NSW STATE EMERGENCY SERVICE

Wagga Wagga City

Local Flood Emergency Sub Plan

FloodSafe

November 2020

To be reviewed no later than November 2025

WAGGA WAGGA CITY FLOOD EMERGENCY SUB PLAN

A Sub-Plan of the Wagga Wagga City Local Emergency Management Plan (EMPLAN)

Volume 1 of the Wagga Wagga City Local Flood Plan

AUTHORISATION

The Wagga Wagga City Flood Emergency Sub Plan is a sub plan of the Wagga Wagga City Local Emergency Management Plan (EMPLAN). It has been prepared in accordance with the provisions of the ***State Emergency Service Act 1989*** **(NSW)** and is endorsed by the Local Emergency Management Committee in accordance with the provisions of the ***State Emergency and Rescue Management Act 1989*** **(NSW)**.

Recommended

NSW SES Wagga Wagga Unit Commander

Date: 13-10-2021

Endorsed

Chair, Local Emergency Management Committee

Date: 13/10/2021

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DISTRIBUTION LIST

This Local Flood Plan is distributed through the NSW State Emergency Service in electronic format and is maintained on the NSW SES FloodSafe (www.floodsafe.com.au) website.

VERSION HISTORY

The following table lists all previously endorsed versions of this plan.

Description	Date
Wagga Wagga Local Flood Plan	January 2006

AMENDMENT LIST

Suggestions for amendments to this plan should be forwarded to:

The Zone Commander
Southern Zone
NSW State Emergency Service
206 Fernleigh Road
WAGGA WAGGA NSW 2650

Amendments promulgated in the amendments list below have been entered in this plan.

Amendment Number	Description	Updated by	Date

Document Issue: 31102020

LIST OF ABBREVIATIONS

The following abbreviations have been used in this plan:

AAR	After Action Review
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AIIMS	Australasian Inter-service Incident Management System
ARI	Average Recurrence Interval (Years)
ALERT	Automated Local Evaluation in Real Time
AWRC	Australian Water Resources Council
BOM	Australian Government Bureau of Meteorology
CBRN	Chemical, Biological, Radiation or Nuclear
DCF	Dam Crest Flood
DPIE	Department Planning, Industry and Environment (formerly Office of Environment and Heritage)
DSNSW	Dam Safety NSW
DSEP	Dam Safety Emergency Plan
DVR	Disaster Victim Registration
EMPLAN	Emergency Management Plan
FRNSW	Fire and Rescue NSW
GIS	Geographic Information System
GRN	Government Radio Network
IAP	Incident Action Plan
ICC	Incident Control Centre
IFF	Imminent Failure Flood
LEMC	Local Emergency Management Committee
LEOCON	Local Emergency Operations Controller

LO	Liaison Officer
LGA	Local Government Area
MHL	Manly Hydraulics Laboratory
NSW RFS	New South Wales Rural Fire Service
NSW SES	NSW State Emergency Service
NSW VRA	Volunteer Rescue Association
PMF	Probable Maximum Flood
PMR	Private Mobile Radio
PMP	Probable Maximum Precipitation
PIIC	Public Information and Inquiry Centre
REMC	Region Emergency Management Committee
REMO	Regional Emergency Management Officer
REOCON	Region Emergency Operations Controller
RMS	Roads and Maritime Services, Transport for NSW
SEOCON	State Emergency Operations Controller
SERCON	State Emergency Recovery Controller
SEWS	Standard Emergency Warning Signal
SITREPs	Situation Reports
VRA	NSW Volunteer Rescue Association
WNSW	WaterNSW

GLOSSARY

Annual Exceedance Probability (AEP). The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood level (height) has an AEP of 5%, there is a 5% chance (that is, a one-in-20 chance) of such a level or higher occurring in any one year (see also Average Recurrence Interval).

Assistance Animal. A guide dog, a hearing assistance dog or any other animal trained to assist a person to alleviate the effect of a disability (Refer to Section 9 of the Disability Discrimination Act 1992).

Assembly Area. An assembly area is a designated location used for the assembly of emergency-affected persons before they move to temporary accommodation or a nominated evacuation centre. As such these areas do not provide welfare assistance nor are they used for long term sheltering or provision of meals. An assembly area may also be a prearranged, strategically placed area, where support response personnel, vehicles and other equipment can be held in readiness for use during an emergency.

Australian Height Datum (AHD). A common national surface level datum approximately corresponding to mean sea level.

Average Recurrence Interval (ARI). The long-term **average** number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods reaching a height as great as, or greater than, the 20 year ARI flood event will occur **on average** once every 20 years.

Catchment (River Basin). The land area draining through the mainstream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.

Dambreak Study. A Dambreak Study is undertaken to determine the likely downstream inundation areas in case of a dam failure. Modelling is undertaken for a range of dam breach possibilities and design floods. The dambreak study includes information such as the extent of flooding, flood travel times and flood water velocities. The study can assist dam owners, regulators, and emergency agencies in the preparations of evacuation plans, dam break and other flood warning systems, and hazard classification of affected areas.

Dam Failure. The uncontrolled release of a water storage. The failure may consist of the collapse of the dam or some part of it, or excessive seepage or discharges. The most likely causes of dam failure are;

- **Flood Induced Dam Failure**: Dam failure caused by flood, either due to overtopping erosion or by subsequent structural failure.
- **Sunny Day Dam Failure**: Dam Failure as a result of factors other than flood i.e. other than flood flow into the reservoir. Causes of "Sunny Day" dam failure can include internal erosion, landslide, piping, earthquake or sabotage.

Dam Safety Emergency Plan (DSEP). A DSEP outlines the required actions of owners and their personnel at dams in response to a range of possible emergency situations. Dams Safety NSW requires a quality controlled DSEP, with associated dambreak warning procedures to be prepared for prescribed dams where persons may be at risk downstream, if the dam failed.

Declared Dam. "Declared" dams are those described in Part 3 of the Dams Safety Act 2015 No 26 (NSW). Dams Safety NSW will “declare” dams that have a potential to threaten downstream life, or cause major property, environmental or public welfare damage.

Design Flood (or Flood Standard). A flood of specified magnitude that is adopted for planning purposes. Selections should be based on an understanding of flood behaviour and the associated flood risk, and take account of social, economic and environmental considerations. There may be several design floods for an individual area.

Emergency Alert. The national telephone warning system used by emergency services to send voice messages to landlines and text messages to mobile phones within a defined area, about likely or actual emergencies.

EMPLAN (Emergency Management Plan). The Plan established in accordance with the provisions in the *State Emergency Rescue Management Act 1989*. The object of an EMPLAN is to ensure the coordinated response by all agencies having responsibilities and functions in emergencies.

Essential Services. Those services often provided by local government authorities that are considered essential to the life of organised communities. Such services include power, lighting, water, gas, sewerage and sanitation clearance.

Evacuation. The temporary movement of people from a dangerous or potentially dangerous place to a safe location, and their eventual return. It is a safety strategy which uses distance to separate people from the danger created by the hazard.

Evacuation Order. Notification to the community, authorised by the NSW SES, when the intent of an Incident Controller is to instruct a community to immediately evacuate in response to an imminent threat.

Evacuation Warning. Notification to the community, authorised by the NSW SES, when the intent of an Incident Controller is to warn a community of the need to prepare for a possible evacuation.

Flash Flooding. Flooding which is sudden and often unexpected because it is caused by sudden local or nearby heavy rainfall. It is sometimes defined as flooding which occurs within six hours of the rain that causes it.

Flood. Relatively high water level which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences, including Tsunami.

Flood Classifications. Locally defined flood levels used in flood warnings to give an indication of the severity of flooding (minor, moderate or major) expected. These levels are used by the State Emergency Service and the Australian Government Bureau of Meteorology in flood bulletins and flood warnings.

Flood Intelligence. The product of collecting, collating, analysing and interpreting flood-related data to produce meaningful information (intelligence) to allow for the timely preparation, planning and warning for and response to a flood.

Flood Fringe. The remaining area of flood prone land after floodway and flood storage have been defined.

Flood Liable Land (also referred to as Flood Prone Land). Land susceptible to flooding by the Probable Maximum Flood (PMF) event. This term also describes the maximum extent of a **floodplain** which is an area of a river valley, adjacent to the river channel, which is subject to inundation in floods up to this event.

Flood of Record. Maximum observed historical flood.

Floodplain. Area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land.

Floodplain Management Plan. A plan developed in accordance with the principles and guidelines in the New South Wales Floodplain Development Manual. Such a plan usually includes both written and diagrammatic information describing how particular areas of flood prone land can be used and managed to achieve defined objectives.

Flood Plan. A response strategy plan that deals specifically with flooding and is a Sub-Plan of an Emergency Management Plan. Flood plans describe agreed roles, responsibilities, functions, strategies and management arrangements for the

conduct of flood operations and for preparing for them. A flood plan contains information and arrangements for all floods whereas an IAP is for a specific flood/event.

Flood Rescue. The rescue or retrieval of persons trapped by floodwaters.

Flood Storage Areas. Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation.

Floodway. An area where a significant volume of water flows during floods. Such areas are often aligned with obvious naturally defined channels and are areas that, if partially blocked, would cause a significant redistribution of flood flow which may in turn adversely affect other areas. They are often, but not necessarily, the areas of deeper flow or the areas where higher velocities occur.

Flood Watch. A Flood Watch is a notification of the potential for a flood to occur as a result of a developing weather situation and consists of short generalised statements about the developing weather including forecast rainfall totals, description of catchment conditions and indicates streams at risk. The Bureau will also attempt to estimate the magnitude of likely flooding in terms of the adopted flood classifications. Flood Watches are normally issued 24 to 36 hours in advance of likely flooding. Flood watches are issued on a catchment wide basis.

Flood Warning. A Flood Warning is a gauge specific forecast of actual or imminent flooding. Flood Warnings specify the river valley, the locations expected to be flooded, the likely severity of flooding and when it will occur.

Functional Area. A category of services involved in the preparations for an emergency, including the following:

- Agriculture and Animal Services;
- Energy and Utility Services;
- Engineering Services;
- Environmental Services;
- Health Services;
- Public Information Services;
- Telecommunication Services;
- Transport Services; and
- Welfare Services.

Geographic Information System (GIS). A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analysing, and displaying all forms of geographically referenced information.

Incident Controller. The individual responsible for the management of all incident control activities across a whole incident.

Incident Action Plan (IAP). An action plan for managing a specific event. Information from the Local Flood Plan is used to develop the flood IAP.

Indirect Effect. Indirect effects are generally a consequence of infrastructure damage or interruption of services and can affect communities distant from the actual flood footprint i.e. floodplain. Indirect effects can also refer to indirect losses due to disruption of economic activity, both in areas which are inundated or isolated. Indirect effects are one of the three primary sources of risk in the context of flooding (the other two are inundation and isolation).

Inundation. See definition for Flood.

Isolation. Properties and/or communities where flooding cuts access to essential services or means of supply. Isolation is one of the three primary sources of risk in the context of flooding (the other two are inundation and indirect effects).

Liaison Officer (LO). A person nominated or appointed by an organisation or functional area, to represent that organisation or functional area at a control centre, emergency operations centre, or coordination centre. A liaison officer maintains communications with and conveys directions/requests to their organisation or functional area, and provides advice on the status, capabilities, actions and requirements of their organisation or functional area.

Local Emergency Management Committee (LEMC). The LEMC is responsible for the preparation of plans in relation to the prevention of, preparation for, response to and recovery from emergencies in the local government area for which it is constituted. In the exercise of its functions, the Committee is responsible to the Region Emergency Management Committee (REMC) and may communicate with the REMC for matters associated with Functional Areas that are not represented at the local Level.

Local Overland Flooding. Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.

Major Flooding. Flooding which causes inundation of extensive rural areas, with properties, villages and towns isolated and/or appreciable urban areas flooded.

Minor Flooding. Flooding which causes inconvenience such as closing of minor roads and the submergence of low-level bridges. The lower limit of this class of flooding, on the reference gauge, is the initial flood level at which landholders and/or townspeople begin to be affected in a significant manner that necessitates the issuing of a public flood warning by the Australian Government Bureau of Meteorology.

Moderate Flooding. Flooding which inundates low-lying areas, requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered.

Moveable Dwellings. Any tent, or any caravan or other van or other portable device (whether on wheels or not), used for human habitation; or a manufactured home; or any conveyance, structure or thing of a class or description prescribed by the (Local Government) regulations (4).

Operational Area Commander. The individual commanding an operational area. An Operational Area Command may be established for an area with multiple incident management teams functioning and can cross local government and NSW SES Zone boundaries.

Peak Height. The highest level reached, at a nominated gauging station, during a flood event.

Probable Maximum Flood (PMF). The largest flood that could conceivably be expected to occur at a particular location, usually estimated from probable maximum precipitation. The PMF defines the maximum extent of flood prone land, that is, the floodplain. It is difficult to define a meaningful Annual Exceedance Probability for the PMF, but it is commonly assumed to be of the order of 10^4 to 10^7 (once in 10,000 to 10,000,000 years).

Riverine Flooding. Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam. Riverine flooding generally excludes watercourses constructed with pipes or artificial channels considered as stormwater channels.

Runoff. The amount of rainfall which ends up as stream flow, also known as 'rainfall excess', since it is the amount remaining after accounting for other processes such as evaporation and infiltration.

Stage Height. A level reached, at a nominated gauging station, during the development of a flood event.

Stream Gauging Station. A place on a river or stream at which the stage height is routinely measured, either daily or continuously, and where the discharge is measured on a

regular basis so as to develop a relationship between stage and discharge or rating curve.

Spontaneous Volunteers. Spontaneous Volunteers are community members who mobilise during periods of significant flooding or severe storms to support NSW communities. Spontaneous Volunteers are coordinated by the NSW SES in a range of roles that generally do not require training or previous experience, and there is no expectation of an ongoing volunteer commitment. Spontaneous volunteers provide the NSW SES with additional capacity to support preparedness, response and recovery operations and/or activities.

Total Flood Warning System. A flood warning system is made up of components which must be integrated if the system is to operate effectively. Components of the total flood warning system include monitoring rainfall and river flows, prediction, interpretation of the likely impacts, construction and dissemination of warning messages, response by agencies and community members, and review of the warning system after flood events.

PART 1 - INTRODUCTION

1.1 PURPOSE

1.1.1 This plan covers preparedness measures, the conduct of response operations and the coordination of immediate recovery measures from all levels of flooding within the Wagga Wagga City Local Government Area (LGA). It covers operations for all levels of flooding within the Council area.

1.2 AUTHORITY

1.2.1 This plan is issued under the authority of the *State Emergency and Rescue Management Act 1989* (NSW) and the *State Emergency Service Act 1989* (NSW). It has been approved by the NSW SES Wagga Wagga Unit Commander and the NSW SES Southern Zone Commander as a NSW SES Plan and endorsed by the Wagga Wagga City Local Emergency Management Committee (LEMC) as a sub plan of the Local EMPLAN.

1.3 AREA COVERED BY THE PLAN

1.3.1 The area covered by the plan is the Wagga Wagga City LGA which includes: the major urban centre of Wagga Wagga, the towns of Tarcutta, Forest Hill and Uranquinty, the villages of Humula, Gumly Gumly, Ladysmith, Mangoplah, Collingullie, Galore, Oura and Currawarna and intervening rural areas.

1.3.2 The Council area includes the Murrumbidgee River from Eringoarrah to Berembed Weir. It also includes tributary creeks and streams entering the river between these locations. These are Tarcutta, Kyeamba, Houlaghans, Sandy, Bullenbung and Beaver / Old Man Creeks.

1.3.3 The Council area and its principal rivers and creeks are shown in Attachment 3.

1.3.4 The Council area is in the NSW SES Southern Zone and for emergency management purposes is part of the Riverina Murray Emergency Management Region.

1.4 DESCRIPTION OF FLOODING AND ITS EFFECTS

1.4.1 The NSW SES maintains information on the nature of flooding and effects of flooding on the community in the Wagga Wagga City LGA.

