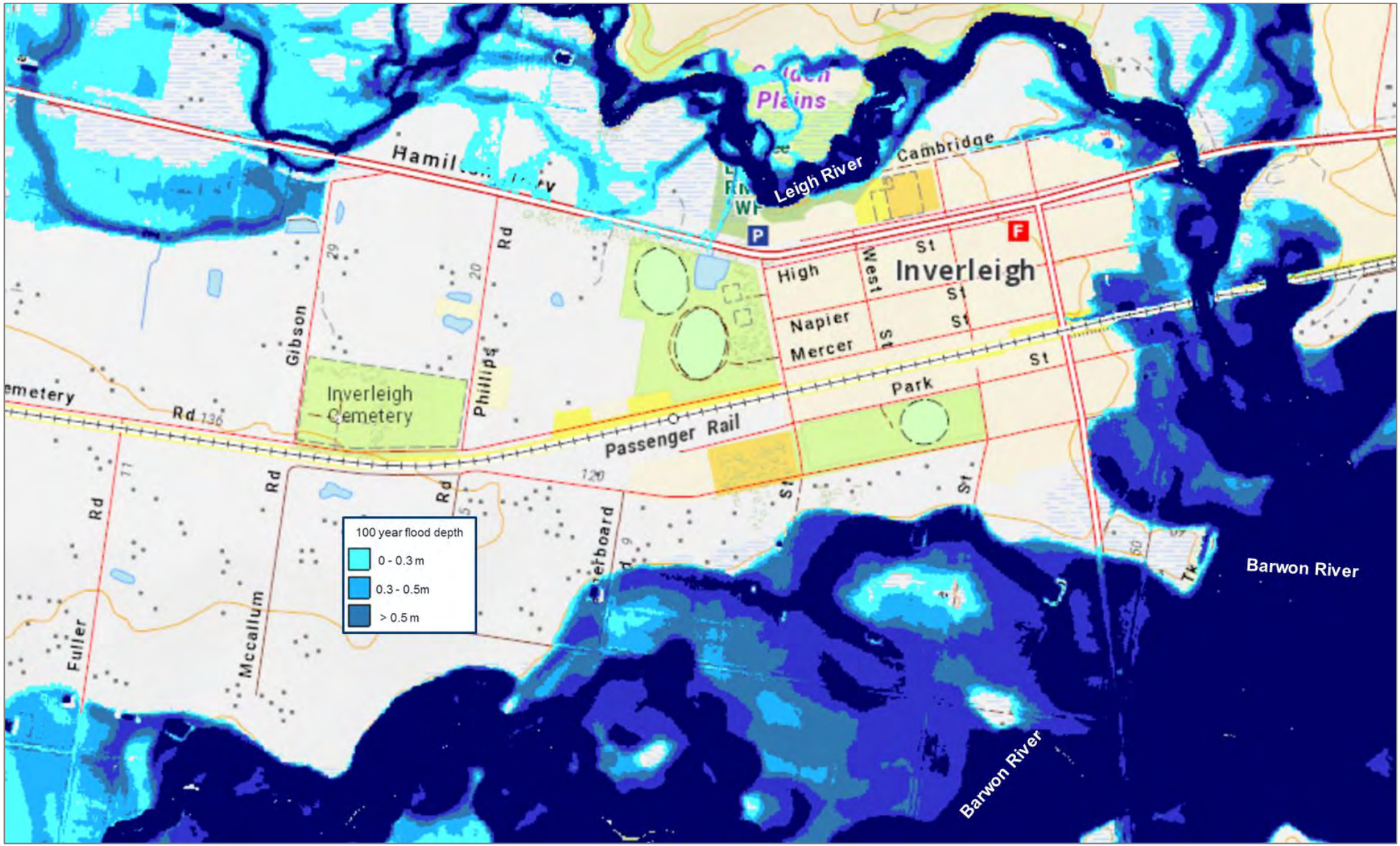


Figure 49. Inverleigh 200-year ARI (Barwon River dominant) flood depth map (Water Technology 2018).

