Horsham Rural City Council

Flood Emergency Plan

A Sub-Plan of the

Municipal Emergency Management Plan

January 2018

For Horsham Rural City Council

And

VICSES Horsham Unit

Version 2.1

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Distribution List

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2	Inspector Neil Cheney	RERC	
3	Officer in Charge	Horsham Police Station	
4	Senior Constable Peter Mellington	Natimuk Police Station	
5	Danielle Fowler	MECC	
6	John Martin	MERO	
7	Martin Duke	Deputy MERO	
	Rob Moir	Deputy MERO	
	Rhonda McNeil	HRCC EMLO	
8	Anne Donovan	MRM	
9	Tony Grimme	VICSES Mid West RHQ	
10	Jarred McLean	VICSES Horsham Unit	
11	Dale Russell	CFA District 17 (Horsham)	
12	Stuart Webb	CFA Natimuk	
13	Frank Barnes	CFA Dadswells Bridge	
14	Len Hawker	CFA Horsham	
15	Paul Burton	Ambulance Victoria Grampians Region	
16	Daryl Sinclair	VicRoads Grampian Region	
17	David Tepper	Department of Health & Human Services Grampians Region	
18	Victoria Hart	GWMWater	
19	Paul Fennell	Wimmera Catchment Management Authority	
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Document Transmittal Form / Amendment Certificate

This Municipal Flood Emergency Plan (MFEP) will be amended, maintained and distributed as required by VICSES in consultation with the Horsham Rural City Council Municipal Emergency Management Planning Committee.

Suggestions for amendments to this Plan should be forwarded to VICSES Regional Office Amendments listed below have been included in this Plan and promulgated to all registered copyholders.

Minor administrative updates may be made to this plan without the complete plan having to be endorsed again by Council. The minor updates will be noted by the MEMPC and recorded in the Version Control Table below.

Amendment Number	Date of Amendment	Amendment Entered By	Summary of Amendment
Version 2.0	12/12/2016	Gavin Kelly	Acceptance of changes, comments and additional information into this draft version for consultation.
Version 2.1	29/12/2017	John Martin	Incorporation of comments and formatting after final consultation with sub-committee and MEMPC.

This Plan will be maintained on the www.ses.vic.gov.au and www.hrcc.vic.gov.au websites.

List of Abbreviations & Acronyms

The following abbreviations and acronyms are used in the Plan:

AEP	Annual Exceedance Probability
AHD	Australian Height Datum (the height of a location above mean sea level in metres)
AIIMS	Australasian Inter-service Incident Management System
AoCC	Area of Operations Control Centre / Command Centre
ARI	Average Recurrence Interval
ARMCANZ	Agricultural & Resource Management Council of Australia & New Zealand
AV	Ambulance Victoria
BoM	Bureau of Meteorology
CEO	Chief Executive Officer
CFA	Country Fire Authority
CMA	Catchment Management Authority
DELWP	Department of Environment Land, Water and Planning
DH	Department of Health
DHHS	Department of Health & Human Services
EMLO	Emergency Management Liaison Officer
EMMV	Emergency Management Manual Victoria
EMT	Emergency Management Team
EO	Executive Officer
FO	Floodway Overlay
FWS	Flood Warning System
FZ	Floodway Zone
HRCC	Horsham Rural City Council
IC	Incident Controller
ICC	Incident Control Centre
IMT	Incident Management Team
LSIO	Land Subject to Inundation Overlay
MECC	Municipal Emergency Coordination Centre
MEMP	Municipal Emergency Management Plan
MEMPC	Municipal Emergency Management Planning Committee
MERC	Municipal Emergency Response Coordinator
MERO	Municipal Emergency Resource Officer
MFEP	Municipal Flood Emergency Plan (This Plan)
MRM	Municipal Recovery Manager
PMF	Probable Maximum Flood
RCC	Regional Control Centre
RDO	Regional Duty Officer
RERC	Regional Emergency Response Coordinator
SCC	State Control Centre
SEWS	Standard Emergency Warning System
SHERP	State Health Emergency Response Plan
SOP	Standard Operating Procedure
VicPol	Victoria Police
VICSES	Victoria State Emergency Service

Municipal Endorsement

This Municipal Flood Emergency Plan (MFEP) has been prepared by a flood working group as part of the Horsham Rural City Council Municipal Emergency Management Planning Committee pursuant to Section 20 of the Emergency Management Act 1986 (as amended).

This MFEP is a supporting plan to the Horsham Rural City Council Municipal Emergency Management Plan (MEMP), is consistent with the Emergency Management Manual Victoria (EMMV) and takes into account the outcomes of the Emergency Risk Assessment process undertaken by the Municipal Emergency Management Planning Committee (MEMPC).

The Municipal Flood Emergency Plan is consistent with the Regional Flood Emergency Plan and the State Flood Emergency Plan.

This Municipal Flood Emergency Plan is a result of the cooperative efforts of the Horsham Rural City Council MEMPC and its member agencies.

This Plan is endorsed by the Horsham Rural City Council MEMPC as a supporting plan to the MEMP.

Endorsement

……..

Vic SES Regional Manager, Grampians Region Date

……..

Chair HRCC MEMPC Date

PART 1. INTRODUCTION

1.1. Horsham Rural City Council

The Horsham Rural City Council (HRCC) Municipality has a population approaching 20,000 people and covers an area of 4,340 square kilometres. Centred on the city of Horsham, which has a population of about 15,000 people, the municipality's principal economic activity is the agricultural sector and Horsham is the major retail, business and service centre for the wider Wimmera- Southern Mallee region.

The Melbourne-Adelaide transport corridor traverses the Wimmera Region, placing Horsham within an important regional and national context. The city is also at the junction of three major highways - the Western, Wimmera and Henty Highways.

The main waterway within the Municipality is the Wimmera River. Mount William Creek, Burnt Creek, MacKenzie River and Norton Creek are all major tributary streams to it. Yarriambiack Creek is a distributary stream from the Wimmera River located on the north-eastern boundary of the municipality.

Natimuk Creek does not connect with the Wimmera River, and while having a fairly small catchment, can rise suddenly, causing flooding in Natimuk township, before flowing to a series of lakes north of Natimuk.

The Wimmera River flows through Horsham's urban area and much of the city's infrastructure is located on the floodplain and is affected by periodic flooding.

The headwaters of the Glenelg River also lie on the perimeter of the municipality. Flooding of the headwaters of the Glenelg River is not a consideration within this Plan as the Glenelg River does not affect significant assets within the municipality.

Towns affected by flooding within the municipality are Horsham, Natimuk and Dadswells Bridge. Specific rural residential areas subject to flooding in the municipality include, Drung, Riverside, Longerenong, and St Helens Plains. Large areas of rural land are also subject to floods and access to properties across the municipality is affected for extended periods during major flood events.

The Wimmera River floodplain upstream of Horsham is wide and flooding extensive, while downstream from Horsham to the northern municipal boundary, flooding is generally contained within a narrow floodplain.

Downstream from the Yarriambiack Creek confluence and upstream of Horsham, flood flows break out from the Wimmera River and flood the adjoining Longerenong floodplain. The natural storage provided by this floodplain attenuates and reduces the flood peak downstream.

Dooen Swamp, 6 km upstream from Horsham, provides a large flood storage area on the Wimmera River. Dooen Swamp fills quickly and is slow to empty. Its effect in reducing peak flood flows reduces as the flood size increases and/or during a second or third flood in quick succession as the swamp fills early during an event.

The characteristics of the floodplain in Horsham have been significantly altered by the construction of levees running from Peppertree Lane along Menadue Street and near Hamilton Street.

In smaller floods only rural areas of the floodplain proper are subjected to inundation. The urbanised area of Horsham remains unaffected initially due to the Peppertree Lane to Menadue Street levee, but as river levels rise above the 5% AEP (20 year ARI) flood level, water begins to encroach into residential areas.

The Wimmera River environs from Glenorchy to Horsham start to experience localised flooding when the river reaches the minor flood level at Glenorchy, although some local access may be interrupted at lower flood levels.

Horsham is relatively flat and has limited drainage infrastructure. Stormwater drainage is discharged to the Wimmera River through a number of outfalls. Consequently, localised urban stormwater flooding occurs from time to time but quickly dissipates provided the Wimmera River is not high.

When the Wimmera River floods, localised urban flooding may occur with subsequent follow up rainfall due to backup of the urban drainage system. During riverine floods Horsham Rural City Council implements an urban drainage flooding procedure that includes emergency stormwater pumping into the flooded Wimmera River.

1.2. Purpose and Scope of the Municipal Flood Emergency Plan

The purpose of this MFEP is to detail arrangements for the planning, preparedness/prevention, response and recovery from flood incidents within the Horsham Rural City municipality.

As such, the scope of the Plan is to:

- Identify the Flood Risk to Horsham Rural City municipality.
- Support the implementation of measures to minimise the causes and impacts of flood incidents within the Horsham Rural City municipality.
- Detail response and recovery arrangements including preparedness, incident management, command and control;
- Identify linkages with local, regional and state emergency and wider planning arrangements with specific emphasis on those relevant to flood.

1.3. HRCC Flood Emergency Planning Working Group

Membership of the Horsham Rural City Council Flood Emergency Planning working group comprised the following representatives from the following agencies and organisations:

- VICSES Regional Officer – Emergency Management (Chair) & VICSES Horsham Unit Controller
- Horsham Rural City Council – Municipal Emergency Resources Officer (MERO)
- Victoria Police – Municipal Emergency Response Coordinator (MERC)
- Catchment Management Authority – Floodplain Management Team Leader
- CFA – District 17 Operations Officer & Horsham Group Officer

1.4. Responsibility for Planning, Review & Maintenance of this Plan

This Municipal Flood Emergency Plan must be maintained in order to remain effective.

VICSES, through the HRCC MEMPC, has responsibility for preparing, reviewing, maintaining and distributing this plan.

The plan should be reviewed:

- Following any new flood study;
- Following changes in non-structural and/or structural flood mitigation measures;
- After the occurrence of a significant flood event within the Horsham Rural City municipality. Property inundation tables should be should be updated within five weeks of the flood peak with information collected as part of post-flood information recording activities and as may be collected as a consequence of the event debrief (see Part 3 Section 18) as well as from the collective experience of the flood Emergency Management Team.

1.5. Endorsement of the Plan

The Draft MFEP has been circulated to Horsham Rural City Council MEMPC for endorsement with the recommendation to include the HRCC MFEP as a supporting plan of the HRCC MEMP.

The MEMPC endorsed the plan at its meeting dated 20 July 2017 and has been forwarded to the Vic SES Regional Manager, Grampians Region, for endorsement.

1.6. Plan Structure

Horsham Municipality has three townships which are affected by flooding Horsham, Natimuk and Dadswells Bridge. The rural residential locations of Drung, Riverside, Longerenong and St Helens Plains are incorporated as part of Horsham for this plan. The MFEP covers general arrangements for all flood response incidents.

Appendix A covers specific arrangements for Horsham, including the rural residential areas of Drung, Riverside, Longerenong, and St Helens Plains

Appendix B covers specific arrangements for Dadswells Bridge

Appendix C covers specific arrangements for Natimuk.

PART 2. PREVENTION/PREPAREDNESS RRANGEMENTS

2.1. Community Awareness for all Types of Flooding

Relevant details of this MFEP will be released to the community through local media, the FloodSafe program, websites (VICSES and Horsham Rural City Council) upon formal adoption by the Horsham Rural City Council MEMPC.

VICSES with the support of Horsham Rural City Council and Wimmera CMA will coordinate community education programs for flooding within the Municipality.

2.2. Structural Flood Mitigation Measures

Flood mitigation measures that exist within each area are detailed in **Appendices A3, B3 & C3 Flood Emergency Plan**

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 HRCC MEMPC. This Plan should be regularly exercised, preferably on a 24-month basis.

2.3.2 Flood Warning

Arrangements for flood warning are contained within the State Flood Emergency Plan and the EMMV (Part 3 Section 5.2) and on the BoM website.

Specific details of local flood warning system arrangements are detailed in Horsham, Dadswells Bridge and Natimuk **Appendices A5, B5 & C5 – Flood Warning Systems.**

2.3.3 Planning Scheme and Zones

The Horsham Planning Scheme includes extensive flood zones. These have been prepared based on a series of flood studies over many years. Some very recent flood studies are in the process of being formally updated into the Planning Scheme, and further flood studies continue to be undertaken from time-to-time to update this knowledge.

Planning Scheme maps are critical in ensuring that new development considers potential flood interaction to avoid placing the community at un-necessary risk. New developments subject to Planning Permits are required to take these flood interactions into consideration, and evaluation by regulators will include an assessment of the formalised Planning Scheme maps and the latest flood studies that are in the process of being formally adopted to ensure sound planning decisions are made.

The Planning Scheme maps can be found at the following link (valid December 2017):

http://planningschemes.dpcd.vic.gov.au/schemes/horsham/maps

During a flood event, reference should instead be made to flood study maps prepared by the Wimmera CMA at the following link (valid December 2017):

http://www.wcma.vic.gov.au/permitsplanningfloodadvice/FloodInvestigations/HRfloodmaps

2.3.4 Community Observers Network

Community observers provide a means of gathering information in real time on flood behaviour along a stream system, and a network for the distribution of community information and warnings to the community along the stream system.

This program is currently under development. The following sites have been established:

1. Wimmera River at Town Gauge
2. Wimmera River at Riverside
3. Wimmera River at Marma Bridge (where is that?)
4. Wimmera River at Fauxs Bridge
5. Sheepwash Creek at Wal Wal Road
6. Mt William Creek at Wal Wal Road
7. MacKenzie River at Tatlocks Bridge
8. Burnt Creek at Millers Road
9. Burnt Creek at Williams Road (footbridge)
10. Two Mile Creek at Misery Bridge
11. Yarriambiack Creek at Longerenong Road.

Refer to Appendix A7 for information about the flood levels at these gauging stations.

PART 3. RESPONSE ARRANGEMENTS

3.1. Introduction

3.1.1 Activation of Response

Flood response arrangements may be activated by the Regional Duty Officer (RDO) VICSES Mid West Region or the Incident Controller for a flood event.

The Incident Controller or RDO VICSES will activate agencies as required and documented in the State Flood Emergency Plan.

3.1.2 Responsibilities

There are a number of agencies with specific roles that will act in support of VICSES and provide support to the community in the event of a serious flood within the Horsham Rural City Municipality. These agencies will be engaged through the Emergency Management Team (EMT) established for a flood event.

The general roles and responsibilities of supporting agencies are detailed within the Horsham Rural City Council MEMP, EMMV (Part 7 'Emergency Management Agency Roles'), State Flood Emergency Plan and Regional Flood Emergency Plan.

3.1.3 Municipal Emergency Coordination Centre (MECC)

The role of the MECC is phasing out, with most coordination of the EMT and support agencies is now occurring at the ICC.

Council will continue to operate its own coordination centre to facilitate its own operations during emergency events.

Council Liaison with the ICC will generally be through an EMLO based, at least part-time, at the ICC.

3.1.4 Escalation

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

Resourcing and event escalation arrangements are described in the EMMV ('State Emergency Response Plan' – Part 3).

3.2. Strategic Control Priorities

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

- Protection and preservation of life is paramount - this includes:
    - Safety of emergency services and support personnel, and;
    - Safety of community members including vulnerable community members and visitors/tourists located within the incident area.
- 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.;
- Protection of critical infrastructure and community assets that support community resilience;

- Protection of residential property as a place of primary residence;
- Protection of assets supporting individual livelihoods and economic production that supports individual and community financial sustainability
- Protection of environmental and conservation values that considers the cultural, biodiversity, and social values of the environment;
- Circumstances may arise where the Incident Controller is required to vary these priorities, with the exception being that the protection of life should remain the highest. This shall be done in consultation with the State Controller and relevant stakeholders based on sound incident predictions and risk assessments.

3.3. Command, Control & Coordination

The command, control and coordination arrangements in this Municipal Flood Emergency Plan are consistent with those detailed in State and Regional Flood Emergency Plans. For further information, refer to Part 3 Section 3.2 of the EMMV.

Specific command, control and coordination arrangements are detailed in **Appendices A3, B3 & C3 Flood Emergency Plan**

3.3.1 Control

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

Part 7 of the EMMV prepared under the *Emergency Management Act 1986 (as amended)*, identifies VICSES as the Control Agency for flood. It identifies DELWP as the Control Agency responsible for "*dam safety, water and sewerage asset related incidents*" and other emergencies

All flood response activities within the Horsham Rural City municipality including those arising from a dam failure or retarding basin / levee bank failure incident will be under the control of the appointed Incident Controller, or his / her delegated representative.

3.3.2 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 Incident Controller responsibilities are as defined in Part 3 Appendix A of the EMMV

3.3.3 Incident Control Centre (ICC)

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

The following pre-determined Incident Control Centre locations has been identified.

- Level 3 Flood Incidents - DELWP District Office Natimuk Rd Horsham

3.3.4 Divisions and Sectors

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

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

Division	Sector

Horsham	Horsham City, Drung, Riverside, Horsham South
Dadswells Bridge	Not Applicable
Natimuk	Not Applicable
Rural Floodplain	St Helens Plains, Lubeck – Longerenong

Other Divisions or Sectors *may* be established on the decision of the Incident Controller should the circumstances warrant this.

Pre-determined Division Command locations are:

- CFA District 17 Headquarters Horsham.
- DELWP District Office Natimuk Rd Horsham.
- Dadswells Bridge CFA Station prior to flood arrival.
- Natimuk CFA Station.

3.3.5 Incident Management Team (IMT)

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

Refer to Part 3 of the EMMV for guidance on operational roles and responsibilities.

3.3.6 Emergency Management Team (EMT)

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

Organisations, including Horsham Rural City Council, required within the EMT 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 Part 3 of the EMMV for guidance on EMTs.

3.3.7 On Receipt of a Flood Watch / Severe Weather Warning

Incident Controller or VICSES RDO (until an incident controller is appointed) will undertake actions as defined within the flood intelligence cards, **Appendices A3, B3 & C3 Flood Emergency Plan.** General considerations by the Incident Controller/VICSES RDO will be as follows:

- Develop an appreciation of current flood levels and predicted levels. Are floodwaters, rising, peaking or falling? Seek expert advice from relevant agencies, primarily the CMA regarding the anticipated flood level (e.g. AEP) and availability of flood mapping for that class of flood event.
- Review flood intelligence to assess likely flood consequences
- Monitor weather and flood information – www.bom.gov.au or www.floodzoom.vic.gov.au
- Assess Command and Control requirements.

- Review local resources and consider needs for further resources regarding personnel, property protection, flood rescue and air support
- Notify and brief appropriate officers. This includes Regional Control Centre (RCC) (if established), State Control Centre (SCC) (if established), Council, other emergency services through the EMT.
- Assess ICC readiness (including staffing of IMT and EMT) and open if required
- Ensure flood bulletins and community information are prepared and issued to the community
- Monitor watercourses and undertake reconnaissance of low-lying areas
- Develop media and community information management strategy
- Ensure flood mitigation works are being checked by owners
- Develop and issue incident action plan, if required
- Develop and issue situation report, if required.

3.3.8 On Receipt of the First and Subsequent Flood Warnings

Incident Controller/VICSES RDO (until an incident controller is appointed) will undertake actions as defined within the flood intelligence cards. **Appendices A3, B3 & C3 Flood Emergency Plan** General considerations by the Incident Controller/VICSES RDO will be as follows:

- Develop an appreciation of current flood levels and predicted levels. Are floodwaters, rising, peaking or falling? Seek expert advice from relevant agencies, primarily the CMA regarding the anticipated flood level (e.g. AEP) and availability of flood mapping for that class of flood event.

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. telecommunications, gas, 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. Community Information and Warnings

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

Community information and warnings communication methods available include:

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

Refer to **Appendices A5, B5 & C5 Flood Warning Systems,** for the specific details of how community information and warnings are to be provided for Horsham, Dadswells Bridge and Natimuk communities.

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

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

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

Department of Health and Human Services will coordinate information regarding public health and safety precautions.

3.5. Media Communication

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

3.6. Post Impact Assessment

A post impact assessment will be conducted in accordance with Part 3 of the EMMV to assess and record the extent and nature of damage caused by flooding. This information will then be used to provide the basis for further needs assessment and recovery planning by DHHS and recovery agencies. The extent of this assessment will be guided by the scale of flooding, and the available mapping of flooding in different areas.

3.7. Preliminary Deployments

When flooding is expected to be severe enough to cut access to towns and/or communities the Incident Controller will consult with relevant agencies to ensure that resources are in place if required to provide emergency response. These resources might include emergency service personnel, food items and non-food items such as medical supplies, shelter, assembly areas, relief centres etc.

3.8. Response to Flooding

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

When conducting pre-event planning for 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, and resources available

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 advising them not to attempt to flee by entering floodwater if they become trapped, and that it may be safer to seek the highest point within the building and to telephone 000 if they require rescue. This advice needs to be provided even when evacuation may be possible, due to the likelihood that not all community members will evacuate.

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

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

During a flood it will often be difficult, due to the rapid development of flooding, to ensure evacuation centres ahead of actually triggering the evacuation as is normal practice but this is insufficient justification for not adopting evacuation.

Refer to **Appendix A3, B3 or C3 Flood Emergency Plan** for response arrangements for flood events for the Horsham, Dadswells Bridge and Natimuk communities.

3.9. Evacuation

The decision to recommend or warn people to prepare to evacuate or to evacuate immediately rests with the Incident Controller.

Once the decision is made VicPol Evacuation Manager is responsible for the management of the evacuation process where possible. VICSES and other agencies will assist where practical. VICSES is responsible for the development and communication of evacuation warnings.

VicPol is responsible for registering people affected by a flood emergency including those who have been evacuated, but this is typically delegated to the Red Cross..

Refer to Part 8, Appendix 9 of the EMMV and the Evacuation Guidelines for guidance of evacuations for flood emergencies.

Refer to **Appendix A4, B4, or C4 Flood Evacuation Arrangements** of this Plan for detailed evacuation arrangements for Horsham, Dadswells Bridge and Natimuk communities.

3.10. Flood Rescue

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

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

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

3.11. Aircraft Management

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

Air support operations will be conducted under the control of the Incident Controller.

The Incident Controller may request aircraft support through the State Air Desk located at the State Control Centre who will establish priorities.

Suitable airbase facilities are located at Horsham Airport.

3.12. Resupply

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

When predictions/intelligence indicate 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.

3.13. 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 residential and commercial impacts from floods have been detailed in recent flood investigations and the subsequent flood modelling and mapping as outputs from those studies.

The Horsham Rural City Council and SES Horsham Unit each maintain a small stock of sandbags, and back-up supplies are available through the VICSES Regional Headquarters and Stawell and Dimboola SES Units. The Incident Controller will determine the priorities related to 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, residences and businesses with a history (observed or modelled) of above-floor inundation, or where there is a higher likelihood of impact.

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 ICC, CMA, LGA and VICPOL and within appropriate approval frameworks.

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

Refer to **Appendix A3, B3, or C3 Flood Emergency Plan** for further specific details of essential infrastructure requiring protection and location of sandbag collection point(s) for Horsham Dadswells Bridge and Natimuk communities.

3.14. Disruption to Services

Disruption to services other than essential community infrastructure and property can occur in flood events. Refer to **Appendix A3, B3 or C3 Flood Emergency Plan** for specific details of likely disruption to services and proposed arrangements to respond to service disruptions in Horsham, Dadswells Bridge and Natimuk communities.

3.15. Disruption to Road Network

Horsham Rural City Council and VicRoads 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. Horsham Rural City Council staff may also liaise with and advise VicRoads as to the need or advisability of erecting warning signs and / or of closing roads and bridges under its jurisdiction. VicRoads is responsible for designated main roads and highways and Council is responsible for the designated local road network.

VicRoads and Horsham Rural City Council will communicate community information regarding road closures via their respective websites. www.roads.vic.gov.au and www.hrcc.vic.gov.au

Refer to **Appendix A3, B3 or C3 Flood Emergency Plan** for specific details of possible disruption to road networks and proposed arrangements for emergency service response in Horsham, Dadswells Bridge and Natimuk communities.

3.16. Dams

DELWP is the nominated 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.

Major dams with potential to cause structural and community damage within the Horsham Rural City municipality are listed in **Appendix A1**, **B1 or C1 Flood Threats** for Horsham, Dadswells Bridge and Natimuk communities.

Dams within the municipality which may cause impacts include Taylors Lake, and to a lesser extent Green Lake. Dams in adjoining municipalities which could cause impacts on some part of this municipality include Lake Bellfield, Rocklands Reservoir and Wartook Reservoir.

3.17. Wastewater related public health issues & critical sewerage assets

Inundation of critical sewerage assets including septic tanks and sewerage pump stations may result in water quality problems within the Horsham Rural City 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 Horsham Rural City Council Environmental Health Officer to inspect and report to the MERO and the ICC on any water quality issues relating to flooding

3.18. After Action Review / Debrief

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

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

PART 4. EMERGENCY RELIEF AND RECOVERY

4.1. General

Arrangements for relief and recovery from a flood incident within the Horsham Rural City Municipality are detailed in the Horsham Rural City Council MEMP and associated relief and recovery supporting plans.

4.2. Emergency Relief

The decision to recommend the opening of an emergency relief centre rests with the Incident Controller in consultation with the MERC, MERO and MRM. Incident Controllers are responsible for ensuring that relief arrangements have been considered and implemented where required under the State Emergency Relief and Recovery Plan (Part 4 of the EMMV).

The range and type of emergency relief services to be provided in response to a flood event will be dependent upon the size, impact, and scale of the flood. Refer to Part 4 of the EMMV for details of the range of emergency relief services that may be provided.

Emergency Relief Centres for communities within HRCC are listed in the Emergency Relief Centres document as part of the HRCC MEMP.

4.3. Animal Welfare

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

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

Matters relating to the welfare of wildlife are to be referred to DELWP.

The HRCC MEMP – Animal Welfare Plan details animal shelter compound locations and arrangements for animal welfare for the Horsham Natimuk and Dadswells Bridge communities.

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 on page 49 of the HRCC MEMP.

APPENDIX A1 - FLOOD THREATS – Horsham and rural residential areas

1. General

The Wimmera River, and its tributaries Mount William Creek, Burnt Creek, MacKenzie River and Norton Creek form the main waterway system in Horsham Rural City Municipality. Yarriambiack Creek is a distributary stream on the Wimmera River located on the eastern boundary of the municipality upstream of Horsham.

The Wimmera River environs from Glenorchy to Horsham start to experience localised flooding when the river reaches the minor flood level at Glenorchy, although some local access may be interrupted at lower flood levels.

Flood flows break out from the Wimmera River and flood the adjoining Longerenong floodplain between the Yarriambiack Creek confluence and Horsham township. The natural storage provided by the floodplain attenuates and reduces the downstream flood peak. Dooen Swamp, 6 km upstream from Horsham, provides a large flood storage area on the Wimmera River. Its effect in reducing peak flood flows reduces as the flood size increases and/or during multiple floods in quick succession as the swamp fills early during an event.

The Taylors Lake Outlet Channel crosses the Wimmera River upstream of Horsham and influences flood behaviour by slightly reducing floodwater flows to the west. For floods from a 20% AEP event and above, the channel overtops south of the Wimmera River. North of the river, historically the backed up water flooded the Barrabool State forest which also provides natural storage. The channel has been filled in in this section, although flood modelling has shown this to have little impact upon the direction or extent of flood flows. Observations in subsequent floods will improve the understanding of any changes in this area due to the infilling of sections of this channel.

Burnt Creek joins the Wimmera River in Horsham and has a catchment area of approximately 186 km^2. The small channel capacity of Burnt Creek's lower catchment north of the Western Highway means that for relatively small (20% AEP) floods approximately 50% of the flow leaves the main stream course and flows along a southern channel, re-joining the main stream just upstream of Williams Road.

The Horsham area is impacted by flooding of the Wimmera River and Burnt Creek, if the same rainfall event triggers a flood event in both waterways Burnt Creek will peak first, followed by the Wimmera River. There is potential for both waterways to peak concurrently although this would require large rainfalls falling in the upper Wimmera Catchment with a second burst of rainfall falling over the Burnt Creek catchment approximately 4 days apart later, a statistically unlikely scenario.

Much of the Horsham's infrastructure is located on the floodplain and is affected by periodic flooding. The characteristics of the floodplain in Horsham City have been significantly altered by the construction of flood mitigation works including the Wotonga Basin Weir and levees that run from Peppertree Lane to Menadue Street near Hamilton St. These structures provide minimal protection and are drowned out in larger events. Both systems are inundated commencing with floods between the 20 and 50 year ARI events.

The Horsham urban area is relatively flat and has limited drainage infrastructure. Stormwater drainage is discharged to the Wimmera River through a number of outfalls. Consequently, localised urban stormwater flooding occurs from time to time but quickly dissipates provided the Wimmera River is not high. Stormwater flooding may persist for some time if river levels are high, either through operational procedures of the weir or from flood flows.

When the Wimmera River floods, localised urban flooding will occur due to backup of the urban drainage system. During riverine floods Horsham Rural City Council implements an urban drainage flooding procedure that includes emergency stormwater pumping into the flooded Wimmera River.

Decommissioning of the redundant irrigation and stock and domestic channels during 2013-14 was accompanied with a detailed investigation which ascertained that most channels could be removed without noticeable adverse effects on properties. One section of channel, adjacent to Rokeskys Road,

Riverside, was identified as providing an important flood mitigation effect. Works have been undertaken to create a levee within the Rokeskys Road formation, instead of this channel. Removal of this formation would increase flooding for 10 properties in the Horsham and Riverside areas that would not have otherwise experienced flooding in a 1% AEP event.

2. Flood Studies and other flood information

2.1 Flood Studies

There are numerous flood studies covering the Horsham area including:

- Horsham Flood Study (2003)[i];
- Horsham Flood Study 2006
- Horsham & Wartook Valley Flood Study 2016
- Yarriambiack Creek Flood Investigation Study (2003)[ii];
- Wimmera River and Yarriambiack Creek Flows Study (2009)[iii];
- Wimmera Region Flood Report - January 2011 (2011)[iv]
- Horsham Bypass Hydrology and Hydraulics Study (2013)[v].
- Horsham Floodplain Management Study Volume 1 –Final Report (1982) [vi]
- East Horsham Flood Plan –Flood Intelligence Report, (2014) [vii].
- Lower Wimmera Flood Study 2016

2.2 Cadastral datasets

The Wimmera CMA holds digital cadastral information, licensed from DELWP, in ESRI Shapefile format.

2.3 Satellite imagery

No satellite imagery is available of flooding in this municipality.

2.4 Aerial photography

Various sub-catchments are covered by 1:46,000 digital orthorectified colour aerial photography, with pixel resolution of 1m (flown 2002).

The entire catchment is covered by 1:40,000 digital orthorectified colour aerial photography, with pixel resolution of 0.6 m (flown 2011). 50 cm 2010 orthorectified true colour aerial photography is also available.

The Wimmera CMA also has 15 cm visual and near-infrared aerial photography for selected streams within the Wimmera catchment flown in January 2011 during the flood event. There is also 15cm aerial photography of selected streams flown in December 2009.All aerial photography is available as ECW format.

2.5 Digital Elevation Model

Wimmera CMA has several Airborne Laser Scanning derived Digital Elevation Models (DEM's) within the HRCC area available for use in determining likely flood impacts Flood Intelligence Cards

All flood intelligence records are approximations. This is because no two floods at a location, even if they peak at the same height, will have identical impacts. Flood intelligence cards detail the relationship between flood magnitude and flood consequences. More details about flood intelligence and its use can be found in the Australian Emergency Management Manuals flood series at http://www.ema.gov.au and in particular in Manual 20 "Flood Preparedness"

3. Historic Floods

Flood events from the Wimmera River have been a regular feature of the history of Horsham, with large floods occurring in 1889, 1894, 1909, 1915, 1923, 1955, 1956, 1960, 1964, 1974, 1975, 1981, 1983, 1984, 1988, 1996, 2010, 2011 and 2016.

The January 2011 event is recognised as the largest recent event.

3.1 January 2011

Rainfall

In 2010 Victoria recorded its wettest year since 1974 with part of the Wimmera region suffering major flooding during September. Additional to the wet conditions in 2010, the Wimmera region received heavy rainfall across 9-14 January 2011 setting rainfall records at nine rainfall gauging stations. The resultant streamflow caused all but two Wimmera catchment streamflow gauges to record their highest recorded levels.

The recorded maximum peak flow in the Wimmera River began at Eversley on the morning of Friday 14 January and ended at Tarranyurk in the afternoon of Friday 21 January. Glenorchy reached its maximum level during the morning of Saturday 15 January while the peak level occurred at Horsham late morning.

During January 2011 the Wimmera water storages all received significant inflows. Lake Wartook and Lake Lonsdale were the most heavily affected, with inflow volumes in excess of their total storage capacities. This resulted in uncontrolled spillway outflows and severely curtailed any ability to operationally mitigate storage outflows. The high stream flow in the Wimmera River and its tributaries resulted in inundation of large areas of agricultural land, rural communities and townships. Extensive sandbagging and mitigation works were completed in most towns which had warning of the flood potential. Horsham Rural City Council distributed 128,000 and sandbags.

Flooding

Prior to the heavy rainfall in January and in response to forecasts, the Horsham Weir boards were fully removed on Monday 10 January 2011.

Flooding from Burnt Creek on Friday the 14 January 2011 closed Williams Road. Properties along much of the Creek were sandbagged. Burnt Creek, at Wonwondah East gauge, peaked on the afternoon of Saturday 15 January 2011. At the same time the Wimmera River was rising and recorded a gauge level of 3.32 m at Walmer streamflow gauge, approximately 1 m below its eventual flood peak level. A bank was installed across the Western Highway to prevent water flowing from Burnt Creek along Stawell Road, although some flow had occurred prior to the bank being installed.

The Walmer streamflow gauge recorded a peak height of 4.27m, the previous recent highest was 3.64 (1975) estimated as being between a 100 to 200 year ARI event, dependent on location and proximity to the range of Wimmera River tributaries. The ARI of January 2011 has been estimated based on modelled depths and extents produced during the Yarriambiack Creek and Wimmera River Flows Study.

It is estimated that there were approximately 141 properties affected, 260 properties without power and 500 properties isolated in the broader Horsham area. Within the East Horsham area there were 9 houses inundated above floor.

Within Horsham there were 15 houses inundated above floor with many being protected from extensive sandbagging. This compares to the predicted 35 during a 100-year event and 111 in a 200-year event (Water Technology 2009). Thirty-one shops were affected by floodwaters. Within Horsham there were two aged care facilities evacuated, along with other municipal facilities and one caravan park.

Figure 1 Inundation through the Riverside and Drung areas during January 2011

3.2 Rainfall

The following rainfall amounts (if they fall generally over the Upper Wimmera River catchment) could lead to flooding but are provided as an indicative guide only.

General rain greater than a 20% AEP event over the Upper Wimmera River catchment signals a need for increased vigilance for possible flooding of low lying farmland along the Wimmera River and its tributaries.

General rain greater than 5% AEP event over the Upper Wimmera River catchment signals a need for increased vigilance for possible of flooding of low lying areas in Horsham.

Table 1 provides an indication of upper catchment rainfall parameters associated with different AEP events.

Users of the flood intelligence card should consider rainfall depth and rates at locations in the vicinity of Horsham when at risk of stormwater inundation and streamflow gauges when at risk of floodwater inundation. Local data and data from the BoM website (http://www.bom.gov.au/) should be used. It is suggested that the following sites, available from the BoM website, will provide useful indicative rainfall data:

- Horsham AWS;
- Stawell AWS;
- Wimmera River Upstream Dimboola;
- Longerenong AWS; and
- Polkemmet Road (Horsham) AWS.

Table 1 BoM Intensity - Frequency-Duration (IFD) Design Rainfalls (mm) for Elmhurst AWS

Rainfall in mm	Annual Exceedance Probability (AEP)				
Duration	20%	10%	5%	2%	1%
1 hour	21.1	25.5	30.3	37.1	42.9
2 hours	26.4	31.8	37.4	45.6	52.5
3 hours	30.2	36.2	42.5	51.6	59.1
6 hours	38.5	45.9	53.6	64.5	73.4
12 hours	49.7	59.2	68.9	82.5	93.5
1 day	63.6	76.1	88.9	106.8	121.2
2 days	78.5	94.9	111.9	135.7	155.2
3 days	86.5	104.9	124.4	152	174.9
4 days	91.3	110.8	131.5	161.4	186.4
5 days	94.5	114.4	135.5	166.6	192.8

3.3 Riverine Flooding

The following communities are impacted by riverine flooding from the listed waterways.

Community	Impacting Waterways
Riverside	Wimmera River, Burnt Creek
Drung	Wimmera River
Longerenong	Wimmera River, Yarriambiack Creek, Two Mile Creek
St Helens Plains	Wimmera River
Horsham City	Wimmera River, Burnt Creek
Natimuk	Natimuk Creek
Wartook	MacKenzie River

3.4 Stormwater Flooding

Stormwater induced flooding in the East Horsham area is likely to cause some overland flow, inundation of road and agricultural land. However, due to the very flat terrain of the area, stormwater inundation is not anticipated to cause inundation of dwellings or prevent access to private property due to the low depths and velocities of stormwater, however access may be limited in some locations due to boggy ground conditions.

4. Description of Major Waterways and Drains

4.1 Wimmera River

The Wimmera River is the principal waterway within the municipality. Its main tributaries, which all originate from the south, are Mount William Creek, Burnt Creek, MacKenzie River and Norton Creek (refer to **Appendix A6 Maps).**

The Wimmera River floodplain between Glenorchy and Horsham is a large and relatively flat alluvial area. It is characterised by wetlands, the largest being Darlot and Dooen Swamps. These areas (ie. the natural storage of the floodplain) have a vital role in the natural mitigation of floods and help prevent flooding at Horsham.

The Horsham Floodplain Management Study (SRWSC, 1982) highlighted the significant role the floodplain upstream of Horsham plays in attenuating flood peaks. The study recommended that the natural floodplain upstream of Horsham be protected so that its flood storage and attenuation characteristics are retained.

Low flows through Horsham are controlled by the Horsham Weir located just downstream of Drummond Street. Prior to a sizeable flood passing, the regulators on the weir are lowered and boards removed to minimise their influence on the passage of floodwater through the weir.

4.2 Mount William Creek

Mount William Creek originates well south of the municipality, and flows in a north to north-west direction, eventually entering the Wimmera River upstream of Yarriambiack Creek/ Wimmera River confluence. The lower Mount William Creek floodplain is flat with many small floodways in addition to the main channel. From Horsham-Lubeck Road (near the common boundary between the Horsham Rural City Council and the Yarriambiack and Northern Grampians Shires) to the Wimmera River, the creek runs parallel to and close to the Wimmera River.

Lake Lonsdale is upstream of Dadswells Bridge and was built in 1903. It is an on-stream storage on Mount William Creek within the Northern Grampians Shire and commands an area of about 25% of the Wimmera River catchment at Horsham and about 70% of Mt William Creek Catchment at Dadswells Bridge. Knowledge of the status of Lake Lonsdale, e.g. if it is spilling or about to spill, is important in determining the likely impact of flooding in Dadswells Bridge and surrounding areas, and the potential additional contribution of this source to floods in the Wimmera River.

4.3 Burnt Creek

Burnt Creek joins the Wimmera River at Horsham and has a catchment area of approximately 186 km^2. Burnt Creek can flood either from heavy rainfall in its own catchment, or via cross-catchment flows from the MacKenzie River, as Burnt Creek connects to that River at Distribution Heads. Burnt Creek is connected to the MacKenzie River at Distribution Heads near the south end of Staehrs Road. Flood flows from the MacKenzie River usually split at this point so that Burnt Creek often receives significant flows from this source.

4.4 Yarriambiack Creek

Yarriambiack Creek is a distributary stream located on the eastern boundary of the municipality upstream of Horsham. It flows in a northerly direction, with its floodwaters also contributing to Darlot Swamp.

Former water supply infrastructure at the Wimmera River/Yarriambiack Creek confluence influences the split of flow with the between the catchments.

4.5 Lake System

From the south-eastern boundary of the municipality to just upstream of Horsham there are a number of Lakes (Dock Lake, Green Lake, Pine Lake and Taylors Lake) that are off-stream storages forming part of the GWMWater reservoir system. These lakes as well as other storages in the upper catchment (Lakes Lonsdale, Fyans, Wartook and Bellfield) are all operated by GWMWater. These lakes provide a small attenuating capacity for larger events, for example Taylors or Pine Lakes can only take around 1200-1600 ML/d from the Wimmera Inlet channel coming from the Wimmera side, or around 600 ML/d from the Burnt Creek side. The Taylors Lake Outlet channel to the Wimmera River can carry flows of up to 380ML/d, however this capacity is not available when the Wimmera River is at moderate flood levels or above, as the channel is overtopped by the Wimmera River.

5. Dams

There are eight major water storages in the Wimmera River catchment either in or upstream of the municipality. None of these storages are intended for use as flood mitigation and do not have a significant ability to influence flood levels.