1.5 RESPONSIBILITIES

1.5.1 The general responsibilities of Emergency Service Organisations and Supporting Services (functional areas) are listed in the State Emergency Management Plan (EMPLAN). Some specific responsibilities are expanded

upon in the following paragraphs. The extent of their implementation will depend on the severity of the flooding.

1.5.2 **NSW SES Wagga Wagga Unit Commander:** The NSW SES Wagga Wagga Unit Commander is responsible for dealing with floods as detailed in the NSW State Flood Plan, and will;

Preparedness

a. Maintain a Local Headquarters at 208 Fernleigh Rd, Wagga Wagga in accordance with current NSW SES Policies and Procedures.

b. Ensure that NSW SES members are trained to undertake response operations in accordance with current NSW SES Policies and Procedures.

c. Coordinate the development and operation of a flood warning service for the community.

d. Participate in floodplain risk management initiatives organised by the Wagga Wagga City Council.

e. Coordinate a community engagement and capability building program regarding local flood issues and associated risks to assist communities in building resilience to floods.

f. Identify and monitor communities at risk of flooding.

g. Ensure that the currency of this plan is maintained.

Response

h. NSW SES will appoint an appropriate **Incident Controller** in accordance with current NSW SES Policies and Procedures to undertake flood response roles. The Incident Controller will;

- Control flood and storm response operations. This includes;
  - Directing the activities of the NSW SES Units operating within the Council area.
  - Coordinating the activities of supporting agencies and organisations and ensuring that liaison is established with them.
  - Contribute to preparation of a Zone Incident Action Plan (IAP).
- Coordinate the provision of information services in relation to;
  - Flood heights and flood behaviour.
  - Road conditions and closures.
  - Advice on methods of limiting property damage.
  - Confirmation of Evacuation Warnings and Evacuation Orders.
- Direct the conduct of flood rescue operations.
- Coordinate the provision of the evacuation of people and/or communities.

- Provide immediate welfare support for evacuated people.
- Coordinate the provision of emergency food and medical supplies to isolated people and/or communities.
- Manage and support Spontaneous Volunteers.
- Coordinate operations to assist the community to protect property. This may include;
  - Arranging resources for sandbagging operations.
  - Raising and moving household furniture.
  - Raising or moving commercial stock and equipment.
- Assist Wagga Wagga City Council to organise temporary repairs or improvements to levees.
- Where possible, arrange for support (for example, accommodation and meals) for emergency service organisation members and volunteers assisting them.
- Ensure that the managers of Caravan Parks are advised of flood warnings and the details of any Evacuation Order.
- If NSW SES resources are available, assist with emergency fodder supply operations conducted by Agriculture and Animal Services.
- If NSW SES resources are available, assist the NSW Police Force, RMS and Council with road closure and traffic control operations.
- Exercise financial delegations relating to the use of Emergency Orders following current NSW SES Policies and Procedures.
- Coordinate the collection of flood information for development of intelligence.
- Submit Situation Reports to the NSW SES Southern Zone Headquarters and agencies assisting within the Council area. These should contain information on;
  - Road conditions and closures.
  - Current flood behaviour.
  - Current operational activities.
  - Likely future flood behaviour.
  - Likely future operational activities.
  - Probable resource needs.
- Keep the Local Emergency Operations Controller advised of the flood situation and the operational response.
- Issue the 'All Clear' when flood operations have been completed.

Recovery

i. Ensure that appropriate After Action Reviews (AAR) are held after floods.

j. NSW SES will provide appropriate representation to the Recovery Committee for the duration of the response phase of an event and as agreed during the recovery phase.

1.5.3 **NSW SES Wagga Wagga Unit Members:**

a. Carry out flood response tasks. These may include;

- The management of the NSW SES Wagga Wagga Unit Incident Control, Dvision or Sector Command Centre.
- Assist in the collection of flood information for the development of intelligence.
- Flood rescue.
- Evacuation.
- Providing immediate welfare for evacuated people.
- Delivery of warnings and information.
- Resupply.
- Assist Council with monitoring of levees if resources permit.
- Sandbagging.
- Raising and/or moving household furniture and commercial stock.
- Animal rescue.
- Assisting Council in repairing or improving levees.
- Assisting with road closure and traffic control operations.
- Assisting with emergency fodder supply operations.

b. Assist with flood and storm preparedness activities.

c. Undertake training in flood and storm response operations.

1.5.4 **Wagga Wagga City Local Emergency Operations Controller (LEOCON):**

a. Monitor flood operations.

b. Request and coordinate support to the NSW SES Incident Controller if requested to do so.

1.5.5 **Wagga Wagga City Local Emergency Management Officer (LEMO):**

a. Provide executive support to the LEMC and LEOCON in accordance with the Wagga Wagga City Local Emergency Management Plan.

b. At the request of NSW SES,, advise appropriate agencies and officers of the start of response operations.

1.5.6 **Wagga Wagga City Council:**

Preparedness

a. Develop and implement Floodplain Risk Management Plans in accordance with the NSW Government's Flood Prone Land Policy and the Floodplain Development Manual.

b. Establish and maintain Floodplain Risk Management Committees and ensure that key agencies are represented on such committees.

c. Provide Levee Studies, Flood Studies and Floodplain Management studies to the NSW SES.

d. Inspect and maintain all levees.

e. Carry out emergency repairs to levees if required.

f. Maintain a plant and equipment resource list for the Council area.

g. Work with NSW SES on the development and implementation of a community engagement and capability building program.

Response

h. At the request of the NSW SES Incident Controller, deploy personnel and resources for flood related activities.

i. Close and reopen council roads (and other roads nominated by agreement with the RMS) and advise the NSW SES Incident Controller and the Police.

j. Provide information on the status of roads.

k. Provide regular information to the NSW SES about the status and integrity of all levees.

l. Carry out operations, surveillance and monitoring of Council flood infrastructure as per the Wagga Wagga City Council Response Plan.

m. Provide either sandbagging equipment or filled sandbags to urban and village areas in which flooding is expected.

n. Provide back-up radio communications.

o. In the event of evacuations, assist Agriculture and Animal Services Functional Area with making facilities available for the domestic pets and companion animals of evacuees.

p. Provide advice to the NSW SES and the Health Services Functional Area during floods about key council managed infrastructure such as sewerage treatment and water supply.

q. Advise the NSW Environmental Protection Authority (EPA) of any sewage overflow caused by flooding.

r. Work with the NSW SES and Department of Planning, Industry and Environment (DPIE) to collect flood related data during and after flood events.

Recovery

s. Provide for the management of health hazards associated with flooding. This includes removing debris and waste post flooding. Note: Council staff cannot enter Private Property to collect debris without the express permission from the Council Director of Operations. Council staff can remove waste material and debris from Council property which includes the nature strip.

t. Assist with ensuring that premises that have been inundated are fit and safe for reoccupation and assess any need for demolition.

u. Assist with identifying and procurement of suitable facilities for the safe and secure storage of evacuees' furniture as required.

v. Provide assistance, advice and services to NSW Government in accordance with the NSW State Recovery Plan.

1.5.7 **Agriculture and Animal Services Functional Area:**

a. When requested by NSW SES;

- Activate the Agriculture and Animal Services Supporting Plan as required and coordinate the provision of required services which may include;
  - Co-ordinate response for all animals including pets, livestock and wildlife.
  - Supply and delivery of emergency fodder.
  - Emergency water replacement in certain circumstances.
  - Coordinate the management of livestock and farm animals.
  - Advice on dealing with dead and injured farm animals.
  - Financial, welfare and damage assessment assistance to flood affected farmers.
  - Co-ordinate the establishment of animal shelter facilities for the domestic pets and companion animals of evacuees.

1.5.8 **Australian Government Bureau of Meteorology (BOM):**

a. Provide Flood Watches for the Murrumbidgee River Basin.

b. Provide Flood Warnings, incorporating height-time predictions, for Gundagai (AWRC No. 410004) and Wagga Wagga (AWRC No. 410001).

c. Provide Severe Weather Warnings when flash flooding is likely to occur as a result of heavy rainfall.

1.5.9 **Caravan Park Owners and or Managers:**

a. Prepare a Flood Emergency Plan for the Caravan Park.

b. Ensure that owners and occupiers of movable dwellings are aware that the Caravan Park is flood liable by;

- Providing a written notice to occupiers taking up residence. The notice will indicate that the Caravan Park is liable to flooding and designate the location of flood liable land within the park.
- Displaying this notice and the emergency arrangements for the Caravan Park prominently in the park.

c. Ensure that owners and occupiers of movable dwellings are aware that if they are expecting to be absent for extended periods, they should:

- Provide the Management of the Caravan Park with a contact address and telephone number in case of an emergency.
- Leave any movable dwelling in a condition allowing it to be relocated in an emergency (i.e. should ensure that the wheels, axles and draw bar of the caravans are not removed, and are maintained in proper working order).

d. Ensure that occupiers are informed of Flood Information. At this time, occupiers should be advised to;

- Ensure that they have spare batteries for their radios, as part of their Emergency Kit.
- Listen to a local radio station for updated flood information.
- Prepare for evacuation and movable dwelling relocation.

e. Ensure that owners and occupiers of caravans are aware of what they must do to facilitate evacuation and movable dwelling relocation prior to flooding occurring.

f. Coordinate the evacuation of people and the relocation of movable dwellings when floods are rising and their return when flood waters have subsided. Movable dwellings will be relocated back to the Caravan Park(s) by owners or by vehicles and drivers arranged by park management.

g. Secure any movable dwellings that are not able to be relocated to prevent floatation.

h. Inform the NSW SES of the progress of evacuation and/or movable dwellings relocation operations and of any need for assistance in the conduct of these tasks.

1.5.10 **Child Care Centres and Preschools:**

a. Childcare Centres are to be contacted by the NSW SES in the event of possible flooding or isolation.

b. When notified the Child Care Centres and Preschools should;

- Liaise with the NSW SES and arrange for the early release of children whose travel arrangements are likely to be disrupted by flooding and/or road closures.

- Assist with coordinating the evacuation of Preschools and Child Care Centres.

1.5.11 **Community Members:**

Preparedness

a. Understanding the potential risk and impact of flooding;

b. Preparing homes and property to reduce the impact of flooding;

c. Understanding warnings and other triggers for action and the safest actions to take in a flood;

d. Households, institutions and businesses developing plans to manage flood risks, sharing and practicing this with family, friends, employees and neighbours;

e. Having an Emergency Kit;

f. Being involved in local emergency planning processes.

1.5.12 **Department of Planning, Industry and Environment:**

a. Assist the NSW SES gain access to relevant studies regarding flooding, including Flood Studies and Floodplain Risk Management Studies undertaken under the Floodplain Management Program.

b. Assist the NSW SES in obtaining required outputs from Flood Studies and Floodplain Risk Management Studies under the Floodplain Management Program which assist the NSW SES in effective emergency response planning and incorporating information into the NSW Floods Database.

c. Coordinate the collection of post event flood data, in consultation with the NSW SES and or Council.

d. Provide specialist advice to the NSW SES on flood related matters to the identification of flood risks.

e. Provide data to the Bureau of Meteorology and NSW SES real-time or near real-time access to river height gauges and height data for the development of official flood warnings (through a contract with MHL as described in the Response section of this plan).

f. Assist the NSW SES in the exercising of this Flood Sub Plan.

g. **Parks and Wildlife Service:**

- Close and reopen Parks and Wildlife Service roads when affected by flood waters and advise the NSW SES of its status.
- Facilitate the safe reliable access of emergency resources on National Parks and Wildlife Service managed roads.
- Assist the NSW SES with identification of road infrastructure at risk of flooding.
- Manage traffic on Parks and Wildlife Service roads.

- Assist the NSW SES with the communication of warnings and information provision to the public through variable message signs and other appropriate means.

1.5.13 **Energy and Utility Services Functional Area:**

a. When requested by NSW SES;

- Implement the Energy and Utilities Services Functional Area Supporting Plan.
- Where required, coordinate energy and utility services emergency management planning, preparation, response and recovery, including the restoration of services following a flood event.
- Coordinate advice to the NSW SES of any need to disconnect electricity, gas, water or wastewater services.
- Assist the NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.
- Identify interdependencies between flooding and utility services due to secondary impacts of flooding and advise the NSW SES.
- Assist the NSW SES with advisory notices relating to hazards from utility services during flooding.
- Coordinate with utilities on restoration of services, including advisory notices relating to estimated time for restoration and mandatory safety checks prior to reconnection. Advise the NSW SES and the relevant recovery committee and coordinator of the timetable for restoration.

b. Local Utility Service Distribution Providers (electricity, gas, water, waste water):

- Provide advice to the NSW SES Incident Controller of any need to disconnect power/gas/water/wastewater supplies or of any timetable for reconnection.
- Advise the NSW SES of any hazards from utility services during flooding.
- Advise the public with regard to electrical hazards during flooding and to the availability or otherwise of the electricity supply.
- Clear or make safe any hazard caused by power lines or electricity distribution equipment.
- Reconnect customers' electrical/ gas/ water/wastewater installations, when certified safe to do so and as conditions allow.
- Assist the NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.

1.5.14 **Engineering Services Functional Area:**

a. When requested by NSW SES;

- Provide engineering advice regarding the integrity of damaged structures.
- Assist the NSW SES with damage assessment.
- Acquire and/or provide specialist technical engineering expertise.
- Assist the NSW SES and Council with the assessment and operation of flood protection levees when requested.
- Assist with property protection, including the construction or repair of levees.
- Coordinate the restoration of critical public facilities.

b. When requested by the Recovery Coordinator:

- Establish Recovery Centres by the procurement and fit-out of suitable properties.

1.5.15 **Environmental Services Functional Area:**

a. When requested by NSW SES;

- Implement the Environmental Services Functional Area (Enviroplan) Supporting Plan if required.

1.5.16 **Forestry Corporation of NSW:**

a. Close and evacuate at risk camping grounds in State Forest managed areas.

b. Close and reopen Forestry Corporation of NSW roads when affected by flood waters and advise the NSW SES of its status.

c. Facilitate the safe reliable access of emergency resources on Forestry Corporation managed roads.

d. Assist the NSW SES with identification of road infrastructure at risk of flooding.

e. Manage traffic on Forestry Corporation roads.

f. Assist the NSW SES with the communication of warnings and information provision to the public through variable message signs and other appropriate means.

1.5.17 **Health Services Functional Area:**

a. When requested by NSW SES;

- Activate Healthplan if required.
- Ensure that appropriate business continuity plans are developed for essential health infrastructure and are activated during floods.
- Provide medical support to the NSW SES.
- Establish health surveillance in affected areas.

- Assess potential public health risks that either acutely endanger the health of human populations or are thought to have longer term consequences.
- Provide environmental health advice.
- Provide public health warnings and advice to affected communities.
- Provide psychological counselling support to the community and emergency response workers impacted, via NSW Health Mental Health Division.
- Assist the NSW SES with the warning and coordination of evacuation of public hospitals, private hospitals and residential aged care facilities.
- Undertake the assessment of vulnerable members of the community for mental health and drug and alcohol dependant persons, dialysis, community health clients and oxygen dependant persons in the community, known to the health service.

1.5.18 **John Holland:**

a. Will close and reopen railway lines affected by flood waters and advise the NSW SES. Note: The Australian Rail Track Corporation (ARTC) operates and manages the main Sydney to Melbourne line.

1.5.19 **Murrumbidgee Region Transport Services Functional Area Coordinator (TSFAC):**

a. The TSFAC will assist NSW SES, Emergency Services and other functional areas through the provision of traffic and transport operations as consistent with the roles of Transport organisations, including;

- The movement of emergency equipment and personnel.
- The movement of emergency supplies and goods, including water, fuel and food.
- The evacuation of people and animals.
- Assistance for medical transport.
- Transportation of animals and infectious material/dangerous goods.
- Maintaining and operating a transport route advisory service to the NSW SES, emergency services organisations and other Functional Areas and members of the community.
- Coordinate the provision of traffic and transport operations as consistent with the roles of Transport organisations.

