

Mildura Rural City Council

Municipal Flood Emergency Plan

Incorporating Storm/Flash Flood

Sub-Plan of the Municipal Emergency Management Plan

For the Mildura Rural City Council
and
VICSES Units Mildura, Ouyen and Murrayville

Version 1.1, August 2022

As at 26/08/2022



Acknowledgement

The Mildura Rural City Council and the Victoria State Emergency Service acknowledge the traditional custodians of the land, which now comprise the Mildura Rural City municipality. We pay our respects to Elders past and present, and celebrate and respect their continuing culture and acknowledge the memories of their ancestors.

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Distribution of the Municipal Flood Emergency Plan

Once endorsed and signed the, MFEP will be distributed electronically to all MFEP working group members, MEMPC Chair, council and MEMO by VICSES, It will then be the responsibility of the members to arrange for plan distribution within their own agencies, any additional distribution requirements will be undertaken by VICSES in consultation with the Chair of the MEMP committee.

Distribution List

Copy	Issue To:		
	Name	Organisation	
Original	VICSES		
	Operations Officer Swan Hill	VICSES Swan Hill Office.	
	Chief Executive Officer	Mildura Rural City Council	
	Municipal Emergency Management Officer/s	Mildura Rural City Council	
	Municipal Recovery Manager	Mildura Rural City Council	
	Municipal Emergency Response Coordinator	Victoria Police - Mildura	
	Regional Emergency Management Inspector	Victoria Police - Bendigo	
	Officer in Charge	Victoria Police - Mildura Police Station	
	Regional Manager	VICSES North West Regional Headquarters Bendigo	
	Controller	VICSES - Mildura Unit	
	Controller	VICSES - Ouyen Unit	
	Controller	VICSES - Murrayville Unit	
	Flood Plain Manager	Mallee Catchment Management Authority	
	Senior Forest Fire Management Officer Emergency Preparedness	Department of Environment, Land, Water and Planning - Irymple Office	
	Knowledge Broker	Department of Jobs, Precincts and Regions - Irymple Office	
	Senior Team Manager Mildura	Ambulance Victoria - Loddon Mallee Branch	
	Commander	Country Fire Authority - District 18 Mildura Office	
	Officer In Charge	Fire Rescue Victoria - Station 72 Mildura	
	Regional Officer Emergency Management	Department of Transport	
	Emergency Management	Department of Families, Fairness and Housing	
	Manager Plant Operations and Maintenance	Lower Murray Water - Mildura	

Note: VICSES will be responsible for the initial distribution of this plan. It is the responsibility of each agency to distribute more widely within their agency as required.

Document / Version Control

This Municipal Flood Emergency Plan (MFEP) will be amended, maintained and distributed as required or every 3 years facilitated by VICSES in consultation with the Mildura Flood Working Group (MFWG)

Suggestions for amendments to this Plan should be forwarded to VICSES Regional Office at: northwest@ses.vic.gov.au. Amendments listed below have been included in this Plan and updated as a new version/revision.

Amendment Number	Version Number	Date of Amendment	Amendment Entered By	Summary of Amendment
1	1.0	January 2021	P Patterson	<ul style="list-style-type: none"> • Full reissue and transition of information to new template • Update of information from 2017 storm event. • Incorporation of Legislative changes as provided in the State Emergency Management Plan and EM Act 2013 as amended.
2	1.1	August 2022	P Patterson	<ul style="list-style-type: none"> • Administrative amendments throughout document. • Update of version control date.

Once adopted by the Mildura MEMPC this plan will be available on the VICSES website at www.ses.vic.gov.au/get-ready/your-local-flood-information and the municipal website at; <http://www.mildura.vic.gov.au>.

A copy of the plan will also be available at: <https://www.floodzoom.vic.gov.au/> (for registered users)

Acronyms

AEP	Annual Exceedance Probability	MEMPC	Municipal Emergency Management Planning Committee
AHD	Australian Height Datum (the height of a location above mean sea level in metres)	MERC	Municipal Emergency Response Coordinator
ARI	Average Recurrence Interval	MFEP	Municipal Flood Emergency Plan
		MRCC	Mildura Rural City Council.
AV	Ambulance Victoria	MRM	Municipal Recovery Manager
BoM	Bureau of Meteorology	RAC	Regional Agency Commander
CERA	Community Emergency Risk Assessment	RCC	Regional Control Centre
CFA	Country Fire Authority	RDO	Regional Duty Officer
CMA	Catchment Management Authority	SAC	State Agency Commander
DELWP	Department of Environment, Land, Water and Planning	SCC	State Control Centre
DFFH	Department of Families, Fairness and Housing	SDO	State Duty Officer
DJPR	Department of Jobs Precincts and Regions	SEMP	State Emergency Management Plan
DNRE	Dept of Natural Resources and Environment (now DELWP)	SHERP	State Health Emergency Response Plan
DoT	Department of Transport	VICSES	Victoria State Emergency Service
EMLO	Emergency Management Liaison Officer		
FRV	Fire Rescue Victoria		
ICC	Incident Control Centre		
IC	Incident Controller		
IIA	Initial Impact Assessment		
IEMT	Incident Emergency Management Team		
IMT	Incident Management Team		
IMS	Incident Management System		
JSOP	Joint Standard Operations Procedure		
MAV	Municipal Association Victoria		
MEOC	Municipal Emergency Operations Centre		
MEMO	Municipal Emergency Management Officer		
MEMP	Municipal Emergency Management Plan		

Part 1. Introduction

1.1 Approval and Endorsement

This Municipal Flood Emergency Plan (MFEP) has been prepared by Mildura Rural City Flood Working Group (MRCCFWG) and with the authority of Mildura Rural City Municipal Emergency Management Planning Committee (MEMPC) pursuant to Section 60A of the Emergency Management Act 2013(as amended).

The MEMPC flood working group have undertaken the consultations with the Mildura community in relation to the arrangements contained within this plan:

This MFEP is a sub plan to the MRCC - MEMP, and is consistent with the State Emergency Management Plan (SEMP), the Victorian Floodplain Management Strategy (DELWP, 2016), which builds on the technical basis of the Victoria Flood Management Strategy (DNRE, 1998a). Also taken into account are the outcomes of the Community Emergency Risk Assessment (CERA) process for Storm/Flash Flood undertaken by the Municipal Emergency Management Planning Committee (MEMPC).

The Municipal Flood Emergency Plan is consistent with the VICSES Loddon Mallee Region Emergency Plan Flood and Storm Sub Plans and the VICSES State Emergency Plan Flood and Storm Sub Plans.

The MFWG acknowledges the contribution of the following:

- VICSES Unit Controllers (Mildura, Ouyen, Murrayville)
- Bureau of Meteorology.
- Parks Victoria
- New South Wales Water
- Murray Darling Basin Authority
- South Australia Water
- Local community representatives

This Municipal Flood Emergency Plan is a result of the cooperative efforts of the Mildura Rural City Flood Planning Working Group (MRCCFWG) and its member agencies, and incorporates flooding from either riverine or storm related (flash flood) events.

This Plan is endorsed by Mildura Rural City MEMPC as a sub-plan to the MEMP

Approval

Mr Peter l’Anson

Date

Chair – Municipal Emergency Management Planning Committee

Endorsement

.....

Ms Sharon Unthank

Date

Loddon Mallee Region VICSES Regional Manager

Endorsement

.....

1.2 Purpose and Scope of this Flood/Storm Emergency Plan

The purpose of this MFEP is to detail arrangements agreed for the planning, preparedness, response and recovery from both riverine and storm related (flash) flood incidents within the Mildura Rural City municipality.

As such, the scope of the Plan is to:

- Identify the storm / flash flood Risk to the municipality;
- Identify riverine related Flood Risk to the municipality
- Support the implementation of measures to minimise the impacts of either storm / flash flood and riverine flood incidents within the Mildura Municipality;
- Detail response and recovery arrangements including preparedness, Incident Management, Control and Command;
- Identify linkages with Local, Regional and State emergency planning arrangements with specific emphasis on those relevant to storm and flood.

1.3 Municipal Flood Working Group (MFWG)

Membership of the Mildura Emergency Management Planning Committee -- Flood Working Group (MFWG) will comprise of the following representatives from the following agencies and organisations:

- VICSES Regional Officer – Emergency Management (**Chair**),
- Mildura Rural City Council (Emergency Management and Recovery Coordinator)
- Victoria Police (Municipal Emergency Response Coordinator MERC),
- Mallee Catchment Management Authority- Planning and Assessment Officer
- Department of Families, Fairness and Housing (DFFH) – Emergency Management Coordinator
- Department of Environment, Land, Water and Planning (DELWP) Fire Management Officer Em Prep
- Department of Jobs, Precincts and Regions – Knowledge Broker
- Country Fire Authority – Commander
- Lower Murray Water – Manager Plant Operations and Maintenance

1.4 Responsibility for Planning, Review & Maintenance of this Plan

This MFEP must be maintained in order to remain effective.

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

The plan should be reviewed following:

- A new flood study;
- A significant change in flood mitigation measures;
- After the occurrence of a significant storm/flood event within the Municipality;
- Or if none of the above occur at least once every 3 years

Part 2. Mitigation arrangements

2.1 Community Engagement and Awareness

Details of this MFEP will be released to the community through local media, the FloodSafe program, websites (VICSES and the Municipality) upon formal adoption by Mildura Rural City Council. VICSES with the support of Mildura Rural City Council and Mallee Catchment Management Authority will coordinate community education programs for flooding within the council area e.g. FloodSafe/StormSafe. A Business Flood Safe Programme was established and delivered in 2016 within the Mildura City this was led by VICSES and is an ongoing program.

2.2 Structural Flood Mitigation Measures

An audit of the Mildura Urban Levees (for the Murray River) was undertaken in 2004 (Price Merrett Consulting, 2004) and can provide a detailed list of levees, including locations, a brief description and the condition of the levee at the time of the Audit. This document can be found at:

https://www.parliament.vic.gov.au/images/stories/FLOOD/77_Mildura_Rural_City_Council.pdf

Refer to **Appendix D 3 (page 38)** for maps of the locations of the levees and also provide some information on the condition of the levees at the time of the report.

2.3 Non-structural Flood Mitigation Measures

2.3.1 Exercising the Plan

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

2.3.2 Flood Warning

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

Refer to **Appendix C (page 35)** for details on Warnings issued by VICSES

Local Knowledge

There is no formalised Information Officer network within the Mildura Rural City Council municipal area.

If a situation necessitates, the Control Agency (VICSES), with the assistance of council, and other relevant agencies may utilise Community Leaders, Community Emergency Liaison Officers and other identified contacts as means of gathering and providing information in real time on the impacts and expectations of a flood/storm event. These contacts may also be used to assist in the provision of information and warnings to the affected community.

Part 3. Response arrangements

3.1 Introduction

3.1.1 Response Activation

Flood/Storm response arrangements may be activated by the Regional Duty Officer (RDO) VICSES Loddon Mallee Region or Regional Agency Commander (RAC).

The VICSES appointed Incident Controller (IC) or RDO will activate agencies as required, and as documented in the State Emergency Management Plan – Flood Sub Plan.

3.1.2 Responsibilities

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

Agency roles and responsibilities can be found at; [EMV agency responsibilities](#) and the State Emergency Management Plan – Flood/Storm Sub Plan and Regional Flood/Storm Emergency Plan.

3.1.3 Municipal Emergency Operations Centre (MEOC)

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

The function, location, establishment and operation of the Municipal Emergency Operations Centre will be as detailed in the MEMP.

3.1.4 Escalation

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

Mildura Rural City Council is also a signatory to the Municipal Association of Victoria (MAV) inter-council emergency management resource sharing protocol.

Resourcing and event escalation arrangements are described in the Victorian State Emergency Management Plan page 24 (<https://files-em.em.vic.gov.au/public/JSOP/SOP-J03.09.pdf>)

3.2 The six C's

Arrangements in this MFEP must be consistent with the 6 C's as detailed in the [Victorian Emergency Operations Handbook](#), Edition 2, page 14.

- **Control:** Overall direction of response activity in an emergency, operating horizontally across agencies.
- **Command:** The internal direction of personnel and resources within an agency, operating vertically within the agency.
- **Coordination:** Bringing together agencies and resources to ensure effective preparation for response to, and recovery from emergencies.
- **Consequence:** Management of the effects of emergencies on individuals, communities, infrastructure and the environment.
- **Communication:** Engagement and provision of information across agencies and proactively with the community to prepare for, respond to and recover from emergencies.
- **Community Connection:** Understanding and connecting with trusted networks, trusted leaders and all communities to support resilience and decision making.

3.2.1 Control

The Victoria State Emergency Service Act 2005 Part 2, section 5(a) and 5(c) (as amended) and the [State Emergency Management Plan](#) (SEMP) page 64, identifies VICSES as the Control Agency for storm and flood events, and details the agencies authority to plan for and respond to flood and storm events.

All flood and/or storm related response activities within the Mildura Rural City municipality, including those arising from a retarding basin or levee bank failure will therefore be under the control of the VICSES appointed IC.

3.2.2 State Emergency Management Priorities

The State Emergency Management Plan identifies priorities which underpin and guide all decisions during a response to any emergency these priorities can be found at: [SEMP](#) Page 7.

3.2.3 Incident Controller (IC)

An Incident Controller (IC) will be appointed by the VICSES (as the Control Agency) to manage the response to a flood or storm event.

This decision could be made on the advice of the Bureau of Meteorology or at the direction of the Emergency Management Commissioner (or representative) that a flood or storm event will occur or is occurring. The IC responsibilities are as defined in the State Emergency Management Plan, page 60.

3.2.4 Incident Control Centre (ICC)

When required, the Control Agency will establish an Incident Control Centre from which incident response control and command functions will be conducted.

Pre-determined ICC locations are located at:

Incident Level	Location	ICC Location	Facility owner	Key contact
Level 3	Irymple	Cnr 11 th Street and Koorlong Avenue	DJPR	03 5051 4500
Level 3	Epsom	Cnr Midland Hwy and Taylor Street Epsom	DELWP	03 5430 4600

3.2.5 Divisions and Sectors

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

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

Division	Command location	Sector
Mildura	VICSES Mildura HQ 70 Twelfth Street	Mildura
		Merbein
		Red Cliffs
		Irymple
		Ouyen
		Murrayville

3.2.6 Incident Management Team (IMT)

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

Refer the State Emergency Management Plan, [SEMP](#) page 64 for guidance on IMT's.

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

When requested, organisation should endeavour to provide personnel resources to support the function of the IEMT, this representation could be in various form including but not limited to physical attendance, video or teleconference systems.

Refer to the State Emergency Manage Plan, [SEMP](#) pages 61-62 for guidance on IEMT.