Table 2 Wimmera River catchment Significant Water Storages

Location	Owner	Dam Capacity (ML)	Comments
Taylors Lake	GWMWater	27,000	Water supply storage filled from water harvested either from the Wimmera River or transfer from other storages.
Pine Lake	GWMWater	62,000	Non operational
Green Lake	GWMWater	5,350	Non operational – recreational supply only
Dock Lake	GWMWater	4,420	Non operational
Wartook Reservoir	GWMWater	29,300	Upstream of Wartook community on MacKenzie River
Lake Bellfield	GWMWater	78,500	Upstream from Halls Gap and Dadswells Bridge. Water from Bellfield enters Mt William Ck via Lake Lonsdale
Lake Lonsdale	GWMWater	65,500	Upstream from Dadswells Bridge
Lake Fyans	GWMWater	18,500	Upstream from Dadswells Bridge. Water from Lake Fyans enters Mt William Ck via Lake Lonsdale

Flooding resulting from failure of the listed dams is likely to cause some inundation of agricultural land and road infrastructure. The detailed information on the potential impacts on dwellings and private infrastructure is unknown. Flood inundation mapping has been provided by GWMWater to the Wimmera CMA.

APPENDIX A2 -Typical Flood Peak Travel Times- Horsham and rural residential areas

1. Overview

Flood Peak Travel Times are highly dependent on conditions prior to any rain event. It is therefore difficult to estimate typical flood peak travel times due to the low number of stream gauges in the Wimmera River upper catchment. The timing of flood flows in Horsham is based largely on stream gauging.

The speed a flood moves along a waterway is dependent on conditions prior to the triggering rain event. A flood on a 'dry' watercourse will generally travel more slowly than a flood on a 'wet' watercourse (e.g. the first flood after a dry period will travel more slowly than the second flood in a series of floods) and big floods tend to travel faster than small floods. Hence, the size of the flood, recent flood history, soil moisture and forecast weather conditions all need to be considered when using the following information to direct flood response activities.

Within the Horsham municipality, Wimmera River floods travel slowly within the main stream – the rate of rise is slow, peaks are long and flat and the rate of fall is generally around 3 to 5 times the rate of rise.

The reality that a community at risk can be inundated before the peak of the flood can be overlooked. In the past efforts have concentrated on estimating and forecasting the time of the peak, however this can sometimes be detrimental. Rural residential areas of St Helens Plains, Longerenong, Riverside and Drung should be warned to prepare **before** Horsham. Messaging should focus on the expected extent and timing of inundation with respect to upstream areas and Horsham, warnings can focus on rural residential areas upstream of Horsham and Horsham with specific timing and extents issued for both. The below table shows the peak inundation in rural residential areas upstream of Horsham will occur approximately 3-4 days after it is observed at Eversley and 2 days at Glenorchy.

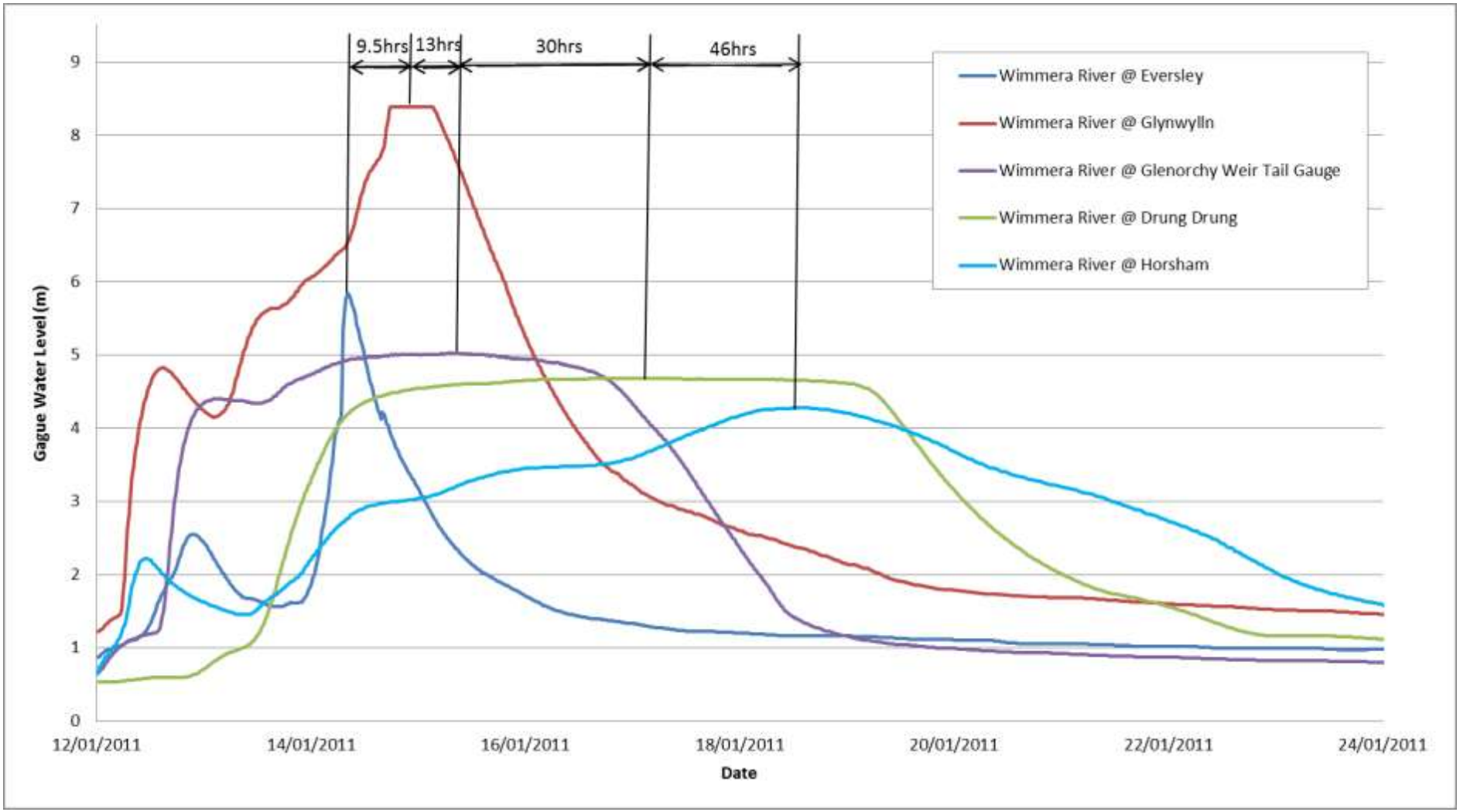
Flood extents, depth and hazard maps are available for a range of design events for both Burnt Creek and the Wimmera River. These maps have been generated based on modelled inflows and the time between flood peaks. Maps of this inundation are shown in **Appendix A6 Maps.** These maps have been produced from modelling completed during the Wimmera River and Yarriambiack Creek Flows Study and the Horsham Bypass Hydrology and Hydraulics Study.

Modelling of a Burnt Creek flood peak concurrent with the Wimmera River peak results in a general increase in 100 year ARI flood levels.

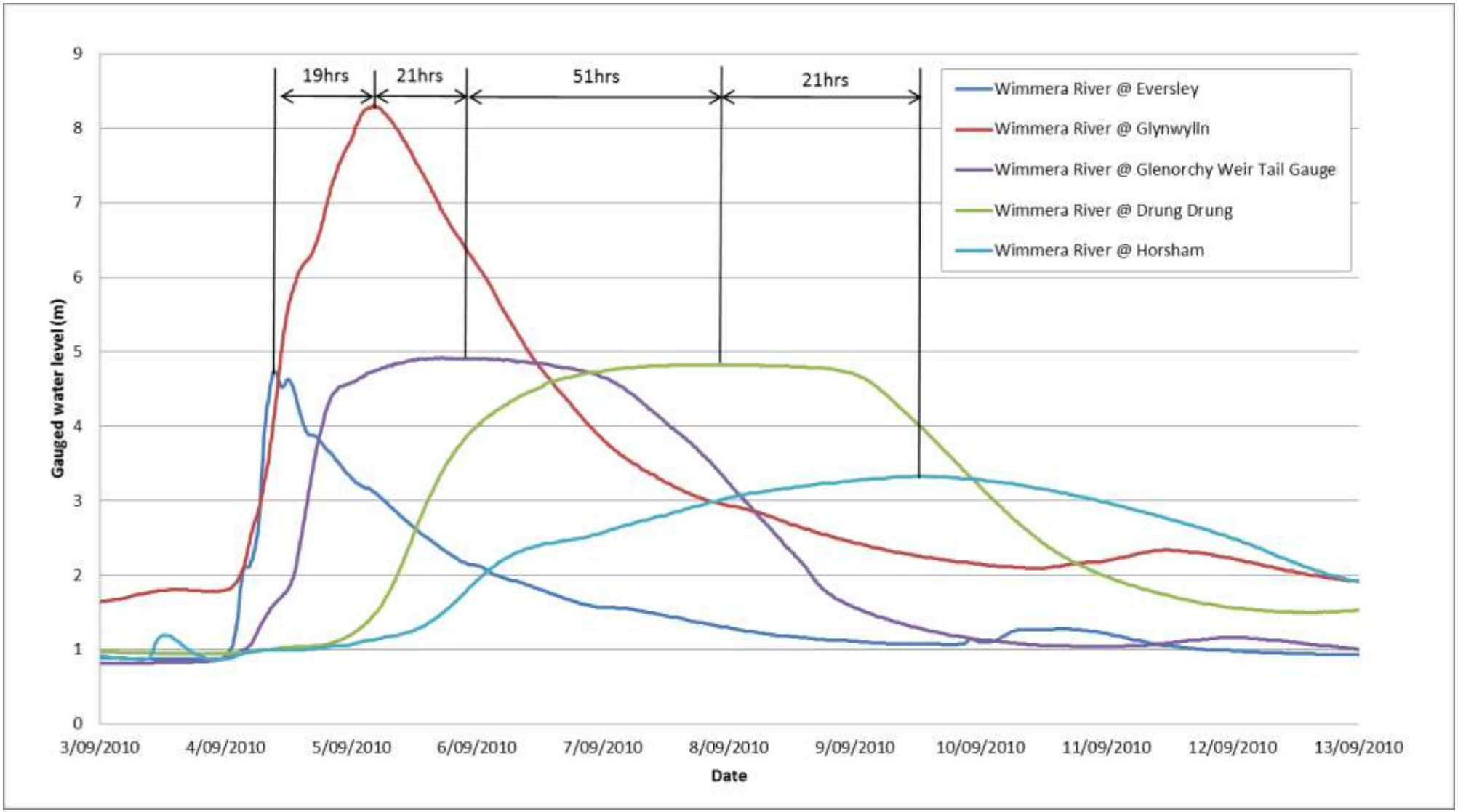
Model results showed a maximum increase of approximately 0.2 m in the Burnt Creek channel north of Williams Road. There are more widespread increases of 0.03 m across the broader floodplain with increases of up to 0.12 m in the Wimmera River channel and across the Horsham township. These increases will impact on the number of buildings inundated above floor (channel decommissioning memo Water Tech 2013).

Flood travel times from Glenorchy to Longerenong (the Wimmera River) and from Lake Lonsdale to Longerenong (Mount William Creek) are similar with the result that flood peaks often coincide causing floodwaters to join across the Wimmera floodplain and the lower reaches of the Mount William floodplain.

There are several rainfall and streamflow gauges within the study area. These include streamflow gauges on the Wimmera River located at Horsham (Walmer) and Drung Drung, there are also tributary streamflow gauges on Burnt Creek (Wonwondah) and Mt William Creek (Lake Lonsdale). Rainfall gauges located in close proximity to East Horsham are Horsham (AWS), Longerenong (AWS) and Drung Drung (AWS).



Graph 1 Wimmera River Flood Hydrographs for January 2011 event



Graph 2 Wimmera River Hydrograph for September 2010 flood event

2. Travel Time Information

Introduction

The table below provides generalised information about the travel times of floods. This is useful to assist in informing the community about when floods might be expected, and the amount of preparation time for various actions that need to occur during a flood.

It must be noted that each flood may have different characteristics depending on a wide range of factors, and therefore that these times can only be considered as indicative.

Table 3

Location From	Location To	Typical Travel Time	Comments
RIVERINE FLOODING – Wimmera River			
Floods are characterised by long flat peaks and slow recessions although the rise can be quite sharp, particularly at Glenorchy and upstream. The further down the catchment the longer the peak and the slower the recession. A second flood on the river will travel faster than a flood on a dry river and a big flood will in general travel faster than a small flood.			
Start of rainfall (upper catchment)	-	0	
Eversley	Glynwylln	7 – 19 hours	
Glynwylln	Glenorchy	18 – 30 hours	
Glenorchy	Drung Drung	45 – 60 hours	Travel time of Mount William Creek depends on the storage volume available in Lake Lonsdale, flood peaks can coincide, causing floodwaters to join across the Wimmera floodplain and the lower reaches of the Mount William floodplain.
Glenorchy	Horsham	3 to 4 days	High flows from MacKenzie River and Darragan & Norton Creeks are likely to slow travel time and increase the peak at Horsham due to backwater effects – this can slow the travel time during a big flood.
Horsham	Quantong Bridge	10 - 20 hours	
Horsham	Dimboola	3 days or more	Initial earlier peak likely from MacKenzie River and Darragan & Norton Creeks
Quantong Bridge	Polkemmet Bridge	12 hours	Initial earlier peak likely from MacKenzie River and Darragan & Norton Creeks
Quantong Bridge	Lochiel Bridge	36 hours	Initial earlier peak likely from MacKenzie River and Darragan & Norton Creeks
Polkemmet Bridge	Lochiel Bridge	24 hours	Initial earlier peak likely from MacKenzie River and Darragan & Norton Creeks
Dimboola	Tarranyurk	2 days or more	
RIVERINE FLOODING – Burnt Creek			

Start of rainfall (upper catchment)	Burnt Creek at Wonwondah East	0.5 – 2 days-	The travel time of flow in Burnt Creek can be dependent on the operation of several operating structures and the spatial distribution of rainfall. Structures to be monitored include Lake Wartook, the Burnt Creek offtake point from MacKenzie River and the offtake of Bungalally Creek from Burnt Creek.
RIVERINE FLOODING – Mount William Creek			
Start of rainfall (upper catchment)	Mokepilly	24-36 hrs	Travel time can vary due to the spatial distribution of rainfall to the east. Rainfall distribution can vary due to the topography. .
Mokepilly	Lake Lonsdale (DS)	12-36 hrs	Travel time can vary due to the contribution of Fyans Creek and storage volume available in Lake Bellfield as well as the storage volume available in Lake Lonsdale.
Lake Lonsdale (DS)	**Dadswells Bridge**	**12-24 hrs**	

2.1 Historic Peak Flow: Wimmera River and Burnt Creek

Tables 4 and 5 below document travel times observed during the most recent events on the Wimmera River and Burnt Creek. Travel times were calculated as the time that the **peak** of the event takes to move from one gauge to the next. Note that the onset of flooding can occur before the peak water level occurs. CMA knowledge should be used for additional travel time information where flood warning gauges are not available. These tables complement the indicative times shown in **Table 3** above.

Table 4 Timing of peak flow on the Wimmera River for historic events

Reach	January 2011	September 2010	September 1988
Wimmera River at Eversley	0	0	0
Wimmera River at Glynwylln	9.5 hrs	19 hrs	7 hrs
Wimmera River at Glenorchy	22.5 hrs	30 hrs	18 hrs
Wimmera River at Drung Drung	53 hrs	75 hrs	63 hrs
Wimmera River at Horsham (Walmer)	99 hrs	122 hrs	95 hrs
Wimmera River upstream of Dimboola	125.5 hrs	157 hrs	-
Wimmera River at Tarranyurk	170 hrs	233 hrs	-

Table 5 Historic timing of peak flow at Burnt Creek and the Wimmera River

Event	Burnt Creek @ Wonwondah	Wimmera River @ Walmer	Time between peaks
October 1996	01/10/1996 0:38	05/10/1996 4:00	4 days 3:22 hrs
September 2010	05/09/2010 4:30	09/09/2010 12:00	4 days 7:30 hrs
January 2011	14/01/2011 5:45	18/01/2011 11:30	4 days 5:45 hrs
December 2011 #	21/12/2011 18:15	22/12/2011 11.30	0 days 17:15 hrs
Model predictions	-	-	4 days 6:00 hrs

Note that the December 2011 event comprised two different rainfall events, with an initial localised rainfall event in the Wimmera River catchment around Joel ahead of the second event.

APPENDIX A3 FLOOD EMERGENCY PLAN - Horsham and rural residential areas

1. Overview of Flooding Consequences

Very large flood events may possibly threaten the Horsham sewerage treatment works which are located to the south west of town beside the Horsham Golf Course off Pearsons Road near the MacKenzie River.

The racecourse and adjacent residential areas within Horsham are located on (relatively) low lying land adjacent to the Wimmera River anabranch. Flooding in these areas may be caused by riverine flooding causing backing up of water in the urban stormwater system;

Flooding of area east of Horsham will include the communities of Riverside, Drung, Longerenong and St Helens Plains. The most densely populated of these area are Riverside and Drung.

Other infrastructure which may be impacted includes Longerenong College and a power sub-station:

- Longerenong College located at 229 Longerenong Road. The College occupies a large area of land, some of which may be inundated. However, neither the 100 year ARI event or observed extents from the January 2011 event have shown inundation at the main building complex. Inundation surrounding Longerenong is a consequence of flooding in the Wimmera River which passes floodwater along Yarriambiack Creek and Two Mile Creek.

- The SPAusNet Power substation located on the corner of the Lubeck-Horsham Road and River Side East Road. The substation has little to no potential to be impacted by the Wimmera River and Burnt Creek, it was not impacted during the January 2011 event. This was predominantly because the peak flow on Burnt Creek and the Wimmera River did not coincide and the peak flow in Burnt Creek alone was not sufficient to cause inundation. Modelling of concurrent peaks in both Burnt Creek and the Wimmera River would assist in a better understanding of the inundation potential.

There is significant isolation risk for the residents of East Horsham due to roads closed by depth of floodwaters. This isolation would be caused by flooding of the Wimmera River. Flooding of Burnt Creek alone is unlikely to isolate residents from major roads. Detail on the isolation for each of the four communities is different and has therefore been separated into Riverside/Drung and Longerenong/St Helens Plains below.

Inundation from Burnt Creek has the potential to impact on residents of Riverside approximately 12-48 hrs after rainfall.

Inundation from the Wimmera River has the potential to impact on all of Riverside. Flooding of the Wimmera River will begin approximately 45-96 hrs after flooding in Glenorchy, the closest township upstream. For a more detailed understanding of travel time refer to **Table 4.**

1.1 Warning Times

Refer to **Appendix A2 Section 2**, Travel Time Information (pages 30-32).

1.2 Areas Affected

Refer to **Appendix A3 Section 3.2** Disruption to Service table (page 38) and **Appendix A3 Section 3.3** Disruption to Essential Community Infrastructure (pages 38-39).

1.3 Properties Affected

Refer to **Appendix A3 Section 4 Table 7**, Intelligence Cards pages 41 to 120

1.3.1 Horsham

Refer to **Appendix A3 Section 5.2**, Intelligence Cards pages 69 to 120

1.3.2 Riverside/Drung

Riverside and Drung rural residential areas on the eastern edge of Horsham. Isolation is caused by flooding of the Wimmera River and Burnt Creek concurrently or the Wimmera River alone.

- Closures of combinations of the following roads can isolate Riverside and Drung:
- Lubeck-Horsham Road;
- Riverside Road;
- Wimmera Highway;
- Western Highway; and
- Drung-Jung Road.

Due to the warning time available, evacuation of members of the community at a higher risk should be possible. If there is an unexpected rainfall event causing rapid rises in Burnt Creek evacuation will be able to occur to the north, over the Wimmera River at Riverside Road.

1.3.3 Longerenong/St Helens Plains

Inundation in Longerenong and St Helens Plains is caused by flooding in the Wimmera River and its distributaries Yarriambiack Creek and Two Mile Creek.

Closures of combinations of the following roads may isolate some areas of Longerenong and St Helens Plains:

- Lubeck-Horsham Road;
- Murtoa-Glenorchy Road;
- Wimmera Highway;
- Horsham-Wal Wal Road;
- Longerenong Road;
- Burnt Clay Road;
- Tuckers Road;
- Andrews Road;
- West Road/Rockeskys Road; and
- Drung-Jung Road.

Due to the warning time available, evacuation of members of the community at a higher risk should be possible.

Table 6 Summary of flood affected properties in the Rural Residential areas upstream of Horsham area

Summary of number of flood affected properties in the East Horsham (Riverside, Drung, Longerenong, St Helens Plains) Area **EXISTING CONDITIONS**						
	Design Flood ARI (years)					
	5	10	20	50	100	200
Discharge at the Wimmera River Gauge @ Walmer (ML/d)	10, 000	10,500	22,000	30,000	35,000	43,000
Discharge at the Burnt Creek Gauge @ Wonwondah East (ML/d)	710	1330	#	#	#	#
Number of allotments with an associated building	91	103	139	179	197	199
Number of buildings within 50 m of the flood extent	25	31	64	110	133	149
Number of buildings within the flood extent	-	-	6	32	59	73

*As mentioned previously in this plan, modelling used to determine the number of properties and buildings inundated represents a combination of flow in both Burnt Creek and the Wimmera River. However, the peak flows in each waterway do not generally occur concurrently. E.g. the 5 year ARI event generates a 10,000 ML/d flow in the Wimmera River and 710 ML/d in Burnt Creek, the peaks of these events will normally be separated by several-many hours.

Data for the Burnt Creek gauge to be inserted after completion of the Wartook Valley study.

1.4 Road Network

Detailed mapping of areas of the road network impacted by floodwaters is planned to be included in a subsequent version of this Plan.

2. Structural Flood Mitigation Measures

2.1 Horsham Weir

The Horsham Weir is located on the Wimmera River just downstream of Drummond Street. It is a concrete structure with 27 bays of removable stop boards along with eight electrically operated aluminium flume gates.

The weir is operated and owned by Horsham Rural City Council.

During low flow periods the water levels in the Wimmera River through the town are controlled by the weir. The influence of the weir during low flows also extends to the lower reach of Burnt Creek downstream of Williams Road.

The alterations to the settings on the Horsham Weir are implemented following predicted flow rates being received from either the BoM, WCMA or GWMWater. Council staff will also separately monitor the weir level and flow rates in periods of significant rain.

Current operating rules are designed to minimise the impact of the weir at high flows. The aluminium flume gates are lowered into a laid-down position and removal of the weir stop boards commences when the Wimmera River flow reaches 613 ML/d. All stop boards are removed when the Wimmera River flows reaches flow of 5,145 ML/d corresponding to approximately a 50% AEP (2 year ARI) flow.

When the Horsham Weir is lowered in anticipation of high flows within the Wimmera River at Horsham, Council personnel will advise five landholders in the Quantong area and the MERO at Hindmarsh Shire by phone to expect higher than normal flows.

The weir drowns out at high flows (ie. is completely inundated) and has no significant impact on water levels provided all stop boards are removed and the eight flume gates are laid flat.

2.2 Wotonga Basin Weir

Wotonga Basin Weir is owned and operated by the Horsham Rural City Council and is the control measure to protect high river flow from entering the City drainage system, including City Gardens Estate, O'Callaghans Parade and Firebrace Street.

Operation involves the placement of weir boards and subsequent "pumping" from above weir into a high river.

Activation commences when the Walmer Gauge reaches 3.3m (approx. 12,800 ML/d flow)

2.3 Rose and Olympic Streets Drainage Flood Gates

The Rose and Olympic Street drains are owned and operated by the Horsham Rural City Council. Council operates flood gates on these drains to prevent high river flows from entering the City drainage system.

Operation involves the "pumping" from above floodgates into a high river.

Activation commences when the Walmer Gauge reaches 3.3m (approx. 12,800 ML/d flow).

2.4 Peppertree Lane to Menadue Street and Hamilton St Levee

While it may have been intended that these levees were built to accommodate a 1% AEP flood, this has been found to be not the case. In the 1% AEP flood, water overtops the levee in several locations. In particular, near the upstream end of Peppertree Lane. As a result of this overtopping, it needs to be recognised that while the levee may provide protection for houses and properties behind the levee in up to about a 2% flood, for larger floods plans need to recognise that inundation of properties behind the levee will occur. The extent of this flooding can be readily identified in 1% AEP flood maps.

A levee audit conducted in 1996 (Findlay Irrigation Services et al, 1996) indicated that the Horsham levee system does not correspond to the original design profile. The Menadue Street/Peppertree Lane area has a low point midway along the levee and drops beneath the original design profile at either end. The consequence of the above is that the levee system will only provide flood protection up to around the 5% AEP (20 year ARI) flood level (Water Technology, 2003).

The Horsham 2006 flood study examined a number of issues, including the merit in raising this levee to the intended 1% AEP level. Modelling of the impacts of raising the levee determined that if it is raised to the 1% levee, that the depth of flooding would increase in other areas of Horsham, causing a number of buildings and residences which would otherwise not have above floor inundation, to be inundated by the 1% AEP flood. For this reason, it was decided not to proceed with raising the levee.

Any future proposal to raise the levee, **even on a temporary basis by sand-bagging or similar**, should only proceed if modelling is conducted and the results are found to be acceptable – i.e. no adverse impact on other properties by doing so. This may be the case if some of the potentially impacted properties are changed, e.g. re-built with higher floor levels.

2.5 Water Supply Channels in Rural Residential Area

There are no formal flood mitigation schemes in operation in in the rural residential areas upstream of Horsham but there are a number of water supply channels which influence the depth and extent of inundation through the area. The major locations are:

- Taylors Lake Outlet Channel (transports water from Taylors Lake to the Wimmera River at Yarriambiack Creek – caused significant constriction of floodwater during the January 2011 flood event
- Channel 3, otherwise known as the West Channel (runs north-south along West Road which becomes Rokeskys Road at the northern end)

Part of the Channel 3 bank adjacent to Rokeskys Rd has been re-constructed as a levee, with the ability to pass limited flows, built into a raised road formation from Horsham-Lubeck Road to Heards Road. Ongoing maintenance of this road will be required to maintain the levee at the designed level.

2.6 Walmer Syphon Drainage Issues

In the January 2011 flood event, heavy rain caused stormwater flooding in the MacKenzie Court area, and some nearby areas. A number of works have occurred since that flood, reducing the likelihood of similar flooding in future events. The Walmer Syphon, previously used for water supply, now provides some drainage relief in this general area. Operation of the Walmer Syphon should be checked to ensure effective operation of the drainage system in this area during major events.

3. Flood Impacts and Required Action

3.1 Sandbag strategy

The strategy has the following elements:

Prior to a flood:

- Both HRCC and VICSES will ensure that there are sufficient numbers of sandbags in stock in strategic locations in preparation for floods. Council normally stocks 10,000 sandbags in Horsham, and 5000 at Natimuk. The condition and number of bags are subject to a pre-season check each year on 1 May.

When a flood warning has been issued or flooding is imminent:

- HRCC and VICSES will establish an initial sandbag filling facilities at the Council Depot in Selkirk Drive. This site is suitable for the period of time in advance of a flood peak arriving.
- As a large flood approaches Horsham, alternative sites will be needed north and south of the River, as the Council Depot is inundated at the peak of large floods.
    - Alternative sites to consider could include the GWMWater depot in Kalkee Rd or the former VicRoads site also in Kalkee Rd. Permission would be required from these parties.
    - In large floods a sandbag depot is also required south of the river. Sites to consider include the Kenny Rd Transfer station or Council's Stack Site in Golf Course Rd. Wimmera Aquatrail and KLM have sand supplies on the south side of river.
- Sandbags and plastic sheeting will be allocated to properties that meet the following criteria:
    - Essential infrastructure, for example:
        - The power station at Riverside stayed dry in the 2011 event. Sandbags should be provided as a precaution for the building in case the Rokesky Rd levee fails.
        - Sewer pumps.
        - The railway culvert in Dooen Rd (opposite Peppertree Lane) to prevent flooding west of the railway line, as due to the low level of the Police Paddock basin, flood waters may back up into the Rodda Place and Puls Place drains and impact on the adjacent residences. (Subject to consultation with ICC and CMA for each event).
        - Schools, kindergartens, aged care facilities, public buildings.
    - Essential travel routes. Note that when the Wimmera River overtops the city levee Madden St can become the only trafficable route to drive from north to south in Horsham. When this occurs the houses in Madden St need protection from traffic wash.

- Brick residences identified as being at risk of over-floor flooding. Generally, 25 to 50 sandbags per house will be supplied to protect door openings and vents. Sandbags will not be supplied for building levees around houses. Proof of occupation/ownership is required e.g. a driver's licence or account from a utility.
- Public buildings.
- Commercial premises for doors and other openings.
- Generally, sandbags will not be supplied to properties if the table in **Section 5.2** of this Appendix or flood inundation maps (for rural properties) indicate a house is not at risk of over floor flooding. However, it is recognised that shed floors are often lower than residential floors and an allocation of sandbags may be made to impacted properties based on the assessment of the staff on duty and adequate numbers of sandbags being available for higher priority assets.

- Large numbers of sandbags will not be supplied to residences with cement sheet or weatherboard construction on raised footings (see point below) to build a levee surrounding the house. For these residences plastic sheeting and tape will be supplied (if available) to create a waterproof membrane, using the house walls for structural strength. Sandbags will be supplied to anchor the membrane.
- Sandbags will not be supplied in any circumstances to residential or rural properties to construct levee walls around houses or around or along property boundaries.

3.2 Disruption to Services

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

Service	Impact	Trigger Point for action	Strategy/Temporary Measures
Power	Loss of power supply to flooded areas of Horsham	5% AEP flood predicted	Power cut to substations in flooded areas of Horsham. (includes part of CBD)
Gas	Nil		
Rural school buses	Low lying rural roads flooded	20% AEP flood predicted	Buses directed to alternative routes
City school buses	Low lying areas of Horsham flooded	2% AEP flood predicted	Buses directed to alternative routes
Water	Nil	Drinking water supply in the 2010-11 floods was not interrupted in Horsham and Natimuk.	People reliant on rainwater will need to assess whether their supply may have been contaminated.
Sewerage	Toilets not useable in flooded areas.	2% AEP flood predicted	Evacuate affected properties
Telephone	(To be added in next version of plan)		

3.3 Disruption to Essential Community Infrastructure

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

Facility	Impact	Trigger Point for action	Strategy/Temporary Measures
Ambulance	Ambulance access to station cut off by flood waters	5% AEP predicted	Plan for basing ambulances at Horsham Hospital. Plan to sandbag Madden Ave to facilitate north - south access for emergency vehicles.
Kurrajong Lodge Age Care Home	Inundation	5% AEP predicted	Consider evacuate residents to alternative accommodation
Garden Village Age Care Facility (Unassisted)	Access and sewerage issues	5% AEP predicted	Consider evacuate residents to alternative accommodation
Sunnyside Lutheran Rest Home	Inundation	5% AEP predicted	Consider evacuate residents to alternative accommodation
Holy Trinity Lutheran School	Inundation	5% AEP predicted	Close school for days of predicted flooding.
Riding for Disabled	Inundation	10% AEP predicted	Close facility and relocate horses and assets.
Showground Horse Stables	Inundation	5% AEP predicted	Close stables and relocate horses.
St Brigid's College	Access	TBD	School may be closed

Caravan Parks	Caravan evacuation location	Comments
Horsham Riverside Caravan Park	190 Firebrace St, Horsham	Consider relocating caravans if a flood greater than 5% AEP predicted. 4.96m Glenorchy gauge.

4. Command, Control and Coordination

Refer to **Part 3.2** of EMMV for full details.

4.1 Introduction – flood intelligence cards

There is a range of water level and streamflow gauges within the Wimmera River and Burnt Creek catchments. Actions are driven by predicted levels referenced to the Walmer streamflow gauge downstream of Horsham. Predictions for this gauge will be made based on observed levels at the following gauges:

- Wimmera River at Eversley
- Wimmera River at Glynwylln
- Wimmera River at Glenorchy (table included)
- Mt William Creek at Lake Lonsdale D/S
- Wimmera River at Drung Drung

- Wimmera River at Walmer (table included)
- Wimmera River at Quantong (table included)
- Burnt Creek at Wonwondah East (table included)

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, are likely to have identical impacts. Further, the hydrologic and hydraulic modelling that underpins much of the intelligence detailed below is informed by a number of assumptions and approximations 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, in particular in Manual 20 “Flood Preparedness”.

All levels, impacts and actions listed in the following flood intelligence card and graph may need to be adjusted to better reflect experience.

Note that:

- Burnt Creek is likely to begin flooding between 4 and 5 days before the Wimmera River if flooding has been generated by the same rainfall event.
- Mapping and flood modelling have been based on flood levels receding in Burnt Creek prior to the Wimmera River reaching its peak level. The timing of each waterway needs to be considered prior to the prioritisation of sandbags.
- Road closures as a result of Burnt Creek flooding will begin to occur approximately 6 to 12 hours after rainfall
- Road closures as a result of Wimmera River flooding will begin to occur at approximately 36 to 72 hours after flooding in Glenorchy.

4.2 Wimmera River at Glenorchy

The following table is included in this Flood Response Plan as it gives an indication of flood impacts upstream of Horsham to the HRCC - NGSC boundary.

The Bureau of Meteorology anticipate being able to provide a minimum of 24 hours warning lead time of flooding at Glenorchy in most situations. An absolute minimum of 8 to 10 hours is anticipated in the unlikely event of failure of most rain gauges in the upper parts of the catchment.

Table 7 - Flood Intelligence Card Wimmera River at Glenorchy

WIMMERA RIVER at GLENORCHY				
River Height (m)	River Flow (ML/d)	Consequence / Impact downstream to Horsham	Action/	Comments
1.82m	2,000ML/d	Water flows into Dooen Swamp with a river flow of about 2,000ML/d.	Advise landholders so that stock can be moved from Dooen Swamp.	80% AEP (1.3 year ARI) event
4.00m	7,000ML/d	Localised minor flooding of rural land adjacent to the Wimmera River.	Advise landholders so that stock can be moved from low lying areas along the river.	Minor Flood Level 50% AEP (2 year ARI)
4.72m	13,500ML/d	Likelihood of North Road being flooded as river levels rise and the flow path activates.	Erect “Water Over Road” signs either end of North Road.	August 1980 event 23% AEP (4.4 year ARI)
4.75m	14,200ML/d		Advise that driving in water more than 300mm deep is highly dangerous and may result in loss of life	Moderate Flood Level 21% AEP (4.7 year ARI)
4.77m	14,600ML/d			20% AEP (5 year ARI) event
4.78m	14,800ML/d			October 1996 event 19.5% AEP (5.1 year ARI)
4.79m	15,000ML/d			October 1992 event 19% AEP (5.3 year ARI)
4.85m	17,200ML/d			August 1981 event 14% AEP (7 year ARI)
4.86m	17,700ML/d			September 1983 event 13% AEP (7.7 year ARI)
4.90m	19,300ML/d			Major Flood Level
4.90m	19,720ML/d	Modelling suggests: • At Glenorchy town centre: • 3 properties will experience above floor flooding, at 38B Bunbury St, 40	• Notify as required. • Be prepared to assist with resources as required.	10% AEP (10 year ARI)

WIMMERA RIVER at GLENORCHY				
River Height (m)	River Flow (ML/d)	Consequence / Impact downstream to Horsham	Action/	Comments
		Bunbury St, and 19 Cameron St. All 3 properties are along Forest St intersections. • water on road and flooding of properties likely within Bunbury, Cameron, Boyd, Forest, Dry and Arapiles St. At major roads: • water on roads at Old Glenorchy Road, Campbells Bridge Road,	• Advise that driving in water more than 300mm deep is highly dangerous and may result in loss of life.	
4.91m	20,100ML/d			October 1975 event 9.4% AEP (11 year ARI)
4.94m	22,800ML/d			October 1973 event 6.4% AEP (16 year ARI)
4.96m	24,320ML/d	Modelling suggests: At Glenorchy town centre: • a further 2 properties experience above floor flooding, at 11 Carfrae St and 27 Boyd St. • water on road and flooding of properties likely at Green St and Bridge St. • At major roads: • water, up to 1m depth, on Old Glenorchy Road, Campbells Bridge Road • shallow water on Stawell – Warracknabeal Road, still passable.	Notify as required. • Be prepared to assist with resources as required. • Notify that driving in water more than 300mm deep is highly dangerous and may result in loss of life. • Notify that rural property owners may be isolated for some days.	5% AEP (20 year ARI) event

WIMMERA RIVER at GLENORCHY				
River Height (m)	River Flow (ML/d)	Consequence / Impact downstream to Horsham	Action/	Comments
4.97m	25,200ML/d			September 1988 event 4.3% AEP (23 year ARI)
5.01m	29,730ML/d	Modelling suggests: At Glenorchy town centre: • a further 5 properties experience above floor flooding (10 in total), centralised along the Forest St intersections (see modelling maps). • majority of township has water up to 0.25m, except for Clarke St and the Train Station. At major roads: • water, up to 1m depth, on Old Glenorchy Road, Campbells Bridge Road, and Glenorchy – Callawadda Rd • shallow water on Stawell – Warracknabeal Road, potentially unpassable at this stage.	• Notify as required. • Be prepared to assist with resources as required. • Notify that driving in water more than 300mm deep is highly dangerous and may result in loss of life. • Notify that rural property owners may be isolated for some days.	2% AEP(50 year ARI) event
		Modelling suggests: At Glenorchy town centre: • a further 3 properties experience above floor flooding (13 in total), centralised along the Forest St intersections (see modelling maps). • majority of township has water up to 0.25m, except for Clarke St and the	• Notify as required. • Be prepared to assist with resources as required. • Notify that driving in water more than 300mm deep is highly dangerous and may result in loss of life. • Notify that rural property owners may be isolated for some days.	

WIMMERA RIVER at GLENORCHY				
River Height (m)	River Flow (ML/d)	Consequence / Impact downstream to Horsham	Action/	Comments
		Train Station. Some parts of town have water deeper than 1m. At major roads: • water, up to 1m depth, on Old Glenorchy Road, Campbells Bridge Road, and Glenorchy – Callawadda Rd • Shallow water on Stawell – Warracknabeal Road, likely unpassable at this stage. • Shallow water on Horsham – Glenorchy Road, potential for water to be dangerous to motorists at some points.	• Consider need to evacuate or resupply rural properties.	
5.03m	33,350ML/d			1% AEP (100 year ARI) event
5.05m	36,600ML/d			January 2011 event 0.5% AEP (200 year ARI) event
		No information other than more damaging than the 200 year ARI event.		Probable Maximum Flood (PMF)

The flows, gauge heights, AEPs and ARIs quoted in the above table have been extracted from the analyses documented in Water Technology (2003).

Flood impacts described in the above table relate primarily to mainstream flooding from the Wimmera River. It should be noted that local impacts, or impacts in excess of those indicated may be attributable to flooding emanating from Mount William Creek. Similarly, local increases in flood levels and impacts may result from local factors such as culvert and other blockages and from obstructions to overland flows such as earthworks, channels, fences, building and the like

4.3 Rural Residential areas upstream of Horsham based on Walmer Gauge

Table 8

Discharge at Walmer	AEP of flood	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
It is important that sand and sandbags are available for East Horsham residents in a location specific for their use and made available to residents as soon as possible after it becomes apparent that flooding is likely. Sandbags should be available from several locations as some areas will be isolated. Residents using sandbags need to be aware of the correct way to lay sandbags and also be aware that due to the length of inundation some water will pass through the bags. Pumps may be used to remove this water if an area of ground is able to be excavated to create a low point to pump water from.			
USING THIS INTELLIGENCE CARD. Obtain the predicted level at the Wimmera River gauge at Walmer. 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 remembering that water will rise quickly and that some actions may need to be initiated in an order that is different from their relative placement in this table.			
Note that: • Burnt Creek is likely to begin flooding between 4 and 5 days before the Wimmera River if flooding has been generated by the same rainfall event. • Mapping and flood modelling have been based on flood levels receding in Burnt Creek prior to the Wimmera River reaching its peak level. The timing of each waterway needs to be considered prior to the prioritisation of sandbags. • Road closures as a result of Burnt Creek flooding will begin to occur at approximately 6 to 12 hours after rainfall • Road closures as a result of Wimmera River flooding will begin to occur at approximately 36 to 72 hours after flooding in Glenorchy.			
	20% AEP (5-year ARI) 10,000 ML/day Gauge level 3.47m	Wimmera River exceeds its capacity and inundated sections of Burnt Clay Road (max depth: >300mm, observed 1km west of Barrabool Road, remainder of inundation is less than 100-200mm) Yarriambiack Creek transfers flow north with some sections of Flume Road inundated, some flow is transferred back to the Wimmera River via Two Mile Creek. Portions of Longerenong Road are inundated. Depths are greatest 200m west of Mills Road, exceeding 300mm. Breakouts from Yarriambiack Creek across to Two Mile Creek inundate:	Warn residents along Burnt Creek (Horsham Lubeck Road, Cameron Road south). Short warning time may impact on their ability to protect assets. Consider closing the following roads: • Burnt Clay Road (at Barrabool Road) • Doug Tuckers Road • Delahuntys Road (north of Longerenong Road) • Drung Jung Road (north of Longerenong Road) Provide warnings to all buildings on inundated allotments and provision for sandbags to be allocated to those that request

Discharge at Walmer	AEP of flood	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
		• Doug Tuckers Road (max depth: >300mm) • Mills Road (max depth: 300mm) • Delahuntys Road (max depth: 200-300mm south of Longerenong Road, **<1m** north of Longerenong Road) and • Drung Jung Road (max depth: 200-300mm south of Longerenong Road, >300mm north of Longerenong Road). A breakout to the south upstream of Gross Road inundating Pine Lake Road (max depth: >300mm), Lubeck Horsham Road (max depth: 100mm) and North Road (max depth: >300mm). Burnt Creek inundates Andrews Road (max depth: 100-200mm), the southern end of Riverside East Road (max depth: 100-200mm) and Cameron Road (max depth: 100mm) Riverside Road is inundated either side of the Wimmera River bridge (max depth 200-300mm) 25 buildings with inundation within 50m. These are located on: • Doug Tuckers Road (1) • Longerenong Road (2) • Horsham Lubeck Road (5 – 1 at Gross's Bridge) • Cameron Road (1) • Western Highway (1) • Andrews Road (4) • Brighton Drive (1)	them. Ensure inundation mapping is available online and at request. Monitor water levels throughout the area and timing flows in at all streamflow gauges.

