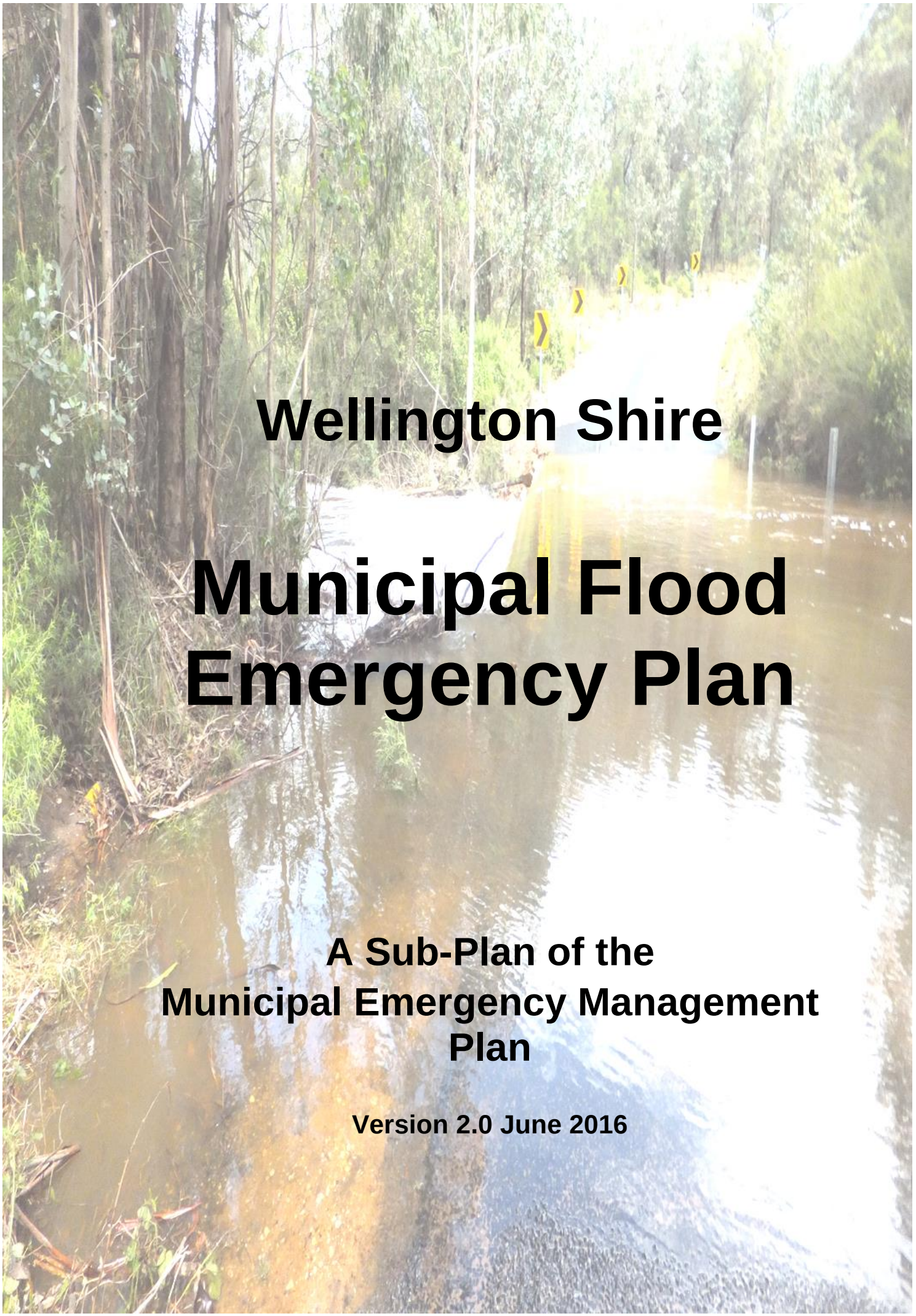

Wellington Shire

Municipal Flood Emergency Plan

A Sub-Plan of the Municipal Emergency Management Plan

Version 2.0 June 2016

ACTIVATION OF PLAN

In the event of an emergency within the Shire of Wellington contact the Senior Sergeant, Sale Police Station, who will activate the Municipal Emergency Management Plan (MEMP).

The Municipal Emergency Resource Officer (MERO) or his deputies (D/MERO) can also activate the MEMP.

Wellington Shire

MUNICIPAL EMERGENCY RESOURCE OFFICER

24 HOUR EMERGENCY CONTACT NUMBER

1300 366 244

For Urgent Requests for Assistance Contact:

Phone: 1300 366 244 for the Duty Officer who will contact a **Municipal Emergency Resource Officer** (**MERO**) and request their assistance.

To forward electronic versions of media releases/information updates in an emergency:

Email: mecc@wellington.vic.gov.au

or for hard copies:

Marked "To urgent attention of Municipal Emergency Resource Officer (MERO)"

Fax: (03) 5142 3501

Please note:

The following group email contact is also available for general information dissemination and requests for non-urgent matters:

Email: mecc@wellington.vic.gov.au

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ATTACHMENTS (by river system)

Distribution List

The Distribution List for this Plan is the same as in the Wellington Municipal Emergency Management Plan (MEMP).

This Plan will be released to the community through the websites of both VICSES and Wellington Shire Council.

Amendment Certificate

This Municipal[1] Flood Emergency Plan (MFEP or Plan) will be amended, maintained and distributed by Wellington Shire Council on behalf of the Wellington Municipal Emergency Management Planning Committee (MEMPC).

Suggestions for amendments to this Plan should be addressed to the:

Chair, Municipal Emergency Management Planning Committee
Wellington Shire Council
18 Desailly Street (PO Box 506)
Sale VIC 3850

or sharon.smith@wellington.vic.gov.au (Executive Officer, MEMPC)

Amendments listed below have been included in this Plan.

Amendment Number	Date of Amendment	Amendment Entered By	Summary of Amendment
1.4	May 2014	VICSES	Final published version
1.5	Aug 2015	S Smith	Complete review of plan (plan only, not Attachments) to make fully multi-agency.
1.6	Sep 2015	S Smith	Update after feedback from Stakeholders.
1.7	Oct 2015	S Smith	Update after feedback from Stakeholders.
1.8	Mar 2016	S Smith	Update after feedback from SRW and DELWP
2.0	28 Jun 2016	S Smith	Endorsement by Municipal Flood Management Planning Subcommittee
2.0	25 Jul 2016	S Smith	Adopted by Municipal Emergency Management Planning Committee

This Plan is available on the VICSES website, Link: Wellington Shire Council — Victoria State Emergency Service and the Wellington Shire Council website, Link: Wellington Shire Council Floods

[1] Municipal refers to the geographical area of the Wellington Shire

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)
ARI	Average Recurrence Interval
AV	Ambulance Victoria
BoM	Bureau of Meteorology
CERA	Community Emergency Risk Assessment
CFA	Country Fire Authority
CMA	Catchment Management Authority
DEDJTP	Department of Economic Development, Jobs, Transport and Resources
DELWP	Department of Environment, Land, Water and Planning
DET	Department of Education & Training
DHHS	Department of Health & Human Services
EMMV	Emergency Management Manual Victoria
EMT	Emergency Management Team
EO	Executive Officer
EPA	Environmental Protection Authority
ERC	Emergency Relief Centre
FO	Floodway Overlay
FWS	Flood Warning System
FZ	Floodway Zone
GW	Gippsland Water
IC	Incident Controller
ICC	Incident Control Centre
IMS	Incident Management System
IMT	Incident Management Team
LSIO	Land Subject to Inundation Overlay
MCC	Municipal 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
MRM	Municipal Recovery Manager
PMF	Probable Maximum Flood
PV	Parks Victoria
RCC	Regional Coordination Centre
RCC	Regional Control Centre
RDO	Regional Duty Officer
RERC	Regional Emergency Response Coordinator
SBO	Special Building Overlay
SCC	State Control Centre
SEWS	Standard Emergency Warning System
SHERP	State Health Emergency Response Plan
SRW	Southern Rural Water
TFWS	Total Flood Warning System
VCC	Victorian Council of Churches
VicPol	Victoria Police
VicRoads	Victoria Corporation Victoria
VICSES	Victoria State Emergency Service
WGCMA	West Gippsland Catchment Management Authority
WSC	Wellington Shire Council

Glossary

1% Annual Exceedance Probability (AEP)	The design flood event that regulates new development and construction standards in Victoria i.e. Local Government Planning Schemes
1% Flood	1% chance of being flooded in any one year from riverine flooding alone.
Flash Flooding	Caused by heavy and often localised rainfall, resulting in both artificial and natural drainage systems exceeding capacity, resulting in water flowing along roads and/or land occupied by houses and other buildings.
Flood Warning	Warnings of “Minor, Moderate or Major” flooding in areas where the BoM has installed specialised warning systems. In these areas, the flood-warning message will identify the river valley, the locations expected to be flooded, the likely severity of the flooding and when it is likely to occur.
Flood Watch	Advice of possible flooding, if flood-producing rain is expected to happen in the near future. Identifies the catchments’ that are expected to receive flood-producing rains.
Floodplain	The land, which may be covered by water when the river overflows its banks during floods. The extent of a floodplain will normally be greater than the area covered in a 1% flood.
Lacustrine / Estuarine flooding	Caused by the water level in a lake exceeding capacity resulting in inundation of surrounding land.
Major Flooding	Causes inundation to extensive rural areas and appreciable urban area. Properties and towns are likely to be isolated and major traffic routes are likely to be closed. Numerous evacuations may be required.
Minor Flooding	Causes inconvenience with low-lying areas next to watercourses being inundated, requiring the removal of livestock and equipment. Minor roads may be closed and low level bridges submerged.
Moderate Flooding	May require evacuation of some homes and main traffic routes may be covered. The area of inundation is substantial in rural areas.
Observed river height	Highest river height (in meters) at a river height measuring gauge located along the river. In most cases, a zero reading is the lowest water level that is reached during dry conditions. In many tidal areas and some inland areas, river levels are expressed in meters above mean sea level or Australian height Datum (AHD).
Peak river height	The highest river height (in meters) observed during a flood event at the specified site on the river.
Predicted river height	Height (in meters) to which the river is predicted to rise at the river gauge referred to in the warning. The actual depth of floodwater will vary across the flood plain. Knowledge of past flood events, as well as estimates of flood levels from flood studies, are used by local Councils, emergency services and landowners to determine which areas are likely to be flooded from predicted river height.
Riverine Flooding	Caused by heavy or sustained rainfall in a river or creek exceeding channel capacity resulting in inundation of the adjacent flood plain.
Storm Surge	A storm surge is an offshore rise of water associated with a low pressure weather system. Storm surges are caused primarily by high winds pushing on the ocean's surface.

AUTHORISATION and ENDORSEMENT

The Wellington Shire Council is custodian of the Wellington Municipal Flood Emergency Plan (MFEP) as a sub plan of the Municipal Emergency Management Plan (MEMP).

This Municipal Flood Emergency Plan has been prepared by the Wellington Flood Management Planning sub-Committee (MFloodMPC) and endorsed by the Wellington Municipal Emergency Management Planning Committee (MEMPC) pursuant Section 20 of the *Emergency Management Act 1986* (as amended).

This plan is administered by the Wellington MFloodMPC.

This Plan addresses the preparedness for and response to flooding in the Wellington Shire after consultation with those agencies and organisations identified in the Plan.

The Plan is consistent with the VICSES Gippsland (East) Regional Flood Emergency Plan Link: Regional plans — Victoria State Emergency Service and the VICSES State Flood Emergency Plan Link: State plans — Victoria State Emergency Service.

This Plan should be read in conjunction with the Wellington Municipal Emergency Management Plan Link: Wellington Shire Council Emergency Management and the *Emergency Management Manual Victoria* available in the Emergency Management Victoria Website. Link: Emergency Management Manual Victoria | Emergency Management Victoria.

On this 5th day of August 2016, in accordance with Section 20 Clause 1 of the *Emergency Management Act 1986,* I, David Morcom, Chief Executive Officer, endorse the Wellington Shire Municipal Flood Emergency Plan as adopted by the Municipal Emergency Management Planning Committee on 25 July 2016.

_____ 5 August 2016

DAVID MORCOM
Chief Executive Officer
Wellington Shire Council

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Part 1. INTRODUCTION

1.1 Municipality Profile

The Wellington Shire profile in terms of its location, topography, demography and other general matters is provided in the Municipal Emergency Management Plan (MEMP).

1.2 Municipality Flood Risk

Flooding is a natural hazard in several areas of Wellington Shire. Whether floods are caused by high rainfall, rising river levels, coastal storm surges, changed infrastructure or inadequate drainage, they can severely disrupt communities by causing injury, loss of life, property damage, personal hardship, road closures, significant rural impact on livestock and fencing, and the municipality's economy.

Low to moderate flooding is a relatively frequent event in Wellington Shire. Such events are well within the capability and capacity of local emergency services. It is major or widespread flood events dealt with in this Plan. This plan deals with major or widespread flood events.

> *Two centuries of development on floodplains and low-lying areas mean that legacy issues will remain into the future.*

The 2016 Community Emergency Risk Assessment (CERA) review identified a Major Flood as having a residual risk of "High" within Shire footprint. Further details concerning the CERA process and the Treatment Plan for major flood is contained in the MEMP, Link: Wellington Shire Council Emergency Management.

Detailed flood threats, historical flood information, flood peak travel times, local flood emergency plans, community consequences and impacts, maps and general flood and flood infrastructure information for each river system are provided in the Attachments and Appendices to this Plan.

1.3 Purpose and Scope of this Flood Emergency Plan

The purpose of this Plan is to detail arrangements agreed for the mitigation (prevention and preparedness), response to flood and the recovery from flood within Wellington Shire.

As such, the scope of the Plan is to:

- Identify flood behaviour for each river system;
- Detailed flood risk such as riverine, estuarine, storm surge[2];
- Support the implementation of measures to minimise the causes, consequences and impacts of flood events within the municipality;
- Detail Response arrangements including Incident Management, Command, Control and Co-ordination, flood warnings and evacuation arrangements; and
- Identify linkages with Local, Regional and State emergency and wider planning arrangements with specific emphasis on those relevant to flood.

[2] The primary cause of coastal inundation is storm surge combined with high tides. Flooding can be worsened in estuaries in coastal catchments and seasonal river mouth closures.

1.4 Wellington Flood Management Planning Committee (MFloodMPC)

The membership of the Wellington Flood Management Planning Subcommittee (MFloodMPC) is as follows:

- Department of Environment, Land, Water and Planning (DELWP)
- Southern Rural Water (SRW)
- VicRoads
- Victoria Police (VicPol)
- Victoria State Emergency Service (VICSES), Chair
- Wellington Shire Council (WSC)
- West Gippsland Catchment Management Authority (WGCMA)
- Other agencies as required (i.e. Bureau of Meteorology, infrastructure owners)

The MFloodMPC meets, as a minimum, twice per year. See also paragraph 1.5

The role of this Subcommittee is to:

- Ensure the integration of existing municipal and agency plans;
- Plan for flood management in a manner that coordinates flood management activities and recognises the importance of a mix of community safety and agency operational activities;
- Monitor, review and report on the delivery of the Municipal Flood Management Plan;
- Work with the Municipal Emergency Management Planning Committees to align planning activities;
- To share knowledge and create an environment of continuous improvement;
- Liaise and engage with community groups in relation to flood management planning

1.5 Responsibility for Review and Maintenance of this Plan

The MFloodMPC is responsible to the Municipal Emergency Management Planning Committee for preparing, reviewing and maintaining this Plan.

This Plan should be reviewed:

- Following any new flood study;
- Change in non-structural and/or structural flood mitigation measures;
- After a major flood event;
- When significant changes in land use or community characteristics occur; or
- When there are changes that alter agreed plan arrangements.

1.6 Emergency Management Responsibilities

VICSES is the legislated ‘control’ agency for flood response. There are also a number of agencies with ‘key support roles’, and other agencies/organisation that will act in support of VICSES and provide support to the community in the event of a flood within the Shire. Support may include provision of essential services, personnel, or material support to VICSES or affected people and communities.

The general roles and responsibilities of the key supporting agencies are detailed in the Emergency Management Manual Victoria (EMMV) Part 7 ‘Emergency Management Agency Roles’, the State Flood Emergency Plan and the Regional Flood Emergency Plan and on agency websites.

Some specific flood support roles are expanded upon in Table 1 below. The extent of their implementation will depend on the severity of the flooding.

VICSES ensures that all agencies and organisations mentioned in Table 1 are aware of their roles and responsibilities.

Table 1. Emergency Management Roles and Responsibilities for Flood

Agency/ Communities'	Specific "Flood" Responsibilities	Web links and Comments
Ambulance Victoria (AV)	• Support the evacuation of vulnerable people. • Support other agencies.	
Bureau of Meteorology BOM	• Key Support Agency for flood. • Contribute to community awareness of meteorological and hydrological phenomena and warning systems • Provide meteorological forecasts and advice, including Severe Thunderstorm Warnings, Severe Weather Warnings, Flood Watches and Flood Warnings. • Flood monitoring and prediction, this involves: ○ meteorological input, ○ collecting data from rainfall and stream flow data networks, ○ operating flood prediction models, ○ preparing and issuing warnings to key agencies and selected media.	Bureau of Meteorology
Country Fire Authority CFA	• Support Agency for flood, supporting VICSES in their response role i.e. provision of personnel. • Aircraft Support: Management of airbases and provision of air observers. • Provide assistance, advice and information to other agencies responsible for, or involved in recovery activities.	
Communities - Residential & commercial property owners'	• Take an active interest in ensuring that their property and contents are insured and that their insurance premiums are tailored to their flood risk. • Residents and business owners in potentially flood prone areas should: ○ Understand their flood risk, ○ Prepare a flood emergency plan for their home or business and put in place effective measures to mitigate flood impact for their dwellings and business premises, and to aid in flood recovery, ○ Where physically capable fill and move sandbags to protect their property. As a guide 25 sandbags is a reasonable supply to residents to allow for coverage of doorways, blocking vents, drains and toilets. Additional sandbags may be provided taking into consideration individual issues and local priorities. ○ Following advice from Council regarding the disposal of sandbags from their property, as part of the clean-up. • Landholders may clear vegetation from waterways using a licence from the WGCMA, depending on the area.	Emergency Plans and Kits — Victoria State Emergency Service VICSES has an established community education program to support community and business in responding to flood emergencies Links: FloodSafe — Victoria State Emergency Service Your local flood information — Victoria State Emergency Service

Agency/ Communities'	Specific "Flood" Responsibilities	Web links and Comments
Community - Critical Facility owners'	• Working with VICSES to develop an effective flood mitigation plan for their property.	
Department of Economics, Development, Jobs, Transport and Resources DEDJTR	• Provide advice on animal welfare and dealing with dead and injured animals. • With the support of participating and supporting organisations i.e. Council, provide animal care services for pets and companion animals of evacuees.	
Department of Environment, Land, Water and Planning DELWP	• Key Support Agency for flood. • Coordination of Total Flood Warming System (TFWS) services at the state level in consultation with VICSES, BoM, WGCMA, Council and Gippsland Water. • Dam Safety management. • Flood mapping: Coordinates the statewide flood database, collates flood height and extent mapping data across the state. The data is captured and developed through a number of flood risk assessment investigations and studies. The information is stored as a series of Geographic Information System (GIS) layers, collectively known as the Victorian Flood Database (VFD). • Assists Council to manage floodplains and implement mitigation works to reduce the risk of flooding. • Facilitates the management of levee systems and the oversight of flood warning systems. • Aircraft Support: Management of airbases and provision of air observers. • Environmental impact assessment following a significant flood.	DELWP - Floodplain management
Parks Victoria PV	• Support the flood response and recovery actions, including IMT's, field operations, reopening of roads and bridges on PV land, and management of park visitors. • Management of any water control structures located on PV land. • Clearing and restoration of roads, bridges and other assets within its parks and reserves. • Response agency for emergency flood situations within its operating area. • Control agency for waterway pollution within its operating area.	
Department of Education and Training DET **School Principals**	• As requested by the VICSES Incident Controller, arrange for the relocation of students to another school (or staging point) during school hours for those students whose travel arrangements are likely to be disrupted by flooding and/or road closures. When students are relocated to an area outside the flood zone, DET (via individual schools) will make arrangements, with parents, for students to be pick-up or bussed home at the end of the school day.	

Agency/ Communities'	Specific "Flood" Responsibilities	Web links and Comments
Environment Protection Authority EPA	• Works with Councils and DELWP in flood-affected communities, to designate landfill facilities for the disposal of dead livestock. • Works with Councils, farmers and landowners on disposal of waste related to flood events. • EPA also assists the waterway manager on disposal of large numbers of flood-related fish deaths.	The Environment Protection Authority Victoria (EPA)
Essential Services Operators	The operators of essential services infrastructure are responsible for developing and implementing site specific strategies to mitigate all risks to business including: • Assessing risk and consequences posed by flooding • Developing and implementing flood risk mitigation plans for each facility at risk of flooding. • Developing flood response plans.	
Fulham Correctional Centre	If requested: • Assist with sandbagging efforts. • Assist with clean up; debris collection removal. • Catering support.	
Gippsland Water GW	• Key Support Agency for flood. • Keep VICSES advised of the status of utilities and the ongoing ability to provide services. • Advise VICSES of the security of critical water and wastewater assets to assist preparedness and response activities in the event of flood. • Maintain or improve the security of critical water and wastewater. • Check and correct where possible the operation of critical water and wastewater assets in times of flood. • Advise the IC in the event of inundation of critical water and wastewater assets.	
Relief & Recovery Support Services	• Refer to the Municipal Emergency Management Plan (MEMP) and the Wellington Relief and Recovery Plan.	Red Cross, VCC, DHHS, Salvation Army, etc.
Sale RAAF Base	• Assist as requested via the Defence Aid to the Civilian Community (DACC) process.	
Southern Rural Water SRW	• SRW manages three major water storages that may impact on Wellington Shire. • None of these storages were designed to manage floods. • Most of our dams do not have flood gates, which means they cannot significantly reduce flood flows. • Lake Glenmaggie has flood gates and we do attempt to assist in managing flood flows - however it is also a relatively small dam in a large catchment. • Lake Narracan on the Latrobe River has flood gates however, it only has a tiny capacity compared to its catchment, and cannot reduce significant flood flows.	Floods | Southern Rural Water

Agency/ Communities'	Specific "Flood" Responsibilities	Web links and Comments
AusNet Services	• Provide advice to the VICSES Incident Controller of any need to disconnect power supplies or of any timetable for reconnection. • Clear or make safe any hazard caused by power lines or electrical reticulation equipment. • Assess the necessity for and implement the disconnection of customers' electrical installations where these may present a hazard. • Advise the public as to the availability or otherwise of the electricity supply. • Inspect, test and reconnect customers' electrical installations as conditions allow.	AusNet Services - Electricity - Interruptions & Faults
Telstra	• Maintain Fixed and Mobile telephone services. • Repair and restore telephone facilities damaged by flooding. • Maintain Victorian Government Emergency Radio Network. • Provide additional telecommunications support. This can be done by the use of our mobile base stations for mobile phones and the setup of a complete exchange if one gets damaged.	
Victoria Police VicPol	• Co-locate with and assist the Incident Controller with the decision and warning stages if required. • Manage the withdrawal, shelter and return stages of the evacuation in consultation with the Incident Controller and Health Commander. • With local assistance (MERC/MERO) source and manage resources to facilitate evacuation in consultation with control and support agencies. • Maintain ongoing liaison with the Incident Controller for the duration of the evacuation. • Monitor the establishment and maintenance of safe access and egress routes for evacuees. • In consultation with the Incident Controller and other agencies maintain communications with the affected community. • Ensure registration of evacuees is initiated if required.	
VicRoads	• Close and reopen roads as necessary and advise the VICSES Incident Controller and Council of the closure and later re-opening. • Provide road condition information to the public.	Incidents & alerts : VicRoads

Agency/ Communities'	Specific "Flood" Responsibilities	Web links and Comments
Victorian State Emergency Service VICSES	• The VICSES is the state authority responsible for managing response to floods, including public meetings and decisions on flood response such as evacuation. • Coordinating activities of supporting agencies and organisations and ensuring that liaison is established with them. • Coordinate a public education program so residents of flood prone areas can be made aware of and ready for the flood threat. • Develop and maintain a flood intelligence system. • Coordinate the development and operation of flood warning services for the community. • Ensuring that people/communities at risk of flooding are identified and monitored. • Provide information services in relation to a flooding event. • Direct the conduct of flood rescue and evacuation of people and/or communities in support of VicPol. • Coordinate operations in accordance with its Sandbagging Policy i.e. by providing sandbags and sand to local communities. • Advise the community and supporting agencies when flood operations have been completed. • Support in flood recovery, if requested. • After a significant flood event, VICSES, WGCMA and Council will co-ordinate the collection and collation of flood intelligence, including local knowledge.	Call 132 500 for emergency SES assistance during a flood or storm. VICSES Information Line (1300 842 737) when activated. Emergency Plans and Kits — Victoria State Emergency Service VICSES community education program to support community and business in responding to flood emergencies Link: FloodSafe — Victoria State Emergency Service Your local flood information — Victoria State Emergency Service
VLine	• Close and re-open the Bairnsdale line as necessary and advise the VICSES Incident Controller.	
Wellington Shire Council WSC, or Council	• Key Support Agency for flood. • Control development on floodplains through their local planning schemes. • Manage local community flood mitigation infrastructure. • Procure sandbags to protect Council owned facilities including Community Critical Facilities managed by Council. • Identify Community Critical Facilities. • At the request of the VICSES Incident Controller, deploy personnel and resources for flood related activities. • Coordinate the community relief and recovery arrangements in accordance with the Municipal Emergency Management Plan (MEMP). • Close and reopen Council roads as necessary and advise the VICSES Incident Controller and VicRoads of the closure and later re-opening • In conjunction with the DHHS, provide for the management of health hazards associated with flooding. • Ensure premises are fit and safe for reoccupation and assess any need for demolition. • Coordinate clean-up including disposal of sandbags.	

Agency/ Communities'	Specific "Flood" Responsibilities	Web links and Comments
West Gippsland Catchment Management Authority WGCMA	• West Gippsland Catchment Management Authority has statutory powers under the *Water Act 1989* to manage waterways, floodplains and rural drainage. • Prepare a Floodplain Management Strategy for their region. The strategy includes four objectives: ○ Adopt a consistent approach to assessing flood risks and prioritising flood management activities, ○ Build relationships and embed accountabilities for floodplain management, ○ Provides transparency and consistency in managing flood risks, ○ Encourage communities to takes actions to manage their own risks, allowing local communities to determine their flood service needs. • Provide input to planning schemes, responding to planning permit referrals and helping resolve planning issues. • Facilitate the development, maintenance and upgrading of regional flood warning systems. • Coordinate the collection of flood information such as: flood photography, flood heights and flow rates and velocities in times of significant floods. • During a flood emergency support VICSES: ○ With advice on the behaviour and movement of floods, ○ By monitoring regional flood warning systems, ○ Coordinating flood monitoring and collecting data. • Develop and prioritise flood recovery programs for CMA assets/waterways, including restoring impacts of river erosion where there is an immediate danger of the formation of river breakaways and/or immediate danger to CMA and public assets.	

2012 Flood - Tinamba

Part 2. PREVENTION / PREPAREDNESS ARRANGEMENTS

2.1 Floodplain Management

The new Victorian Floodplain Management Strategy (VFMS), released in 2016, builds on lessons from the 2010 to 2012 floods; which affected Maffra, Newry, Stratford, Tinamba and Sale in the Wellington Shire. The VFMS *(Link: DELWP - Victorian Floodplain Management Strategy)* sets the direction for floodplain management in Victoria and has four key parts:

- **Assessing flood risks and sharing information** provides the technical basis for assessing flood risk and commits to sharing flood risk information. It sets the framework to prioritise flood mitigation activities based on the level of flood risk.
- **Avoiding or minimising future risks** endorses the use of planning controls to manage the potential growth in flood risk. It sets accountabilities in land use planning to avoid increased stormwater runoff from new developments and endorses planning benchmarks that consider predicted increases in sea levels.
- **Reducing existing risks** clarifies the institutional arrangements to mitigate the risk and consequence of floods. It also explains how flood warning systems will be tailored to meet community needs.
- **Managing residual risks** focuses on how access to better information can reduce the consequence of flood events. The response and recovery activities align the Strategy with the broader emergency management framework.

2.2 Flood Studies

The West Gippsland Catchment Authority (WCMA) has undertaking flood studies in the following areas to help agencies and communities understand flooding better and to improve land use planning and emergency response to floods:

- Rosedale
- Seaspray
- Latrobe River
- Avon River Regional Flood Mapping

Flood studies provide more detailed information about flood behavior in a certain area, including development of sophisticated computer models that incorporate local knowledge, anecdotal information and historical information to determine flood extents, depths and velocities for a variety of flood sizes. After a study has been completed flood inundation maps and information can be used by land planners, the community and emergency services. This information also informs this Plan, in particular in the Attachments and Appendices. Link: Flood studies | West Gippsland Catchment Management Authority

2.3 Flood Intelligence

Flood intelligence describes flood behaviour and its effects on the community. The effects include:

- Inundation (which may lead to a need for evacuation and/or property protection).
- Isolation (creating a need for resupply and/or rescue).
- Disruption to community activities (e.g. road closures)

Flood intelligence is obtained by the process of gathering and assessing information for the purpose of estimating the likely impacts and consequences of pending and future floods. It is used to facilitate operational decision-making and the provision of warnings and information to agencies and the public.

VICSES develops and maintains a flood intelligence system for the municipal footprint, including; records of the effects of flooding at different heights. These records are held in flood intelligence cards and are also contained in the Appendices.

2.4 Flood Warning Services

All Victorian communities receive weather-related warnings such as Flood Watches and Severe Weather Warnings delivered by BoM. These services provide advice on weather conditions that have the potential for heavy rainfall and flooding.

BoM's website also provides near real-time river height data and rainfall data, for most major rivers at risk of flooding. This information allows people to make their own judgements about the rates of change and the potential for local consequences during a flood.

VICSES issues FloodSafe guides to support local communities in preparing for and responding to floods.

Victoria also has a flood warning system that involves several elements: rainfall and stream flow gauging, mapping, warnings and predictions. All these elements need to come together in order for the total system to give communities effectively warnings about approaching floods.

A vital part of the flood warning system is the stream flow-gauging network. There are numerous gauging sites throughout Wellington Shire; there locations are listed in each Appendix A to each river system. These gauges serve a range of purposes. Some gauges are primary flood warnings sites providing vital real-time river height data, other sites are used to provide further backup data and flash flooding information.

Victoria's flood warning system is called the Total Flood Warning System (TFWS).

2.4.1 Total Flood Warning System Services

The purpose of the Total Flood Warning System (TFWS) is to enable and persuade people, communities and organisations to take action to increase safety and reduce the costs of flooding. It seeks to achieve this by generating appropriate responses from people and organisations at risk, and from the agencies with responsibilities during flood times.[3]

The TFWS comprises of six integral parts[4]:

1. **Prediction** – detecting changes in the environment that lead to flooding, and predicting river levels during flood[5].
2. **Interpretation** – identifying in advance the impacts of the predicted flood levels on communities at risk.
3. **Message construction** – devising the content of the message which will warn people of impending flooding.
4. **Communication** – disseminating warning information in a timely fashion to people and organisations likely to be affected by the flood.
5. **Response** – generating appropriate and timely actions from the threatened community and from the agencies involved.
6. **Review** – examining the various aspects of the system with a view to improving its performance.

[3] Mary Barry, *Total flood warning systems*, The Australian Journal of Emergency Management, Vol.23 No. 3, August 2008

[4] Ibid

[5] Note: This Plan acknowledges that not all river systems are serviced by flood monitoring gauges. As part of flood studies future monitoring infrastructure could be determined.

Communities with high potential for flood damage receive more sophisticated TFWS services. These can include local predictions about the rise and fall of floodwaters, details on the roads and properties likely to be inundated, and local advice about how to prepare for and respond to predicted floods.

2.4.2 Clarifying accountabilities for each TFWS element

The relevant agencies' roles and responsibilities in operating and maintaining the TFWS is as follows:

Data collection network infrastructure: The river height and rainfall gauging network infrastructure is maintained through the Gippsland Regional Water Monitoring Partnership (involving DELWP, Council, WGCMAs, SRW and Gippsland Water). The Partnership contributes funds to the maintenance of those parts of the network whose primary function is to support the TFWS.

Flood prediction service maintenance: BoM maintains and funds the prediction services for the locations as defined in the Partnership agreement. Maintenance includes continually improving prediction techniques, interpretation (flood mapping) and completion of local flood studies to produce updated flood mapping. DELWP includes updated flood mapping and flood behaviour information into the flood intelligence platform.

Message construction and dissemination: BoM maintain appropriate flood warning messages and associated dissemination channels. VICSES maintains its dissemination channels for flood bulletins. DELWP maintains the flood intelligence platform to enable appropriate information for messages and bulletins to be accessed. Council may relays approved messages from the BoM and VICSES on its website and social media.

Flood response planning and community awareness: VICSES maintains flood response plans and community education material. WGCMAs supply VICSES with any significant updates.

2.4.3 FloodZoom

DELWP has developed a ground-breaking, web-based tool that provides an authoritative range of flood information to agencies, before, during and after floods – all in the one resource.

FloodZoom brings together flood forecasts, flood mapping, real-time river height gauges and property data to provide flood response agencies with improved knowledge of likely flood impacts.

Flood-prone communities will benefit from more accurate and timely flood warnings that are specific to their local community, improved flood preparedness and flood response activities, and better informed planning decisions.

For further details go to Link: Flood warning improvements - DELWP

2.5 Flash flood warning services

Flash flooding poses a potential threat to life in some regional urban centres. Flash flood warnings centre on a rapid response (less than six hours) to the conditions that might lead to flooding:

- WGCMA, with support from VICSES and Council, identify areas where flash flooding poses a risk to life.
- VICSES will work with DELWP, BoM, and the Emergency Management Commissioner to evaluate the potential to provide localised neighbourhood-scale flash flood warning services where there is a history of flash flooding.

2.6 Structural Flood Mitigation Measures

There are few structural flood mitigation measures that exist within the municipality. Remnants of old levees around the township of Sale are contained in Attachment 2 – Thomson/Macalister Rivers. Leaves around the township of Seaspray are contained in Attachment 3 - Merrimans Creek.

2.7 Non-structural Flood Mitigation Measures

2.7.1 Exercising the Plan

Arrangements for exercising this Plan will be at the discretion of the MEMPC.

2.7.2 Flood Warning

Specific details of local flood warning system arrangements are provided in Appendix E to each river system system Attachment to this Plan.