3.2.7 On Receipt of a Flood Watch / Severe Weather Warning

On receipt of a Flood Watch/Flood Warning or Severe Weather Warning the VICSES Regional Duty Officer (until an incident controller is appointed) will undertake any required actions. This will include:

- Review flood intelligence to assess likely flood consequences
- Monitor weather and flood information – www.bom.gov.au
- Assess Control and Command requirements.
- Review local resources and consider needs for further resources regarding personnel, property protection, flood rescue and air support
- Notify and brief appropriate officers. This includes Regional Control Centre (RCC) (if established), State Control Centre (SCC) (if established), Council, other emergency services through the IEMT.
- Assess ICC readiness (including staffing of IMT and IEMT) and open if required
- Ensure flood warnings and community information is prepared and issued to the community where required
 - Flood (Riverine and flash) Warnings are managed by the RDO/Regional Agency Commander (RAC)
 - Severe Weather/ Thunderstorm warnings are managed by State Duty Officer (SDO)/State Agency Commander (SAC)
- Develop media and public information management strategy
- Monitor watercourses and undertake reconnaissance of low-lying areas
- Ensure flood mitigation works are being checked by owners
- Develop and issue incident action plan, if required
- Develop and issue situation report, if required

3.2.8 On Receipt of the First and Subsequent Flood Warnings

VICSES RDO (until an IC is appointed) will undertake actions as required. General considerations by the IC/VICSES RDO will be as follows:

- Develop an appreciation of current flood levels and predicted levels. Are floodwaters, rising, peaking or falling?
- Review flood intelligence to assess likely flood consequences.
- Consider:
 - What areas may be at risk of inundation?
 - What areas may be at risk of isolation?
 - What areas may be at risk of indirect affects as a consequence of power, gas, water, telephone, sewerage, health, transport or emergency service infrastructure interruption?
 - The characteristics of the populations at risk
- Determine what the at-risk community need to know and do as the flood develops.
- Warn the at-risk community including ensuring that an appropriate warning and community information strategy is implemented including details of:
 - The current flood situation
 - Flood predictions
 - What the consequences of predicted levels may be
 - Public safety advice
 - Who to contact for further information
 - Who to contact for emergency assistance
- Liaise with relevant asset owners as appropriate (i.e. water and power utilities)
- Implement response strategies as required based upon flood consequence assessment.
- Continue to monitor the flood situation – www.bom.gov.au/vic/flood/
- Ensure continued conduct reconnaissance of low-lying areas

3.3 Initial Impact Assessment

The Incident Controller (IC) will when necessary initiate an Initial Impact assessment process. The Initial Impact Assessments will be conducted in accordance with IIA guidelines contained in EMCop/Library/IMT Toolbox/Incident Control (available to registered users only) and record the extent and nature of damage caused by storm/flooding event. This information may then be used to provide the basis for further needs assessment and recovery planning by local government, DFFH and recovery agencies.

3.4 Preliminary Deployments

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

3.5 Response to Flash Flooding

Emergency management response to flash flooding should be consistent with management of storm / flash flooding contained within the State Emergency Response Plan – [Storm Sub-Plan](#), and Loddon Mallee Emergency Response Plan – [Storm Sub-Plan](#).

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

1. Determine if there are barriers to evacuation by considering warning time, safe routes, resources available etc.;
2. If evacuation is possible, then evacuation should be the adopted strategy and it must be supported by a public information capability and a rescue contingency plan;
3. Where it is likely people will become trapped by floodwaters due to limited evacuation options safety advice needs to be provided to people at risk. Advice should be given to not attempt to flee by entering floodwater if they become trapped, it may be safer to seek the highest point within the building and to telephone 000 if they require rescue.
4. For buildings known to be structurally un-suitable an earlier evacuation trigger will need to be established (return to step 1 of this cycle).
5. If an earlier evacuation is not possible then specific preparations must be made to rescue occupants trapped in structurally unsuitable buildings either pre-emptively or as those people call for help, and -
6. Contact the Mildura Rural City Council MERC and MEMO at the earliest opportunity to allow for relief preparation to commence.

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

Refer to **Appendix A 2 (page 29)** for information in relation to flash flood events.

3.6 Evacuation

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

Once the decision is made Victoria Police are responsible for the management of the evacuation process. VICSES and other agencies will assist where practical. VICSES is responsible for the development and communication of evacuation warnings.

Victoria Police are responsible for the registering people affected by a flood emergency including those who have been evacuated, Australian Red Cross support the Victoria Police in undertaking this role

Refer to SEMP and the Evacuation Guidelines for information regarding evacuations in emergencies.

Refer to **Appendix B (page 32)** for general guidance and considerations for an evacuation.

3.7 Flood Rescue

**Victoria Police are the responsible agency for rescue from land or water within Victoria.
New South Wales Police are the responsible agency for rescue from land or water within NSW**

Response agencies may conduct flood rescues within the guidelines provided within the organisation.

Across Victoria there are a number of specialist personnel from response agencies (CFA/FRV/SES/VicPol) who are trained in Swift Water Rescue both land based and in water technicians. Once these teams are deployed their activities are coordinated by Victoria Police in close consultation with the IC/Control agency.

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.

Victoria Police Rescue Coordination Centre are to be notified of any rescues that occur: (03) 9399 7500 or for any rescues in New South Wales waters NSW Maritime (02) 9320 7499

NOTE: There are no specialised Swift Water Rescue resources within the Mildura Rural City Council area. Should these resources be required they will need to be accessed through the ICC/VICSES RDO.

The following resources are available within Mildura Rural City Council to assist with rescue operations:

- Mildura VICSES unit 2 x rescue boats,(Savage 4.2 and Gemini 500).
- DELWP 1 x 6mtr barge

NSW Wentworth SES also have a number of resources that upon request may be available to assist, these include,

- A number NSW accredited land based and in water flood rescue operator's (9 land based and 1 in water rescue operator).
- 2 x rescue boats (Savage 4.85 and Punt 6.2)

3.8 Aircraft Management

Aircraft can be used for a variety of purposes during flood operations, this includes evacuation, resupply, intelligence gathering, emergency assistance to isolated communities/properties and emergency travel.

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

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

Suitable airbase facilities are located at:

- Mildura Airport - located 10 km south west of the city (this facility has the capacity to cater for large aircraft).
- Ouyen Airport
- Linga Airfield near Underbool

A number of other facilities exist which can accommodate rotary winged aircraft this includes various sporting ovals, racing tracks etc, throughout the municipality.

3.9 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 municipality and Department of Families, Fairness and Housing to service communities that are isolated.

3.10 Essential Community Infrastructure and Property Protection

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

The Mildura Rural City Council maintains a small stock of sandbags. Back-up supplies can be made available through the VICSES Regional Headquarters. The IC will determine the priorities related the use of sandbags, which will be consistent with the strategic priorities.

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

Property may be protected by:

- Sandbagging to minimise entry of water into buildings
- Encouraging businesses and households to lift or move contents and/or
- Construction of temporary levees. This will be authorised by the IC in consultation with the CMA, LGA and VICPOL and within appropriate approval frameworks.

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

Refer to **Appendix E (page 47)** for VICSES Sandbag policy and identified sandbag collection point(s).

3.11 Disruption to Services

Disruption to services other than essential community infrastructure and property can occur in flood events. This may include road closures which may affect school bus routes, impacts on water treatment plants affecting potable (drinking) water supplies, impact on sewerage treatment plants and ponds.

3.12 Road Closures

Mildura Rural City Council and DoT will carry out their formal functions of road closures including observation and placement of warning signs.

Mildura Rural City Council staff should also liaise with and advise DoT as to the need or advisability of erecting warning signs and / or of closing roads and bridges.

Mildura Rural City Council and DoT should communicate community information regarding road closures. Information will be updated on the VIC Traffic website: <https://traffic.vicroads.vic.gov.au/>

3.13 Dam Spilling / Failure

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

There are no major dam structures within the Mildura Rural City area although there are 2 substantial dam structures located on the Murray River a significant distance upstream, they are at the lakes of Hume and Mulwala.

Due to the locations of these structures and the distance the water would need to travel there would be several days warning prior to any impact due failure at either of these locations.

All dams have a risk of failure. Close communication with the dam manager is essential in the event of a dam safety incident.

Note: The Mallee CMA is currently seeking more information which will provide an understanding of the impacts on the Mildura Municipality should one of these facilities suffer a catastrophic failure.

3.14 River Locks.

Locks located on the Murray River in Mildura Municipality

Lock 11, at Mildura Weir is controlled and operated by Goulburn Murray Water, who have in place internal operational procedures that are implemented on advice from the BoM or via the IC. These procedures include Flood Incident Management Plans, Operations Manuals and also Dam Safety Plans (as a general rule when water flow is expected to exceed 40,000 mega litres per day, the weir boards need to be removed).

The Locks at Euston Weir, (Lock 15) and at Wentworth (Lock 10) are operated and under the control of Water NSW. A number of operational procedures in placed at both these locations, which are implemented during a flood event this includes Lock Flood Management Plans and Operations Manuals, these arrangements are implemented on advice from the BoM or Incident Controller.

A number of weirs to the west of Mildura are controlled by SA Water, these are operated in accordance with that agencies operations manuals and includes their operation during a flood event.

Refer to contact list contained in **Appendix H (page 53)**.

3.15 Waste Water related Public Health Issues and Critical Sewerage Assets

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

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

Should the Environmental Health Officer for the Mildura Rural City Council become aware of any water quality issues related to flooding they should report this to the MEMO and the ICC.

3.16 Access to Technical Specialists

VICSES has arrangements in place with technical specialists who can provide technical assistance in the event of flood operations.

3.17 After Action Review

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

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

Part 4. Emergency relief and recovery arrangements

4.1 General

Arrangements for relief / recovery from an incident within the Mildura Municipality are detailed in the Mildura Rural City Municipal Emergency Management Plan (MEMP) and/or the Recovery Sub-plan.

4.2 Emergency Relief

The IC is responsible for recommending the activation of relief services and ensuring that relief arrangements have been considered and implemented where required under the State Emergency Management Plan page 25.

The range and type of emergency relief services to be provided in response to a flood event will be dependent upon the size, impact, and scale of the flood. [Refer to State Emergency Management Plan table 11;](#)

Details of the relief arrangements are contained in the Mildura Rural City Council Municipal Emergency Management Plan (MEMP).

4.3 Animal Welfare

Matters relating to the welfare of livestock and companion animals including supply and/or delivery of fodder to stranded livestock or for livestock rescue are to be referred to DJPR.

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

4.4 Transition from Response to Recovery

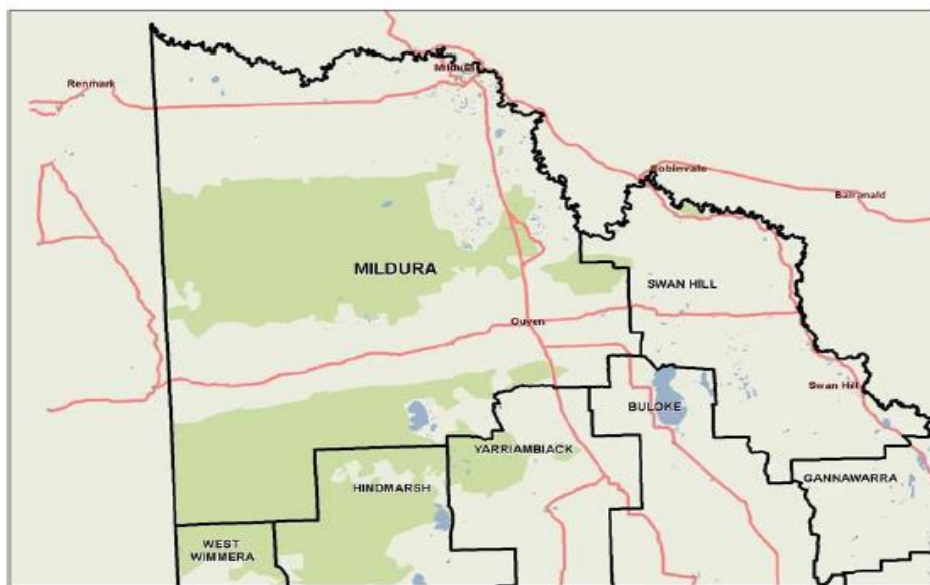
VICSES as the Control Agency is responsible for ensuring effective transition from response to recovery. This transition will be conducted in accordance with existing arrangements as detailed in the State Emergency Management Plan pages 28 and 29.

The template for Transition from Response to Recovery is contained in the Mildura Rural City Municipal Emergency Management Plan, Appendix H.

PART 5: FLOOD THREAT OVERVIEW (including Storm related).

5.1. General

The Mildura Rural City Council municipality is bounded by the Murray River in the north, the South Australian border in the west, both the Swan Hill Rural City and the Buloke Shire border sections to the east and the southern boundary extends from the South Australian border (at a point due west of Lake Albacutya) to where it meets the Buloke Shire approximately 40 kilometres northwest of Sea Lake. The southern boundary has common borders with sections of the West Wimmera, Hindmarsh and Yarriambiack Shires. The Mildura Rural City Council area comprises almost entirely the old Shires of Walpeup and Mildura.



The municipality consists primarily of flat agricultural land plus a combination of river flats, state forests, sand dunes, gypsum flats, rolling plains, Mallee scrub and Mallee desert. Altitude in the area does not exceed 200 metres. Mildura which is the major population centre of the region is located on the Murray River at the northern end of the Municipality.

Riverine flooding in Mildura was a severe threat towards the end of the last century. This risk has been somewhat mitigated with the construction of levees of varying heights to 3.0m along most of the Murray River around Mildura township and since 1956 there has been no significant riverine flooding event Murray River at Mildura.

This levee system is old and possibly unreliable but does offer some protection to the Mildura township.

No levee is guaranteed flood proof and levees can and do fail. When a levee fails, floodwater will enter the previously protected area. Depending on the nature of the levee breach it may occur with little or no warning allowing no time for a formal controlled evacuation to occur.

Flash flooding should not be considered as a risk in isolation as these events often occur in conjunction with wind, rain and/or hail events. This situation occurred during December in 2003 when Mildura was not only subjected to flash flooding but also wind gusts up to 110km/h, these two events occurring simultaneously had significant impact on the community¹.

¹ Loddon Mallee Regional Storm Plan August 2019

A significant rain event also occurred in 2011 with 108 mm of rain falling in 4 hours this resulted in major flash flooding in the Mildura township and surrounds.

Rain events which can cause flash flooding are considered to be a major risk within the Mildura Municipality.²

5.2. Historic Riverine / Storm related Floods

Historic Riverine Flooding³

The six largest riverine floods on record at Mildura occurred (in order of decreasing magnitude) 1870, 1956, 1917, 1931, 1975, and 1974. The 1870 flood event was above normal river level for about seven months. The second largest flood on record was observed in 1956.

Accordingly, the following figures have been adopted for this study:

Table 2: Historical flood records used within this study

Gauging Station Location & Number (BOM number)	Flood Frequency ARI (AEP)	Level (m AHD)	Flow (ML/day)
Mildura D/S 414202 (54700)	1% (100 yr)	39.14	308,000
Mildura D/S 414202 (54700)	2% (50 yr)	38.79	245,000
Mildura D/S 414202 (54700)	5% (20 yr)	38.00	176,000

5.3. Waterways

Waterway	Description
Darling River	The Darling River enters the Murray River near Wentworth. High water on the Darling causes the Murray River to back up along most of its upstream parts.
Murray River	The Barmah Choke at Barmah limits maximum flows to 35,000 ML/d for all major floods this being due to channel capacity. (MDBC, 1992). A levee protects Mildura from Murray River flood. The condition and level of protection varies as there has been some degradation of the banks ⁴ .
Murrumbidgee River (including Lachlan River)	The Murrumbidgee River enters the Murray River approximately half way between Euston and Swan Hill. There are storages on both systems which may have some ability to attenuate flows.

NOTE: there are currently a number of Flood studies underway this also includes a review of the levees within the municipality, once completed relevant data will be included as part of this plan.