Discharge at Walmer	AEP of flood	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
		• On the Wimmera River between Heards and Cameron Road (10)	
	10% AEP (10-year ARI)	The flood extent is similar to the 20% AEP (5-year ARI) event with only a small increase in Wimmera River flow. Flood pattern remains the same with a slight increase in depth and extent. The flood extent is increased most in the areas of: • Barrabool State Forrest (over Burnt Clay Road); • Along the Wimmera River; and • In the areas of Riverside Road, Peels Road and Rogersons Road No major additional roads have been inundated; however depth of inundation has increased by approximately 100mm. The number of buildings within 50m of inundation has increased to 31, an additional 6. Five of these are located on the Wimmera River between the Riverside Road bridge and Cameron Road and one at the northern end of East Road on the Wimmera River. One building on Riverside Rd is located very close to the flood extent, this building may be inundated below floor.	Provision required for additional to sandbags in the Burnt Creek area. Sandbags should be prioritised to residents in Riverside Road, Peels Road, Heards Road along with maps ensuring residents are aware of what they can expect. Consider closing the following roads: • Burnt Clay Road • Doug Tuckers Road • Mills Road • Delahuntys Road (north of Longerenong Road) • Drung Jung Road (north of Longerenong Road) Monitor water levels throughout the area and timing flows in at all streamflow gauges.
	5% AEP (20-year ARI)	The flood extent shows several additional breakouts from the 10% AEP (10-year ARI) event. A breakout from the Marma State Forrest at the Lubeck Horsham Road travels north into the Barrabool State Forest and back into Yarriambiack Creek. A breakout east of the Taylors Lake Outlet Channel passes overland flow west, inundating areas of agricultural land, a breakout from upstream of Gross's Bridge also contributes to this flow.	Advise owners as per Property Inundation Tables to take the necessary flood mitigation measures (6 properties). Provision for enough sandbags to protect properties within 50m of the flood extent. Consider closing the following roads: • Burnt Clay Road

Discharge at Walmer	AEP of flood	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
		The extent of inundation between Yarriambiack Creek and Two Mile Creek increases substantially. Burnt Creek overtops the Lubeck–Horsham Road impacting on property on either side. The following roads are inundated additional to those listed in the 5 and 10 year ARI event: • Taylors Lake North Road (max depth: 200mm) • Domaschenz Road (max depth: 300mm, east of Pine Lake Road, <300mm west of Pine Lake Road) • Pine Lake Road (max depth: <300mm) • McIntyres Road (at the intersection of Pine lake Road, max depth: 300mm) • North Road (between Pine Lake Road and East Road, max depth: >300mm) • East Road (max depth: >300mm) • School Road (max depth: 200-300mm) • Rokeskys Road (100-200mm) * • Heards Road (<100mm) • Rogersons Road (west of Riverside Road, max depth: > 300mm) • Peels Road (western end, max depth: > 300mm) * Note that from late 2014 Rokeskys Road acts as a levee, with a gravel road surface to allow inspection of the levee during	• Doug Tuckers Road • Mills Road • Delahuntys Road (north of Longerenong Road) • Drung Jung Road (north of Longerenong Road) • Domaschenz Road • Taylors Lake North Road • Horsham Lubeck Road • East School Road • School Road • Rogersons Road (west of Riverside Road) Monitor water levels throughout the area and timing flows in at all streamflow gauges.

Discharge at Walmer	AEP of flood	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
		floods. Some minor overtopping of the levee is intended to occur in 1% AEP events. The number of buildings with water at the building has increased from zero to six. Three of these are located in Riverside (the equestrian centre, Riverside Road, Cameron's Road). The other three are located on Riverside East Road, Jung Drung Road and Doug Tuckers Road. The number of buildings within 50m of the flood extent has increased from 31 to 64, the majority of these are in the Riverside area including: • Horsham Lubeck Road • Cameron Road • Cameron Road North • Browns Road • Peel Road • Heards Road • Rogersons Road • Priors Road • Petrie Lane • Riverside East Road	
	2% AEP (50-year ARI)	Several additional breakouts in a 2% AEP (50-year ARI) event. Water breaks out from the Barrabool State Forrest at Sawpit Swamp Road and inundates Longerenong Road. The extent of the Barrabool breakout is increased inundating Gavans Road	Advise owners listed with *'Inundation at building'* to take the necessary flood mitigation measures Consider implementing contingency plans for access through East Horsham

Discharge at Walmer	AEP of flood	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
		and Corkers Creek Road to a greater extent. Upstream of Grosses Bridge inundation is increased in depth and extent. Southern breakouts from east of Taylors Lake Outlet Channel and Gross's Bridge transfer more water merging with the inundation created by Burnt Creek, this inundation also pushes further north overtopping the Horsham Lubeck Road, merging with breakouts from the Wimmera River north of Browns Road. Significantly more inundation is observed in the vicinity of Rokeskys Road, Browns Road, Riverside East, Butlers Road, Heards Road and Peels Road. The culverts on Burnt Creek at the Western Highway are unable to transfer the required flow rate with water flowing towards Horsham in the Western Highway southern table drain. Action is required to prevent this water flowing into Horsham's urban drain system, along the table drain. This may involve blocking the table drain at natural depressions – however, monitoring of water levels across the Western Highway will be required. The following roads are inundated additional to those listed in the 5% AEP (20-year ARI) event: • Rokeskys Road (north of Horsham-Lubeck Road, max depth: 100-200mm) - note this is now a levee • Riverside East Road (max depth: 300mm) • Butlers Road (max depth: <100mm) • Peels Road (max depth: >300mm) • Horsham – Lubeck Road (max depth: 200mm) The number of buildings listed as *'inundation at building'* has increased from 6 to 33. There is one additional building on the eastern side of the study area at the Northern end of Taylors	Consider evacuating parts of Riverside Monitor stream gauges in the Wimmera River and Burnt Creek. Consider closing the following roads: • Burnt Clay Road • Doug Tuckers Road • Mills Road • Delahuntys Road (north of Longerenong Road) • Drung Jung Road (north of Longerenong Road) • Domaschenz Road • Taylors Lake North Road • Horsham Lubeck Road • East School Road • School Road • Rogersons Road (west of Riverside Road) • Riverside East Road • Peels Road

Discharge at Walmer	AEP of flood	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
		Lake North Road. The additional remainder are due to breakouts from the Wimmera River to the south, downstream of Gross's Bridge. The go-cart/motor cycle track on the Henty Highway has become inundated with the club house showing inundation at the building. An additional 26 buildings are highlighted with inundation at the building in the following streets (total 32): • Heards Road • Riverside Road • Petrie lane • Browns Road • Riverside East Road • Cameron Road North • Cameron Road	
	1% AEP (100-year ARI)	Similar to (but slightly smaller than) January 2011 flood when extensive damage was caused to both residential and agricultural land – refer to Wimmera CMA estimated extent. The extent is similar to that of the 2% AEP (50-year ARI) event with several additional breakouts on: • Northern end of School Road (agricultural land impacted only) • Overland flow through Rogersons Road (8 properties within 50m of flood extent)	Continue to monitor rainfall and water levels. Consider implementing evacuation plans. Ensure sandbags are available to all East Horsham residents requiring them. Potential Road closures are same as for the 2% AEP (50-year ARI) ARI event.

Discharge at Walmer	AEP of flood	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
		• Agricultural land west of Cameron Road There is a general increase in extent and depth by 10-20cm as compared to the 2% AEP (50-year ARI) event. The following roads are inundated additional to those listed in the 2% AEP (50-year ARI) event: • Rogersons Road (max depth: <100mm); and • Henty Highway (max depth: <100mm) An additional 26 buildings are listed as *'Inundation at building'*. All of these are west of Gross's Bridge with the three east of this point with inundation at the building location in the 2% AEP (50-year ARI) event. An additional three buildings are shown with *'Inundation at building'* on the Horsham Lubeck Road. All Properties on Cameron Road North are either listed as *'Inundation at building'* or in direct proximity to flood water. Properties on Heards Road, Peels Road and Rogersons Road are all in direct risk of below floor inundation.	
	0.5% AEP (200-yr ARI)	General increase in inundation on the 1% AEP (100-year ARI) with no significant additional breakouts. Depth has increased by 100-200mm with less 'islands' in the extent of inundation. No additional roads inundated. Number of buildings listed as *'Inundation at building'* has increased by 14 (total 73) Additional buildings are located:	Continue to monitor rainfall and water levels. Consider implementing evacuation plans. Ensure sandbags are available to all East Horsham residents requiring them. Potential Road closures are as for the 2% AEP (50-year ARI) ARI event.

Discharge at Walmer	AEP of flood	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
		• Southern breakout North Road and Horsham Lubeck Road • Horsham Lubeck Road • Peels Road • Cameron Road North • Heards Road • Riverside Road • Butlers Road • Burnt Clay Road • Field Days Road • East Road (Northern end)	

4.4 Wimmera River at Walmer (approx 3.7km downstream of the Horsham Weir)

The Bureau of Meteorology anticipate being able to provide a minimum of 2 days warning lead time of Wimmera River flooding at Horsham as the flood travel time from Glenorchy to Horsham is generally between 2 and 3 days.

Table 9

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
0.81m	613ML/d	Increased water flows are expected through the municipality.	Commence lowering of the Horsham Weir (refer to Appendix D).	Task generally requires a work team of 4 people for half a day.

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
		Experience suggests: • After years of drought, large volumes of debris (fallen trees etc.) may be resident in the Wimmera River immediately downstream of Horsham Weir which may contribute to water backing up in Horsham City.	**Consider** earthworks to remove debris (excavator team may be suitable).	
2.47m	5,145ML/d	• The Horsham Weir becomes ineffective at this time. The force generated by increased flood flows is likely to damage the Weir. • Removal of the Weir, in the first instance, will create increased flows for a short distance downstream.	• Horsham Weir should now be entirely lowered, including boards removed, as per Appendix D. • Notify Hindmarsh Shire MERO or Deputy MERO of increased flows. • Notify five (5) downstream landowners of increased flows. Hindmarsh Shire Acting MERO Wayne Schulze 0428 322 835 Hindmarsh Deputy MERO – Janette Fritsch 0428 365 527 Daryl Moore 0419 639 774 Peter Langlands 5382 3772 Brian Hoffman 5384 0212 Keith Lindner 5384 0254 Peter O'Toole 5387 1309	52% AEP (1.9 year ARI)
2.97m	8,250ML/d			August 1980 event 35% AEP (2.9 year ARI)

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
3.30m	12,800ML/d	Modelling suggests: At Horsham: • Likely flooding within the anabranch area of town, from eastern end of Hamilton Street through to the Horsham Botanic Gardens and Wotonga Basin. • Water pressure from the river is likely pushing backwards up into Wotonga Basin, contributing to flooding of the town stormwater system. • Likely that the stormwater system will be at capacity and increased flows (both land flows and precipitation) will begin to flow out of the city stormwater drains and appear above ground. • Powercor assets are likely to be under threat, such as substation at intersection of Stawell Rd / Henty Hwy.	• Establish seal on the Wotonga Basin Weir to prevent backwater flow into the anabranch area of town (refer to Appendix E). • Install pumps at Wotonga Basin – • Prepare to pump out from behind the Wotonga Basin Weir to prevent rising levels in the stormwater system. • GWMWater to seal off sewerage outlets in the vicinity of Wotonga Basin. • Check Horsham Caravan Park stormwater outlets. • **Consider** sandbagging stormwater outlets. • Liaise with Powercor to see if they require assistance with sandbagging / installation of pumps etc. • **Consider** requirement for HRCC staff and volunteer work-parties if widespread flooding is expected. Consideration needs to be given to: ▪ 24hrs operations, broken into 3 or 4 shift cycles; ▪ Relief Centres; ▪ Recovery Centre; ▪ Aged Care facilities; ▪ Caravan Parks;	The Jan 2011 event enveloped all attempts to sandbag stormwater outlets, rendering them a wasted effort as water levels surpassed them. Sandbags became a hindrance to receding waters. Cost:Benefit analysis to be decided by MERO at the time.

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
			▪ vulnerable persons care (medical, age, meals on wheels etc.); ▪ bulk sandbagging, with a "how to build effective sandbag walls" flyer available for residents; ▪ providing information, including Flood Inundation model maps for viewing; ▪ distributing public information via website, text, twitter, facebook, SES, VicRoads, doorknocking etc.; ▪ earthworks by Depot Staff; and ▪ traffic coordination in conjunction with Police, SES and VicRoads.	Roughly 120,000 sandbags were distributed to homes and businesses during Jan 2011 event, many not effective due to poor construction techniques. Many not required – use of current flood mapping may target distribution more effectively
3.31m	12.900ML/d	Water is likely to affect daily operations of stock around the Quantong Bridge area.	Advise landholders around Quantong Bridge so that stock can be moved to higher ground.	Minor Flood Level
3.31m	12.900ML/d	Modelling suggests: At Horsham: • 7 properties within Horsham may experience below floor flooding, particularly at western end of Barnes Boulevard. • water on Williams Road at Burnt Creek crossings • Flooding along Pryors Lane and Cameron Road, all the way to the Western Highway, more than 1m deep in places. At Riverside:	• Advise residents of likely flooding (see Appendix B and Flood Inundation Model maps). • Make Flood Inundation model maps for 20% / 5 year event available to public. • Inform Depot Members so that Roving Teams may erect road signage, in conjunction with Police and SES efforts. • **Consider** road closed signage and detour requirements for Williams Road, in conjunction with VicRoads.	20% AEP (5 year ARI) event (WCMA modelling available)

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
		• Riverside Road (nth & sth) and CarrCarr Street flooded more than 0.5m deep in places. • minor flooding at northern end of Riverside East Road.		
3.33m	13,500ML/d	Experience suggests: • Water likely to be banked against earth masses in the areas surrounding Taylors Lake, Pine Lake, Green Lake, and Dock Lake. Natural water flows may be hindered or altered, causing flooding of road systems.	**Consider** requirement for earth works to allow water flows. Mobilise plant assets and staff to conduct tasks as required, in conjunction with ICC & SES efforts.	October 1992 event 18.9% AEP (5.3 year ARI) In Jan 2011, many culverts were blocked from debris requiring attention to enable natural flows.
3.36m	14,500ML/d			October 1973 event 16.8% AEP (6 year ARI)
3.40m	15,600ML/d			February 1911 event. 14.7% AEP (6.8 year ARI)
3.43m	16,700ML/d			October 1975 event 12.9% AEP (7.8 year ARI)
3.44m	17,100ML/d			September 1916 event. 12.2% AEP (8 year ARI)
3.45m	18,000ML/d			Moderate Flood Level
3.47m	18,100ML/d	Modelling suggests: At Horsham: • 13 properties within Horsham will experience below floor flooding, particularly at Hayes Dr,	• Advise residents of likely flooding (see Appendix B and Flood Inundation Model maps).	10% AEP (10 year ARI) event (WCMA modelling available)

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
		Bullen Ct, Fulton Ave, Wimmera Rise and western end of Barnes Boulevard. Water will be on road of these streets and properties may experience below floor flooding. • Northern end of Cameron Road inundated. • Properties likely to be already affected in Peppertree Lane, Pryors, Riverside & Williams Road and Weldon Power Court.	• Make Flood Inundation model maps for 10% / 10 year event available to public. • Inform Depot Members so that Roving Teams may offer advice, erect road signage, door knock, sandbag or evacuate houses identified as subject to flooding (see list at Appendix B and Flood Model maps at Appendix J).	- The Jan 2011 event enveloped all attempts to sandbag stormwater outlets, rendering them a wasted effort as water levels surpassed them. Sandbags became a hindrance to receding waters from roadways.
3.50m	19,350ML/d	Experience suggests: At Horsham: • Properties affected in Cameron & Heards Road and MacBain Street.		August 1923 event 9.1% AEP (11 year ARI)
	19,214ML/d			October 1996 event 9.3% AEP (10.8 year ARI)
3.55m	21,004ML/d			September 1988 event 7.5% AEP (13 year ARI)
3.58m	22,900ML/d			Major Flood Level
3.61m	23,700ML/d	Modelling suggests: At Horsham: • 17 properties within Horsham will experience below floor flooding, likely in Firebrace, Gillespie, Hamilton, MacBain, Madden, McBryde & Urquhart Street, Hopkins Drive and O'Callaghans Parade. • New subdivision in Robinson St may lead to access issues for residents in that subdivision.	• Advise residents of likely flooding (see Appendix B and Flood Inundation Model maps) • Make Flood Model maps for 5% / 20 year event available to public. • **Consider** road closed signage and detour requirements for Riverside Road, Carr Street and Eastgate Drive/Barnes Boulevard, in conjunction with Police and SES.	5% AEP (20 year ARI) event (WCMA modelling available)

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
		• Water up to 0.5m deep encroaching on land on the river side of Barnes Boulevard downstream of Drummond Street. • River end of Peppertree Lane flooded to more than 1m deep. • Flooding along Cameron Road more than 1m deep in places with shallow flooding (0 – 0.5m) extending almost to the Henty Highway along western side of Cameron Road. • Shallow flooding (up to 0.25m deep) on land adjacent to Burnt Creek upstream (south & north) of Williams-Road. • Wotonga Basin Weir overtopped. At Riverside: • Riverside Road (north) and Carr Street flooded more than 0.5m deep in places. Majority of properties in the area with water across land, but below floor.	• Advise that driving in water more than 300mm deep is highly dangerous and may result in loss of life. • Advise rural property owners that they may be isolated for some days. • If it is raining in Horsham expect flood impacts through the Anabranch area to be more severe and look at earlier warning of house flooding and road closures. • Inform Depot Members so that Roving Teams may offer advice, erect road signage, door knock, sandbag or evacuate houses identified as subject to flooding (see list at Appendix B and Flood Model maps at Appendix J). • **Consider** making safe any pumping equipment at Wotonga Basin Weir.	The Jan 2011 experience showed that residents, tourists and businesses (trucks with food supplies etc.) are more interested in what road is open, rather than what road is closed. Effort must be made to liaise with VicRoads to inform the public (website etc.) of bypass routes.
3.63m	24,800ML/d			August 1981 event 4.7% AEP (21 year ARI)
3.65m	26,000ML/d	Experience suggests: At Horsham: • Access to CFA, SES and Ambulance depots likely to be difficult around this level.	• **Consider** relocating SES and CFA equipment and operations with regard for likely road closures. • **Consider** stationing ambulance operations from the Hospital until flood waters recede. • **Consider**, in conjunction with Police, Hospital and SES, access to Hospital from south side	Discuss with SES, Police, Hospital and VicRoads.

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
			of Sloss and McBryde Streets. Consider use of Madden St as bypass, additionally, discuss rotary wing (helicopter) options. • **Consider** closing the Western Highway in anticipation of higher flood waters across the road and also due to excessive load on the Wimmera Bridge from flood waters pushing against it.	
3.69m	29,100ML/d			September 1915 event. 2.7% AEP (37 year ARI)
3.70m	29,700ML/d	Modelling suggests: At Horsham: • Over floor flooding of houses likely in Firebrace and McBryde Streets. • Properties affected in Arnott, Clark, Cook, Glancy, Knowles, Lawrence, Margaret, McPherson, Rennison, Sloss, Wettenhall & Wilson Street, Leskie Close, Madden & Trinity Drive, Peels & Stawell Road and Royal Court. Experience suggests: • Stormwater drainage is likely to be at capacity by this stage, causing water to creep out of many drains throughout town.	• Advise residents of likely flooding (see Appendix B and Flood Inundation Model maps) • Make Flood Inundation Model maps for 2% / 50 year event available to public. • Inform Depot Members so that Roving Teams may offer advice, erect road signage, door knock, sandbag or evacuate houses identified as subject to flooding (see list at Appendix B and Flood Model maps at Appendix J). • **Consider** closing the Western Highway, as above. • Stormwater drains spilling water to roads is unlikely to require road closures, but be prepared to reassure public that it is normal.	Discuss with SES, Police, Hospital and VicRoads.
3.71m	30,400ML/d			October 1894 event 2.3% AEP (43 year ARI)

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
3.72m	31,200ML/d	Modelling suggests: At Horsham: • Over floor flooding of 2 houses and below floor flooding of a further 74 properties within Horsham. • Water 0.25m-0.5m deep along majority of Hamilton St and O'Callaghans Parade, thereby restricting movement north-south, including access to Hospital, SES, CFA and Ambulance depots. • Breakouts occur between the end of Menadue Street and the Showgrounds to the town Anabranch across MacBain, McBryde, Hamilton, Robinson, McPherson (Western Highway), Urquhart, Firebrace, Madden and Darlot Streets and O'Callaghans Parade with flooding of properties up to 0.5m. At Riverside: • Riverside Road flooded more than 0.5m deep in places. • Flooding along Carr Street, Peels Road and Heards Road, Cameron Road and Browns Road, more than 1m deep in places.	• If not already done, relocate SES and CFA equipment and operations. • If not already done, ensure emergency access to hospital is available. • **Consider** use of Madden St as bypass for required traffic. • Close the Western Highway, if required. • Erect "Road Closed" signs either side of Burnt Creek on Williams Road. • Inform Depot Members so that Roving Teams may offer advice, erect road signage, door knock, sandbag or evacuate houses identified as subject to flooding (see list at Appendix B and Flood Model maps at Appendix J). Likely that they should erect "Water Over Road" signs along Baillie, Rennison, Arnott, Gillespie, MacBain, McBryde, Hamilton, Robinson, McPherson (Western Highway), Urquhart, Firebrace, Madden and Darlot Streets. • **Consider** closing the Dooen Rd culverts, underneath the railway line, at the intersections of Pryors Rd, Peppertree Ln and Cameron Rd. (Peppertree Ln is the main box culvert). This would be done if there is risk of flooding in the Puls Place and Gerlach St areas. • Advise property owners in the streets of likely flooding to 0.5m depth and those listed in Appendix B.	2% AEP(50 year ARI) event (WCMA modelling available) Madden St is shown underwater in modelling maps; however recent construction has elevated the road. During Jan 2011 event the road was used as a town bypass route. This route should be restricted to required traffic only – emergency, relief, food/water etc. During Jan 2011 event, closure of Dooen Rd culverts was hotly debated. Pro: hinder water movement into northern approaches to city, mitigating risk of house inundations in Primary School and Forsyth Ave areas. Con: closing natural drainage facility of Police Paddock, thereby increasing risk of further inundations south of railway line. Cost:Benefit

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
			• Advise that driving in water more than 300mm deep is highly dangerous and may result in loss of life.	analysis to be conducted by MERO at the time.
3.77m	35,000ML/d		Consider need to evacuate or resupply rural properties.	September 1983 event 1.3% AEP (77 year ARI)
3.79m	37,000ML/d	Modelling suggests: At Horsham: • Over floor flooding of 35 houses and below floor flooding of a further 315 properties within Horsham • Over floor flooding of houses in Arnott, Baillie, Cook, Hamilton, Madden, MacBain, Rennison, Robinson & Sloss Street, Cameron & Peel Road, Hopkins Drive, O'Callaghans Parade and Peppertree Lane. • Properties affected in Bank, Carr, Culliver, Lewis, Menadue, Read, Selkirk & Webster Street, Dooen Road, Gross, Jardwa, Rahley, Regal, Schier & Willow Court and Shalom Place. • Water on road in Southbank area, particularly Major Mitchell Drive, Ballard Street, Burnett Street and Stapylton Court. • Water up to 0.5m deep in front of SES and CFA depots and at intersection of Hamilton and McPherson Streets – access to depots will be difficult.	• SES, CFA and Ambulance equipment and operations should be relocated. • In conjunction with SES and VicRoads, close all low level bridges and river crossings. • Close all flooded roads. • Advise that driving in water more than 300mm deep is highly dangerous and may result in loss of life. • Inform Depot Members so that Roving Teams may offer advice, erect road signage, door knock, sandbag or evacuate houses identified as subject to flooding (see list at Appendix B and Flood Model maps at Appendix J). • Close Western Highway as required, in conjunction with VicRoads and SES. • Advise land owners outside of Horsham, and make Flood Inundation Model maps for 1% / 100 year events available. • Advise property owners in the urban area of the likelihood of street and property flooding (refer to Appendix B and J).	1% AEP (100 year ARI) event (WCMA modelling available)

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
		• Riverside Road flooded more than 1m deep in places with extensive flooding extending downstream through the urban area and along the town Anabranch with depths up to 1m. • Water in southern end of Council Depot. • Breakout around upstream end of Peppertree Lane / Menadue Street Lane levee and overtopping of Menadue Street near Baillie Street. Out of Horsham: • Extensive inundation along Burnt Creek upstream of Williams Road which is flooded to a depth of more than 0.5m and flooding of properties on the west side both upstream and downstream of the Burnt Creek bridge to a depth of around 0.25m. Flooding on estate roads at least 0.25m deep. • Burnt Creek across Western Highway likely to have swelled over road up to 1m deep. • Cameron Road, Horsham-Lubeck Road, Drung and Longerenong with extensive water. • Dooen Swamp at capacity.	• Sandbag and make safe diesel station in Council Depot. • **Consider** relocating Council Depot operations.	
3.80m	37,850ML/d	Modelling suggests: At Horsham: • Over floor flooding of houses in Carr, Clark, Gillespie, Lawrence, Margaret, Selkirk, Urquhart & Wilson Street, Dooen, Riverside &	• Inform Depot Members so that Roving Teams may offer advice, erect road signage, door knock, sandbag or evacuate houses identified as subject to flooding (see list at Appendix B and Flood Model maps at Appendix J).	

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
		Williams Road, Gross & Regal Court and Trinity Drive. • Properties affected in Coughlin Court, Edmonds, Latus, Major Mitchell, O'Donnell, Stockton & Wotonga Drive, Johnson Street and Olga Avenue.		
3.85m	42,000ML/d	Modelling suggests: At Horsham: • Over flood flooding of houses in Culliver, Glancy & Menadue Streets and Heards Road.	• Inform Depot Members so that Roving Teams may offer advice, erect road signage, door knock, sandbag or evacuate houses identified as subject to flooding (see list at Appendix B and Flood Model maps at Appendix J).	
3.86m	42,400ML/d			August 1909 event 0.5% AEP (200 year ARI)
	43,000ML/d	Modelling suggests: At Horsham: • Over floor flooding of 111 houses and below floor flooding of a further 464 properties within Horsham. • Water more than 0.5m deep in front of SES and CFA depots and at intersection of Hamilton and McPherson Streets – no access. • Inundation extends to the Henty Highway from upstream of Riverside Road and extends downstream through the urban area and along the town Anabranch with depths in excess of 1m in places.	• Advise property owners in the urban and rural areas of the City of the likelihood of road and property flooding in excess of 1m (refer to Appendix B and Appendix J). • Inform Depot Members so that Roving Teams may offer advice, erect road signage, door knock, sandbag or evacuate houses identified as subject to flooding (see list at Appendix B and Flood Model maps at Appendix J). • Advise that driving in water more than 300mm deep is highly dangerous and may result in loss of life.	0.5% AEP (200 year ARI) event (WCMA modelling available)

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
		• A major flow path extends from the lower end of the Menadue Street / Peppertree Lane levee near Baillie Street through the town Anabranch. • Extensive inundation along Burnt Creek with 2 x houses flooded over floor on the western upstream side of the Williams Road bridge over Burnt Creek. Estate roads flooded to a depth of between 0.25m and 0.5m. • Water flowing south along Dooen Rd along railway line back towards City. Also town anabranch. • Horsham Racetrack and Showgrounds likely to be beyond capacity. • Water on road in Ashwin Cl, Ashwin Walk, Magee Ct, Bennett Rd, Tydeman St, Landy St, Laurel St, Iris St, Rose St, and Natimuk Road. • Water on road in Reed St, Arnott St, Bowen St, Cook St, Hopkins Dr, and Robinson St. Properties may be affected. Experience suggests: • Significant amounts of debris flowing down Wimmera River. In Jan 2011, tree trunks, hay bales and other large items were catching on piers of the Wimmera Bridge, risking structural integrity.	**Re-Consider** the Dooen Rd culverts, as per 50yr event notes above, as water is likely flowing south along Dooen Rd back into the City as far as Perry Dr. **Consider** actions to break up debris and make it flow downstream. In Jan 2011, both an excavator on top the Wimmera Bridge and Water Police in the river were used.	Excavator may be exerting unsafe loads on the bridge. Consult engineers before making this decision.
4.21m		Quantong Bridge on Wimmera Highway, between Asplins Rd and Natimuk-Hamilton Rd, is likely to	Inform VicRoads. Consider road closure. Consider bypass options.	Experienced during Jan 2011 event.

WIMMERA RIVER at WALMER				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality Refer to maps and lists at Appendix J	Action[viii]	Comments
		flood over road when the Walmer Gauge reaches 4.21m.		
4.27m	32, 971 ml/			January 2011 event
Water begins receding		Begin post impact processes, including debrief and recording of information.	• Information gathered should be used to update this document as per Part 3, Paragraph 6. • Begin to collate information that may be helpful for HRCC Recovery Operations, such as: ○ Social: house, health, food, water, septics, personal support ○ Economic: business, farms, fencing, animals, food, tourism ○ Built: buildings, roads, sport, paths, bridges, signs, power ○ Natural: trees, weeds, fauna, vegetation removal, erosion ○ Business Continuity: org structure for recovery	

The flows, gauge heights, AEPs and ARIs quoted in the above table have been extracted from the analyses documented in Water Technology (2003).

Flood impacts described in the above table relate primarily to mainstream flooding from the Wimmera River and Burnt Creek. Local impacts, or impacts in excess of those indicated, may occur as a result of local stormwater runoff and drainage. Similarly, local increases in flood levels and impacts may result from local factors such as culvert and other blockages and from obstructions to overland flows such as earthworks, fences, building, cars and the like.

4.5 Wimmera River at Quantong Bridge

The Bureau of Meteorology anticipate being able to provide a minimum of 2½ days warning lead time of Wimmera River flooding at Quantong Bridge as the flood travel time from Horsham to Quantong Bridge is generally around 10 hours. The levels indicated in the table are draft and subject to ratification by the Bureau of Meteorology.

Note: that flows from the MacKenzie River and from Darragan and Norton Creeks can give an initial flood peak at Quantong Bridge well before the main peak from the upstream parts of the Wimmera catchment.

Table 10 Wimmera River at Quantong Bridge

WIMMERA RIVER at QUANTONG BRIDGE				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality	Action[1]	Comments
5.72m			Advise that driving in water more than 300mm deep is highly dangerous and may result in loss of life.	Minor Flood Level
6.00m			Advise rural property owners that they may be isolated for some days	Moderate Flood Level
6.72m				Major Flood Level
				Probable Maximum Flood (PMF)

4.6 Burnt Creek at Wonwondah East

The table below is preliminary, subject to outcomes of the Wartook Valley Flood Study.

[1] All references to unsafe driving depths have been extracted from Appendix J of *Floodplain Management in Australia, Best Practice Principles and Guidelines* (ARMCANZ, 2000)

BURNT CREEK at WONWANDAH EAST				
River Height (m)	River Flow (ML/d)	Consequence / Impact/ within the Municipality	Action[2]	Comments
1.01m	1,200ML/d			20% AEP (5 year ARI) event
1.08m	1,800ML/d			10% AEP (10 year ARI) event
1.12m	2,500ML/d	Modelling suggests: • Access likely to be cut to residences in the Weldon Power Court area on Burnt Creek, including Camerons Road, Williams Road, Stockton Drive areas	Advise that driving in water more than 300mm deep is highly dangerous and may result in loss of life.	5% AEP (20 year ARI) event
Jan 11 event - no records of gauge heights		Experience suggests: Most crossings over Burnt Creek, Bungalally Creek and MacKenzie River will be submerged and not passable. In particular, in Jan 2011 the following roads were cut by swollen creeks: North-East Wonwondah / Laharum Road, McKenzies Road, Hickeys Road, Franciscos Road, Brimpaen-Laharum Road, and many roads closer to Horsham. For example, Brimpaen-Laharum Road had roughly 2 metres of water flowing over the road.	• Be aware of road closures. Update VicRoads as appropriate. • Be prepared to task Depot Roving Teams to assist with either manpower or plant assets. • Be prepared to assist evacuations. • Be prepared to advise residents and assist during periods of isolation.	Efforts should be made in the next flood event to record gauge heights and the relevant impacts and actions.

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

[2] All references to unsafe driving depths have been extracted from Appendix J of *Floodplain Management in Australia, Best Practice Principles and Guidelines* (ARMCANZ, 2000)

5. Property Inundation Tables

5.1 Introduction

The following is a list of properties expected to experience flooding (and the depth of that flooding) at various heights relative to the Walmer river gauge along with an indication of the likely depth of over floor flooding**. It is strongly recommended that the following list be used in conjunction with the flood inundation maps (Appendix A6 Maps)** where a red dot has been used to show each floor level lower than the expected flood height (ie. where over floor flooding is likely).

5.2 Property Inundation Table – Horsham City

* Properties reported as 'inundated' during the Jan 2011 event by the Post Impact Assessments Coordinator did not include information regarding river height or depth of inundation. Note: the peak gauge recording was 4.27m on the Walmer gauge at 1300hrs, 18 Jan 11.

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
24 Arnott Street	---	---	0.11m	0.41m	0.59m				
25 Arnott Street	---	---	---	---	0.12m				
26 Arnott Street	---	---	---	0.11m	0.30m				
27 Arnott Street	---	---	---	0.05m	0.25m				
28 Arnott Street	---	---	---	0.07m	0.25m		0.04m	0.22m	
29 Arnott Street	---	---	0.001 m	0.38m	0.57m				
30 Arnott Street	---	---	---	---	0.22m				
31 Arnott Street	---	---	---	0.07m	0.27m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
32 Arnott Street	---	---	---	---	0.20m				
33 Arnott Street	---	---	---	---	0.21m				
34 Arnott Street	---	---	---	---	0.22m				
35 Arnott Street	---	---	---	---	0.12m				
36 Arnott Street	---	---	---	---	0.23m			0.02m	
37 Arnott Street	---	---	---	---	0.21m				
38 Arnott Street	---	---	---	---	0.22m				
40 Arnott Street	---	---	---	0.17m	0.37m				
42 Arnott Street	---	---	---	0.28m	0.48m				
44 Arnott Street	---	---	---	0.20m	0.41m				
46 Arnott Street	---	---	---	0.26m	0.47m				
48 Arnott Street	---	---	---	0.27m	0.48m				
50 Arnott Street	---	---	0.01m	0.34m	0.55m				
2 Baillie Street	---	---	0.13m	0.33m	0.50m		0.01m	0.19m	PIA coordinator reported this property as ‘inundated’ during the Jan 2011 event. Over floor flooding did occur.*