1.5.20 **NSW Ambulance:**

a. Assist with the evacuation of at risk communities (in particular elderly and/or infirm people).

b. Deploy ambulance resources to appropriate locations if access is expected to be lost.

c. Assist the NSW SES with flood rescue operations.

1.5.21 **Fire and Rescue NSW, Wagga Wagga and Turvey Park:**

a. FRNSW responsibilities are primarily confined to the FRNSW Fire District. Any deployment of FRNSW resources to assist NSW SES in flood events rests with the respective FRNSW Commander which must be a Senior Officer.

b. The FRNSW Commander will assess the capability of FRNSW to assist NSW SES in the following tasks:

- Assist the NSW SES with the warning and/or evacuation of at risk communities.
- Assist the NSW SES with the monitoring / reconnaissance of flood prone areas.
- Assist the NSW SES with the resupply of isolated communities and/or properties.
- Assist the NSW SES with property protection tasks including sandbagging.
- Provide resources for pumping flood water out of buildings and from low-lying areas.
- Assist with clean-up operations, including the hosing out of flood affected properties.
- Coordinate the deployment of fire resources to communities within Fire and Rescue NSW Fire Districts if access is expected to be lost in consultation with the NSW SES.

c. FRNSW will use its best endeavours to deploy appliances and or resources into locations where access is expected to be lost.

d. NSW SES may request additional resources from FRNSW through the NSW SES State Command Centre for deployment to an area of operations under the provisions of the NSW State Flood Plan.

1.5.22 **NSW SES Flood Warning Network: Oura, Mangoplah, Flowerdale, Gumly Gumly, Ladysmith, Uranquinty, Collingullie, Currawarna and Galore:**

a. Provide flood information to the NSW SES Incident Controller.

b. Distribute flood warnings and flood information provided by the NSW SES Incident Controller.

1.5.23 **NSW Police Force, Wagga Wagga (Riverina Police District):**

a. Assist the NSW SES with the delivery of Evacuation Warnings and Evacuation Orders.

b. Assist the NSW SES with the conduct of evacuation operations.

c. Conduct road and traffic control operations in conjunction with council and/or RMS.

d. Coordinate the registration of evacuees.

e. Secure evacuated areas.

1.5.24 **NSW Rural Fire Service (RFS Riverina Zone):**

a. Provide personnel in rural areas and villages to;

- Inform the NSW SES Incident Controller about flood conditions and response needs in their own communities, and
- Disseminate flood information.

b. Provide personnel and high-clearance vehicles for flood related activities.

c. Assist the NSW SES with the delivery of Evacuation Warnings and Evacuation Orders.

d. Assist the NSW SES with the conduct of evacuations.

e. Provide equipment for pumping flood water out of buildings and from low-lying areas.

f. Assist with the removal of caravans.

g. Provide back-up radio communications.

h. Assist with clean-up operations, including the hosing of flood affected properties.

i. Deploy fire resources to appropriate locations if access is expected to be lost.

j. NSW SES may request additional resources from NSW RFS through the NSW SES State Command Centre for deployment to an area of operations under the provisions of the NSW State Flood Plan.

1.5.25 **NSW TrainLink (Transport for NSW):**

a. Operate NSW regional, interstate and urban rail services through the Wagga Wagga City including the management of railway services affected by flood waters and advise the NSW SES.

b. Assist the NSW SES with the movement or evacuation of people during flood response operations if required.

c. Convey flood information and flood warnings to passengers and travellers in NSW.

d. Cooperate with, and assist the NSW SES Incident Controller in relation to public safety during flood emergencies.

e. Cooperate with the Murrumbidgee Region Transport Services Functional Area Coordinator.

1.5.26 **NSW Volunteer Rescue Association Inc. (VRA), Wagga Wagga Rescue Squad:**

a. Assist the NSW SES Wagga Wagga Unit with flood response operations, where equipment and training are suitable.

1.5.27 **Owners of Declared Dams within or upstream of Wagga Wagga City**

Dam	Owner
Talbingo Dam	Snowy Hydro Ltd.
Blowering Dam	WaterNSW

a. Maintain and operate the Dam Failure Warning System for their Dam(s).

b. Contribute to the development and implementation of community engagement and capacity building programs on flooding.

c. Consult with NSW SES on the determination of dam failure alert levels and notification arrangements when developing Dam Safety Emergency Plans.

d. Maintain a Dam Safety Emergency Plan and provide copies to the NSW SES.

e. Provide information on the consequences of dam failure to the NSW SES for incorporation into planning and flood intelligence.

f. Close and evacuate at risk camping grounds/recreational areas within their managed areas.

1.5.28 **Public Information Services Functional Area:**

a. When requested by NSW SES;

- Assist the NSW SES in the establishment and operation of a Joint Media Information Centre.

1.5.29 **Riverina Medical and Dental Aboriginal Corporation, Wiradjuri Aboriginal – Community Child Care Centre Corporation and Wagga Local Aboriginal Land Council:**

a. Act as the point of contact between the NSW SES and the Wiradjuri community.

b. Inform the NSW SES Incident Controller about flood conditions and response needs.

c. Disseminate flood information, including Flood and Evacuation Warnings, to the Wiradjuri community.

1.5.30 **Roads and Maritime Services, Transport for NSW:**

a. Manage traffic on state roads, state highways and waterways affected by flood waters and advise the NSW SES of their status including the Hume Highway, Sturt Highway and Olympic Way.

b. Facilitate the safe reliable access of emergency resources on RMS managed roads.

c. Assist the NSW SES with identification of road infrastructure at risk of flooding.

d. Assist in Traffic management associated with evacuations where necessary.

e. Enter current state road closure information into the Live Traffic site.

f. Assist the NSW SES and Council with the communication of warnings and information provision to the public through variable message signs.

g. Cooperate with the Murrumbidgee Region Transport Services Functional Area Coordinator.

1.5.31 **School Administration Offices (including Catholic Education Office Wagga Wagga, Department of Education Wagga Wagga and Private Schools):**

a. Liaise with the NSW SES and arrange for the early release of students whose travel arrangements are likely to be disrupted by flooding and/or road closures (or where required, for students to be moved to a suitable location until normal school closing time).

b. Pass information to school bus drivers/companies and/or other schools on expected or actual impacts of flooding.

c. Assist with coordinating the evacuation of schools when flooding or isolation is expected to occur.

d. Provide space in schools for evacuation centres where necessary.

1.5.32 **Spontaneous Volunteers:**

a. Assist the NSW SES and the comunuity with;

- Delivery of Evacuation Warnings.
- Conduct of evacuations.
- Lifting and/or moving household furniture and commercial stock.
- Sandbagging.
- Monitoring of levees.
- Relocation of caravans.

1.5.33 **Telecommunication Services Functional Area:**

a. When requested by NSW SES;

- Coordinate the restoration of telephone facilities damaged by flooding.
- Assist the NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.

1.5.34 **WaterNSW:**

a. Collect and maintain flood data including data relating to flood heights, velocities and discharges.

b. Provide the Bureau of Meteorology and NSW SES real-time or near real-time access to river height gauges and height data for the development of official flood warnings.

c. Provide flow rating charts for river height gauges.

d. Manage (with technical support from DPIE) the approval process under the Water Act 1912 and Water Management Act 2000 for flood control works (earthworks, embankments and levees which can affect the distribution of floodwaters) including;

- Assessment and approval of flood control works (including flood mitigation works) in rural areas designated under the Acts.
- Use of floodplain management plans prepared by DPIE in rural areas designated under the Acts to assess flood control work approvals.
- Giving the NSW SES access to relevant studies regarding flooding and studies supporting floodplain management plans prepared by DPIE including Flood Studies, Floodplain Risk Management Studies and flood behaviour investigations.

1.5.35 **Welfare Services Functional Area:**

a. When requested by NSW SES;

- Establish and manage Evacuation Centres and provide disaster welfare services from Recovery Centres.
- Administer the Personal Hardship and Distress component of the NSW Disaster Relief Scheme established to provide financial assistance to people affected by emergencies.

1.6 INTRA-ZONE ASSISTANCE ARRANGEMENTS

1.6.1 A local intra-zone mutual assistance arrangement exists in which the NSW SES Wagga Wagga and the NSW SES Junee Units will deploy resources to support each other.

1.6.2 Operations involving the Oura area will be conducted by the NSW SES Junee Unit when the community is isolated by flood waters from Wagga Wagga.

PART 2 - PREPAREDNESS

2.1 MAINTENANCE OF THIS PLAN

2.1.1 The NSW SES will maintain the currency of this plan by;

a. Ensuring that all agencies, organisations and officers mentioned in it are aware of their roles and responsibilities.

b. Conducting exercises to test arrangements.

c. Reviewing the contents of the plan;

- After each flood operation.
- When significant changes in land-use or community characteristics occur.
- When new information from flood studies become available.
- When flood control or mitigation works are implemented or altered.
- When there are changes that alter agreed plan arrangements.

2.1.2 The plan is to be reviewed no less frequently than every five years.

2.2 FLOODPLAIN RISK MANAGEMENT

2.2.1 The NSW SES Wagga Wagga Unit Commander will ensure that;

a. NSW SES participates in local Floodplain Risk Management Committee activities when those committees are formed, in accordance with current NSW legislation.

b. The NSW SES Southern Zone Headquarters is informed of involvement in floodplain risk management activities.

2.3 DEVELOPMENT OF FLOOD INTELLIGENCE

2.3.1 Flood intelligence describes flood behaviour and its effects on the community.

2.3.2 The NSW SES maintains a centralised Flood Intelligence System.

2.4 DEVELOPMENT OF WARNING SYSTEMS

2.4.1 The NSW SES establishes total flood warning systems for areas affected by flooding. This requires;

a. An identification of the potential clients of flood warning information at different levels of flooding (i.e. who would be affected in floods of differing severities).

b. Available information about the estimated impacts of flooding at different heights.

c. Identification of required actions and the amounts of time needed to carry them out.

d. Appropriate means of disseminating warnings to different clients and at different flood levels.

2.4.2 The BOM monitors water levels throughout the Murrumbidgee catchment from data obtained from sites owned WaterNSW. Data gathered informs Flood Warnings issued by the BOM and is provided to the NSW SES.

2.5 COMMUNITY RESILIENCE

2.5.1 The community needs to be as prepared as emergency agencies for the impact of all hazards, including flooding.

2.5.2 As the combat agency, NSW SES has the primary responsibility for the collation, assessment and public dissemination of information relating to flooding. To do this, NSW SES will require assistance from other agencies, particularly Council, Dam Owners, and the BOM in the development and delivery of materials.

2.5.3 The NSW SES Wagga Wagga Unit Commander with the assistance of the Wagga Wagga City Council, the NSW SES Southern Zone Headquarters and NSW SES State Headquarters, is responsible for the collation, assessment and public dissemination of information relating to flooding.

2.5.4 A range of tailored strategies to be employed with NSW communities include:

a. Dissemination of flood-related brochures in flood liable areas.

b. Talks and displays orientated to at-risk groups, community organisations, businesses and schools.

c. Publicity given to this plan and to flood-orientated NSW SES activities through local media outlets, including articles in local newspapers about the flood threat and appropriate responses.

d. Use of social media such as Facebook and Twitter etc.

2.6 TRAINING

2.6.1 Throughout this document there are references to functions that must be carried out by the members of the NSW SES Wagga Wagga Unit. The NSW SES Wagga Wagga Unit Commander is responsible for ensuring that the members are;

a. Familiar with the contents of this plan.

b. Trained in the skills necessary to carry out the tasks allocated to the NSW SES.

2.7 RESOURCES

2.7.1 The NSW SES Wagga Wagga Unit Commander is responsible for maintaining the condition and state of readiness of NSW SES equipment and the NSW SES Wagga Wagga Unit Headquarters.

PART 3 - RESPONSE

CONTROL

3.1 CONTROL ARRANGEMENTS

3.1.1 The NSW SES is the legislated Combat Agency for floods and is responsible for the control of flood operations. This includes the coordination of other agencies and organisations for flood management tasks.

3.1.2 The Local EMPLAN will operate to provide support as requested by the NSW SES Incident Controller.

3.2 OPERATIONAL MANAGEMENT

3.2.1 NSW SES utilises the Australasian Inter-service Incident Management System (AIIMS), which is based on five principles;

a. Flexibility;

b. Functional management;

c. Management by objectives;

d. Unity of Command; and

e. Span of control.

3.2.2 AIIMS provides for different incident levels based on the complexity of management.

3.2.3 The Wagga Wagga Local Government Area may be included into an Area of Operations based on the classification of the incident as a Level 1, 2 or 3 incident.

3.2.4 The Local Government Area may be divided into Sectors and Divisions to manage the flood event (Divisions are usually a group of Sectors).

3.2.5 Sectors and Divisions may be based on floodplain classifications, geographical, physical or functional boundaries. An LGA, town, city or suburb may be one sector or split into several Sectors and Divisions.

3.3 START OF RESPONSE OPERATIONS

3.3.1 This plan is always active to ensure that preparedness actions detailed in this plan are completed.

3.3.2 Response operations will begin;

a. On receipt of a Bureau of Meteorology Flood Watch, Preliminary Flood Watch, Flood Warning, Severe Thunderstorm Warning or a Severe Weather Warning for heavy rain resulting in flash flooding.

b. On receipt of a dam failure alert.

c. When other evidence leads to an expectation of flooding within the Council area.

3.3.3 Contact with the Bureau of Meteorology to discuss the development of Flood Warnings will normally be through the NSW SES Southern Zone Headquarters and/or NSW SES State Headquarters.

3.3.4 The following persons and organisations will be advised of the start of response operations regardless of the location and severity of the flooding anticipated:

a. NSW SES Southern Zone Headquarters.

b. NSW SES Wagga Wagga Unit Commander.

c. NSW SES Wagga Wagga City Unit.

d. Wagga Wagga LEOCON (for transmission to the NSW Police Force District Headquarters).

e. Wagga Wagga LEMO (for transmission to appropriate Council Officers, Departments and LEMC Members).

f. Wagga Wagga City Council Mayor.

g. Member for Wagga Wagga NSW Parliament.

h. Other agencies listed in this plan will be advised by the LEMO on the request of the NSW SES Incident Controller and as appropriate to the location and nature of the threat.

3.4 RESPONSE STRATEGIES

3.4.1 The main response strategies for NSW SES flood operations include;

a. Information Provision and Warning

- Provision of warnings, information and advice to communities.
- Inform the community regarding the potential impacts of a flood and what actions to undertake in preparation for flooding.
- Provide timely and accurate information to the community.

b. Property protection

- Protect the property of residents and businesses at risk of flood damage.
- Assistance with property protection by way of sandbagging and the raising or transporting of furniture, personal effects, commercial stock and caravans.
- Assistance with the protection of essential infrastructure.

c. Evacuation

- Evacuation is a risk management strategy that may be used to mitigate the effects of an emergency on a community. It involves the

movement of people to a safer location and their return. For an evacuation to be effective it must be appropriately planned and implemented.

d. Flood Rescue

- The rescue or safe retrieval of persons or animals trapped by floodwaters.

e. Resupply

- Minimise disruption upon the community by resupplying towns and villages which have become isolated as a consequence of flooding.
- Ensure supplies are maintained to property owners by coordinating the resupply of properties which have become isolated as a consequence of flooding.

3.4.2 The NSW SES Incident Controller will select the appropriate response strategy to deal with the expected impact of the flood in each Sector and/or community. The impact may vary so a number of different strategies may need to be selected and implemented across the whole operational area. The available strategies for each Sector and/or community are maintained by the NSW SES.

3.4.3 Supporting agency strategies may include;

a. Protect the community from incidents involving fire and hazardous materials.

b. Maintain the welfare of communities and individuals affected by the impact of a flood.

c. Minimise disruption to the community by ensuring supply of essential energy and utility services.

d. Ensure coordinated health services are available to and accessible by the flood affected communities.

e. Maintain the welfare of animals affected by the impact of a flood.