Refer to **Appendix A 1 (page 21)** for detailed information in relation to riverine flooding threat.

5.4. Dam Failure

There are no significant dam structures within the Mildura Rural City Council area, although there are a large number of large farm type dams which are not seen as a major risk.

5.4. River Locks

Within the municipality are a number of river weirs and locks located on the Murray River. During a flood event the agencies responsible for this infrastructure have arrangements are in place to remove boards from the weirs and to open locks to allow an unimpeded flow of water through the system. (see section 3.13 page 14)

² Loddon Mallee Regional Storm Plan August 2019

³ Reference: *Murray River Flood Plain Management - Study Detailed Report* (Rural Water Commission of Victoria & Water Resources Commission of New South Wales, 1986).

⁴ Mildura Urban levee audit 2004-Price Merrett Consulting

5.5. Flash Flood Risk

The City of Mildura is subject to flash flooding, with large storm events resulting in many of the urban stormwater drainage systems and watercourses within the municipality exceeding their capacity. When this occurs and the water will either commence pooling at the lowest point or tend to flow, following either natural or manmade contours of the landscape to its lowest point.

It should also be noted that due to the geology of the area (mainly sandy loam type soil) water will find its own level by permeating through the soil to these low points.

Flash Flooding affects a large number of urban properties, both local and state road systems. Flash Floods also have the potential to affect the area outside the main urban area of the city, numerous rural areas and watercourses.

Historic Flash Flooding⁵:

- November 1991: Flood damage reported from Red Cliffs.
- March 1992: 0.5-metre-deep water in some areas of Mildura. Houses flooded and fruit damaged.
- November 1992: 52.2mm of rain fell in 30 minutes.
- December 1992: 24.8mm of rain fell in 40 minutes.
- December 2003: 43.4mm of rain fell in 22 minutes.
- January 2007: 48mm of rain fell in 10 minutes resulting in 35 calls to VICSES related to storm damaged properties and localised flash flooding a number of calls were received by response agencies to rescue events where people were trapped by flood waters.
- February 2011: 108mm of rain fell in 4 hours causing major flash flooding; this event caused significant property and agricultural damage due to water pooling and considerable effort was involved in pumping water away from affected areas.

Note: Data in relation to calls for assistance including mapping is available from the VICSES data storage system this Initial Impact Assessment information was made available to relief/recovery agencies to assist with their recovery efforts.

⁵ BOM Severe Storm Archive Date Range 1970 to 2014, www.bom.gov.au/australia/stormarchive

5.6 Severe Storm

A number of severe storm events have impacted the Mildura municipality over the last 10 years this is in addition to the flash flooding events identified in section 5.

December 2017

On the 19th of December 2017 a severe thunderstorm impact the Mildura Municipality this was primarily a wind related event with gusts of up to 89kph recorded. This event resulted in approximately 200 calls to the VICSES Mildura Unit, 88 of these related to building damage, 91 trees down and 29 trees on roads. This event also resulted in some agricultural damage including grape vines

On the 11th November 2016 a severe thunderstorm impacted the Mildura Municipality this not only resulted in a large number of private and public buildings being damaged but also significant rural stock and crop losses which include:

- 283 buildings damaged, of which 5 were uninhabitable.
- 77 Municipal buildings damaged,
- 1,327 rural and farming properties affected across the municipality rural impacts included;

Wine Grape (ha)	Table Grape (ha)	Summer (stone) Fruit (ha)	Avocado and other fruit trees (ha)	Dried Fruit (ha)	Nuts (ha)	Citrus (ha)	Berries (ha)	Olives (ha)	Other Vegetables (ha)	Cereal/ Legume Crops (ha)
1,254	1,829	83	21	204	228	114	0	15	73	21,004

- Other losses include: Livestock: 300 quail, 161ha, Murray Cod (farm): 6000 (9 tonnes): Grazing pasture; Additionally 500,000 nursery stock losses and 300,000 propagules damaged.⁶

5.7. Triggers for Flash Flooding

Flash Flooding within the municipality typically occurs with rainfall rates of more than 25mm per hour for an hour or more. Such events, which are mainly confined to the summer months, do not generally create widespread flooding since they only last for a short time and affect limited areas.

Flooding from these storms usually occur with little warning and localised damage can be severe, particularly through the CBD of Mildura.

Blocked stormwater drains can also lead to overland flows and associated flooding from the drain surcharges. The likely location of such flooding is hard to predict other than in cases where a drain has a history of surcharging. Council records may provide some guidance in such cases.

Refer to **Appendix A 2 (page 29)** for flash flood descriptions and observed rainfall peak information.

⁶ DEDJTR impact assessment data December 2016

APPENDIX A 1 – MILDURA RIVERINE FLOOD THREATS.

1. General

The flood extent adopted and plotted within the Mildura urban area is that for the 1956 event. The extent of the 1956 flood was slightly greater than that of 1974 and 1975, even though the difference in elevation was around one metre. A statistical analysis of the 115 years of flood records has indicated that the 1956 flood was very close to the 1% flood event and was therefore adopted by the Rural Water Corporation (precursor to the Goulburn – Murray Water) as the design event for flood plain management within the Mildura Urban Area.

During the 2016 Murray River flood event the river at Mildura only reached the Minor flood level. This had some impact on private and public infrastructure; and included the above floor inundation of the Café located at the entrance to the new marina complex and inundation of the Apex Caravan Park which was unable to operate for several months due to high water levels.

It should be noted that due to Mildura's location, flood waters from the Murray River may remain high for extended periods of time this creates a situation where levees, assets or infrastructure are exposed flood waters for extended periods of time (in some cases months) which may affect their integrity and structural stability.

2. Overview of Structural Mitigation Measures

There are a number of levees within the municipality; most of these are located along the Murray River. An audit of the Murray River levees (along the Victorian side) was conducted in 2004 by Price Merrett consulting, the mapping of levees from this audit together with other relevant information is provided in the maps in Appendix D.

In most cases little is known regarding these levees this includes ownership, structural integrity, date of construction and to some extent the level of protection they offer.

Note: Appendix D 3 (page 38) contains maps of structural mitigation measures in place along the Murray River these maps also provide some guidance to heights AHD and condition as at 2004.

APPENDIX A 1 MILDURA RIVERINE FLOOD THREATS

Table B1 : Murray River Information:

MURRAY RIVERINA BASIN					
Murray River: Euston to Mildura					
Rivers and Tributaries Apart from the Murray	NSW: A number of minor watercourses in low-lying areas distributing water into the floodplain. VIC: No major tributaries. Minor watercourses include Chalka Creek, Cantala Creek, Inlet Creek, Towrie Creek and Outlet Creek.				
Physical Description of Catchment					
This reach comprises a relatively uncomplicated section of the river. On the Victorian side, Chalka and Cantala Creeks feed a system of lakes, collectively referred to as the Hattah lakes, which contain significant wetlands. Further downstream, and also on the Victorian side of the Murray, lie Bullock Swamp, Lake Iraak, Karadoc Swamp and Kings Billabong. Lakes on the NSW side of the Murray include Lake Gol Gol and Gol Gol Swamp.					
Flooding is influenced by catchment conditions in the previous reach, notably Murray River flows passing downstream of Swan Hill, and flows from the Wakool and Murrumbidgee Rivers. Flooding is influenced by the magnitude and timing of flows along these paths.					
For flows above 37,000 ML/d at Euston (about a 2 year ARI), the first of the Hattah Lakes begin to fill. The lakes fill sequentially, with river flows at Euston gauge being required to reach 152,000 ML/d for a sustained period to reach lake Kramen (10 year ARI).					
The total sub catchment has not been defined as catchment boundaries are indistinct.					
Flooding Characteristics (indicative only - major floods or larger):					
	Waterway	Floodplain	Comments		
Width	200 m to 300 m	<ul style="list-style-type: none"> • 1 - 3 km near Euston • 3 - 5 km elsewhere 	These widths apply to both sides of the Murray.		
Depth	8-10 m	1.5 – 3 m	Based on longitudinal sections and the "Murray River Floodplain Atlas" (GHD et al. 1986).		
Flow Velocity	0.5 to 0.7 m/s	0.3 to 0.5 m/s	Ball park estimate. Less in flood storage areas.		
Duration of Flooding	Up to 6 months	Up to 6 months	Based on 1956 flood hydrograph at Euston.		
Flood Warning Time	Over 2 weeks	Over 2 weeks	Average travel time from Euston to Mildura is 5.2 days, with considerable advance warning further upstream.		
Flood Warning Stations (Key ones in bold)					
Flood warning stations relevant to this reach of the Murray include Euston and Colignan. Useful flood warning information could be available for inflows upstream of this reach, e.g. Murray River at Swan Hill (409204)					
	Category	Flow (ML/d)	Gauge Height at Current Site		Frequency
			(m)	(m AHD)	Years
414203 Euston	Minor	91,000	8.00	49.84	4
	Moderate	113,000	8.60	50.44	5
	Major	174,000	9.60	51.44	14
414207 Murray River, Colignan	Minor	98,000	8.00	43.06	7
	Moderate	135,000	8.50	43.56	13
	Major	240,000	9.00	44.06	83
Flood Impacts Where Known (Consider flood damages & impacts on assets, community and environment)					
Minor Flood	Expect floods to be more or less confined to natural banks and low-lying terraces. Some of the Hattah Lakes may start to fill. Levees, where they exist, will generally contain floodwaters.				
Moderate Flood	Increasing numbers of effluent flow paths and flood storage areas on the lowermost parts of the floodplain will commence to operate. Extent and magnitude may be difficult to predict. However many of the Hattah Lakes will fill.				
Major Flood	Extensive flooding is likely along the major flood storage areas and along all major watercourses. Any levees protecting low-lying areas are not expected to overtop, until the flood magnitude approaches that of the 1956 flood (ie about a 50-60 year ARI). May need to check levees at Mildura to see they don't fail. There may be some damages to crops, buildings, roads and fences in some areas.				
More Extreme Flood	Wide expanse of floodwaters, many kilometres wide. Prolonged flooding will occur. Expect massive disruption with roads, possibly schools, etc. closed. Parts of Mildura may be affected. Scouring of bed may be accelerated.				
Existing Flood Data					
<ul style="list-style-type: none"> • 1956 oblique aerial flood photography – incomplete coverage. • 1974 aerial flood photography (taken 1 Dec. 1974) (Belsar Island to Lindsay Island – Plan No. 132061) • 1975 Landsat imagery (2305/23350/7 – taken 23 Nov. 1975). • A few flood levels, particularly at Mildura. • 1956, 1974 and 1975 ARIs for floods at Euston were 67, 19 and 21 years respectively. • At Colignan the 1974 and 1975 ARIs were 46 years and 21 years respectively. Note that this gauge only dates back to 1960. • Flood photos were not taken at the flood peak. 					

APPENDIX A 1 MILDURA RIVERINE FLOOD THREATS

MURRAY RIVERINA BASIN			
Murray River: Euston to Mildura			
Flood Data Needs and Triggers:			
There is a general need for flood photography for the larger floods, covering the full width of the ancestral floodplain. Existing information gives incomplete coverage or is of poor resolution. Flood warning time is ample for arranging aerial flood photography to coincide with a flood peak.			
	Minor Flood	Moderate Flood	Major & Extreme Floods
Flood Levels	N/A	Arrange for levels to be pegged.	Arrange for levels to be pegged.
Ungauged Flow Measurements	N/A	N/A	N/A
Aerial Flood Photography, Etc.	N/A	N/A	Arrange aerial flood photography coincident or shortly after the flood peak. Multiple passes on different days desirable.
Satellite Imagery	N/A	Check LANDSAT coverage when flood has passed	Consider satellite imagery as a supplement or alternative to flood photography
Evaluation of Asset Performance	N/A	N/A	Check/document performance of levees and other structures
Post Flood Damages Assessment	N/A	N/A	Consider collating flood damages and/or arranging a flood damages questionnaire.

APPENDIX A 1 MILDURA RIVERINE FLOOD THREATS

MURRAY RIVERINA BASIN						
Murray River: Mildura to Kulnine East						
Rivers and Tributaries Apart from the Murray		NSW: Darling River. VIC: No major tributaries. Minor watercourses include Wallpolla Creek and Mullroo Creek				
Physical Description of Catchment						
From Mildura to Loch 9 at Kulnine East, the river is characterised by substantial meander patterns and alluvial deposits. Prominent water features include Lakes Hawthorn and Ranfurly, near Mildura. Further downstream, Wallapolla Creek forms an anabranch to the south of the Murray River.						
The Darling River enters the Murray via two main anabranches located near Wentworth, providing significant areas of flood storage.						
Flooding is influenced by catchment conditions along the Murray River and the Darling River, in particular then timing of flood peaks.						
The total sub catchment has not been defined as catchment boundaries are indistinct.						
Flooding Characteristics (indicative only - major floods or larger):						
	Waterway	Floodplain	Comments			
Width	200 m to 300 m	<ul style="list-style-type: none"> • 2 – 6 km generally • wider at the Darling anabranches 	These widths apply to both sides of the Murray.			
Depth	9 m	1 m for the higher terraces, deeper for low-lying areas	Based on longitudinal sections and the "Murray River Floodplain Atlas" (GHD et al. 1986).			
Flow Velocity	0.3 to 0.6 m/s	0.15 to 0.5 m/s	Ball park estimate. Less in flood storage areas.			
Duration of Flooding	Up to 6 months	Up to 6 months	Based on 1956 flood hydrograph at Euston.			
Flood Warning Time	Over 2 weeks	Over 2 weeks	Average travel time from Mildura to Kulnine East is approximately 6 days, with considerable advance warning further upstream.			
Flood Warning Stations (Key ones in bold)						
Flood warning stations relevant to this reach of the Murray include Mildura. Useful flood warning information could be available for inflows upstream of this reach, eg. Murray River at Colignan (414207). See Appendix 1 for details of specific stream gauge stations.						
		Category	Flow (ML/d)	Gauge Height at Current Site		Frequency
				(m)	(m AHD)	Years
414202	Mildura	Minor	84,000	8.30	36.01	4
		Moderate	143,000	9.80	37.51	8
		Major	217,000	10.80	38.51	35
Flood Impacts Where Known (Consider flood damages & impacts on assets, community and environment)						
Minor Flood	Expect floods to be more or less confined to natural banks and low-lying terraces and depressions. Levees, where they exist, will generally contain floodwaters.					
Moderate Flood	Increasing numbers of effluent flow paths and flood storage areas on the lowermost parts of the floodplain will commence to operate. Extent and magnitude may be difficult to predict. However many of billabongs and lakes on the active floodplain may fill. For flows above 100,000 ML/d, widespread flooding is expected.					
Major Flood	Extensive and prolonged flooding is likely along the major flood storage areas and along all major watercourses. May need to check levees at Mildura to see they don't fail. There may be some damages to crops, buildings, roads and fences in some areas.					
More Extreme Flood	Wide expanse of floodwaters, many kilometres wide. Prolonged flooding will occur. Expect massive disruption with roads, and possibly schools, etc. closed. Parts of Mildura may be affected. Scouring of bed may be accelerated. In a 100-year ARI flood it is conceivable that large areas within the Murray Trench (the ancestral floodplain) could flood.					