2.7.3 Flood Wardens

There is no formal system of Flood Wardens. Volunteer Flood Warden Systems are used as a source of local information to assist farmers on or near rivers manage their paddocks and assets which get inundated when flows reach certain levels in the rivers. These community based Flood Wardens operate phone trees where other members of the community assist in contacting people.

2012 Flood – Port of Sale

Part 3. RESPONSE ARRANGEMENTS

3.1 Response Triggers and Activation

Severe Weather Warnings aim to provide advance notice of very heavy rainfall that is likely to lead to flash flooding, abnormally high tides or storm surge. Warnings are issued by the BoM when severe weather is expected to affect land-based communities within the next 24 hours (but is not directly the result of severe thunderstorms, tropical cyclone or fire weather warnings) and are issued for a Weather District. Wellington Shire falls in the 'West & South Gippsland' District.

Flood Watches are issued by the BoM when predicted rainfall may lead to flooding. They are issued 24 to 36 hours in advance of any likely flooding and are issued for a Weather District.

3.1.1 Activation of Response

VICSES is the legislated Control Agency for floods and is responsible for the control of flood operations. This includes the coordination of other agencies and organisations for flood management tasks.

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

The VICSES RDO/IC will activate agencies as required as documented in the State Flood Emergency Plan.

Response arrangements are also contained in the MEMP.

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 significant flood within the Wellington Shire, refer Table 1. These agencies will be engaged through the Emergency Management Team (EMT).

3.1.3 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.

The six Gippsland municipalities have a resource sharing agreement in place for all emergency events.

3.2 Strategic Control Priorities

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

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

   a. Safety of emergency services personnel, and;

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

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

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

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

5. Protection of assets supporting individual livelihoods and economic production that supports individual and community financial sustainability;
6. Protection of environmental and conservation values that considers the cultural, biodiversity, and social values of the environment.

Circumstances may arise where the IC is required to vary these priorities, with the exception being that the protection 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 the State Emergency Response Plan (SERP)[6] - Part 3 of the EMMV, VICSES State and Regional Flood Emergency Plans, and the Wellington MEMP.

3.3.1 Control

Sections 5(a) and 5(c) 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 also identifies DELWP as the Control Agency responsible for dam safety and, water and sewerage asset related incidents. These assets are managed by the local Water Corporation on behalf of DELWP.

3.3.2 Incident Controller (IC)

An IC will be appointed by the VICSES to command and control available resources in response to a flood event on the advice of BoM that a flood event will occur or is occurring. The IC responsibilities are as defined in the SERP.

3.3.3 Incident Control Centre (ICC)

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

Pre-determined ICC locations for flood are:

- **Level 1**[7] – Local VICSES Unit
- **Level 2** - VICSES East Region Headquarters, 82a Moore St Moe or VICSES East Region Office, 130 Macleod Street, Bairnsdale
- **Level 3** – Regional Control Centre facility, 181 Franklin Street, Traralgon

3.3.4 Incident Management Team (IMT)

The IC will form an Incident Management Team (IMT).
Part 3 of the EMMV provides guidance on the IMT and Incident Management System (IMS).

[6] Emergency Management Manual Victoria | Emergency Management Victoria

[7] Level 1, 2 and 3 incidents are described in the SERP

3.3.5 Emergency Management Team (EMT)

The function of the Emergency Management Team (EMT) is to support the IC in determining and implementing appropriate incident management strategies for the flood event.

If the flood event requires a response by more than one agency, the IC is responsible for forming the EMT.

The EMT consists of:

- Incident Controller
- Support Agency commanders
- Commander of supporting health agencies
- Regional Recovery Coordinator (DHHS) and/or Municipal Recovery Manager (Council)
- Emergency Response Co-ordinator (MERC or RERC) , and
- Other specialist persons as required.

For detailed information in relation to roles and responsibilities of the EMT refer to the SERP at Part 3 of the EMMV and Practice Note Emergency Management Team available from the Emergency Management Manual Victoria | Emergency Management Victoria website

3.3.6 On Receipt of a Flood Watch / Severe Weather Warning

The VICSES will:

- Ensure flood bulletins and community information are prepared and issued to the community, refer paragraph 3.4.
- Notify and brief as appropriate. This includes the Gippsland 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.
- Review flood intelligence to assess likely flood consequences.
- Monitor weather and flood information – www.bom.gov.au
- Assess Command and Control requirements.
- Review local resources and consider needs for further resources regarding personnel, property protection, flood rescue and air support.
- Monitor watercourses and undertake reconnaissance of low-lying areas.
- Ensure flood mitigation works are being checked by owners i.e. Southern Rural Water
- Develop and issue incident action plan, as required.
- Develop and issue situation report, as required.

3.3.7 On Receipt of the First and Subsequent Flood Warnings from the BOM

The VICSES will:

- Review flood intelligence to assess likely flood consequences.
- Determine what the at-risk communities need to know and do as the flood develops.
- Liaise with the Municipal Emergency Response Coordinator (MERC), VicPol and if deemed appropriate the MERC will advise Wellington Shire Council to open its municipal emergency coordination function.
- Continue to warn the at-risk communities including ensuring that an appropriate warning and community information strategy is implemented.
- Liaise with relevant critical infrastructure owners as appropriate (i.e. water and power utilities).
- Implement response strategies as required based upon flood consequence assessment.
- Continue to monitor the flood situation – www.bom.gov.au/vic/flood/
- Continue to undertake reconnaissance of low-lying areas.

3.4 Community Information and Warnings

The BoM has the responsibility for issuing Flood and Severe Weather Warnings.

VICSES, as the Control Agency, provides further community messaging.

Council has the responsibility to assist VICSES to warn individuals and communities and will do this via its Website. Other agencies such as CFA, DELWP, PV and VicPol may be requested to assist VICSES with the communication of community flood warnings.

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

DHHS assisted by Council will coordinate information regarding public health and safety precautions. Guidelines for the distribution of community information and warnings are contained in the State Flood Emergency Plan.

Community information and warnings will be targeted at local, regional and state wide needs and may include:

- Radio and Television;
- Social media
- Verbal Messages (i.e. Doorknocking);
- Agency/Council Websites;
- VICSES Information Line 1300 842 737 (when activated);
- Variable Message Signs (i.e. road signs);
- Emergency Alert messaging;
- Standard Emergency Warning Signal (SEWS)
- Community meetings;

Refer to Appendix C and E in each River System attachment for the specific details of how community information and warnings may be provided.

3.5 Media Communication

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

Refer also to the Wellington MEMP - Information and Warnings.

3.6 Impact Assessment

The IC is responsible for initiating the impact assessment process. Once it is initiated the IC will request the appointment of a coordinator to manage the first phase of assessment.

Impact Assessment is not the responsibility of a single agency; it encompasses data drawn from a number of different agencies and government departments. Whilst the Initial Impact Assessment phase is essentially a visual inspection by first responders, the Secondary Impact Assessment utilise data drawn from various sources including the affected community, response agencies, Council, DET, DHHS, DELWP, VicRoads and subject matter expert's depending on the nature and scale of the event.

This information may then be used to provide the basis for further needs assessment and recovery planning by DHHS, Council and other recovery agencies.

Further details on the impact assessment process can be found in the Emergency Management Victoria Impact Assessment Guidelines for Class 1 Emergencies 2015.

3.7 Evacuation

VicPol is the Control Agency responsible for evacuations. The decision to recommend evacuation to VicPol rests with the IC and VicPol.

Once the decision is made, VicPol are responsible for the coordination of the evacuation process. VICSES and other agencies will assist where practical.

VICSES is responsible for the development and communication of evacuation warnings.

VicPol and/or Australian Red Cross have the responsibility of registering people affected by a flood emergency including those who have been evacuated, usually to an Emergency Relief Centre (ERC).

The MERC, VicPol will advise Wellington Shire Council should the establishment of and ERC be required. Refer to the Wellington MEMP and Part 3 of the EMMV for guidance on evacuations in emergencies.

3.8 Flood Rescue

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

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

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

Where the water is flowing at or above walking pace it is considered to be swift water. The responsibility for swift water rescue sits with Victorian Water Police who will provide a Senior Sergeant from Water Police to attend the local ICC to manage swift water rescues.

3.9 Aircraft Management

Aircraft can be used for a variety of purposes during flood operations including evacuation, resupply, reconnaissance, intelligence gathering and emergency travel. Air support operations will be conducted under the control of the IC.

3.10 Resupply

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

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

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

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

3.11 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.

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

If VICSES sandbags are becoming limited in supply, then priority will be given to protection of essential community infrastructure. Other high priorities may include for example locations where vulnerable people are located e.g. aged care facilities, and the protection of historical buildings.

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

Refer to Appendix C of each River System attachment to this Plan for further specific details of essential infrastructure requiring protection.

3.12 Road Closures

Wellington Shire Council, VicRoads, VicPol, Parks Victoria and DELWP will carry out their formal functions as road authorities.

VicRoads are responsible for designated freeways and arterial roads and Council is responsible for designated municipal roads. Other agencies, such as Parks Victoria or DELWP are responsible for state owned non-arterial roads (e.g. roads in National Parks or State Forests).

VicRoads will communicate road conditions via their websites. Other road authorities will provide VicRoads with relevant information to enable effective community messaging.

Likely Major Road Closures due to flooding

Road	Location of signage or closed gates
South Gippsland Highway	1) South of Sale. 2) Stradbroke at Merrimans Creek. 3) at Alberton River, east side. 4) West of Toora
Princes Freeway/Highway	1) Stratford

3.13 Dam Failure

Probability of a dam failure is extremely low, however their effects can be significant. In Victoria dam safety is monitored and warning arrangements are in place to warn downstream residents of potential dam failure threats. Should dam failure occur, significant downstream flooding with potentially swift flowing water and high amounts of debris can occur; refer Wellington MEMP.

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

The Thomson Reservoir (managed by Melbourne Water) lies in Baw Baw Shire however impacts of any breach will include the Wellington Shire through the Thomson River system.

Any breach of the Blue Rock Lake which lies in Baw Baw Shire and Lake Narracan which lies in the Latrobe City Council area can both impact Wellington Shire along the Latrobe River. Blue Rock Lake impounds the Tanjil River which flows into the Latrobe River upstream of Lake Narracan. Flood flow from a dam breach of Blue Rock would impact Baw Baw, Latrobe and Wellington LGAs.

Lake Glenmaggie is located within Wellington Shire and impacts will be on the Macalister River system and the Thomson River system downstream of Bundalaguah Links: Lake Glenmaggie | Southern Rural Water Macalister Irrigation District | Southern Rural Water Lake Glenmaggie's large catchment means that river flows can be quite extreme, so even when the reservoir is only partly full SRW can have limited ability to reduce the impact of floods downstream. At such times, SWR work with the emergency services agencies to help ensure that downstream communities are well informed Link: Floods | Southern Rural Water

Cowwarr Weir (a diversion weir rather than a storage) is also located within Wellington Shire and impacts will be on Cowwarr Channels and the Thomson River.

THESE DAMS ARE NOT DESIGNED OR OPERATED FOR FLOOD MITIGATION, although some flood mitigation can occur as a result of the flow being lessened by a dam.

Details of these dams with the potential to cause structural and community damage within the Municipality are listed in Appendix A of each River System attachment to this Plan.

3.14 Water and Wastewater related Public Health Issues and Critical Assets

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

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

Council and Gippsland Water will provide information to affected communities on possible water supply contamination and the safety of the drinking water supply. However, it should be assumed that if there is flooding, there will be some contamination.

3.15 After Action Review

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

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

Lake Glenmaggie (photo courtesy of the ABC)

Part 4 EMERGENCY RELIEF & RECOVERY ARRANGEMENTS

4.1 General

Incident Controllers (IC) 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 Link: Emergency Management Manual Victoria | Emergency Management Victoria.

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.

The decision to open an Emergency Relief Centre (ERC) primarily rests with the IC. Once advised by the IC, VicPol (MERC) will request Council to open an ERC.

Relief and recovery arrangements within the municipality are detailed in the Wellington MEMP Link: Wellington Shire Council Emergency Management and the Municipal Relief and Recovery Plan.

4.2 Transition from Response to Recovery

VICSES as the Control Agency is responsible for ensuring effective transition from response to recovery. This transition will be conducted in accordance with existing arrangements as detailed in the SERP and the Wellington MEMP. However, it is expected that recovery will commence from the outset of a flood incident.

1978 Flood – Cowwarr Weir

Intentionally Blank

ATTACHMENT 01 AVON RIVER, PERRY RIVER

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ASSOCIATED REPORTS

State Flood Intelligence Report, Victoria State Emergency Service (2011)

http://trove.nla.gov.au/ndp/del/article/50211705…….

Effects of Flooding on the Avon River Catchment in April 1990, IDA (1990)

Report on Gippsland April 1990 Floods, Rural Water Commission of Victoria (1991)

ACCURACY & CONFIDENTIALITY

Use this information as a guide to the possible effects of a flood. This plan is based on estimates of flood behaviour and particular effects may occur at heights different from those indicated here. They may also occur at slightly different heights in different floods. This card may contain sensitive information about the effects of flooding on private property. Specific reference to private addresses or businesses must be made directly to owners or other emergency services but not via broadcast or print media.

Floodwaters from the Avon River lap near the edge of Stratford in Gippsland after two days of torrential rain.

APPENDIX A.02 – FLOOD THREATS

WEATHER PATTERNS

The flood producing rainfall usually comes from a low-pressure system off the south coast of New South Wales or from a low-pressure weather system, which comes through Central Australia.

As seen in April 1990, heavy rain can fall in the upper catchment while less rain falls in the lower part of the valley. Localised heavy falls can cause flash flooding. Further, high water levels in Lake Wellington, south of the catchment, can cause a hold-up of the floodwater and spread it over a greater area below Stratford. This can result in people being flooded by a backwater effect rather than by direct flooding from the river.

OVERVIEW OF RIVER SYSTEM

AVON RIVER

The Avon River rises on the slopes of **Mt Wellington**, adjacent to the Great Dividing Range, flows 123km south to Lake Wellington in the Gippsland Lakes and has two major tributaries, **Valencia Creek** and **Freestone Creek**

The upper catchment is contained in the rugged, heavily forested and largely inaccessible Avon Wilderness Park. The river is joined by the **Turton River** from the east and then **Ben Cruachan Creek** to the west. The river then passes the ***Avon River @ The Channel*** BoM Flood Gauge before breaking out on to the floodplain.

Valencia Creek is a major tributary of the Avon River with most of its catchment in steep forested terrain. It passes the *Valencia Creek @ Gillio Rd* BoM flood gauge before it breaks out onto the flood plain just prior to joining the main stream from the east. The river then passes through the township of **Valencia Creek**.

Freestone Creek, another significant tributary, passes the *Freestone Creek @ Briagolong* BoM flood gauge before passing the nearby town of Briagolong and then joining the main stream from the east. The river doesn't pass through the township of **Boisdale** however the floodplain extends to the township. The floodplain is located almost entirely on the western side of the main river course however overland flow originating from local catchments does result in some flooding on the eastern side.

The river continues in a southerly direction to the township of Stratford where the *Avon River @ Stratford* BoM flood gauge is located. 10km downstream of Stratford the river is joined from the west by **Nuntin Creek (Drain)** which commences just downstream of **Boisdale** as a formal excavated drain and transitions into a natural creek near the township of Stratford.

The river is then joined by the Perry River as they both flow into Lake Wellington at the same location.

The steep, forested catchment covers an area of approximately 1500^2 km. It is a funnel-shaped catchment, which fills the river quickly in times of heavy rainfall. As a result, flooding on the Avon is very rapid and early warnings are most important. Although some warning is available for downstream residents and landholders, there is often little or no warning time available for people in the upper reaches of the catchment.

PERRY RIVER

The **Perry River** starts below **Fernbank** and flows south for 28.5kms to join the Avon River just before it flows into Lake Wellington. The three major tributaries feeding the Perry River are Sandy Creek, Fiddlers Creek and Jones Creek.

FLOOD RISKS

The behaviour of the Avon River can change rapidly as the level of water increases during a flood. The steep upper catchment results in quick run-off which spills over the river banks when it reaches the flatter land downstream. Rain in the foothills above Stratford can result in rapid river level rises even if there is no rain at Stratford.

FLOODING FREQUENCY

Floods are a regular occurrence on the Avon River, with minor events occurring every year or so, but sometimes as often as three or four times in the one year. Major events usually result from heavy rain across the whole catchment and are less frequent but have been recorded during 1893, 1920, 1952, 1988, 1990, 2007 and 2012.

RURAL FLOOD RISK

Throughout the Avon River catchment there a number of areas that have significant rural flood risk. Though these areas are not highly populated, rural properties are susceptible to isolation or inundation. Specific areas at risk are low lying areas around:

- **Avon River –** Monomak, Valencia Creek, Bushy Park, Boisdale, Llowlong, Stratford
- **Freestone Creek** – Briagolong, Bushy Park

DAM FAILURE FLOOD RISK

There are no significant water storages on the Avon River.

HEALTH & ENVIRONMENTAL RISKS

There are many septic tanks in the rural areas that may be inundated by floodwaters and farm chemicals stored in farm sheds on the floodplain.

PROPERTIES AT RISK

Community	Location	Impact
Boisdale	Main St	2 properties flooded & isolations
Briagolong	Landy St & Rosstrevor Ave	11 properties flooded & isolations
Stratford	Airley Rd, Freemans Lane, McMillans St, Newton Drive, Princes Highway Caravan park	20 properties flooded & isolations

COMMUNITY PROFILE

In general, this area has a stable, English-speaking Anglo-Saxon population. New residents mix with those who have lived in the area for generations. 20% of the population is employed on farming enterprises. There are a number of older residents who require support with evacuation.

HISTORICAL FLOODS

Periods of heavy rain leading to major flood events can occur in Wellington Shire at any time of the year although significant flood events generally occur between April and December. Significant floods have occurred in the Avon River as shown in the tables below. Impacts of significant events are discussed below the table.

EVENT	AVON RIVER @ THE CHANNEL	FREESTONE CK @ BRIAGOLON	VALENCIA CREEK @ GILLIO ROAD	AVON RIVER @ STRATFORD	AVON RIVER @ CLYDEBANK
1978 Jun	8.02	5.13	3.74	6.78	-
1984 Jun	5.04	4.39	2.77	5.11	-
1985 Apr	5.11	3.40	2.51	-	-
1985 Oct	6.17	4.56	3.12	5.60	-
1990 Apr	11.23	7.77	6.46	9.01	-
1993 Sept	5.56	3.92	2.81	5.10	-
1995 Oct	6.33	4.17	2.91	5.38	-
1998 Jun	6.16	6.43	3.84	6.80	-
2005 Feb	6.56	4.66	2.95	5.71	3.34
2007 June	9.61	7.02	5.81	8.86	4.09
2011 Aug	6.60	5.26	4.04	6.51	3.48
2012 Mar	5.56	4.60	3.43	5.61	3.38
2012 Jun	8.80	6.99	5.44	8.32	3.88
Major	7.50			6.50	
Moderate	6.90			6.00	
Minor	5.00			4.50	

< Minor | Minor | Moderate | Major

1950 FLOOD EVENT

VIC FLOODS AT PEAK, FAMILIES TAKEN TO SAFETY

The Adelaide Advertiser, April 6, 1950

Floodwaters today smashed an 80 ft. span of the Avon River bridge at Stratford, and hurled a woman 50 ft. to her death in the raging torrent below.

East Gippsland Rivers continued to rise rapidly today, and towns from Heyfield to the coast face their greatest flood crisis in history. Families in the Sale and Maffra districts were this evening evacuated from their marooned homesteads.

Mrs. Florence Evelyn Beechey of Stratford, fell to her death in the swirling waters of the flooded Avon River when a bridge on the Princes Highway at Stratford collapsed. A watch was being kept on the bridge, which appeared likely to collapse under the strain of the flooded river. Mrs. Beechey was driving three cows across the bridge. A police car drove past her and crossed safely. However, when Mrs. Beechey reached the center of the bridge it collapsed before the eyes of more than 100 people, who were watching the floodwaters. She and the cows plunged into the river and were swept out of sight. Mrs.

1990 FLOOD EVENT

Flooding in the Avon in April 1990 was significantly larger than the previous highest recorded flood in 1971. It was produced by an intense and unstable east coast low. The upper catchment experienced very heavy rainfall, with records of over 250mm of rain being common over the weekend 21-22 April. The Valencia Creek rainfall station recorded 240mm while the highest weekend total was on the Macalister at Murderers Hill with 375mm.

Overbank flow in 1990 was approximately 1m deeper than 1971 through Boisdale. Overbank flooding caused serious problems to houses and property, especially along the western floodplain. The main point at which flow broke out from the channel was identified as the breached artificial levee on private property just upstream of the Freestone Creek confluence. Overbank flow in the Boisdale area had sufficient depth to cross lateral barriers on the floodplain, such as artificial levees built around drainage and irrigation channels and inundate the entire floodplain.

The 1990 flood produced the highest flows ever recorded at that time in both the upper and lower catchments. Indications are that it was a 1 in 50yr ARI flood event. The river overflowed and caused major flooding across the full extent of the floodplain downstream through Stratford and to Lake Wellington. Major breakouts occurred in the Nuntin Creek (Drain) area.

70 houses were flooded at Boisdale and surround districts. In Boisdale and surrounding districts, 70 houses were flooded with 26 out of the 29 houses in the township flooded and all residents evacuated. At Stratford and surrounds 51 houses were flooded. The Princes Highway at Stratford was cut and the rail bridge was severely damaged.

2007 FLOOD EVENT

By early morning Friday 20th April, a low pressure centre had developed over western NSW which intensified and moved to the southeast locating just off the far south NSW coast by early morning Saturday 21st April. At this stage a strengthening and extremely moist south easterly airstream had extended across Gippsland to the Great Dividing Range and intense rainfall had commenced. The intense rainfall persisted for a period of 35 to 48 hours over a substantial part of the area.

In the last week of June 2007, Gippsland received record rainfall associated with an intense low pressure system. The storm followed one of the state's worst fire seasons, the 2006/07 Great Divide Bushfires, when 1.2 million hectares were burnt and vast areas of soil were exposed. Further compounded by other minor floods in March and November 2007, the storm in June 2007 resulted in major flooding and widespread damage to community and public assets in Gippsland.

Consideration of rainfall depths and intensities across the upper reaches of the Avon catchment (see Figure 2.4 and Appendix C) demonstrate why the Avon River also experienced significant major flooding. Flood flows and levels were marginally below the record flooding experienced in April 1990. At Briagolong on Freestone Creek as well as at both The Channel and Stratford (Avon River), levels and flows were lower than in April 1990 although at Stratford it was very similar. At Stratford the level was only 140mm lower and the flow only around 7,400ML/d less than in 1990. At each location, this event was the 2nd highest on record since 1967, 1972 and 1889 respectively. The assessed ARI varied from 22 years at Briagolong to 40 years at The Channel. A more complete summary of flows, levels and past record events at key gauging stations is provided in Appendix D.

MAJOR WATER STORAGES & LEVEES

There are no major water storages or levees in the catchment.

MAJOR ROAD CLOSURES

Riverine Flooding	Flash Flooding
Princes Highway @ Stratford	

RURAL ROAD CLOSURES

This is not a comprehensive list

Riverine Flooding	Flash Flooding
Valencia Creek Bridge	
Valencia Creek Rd – east of Valencia Creek	
Wombat Crossing	
Weir's Crossing	
Georges Creek - north of Briagolong	
BRIAGOLONG	
McLean St @ Rosstrevor St intersection	
Cahill St	
Avon St - between McLean & Landy	
Station St - Landy St to Forbes St	
Boisdale Rd – east of Boisdale	
Low level roads and bridges throughout the region may be submerged and closed	

GAUGE LOCATIONS

Gauge Name	Location	Gauge Zero m AHD	No.
Avon River @ The Channel	5km d/stream of Navigation Ck junction	72.000	225224
Valencia Creek @ Gillio Road			225223
Freestone Creek @ Briagolong	5km upstream of Briagolong	63.238	225218
Avon River @ Stratford	400m upstream of Princes Hwy bridge	6.479	225201
Avon River @ Clydebank (Chinns Bdg)			225234

GAUGE LEVEL INFORMATION

Gauge Name	Event	Gauge Height (m)	Flow (ML/d)	ARI (1 in X years)
Avon River @ The Channel		11.51	112,000	100
225224	1990 Apr	11.23	108,000	88
		10.02	90,200	50
	2007 Jun	9.61	83,552	
	2012 Jun	8.80		
		8.72	69,700	25
	1978 Jun	8.02		
Major		**7.50**	**52000**	**13**
		7.02	45,300	10
Moderate		**6.90**	**43600**	**9**
	2011 Aug	6.60		
	2005 Feb	6.56		
	1995 Oct	6.33	35900	8
	1985 Oct	6.17	33700	6
	1998 Jun	6.16	33600	6
	2001 Nov	6.01		
		5.82	29,100	5
	1993 Sep	5.56	25,700	4
	2012 Mar	5.56		
	1978 Mar	5.19		
	1985 Apr	5.11		
	1984 Jun	5.04		
Minor		**5.00**	**19500**	**3**
Valencia Ck @ Gillio Road	1990 Apr*	6.46	45,000	~40
225223	2007 Jun	5.81		
* Gauge washed away during this event	2012 Jun	5.44		
	2011 Aug	4.04		
	1998 Jun	3.84		
	1978 Jun	3.74		
	1985 Oct	3.12		
	2005 Feb	2.95		
	1995 Oct	2.91		
	1976 Oct	2.88		
Freestone Creek @ Briagalong			114,000	100
225218		8.53	86,900	50
	1990 Apr	7.77	71,300	

Gauge Name	Event	Gauge Height (m)	Flow (ML/d)	ARI (1 in X years)
		7.36	63,000	25
	2007 Jun	7.02	56,672	
	2012 Jun	6.99		
	1971 Jan	6.73	51,400	
	1991 Jan	6.71?		
	1998 Jun	6.43		
		5.86	37,100	10
	2011 Aug	5.26		
	1978 Jun	5.13		
	1970 May	4.91		
	1970 Jun	4.80		
		4.75	21,800	5
	2005 Feb	4.66		
	1988 Nov	4.63		
	2012 Mar	4.60		
	1985 Oct	4.56		
	1970 Jan	4.49		
	1970 Aug	4.42		
	1984 Jul	4.39		
	1995 Oct	4.17		
Avon River @ Stratford		11.97	439,000	100
225201		10.67	328,000	50
	1990 Apr	9.01	246,000	
	2007 Jun	8.86	245,000	
		8.78	233,000	25
	2012 Jun	8.32		
	1998 Jun	6.80	143,000	
	1978 Jun	6.78		
		6.71	135,000	10
	2011 Aug	6.51		
Major		**6.50**	**126,000**	**9**
Moderate		**6.00**	**103,000**	**7**
	2005 Feb	5.71		
	2012 Mar	5.61		
	1985 Oct	5.60		
		5.40	78,000	5
	1995 Oct	5.38		
	2007 Nov	5.20		

Gauge Name	Event	Gauge Height (m)	Flow (ML/d)	ARI (1 in X years)
	1984 Jul	5.12		
	1993 Sept	5.10		
	1988 Nov	4.67		
	1985 Sep	4.62		
Minor		**4.50**	**45,700**	**3**
Avon River @ Clydebank (Chinns Bridge)	2007 Jun	4.09		
225234	2012 Jun	3.88		
	2011 Jul	3.69		
No records between Dec 1977 & Aug 2004	2011 Aug	3.48		
	2007 Nov	3.4		
	2012 Mar	3.38		
	2005 Feb	3.34		
	2007 Jul	3.26		
	2008 Nov	2.56		
	2005 Jul	2.5		
	1977 Sep	2.23		
	2005 Nov	2.22		
	2005 Dec	2.22		

APPENDIX B.02 - TYPICAL FLOOD PEAK TRAVEL TIMES

Travel times are calculated as the time the peak of the event takes to move from one gauge to the next. Note the onset of flooding can occur before the peak water level occurs.

It is possible for flooding to commence at downstream locations prior to peak heights being reached in the upper parts of the catchment due to both locally heavy rainfall and the backwater effects mentioned earlier.

Due to the high level of variability in antecedent catchment conditions, flood travel times can vary significantly, as demonstrated in previous floods.

Travel times listed here are **INDICATIVE ONLY** and are **HIGHLY VARIABLE**.

From	To	Hours
The Channel	Bushy Park	3-4
The Channel	Stratford	6-7
Gillio Road	Stratford	6-7
Briagolong	Stratford	5-6
Bush Park	Stratford	3-4

APPENDIX C.02a – FLOOD EMERGENCY PLAN STRATFORD

LOCATION

Stratford is a small town on the Princes Highway 17 kms east of Sale and is located on the Avon River. The town services the local farming community and is a popular stopping point for travellers.

FLOOD BEHAVIOUR

The Avon River is reputed to be one of the fastest rising waterways in the southern hemisphere. The river has a large, steep, funnel shaped catchment which results in extremely rapid water level rises in the upper catchment. When the river reaches the lower reaches around Stratford & Bushy Park, it flattens out and slows, spilling over the banks and inundating the lower lying rural properties. Local roads may have sudden inundation which can occur prior to the minor flood warning trigger point catching motorists unaware.

FLOOD MITIGATION SYSTEMS

There are no flood mitigation systems in Stratford

FLOOD WARNINGS

The Bureau of Meteorology provides warnings for Stratford and is able to provide warnings and flood height predictions once upstream gauges have peaked giving approximately 6-24 hours ahead of peaks in rural areas, approximately 6-48 hours in Stratford.

ROAD CLOSURES

- During major events, the Princes Highway will be cut at the Avon River bridge.
- Low lying roads which cross or run parallel to the Avon River may flood during relatively minor floods.

STRATFORD & SURROUNDS

- **Princes Hwy** - @ Princes Highway bridge Stratford
- **Maffra Rd** - west of Stratford
- **Stewarts Lane** - @ Weirs Crossing

GAUGE LEVEL INFORMATION

Avon River @ Stratford (225201)

Flood Class	Flood Event	Stratford
	1990 Apr	9.01
	2007 Jun	8.86
	2012 Jun	8.32
	1998 Jun	6.80
	1978 Jun	6.78
	2011 Aug	6.51
Major		**6.50**
Moderate		**6.00**
	2005 Feb	5.71
	2012 Mar	5.61
	1985 Oct	5.60
	1995 Oct	5.38
	2007 Nov	5.20
	1984 Jul	5.12
	1993 Sept	5.10
	1988 Nov	4.67
	1985 Sep	4.62
Minor		**4.50**

DETAILED CONSEQUENCES & IMPACTS – FLOOD INTELLIGENCE CARD

Gauge	No.	Location	Datum Type
Avon River @ Stratford	225201	400m upstream of Princes Hwy bridge.	AHD

Height (m)	Consequences	Operational Considerations

4.50	**MINOR FLOOD LEVEL**
	
	SUMMARY
	• Rural Properties at low level may be affected. Property owners should move pumps and stock to higher ground
	• Minor roads may be closed and low-level bridges submerged isolating local residents.
	
	ROADS
	• **Road Closed (&low level bridges)**
	  ▷ Valencia Creek Bridge
	  ▷ Wombat Crossing
	  ▷ Weir's Crossing
	  ▷ Georges Creek north of Briagolong	

6.00	**MODERATE FLOOD LEVEL**	
6.50	**MAJOR FLOOD LEVEL** **ROADS** • **Road Closed** ▷ Princes Highway at the railway bridge west of Stratford.	……
8.32	**JUNE 2012**	……
8.86	**JUNE 2007**	……
9.01	**APRIL 1990**	……

DETAILED CONSEQUENCES & IMPACTS – FLOOD INTELLIGENCE CARD

Gauge	No.	Location	Datum Type
Avon River @ The Channel	225224		

Height (m)	Consequences	Operational Considerations
5.00	**MINOR FLOOD LEVEL** **SUMMARY** | Rural Properties at low level may be affected. | Minor roads may be closed and low-level bridges submerged isolating local residents. **ROADS** | **Road Closed** ▷ Valencia Creek Bridge ▷ Wombat Crossing ▷ Weir's Crossing ▷ Bushy Park	| Ensure road closures at Valencia Creek, wombat, Georges Creek and Weirs Crossing are in place. | Warn farmers to move stock and pumps to higher ground
6.90	**MODERATE FLOOD LEVEL** **SUMMARY** | Overbank inundation on farmland above Valencia Creek Bridge and below Bushy Park. | Communities north of Briagolong and Valencia Creek may be isolated. | Briagolong may experience flow-through of water on the western side with flows from Victoria St (bet. Smith & McLean); across McLean and Rosstrevor Sts intersection; through private property, across Cahill & Avon Sts bet. McLean & Landy; down Station St from Landy St, across Forbes St & into paddock. | No residential properties will be impacted. **ROADS CLOSED** ▷ Georges Creek – nth of Briagolong ▷ Paddy Lees	| Possible community meetings required | Telephone contact with Wombat area residents. | Monitor conditions on Valencia Creek & Freestone Creek as Freestone Creek can push water across into Boisdale. | Mobile VICSES teams required in Valencia Creek & Nuntin

Height (m)	Consequences	Operational Considerations
7.50	**MAJOR FLOOD LEVEL**	Deliver sand to Boisdale Recreation Reserve.
8.00	**Boisdale** at risk of flooding	Complete evacuations prior to gauge reaching this level.
8.80	**JUNE 2012**	
9.61	**JUNE 2007**	
11.23	**APRIL 1990**	……

APPENDIX D.02 – EVACUATION ARRANGEMENTS

The Incident Controller may make the decision to evacuate an at-risk community. Evacuation is the responsibility of VICPOL and will be conducted as per the EMMV and the MEMP.

APPENDIX E.02 - FLOOD WARNING SYSTEM

FLOOD WARNING

The Bureau of Meteorology provides a Flood Warning Service for the Thomson River.