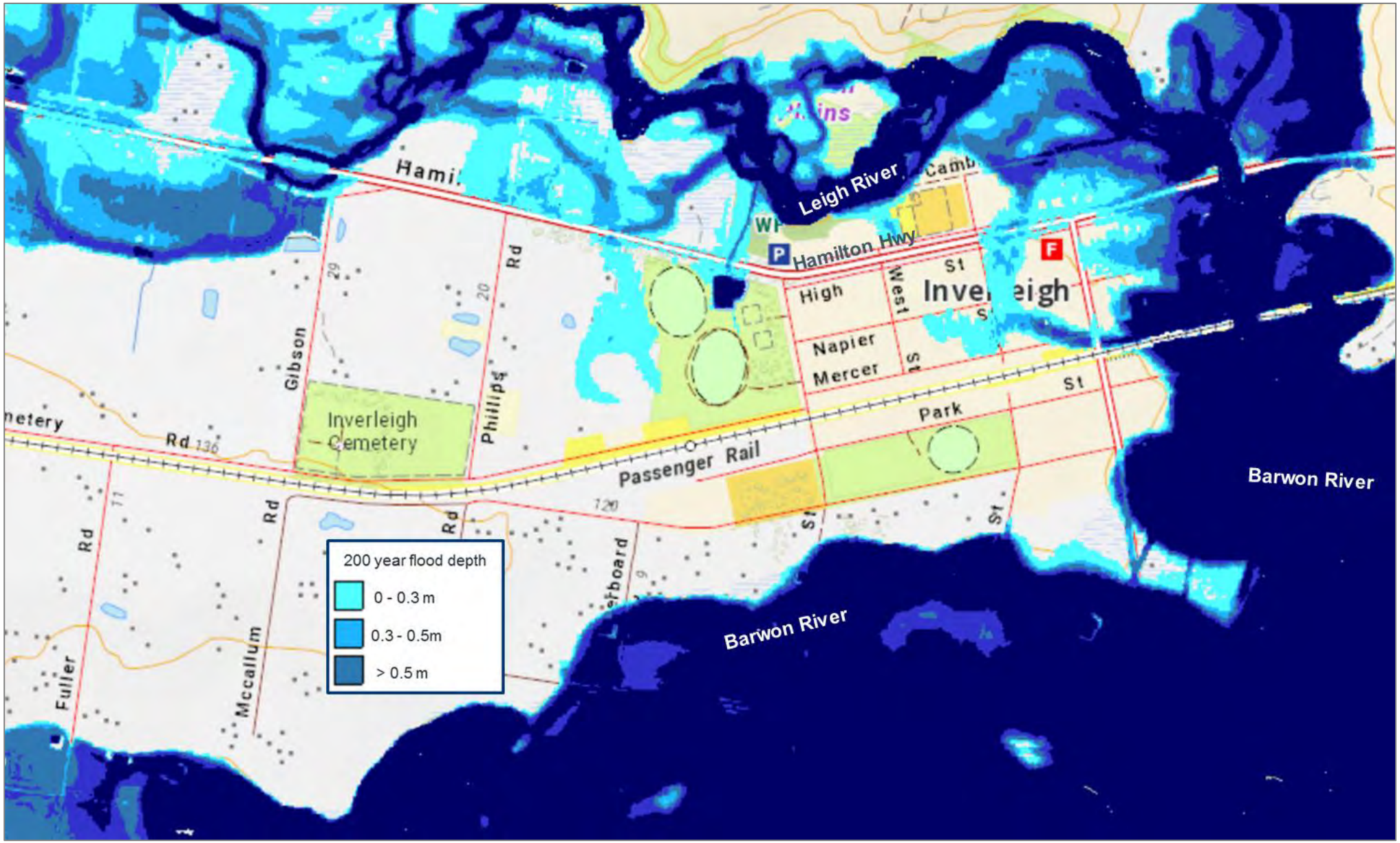


Figure 50. Inverleigh 500-year ARI (Barwon River dominant) flood depth map (Water Technology 2018).