3.5 INCIDENT CONTROL CENTRES

3.5.1 The NSW SES Wagga Wagga Unit Incident Control Centre (ICC) is located at the Wagga Wagga Unit Headquarters at the rear of 208 Fernleigh Rd, Wagga Wagga.

3.5.2 The NSW SES Southern Zone Incident Control Centre (ICC) is located at 206 Fernleigh Rd, Wagga Wagga.

3.5.3 The Emergency Operations Centre (EOC) for Wagga Wagga is located at The Bob Osbourne Skills Centre, 208 Fernleigh Rd, Wagga Wagga.

3.6 LIAISON

3.6.1 Any agency with responsibilities identified in this plan may be requested by the NSW SES to provide liaison (including a Liaison Officer where necessary) to the relevant NSW SES ICC, or designated Emergency Operations Centre.

3.6.2 In accordance with NSW EMPLAN, Liaison Officers will;

a. Maintain communication with and convey directions/requests to their organisation or functional area;

b. Provide advice on the status, resource availability, capabilities, actions and requirements of their organisation or functional area, and

c. Where appropriate, have the authority to deploy the resources of their parent organisation at the request of the NSW SES Incident Controller.

3.7 END OF RESPONSE OPERATIONS

3.7.1 When the immediate danger to life and property has passed the NSW SES Incident Controller will issue an 'All Clear' message signifying that response operations have been completed. The message will be distributed through the same media outlets as earlier evacuation messages. The NSW SES Incident Controller will also advise details of recovery coordination arrangements, arrangements made for clean-up operations prior to evacuees being allowed to return to their homes, and stand-down instructions for agencies not required for recovery operations.

PLANNING

3.8 COLLATING SITUATIONAL INFORMATION

Strategy

3.8.1 The NSW SES maintains and records situational awareness of current impacts and response activities.

Actions

3.8.2 The NSW SES Wagga Wagga Unit ICC collates information on the current situation in the Wagga Wagga City LGA and incorporates this into Situation Reports.

3.8.3 The NSW SES Southern Zone ICC collates Zone-wide information for inclusion in NSW SES Zone Situation Reports.

3.8.4 Sources of situational information during times of flooding are;

a. **Agency Situation Reports**. Agencies and functional areas provide regular Situation Reports (SITREPs) to the NSW SES.

b. **Active Reconnaissance**. The NSW SES Incident Controller is responsible for coordinating the reconnaissance of impact areas, recording and communicating observations. Reconnaissance can be performed on the

ground and using remote sensing. The NSW SES monitors the following problem areas:

- Flowerdale flats
- Eastern section of the Sturt Hwy
- Wagga Wagga Beach

c. The **Bureau of Meteorology's Flood Warning Centre** provides river height and rainfall information, data is available on the Bureaus website http://www.bom.gov.au/nsw/flood/.

d. **Manly Hydraulics Laboratory (a business unit within NSW Public Works)** automated river watch system funded by the Office of Environment and Heritage. This system provides river height and rainfall readings for a number of gauges in the Wagga Wagga City LGA. Recent data from this system is available on the Manly Hydraulic Laboratory website: http://www.mhl.nsw.gov.au. A history of area floods is also available upon request via the website.

e. **WaterNSW**. This office advises flow rates and rates of rise for the Murrumbidgee River. Daily river reports containing information on gauge heights and river flows are available from the website: http://waterinfo.nsw.gov.au/.

f. **Tabling, T3 Intake Structure and Jounama Dam Storage Monitoring System.** This system provides information on Talbingo and Jounama Dams and the likely effects of failure. This system is operated by Snowy Hydro Ltd.

g. **Blowering Dam Storage Level Recorder**. This system provides storage level information on Blowering Dam. This system is operated by WaterNSW.

h. **Burrinjuck Dam Storage Level Recorder**. This system provides storage level information on Burrinjuck Dam. This system is operated by WaterNSW.

i. **NSW SES Southern Zone Headquarters**. The Zone Headquarters provides information on flooding and its consequences, including those in nearby council areas (this information is documented in Flood Bulletins and Situation Reports).

j. **Wagga Wagga City Council**. Will provide information on the status of roads. The Wagga Wagga City Council also monitors the following levees:

- Main town levee
- North Wagga levee
- Gumly Gumly levee
- Uranquinty levee

- Tarcutta levee

3.8.5 During flood operations sources of information on roads closed by flooding include;

a. Wagga Wagga City Council Facebook and or Twitter (website: http://www.wagga.nsw.gov.au and telephone service: 02 6926 9100).

b. Wagga Wagga Police – Riverina Police District.

c. Live Traffic NSW (Roads and Maritime Services, Transport for NSW) at https://www.livetraffic.com/ or by calling 13 27 01.

d. NSW SES Southern Zone Headquarters.

e. NSW SES Wagga Wagga Unit Headquarters.

3.8.6 Situational information relating to consequences of flooding in relation to the closure of roads should be used to verify and validate existing NSW SES Flood Intelligence records.

3.9 PROVISION OF FLOOD INFORMATION AND WARNINGS

Strategy

3.9.1 The NSW SES Wagga Wagga Unit Headquarters provides advice to the NSW SES Southern Zone Headquarters on current and expected impacts of flooding in the Wagga Wagga City LGA.

3.9.2 The NSW SES Southern Zone Headquarters issues NSW SES Flood Bulletins, NSW SES Livestock and Equipment Warnings, Evacuation Warnings and Evacuation Orders to media outlets and agencies on behalf of all NSW SES Units within Southern Zone.

Actions

3.9.3 The **NSW SES Incident Controller** will ensure that the NSW SES Southern Zone Commander is regularly briefed on the progress of operations.

3.9.4 **NSW SES Wagga Wagga Unit Incident Control Centre staff** will be briefed regularly so that they can provide information in response to inquiries received in person or by other means such as phone or email.

3.9.5 **Bureau of Meteorology Severe Thunderstorm Warning**. These are issued direct to the media by the BOM when severe thunderstorms are expected to produce dangerous or damaging conditions such as strong winds and heavy rain that may lead to flash flooding. Severe thunderstorms are usually smaller in scale than events covered by Flood Watches, Flood Warnings and Severe Weather Warnings.

3.9.6 **Bureau of Meteorology Severe Weather Warnings for Flash Flooding**. These are issued direct to the media by the BOM and provide a warning of the possibility for flash flooding as a result of intense rainfall. These warnings are issued when severe weather is expected to affect land-based communities

with 6 to 24 hours. Severe Weather Warnings may also include other conditions such as Damaging Winds.

3.9.7 **Bureau of Meteorology Flood Watches**. Flood Watches are issued by the BOM to advise people of the potential for flooding in a catchment area based on predicted or actual rainfall. Flood Watches will be included in NSW SES Flood Bulletins issued by the NSW SES Southern Zone Headquarters.

3.9.8 **Bureau of Meteorology Flood Warnings.** The NSW SES Southern Zone Headquarters will send a copy of BOM Flood Warnings to the NSW SES Wagga Wagga City Unit. On receipt the NSW SES Incident Controller will provide the NSW SES Southern Zone Headquarters with information on the estimated impacts of flooding at the predicted heights for inclusion in NSW SES Zone Flood Bulletins.

3.9.9 **NSW SES Livestock and Equipment Warnings**. Following heavy rain or when there are indications of significant creek or river rises (even to levels below Minor Flood heights), the NSW SES Incident Controller will advise the NSW SES Southern Zone Headquarters which will issue NSW SES Livestock and Equipment Warnings.

3.9.10 **NSW SES Local Flood Advices**. The NSW SES Incident Controller may issue Local Flood Advices for locations not covered by Bureau Flood Warnings. They may be provided verbally in response to phone inquiries but will normally be incorporated into NSW SES Zone Flood Bulletins.

3.9.11 **NSW SES Flood Bulletins**. The NSW SES Southern Zone Headquarters will regularly issue NSW SES Flood Bulletins which describe information on the estimated impacts of flooding at the predicted heights (using information from Bureau Flood Warnings and NSW SES Local Flood Advices) and public safety information to members of the community, Council, media outlets, emergency services and agencies.

3.9.12 **NSW SES Evacuation Warnings and Evacuation Orders**. These are usually issued to the media by the NSW SES Southern Zone Commander on behalf of the NSW SES Incident Controller.

3.9.13 **Dam Failure Alerts**. Dam failure alerts are issued to NSW SES by the dam owner, in accordance with arrangements in the Dam Safety Emergency Plan (DSEP), the system involves the Dam Owner notifying NSW SES State Operations Centre (SOC), who in turn distributes the warning to the NSW SES Zone Headquarters and NSW SES Unit Headquarters.

3.9.14 A flow chart illustrating the notification arrangements for potential dam failure is shown in Attachment 2.

3.9.15 Dam failure alert levels are set in consultation with the NSW SES and are used to trigger appropriate response actions. The conditions that define each of the alert levels are listed in the relevant DSEP. Responses escalate as the alert level migrates from white to amber to red. Table 1 briefly outlines example defining conditions and appropriate NSW SES responses associated with each alert.

Alert Level	Example Defining Condition	NSW SES Response	NSW SES Warning Product
White	May be a structural anomaly. May be increased monitoring in response to a heavy rainfall event	Implements notification flowchart. Check operational readiness.	This is a preliminary alert to assist the NSW SES in its preparation. This is not a public alert.
Amber	Failure possible if storage level continues to rise or structural anomaly not fixed	Implements notification flowchart. Warn downstream population at risk to prepare to evacuate	NSW SES Evacuation Warning
Red	Failure imminent or occurred	Implements notification flowchart. Evacuation of downstream populations	NSW SES Evacuation Order

Table 1: Dam Failure Alert Levels

Note: Some DSEPs will have alert levels that proceed directly from White to Red. This is the case if adequate time does not exist between the three alert levels to evacuate the downstream population at risk. The decision to omit the Amber Alert level, and the general setting of Alert levels should be undertaken in consultation with the NSW SES.

3.9.16 The NSW SES / Dam Owner will disseminate warnings to the population at risk of dam failure (these arrangements are specific to each dam, are negotiated between the Dam Owner and NSW SES, and are documented in the DSEP).

3.9.17 Special arrangements apply in the case of severe flooding that may have the potential to cause the failure of Talbingo Dam. Details of these arrangements are maintained by the NSW SES.

3.9.18 **Standard Emergency Warning Signal (SEWS).** This signal may be played over radio and television stations to alert communities to Evacuation Warnings, Evacuation Orders, Special Warnings or Dam-Failure Warnings. Approval to use the signal is associated with who approves the warning/order message.

3.9.19 **The Public Information and Inquiry Centre (PIIC)** (operated by the NSW Police Force) will answer calls from the public regarding registered evacuees and provide authorised emergency information to the public.

3.9.20 **The Disaster Welfare Assistance line** is a central support and contact point for disaster affected people inquiring about welfare services advice and assistance. This normally operates during business hours, but can be extended when required.

3.9.21 **The RMS Transport Information Line** will provide advice to callers on the status of roads. The RMS website also lists road closure information.

3.9.22 **Wagga Wagga City Council** will provide information on the status of roads.

3.9.23 Collation and dissemination of road information is actioned as follows:

a. As part of Situation Reports, the NSW SES Incident Controller provides road status reports for main roads in the Council area to the NSW SES Southern Zone Headquarters or NSW SES State Command Centre.

b. The NSW SES Southern Zone Headquarters distributes information on main roads to NSW SES Units, media outlets, emergency services and agencies as part of NSW SES Flood Bulletins.

OPERATIONS

3.10 AIRCRAFT MANAGEMENT

3.10.1 Aircraft can be used for a variety of purposes during flood operations including evacuation, rescue, resupply, reconnaissance (aerial remote sensing) and emergency travel.

3.10.2 Air support operations will be conducted under the control of the NSW SES Southern Zone Headquarters, which may allocate aircraft to NSW SES Units if applicable.

3.10.3 NSW SES maintains the following information for the Wagga Wagga City Council area;

a. Locations of suitable helicopter landing points.

b. Locations of suitable airports and records detailing aircraft size and type that can land at airports.

c. Intelligence on when access to these locations is expected to be lost.

3.11 ASSISTANCE FOR ANIMALS

3.11.1 Matters relating to the welfare of livestock, companion animals and wildlife are to be referred to Agriculture and Animal Services Functional Area.

3.11.2 Requests for emergency supply and/or delivery of fodder to stranded livestock, or for livestock rescue, are to be referred to Agriculture and Animal Services Functional Area.

3.11.3 Requests for animal rescue should be referred to the NSW SES.

3.12 COMMUNICATION SYSTEMS

3.12.1 The primary means of communications between fixed locations is by telephone, email and facsimile.

3.12.2 The primary means of radio communication to and between deployed NSW SES resources is by NSW SES Private Mobile Radio (PMR) Network.

3.12.3 All Liaison Officers will provide their own communication links back to their parent agencies.

3.12.4 All other organisations will provide communications as necessary to their deployed field teams.

3.12.5 Back-up communications are provided as follows:

a. UHF radio network provided by the NSW Rural Fire Service.

3.13 PRELIMINARY DEPLOYMENTS

3.13.1 When flooding is expected to be severe enough to cut road access to villages, towns, and/or rural communities within the Wagga Wagga LGA, the NSW SES Incident Controller will ensure that resources are in place for the distribution of foodstuffs and medical supplies to the areas that could become isolated.

3.13.2 When access between locations is expected to be cut, the NSW SES Incident Controller will advise appropriate agencies so that resources (including sandbags, firefighting appliances, ambulances, etc.) are deployed to ensure that operational capability is maintained.

3.14 ROAD AND TRAFFIC CONTROL

3.14.1 A number of roads within the council area are affected by flooding. NSW SES maintains details of these roads.

3.14.2 The council closes and re-opens its own roads. The council is also responsible for closing and re-opening the Sturt Highway within the urban centre of Wagga Wagga in its capacity as an agent of the RMS.

3.14.3 The NSW Police Force has the authority to close and re-open roads but will normally only do so (if the Council or the RMS have not already acted) if public safety requires such action.

3.14.4 When resources permit, the NSW SES assists Council, RMS or the Police by erecting road closure signs and barriers.

3.14.5 In flood events, the NSW SES Incident Controller may direct the imposition of traffic control measures. The entry into flood affected areas will be controlled in accordance with the provisions of the *State Emergency Service Act, 1989 NSW (Part 5, Sections 19, 20, 21 and 22)* and *the State Emergency Rescue Management Act, 1989 NSW (Part 4, Sections 60KA, 60L and 61).*

3.14.6 Police, RMS or Council officers closing or re-opening roads or bridges affected by flooding are to advise the NSW SES Wagga Wagga Unit ICC, which will then provide a road information service to local emergency services, the public and the NSW SES Southern Zone Headquarters. All such information will also be passed to the Police, RMS and Council.

3.15 STRANDED TRAVELLERS

3.15.1 Flood waters can strand travellers. Travellers seeking assistance will be referred to the Welfare Services Functional Area for the arrangement of emergency accommodation.

3.16 MANAGING PROPERTY PROTECTION OPERATIONS

Strategy

3.16.1 Protect the property of residents and businesses at risk of flood damage.

Actions

3.16.2 The NSW SES is the responsible agency for the coordination of operations to protect property.

3.16.3 Property may be protected from floods by;

a. Raising or moving of household furniture.

b. Rasing or moving commercial stock and equipment.

c. Sandbagging to minimise entry of water into buildings.

3.16.4 The NSW SES maintains stocks of sandbags.

3.16.5 Property protection options are however very limited in the Wagga Wagga City LGA due to the large number of properties that can be affected and the depth of floodwaters arising from severe flooding on the Murrumbidgee River.

3.17 MANAGING FLOOD RESCUE OPERATIONS

Strategy

3.17.1 Rescue of people and animals from floods.

Actions

3.17.2 The NSW SES Incident Controller controls flood rescue in Wagga Wagga City LGA during a flood emergency.

3.17.3 Flood rescues, may be carried out by accredited units in accordance with the guidelines contained in the NSW State Rescue Policy, 4th Edition, November 2018.