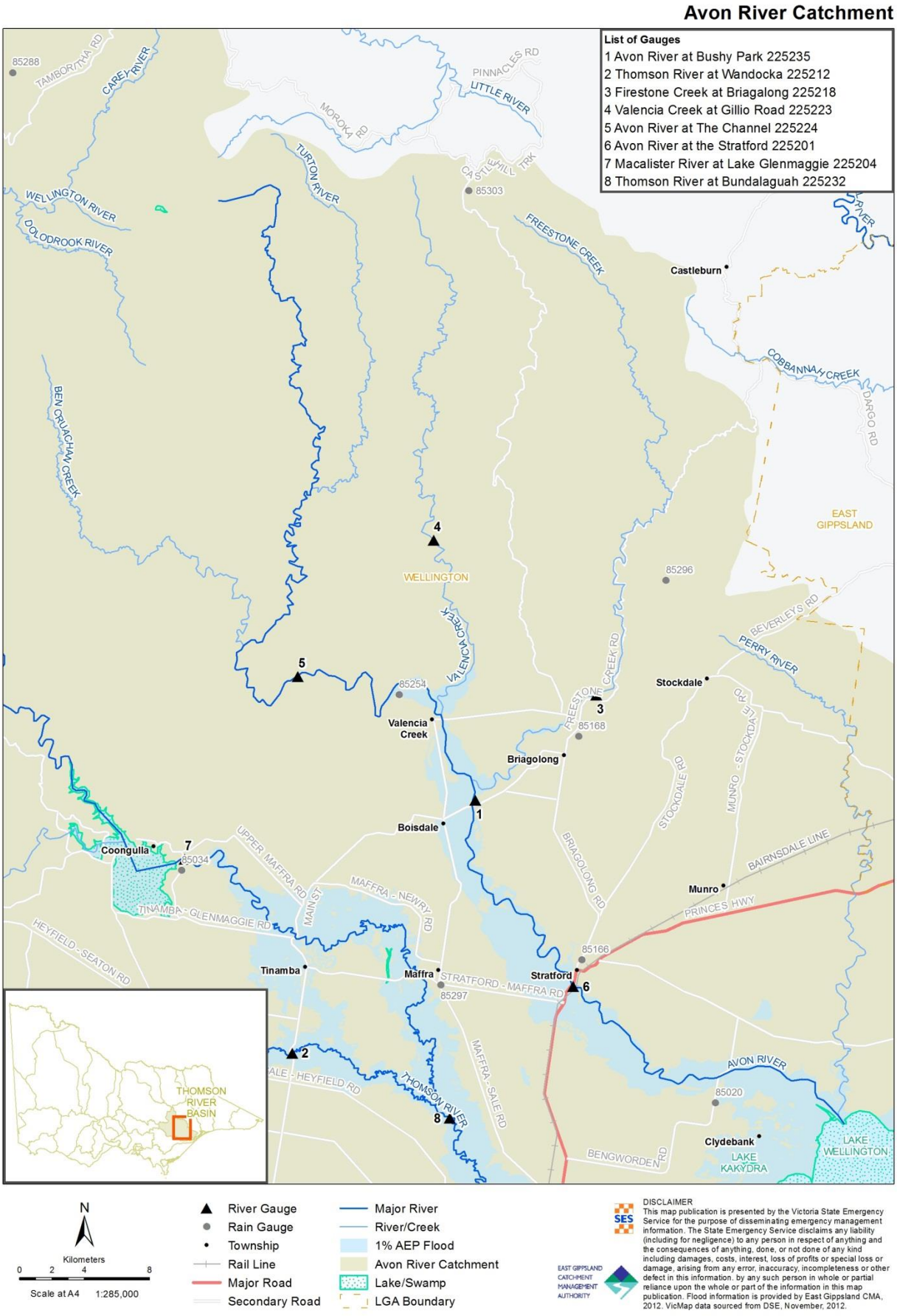
LOCAL FLOOD WARNING SYSTEM ARRANGEMENTS

The Bureau of Meteorology provides warnings for the Thomson River and is able to provide warnings and flood height predictions approximately 12-24 hours ahead of peaks in rural areas, approximately 48 hours in Sale.

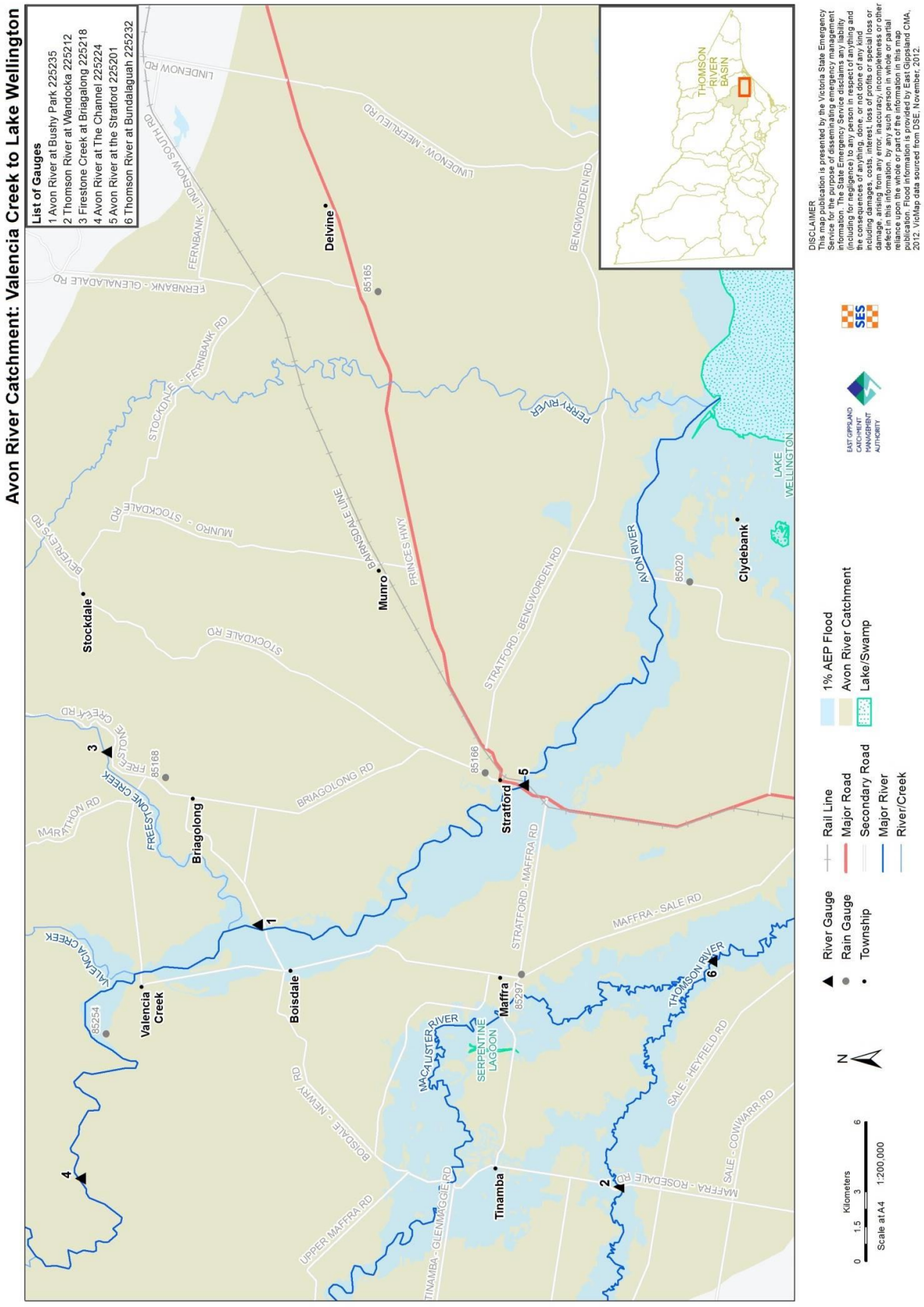
APPENDIX F.04 – MAPS

- Avon River Catchment Map
- Avon River – Valencia Creek to Lake Wellington Map

Avon River Catchment Map



Avon River –Valencia Creek to Lake Wellington Map



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ATTACHMENT 02 THOMSON RIVER, MACALISTER RIVER

Table of Contents

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- WSC (2008); Tinamba Community Emergency Plan
- DSE & Parks Vic (2010); 2007 Gippsland Flood/Storm Recovery Program Final Report; Victorian Government Department of Sustainability & Environment and Parks Victoria.
- WaterTech (2012); DRAFT The Gippsland Floods of June 2012 – Documentation and Review; Prepared by Water Technology on behalf of West Gippsland Catchment Management Authority, December 2012
- Southern Rural Water website: http://www.srw.com.au
- Melbourne Water website: http://www.melbournewater.com.au

ACCURACY & CONFIDENTIALITY

Use this information as a guide to the possible effects of a flood. This card is based on estimates of flood behaviour and particular effects may occur at heights different from those indicated here. They may also occur at slightly different heights in different floods. This card may contain sensitive information about the effects of flooding on private property. Specific reference to private addresses or businesses must be made directly to owners or other emergency services but not via broadcast or print media.

APPENDIX A.02 – FLOOD THREATS

OVERVIEW OF RIVER SYSTEM

The flooding behaviour on the Thomson, Macalister and Latrobe River floodplain is complex. The Thomson has the Thomson Dam & Cowwarr Weir on stream, joins with the Macalister River (which has Lake Glenmaggie on stream) and then joins with the Latrobe River and flows into the Gippsland Lakes at Lake Wellington. The upper catchment for both the Thomson and Macalister are both made of steep valley tracts in thick forest which is frequently subject to intense fire, with the consequent issues of fast run off water and erosion.

Both Cowwarr Weir and Lake Glenmaggie are controlled by Southern Rural Water (1300 139 51) www.srw.com.au and the Thomson Dam is controlled by Melbourne Water www.melbournewater.com.au.

THOMSON RIVER

The **Thomson River** rises in the forested mountains of the **Great Dividing Range** near **Mt Gregory** where the western edge of the Thomson River catchment borders the **Yarra River** catchment. Its catchment is approximately 3,500 km^2, most of which is rugged mountains. Most settlement is on the relatively steep floodplain downstream from **Cowwarr Weir**.

It flows in an easterly direction to the **Thomson Reservoir**. A large tributary, the **Jordan River**, rises in the hills north of where the Thomson rises and near where the north western border of the catchment borders the **Goulburn River** catchment. The Jordan River flows in an easterly direction until the township of **Jericho** and then south east until it flows into the Thomson Reservoir.

The Thomson Reservoir is run by Melbourne Water and generally contains runoff above the dam, having been at capacity in only three years since construction: 1992, 1993 and 1996.

The Thomson River continues below the reservoir in a southerly direction (the *Thomson River @ The Narrows* BoM flood gauge is located just below the reservoir) to the confluence with its major tributary, the **Aberfeldy River**. Aberfeldy River is a narrow mountain stream running through steep forest where the *Thomson River @ Beardmore* BoM flood gauge is located and then further south where it receives waters from **Donnelly Creek** and then **Fulton Creek** before flowing into the Thomson River. The Thomson continues to flow south through heavily forested mountains until it reaches **Coopers Creek**, a small settlement where the *Thomson River @ Coopers* Ck BoM flood gauge is located.

The Thomson continues to flow south, then east, then north through forested hills around **Walhalla** where Stringers Creek joins the river after passing through the township of Walhalla where approximately 45 special use properties are at risk of flood in a 1% AEP event.

Lammers Creek and **Deep Creek** join the river as it turns eastwards and then southwards through forested hills until it crosses the Shire boundary into **Wellington Shire** and breaks out into open grassy farmland just above **Cowwarr Weir**.

During an exceptional flood in 1952, the Thomson River formed a breakaway course through a series of depressions beginning at the point where the river emerges from the foothills on to the river plains. The new course continues east to rejoin the original course near **Heyfield**. The distance of the new course between the breakaway and rejoining points is much less than that of the former course, while the fall between the two points remains the same.

This breakaway remains and is called **Rainbow Creek**. **Cowwarr Weir** and diversion channel were constructed at the point where the breakaway course of the Rainbow Creek begins. It is controlled by Southern Rural Water as a source of irrigation water and is not designed to mitigate flooding.

Flooding in the lower reaches of Rainbow Creek can block access to **Heyfield** on the Traralgon-Maffra Road (also known as Heyfield-Traralgon Road) just outside of the town.

The Thomson passes to the south of the township of **Heyfield** where it threatens approximately 100 predominantly rural properties in a 1% AEP event.

Rainbow Creek passes to the north of the township of **Cowwarr** with approximately 60 predominantly rural properties at risk in a 1% AEP flood event and then continues on to join the main river channel again downstream of **Heyfield**.

Both the Thomson River and Rainbow Creek can also cause flooding in the predominantly rural areas downstream of Cowarr Weir. They combine again downstream of Heyfield.

The Thomson River is joined by the **Macalister River** upstream of **Sale** at **Bundalaguah** and passes through the **Desailly Flats** before passing under the Princes Highway Bridge between Sale and its outlying suburb of **Wurruk**.

During flooding events, the Thomson River overflows into **Lavers Creek** which breaks out across the floodplain to the north of Sale and spills into **Flooding Creek** which meanders through the outskirts of **Sale** joining the **Sale Canal** behind the **Shire Offices** where the **Flood Gauge** is located. The Sale Canal is a man-made tributary of the Thomson River which joins the Thomson downstream of Sale but causes flooding in and around the **Port of Sale.**

Sale sits on the northern edge of an extensive wetland area with flooding caused by a complex interaction of flooding in the **Latrobe and Thomson Rivers, Flooding Creek and the Sale Canal** as well as high lake levels in **Lake Wellington**. Flooding can occur with one or more of these causes.

There are approximately 250 residential, commercial, industrial and rural properties in Sale and Wurruk at threat of flooding in a 1% AEP event.

The Thomson River joins the Latrobe River at **Longford** and will flood the **South Gippsland Highway** during Minor events. All traffic will need to be diverted through **Rosedale.** This impacts residents of Longford, Seacombe, Loch Sport and Yarram. Roadworks are currently (as at November 2012) underway which will increase the height of this road to a 1 in 20 yr height.

During recorded historical events, the Latrobe River flood peak generally arrives well after the Thomson River flood peak, flood impacts in this area are predominately influenced by local flood plain conditions and flood flows generated by the Thomson River.

MACALISTER RIVER

The **Macalister River** is a tributary of the **Thomson River** and has a total catchment area of approximately 2200km^2 of which 80% is above **Lake Glenmaggie** which in some instances can influence flooding downstream. This catchment floods and disperses rapidly unless severe flooding in the **Gippsland Lakes** prevents dispersion, extending and prolonging flooding north of **Sale**.

The river system originates in the Victorian High Country north of **Glencairn** where the *Macalister River @ Glencairn* BoM flood gauge is located, and then flows downstream to the township of **Licola** where the *Macalister River @ Licola* BoM flood gauge is located. This flood gauge was washed away during the June 2007 flood event. The upper Macalister catchment is a large, steep catchment resulting in rapid, fast-flowing and turbulent floods.

The River then flows in a SSE direction until it reaches **Lake Glenmaggie** which has outflows controlled at **Glenmaggie Weir** by **Southern Rural Water.** This is an irrigation storage dam, not a flood mitigation dam and although operation of the dam can have significant influence on downstream flooding, this capacity is reduced during major or significant events. Flood impacts for the townships below Lake Glenmaggie are described based on the flows at the *Macalister River @ d/s of Lake Glenmaggie* BoM flood gauge.

Downstream of Lake Glenmaggie the Macalister River flows east across a wide floodplain between the townships of **Newry** (to the north) and **Tinamba** (to the south) and into the township of **Maffra** before flowing

south to join the Thomson River north west of **Sale**. Flooding in the lower Macalister River is generally determined by the outflows of Lake Glenmaggie and when in flood, the river flows across the floodplain utilising drains, irrigation channels and natural breakouts to cover much of the floodplain. One significant breakout occurs just below Lake Glenmaggie, travelling south of Tinamba and entering the Thomson River upstream of the Macalister River confluence. This part of the floodplain is complicated with interactions of floodwater, irrigation channels and the numerous anabranches of the Macalister River causing quite complex flow patterns during flood events.

FLOOD RISKS

The areas at highest risk of flood on the Thomson and Macalister Rivers are the low lying farmland areas around Licola, Tinamba, Newry, Heyfield, Maffra and Desailly Flats along with access throughout those areas and in and around Sale. Small communities, businesses and rural properties are at risk but no major infrastructure, schools, hospitals or health centres at risk

URBAN FLOOD RISK

- **Sale**– 64 residential properties, 254 total in a 1% AEP event (pop. 13,336 at 2006)
- **Heyfield** – 1 residential properties, 20 total in a 1% event (pop. 2,099)

RURAL FLOOD RISK

Low lying areas around -

- **Thomson River & Rainbow Creek** –downstream of Coopers Creek, Cowwarr Weir, Cowwarr, Heyfield, Sale, Wurruk and Desailly Flats.
- **Flooding Creek / Sale Canal** –Sale, Desailly Flats
- **Macalister River** – Newry, Glen Falloch, Glenmaggie, Heyfield, Tinamba, Riverslea, Bundalaguah, Myrtlebank

DAM FAILURE FLOOD RISK

The Thomson Dam, operated by Melbourne Water, poses a risk to the communities downstream of the dam but particularly the township of Sale. A dam safety plan will be available in the offices of the Wellington Shire Council and VICSES. Maps showing possible inundation form part of those plans.

Lake Glenmaggie and Cowwarr Weir, operated by Southern Rural Water, pose a risk to the communities immediately downstream including Heyfield, Tinamba, Newry and Maffra.

HEALTH & ENVIRONMENTAL RISKS

There are many septic tanks in the rural areas that may be inundated by floodwaters and farm chemicals stored in farm sheds on the floodplain.

PROPERTIES AT RISK

Community	Location	Impact
Sale		64 residential properties
Licola	Licola Creek Road	1 house inundated Lions Village Camp
Newry / Upper Maffra	Bellbird Cnr, Centre Rd, Dawson St, Hastings St, Lower Newry Rd, Maffra-Newry Rd, Main St, McCole St, Newry-Tinamba Rd, Rafferty St, Upper Maffra Rd, Websters Rd	52 houses inundated (above floor?) General Store and Hotel
Tinamba	Deans Rd, Fairchilds Rd, Glenmaggie Rd, Maffra-Rosedale Rd, Maffra Traralgon Rd, Main Rd,	31 houses inundated (above floor?)
	McKinnons Rd, McLachlans Rd, Newry Rd, Osbourne's Rd, Seaton Rd, Tinamba–Newry Rd, Tinamba–Seaton Rd	Tinamba General Store, Tinamba Hall, Hotel
Cowwar	Paradise Valley Rd and Portas Mill Rd	2 houses inundated (above floor?)
Glenmaggie	Kellemers Rd, Licola Rd, Chumleys Rd	3 houses inundated (above floor?)
Maffra / Riverslea	Back Water Rd, Bushy Park Rd, Carpenter St, Gibney St, Maffra–Traralgon Rd, Mewburn Park Rd, Mills Lane, Riversdale Rd and Stratford-Maffra Rd	18 houses inundated (above floor?)
Heyfield	Low lying areas around the town and below Gibson Knox	1 house

ISOLATION RISK

Community	Road	Closure point	Pop'n
Heyfield		Thomson River & Boggy Ck near Tinamba	2009
Cowwarr			563
Glenmaggie		Macalister River	165
Licola		Macalister River	121
Maffra / Riverslea		Macalister	4149
Newry / Upper Maffra			

HISTORICAL FLOODS

Periods of heavy rain leading to major flood events can occur in Wellington Shire at any time of the year although significant flood events generally occur between April and December.

Significant floods have occurred in the Thomson and Macalister Catchment as shown in the tables below. Impacts of significant events are discussed below the table.

THOMSON RIVER

EVENT	THOMSON R @ THE NARROWS	ABERFELDY R @ BEARDMORE	THOMSON R @ COOPERS CK	THOMSON R @ U/S COWWARR WEIR	RAINBOW CK @ HEYFIELD	THOMSON R @ HEYFIELD	THOMSON R @ WANDOCKA	THOMSON R @ BUNDALAGUAH	FLOODING CK @ SALE WHARF
1934 Dec	-	-	5.49	-	-	-	-	-	
1976 Oct	2.58	3.74	4.02	6.00	-	-	-	-	
1978 May	1.64	2.68	2.92	5.06	-	-	6.61	7.32	
1978 Jun	3.51	5.65	6.40	9.10	-	-	6.96	7.68	5.20
1978 Sep	2.06	2.21	2.56	4.26	-	-	6.28	7.15	
1983 Oct	0.68	1.67	1.65	3.90	-	-	6.48	7.16	
1985 Oct	0.68	2.55	2.28	4.30	-	-	6.55	7.65	
1985 Nov	0.82	1.48	1.32	3.65	-	-	6.28	7.16	
1985 Dec	0.73	1.89	1.84	4.15	-	-	6.52	7.35	3.10
1988 Apr	0.72	1.12	1.38	3.82	-	-	6.48	6.50	
1990 Apr	1.28	4.95	4.72	7.04	-	-	6.92	-	3.75
1990 Oct	1.00	1.73	1.73	3.77	-	-	6.50	-	3.00
1992 Sep	0.96	1.89	1.84	3.75	3.89	-	6.26	-	2.75
1992 Dec	1.54	2.76	2.55	4.53	5.05	4.54	6.84	-	3.65
1993 Sep	1.39	4.27	4.22	5.57	5.12	4.45	6.83	-	4.10
1995 Oct	1.21	3.22	3.18	4.82	4.86	4.26	6.64	-	
1995 Nov	1.00	1.60	1.79	4.48	4.77	4.41	6.66	-	3.62
1998 Nov	0.62	1.89	2.06	4.73	4.83	4.21	6.63	7.40	3.18
2005 Feb	-	-	-	4.43	4.27	2.88	6.39	5.98	
2007 Jun	-	6.34	-	7.59	5.10	4.06	6.78	7.72	4.23
2007 Nov	-	3.50	-	5.20	4.86	4.12	6.73	7.60	3.70
2011 Jul	-	2.20	-	4.09	4.47	3.07	6.43	7.26	2.84
2011 Aug	-	3.52	-	4.87	4.86	3.41	6.57	7.50	3.33
2012 Mar	-	1.94	-	3.74	3.90	3.11	6.04	6.93	2.26
2012 Jun	-	4.76	-	6.36	-	4.36	6.73	7.64	4.10
Major			5.00	5.50			6.70		4.00
Moderate			3.50	4.50			6.50		3.00
Minor			2.30	3.60			6.20		2.40

< Minor Minor Moderate Major

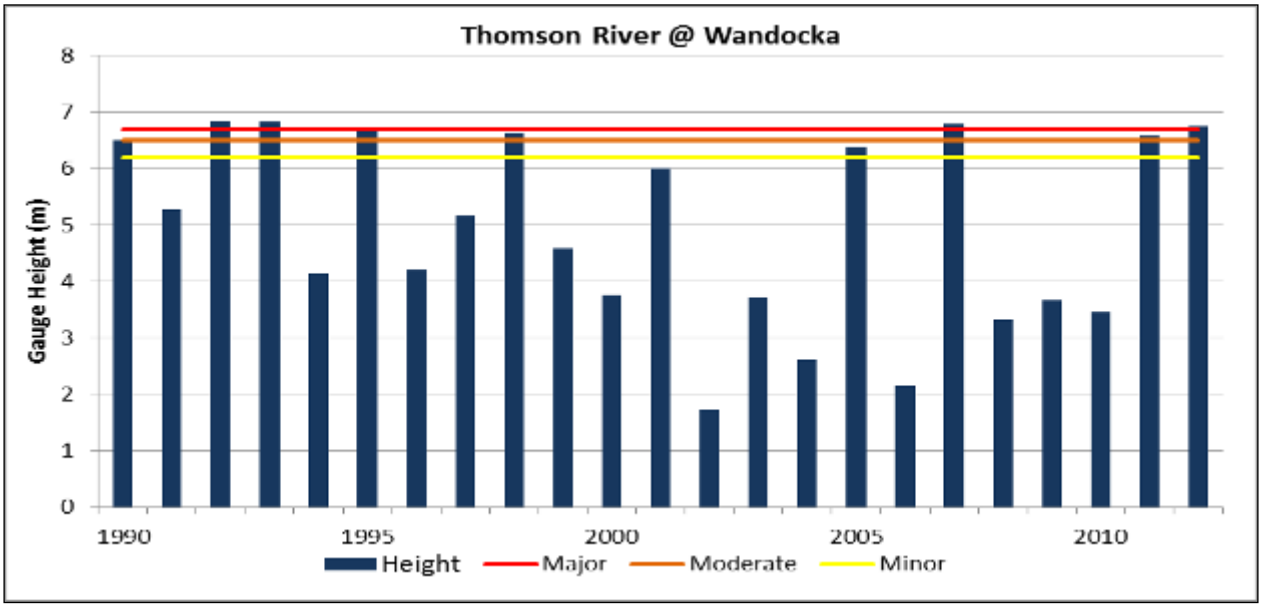
MACALISTER RIVER

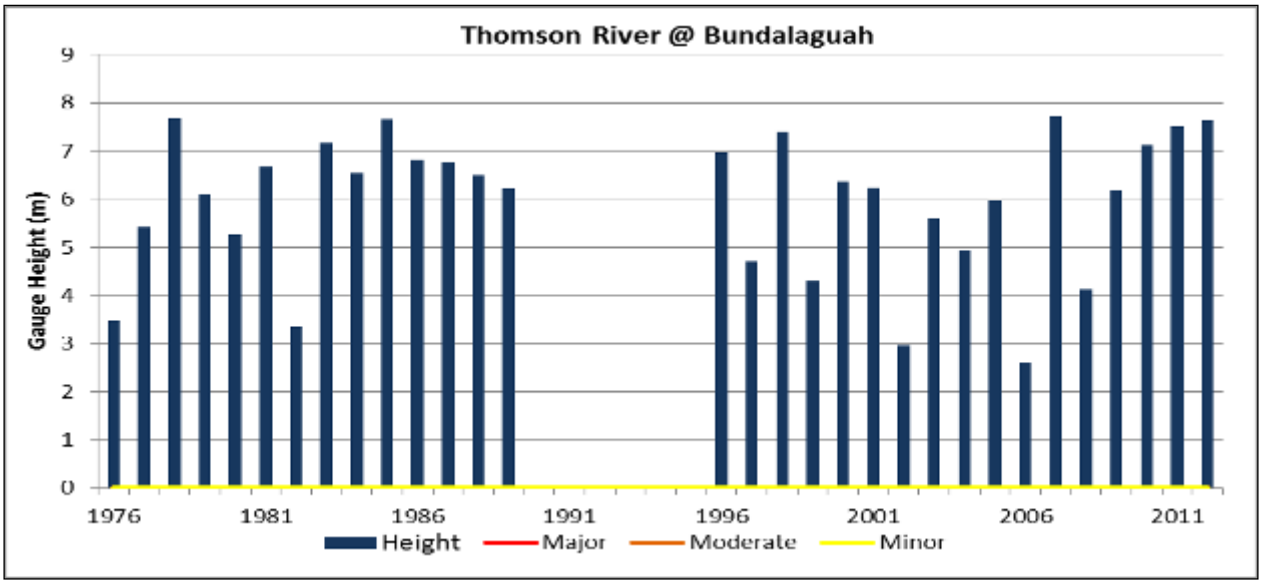
Due to the number of events that exceeded the minor flood class level at Glenmaggie but did not reach classification elsewhere on the system, not all minor flood events are listed. Outlfow from Lake Glenmaggie is measured in ML/d and translated into metres.

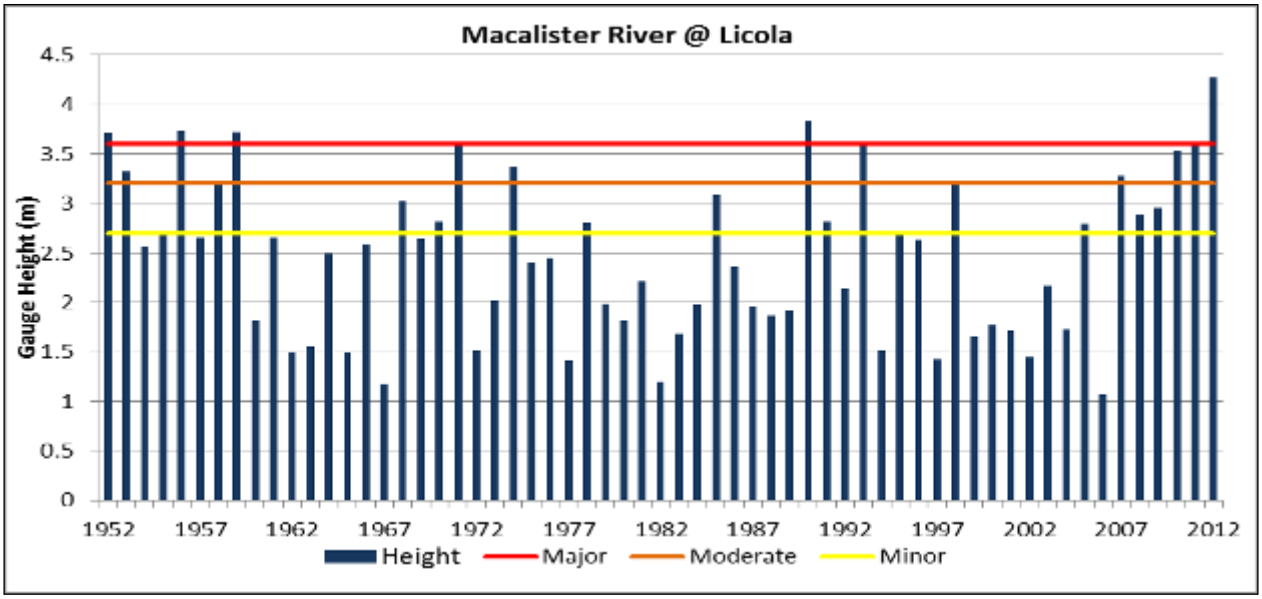
EVENT	MACALISTER R @ GLENCAIRN	MACALISTER R @ LICOLA	MACALISTER R @ D/S	GLENMAGGIE CK @ THE GORGE	MACALISTER R @ D/S LAKE GLENMAGGIE	MACALISTER R @ D/S LAKE GLENMAGGIE ML/d
1961 Sep	-	2.65	-	-	5.67	
1964 Oct	-	2.03	-	-	4.55	
1966 Dec	-	2.59	-	-	4.52	
1968 Oct	3.02	3.02	3.32	-	5.03	
1969 Jun	2.00	2.64	3.15	-	4.59	
1970 Jan	0.75	1.31	1.87	-	4.82	
1970 May	2.09	2.82	3.62	-	5.73	
1970 Jun	1.85	2.53	3.59	-	5.70	
1970 Aug	2.21	2.78	2.96	-	4.66	
1970 Dec	0.67	1.11	1.39	-	5.03	
1971 Jan	0.58	2.00		-	8.64	110,600
1971 Nov	3.28	3.63	4.12	-	5.31	
1974 Aug	1.93	2.41	2.76	-	5.54	
1976 Oct	1.49	2.45	3.18	3.25	5.99	
1978 Jun	1.94	2.81	3.52	3.35	7.87	88,900
1985 Oct	2.34	3.09	3.80	3.06	6.40	
1990 Apr	2.74	3.83	4.65	4.80	2.18	
1990 Oct	1.66	1.87	1.75	2.71	4.20	
1992 Dec	2.04	2.14	2.01	3.19	6.05	
1993 Sep	3.03	3.58	4.05	3.53	7.63	75,500
1993 Oct	3.50	3.50	3.37	1.57	5.74	
1995 Oct	2.14	2.70	2.84	3.44	7.25	66,500
1996 Oct	2.42	2.63	2.29	1.39	4.21	
1998 Sep	3.71	3.22	2.91	1.44	4.45	
1998 Nov	1.80	2.00	1.97	-	6.27	42,000
2007 Jun	4.75	~5.15	6.53	-	9.57	147,600
2010 Sep	3.11	3.53	2.65	1.32	4.06	
2010 Dec	2.82	3.33	2.30	1.61	2.49	
2011 Aug	2.23	3.62	2.98	3.28	4.50	
2012 Jun	3.14	4.27	3.86	3.67	6.43	58,000
Major		3.60			5.20	35,000
Moderate		3.20			4.00	22,000
Minor		2.70			2.30	7,500

< Minor | Minor | Moderate | Major

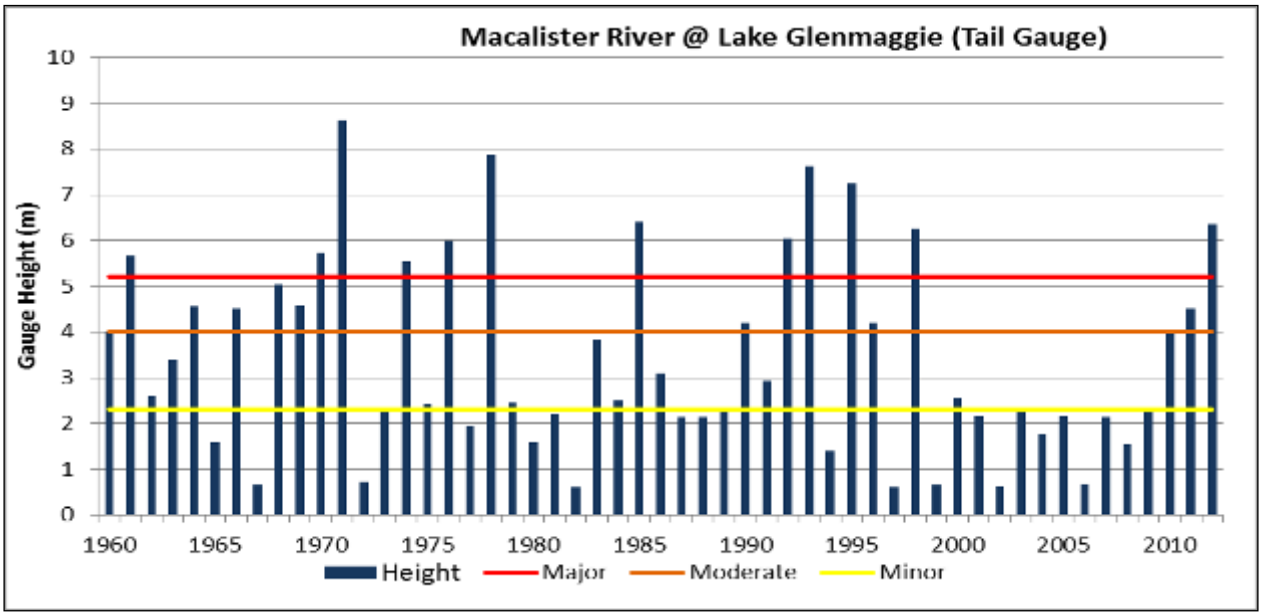
MAXIMUM ANNUAL GAUGE HEIGHTS







* The gauge was washed away in 2007 and does not show the correct value



* Data for 2007 not complete

APRIL 1990 FLOOD EVENT

WEATHER SYSTEMS

Conditions in the months leading to the April flood event were drier and warmer than normal. By early morning Friday 20 April a low pressure centre developed in the low pressure trough over western NSW. This low then intensified and moved to the southeast over the next 24 hours becoming located just off the far south NSW coast by early morning Sat 21 April. At this stage a strengthening and extremely moist south easterly airstream had extended across Gippsland to the Great Dividing Range and intense rainfall had commenced over this area. The intense rainfall persisted for a period of 36-48 hrs over a substantial part of the area.