APPENDIX A 1 MILDURA RIVERINE FLOOD THREATS

MURRAY RIVERINA BASIN						
Murray River: Kulnine East to SA Border						
Rivers and Tributaries Apart from the Murray		NSW: No significant tributaries. VIC: Lindsay Creek, Potterwalkagee Creek, Mullaroo Creek				
Physical Description of Catchment						
From Kulnine East to the SA border, the river is characterised by substantial meander patterns and deposits. Prominent water features include Lake Victoria in NSW and Lindsay Island in Victoria, which contains a substantial number of billabongs and drainage lines. To the south of Lindsay Island is Lake Wallwalla, an intermittent lake on the edge of the ancestral floodplain of the Murray.						
Flooding is influenced by upstream inflows, with long duration flooding for major floods. Strong flows occur in the channels of the river and effluent flowpaths, with relatively still water between the channels.						
The total sub catchment has not been defined as catchment boundaries are indistinct.						
Flooding Characteristics (indicative only - major floods or larger):						
	Waterway	Floodplain	Comments			
Width	200 m to 300 m	5 to 15 km generally	These widths apply to both sides of the Murray. The floodplain extends to up to 35 km at its widest point, from Lake Wallwalla to Lake Victoria			
Depth	8 m	1 m for the higher terraces, deeper for low-lying areas	Based on longitudinal sections and the "Murray River Floodplain Atlas" (GHD et al. 1986).			
Flow Velocity	0.3 to 0.6 m/s	0.2 to 0.5 m/s	Ball park estimate. Less in flood storage areas.			
Duration of Flooding	Up to 6 months	Up to 6 months	Based on 1956 flood hydrograph at Euston.			
Flood Warning Time	Over 2 weeks	Over 2 weeks	Average travel time from Kulnine East to the SA border is approximately 6 days, with considerable advance warning further upstream.			
Flood Warning Stations (Key ones in bold)						
There are no flood warning stations relevant to this reach of the Murray. Useful flood warning information could be available for inflows upstream of this reach, eg. Murray River at Mildura (414202). See Appendix 1 for details of specific stream gauge stations.						
		Category	Flow (ML/d)	Gauge Height at Current Site		Frequency
				(m)	(m AHD)	Years
414203	Mildura	Minor	84,000	8.30	36.01	4
		Moderate	143,000	9.80	37.51	8
		Major	217,000	10.80	38.51	35
Flood Impacts Where Known (Consider flood damages & impacts on assets, community and environment)						
Minor Flood	Expect floods to be more or less confined to natural banks and low-lying terraces and depressions. Levees, where they exist, will generally contain floodwaters.					
Moderate Flood	Increasing numbers of effluent flow paths and flood storage areas on the lowermost parts of the floodplain will commence to operate. Extent and magnitude may be difficult to predict. However many of billabongs and lakes on the active floodplain may fill. For flows above 100,000 ML/d, widespread flooding is expected, with widths exceeding 4 – 6 km.					
Major Flood	Extensive and prolonged flooding is likely along the major flood storage areas and along all major watercourses. There may be some damages to crops, buildings, roads and fences in some areas.					
More Extreme Flood	Wide expanse of floodwaters, many kilometres wide. Prolonged flooding will occur. Expect massive disruption with roads, and possibly schools, etc. closed. Scouring of bed may be accelerated. In a 100-year ARI flood it is conceivable that large areas within the Murray Trench (the ancestral floodplain) could flood.					

Reference Information supplied by Mallee CMA flood data assessment manual

APPENDIX A 1 MILDURA RIVERINE FLOOD THREATS

Table B2. Information Murray River Gauging Stations

MALLEE BASIN					
(Ref Thiess Environmental Services (Feb 1999): Flood Warning Station Manual)					
STATION 414200		MURRAY RIVER, WAKOOL JUNCTION			
Catchment Area	Not calculated		Station Location	5 km downstream junction	
Description	Flat farmland		Station Operating Period	Site A – Jun 1967 to date Site B – June 1937 to July 1953 Site C – July 1953 to June 1967	
Notes Max. Discharge measurement was 11.87 m gauge height corresponding to 222,000 ML/d. Zero gauge height is 49.118 m AHD. Information below is subject to periodic revision.					
Date/Event	Gauge Height at Current Site		Flow	Frequency	Comments
	m	m AHD	ML/d	Years	
100 year ARI flood			293,000	100	
50 year ARI flood	12.52	61.64	236,000	50	
Aug 1956	12.43	61.55	228,000	45	
25 year ARI flood	11.94	61.06	185,000	25	
Nov 1975	11.89	61.01	180,000	24	
Dec 1975	11.55	60.67	153,000	16	
	11.50	60.62	149,000	15	Major Flood (BOM).
Sep 1955	11.41	60.53	143,000	13	
Oct 1993	11.40	60.52	142,000	13	
Nov. 1974	11.40	60.52	142,000	13	
10 year ARI flood	11.17	60.29	127,000	10	
	10.50	59.62	90,300	5	Moderate Flood (BOM)
5 year ARI flood	10.47	59.59	88,900	5	
	8.80	57.92	47,100	2	Minor Flood (BOM)

MALLEE BASIN					
(Ref Thiess Environmental Services (Feb 1999): Flood Warning Station Manual)					
STATION 414201		MURRAY RIVER, BOUNDARY BEND			
Catchment Area	Not calculated		Station Location	2.5 km upstream of Post Office	
Description	Flat farmland		Station Operating Period	Site A – June 1955 to December 1962 Site B – July 1964 to date to date	
Notes Max. discharge measurement was 8.51 m gauge height corresponding to 91,400 ML/d. Zero gauge height is 47.707 m AHD. Information below is subject to periodic revision.					
Date/Event	Gauge Height at Current Site		Flow	Frequency	Comments
	m	m AHD	ML/d	Years	
100 year ARI flood	9.28	56.99	382,000	100	
50 year ARI flood	9.21	56.92	307,000	50	
Aug 1956	9.21	56.92	304,000	49	
25 year ARI flood	9.12	56.83	239,000	25	
Oct 1974	9.02	56.73	198,000	16	
Nov 1975	9.02	56.73	195,000	15	
	9.00	56.71	192,000	14	Major Flood (BOM).
Dec 1975	8.90	56.61	163,000	10	
10 year ARI flood	8.88	56.59	162,000	10	
Sep 1981	8.86	56.57	158,000	10	
Oct 1973	8.82	56.53	152,000	9	
	8.50	56.21	116,000	5	Moderate Flood (BOM)
5 year ARI flood	8.44	56.15	112,000	5	
	8.00	55.71	84,400	3	Minor Flood (BOM)

APPENDIX A 1 MILDURA RIVERINE FLOOD THREATS

MALLEE BASIN (Ref Thiess Environmental Services (Feb 1999): Flood Warning Station Manual)					
STATION 414213		MURRAY RIVER, EUSTON			
Catchment Area	Not calculated		Station Location	Lock 15 tail gauge	
Description	Flat farmland		Station Operating Period	Site A – August 1872 to Feb 1921 Site A – Jan. 1929 to Feb. 1931 Site A – Nov. 1938 to Sep. 1972 Site B – Jan. 1930 to Dec. 1959 Site C – March 1938 to date	
Notes Max. discharge measurement was 10.58 m gauge height corresponding to 299,000 ML/d. Zero gauge height is 41.840 m AHD. Information below is subject to periodic revision.					
Date/Event	Gauge Height at Current Site		Flow	Frequency	Comments
	m	m AHD	ML/d	Years	
100 year ARI flood			339,000	100	
Aug 1956	10.59	52.43	302,000	67	
50 year ARI flood	10.43	52.27	275,000	50	
Jul 1931	10.25	52.09	248,000	37	
25 year ARI flood	10.03	51.87	218,000	25	
Nov 1975	9.91	51.75	205,000	21	
Oct 1974	9.84	51.68	198,000	19	
	9.60	51.44	174,000	14	Major Flood (BOM).
Oct 1955	9.59	51.43	173,000	14	
Nov 1993	9.56	51.4	171,000	13	
10 year ARI flood	9.32	51.16	152,000	10	
	8.60	50.44	113,000	5	Moderate Flood (BOM)
5 year ARI flood	8.50	50.34	108,000	5	
	8.00	49.84	91,000	4	Minor Flood (BOM)

MALLEE BASIN (Ref Thiess Environmental Services (Feb 1999): Flood Warning Station Manual and Gutteridge Haskins and Davey et al. (Dec. 1986): Murray River Floodplain Management Study)					
STATION 414202		MURRAY RIVER, MILDURA			
Catchment Area	Not calculated		Station Location	50 m downstream Lock 11	
Description	Flat farmland		Station Operating Period	Site A – Sep. 1864 to April 1890 Site B – April 1890 to April 1893 Site C – April 1893 to April 1926 Site D – April 1926 to Dec. 1927 Site E – June 1927 to Feb. 1929 Site F – Feb. 1927 to date	
Notes Max. discharge measurement was 11.38 m gauge height corresponding to 298,500 ML/d. Zero gauge height is 27.712 m AHD. Information below is subject to periodic revision. Frequency analysis for Mildura was based on Murray River Flood Study (GH&D et al, 1986)					
Date/Event	Gauge Height at Current Site		Flow	Frequency	Comments
	m	m AHD	ML/d	Years	
Nov. 1870			370,000	125	
100 year ARI flood	11.45	39.16	308,000	100	
Aug 1956	11.44	39.15	306,000	100	
50 year ARI flood	11.08	38.79	245,000	50	
Sep 1917	10.82	38.53	220,000	35	
	10.80	38.51	217,000	35	Major Flood (BOM).
July 1931	10.72	38.43	209,800	33	
Oct 1974	10.32	38.03	178,000	21	
Dec 1975	10.29	38.00	176,000	20	
	9.80	37.51	143,000	8	Moderate Flood (BOM)
Oct 1981	9.67	37.38	136,000	7	
	8.30	36.01	84,000	4	Minor Flood (BOM)

APPENDIX A 1 MILDURA RIVERINE FLOOD THREATS

MALLEE BASIN					
(Ref Thiess Environmental Services (Feb 1999): Flood Warning Station Manual)					
STATION 414207		MURRAY RIVER, COLIGNAN			
Catchment Area	Not calculated		Station Location	Below Euston	
Description	Flat farmland		Station Operating Period	Site A – June 1960 to date	
Notes					
Max. discharge measurement was 8.87 m gauge height corresponding to 178,045 ML/d. Zero gauge height is 35.062 m AHD. Information below is subject to periodic revision.					
Date/Event	Gauge Height at Current Site		Flow	Frequency	Comments
	m	m AHD	ML/d	Years	
100 year ARI flood			253,000	100	
	9.00	44.06	240,000	83	Major Flood (BOM).
50 year ARI flood	8.91	43.97	209,000	50	
Nov 1974	8.90	43.96	204,000	46	
25 year ARI flood	8.75	43.81	169,000	25	
Nov 1975	8.70	43.76	159,000	21	
Dec 1975	8.53	43.59	138,000	14	
	8.50	43.56	135,000	13	Moderate Flood (BOM)
Nov 1993	8.49	43.55	133,000	13	
Oct 1973	8.41	43.47	125,000	11	
Sep 1981	8.36	43.42	121,000	10	
10 year ARI flood	8.35	43.41	121,000	10	
	8.00	43.06	98,000	7	Minor Flood (BOM)
5 year ARI flood	7.76	42.82	88,000	5	

At Mildura

Gauging Station Location & Number (BOM number)	Flood Frequency ARI (AEP)	Level (m AHD)	Flow (ML/day)
Mildura D/S 414202 (54700)	1% (100 yr.)	39.14	308,000
Mildura D/S 414202 (54700)	2% (50 yr.)	38.79	245,000
Mildura D/S 414202 (54700)	5% (20 yr.)	38.03	176,000

Reference: Murray River Flood Plain Management - Study Detailed Report (Rural Water Commission of Victoria & Water Resources Commission of New South

APPENDIX A 2 – MILDURA STORM / FLASH FLOOD

1. Overview of Storm related Flash Flooding Consequences

All indicated actions will need to be driven by storm and/or rainfall predictions and observations.

Multiple Streets and Roads are affected by heavy downpours, with some houses and businesses also coming under threat or inundation.

2. Flash Flood Impacts and Required Actions

The table below provides an overview of the consequences of storm/flash flooding based on council triggers and various events. As the catchment is ungauged it is not possible to provide specific heights at which these impacts will be triggered. All actions must therefore be driven by storm and rainfall level prediction and observations.

- Local drainage in Mildura is not affected by flood levels of the Murray River, except for a small area in the north-east.
- Internal flooding on the city side of levees is possible as there are no pumps to remove this water.
- During the Flash flooding event of February 2011 in excess of 170 houses were inundated above floor level to various heights.

Note – In Flash Flood events most affected areas do not have gauges; it will only be possible to provide a general description of likely flood impacts.

Map of Flash Flooding (water pooling) hot spots based on the 2011 event within the Mildura Rural City Council Area can be found on page 37, substantial works on drainage infrastructure have occurred since this time which should significantly alleviate the impacts of future events.

The table below provides some guidance in relation to observed rainfall triggers and potential actions required. This information is based dry catchment conditions.

During individual events consideration of a wet catchment and changing conditions must be taken into account when using this data.

Note:

1. Annual Exceedance Probability is the chance in percentage of the event occurring in any given year.

2. ARI (Average Recurrence Interval) The average or expected period of time (in years) over which the event is expected to occur.