3.17.4 Additional flood rescue boats and crews can be requested through the NSW SES Southern Zone Headquarters.

3.17.5 There may be some residual population which did not evacuate during the early stages of flooding and which require rescue.

3.18 MANAGING EVACUATION OPERATIONS

Strategy

3.18.1 When there is a risk to public safety, evacuation is the primary strategy. Circumstances may include;

a. Evacuation of people when their homes or businesses are likely to flood.

b. Evacuation of people who are unsuited to living in isolated circumstances, due to flood water closing access.

c. Evacuation of people where essential energy and utility services are likely to fail, have failed or where buildings have been made uninhabitable.

Actions

3.18.2 The evacuation operation will have the following stages:

a. Decision to evacuate.

b. Mobilisation (mobilisation may begin prior to the decision to evacuate).

c. Evacuation Warning delivery.

d. Evacuation Order delivery.

e. Withdrawal.

f. Shelter.

g. Return.

3.18.3 During floods evacuations will be controlled by the NSW SES. Small-scale evacuations will be controlled by the NSW SES Incident Controller. Should the scale of evacuation operations be beyond the capabilities of local resources control may be escalated to the next operational command level.

Decision to evacuate

3.18.4 In most cases the decision to evacuate rests with the NSW SES Commissioner who exercises his/her authority in accordance with *Section 22(1) of The State Emergency Service Act 1989 NSW.* However, the decision to evacuate will usually be made after consultation with the NSW SES Southern Zone Commander and the LEOCON.

3.18.5 All evacuation decisions will be made as per the *NSW SES Communication and Dissemination of Evacuation Decisions Standard Operating Procedure*. Evacuation operations are to be consistent with the NSW Evacuation Management Guidelines.

3.18.6 Some people will make their own decision to evacuate earlier and move to alternate accommodation, using their own transport. This is referred to as self-managed evacuation.

Mobilisation

3.18.7 The NSW SES Incident Controller will request the following personnel for doorknock teams for designated Sectors/locations:

a. NSW SES Wagga Wagga Unit members.

b. NSW RFS Riverina Zone District members.

c. Local Police Force Officers via the local police district.

3.18.8 The NSW SES Southern Zone Commander will request any additional personnel required to assist with doorknock teams using;

a. NSW SES members from the NSW SES Southern Zone and surrounding NSW SES Zones.

b. FRNSW personnel arranged via the FRNSW Liaison Officer.

c. NSW RFS personnel arranged via the NSW RFS Liaison Officer.

3.18.9 The NSW SES Incident Controller will request the LEMC to provide Council personnel to assist with traffic coordination within Sector(s)/Community.

3.18.10 The NSW SES Incident Controller will arrange Liaison Officers for Sector Command Centres.

3.18.11 The NSW SES Incident Controller will request the required number of buses for Sectors via the Transport Services Functional Area.

Delivery of Evacuation Warnings and Evacuation Orders

3.18.12 The NSW SES will advise the community of the requirements to evacuate. The NSW SES will issue an **Evacuation Warning** when the intent of an NSW SES Incident Controller is to warn the community of the need to prepare for a possible evacuation.

3.18.13 The NSW SES will issue an **Evacuation Order** when the intent of the NSW SES Incident Controller is to instruct a community to immediately evacuate in response to an imminent threat.

3.18.14 The NSW SES Incident Controller will distribute Evacuation Warnings and Evacuation Orders to;

a. Sector/Division Command Centres (where established).

b. Wagga Wagga City Local Emergency Operations Centre.

c. Wagga Wagga City Council.

d. Wagga Wagga Police Local Police District.

e. Wagga Wagga Rural Fire Service Control Centre.

f. Local Radio Stations.

g. Other local agencies and specified individuals.

3.18.15 The NSW SES Incident Controller will distribute Evacuation Warnings and Evacuation Orders to;

a. The NSW SES State Strategic Coordination Centre.

b. Affected communities via dial-out warning systems where installed or applicable.

c. Relevant media outlets and agencies.

3.18.16 Evacuation Warnings and Evacuation Orders may be delivered through;

a. Radio and Television Stations.

b. Doorknocking by emergency service personnel.

c. Public address systems (fixed or mobile).

d. Telephony-based systems (including Emergency Alert).

e. Two-way Radio.

f. Direct access to Radio Station [ABC Radio Riverina, 2WG, 2AAA, Triple M, Hit 93.1, 101.9 Riverina Christian Radio].

g. Social Media i.e. Facebook and Twitter.

3.18.17 The Standard Emergency Warning Signal (SEWS) may be used to precede all Evacuation Orders broadcast on Radio Stations.

3.18.18 Doorknock teams will work at the direction of;

a. The Sector Commander if a Sector Command Centre is established; or.

b. The relevant Division Commander where a Sector Command Centre has not been established; or

c. The Incident Controller.

3.18.19 Field Teams conducting doorknocks will record and report back the following information to their Sector Commander/Division Commander/ Incident Controller;

a. Addresses and locations of houses doorknocked and/or evacuated.

b. The number of occupants.

c. Details of support required (such as transport, medical evacuation, assistance to secure house and/or property and raise or move belongings).

d. Details of residents who refuse to comply with the Evacuation Order.

3.18.20 Refusal to evacuate. Field teams should not waste time dealing with people who are reluctant or refuse to comply with any Evacuation Order. These cases are to be referred to the NSW Police Force.

Withdrawal

3.18.21 Evacuations will generally be carried out in stages starting from the lowest areas, low flood islands and low trapped perimeters; and progressively from higher areas.

3.18.22 The most desirable method of evacuation is via road using private transport. This may be supplemented by buses for people who do not own or have access to a motor vehicle. However, other means of evacuation may also be used if available and as necessary (e.g. by foot, rail, air).

3.18.23 Evacuees who require emergency accommodation or disaster welfare assistance will be directed to the designated Evacuation Centres. Evacuees who have made their own accommodation arrangements will not be directed

to Evacuation Centres. It is not possible to determine in advance how many will fall into this category.

3.18.24 Evacuees will:

a. Move under local traffic arrangements from the relevant Sectors/Community via managed evacuation routes;

b. Continue along the suburban/regional/rural road network to allocated Evacuation Centres.

3.18.25 **Health Services**. The Health Services Functional Area will coordinate the evacuation of Hospitals, Health Centres and Aged Care Facilities (including Nursing Homes).

3.18.26 **Schools.** School Administration Offices (Department of Education, Catholic Education Office and Private Schools) will coordinate the evacuation of schools if not already closed.

3.18.27 If there is sufficient time between the start of response operations and the evacuation of communities, the NSW SES Southern Zone Commander will discuss the temporary closure of appropriate schools with the Regional Director, Riverina Region, Department of Education. This will enable pupils to stay at home or be returned home so they can be evacuated (if required) with their families.

3.18.28 Note that in the Wagga Wagga City LGA, school principals may close some schools affected by flooding in the early stages of flooding.

3.18.29 **Caravan Parks**. When an evacuation order is given occupiers of movable dwellings should:

a. Isolate power to moveable dwellings.

b. Collect personal papers, medicines, a change of clothing, toiletries and bedclothes.

c. Raise the other contents in any remaining dwellings as high as possible.

d. Move to friends, relatives or a designated Evacuation Centre if they have their own transport, or move to the Caravan Office to await transport.

e. If undertaking self-managed evacuation, register their movements with the caravan park management upon leaving the park.

3.18.30 Where possible, dwellings that can be moved will be relocated by their owners. Park managers will arrange for the relocation of movable dwellings as required. Council and NSW SES personnel may assist if resources permit.

3.18.31 Caravan Park Management will ensure that their Caravan Park is capable of being evacuated in a timely and safe manner.

3.18.32 Advise the NSW SES Incident Controller of:

a. The number of people requiring transport.

b. Details of any medical evacuations required.

c. Whether additional assistance is required to effect the evacuation.

3.18.33 Check that all residents and visitors are accounted for.

3.18.34 Inform the NSW SES Incident Controller when the evacuation of the Caravan Park has been completed.

3.18.35 Provide the NSW SES Incident Controller with a register of people that have been evacuated.

3.18.36 **Assistance Animals, Pets and Companion Animals of Evacuees:** Assistance animals (guide dogs, hearing assistance animals, etc.) will remain in the care of their owners throughout the evacuation. This includes transport and access into Evacuation Centres etc.

Where possible owners should take their companion animals with them when they are asked to evacuate. Due to safety restrictions, it may not be possible to allow companion animals to accompany their owners when being transported via aircraft or flood rescue boat. In such circumstances Agriculture and Animal Services will coordinate separate arrangements for evacuation and care of companion animals.

3.18.37 **Transport and Storage:** Transport and safe secure storage of furniture from flood threatened properties will be arranged if time and resources permit.

3.18.38 **Security:** The NSW Police Force will coordinate the provision of overall security for all evacuated areas.

3.18.39 The NSW SES Incident Controller is to provide the following reports to the NSW SES Southern Zone Headquarters:

a. Advice of commencement of the evacuation of each Sector,

b. Progress reports (by Sectors) during evacuations,

c. Advice of completion of the evacuation of each Sector.]

3.18.40 **Assembly Areas:** An assembly area is a designated location used for the assembly of emergency-affected persons before they move to temporary accommodation or a nominated Evacuation Centre. As such these areas do not provide welfare assistance nor are they used for long term sheltering or provision of meals. An assembly area may also be a prearranged, strategically placed area, where support response personnel, vehicles and other equipment can be held in readiness for use during an emergency.

Shelter

3.18.41 **Evacuation Centres:** Evacuees will be advised to go to friends or relatives, or else be taken to the nearest accessible Evacuation Centre, which may initially be established at the direction of the NSW SES Incident Controller, but managed as soon as possible by Welfare Services.

3.18.42 The following locations are suitable for use as Flood Evacuation Centres, however these will be reviewed during the incident by the planning team and in accordance with the NSW Evacuation Management Guideline:

a. North Wagga Sector

- Charles Sturt University, Boorooma St, Estella
- The Riverina Anglican College, Farrar Rd, Estella

b. Oura Sector

- Oura Presbyterian Church
- Junee Showgrounds, Park Lane, Junee

c. Tarcutta Sector

- Tarcutta RSL and Citizens Club, Sydney Road, Tarcutta

d. Uranquinty Sector

- Uranquinty Public School, Pearson St, Uranquinty.

e. East Wagga Sector (includes Gumly Gumly, Forest Hill, Alfredtown and Ladysmith)

- Forest Hill Public School, Sturt Hwy, Forest Hill.
- Lake Albert Public School, Main Street, Lake Albert.
- Lake Albert Hall, Lake St, Lake Albert.
- Lady Smith Public Hall, Kyemba St, Ladysmith.

f. West Wagga Sector (includes Flowerdale and Edward St)

- Holy Trinity Primary School, Bardia St

g. Central Wagga Sector

- Ashmont Public School, Bardia St
- Holy Trinity Primary School, Bardia St
- Rules Club, Fernleigh Rd
- Glenfield Park Community Centre, Tanda Pl
- Henschke Primary School, Bourke St
- Charles Sturt University, South Campus, Fernleigh Rd
- Mt Austin High School, Bourke St
- Tolland Public School, Hawkes Place
- Mount Austin Public School, Bourke St
- Kyeamba Smith Hall, Bourke St
- Wagga Wagga TAFE, Macleay St
- Kildare Catholic College, Coleman St

- Turvey Park Primary School, Halloran St
- Wagga Wagga High School, Coleman St
- Sturt Public School, Lake Albert Rd
- Sacred Heart Primary School, Lake Albert Rd
- Mater Dei College, Gregadoo Rd
- Kooringal High School, Ziegler Ave
- Kooringal Public School, Lake Albert Rd
- Lutheran Primary School, Red Hill Rd

h. Collingullie and Galore Sector

- Collingullie Public School, Urana St, Collingullie
- Collingullie Soldiers Memorial Hall, Sturt Hwy, Collingullie
- Lockhart Central School, Halliday St, Lockhart

i. Currawarna and Euberta Sector

- Currawarna Public School, Old Narrandera Rd and Currawarna Community Centre, Old Narrandera Rd

3.18.43 **Registration:** The NSW Police Force will facilitate the requirement of Disaster Victim Registration (DVR) for people evacuated to designated Evacuation Centres.

3.18.44 **Animal Shelter:** Facilities to hold and care for companion animals of evacuees will be coordinated by Agriculture and Animal Services if required. If required, Agriculture and Animal Services will also coordinate refuge areas for livestock (e.g. horses) where feasible.

Return

3.18.45 The NSW SES Incident Controller will advise when return to evacuated areas is safe after flood waters have receded and reliable access is available.

3.18.46 The NSW SES Incident Controller will determine when it is safe for evacuees to return to their homes in consultation with:

a. The Recovery Coordinating Committee (if established)

b. Welfare Services Functional Area Coordinator (welfare of evacuees)

c. Engineering Services Functional Area Co-ordinator (safety of buildings, structural integrity of levees/dams)

d. Health Service Functional Area Coordinator (public health)

e. Transport Services Functional Areas Coordinator (arrangement of transport)

f. The Wagga Wagga City LEOCON

g. The Wagga Wagga City Council

h. NSW SES Southern Zone Commander

i. Other appropriate agencies/functional areas as required (mitigation and advice regarding identified risks resulting from the flood event).

3.18.47 Once it is considered safe to do so, the NSW SES Incident Controller will authorise the safe return of evacuees.

3.18.48 The return will be controlled by the NSW SES Incident Controller and may be conducted, at their request, by the Recovery Coordinator.

3.19 MANAGING RESUPPLY OPERATIONS

3.19.1 The NSW SES is responsible for the coordination of the resupply of isolated communities and properties.

3.19.2 If isolation is expected to occur, residents should be encouraged to consider their needs and suitability for an unknown period of isolation.

3.19.3 If properties/communities are going to remain in locations expected to become isolated, households/retailers should be encouraged to stock up on essential supplies.

3.19.4 Where practicable, once supplies are delivered to the NSW SES designated loading point, the NSW SES Incident Controller will arrange for the delivery of essential foodstuffs, fuels or urgent medical supplies required by an isolated property or community.

3.19.5 All reasonable effects will be made to deliver supplies, however where necessary the NSW SES will prioritise the delivery of items.

Resupply of Isolated Towns and Villages

Strategy

3.19.6 Minimise disruption upon the community by resupplying towns and villages which have become isolated as a consequence of flooding.

Actions

3.19.7 The NSW SES is responsible for the coordination of the resupply of isolated communities.

3.19.8 If flood predictions indicate that areas are likely to become isolated, the NSW SES Incident Controller should advise retailers that they should stock up.

3.19.9 When isolation occurs, retailers will be expected to place orders with suppliers where they have a line of credit and to instruct those suppliers to package their goods and deliver them to loading points designated by the NSW SES.

3.19.10 The NSW SES is prepared to deliver mail to isolated communities but may not be able to do so according to normal Australia Post timetables.

3.19.11 The NSW SES will assist hospitals with resupply of linen and other consumables where time and resources permit.

Resupply of Isolated Properties

Strategy

3.19.12 Ensure supplies are maintained to properties by coordinating the resupply of properties which have become isolated as a consequence of flooding.

Actions

3.19.13 The resupply of isolated properties is a common requirement during floods and coordination can be difficult because requests can emanate from a variety of sources. Isolated properties may call their suppliers direct, place their orders through their own social networks or contact the NSW SES.

3.19.14 The principles to be applied when planning for the resupply of isolated properties are;

a. The NSW SES will coordinate resupply and establish a schedule.

b. Some isolated households will not have the ability to purchase essential grocery items due to financial hardship. If an isolated household seeks resupply from the NSW SES and claims to be, or is considered to be, in dire circumstances, they are to be referred to Welfare Services for assessment of eligibility. Where financial eligibility criteria are met, Welfare Services will assist with the purchase of essential grocery items. Welfare Services will deliver the essential grocery items to the NSW SES designated loading point for transport.

c. Local suppliers will liaise with the NSW SES regarding delivery of resupply items to the designated loading point.

d. Local suppliers are responsible for packaging resupply items for delivery.