FORECAST

Indications on Friday 20 April were that prolonged and heavy rain would be required to overcome the dry state of Gippsland catchments. In addition, the low flows observed in Gippsland streams over the preceding weeks suggested substantial runoff would be needed to cause rivers to rise to flood level. Although rain with local heavy falls was the main theme of meteorological forecasts and outlooks issued on Friday, it was considered the dryness of catchments would lessen the likelihood of immediate flooding from even moderately heavy rain. The first public issued flood warnings for the Thomson were issued soon after 10am on Sat 21 April. It is apparent that runoff started not long after commencement of heavy rainfall. This was a result of the ground being unable to take up the intense rainfall quickly enough rather than because moisture deficits were satisfied.

EVENT

Heavy rainfall occurred in the Thomson and Macalister River catchments on Saturday 21 and Sunday 22 April 1990.

The **Thomson Reservoir** remained below full supply level and released very little water to the river during the event despite increasing the storage volume by 32,000ML over the 72 hrs from 0800hrs Saturday 21. At the **Narrows**, downstream of the Thomson Dam, flows remained quite low throughout the flood. At **Beardmores on the Aberfeldy River** flows were very high with a recorded peak of approximately 31,000ML 2200hrs Saturday 21. The flooding experienced in the Thomson basin was to a large degree due to flooding in this river.

Upstream of **Cowwarr Weir** on the Thomson River the floodplain is relatively well confined and in this reach the flood was about a 1 in 15yr event. Flows at Cowwarr Weir were significantly below the 1978 flow at this site peaking at 77,000 ML/d or 7.2m at 2300hrs on Saturday 21 but larger than both the 1934 and 1971 events. However the weir was quickly overcome and had little mitigation effect on subsequent downstream flooding.

The creeks downstream of Cowwarr Weir, particularly those flowing from the **Murderers Hill** area, where the heaviest official fall (375mm in 72hrs) was recorded, contributed significantly to the flood. There was substantial surface runoff downstream from the Weir on the Saturday morning with a rapid rise in water levels Saturday event catching many farmers, stock and travellers by surprise. In the lower catchment the **Thomson River @ Wandocka** peaked at 114,000ML/d, significantly higher than in June 1978 at 0120hrs Sunday 22.

High rainfall in the upper **Macalister River** catchment resulted in **Stringybark Creek** flows reaching a 20 year event and at T**he Gorge** recording the highest flow since measurements began in 1973. Peak inflows to **Lake Glenmaggie** were 113,000ML/d taking storage from 11% to 90% with the Lake containing the full flood flow. Releases were commenced late Sunday but contained below Minor flood level. Had Lake Glenmaggie not mitigated the flood in the Macalister, flood damage in Maffra and Sale are would have been substantially more severe, likely producing a record flood at Sale.

As the Thomson River flood approached Sale it flattened out with the South Gippsland Highway being cut early on Sunday and the peak reaching **Flooding Creek @ Sale Wharf** late on the Sunday. Levels began to subside around Sale on Monday the 23rd however the combination of high tides and wind induced back-up in the Gippsland Lakes, together with the effects of high inflows to the lakes from flooding rivers further east, resulted in a further small rise at Sale late on the Monday.

IMPACTS

The Port of Sale was flooded and both the Princes Highway and Sough Gippsland Highway were cut at the peak of the flood. Heyfield was the greatest impacted community in this event.

2007 FLOOD EVENT

There were two floods that caused significant flooding to the Macalister River downstream of Lake Glenmaggie, in June and November. The June event was the larger of the two and the largest flood in memory. This flood event is the subject of this commentary.

WEATHER SYSTEM

During June 2007 four major east coast lows formed off the coast of NSW and east of Victoria. Each east coast low produced varying amounts of heavy rain. In the week commencing 17th June, BoM weather forecasts began to mention an east coast low that was likely to bring considerable rain to Gippsland. As this low pressure system weakened and moved away from the east coast, BoM weather forecasts began to refer to another east coast low, scheduled for the following week. It is this east coast low that produced the heavy rainfall that resulted in the significant flood event.

A low pressure trough over South Australia on Mon 25th moved eastwards over Victoria on Tues 26th to form an intense low pressure system in eastern Bass Strait near the south coast of NSW. The low deepened rapidly overnight on the 27th and became complex and moved close to eastern Victoria early on Thu 28th.

FORECASTS

BoM weather forecasts predicted a number of days in advance the commencement of heavy rain on Wed 27th and for the rain to continue until the early part of Thu 28th before easing. Rainfall totals for the 48 hours commencing 9am on the Wednesday were expected to range mostly between 100-175mm over the eastern and mountain parts of Gippsland with some isolated falls above 200mm possible.

EVENT

In the last week of June 2007, Gippsland received record rainfall associated with an intense low pressure system. The storm followed one of the state's worst fire seasons, the 2006/07 Great Divide Bushfires, when 1.2 million hectares were burnt and vast areas of soil were exposed. Further compounded by other minor floods in March and November 2007, the storm in June 2007 resulted in major flooding and widespread damage to community and public assets in Gippsland.

24 hour rainfall totals in the catchment were considered as a greater than 1 in 100 yr at Murderers Hill, Mt Wellington, Callignee North and Koornalla and between 50 & 100 yr at Mt Tassie and Reeves Knob. The associated runoff was assessed as a 1 in 200 year event.

The gauge at Licola (*Macalister River @ Licola*) was washed away during this event.

Lake Glenmaggie went from 50% storage capacity to spilling overnight as a result of the highest inflows on record with peak inflows at approximately 260,000ML/d (one report says 315,000ML/d)[8]. Peak outflows were also the highest on record at 147,600ML/d reaching 9.57m on the *Macalister River @ d/s Lake Glenmaggie* gauge.

This was the largest flood on record for the Macalister River.

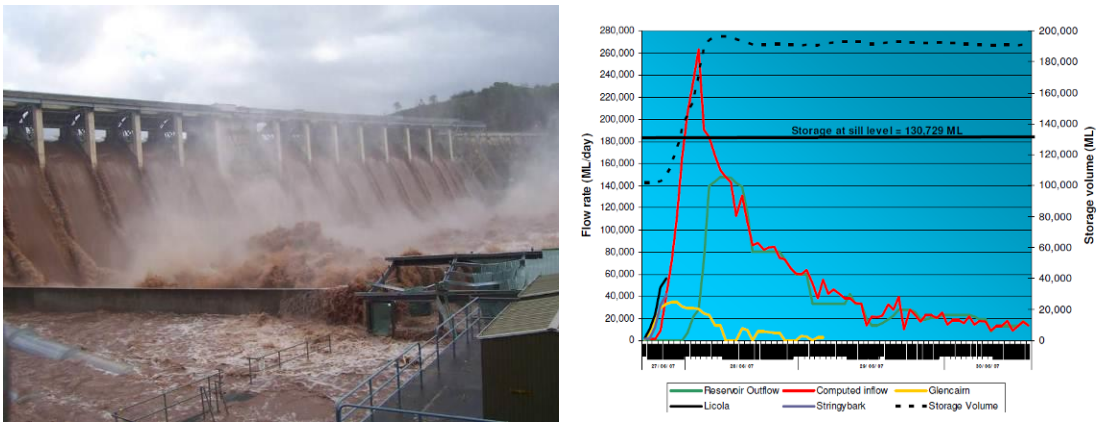
[8] SRW (2008)

IMPACTS

Upstream of Lake Glenmaggie, the flood significantly damaged 22km of the southern-most end of Tamboritha Road which is the main access to the Alpine National Park and other public land from the west. There was also significant damage to the Licola Road, including a partial failure of the bridge into the town of Licola, and the loss of Cheynes Bridge, between Heyfield and Licola.

Several school camps and caravan parks upstream of Lake Glenmaggie were destroyed, while downstream of the dam significant areas of rural land was inundated, causing damage to fences, crops, shedding, roads and bridges.

Tamboritha Road and Sale Common



Lake Glenmaggie Inflows & Outflows June 2007

Flooding Creek @ Sale Wharf Gauge, June 2007

2012 FLOOD EVENT

CATCHMENT CONDITIONS - The above average rainfall in preceding months most likely led to higher than average soil moisture storage levels, and an increased conversion of rainfall to runoff. The major reservoirs in the West and East CMA regions were all above 70% capacity during May 2012.

FRIDAY JUNE 1 - The BoM advised VicSES that an east coast low was expected to develop on Monday and that significant riverine flooding in Victorian catchments was considered unlikely at that stage.

SATURDAY JUNE 2 - BoM advised VicSES that heaviest falls were likely over Gippsland from midday Monday to midday Tuesday, with peak totals around 100mm possible on the ranges with the potential for damaging gusts to around 100km/hr along the coast. **Flood Watches** were issued for East Gippsland and West & South Gippsland during the afternoon.

SUNDAY JUNE 3 - In the morning a low pressure trough extended along the east coast of the continent extending into Bass Strait with a band of rain associated. During the day the trough deepened, bringing heavy rainfall to South and far East Gippsland. A **Severe Weather Warning** for heavy rain was issued at 16:02hrs on Sunday for the South West, Central, West and South Gippsland and East Gippsland forecast districts.

MONDAY JUNE 4 - The weather system intensified overnight Sunday with a low developing just east of Gabo Island, deepening rapidly during Monday. This directed a strong onshore south easterly flow over eastern Victoria, resulting in significant rainfall totals in Gippsland. At 04:48hrs Monday the **Severe Weather Warning** was extended to cover the North East district and was updated to warn for damaging winds as well as heavy rain. At 10:33hrs a final flood warning was issued for the Latrobe River in relation to the previous week's rain event.

On Monday morning SES was advised that expected rainfall amounts had increased and that 80-120mm was possible through central and eastern Gippsland with peak totals about the ranges of around 150mm. Hydrology advised that the forecast rainfall amounts would likely lead to minor to moderate riverine flooding through Gippsland but that given catchments were quite wet in West Gippsland some major flooding could not be ruled out. As the east coast low deepened just east of Victoria during Monday morning, an extensive band of rain and damaging winds developed across Gippsland . Persistent rain fell throughout the afternoon and continued overnight and into Tuesday. Damaging winds extended inland to affect elevated locations overnight with the strongest gust recorded being 144km/hr at Mt Buller. At 15:55hrs the first flood warning for this event was issued. Numerous flood warnings were then issued during the afternoon and overnight as the rainfall began to result in stream rises on Victoria's river systems. In the 24 hours from 09:00hrs Monday, there was widespread rain of between 100-150mm of rain with higher totals (200mm) about the ranges, between 1 and 2 times their average June monthly rainfall.

TUESDAY JUNE 5 - The rain received in the 24hrs to 09:00hrs on Tuesday pushed both the Thomson and Macalister, along with most river systems in the central and eastern Gippsland region into major flood. Rainfall totals were: Murderers Hill (191mm), Glencairn (120mm), Licola (161mm) Snowy Range (42mm) High Ridge (32mm) Mt Sunday (64mm) and Mt Tamboritha (125mm). As the low weakened and moved away from Victoria during Tuesday, winds contracted to the far east and then eased. By the afternoon, the rain over Gippsland had eased to scattered shower activity though this continued to bring some reasonable totals to a handful of locations before the shower activity eased overnight. Lake Glenmaggie inflows quickly swelled to 56,000ML/day peaking at ~94,000ML/d around midday. Airspace reached a low of ~3% and remained at that level for some days.

LAKE GLENMAGGIE - Management of significant inflows into the Glenmaggie Dam provided positive outcomes for downstream residents and stakeholders. Management of outflows took advantage of the available airspace in the dam allowing peak outflows from the dam to not exceed around 58,000 ML/day at any point during the event. This significant attenuation of flows greatly reduced flooding in townships downstream (e.g. Newry and Tinamba). Air space in the dam got down to ~3% late on the 5th of June and remained at this level for some days after the higher inflows had subsided.

THOMSON RESERVOIR - With starting storage levels at ~57% and significant flows in the Aberfeldy River (4th highest on record), Melbourne Water did not need to provide environmental flows and could contain all runoff above the dam and minimise outflows. This reduced some impacts on downstream communities.

MAJOR WATER STORAGES

Name	River	Capacity (ML)	FSL (m AHD)	Outflow	Operator
Thomson Reservoir	Thomson	1,068,000		Fixed Crest	MW
Lake Glenmaggie	Macalister	177,640	77.10	Spillway	SRW
Cowwarr Weir	Thomson	210	65.11	Gated Structure	SRW

- MW – Melbourne Water
- SRW – Southern Rural Water

THOMSON RESERVOIR

The Thomson Reservoir is situated 130km from Melbourne on the Thomson River near the former township of Beardmore and the Baw Baw National Park. It is managed by Melbourne Water, is the largest of all Melbourne's reservoirs with a capacity of 1,068,000 ML (60% of Melbourne's storage capacity and four times that of the Melbourne's next biggest reservoir) and came into commission in 1984.

Water is piped through the Thomson Yarra divide to the Upper Yarra Reservoir via a 19km long tunnel and then onto Silvan Reservoir as drinking water for Melbourne. It also releases environment flows to the Thomson River and irrigation releases for agriculture via a small hydro-power plant which contributes to the State power grid. Releases are made from three locations downstream of the dam:

- immediately downstream of the dam;
- 11 km downstream of the dam at the Narrows and;
- 23 km downstream of the dam at Coopers Creek.

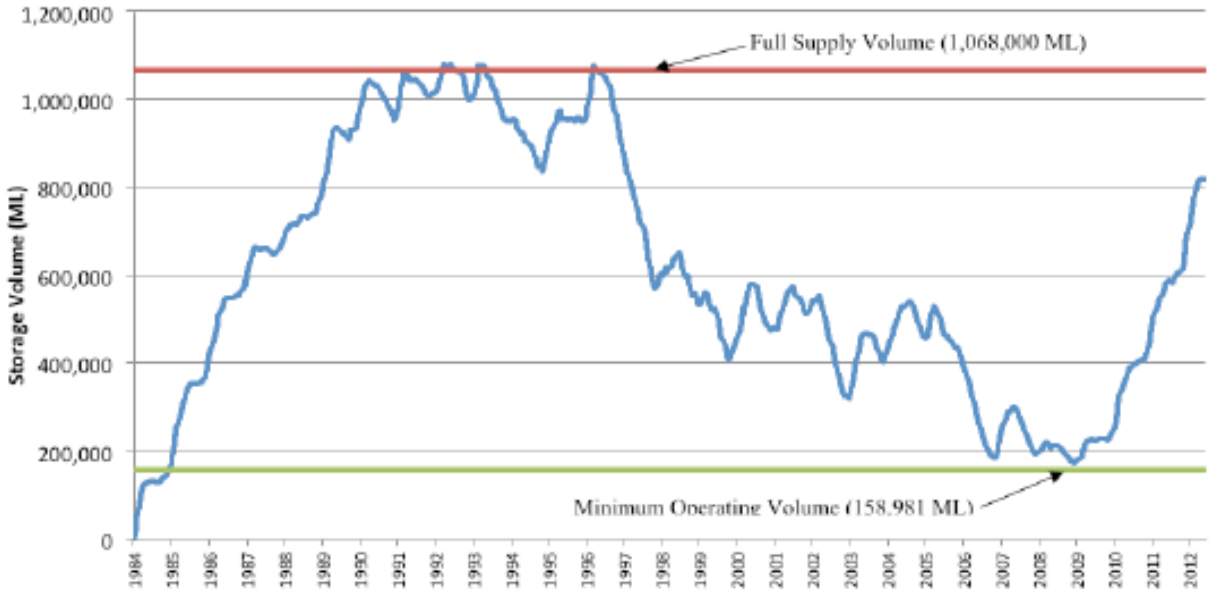
THOMSON RESERVOIR INFLOWS & OUTFLOWS (ML)

Green highlighted years were the only years the Reservoir was at 100% and spilt into the Thomson River.

Year	Inflows	Outflows	
		Upper Yarra	Thomson
1984	220,400	16,700	44,400
1985	240,300	300	32,100
1986	236,300	200	32,300
1987	187,500	37,000	34,700
1988	204,900	90,400	42,300
1989	245,400	0	43,700
1990	310,200	70,800	143,000
1991	273,700	85,700	176,000
1992	318,900	45,000	238,600
1993	274,900	70,400	231,400
1994	206,200	211,100	143,800
1995	278,600	80,800	143,600
1996	309,600	13,400	195,100
1997	93,600	254,400	172,700
1998	182,200	181,200	75,200

Year	Inflows	Outflows	
		Upper Yarra	Thomson
1999	125,600	195,700	56,000
2000	227,800	96,000	74,100
2001	175,400	135,000	51,000
2002	139,500	198,600	46,600
2003	210,500	161,100	46,000
2004	179,500	67,000	50,100
2005	151,100	137,800	53,100
2006	73,400	214,300	84,200
2007	179,200	96,100	51,900
2008	129,100	161,200	49,200
2009	153,400	90,100	50,200
2010	210,600	2,500	44,600
2011	244,400	400	48,800
2012	294,800	2,300	59,300

THOMSON RESERVOIR - STORAGE LEVELS (1984 - 2012)



COWWARR WEIR

Cowwarr Weir is situated near the township of Cowwarr on Rainbow Creek, an anabranch of the Thomson River that was formed during a significant flood in 1952. It is operated by Southern Rural Water and is a concrete gravity structure with three steel vertical lift spillway gates for regulating water supply from the Thomson River to the Macalister Irrigation District.

In 1959 the Cowwarr Weir and diversion channel were constructed at the point where the breakaway course of the Rainbow Creek begins. The weir allows control of water flow along the breakaway and to divert water to the area south of the Thomson River along the Cowwarr Channel to supplement water from Lake Glenmaggie for irrigation in the Nambrok-Denison area.

Thomson River water is diverted via the Cowwarr Weir channel generally at the beginning of the spring months which enables water to be conserved in Lake Glenmaggie on the Macalister River. Under normal conditions during the irrigation season the Cowwarr Weir is maintained at or near the full supply level.

LAKE GLENMAGGIE

Lake Glenmaggie is located on the Macalister River upstream of Tinamba and Newry and is managed by Southern Rural Water. It was originally constructed in 1920 with further works in the 1950's to raise the height of the dam wall and establish 14 flood gates. The dam wall, which creates the lake, is a mass concrete overfall dam with irrigation outlets on both sides of the river serving irrigation channels and a central portion which is an overfall spillway. The flood gates that make up the spill way can only operate when the reservoir level reaches 119,174ML or about 70% of capacity.

The Lake was constructed to service the Macalister Irrigation District which 53,000 hectares around the Macalister and Thomson Rivers, extending from Lake Glenmaggie to Sale. To distribute the water from Lake Glenmaggie, three main channels have been constructed:

- Main Northern (capacity 500 ML/d);
- Main Southern (capacity 1,460 ML/d); and
- Main Eastern (capacity 600 ML/d).

The Main Southern is supplemented by flow from the Cowwarr Channel diverted from the Thomson River at Cowwarr Weir.

Lake Glenmaggie's large catchment means that river flows can be quite extreme and during significant events, SRW have limited ability to reduce the impact of floods downstream.

During heavy rainfall events, releases from the lake are constantly planned and conducted to 'even out' the flood peak. These releases are based on actual and predicted rainfall levels, stream flow measurements upstream from Lake Glenmaggie and calculated inflows.

Flood Class Levels for townships downstream of Lake Glenmaggie are based on the releases from Lake Glenmaggie.

LAKE GLENMAGGIE RESERVOIR INFLOWS & OUTFLOWS

BY YEAR			
Year	Inflows (ML/d)	Outflows (ML/d)	Gauge Height (m)
1935	83,200	77,000	-
1950	91,000	62,400	-
1952	108,000	88,100	-
1971 Jan	123,000	110,600	8.64
1978 Jun	102,000	88,900	7.87
1993 Sep	69,700	75,500	7.63
1995 Oct	62,600	66,500	7.25
1998 Nov		52,000	6.27
2007 Jun	~260,000	147,600	9.57
2007 Nov	69,000	59,000	-
2012 Jun	93,700	58,000	6.43

BY HIGHEST OUTFLOW			
Year	Inflows (ML/d)	Outflows (ML/d)	Gauge Height (m)
2007 Jun	~260,000	147,600	9.57
1971 Jan	123,000	110,600	8.64
1978 Jun	102,000	88,900	7.87
1952 Jun	108,000	88,100	-
1935	83,200	77,000	-
1993 Sep	69,700	75,500	7.63
1995 Oct	62,600	66,500	7.25
1950	91,000	62,400	-
2007 Nov	69,000	59,000	-
2012 Jun	93,700	58,000	6.43
1998 Nov		42,000	6.27
	Major	**35,000**	**5.20**
	Moderate	**22,000**	**4.00**
	Minor	**7,500**	**2.30**

LEVEES

Name	River	Location	Condition	Operator
Sale Levee	Thomson River & Flooding Creek	Sale to Swing Bridge		Unknown
?	Macalister River	Maffra Weir to Thomson River		
McArdles Gap	Thomson River	Thomson River Caravan Park (South Gippsland Highway)	Unknown	Unknown
McCanns Bank	Thomson River	South of Sale between Thomson and Latrobe Rivers	Unknown	Unknown

The levee on the southern bank of the Thomson River at Sale appears to impact on the flood levels at the Port of Sale. As the flood waters move down the Thomson River they are held back by the levee and push towards the South Gippsland Highway creating a funnel effect. The levee just overtops during a 1 in 5 AEP event with the levels on the upstream side of the levee being approximately 800mm higher than on the downstream side forcing levels up towards the Port of Sale and Princes Highway area. For the 1 in 100 AEP event the levees is overtopped but the peak levels on either ride of the levee vary from 100mm up to 800mm depending on the location. With the South Gippsland Highway upgrade in place the main mitigation option which could be considered is the lowering of this levee to open the floodplain on the southern side of the Thomson River. This will reduce the afflux at the Port of Sale by a minimum of 30mm. [9]

[9] SMEC (2004); Port of Sale Hydrological Study; Prepared by Snowy Mountains Engineering Corporation for Wellington Shire Council.

MAJOR ROAD CLOSURES

Riverine Flooding	Flash Flooding
South Gippsland Hwy – between Sale and Longford **Princes Hwy** - @ Wurruk	**Princes Hwy** - Cnr Foster St (Princes Hwy) and MacArthur St - Sale

RURAL ROAD CLOSURES

Riverine Flooding

COWWARR

Cowwarr Seaton Rd – between Traralgon Maffra Rd & Heyfield Dawson Rd

Cowwarr Heyfield Rd

Downings Rd - @ Cowwarr Weir

Stoney Creek Rd - @ Stoney Creek low level crossing

NEWRY

Lower Newry Rd

Upper Maffra Rd – between Tinamba Newry Rd & **Websters Rd**

Factory Lane

Tinamba Newry Rd

Main Street

Heyfield Upper Maffra Rd - @ Hagens Bridge between Tinamba Glenmaggie Rd & Upper Maffra Rd

TINAMBA

Tinamba Seaton Rd – between Tinamba Newry Rd & Upper Maffra Rd

Tinamba Glenmaggie Rd – between Tinamba Newry Rd & Upper Maffra Rd

McKinnons Rd

Traralgon Maffra Rd – between Tinamba & Maffra, south of Heyfield

Boggy Creek Rd – between Traralgon Maffra Rd & Riverside Rd

BUNDALAGUAH

Cotos Lane

Blyths Rd – western end

Bundalaguah Rd

Riversdale Rd – from Bundalaguah for approx. 1.7km

Cobains Rd – western end

HEYFIELD

Heyfield Traralgon Rd – just outside of Heyfield from Rainbow Creek

Heyfield Coongulla Rd – near Angle Channel Rd

DESAILY FLATS

Kearys Rd

Horseshoe Rd

Spencers Rd

Pooleys Rd

Centre Rd

Back Maffra Rd

LONGFORD

Dowds Lane – near Longford, off the Longford Loch-Sport Rd

OTHER

Myrtlebank Fulham Rd – Myrtlebank, in proximity to and between Thompson River Bridge and Stirling Bridge

Weir Road - @ Lanigans Bride

Riverview Road - near intersection with Maffra Rosedale Rd

All low lying roads on the floodplain are subject to flooding.

DISRUPTION TO SERVICES

Many roads are closed for the duration of flooding which impacts school bus routes and access for emergency services.

GAUGE LOCATIONS

Gauge Name	Location	Gauge Zero m AHD	No.
RIVER GAUGES			
Thomson R @ The Narrows	d/s of the Thomson Reservoir	N/A	225210
Aberfeldy R @ Beardmore	300m upstream of the Walhalla-Aberfeldy Rd Bridge	305.552	225213
Thomson R @ Coopers Ck	400m downstream of Coopers Ck junction	185.200	225208
Thomson R @ u/s Cowwarr Weir	4.5km upstream of Cowwarr Weir	069.400	
Rainbow Ck @ Heyfield	N/A	033.837	225236
Thomson R @ Heyfield	N/A	035.846	225200
Thomson R @ Wandocka	At Gibbs and Knox Bridge	019.423	225212
Thomson R @ Bundalaguah	N/A	N/A	225232
Flooding Ck @ Sale Wharf	N/A	N/A	225237
Macalister R @ Glencairn	5km u/s of the Barkly R junction	293.54	225219
Macalister R @ Licola	30m d/s of the bridge	188.889	225209
Macalister R @ d/s Stringybark Ck		105.249	225221
Macalister R @ d/s Lake Glenmaggie	100m d/s of Lake Glenmaggie	49.948	225204
RAINFALL GAUGES			
Murderers Hill	Thomson Catchment		85289
Glencairn	Macalister Catchment		85058
Licola	Macalister Catchment		85306
Snowy Range	Macalister Catchment		85302
High Ridge	Macalister Catchment	83094	
Mt Sunday	Macalister Catchment	83093	
Mt Tamboritha	Macalister Catchment	85288	

GAUGE LEVEL INFORMATION

Gauge Name	Event	Gauge Height (m)	Flow (ML/d)	ARI (1 in x years)
Thomson R @ The Narrows	1978 Jun	3.51	14,478	
225210	1960 Jul	3.41	15,971	
	2003 Dec	1.27	1,630	
Aberfeldy R @ Beardmore			62,700	100
225213		5.94	45,400	50
	1978 Jun	5.65	40,800	
		5.01	31,700	25
	1990 Apr	4.95	30,900	
		3.77	18,200	10

Gauge Name	Event	Gauge Height (m)	Flow (ML/d)	ARI (1 in x years)
	2011 Aug	3.50		
		2.83	10,800	5
	2011 Jul	2.20		
	2012 Mar	1.94		
Thomson R @ Coopers Ck		6.60	76,500	100
225208	1978 Jun	6.40	72,000	
		5.74	58,600	50
	1934 Dec	5.49	53,800	
Major		**5.00**	**44,600**	
		4.95	43,700	25
		3.96	27,800	10
Moderate		**3.50**	**21,800**	**7**
		3.21	18,300	5
	1995 Oct	3.18	17,925	
Minor		**2.30**	**9,690**	**2**
Thomson R @ u/s Cowwarr Weir			170,000	100
		10.32	113,000	50
	1978 Jun	9.10	95,800	38
		7.58	72,800	25
	1990 Apr	7.04	64,600	21
	1976 Oct	6.00	47,400	13
	1993 Sep	5.57	39,400	10
		5.52	38,600	10
Major		**5.50**	**40,000**	**10**
	1978 May	5.06	29,400	7
	2011 Aug	4.87		
		4.68	22,320	5
Moderate		**4.50**	**20,000**	**4**
	2011 Jul	4.09		
	2012 Mar	3.74		
Minor		**3.60**	**7,020**	**<2**
Rainbow Ck @ Heyfield	1993 Sep	5.12	32,602	
225236	2007 Jun	5.10	n/a	
	1992 Dec	5.05	30,518	
	2011 Aug	4.86		
	2011 Jul	4.47		
	2012 Mar	3.90		
Thomson R @ Heyfield	1992 Dec	4.54	3,615	
225200	1993 Sep	4.45	3,509	
	1995 Nov	4.41	3,459	

Gauge Name	Event	Gauge Height (m)	Flow (ML/d)	ARI (1 in x years)
	2011 Aug	3.41		
	2012 Mar	3.11		
	2011 Jul	3.07		
Thomson R @ Wandocka			133,000	100
225212			99,200	50
			71,700	25
	1978 Jun	6.96	56,600	
	1990 Apr	6.92	50,800	
		6.82	43,400	10
	2007 Jun	6.78	28,750	
		6.75	27,000	5
Major		**6.70**	**23,800**	**4**
	2011 Aug	6.57		
Moderate		**6.50**	**14,800**	**3**
	2011 Jul	6.43		
Minor		**6.20**	**8,900**	**>2**
	2012 Mar	6.04		
Thomson R @ Bundalaguah	2007 Jun	7.72	136,457	
225232	1978 Jun	7.68	123,961	
	1985 Oct	7.65	115,685	
	2012 Jun	7.64		
	2007 Nov	7.60		
	2011 Aug	7.50		
	1998 Nov	7.40		
	2011 Jul	7.26		
	1996 Oct	6.96		
	2012 Mar	6.44		
Flooding Ck @ Sale Wharf	1978 Jun	5.20		
225237	2007 Jun	4.23		
	1993 Sep	4.10		
	2012 Jun			
Major		**4.00**		
	1990 Apr	3.75		
	2007 Nov	3.70		
	1992 Dec	3.65		
	1995 Nov	3.62		
	1995 Nov	3.39		
	2011 Aug	3.34		
	1998 Nov	3.18		
Moderate	1990 Oct	**3.00**		

Gauge Name	Event	Gauge Height (m)	Flow (ML/d)	ARI (1 in x years)
	2011 Jul	2.84		
	1992 Sep	2.75		
	1996 Oct	2.50		
Minor		**2.40**		
Macalister R @ Glencairn	2007 Jun	4.75	37,189	
225219		4.33	32,300	100
		3.99	28,500	50
	1988 Sep	3.71	25,500	
		3.63	24,600	25
	1993 Oct	3.50	23,100	
		3.12	19,200	10
		2.75	15,000	5
Minor		**1.80**	**6,600**	**<2**
Macalister R @ Licola	2007 Jun	~5.15	~120,000	
225209		4.69	61,900	100
		4.35	55,000	50
Major		**4.00**		
		3.94	47,700	25
	1990 Apr	3.83	44,000	15
	1956 Jan	3.72	42,200	
	2010 Sep	3.53	24,851	
		3.48	37,400	10
Moderate		**3.30**		
		3.05	29,100	5
Minor		**2.00**		
Macalister R @ d/s Stringybark Ck	2007 Jun	6.53	187,108	
	1990 Apr	4.65	51,703	20
225221	1971 Nov	4.12	44,032	
Macalister R @ d/s Lake Glenmaggie	2007 Jun	9.57	136,795	
		9.07	120,000	100
225204	1971 Jan	8.64	110,607	
		8.38	96,300	50
	1978 Jun	7.87	88,895	
	1952 Jun	-	88,100	
	1935	-	77,000	
	1993 Sep	7.63	75,500	
		7.62	75,300	25
	1995 Oct	7.25	66,500	
	1950	-	62,400	
	2007 Nov	-	59,000	

Gauge Name	Event	Gauge Height (m)	Flow (ML/d)	ARI (1 in x years)
	2012 Jun	6.43	58,000	
	1998 Nov	6.27	42,000	
Major		**5.20**	**35,000**	
Moderate		**4.00**	**22,000**	
Minor		**2.30**	**7,500**	

APPENDIX B.02 - TYPICAL FLOOD PEAK TRAVEL TIMES

Travel times are calculated as **the time the peak of the event takes to move from one gauge to the next**. Note the onset of flooding can occur before the peak water level occurs.

It is possible for flooding to commence at downstream locations prior to peak heights being reached in the upper parts of the catchment due to both locally heavy rainfall and the backwater effects mentioned earlier.

Due to the high level of variability in antecedent catchment conditions, flood travel times can vary significantly, as demonstrated in previous floods.

Travel times listed here are **INDICATIVE ONLY** and are **HIGHLY VARIABLE**.

Gauge Name	June 1978	April 1990	Sept 1993
Thomson R @ The Narrows	0	0	0
Thomson R @ Coopers Ck	3.0 hrs	7.5 hrs	2.0 hrs
Thomson R @ Heyfield	N/A	N/A	2.5 hrs
Thomson R @ Wandocka	8.0 hrs	10.5 hrs	3.0 hrs
Thomson R @ Bundalaguah	14 hrs		
Flooding Ck @ Sale Wharf			

Gauge Name	Oct 1993	Sep 1998	Jun 2007
Macalister R @ Glencairn	0	0	0
Macalister R @ Licola	2.0 hrs	2.0 hrs	0.5 hrs
Macalister R @ d/s Stringybark Ck	6.5 hrs	7.5 hrs	3.5 hrs
Macalister R @ Lake Glenmaggie	18.5 hrs	15 hrs	-

LOCATION

Sale is situated on the Thomson River downstream of the confluences of the Macalister River and upstream of the confluence with the Latrobe River. Flooding Creek and Sale Canal run through the town and join the Thomson prior to its confluence with the Latrobe which then leads into Lake Wellington in the Gippsland Lakes.

FLOOD BEHAVIOUR

Sale sits on the northern edge of an extensive wetland area with flooding caused by a complex interaction of flooding in the **Latrobe and Thomson Rivers, Macalister River, Flooding Creek** and the **Sale Canal** as well as high lake levels in **Lake Wellington**. Flooding can occur with one or more of these causes.

The Thomson River is joined by the **Macalister River** upstream of **Sale** at **Bundalaguah** and then passes through the **Desailly Flats** before passing under the Princes Highway bridge between Sale and it's outlying suburb of **Wurruk**.

During flooding events, the Thomson River overflows into **Lavers Creek** which breaks out across the floodplain to the north of Sale and spills into **Flooding Creek** which meanders through the outskirts of **Sale** joining the **Sale Canal** behind the **Shire Offices** where the **Flood Gauge** is located. The Sale Canal is a man-made tributary of the Thomson River which joins the Thomson downstream of Sale but causes flooding in and around the **Port of Sale.**

FLASH FLOODING

Sale is prone to flash flooding when large rain events overwhelm the storm water drains and Flooding Creek, impacting internal roadways but no private property.

FLOOD MITIGATION SYSTEMS

There are no flood mitigation systems in Sale.

FLOOD WARNINGS

The Bureau of Meteorology provides warnings for Sale and is able to provide warnings and flood height predictions once upstream gauges have peaked giving approximately 6-24 hours ahead of peaks in rural areas, approximately 6-48 hours in Sale

ROAD CLOSURES

Sale is on the **Princes Highway** and the **South Gippsland Highway**. The South Gippsland Highway is cut at Longford at 2.40m (Minor) and is typically closed for several days. The Thomson River Caravan Park is isolated at this time **and** an alternative route for people travelling to/from Longford, Loch Sport and associated communities is via Rosedale.

Roads in the low lying rural areas to the north (Desailly Flats) and the south west of Sale are closed during minor events. Due to the nature of causeways crossing some of the streams, the water depth can be hard to gauge and flows can be **swift**. **The Desailly Flats will be inaccessible when this occurs.**

Specific **details** on road closures are included in the detailed consequences table.