Observed Rainfall Peak Intensity	Annual Exceedance Probability	Consequence / Impact	Actions may include (but not limited to) closure of road, sandbagging, issue warning and who is responsible
0.01 mm to 27 mm	Between 100% and 10% (1 to 10 year ARI)	<ul style="list-style-type: none"> • Flooding generally confined to drainage in all areas. • Minor breakout in some drainage - ref mapping Appendix F. • Drainage pumps may be operating at this point. • Indi Avenue RED CLIFFS Some minor inundation over roads and property. 	<p>Council and DoT to monitor the situation and action accordingly</p> <p>Potential for some properties to be affected (based on past events):</p> <ul style="list-style-type: none"> • Fourteenth Street MILDURA • Fifteenth Street IRYMPLE • Ginquam Avenue NICHOLS POINT <p>Monitor for possible water over road, Street inundation or need for road closures (as per past events):</p> <ul style="list-style-type: none"> • Euneva Drive MILDURA • Cedar Avenue MILDURA • The Crescent MILDURA • Kalimna Drive MILDURA

APPENDIX A 2 MILDURA STORM/FLASH FLOOD

Observed Rainfall Peak Intensity	Annual Exceedance Probability	Consequence / Impact	Actions may include (but not limited to) closure of road, sandbagging, issue warning and who is responsible
27 mm to 33 mm	Between 10% and 5% (10 to 20 year ARI)	<ul style="list-style-type: none"> • Additional inundation impacting a number of properties. • Draining breaks or 'topping' may occur. • Drainage pumps that may be operating at this point: • Cowra Avenue and Fourteenth Street MILDURA • Koorlong Avenue IRYMPLE 	<p>SES with assistance from the municipality to provide community information regarding potential issues with drain blockages due to organic leaf matter and debris.</p> <p>Monitor for further possible water over road, Street inundation or need for road closures (as per past events):</p> <ul style="list-style-type: none"> • Benetook and Dolfon Drive BIRDWOODTON • Benetook Avenue MILDURA • Emerald Drive MILDURA • Euneva Drive MILDURA - further threat • John Monash Boulevard MILDURA • Madden MILDURA • Ninth Street between Etiwanda and San Mateo MILDURA • Plantation Street MILDURA • Seventh Street MILDURA • Corner San Mateo and Fourteenth street NANGILOC • Fifth Street NICHOLS POINT
33 mm to 41 mm	Between 5% and 2% (20 to 50 ARI)	<p>Monitor potential for any over floor inundation.</p> <p>Drainage pumps that may be operating at this point:</p> <ul style="list-style-type: none"> • Calder Highway IRYMPLE <p>Monitor for any sewer pumps likely to be inundated based on past events.</p> <p>Liaise with council for Water treatment plants and water storage areas like to be affected in this size event.</p> <p>Mildura rail Freight Line affected in past events.</p>	<p>SES, municipality, CFA, DoT and VICPOL to monitor for further possible water over road, Street inundation or need for road closures and potential closure of railway line and notification to VicTrack. (as per past events):</p> <ul style="list-style-type: none"> • Bakogiannis Court MILDURA • Richardson Street WALPEUP • Farrell Street OUYEN • Scott Street OUYEN <p>SES to contact both private and Government Agencies regarding impacts and consequences. Consider DIVCOM and Sector facility locations (located in Control, Command, & Coordination of this document) and operational structures.</p>
41 mm to 150 mm	Between 2% and 1% (50 to 100 year ARI)	<p>Certain infrastructure or assets need sandbagging where possible?</p> <p>Monitor groundwater wells likely to be inundated.</p> <p>Drainage pumps that may be operating at this point:</p> <ul style="list-style-type: none"> • Wilkie Drive IRYMPLE • Koorlong Ave IRYMPLE • Hugh King Drive MILDURA 	<p>Monitor for further possible water over road, Street inundation or need for road closures (as per past events):</p> <ul style="list-style-type: none"> • McKays Road BIRDWOODTON • White Cliff Avenue KOORLONG • Channel Road MERBEIN • Cowanna Avenue MERBEIN • Barwon Court MILDURA • Beasy Court MILDURA • Benetook Avenue MILDURA • Bingara Close MILDURA • Burnside Way MILDURA • Deakin Avenue MILDURA • Eleventh Street MILDURA • Fourteenth Street MILDURA

APPENDIX A 2 MILDURA STORM/FLASH FLOOD

Observed Rainfall Peak Intensity	Annual Exceedance Probability	Consequence / Impact	Actions may include (but not limited to) closure of road, sandbagging, issue warning and who is responsible
			<ul style="list-style-type: none"> • Hollywood Boulevard MILDURA • Madden Avenue MILDURA • Maloney Drive MILDURA • Ninth and Etiwanda flooded - business under water in past event • Plane Tree Drive MILDURA • Plantation Street MILDURA • Riverside Avenue MILDURA • Settlers Drive MILDURA • Cureton Avenue NICHOLS POINT • Eleventh Street NICHOLS POINT • Belar Avenue IRYMPLE • Calder Highway between RED CLIFFS and SUNNYCLIFFS • Fifteenth Street IRYMPLE • Fourteenth Street IRYMPLE • Harris Close IRYMPLE • Irymple Avenue IRYMPLE • Koorlong Avenue IRYMPLE • Sandilong Avenue IRYMPLE • Sultana Avenue IRYMPLE • Fitzroy Avenue RED CLIFFS • Heath Street RED CLIFFS • Jacaranda Street RED CLIFFS • Jamieson Avenue RED CLIFFS • Nursery Ridge Road RED CLIFFS • Old Wentworth Road YELTA • Beasy court and Jobson Court (Sewerage water coming up through draining system?)

APPENDIX B - FLOOD EVACUATION GUIDANCE

Phase 1 - Decision to Evacuate

The IC may make the decision to recommend an evacuation of an at-risk community under the following circumstances:

- Properties are likely to become inundated;
- Properties are likely to become isolated and the occupants are not able to self-relocate.
- As a consequence of the flooding, public health may be at risk. In this situation evacuation is considered the most effective risk treatment. This is the role of the Health Commander of the incident to assess and manage. Refer to the [State Health Emergency Response Plan \(SHERP\)](#) for details; and/or;
- Essential services have been damaged and are not available to a community and evacuation is considered the most effective risk treatment.

The following should be considered when planning for evacuation:

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

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

Phase 2 – Warning

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

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

Phase 3 – Withdrawal

Withdrawal will be controlled by VICPOL. VICSES in consultation with DoT and council will provide advice regarding most appropriate evacuation routes and locations for at-risk communities.

VICSES, CFA, FRV and AV will provide resources where available to support activities. VICPOL/DoT/Council with route control and may assist VICPOL in arranging evacuation transportation.

VICPOL will control security of evacuated areas.

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

Phase 4 – Shelter

The decision of shelter options should be made in consultation with the IC, VicPol and the municipality.

The Mildura MEMP contains information and details of identified Relief Centres within the municipality.

Animal Shelter

The Mildura Rural City Council has limited capacity to assist with animal shelter requirements; this consists primarily of existing council compounds used to hold wandering domestic animals.

For information regarding livestock and wildlife refer to section 4.2, page 16.

Phase 5 – Return

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

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

Considerations for deciding whether to advise of return include:

- Current flood situation;
- Status of flood mitigation systems;
- Size and location of the community;
- Access and egress routes available and their status;
- Resources required to coordinate the return;
- Special needs groups;

APPENDIX B FLOOD EVACUATION GUIDANCE

- Forecast weather;
- Transportation particularly for people without access to transport

APPENDIX C - FLOOD WARNING SYSTEMS

Flood Warning Products

Flood Warning products and Flood Class Levels can be found on the [BoM website](#). Flood Warning products include Severe Thunderstorm Warnings, Severe Weather Warnings, Flood Watches and Flood Warnings.

Severe Thunderstorm and Severe Weather Warnings

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

Flood Watches

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

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

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

Flood Warnings

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

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

- ◆ Rainfall amounts for selected locations within and adjacent to the catchment;
- ◆
- ◆ River heights and trends (rising, steady, falling) at key locations within the catchment;
- ◆
- ◆ Outflows (in ML/d) from any major dams within the catchment;
- ◆
- ◆ Forecasts of the height and time of flood peaks at key locations;
- ◆
- ◆ Weather forecast and the likely impact of expected rainfall on flooding; and
- ◆ A warning re-issue date and time

APPENDIX C - FLOOD WARNING SYSTEM




VICSES distributes flood Watch and Warning information to the media and agencies through the standard emergency platform of “VicEmergency” via EM-Cop.

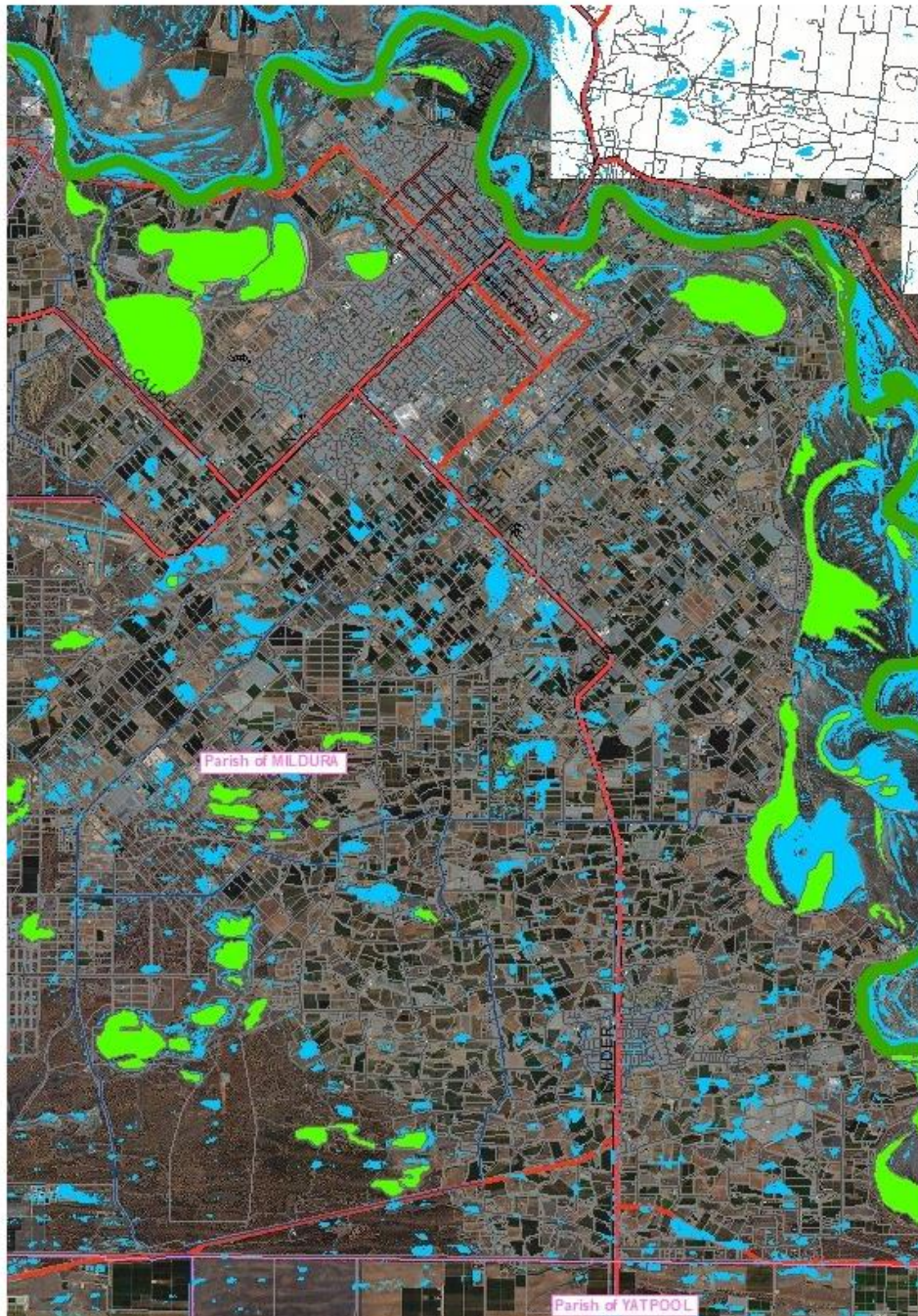
The VICSES Region Headquarters Loddon Mallee Region, or if established an ICC will be responsible for drafting, authorizing and issuing warnings, using the EM-COP Public Publisher (registered users only).

Local Flood Warning System Arrangements

There are no local flood warning systems for flash flooding in the Mildura municipality.

Figure 1: Locations of pooling water after the 2011 storm event

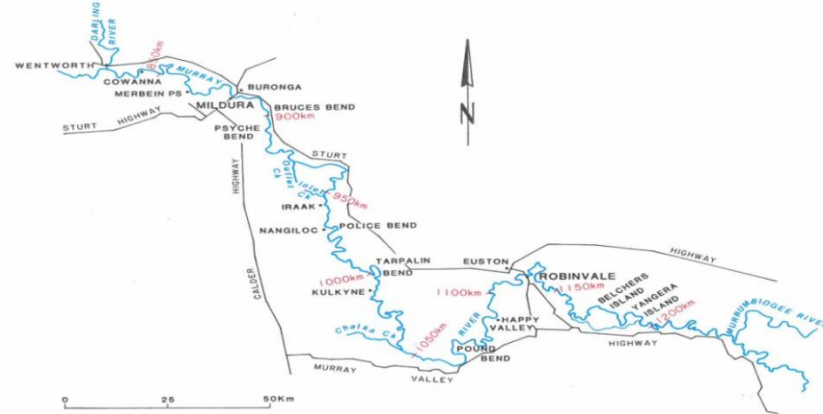
-  Existing Wetlands
-  Pooling Water
-  Murray River



Map - Courtesy Mallee Catchment Management Authority

APPENDIX D 2 – MURRAY RIVER FLOOD PROFILES

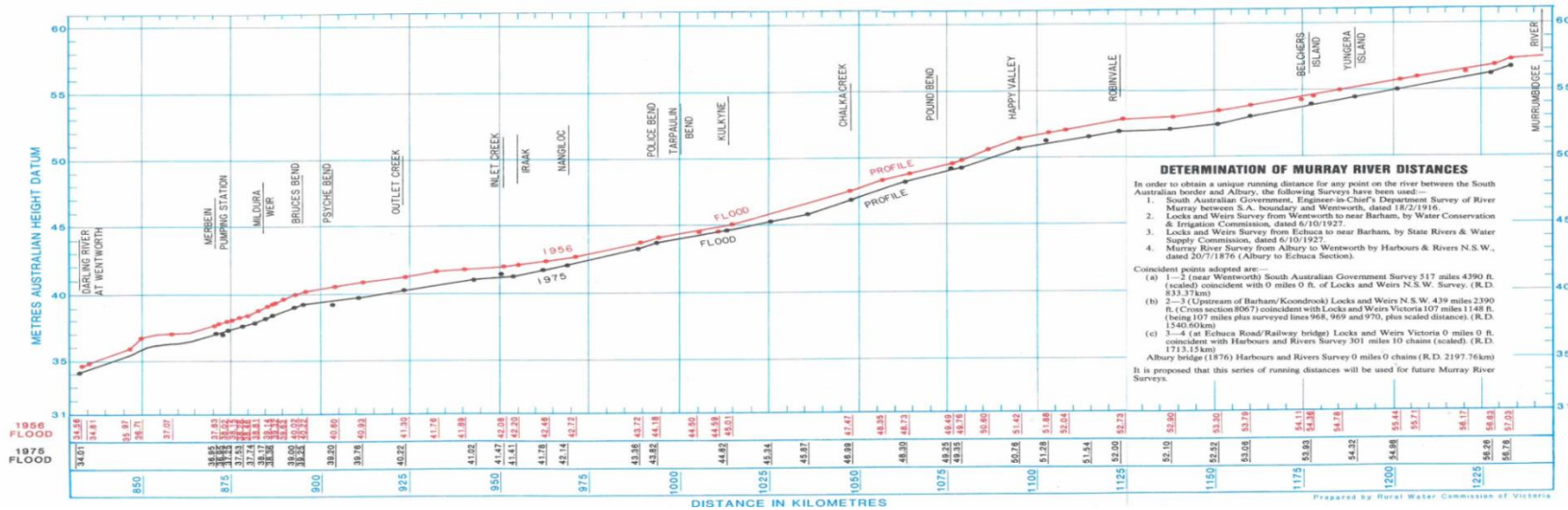
WENTWORTH TO MURRUMBIDGEE RIVER FLOOD PROFILES



NOTES

- Flood level information was obtained from the following sources:—
 - 1975 Flood Levels — R.W.C. Plan No. 108849 (Sheets 4-6) and R.W.C. Plan No. 136092.
 - 1956 Flood Levels — R.W.C. Plan No. 19862 and Plan No. 141286.
- 1956 and 1975 Flood levels were also obtained at Locks 6, 7, 8 and 9 along the Murray River between Wentworth and just beyond the South Australian border. These levels are not shown on this longitudinal section but are as follows:—

Location	River R. D. (Km)	1956 Flood Level (m A.H.D.)	1975 Flood Level (m A.H.D.)
Lock No. 6	635.3	22.03	20.92
S.A./Vic. border	652.9		
Lock No. 7	702.9	26.33	25.72
Lock No. 8	732.0	28.00	27.39
Lock No. 9	771.4	30.76	29.98
- All floods levels are shown in metres to Australian Height Datum.