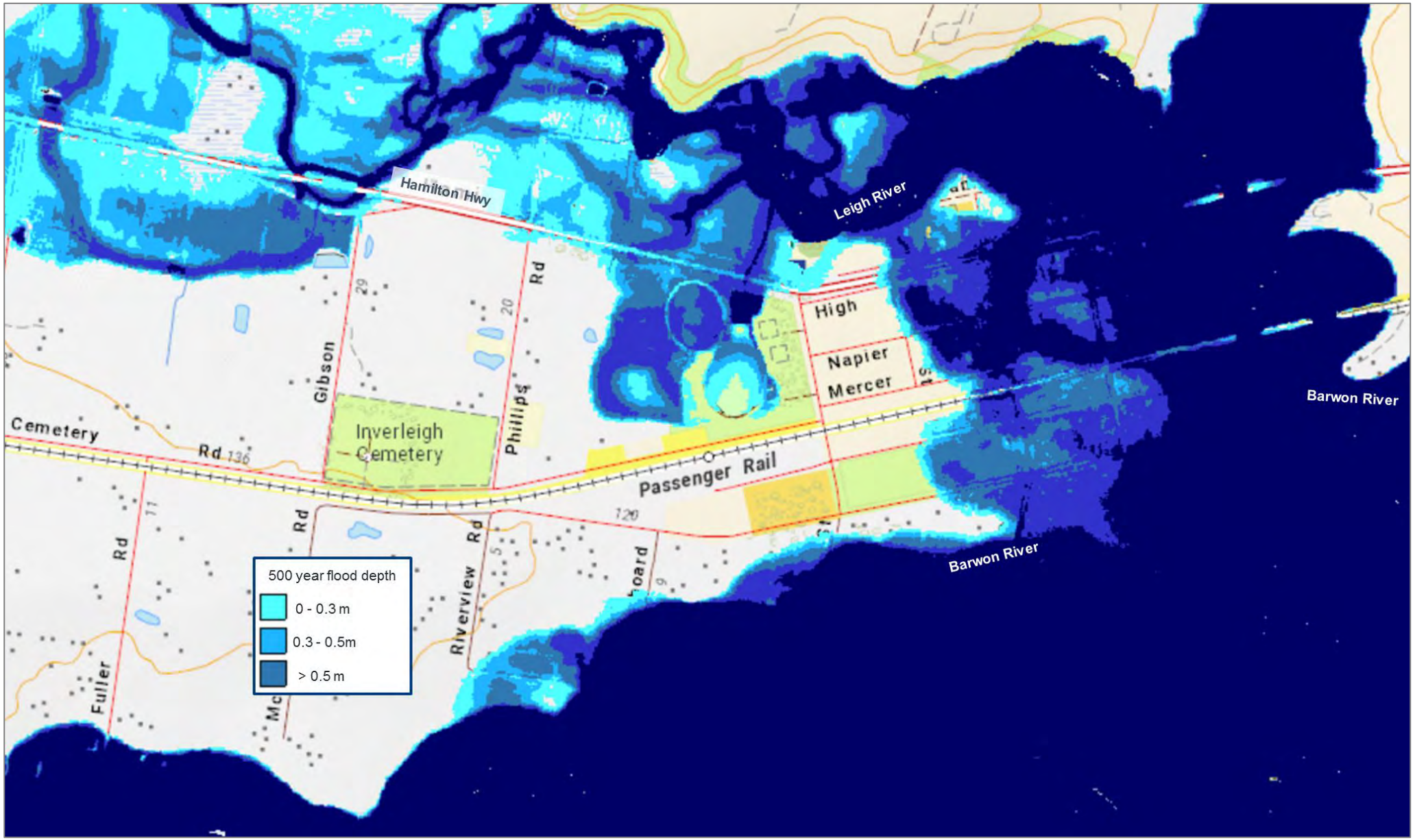


Figure 51. Shelford 5-year ARI flood depth map (DEECA 2016).