Riverine Flooding	Flash Flooding
Princes Hwy – Sale **South Gippsland Hwy – between** Sale and Longford **Princes Hwy** - @ **Wurruk** **Princes Hwy** - @ Thomson River bridge **Dargo St** – various places **Park St** **May St** **Maxfields Rd** **Stephenson St** **Johns St** **Canal Rd** **McMillan St** **Leo St** **Walter St** **Johns St** **Billabong Rd** **Tylers Rd** **Magpie Ln**	**Princes Hwy** – Foster St (Princes Hwy) & MacArthur St

GAUGE LEVEL INFORMATION

Flood Class	Flood Event	Bundalaguah	Port of Sale
	1978 Jun	7.68	5.20
	2007 Jun	7.72	4.23
	2012 Jun 1993 Sep	7.64	4.10
Major			**4.00**
	1990 Apr	-	3.75
	2007 Nov	7.60	3.70
	1992 Dec	-	3.65
	1995 Nov	-	3.62
	2011 Aug	7.50	3.34
	1998 Nov	7.40	3.18
Moderate			**3.00**
	2011 Jul	7.26	2.84
	1992 Sep	-	2.75
	1996 Oct	6.96	2.50
Minor			**2.40**

DETAILED CONSEQUENCES & IMPACTS – FLOOD INTELLIGENCE CARD

Gauge	No.	Location	Datum Type
Flooding Creek @ Sale Wharf	225237	Port of Sale	**AHD**

NB Refer attachment for specific property addresses grouped by impact risk.

Depths quoted are above ground level.

Properties are considered isolated when 20cm of water is across the road

Height (m)	Consequences	Operational Considerations
2.40	**MINOR FLOOD LEVEL** **SUMMARY** | South Gippsland Highway closed at Thomson River Caravan Park on the South Gippsland Highway – access to Sale from Loch Sport, Golden Beach and Yarrram is via Rosedale. | Rural Properties may be affected. Property owners should move pumps and stock to higher ground | Low lying properties in and around Sale will be flooded.	| Thomson River Caravan Park on Sale Longford Rd should be evacuated due to isolation | Loch Sport & Longford will need to use alternative rout via Rosedale once Sth Gippsland Highway is closed. | Signage for road closed at Loch Sport | Ensure Department of Education are aware of Road

Height (m)	Consequences	Operational Considerations

	• Properties in Dargo St and the Thomson River Caravan Park will be isolated.
	• The South Gippsland Highway will be closed to all traffic.
	• Boat mooring lines may need to be extended.
	
	PROPERTIES
	• **Flooded (not over floor)**
	  ▷ 15 properties in total
	  ▷ Dargo St, [40, 44, 48, 56]
	  ▷ Undeveloped land along May St
	  ▷ York St, [14, 24]
	  ▷ Lacey St, [2]
	  ▷ Stephenson St, [Lot 10, 11, 17]
	  ▷ Desailly flats – couple of homes
	• **Isolated**
	  ▷ 5 in total
	  ▷ Dargo St, [14, 46, 78]
	  ▷ Sale Golf Course
	  ▷ Thomson River Caravan Park
	
	ROADS
	• **Water over Road**
	  ▷ Dargo St west of park St
	  ▷ Park St, south of Dargo St
	  ▷ May St west of Stephenson St
	  ▷ Maxfields Rd
	• **Road Closed**
	  ▷ South Gippsland Highway between Sale and Longford
	  ▷ Dargo St alongside Flooding Creek
		Closures going into the school week
		• Signage ready for low lying roads to be closed when flooded
		• Boats moored at head of Canal may need ropes lengthened – Gippsland Ports?
		• Tourist fishermen may unwittingly be isolated due to road closures
		• Visit to the VIC and fishing supply stores in Sale to ensure fishermen buying bait etc are aware they may be isolated for 3+ days
		• Ensure that sporting grounds, if being utilised, are aware of flooding impacts

2.60	**ROADS**
	• **Road Closed**
	  ▷ Dargo St, west of Park St
	  ▷ Park St, south of Dargo St
	  ▷ May St, west of Stephenson St
	  ▷ Maxfields Rd
		• ……

3.00	**MODERATE FLOOD LEVEL** **SUMMARY**	• Cars in Civic Centre car park to be moved • Advise Golf Course of situation to avoid golfers being isolated

Height (m)	Consequences	Operational Considerations
	• Up to 50 properties in Stephenson, Johns Dargo, Stevens & Parks Sts, Billabong Rd & the Sth Gippsland H'way will be flooded. • Rainbow Creek, a tributary near Cowwarr, may flood behind Cowwarr and block traffic on the Heyfield-Traralgon Road just outside Heyfield. • Access along minor rural roads may be cut – extensive flooding of paddocks near the river is possible as the area around Sale is so low lying • Fishermen should take care around Lake Wellington and Sale Wetlands as access to fishing spots may be cut by rising waters, stranding fishermen without warning. **PROPERTIES** • **Flooded** ▷ 48 properties in total ▷ 33 new <= 0.60m ▷ Stephenson St, all properties (approx. 11) ▷ Johns St, all properties (approx 2) ▷ South Gippsland Hwy, between Stephenson St & May St (approx 6) ▷ Dargo St, all properties not included in minor (approx 9) ▷ Park St, all properties (approx 3) ▷ Billabong Rd, 30 ▷ Stevens St, 74 ▷ 15 previously now up to 0.60m • **Isolated** ▷ Cnr Stephenson & May Sts ▷ 5 previously **ROADS** • **Water over Road** ▷ May St ▷ Stephenson St ▷ Johns St ▷ Canal Rd ▷ McMillan St, beside Port of Sale ▷ Leo St @ Stephenson St ▷ Walter St @ Stephenson St ▷ Johns St ▷ Billabong Rd ▷ Tylers Rd south of Magpie Lane ▷ Magpie Lane • **Road Closed**	• Check the industrial looking areas that will be inundated do not have chemicals that will be mixed into the floodwaters

Height (m)	Consequences	Operational Considerations
	▷ Dowds Lane, off the Longford Loch Sport Rd	
	| Fishermen:- Dowd's Lane off the Longford-Loch Sport Rd, near Dowd's Morass. Carp fishermen set up camp with vans near the Morass and when the water rises find their exist is blocked by water on Dowd's Lane.	
	| Desailly Flats, east of Sale – Levee bank – you can be standing on Desailly Flat and not see water at all because of the long grass then the river drains up through the grass and within an hour the fence posts are under.	
3.20	**ROADS**	| ……
	| Road Closed ▷ May St ▷ Stephenson St ▷ Johns St ▷ Canal Rd ▷ McMillan St, beside Port of Sale ▷ Leo St @ Stephenson St ▷ Walter St @ Stephenson St ▷ Johns St ▷ Billabong Rd ▷ Tylers Rd south of Magpie Lane ▷ Magpie Ln	
3.75	**APRIL 1990**	| ……
4.00	**MAJOR FLOOD LEVEL**	| ……
	SUMMARY | Cemetery Road, Sale also known as Back Maffra Rd is blocked. | Extensive flooding at western end of Sale including Desailly flats, Cunninghame St near the sports fields, Finegan Crt, Stephenson St, Dargo and Lacey Sts. | Princes Highway closed at Wurruk when Thomson River tops the bridge between Sale and Wurruk. | Port of Sale complex in Canal Road at the mouth of the Sale Canal flooded with water in the carpark behind the Shire offices in Foster Street (Princes Highway)	
4.10	**JUNE 2012**	| ……

Height (m)	Consequences	Operational Considerations
4.23	**JUNE 2007**	……
5.20	**JUNE 1978**	……

APPENDIX C.02b – FLOOD EMERGENCY PLAN - MAFFRA, TINAMBA, NEWRY

LOCATION

The townships of Maffra, Tinamba and Newry are on the Macalister River downstream of Lake Glenmaggie above the confluence with the Thomson River. It is a predominantly rural area with streams and drains crossing the floodplains of the Macalister Irrigation District.

FLOOD BEHAVIOUR

Flooding in this area relates directly to the releases from Lake Glenmaggie which is operated by Southern Rural Water.

An outflow from Lake Glenmaggie of 7,500 ML/d (instantaneous maximum) is classified as minor flooding, 22,000 ML/d is classified as moderate flooding and 35,000 ML/d is classified as a major flood.

Flooding occurs frequently on the Macalister River. From 1976 to 2007 there were 38 minor floods, no moderate floods and 9 major floods.

This part of the floodplain is complicated with interactions of floodwater, irrigation channels and the numerous anabranches of the Macalister River causing quite complex flow patterns during flood events.

CONSEQUENCES AND IMPACTS SUMMARY

The **Tinamba** community experience flooding when outflow from Lake Glenmaggie reaches 30,000 ML/day. This community is generally well prepared for floods and a community emergency plan exists for this town.

The **Newry** community experience flooding when outflow from Lake Glenmaggie reaches 60,000ML/day. This level of outflow causes water to wash out to Newry before heading down to Tinamba and Maffra. Prior to the 2007 major flood event (148,000ML/day), it was not generally known that flooding could occur in Newry at this level of outflow, which resulted in many people being caught unprepared.

FLOOD MITIGATION SYSTEMS

There are no flood mitigation systems in this area however Lake Glenmaggie is able to impact to some degree, downstream flows during a flood event.

FLOOD WARNINGS

The Bureau of Meteorology provides warnings for the Lake Glenmaggie gauge and is able to provide warnings and flood height predictions once upstream gauges have peaked and after Southern Rural Water have given an indication of their planned outflow rate.

ROAD CLOSURES

Specific **details** on road closures are included in the detailed consequences table.

Riverine Flooding	Flash Flooding
Coongulla-Heyfield Rd	
Most roads on the floodplain	

COMMUNITY PROFILE

Tinamba, Newry and Maffra are small rural towns with populations ranging from ~100 to over 4,000 (Maffra).

GAUGE LEVEL INFORMATION

Macalister River @ d/s Lake Glenmaggie gauge

Flood Class	Flood Event	Gauge Height (m)	Outflow (ML)
	2007 Jun	9.57	147,640
100 yr ARI			146,016
50 yr ARI		9.07	120,000
	1971 Jan	8.64	110,607
		8.38	96,300
20yr ARI	1978 Jun	7.87	88,895
	1952 Jun		77,800
	1993 Sep	7.63	75,500
		7.62	75,300
	1995 Oct	7.25	66,500
	2007 Nov	-	59,000
	2012 Jun	6.43	58,000
	1998 Nov	6.27	42,000
		5.59	35,600
Major		**5.20**	**35,000**
Moderate		**4.00**	**22,000**
Minor		**2.40**	**7,500**

SANDBAGGING PROTOCOL

Following communication with the SES, sand will be delivered to designated point, outside of the Tinamba Hall

Supplies of sandbags and a roll of black plastic will be stored at the Tinamba General Store shed. Further sandbags will delivered by the SES as required. Extra sand shovels will be brought out by the SES

Community members are encouraged to assist with filling and distributing sandbags

Sandbags are filled outside of the Tinamba Hall and then loaded onto a transport vehicle for delivery to homes

Outlying residents are welcome to fill sandbags for their properties but are encouraged to also assist with the township sandbagging process

The SES will deliver sandbags to outlying residents as requested. Community wardens can assist in estimating the number of sandbags required to protect homes

DETAILED CONSEQUENCES & IMPACTS – FLOOD INTELLIGENCE CARD

Gauge	No.	Location	Datum Type
Macalister River @ d/s Lake Glenmaggie	225204		**AHD**

Outflow (ML/day)	Gauge Height (m)	Consequences	Operational Considerations
7,500	**2.30**	**MINOR FLOOD LEVEL** **SUMMARY** | Steep catchment so localised flash flooding is possible | Mainly nuisance flooding on low-lying rural properties – no house affected **PROPERTIES** | Low lying rural properties flooded (not over floor) **ROADS** | Low level rural crossings may be impacted	| Alert Maffra SES | Confirm Glenmaggie releases with Southern Rural Water | Advise rural areas to lift pumps and move stock to higher ground. | Maffra Unit have initial supplies sandbags at LHQ plus Coongulla, Briagolong, Newry & Tinamba CFA and Tinamba General Store. | Community meetings not necessary at this level | Caravan parks possibly at threat.
16,000		**SUMMARY** | Thomson River Caravan Park d/stream of Sale will flood	| Advise Thomson River Caravan Park to consider evacuation.
18,000		**SUMMARY** | South Gippsland Highway d/s Sale will close – new works will increase this level | River will enter Serpentine Drain system	| Advise VicRoads of possible road closure.
22,000	**4.00**	**MODERATE FLOOD LEVEL** **SUMMARY** | Many roads across the floodplain will now be flooded. | School bus routes affected to Maffra Secondary College and Boisdale Consolidated School (fed from Newry, Tinamba, Valencia Creek, Upper Maffra, Briagolong areas)	| Implement Tinamba & Newry Community Emergency Plans | Consider Community Meetings at **both** Newry & Tinamba | Early evacuations of Newry & Tinamba if MAJOR flood predicted | Possible Relief Centre at Maffra Memorial Hall | Response teams/vehicles may get isolated by rapidly rising water, particularly in foothills.

Outflow (ML/day)	Gauge Height (m)	Consequences	Operational Considerations
		• River breaks out over southern bank allotment 105c, Tinamba Parish on its way to Boggy Creek • **TINAMBA** – flood waters in the streets **PROPERTIES** • **Isolated** ▷ Properties in foothills in Upper Maffra as creeks cut roads (Wombat Creek, Georges Creek nth of Briagolong, Little Plain **ROADS** • Maffra-Traralgon Rd @ Riverslea, just west of Maffra will be closed.	• Liaise with Murray Goulburn regarding access for milk tankers. • Road blocks to control traffic movement in towns. • SES support from outside local unit required
30,000		**SUMMARY** • **TINAMBA** township will flood • River will likely break out at Greenvale Farm (between Tinamba and Newry), causing water to flow through Tinamba township and cutting access on Maffra-Traralgon Road **ROADS** • **Road Closed** ▷ Maffra-Traralgon Rd	•
35,000	**5.20**	**MAJOR FLOOD LEVEL** **SUMMARY** • Volume and rate of flooding in steep country may cause damage to roads and bridges • **TINAMBA** – swift water through intersections in town to a depth of 0.5m • **NEWRY** - should prepare for extensive flooding	• Sand and sand bagging team to **Newry** in readiness • Community Meetings required at **both** Newry & Tinamba • Tinamba, Newry, Boisdale, Stratford and Heyfield as sectors if required
50,000		•	• If releases are to exceed 50,000ML/d, evacuation of Newry needs to be finalised prior to this point

Outflow (ML/day)	Gauge Height (m)	Consequences	Operational Considerations
60,000	**5.60**	**SUMMARY** | River will break out CA 11c Parish of Maffra, to flood Newry **TINAMBA** | SRW will issue advice that NEWRY is under threat. **NEWRY** | Township will flood. Swift water can get to a depth of 0.5m in Main St **MAFFRA** | Communities downstream from Newry and Tinamba will have extensive flooding with evacuations required.	| Prepare communities downstream from Newry and Tinamba for extensive flooding and road closures with possible evacuations in low lying areas | Peak usually recedes after 4-8 hours
	6.43	**JUNE 2012 EVENT**	| ……
88,895	**7.87**	**JUNE 1978 EVENT**	**……**
90,000		**1 in 100 yr ARI levels** **SUMMARY** | SRW considers it an Extreme Event and will continue to notify at 15,000MLd interval changes.	|
110,607	**8.64**	**JANUARY 1971 EVENT**	**……**
136,795	**9.57**	**JUNE 2007 EVENT**	**……**
300,000		**SUMMARY** | Reservoir will overtop	| ……

Tinamba 1950

DETAILED CONSEQUENCES & IMPACTS – FLOOD INTELLIGENCE CARD

Gauge	No.	Location	Datum Type
Thomson River @ u/s Cowwarr Weir			**AHD**

Outflow (ML/day)	Consequences	Operational Considerations
1,000		Consideration should be given to the removal of pumps and stock near river.
7,500	**MINOR FLOOD LEVEL – US/ COWWARR WEIR**	……

PROPERTIES

Flooded (not over floor)

- Low lying rural properties
- NIL houses.

Outflow (ML/day)	Consequences	Operational Considerations
	ROADS **Water over Road** ▷ Low level rural crossings may be impacted	
9,200	**MINOR FLOOD LEVEL - WANDOCKA**	…….
	SUMMARY Minor flood level for Wandocka	
15,100	**MODERATE FLOOD LEVEL - WANDOCKA** **SUMMARY** ……	Rainbow Creek, a tributary near Cowwarr, may flood behind Cowwarr and block traffic on the Heyfield-Traralgon Road just outside Heyfield. Access along minor rural roads may be cut - extensive flooding of paddocks near the
20,000	**MODERATE FLOOD LEVEL - U/S COWWARR WEIR**	……
24,300	**MAJOR FLOOD LEVEL - WANDOCKA** **ROADS** **Road Closed** ▷ Maffra-Traralgon Road	Cemetery Rd, Sale, also known as back Maffra Rd, blocked. Flooding possible in lower lying areas near the Heyfield Racecourse. Heyfield-Coongulla Rd may be blocked near Angle Channel Rd corner.
40,000	**MAJOR FLOOD LEVEL – U/S COWWARR WEIR**	…..

APPENDIX D.02 – EVACUATION ARRANGEMENTS

The Incident Controller may make the decision to evacuate an at-risk community. Evacuation is the responsibility of VICPOL and will be conducted as per the EMMV and the MEMP.

APPENDIX E.02 - FLOOD WARNING SYSTEM

FLOOD WARNING

The Bureau of Meteorology provides a Flood Warning Service for the Thomson River.

LOCAL FLOOD WARNING SYSTEM ARRANGEMENTS

The Bureau of Meteorology provides warnings for the Thomson River and is able to provide warnings and flood height predictions approximately 12-24 hours ahead of peaks in rural areas, approximately 48 hours in Sale.

APPENDIX F.04 – MAPS

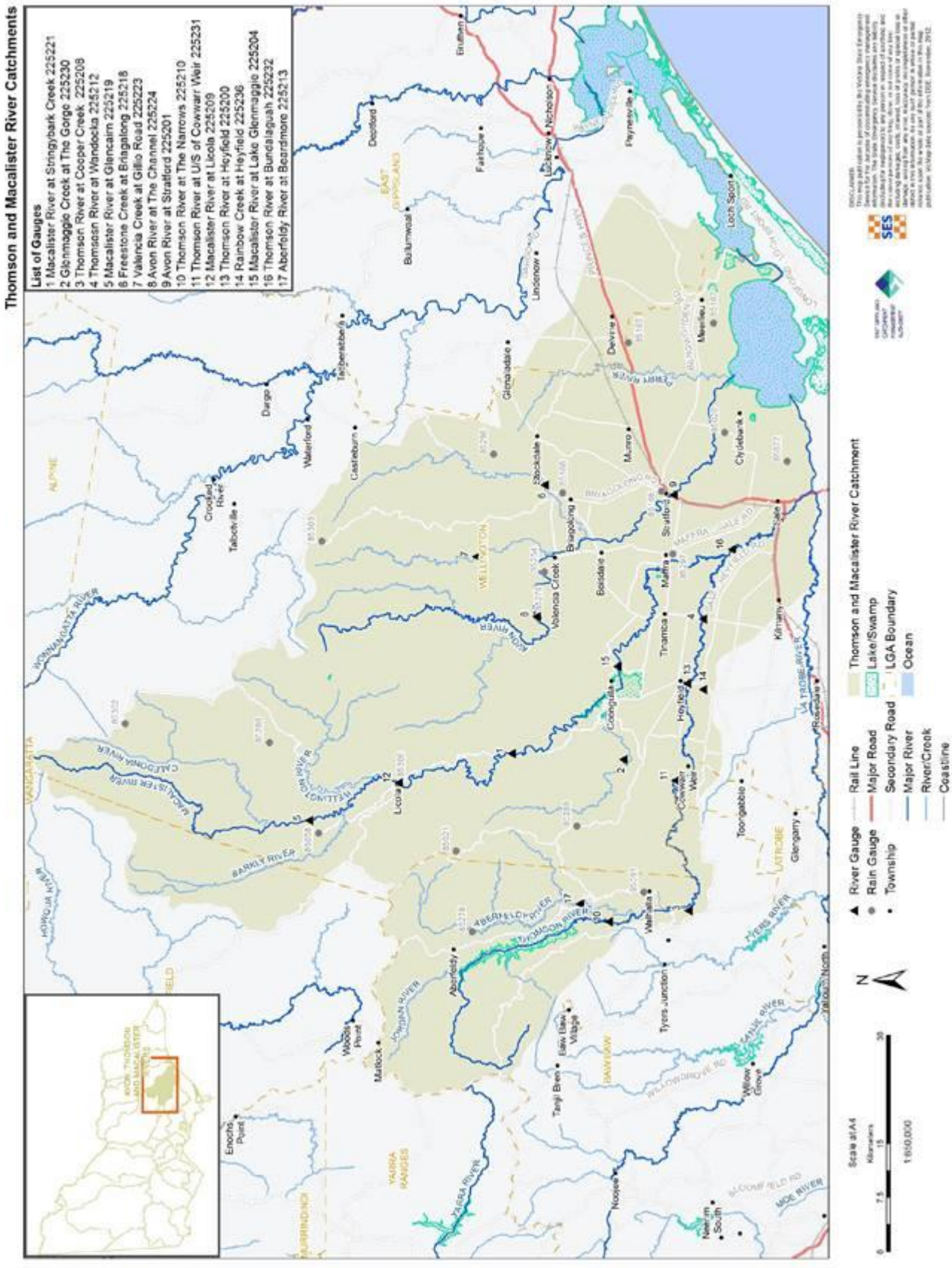
Schematic Diagram Thomson River

Bureau of Meteorology Flood Warning Data Network.

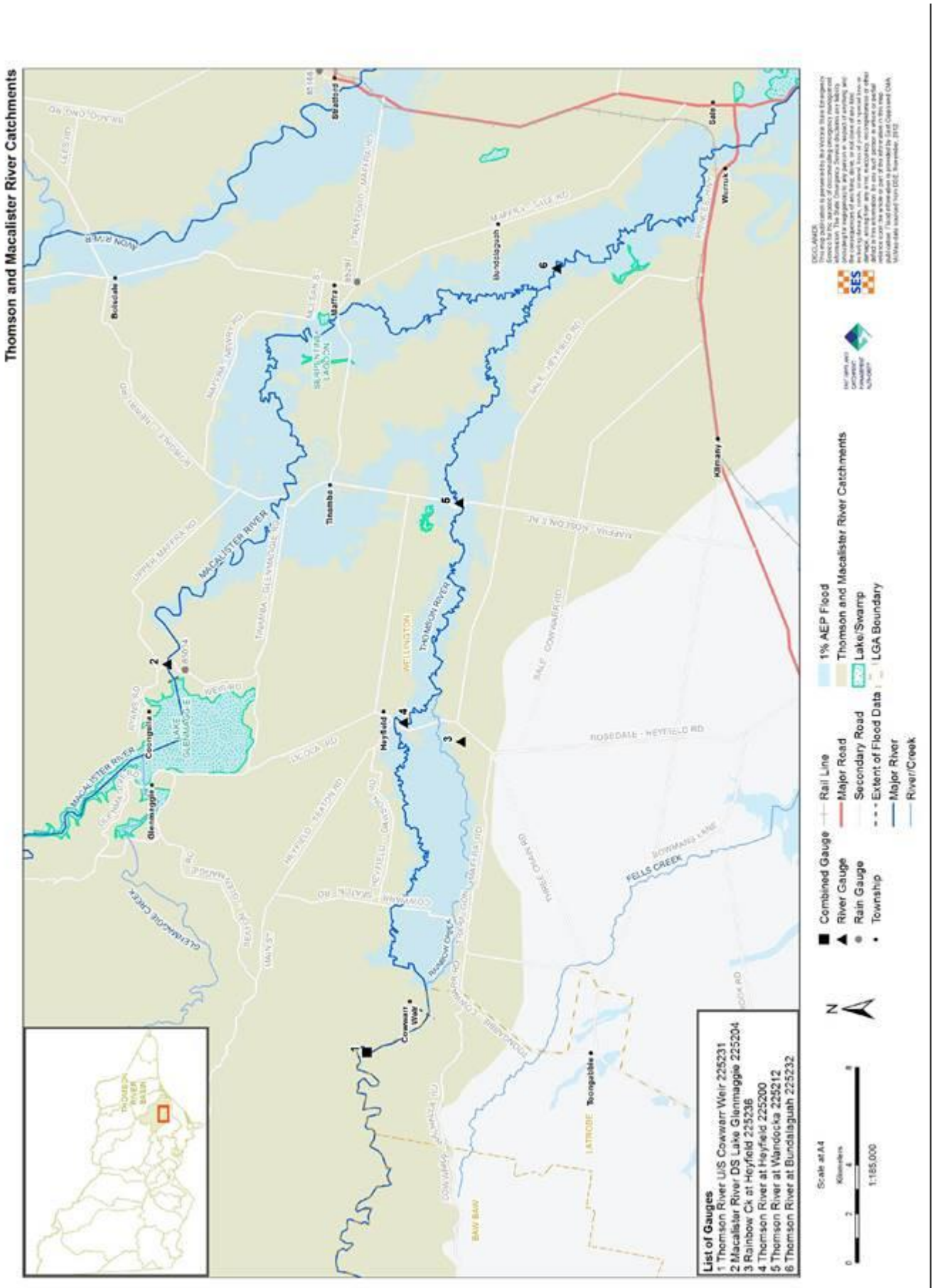
Schematic Diagram Thomson River

TO BE INSERTED

Thomson and Macalister Rivers Catchment Map



Lake Glenmaggie to Bundalaguah Map



ATTACHMENT 03 MERRIMANS CREEK

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ASSOCIATED REPORTS

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Victorian Resources Online, Department of Primary Industry http://vro.dpi.vic.gov.au/dpi/vro/

Australian Rainfall & Runoff Revision Projects, Project 5, Regional Flood Methods, December 2009, Engineers Australia, Barton ACT

Camp Scott Furphy PL (1980) Seaspray Flood Study. Prepared by Camp Scott Furphy for the State Rivers & Water Supply Commission and Shire of Rosedale

Findlay (1996) Seaspray Flood Mitigation Scheme Levee Audit Report. Prepared by Findlay Irrigation Design Services and BM Consulting Civil Engineers for the Department of Natural Resources and Environment.

Seaspray Flood Mitigation Scheme Operating Procedures, Wellington Shire Council, Sale, VIC, 2005

ACKNOWLEDGEMENT

Front Cover photo by Leanne Peck, Sale Entrant in the Gippsland Water National Water Week Photo Competition, October 2011

ACCURACY & CONFIDENTIALITY

Use this information as a guide to the possible effects of a flood. This card is based on estimates of flood behaviour and particular effects may occur at heights different from those indicated here. They may also occur at slightly different heights in different floods. This card may contain sensitive information about the effects of flooding on private property. Specific reference to private addresses or businesses must be made directly to owners or other emergency services but not via broadcast or print media.

APPENDIX A.06 – FLOOD THREATS

OVERVIEW OF RIVER SYSTEM

WEATHER PATTERNS

Low pressure weather systems off the NSW south coast (east coast lows) often cause heavy rain in Gippsland including the Merrimans Creek catchment, as do low pressure weather systems entering the catchment from central Australia.

THE ORIGIN OF MERRIMANS CREEK

Merrimans Creek is part of the **South Gippsland Basin** as referred to by the Bureau of Meteorology and Department of Sustainability and Environment.

Merrimans Creek catchment has an area of 520km^2 with its headwaters at Mt Tassie approximately 700m above sea level on the southern slopes of the Hoddle Range.

There are three main contributors to Merrimans Creek:

- Merrimans Creek
- Monkey Creek
- Blind Creek - *normally an anabranch of Merrimans Creek during a flood event*

The main stream of **Merrimans Creek** falls steeply in the first 20km to the rural locality of **Gormandale** (pop 757), in the 54km from there to Seaspray the average stream slope is less than 2.5m/Km.

Merrimans Creek makes its way through the locality of **Willung** to the **Stradbroke West** gauging station which has a catchment of 256km^2.

It then crosses the **South Gippsland Highway,** closing the Highway during moderate events and then makes its way into the rural locality of **Stradbroke** (pop 378).

A main tributary contributing downstream of Stradbroke West is **Monkey Creek** which drains a catchment of approximately 92km^2.

The Creek flows through rural grazing properties until it reaches the **Prospect Rd Bridge** gauging station, which has a catchment of 529km^2.

Below the Prospect Rd Bridge the flood plain widens and flattens with the catchments of Lake Reeve to the east and Lake Denison to the west before passing through **Seaspray** (permanent pop 190).

Meanders generally form during flood events, dispersing water in sometimes unexpected directions. Because of the flood mitigation infrastructure around the town, and the numerous combinations of flow paths, floodwater can move in numerous directions throughout the town, and each flood will behave differently.

FLOOD MITIGATION IN SEASPRAY

Wellington Shire Council operates a flood mitigation scheme for the township of Seaspray.

Refer to the Seaspray Flood Mitigation Scheme Operating Procedures and more detail in the Flood Emergency Plan for the Seaspray township.

SCHEMATIC DIAGRAM

TO BE SUPPLIED

Intentionally Blank

FLOOD RISKS

FLOODING FREQUENCY

Merrimans Creek has had at least 12 significant events between 1916 and 1980.

TIDAL / ESTUARINE / STORM SURGE FLOODING

Properties subject to flooding with Sea Level Rise predictions for 2030 have been included as probable flooding impact for storm surge.

Seaspray has been flooded in the past by high sea level, the flood mitigation scheme is also designed to mitigate against this type of event. It was recognised that high sea levels could aggravate Merrimans Ck flooding if peaks coincided. To estimate tides at Seaspray, add 25 mins to tide peaks at Port Phillip Heads.

URBAN FLOOD RISK

The township of Seaspray situated at the entrance includes all urban flood risk in the catchment.

RURAL FLOOD RISK

Rural areas the length of Merrimans Creek and around the township of Seaspray.

HEALTH & ENVIRONMENTAL RISKS

There are many septic tanks in the rural areas that may be inundated by floodwaters and farm chemicals stored in farm sheds on the floodplain.

PROPERTIES AT RISK

The table below is a breakdown of the number of properties impacted in a 1% AEP riverine event and in a storm surge event. These figures are indicative only and based on a mixture of actual impacts during historical events which were less than the 1% event, mapping and sea level rise predictions as at 2030. Any revisions will increase the number of properties.

Community	RIVERINE # properties flooded in 1% AEP					STORM SURGE # properties flooded in 2030 Sea Level Rise				
	Residential	Business	Industrial	Rural	Total	Residential	Business	Industrial	Rural	Total
Seaspray	7	0	0	18	25	150	0	0	12	162
Stradbroke	0	0	0	38	38	0	0	0	0	0
Gormandale	1	0	0	33	34	0	0	0	0	0
Willung	0	0	0	31	31	0	0	0	0	0

HISTORICAL FLOODS

Periods of heavy rain leading to major flood events can occur in Gippsland at any time of the year.

Significant floods have occurred in the Merrimans Creek Catchment as shown in the table below. Impacts of significant events are discussed below the table.

NB there are no Flood Class Levels for this catchment.

EVENT	CALIGNEE STH	STRADBROKE WEST	PROSPECT RD BRIDGE
1985 Dec	2.53	5.04	1.91
1988 Dec	3.01	-	1.47
1989 Oct	2.37	4.78	1.57
1990 Apr	2.76		1.21
1993 Sep	3.54	8.32	5.53
1995 Oct	2.60	6.08	2.59
1995 Nov	3.30	8.20	5.70
1996 Aug	1.90	5.11	1.84
1996 Sep	1.86	4.05	1.88
1998 Nov	2.40	4.78	1.85
2001 Apr	3.12	4.68	1.72
2001 Aug	2.30	4.25	2.15
2005 Feb	2.98	3.15	1.33
2007 Jun	3.02	6.18	2.17
2007 Nov	2.69	3.96	1.53
2011 Jul	3.23	6.39	2.57
2011 Aug	2.21	3.55	1.61
2012 Mar			
2012 Jun			

1935 FLOOD EVENT

SEASPRAY IN FLOOD

Gippsland Times, Thursday April 25, 1935

NORTH END A HUGE LAKE

This is an age of records! Ten consecutive days of rain, and three floods within six months, is something that will be long remembered.

Rain began to fall at this seaside resort on Friday week, and continued every day until Sunday last

The north end of the township is a huge lake. Every house is surrounded by water, and the few occupants are moving about bare-footed, and in long water-proof boots. They are unable to get to Sale in their motor cars until the water between Longford and Sale recedes. They came to Seaspray to spend their holidays. They expected fine weather, but got a flood instead, and those who waited until Sunday could not get home.

Longford on Monday was the scene of great activity. Local residents and visitors from a distance were there. Many motors were parked near the flood water's edge. Mr. Arclie Bott, in his big motor boat, conveyed passengers to Sale. Those who undertook the journey had the depth and the vast, extent of the flood impressed on them.

On Sunday evening the bridge at Longford became impassable, and most of the Punt Lane was underwater. The north end of Seaspray will always be subject to flooding until there is an effective drainage scheme, which is long overdue. The overflow of water from Merriman's Creek breaks through a gap a couple of hundred yards south of the

1952 FLOOD EVENT

SEASPRAY HOUSES EVACUATED

MERRIMANS CREEK OVERFLOWS QUICKLY

Residents of Seaspray had plenty of warning on Monday night that Merriman's Creek would break its banks and overflowed into the settlement. The residents who were likely to suffer evacuated carefully, lifting floor coverings and storing furniture high enough to be out of the way of serious damage. This proved most successful as the creek rose rapidly.

Soon after the people were out of the danger section, the overflowing creek waters were lapping the floorboards. Still rising at a high rate of speed, these waters swirled through the houses leaving a trail of mud and debris. Fortunately there was no sandbar across the mouth of the stream on this occasion and as the water backed up, it forced its way out to sea. On Tuesday evening, it was reported that the creek had gone down as rapidly as it had risen. In the districts leading to Seaspray, waters cut the South Gippsland Highway in several places and beyond Stradbroke, Monkey creek was well de have passed.

1978 FLOOD EVENT

The June 1978 flood event was (until 1980) the highest flood on record. Out of the 55 permanently occupied residential properties sampled, 42 were flooded at or above floor level and out of 42 seasonally occupied residences sampled, 38 were flooded at or above floor level. Only 15-20 allotments out of a total of approximately 320 allotments were not subjected to any inundation during the June 1978 flood. One of the largest on record.

1993 FLOOD EVENT

On Sept 11 an intense anticyclone was forming in the wake of a front which moved through Victoria between 11 & 12 September. By Sept 14th a pronounced low pressure system had developed and then intensified and had positioned itself off the NSW south coast (east coast low) by 15th Sept. This low pressure system intensified and caused heavy rainfall in the catchment causing major flooding in Seaspray.