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
33 Baillie Street	---	---	---	0.08m	0.29m			0.05m	
35 Baillie Street	---	---	---	---	0.17m			0.06m	
39 Baillie Street	---	---	---	---	0.17m				
45 Baillie Street	---	---	---	---	0.09m				
47 Baillie Street	---	---	---	---	0.21m				
49 Baillie Street	---	---	---	0.09m	0.32m			0.09m	
51 Baillie Street	---	---	---	0.05m	0.26m			0.11m	
53 Baillie Street	---	---	---	0.10m	0.32m				
55 Baillie Street	---	---	---	0.05m	0.27m				
57 Baillie Street	---	---	---	---	0.19m				
59 Baillie Street	---	---	---	---	0.17m				
61 Baillie Street	---	---	---	---	0.14m				
43 A/B/C Baillie Street	---	---	---	---	0.19m				
43 A/B/C Baillie Street	---	---	---	---	0.13m				
43 A/B/C Baillie Street	---	---	---	---	0.09m				
1 Bank Street	---	---	---	---	0.14m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
2 Bank Street	---	---	---	0.04m	0.27m				
14 Barnes Boulevard	---	---	---	---	0.01m				
18 Barnes Boulevard	---	---	---	---	0.11m				
22 Barnes Boulevard	---	---	---	---	0.05m				
96 Barnes Boulevard	---	---	---	---	0.04m				
112 Barnes Boulevard	---	---	---	---	0.02m			N/A	
137 Barnes Boulevard	0.29m	0.50m	0.70m	0.78m	0.95m				
145 Barnes Boulevard	---	---	---	---	0.13m			N/A	
147 Barnes Boulevard	0.39m	0.61m	0.80m	0.86m	1.05m				
149 Barnes Boulevard	---	---	---	---	0.03m			N/A	
417 Browns Road									PIA coordinator reported this property as ‘inundated’ during the Jan 2011 event. Over floor flooding did occur.*
Cameron Road	---	---	0.40m	0.61m	0.77m		0.06m	0.22m	Unknown locations
	---	---	0.06m	0.27m	0.43m				Unknown locations
Cameron Road	---	---	0.43m	0.64m	0.83m			0.03m	Modelling of water depth on road, at the deepest point.
Cameron Road	---	---	---	---	0.22m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
40A Cameron Road	---	---	0.17m	0.38m	0.54m				
44 Cameron Road									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
52 Cameron Road	---	0.51m	0.89m	1.10m	1.27m			0.05m	PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
251 Cameron Road	---	---	0.06m	0.31m	0.51m			0.19m	
257 Cameron Road	---	---	0.04m	0.28m	0.48m				
37 Cameron Road	---	---	0.16m	0.37m	0.53m				
31 Cameron Road	---	---	0.19m	0.40m	0.56m				
49 Cameron Road	---	---	0.21m	0.41m	0.57m				
1 Cameron Road	---	---	---	0.21m	0.31m				
1 Carr Street	---	---	---	0.13m	0.35m				
2 Carr Street	---	---	---	0.03m	0.25m				
3 Carr Street	---	---	---	0.26m	0.48m			0.13m	
3A Carr Street	---	---	---	0.10m	0.32m			0.13m	
4 Carr Street	---	---	---	0.09m	0.31m				
5 Carr Street	---	---	---	0.12m	0.33m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
6 Carr Street	---	---	---	---	0.26m				
7 Carr Street	---	---	---	0.07m	0.29m				
8 Carr Street	---	---	---	0.01m	0.23m			0.03m	
9 Carr Street	---	---	---	0.08m	0.30m				
10 Carr Street	---	---	---	0.06m	0.27m				
11 Carr Street	---	---	---	0.16m	0.38m				
12 Carr Street	---	---	---	0.14m	0.35m			0.10m	
13 Carr Street	---	---	---	0.02m	0.24m				
14 Carr Street	---	---	---	---	0.21m				
15 Carr Street	---	---	---	0.30m	0.52m				
1A Clark Street	---	---	---	0.08m	0.35m				
1B Clark Street	---	---	---	---	0.15m				
1C Clark Street	---	---	---	0.12m	0.41m			0.25m	
2A Clark Street	---	---	---	0.21m	0.47m			0.19m	
2B Clark Street	---	---	---	0.34m	0.60m			0.13m	
2 Clover Court	---	---	---	---	0.15m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
3 Clover Court	---	---	---	---	0.06m				
4 Clover Court	---	---	---	---	0.20m			N/A	
5 Clover Court	---	---	---	---	0.14m				
1 Cook Street	---	---	---	0.31m	0.55m			0.23m	
3 Cook Street	---	---	---	0.46m	0.70m		0.14m	0.38m	
1 Coughlin Court	---	---	---	---	0.17m				
4 Coughlin Court	---	---	---	---	0.01m				
1 Culliver Street	---	---	---	0.04m	0.25m				
3 Culliver Street	---	---	---	0.01m	0.22m				
5 Culliver Street	---	---	---	0.01m	0.22m				
7Culliver Street	---	---	---	0.01m	0.22m			0.01m	
9 Culliver Street	---	---	---	0.10m	0.31m				PIA coordinator reported this property as ‘inundated’ during the Jan 2011 event. Over floor flooding did occur.*
11 Culliver Street	---	---	---	0.12m	0.34m				
13 Culliver Street	---	---	---	0.01m	0.23m				
15 Culliver Street	---	---	---	---	0.18m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
18 Culliver Street	---	---	---	---	0.10m				
19 Culliver Street	---	---	---	---	0.23m				
20 Culliver Street	---	---	---	---	0.06m				
21 Culliver Street	---	---	---	0.05m	0.27m				
22 Culliver Street	---	---	---	---	0.09m				
23 Culliver Street	---	---	---	---	0.18m				
24 Culliver Street	---	---	---	---	0.01m				
1-25 Culliver Street	---	---	---	0.13m	0.35m				
2-25 Culliver Street	---	---	---	---	0.11m				
3-25 Culliver Street	---	---	---	---	0.01m				
27 Culliver Street	---	---	---	---	0.28m				
35 Culliver Street	---	---	---	---	0.19m				
37 Culliver Street	---	---	---	---	0.20m				
39 Culliver Street	---	---	---	---	0.26m				
41 Culliver Street	---	---	---	---	0.16m				
43 Culliver Street	---	---	---	---	0.18m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
Dooen Road	---	---	---	0.04m	0.20m			0.10m	Modelling of water depth on road, at the deepest point.
144 Dooen Road	---	---	---	---	0.10m				
146 Dooen Road	---	---	---	---	0.16m				
148 Dooen Road	---	---	---	0.12m	0.28m				
150 Dooen Road	---	---	---	---	0.06m				
200 Dooen Road									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
1 Edmonds Drive	---	---	---	---	0.28m				
1A Edmonds Drive	---	---	---	---	0.27m				
2 Edmonds Drive	---	---	---	---	0.18m				
3 Edmonds Drive	---	---	---	---	0.14m				
4 Edmonds Drive	---	---	---	---	0.17m				(Jan 11) This property reported water in their yard to MECC. Neither MECC nor PIA recorded water entering the house.
5 Edmonds Drive	---	---	---	---	0.08m				
6 Edmonds Drive	---	---	---	---	0.07m			N/A	
8 Edmonds Drive	---	---	---	---	0.08m			N/A	
9 Edmonds Drive	---	---	---	---	0.08m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
Firebrace Street	---	---	0.60m	0.99m	1.13m	N/A	N/A	N/A	Modelling of water depth on road, at the deepest point.
107 Firebrace Street	---	---	---	---	0.02m				
109 Firebrace Street	---	---	---	0.26m	0.47m				
109 Firebrace Street	---	---	---	0.46m	0.68m				
113 Firebrace Street	---	---	---	0.17m	0.36m				
115 Firebrace Street	---	---	---	---	0.06m				
121 Firebrace Street	---	---	---	---	0.23m			N/A	
146 Firebrace Street	---	---	---	---	0.03m				
148 Firebrace Street	---	---	0.41m	0.78m	0.86m	0.32m	0.69m	0.77m	
152 Firebrace Street	---	---	0.59m	0.95m	1.04m		0.15m	0.24m	
156 Firebrace Street	---	---	0.15m	0.51m	0.60m		0.08m	0.16m	
156 Firebrace Street	---	---	---	0.32m	0.40m		0.03m	0.11m	
156 Firebrace Street	---	---	---	0.11m	0.17m		N/A	N/A	
166 Firebrace Street	---	---	---	0.05m	0.14m			0.03m	
168 Firebrace Street	---	---	0.07m	0.47m	0.60m				
168A Firebrace Street	---	---	0.15m	0.55m	0.70m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
168B Firebrace Street	---	---	0.27m	0.67m	0.82m				
170 Firebrace Street	---	---	---	---	0.05m				
190 Firebrace Street (Caravan Park)			0.60m	0.99m	1.13m				PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
16 Gillespie Street	---	---	---	0.13m	0.32m				
17 Gillespie Street	---	---	0.11m	0.42m	0.60m				
18 Gillespie Street	---	---	---	0.08m	0.29m				
19 Gillespie Street	---	---	---	0.19m	0.37m				
20 Gillespie Street	---	---	---	0.15m	0.35m				
21 Gillespie Street	---	---	---	0.10m	0.28m				
22 Gillespie Street	---	---	---	0.11m	0.30m				
23 Gillespie Street	---	---	---	---	0.15m				
24 Gillespie Street	---	---	---	0.06m	0.23m				
25 Gillespie Street	---	---	---	---	0.13m				
26 Gillespie Street	---	---	---	0.13m	0.32m				
27 Gillespie Street	---	---	---	---	0.10m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
28 Gillespie Street	---	---	---	0.21m	0.41m				
29 Gillespie Street	---	---	---	---	0.13m				
31 Gillespie Street	---	---	---	---	0.18m				
32 Gillespie Street	---	---	0.08m	0.37m	0.55m				
32 Gillespie Street	---	---	0.05m	0.33m	0.52m			0.11m	
33 Gillespie Street	---	---	---	---	0.16m				
34 Gillespie Street	---	---	---	---	0.19m				
35 Gillespie Street	---	---	---	0.05m	0.25m				
36 Gillespie Street	---	---	---	---	0.22m				
37 Gillespie Street	---	---	---	0.12m	0.32m				
38 Gillespie Street	---	---	---	0.14m	0.34m				
39 Gillespie Street	---	---	---	0.28m	0.49m				
40 Gillespie Street	---	---	---	0.14m	0.34m				
41 Gillespie Street	---	---	---	0.17m	0.38m				
42 Gillespie Street	---	---	---	0.13m	0.34m			0.09m	
43 Gillespie Street	---	---	---	0.16m	0.37m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
44 Gillespie Street	---	---	---	0.07m	0.27m				
45 Gillespie Street	---	---	---	0.13m	0.34m				
46 Gillespie Street	---	---	---	---	0.16m				
49 Gillespie Street	---	---	---	---	0.20m				
1 Glancy Street	---	---	---	0.18m	0.39m			0.02m	
2 Glancy Street	---	---	---	0.07m	0.28m				
3 Glancy Street	---	---	---	0.22m	0.43m				
4 Glancy Street	---	---	---	---	0.15m				
5 Glancy Street	---	---	---	0.17m	0.38m				
6 Glancy Street	---	---	---	---	0.14m				
7 Glancy Street	---	---	---	0.21m	0.42m				
8 Glancy Street	---	---	---	---	0.16m				
9 Glancy Street	---	---	---	0.20m	0.41m				
10 Glancy Street	---	---	---	---	0.21m				
11 Glancy Street	---	---	0.002 m	0.26m	0.47m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
12 Glancy Street	---	---	---	---	0.24m				
13 Glancy Street	---	---	---	0.23m	0.44m				
14 Glancy Street	---	---	---	---	0.21m				
1 Gross Court	---	---	---	0.07m	0.29m			0.01m	
2 Gross Court	---	---	---	0.20m	0.41m			0.04m	
3 Gross Court	---	---	---	0.06m	0.28m				
4 Gross Court	---	---	---	0.16m	0.38m				
5 Gross Court	---	---	---	0.16m	0.38m				
6 Gross Court	---	---	---	0.04m	0.26m			0.03m	
20 Johnson Street	---	---	---	---	0.14m				
22 Johnson Street	---	---	---	---	0.05m				
23 Johnson Street	---	---	---	---	0.13m				
25 Johnson Street	---	---	---	---	0.20m				
27 Johnson Street	---	---	---	---	0.21m				
Hamilton Street	---	---	---	0.29m	0.56m			0.23m	Modelling of water depth on road, at the deepest point.
Hamilton Street	---	---	---	0.08m	0.35m		0.02m	0.29m	

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
Hamilton Street	---	---	---	---	0.16m			0.51m	
31 Hamilton Street	---	---	---	0.07m	0.31m				
33 Hamilton Street	---	---	---	0.20m	0.49m		0.05m	0.34m	
33A Hamilton Street	---	---	---	0.14m	0.42m		0.02m	0.30m	
41 Hamilton Street	---	---	---	0.37m	0.63m		0.02m	0.29m	
42 Hamilton Street	---	---	---	0.08m	0.35m				
43 Hamilton Street	---	---	0.24m	0.67m	0.92m				
43 Hamilton Street	---	---	---	0.38m	0.64m				
44 Hamilton Street	---	---	---	---	0.17m			0.05m	
50 Hamilton Street	---	---	---	0.22m	0.43m			0.10m	
15707 Hamilton Street	---	---	0.29m	0.72m	0.97m		0.10m	0.35m	
15738 Hamilton Street	---	---	0.29m	0.73m	0.98m		0.11m	0.36m	
Heards Road	---	0.23m	0.46m	0.63m	0.74m			0.01m	Modelling of water depth on road, at the deepest point.
18 Heards Road	---	---	---	0.09m	0.21m				
40 Heards Road	---	---	---	0.05m	0.15m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
63 Heards Road	---	---	---	---	---				PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
66 Heards Road	---	---	---	0.11m	0.22m				
98 Heards Road	---	---	0.15m	0.31m	0.42m			0.04m	PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
1 Hopkins Drive	---	---	---	0.19m	0.43m			0.24m	
2 Hopkins Drive	---	---	---	0.28m	0.52m		0.04m	0.28m	
3 Hopkins Drive	---	---	---	0.09m	0.32m			0.18m	
4 Hopkins Drive	---	---	---	0.20m	0.43m			0.19m	
5 Hopkins Drive	---	---	---	0.05m	0.28m			0.18m	
6 Hopkins Drive	---	---	---	0.27m	0.50m			0.20m	
7 Hopkins Drive	---	---	---	0.13m	0.35m			0.14m	
8 Hopkins Drive	---	---	---	0.44m	0.67m		0.03m	0.26m	
9 Hopkins Drive	---	---	---	0.04m	0.25m			0.17m	
10 Hopkins Drive	---	---	---	0.28m	0.51m			0.17m	
11 Hopkins Drive	---	---	---	0.23m	0.45m			0.21m	
12 Hopkins Drive	---	---	---	0.33m	0.56m		0.07m	0.30m	

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
12A Hopkins Drive	---	---	---	0.16m	0.39m			0.10m	
13 Hopkins Drive	---	---	---	0.11m	0.33m			0.10m	
6 Jardwa Court	---	---	---	0.04m	0.21m				
1-1 Knowles Street	---	---	---	---	0.24m				
2-1 Knowles Street	---	---	---	0.10m	0.33m				
3 Knowles Street	---	---	---	0.09m	0.32m				
5 Knowles Street	---	---	---	0.06m	0.30m				
6 Knowles Street	---	---	---	0.30m	0.54m				
7 Knowles Street	---	---	---	---	0.25m				
8 Knowles Street	---	---	---	0.17m	0.42m				
9 Knowles Street	---	---	---	---	0.21m			N/A	
11 Knowles Street	---	---	---	---	0.07m				
17 Knowles Street	---	---	---	---	0.11m				
18 Knowles Street	---	---	---	---	0.21m				
20 Knowles Street	---	---	---	---	0.05m				
22 Knowles Street	---	---	---	0.02m	0.29m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
24 Knowles Street	---	---	---	0.02m	0.11m				
6 Latus Drive	---	---	---	---	0.12m				
2 Lawrence Street	---	---	---	0.08m	0.30m				
4 Lawrence Street	---	---	---	---	0.19m				
7 Lawrence Street	---	---	---	0.28m	0.50m			0.07m	
9 Lawrence Street	---	---	---	0.06m	0.29m			0.05m	
10 Lawrence Street	---	---	---	0.03m	0.25m				
11 Lawrence Street	---	---	---	0.08m	0.30m			0.02m	
12 Lawrence Street	---	---	---	0.01m	0.23m				
13 Lawrence Street	---	---	---	0.08m	0.30m				
14A Lawrence Street	---	---	---	0.18m	0.40m				
14B Lawrence Street	---	---	---	---	0.20m				
15A Lawrence Street	---	---	---	0.20m	0.42m			0.01m	
15B Lawrence Street	---	---	---	0.20m	0.42m			0.01m	
16 Lawrence Street	---	---	---	0.10m	0.32m				
17 Lawrence Street	---	---	---	0.24m	0.46m			0.03m	

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
18 Lawrence Street	---	---	---	0.16m	0.39m				
19 Lawrence Street	---	---	---	0.24m	0.46m				
21 Lawrence Street	---	---	---	0.38m	0.61m				
2 Leskie Close	---	---	---	0.05m	0.27m				
4 Leskie Close	---	---	---	0.22m	0.44m				
6 Lewis Street	---	---	---	0.02m	0.24m				
88 Longerenong Road									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
488 Lubeck Rd									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
3 MacBain Street	---	---	0.72m	1.02m	1.23m	N/A	N/A	N/A	
3 Madden Street	---	---	0.17m	0.54m	0.62m	N/A	N/A	N/A	
3 Madden Street	---	---	0.42m	0.78m	0.86m	N/A	N/A	N/A	
3 Madden Street	---	---	---	---	0.34m			N/A	
9 Madden Street	---	---	0.52m	0.88m	0.96m				
11 Madden Street	---	---	0.68m	1.03m	1.12m	N/A	N/A	N/A	
13 Madden Street	---	---	0.38m	0.74m	0.82m		0.30m	0.38m	

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
15 Madden Street	---	---	---	0.19m	0.28m				
1 Mardon Drive	---	---	---	0.15m	0.38m				
3 Mardon Drive	---	---	---	0.10m	0.33m				
5 Mardon Drive	---	---	---	---	0.28m				
7 Mardon Drive	---	---	---	---	0.26m				
13 Mardon Drive	---	---	---	---	0.17m				
15 Mardon Drive	---	---	---	---	0.29m				
17 Mardon Drive	---	---	---	---	0.15m				
21 Mardon Drive	---	---	---	---	0.16m				
22 Mardon Drive	---	---	---	---	0.19m				
23 Mardon Drive	---	---	---	---	0.16m				
24 Mardon Drive	---	---	---	0.13m	0.35m				
25 Mardon Drive	---	---	---	---	0.18m				
1 Margaret Street	---	---	---	0.20m	0.42m			0.11m	
2 Margaret Street	---	---	---	0.23m	0.46m			0.12m	
3 Margaret Street	---	---	---	0.15m	0.36m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
4 Margaret Street	---	---	---	0.23m	0.46m				
5 Margaret Street	---	---	---	---	0.28m				
6 Margaret Street	---	---	---	0.17m	0.39m				
7 Margaret Street	---	---	---	0.13m	0.35m				
8 Margaret Street	---	---	---	0.23m	0.45m				
9 Major Mitchell Drive	---	---	---	---	0.05m			N/A	
19 Major Mitchell Drive	---	---	---	---	0.06m			N/A	
1-31 Major Mitchell Drive	---	---	---	---	0.12m				
MacBain Street	---	0.16m	0.60m	0.85m	1.07m		0.16m	0.38m	Modelling of water depth on road, at the deepest point.
1 MacBain Street	---	---	0.49m	0.77m	0.98m				
2 MacBain Street	---	---	0.39m	0.64m	0.86m				
3 MacBain Street	---	---	0.57m	0.86m	1.08m			0.10m	
4 MacBain Street	---	---	---	---	0.10m				
5 MacBain Street	---	---	0.40m	0.71m	0.93m		0.01m	0.23m	
6 MacBain Street	---	---	---	---	0.14m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
8 MacBain Street	---	---	0.13m	0.39m	0.61m				
McBryde Street	---	---	0.54m	0.84m	1.05m				Modelling of water depth on road, at the deepest point.
McBryde Street	---	---	---	0.08m	0.29		0.07m	0.29m	
McBryde Street	---	---	---	---	0.07				
3 McBryde Street	---	---	0.60m	0.90m	1.11m	0.01m	0.30m	0.51m	PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
56 McPherson Street	---	---	---	0.12m	0.40m		0.01m	0.29m	
58 McPherson Street	---	---	---	---	0.15m				
60 McPherson Street	---	---	---	---	0.13m				
62A McPherson Street	---	---	---	---	0.03m				
73 McPherson Street	---	---	---	0.07m	0.33m		N/A	N/A	
73 McPherson Street	---	---	---	---	0.29m				
77 McPherson Street	---	---	---	---	0.24m				
68 McTavish Boulevard									(Jan 11) This property reported to MECC that it experienced water on the property. No further information available – thought to possibly be stormwater.
2 Menadue Street	---	---	---	---	0.19m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
4 Menadue Street	---	---	---	---	0.15m				
8 Menadue Street	---	---	---	---	0.21m				
22 Menadue Street	---	---	---	---	0.08m				
26 Menadue Street	---	---	---	---	0.16m				
28 Menadue Street	---	---	---	---	0.27m				
30 Menadue Street	---	---	---	---	0.20m				
32 Menadue Street	---	---	---	0.20m	0.40m			0.01m	
34 Menadue Street	---	---	---	---	0.08m				
36 Menadue Street	---	---	---	0.01m	0.24m				
2 O'Callaghans Parade	---	---	0.28m	0.69m	0.88m		0.01m	0.20m	
6 O'Callaghans Parade	---	---	---	0.20m	0.39m			0.11m	
8 O'Callaghans Parade	---	---	---	0.14m	0.34m			0.07m	
12 O'Callaghans Parade	---	---	---	---	0.23m				
15-17 O'Callaghans Parade	---	---	---	0.18m	0.39m		0.02m	0.23m	

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
18 O'Callaghans Parade	---	---	---	0.09m	0.30m				
18 O'Callaghans Parade	---	---	---	0.08m	0.29m				
19-21 O'Callaghans Parade	---	---	---	0.19m	0.40m			0.09m	
52 O'Callaghans Parade	---	---	0.23m	0.66m	0.86m				
52 O'Callaghans Parade	---	---	---	0.30m	0.50m				
18 O'Connor Drive									(Jan 11) This property reported to MECC that water in their yard was caused by runoff from Horsham College Senior campus. Neither MECC nor PIA recorded water entering the house.
20 O'Connor Drive									(Jan 11) This property reported to MECC that water in their yard was caused by runoff from Horsham College Senior campus. Neither MECC nor PIA recorded water entering the house.
O'Donnell Drive	---	---	---	---	0.29m			N/A	Modelling of water depth on road, at the deepest point.
1A O'Donnell Drive	---	---	---	---	0.08m				
11 Olga Avenue	---	---	---	---	0.24m				
13 Olga Avenue	---	---	---	---	0.07m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
15 Olga Avenue	---	---	---	---	0.12m				
77 Peels Road	---	---	---	0.38m	0.42m				
80 Peels Road	---	---	---	0.15m	0.19m		0.28m	0.32m	
70 Peels Road	---	---	---	0.21m	0.25m				
55 Peels Road	---	---	---	0.01m	0.09m				
RMB 3312 Peels Road	---	---	---	---	0.07m				
40 Peels Road	---	---	---	0.01m	0.10m				PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.* But not supported by other data.
Peppertree Lane	0.47m	0.89m	1.32m	1.53m	1.70m		0.03m	0.21m	Modelling of water depth on road, at the deepest point.
Peppertree Lane	---	---	---	0.22m	0.39m		N/A	N/A	
Peppertree Lane	---	---	---	0.08m	0.24m				
Peppertree Lane	---	---	---	0.18m	0.34m				
25 Peppertree Lane									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
64 Peppertree Lane	---	---	---	0.11m	0.27m				
67 Peppertree Lane	---	---	---	0.74m	0.90m		0.02m	0.18m	PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
77 Peppertree Lane	---	---	0.15m	0.61m	0.78m				
98 Peppertree Lane	---	---	0.08m	0.30m	0.46m				
126 Peppertree Lane									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
Pryors Road	1.80m	2.10m	2.46m	2.66m	2.82m				Modelling of water depth on road, at the deepest point.
17 Pryors Road	---	---	---	---	0.13m				
21 Pryors Road	---	---	---	---	0.16m				
28 Pryors Road	---	---	---	---	0.12m			N/A	
29 Pryors Road	---	---	---	0.13m	0.31m		N/A	N/A	
29 Pryors Road	---	---	---	---	0.21m				
30 Pryors Road	---	---	---	---	0.14m				
31 Pryors Road	---	---	---	0.17m	0.34		N/A	N/A	
33 Pryors Road	---	---	---	0.29m	0.47m				
34 Pryors Road	---	---	---	0.37m	0.53m				PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
35 Pryors Road	---	---	---	0.03m	0.20m				
37 Pryors Road	---	---	---	0.13m	0.31m				
39 Pryors Road	---	---	---	0.15m	0.32m				
41 Pryors Road	---	---	---	0.18m	0.34m		N/A	N/A	
43 Pryors Road	---	---	0.36m	0.57m	0.73	N/A	N/A	N/A	
43 Pryors Road	---	---	---	0.19m	0.36m				
50 Pryors Road	---	---	---	0.18m	0.35m				
56 Pryors Road	---	---	0.42m	0.64m	0.80m				
73 Pryors Road	---	---	0.24m	0.45m	0.62m				PIA coordinator reported this property as ‘inundated’ during the Jan 2011 event. Over floor flooding did occur.*
75 Pryors Road	---	---	0.39m	0.60m	0.76m				PIA coordinator reported this property as ‘inundated’ during the Jan 2011 event. Over floor flooding did occur.*
RMB 3229 Pryors Road	---	---	0.45m	0.66m	0.82m				
1 Rahley Court	---	---	---	---	0.14m				
3 Rahley Court	---	---	---	---	0.06m				
4 Rahley Court	---	---	---	---	0.10m				
2 Read Street	---	---	---	0.20m	0.39m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
4 Read Street	---	---	---	0.13m	0.32m				
1 Regal Court	---	---	---	0.40m	0.63m				
2 Regal Court	---	---	---	0.11m	0.30m				
3 Regal Court	---	---	---	0.13m	0.32m		N/A	N/A	
4 Regal Court	---	---	---	0.05m	0.28m				
5 Regal Court	---	---	---	0.15m	0.38m		N/A	N/A	
6 Regal Court	---	---	---	0.34m	0.56m			0.06m	
4 Rennison Street	---	---	---	0.11m	0.33m				
5 Rennison Street	---	---	---	---	0.12m				
7 Rennison Street	---	---	---	---	0.25m				
1-8 Rennison Street	---	---	0.01m	0.36m	0.57m				
2-8 Rennison Street	---	---	---	0.31m	0.52m				PIA coordinator reported this property as ‘inundated’ during the Jan 2011 event. Over floor flooding did occur.*
3-8 Rennison Street	---	---	---	0.38m	0.59m		0.03m	0.25m	
9 Rennison Street	---	---	---	0.10m	0.32m				
10 Rennison Street	---	---	---	0.12m	0.33m			0.16m	

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
11 Rennison Street	---	---	---	0.17m	0.39m				
12 Rennison Street	---	---	---	0.09m	0.31m				
13 Rennison Street	---	---	---	0.19m	0.41m				
14 Rennison Street	---	---	---	0.11m	0.32m				
15 Rennison Street	---	---	---	0.17m	0.39m				
16 Rennison Street	---	---	---	0.26m	0.48m			0.03m	
1-17 Rennison Street	---	---	---	0.15m	0.37m				
2-17 Rennison Street	---	---	---	0.14m	0.36m				
3-17 Rennison Street	---	---	---	0.14m	0.36m				
18 Rennison Street	---	---	---	0.15m	0.37m				
20 Rennison Street	---	---	---	0.18m	0.40m				
22 Rennison Street	---	---	---	0.22m	0.44m				
23 Rennison Street	---	---	---	0.17m	0.39m				
24 Rennison Street	---	---	---	0.32m	0.54m				
25 Rennison Street	---	---	---	0.14m	0.37m				
26 Rennison Street	---	---	---	0.09m	0.31m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
27 Rennison Street	---	---	---	0.03m	0.25m				
28 Rennison Street	---	---	---	0.06m	0.28m				
29 Rennison Street	---	---	---	---	0.22m				
30 Rennison Street	---	---	---	0.07m	0.29m				
31 Rennison Street	---	---	---	---	0.19m				
33 Rennison Street	---	---	---	0.08m	0.31m				
35 Rennison Street	---	---	---	---	0.08m				
37 Rennison Street	---	---	---	---	0.05m				
Riverside Road	0.41m	0.64m	0.92m	1.11m	1.25m				Modelling of water depth on road, at the deepest point.
Riverside Road	0.25m	0.49m	0.77m	0.96m	1.10m				
Riverside Road	0.46m	0.69m	0.98m	1.17m	1.31m			0.12m	
RMB 3250 Riverside Road	---	---	0.19m	0.38m	0.53m				
RMB 3252 Riverside Road	---	---	---	0.04m	0.18m				
RMB 3334 Riverside Road	---	---	0.27m	0.46m	0.60m			0.07m	

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
495 Riverside East Road									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
499 Riverside East Road									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
532 Riverside East Road									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
721 Riverside East Road									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
22 Robinson Street	---	---	---	0.26m	0.50m		0.07m	0.31m	
99 Robinson Street	---	---	0.25m	0.56m	0.78m	N/A	N/A	N/A	
101 Robinson Street	---	---	0.51m	0.81m	1.03m		0.14m	0.36m	
102 Robinson Street									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
103 Robinson Street	---	---	0.32m	0.63m	0.84m		0.28m	0.50m	PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
318 Rodeskys Road									PIA coordinator reported this property as 'inundated' during the Jan 2011 event. Over floor flooding did occur.*
1 Royal Court	---	---	---	0.47m	0.73m		N/A	N/A	
2 Royal Court	---	---	---	0.09m	0.35m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
3 Royal Court	---	---	---	---	0.18m				
4 Royal Court	---	---	---	0.10m	0.25m				
5 Royal Court	---	---	---	---	0.16m				
6 Royal Court	---	---	---	0.30m	0.55m				
1 Schier Court	---	---	---	---	0.17m				
2 Schier Court	---	---	---	---	0.17m				
3 Schier Court	---	---	---	---	0.13m				
4 Schier Court	---	---	---	---	0.24m				
5 Schier Court	---	---	---	0.05m	0.28m				
6 Schier Court	---	---	---	---	0.22m				
7 Schier Court	---	---	---	0.09m	0.31m				
8 Schier Court	---	---	---	0.11m	0.33m				
9 Schier Court	---	---	---	---	0.14m				
10 Schier Court	---	---	---	---	0.19m				
Selkirk Street	---	---	---	---	0.23m				Modelling of water depth on road, at the deepest point.
Selkirk Street	---	---	---	---	0.06m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
Selkirk Street	---	---	---	---	0.22m			0.17m	
Selkirk Street	---	---	---	0.23m	0.45m				
Selkirk Street	---	---	---	0.01m	0.22m				
Selkirk Street	---	---	---		0.19m			0.12m	
1 Shalom Place	---	---	---	0.06m	0.27m				
2 Shalom Place	---	---	---	0.08m	0.30m				
3 Shalom Place	---	---	---	0.08m	0.30m				
4 Shalom Place	---	---	---	---	0.24m				
5 Shalom Place	---	---	---	---	0.25m				
6 Shalom Place	---	---	---	0.06m	0.28m				
7 Shalom Place	---	---	---	---	0.25m				
8 Shalom Place	---	---	---	---	0.17m				
9 Shalom Place	---	---	---	---	0.18m				
10 Shalom Place	---	---	---	---	0.20m				
11 Shalom Place	---	---	---	---	0.23m				
12 Shalom Place	---	---	---	0.05m	0.26m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
13 Shalom Place	---	---	---	0.08m	0.29m				
Sloss Street	---	---	---	0.37m	0.61m		N/A	N/A	Modelling of water depth on road, at the deepest point.
Sloss Street	---	---	---	0.35m	0.59m		0.40m	0.64m	
1 Sloss Street	---	---	---	0.45m	0.70m				
1 Sloss Street	---	---	---	0.14m	0.37m		N/A	N/A	
1A Sloss Street	---	---	---	0.09m	0.29m				
1B Sloss Street	---	---	---	---	0.22m			0.25	
2 Sloss Street	---	---	---	---	0.20m				
2A Sloss Street	---	---	---	0.15m	0.37m			0.17m	
3 Sloss Street	---	---	---	---	0.24m			0.14m	
5 Sloss Street	---	---	---	0.36m	0.61m		0.06m	0.31m	
7 Sloss Street	---	---	---	0.17m	0.42m				
13 Sloss Street	---	---	---	0.16m	0.43m				
Stawell Road	---	---	---	0.07m	0.26m				
8 Stockton Drive	---	---	---	---	0.04m				
12 Stockton Drive	---	---	---	---	0.02m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
13 Stockton Drive	---	---	---	---	0.12m				
14 Stockton Drive	---	---	---	---	0.14m				
14A Stockton Drive	---	---	---	---	0.19m				
15 Stockton Drive	---	---	---	---	0.02m				
16 Stockton Drive	---	---	---	---	0.04m				
17 Stockton Drive	---	---	---	---	0.01m				
Trinity Drive	---	---	---	0.02m	0.23m			0.18m	Modelling of water depth on road, at the deepest point.
Trinity Drive	---	---	---	---	0.07m				
2 Trinity Drive	---	---	---	---	0.20m				
4 Trinity Drive	---	---	---	---	0.19m				
8 Trinity Drive	---	---	---	0.10m	0.32m				
10 Trinity Drive	---	---	---	---	0.23m				
12 Trinity Drive	---	---	---	---	0.21m				
14 Trinity Drive	---	---	---	0.14m	0.36m				
Urquhart Street	---	---	0.61m	1.04m	1.29m	N/A	N/A	N/A	Modelling of water depth on road, at the deepest point.
Urquhart Street	---	---	---	---	0.24m			N/A	

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
Urquhart Street	---	---	---	0.09m	0.35m			0.19m	
39 Urquhart Street	---	---	---	0.16m	0.41m			0.20m	
40 Urquhart Street	---	---	---	0.24m	0.49m				
41 Urquhart Street	---	---	0.08m	0.52m	0.77m				
41 Urquhart Street	---	---	---	0.31m	0.56m			0.22m	
42-46 Urquhart Street	---	---	---	---	0.16m			0.04m	
42-46 Urquhart Street	---	---	---	---	0.30m				
45-47 Urquhart Street	---	---	---	0.15m	0.40m				
48 Urquhart Street	---	---	---	---	0.20m			0.17m	
49 Urquhart Street	---	---	---	0.35m	0.60m			0.05m	
51 Urquhart Street	---	---	---	0.34m	0.59m			0.04m	
1 Webster Street	---	---	---	0.33m	0.56m				
2 Webster Street	---	---	---	---	0.16m				
3 Webster Street	---	---	---	0.22m	0.47m				
4 Webster Street	---	---	---	---	0.17m				
5 Webster Street	---	---	---	0.09m	0.31m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
7 Webster Street	---	---	---	---	0.24m				
9 Webster Street	---	---	---	0.04m	0.27m				
11 Webster Street	---	---	---	---	0.18m				
13 Webster Street	---	---	---	---	0.14m				
2 Weldon Power Court	---	0.08m	0.26m	0.46m	0.67m				
4 Weldon Power Court	---	---	---	0.12m	0.33m				
6 Weldon Power Court	---	---	---	0.40m	0.61m				
8 Weldon Power Court	---	---	---	---	0.19m				
10 Weldon Power Court	0.07m	0.16m	0.22m	0.29m	0.44m				
11 Weldon Power Court	---	---	---	---	0.07m				
12 Weldon Power Court	0.14m	0.42m	0.48m	0.52m	0.65m	N/A	N/A	N/A	
13 Weldon Power Court	0.05m	0.11m	0.15m	0.17m	0.21m				
14 Weldon Power Court	0.07m	0.14m	0.18m	0.21m	0.29m				
16 Weldon Power Court	0.13m	0.19m	0.24m	0.25m	0.31m				
470 West Road									PIA coordinator reported this property as ‘inundated’ during the Jan 2011 event. Over floor flooding did occur.*

HORSHAM CITY									
Location of House (Street Name & Number)	Depth of flooding at property for selected river heights on the Walmer gauge.					Depth of over floor flooding at property for selected river heights on the Walmer gauge.			Comments
	3.47m	3.61m	3.72m	3.79m	3.86m	3.72m 2% AEP	3.79m 1% AEP	3.86m 0.5% AEP	
2 Wettenhall Street	---	---	---	0.07m	0.23m				
4 Wettenhall Street	---	---	---	0.06m	0.29m				
6 Wettenhall Street	---	---	---	0.05m	0.29m				
8 Wettenhall Street	---	---	---	0.03m	0.26m				
10 Wettenhall Street	---	---	---	0.07m	0.31m				
12 Wettenhall Street	---	---	---	0.05m	0.29m				
Williams Road	---	---	---	---	0.15m			N/A	
35 Williams Road	---	---	---	0.21m	0.42m				
68 Williams Road	---	---	---	0.12m	0.33m			0.17m	
69 Williams Road	---	---	---	---	0.13m				
70 Williams Road	---	---	---	0.07m	0.28m				
71 Williams Road	---	---	---	---	0.12m				
72 Williams Road	---	---	---	0.11m	0.32m				
74 Williams Road	---	---	---	0.13m	0.34m				
75 Williams Road	---	---	---	---	0.13m				
76 Williams Road	---	---	---	0.11m	0.33m				

HORSHAM CITY									
Location of House (Street Name & Number)	Depth of flooding at property for selected river heights on the Walmer gauge.					Depth of over floor flooding at property for selected river heights on the Walmer gauge.			Comments
	3.47m	3.61m	3.72m	3.79m	3.86m	3.72m 2% AEP	3.79m 1% AEP	3.86m 0.5% AEP	
77 Williams Road	---	---	---	---	0.16m				
78 Williams Road	---	---	---	0.17m	0.38m				
79 Williams Road	---	---	---	---	0.20m				
80 Williams Road	---	---	0.08m	0.28m	0.50m				
80A Williams Road	---	---	---	0.16m	0.37m			0.08m	
81 Williams Road	---	---	---	---	0.29m				
95 Williams Road	0.41m	0.55m	0.73m	0.92m	1.14m			0.18m	
133 Williams Road	---	---	---	---	0.03m				
1 Willow Court	---	---	---	0.02m	0.10m				
2 Willow Court	---	---	---	---	0.20m				
3 Willow Court	---	---	---	0.10m	0.28m		N/A	N/A	
4 Willow Court	---	---	---	---	0.17m				
1 Wilson Street	---	---	---	---	0.46m				
7 Wilson Street	---	---	---	---	0.21m				
7A Wilson Street	---	---	---	---	0.10m				
7B Wilson Street	---	---	---	---	0.31m				

HORSHAM CITY									
Location of House (Street Name & Number)	**Depth of flooding at property for selected river heights on the Walmer gauge.**					**Depth of over floor flooding at property for selected river heights on the Walmer gauge.**			**Comments**
	3.47m	**3.61m**	**3.72m**	**3.79m**	**3.86m**	**3.72m 2% AEP**	**3.79m 1% AEP**	**3.86m 0.5% AEP**	
9 Wilson Street	---	---	---	---	0.11m				
11 Wilson Street	---	---	---	---	0.05m				
23 Wilson Street	---	---	---	0.30m	0.55m				
27 Wilson Street	---	---	---	0.05m	0.30m		0.01m	0.26m	
29 Wilson Street	---	---	---	---	0.28m			0.01m	
31 Wilson Street	---	---	---	---	0.24m			0.06m	
1/5 Wilson Street	---	---	---	---	0.04m				
2/5 Wilson Street	---	---	---	---	0.02m				
3/5 Wilson Street	---	---	---	---	0.25m				
4/5 Wilson Street	---	---	---	---	0.16m				
42826 Wilson Street	---	---	---	---	0.02m				CMA to advise
14 Wotonga Drive	---	---	---	---	0.20m				
2-15 Wotonga Drive	---	---	---	---	0.01m				

HORSHAM CITY									
Location of House (Street Name & Number)	Depth of flooding at property for selected river heights on the Walmer gauge.					Depth of over floor flooding at property for selected river heights on the Walmer gauge.			Comments
	3.47m	3.61m	3.72m	3.79m	3.86m	3.72m 2% AEP	3.79m 1% AEP	3.86m 0.5% AEP	

5.3 Property Inundation Table East Horsham

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
8836	WESTERN	HWY	BUNGALALLY	0.73	0.74	0.88	0.92	0.94	0.97	-	-	-	-	-	-
480	DELAHUNTYS	RD	DADSWELLS BRIDGE	1.68	1.74	1.90	1.96	2.00	2.06	-	-	-	-	-	--
11	CAMERON	RDN	DOOEN	-	-	-	0.57	0.76	0.93	-	-	-	-	0.07	0.22
49	CAMERON	RDN	DOOEN	-	0.08	0.67	0.99	1.18	1.34	-	-	-	-	0.07	0.23
25	CAMERON	RDN	DOOEN	-	-	-	0.69	0.88	1.05	-	-	-	-	0.16	0.25
31	CAMERON	RDN	DOOEN	-	-	-	0.56	0.75	0.92	-	-	-	-	0.16	0.31
37	CAMERON	RDN	DOOEN	-	-	0.39	0.71	0.90	1.06	-	-	-	-	-	0.06
372	HENTY	HWY	DOOEN	3.71	3.88	4.36	4.55	4.67	4.78	-	-	-	-	-	

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
1	CAMERON	RDN	DOOEN	-	-	-	0.23	0.50	0.68	-	-	-	-	0.06	0.24
354	HENTY	HWY	DOOEN	-	-	-	-	-	0.22	-	-	-	-	-	-
43	GRANT	DR	DOOEN	1.25	1.44	1.97	2.19	2.31	2.39	-	-	-	-	-	-
49	GRANT	DR	DOOEN	-	-	0.23	0.41	0.52	0.61	-	-	-	-	-	-
61	GRANT	DR	DOOEN	-	0.12	2.33	2.52	2.63	2.73	-	-	-	-	-	-
67	GRANT	DR	DOOEN	-	0.18	2.29	2.48	2.59	2.69	-	-	-	-	-	-
77	GRANT	DR	DOOEN	-	0.32	0.75	0.94	1.05	1.15	-	-	-	-	-	-
87	GRANT	DR	DOOEN	-	0.32	0.75	0.94	1.05	1.15	-	-	-	-	-	-
764	HENTY	HWY	DOOEN	-	-	1.21	1.43	1.54	1.63	-	-	-	-	-	-
650	HENTY	HWY	DOOEN	8.22	8.40	8.95	9.17	9.29	9.37	-	-	-	0.33	0.45	0.53
11	GRANT	DR	DOOEN	2.32	2.50	3.05	3.27	3.38	3.47	-	-	-	-	-	-
21	GRANT	DR	DOOEN	1.72	1.90	2.45	2.67	2.78	2.87	-	-	-	-	-	-
38	BRIGHTON	DR	DOOEN	4.59	4.77	5.32	5.54	5.66	5.74	-	-	-	-	-	-
30	BRIGHTON	DR	DOOEN	4.73	4.91	5.46	5.69	5.80	5.89	-	-	-	-	-	-
24	BRIGHTON	DR	DOOEN	5.52	5.70	6.25	6.47	6.59	6.67	-	-	-	-	-	-
14	BRIGHTON	DR	DOOEN	5.14	5.32	5.87	6.09	6.21	6.29	-	-	-	-	-	-
64	RIVER HEIGHTS	RD	DOOEN	2.32	2.50	3.05	3.27	3.38	3.47	-	-	-	-	-	-
88	LONGERENONG	RD	DOOEN	5.12	5.23	5.52	5.66	5.73	5.79	-	-	-	0.22	0.33	0.42

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
10	LONGERENONG	RD	DOOEN	0.25	0.43	0.98	1.21	1.32	1.40	-	-	-	-	-	-
28	LONGERENONG	RD	DOOEN	0.38	0.56	1.11	1.33	1.45	1.53	-	-	-	-	-	-
36	LONGERENONG	RD	DOOEN	0.49	0.67	2.16	2.38	2.50	2.58	-	-	-	-	-	-
	LONGERENONG	RD	DOOEN	5.51	5.57	5.82	5.97	6.06	6.14	-	-	-	-	-	-
43	PETRIE	LA	DOOEN	3.20	3.34	3.88	4.19	4.38	4.54	-	-	-	0.63	0.82	0.76
37	RIVERSIDE	RD	DOOEN	-	-	0.62	0.88	1.05	1.20	-	-	-	-	-	-
55	CAMERON	RDN	DOOEN	1.34	1.46	2.04	2.36	2.55	2.71	-	-	-	-	-	-
94	RIVERSIDE	RD	DOOEN	0.63	0.78	1.23	1.47	1.64	1.78	-	-	0.22	0.46	0.62	0.77
67	RIVERSIDE	RD	DOOEN	0.16	1.62	2.05	2.28	2.43	2.57	-	-	-	-	-	-
24	RIVERSIDE	RD	DOOEN	-	0.46	0.87	1.14	1.31	1.45	-	-	-	-	-	0.13
2	BRIGHTON	DR	DOOEN	4.86	5.04	-	5.81	5.93	6.01	-	-	-	-	-	-
50	GROSS	RD	DRUNG	2.98	3.01	3.25	3.29	3.32	3.34	-	-	-	-	-	-
318	ROKESKYS	RD	DRUNG	1.35	1.51	1.81	1.93	1.99	2.04	-	-	-	-	0.06	0.12
212	ROKESKYS	RD	DRUNG	3.63	3.74	6.70	6.90	7.01	7.10	-	-	-	-	-	-
354	WEST	RD	DRUNG	2.51	2.50	6.70	6.90	7.01	7.10	-	-	-	-	-	-
470	WEST	RD	DRUNG	-	-	-	1.47	1.70	1.88	-	-	-	-	-	0.09
417	BROWNS	RD	DRUNG	-	-	-	1.16	1.24	1.32	-	-	-	0.84	0.91	1.00
409	SCHOOL	RD	DRUNG	-	-	-	5.39	5.45	5.52	-	-	-	-	-	-