North St
Cunningham St
Russell St
Shelford
Tolson St
Shelford Public Hall
Shelford Recreation Reserve
Shelford Recreation Reserve
Shelford Recreation Reserve
Shelford War Memorial
Bannockburn - Shelford Road
Shelford Primary School
Thomson St
5 year flood depth
0 - 0.3 m
0.3 - 0.5m
> 0.5 m

Figure 52. Shelford 10-year ARI flood depth map (DEECA 2016).

Figure 53. Shelford 20-year ARI flood depth map (DEECA 2016).

Figure 54. Shelford 50-year ARI flood depth map (DEECA 2016).

Figure 55. Shelford 100-year ARI flood depth map (DEECA 2016).

Figure 56. Shelford 200-year ARI flood depth map (DEECA 2016).

Catchment Schematics

Schematics detailing the drainage catchments relevant for this municipality have been included in this Appendix. Each Schematic outlines the drainage system comprising of rivers and creeks contained within the Leigh River Catchment.

Within each Schematic, there are details useful to flood response such as those relating to gauges, towns, rivers, creeks, drains and reservoirs. Historical facts and figures may also be shown.

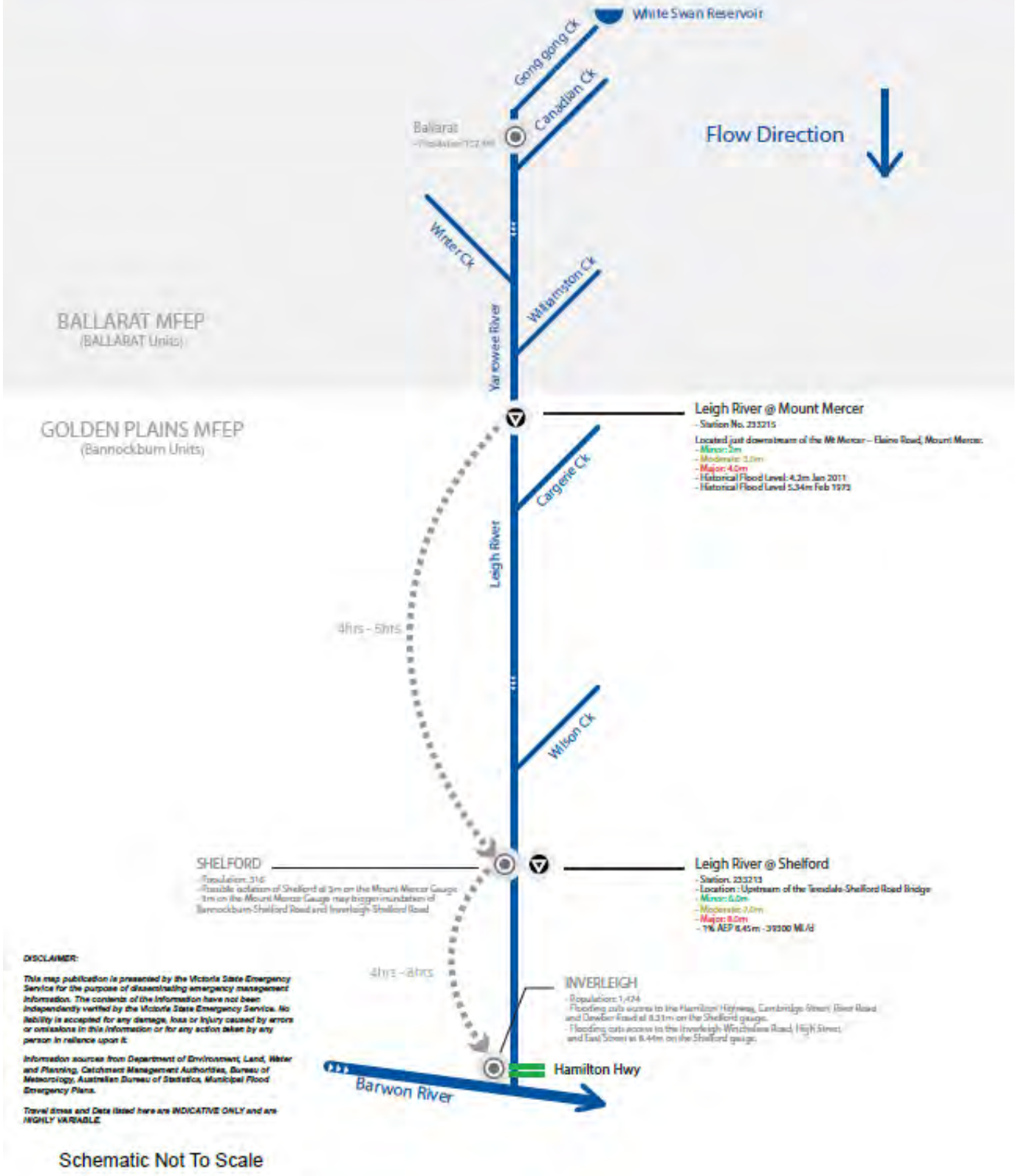
The schematics also detail the response boundaries for SES Units and local government and provide a reference link to the corresponding Municipal Flood Emergency Plan.