Although the only source of floodwaters was Merrimans Ck, floodwaters entered **Seaspray** from two directions – from the **main stream** where it overtopped the constructed levee system and from an **eastern prior stream** where floodwaters were blocked by irrigation channels.

To the north of Seaspray, immediately below the **Prospect Rd Bridge** the flood was contained within the banks of Merrimans Ck. Upstream of the town, floodwater broke away from the main stream and flowed east along a prior stream course.

This water would normally flow back into the main stream via **Blind Ck**, an anabranch of Merrimans Ck during flood events, but **was obstructed by two irrigation embankments on private land which blocked the head of the Blind Creek depression.**

Most of this breakaway was intercepted by the main **Seaspray Rd** and drained along the roadside into a part of the township unprotected by levees. It then crossed Seaspray Rd about 580m from **Ellen Ave**, flowed rapidly toward town spilling into Ellen Ave and **Davies St** and flowing down **Griffioen's Driveway**.

After passing through properties on Ellen Avenue, Main Rd and Davies St, water collected behind the Hansen St Levee and flowed into the Centre Rd area being unable to escape to the Lake Reeve Floodway.

Downstream of the Merrimans Creek / Blind Creek confluence, there are two levees on the eastern bank, **Griffioens Levee** and **Government Rd Levee**. The northern extent of the Government Rd Levee was overtopped with flow also breaching the higher ground between the two levees to a shallow depth over a length of 115m for several hours.

A depression near the west end of **Government Rd** channelled water toward the residential area of Government Rd and **Rowley St**. Water flowed knee-deep east along Government Rd, crossed **Futcher St** and overtopped the **Hansen St Levee** into the **Lake Reeve floodway**.

This event was considered to be a 2% AEP / 50yr ARI event. 186 blocks were impacted, 140 with houses, 75 impacted, 44 flooded above floor level.

Seaspray Rd area was evacuated with little warning due the unexpected direction of the floodwaters. The Government Rd area was evacuated with timely warning.

Properties on the south-east side of the Lake Reeve floodway were largely spared from flooding, however, some properties were affected by water which flowed under the floodway through the stormwater drainage system.

Financial impact - approximately $1.3m for urban residential damage in Seaspray and $134k for infrastructure.

MAJOR WATER STORAGES

There are no major water storages on Merrimans Creek.

LEVEES

All levees are operated by Wellington Shire and are in Seaspray on Merrimans Creek

Name	Condition
Irving St Levee	Used for vehicle access to the Buckley St pumping station
Griffioens Levee	Outflanked in 1993
Hansen St Levee	Outflanked in 1993
Government Rd Levee	Outflanked in 1993
Trood St Levee	
Shoreline Rd Levee	

Flood mitigation works in Seaspray involve a system of levees to protect the coastal town from flooding from Merrimans Creek. The Seaspray levee works were constructed by the former Shire of Rosedale and completed in 1987. They are now the responsibility of Wellington Shire Council. They were inspected in 1996 and found to be in good condition.

The levee system was outflanked during the 1993 event but provided full protection for the town during the Nov/Dec 1995 event.

A map of the levee system is attached in Appendix F.

A copy of the Operation Procedures for the Seaspray Flood Mitigation Scheme can be accessed via the Wellington Shire Council.

A drainage pipe passes through Levee 2 to provide drainage in the Main Rd area. There is no backflow device on this structure which may result in flooding behind the levee without temporary works.

There is a Lake Reeve floodway with a gated structure to manage flows between Merrimans Creek and Lake Reeve.

There are 2 levees on the eastern bank of Merrimans Ck d/stream of the Blind Ck confluence. Griffioen's Levee is used as an irrigation channel and is elevated above surrounding land at its southern extremity.

The northern extremity of the Government Road levee tapers gradually into the higher ground which separates the two levees.

Lake Reeve Floodway – The crest of the weir allowing spill from Merriman Ck to the floodway is at 2.20m AHD and the crest of the adjoining Government Rd Levee is at 2.70m AHD.

MAJOR ROAD CLOSURES

Riverine Flooding	Flash Flooding
Seaspray Rd – Carrs Ck (during extreme events) **South Gippsland Highway** – at Stradbroke	

RURAL ROAD CLOSURES

Riverine Flooding	Flash Flooding
Taylors Lane - @ bridge over Merrimans Creek, Stradbroke	

DISRUPTION TO SERVICES

There is no identified disruption to services.

GAUGE LOCATIONS

Gauge Name	Location	Gauge Zero m AHD	No.
Merrimans Ck @ Callignee South	Lat -38.36 Long 146.65		227205b
Merrimans Ck @ Stradbroke West			227239a
Merrimans Ck @ Prospect Rd			227240a

GAUGE LEVEL INFORMATION

Gauge Name	Event	Gauge Height (m)	Flow (ML/d)	ARI (1 in X years)
Merrimans Ck @ Callignee Sth 227205	1993 Sep	3.54		
	2012 Jun	3.31		
	1995 Nov	3.30		
	2011 Jul	3.23		
	2001 Apr	3.12		
	2007 Jun	3.02		
	1988 Dec	3.01		
	2005 Feb	2.98		
	1990 Apr	2.76		
	2007 Nov	2.69		
Merrimans Ck @ Stradbroke West 227239	1993 Sep	8.32		
	1995 Nov	8.20		
	2011 Jul	6.39		
	2007 Jun	6.18		
	1995 Oct	6.08		
	1996 Aug	5.11		
	1985 Dec	5.04		
	1989 Oct	4.78		

Gauge Name	Event	Gauge Height (m)	Flow (ML/d)	ARI (1 in X years)
	1998 Nov	4.68		
	2001 Apr	4.25		
Merrimans Ck @ Prospect Rd Seaspray 227240	1995 Nov	5.70		
	1993 Sep	5.53		
	1995 Oct	2.59		
	2011 Jul	2.57		
	2007 Jun	2.17		
	2001 Aug	2.15		
	1985 Dec	1.91		
	1996 Sep	1.88		
	1998 Nov	1.85		
	1996 Aug	1.84		

NB: there are no flood class levels for Merrimans Creek

APPENDIX B.06 - TYPICAL FLOOD PEAK TRAVEL TIMES

Travel times are calculated as the time the peak of the event takes to move from one gauge to the next. Note the onset of flooding can occur before the peak water level occurs.

It is possible for flooding to commence at downstream locations prior to peak heights being reached in the upper parts of the catchment due to both locally heavy rainfall and the backwater effects mentioned earlier.

Due to the high level of variability in antecedent catchment conditions, flood travel times can vary significantly, as demonstrated in previous floods.

Travel times listed here are **INDICATIVE ONLY** and are **HIGHLY VARIABLE**.

Gauge Name	Sept 1993	April 1990	June 1978
Merrimans Ck @ Callignee Sth	0		
Merrimans Ck @ Stradbroke West	8.5 hrs	0	0
Merrimans Ck @ Prospect Rd Bridge	14.5hrs		
Merrimans Ck @ Seaspray	15.5		

APPENDIX C.06 – FLOOD EMERGENCY PLAN - SEASPRAY

LOCATION

Seaspray is a holiday resort on Ninety Mile Beach, 32km south of Sale, at the end of Merrimans Creek where it flows out to Bass Strait. It is predominantly a holiday resort for seasonal and casual visitors.

Seaspray is situated on the eastern floodplain of Merrimans Creek, closely behind the coastal sand dunes.

FLOOD BEHAVIOUR

Seaspray has been significantly flooded on at least 12 occasions between 1916 and 1980. A levee system was constructed in 1987. In the 1993 major flood event the levee system was breached in several places but provided adequate protection in some parts of the town during the 1995 event.

The main cause of serious flooding is flow breaking out from **Merrimans Creek** and flowing over **Griffioens Levee** and **Government Rd Levee** towards Lake Reeve over the low lying land where Seaspray is situated.

Blind Creek drains a small local catchment and receives overflows from Merrimans Creek via a connecting prior stream channel. During the 1993 event, floodwater overflowed from an eastern prior stream which had been blocked from flowing down Blind Ck by irrigation embankments, and entered the town from the north.

Tidal flooding can also occur. Formation of a sandbar at the sea outlet at Merrimans Creek aggravates Creek flooding but offers some protection against tidal flooding. Of the 12 significant flood events, the two in 1962 and 1975 were caused via tidal flooding.

High sea levels would aggravate the extent of flooding if peak sea levels coincided with peak flood flows. A 1% AEP sea level event would provide a sea level of 2.95m AHD.

Neither **Lake Reeve** nor **Lake Denison** has significant impact on the frequency and extent of major flooding at Seaspray.

CONSEQUENCES AND IMPACTS SUMMARY

	RIVERINE # properties flooded in 1% AEP					STORM SURGE # properties flooded in 2030 Sea Level Rise				
	Residential	Business	Industrial	Rural	Total	Residential	Business	Industrial	Rural	Total
Seaspray	7	0	0	18	25	150	0	0	12	162

FLOOD MITIGATION SYSTEMS

The flood mitigation system is operated by Wellington Shire Council under Operation Procedures that are attached to their MEMP.

Essentially, the flood mitigation system at Seaspray protects the town from riverine, sea and flash flooding. It consists of a floodway between Merrimans Creek and Lake Reeve, a levee system beside Merrimans Creek and along the floodway, and a manual regulator to regulate flows from the creek into the floodway.

The levee bank system not only prevents Merrimans Creek and sea waters from entering the township, it also allows the Merrimans Creek pool water level to rise enough to open the mouth of the creek and to maintain water in the floodway or the pool for swimming.

There is a flow chart attached which shows the decision making process to follow for riverine, flash flooding or sea flooding to reduce flooding impacts in Seaspray.

FLOOD WARNINGS

The Bureau of Meteorology provides general warnings for Merrimans Creek gauge heights. There are no flood class levels for Seaspray.

ROAD CLOSURES

Riverine Flooding	Flash Flooding
Government Rd – west of Futcher St **Rowley St** **Short St** **Hansen St** **Newton St** **Centre Rd** **Main Rd** **Davies St** **Ellen Ave** **Tip Rd** **Foreshore Rd** **Lyons St** – between Foreshore Rd & Bearup St **Buchan St** – between foreshore Rd & Beaurup St	.

CRITICAL INFRASTRUCTURE

Centre Rd Pumping Station – Cnr Centre Rd and Catton St
Buckley St Pumping Station – Buckley St just sth of Irving St Levee

GAUGE LEVEL INFORMATION

Merrimans Creek @ Prospect Rd Bridge, Seaspray

Flood Event	Gauge Height (m) AHD	
1995 Nov	5.70	
1993 Sep	5.53	
1995 Oct	2.59	
2011 Jul	2.57	
2007 Jun	2.17	
2001 Aug	2.15	
1985 Dec	1.91	
1996 Sep	1.88	
1998 Nov	1.85	
1996 Aug	1.84	

Date	Flood Discharge m^3/s	Rank	Comment
1978 Jun	330	1	Estimated from flood level data
1952 Jun	194	2	Estimated by RORB
1935 Apr		3	
1951 Feb		4	
1949 Jul		5	Mouth blocked
1975 May		6	
1971 Feb	104	7	
1944 May		8	Mouth blocked
1962 Jan		9	Tide affected
1936		10	
1934 Dec		11	
1916 Sep		12	

DETAILED CONSEQUENCES & IMPACTS - FLOOD INTELLIGENCE CARD

Gauge	No.	Location	Datum Type
Merrimans Creek @ Prospect Road Bridge			AHD

NB The consequences listed below indicate impact when the mouth of the estuary is closed. When the mouth is open, impact is far less.

Height (m)	Consequences	Operational Considerations
7.5m³/sec	**FIRST Warning Level** • Merrimans Creek pool = 2.3m AHD • All water will pass down the floodway.	Entrance opening equipment and manpower to be mobilised.
15m³/sec	**SECOND Warning Level** • Merrimans Creek pool = 2.3m AHD	• **Every effort** must be made to open the mouth and keep it open. • Regulator to be progressively barred up to 2.7m AHD. • Entrance opening equipment and manpower to remain on standby until flood risk passes.
30m³/sec	**THIRD Warning Level** • Merrimans Creek pool < 2.7m AHD • If mouth remains closed, possible flooding of township will occur. • If flows exceed 15m³ / sec down the Lake Reeve floodway Hansen Street and Shoreline Road levees will overtop, flooding the township including areas behind the Government Road levee. • To ensure this doesn't occur, the regulator MUST be barred up to 2.7m AHD.	• Town should be alerted to possible flooding.
45m³/sec	**LEVEE FAILURE** • Merrimans Creek pool = 2.7m AHD • 15m³/**sec** will be discharging down Lake Reeve floodway and 30m³ /sec flowing down Masons Creek.	• Consider evacuation of impacted areas.

Height (m)	Consequences	Operational Considerations
	Levee system will be on the verge of overtopping and possible total failure.	
	June 2012 EVENT	
	There were no impacts.	
	1993 EVENT	.....

SUMMARY

Griffioens Levee, Government Rd Levee, Hansen St Levee all overtopped

ROADS

- **Government Rd** – west of Futcher St
- **Rowley St**
- **Short St**
- **Hansen St**
- **Newton St**
- **Centre Rd**
- **Main Rd**
- **Davies St**
- **Ellen Ave**
- **Tip Rd**
- **Foreshore Rd**
- **Lyons St** – between Foreshore Rd & Bearup St
- **Buchan St** – between foreshore Rd & Beaurup St

PROPERTIES

Flooded

- **Seaspray Caravan Park**
- 211 properties in total on the following roads as per Detailed Property Listing attached
  - Foreshore Rd
  - Buckley St
  - Irving St
  - Government Rd
  - Rowley St
  - Newton St

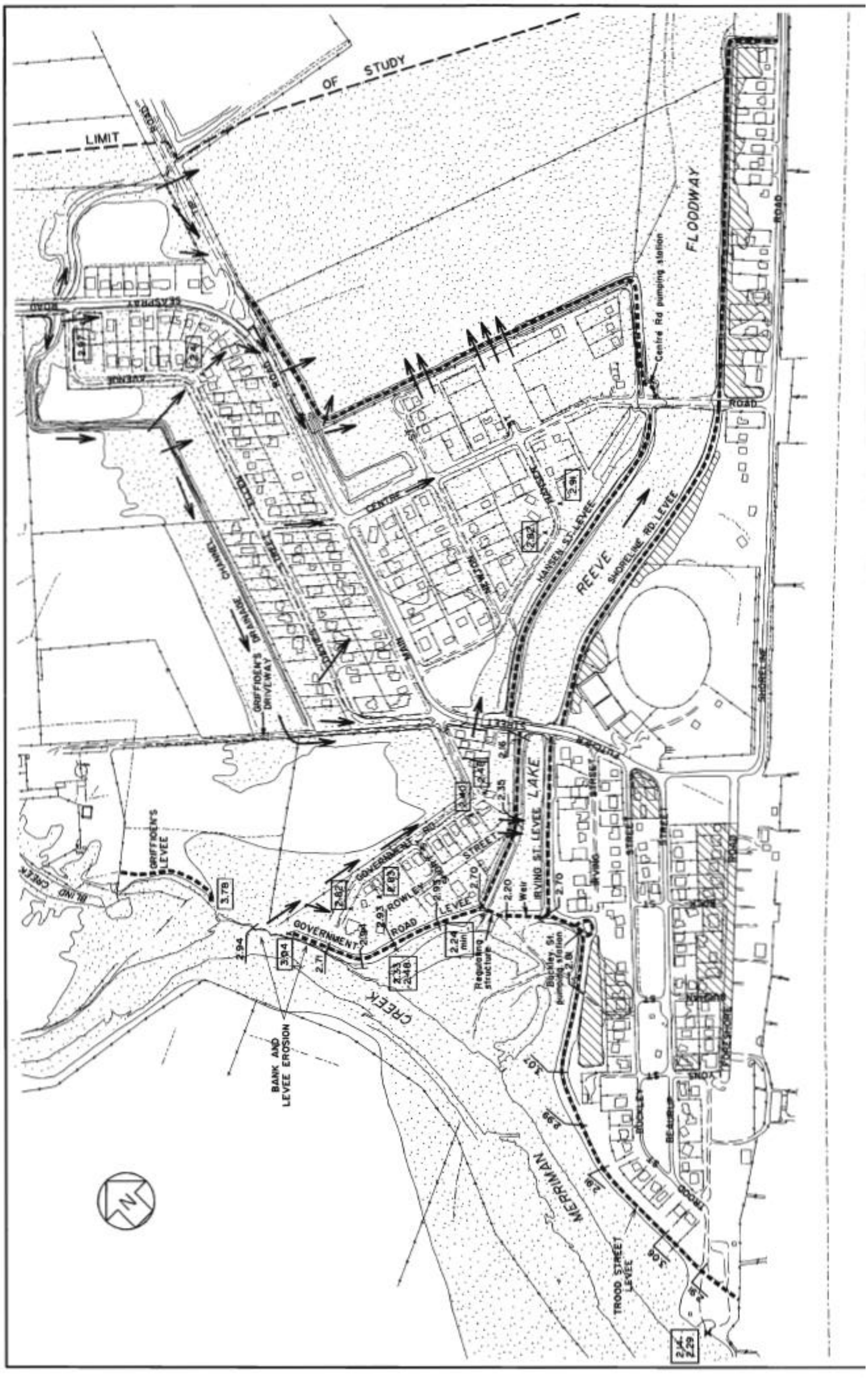
Height (m)	Consequences	Operational Considerations
	▷ Hansen St ▷ Centre Rd ▷ Main Rd (Seaspray Rd) ▷ Ellen Ave ▷ Davies St ▷ Catton St ▷ Shoreline Dve	

DETAILED PROPERTY LISTINGS

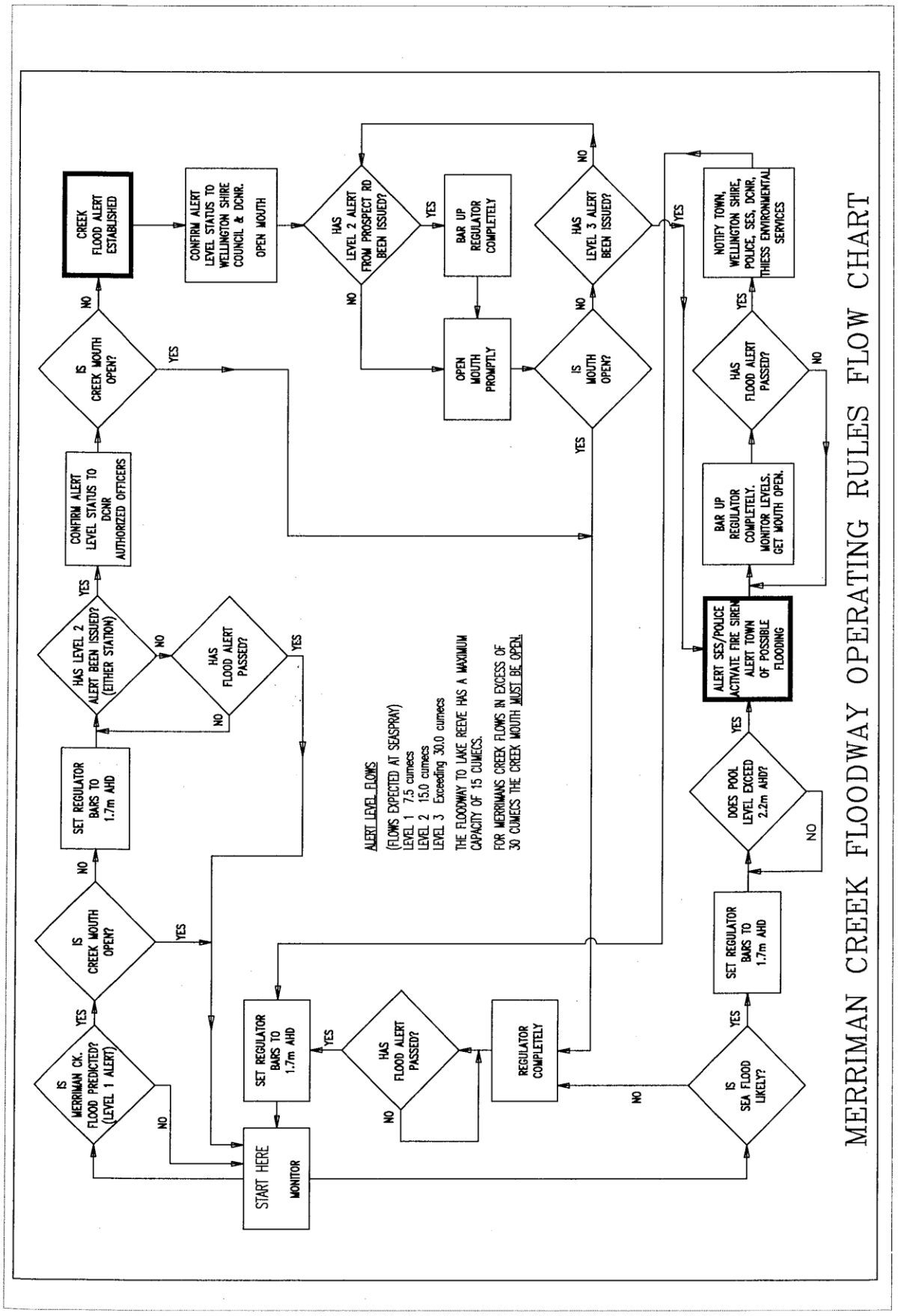
NB – Individual residence floor heights are unknown, the information provided represents flooding impact at ground levels only

Event	No of Properties	Property Address
1993		
	211	**Seaspray Caravan Park** **Foreshore Rd** – 27, 25, 23, 21, 19, 17, 15, 13, 11, 9, 7 **Buckley St** – 10, 8, 6, 4 **Irving St** – 23, 21, 19, 17, 15, 13, 11, 9, 7, 5, 3, **Government Rd** – 1, 2, 3, 4, 5, 6, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37-39, 41, 43, 45 **Rowley St** – 1, 3, 5, 7, 9, 11, 13, 15, 17, **Newton St** – 1, 3, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18 **Hansen St** – 7, 9, 11-13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25 **Centre Rd** – 2, 4, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 23, 25 **Main Rd (Seaspray Rd)** – 9, 11, 13, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83 **Ellen Ave** – 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44 **Davies St** – 1, 3, 5, 7,8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 37-47, Lot 2 **Catton St** – 2, 4, 6, 8 **Shoreline Dve** – 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59

MAPS


LIMIT
OF
STUDY
FLOODWAY
Centre Rd pumping station
ROAD
CENTRE
HANSEN ST. LEVEE
REEVE
SHORELINE RD. LEVEE
LAKE
IRVING ST. LEVEE
GRIFFIOEN'S DRIVEWAY
GRIFFIOEN'S LEVEE
3.78
GOVERNMENT
ROWLEY
ROAD
Regulating structure
Weir
BANK AND LEVEE EROSION
CREEK
MERRIMAN
TROOD STREET LEVEE


300 400 500
APPROX.
HANSEN STREET LEVEE
SHORELINE ROAD LEVEE
DRAINAGE CHANNEL
IRRIGATION CHANNELS
GOVERNMENT ROAD LEVEE
SEASPRAY
IRVING STREET LEVEE
EMBANKMENTS


MERRIMAN CREEK FLOODWAY OPERATING RULES FLOW CHART
START HERE
MONITOR
IS MERRIMAN CK. FLOOD PREDICTED? (LEVEL 1 ALERT)
IS CREEK MOUTH OPEN?
SET REGULATOR BARS TO 1.7m AHD
HAS LEVEL 2 ALERT BEEN ISSUED? (EITHER STATION)
HAS FLOOD ALERT PASSED?
CONFIRM ALERT LEVEL STATUS TO DCNR AUTHORIZED OFFICERS
IS CREEK MOUTH OPEN?
CREEK FLOOD ALERT ESTABLISHED
CONFIRM ALERT LEVEL STATUS TO WELLINGTON SHIRE COUNCIL & DCNR.
OPEN MOUTH
HAS LEVEL 2 ALERT FROM PROSPECT RD BEEN ISSUED?
BAR UP REGULATOR COMPLETELY
OPEN MOUTH PROMPTLY
IS MOUTH OPEN?
HAS LEVEL 3 ALERT BEEN ISSUED?
NOTIFY TOWN, WELLINGTON SHIRE, POLICE, SES, DCNR, THIESS ENVIRONMENTAL SERVICES
HAS FLOOD ALERT PASSED?
BAR UP REGULATOR COMPLETELY. MONITOR LEVELS. GET MOUTH OPEN.
ALERT SES/POLICE ACTIVATE FIRE SIREN ALERT TOWN OF POSSIBLE FLOODING
DOES POOL LEVEL EXCEED 2.2m AHD?
SET REGULATOR BARS TO 1.7m AHD
IS SEA FLOOD LIKELY?
REGULATOR COMPLETELY
HAS FLOOD ALERT PASSED?
SET REGULATOR BARS TO 1.7m AHD
ALERT LEVEL FLOWS
(FLOWS EXPECTED AT SEASPRAY)
LEVEL 1 7.5 cumecs
LEVEL 2 15.0 cumecs
LEVEL 3 Exceeding 30.0 cumecs
THE FLOODWAY TO LAKE REEVE HAS A MAXIMUM CAPACITY OF 15 CUMECS.
FOR MERRIMANS CREEK FLOWS IN EXCESS OF 30 CUMECS THE CREEK MOUTH MUST BE OPEN.
YES
NO

APPENDIX D.02 – EVACUATION ARRANGEMENTS

The Incident Controller may make the decision to evacuate an at-risk community. Evacuation is the responsibility of VICPOL and will be conducted as per the EMMV and the MEMP.

APPENDIX E.02 - FLOOD WARNING SYSTEM

FLOOD WARNING

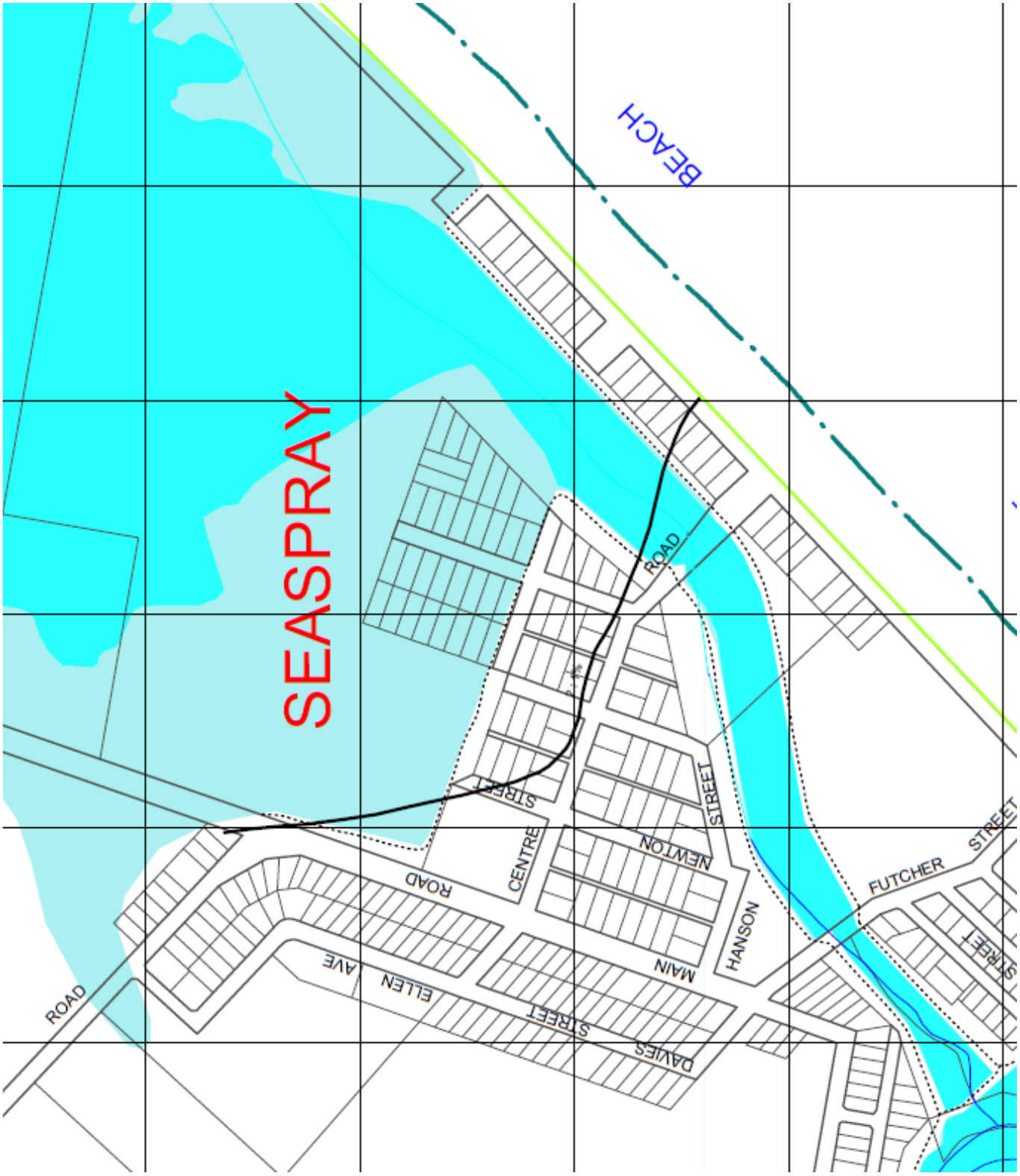
The Bureau of Meteorology does not provide a Flood Warning Service for Merrimans Creek however gauge heights are published to their website.

APPENDIX F.02 – MAPS

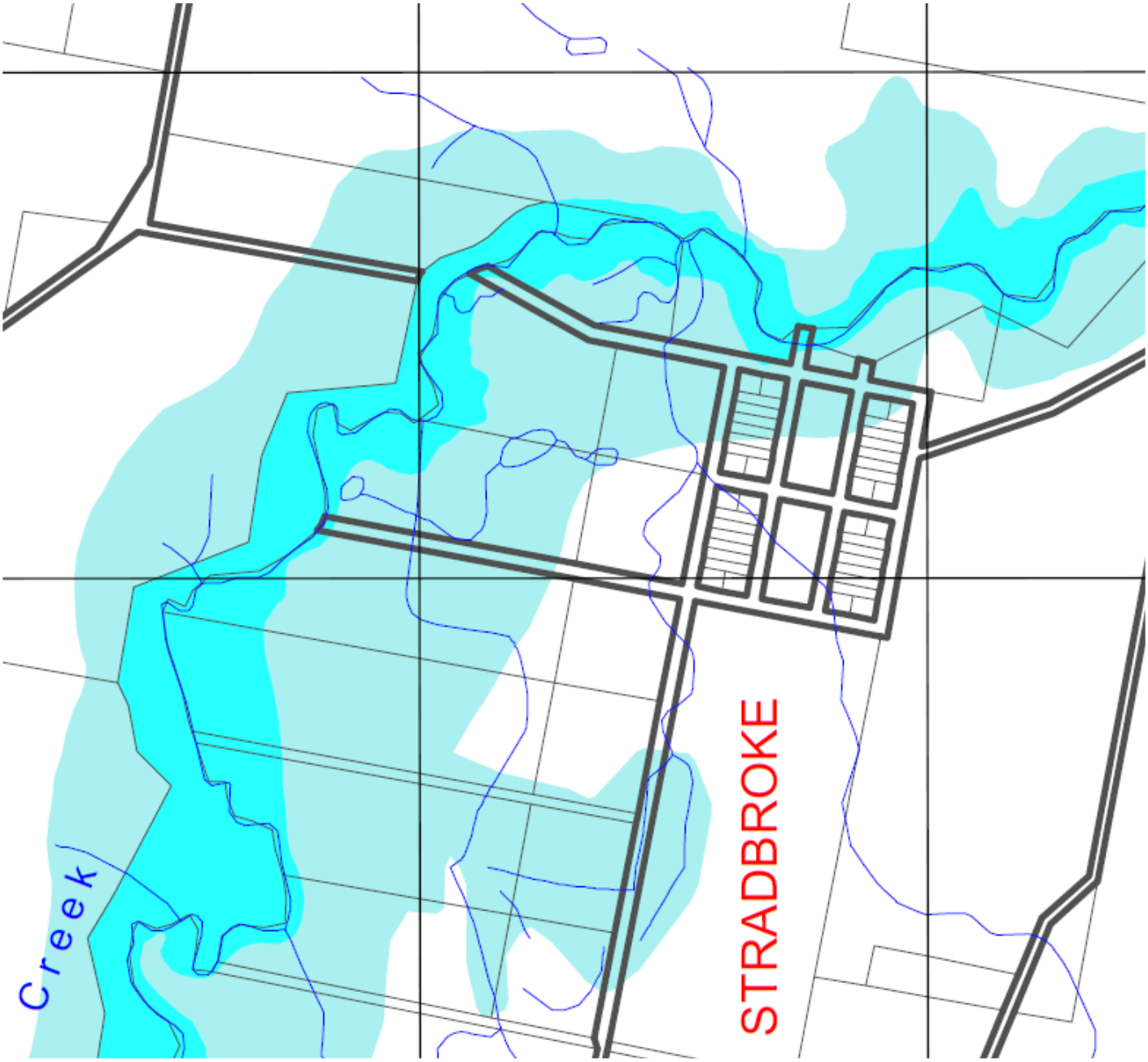
- Merrimans Creek Catchment Map
- Seaspray 1% AEP Event Flood Map
- Stradbroke 1% AEP Event Flood Map

MERRIMANS CREEK CATCHMENT MAP

SEASPRAY – 1% AEP FLOOD MAP



STRADBROKE – 1% AEP FLOOD MAP



ATTACHMENT 05 GIPPSLAND LAKES

Table of Contents

ASSOCIATED REPORTS

Gippsland Lakes Flood Level Modelling Project

SKM Series of Gippsland Lakes Flood Warning System Reports

ACCURACY & CONFIDENTIALITY

Use this information as a guide to the possible effects of a flood. This card is based on estimates of flood behaviour and particular effects may occur at heights different from those indicated here. They may also occur at slightly different heights in different floods. This card may contain sensitive information about the effects of flooding on private property. Specific reference to private addresses or businesses must be made directly to owners or other emergency services but not via broadcast or print media.

APPENDIX A.08 – FLOOD THREATS

OVERVIEW OF RIVER SYSTEM

WEATHER PATTERNS

Low pressure weather systems off the NSW south coast (east coast lows) often cause heavy rain in the **Gippsland Lakes** catchment resulting in significant lake rises. So, too, do low pressure weather systems entering the catchment from central Australia and rainfall on the Great Divide and adjoining catchments.

THE CATCHMENT

The **Gippsland Lakes** are a series of coastal lagoons with a catchment of over 2 million hectares spreading from Warragul in the west, Lakes Entrance in the East and Mt Hotham to the north.