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
244	DOMASCHENZ	RD	DRUNG	0.39	0.40	1.97	2.11	2.16	2.21	-	-	-	-	-	-
327	TAYLORS LAKE NORTH	RD	DRUNG	-	-	1.37	1.46	1.49	1.53	-	-	-	-	-	-
	HORSHAM LUBECK	RD	DRUNG	-	-	-	6.90	7.00	7.10	-	-	-	-	-	-
1133	HORSHAM LUBECK	RD	DRUNG	0.68	0.69	1.44	1.57	1.63	1.67	-	-	-	-	-	-
488	HORSHAM LUBECK	RD	DRUNG	-	-	0.24	0.83	0.99	1.11	-	-	-	-	0.18	0.28
950	HORSHAM LUBECK	RD	DRUNG	-	-	0.54	1.39	2.52	2.65	-	-	-	-	-	-
774	HORSHAM LUBECK	RD	DRUNG	-	-	0.28	0.34	1.83	1.96	-	-	-	-	-	-
18	GROSS	RD	DRUNG	3.30	3.33	3.64	3.70	3.72	3.75	-	-	-	-	-	-
977	HORSHAM LUBECK	RD	DRUNG	1.14	1.15	1.23	1.30	1.34	1.37	-	-	-	-	-	-
808	EAST	RD	DRUNG	3.59	3.67	4.34	4.55	4.66	4.79	-	-	-	-	-	0.00
591	SCHOOL	RD	DRUNG	-	-	-	-	1.39	1.49	-	-	-	-	0.07	0.12
606	SCHOOL	RD	DRUNG	-	0.61	1.10	1.31	1.41	1.52	-	-	-	-	-	0.00
	HORSHAM LUBECK	RD	DRUNG	0.99	1.02	2.21	2.46	2.65	2.79	-	-	-	-	-	0.20
	HORSHAM LUBECK	RD	DRUNG	3.72	3.79	4.41	4.57	4.65	4.76	-	-	-	-	-	
644	HORSHAM LUBECK	RD	DRUNG	0.16	7.44	8.17	8.40	8.55	8.66	-	-	-	-	0.11	0.18
146	MCINTYRES	RD	DRUNG	0.85	0.86	0.92	0.93	0.94	0.95	-	-	-	-	-	-
200	NORTH	RD	DRUNG	1.21	7.44	8.17	8.40	8.55	8.66	-	-	-	-	-	-
73	NORTH	RD	DRUNG	0.68	0.69	1.26	1.31	1.34	1.36	-	-	-	-	-	-

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
224	NORTH	RD	DRUNG	1.77	7.44	8.17	8.40	8.55	8.66	-	-	-	-	-	-
273	NORTH	RD	DRUNG	1.15	1.16	1.69	1.89	1.99	2.09	-	-	-	-	-	-
417	HORSHAM LUBECK	RD	DRUNG	-	-	-	0.75	0.90	1.01	-	-	-	-	-	-
	SCHOOL	RD	DRUNG	-	0.21	0.70	0.90	1.00	1.11	-	-	-	-	-	0.00
538	HORSHAM LUBECK	RD	DRUNG	-	-	-	-	-	0.56	-	-	-	-	-	-
	LUBECK HORSHAM/GOLTON	RD	DRUNG DRUNG	-	-	-	-	-	-	-	-	-	-	-	-
	LUBECK HORSHAM	RD	DRUNG DRUNG	-	-	-	-	-	-	-	-	-	-	-	-
	BURNT CLAY	RD	DRUNG DRUNG	-	-	-	-	-	-	-	-	-	-	-	-
61	PRYORS	RD	HORSHAM		0.49	0.81	0.97	1.10	1.29	-	-	-	-	-	0.10
52	CAMERON	RD	HORSHAM	-	-	0.86	5.06	5.25	5.42	-	-	-	-	-	-
44	CAMERON	RD	HORSHAM	-	-	-	1.47	-	1.83	-	-	-	0.17	0.25	0.41
40	CAMERON	RD	HORSHAM	-	-	-	1.18	1.37	1.54	-	-	-	0.17	0.29	0.45
64	PRYORS	RD	HORSHAM	-	-	-	0.82	1.01	1.18	-	-	-	-	0.17	0.33
	CAMERON	RD	HORSHAM	4.06	4.16	4.79	5.13	5.33	5.50	-	-	-	0.04	0.22	0.39
325	CAMERON	RD	HORSHAM	-	-	-	-	-	2.71	-	-	-	-	-	-
325	CAMERON	RD	HORSHAM	4.13	4.29	5.02	5.37	5.57	5.75	-	-	-	0.66	0.86	1.03
289	CAMERON	RD	HORSHAM	-	-	-	-	-	-	-	-	-	-	0.05	0.20
217	CAMERON	RD	HORSHAM	3.38	3.58	4.55	4.98	5.25	5.49	-	-	-	0.07	0.36	0.60

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
191	CAMERON	RD	HORSHAM	-	-	0.27	0.43	0.46	0.57	-	-	-	-	-	-
139	CAMERON	RD	HORSHAM	0.68	0.69	0.87	0.97	1.19	1.55	-	-	-	-	-	-
141	CAMERON	RD	HORSHAM	-	-	0.14	0.18	0.20	0.24	-	-	-	0.09	0.11	0.15
217	CAMERON	RD	HORSHAM	-	-	0.23	0.27	0.29	0.35	-	-	-	-	0.04	0.07
73	PRYORS	RD	HORSHAM	3.30	3.51	4.43	4.89	5.19	5.44	-	-	-	-	-	-
505	TUCKERS	RD	JUNG	-	-	0.30	0.63	0.82	-	-	-	-	0.18	0.36	0.55
131	DOUG TUCKERS	RD	LONGERENONG	0.44	0.43	0.72	0.89	1.00	1.16	-	-	-	-	-	-
	DRUNG JUNG	RD	LONGERENONG	4.32	4.37	4.52	4.55	4.57	4.59	-	-	-	-	-	-
420	DRUNG JUNG	RD	LONGERENONG	3.54	3.55	3.71	3.75	3.77	3.78	-	-	0.00	0.00	0.00	0.00
286	MAGEES	RD	LONGERENONG	2.01	2.03	2.85	2.86	2.84	2.85	-	-	-	-	-	-
89	MILLS	RD	LONGERENONG	5.19	7.42	8.13	8.36	8.50	8.63	-	-	-	-	-	-
38	TRALEE	LA	LONGERENONG	3.35	3.41	3.49	3.54	3.56	3.59	-	-	-	-	-	-
37	FIELD DAYS	RD	LONGERENONG	2.99	2.98	3.32	3.56	3.69	3.85	-	-	-	-	-	-
37	DOUG TUCKERS	RD	LONGERENONG	-	-	0.21	0.53	0.72	3.52	-	-	-	-	-	0.00
875	LONGERENONG	RD	LONGERENONG	1.55	1.62	1.73	1.77	1.80	1.86	-	-	0.00	0.00	0.00	0.00
26	WEST	RD	LONGERENONG	2.81	2.85	3.02	3.20	3.32	3.50	-	-	-	-	-	-
464	LONGERENONG	RD	LONGERENONG	3.09	7.93	8.48	8.71	8.82	8.91	-	-	-	-	-	-
464	LONGERENONG	RD	LONGERENONG	3.49	3.57	6.70	6.90	7.00	7.10	-	-	-	-	-	-

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
	LONGERENONG	RD	LONGERENONG	3.49	3.57	6.70	6.90	7.00	7.10	-	-	-	-	-	-
	LONGERENONG/BURNT CLAY	RD	LONGERENONG	-	-	-	0.11	0.19	0.37	-	-	-	-	-	-
108	CAMERON	RD	RIVERSIDE	-	-	-	-	-	-	-	-	-	-	-	-
76	CAMERON	RD	RIVERSIDE	1.99	1.99	2.08	2.13	2.15	2.20	-	-	-	-	-	-
553	RIVERSIDE EAST	RD	RIVERSIDE	0.96	0.97	1.10	1.19	1.22	1.28	-	-	-	-	-	-
5	BUTLERS	RD	RIVERSIDE	-	-	-	-	0.56	0.62	-	-	-	-	-	-
532	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	0.81	0.88	0.94	-	-	-	-	0.05	0.09
532	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	3.30	3.37	3.43	-	-	-	0.19	0.28	0.34
76	ROGERSONS	RD	RIVERSIDE	-	-	-	3.30	3.37	3.43	-	-	-	0.19	0.28	0.34
481	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	-	0.38	0.60	-	-	-	-	-	-
	ANDREWS	RD	RIVERSIDE	-	-	-	0.67	0.76	0.82	-	-	-	0.06	0.11	0.17
	WEST	RD	RIVERSIDE	-	-	-	1.21	1.42	1.65	-	-	-	-	-	-
286	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	1.68	1.81	2.05	-	-	-	-	-	-
371	WEST	RD	RIVERSIDE	2.00	2.00	2.07	2.12	2.14	2.20	-	-	-	-	-	-
310	BROWNS	RD	RIVERSIDE	-	-	-	3.60	3.74	3.84	-	-	-	-	-	-
120	ROGERSONS	RD	RIVERSIDE	-	-	-	0.51	0.58	0.62	-	-	-	0.12	0.19	0.23
567	RIVERSIDE EAST	RD	RIVERSIDE	3.37	3.47	4.13	4.47	4.67	4.83	-	-	-	-	-	-
161	BROWNS	RD	RIVERSIDE	-	-	-	-	-	-	-	-	-	-	-	-

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
272	BROWNS	RD	RIVERSIDE	0.33	0.83	1.15	4.25	4.45	4.60	-	-	-	-	-	-
167	RIVERSIDE	RD	RIVERSIDE	-	-	-	1.46	1.52	1.55	-	-	-	0.10	0.15	0.19
133	BROWNS	RD	RIVERSIDE	-	-	-	-	1.00	1.04	-	-	-	-	-	-
73	BUTLERS	RD	RIVERSIDE	0.60	0.70	1.39	1.73	1.93	2.09	-	-	-	-	-	-
23	BUTLERS	RD	RIVERSIDE	-	-	0.43	1.03	1.09	1.14	-	-	-	-	0.08	0.12
47	BUTLERS	RD	RIVERSIDE	-	-	-	0.59	0.70	0.78	-	-	-	-	0.16	0.20
68	BUTLERS	RD	RIVERSIDE	-	-	-	1.00	1.11	1.18	-	-	-	-	-	0.15
20	BUTLERS	RD	RIVERSIDE	-	-	-	1.10	1.14	1.17	-	-	-	-	-	-
80	PEELS	RD	RIVERSIDE	-	-	-	-	0.30	0.33	-	-	-	-	0.12	0.13
181	HEARDS	RD	RIVERSIDE	-	-	-	0.14	0.31	0.46	-	-	-	-	-	0.08
52	PEELS	RD	RIVERSIDE	1.14	1.32	1.87	2.10	2.21	2.30	-	-	-	-	0.07	0.19
832	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	0.37	0.55	0.71	-	-	-	-	-	0.11
261	HEARDS	RD	RIVERSIDE	6.40	6.57	7.13	7.35	7.47	7.55	-	-	-	-	0.09	0.18
465	WEST	RD	RIVERSIDE	6.11	6.29	6.84	7.07	7.19	7.28	-	-	-	0.07	0.19	0.27
483	WEST	RD	RIVERSIDE	-	-	-	0.33	0.63	0.90	-	-	-	-	-	-
256	HORSHAM LUBECK	RD	RIVERSIDE	-	-	-	-	0.37	0.46	-	-	-	-	-	-
352	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	-	0.51	0.56	-	-	-	-	-	-
290	HORSHAM LUBECK	RD	RIVERSIDE	0.42	0.42	0.47	0.50	0.56	0.67	-	-	-	-	-	-

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
99	HORSHAM LUBECK	RD	RIVERSIDE	0.31	0.32	0.37	3.43	3.58	3.74	-	-	-	-	-	-
178	HORSHAM LUBECK	RD	RIVERSIDE	-	-	0.70	1.04	1.15	1.27	-	-	-	-	-	0.10
379	RIVERSIDE EAST	RD	RIVERSIDE	0.22	0.22	0.25	0.27	0.29	2.73	-	-	-	-	-	-
142	CAMERON	RD	RIVERSIDE	-	-	-	-	0.16	0.26	-	-	-	-	-	-
80	HORSHAM LUBECK	RD	RIVERSIDE	3.75	3.76	3.95	4.05	4.10	4.27	-	-	-	-	-	-
142	HORSHAM LUBECK	RD	RIVERSIDE	2.08	2.09	2.26	2.33	2.36	2.44	-	-	-	-	-	-
52	HORSHAM LUBECK	RD	RIVERSIDE	2.09	2.09	2.21	2.26	2.29	2.35	-	-	-	-	-	-
151	HORSHAM LUBECK	RD	RIVERSIDE	2.19	2.20	2.38	2.46	2.49	2.61	-	-	-	-	-	-
	HORSHAM LUBECK	RD	RIVERSIDE	-	-	0.19	0.35	0.46	0.54	-	-	-	-	-	-
69	HORSHAM LUBECK	RD	RIVERSIDE	-	-	-	2.23	2.30	2.34	-	-	-	1.78	1.85	1.44
69	HORSHAM LUBECK	RD	RIVERSIDE	-	-	0.80	0.86	0.97	1.10	-	-	-	-	-	-
53	HORSHAM LUBECK	RD	RIVERSIDE	-	-	0.80	0.86	0.97	1.10	-	-	-	-	-	-
131	HORSHAM LUBECK	RD	RIVERSIDE	-	-	0.46	2.03	2.10	2.26	-	-	-	-	-	-
131	HORSHAM LUBECK	RD	RIVERSIDE	-	-	0.75	1.84	1.95	2.03	-	-	-	-	-	-
480	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	0.67	0.74	0.80	-	-	-	-	-	-
102	HORSHAM LUBECK	RD	RIVERSIDE	2.04	2.05	2.20	2.27	2.31	2.39	-	-	-	-	-	-
425	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	0.32	0.45	0.52	-	-	-	-	-	-
77	PEELS	RD	RIVERSIDE	-	-	-	0.70	0.82	0.93	-	-	-	-	-	0.12

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
98	HEARDS	RD	RIVERSIDE	-	-	0.41	0.85	0.96	1.07	-	-	-	0.06	0.19	0.23
102	HEARDS	RD	RIVERSIDE	-	-	-	0.49	0.62	0.73	-	-	-	-	0.04	0.14
40	PEELS	RD	RIVERSIDE	-	-	0.21	0.66	0.81	0.96	-	-	-	-	0.13	0.25
66	HEARDS	RD	RIVERSIDE	-	-	0.45	0.65	0.77	0.88	-	-	-	0.10	0.22	0.26
7	PEELS	RD	RIVERSIDE	-	0.70	1.16	1.39	1.54	1.69	-	-	-	-	-	0.16
33	PEELS	RD	RIVERSIDE	-	0.43	0.89	1.13	1.29	1.44	-	-	-	-	-	
40	HEARDS	RD	RIVERSIDE	-	-	0.60	0.78	0.90	1.02	-	-	-	0.12	0.24	0.29
53	PEELS	RD	RIVERSIDE	-	-	0.45	0.70	0.88	1.06	-	-	-	-	0.13	0.24
151	RIVERSIDE	RD	RIVERSIDE	0.52	0.64	1.10	1.33	1.48	1.63	-	-	-	-	-	-
12	ROGERSONS	RD	RIVERSIDE	-	-	-	0.42	1.45	1.53	-	-	-	-	-	-
103	ROGERSONS	RD	RIVERSIDE	-	0.38	0.85	1.20	1.39	1.56	-	-	-	-	-	-
99	ROGERSONS	RD	RIVERSIDE	-	-	-	-	0.35	0.41	-	-	-	-	-	-
87	ROGERSONS	RD	RIVERSIDE	-	-	-	-	0.60	0.66	-	-	-	-	-	-
68	ROGERSONS	RD	RIVERSIDE	-	-	-	-	0.91	1.01	-	-	-	-	-	-
44	ROGERSONS	RD	RIVERSIDE	-	-	-	-	0.29	0.38	-	-	-	-	0.13	0.19
164	RIVERSIDE	RD	RIVERSIDE	0.19	0.48	1.02	1.30	1.48	1.63	-	-	-	-	0.22	0.28
104	ROGERSONS	RD	RIVERSIDE	-	0.57	1.07	1.37	1.56	1.72	-	-	-	-	-	-
158	RIVERSIDE	RD	RIVERSIDE	-	-	0.21	0.44	0.59	0.73	-	-	-	-	-	-

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
	WESTERN	HWY	RIVERSIDE	2.40	2.41	2.58	2.64	2.67	2.73	-	-	-	-	-	-
	WEST	RD	RIVERSIDE	2.74	2.75	2.84	2.89	2.92	2.96	-	-	-	-	0.06	0.08
70	PEELS	RD	RIVERSIDE	-	-	-	0.38	0.53	0.68	-	-	-	-	0.04	0.18
59	ROGERSONS	RD	RIVERSIDE	-	-	-	-	0.30	0.37	-	-	-	-	-	-
324	RIVERSIDE EAST	RD	RIVERSIDE	1.37	1.37	1.42	1.45	1.52	1.65	-	-	0.08	0.11	0.25	0.40
42	BUTLERS	RD	RIVERSIDE	-	-	-	-	0.15	1.30	-	-	-	-	-	-
495	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	1.00	1.05	1.10	-	-	-	0.18	0.25	0.31
63	HEARDS	RD	RIVERSIDE	1.52	1.67	2.11	2.31	2.42	2.53	-	-	-	0.12	0.24	0.35
744	RIVERSIDE EAST	RD	RIVERSIDE	-	-	0.20	0.74	0.86	0.98	-	-	-	0.25	0.37	0.49
795	RIVERSIDE EAST	RD	RIVERSIDE	-	-	0.33	1.44	1.58	1.69	-	-	-	-	-	-
786	RIVERSIDE EAST	RD	RIVERSIDE	-	-	0.15	1.18	1.30	1.43	-	-	-	-	-	-
636	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	-	0.16	0.27	-	-	-	-	-	-
721	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	0.90	1.03	1.15	-	-	-	0.32	0.45	0.56
102	ANDREWS	RD	RIVERSIDE	1.00	1.00	1.16	1.23	1.42	1.57	-	-	-	-	0.05	0.17
75	PRYORS	RD	RIVERSIDE	0.30	0.52	1.1	1.3	1.6	1.8	-	-	-	0.28	0.47	0.64
425	RIVERSIDE EAST	RD	RIVERSIDE	-	-	-	-	-	-	-	-	-	-	-	-
831	RIVERSIDE EAST	RD	RIVERSIDE	1.5	1.7	2.2	2.5	2.6	2.75	-	-	-	-	-	-
205	HEARDS	RD	RIVERSIDE	2.25	2.43	2.99	3.22	3.33	3.42	-	-	-	-	-	-

Location				Depth of flooding at lowest part of property for each ARI						Depth at building for each ARI					
House No.	Street Name	Street Type	Locality	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr
154	HORSHAM LUBECK	RD	RIVERSIDE	0.22	0.22	0.26	0.28	0.30	0.37	-	-	-	-	-	-
	HORSHAM LUBECK	RD	RIVERSIDE	-	-	0.95	1.31	1.52	1.66	-	-	-	-	-	-
	HORSHAM LUBECK	RD	ST HELENS PLAINS	-	-	0.18	0.19	0.19	0.20	-	-	-	-	-	-
	DOMASCHENZ	RD	ST HELENS PLAINS	-	-	1.87	2.70	3.54	3.55	-	-	-	-	-	-
476	TAYLORS LAKE NORTH	RD	ST HELENS PLAINS	4.38	4.42	4.55	4.58	4.59	4.61	-	-	-	0.00	0.00	0.00
212	TAYLORS LAKE NORTH	RD	ST HELENS PLAINS	-	-	2.15	2.21	2.24	2.27	-	-	-	-	-	-
1253	ST HELENS	RD	ST HELENS PLAINS	1.90	1.95	2.25	2.30	2.33	2.37	-	-	-	-	-	-

APPENDIX A4 FLOOD EVACUATION ARRANGEMENTS – Horsham and rural residential areas

Phase 1 - Decision to Evacuate

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

- Properties are likely to become inundated overfloor;
- Properties are likely to become isolated and occupants are not prepared or capable to manage 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 to conduct an evacuation;
- Time available to conduct an evacuation;
- Evacuation priorities and evacuation planning arrangements;
- Access and egress routes available and their potential flood risk;
- Current and likely future status of essential infrastructure;
- Resources required to conduct the evacuation;
- Resources available to conduct the evacuation;
- Shelter including Emergency Relief Centres, Assembly Areas etc.;
- Vulnerable people and facilities;
- Transportation;
- Registration
- People of CALD background and transient populations;
- Safety of emergency service personnel;
- Different stages of an evacuation process.

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

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

Sector	Gauge	Trigger (for consideration of evacuation)
5% AEP – No sectors required	Glenorchy	4.96m
2% AEP – No sectors required	Glenorchy	5.01m
Greater than or equal to a 1% AEP – Horsham City, Horsham South and Horsham East Sectors established	Glenorchy	5.03
5% AEP – No sectors required	Walmer	3.61m
2% AEP – No sectors required	Walmer	3.72m
Greater than or equal to 1% AEP – Horsham City, Horsham South and Horsham East Sectors established	Walmer	3.79m

The table below details time required to evacuate areas from decision being made to evacuate residents. The number of residences affected is very approximate.

AEP	No of residences affected	Decision time	Start Evacuation Notifications	Time to notify residents	No. of doorknock teams
2-5% AEP	60	06:00 to 19:00	Within 2 hour of decision	1 hour	3
2-5% AEP	60	19:00 to 06:00	At 07:00 next day	1 hour	3
1%	360	06:00 to 18:00	Within 2 hour of decision	2 hours	20
1%	360	19:00 to 06:00	At 07:00 next day	2 hours	20
0.5%	580	06:00 to 18:00	Within 2 hours of decision	2 hours	30
0.5%	580	16:00 to 06:00	At 07:00 next day	2 hours	

					30

The following **Evacuation Checklist** can be used as a guide when evaluating the need for evacuation in a particular area as a result of flooding.

Key Questions	Answers
Are there any existing Flood Evacuation Plans for the Municipality?	
Name of area(s) at risk.	
How many people are at risk (including special needs groups)?	
When and where are access routes likely to be disrupted?	
Is the area a flood island, accessible by road, accessible overland or land locked?	
How much time is available to warn the area? **Where Flash Flooding risks exist adopt the strategy detailed in Section 3.8 of this MFEP.**	
Under what circumstances and in what areas is shelter in place and not evacuation the best option?	
Where are Flood Relief Centres located?	
What are the triggers for evacuation? (i.e. a particular area at a specified gauge height?) – refer to Appendix C of this MFEP.	
How will evacuation warning messages be communicated to people?	
Have standard evacuation messages been developed for predicted or likely flood scenarios?	
What forms of transport are needed to assist with evacuation?	
Where are airbase facilities located?	
Where are animal shelter compounds located? Any other arrangements for management and accommodation of pets / animals?	
What are the local command and control arrangements for evacuation?	
Other Confirmations and Clarifications:	
Clarify and confirm local arrangements and responsibilities for evacuation at the local level. This includes:	

- Confirming and facilitating local awareness of responsibilities for the decision to evacuate (i.e. Incident Controller), the management of evacuation (i.e. VicPol) and the tasks to be undertaken for evacuation (i.e. development and communication of evacuation warnings).
- The role of agencies at the local level involved in evacuation (i.e. VicPol, VICSES, Australian Red Cross, etc.)

Local arrangements must be consistent with arrangements as set out in Part 8 of the EMMV and the Evacuation Guidelines.

Phase 2 – Warning

Warnings may include a warning to prepare to evacuate and a warning to evacuate immediately. Once the decision to evacuate has been made, the at-risk community will be warned to evacuate. Evacuation warnings can be disseminated via methods listed in Phase 3 of this plan.

From past experience flood intelligence should be able to provide probable Horsham flood levels at least 24 hours in advance of flood waters reaching Horsham. Therefore, the Incident Controller should aim to provide at least 24 hours' evacuation notice to all affected residents. All residences that are expected to be flooded over floor should be doorknocked and if they are absent additional measures taken to ensure they have a personal warning delivered using all available means. Council will make available ratepayer database information to assist with contacting over floor flooding residents.

Evacuation warning messages will be developed and issued by VICSES in consultation with the Vic Pol Evacuation Manager, MERC MERO, DHS and other key agencies and expert advice (CMA's and Flood Intelligence specialists). For Horsham City the message will take one of three forms.

Phase 3 – Evacuation

Evacuation will be controlled by VicPol evacuation Manager. The Evacuation Manager is responsible for managing the withdrawal which will include developing an evacuation plan which clearly identifies activities and timelines as well as the roles and responsibilities of all agencies involved.

VICSES, CFA, AV and Local Government will provide resources where available to:

- Provide evacuation warnings and information to residents at risk.
- Support VICPOL/VICROADS with route control.
- May assist VICPOL in arranging evacuation transportation.

VICPOL will control security of evacuated areas.

Evacuees will be encouraged to move using their own transport where possible. Transport for those without vehicles or other means will be arranged by VICPOL with the assistance of support agencies.

Special needs groups are identified in Council's 'residents at risk' register. Further information on Council's 'residents at risk' register can be obtained from the HRCC MERO.

Phase 4 – Shelter

Relief Centres catering for people's basic needs may be established to meet the immediate needs of people affected by flooding. Emergency Relief Centres are listed in the HRCC MEMP in the Emergency Relief Centre Supporting Plan. Maps of Relief Centre locations are provided in the Emergency Relief Centre Supporting Plan. The appropriate Relief Centre for the event will be advised to the public via multi media outlets during the incident.

VICPOL in consultation with SES will liaise with Local Government and DHS (where regional coordination is required) via the relevant Incident 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

The Wimmera Animal Welfare Plan is a supporting plan to the HRCC MEMP and outlines procedures to follow when dealing with animals both domestic and livestock during an emergency.

Matters relating to the welfare of wildlife are to be referred to DELWP.

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

APPENDIX A5 FLOOD WARNING SYSTEMS – Horsham and rural residential areas

1. Flood Warning Products

Flood Warning products and flood class levels can be found on the BoM website. Flood warning products include severe thunderstorm warnings, severe weather warnings, flood watches, flood warnings, flood bulletins and local flood warning systems.

BoM Severe Weather Warnings are issued for relevant areas when required. These are delivered to all agencies and SES engages with the Municipality and Emergency Service Organisations to ensure operational readiness.

1.1 Severe Thunderstorm and Severe Weather Warnings

The BoM can forecast the environment in which severe thunderstorms or small scale weather systems that are locally intense and slow moving may occur and provides a generalised service to that effect. However, it is not yet technically possible to predict individual flash flooding events except on time scales of tens of minutes at the very best.

The BoM issues warnings of flash flooding when it becomes apparent that an event has commenced which may lead to flash flooding or when flash flooding has commenced.

1.2 Flood Watches

Flood watches are issued by the BoM to notify communities and other stakeholders within broad areas (rather than specific catchments) of the potential flood threat from a developing weather situation. They provide a 'heads up' of likely flooding.

Flood watches are based on an assessment of the developing weather situation and indicators of current catchment wetness. They provide generalised statements about expected forecast rainfall totals, the current state of the catchments within the target area and the streams at risk from flooding. Instructions for obtaining rain and stream level observations and access to updated Watches and Warnings are also included.

Normally, the BoM would issue a Flood Watch 24 to 36 hours in advance of any likely flooding and issue updates as required. If at any time during that period there was an imminent threat of floods occurring, the Flood Watch would be upgraded to a Flood Warning.

1.3 Flood Warnings

1.3.1 Overview

Flood Warnings are firm predictions of flooding based on actual rainfall and river height information as well as the results of stream flow based models of catchment behaviour that take account of antecedent conditions (i.e. the 'wetness' of the catchment, storage levels within dams, etc) and likely future rainfall. Releases from dams are an essential input to such models.

Flood warnings are categorised as 'minor', 'moderate' or 'major' (see BoM website for an explanation of these terms and current flood class levels) and indicate the expected severity of the flood for agreed key locations along the river.

1.3.2 Wimmera River

A flood warning system has been implemented within the Municipality for parts of the Wimmera River. The system involves the issue of timely flood warnings by the Bureau of Meteorology to the media, VICSES, Council and other stakeholder agencies and organisations and the prompt alerting and dissemination of such warnings by VICSES to other agencies and organisations. Stakeholder agencies and organisations, are responsible for onward dissemination of the warning details.

Flood warnings will also include:

- Rainfall amounts for selected locations within and adjacent to the Wimmera River catchment;
- River heights and trends (rising, steady, falling) at key locations (eg. Eversley, Crowlands, Navarre, Glynwylln, Stawell, Glenorchy, Fyans Creek, Wonwandah East, Walmer and Quantong Bridge);
- Outflows (in ML/d) from dams (eg. Lake Lonsdale, Lake Fyans, Lake Wartook and Lake Bellfield) within the catchment;
- Forecasts of the height and time of flood peaks at key locations (eg. Glenorchy and Walmer ;
- Weather forecast and the likely impact of expected rainfall on flooding; and
- A warning re-issue date and time.

Note 1: The term "local flooding" may be used for localised flooding resulting from intense rainfall over a small area.

Note 2: The term "significant rises" may be used in the early stages of an event when it is clear that river levels will rise but it is too early to say whether they will reach flood level.

Note 3: While there is a river gauge board at the Horsham Weir, it is the gauge at Walmer, downstream from the weir, that is referred to in all flood warnings for Horsham.

Additional information (eg. weather radar and satellite images as well as updated rain and river level information) can also be obtained from the Bureau's website (www.bom.gov.au/hydro/flood/vic) or for the cost of a local call on ☎ 1300 659 217.

1.4 Flood Bulletins

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

The relevant VICSES Region Headquarters or the established ICC will normally be responsible for drafting, authorising and issuing Flood Bulletins.

Flood Bulletins should refer to the warning title within the Bulletin header.

Flood Bulletins should follow the following structure:

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

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

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

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

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

2. Flood Class Levels

The occurrence of a certain class of flooding at one point in a catchment will not necessarily lead to the same class of flooding at other points – for example along the main river and its tributary creeks or along a drainage network's overland flow paths. This is because the floodplain physiography and use (and thus flood impact) varies along the river or flow path and also because antecedent conditions combined with where and how rainfall occurs (both in time and space) will drive how a flood develops and progresses.

It is emphasised that the flood class levels, where cited, refer to that part of the watercourse where the flood effects can be related to the gauge reading.

It is important to remember that flood impact is dependent on more than the peak height or flow. The rate of rise, duration, extent and season of flooding are also important. For this reason, flood class levels can only be considered as a guide to flood severity.

3. Relevant gauges

3.1 Overview

There are a number of streamflow gauges which can be monitored to determine the likelihood of flood inundation. These are listed below and are discussed in detail individually later in this section.

- Wimmera River at Glynwylln
- Wimmera River at Glenorchy
- Mt. William Creek at Lake Lonsdale D/S
- Yarriambiack Creek at Wimmera
- Wimmera River at Drung Drung
- Burnt Creek at Wonwondah East
- Wimmera River at Walmer

The gauges of most significance for East Horsham are the Wimmera River at Walmer and Burnt Creek at Wonwondah East.

3.2 Stormwater and rainfall gauging

To monitor inundation that may occur as a direct result of storms, rainfall gauges must be monitored. There are several daily rainfall gauges in the Horsham area; however, these will only provide a rainfall total for the 24 hours prior to 9am on the recorded date.

There are also a number of instantaneous rainfall gauges which record the rate of rainfall in mm/hr (Automatic Weather Station (AWS) rainfall gauges). Pluviograph rainfall gauges that are relevant to Horsham are shown in the table below, with details on the gauge included:

Gauge Name	Gauge No.	Average Annual Rainfall (mm)	Highest Daily Total (mm)	Start of record
Hopetoun Airport	77010	312	75 (12th Jan 2011)	2004

Nhill AWS	78015	326	64.4 (12th Jan 2011)	2003
Wimmera River US Dimboola	578004	410	131.6 (7 Nov 1957)	1882
Horsham AWS	79100	379	101.4 (12 Jan 2011)	1997
Longerenong AWS	79028	417	97 (12 Jan 2011)	1860
Stawell AWS	79105	493	86.6 (14 Jan 2011)	1996

Live readings from these gauges are available online via the BoM website –

http://www.bom.gov.au/vic/flood/rain_river.shtml

http://www.bom.gov.au/cgi-bin/wrap_fwo.pl?IDV60148.html

3.3 Key Streamflow Gauge

It is also suggested the following sites be used to provide stream flow data:

- Key streamflow gauges:
    - Burnt Creek at East Wonwondah
    - Wimmera River at Walmer
- Additional Streamflow gauges
    - Wimmera River at Glynwylln
    - Wimmera River at Glenorchy
    - Mt. William Creek at Lake Lonsdale D/S
    - Wimmera River at Drung Drung

There are a range of water level and streamflow gauges within the Wimmera River and Burnt Creek catchments. Actions for Horsham are driven by predicted levels referenced to the Walmer streamflow gauge downstream of Horsham. Predictions for this gauge will be made based on observed levels at the following gauges:

- Wimmera River at Eversley
- Wimmera River at Glynwylln
- Wimmera River at Glenorchy
- Mt William Creek at Lake Lonsdale D/S
- Wimmera River at Drung Drung

3.3.1 Burnt Creek at Wonwondah East

The peak levels and flows of some recent floods are:

Gauge Height at Current Site (m)	Flow at Current Site (ML/d)	Date
1.07	1,596	January 2011
1.04	1,388	October 1992
1.04	1,398	October 1996
1.02	1,246	September 1992

Note: Information for the 5, 10, 20 and 50 year ARI events is for Burnt Creek only, information on the 100 and 200 year ARI events is included in the Wimmera River at Walmer information as the flooding from Burnt Creek and Wimmera River is merged.

Burnt Creek Flow (ML/d)	Annual Exceedance Probability	Consequence / Impact	Action Actions may include (but not limited to) Evacuation, closure of road, sandbagging, issue warning and who is responsible
710	20% AEP (5 year ARI)	No properties impacted below floor, 10 buildings on Burnt Creek within 50m of flood extent	Warn residents and ensure they are aware of what to expect, sandbag septic systems, remove cars, lift portable assets etc.
1,330	10% AEP (10 year ARI)	No properties impacted below floor, 10 buildings on Burnt Creek within 50m of flood extent	Warn residents and ensure they are aware of what to expect, sandbag septic systems, remove cars, lift portable assets etc.
2,270 – TBC	TBC (Wartook Flood Study)	1 property affected below floor and 19 within 50m of the flood extent	Consider sandbagging properties low to the ground on a concrete slab. Ensure all landholders are aware of the inundation that will occur. Monitor flood progress and ensure support is available.
3,360 – TBC	TBC	2 properties affected below floor and 21 others within 50m of flood extent. Burnt Creek flood water merges with the Wimmera River	Consider sandbagging properties low to the ground on a concrete slab. Ensure all landholders are aware of the inundation that will occur. Monitor flood progress and ensure support is available.
4,180 – TBC	TBC	Discussed in respect to the Wimmera River at Walmer gauge as flood water is fully combined.	
6,570 – TBC	TBC		

3.3.2 Wimmera River

The peak levels and flows of some recent floods are:

Gauge	Gauge height (m)	Flood Rating	AEP or flood year	ARI	Rating Flow (ML/d)
Wimmera at Walmer			20%	5 year	10,000
Wimmera at Walmer			10%	10 year	10,500
Wimmera at Walmer	3.3	Minor			12,800
Wimmera at Walmer	3.45	Moderate			17,500
Wimmera at Walmer			5%	20 year	22,000
Wimmera at Walmer	3.64		Sep-83		25,311
Wimmera at Walmer	3.7		2%	50 year	30,000
Wimmera at Walmer	3.77		1%	100 year	35,000
Wimmera at Walmer	3.87		1/08/1909		43,900
Wimmera at Walmer	3.87		October 1894		44,300
Wimmera at Walmer	3.86		0.50%		43,000
Wimmera at Walmer	4.27		Jan-11		
Wimmera at Glynwylln	7.4		Aug-82		24,700
Wimmera at Glynwylln	7.47		Sep-88		34,200
Wimmera at Glynwylln	8.31		Sep-10		37,987
Wimmera at Glynwylln	8.63*		Jan-11		
Wimmera at Glenorchy	4	Minor	50%	2 year	7,000
Wimmera at Glenorchy	4.75	Moderate	20%	5 year	14,100
Wimmera at Glenorchy	4.9	Major	10%	10 year	19,300

Wimmera at Glenorchy	4.97		Oct-73		24,700
Wimmera at Glenorchy	4.97		Sep-88		25,200
Wimmera at Glenorchy				50	29,000
Wimmera at Glenorchy				100	32,800
Wimmera at Glenorchy	5.03		Jan-11		39,527
Wimmera at Drung	3.83		Sep-88		16,193
Wimmera at Drung	3.92		Sep-83		19,892
Wimmera at Drung	4.82		Sep-10		Unavailable

- Derived Height

3.3.3 Mt. William Creek at Lake Lonsdale D/S

Location –At the the outlet structure on Lake Lonsdale

Gauge Zero –Unavailable

Flood Class Levels –Unavailable

Flood Frequency –

Gauge Height at Current Site (m)	Flow at Current Site (ML/d)	ARI (1 in X Years)
N/A	44,200	100
N/A	26,200	50
N/A	14,900	25
N/A	6,480	10
N/A	3,120	5

Flood History –

Gauge Height at Current Site (m)	Flow at Current Site (ML/d)	Date
N/A	38,530	January 2011
188.40	27,300	August 1909
188.18	16,300	September 1915

3.3.4 Wimmera River at Drung Drung

Location –Approximately 14km upstream of Horsham on Drung - Jung Rd

Gauge Zero –128.857 m AHD

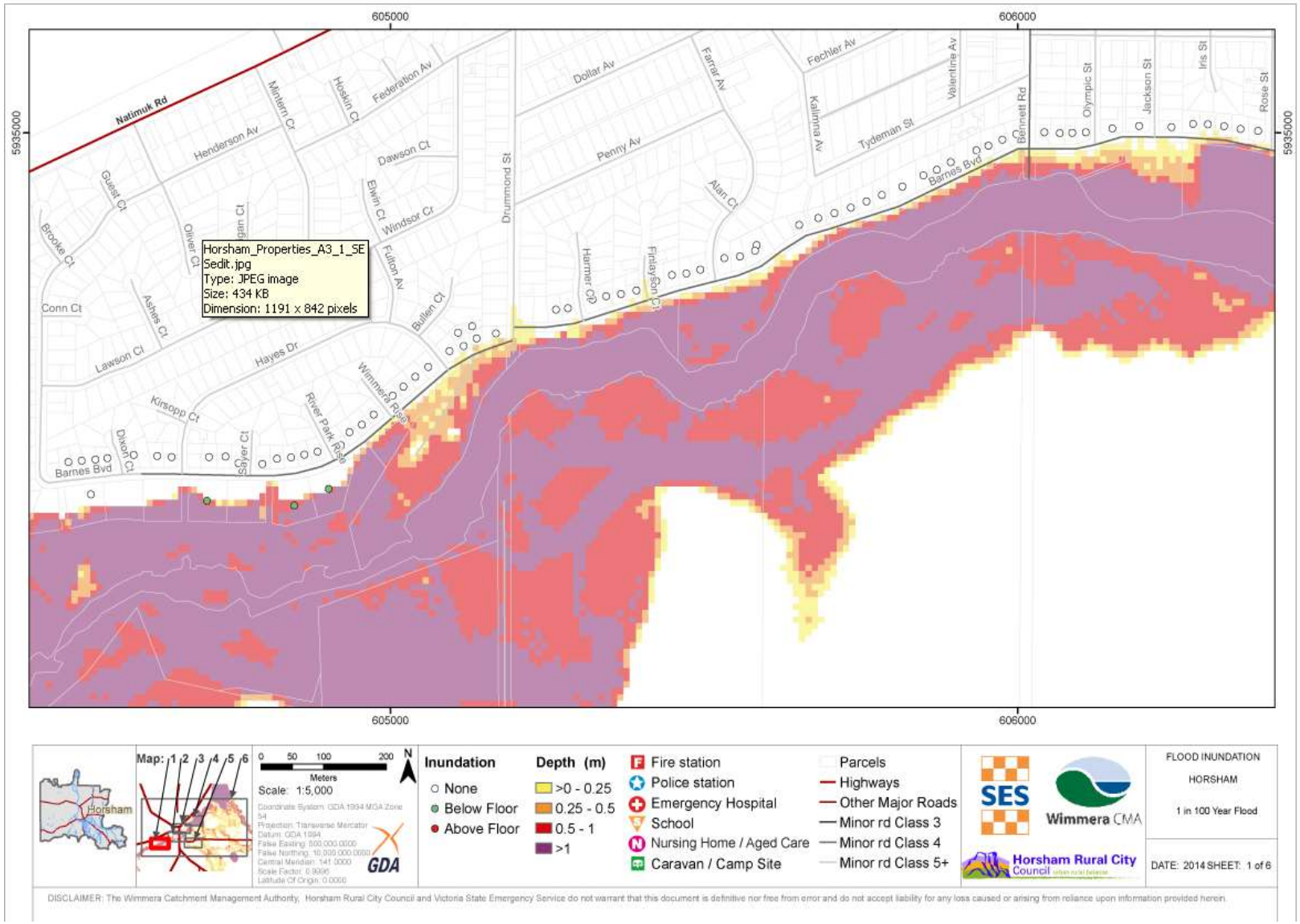
Flood Class Levels – Unavailable

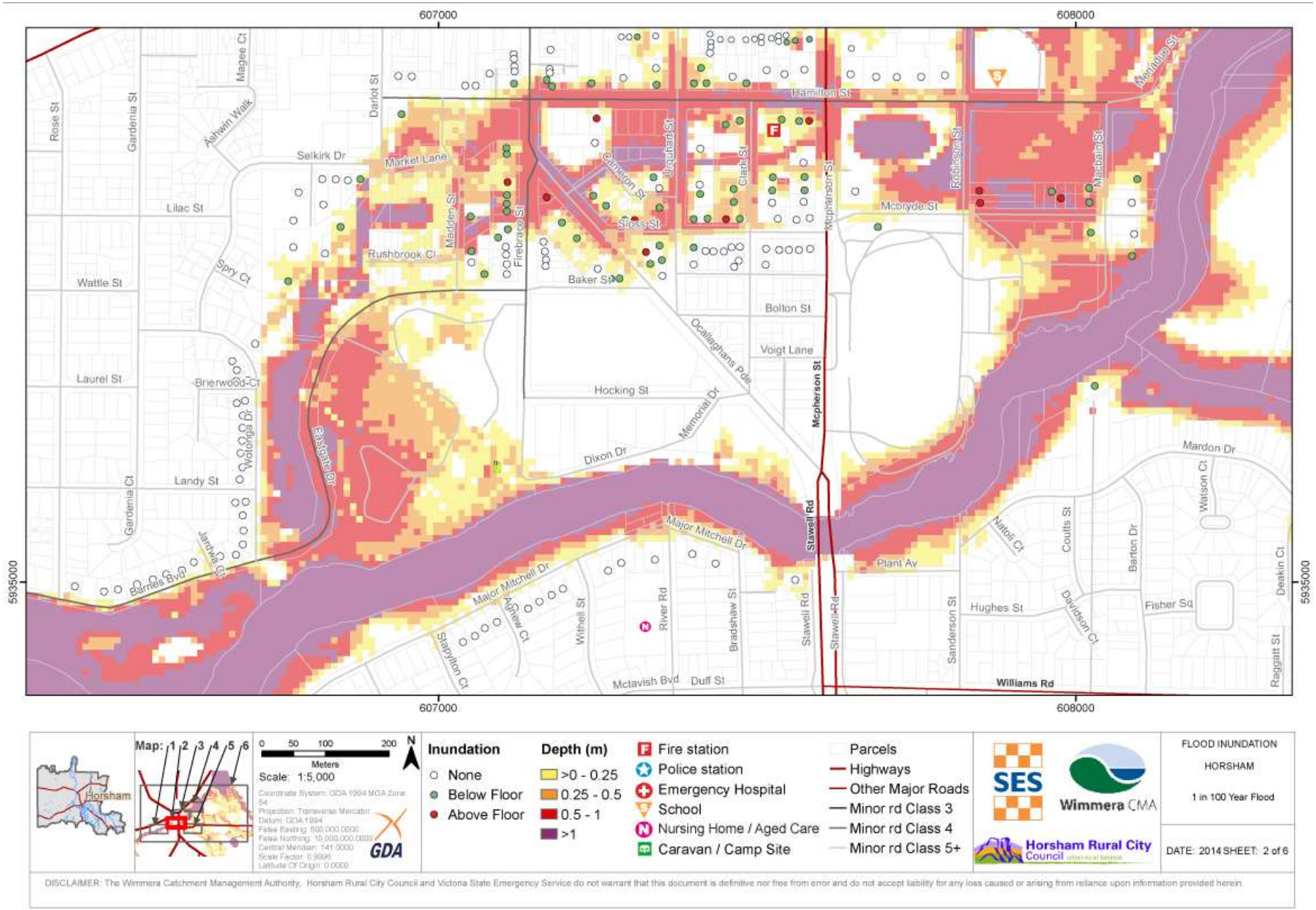
Flood Frequency – Unavailable

Flood History –

Gauge Height at Current Site (m)	Flow at Current Site (ML/d)	Date
4.82	Unavailable	September 2010
3.92	19,892	September 1983
3.83	16,193	September 1988