Details within these Catchment Schematics reflect those contained within either other sections of this Municipal Flood Emergency Plan or refer to other Municipal Flood Emergency Plans. These details have been filtered to contain only key facts. For more information on a gauge, drainage system or town consult the corresponding Flood Emergency Plan

Note that not all waterways or drains are included in the schematics, only those that are likely to contribute to flooding further on along the drainage system. Also note the flow direction; the schematics either flow from the top of the page to the bottom, or vice versa.

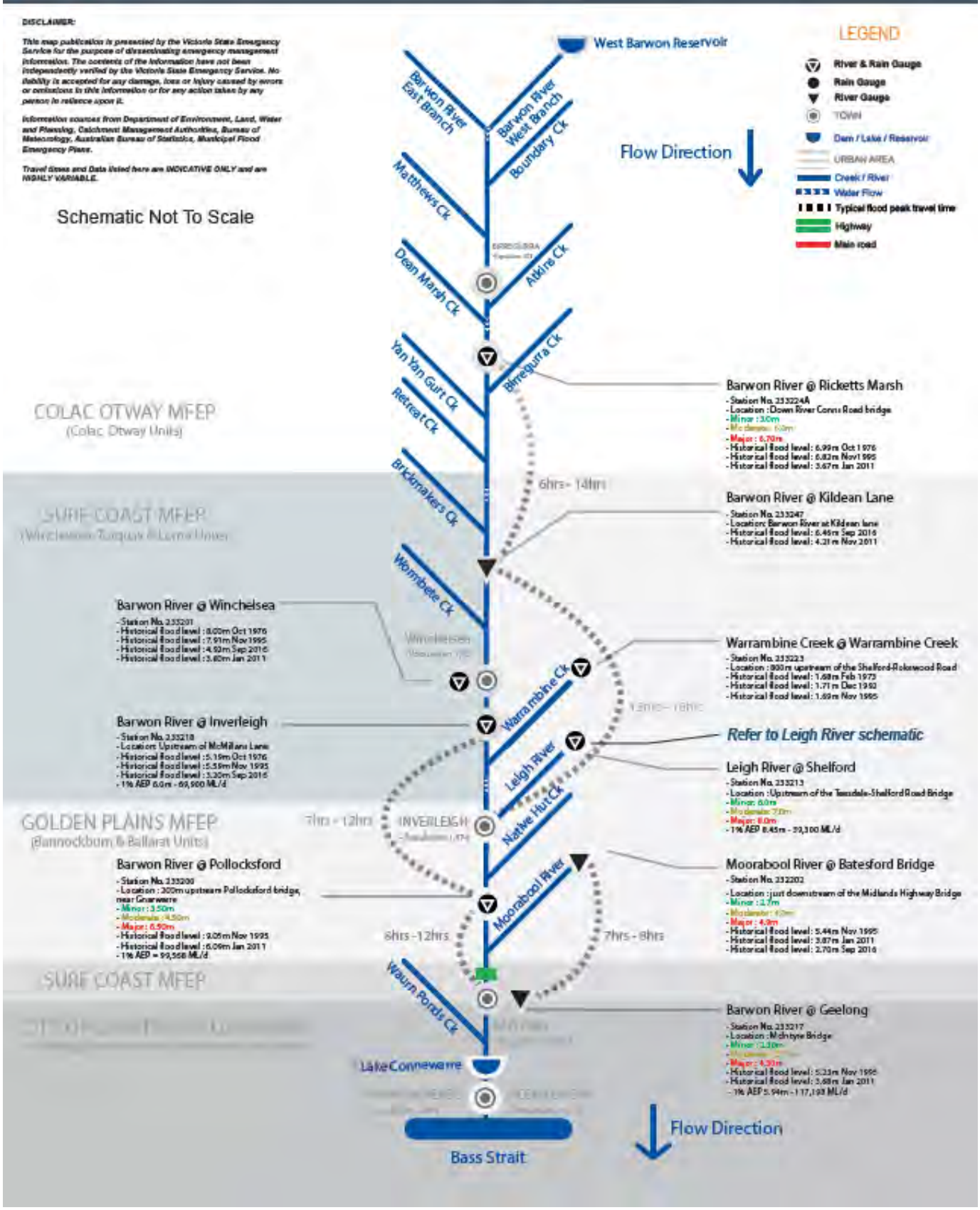
Leigh River Catchment Schematic

Version 2 - November 2020



Barwon River Catchment Schematic

Version 2 - November 2020

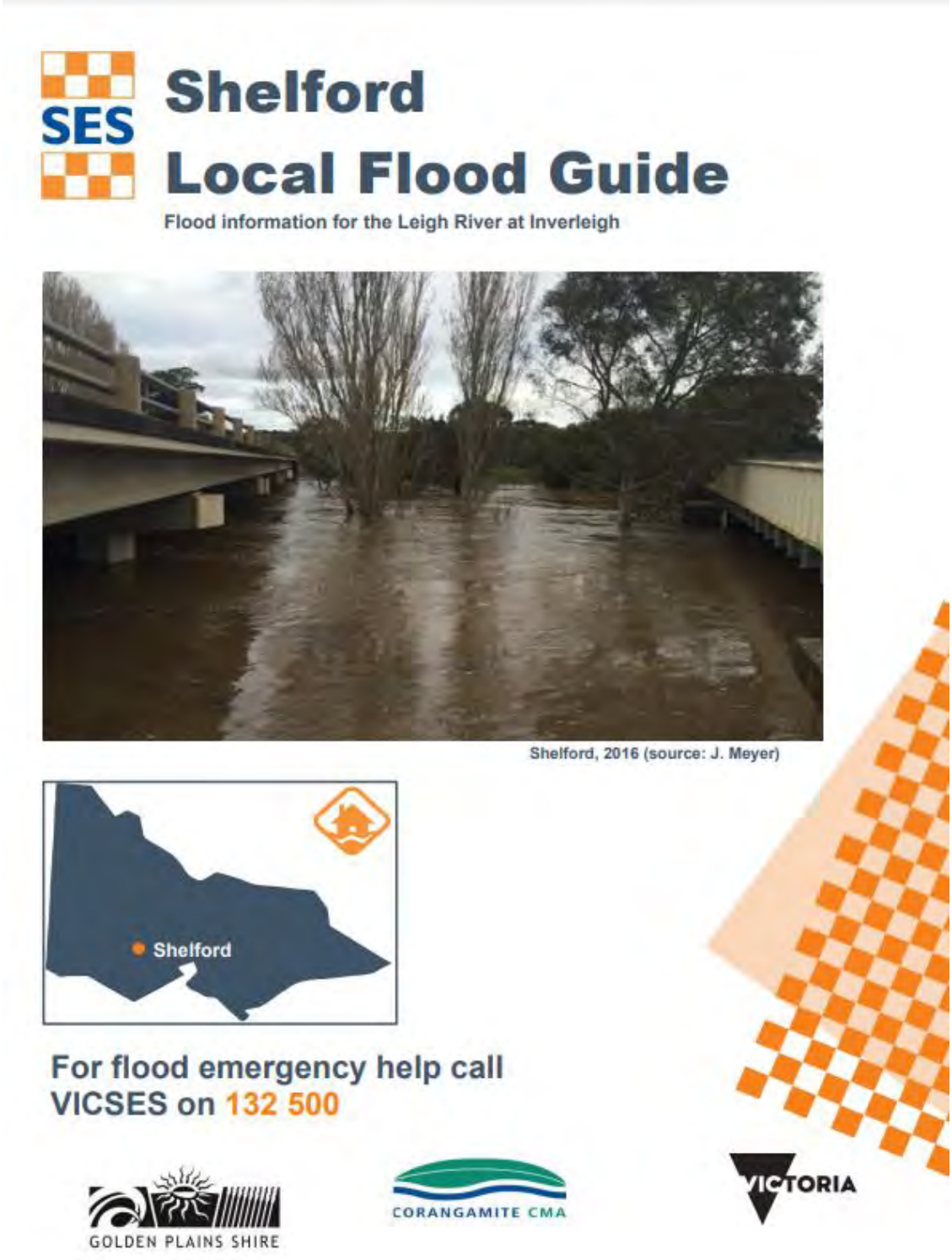


Appendix G: Local flood information

Two Local Flood Guides have been developed for the Golden Plains Shire Council;

- Refer to the link below for the Shelford Local Flood Guide

  https://www.ses.vic.gov.au/documents/112015/135024/Shelford+Local+Flood+Guide-pdf/3a541497-8896-43b5-b97e-b7d2a9780bcb



- Refer to the link below for the Inverleigh Local Flood Guide

  https://www.ses.vic.gov.au/documents/112015/135024/2017+-+LFG+-+Inverleigh+14+November+2017-reduced.pdf/9732ca2e-b9e5-e832-6fa8-07567b85bdfc