DETERMINATION OF MURRAY RIVER DISTANCES

In order to obtain a unique running distance for any point on the river between the South Australian border and Albury, the following Surveys have been used:—

- South Australian Government, Engineer-in-Chief's Department Survey of River Murray between S.A. boundary and Wentworth, dated 18/2/1916.
- Locks and Weirs Survey from Wentworth to near Barham, by Water Conservation & Irrigation Commission, dated 6/10/1927.
- Locks and Weirs Survey from Echuca to near Barham, by State Rivers & Water Supply Commission, dated 6/10/1927.
- Murray River Survey from Albury to Wentworth by Harbours & Rivers N.S.W., dated 20/7/1876 (Albury to Echuca Section).

Coincident points adopted are:—

- 1-2 (near Wentworth) South Australian Government Survey 517 miles 4390 ft. (scaled) coincident with 0 miles 0 ft. of Locks and Weirs N.S.W. Survey. (R.D. 433.3 km)
- 2-3 (Upstream of Barham/Koonooka) Locks and Weirs N.S.W. 439 miles 2390 ft. (Cross section 8067) coincident with Locks and Weirs Victoria 107 miles 1148 ft. (being 107 miles plus surveyed lines 968, 969 and 970, plus scaled distance). (R.D. 1540.60 km)
- 3-4 (at Echuca Road/Railway bridge) Locks and Weirs Victoria 0 miles 0 ft. coincident with Harbours and Rivers Survey 301 miles 10 chains (scaled). (R.D. 1713.15 km)

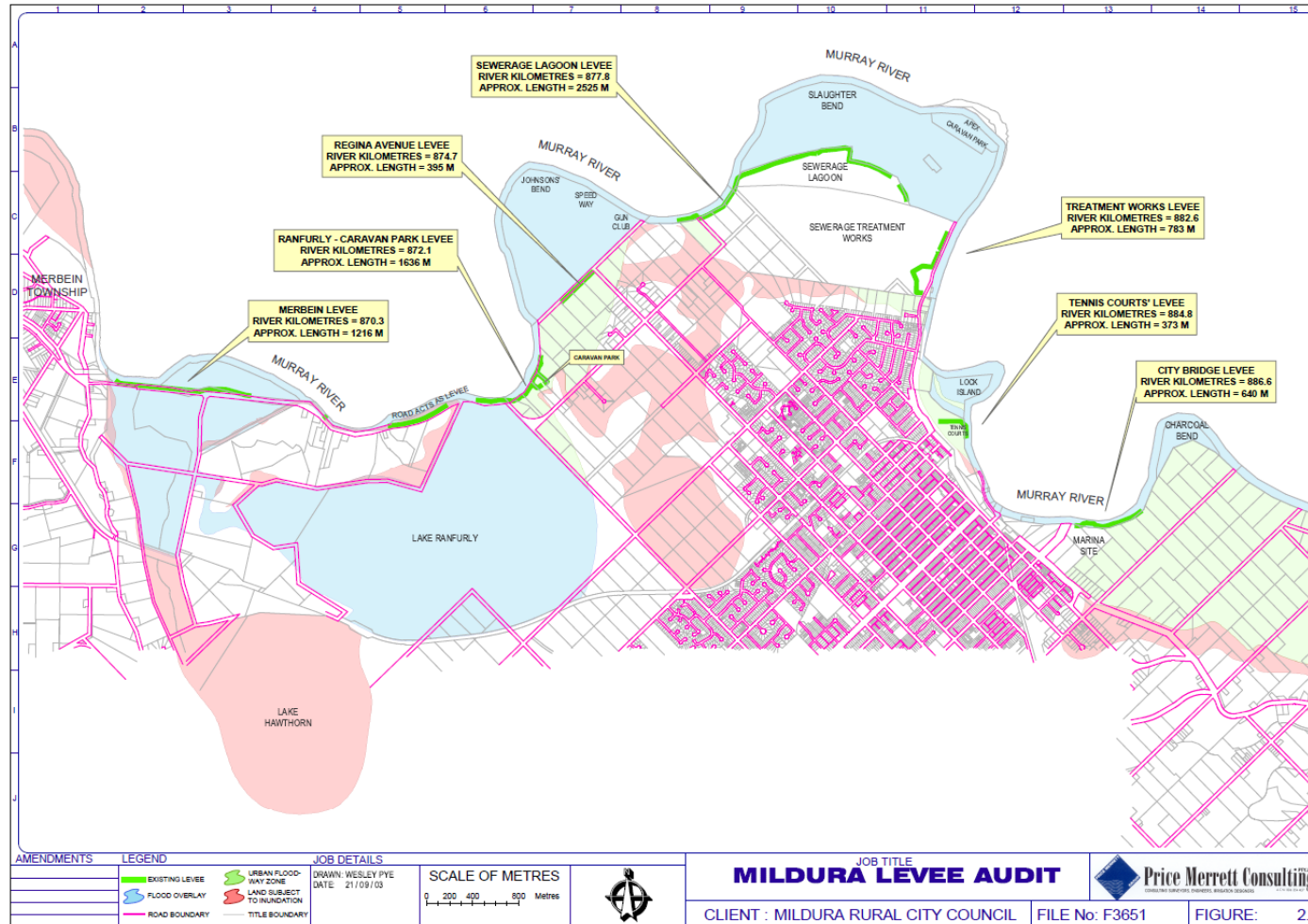
Albury bridge (1876) Harbours and Rivers Survey 0 miles 0 chains (R.D. 2197.76 km)

It is proposed that this series of running distances will be used for future Murray River Surveys.

Prepared by Rural Water Commission of Victoria

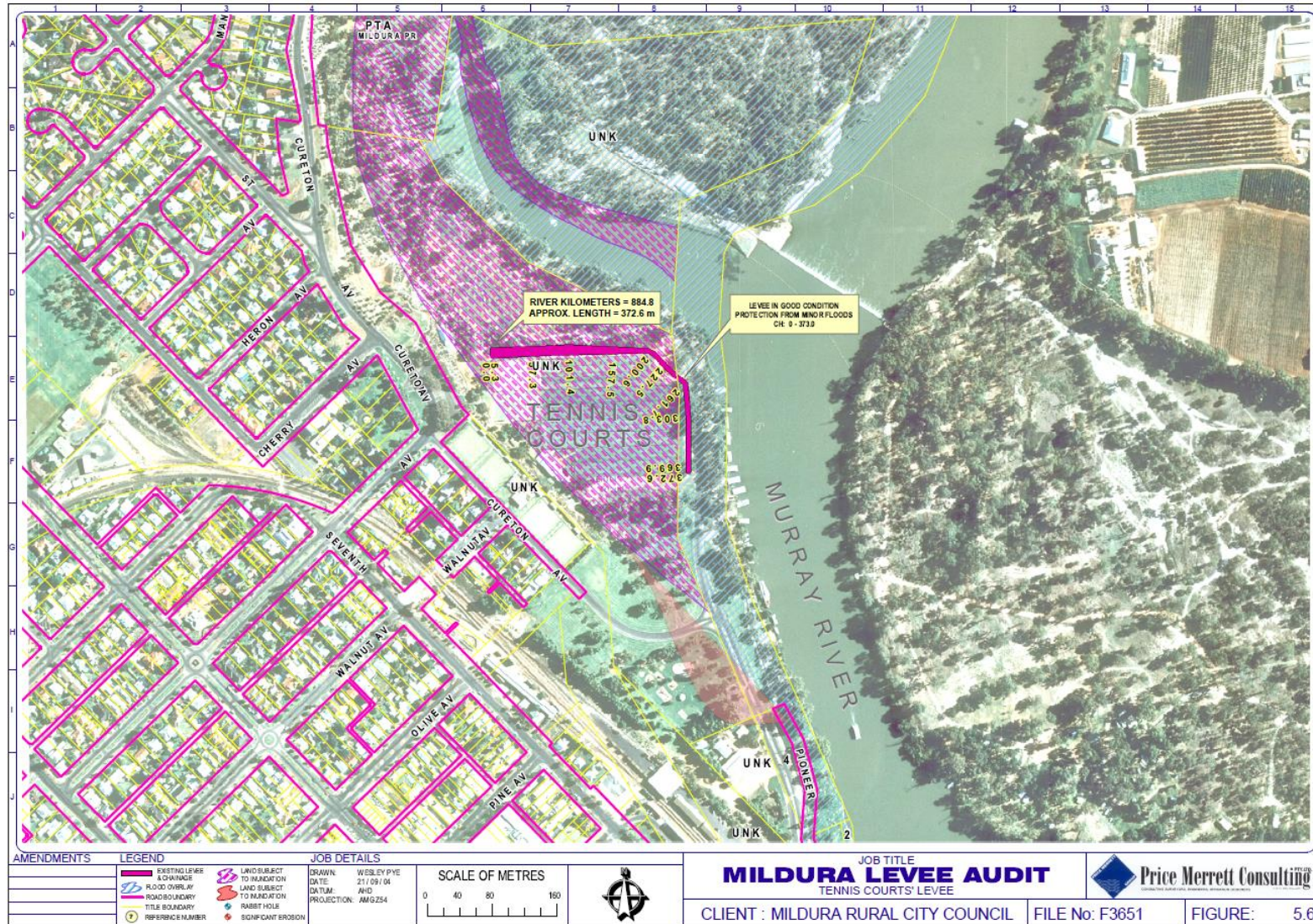
APPENDIX D 3 – MAPS OF STRUCTURAL MITIGATION MEASURES

Figure 1 Mildura Town Levee Overview.