APPENDIX A6 Maps

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Ashwin Walk
Darlot St
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Firebrace St
Spry Ct
Wattle St
Laurel St
Brierwood Ct
Wolonga Dr
Gardenia Ct
Landy St
Jardine Ct
Barnes Blvd
Bangalore Dr
Hamilton St
Cameron St
Urquhart St
Clark St
Mcpherson St
Robinson St
Maclean St
Menindee St
Mcbryde St
Sloss St
Baker St
Bolton St
Ocallaghans Pde
Voigt Lane
Hocking St
Memorial Dr
Dixon Dr
Major Mitchell Dr
Stawell Rd
Plant Av
Mardon Dr
Watson Ct
Natoli Ct
Coutts St
Barton Dr
Deakin Ct
Fisher Sq
Hughes St
Davidson Ct
Sanderson St
Raggatt St
Williams Rd
Duff St
Mctavish Blvd
Starpylton Ct
Agnew Ct
Withell St
River Rd
Bradshaw St
Horsham
Map: 1 2 3 4 5 6
0 50 100 200
Meters
Scale: 1:5,000
N
GDA
Inundation
None
Below Floor
Above Floor
Depth (m)
>0 - 0.25
0.25 - 0.5
0.5 - 1
>1
Fire station
Police station
Emergency Hospital
School
Nursing Home / Aged Care
Caravan / Camp Site
Parcels
Highways
Other Major Roads
Minor rd Class 3
Minor rd Class 4
Minor rd Class 5+
SES
Wimmera CMA
Horsham Rural City Council
FLOOD INUNDATION
HORSHAM
1 in 100 Year Flood
DATE: 2014 SHEET: 2 of 6
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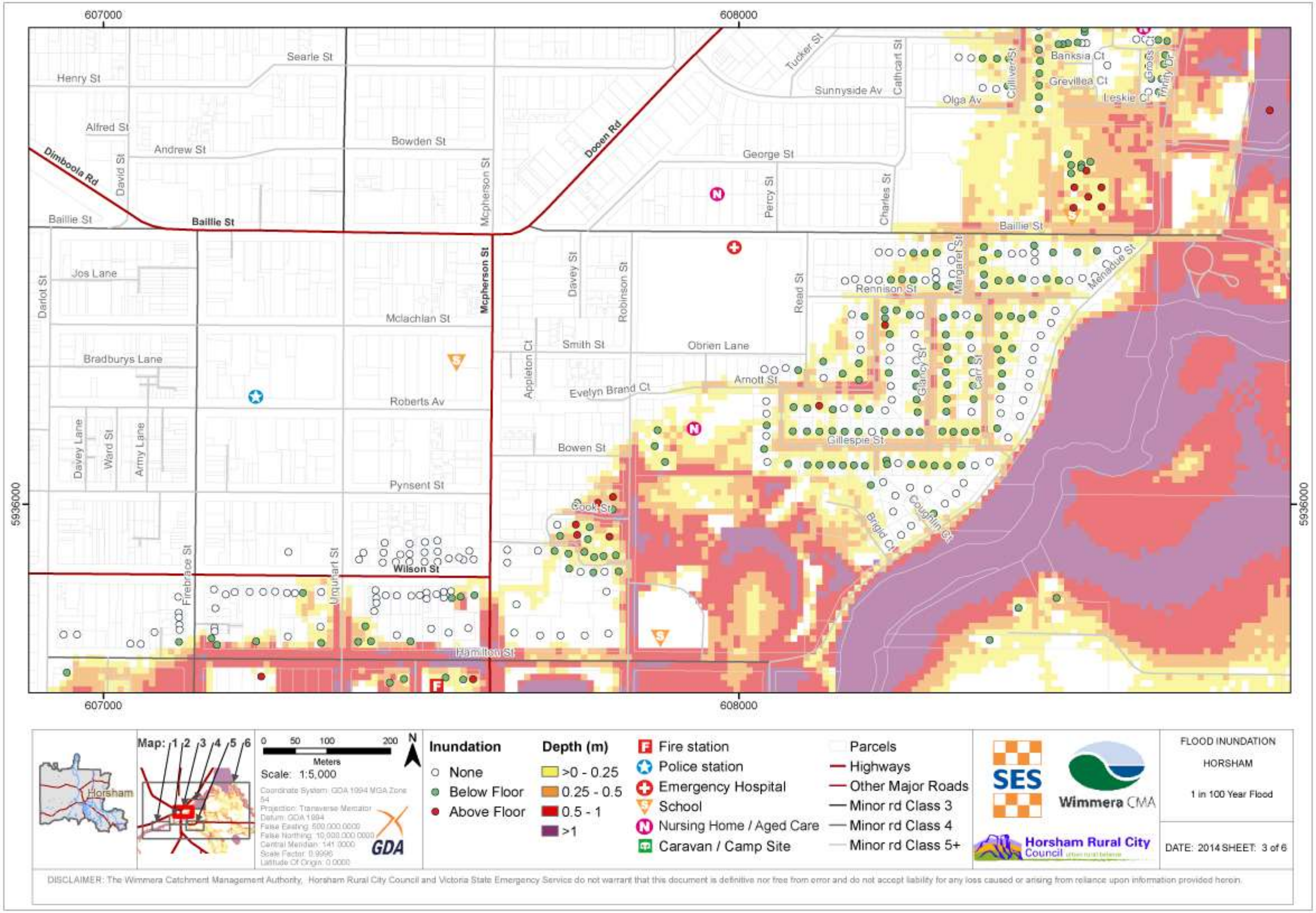
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608000
5936000
Searle St
Henry St
Alfred St
Andrew St
Bowden St
Dimboola Rd
David St
Doonen Rd
Tucker St
Cathcart St
Sunnyside Av
Olga Av
Banksia Ct
Grevillea Ct
Leskie Ct
George St
Percy St
Charles St
Baillie St
Mcpherson St
Jos Lane
Darlot St
Davey St
Robinson St
Read St
Rennison St
Margaret St
Menadue St
Mclachlan St
Smith St
Obrien Lane
Bradburys Lane
Appleton Ct
Evelyn Brand Ct
Arnott St
Glancy St
Carr St
Roberts Av
Bowen St
Gillespie St
Davey Lane
Ward St
Army Lane
Pynsent St
Cook St
Brigid Ct
Coughlin Ct
Firebrace St
Urquhart St
Wilson St
Hamilton St
Horsham
Map: 1 2 3 4 5 6
0 50 100 200
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Scale: 1:5,000
Coordinate System: GDA 1994 MGA Zone 54
Projection: Transverse Mercator
Datum: GDA 1994
False Easting: 500,000.0000
False Northing: 10,000,000.0000
Central Meridian: 141.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
GDA
Inundation
None
Below Floor
Above Floor
Depth (m)
>0 - 0.25
0.25 - 0.5
0.5 - 1
>1
Fire station
Police station
Emergency Hospital
School
Nursing Home / Aged Care
Caravan / Camp Site
Parcels
Highways
Other Major Roads
Minor rd Class 3
Minor rd Class 4
Minor rd Class 5+
SES
Wimmera CMA
Horsham Rural City Council
FLOOD INUNDATION
HORSHAM
1 in 100 Year Flood
DATE: 2014 SHEET: 3 of 6
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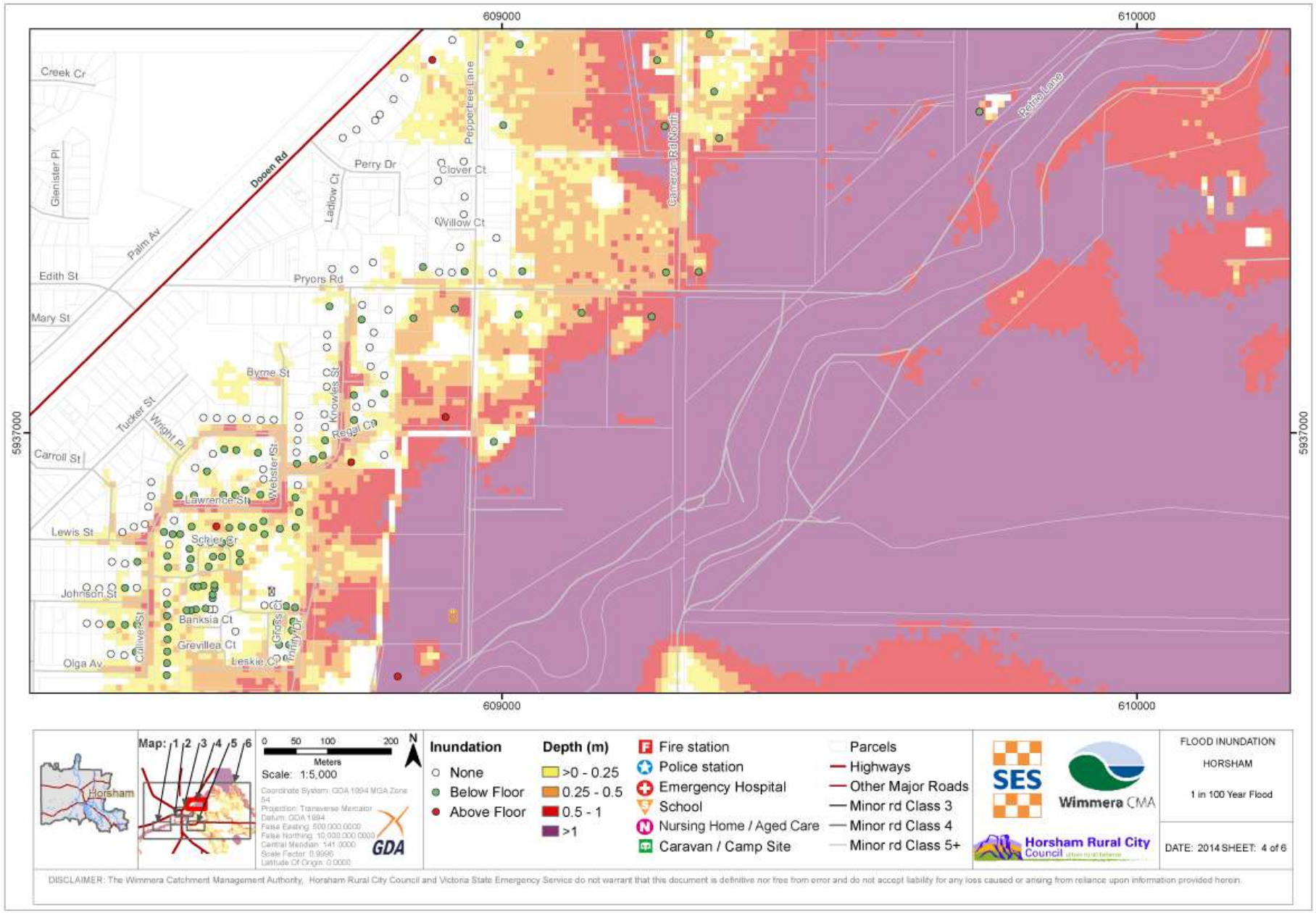
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Lewis St
Johnson St
Olga Av
Perry Dr
Ladlow Ct
Peppertree Lane
Clover Ct
Willow Ct
Pryors Rd
Byrne St
Knowles St
Regal Ct
Webster St
Lawrence St
Scheer St
Banksia Ct
Grevillea Ct
Leskie Ct
Cameron Rd North
Petrie Lane
Horsham
Map: 1 2 3 4 5 6
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Scale: 1:5,000
GDA
Inundation
None
Below Floor
Above Floor
Depth (m)
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0.25 - 0.5
0.5 - 1
>1
Fire station
Police station
Emergency Hospital
School
Nursing Home / Aged Care
Caravan / Camp Site
Parcels
Highways
Other Major Roads
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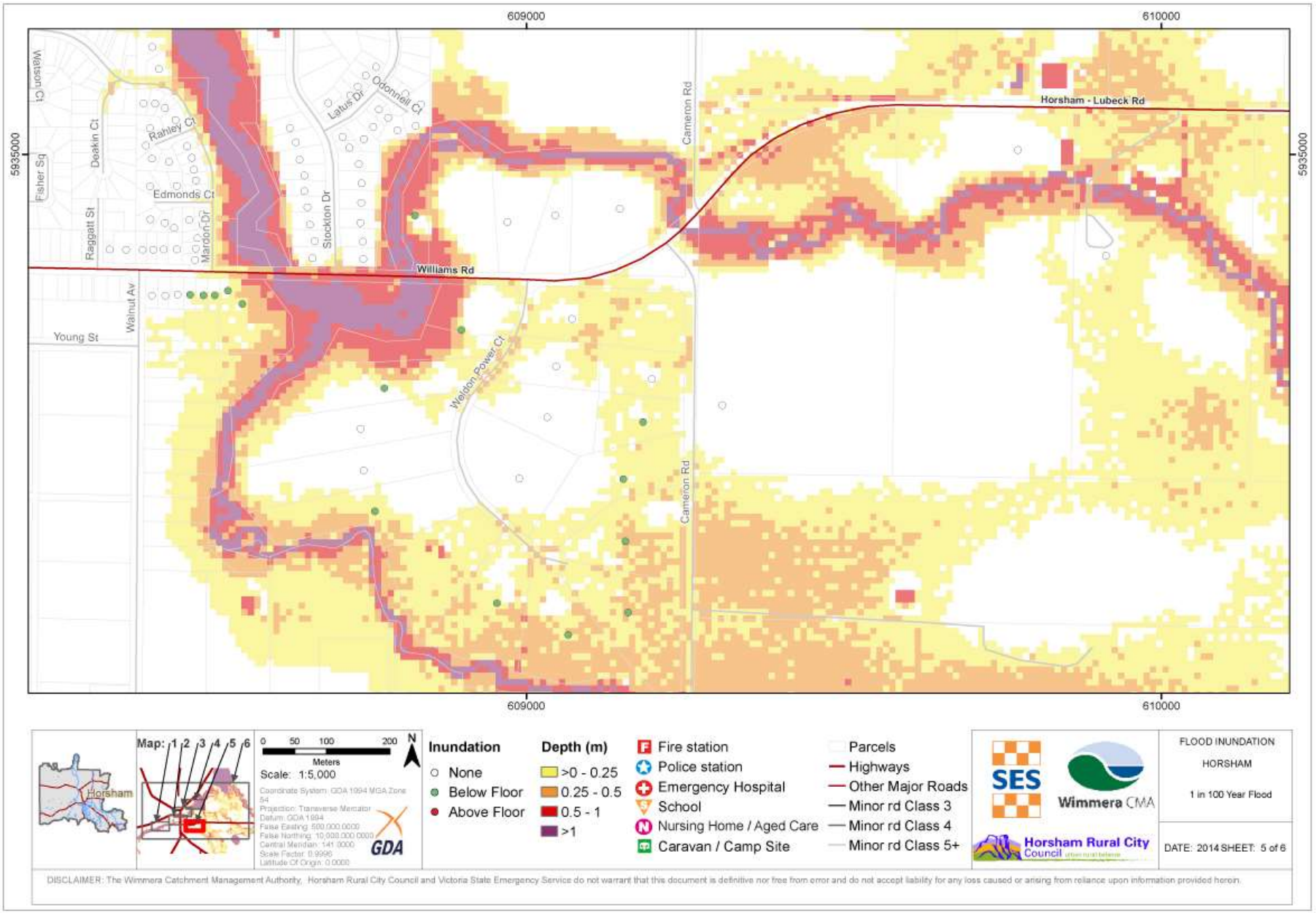
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Mardon Dr
Stockton Dr
Laflus Dr
Odonnell Ct
Cameron Rd
Horsham - Lubeck Rd
Williams Rd
Walnut Av
Young St
Weldon Power Ct
Cameron Rd
Map: 1 2 3 4 5 6
Horsham
0 50 100 200 N
Meters
Scale: 1:5,000
GDA
Inundation
None
Below Floor
Above Floor
Depth (m)
>0 - 0.25
0.25 - 0.5
0.5 - 1
>1
Fire station
Police station
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Highways
Other Major Roads
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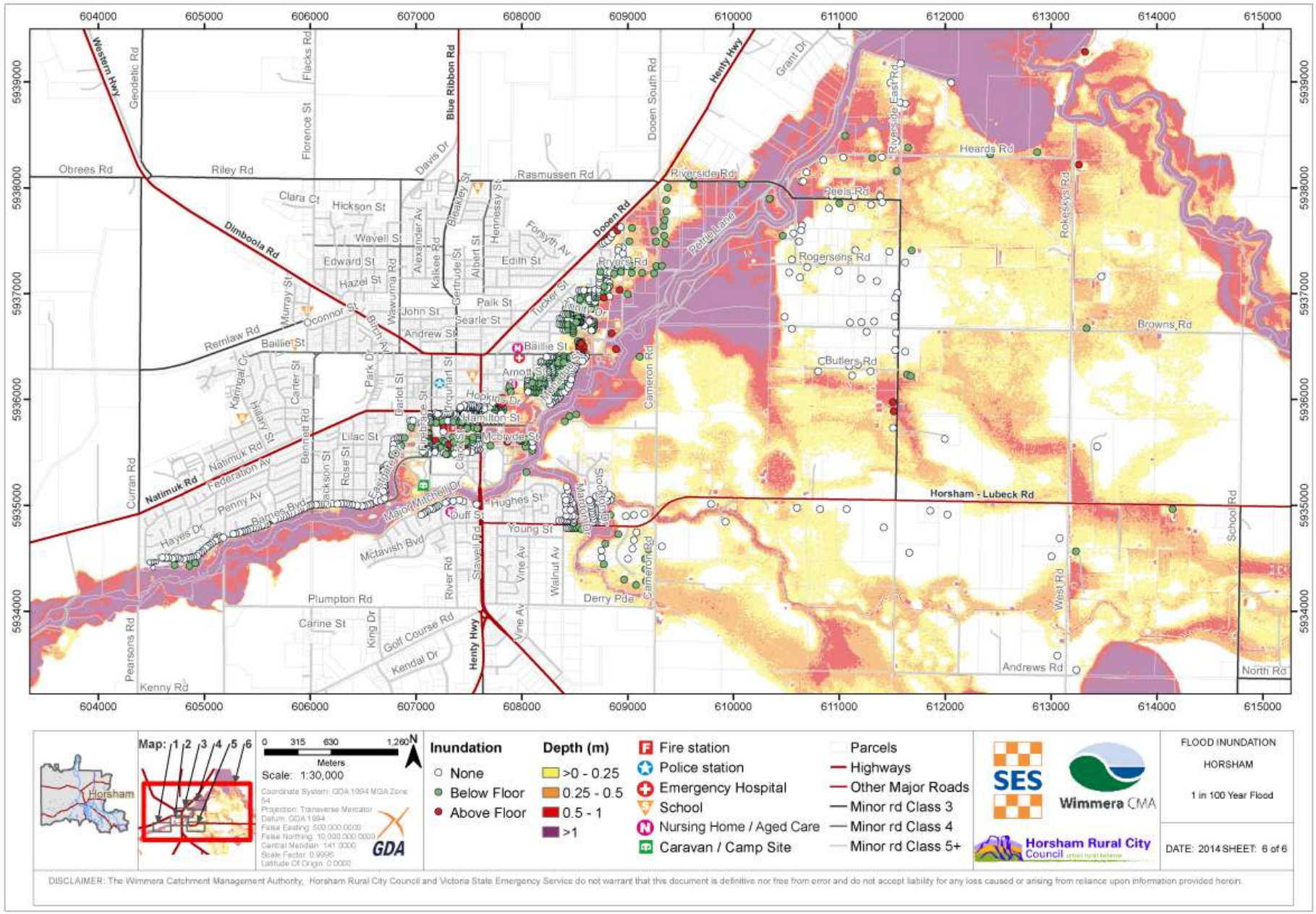
Inundation
None
Below Floor
Above Floor
Depth (m)
>0 - 0.25
0.25 - 0.5
0.5 - 1
>1
Fire station
Police station
Emergency Hospital
School
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Minor rd Class 4
Minor rd Class 5+
Map: 1 2 3 4 5 6
Scale: 1:30,000
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APPENDIX A7 Community Gauging Stations

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Gauge No	Site	Theiss Gauge Zero (m AHD)	200 yr ARI (m AHD)	200 yr ARI on Gauge	100 yr ARI (m AHD)	100 yr ARI on Gauge	50 yr ARI (m AHD)	50 yr mark on gauge	20 yr ARI (m ADH)	20 yr mark on Gauge	10 yr ARI (m AHD)	10 yr ARI on Gauge	5 yr ARI (m AHD)	5 yr ARI on Gauge	Mark on Gauge Jan 2011 FL (m)	Jan 2011 FL (m AHD)	Mark on Gauge 1983 FL (11yr ARI) (m)	1983 FL (11yr ARI) (m AHD)	Mark on Gauge 1996 FL (5.8yr ARI) (m)	1996 FL (5.8yr ARI) (m AHD)
1	Wimmera River at old Town Gauge	124.39	126.40	2.01	126.25	1.86	125.9	1.51	125.7	1.31	125.10	0.71	124.80	0.41	1.89	126.28	0.71	125.1	0.07	124.46
2	Wimmera River at Riverside	124.70	127.90	3.20	127.75	3.05	127.6	2.90	127.4	2.70	126.70	2.00	126.60	1.90	3.05	127.75	2.00	126.7	1.95	126.65
3	Wimmera River at Mamma Bridge	139.75	143.45	3.70	143.30	3.55	143.25	3.50	143.1	3.35	142.85	3.10	142.80	3.05	3.75	143.5	3.10	142.85	3.00	142.75
4	Wimmera River at Fauvi's Bridge	147.65	150.85	3.20	150.80	3.15	150.7	3.05	150.45	2.80	150.20	2.55	150.00	2.35	3.20	150.85	2.55	150.2	2.50	150.15
5	Sheepwash Creek at Wal Wal Road	146.28	149.30	3.02	149.10	2.82	149	2.72	148.85	2.57	148.65	2.37	NA	NA	2.82	149.1	2.37	148.65	1.92	148.2
6	Mt William Creek at Wal Wal Road	147.89	149.10	1.21	149.00	1.11	148.8	0.91	148.6	0.71	NA	NA	NA	NA	1.11	149		no flow at this ARI		no flow at this ARI
7	McKenzie River at Tatlocks Bridge	184.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.00	186.22	No flood contours or flood extent mapping available			
8	Burnt Creek at Millers Road	139.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.31	141.21	No flood contours or flood extent mapping available			
9	Burnt Creek at Williams Road (footbridge)	124.70	127.40	2.70	127.20	2.50	126.8	2.10	126.4	1.70	NA	NA	NA	NA	2.20	126.9	NA	NA	NA	NA
10	2 Mile Creek at Misery Bridge	130.34	132.40	2.06	132.20	1.86	132	1.66	131.8	1.46	131.20	0.86	131.00	0.66	1.76	132.1	0.86	131.2	0.66	131
11	Yarriambiack Creek at Longerenong Road	134.27	136.70	2.43	136.60	2.33	136.59	2.32	136.58	2.31	136.57	2.30	136.56	2.29	2.33	136.6	2.30	136.57	2.29	136.56

APPENDIX B1– FLOOD THREATS FOR DADSWELLS BRIDGE

1. General

The town of Dadswells Bridge is located in the north of the Mt William Creek catchment, downstream from Lake Lonsdale, approximately 28km northwest of Stawell, and is within the Rural City of Horsham. The town is situated on the banks of Mount William Creek adjacent to the Western Highway.

The catchment originates in the Grampians Ranges and the foothills to the immediate east of the Grampians Ranges. From its headwaters it flows generally in a northerly direction into and out of Lake Lonsdale and then to its confluence with the Wimmera River north of Dadswells Bridge. As Mt William Creek flows into agricultural areas the topography flattens to form a wide floodplain with many incised creeks.

Lake Lonsdale is upstream of Dadswells Bridge and was built in 1903. It is an on-stream storage on Mount William Creek within the Northern Grampians Shire Depending on the initial draw down of the Lake at the start of a flood and the magnitude of the flood, the Lake can reduce peak flows by up to 25%.

Dadswells Bridge is affected by riverine flooding of the Mt William Creek. Damaging floods inundated the town in 1909, 1975, 1981, 1992 and January 2011.

The lower reaches of Mount William Creek are heavily influenced by several GWMWater channels and storages. During large flood events, the lower reaches are also heavily influenced by flows in the Wimmera River.

There are three major storages in the catchment: Lake Bellfield on Fyans Creek, Lake Fyans, an off-stream storage linked by channels to Fyans Creek, and Lake Lonsdale on Mount William Creek.

2. Flood Studies and other flood information

2.1 Flood Studies

The Wimmera CMA completed a major flood study of the Mt William Ck catchment in 2014. Information from that flood study has been used to delineate the extent of flooding in the Mt William Ck catchment within the Horsham Rural City municipality.

The study included the determination and documentation of flood levels, extents, velocities and depths (and thus flood risk) for a range of flood events (5, 10, 20, 50, 100 and 200-year recurrence intervals and Probable Maximum Flood) and including consideration for climate change.

2.2 Cadastral datasets

The Wimmera CMA holds digital cadastral information, licenced from DELWP, in ESRI Shapefile format.

2.3 Satellite imagery

The Mount William Creek catchment is covered by 10m pixel Spot VNIR 2001 satellite imagery.

2.4 Aerial photography

Various sub-catchments are covered by 1:46,000 digital orthorectified colour aerial photography, with pixel resolution of 1m (flown 2002).

The entire catchment is covered by 1:40,000 digital orthorectified colour aerial photography, with pixel resolution of 0.6 m (flown 2011). 50 cm 2010 orthorectified true colour aerial photography is also available.

The Wimmera CMA also has 15 cm visual and near-infrared aerial photography for selected streams within the Wimmera catchment flown in January 2011 during the flood event. There is also 15cm aerial

photography of selected streams flown in December 2009.All aerial photography is available as ECW format.

2.5 Digital Elevation Model

Wimmera CMA has a catchment-wide Airborne Laser Scanning derived Digital Elevation Model (DEM). This has been used to inform flood studies, and modelling, resulting in delivery of high quality information about flood levels at properties roads and other assets. This data has provided the backbone of many of the products contained in this plan.

2.6 Flood Intelligence Cards

All flood intelligence records are approximations. This is because no two floods at a location, even if they peak at the same height, will have identical impacts. Flood intelligence cards detail the relationship between flood magnitude and flood consequences. More details about flood intelligence and its use can be found in the Australian Emergency Management Manuals flood series at http://www.ema.gov.au and in particular in Manual 20 “Flood Preparedness”

3. Historic Floods

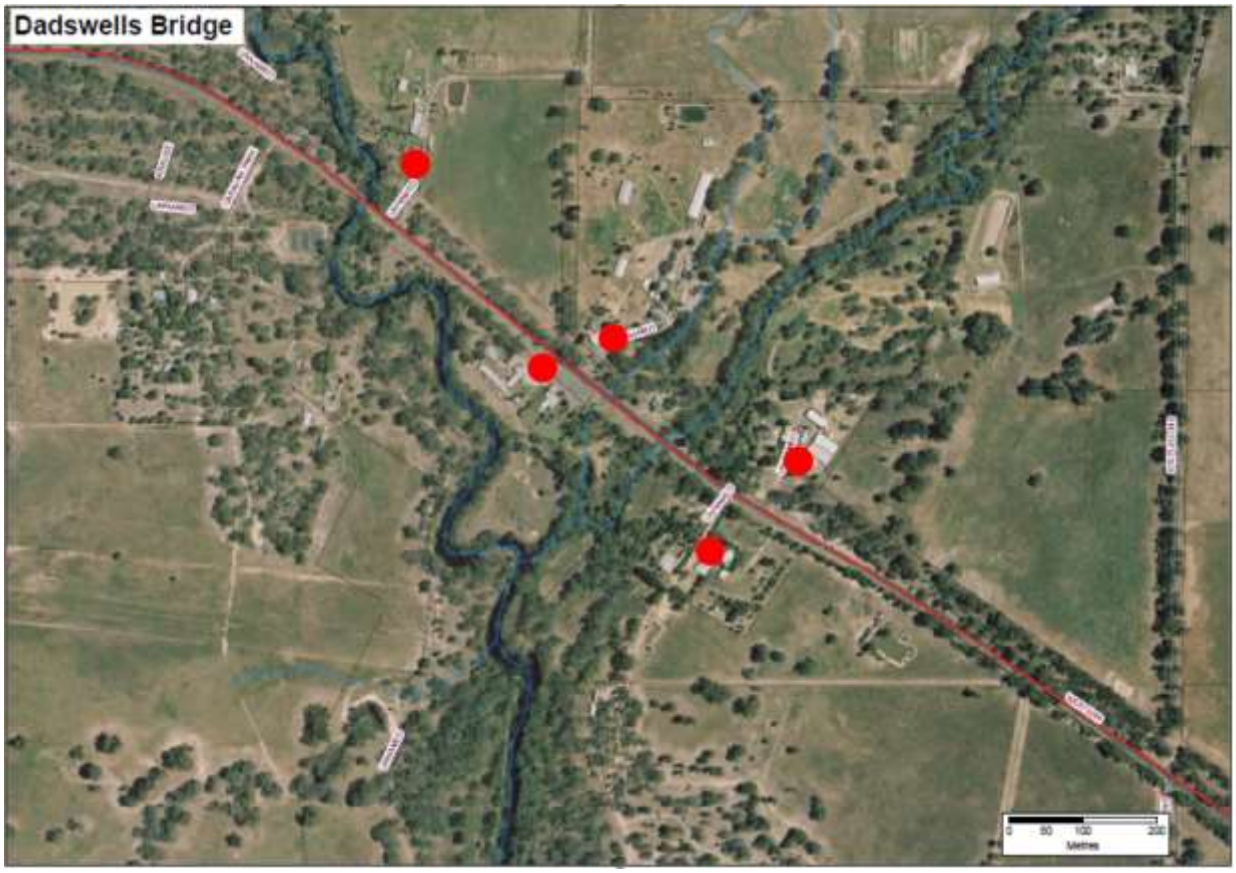
Damaging floods inundated Dadswells Bridge in 1909, 1975, 1981, 1992 and January 2011.

The January 2011 event was initiated by record rainfall (267mm in 3 days at Mt William and 161mm at Dadswells Bridge over the 10-12 January: 11mm, 75mm & 75mm respectively) in the catchment which resulted in the largest flood in memory along Mount William Creek.

At the start of the event, Lake Lonsdale was at 93.8% capacity (49,986 ML). During the event it is estimated to have peaked at 70,205 ML (131.7% capacity). GWMWater estimated the peak flow at the tail gauge was approximately 38,527 ML/d, marginally below the estimated 1% AEP flood flow of 44,200 ML/d (see photograph below). The previous highest flood recorded at the tail gauge (27,300 ML/d) occurred in 1909.

Photo - Lake Lonsdale Spilling 2011

The 2011 flood caused widespread damage to property along the length of the creek and resulted in the inundation of a number of homes and buildings in Dadswells Bridge (see photograph below).



4. Flood Threats

4.1 Rainfall

The following rainfall amounts (if they fall generally over the Upper Wimmera River catchment) could lead to flooding but are provided as an indicative guide only.

General rain greater than a 20% AEP event over the Upper Wimmera River catchment signals a need for increased vigilance for possible flooding of low lying farmland along the Wimmera River and its tributaries.

General rain greater than 5% AEP event over the Upper Wimmera River catchment signals a need for increased vigilance for possible of flooding of low lying areas in Horsham.

The table below provides an indication of upper catchment rainfall parameters associated with different AEP events.

Users of the flood intelligence card should consider rainfall depth and rates at locations in the vicinity of Horsham when at risk of stormwater inundation and streamflow gauges when at risk of floodwater inundation. Local data and data from the BoM website (http://www.bom.gov.au/) should be used. It is suggested that the following sites, available from the BoM website, will provide useful indicative rainfall data:

- Horsham AWS;
- Stawell AWS;
- Wimmera River Upstream Dimboola;
- Longerenong AWS; and
- Polkemmet Road (Horsham) AWS.

Table 11 Halls Gap Intensity-Frequency-Duration (IFD) Design Rainfalls Source: BoM

	Annual Exceedance Probability (AEP)				
Duration	20%	10%	5%	2%	1%
1 hour	22.8	27.7	33.1	40.9	47.5
2 hour	28.6	34.7	41.2	50.7	58.7
3 hour	32.9	39.8	47.1	57.7	66.6
6 hour	42.6	51.3	60.3	73.2	83.7
12 hour	55.9	66.9	78.2	93.8	106.4
24 hour	72.6	86.4	100.2	119.1	134.1
48 hour	90.6	107.2	123.7	145.9	163.2
72 hour	100.9	118.8	136.5	160.3	178.7
96 hour	107.9	126.6	145	169.5	188.3
120 hour	113.4	132.6	151.3	176	195
144 hour	118.1	137.6	156.5	181.2	200
168 hour	122.4	142.1	161.1	185.6	204

5. Description of Major Waterways

Waterway or Drain	Description
Mount William Creek	The river gauge most relevant to Dadswells Bridge is the Lake Lonsdale tail gauge, located just downstream of the Lake Lonsdale outlet. Note that the Mt William Creek Flood Investigation (WBM, 2014) identified possible PALS locations at Dadswells Bridge and linked these locations to the flood inundation maps; and

6. Dams

Table 12 - Major Dams upstream of Dasdwells Bridge

Location	Owner	Capacity (ML)	Comments
Lake Bellfield	GWMWater	78,500	On-stream storage upstream of Halls Gap and Dadswells Bridge via Lake Lonsdale
Lake Lonsdale	GWMWater	65,500	On-stream storage upstream of Dadswells Bridge, normally operated to a maximum volume of 53,300 ML.
Lake Fyans	GWMWater	18,500	Off-stream storage upstream of Dadswells Bridge via Lake Lonsdale

APPENDIX B2 - TYPICAL FLOOD PEAK TRAVEL TIMES

1. Mt William Creek

The Mount William Creek catchment includes a number of waterways, namely, Mount William Creek, Salt Creek, Fyans Creek, Pleasant Creek, Sheepwash Creek and Golton Creek along with their tributaries. The Wimmera River heavily influences the downstream reaches of the catchment. The majority of the catchment is used for agricultural purposes, predominately grazing. There are several townships within the catchment including Pomonal, Moyston, Stawell, Dadswells Bridge and Halls Gap.

Table 13 Mt William Creek - Typical Flood Peak Travel Times Source: WBM 2014

Location From	Location To	Approx. Time	Comments
Start of rainfall	Lake Lonsdale	1 – 2 days	Depends on catchment wetness
Start of rainfall	Dadswells Bridge	2 to 5 days	Highly dependent on rainfall totals and the level of Lake Lonsdale prior to the event
Lake Lonsdale spillway	Dadswells Bridge	8 to 12 hours	With Lake Lonsdale spilling

APPENDIX B3 –FLOOD EMERGENCY PLAN - DADSWELLS BRIDGE

1. Overview of flooding consequences

The township of Dadswells Bridge is, located on the Western Highway 30 kilometres north-west of Stawell on the Western Highway. The Mt William Creek flows through the town. The Lake Lonsdale tail gauge records flows in the section of Mt William Creek that is relevant to Dadswells Bridge. Lake Lonsdale can absorb flood flows until it fills from which point on the Mt William Creek flow at Dadswells Bridge reflects total flows in the catchment.

In past floods six residences, four businesses and the town hall have been impacted by flooding however the town hall floor has been raised post the January 2011 flood.

1.1 Warning Times

Flooding in the Mount William Creek catchment is generally caused by significant rainfall over the catchment upstream of Lake Lonsdale. This usually results from a large regional event. Locally intense rainfall can lead to flash flooding in the upper reaches around Moyston and Pomonal but flooding downstream of Lake Lonsdale and around Dadswells Bridge would not be expected unless Lake Lonsdale was spilling.

In general terms, response time for the upper parts of the catchment is much shorter than for the catchment below Lake Lonsdale. It is generally considered to be of order 1 - 2 days, while response in the lower catchment is considered to be of order of 2 - 5 days and highly dependent on the available storage within Lake Lonsdale.

Floods develop and rise quickly in the upper parts of the catchment around Moyston and Pomonal, particularly when the area is wet. Response times on a wet catchment would be expected to be generally less than 6 hours but could be a day or longer when the area is dry, provided that rainfall was not intense.

The situation at Dadswells Bridge is different. Response time (i.e. the time from the beginning of rain to initial stream rises) is very much longer and heavily influenced by the level of Lake Lonsdale and whether it is spilling.

Travel time from Lake Lonsdale (when it is spilling) to Dadswells Bridge ranges from around 8 to 12 hours, depending on the size of the flood.

1.2 Areas and Properties Affected

The Mount William Creek Flood Investigation (WBM, 2014) has shown that damage other than to roads (e.g. disruption and restrictions to regional access) and the agricultural sector (e.g. fences, pasture, etc) arising from floods less than the 1% AEP (100-year ARI) event is not large and comes from flooding of 25 properties 11 of which also experience over-floor flooding. Seven of the over-floor flooded buildings are in Dadswells Bridge (the motel, 2 x houses and 2 x shops) with the balance at Stawell (1 x house, 2 x shops and a nursery).

Four of the 7 properties flooded over-floor in Dadswells Bridge begin to be wetted between the 10-year and 20-year ARI events. Floods more severe than the 1% AEP event result in an increase in the number of buildings at-risk of over-floor flooding (up from 7 to 18 at the PMF with only 1 building not flooded over-floor) and additional disruption and restrictions to regional access due to flooded roads.

The flood inundation maps at **Appendix B6** provide guidance on the likely extent and depth of flooding

A summary and a detailed listing of the properties likely to be flooded and inundated over-floor is provided in the table below, and in the table in section 5.2

Summary of number of flood affected properties in Mt William Creek catchment within HORSHAM RURAL CITY (ref WBM, 2014) EXISTING CONDITIONS							
	Design Flood AEP (%)						
	20%	10%	5%	2%	1%	0.5%	PMF
Level at primary PALS site (mAHD) see note #	163.785	164.227	164.555	164.713	164.785	164.820	165.294
Level at alternative PALS site (mAHD) see note ##	163.716	164.113	164.505	164.713	164.798	164.871	165.495
Number of properties flooded above floor	0	0	4	7	7	7	18
Number of properties flooded below floor only	0	0	4	4	7	8	1
Total number of flooded properties	0	0	8	11	14	15	19
Number of properties within 100 mm of flooding over-floor	0	0	0	0	2	2	0

PALS stands for Portable Automated Logging System. The primary site refers to a location at the Mt William Ck main channel immediately upstream of the Western Highway at the Bridge, at coordinates 634571.354E, 5913394.967N.