The seven major river systems of the **Thomson, Macalister, Latrobe, Avon, Mitchell, Nicholson** and **Tambo** Rivers all empty into the Gippsland Lakes, travelling west to east and joining Bass Strait through an artificial entrance at the township of Lakes Entrance.

Flooding on the Gippsland Lakes is very complex and the predictions take into account how much water is travelling down the river systems that lead into the lakes, along with wind, tide and coastal ocean levels. When the volume of water from the rivers reaches the lakes in relation to each other and how quickly it can escape through the entrance are key considerations. These predictions will never be perfect as every flood is different and the Gippsland Lakes is a dynamic environment.

Unlike rivers, when the lakes flood it doesn't come through fast and furiously, peak and then recede. It rises slowly and hangs around for up to a week or more with levels rising and falling with tidal and wind conditions and as different river volumes move through the system. Some people and properties can be isolated for up to two weeks.

Flooding occurs as a result of flooding in the Gippsland Lakes caused in turn by flooding of the Latrobe, Thomson, Macalister, Avon, Mitchell, Nicholson & Tambo Rivers which lead into the Lakes. Flooding typically occurs after those rivers have experienced flooding with peaks slow to rise and recede, sometimes taking up to 14 days.

FLOOD RISKS

Boat ramps, jetties and car parks flood early causing unwary boat owners to return and find their cars flooded. There are hundreds of boats moored around the lakes system that will require their mooring lines lengthened once the lakes reach 0.80m. Mooring lines will need to be extended and reduced regularly during the event and jetties will be difficult to access from land during the event.

HEALTH & ENVIRONMENTAL RISKS

Septic tanks, low lying sewerage pump stations and public toilets, which can cause sewerage overflows into floodwaters and homes and salt water inundation into the sewerage system.

PROPERTIES AT RISK IN A 1% EVENT

The table below is a breakdown of the number of properties impacted in a 1% AEP riverine event. These figures are supported by mapping from lidar data and intensive intelligence gathering and represent a very accurate assessment.

Loch Sport	Hollands Landing	Seacombe	Ocean Grange	Total
557	41	40	9	647

HISTORICAL FLOODS

Significant floods have occurred in the Gippsland Lakes as shown in the table below. Impacts of significant events are discussed below the table. NB there are other Minor and Moderate flood events that are not yet included.

EVENT	LAKES ENTRANCE	METUNG	PAYNESVILLE EAGLE POINT	RAYMOND ISLAND	LOCH SPORT	HOLLANDS LANDING
1893	-	-	1.67	1.67		-
1952	1.80	1.69	1.49	1.49	1.52	-
1978	1.00	1.66	1.66	1.66		-
1990 Apr	1.20					-
1998 Jun	1.30	1.75	1.35	1.35		-
2007 Jun	1.40	1.50	1.51	1.51	1.42	-
2012 Jun						
Major	1.30	1.90	1.30	1.30	1.40	0.90
Moderate	1.10	1.60	1.10	1.10	1.20	-
Minor	0.90	0.80	0.70	0.70	0.90	0.70

< Minor Minor Moderate Major

1990 FLOOD EVENT

WEATHER SYSTEM

By early morning Friday 20th April, a low pressure centre had developed over western NSW which intensified and moved to the southeast locating just off the far south NSW coast by early morning Saturday 21st April. At this stage a strengthening and extremely moist south easterly airstream had extended across Gippsland to the Great Dividing Range and intense rainfall had commenced. The intense rainfall persisted for a period of 35 to 48 hours over a substantial part of the area.

FORECASTS

Indications on Friday 20th April were that prolonged and heavy rain would be required to overcome the dry state of Gippsland catchments. In addition, the low flows observed in Gippsland streams over the preceding weeks suggested substantial runoff would be needed to cause rivers to rise to flood level.

Although rain with local heavy falls was the main theme of meteorological forecasts and outlooks issued for Gippsland on the Friday, it was considered the dryness of catchments would lessen the likelihood of immediate flooding from even moderately heavy rain.

WEATHER SYSTEM

During June 2007 four major east coast lows formed off the coast of NSW and east of Victoria. Each east coast low produced varying amounts of heavy rain. In the week commencing 17th June, BoM weather forecasts began to mention an east coast low that was likely to bring considerable rain to Gippsland.

As this low pressure system weakened and moved away from the east coast, BoM weather forecasts began to refer to another east coast low, scheduled for the following week. It is this east coast low that produced the heavy rainfall that resulted in the significant flood event.

A low pressure trough over South Australia on Mon 25th moved eastwards over Victoria on Tues 26th to form an intense low pressure system in eastern Bass Strait near the south coast of NSW. The low deepened rapidly overnight on the 27th and became complex and moved close to eastern Victoria early on Thu 28th.

FORECASTS

BoM weather forecasts predicted a number of days in advance the commencement of heavy rain on Wed 27th and for the rain to continue until the early part of Thu 28th before easing. Rainfall totals for the 48 hours commencing 9am on the Wednesday were expected to range mostly between 100-175mm over the eastern and mountain parts of Gippsland with some isolated falls above 200mm possible.

EVENT

The intense rainfall over Gippsland and the southern slopes of the Great Dividing Range was well in excess of infiltration capacity and caused all seven of the rivers that flow into the Gippsland Lakes - the Latrobe, Thomson, Macalister, Avon, Mitchell, Nicholson and Tambo – to flood. In turn this caused flooding through the Lakes system which at various times and degrees was exacerbated by unhelpful wind conditions and tidal variations including a king tide.

This event was the largest in recent times with levels rising over 1.3m above normal lake level as floodwaters from the surrounding rivers entered, this event was estimated to be around a 20 year ARI event. Lake levels would have been even higher had the Latrobe catchment been subjected to higher rainfalls and severe flooding.

For the first time BoM issued flood warnings for the Gippsland Lakes. Peak levels around the Lakes were influenced by the high inflows combined with tidal conditions and winds and were in general a little higher than experienced in 1998.

Wind and tide influences and the timing of the floodwaters entering the lakes from the different river systems caused the peaks in Paynesville, Metung and lakes Entrance to occur ahead of Lake Wellington.

IMPACTS

The flood caused substantial community disruption and damage. Estimated direct damage was of the order of $110 million and total damage upwards of $116 million. Difficulties in quantifying indirect and intangible damages means that the total cost of this flood to the community may never be fully assessed.

All lakeside communities were impacted to different degrees including Hollands Landing, Seacombe, Loch Sport, Paynesville, Eagle Point, Raymond Island, Metung, Mosquito Point, Tambo Bay and Lakes Entrance. There were many isolations in most of these communities for an extended period. The Raymond Island Ferry ceased operating and isolated residents for 7 days causing over 70 residents and visitors to leave the island. In all 13 houses and 30 sheds were inundated in the town and along the north western shoreline of the Island.

MAJOR WATER STORAGES

There are no major water storages over 1,000ML on the Gippsland Lakes.

LEVEES

There are no levees in the Gippsland Lakes.

MAJOR ROAD CLOSURES

Lacustrine/Estuarine Flooding	Flash Flooding
National Park Road – Loch Sport **Hollands Landing Road** – Hollands Landing	

GAUGE LOCATIONS

Gauge Name	*Location*	Gauge Zero m AHD	No.
Hollands Landing		0.00	
Loch Sport		0.00	
Paynesville		0.00	
Metung		0.00	
Lakes Entrance		0.00	

GAUGE LEVEL INFORMATION

Gauge Name	Flood Class / Event	Gauge Height (m)	ARI (1 in X years)
Hollands Landing		2.00	100
	2007 Jun		
Major		**0.90**	
Minor		**0.70**	
Loch Sport		1.90	100
Lake Reeve	1952	1.52	
		1.50	~20-50
	2007 Jun	1.42	
Major		**1.40**	
Moderate		**1.20**	**~2-10**
Minor		**0.90**	**~1-5**

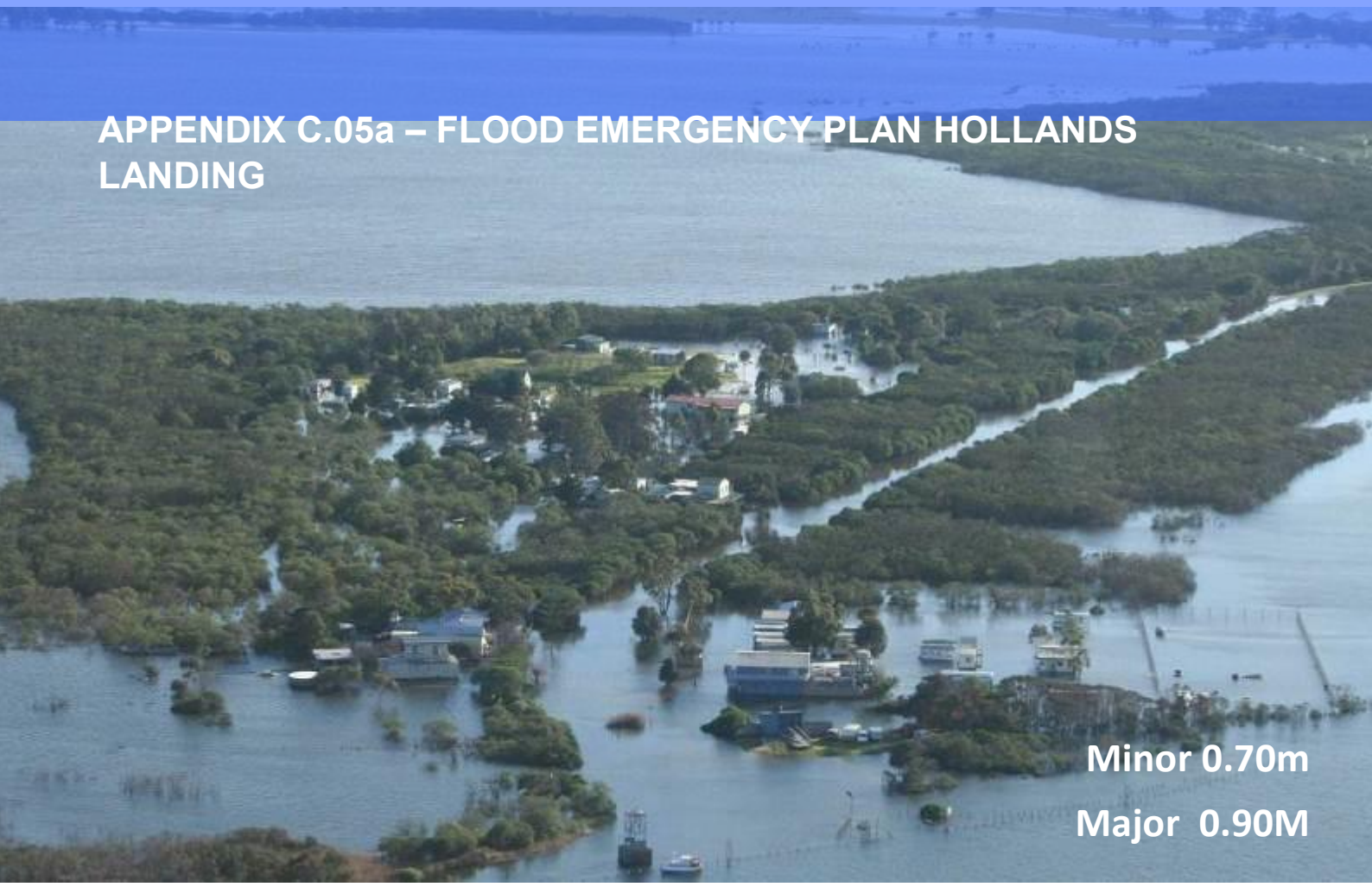
APPENDIX B.05 - FLOOD PEAK TRAVEL TIMES

Travel times are calculated as the time the peak of the event takes to move from one gauge to the next. Note the onset of flooding can occur before the peak water level occurs.

Due to the high level of variability in antecedent catchment conditions, flood travel times can vary significantly, as demonstrated in previous floods.

No travel times have been listed due to the variable nature of estuarine flood peaks.

APPENDIX C.05a – FLOOD EMERGENCY PLAN HOLLANDS LANDING



LOCATION

Hollands Landing sits between Lakes Wellington and Victoria at the mouth of McLennan Straits. It is a very low-lying small community that will be isolated and heavily impacted during most flooding events.

FLOOD BEHAVIOUR

Flooding in this community occurs as a result of flooding in the Gippsland Lakes caused in turn by flooding of the Latrobe, Thomson, Macalister, Avon, Mitchell, Nicholson & Tambo Rivers which lead into the Lakes.

Flooding typically occurs after those rivers have experienced flooding with peaks slow to rise and recede, sometimes taking up to 14 days.

Easterly winds also increase the lake levels at this location by up to 0.50m.

The community is so low lying that there is not much difference in lake heights between a minor impact and a major one.

CONSEQUENCES AND IMPACTS SUMMARY

| The table below is a breakdown of the number of properties impacted at each gauge height at the Hollands Landing Gauge.

Gauge Height	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
Flooded	2	10	19	All	All	All	All	All	All	All	All	All
(undeveloped)	17	84	193	All	All	All	All	All	All	All	All	All
Isolated	0	0	All	All	All	All	All	All	All	All	All	All

FLOOD MITIGATION SYSTEMS

There are no flood mitigation systems at Hollands Landing.

FLOOD WARNINGS

The BoM is able to predict flood heights 12-52 hours ahead of peaks in this location as part of the Gippsland Lakes Flood Warning System.

ROAD CLOSURES

Access to Hollands Landing is via Hollands Landing Rd, which will be closed to all traffic at 1.00m.

Properties in Hollands Landing are isolated early for an extended duration.

Once the access is cut, Hollands Landing is isolated for up to 14 days or more depending upon the extent of lake height and duration of the peak. Many will not be aware that if isolated, they will be for some time. It is important to ensure those at risk have either evacuated or have enough medication and supplies.

Full intelligence on when a road is closed and what component is listed in the attached detailed consequence s and impacts section.

Local Road Closures		
	Bream Rd	Hollands Landing Rd	Kendall Rd
	Buswell Rd	Ibis Rd	Snow Gum Rd
	Government Rd		

CRITICAL INFRASTRUCTURE

There is no critical infrastructure.

COMMUNITY PROFILE

There are many non-permanent residents in Hollands Landing leaving many houses unattended during flood events with owners unable to take appropriate actions to minimise the impact of flooding. The caravan park floods at very low levels and there are many undeveloped properties that may have tents/ caravans. A Relief Centre should be an early consideration for members of this community.

GAUGE LEVEL INFORMATION

Flood Class	Flood Event	Hollands Landing
	100 yr ARI	2.00
	2007 Jun	
Major		**0.90**
	2012 Jun	
Minor		**0.70**

DETAILED CONSEQUENCES & IMPACTS – FLOOD INTELLIGENCE CARD

Gauge	No.	Location	Datum Type
Hollands Landing Gauge		Hollands Landing Jetty, Hollands Landing Road, last pole on jetty facing the water	AHD

NB Refer attachment for specific property addresses grouped by impact risk.

Depths quoted are above ground level.

Properties are considered isolated when 20cm of water is across the road

Height (m)	Consequences	Operational Considerations
0.0 – 0.2	~ Tidal Variation	
0.70	**MINOR FLOOD LEVEL** **PROPERTIES** **Flooded** ▷ 17 properties in total (2 developed) ▷ 17 new up to 0.10m [Alpha Group] ▷ Lakeview Caravan Park **ROADS** **Water over Road** ▷ Deegan Ave ▷ View Hill Road ▷ Kangaroo Rd ▷ Bettong Rd **Road Closed** ▷ nil	Recon area by talking with Caravan Park Warn residents in those areas that will be flooded Talk with VicRoads Activate local SES Unit Gippsland Ports – McLennan Straits Recommend to re-locate from impacted areas

Height (m)	Consequences	Operational Considerations
0.80	**PROPERTIES** **| Flooded** ▷ 84 properties in total (10 developed) ▷ 67 new up to 0.10m [Bravo Group] ▷ 17 previous up to 0.20m ▷ List street names and numbers or utilise separate sheet **ROADS** **| Water over Road** ▷ Deegan Ave ▷ View Hill Road ▷ Kangaroo Rd ▷ Bettong Rd ▷ Lyrebird Rd ▷ Platypus Rd ▷ Bronze Wing Rd ▷ Le Grande Ave **| Road Closed** ▷ nil	| Doorknock affected areas
0.90	**MAJOR FLOOD LEVEL** **| Flooded** ▷ 193 properties in total (19 developed) ▷ 109 new up to 0.10m [Charlie Group] ▷ 84 previous up to 0.30m **| Isolated** ▷ All properties on Le Grande Ave **ROADS** **| Water over Road** ▷ Lyrebird Rd ▷ Platypus Rd ▷ Bronze Wing Rd ▷ Le Grande Ave ▷ Kendall, Rd ▷ Buswell Rd ▷ Snow Gum Rd ▷ Government Rd ▷ Hollands Landing Rd ▷ Ibis Rd ▷ Bream Rd **| Road Closed**	| If evacuation is considered necessary, it is important to have people leaving now prior to the access point being closed @ 1.00m

Height (m)	Consequences	Operational Considerations
	▷ Deegan Ave ▷ View Hill Road ▷ Kangaroo Rd ▷ Bettong Rd	
1.00	**SUMMARY** | Hollands Landing is now isolated for up to 14 days. | Hollands Landing Road is now closed at the northern end of the town. | The majority of developed and undeveloped lots are flooded | Whole of Lakeview Caravan Park is underwater. **PROPERTIES** | **Flooded** ▷ 193 previous up to 0.40m | **Isolated** ▷ ALL **ROADS** | **Road Closed** ▷ Lyrebird Rd ▷ Platypus Rd ▷ Bronze Wing Rd ▷ Le Grande Ave ▷ And those listed previously	| ……
1.20	**2007 FLOOD LEVEL** **SUMMARY** | Roseneath Caravan Park will be cut off for several days **PROPERTIES** | **Isolated** ▷ ALL **ROADS** | **Road Closed** ▷ Kendall, Rd ▷ Buswell Rd ▷ Snow Gum Rd	| ……

Height (m)	Consequences	Operational Considerations
	▷ Government Rd ▷ Hollands Landing Rd ▷ Ibis Rd ▷ Bream Rd ▷ And those listed previously	
2.00	**1 in 100 YEAR FLOOD**	

DETAILED PROPERTY LISTINGS

NB – Individual residence floor heights are unknown, the information provided represents flooding impact at ground levels only

Height (m)	Group Name	No of Proper-ties	Property Address
0.70	ALPHA		
		17	Hollands Landing Rd [57, 59] Lakeview Caravan Park – 50% of property wet, boat storage 20cm deep 14 undeveloped properties
0.80	BRAVO		
		67	Hollands Landing Rd [1, 11, 214, 216] Deegan Ave [1] Lyrebird Ave [7, 9] Government Rd [83] 59 undeveloped properties
0.90	CHARLIE		
		109	9 developed properties on Hollands Landing Rd Bream Rd Platypus Ave 100 undeveloped properties
1.00	DELTA		
			Majority of developed and undeveloped lots are flooded

APPENDIX C.05b – FLOOD EMERGENCY PLAN LOCH SPORT

LOCATION

Loch Sport is on the Gippsland Lakes, bordered by Lakes Victoria and Reeve. It is a very low lying area with one access route via the Longford - LochSport Road. There is a causeway between Lake Victoria and Lake Reeve providing vehicle access to 90 Mile Beach.

FLOOD BEHAVIOUR

- Flooding in this community occurs as a result of flooding in the Gippsland Lakes caused in turn by flooding of the Latrobe, Thomson, Macalister, Avon, Mitchell, Nicholson & Tambo Rivers which lead into the Lakes.
- Wind can also impact levels on the Lake Victoria side by up to half a metre.
- Flooding typically occurs after those rivers have experienced flooding with peaks slow to rise and recede, sometimes taking up to 14 days.
- Properties facing Lake Reeve will experience less impact from flooding than those facing Lake Victoria until such time as the Stockyard Hill causeway overtops. Lake Reeve will then fill more rapidly until the water equalises. The delay in flooding to properties in Lake Reeve is considered in the flood intelligence cards.
- Flooding can begin with lake water back flowing through the storm water drains prior to the lake encroaching the lakes edge.

CONSEQUENCES AND IMPACTS SUMMARY

Gauge Height	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
LAKE VICTORIA												
Flooded	4	16	29	44	55	104	127	156	180	224	230	234
Isolated	0	0	26	26	64	102	102	157	190	190	190	190
LAKE REEVE												
Flooded	0	0	0	4	54	64	163	197	228	266	296	318
Isolated	0	0	0	0	0	10	44	235	2480	2518	2534	253

FLOOD MITIGATION SYSTEMS

There are no flood mitigation systems at Loch Sport.

FLOOD WARNINGS

The BoM is able to predict flood heights 12-52 hours ahead of peaks in this location as part of the Gippsland Lakes Flood Warning System.

ROAD CLOSURES

- Access to Loch Sport is via the Longford Loch Sport Rd.
- Over 2000 mostly undeveloped properties are isolated once Cliff St becomes impassable. If evacuation of any resident of Loch Sport east of the Cliff St / National Park Rd intersection, is considered necessary, evacuation by car would need to occur prior to 1.20m, however evacuation on foot is still possible along the high ground between Basin Boulevard and National Park Rd.
- The South Gippsland Highway is likely to be closed due to flooding in the Thomson and/or Latrobe Rivers, an alternative route is available via Rosedale.
- Full intelligence on when a road is closed and what component is listed in the attached detailed consequences and impacts section

Local Road closures

- Barton St
- Basin Blvd
- Centre Rd
- Charlies St
- Cliff St
- Davies St
- First St
- Foster St
- Goodlett Ave
- Government Rd
- National Park Rd
- Reeves St
- Sanctuary Rd
- Sandra Crt
- Seagull Rd
- Stevenson Rd
- Stockyard Hill Rd Causeway
- The Boulevarde
- Victoria Pde
- Victoria St
- Wallaby Rd
- Wilhelm Rd

COMMUNITY PROFILE

The population is generally elderly with many living alone and without family support within the district. Consideration must be given to those at high risk and in need of assistance to move belongings to higher levels and to evacuate. There are many non-resident dwellings with populations increasing significantly during peak holiday times and summer weekends.

GAUGE LEVEL INFORMATION

Flood Class	Flood Event	Loch Sport
** Lake Reeve	1952	1.52
	2007	1.42
Major		**1.40**
Moderate		**1.20**
Minor		**0.90**

DETAILED CONSEQUENCES AND IMPACTS – FLOOD INTELLIGENCE CARD

Gauge	No.	Location	Datum Type
Gippsland Lakes @ Loch Sport Marina			AHD

NB Refer attachment for specific property addresses grouped by impact risk.

Depths quoted are above ground level.

Properties are considered isolated when 20cm of water is across the road

Height (m)	Consequences	Operational Considerations
0.0 – 0.2	~ Tidal Variation	
0.70	**MINOR FLOOD LEVEL** **PROPERTIES** **Flooded** ▷ 4 properties in total ▷ 4 new up to 0.10m [Alpha Group] **ROADS** **Water over Road** ▷ Victoria Parade **Road Closed** ▷ Nil	
0.80	**PROPERTIES** **Flooded** ▷ 16 properties in total ▷ 12 new up to 0.10m [Bravo Group – Lake Victoria] ▷ 4 previously up to 0.20m **Isolated** ▷ Nil **ROADS** **Water over Road** ▷ Victoria Pde ▷ Seagull Dve ▷ Lake Reeve Causeway – Stockyard Hill Rd ▷ Barton St - @ Sanctuary Rd ▷ Reeves St **Road Closed** ▷ nil	Consideration needs to be given for the need for early evacuation of properties along Victoria Pde that will be isolated at 0.90m and will start to be impacted at 0.80m

Height (m)	Consequences	Operational Considerations
0.90	**MINOR FLOOD LEVEL** **PROPERTIES** **| Flooded** ▷ 29 properties in total ▷ 13 new up to 0.10m [Charlie Group – Lake Victoria] ▷ 16 previously up to 0.30m **| Isolated** ▷ 26 properties in total ▷ 26 new [Charlie Group – Lake Victoria] **ROADS** **| Water over Road** ▷ Foster St @ Victoria Pde ▷ Centre Rd ▷ Wallaby Rd - between Syme St & Sandra Court ▷ Car park and boat ramp access on Seagull Dve **| Road Closed** ▷ Victoria Pde	
1.00	**PROPERTIES** **| Flooded** ▷ 70 properties in total ▷ 41 new up to 0.10m ▪ 15 [Delta Group – Lake Victoria] ▪ 26 [Alpha Group – Lake Reeve] ▷ 29 previously up to 0.40m **| Isolated** ▷ 26 properties in total ▷ nil new ▷ 26 previously **ROADS** **| Water over Road** ▷ Foster St - @ Victoria Pde ▷ Centre Rd ▷ Wallaby Rd - between Syme St & Sandra Court ▷ Car park and boat ramp access on Seagull Dve ▷ Seagull Rd - near boat ramp ▷ Sanctuary Rd - between Warren & Barton Sts ▷ Davies St ▷ Lake Reeve Causeway – Stockyard Hill Rd	

Height (m)	Consequences	Operational Considerations
	Road Closed ▷ Previously listed	
1.10	**PROPERTIES** **Flooded** ▷ 131 properties in total ▷ 61 new up to 0.20m ▪ 11 [Echo Group – Lake Victoria] ▪ 23 [Bravo Group – Lake Reeve] ▪ 27 [Charlie Group – Lake Reeve] ▷ 70 previously up to 0.50m **Isolated** ▷ 64 properties in total ▷ 38 new [Echo Group – Lake Victoria] ▷ 26 previously	If evacuation by road of any persons in Loch Sport east of the Cliff St / National Park Road intersection is considered necessary, they would need to be evacuated prior to the water reaching 1.20m
	ROADS **Water over Road** ▷ Seagull Rd - near boat ramp ▷ Sanctuary Rd - between Warren & Barton Sts ▷ Davies St ▷ Lake Reeve Causeway – Stockyard Hill Rd ▷ National Park Rd - between Cliff & Holmes Sts **Road Closed** ▷ Foster St @ Victoria Pde ▷ Centre Rd ▷ Wallaby Rd between Syme St & Sandra Court ▷ Car park and boat ramp access on Seagull Dve ▷ And previously listed	
1.20	**MODERATE FLOOD LEVEL** **PROPERTIES** **Flooded** ▷ 190 properties in total ▷ 59 new up to 0.10m ▪ 49 [Foxtrot Group – Lake Victoria] ▪ 10 [Delta Group – Lake Reeve] ▷ 131 previously up to 0.60m **Isolated** ▷ 78 properties in total ▷ 17 new [Delta Group – Lake Reeve] ▷ 64 previously	If evacuation by road of any persons in Loch Sport east of the Cliff St / National Park Road intersection is considered necessary, they would need to be evacuated prior to the water reaching 1.20m, however walking access is still possible along the high ground between Basin Boulevard and National Park Rd

Height (m)	Consequences	Operational Considerations

ROADS

| Water over Road

- National Park Rd - between Cliff & Holmes Sts
- Wallaby Rd - east of causeway
- Sandra Crt
- Seagull Rd - near boat ramp & car park
- Basin Blvd - between Marina Dve & Cove St
- Charlies St - between Government & Centre Rds
- Stevenson Rd – bet. Government & Centre Rds
- Sanctuary Rd - near Second Ave
- Barton St - between Campbell & Sanctuary Rds
- Cliff St - @ National Park Rd

| Road Closed

- Seagull Rd - near boat ramp
- Sanctuary Rd - between Warren & Barton Sts
- Davies St
- Lake Reeve Causeway – Stockyard Hill Rd
- And previously listed

1.30 PROPERTIES

| Flooded

- 312 properties in total
- 122 new up to 0.20m
  - 23 [Golf Group – Lake Victoria]
  - 46 [Echo Group – Lake Reeve]
  - 53 [Foxtrot Group – Lake Reeve]
- 190 previously up to 0.70m

| Isolated

- 112 properties in total
- 34 new [Foxtrot Group – Lake Reeve]
- 78 previously

ROADS

| Water over Road

- Wallaby Rd - east of causeway
- Sandra Crt
- Seagull Rd - near boat ramp & car park
- Basin Blvd - between Marina Dve & Cove St
- Charlies St - between Government & Centre Rds
- Stevenson Rd – bet. Government & Centre Rds
- Sanctuary Rd - near Second Ave
- Barton St - between Campbell & Sanctuary Rds
- Cliff St - [@ National Park Rd

Height (m)	Consequences	Operational Considerations
	▷ Christopher Court ▷ Joan Court ▷ Karen Crt ▷ Simon Crt ▷ Anthony Crt **| Road Closed** ▷ National Park Rd - between Cliff & Holmes Sts ▷ And previously listed	
1.40	**PROPERTIES** **| Flooded** ▷ 375 properties in total ▷ 63 new up to 0.10m ▪ 29 [Hotel Group – Lake Victoria] ▪ 34 [Golf Group – Lake Reeve] ▷ 312 previously up to 0.80m **| Isolated** ▷ 142 in total ▷ 30 new ▪ 25 [Hotel Group – Lake Victoria] ▪ 5 [Golf Group – Lake Reeve] ▷ 112 previously	
	ROADS **| Water over Road** ▷ Christopher Court ▷ Joan Court ▷ Karen Crt ▷ Simon Crt ▷ Anthony Crt ▷ Wilhelm Rd **| Road Closed** ▷ Wallaby Rd - east of causeway ▷ Sandra Crt ▷ Seagull Rd - near boat ramp & car park ▷ Basin Blvd - between Marina Dve & Cove St ▷ Charlies St - between Government & Centre Rds ▷ Stevenson Rd – bet. Government & Centre Rds ▷ Sanctuary Rd - near Second Ave ▷ Barton St - between Campbell & Sanctuary Rds ▷ Cliff St -@ National Park Rd ▷ And previously listed	
1.50	**2007 FLOOD EVENT**	|

Height (m)	Consequences	Operational Considerations
	PROPERTIES **| Flooded** ▷ 430 properties in total ▷ 55 new up to 0.10m ▪ 24 [India Group – Lake Victoria] ▪ 31 [Hotel Group – Lake Reeve] ▷ 375 previously up to 0.90m **| Isolated** ▷ 2420 in total ▷ 2278 new – mostly undeveloped ▪ 33 [India Group – Lake Victoria] ▪ 2245 [Golf Group – Lake Reeve] ▷ 142 previously **ROADS** **| Water over Road** ▷ Wilhelm Rd ▷ Marina Dve - near Basin Blvd ▷ Charles St - @ Victoria Pde ▷ Goodlett Ave - near Wattle St ▷ First St - @ Sanctuary Rd ▷ Sanctuary Rd - between 2nd & 3rd **| Road Closed** ▷ Christopher Court ▷ Joan Court ▷ Karen Crt ▷ Simon Crt ▷ Anthony Crt ▷ And previously listed	
1.60	**PROPERTIES** **| Flooded** ▷ 539 properties in total ▷ 109 new up to 0.20m ▪ 44 [Juliet Group – Lake Victoria] ▪ 38 [India Group – Lake Reeve] ▪ 27 [Juliet Group – Lake Reeve] ▷ 430 previously up to 1.00m **| Isolated** ▷ 2458 in total ▷ 38 new ▪ 1 [India – Lake Reeve] ▪ 37 [Juliet – Lake Reeve] ▷ 2420 previously	

Height (m)	Consequences	Operational Considerations
	ROADS **| Water over Road** ▷ Marina Dve - near Basin Blvd ▷ Charles St - @ Victoria Pde ▷ Goodlett Ave - near Wattle St ▷ First St - @ Sanctuary Rd ▷ Sanctuary Rd - between 2nd & 3rd ▷ Victoria St - near Marina Dve ▷ The Boulevarde ▷ Government Rd - @ Warren St **| Road Closed** ▷ Wilhelm Rd ▷ And previously listed	
1.70	**1 in 50 YEAR FLOOD LEVEL**	
	PROPERTIES **| Flooded** ▷ 591 properties in total ▷ 36 new up to 0.10m [Kilo Group] ▷ 539 previously up to 1.10m **| Isolated** ▷ 2474 in total ▷ 16 new [Kilo Group] ▷ 2458 previously	
	ROADS **| Water over Road** ▷ Victoria St - near Marina Dve ▷ The Boulevarde ▷ Government Rd - @ Warren St ▷ National Park Rd - bet. Sandra & Christopher Crts **| Road Closed** ▷ Marina Dve - near Basin Blvd ▷ Charles St - @ Victoria Pde ▷ Goodlett Ave - near Wattle St ▷ First St - @ Sanctuary Rd ▷ Sanctuary Rd - between 2nd & 3rd ▷ And previously listed	
1.80	**PROPERTIES**	

Height (m)	Consequences	Operational Considerations
	Flooded ▷ 617 properties in total ▷ 26 new up to 0.10m [Lima Group] ▷ 591 previously up to 1.20m **Isolated** ▷ 2474 in total ▷ 2474 previously **ROADS** **Water over Road** ▷ Government Rd **Road Closed** ▷ Victoria St - near Marina Dve ▷ The Boulevarde ▷ Government Rd - @ Warren St ▷ And previously listed	
1.90	**PROPERTIES** **Flooded** ▷ 641 properties in total ▷ 24 new up to 0.10m [Mike Group] ▷ 617 previously up to 1.30m **Isolated** ▷ 2475 in total ▷ 1 new [Mike Group] ▷ 2474 previously **ROADS** **Water over Road** ▷ Government Rd **Road Closed** ▷ Government Rd ▷ And previously listed	
2.00	**1 in 100 YEAR FLOOD LEVEL** ▷ No data	

DETAILED PROPERTY LISTINGS

NB – Individual residence floor heights are unknown, the information provided represents flooding impact at ground levels only

Lake Victoria is higher than Lake Reeve at the beginning of a flood event but the lakes will equalise but at different rates depending upon the water volume and duration of the event. To cater for this, advice from the CMA indicates that when using the gauge situated in Lake Victoria, the following adjustment is made in Lake Reeve:

Gauge Height (m)	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Lake Victoria	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Lake Reeve	0.1	0.3	0.4	0.6	0.7	0.8	1.0	1.1	1.3	1.4	1.5	1.7
Difference	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.0

The numbers below reflect how the properties appear on the map and have not taken into account the required adjustment. The adjustment occurs as the numbers are translated to the Consequence and Impacts section of the Flood Intelligence Card.