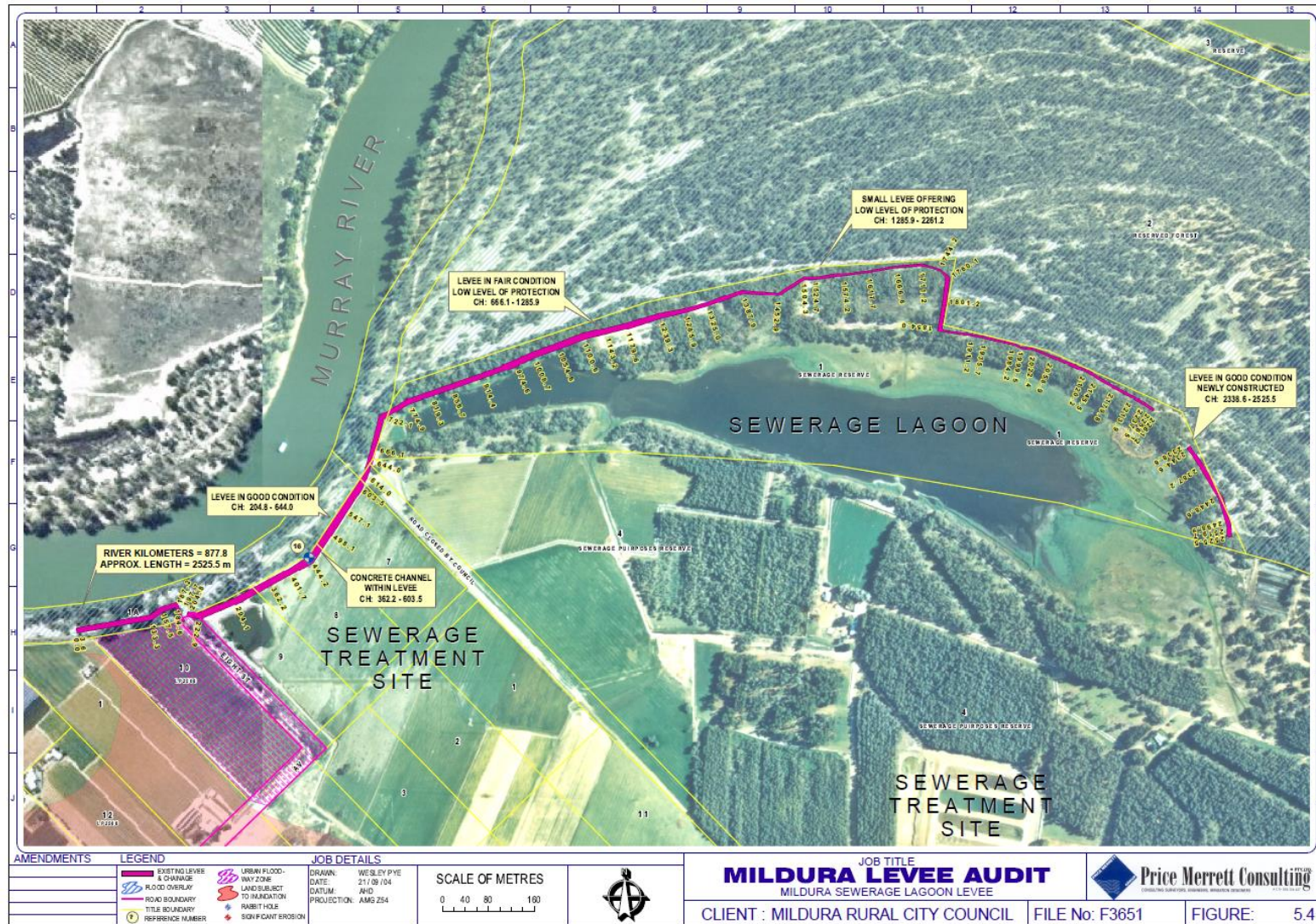
APPENDIX D 3 – MAPS OF STRUCTURAL MITIGATION MEASURES

Figure 2 Tennis Courts



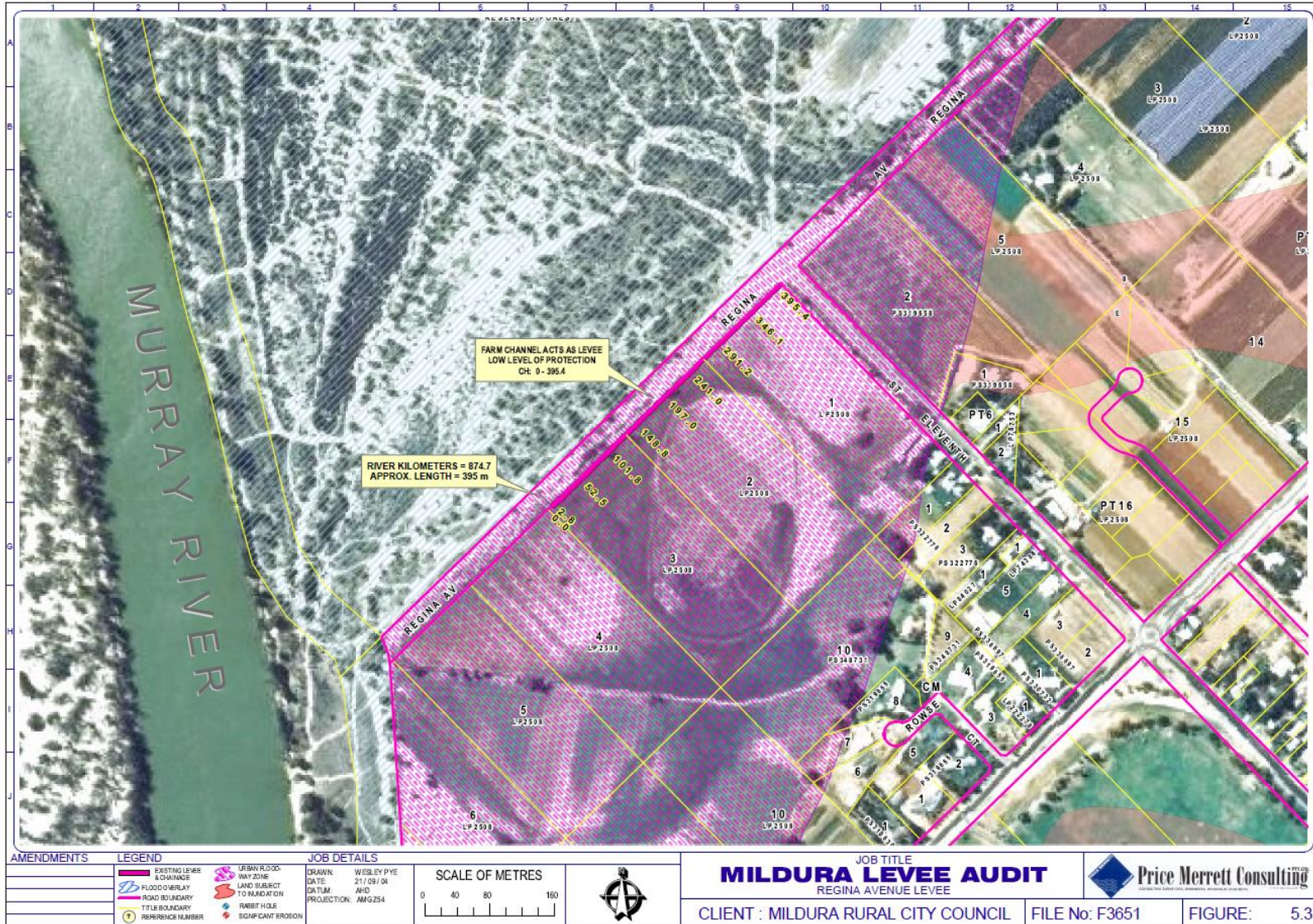
APPENDIX D 3 – MAPS OF STRUCTURAL MITIGATION MEASURES

Figure 3 Sewerage Treatment Plant



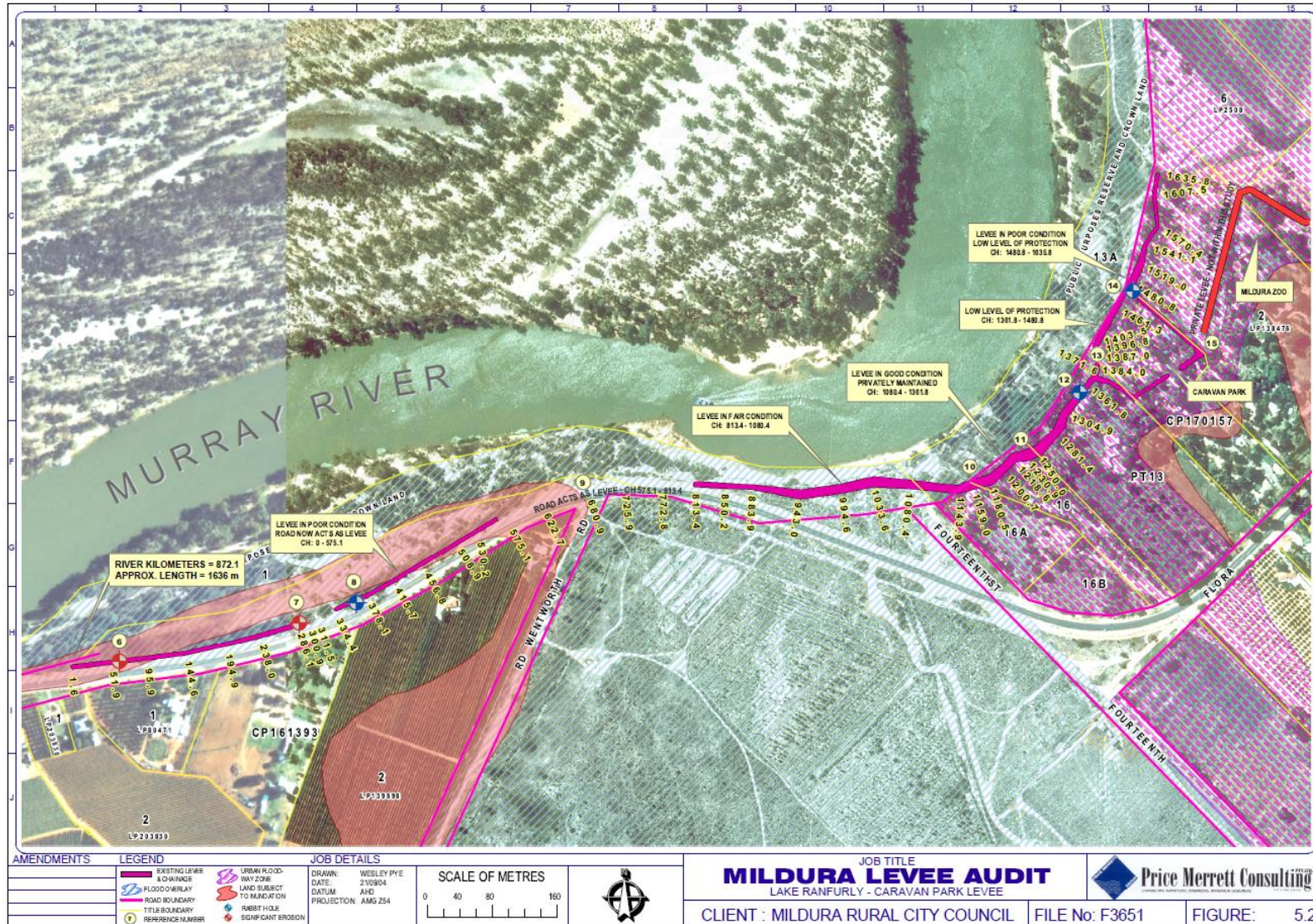
APPENDIX D 3 – MAPS OF STRUCTURAL MITIGATION MEASURES

Figure 4 Regina Avenue



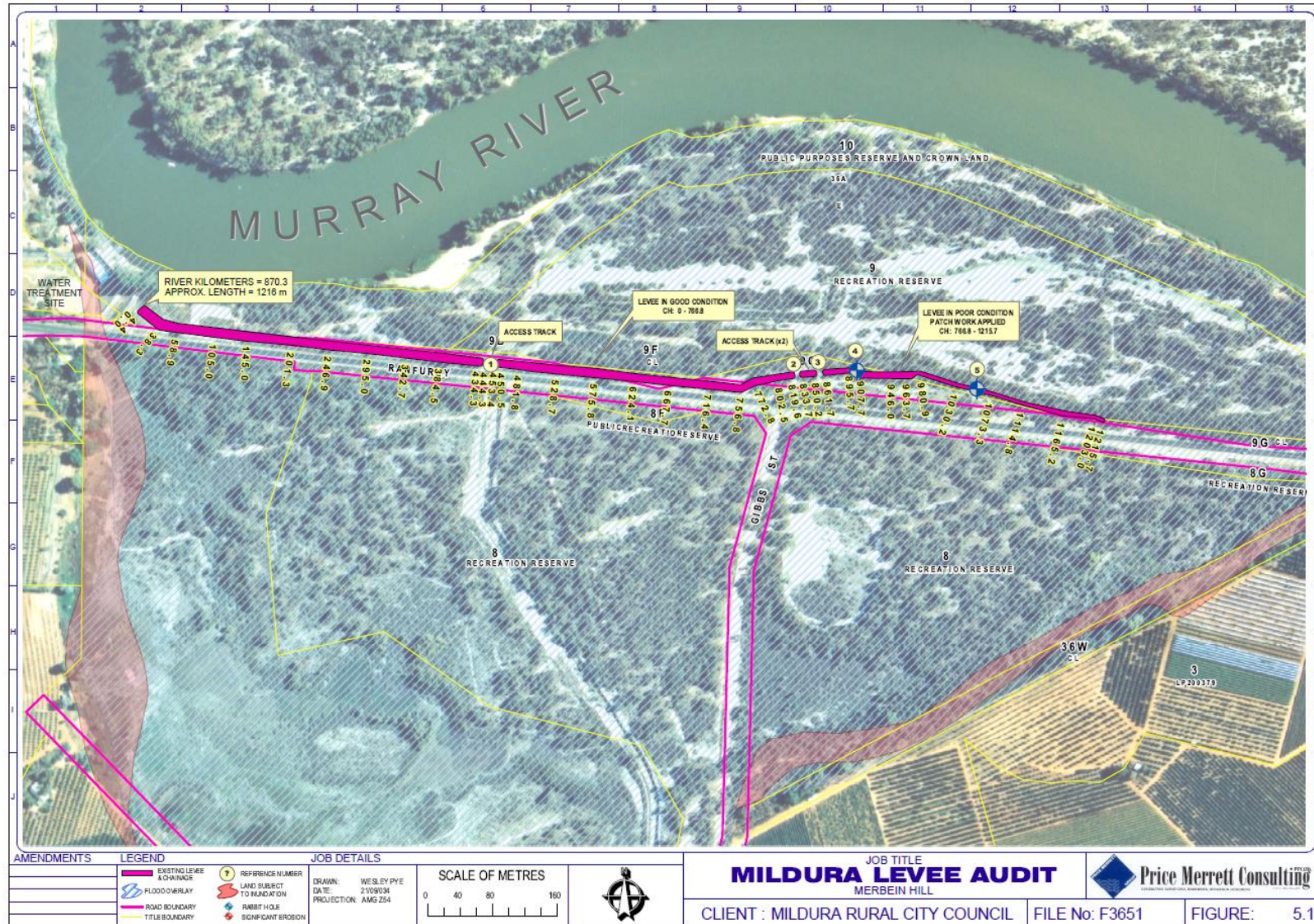
APPENDIX D 3 – MAPS OF STRUCTURAL MITIGATION MEASURES

Figure 5 Ranfurly



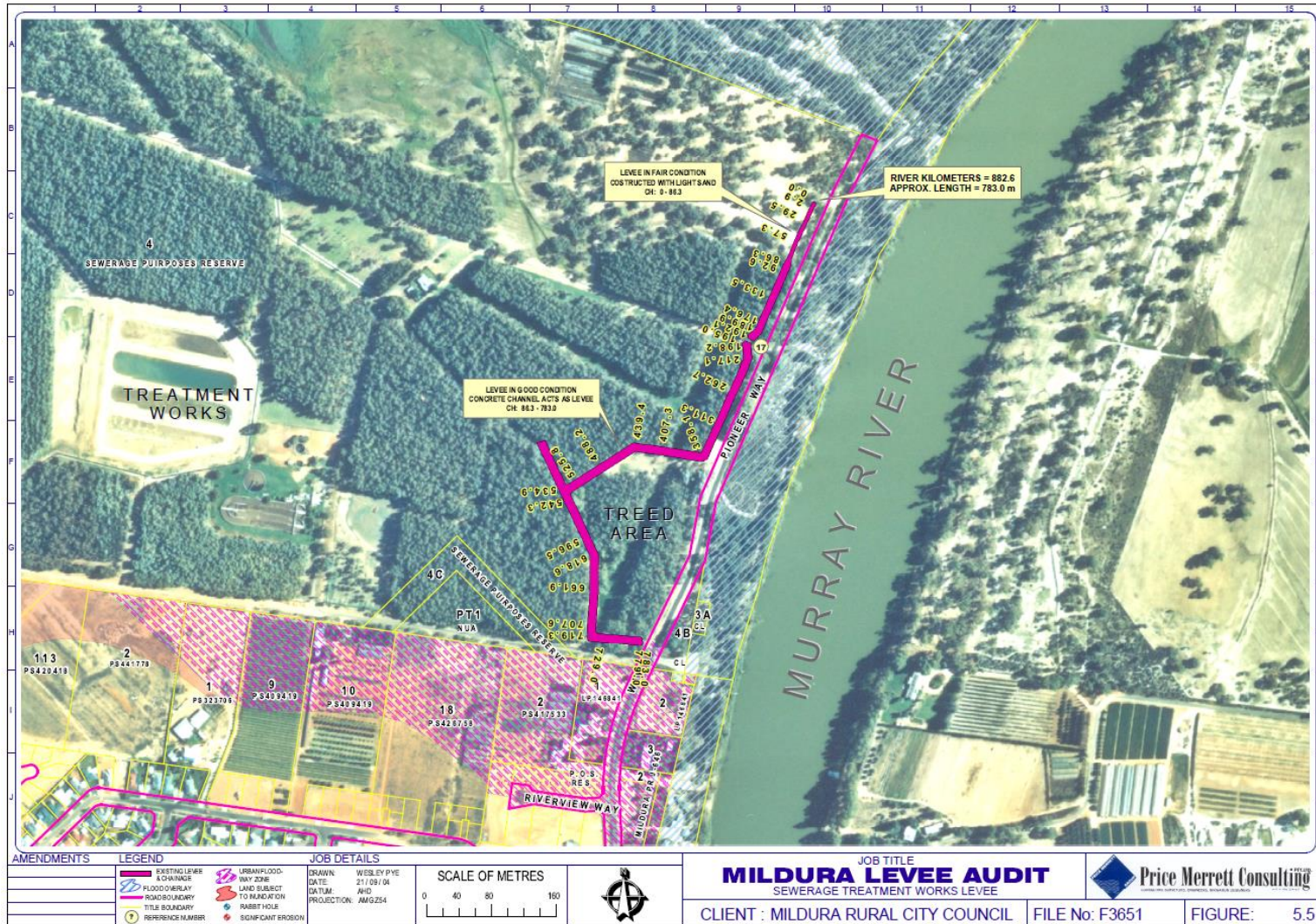
APPENDIX D 3 – MAPS OF STRUCTURAL MITIGATION MEASURES

Figure 6 Merbein



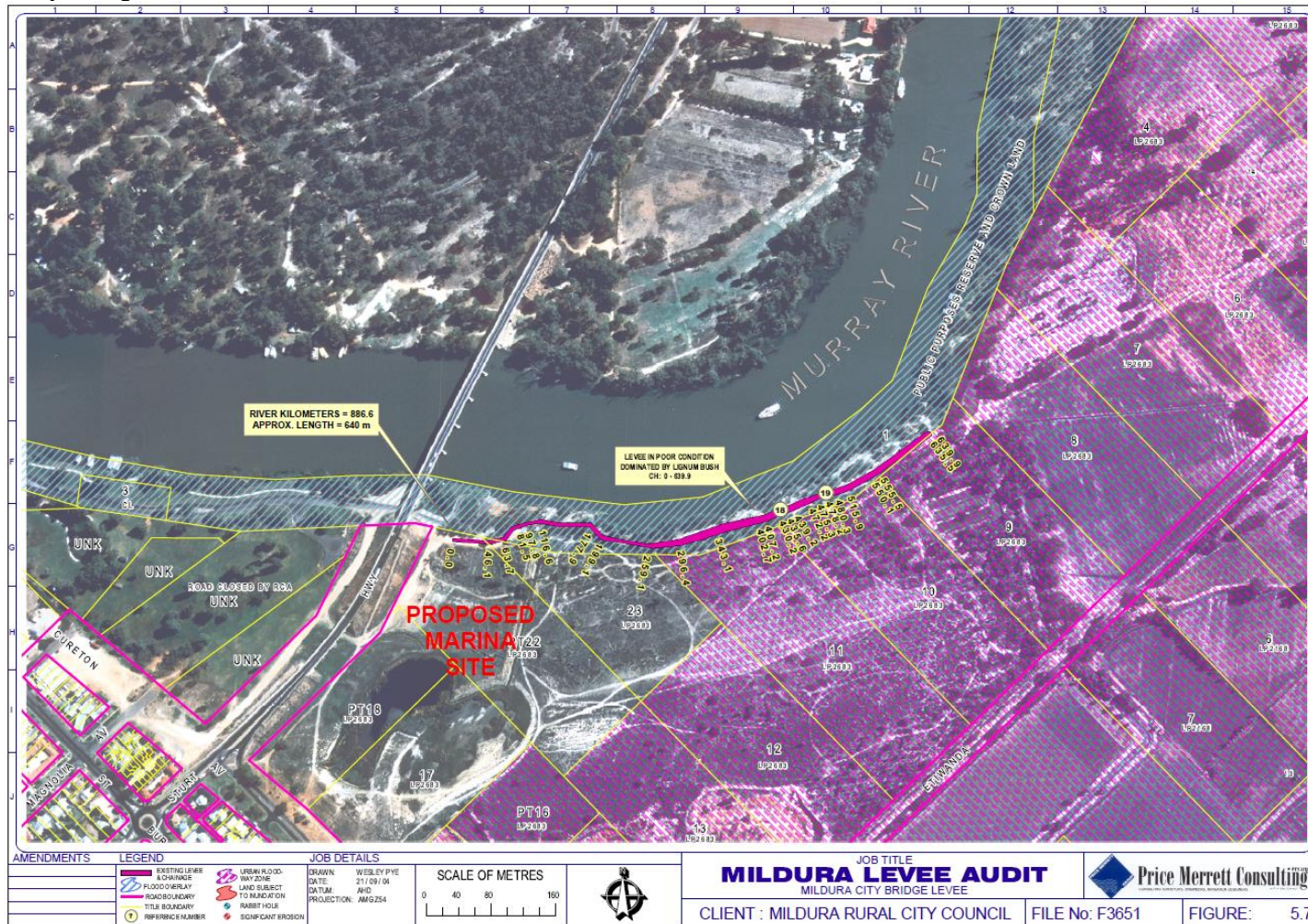
APPENDIX D 3 – MAPS OF STRUCTURAL MITIGATION MEASURES

Figure 7 Sewerage Treatment Works



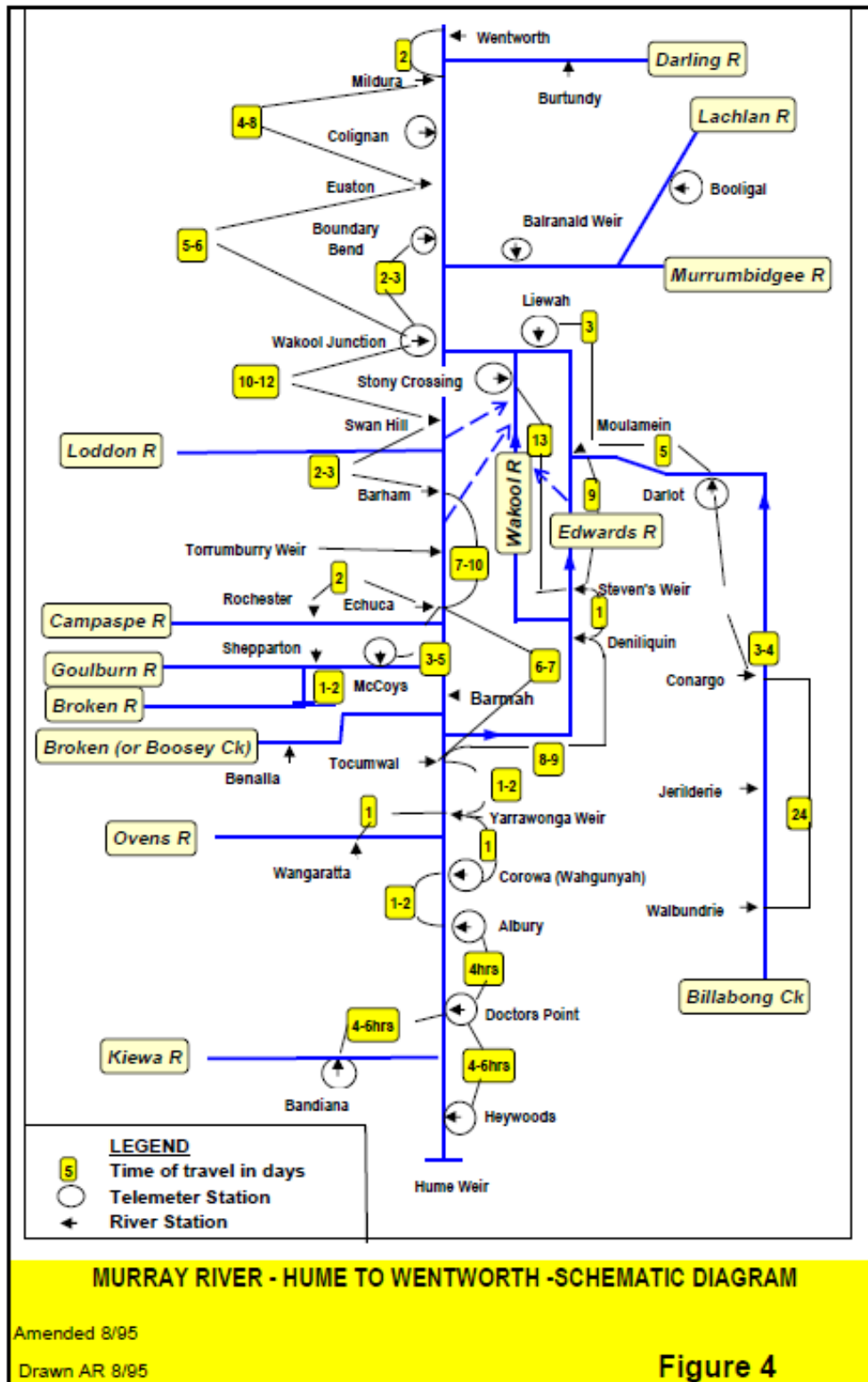
APPENDIX D 3 – MAPS OF STRUCTURAL MITIGATION MEASURES

Figure 8 George Chaffey Bridge



NOTE: the Proposed Marina Site indicated on the map above has now been completed, the levee in this area has been removed.

APPENDIX D 4 – MURRAY RIVER SCHEMATIC



APPENDIX E – SANDBAGS

This applies to the procurement, storage, distribution, use and disposal of sandbags during flood emergencies, primarily Riverine flood events. Sandbags may also be used in Flash Flood events, but due to the quick impact nature of these types of events they are of limited use. Distribution of sandbags will be done in accordance with VICSES policy and depending on the type and extent of the event and will be at the direction of; the local VICSES Unit, the appointed Divisional Commander, or the Incident Controller.

1. Use of sandbags

Sandbags can be used to block doorways, drains and other openings into properties as well as to weigh-down manhole covers, garden furniture and to block sinks, toilets and bath drains to prevent water backing up. They have proven to be successful in keeping water out for short periods of time.

Sandbagging is not always the most effective option and should be considered in the context of this Flood Emergency Plan which includes alternatives for managing flood risk. Other alternatives include moving possessions to higher places, securing objects so they do not float away and placing valuables in water tight containers. During a Flood / Storm event the Incident Controller and operational staff in the flood affected community will assess the overall risk to communities and allocate sandbag resources based on risk.

2. Responsibilities

2.1 VICSES responsibilities include:

- The management of the state-wide procurement and storage of sandbags for flood emergencies
- Providing sandbags to local areas for distribution based on requirements identified in the MFEP
- Identifying distribution arrangements in the MFEP
- Community education and awareness on sandbag management and safe use;
- Identifying critical infrastructure and community critical facilities in the MFEP; and
- Providing a support role in flood recovery.

2.2 Council responsibilities include:

- Providing a support role during flood response;
- Identifying community critical facilities at a municipal level;
- Procuring sandbags to protect council owned facilities including community critical facilities managed by council;
- Providing locations, plant and equipment, where available and capable, to support sandbagging operations as agreed in the MFEP; and
- Coordinating the clean-up and community recovery arrangements.

2.3 Community Critical Facility owners' responsibilities include:

- Working with VICSES to develop an effective flood mitigation plan for their property as part of the MFEP with a priority for permanent structures.

2.4 Other 'Response' agencies responsibilities include:

- Supporting VICSES in their response role.

2.5 Residential and commercial property owners' responsibilities include:

- Understanding their own flood risk
- Preparing an emergency plan for their home or business
- Procurement and storage of sandbags to protect their own property
- Filling and movement of sandbags to protect their property

- Seek advice from their local council regarding the removal of sandbags from their property, as part of the community recovery

3. Community and business education

VICSES has an established community education program to support community and business in responding to flood emergencies (see www.ses.vic.gov.au/prepare/floodsafe).

VICSES will use the existing community education tools and programs (such as the Local Flood Guides and the FloodSafe program) to promote:

Practical information on:

- The purpose, use and disposal of sandbags (see www.ses.vic.gov.au/prepare/floodsafe/floodsafe-resources/sandbag-reference-guide)
- Obtaining sandbags
- Safety considerations e.g. OHS, manual handling, safe use and disposal
- Alternative flood mitigation strategies to sandbagging
- Where to get information – Phone 1800 226 226 or visit <https://emergency.vic.gov.au/respond/>
- The responsibilities of critical infrastructure owners, businesses and private individuals to understand their flood risk and develop a flood plan

Key messages:

- Emergency response agencies will not always have the capacity to provide sandbags due to other competing priorities
- Businesses and individuals need to understand the flood risk to their property and, where appropriate, develop a Flood Emergency Plan
- Sandbagging is only one way of protecting properties against floodwater and not always the most effective option. Sandbagging should be considered in the context of a Flood Emergency Plan which considers alternatives for managing flood risk.

4. Procurement of sandbags

VICSES

VICSES will maintain a supply of sandbags to support the effective readiness and response to flood emergencies as identified in this MFEP.

The number of sandbags required at a State and regional level will be determined from information provided through the MFEP planning process. There may be occasions where the supply of sandbags is limited and priorities for distribution will need to be determined through local emergency management arrangements.