Alternative PALS site is Mt William Creek overflow channel immediately upstream of the Western Highway between the Big Koala and Dadswells Bridge Town Hall at coordinates 634904.264E, 5913125.352N.

1.3 Road Network

Access to Dadswells Bridge from Horsham and Stawell can be cut by floodwaters.

The Western Highway at Dadswells Bridge is inundated by floods from between the 20-year and 50-year ARI level. During a large flood the Western Highway is likely to remain impassable for 2 to 3 days.

Most of the smaller roads in the Mount William Creek floodplain between Lake Lonsdale and the Wimmera River are inundated progressively by large floods.

1.4 Critical Infrastructure

There is no known essential infrastructure affected by flooding at Dadswells Bridge, other than the Western Highway, although the motel is flooded over-floor during large events.

The Western Highway at Dadswells Bridge is the main Adelaide – Melbourne road link.

Community facilities at Dadswells Bridge – Motel (affected by January 2011 flood). Note also that the Town Hall was affected during the January 2011 flood but the floor has since been raised to in excess of the 1% level.

2. Structural Flood Mitigation Measures

2.1 Flood protection Levees

An historic levee is located adjacent to Mt William Creek at Dadswells Bridge. This levee was constructed to protect the Dadswells Bridge Motel and Giant Koala café from inundation. During the January 2011 flood, floodwaters overtopped and moved around this levee. It provides protection to 10% AEP level.

3. Flood Impacts and Required Actions

3.1 Sandbag Strategy

The strategy has the following elements:

Prior to a flood:

- Both HRCC and VICSES will ensure that there are sufficient numbers of sandbags in stock in strategic locations in preparation for floods.

When a flood warning has been issued or flooding is imminent:

- HRCC and VicSES will ensure that sandbag stocks are located in appropriate locations based on the nature of the expected flooding. The nearest Council stock pre-flood is at Horsham.
- For example, sandbags will be located on either side of areas that will be cut by floodwaters during peaks.
- Stocks of sand will also be deposited at these locations.
- The ICC will be advised of these locations.
- Sandbags will be allocated to properties in the following priority:
    - Critical infrastructure,
    - Residences
    - Other buildings
- Sandbags will, in preference, be allocated to properties known to suffer inundation as identified in the appendices to this plan.
- Sandbags will be allocated having regard to the structure of the buildings being protected. E.g. Residences on concrete slabs may need a smaller number of sandbags than houses on stumps. In some cases it may not be viable to complete sandbag a weatherboard house.

3.2 Disruption to Essential Services

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

Service	Impact	Trigger Point for action	Strategy/Temporary Measures
All services using Western Hwy	Highway closed from 1 to 3 days	Water encroaching on the highway.	Close highway at Horsham and Stawell
School bus lines, postal services, railway bus service, emergency services.	Highway closed from 1 to 3 days	Water encroaching on the highway.	Notify agencies and authorities.

3.3 Disruption to Essential Community Infrastructure

Refer to **Appendix B3 Section 5.2**, Flood Intelligence Card – Dadswells Bridge, page 150

3.4 Disruption to Road Network

This work is currently being undertaken and will be included in future versions of this plan.

4. Command, Control and Coordination

The Incident Control Centre for Dadswells Bridge will be located at DELWP Wimmera District Office, Natimuk Rd Horsham. Support for the ICC will be arranged with partner agencies and an EMT will be established at this location.

Division Command will be established at Dadswells Bridge CFA Station and will be staffed by SES and partner agencies prior to the arrival of floodwaters. As this site is likely to be isolated from the centre of Dadswells Bridge during the peak of a major flood, implementation of control measures, as described in the following section, needs to occur prior to the arrival of the peak.

5. Flood Intelligence Card

5.1 Introduction

Flood impacts described in the following table relate riverine flooding to consequences and actions. It should be noted that local impacts, or impacts in excess of those indicated, may occur. Similarly, local increases in flood levels and impacts may result from local factors such as blockages at bridges and from obstructions to overland flows such as works, channels, fences, buildings and the like.

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 intell detailed below is informed by a number of assumptions and approximations 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. It should be noted that local impacts, or impacts in excess of those indicated, may occur. Similarly, local increases in flood levels and impacts may result from local factors such as blockages at bridges and from obstructions to overland flows such as works, channels, fences, buildings and the like.

3. All levels, impacts and actions listed in the following flood intelligence card and graph may need to be adjusted to better reflect experience.

4. Possible flood trigger: flow at the Lake Lonsdale tail gauge exceeding 2,000 ML/d.

5. Trigger for heightened vigilance:

    - If Lake Lonsdale is less than 50% full and rainfall exceeds the 12 hour 1% AEP (100-year ARI) value (see IFD table below)

    - If Lake Lonsdale is more than 50% full and rainfall exceeds the 12 hour 2% AEP (50-year ARI) value (see IFD table below).

    - Ideally, flood warnings and flood bulletins issued by the BoM and VICSES should provide the residents of Dadswells Bridge with at least 15 hours’ notice of impending flooding

thereby allowing sufficient time for residence and business owners to prepare their properties for the flooding.

6. Sandbag walls need to be constructed with a plastic membrane to be effective barriers to flood waters.

7. Horsham Rural City Council and VICSES will establish a sandbag collection point preceding the event.

5.2 Flood Intelligence Card – Dadswells Bridge

Location	Facility	Approximate over floor flooding height, January 2011 flood.	Strategies for Property Owners and Emergency Agencies
5802 Western Highway north side.	Brad Engineering complex and residence on stumps.	20cm	Evacuate residents. Remove or raise valuable items.
5803 (could be 5805) Western Highway south side.	Cement sheet house on stumps.	5cm	Evacuate residents. Remove or raise valuable items.
5829 Western Highway south side.	Giant Koala café, slab floor.	30cm	Sandbag doors and vents. Remove or raise valuable items. Evacuate residents.
5828 Western Highway north side.	Deutscher's Turkey Farm. Slab floor factory.	Processing factory, 7cm	Sandbag doors and vents. Remove or raise valuable items. Evacuate residents.
5835 Western Hwy, south side.	Dadswells Bridge Motel, slab floor	75cm	Sandbag doors and vents. Remove or raise valuable items. Evacuate residents.
Western Hwy, south side.	Dadswells Bridge Caravan Park, cement sheet on slab amenities block.	35cm	Sandbag doors and vents. Remove or raise valuable items. Rest off caravan park above flood level
5862 Western Hwy, north side, to west of Turkey farm	Weather board house on stumps		

6. Property Inundation Table – Dadswells Bridge

6.1 Introduction

The following is a list of properties expected to experience flooding (and the depth of that flooding) along with an indication of the likely depth of over floor flooding. It is strongly recommended that the following list be used in conjunction with the flood inundation maps **Appendix B6 Maps**.

Mount William Creek Catchment – EXISTING CONDITIONS (ref WBM, 2014) It is suggested that this table is used in conjunction with the flood inundation maps and flood intelligence card for Mount William Creek															
LEGEND		Within ~100 mm of flooding over-floor							Depth of over-floor flooding						Comments
Location (Number & Street)	Depth of flooding near building for each ARI							Depth of over-floor flooding at property for each ARI							
	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	PMF	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	PMF	
DADSWELLS BRIDGE															
171 Crutes Road						0.23	1.14							0.77	House
284 Delahuntys Road					0.10	0.18	1.20					-0.08	0.00	1.02	House
180 Jackmans Road					0.03	0.19	1.33							0.84	House
20 Krause Road, Western Hwy							0.40							0.02	Shop at Caravan Park
91 Stapledons Road			0.20	0.32	0.38	0.42	1.32							0.40	House
96 Stapledons Road							0.85							0.51	House
363 Stapledons Road			0.36	0.42	0.45	0.49	1.12							0.22	House
5799 Western Highway				0.43	0.60	0.67	1.22				0.01	0.18	0.25	0.80	House

Mount William Creek Catchment – EXISTING CONDITIONS (ref WBM, 2014)

It is suggested that this table is used in conjunction with the flood inundation maps and flood intelligence card for Mount William Creek

LEGEND		Within ~100 mm of flooding over-floor							Depth of over-floor flooding							Comments
Location (Number & Street)	Depth of flooding near building for each ARI							Depth of over-floor flooding at property for each ARI							
	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	PMF	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	PMF	
5802 Western Highway			0.44	0.59	0.63	0.67	1.24			0.21	0.36	0.40	0.44	1.01	House
5803 Western Highway							0.92							0.21	House
5805 Western Highway				0.34	0.50	0.58	1.12				0.31	0.47	0.55	1.09	Shed
5828 Western Highway			0.22	0.37	0.41	0.45	0.89					-0.06	-0.02	0.42	House
5828 Western Highway			0.47	0.62	0.66	0.69	1.16			0.26	0.41	0.45	0.48	0.95	Shop
5829 Western Highway				0.27	0.37	0.43	0.88				0.27	0.37	0.43	0.88	Shop
5835 Western Highway			0.38	0.64	0.75	0.80	1.24			0.33	0.59	0.70	0.75	1.19	Restaurant
5835 Western Highway			0.30	0.56	0.67	0.72	1.18			0.26	0.52	0.63	0.68	1.14	Motel
5862 Western Highway			0.11	0.15	0.14	0.18	0.62							0.27	House
6604 Western Highway							0.34								House
St HELENS PLAINS															
137 Whyatts Road					0.11	0.20	1.57							1.26	House

APPENDIX B4 - FLOOD EVACUATION ARRANGEMENTS

Phase 1 - Decision to Evacuate

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); and
- Essential services have been damaged and are not available to a community and evacuation is considered the most effective risk treatment.
- The following should be considered when planning for evacuation:
- Anticipated flood consequences and their timing and reliability of predictions;
- Size and location of the community to be evacuated;
- Likely duration of evacuation;
- Forecast weather;
- Flood Models;
- Predicted timing of flood consequences;
- Time required to conduct the evacuation;
- Time available to conduct the evacuation;
- Evacuation priorities and evacuation planning arrangements;
- Access and egress routes available and their potential flood liability;
- Current and likely future status of essential infrastructure;
- Resources required to conduct the evacuation;
- Resources available to conduct the evacuation;
- Shelter including Emergency Relief Centres, Assembly Areas etc;
- Vulnerable people and facilities;
- Transportation;
- Registration
- People of CALD background and transient populations;
- Safety of emergency service personnel; and
- Different stages of an evacuation process.
- The decision to evacuate is to be made in consultation with the MERO, MERC, VicPol Evacuation Manager, DHS, Health Commander and other key agencies and expert advice (CMA's and Flood Intelligence specialists).

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

Towns	Gauge	Trigger
Dadswells Bridge	Lake Lonsdale Tail Gauge	Discharge > 10,000ML/d

The table below details time required to evacuate established areas.

Town	Likely time required for evacuation (including resource assumptions)
Dadswells Bridge	0.5 hours to undertake door knock with 1 team

The following **Evacuation Checklist** can be used as a guide when evaluating the need for evacuation in a particular area as a result of flooding.

Key Questions	Answers
Are there any existing Flood Evacuation Plans for the Municipality?	
Name of area(s) at risk.	
How many people are at risk (including special needs groups)?	
When and where are access routes likely to be disrupted?	
Is the area a flood island, accessible by road, accessible overland or land locked?	
How much time is available to warn the area? **Where Flash Flooding risks exist adopt the strategy detailed in Section 3.8 of this MFEP.**	
Under what circumstances and in what areas is shelter in place and not evacuation the best option?	
Where are Flood Relief Centres located?	
What are the triggers for evacuation? (i.e. a particular area at a specified gauge height?) – refer to Appendix C of this MFEP.	
How will evacuation warning messages be communicated to people?	
Have standard evacuation messages been developed for predicted or likely flood scenarios?	

What forms of transport are needed to assist with evacuation?	
Where are airbase facilities located?	
Where are animal shelter compounds located? Any other arrangements for management and accommodation of pets / animals?	
What are the local command and control arrangements for evacuation?	
Other Confirmations and Clarifications:	
Clarify and confirm local arrangements and responsibilities for evacuation at the local level. This includes: • Confirming and facilitating local awareness of responsibilities for the decision to evacuate (i.e. Incident Controller), the management of evacuation (i.e. VicPol) and the tasks to be undertaken for evacuation (i.e. development and communication of evacuation warnings). • The role of agencies at the local level involved in evacuation (i.e. VicPol, VICSES, Australian Red Cross, etc.) Local arrangements must be consistent with arrangements as set out in Part 8 of the EMMV and the Evacuation Guidelines.	

Phase 2 – Warning

Warnings may include a warning to prepare to evacuate and a warning to evacuate immediately. Once the decision to evacuate has been made, the at-risk community will be warned to evacuate. Evacuation warnings can be disseminated via methods listed in Phase 3 (below) of this plan.

Evacuation warning messages will be developed and issued by SES in consultation with the VICPOL Evacuation Manager, MERO, MERC, DHS and other key agencies and expert advice (CMA's and Flood Intelligence specialists).

The evacuation messaging for Dadswells Bridge should incorporate the timing of the arrival of flood water including the time to peak levels and the expected time that flood waters will overtop the Western Highway. The messaging should also include reference that floodwaters will rise at a steady rate and it will take several hours for floodwaters to reach peak heights and threaten or possibly buildings.

Phase 3 – Evacuation

Withdrawal will be controlled by the VicPol Evacuation Manager. The Evacuation Manager is responsible for managing the withdrawal which will include developing an evacuation plan which clearly identifies activities and timelines as well as the roles and responsibilities of any agencies involved.

VICSES will provide advice regarding the most appropriate evacuation routes and locations for at-risk communities to evacuate to, etc.

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

VICPOL will control security of evacuated areas.

Special needs individuals are identified in Council's 'Vulnerable Facilities / Persons Register.

Phase 4 – Shelter

Relief Centres catering for people's basic needs may be established to meet the immediate needs of people affected by flooding. Emergency Relief Centres are listed in the HRCC MEMP in the Emergency Relief Centre Supporting Plan. Maps of Relief Centre locations are provided in the Emergency Relief Centre Supporting Plan. The appropriate Relief Centre for the event will be advised to the public via multi media outlets during the incident.

VICPOL in consultation with SES will liaise with Local Government and DHS (where regional coordination is required) via the relevant Incident 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

The Wimmera Animal Welfare Plan is a supporting plan to the HRCC MEMP and outlines procedures to follow when dealing with animals both domestic and livestock during an emergency.

Matters relating to the welfare of wildlife are to be referred to DELWP.

Phase 5 – Return

The Incident Controller in consultation with VICPOL Evacuation Manager 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

APPENDIX B5 - FLOOD WARNING SYSTEMS – Dadswells Bridge

1. Flood Warning Products

Flood warning products and flood class levels can be found on the BoM website. Flood warning products include severe thunderstorm warnings, severe weather warnings, flood watches, flood warnings, flood bulletins and local flood warning systems.

BoM Severe Weather Warnings are issued for relevant areas when required. These are delivered to all agencies and SES engages with the Municipality and Emergency Service Organisations to ensure operational readiness.

1.1 Severe Thunderstorm and Severe Weather Warnings

The BoM can forecast the environment in which severe thunderstorms or small scale weather systems that are locally intense and slow moving may occur and provides a generalised service to that effect. However, it is not yet technically possible to predict individual flash flooding events except on time scales of tens of minutes at the very best.

The BoM issues warnings of flash flooding when it becomes apparent that an event has commenced which may lead to flash flooding or when flash flooding has commenced.

1.2 Flood Watches

Flood watches are issued by the BoM to notify communities and other stakeholders within broad areas (rather than specific catchments) of the potential flood threat from a developing weather situation. They provide a 'heads up' of likely flooding.

Flood watches are based on an assessment of the developing weather situation and indicators of current catchment wetness. They provide generalised statements about expected forecast rainfall totals, the current state of the catchments within the target area and the streams at risk from flooding. Instructions for obtaining rain and stream level observations and access to updated Watches and Warnings are also included.

Normally, the BoM would issue a Flood Watch 24 to 36 hours in advance of any likely flooding and issue updates as required. If at any time during that period there was an imminent threat of floods occurring, the Flood Watch would be upgraded to a Flood Warning.

1.3 Flood Warnings

1.3.1 Overview

Flood Warnings are firm predictions of flooding based on actual rainfall and river height information as well as the results of stream flow based models of catchment behaviour that take account of antecedent conditions (i.e. the 'wetness' of the catchment, storage levels within dams, etc) and likely future rainfall. Releases from dams are an essential input to such models.

Flood warnings are categorised as 'minor', 'moderate' or 'major' (see BoM website for an explanation of these terms and current flood class levels) and indicate the expected severity of the flood for agreed key locations along the river.

1.3.2 Mt William Creek

There is currently no specific flood warning system or arrangements in place for the Mt William Creek catchment or Dadswells Bridge township.

1.4 Flood Bulletins

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

The relevant SES Region Headquarters or the ICC will normally be responsible for drafting, authorizing and issuing issue Flood Bulletins.

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

Flood Bulletins should follow the following structure:

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

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

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

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

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

1.5 Local Flood Warning System Arrangements

There are currently no specific local flood warning systems or arrangements in place within Dadswells Bridge. A system of community observers is being currently developed.

2. Flood Class Levels

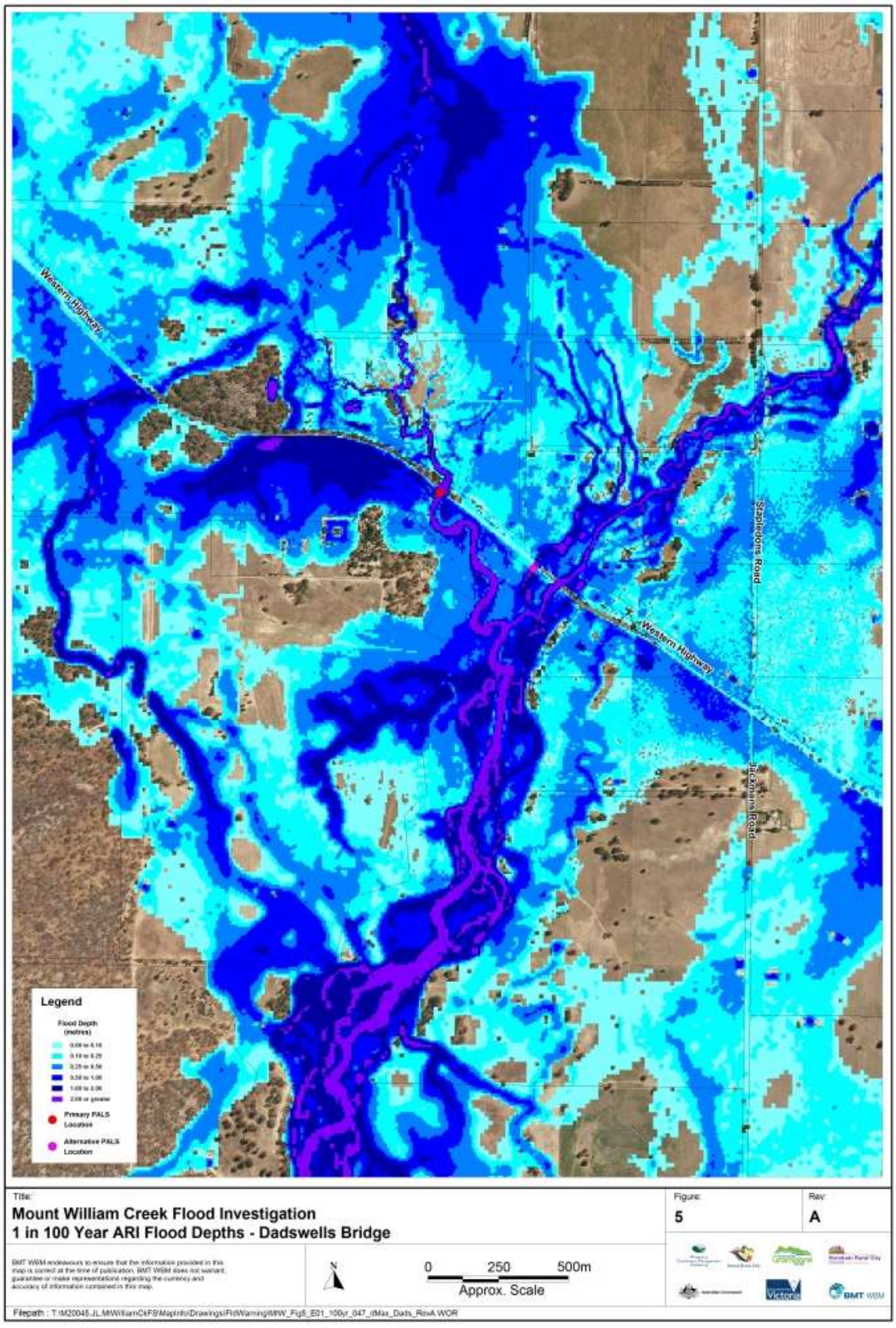
The occurrence of a certain class of flooding at one point in a catchment will not necessarily lead to the same class of flooding at other points – for example along the main river and its tributary creeks or along a drainage network's overland flow paths. This is because the floodplain physiography and use (and thus flood impact) varies along the river or flow path and also because antecedent conditions combined with where and how rainfall occurs (both in time and space) will drive how a flood develops and progresses.

It is emphasised that the flood class levels quoted in the table below refer to that part of the watercourse where the flood effects can be related to the gauge reading.

It is important to remember that flood impact is dependent on more than the peak height or flow. The rate of rise, duration, extent and season of flooding are also important. For this reason, flood class levels can only be considered as a guide to flood severity.

APPENDIX B6 – MAP

3. Flood extent and depths for the 1% AEP (100 year ARI) event – Dadswells Bridge (WBM, 2014)



4. AEP (Annual Exceedance Probability) Flood and Flow Event Extent Map

Click on links below for maps

Flood Map Locations	1-in-5 year event	1-in-10 year event	1-in-20 year event	1-in-50 year event	1-in-100 year event	1-in-200 year event
	AEP Flood and Flow Events					
Mount William Creek 2014	20%	10%	5%	2%	1%	0.5%

PLEASE NOTE: *Maps are provided for general community information purposes only. Flood levels and floor levels are determined from information available at a particular time and actual levels may exceed those shown. For information about flood conditions and restrictions affecting a particular property, contact Wimmera CMA or the relevant council. Neither Wimmera CMA nor the State of Victoria claim or warrant that the information in this map is accurate, complete or up to date, and neither Wimmera CMA nor the State shall be responsible or liable in respect of any use of or reliance placed on it by any person.*

APPENDIX C1-FLOOD THREATS FOR NATIMUK

1. General

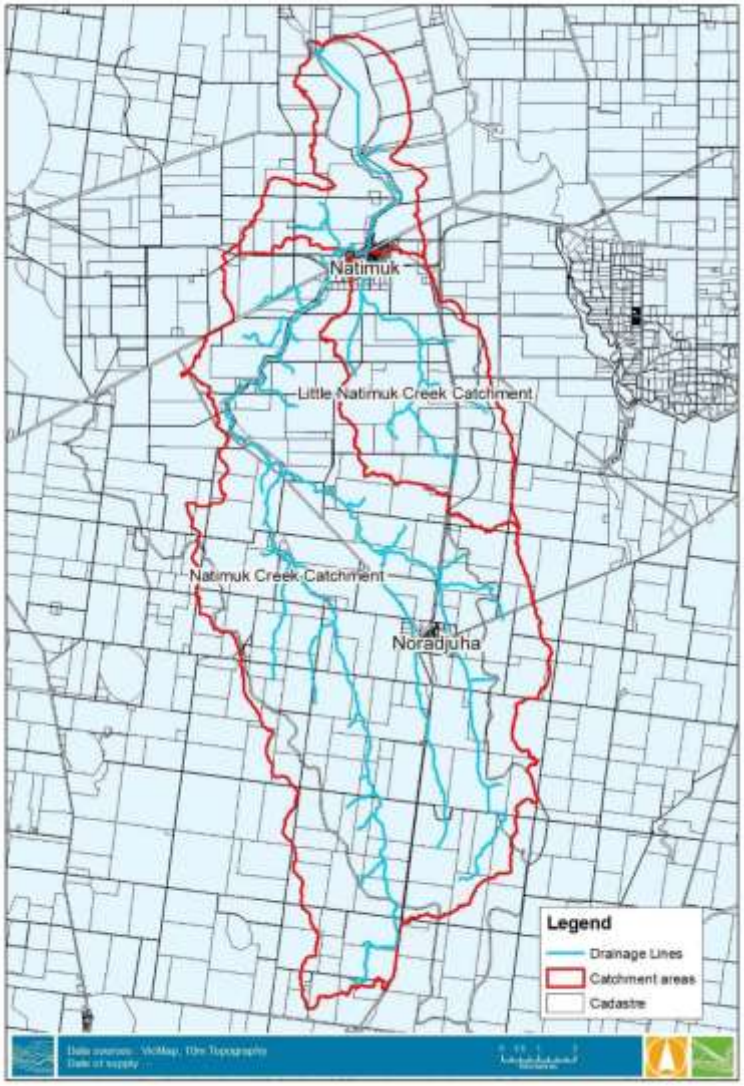
Natimuk is located in the Horsham Rural City municipality and is one of the three towns (Dadswells Bridge, Horsham and Natimuk) affected by flooding within the Municipality.

During heavy rain and subsequent high flow events, Natimuk Creek and Little Natimuk Creek flood parts of Natimuk.

Natimuk is situated on the Wimmera Highway approximately 25 km to the west of Horsham. The township of Natimuk sits at the confluence of Natimuk Creek and Little Natimuk Creek, with Natimuk Creek continuing north and terminating in Natimuk Lake. Natimuk Lake is managed by Parks Victoria and is used for recreation only. Natimuk Creek flows through largely agricultural areas (dry land cereal and cropping) around Noradjuha before flowing through the township of Natimuk. Natimuk Creek and Little Natimuk Creek have catchment areas of approximately 114 km^2 and 25 km^2 respectively. The catchment of these waterways extending to downstream of Natimuk Lake is shown in Figure 1-1. Much of the infrastructure in this township is located on a floodplain.

Both Natimuk Creek and Little Natimuk Creek are ephemeral. Both have no available streamflow information upstream of the township, with minimal information available for Natimuk Creek at Natimuk Lake, consisting only of a water quality gauge with nine spot level readings across April 2006 to October 2007.

Figure 1-1 Natimuk Creek Catchment (Source WaterTechnology 2013)



2. Flood Studies and other flood information

2.1 Flood Studies

Natimuk Flood Investigation Study Report, January 2013

2.2 Cadastral datasets

The Wimmera CMA holds digital cadastral information, licenced from DELWP, in ESRI Shapefile format.

2.3 Satellite imagery

There is no satellite imagery of flooding relevant to this catchment.

2.4 Digital Flood Extent Datasets and Flood Photography

The Victorian Flood Data (VFD) datasets (available from Wimmera CMA) contain a significant quantity of flood information in GIS format. For Natimuk this includes a number of surveyed flood levels from the January 2011 event. These levels are also available from the Wimmera CMA.

Aerial flood photography for the January 2011 event was flown between 17:28 and 18:35 on 12th January and is available from the Wimmera CMA. A number of ground level still photographs are available from the Wimmera CMA for the December 2010 and January 2011 events.

The Wimmera CMA also holds:

- Digital cadastral information as shape files.
- 10m pixel Spot 2001 satellite images for the region.
- A variety of 1:46,000 digital orthorectified colour aerial photograph with pixel resolution of 1m (flown in 2002), and 1:40,000 digital orthorectified colour aerial photograph with pixel resolution of 0.6m (flown in 2004/5) and 0.5m (flown in 2010).
- An airborne laser scanning derived Digital Elevation Model (DEM) with an RMSE of 0.5m.
- A LiDAR dataset derived in October 2011.

2.5 Digital Elevation Model

Wimmera CMA has a catchment-wide Airborne Laser Scanning derived Digital Elevation Model (DEM).

2.6 Flood Inundation Mapping

Flood inundation maps have been produced by Water Technology (September 2012) for the Natimuk and Little Natimuk creeks at Natimuk for the 5, 10, 20, 50, 100 and 200 year ARI flood events. A subset of those maps is included in this MFEP at **Appendix C6**.

These maps should be used in preference to those included in the Horsham Planning Scheme.

2.7 Flood Intelligence Cards

All flood intelligence records are approximations. This is because no two floods at a location, even if they peak at the same height, will have identical impacts. Flood intelligence cards detail the relationship between flood magnitude and flood consequences. More details about flood intelligence and its use can be found in the Australian Emergency Management Manuals flood series at http://www.ema.gov.au and in particular in Manual 20 “Flood Preparedness”

3. Historic Floods

3.1 August 1983 flood

Anecdotal comments indicate that this flood was 150 to 200mm lower than the January 2011 event. It has been suggested that post 1983 there were changes to the Natimuk Creek alignment and width to increase capacity downstream of the township.

3.2 December 2010 flood

Approximately 50-year ARI flood in Natimuk Creek and a little more severe in Little Natimuk Creek

Conditions across the Natimuk Creek catchment prior to the 6th to 8th December 2010 flood were wetter than average. The Natimuk rain gauge recorded above average rainfall for July, August and November.

The most notable rainfall prior to December was 23mm recorded on 25 November 2010. Falls of 6.6mm and 7.2mm were then recorded on the 1st and 3rd of December2010

Rainfall totals of 71.6mm and 54.2mm were recorded at Clear Lake and Natimuk on 8th December 2010 after an intense burst of rain of about 25-30mm on the 6th and further rain on the 7th December 2010.

Information available about the December 2010 event includes:

- Little Natimuk Creek peaked about 5 hours before Natimuk Creek.
- Several roads were inundated in Natimuk including the Wimmera Highway, Elmes Street and Lake Avenue (by Natimuk Creek) and Station Street and Jory Street (by Little Natimuk Creek).
- The marked aerial photograph below shows the approximate extent of flooding on Elmes Street in Natimuk.
- Water was observed to be 400mm higher at 19 Elmes Street in January 2011.
- Water was observed to be 200mm higher at 59 Lake Avenue in January 2011.
- Little Natimuk Creek did not overtop Main Street (Wimmera Highway) in Natimuk but was close to the soffit level and was 610mm higher in January 2011.
- Water covered the back of 87 Main Street and entered the shed.
- No houses were flooded above floor level.

3.3 January 2011 flood

Approximately 100-year ARI flood in Natimuk Creek and a little more severe in Little Natimuk Creek and largest flood on record.

Conditions across the Natimuk Creek catchment prior to the January flood were unusually wet. The Natimuk rain gauge recorded above average rainfall for July, August, November and December 2010. The most notable event in this lead-up period occurred between 6 and 8 December 2010.

The Natimuk rain gauge did not record any rainfall during January until the 10th, when 0.4mm was recorded.

Rain began to fall on Tuesday 11 January 2011 around 10pm. Maximum rainfall intensities were recorded between 6am and 6:30am on the 12 January 2011. Over 100mm of rain was recorded upstream of Natimuk at the Clear Lake gauge, 30km south of the township.

At Natimuk, Little Natimuk Creek had broken its banks and flooded properties along Jory Street by 7am on Wednesday 12 January 2011, 9 hours or so after the rain began and only around an hour after the most intense rain. Little Natimuk Creek peaked around 11am on the Wednesday. Water levels continued to rise until Natimuk Creek peaked at approximately 2:30pm on the Wednesday. Twelve (12) homes were evacuated during the event. A total of twenty-one buildings were inundated above floor level in Lake Avenue, Elmes Street, Wimmera Highway, Depot Lane and Jory Street. A number of roads were inundated in Natimuk including the Wimmera Highway, Elmes Street, Sudholz Street and Lake Avenue (by Natimuk Creek) and Station Street, Jory Street and Schmidt Street (by Little Natimuk Creek).

A second burst of rain occurred overnight on 13th / 14th January 2011. The highest intensities were recorded around 11pm on 13 January 2011. Both the Natimuk and Little Natimuk creeks rose. While flood heights and extents were not recorded, it is apparent that flood depths were less than on 12 January 2011.

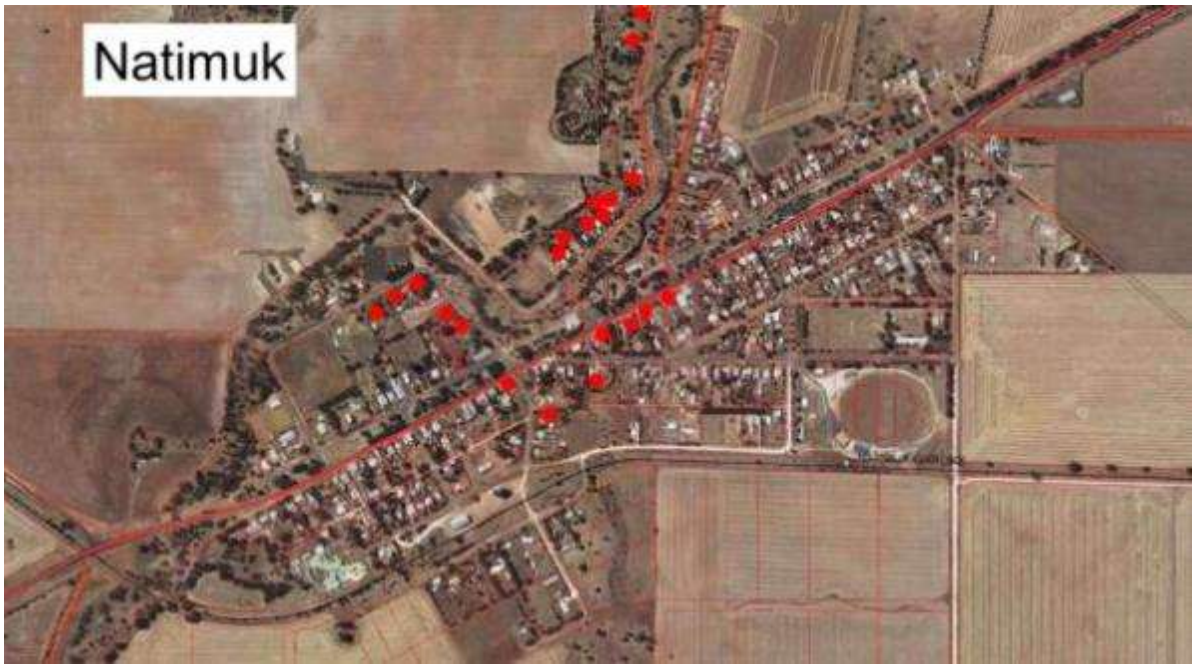


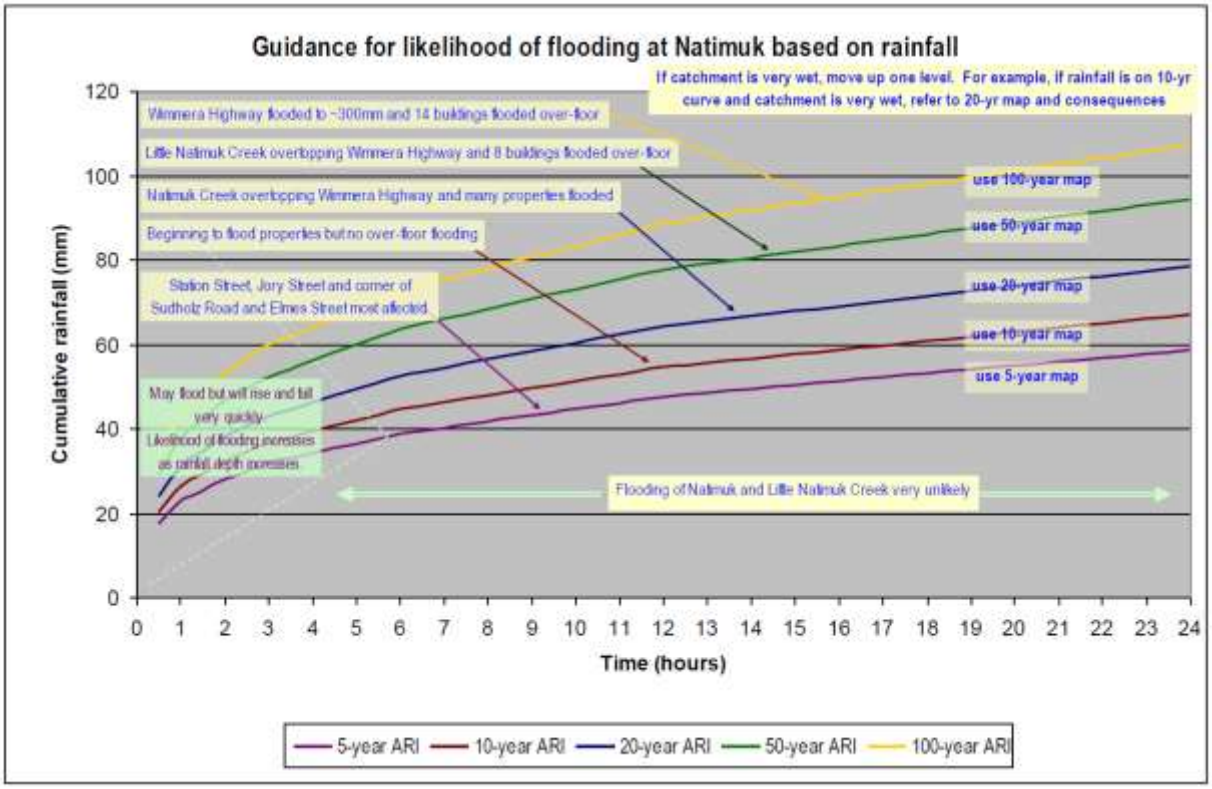
Photo 1 - Natimuk township, showing properties affected by Jan 2011 flood (source: WMCA)

Photo 2 Flooding through Natimuk on 12 Jan 2011 at 11.05am

4. Flood Threats

4.1 Rainfall

Figure 2 below, from the Natimuk Flood Investigation – Flood Intelligence Report 2013, provides a guide to the likely rainfall that will cause different levels of flooding in Natimuk.



4.2 Riverine Flooding

Generally, a wet catchment and a period of heavy rain are required to produce flooding at Natimuk.

4.2.1 Flash Flooding and Overland Flows

Short duration, high intensity rainfall (usually associated with severe thunderstorms or small scale weather systems that are locally intense and slow moving) can cause flooding within the Natimuk Creek catchment. Flooding from these storms occurs with little warning. Such events, which are mainly confined to the summer months, do not generally create widespread flooding since they only last for a short time and affect limited areas.

High intensity rainfall such as associated with thunderstorms giving average rainfall rates of typically more than 30 mm/hour in 30 minutes or so is likely to lead to high flows in the creeks and / or overland flows. Rainfall of this magnitude on a dry catchment is likely to cause some localised, but no over-floor, flooding in Natimuk whereas on a wet catchment it would result in severe flooding in the township.

5. Description of Major Waterways

5.1 Natimuk Creek

The Natimuk Creek catchment is isolated from the Wimmera River and comprises both the Natimuk Creek and the Little Natimuk Creek. The catchment extends from about 25 km south of Natimuk (ie. around 10 km south of Noradjuha or a little north of Toolondo) and is about 8 km wide. Natimuk Creek and Little Natimuk Creek have catchment areas of approximately 114 km^2 and 25 km^2 respectively. The two creeks come together immediately downstream of the Wimmera Highway within Natimuk. The creek then flows into Lake Natimuk around 3km downstream from town and terminates in Lake Wyn Wyn approximately another 5.5km downstream.

There are no substantial dams within the Natimuk Creek catchment although a privately owned swamp is located a short distance to the north of Natimuk and is fed by its own catchment. The swamp is separated from Natimuk Creek by a constructed embankment.

The area is relatively flat. A period of rain is required to “wet up” the catchment and fill the natural floodplain storage before significant runoff is generated. Water levels then rise quickly within the Natimuk and Little Natimuk creeks with initial rises occurring within an hour or so of the start of heavy rain and peak levels occurring within about 8 hours in Little Natimuk Creek and within 12 to 16 hours in Natimuk Creek.

General rain of around 25 mm in 12 hours across a wet Natimuk Creek catchment will causes rises in the Natimuk and Little Natimuk creeks. More substantial rainfall (of order 75 mm to 100 mm in 24 hours or less), again on a wet catchment, will cause severe flooding and over-floor inundation of a number of houses within the town.

Large severe floods generally occur as a result of either:

- Very heavy rainfall such as can occur when warm moist air from a decaying tropical cyclone from north western or northern Australia is dragged down and across north west Victoria (e.g. January 2011); or

- Moderate to heavy rainfall after a prolonged period of general rainfall such as can result from sequences of cold fronts during winter and spring.

Note that the Natimuk Flood Study confirmed that the level of Natimuk Lake is much lower than the level of Natimuk Creek through the township, and flood levels in the township are not influenced by the level in the Lake.

6. Dams

Failure of dams or retarding basins is not a consideration as there are no major storages within the Natimuk Creek catchment.

APPENDIX . C2- TYPICAL FLOOD PEAK TRAVEL TIMES – Natimuk Creek

1. Overview

Definitive information on the time it takes flash flooding (i.e. resulting from heavy rainfall associated with severe weather or thunderstorm activity) to develop (i.e. to arrive at a location) following the start of heavy rain and the time it takes for the maximum water depth / extent to be reached is not available. **Timing is however likely to be short, of the order of 30 minutes.**

In the case of riverine flooding, the time of travel of a flood peak will be influenced by antecedent conditions. A flood on a 'dry' watercourse will generally travel more slowly than a flood on a 'wet' watercourse (e.g. the first flood after a dry period will travel more slowly than the second flood in a series of floods) and big floods tend to travel faster than small floods. Hence, the size of the flood, recent flood history, soil moisture and forecast weather conditions all need to be considered when using the following information to direct flood response activities.