Height (m)	Group Name	No of Properties	Property Address
0.70	ALPHA		
		34	**LAKE VICTORIA** **Impacted – 4 properties** Seagull Dve [10] Victoria St [3] Victoria Pde [34, 36] **LAKE REEVE** **Impacted – 4 properties** Wallaby Way [57, 59] Sanctuary Rd [4, 6, 10, 12, 14, 16, 18, 22, 23, 24, 25, 26, 27, 34] Reeves St [5, 7] National Park Rd [6, 8, 10] Joan Crt [6, 7, 8] Davies St [12, 14, 16, 18, 20, 22]
0.80	BRAVO		
		35	**LAKE VICTORIA** **Impacted – 12 properties** Sandra Crt [8, 10] Seagull Dve [12, 68] Victoria Pde [28, 30, 32, 38, 40, 42, 44, 54] **LAKE REEVE** **Impacted – 23 properties** Sanctuary Rd [8, 28, 30] Reeves St [1, 3, 9, 11, 19] National Park Rd [4, 14, 16, 18, 20, 22] Joan Crt [5] Karen Crt [8] Anthony Crt [14, 16]

Height (m)	Group Name	No of Properties	Property Address
			Camerons Rd [1]
			Davies St [24, 26]
			Wallaby Way [61, 63]
0.90			
		40	**LAKE VICTORIA**
		26 isolated	**Impacted – 13 properties**
			Christopher Crt [2]
			Snipe St [8, 16]
			Seagull Dve [66]
			Victoria St [1, 5]
			Victoria Pde [16, 20, 26, 52, 56, 58, 62]
			Isolated – 26 properties
			Victoria Pde [14-64 even no's (26)]
			LAKE REEVE
			Impacted – 27 properties
			Sanctuary Rd [2, 20, 29, 32, 36, 38, 40, 42]
			Reeves St [13, 15, 17, 21, 23, 25]
			National Park Rd [2, 12, 24]
			Joan Crt [4]
			Karen Crt [6, 7]
			Anthony Crt [4, 6, 8]
			Davies St [32]
			Robin St [25]
			Wallaby Way [65, 74]
1.00	DELTA		
		25	**LAKE VICTORIA**
		17 isolated	**Impacted – 15 properties**
			Wallaby Way [13, 17, 19, 21]
			Sandra Crt [6]
			Christopher Crt [6, 8]
			Snipe St [12, 14]
			Marina Dve [14]
			Lake St [5]
			Victoria Pde [14, 18, 60, 64]
			LAKE REEVE
			Impacted – 10 properties
			Sanctuary Rd [52, 60]
			Reeves St [27, 29]
			Camerons Rd [3]
			Davies St [5, 56, 58, 60]
			Wallaby Way [76]
			Isolated – 17 properties
			Reeves St [1-33 odd no's (17)]
1.10	ECHO		
		57	**LAKE VICTORIA**
		38 isolated	**Impacted – 11 properties**
			Wallaby Way [11]
			Sandra Crt [11]
			Christopher Crt [10, 12]
			Snipe St [10, 14]
			Lake St [3, 11]
			Victoria Pde [24, 46, 50]

Height (m)	Group Name	No of Properties	Property Address
			Isolated – 38 properties
			Victoria Pde [10, 12]
			Lake St [1-21 odd no's (11)]
			Centre Rd [5-53 odd no's (25)]
			LAKE REEVE
			Impacted – 46 properties
			Centre Rd [37, 39, 41, 43, 45, 47, 49, 51, 53]
			Sanctuary Rd [15, 17, 44, 46, 48, 50, 54, 56, 58, 62, 72]
			Reeves St [31]
			National Park Rd [26, 28]
			Joan Crt [3]
			Karen Crt [4]
			Simon Crt [3, 5, 7, 8, 9, 10]
			Anthony Crt [12]
			Davies St [1, 3, 7, 9, 11, 13, 34, 52, 54]
			Wallaby Way [62, 64, 67, 68, 69]
1.20	FOXTROT		
		102	**LAKE VICTORIA**
		34 isolated	**Impacted – 49 properties**
			Wallaby Way [9]
			Sandra Crt [3, 4, 5, 7, 9]
			National Park Rd [348, 350, 352, 354, 356, 358, 360, 362]
			Christopher Crt [4, 14, 20, 22, 24, 26]
			The Boulevarde [34, 36, 62, 64, 66, 68, 72]
			Snipe St [18]
			Toorak Ave [1-3, 5]
			Seagull Dve [64, 70]
			Victoria St [7]
			Bluff Dve [9]
			Marina Dve [14]
			Lake St [1, 7, 9, 15, 17, 19]
			Victoria Pde [2, 4, 6, 8, 10, 12, 22, 48]
			LAKE REEVE
			Impacted – 53 properties
			Centre Rd [5, 7, 9, 35]
			Government Rd [2-4]
			Sanctuary Rd [1, 3, 5, 7, 9, 11, 19, 64, 68, 70]
			Reeves St [33, 37]
			Cliff St [4]
			National Park Rd [30]
			Karen Crt [5]
			Anthony Crt [10, 11, 13]
			Davies St [15, 17, 30, 36, 38, 40, 42, 44, 46, 48, 50]
			Wilhelm St [3, 5, 7]
			Robin St [19, 21, 23]
			Wallaby Way [60, 66, 70, 71, 72, 73, 75, 77, 78, 79, 80, 81, 83]
			Isolated – 34 properties
			Sanctuary Rd [1-22, 24, 26, 28 (25)]
			Joan Crt [3-8 (6)]
			Davies St [1, 3, 5]
1.30	GOLF		
		57	**LAKE VICTORIA**
		5 isolated	**Impacted – 23 properties**
			Sandra Crt [1]
			National Park Rd [334, 344, 346, 364]

Height (m)	Group Name	No of Properties	Property Address
			Christopher Crt [1, 3, 16, 18] The Boulevarde [38, 40, 51, 57, 59, 74 Marina Dve [12, 18] Basin Blvd [13, 17, Loch Sport Hotel & Marina] Lake St [13, 21]
			LAKE REEVE **Impacted – 34 properties** Centre Rd [11, 13, 15, 17, 19, 21] Sanctuary Rd [13, 21, 31, 33, 35, 66] Reeves St [35, 39] Davies St [19, 21, 23, 25, 27, 28] Wilhelm St [7, 9, 11, 13, 15] Robin St [15, 17] Wallaby Way [56, 58, 82, 84, 85, 87, 89] **Isolated – 5 properties** Davies St [7, 9, 11, 12, 14
1.40	HOTEL		
		60 ~2270 isolated	**LAKE VICTORIA** **Impacted – 29 properties** Wallaby Way [12, 14, 16, 18, 20, 22, 24] National Park Rd [366, 368] Christopher Crt [5, 7, 9, 16, 18] The Boulevarde [42, 44, 45, 46, 53, 55, 61] Goodlett Ave [15] Toorak Ave [5] Seagull Dve [14, 16, 18, 20, 28, 72] **Isolated – 25 properties** Sandra Crt [1, 3, 4, 5, 6, 7, 8, 9, 10, 11] Wallaby Way [9, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 26, 28]
			LAKE REEVE **Impacted – 31 properties** Centre Rd [23, 25, 27, 29, 31, 33] Sanctuary Rd [49, 51, 53, 55, 57] Reeves St [41, 43, 45, 47] Cove St [1, 2] National Park Rd [32, 34] Davies St [47, 49, 51] Wilhelm St [6, 17] Robin St [13] Wallaby Way [54, 91, 95, 97, 99, 149] **Isolated – 2245 properties** Sanctuary Rd [23, 25, 27, 29-57, 58, 60, 62, 64 (36)] Davies St [13, 15, 16, 17, 18, 19, 20, 21, 22 (9)] Everything east of cnr cove St & National Park Rd ~ 2200 properties
1.50	INDIA		
		62 34 isolated	**LAKE VICTORIA** **Impacted – 24 properties** National Park Rd [370, 372, 383] Christopher Crt [11, 13] The Boulevarde [4, 32, 45, 47, 50, 52] Goodlett Ave [4, 65, 67, 69, 71] Wattle Gve [220] Seagull Dve [22, 28, 47, 49, 74, 76] Marina Dve [17]

Height (m)	Group Name	No of Properties	Property Address
			Isolated – 33 properties
			Christopher Crt [all (33)]
			LAKE REEVE
			Impacted – 38 properties
			Government Rd [6, 8, 10, 48, 50, 52, 54]
			Sanctuary Rd [37, 39, 43, 45, 47, 76, 86, 88]
			Cliff St [6]
			National Park Rd [36]
			Simon St [6]
			Davies St [29, 37, 39, 45, 53]
			Wilhelm St [4, 19]
			Robin St [11]
			Wallaby Way [52, 86, 88, 90, 93, 101, 103, 105, 107, 109, 111, 147]
			Isolated - 1
			Loch Sport Hotel and Marina
1.60	JULIET		
		71	**LAKE VICTORIA**
		37 isolated	**Impacted – 44 properties**
			Wallaby Way [5]
			National Park Rd [374, 376, 378, 380, 381, 382, 384]
			Christopher Crt [15, 17, 19, 28]
			The Boulevarde [6, 60, 63, 76]
			Goodlett Ave [17, 63, 73]
			Toorak Ave [9]
			Seagull Dve [24, 26, 30, 51, 62, 82]
			Victoria St [9]
			Bluff Dve [11]
			Marina Dve [19, 21, 25, 27, 29, 31, 33, 35, 37]
			Basin Blvd [10, 12, 14, 16, 18, 25]
			Lake St [28]
			LAKE REEVE
			Impacted – 27 properties
			Government Rd [12, 42]
			Sanctuary Rd [41, 78, 82, 90, 92]
			Cove St [3]
			Karen Crt [3]
			Davies St [31, 33, 35, 41, 43, 55]
			Wilhelm St [1, 21, 23]
			Robin St [9]
			Wallaby Way [92, 94, 96, 113, 121, 123, 125, 145]
			Isolated – 37 properties
			Karen Crt [3-8 (6)]
			Davies St [23-53 (31)]
1.70	KILO		
		36	**LAKE VICTORIA**
		16 isolated	**Impacted – 6 properties**
			National Park Rd [386]
			Christopher Crt [21, 23]
			The Boulevarde [28, 54]
			Goodlett Ave [19]
			LAKE REEVE

Height (m)	Group Name	No of Properties	Property Address
			Impacted – 30 properties
			Government Rd [14, 16, 40, 44, 46] Sanctuary Rd [80, 94, 96, 98, 100, 104, 108] Cliff St [8] Cove St [4] National Park Rd [38, 40] Davies St [57] Wilhelm St [25] Robin St [5, 7] Wallaby Way [102, 108, 110, 112, 115, 119, 127, 129, 131, 133]
			Isolated – 16 properties
			Sanctuary Rd [59, 61, 63, 66, 68, 70 (6)] Simon Crt [3, 5, 6, 7, 8, 9 (6)] Anthony Crt [10-13 (4)]
1.80	LIMA		
		26	**LAKE VICTORIA**
			Impacted – 4 properties
			National Park Rd [388] The Boulevarde [30, 48, 49]
			LAKE REEVE
			Impacted – 22 properties
			Government Rd [18, 36, 38] Sanctuary Rd [102, 106, 110] Davies [59] Wilhelm St [27, 29] Robin St [3] Wallaby Way [50, 98, 100, 102, 104, 106, 114, 135, 137, 141, 143] Echinda St [45]
1.90	MIKE		
		24	**LAKE VICTORIA**
			Impacted – 23 properties
			Wallaby Rd [3] National Park Rd [297, 301, 303, 305, 307, 309] Christopher Crt [9, 11, 13, 15, 17, 19, 21, 23, 25, 28] The Boulevarde [47, 49, 63] Seagull Dve [78] Marina Dve [23] Lake St [26]
			LAKE REEVE
			Impacted – 1 property
			Cliff St [10]

APPENDIX D.05 – FLOOD EVACUATION ARRANGEMENTS

The Incident Controller may make the decision to evacuate an at-risk community. Evacuation is the responsibility of VICPOL and will be conducted as per the EMMV and the MEMP.

APPENDIX E.05 - FLOOD WARNING SYSTEM

FLOOD WARNING

The Bureau o f Meteorology provides a Flood Warning Service for the Mitchell River. They will provide estimated peaks for Bairnsdale once upstream gauges have peaked.

LOCAL FLOOD WARNING SYSTEM ARRANGEMENTS

The Gippsland Lakes Flood Warning System is being installed. A new computer-modelling tool has been created to provide forecasts, new river and lakes gauges have been installed and new flood mapping has been produced.

The Bureau of Meteorology are now able to predict and provide warnings to those communities, sometimes several days ahead of flooding reaching those areas.

It is important to understand that different communities around the lakes will experience different flooding impacts during the same event because some towns have buildings and infrastructure closer to the water than in other towns.

APPENDIX F.08 – MAPS

Gippsland Lakes

Hollands Landing Flood Extent 1% AEP

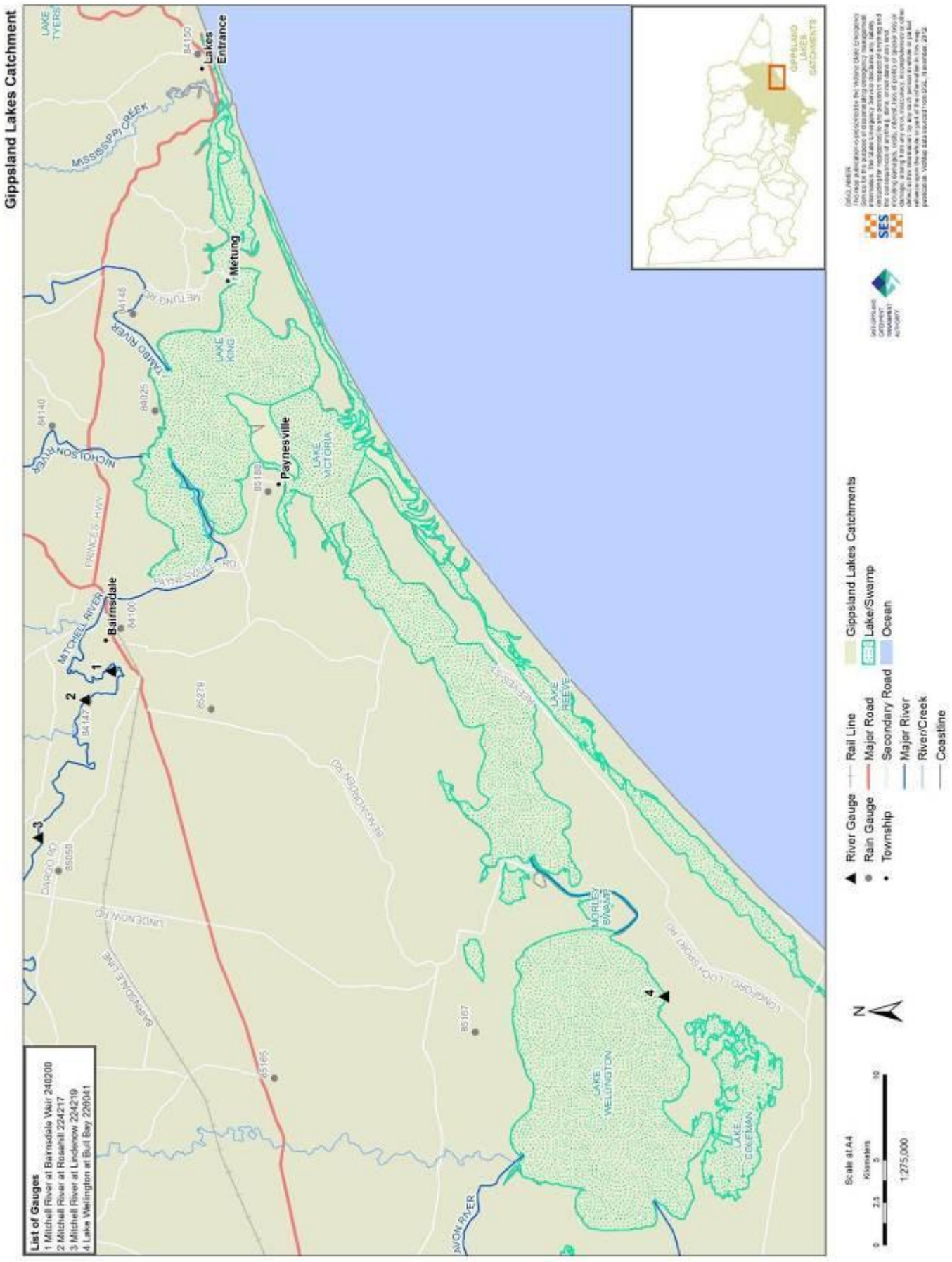
Hollands Landing Flood Extent 10cm Intervals

Loch Sport West Flood Extent 1% AEP

Loch Sport East Flood Extent 1% AEP

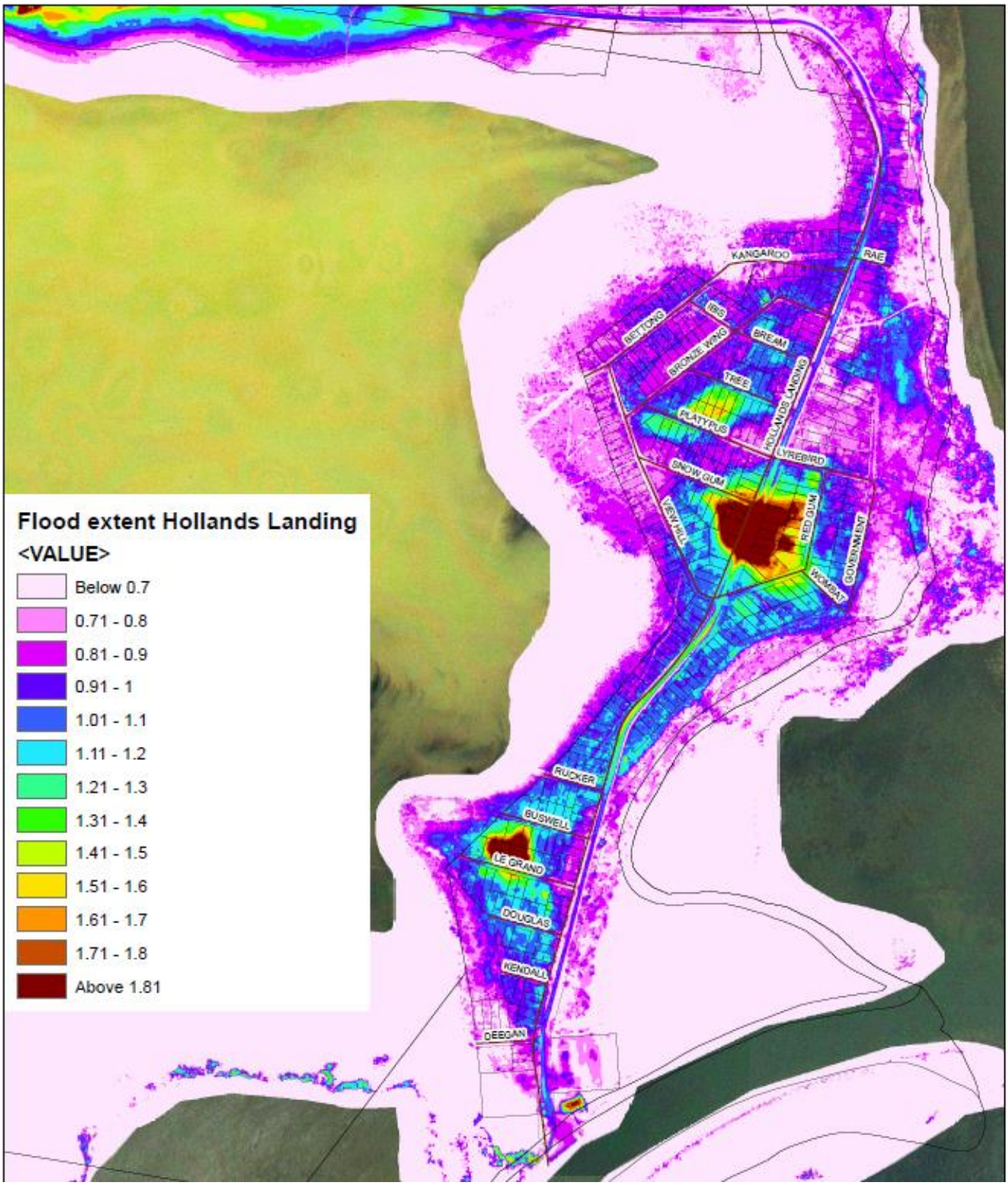
Loch Sport Flood Extent 10cm Intervals

Gippsland Lakes

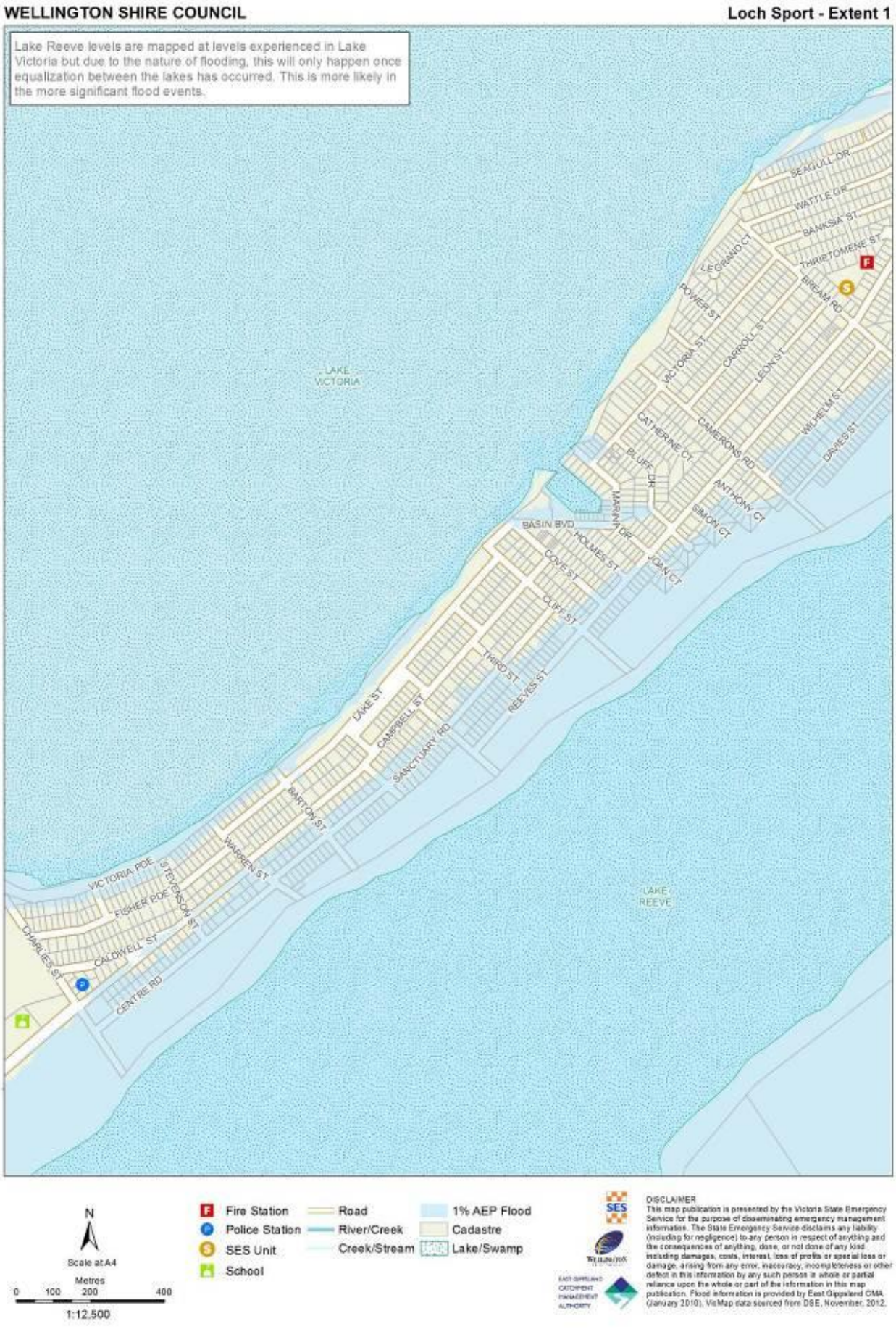


Hollands Landing Flood Extent 1% AEP

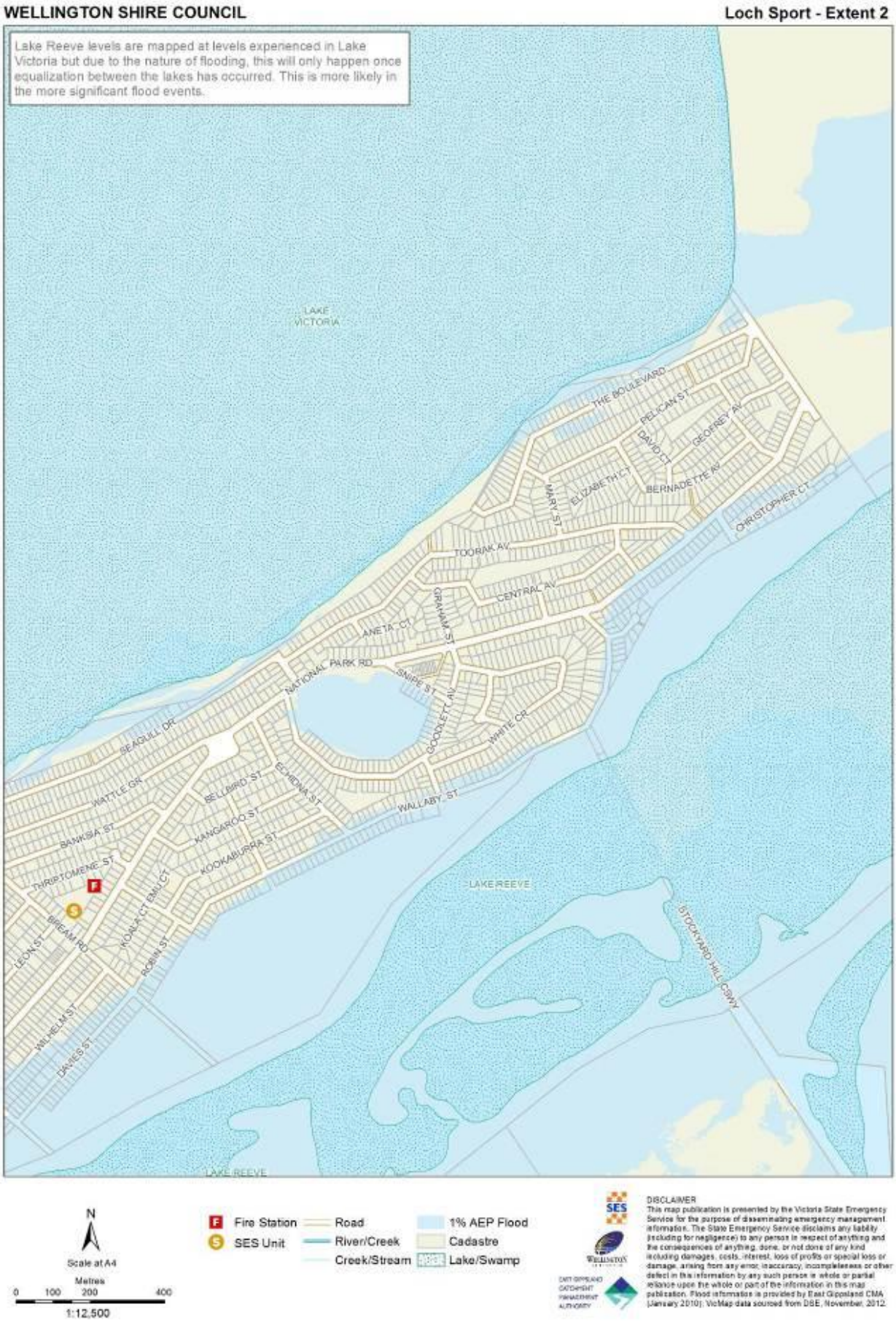
Hollands Landing Flood Extent 10cm Intervals



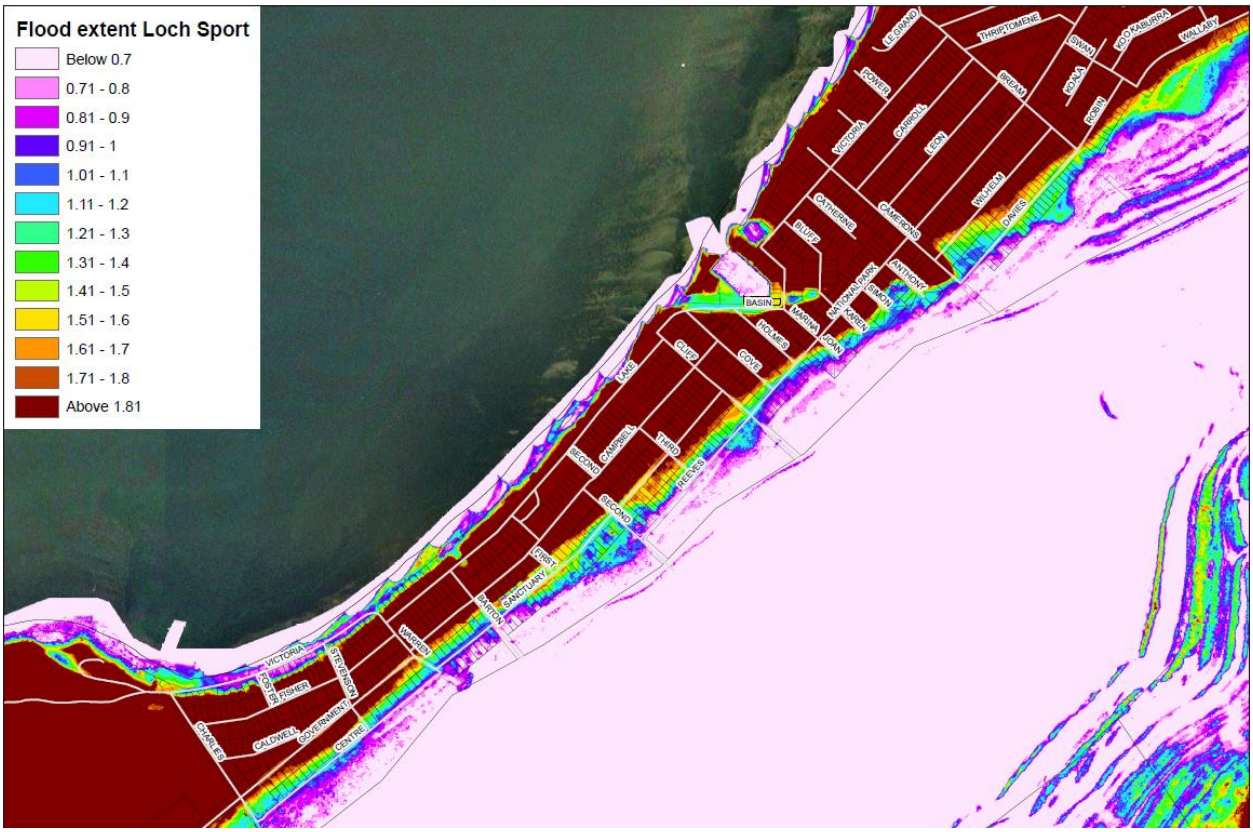
Loch Sport West 1% AEP

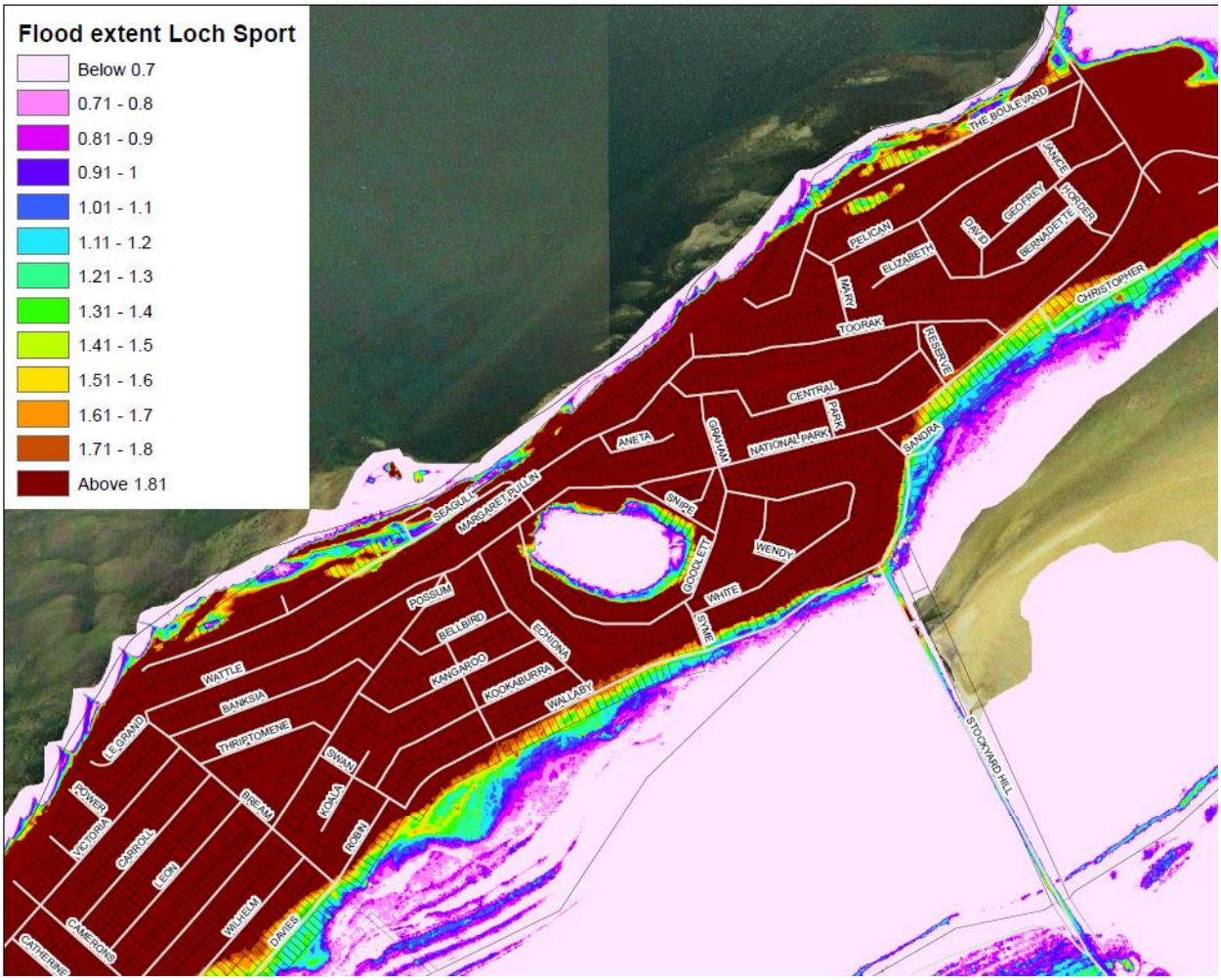


Loch Sport East 1% AEP



Loch Sport Flood Extent 10cm Intervals





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