3.19.15 A flowchart illustrating the Resupply process is shown in Attachment 1. Please note that the flowchart outlines the resupply process but does not encompass all potential situations and/or outcomes.

PART 4 - RECOVERY

4.1 RECOVERY COORDINATION AT THE LOCAL LEVEL

4.1.1 The NSW SES Incident Controller will ensure that planning for long-term recovery operations begins at the earliest opportunity, initially through briefing the LEMC. As soon as possible the LEMC will meet to discuss recovery implications including the need for a Local Recovery Committee. The LEMC will consider any impact assessment in determining the need for recovery arrangements. This is conveyed in the first instance to the State Emergency Operations Controller (SEOCON) for confirmation with the State Emergency Recovery Controller (SERCON).

4.1.2 Once the need for recovery has been identified, the SERCON, in consultation with the SEOCON, may recommend the appointment of a Local Recovery Coordinator and nominate an appropriate candidate to the Minister for Emergency Services.

4.1.3 The SERCON may send a representative to the LEMC and subsequent recovery meetings to provide expert recovery advice and guidance.

4.1.4 The NSW SES Incident Controller and LEOCON will attend recovery meetings to provide an overview of the emergency response operation.

4.1.5 The NSW SES Southern Zone Commander, the Regional Emergency Management Officer (REMO) and appropriate Regional Functional Area Coordinators will be invited to the initial local meeting and to subsequent meetings as required.

4.1.6 The Recovery Committee will:

a. Develop and maintain a Recovery Action Plan with an agreed exit strategy.

b. Monitor and coordinate the activities of agencies with responsibility for the delivery of services during recovery.

c. Ensure that relevant stakeholders, especially the communities affected, are involved in the development and implementation of recovery objectives and strategies and are informed of progress made.

d. Provide the SERCON with an end of recovery report.

e. Ensure the recovery is in line with the National Principles of Disaster Recovery and the NSW tenets.

4.2 RECOVERY COORDINATION AT THE REGION AND STATE LEVEL

4.2.1 In the event that an emergency affects multiple local areas, a Region Emergency Management Committee (REMC) will meet to discuss recovery implications including the need for a Region Recovery Committee. This is

conveyed in the first instance to the SEOCON for confirmation with the SERCON.

4.2.2 In the event of an emergency which affects multiple regions, or is of state or national consequence, or where complex, long term recovery and reconstruction is required, it may be necessary to establish a State Recovery Committee and the appointment of a State Recovery Coordinator.

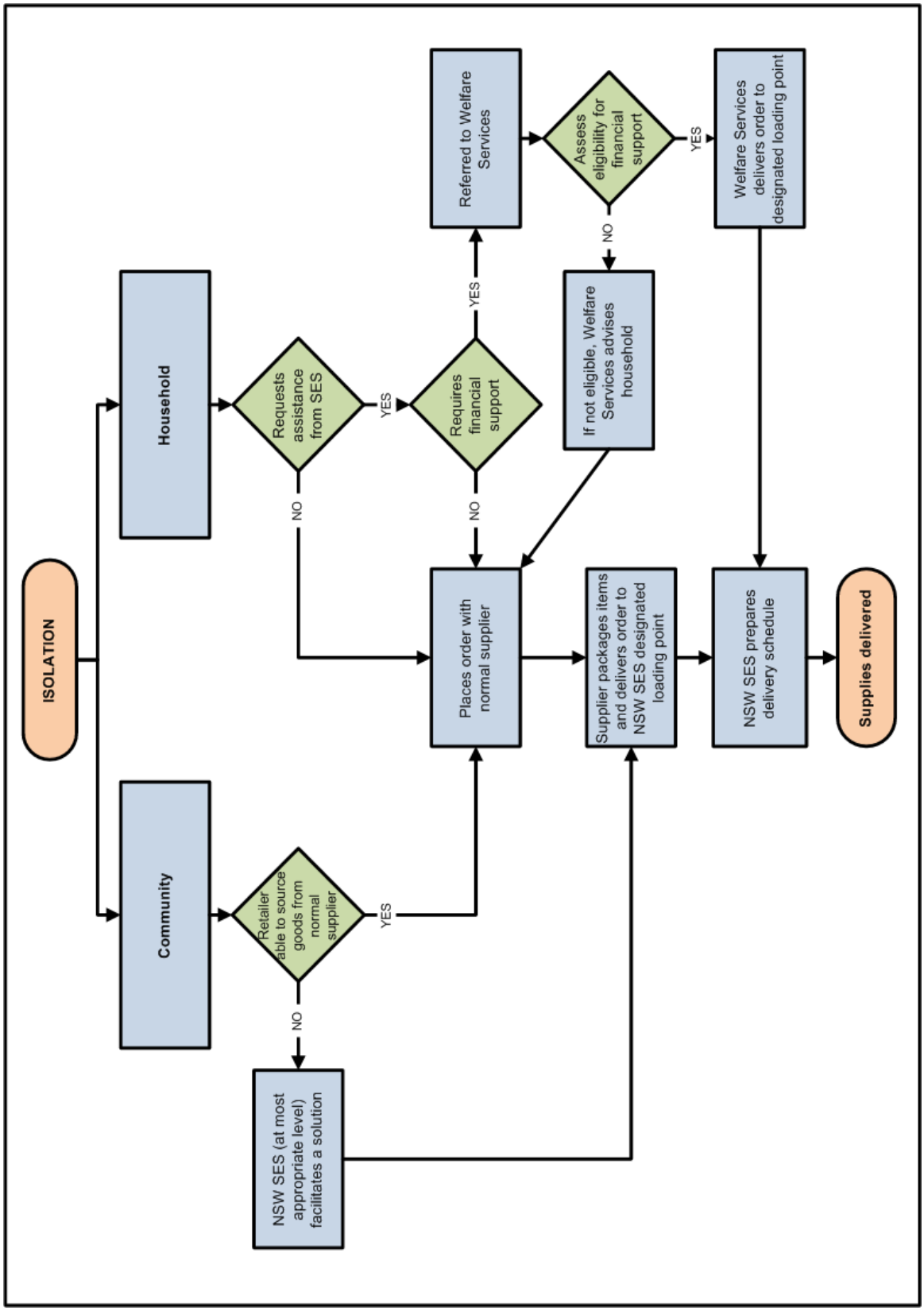
4.3 ARRANGEMENTS FOR DEBRIEFS / AFTER ACTION REVIEWS

4.3.1 As soon as possible after flooding has abated, the NSW SES Wagga Wagga Unit Commander will advise participating organisations of details of response operation after action review arrangements.

4.3.2 The NSW SES Wagga Wagga Unit Commander will ensure that adequate arrangements are in place to record details of the After Action Review (AAR) and each item requiring further action is delegated to an organisation or individual to implement.

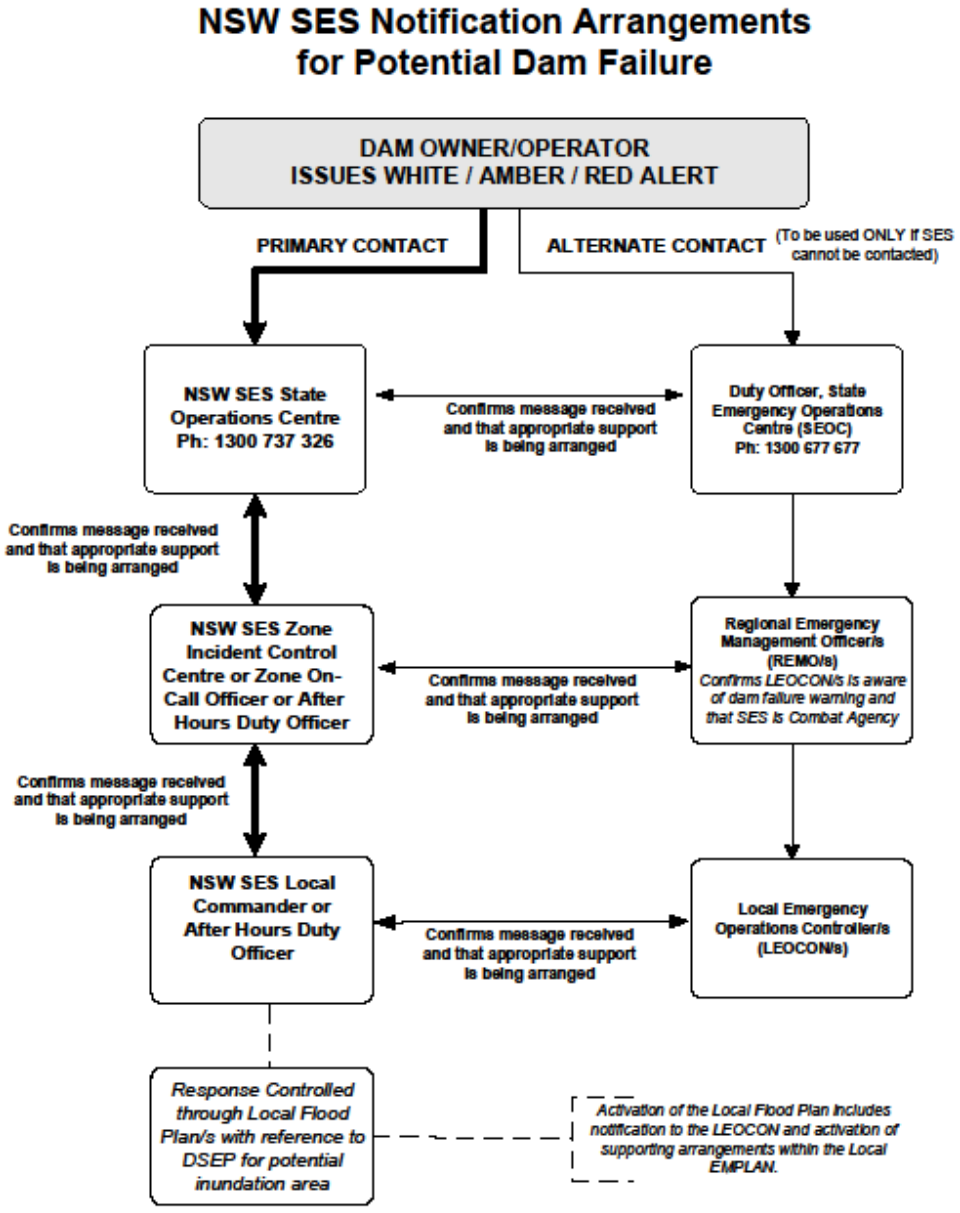
4.3.3 Follow-up to ensure the satisfactory completion of these actions will be undertaken by the Wagga Wagga LEMC.

ATTACHMENT 1 - RESUPPLY FLOWCHART



Please Note: **The chart outlines the resupply process, but does not encompass all potential situations and outcomes.**

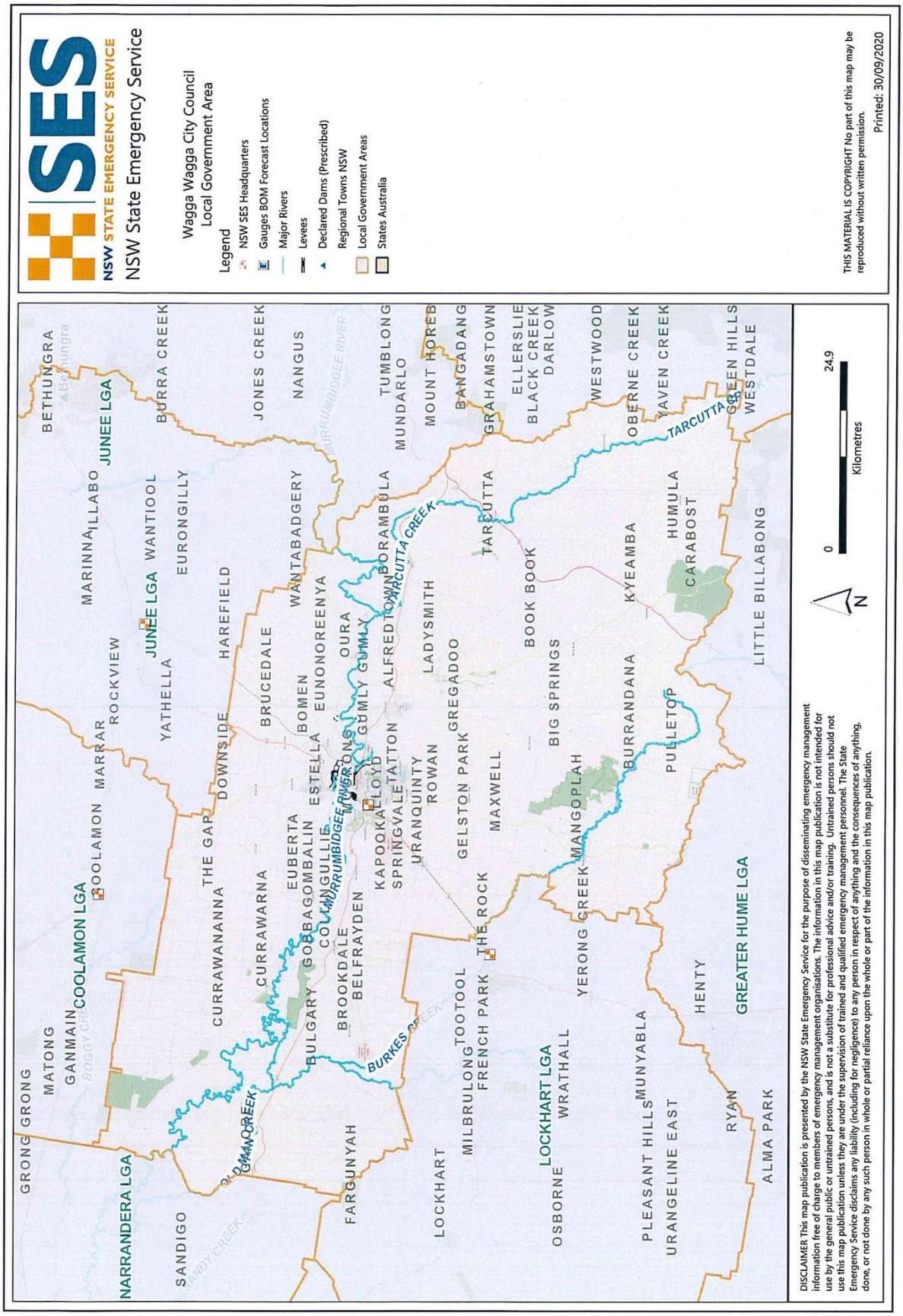
ATTACHMENT 2 - DAM FAILURE ALERT NOTIFICATION ARRANGEMENTS FLOWCHART



NOTES: (As at 1 May 2019)

1. Dam owners should only contact the SEOC if the NSW SES State Operations Centre (SOC) cannot be contacted.
2. The first priority for notification is to contact the NSW SES State Operations Centre. If unavailable, contact the SEOC. At each level, the contacted agency should notify the alternate contact at the same level, before making contact further down the line.
3. The triple zero (000) number for emergency services should only be used if both the NSW SES and the SEOC cannot be contacted, as it is likely the triple zero (000) operators will have difficulty dealing with the very unusual case of potential or actual dam failure.
4. Dam owners should send their Draft DSEP to the NSW SES for review of the emergency management arrangements (nswses.communityplanning@ses.nsw.gov.au).

ATTACHMENT 3 - WAGGA WAGGA CITY LGA MAP



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Hazard And Risk in Wagga Wagga City Council Local Government Area

Volume 2 of the Wagga Wagga City Council

Flood Emergency Sub-Plan

Last Update: 3 February 2025

AUTHORISATION

The Hazard and Risk in Wagga Wagga City Council Local Government Area has been prepared by the NSW State Emergency Service (NSW SES) as part of a comprehensive planning process. The information contained herein has been compiled from the latest available technical studies.