2. Travel Time Information

The table below provides generalised information about the travel times of floods. This is useful to assist in informing the community about when floods might be expected, and the amount of preparation time for various actions that need to occur during a flood.

It must be noted that each flood may have different characteristics depending on a wide range of factors, and therefore that these times can only be considered as indicative.

Table 14- Riverine Flooding - Natimuk Creek and Little Natimuk Creek

Location From	Location To	Typical Travel Time	Comments
RIVERINE FLOODING – Natimuk Creek and Little Natimuk Creek			
Floods are characterised by rapid rises and falls.			
Start of rainfall	Little Natimuk Ck@Natimuk	8 hours or so	To peak with a wet catchment.
	Natimuk Creek @ Natimuk	12 - 16 hours or so	To peak with a wet catchment.
Start of <u>heavy</u> rainfall	Natimuk	~1 hour	To start to rise on a very wet catchment. Would be longer on a drier catchment
	Little Natimuk Ck@Natimuk	~ 4 hours	To peak on a very wet catchment, may be a little longer on a drier catchment.
	Natimuk Creek @ Natimuk	~ 8 hours	To peak on a very wet catchment, may be a little longer on a drier catchment.

APPENDIX C3 –FLOOD EMERGENCY MANAGEMENT PLAN NATIMUK

1. Overview of Flooding Consequences

A wet catchment and a period of heavy rain are generally required to produce flooding at Natimuk.

Parts of Natimuk are flooded by Natimuk Creek and Little Natimuk Creek which join immediately downstream (to the north) of the Wimmera Highway as it passes through the township.

1.1 Warning Times

The flood warning time for Natimuk is short, somewhere around an hour or so for Little Natimuk Creek and a little longer for Natimuk Creek. At Natimuk, Little Natimuk Creek will generally peak around 4 – 6 hours before Natimuk Creek.

1.2 Areas Affected

Appendix C6 -Maps provides guidance on where flooding is likely to occur in Natimuk township.

The floodplain is fairly narrow and there does not appear to be any significant flow breakouts. Within Natimuk, water does overtop from Little Natimuk Creek through a vacant allotment and pools in a lower area on Schmidt Street as shown in the image below.

Photo 4 Location of Breakout from Little Natimuk Creek within Natimuk

1.2.1 Properties Affected in Natimuk

A summary of the number of properties likely to be flooded at Natimuk from Natimuk Creek and Little Natimuk Creek and the number likely to be inundated over-floor is provided below.

Summary of number of flood affected properties in Natimuk - EXISTING CONDITIONS						
	Design Flood ARI (years)					
	5	10	20	50	100	200
Level at Natimuk Creek gauge @ Wimmera Highway						
Equivalent level in mAHD	TBC	TBC	TBC	TBC	TBC	TBC
Gauge board – Gauge zero 118.38m AHD						
Level at Little Natimuk Creek gauge @ Wimmera Highway						
Equivalent level in mAHD	116.28	116.58	116.810	117.09	117.33	117.45
Gauge board – Gauge zero 116.76m AHD						
Number of properties flooded above floor	0	0	1	8	14	20
Number of properties flooded below floor	2	21	32	41	44	40
Number of land parcels flooded	18					
Total number of flooded properties	16	21	33	49	58	60

In broad terms, properties to the south (upstream) of the Wimmera Highway are mostly impacted by Little Natimuk Creek. Other properties at risk are mainly located north of the Highway in Elmes Street and Lake Avenue.

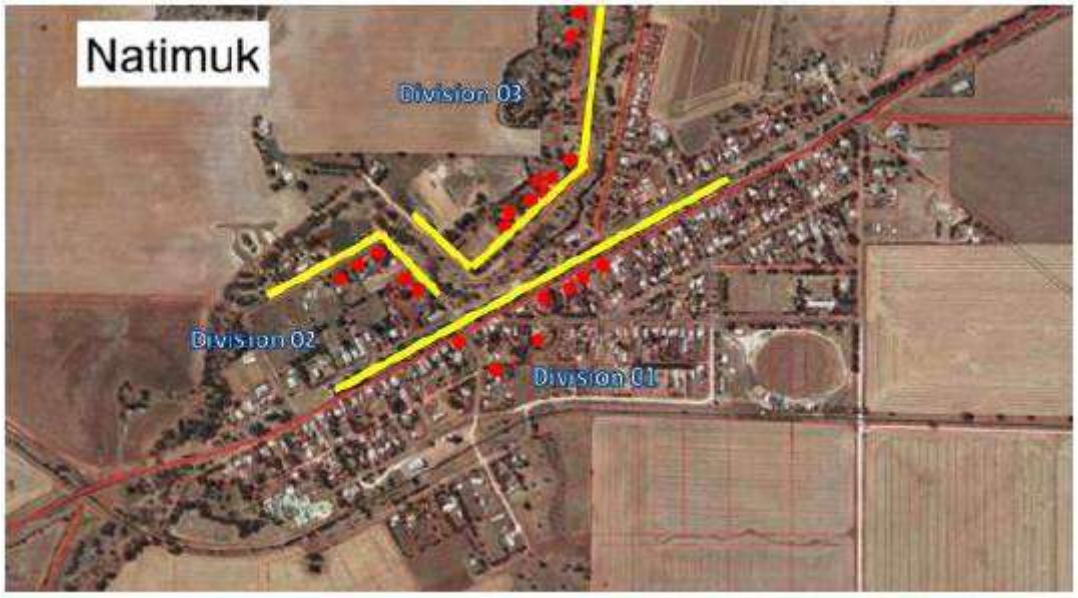


Photo 5 Natimuk Properties flooded above floor height Jan 2011 event

1.3 Road network

The main access roads for Natimuk are:

- The Wimmera Highway;
- Natimuk - Frances Road;

- Lake Road;
- Creek Road.

The Wimmera Highway is the most important road. During a severe flood, the Wimmera Highway may be closed at Natimuk for the best part of a day and local roads further up the catchment are likely to be impassable for a day or more.

The Wimmera Highway was overtopped at both the Natimuk Creek and Little Natimuk Creek crossings in January 2011 but was not overtopped in the December 2010 event. In January 2011, this caused some difficulties for nursing staff at shift-change.

- At the Little Natimuk Creek crossing, the Wimmera Highway is likely to start getting wet around 7 hours after start of rain, maximum depth will occur at around 8 hours, and it will remain wet for up to 12 hours.
- At the Natimuk Creek crossing, the Wimmera Highway is likely to start getting wet around 7 hours after start of rain, the maximum depth will occur at around 12 hours and it will remain wet for up to 22 hours.
- Lake Avenue is likely to start getting wet around 7 hours after start of rain, maximum depth will occur at around 12 hours, and it will remain wet for up to 23 hours.

1.4 Critical Infrastructure

Critical infrastructure, other than the Wimmera Highway, is limited to the police station and Nursing Home. Neither is impacted directly by floods up to and including the 200-year ARI event. Staff and supplies accessing the Nursing Home become an issue when the Wimmera Highway becomes impassable.

The Wimmera Highway may be inundated at Natimuk dependant on flood magnitude. It was overtopped at both the Natimuk Creek and Little Natimuk Creek crossings in January 2011 but was not overtopped in the December 2010 event. Many minor roads in and around Natimuk as well as further up the catchment may also be inundated.

The Telephone exchange is located on floodplain. The sewerage pump station is located on a mound on the flood plain. The wastewater treatment plant is located downstream from Natimuk to the left of the Creek and is not likely to be flooded.

2. Structural Flood Mitigation Measures

2.1 Flood Protection Levees

There are no flood protection levees at Natimuk. There are no substantial levees within the catchment that are considered likely to modify flood behaviour other than the embankment that separates Natimuk Creek and the privately owned swamp located a short distance to the north east of Natimuk township.

The Wimmera Highway (Main Street) through Natimuk acts as a small levee which causes some ponding upstream from somewhere between the 5-year and 10-year ARI flood events on Natimuk Creek and from less than the 5-year ARI event on Little Natimuk Creek.

The railway embankment also acts as a small levee for floods somewhere between the 20-year ARI and 50-year ARI event and causes some ponding in Little Natimuk Creek on the upstream side.

2.2 Drainage Works

A by-wash channel on the northern side of Lake Avenue was constructed to pass a portion of flood flows around the Natimuk township.

3. Flood Impacts and Required Actions

3.1 Sandbag Strategy

Prior to a flood:

- Both HRCC and VICSES will ensure that there are sufficient numbers of sandbags in stock in strategic locations in preparation for floods. Council normally stocks 10,000 sandbags in Horsham, and 5000 at Natimuk. The condition and number of bags are subject to a pre-season check each year on 1 May.

When a flood warning has been issued or flooding is imminent:

- If a large flood is imminent, Council and VicSES will facilitate the issue of sandbags to houses identified in Section 6.1, and consider establishment of an alternative location for sandbags to cater for isolation of parts of the township.
- Sandbags and plastic sheeting will be allocated to properties that meet the following criteria:
    - Essential community infrastructure
    - Brick residences identified as being at risk of over-floor flooding. Generally 25 to 50 sandbags per house will be supplied to protect door openings and vents. Sandbags will not be supplied for building levees around houses. Proof of occupation/ownership is required e.g. a driver's licence or account from a utility.
    - Public buildings.
    - Commercial premises for doors and other openings.
    - Generally sandbags will not be supplied to properties if the table in Section 6.1 of this Appendix or flood inundation maps (for rural properties) indicate a house is not at risk of over floor flooding. However, it is recognised that shed floors are often lower than residential floors and an allocation of sandbags may be made to impacted properties based on the assessment of the staff on duty and adequate numbers of sandbags being available for higher priority assets.
- Large numbers of sandbags will not be supplied to residences with cement sheet or weatherboard construction on raised footings (see point below) to build a levee surrounding the house. For these residences plastic sheeting and tape will be supplied (if available) to create a waterproof membrane, using the house walls for structural strength. Sandbags will be supplied to anchor the membrane.
- Sandbags will not be supplied in any circumstances to residential or rural properties to construct levee walls around houses or around or along property boundaries.

3.2 Disruption to Services

Disruption to a range of services can occur in the event of a flood.

Service	Impact	Trigger point for action	Strategy / Temporary Measures
Telephone exchange	Not affected in Jan 2011 flood (1%AEP)	N/A	Monitor only
Sewerage pump station	Not affected in Jan 2011 flood (1%AEP)	N/A	No action
Wastewater treatment plant	Not affected in Jan 2011 flood (1%AEP)	N/A	No action
School bus routes	Dependant on size of event, numerous local roads and potentially the Wimmera Highway	Event dependant	Liaison with authorities to determine alternate routes

3.3 Disruption to Essential Community Infrastructure

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

Refer to **Appendix C3 Section 5,** Flood Intelligence Card – Natimuk Creek, (pages 173 – 178), and Section 6, Property Inundation Table – Natimuk, (pages 179 to 182)

3.4 Disruption to Road Network

This work is currently being undertaken and will be included in future iterations of this plan. Wimmera CMA has the most current information regarding flooding of the road network in Natimuk.

4. Command, Control and Coordination

Refer to the Command, Control and Coordination section, Part 3 Section 3.2 of EMMV.

5. Flood Intelligence Card

5.1 Introduction – flood intelligence cards

Two telemetred rain gauges have been installed in the Natimuk Creek catchment, one at McNeils Bridge on the Noradjuha Tooan East Road (on Natimuk Ck) and one at the fire dam about 3 km south-east of Natimuk on the Natimuk Hamilton Rd. Rainfall information from these sites, supplemented with information from nearby sites, can be used to inform predictions of likely flood levels, in accordance with the rainfall guide provided in the Natimuk Flood Plan, as presented in **Figure 2** (page 165). The McNeils Bridge site also has a water level gauge. This can be used to give an indication of the response of the catchment to rainfall, the rate of rise, and timing of a peak event, but is not yet correlated with model information hence is not yet available to give predictions of flood timing and levels.

It is suggested that data from the following rainfall stations (**Horsham AWS, Longerenong AWS and Polkemmet Road (Horsham)** – see BoM website) are used to determine an appropriate rainfall depth for use in the following Flood / No Flood guidance tool. It is further suggested that either an average value is used to drive the tool or, for a more conservative approach, the maximum depth from these gauges. This approach will work reasonably well as the IFD gradient across the Municipality is minimal.

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 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”.

5.2 Flood Intelligence Card Natimuk Creek

Observed Rainfall (see graph – figure 2 above)	AEP of flood	Water level at Wimmera Highway Bridge	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
▪ It is important that sand and sandbags are delivered to Natimuk and made available to residents as soon as possible after it becomes apparent that flooding is likely. ▪ Consider how best to assist nursing staff attend the Nursing Home in Natimuk when the Wimmera Highway is flooded.				
USING THIS INTELLIGENCE CARD. Obtain rainfall data and use the 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 remembering that water will rise quickly and that some actions may need to be initiated in an order that is different from their relative placement in this table.				
Note that:: • Lake Avenue is likely to start getting wet around 7 hours after start of rain, maximum depth will occur at around 12 hours, and it will remain wet for up to 23 hours. Properties at 77-85 Lake Avenue may be isolated by rising waters and should be advised of this potential isolation due to water levels in Lake Ave. • At the Little Natimuk Creek crossing, the Wimmera Highway is likely to start getting wet around 7 hours after start of rain, maximum depth will occur at around 8 hours, and it will remain wet for up to 12 hours. • At the Natimuk Creek crossing, the Wimmera Highway is likely to start getting wet around 7 hours after start of rain, the maximum depth will occur at around 12 hours and it will remain wet for up to 22 hours.				
~15mm in 30 minutes to ~60mm in 24 hours	5% AEP (5-year ARI)	NCk: 118.1 mAHD LNCk: 116.6 mAHD	Downstream from the railway culverts, Little Natimuk Creek runs over Station Street to a depth of up to 500mm. Jory Street overtopped by Little Natimuk Creek to depth less than 100mm. Natimuk Creek wetting the corner of Sudholz Road and Elmes Street by up to 300mm. Water in close proximity to Lake Avenue. Water backing up from Natimuk Creek into the Lake Avenue by-wash channel and entering lower sections of land to the east of Lake Avenue.	◦ Place “Water over road” signs and consider closing these roads. ◦ Community Observers to commence monitoring and reporting of rainfall and water levels. ◦ Provide sandbags, plastic and sand into Natimuk (to the nominated collection point – sufficient for the expected severity of flooding.

Observed Rainfall (see graph – figure 2 above)	AEP of flood	Water level at Wimmera Highway Bridge	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
▪ It is important that sand and sandbags are delivered to Natimuk and made available to residents as soon as possible after it becomes apparent that flooding is likely. ▪ Consider how best to assist nursing staff attend the Nursing Home in Natimuk when the Wimmera Highway is flooded.				
USING THIS INTELLIGENCE CARD. Obtain rainfall data and use the 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 remembering that water will rise quickly and that some actions may need to be initiated in an order that is different from their relative placement in this table.				
~20mm in 30 minutes to ~70mm in 24 hours	10% AEP (10-year ARI)	NCk: 118.4 mAHD LNCk: 116.8 mAHD	Little Natimuk Creek running over Station Street and Jory Street (up to 250mm) and getting deeper and faster. First properties (2-14 Jory Street, 83 Main Street and 3 Schmidt Street) starting to experience over ground flooding. Natimuk Creek wetting Creek Road by up to 300mm. Water beginning to impact on the northern corner of Elmes Street. Lake Avenue flooded to around 200mm deep near Nos 47-61. Water entering the Lake Avenue by-wash channel from both ends.	• Close Station Street and Jory Street. • Consider beginning to sandbag shed at 15 Elmes Street to prevent over-floor flooding. • Continue to monitor rainfall and water levels.
			Lake Avenue and Elmes Street getting progressively wetter.	• Review contingency plans for access through Natimuk and to the Nursing Home. • Review evacuation and associated community support arrangements.
~25mm in 30 minutes to ~80mm in 24 hours	5% AEP (20-year ARI)	NCk: 118.6 mAHD	Water at Station Street crossing up to 500mm deep. Jory Street wetted to a depth of around 400mm.	• Consider beginning to sandbag properties likely to experience over-floor flooding for a larger flood.

Observed Rainfall (see graph – figure 2 above)	AEP of flood	Water level at Wimmera Highway Bridge	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
▪ It is important that sand and sandbags are delivered to Natimuk and made available to residents as soon as possible after it becomes apparent that flooding is likely. ▪ Consider how best to assist nursing staff attend the Nursing Home in Natimuk when the Wimmera Highway is flooded.				
USING THIS INTELLIGENCE CARD. Obtain rainfall data and use the 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 remembering that water will rise quickly and that some actions may need to be initiated in an order that is different from their relative placement in this table.				
		LNCk: 117.0 mAHD	Properties on the upstream side of the Wimmera Highway at the Little Natimuk Creek crossing beginning to get wet but no over-floor flooding (eg. 2-14 Jory Street, 3-7 Schmidt Street and 71, 75-79, 81, 83 and 85 Main Street). Water up to 400mm deep in places on Creek Road. Natimuk Creek overtopping Wimmera Highway by up to 100mm. Inundation of the northern parts of Sudholz Road and Elmes Street by up to 200mm. Lake Avenue by-wash channel overtopping the outlet on Lake Avenue. Properties along Lake Avenue (47-65) and on Elmes Street beginning to get wet with water up to 300mm deep on the roads. A shed at 15 Elmes Street likely to be flooded over-floor to about 160mm unless sandbagged earlier.	• Implement traffic management measure for Lake Avenue and Elmes Street. Access issues. • Monitor water levels across the Wimmera Highway at the Natimuk Creek crossing. • Check on the Natimuk Lake Caravan Park and implement evacuation plans as necessary. • Continue to monitor rainfall and water levels.
				• Consider implementing evacuation plan for Jory Street, Elmes Street, Schmidt Street, Sudholz Road and Lake Avenue if more severe flooding is expected.

Observed Rainfall (see graph – figure 2 above)	AEP of flood	Water level at Wimmera Highway Bridge	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
▪ It is important that sand and sandbags are delivered to Natimuk and made available to residents as soon as possible after it becomes apparent that flooding is likely. ▪ Consider how best to assist nursing staff attend the Nursing Home in Natimuk when the Wimmera Highway is flooded.				
USING THIS INTELLIGENCE CARD. Obtain rainfall data and use the 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 remembering that water will rise quickly and that some actions may need to be initiated in an order that is different from their relative placement in this table.				
~30mm in 30 minutes to 95mm in 24 hours	2% AEP (50-year ARI)	NCk: 118.8 mAHD LNCk: 117.2 mAHD	Similar to December 2010 flood. Water at Station Street crossing up to 750mm deep. Water in Jory Street up to 500mm deep. Little Natimuk Creek overtopping the Wimmera Highway to a depth of between 100mm and 200mm. More properties experiencing over-ground flooding. Over-floor flooding of 2 x properties on Main Street near the Little Natimuk Creek crossing. Over-floor flooding of 5 x houses along Lake Avenue. Flooding of Lake Avenue, Elmes Street and creek end of Sudholz Street. Water beginning to affect properties in Schmidt Street.	• Consider sandbagging properties likely to experience over-floor flooding for a larger flood and advise owners of such properties to lift furniture, carpets, etc. • Consider implementing contingency plans for access through Natimuk and to the Nursing Home. • Monitor water levels across the Wimmera Highway at the Natimuk Creek crossing and the Little Natimuk Creek crossing. • Implement evacuation plan? • Continue to monitor rainfall and water levels.
			Depth of water over the Wimmera Highway (Main Street) through Natimuk is increasing. First properties in Lake Avenue and Main Street about to be flooded over-floor.	• Consider closing the Wimmera Highway (Main Street) through Natimuk to traffic bearing in mind that the Nursing Home will need to continue to function. • Lifting of furniture, etc in and sandbagging of properties likely to be flooded over-floor by a larger flood should be well underway.

Observed Rainfall (see graph – figure 2 above)	AEP of flood	Water level at Wimmera Highway Bridge	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
▪ It is important that sand and sandbags are delivered to Natimuk and made available to residents as soon as possible after it becomes apparent that flooding is likely. ▪ Consider how best to assist nursing staff attend the Nursing Home in Natimuk when the Wimmera Highway is flooded.				
USING THIS INTELLIGENCE CARD. Obtain rainfall data and use the 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 remembering that water will rise quickly and that some actions may need to be initiated in an order that is different from their relative placement in this table.				
~35mm in 30 minutes to 110mm in 24 hours	1% AEP (100-yr ARI) similar extent to the **January 2011 flood**	NCk: 118.9 mAHD LNCk: 117.4 mAHD	Similar to January 2011 flood when 12 homes were evacuated and 21 buildings were inundated above floor level in Lake Avenue, Elmes Street, Wimmera Highway, Depot Lane and Jory Street. The Wimmera Highway was also inundated at both Creek crossings. Water at Station Street crossing up to 800mm deep. Substantial inundation along Little Natimuk Creek between Station Street and Wimmera Highway and on the downstream side of the Highway downstream from Sudholz Street. Water around 300mm deep on Schmidt Street. Parts of Creek Road flooded to 500mm. Both creeks flowing over Wimmera Highway to depth of 200mm to 300mm. Significant inundation of Sudholz Road and Elmes Street. Access to homes along Elmes Street limited with depths of 300mm to 400mm. Parts of Lake Avenue flooded to more than 500mm. Parts of Lake Road flooded to depth.	• Continue to monitor rainfall and water levels. • Implement plans as required. • Lifting of furniture, etc in and sandbagging of properties likely to be flooded over-floor by a larger flood should be well advanced. • Develop a plan to transport nursing home staff and supplies through flood water.

Observed Rainfall (see graph – figure 2 above)	AEP of flood	Water level at Wimmera Highway Bridge	Consequence / Impact	Action Actions may include (but not limited to) evacuation, closure of roads, sandbagging, issue of warnings and who is responsible
▪ It is important that sand and sandbags are delivered to Natimuk and made available to residents as soon as possible after it becomes apparent that flooding is likely. ▪ Consider how best to assist nursing staff attend the Nursing Home in Natimuk when the Wimmera Highway is flooded.				
USING THIS INTELLIGENCE CARD. Obtain rainfall data and use the 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 remembering that water will rise quickly and that some actions may need to be initiated in an order that is different from their relative placement in this table.				
			Over-floor flooding of properties in Lake Avenue and Main Street.	
			Further properties flooded over-floor.	
Heavy rain (eg. more than ~100mm in around 12 hours) on a wet catchment	0.5% AEP (200-yr ARI)	NCk: 119.0 mAHD LNCk: 117.5 mAHD	Severe deep flooding near the creek channels. Jory Street flooded to a depth of around 800mm. Schmidt Street flooded to a depth of around 600mm. Flow across Wimmera Highway at Little Natimuk Creek of order 500mm and between 300mm and 400mm at the Natimuk Creek crossing. Water up to 600mm deep along parts of Creek Road. Elmes Street almost entirely inundated. Access to homes along Elmes Street is limited with depths reaching up to 500mm. Lake Avenue flooded to greater than 600mm in parts. Increase in number of buildings flooded over-floor.	• Continue to monitor rainfall and water levels. • Implement plans as required. • Check on the Natimuk Lake Caravan Park and implement evacuation plans if necessary. Move caravans to Rocklands Caravan Park, Balmoral, if necessary. • Develop a plan to transport nursing home staff and supplies through flood water.

6. Property Inundation Table - Natimuk

6.1 Introduction

The following is a list of properties expected to experience flooding (and the depth of that flooding). It is strongly recommended that the following list be used in conjunction with the flood inundation maps Appendix C6 Maps where a red dot has been used to show each floor level lower than the expected flood height (ie. where over floor flooding is likely).

Natimuk – EXISTING CONDITIONS It is suggested that this table be used in conjunction with the flood inundation maps													
LEGEND		Within 100mm of flooding over-floor						Depth of over-floor flooding					Comments
Location (Number & Street)	Depth of flooding at lowest part of property for each ARI						Depth of over-floor flooding at property for each ARI						
	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr	
1-3 Duncan Street	1.66	1.76	1.89	2.06	2.16	2.24							Residential
4 Elmes Street			0.30	0.45	0.56	0.64							Residential
5 Elmes Street			0.25	0.46	0.63	0.73					0.30	0.19	Residential -WB
6 Elmes Street	0.47	0.70	0.93	1.34	1.48	1.56						0.04	Large Shed
	0.47	0.70	0.93	1.34	1.48	1.56							ParksVic Depot / office -WB
7 Elmes Street			0.17	0.39	0.56	0.67						0.08	Residential
15 Elmes Street			0.26	0.44	0.58	0.68			0.16	0.33	0.49	0.60	Shed
17 Elmes Street			0.30	0.48	0.62	0.72						0.08	Residential -Brick on stumps
21 Elmes Street			0.19	0.37	0.51	0.61					0.10	0.20	Residential -WB
23 Elmes Street				0.20	0.37	0.47							Residential -CS
27 Elmes Street				0.20	0.56	0.61							Residential
2 Jory Street				0.18	0.32	0.43							Commercial

Natimuk – EXISTING CONDITIONS It is suggested that this table be used in conjunction with the flood inundation maps

LEGEND		Within 100mm of flooding over-floor						Depth of over-floor flooding						Comments
Location (Number & Street)	Depth of flooding at lowest part of property for each ARI						Depth of over-floor flooding at property for each ARI						
	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr	
	0.19	0.31	0.41	0.51	0.61	0.67							Residential
4 Jory Street	0.24	0.42	0.51	0.62	0.71	0.77							Residential -WB
6 Jory Street	1.58	1.68	1.79	1.90	1.98	2.05							Residential _-WB
10 Jory Street	1.50	1.60	1.71	1.82	1.90	1.96							Residential -Iron
18 Jory Street				0.21	0.33	0.43							Residential -Iron
20 Jory Street				0.13	0.26	0.36							Residential
1 Lake Avenue				0.18	0.32	0.43							Residential
31 Lake Avenue			0.25	0.50	0.67	0.78						0.05	Residential -WB
33 Lake Avenue				0.43	0.61	0.69					0.05	0.15	Residential -WB
35 Lake Avenue				0.36	0.52	0.61							Residential -WB
37 Lake Avenue				0.51	0.66	0.75				0.04	0.23	0.33	Residential -WB
41 Lake Avenue			0.06	0.42	0.59	0.67				0.09	0.30	0.41	Residential -WB
43 Lake Avenue			0.17	0.40	0.61	0.72				0.09	0.28	0.39	Residential -WB
45 Lake Avenue		0.06	0.31	0.55	0.74	0.84					0.16	0.26	Residential -WB
59 Lake Avenue	1.45	1.98	2.18	2.38	2.55	2.65				0.03	0.20	0.29	Residential -WB
71 Lake Avenue	0.17	0.43	0.67	0.88	1.07	1.18				0.01	0.18	0.29	Residential –Brick on slab
73 Lake Avenue	1.45	1.70	1.94	2.13	2.32	2.43							Residential

Natimuk – EXISTING CONDITIONS It is suggested that this table be used in conjunction with the flood inundation maps

LEGEND		Within 100mm of flooding over-floor						Depth of over-floor flooding						Comments
Location (Number & Street)	Depth of flooding at lowest part of property for each ARI						Depth of over-floor flooding at property for each ARI						
	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr	
75 Lake Avenue		1.05	1.28	1.47	1.66	1.76							Residential
77 Lake Avenue		1.05	1.29	1.48	1.67	1.77							Residential
12 Lake Road					0.17	0.28							Residential
42 Lake Road						0.30							Residential
44 Lake Road					0.26	0.38							Residential
46 Lake Road					0.21	0.32							Residential
81 Main Street		0.04	0.32	0.50	0.60	0.68							Post Office
62 Main Street				0.18	0.32	0.43							Commercial –Bick on slab
	0.14	0.44	0.70	0.93	1.14	1.27							Commercial
63-65 Main Street						0.07							National Hotel - Pub
64 Main Street					0.16	0.27							Residential
67 Main Street					0.18	0.35					0.02	0.13	Commercial –Iron on slab
69 Main Street				0.39	0.56	0.65				0.03	0.20	0.32	Commercial –Brick on slab
71 Main Street	1.23	1.51	1.69	1.82	1.96	2.05				0.21	0.34	0.45	Residential -WB
75 Main Street	1.66	1.85	2.00	2.13	2.27	2.36					0.13	0.24	Commercial -Steel
83 Main Street		0.13	0.24	0.37	0.48	0.54							Residential
85 Main Street					0.41	0.47							Old PO -decommissioned

Natimuk – EXISTING CONDITIONS It is suggested that this table be used in conjunction with the flood inundation maps

LEGEND		Within 100mm of flooding over-floor						Depth of over-floor flooding						Comments
Location (Number & Street)	Depth of flooding at lowest part of property for each ARI						Depth of over-floor flooding at property for each ARI						
	5yr	10yr	20yr	50yr	100yr	200yr	5yr	10yr	20yr	50yr	100yr	200yr	
87 Main Street				0.18	0.32	0.43						0.01	Eastern side – shop -Brick
				0.52	1.03	1.09						0.07	Western side – shop -Brick
89 Main Street					0.15	0.21							Commercial _Brick
91 Main Street					0.19	0.25							Brass band building
93-95 Main Street				0.58	1.09	1.15							Old bank building
97 Main Street				0.18	0.32	0.43							Commercial
				0.35	0.87	0.93							Residential
143 Main Street	0.31	0.59	0.86	1.03	1.17	1.26							Residential
1 Schmidt Street	0.18	0.29	0.39	0.50	0.59	0.65							Telstra building. 4 x sheds on site not flooded over-floor -Iron
3 Schmidt Street	0.33	0.45	0.58	0.70	0.81	0.88							Residential -WB
4 Schmidt Street					0.83	0.89							Residential Brick
5 Schmidt Street			0.22	0.35	0.44	0.51							Residential
7 Schmidt Street			0.17	0.29	0.38	0.45							Residential
3 Sudholz Street			0.18	0.36	0.65	0.78							Bowling Club

APPENDIX C4 Flood Evacuation Arrangements Natimuk

There are five stages in the evacuation process: decision, warning, evacuation, shelter and return.

Phase 1 - Decision to Evacuate

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

- When life and safety are at risk;
- 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);
- Buildings have been made uninhabitable;
- Essential services have been damaged and are not available to a community and evacuation is considered the most effective risk treatment.

The following should be considered when planning for evacuation:

- Anticipated flood consequences and their timing and reliability of predictions;
- Size and location of the community to be evacuated;
- Likely duration of evacuation;
- Forecast weather;
- Flood models;
- Predicted timing of flood consequences;
- Time required to conduct the evacuation;
- Time available to conduct the evacuation;
- Evacuation priorities and evacuation planning arrangements;
- Access and egress routes available and their potential flood liability;
- Current and likely future status of essential infrastructure;
- Resources required to conduct the evacuation;
- Resources available to conduct the evacuation;
- Shelter including Emergency Relief Centres, Assembly Areas etc.;
- Vulnerable people and facilities;
- Transportation;
- Registration;
- People of CALD background and transient populations;
- Safety of emergency service personnel;
- Different stages of an evacuation process.

The decision to evacuate should be made in consultation with the Vic Pol Evacuation Manager, MERO, MERC, DHS, Health Commander and other key agencies and expert advice (Wimmera CMA and Flood Intelligence specialists) unless time constraints prevent this consultation.

The table below details time required to evacuate established areas from decision being made to evacuate.

Decision Time	**Likely time required to notify residents to evacuate** **(including resource assumptions)**
07:00 to 18:00	1 hour
18:00 to 22:00	1.5 hours
22:00 to 07:00	2 hours

The following Evacuation Checklist can be used as a guide when evaluating the need for evacuation in a particular area as a result of flooding.

Key Questions	**Answers**
Are there any existing Flood Evacuation Plans for the Municipality?	
Name of area(s) at risk.	
How many people are at risk (including special needs groups)?	
When and where are access routes likely to be disrupted?	
Is the area a flood island, accessible by road, accessible overland or land locked?	
How much time is available to warn the area? **Where Flash Flooding risks exist adopt the strategy detailed in Section 3.8 of this MFEP.**	
Under what circumstances and in what areas is shelter in place and not evacuation the best option?	
Where are Flood Relief Centres located?	
What are the triggers for evacuation? (i.e. a particular area at a specified gauge height?) – refer to Appendix C of this MFEP.	
How will evacuation warning messages be communicated to people?	
Have standard evacuation messages been developed for predicted or likely flood scenarios?	
What forms of transport are needed to assist with evacuation?	

Where are airbase facilities located?	
Where are animal shelter compounds located? Any other arrangements for management and accommodation of pets / animals?	
What are the local command and control arrangements for evacuation?	
Other Confirmations and Clarifications:	
Clarify and confirm local arrangements and responsibilities for evacuation at the local level. This includes: • Confirming and facilitating local awareness of responsibilities for the decision to evacuate (i.e. Incident Controller), the management of evacuation (i.e. VicPol) and the tasks to be undertaken for evacuation (i.e. development and communication of evacuation warnings). • The role of agencies at the local level involved in evacuation (i.e. VicPol, VICSES, Australian Red Cross, etc.) Local arrangements must be consistent with arrangements as set out in Part 8 of the EMMV and the Evacuation Guidelines.	

Phase 2 – Warning or Recommendation

Warnings may include a warning to prepare to evacuate and a warning to evacuate immediately. Once the decision to evacuate has been made, the at-risk community will be warned to evacuate. Evacuation warnings can be disseminated via methods listed in **Phase 3** (below)of this plan.

Evacuation warning messages will be developed and issued by SES in consultation with the VICPOL Evacuation Manager, MERO, MERC, DHS and other key agencies and expert advice (CMA's and Flood Intelligence specialists).

The evacuation messaging for possible affected houses/business's in Natimuk should incorporate the timing of the arrival of flood water including the time to peak levels and the expected time that flood waters will impact the township environs. The messaging should also include reference that floodwaters will rise at a steady rate and it will take several hour for floodwaters to reach peak heights and threaten or possibly buildings. Messages to the community will comprise either a warning to affected people that they prepare to evacuate or a recommendation that they evacuate immediately.

Phase 3 – Evacuation

Evacuation will be controlled by the VicPol Evacuation Manager. The Evacuation Manager is responsible for managing the withdrawal which will include developing an evacuation plan which clearly identifies activities and timelines as well as the roles and responsibilities of any agencies involved.

VICSES will provide advice regarding the 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 / VicRoads with route control and may assist VicPol in arranging evacuation transportation. VICPOL will control security of evacuated areas.

Special needs groups and vulnerable residents likely to need help may be identified via the Home and Community Care (HACC) database, via Council's 'residents at risk' register or through community network organisations. Refer to the MEMP.

Phase 4 – Shelter

Relief Centres catering for people's basic needs may be established to meet the immediate needs of people affected by flooding. Emergency Relief Centres are listed in the HRCC MEMP in the Emergency Relief Centre Supporting Plan. Maps of Relief Centre locations are provided in the

Emergency Relief Centre Supporting Plan. The appropriate Relief Centre for the event will be advised to the public via multi media outlets during the incident.

VICPOL in consultation with SES will liaise with Local Government and DHS (where regional coordination is required) via the relevant Incident 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

The Wimmera Animal Welfare Plan is a supporting plan to the HRCC MEMP and outlines procedures to follow when dealing with animals both domestic and livestock during an emergency.

Matters relating to the welfare of wildlife are to be referred to DELWP.

Phase 5 – Return

The Incident Controller in consultation with VicPol and other relevant agencies will determine when it is safe for evacuees to return to the affected area / 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 may return to the affected area 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.

APPENDIX C5- FLOOD WARNING SYSTEMS - Natimuk

1. Flood Warning Products

Flood warning products and flood class levels can be found on the BoM website. Flood warning products include severe thunderstorm warnings, severe weather warnings, flood watches, flood warnings, flood bulletins and local flood warning systems..

BoM Severe Weather Warnings are issued for relevant areas when required. These are delivered to all agencies and SES engages with the Municipality and Emergency Service Organisations to ensure operational readiness.

1.1 Severe Thunderstorm and Severe Weather Warnings

The BoM can forecast the environment in which severe thunderstorms or small scale weather systems that are locally intense and slow moving may occur and provides a generalised service to that effect. However, it is not yet scientifically possible to predict individual flash flooding events except on time scales of tens of minutes at the very best.

The BoM issues warnings of flash flooding when it becomes apparent that an event has commenced which may lead to flash flooding or when flash flooding has commenced.

1.2 Flood Watches

Flood watches are issued by the BoM to notify communities and other stakeholders within broad areas (rather than specific catchments) of the potential flood threat from a developing weather situation. They provide a 'heads up' of likely flooding.

Flood watches are based on an assessment of the developing weather situation and indicators of current catchment wetness. They provide generalised statements about expected forecast rainfall totals, the current state of the catchments within the target area and the streams at risk from flooding. Instructions for obtaining rain and stream level observations and access to updated Watches and Warnings are also included.

Normally, the BoM would issue a Flood Watch 24 to 36 hours in advance of any likely flooding and issue updates as required. If at any time during that period there was an imminent threat of floods occurring, the Flood Watch would be upgraded to a Flood Warning.

1.3 Flood Warnings

1.3.1 Overview

Flood Warnings are firm predictions of flooding based on actual rainfall and river height information as well as the results of stream flow based models of catchment behaviour that take account of antecedent conditions (i.e. the 'wetness' of the catchment, storage levels within dams, etc) and likely future rainfall. Releases from dams are an essential input to such models.

Flood warnings are categorised as 'minor', 'moderate' or 'major' (see BoM website for an explanation of these terms and current flood class levels) and indicate the expected severity of the flood for agreed key locations along the river.

1.3.2 Natimuk Creek

Two telemetred rain gauges have been installed in the Natimuk Creek catchment, one at McNeils Bridge on the Noradjuha Tooan East Road (on Natimuk Ck) and one at the fire dam about 3 km south-east of Natimuk on the Natimuk Hamilton Rd.

Rainfall information from these sites, supplemented with information from nearby sites, can be used to inform predictions of likely flood levels, in accordance with the rainfall guide provided in the Natimuk Flood Plan, as presented in Table 14 (page 167) above.

The McNeils Bridge site also has a water level gauge. This can be used to give an indication of the response of the catchment to rainfall, the rate of rise, and timing of a peak event, but

is not yet correlated with model information hence is not yet available to give predictions of flood timing and levels.

A general awareness of the likelihood of significant rain will trigger the community's informal monitoring of rain and streamflow conditions, and in essence a neighbourhood collective approach to assisting each other in an event. Council and SES resources will be available to supplement these actions.

1.4 Flood Bulletins

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

The relevant VICSES Region Headquarters or the established ICC will normally be responsible for drafting, authorizing and issuing Flood Bulletins.

Flood Bulletins should refer to the warning title within the Bulletin header.

Flood Bulletins should follow the following structure:

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

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

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

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

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

1.5 Local Flood Warning System Arrangements

There are currently no specific local flood warning systems or arrangements in place within Natimuk. A system of community observers is being currently developed.

2. Flood Class Levels

The occurrence of a certain class of flooding at one point in a catchment will not necessarily lead to the same class of flooding at other points – for example along the main river and its tributary creeks or along a drainage network's overland flow paths. This is because the floodplain physiography and use (and thus flood impact) varies along the river or flow path and also because antecedent conditions combined with where and how rainfall occurs (both in time and space) will drive how a flood develops and progresses.

It is emphasised that the flood class levels quoted in the table below refer to that part of the watercourse where the flood effects can be related to the gauge reading.

It is important to remember that flood impact is dependent on more than the peak height or flow. The rate of rise, duration, extent and season of flooding are also important. For this reason, flood class levels can only be considered as a guide to flood severity.

3. Relevant Gauges

Two telemetred rain gauges have been installed in the Natimuk Creek catchment, one at McNeils Bridge on the Noradjuha Tooan East Road (on Natimuk Ck) and one at the fire dam about 3 km south-east of Natimuk on the Natimuk Hamilton Rd. Rainfall information from these sites, supplemented with information from nearby sites, can be used to inform predictions of likely flood levels, in accordance with the rainfall guide provided in the Natimuk Flood Plan, as presented in Table 14 (page 167) above. The McNeils Bridge site also has a water level gauge. This can be used to give an indication of the response of the catchment to rainfall, the rate of rise, and timing of a peak event, but is not yet correlated with model information hence is not yet available to give predictions of flood timing and levels.

APPENDIX C6 MAPS for NATIMUK

4. AEP (Annual Exceedance Probability) Flood and Flow Event Extent Map

Click on links below for maps

Flood Map Locations	1-in-5 year event	1-in-10 year event	1-in-20 year event	1-in-50 year event	1-in-100 year event	1-in-200 year event
	AEP Flood and Flow Events					
Natimuk 2013	20%	10%	5%	2%	1%	0.5%

PLEASE NOTE: *Maps are provided for general community information purposes only. Flood levels and floor levels are determined from information available at a particular time and actual levels may exceed those shown. For information about flood conditions and restrictions affecting a particular property, contact Wimmera CMA or the relevant council. Neither Wimmera CMA nor the State of Victoria claim or warrant that the information in this map is accurate, complete or up to date, and neither Wimmera CMA nor the State shall be responsible or liable in respect of any use of or reliance placed on it by any person.*