VICSES will maintain the current cross-border and mutual aid arrangements for flood emergencies. VICSES will also work with local councils to access the resource sharing arrangements established between councils during emergencies.

Council

Council will procure sandbags to protect council owned facilities including Community Critical Facilities managed by council

Residential and commercial property owners'

Sandbags may be obtained (purchased) from the following locations:

Bunnings Mildura - 639-665 Fifteenth Street 03 5018 5800

Sand may be obtained from local garden suppliers, and smaller 25kg bags from local hardware stores.

5. Storage of sandbags

VICSES

Sandbags will be stored by VICSES in appropriate locations across the municipality. VICSES will monitor the condition of all its sandbags for deterioration.

VICSES sandbags storage locations and initial quantities are as follows:

Mildura VICSES Local Headquarters (LHQ)	4000 bags (minimum)
Robinvale VICSES Local Headquarters (LHQ)	2000 bags (minimum)
Ouyen VICSES Local Headquarters (LHQ)	2000 bags (minimum)
Murrayville VICSES Local Headquarters (LHQ)	2000 bags (minimum)

Additional sandbag supplies are held at the North West (Loddon Mallee) VICSES Regional Offices, located in Bendigo & Swan Hill. These can be accessed for replenishment or additional requirements. Additional sandbags will be supplied to these locations in the lead up to a flood event.

Council

Sandbags may be stored at appropriate Council locations across the municipality. It is council's responsibility to monitor the condition of its sandbags.

6 Distribution of sandbags

Priorities

The Incident Controller may make sandbags and sand available for flood mitigation activities during declared flood emergencies.

Sandbags will be issued consistent with the Strategic Control Priorities within the State Flood Emergency Plan.

1. Protection of community essential Infrastructure and essential services that support community resilience.
2. Residential property owners identified in the potentially/affected area will as a general rule be provided a bundle of 20 to 25 empty sand bags arrangements will be put in place for sand to be placed at strategic locations for use by affected community members. Maps for distribution points are contained in Appendix F page 51
3. Protection of assets supporting economic production and individual livelihoods.
4. Protection of environmental and conservation values identified in the potential flood area.

Properties identified as being outside the potential flood area, will be referred to an alternative source of sandbags (e.g. local hardware store or sandbag supplier) by VICSES.

Distribution Points

In preparation for a significant flood emergency, VICSES will work with local councils and other agencies to identify appropriate locations for sandbag collection points. Location considerations will include access, safety, human resources and machinery requirements.

- Identified Sand and Sandbag distribution locations are: (note these locations are to be confirmed)
 1. Mildura Football oval Eleventh Street, Mildura;
 2. Irymple – Henshilwood Reserve Karadoc Avenue, Irymple;
 3. Redcliffs – Quandong Park, Erskine Ave Redcliffs;
 4. Merbein – Chaffey Park, River Ave Merbein;
 5. Graincorp silo car park, Carwarp; and
 6. Other locations may be identified as required.
- Distribution sites will be managed by VICSES and supported by council/groups/clubs/organisations who will use provided maps to track the distribution of these supplies to ensure that appropriate affected/potential affected residence will have access to these resources.

The Floodsafe Sandbag Quick Reference Guide;

<https://www.ses.vic.gov.au/documents/112015/136923/2019+-+sandbag+guide.pdf/0d2fa032-dfc6-f277-ea8a-2a0c3666d7c0>, provides guidance on filling, laying and the safe use of sandbags.

As part of the response arrangements, the Incident Controller will track the distribution of sandbags through the Incident Emergency Management Team (IEMT). This information will be provided to the recovery team as part of the transition from response to recovery.

Provision of sand

VICSES

VICSES has plans in place to acquire sand through its own supply arrangements and where necessary through the emergency management arrangements. Sand can be obtained from the following suppliers.

- Mildura Mini Mix and Garden Supplies – 03 5023 1383
- The Rocks Landscape Supplies 03 5023 7857
- Mildura Garden Supplies 0498 228 808

During a localised non declared flood event, sand will be procured by the local responding VICSES Units.

During a declared flood event, sand will be procured via the ICC.

Council

Council will have plans in place to acquire sand through its own supply arrangements

7 Disposal and relocation of used sandbags

Removal and disposal of sandbags used for flood mitigation shall be dealt with under the clean up and community recovery arrangements as outlined in the State Emergency Management Plan. The disposal of sandbags is a shared responsibility between different agencies.

The IC will provide information on sandbag locations to councils, to assist with clean-up. VICSES will continue to work with relevant agencies to develop protocols for the safe and environmentally responsible disposal of sandbags.

APPENDIX F – MAPS OF COMMUNITY COLLECTION LOCATIONS FOR SANDBAG & SAND



Note additional maps are to be included once locations are confirmed in discussions with council

APPENDIX G – LOCAL FLOOD INFORMATION

Local Flood Information

Note:

We are awaiting the results of the flood study currently being undertaken by the Mallee Catchment Management Authority. Once completed local flood information will be included as part of this Flood Plan and also available on the VICSES website.

Information guides to assist communities in how to prepare for and respond to flood and storm events can be found at: <https://www.ses.vic.gov.au/get-ready/your-local-flood-information>

APPENDIX H – FLOOD EMERGENCY PLAN CONTACT LIST

Confidential not for wide distribution