Approved:

Signature: JRStanbury

NSW SES Southern Zone Coordinator Planning

Print Name: Joshua Stanbury

Date: 20/3/2025

Approved:

Signature: Ben Pickup

NSW SES Southern Zone Commander

Print Name: Benjamin Pickup

Date: 21/03/2025

Date Tabled at LEMC: 3 February 2025

CONTENTS

LIST OF TABLES AND FIGURES

Version List

The following table lists all previously approved versions of this Volume.

Description	Date

Amendment List

Suggestions for amendments to this Volume should be forwarded to:

Manager, Emergency Risk Management

NSW State Emergency Service

PO Box 6126, Wollongong NSW 2500

nswses.communityplanning@ses.nsw.gov.au

Amendments promulgated in the amendments list below have been entered in this Volume.

Amendment Number	Description	Updated by	Date
Ver 1.0	Initial Draft	K Read	2024
Ver 1.1	Final Draft	K Read	Jan 2025
Ver 1.2	Final	K Read, J Stanbury	Jan 2025

1 THE FLOOD THREAT

1.1 OVERVIEW

Situated on the banks of the Murrumbidgee River, within the Riverina Region of NSW, the Wagga Wagga City Council area consists of the regional centre of Wagga Wagga and the surrounding communities of Tarcutta, Forest Hill, Uranquinty, Gumly Gumly, Humula, Ladysmith, Mangoplah, Collingullie, Galore, Oura, and Currawarna.

This regional city is the largest inland city in New South Wales and is the central hub for commercial, retail, and business activities within the Riverina district. The council's jurisdiction extends along the Murrumbidgee River from Eringoarrah to Berembed Weir, encompassing various tributaries, creeks, and streams, these include Tarcutta Creek, Kyeamba Creek, Houlaghans Creek, Sandy Creek, Bullenbung Creek, and Beaver/Old-man Creek. The catchment area of the Murrumbidgee River within the Wagga Wagga City Council Local Government Area (LGA) is approximately 26,400 km^2.

Some of the communities within the LGA are affected by riverine flooding along the banks of the Murrumbidgee River. The communities situated on the many tributaries, creeks, and streams are affected by overland flow from rainfall within their catchment. Most Wagga Wagga floodplains are classified as “Low Flood Islands” with restricted flood access.

1.2 LANDFORMS AND RIVER SYSTEMS

Murrumbidgee River

The Murrumbidgee River, a significant tributary of the Murray-Darling Basin, stretching across almost 1,600 kilometres, encompassing much of southern New South Wales and the majority of the Australian Capital Territory. Originating in the Monaro Plains near Cooma, it flows westward until it meets the Murray River close to Balranald.

The Murrumbidgee River is regulated downstream of Burrinjuck Dam and Blowering Dams.

The water from the Tumut River contributes to the flow of the Murrumbidgee River, passing through the Talbingo, Jounama Pondage, and Blowering Dams. Several tributaries, including Jugiong, Muttama, Adelong, Billabong, Hillas, Tarcutta, and Kyeamba Creeks, feed into the river above Wagga Wagga, creating various floodplain areas.

From Wagga Wagga, the river winds through expansive plains. This lower valley section, situated predominantly below 200 meters in elevation, consists of a flat terrain featuring numerous anabranches and effluent creeks. The main tributaries joining the river within the council area below Wagga Wagga are Houlaghans, Sandy and Bullenbung Creeks. A significant tributary of the Bullenbung Creek is Burkes Creek. Beaver/Old Man Creek is an anabranch of the river, which is joined by Bullenbung Creek.

Tarcutta Creek

Tarcutta Creek is a tributary of the Murrumbidgee River which flows through the foothills east of Wagga Wagga in the Tarcutta and Borambola areas. The Tarcutta Creek catchment area is 1700 km^2 (170,000ha) and is a sub-catchment of the Murrumbidgee River.

Kyeamba Creek

Kyeamba Creek is a tributary to the Murrumbidgee River which flows through the Ladysmith area. Creeks flowing into the Kyeamba Creek are O'Briens Creek, Teatree Creek, Crooked Creek and Tooles Creek.

Marshalls Creek

Marshalls Creek is a small tributary of the Murrumbidgee River which flows through the eastern sections of Wagga Wagga. The headwaters of the catchment are located in the Gregadoo Hills, where water then flows into Lake Albert and then into Marshalls Creek.

Houlaghans Creek

Houlaghans Creek is a tributary of the Murrumbidgee River which flows from the North of Wagga Wagga. The headwaters of the catchment are located in the rolling hills of Junee Shire, where water then accumulates from the numerous tributaries before Wallacetown and then flows into the Murrumbidgee river, near Estella.

Sandy Creek

Sandy Creek is a small tributary of the Murrumbidgee River which flows through Uranquinty. The headwaters of the catchment are located in the foothills of Big Springs, Maxwell, Gelston Park, where water then flows passed Uranquinty, before passing Kapooka, and meeting the Murrumbidgee river at Yarragundry.

Bullenbung Creek

Bullenbung Creek is a large tributary of the Murrumbidgee River which flows from the south of the LGA through Lockhart Shire, where it is joined by Burkes Creek. Burkes Creek is a significant catchment that's headwaters are in the Pulletop and Burrandana area.

For details of the catchment, refer to 3- ANNEX River Schematics and Catchment maps.

1.3 STORAGE DAMS

Dam locations are shown on ANNEX River Schematics and Catchment maps.

Four declared dams influence the Wagga Wagga LGA: Blowering Dam, Burrinjuck Dam, Jounama Pondage, and Talbingo Dam.

Table 1: Summary of Blowering Dam	
Owner / Operator	WaterNSW [1]
Description of Dam	Blowering Dam is a 114m high earth and rockfill structure with a central clay core, a concrete spillway, four outlet valves, and an 80MW hydroelectric power station. The embankment has a crest length of 735m. Blowering Dam is the most downstream dam on the Tumut River and provides storage to control the discharge from the Tumut Power Stations for use in the downstream Murrumbidgee and Coleambally Irrigation Areas. A hydroelectric plant (operated by Snowy Hydro Ltd) at the dam toe enables power generation during releases.
Location	It is located on the Tumut River, approximately 13 kilometres upstream of the town of Tumut.
Communities Downstream	Talbingo, Tumut, Brungle, Gundagai, Mundarlo, Wantabadgery, Oura, Gumly Gumly, North Wagga, Wagga Wagga Currawarna, Collingullie
Monitoring System	The dam is equipped with extensive instrumentation, including a telemetry monitoring system. Daily routine surveillance is carried out to ensure proper oversight of the dam's condition.
Warning System	At Blowering Dam, the primary method of notification of the downstream community of flood or potential flood is via the NSW SES. An early warning system is in place for residents who have subscribed to WaterNSW notifications.
Other	Very short travel time to Tumut. Travel times to Wagga Wagga are around 19hrs.

Table 2: Summary of Burrinjuck Dam	
Owner / Operator	WaterNSW [2]
Description of Dam	Burrinjuck Dam is a 93m high concrete gravity dam with a crest of 233m. The spillways consist of side channel spillways at the left and right abutments. In addition, three spillway chutes, controlled by sector gates, are used for the regulated discharge of flood waters into the river bed well beyond the downstream toe and the foundation of the main wall. In addition to the spillway gates, the outlet works comprise one high-level outlet in the left-hand spillway, one mid-level outlet and four low-level irrigation outlets discharging through 4 fixed dispersion cone valves. The storage capacity at FSL (361.667m AHD) is 1,026,00 ML and has a catchment area of 13,000km2
Location	Situated in a narrow gorge on the Murrumbidgee River downstream of Canberra and upstream of Gundagai, approximately 60 km by road from Yass. It lies within the Gundagai LGA and Murrumbidgee River Basin.
Communities Downstream	Jugiong, Gobarralong, Gundagai, Mundarlo, Wantabadgery, Oura, Gumly Gumly, North Wagga, Wagga Wagga, Currawarna, Collingullie, Narrandera
Monitoring System	The dam is monitored by the following Surveillance network: telemetry system (24 hrs/day), inverted plummets (weekly), plummets (weekly), uplift pressure gauges, seepage monitoring (fortnightly), gap measurements (monthly), and deformation surveys (yearly).

Warning System	WaterNSW has an Early Warning Network electronic notification system that will be used to alert identified downstream landholders at risk as well as other self-enrolling members of the public
Other	Dam can safely pass the PMF

Table 3: Summary of Jounama Pondage	
Owner / Operator	Snowy Hydro Limited [3]
Description of Dam	Jounama Pondage consists of a 44-m high rockfill structure with a central clay core and crest length of 518m. The dam has a gross capacity of 43,500 ML with an active capacity of 27,800 ML. Jounama has a gated spillway (sill level RL 381.00) capable of discharging 3.965 ML/sec. The spillway gate sill level at Jounama Dam is RL 381.00, and the highest point on the floor of the River Outlet Tunnel is RL 375.82.
Location	Located on the Tumut River, 18km upstream of Blowering Dam and downstream from Talbingo. It lies within the Snowy Valleys LGA and Murrumbidgee River Basin.
Communities Downstream	Tumut, Brungle, Gundagai, Mundarlo, Wantabadgery, Oura, Gumly Gumly, North Wagga, Wagga Wagga, Currawarna, Collingullie
Monitoring System	Inflows and storage levels are continually recorded, Seismic monitoring, and Site inspections.
Warning System	A hooter sounds at the start of each new gate-opening movement to warn personnel in the vicinity of the increase in discharge.
Other	Very short travel times to Tumut. Travel time to Wagga Wagga is around 19hrs.

Table 4: Summary of Talbingo Dam	
Owner / Operator	Snowy Hydro Limited [4]
Description of Dam	Talbingo Dam is a 161-metre-high rockfill structure with an upstream sloping impervious earth core supported by the rockfill zones. The maximum height of the dam above the foundations is 161.5m, and the crest length is 701.0m. The crest is 9.1 m wide and incorporates a 7.3 m roadway. The reservoir impounded by the construction of Talbingo Dam and T3 Inlet Structure has a storage capacity of 921,400 x 103 m3.
Location	Talbingo Dam is located on the Tumut River 80 km upstream from the confluence of the Tumut and Murrumbidgee Rivers and forms the headwater storage for the operation of the Tumut 3 pumped-storage project.
Communities Downstream	Talbingo, Tumut, Brungle, Gundagai, Mundarlo, Wantabadgery, Oura, Gumly Gumly, North Wagga Wagga, Wagga Wagga, Currawarna, Collingullie, Galore, and Narrandera.
Monitoring System	Inflows and storage levels are continually recorded and monitored, as are seismic monitoring and site inspections. A rigorous system of inspections and monitoring is in place. These include routine inspections by local staff, more detailed annual inspections by local operators and Asset Management Engineering staff, and comprehensive five-yearly audits by external consultants. When observations outside the expected range are logged on the dam management system, alarms are automatically raised, and the appropriate personnel are notified. Asset Management Engineering carries out an initial assessment of the situation and advises the Area Manager on the appropriate action to take.
Warning System	No warning system was identified.

Other	There is an extremely short travel time to the township of Talbingo and a very short travel time to Tumut. Travel times to Wagga Wagga are calculated at around 19 hours

1.4 WEATHER SYSTEMS AND FLOODING

Wagga Wagga has a temperate climate. The highest recorded temperature was 45.2°C on February 7, 2009. The lowest recorded temperature was -6.3°C on July 21, 1982. On average, summer maximum temperatures are about 30°C with a minimum of 15°C. The average winter maximum is 13°C with a minimum of 3°C[5].

The mean annual rainfall is 571.6 mm, with an average of 106.1 rainy days per year. Rainfall is distributed fairly evenly throughout the year, although there is a slight predominance noted during the winter and spring months[5].

During the summer season, maximum temperatures range from 29°C to 32°C. During this time, the relative humidity is relatively low, averaging around 30% at 3 PM. In contrast, winter brings cooler to cold temperatures, with overnight minimums averaging about 3°C and daily maximums typically between 12°C and 14°C. In winter, relative humidity levels increase significantly, averaging over 60% at 3 PM and approaching 90% by 9 PM.[6].

Frost and fog are common features of Wagga Wagga during winter. Although snow has been recorded in the area, it is a very rare occurrence[6].

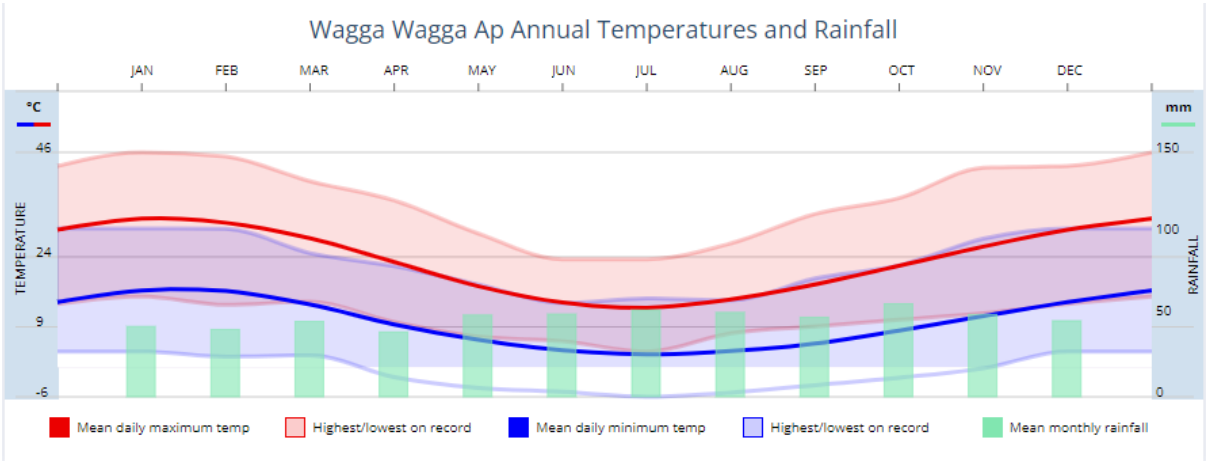


Figure 1 Annual Temperature and Rainfall[7]

The Wagga Wagga local community experiences flooding due to several weather systems:

1. Southern air masses from the Antarctic region moving northeast over the catchment, the primary flood-producing mechanism between April and October.

2. Low-pressure systems on the east coast of Australia causing moist airflows over the Snowy Mountains.

3. Short-duration, high-intensity convective thunderstorms that occur over small areas during summer. These may cause town drainage systems to surcharge and minor creeks to rise rapidly, such thunderstorms do not cause mainstream riverine flooding.

A La-Nina event which maintained two peaks over the two summers of 2010/11-2011/12 occurred. The Bureau of Meteorology states that the 2010-11 peak was one of the strongest on record (comparable to 1917-18, 1955-56 and 1975-76), while the 2011-12 peak was of moderate strength resulting in major flooding at Wagga Wagga[8].

Historically, floods in Wagga Wagga occur during late autumn, winter, and early spring, with the average rainfall over the catchment at 500mm. The wettest months are from May to October.

The following graph shows the monthly distribution of floods greater than 9 metres at the Hampden Bridge gauge.