Appendix H: 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. Field Observers and Field Observers (Community) agency staff will help support this process.

Appendix I: Golden Plains Community Sandbag Collection Points

Triggers to start prefilling sandbags and setting up community sandbag collection points;

- BOM flood watch has been issued for the town/catchment area
- Significant rainfall is predicted for the town/catchment area (greater than 50mm)
- BOM has high certainty the rainfall event will impact a town/catchment area listed below.
- Flooding is immanent

When needed community sandbag collection points will be set up at;

- Inverleigh Bowls Club – 10 Railway Street Inverleigh.
- Shelford Hall: Corner of Rokewood-Shelford Road and Thomson Street, Shelford.

Refer to the list below of key tasks that may be undertaken to prepare sandbag filling and community sandbag collection points.

Agency	Task Description
VICSES	Deliver sandbags to the council depot or other nominated sandbag filling point to prefill the sandbags.
Golden Plains Shire Council	Deliver sand to sandbag filling points documented below.
VICSES / CFA	Deliver prefilled sandbags either directly to buildings that need to be sandbagged or to the nominated community Sandbag collection point. Provide staff/volunteers to set up the community sandbag point. Provide staff/volunteers to distribute prefilled sandbags to the community.
Golden Plains Shire Council / VICSES	Notify the community of the location of the community sandbag collection point via local radio and social media channels.

Inverleigh sandbag filling and community collection point: the Inverleigh Bowls Club, 10 Railway Street, Inverleigh (refer to map below).

Shelford sandbag filling and community collection point: the Shelford Hall: Corner of Rokewood-Shelford Road and Thomson Street, Shelford (refer to map below).

References

Corangamite CMA (2018): Flood Response Guide Report.

DELWP (2016): Barwon River, Thompson Creek and Woady Yaloak Creek Hydrology and Hydraulic Modelling.

DNRE (2000): Golden Plains Shire Flood Data Transfer Mapping Report.

Water Technology (2017): Inverleigh Flood Study Calibration Report.

Water Technology (2018): Inverleigh Flood Study Draft Mitigation Assessment Report.

Water Technology (2018): Inverleigh Flood Study, Flood Warning, Intelligence and Planning Report.

Water Technology (2018): Inverleigh Flood Risk Management Study Report.

Water Technology (2018): Inverleigh Flood Intelligence – Shelford Rating Curve Review.