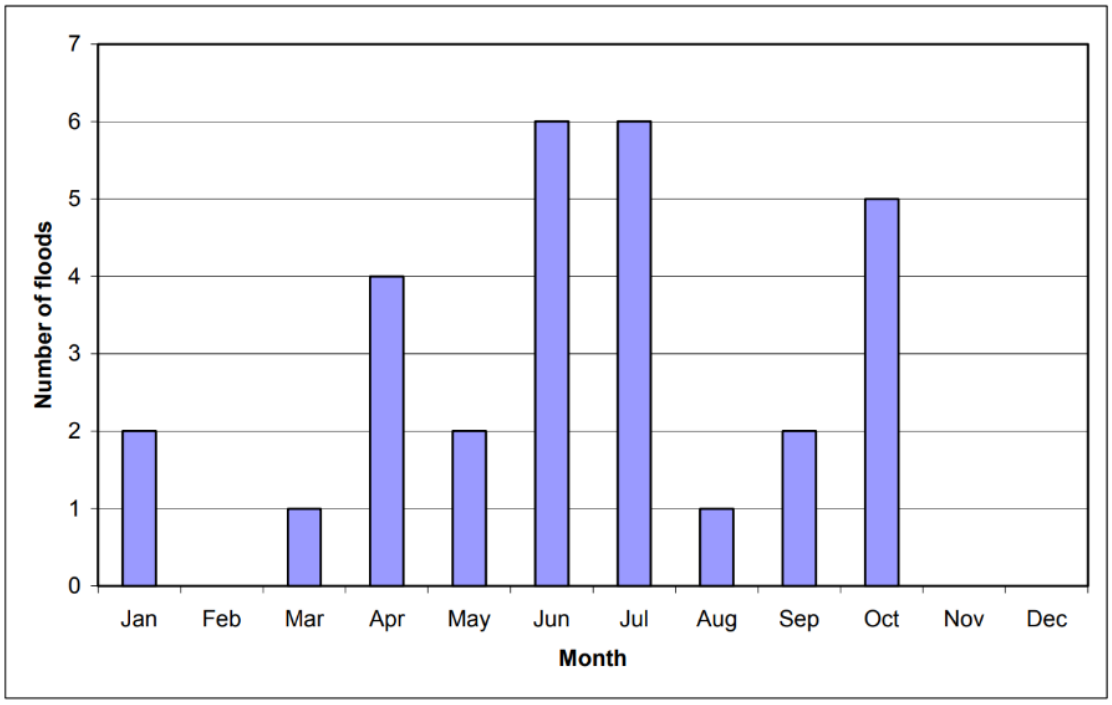


Figure 2 - Seasonal distribution of floods greater than 9 metres at the Wagga Wagga gauge.

1.5 CHARACTERISTICS OF FLOODING

Wagga Wagga is made up of several geographic communities and the flood characteristics differ between each of these. The main differences are the flood hazard, (i.e. flood depths and velocities) in and around each area, and the ability for residents to safely access flood-free land. These inherent differences mean that flood risk mitigation must be approached differently for each community, to achieve the best outcome for residents appropriate to the flood behaviour in that area.

The majority of flooding in Wagga Wagga LGA occurs from riverine flooding, however, some areas may be impacted by overland flooding. A small number of areas of the upper catchment have the potential to be impacted by high-velocity, flash-flood events. Central Wagga Wagga can be impacted by both riverine flooding, as well as stormwater runoff and ponding behind the levee system.

Floods upstream of Wagga Wagga may last several days, and the areas that are inundated are not significant. Flood waters take 2-3 days to travel from Burrinjuck Dam to Wagga Wagga; however, this time may be shorter for more severe floods.

The storage dams located in the upper Murrumbidgee Valley can affect the severity of flooding on the Murrumbidgee floodplain. In particular, these dams can reduce the peak flood discharge, resulting in lower peak flood heights but longer flood durations. This may be done by deliberately storing the flood peak for later release, or by pre-releasing water to create extra space in the dam ahead of an approaching flood. These actions, however, do not mitigate floods, and their effectiveness depends on dam levels.

Downstream from Wagga Wagga, the area subject to inundation is very extensive, water movement is slow, and inundation can last for several weeks.

Numerous small creeks flowing through the council area tend to rise and fall quickly. There are no warning systems for any creeks within the council area.

At Wagga Wagga, the rate of rise of floods can vary significantly between events, although is generally slow and delayed, but can be up to 30cm per hour in large events.

Table 5: Indicative flow travel time for the Murrumbidgee River[9]

Locations	Travel Time
Burrinjuck Dam to Wagga Wagga	42-72 hours
Tumut to Wagga Wagga	33-61 hours
Gundagai to Wagga Wagga	19-52 hours
Wagga Wagga to Narrandera	3.5-5 days

During extreme floods, a minimum of 20 hours of warning time should be available.

1.6 FLOOD HISTORY

There is a recorded history of flooding on the Murrumbidgee River going back to the mid-19th century, but reliable records are available only since 1891. At Wagga Wagga, about twenty floods since 1844 have reached the currently defined major level (9.6 metres). The highest recorded flood at Wagga Wagga since European settlement occurred in 1844 when a height of 10.97 metres is thought to have been reached. The second-highest flood was experienced in July 1853 when a height of 10.9 metres is believed to have been reached.

Significant flooding occurred in 1956 which flooded 1000 properties in central Wagga Wagga[10] and afterwards Council decided to provide levee protection for the city. 1956 saw frequent minor flooding in the area and a major flood of 9.6m in June 1956[11].

The largest flood occurred in August 1974, reaching a height of 10.75 metres at Wagga Wagga. This flood was the largest since 1853. During this event, Burrinjuck Dam had been filled to capacity by rainfall greater than 300mm and recorded snowfalls. North Wagga Wagga, unprotected by levees, suffered inundation, necessitating evacuations, with flood depths reaching more than 1 metre in some areas. Evacuations also took place in Gumly Gumly, whilst some residents in central and west Wagga Wagga prepared to leave their homes, fearing that levees would overtop or fail[12]. The levee system protected properties from inundation in central Wagga Wagga.

In October 2010 and March 2012, Wagga Wagga experienced significant flood events that affected many homes, businesses, and land from Jugiong to Darlington Point. These events were associated with La Niña weather patterns, causing heavy rainfall in the area. In October 2010, flash flooding occurred in and around Wagga Wagga. In March 2012, riverine flooding was predominant, with the flood peaking at 10.6m at the gauge, just below the design height of the Wagga CBD levee at the time.

North Wagga Wagga was also evacuated; the North Wagga Wagga levee was overtopped, leading to the inundation of around 190 homes. In October 2016, Wagga Wagga experienced a significant rainfall event with a maximum gauge reading of 8.95m. The Wagga Beach Caravan Park and areas of Edward Street in the CBD were evacuated. However, neither the North Wagga Wagga nor Wagga Wagga CBD levees were overtopped during this event. In 2022, from August to November, there were 5 major peaks, with the highest peak of 9.70m recorded on November 4th at 1:00 pm[13].

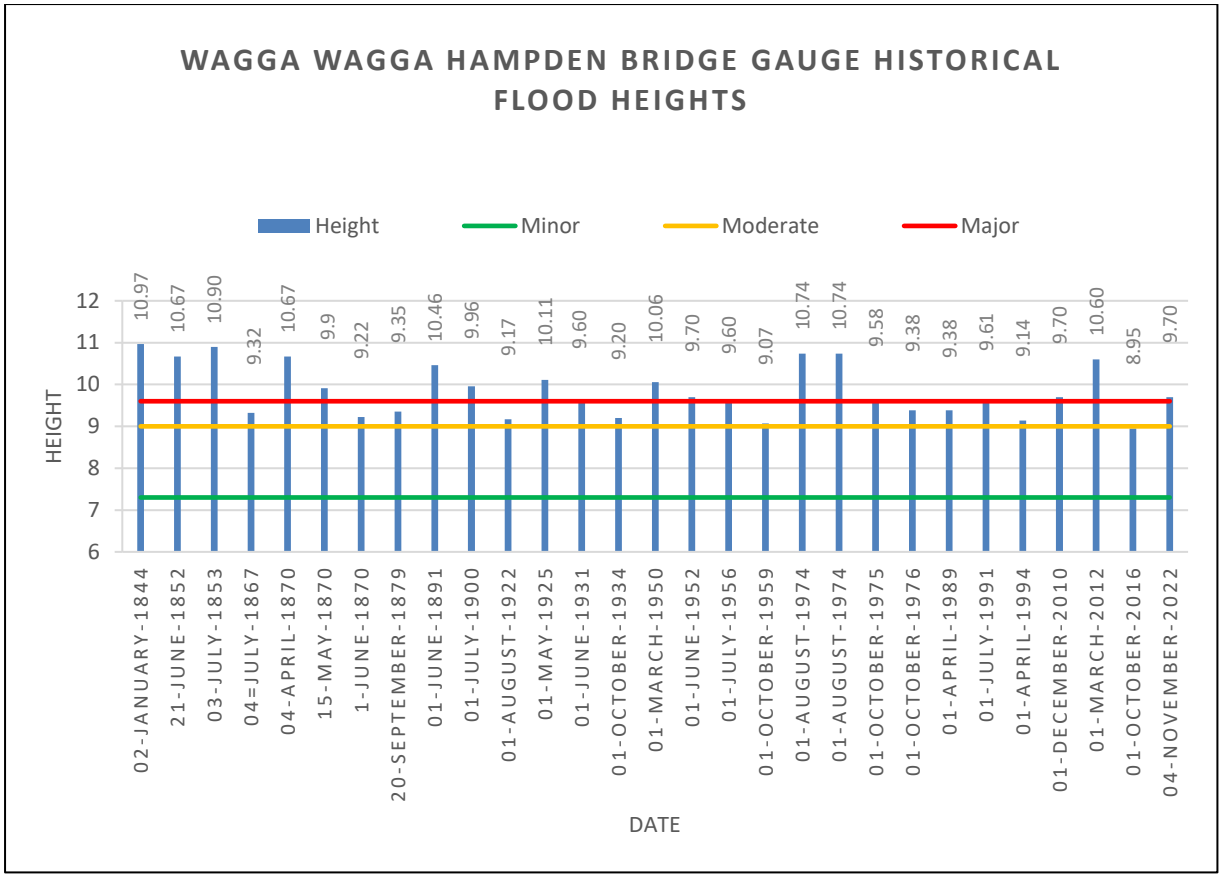


Figure 3 - Historical flood heights greater than 9 metres at the Wagga Wagga gauge[9].

1.7 FLOOD MITIGATION SYSTEMS

There are five levees within the Wagga Wagga City LGA:

i. Wagga Wagga CBD located Kooringal Road to Olympic Highway; and

ii. North Wagga Wagga ring levee,

iii. Gumly Gumly, situated east of Gumly Road,

iv. Uranquinty,

v. Tarcutta.

Each levee is further described within Part 2 - Specific Risk Areas.

Levee locations are shown in the Annex. 5 – LGA and Town Maps.

There are no prescribed detention basins within the Wagga Wagga City LGA:

1.8 EXTREME FLOODING

On rare occasions, extreme flooding can occur, surpassing previous records and affecting areas that have never flooded before. These floods rise rapidly and pose greater risks in terms of depth and velocity. In Wagga Wagga, the infrastructure is planned and built to withstand flooding with a 1% Annual Exceedance Probability (AEP). However, extreme flooding beyond this level could put significant infrastructure at risk, including:

- Water Treatment plants
- Sewerage Treatment plants
- Electrical Infrastructure
- Hospitals
- Emergency Services
- Other support services

Specific Infrastructure at risk can be found in Annex 2 - Facilities at Risk of Flooding.

The extremist flood, which is estimated to be the probable maximum flood (PMF) height for Wagga Wagga, is estimated at 16.1 metres on the Hampden Bridge gauge. This may occur in the unlikely event of a dam failure, where the catchment is already flush with water. The effects of this can be of even greater severity to nominal floods, where they result in large-scale property destruction and mass displacement of the community.

The resulting flood waters would be deep and fast-flowing, consisting of large amounts of debris. The probability of dam failure occurring is very low. Three dam failure scenarios exist:

- Failure of Blowering Dam
- Failure of Burrinjuck Dam
- Failure of the Talbingo Dam resulted in the cascading failure of the Jounama Pondage and Blowering Dam.

Table 6: Hampden Bridge Gauge - Design peak heights and flows[9]

Event	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	0.5% AEP	0.2% AEP	PMF
Peak Gauge Height (M)	9.1	9.7	10.1	10.8	11.3	11.8	12.3	16.1
Event Peak Flow (m^3/s)	1,200	2,000	2,900	4,100	5,100	6,300	8,200	28,400
Event Peak Flow (ML/day)	104,000	173,000	251,000	354,000	441,000	544,000	708,000	2,454,000

2 EFFECTS ON THE COMMUNITY

2.1 COMMUNITY PROFILE

Wagga Wagga City Council local government area is made of several communities that can be affected in a flood. For planning purposes, these can be categorised into suburbs, which include:

Greater Wagga Wagga includes the Wagga Wagga CBD, Estella, Boorooma, Gobbagombalin, Ashmont-Glenfield, Kooringal, East Wagga Wagga, Flowerdale, Gumly Gumly and Lake Albert suburbs.

The outlying villages are their own suburbs**: Oura**, **Ladysmith**, **Tarcutta**, **Uranquinty**, **Galore**, **Currawarna**, **Collingullie, Mangoplah, and Humula.**

Table 7: 2021 Census - Housing and population data

Census Description	LGA[14]	Greater Wagga Wagga	North Wagga Wagga [15]	Oura [16]	Ladysmith [17]	Tarcutta[18]	Uranquinty[19]	Galore [20]	Currawarna[21]	Collingullie[22]	Mangoplah[23]	Humula[24]
Total Persons	**67,609**	**59,159**	**679**	**246**	**215**	**206**	**767**	**79**	**199**	**258**	**291**	**129**
Aged 0-4 yrs	4,578	3,961	26	16	9	12	55	10	11	9	13	6
Aged 5-14 yrs	9170	8,030	78	36	36	31	124	14	35	43	31	15
Aged 65 + yrs	11,196	10,170	121	31	35	47	126	14	26	42	50	35
Of Indigenous Origin	4,471	7,151	32	14	3	14	43	0	8	3	10	10
Who do not speak English well	2,357	2,171	19	0	0	0	0	0	0	0	0	0
Require assistance	3,998	3,750	40	15	5	21	40	5	5	0	9	7

(profound/severe disability)												
Living alone (Total)	6,862	6,401	60	8	19	24	61	6	9	12	17	9
Living alone (Aged 65+)	2,810	685	108	9	5	18	25	0	4	3	3	5
Residing in caravans, cabins or houseboats or improvised dwellings	93	194	4	0	0	0	0	0	0	0	0	0
Occupied Private Dwellings (Households)	**26,775**	**22,164**	**236**	**72**	**81**	**83**	**280**	**25**	**65**	**74**	**94**	**51**
No Motor Vehicle	1,514	1,480	12	0	0	0	13	0	0	0	5	0
Rented via State or Housing Authority	889	885	0	0	0	0	0	0	0	0	0	0
Rented via Housing Co-Op or Community Church Group	190	191	0	0	0	0	0	0	0	0	0	0
Unoccupied Private Dwellings	**2,005**	**1,763**	**24**	**0**	**0**	**25**	**21**	**0**	**15**	**8**	**13**	**11**
Average persons per occupied dwelling	**3**	**2.8**	**2.7**	**2.9**	**2.7**	**2.3**	**2.7**	**2.9**	**2.9**	**2.9**	**2.8**	**2.5**
Average vehicles per occupied dwelling	**2**	**2**	**1**	**2.5**	**2.2**	**2**	**2.1**	**2**	**2.9**	**2**	**2.9**	**2.5**

3 SPECIFIC RISK AREAS - FLOOD

3.1 GREATER WAGGA WAGGA

This includes the suburbs of Central Wagga Wagga, Estella, Boorooma, Gobbagombalin, Ashmont, Kooringal, East Wagga Wagga, Flowerdale, Gumly Gumly and Lake Albert.

Community Overview

Wagga Wagga has a population of 59,159, of which approximately 17% are over 65 years of age. Less than 10% of the population speak a language other than English at home[14].

With the demographics of the community being what they are, it is necessary to assess additional risk vectors for the community such as: Elderly population, Languages other than English and Single parent families.

Single-parent families in Wagga Wagga are quite numerous at 19% compared to the state average of 15%. Single-parent families often have low adult-children ratios, which can make evacuation more difficult.

While the elderly population is also quite high with approx. 17% compared to 13%. The elderly population often require assistance when responding to emergencies. Some may also be socially isolated, resulting in being unaware of evacuation warnings or unable to decide on a course of action.

Due to recent floods in Wagga Wagga in 2010, 2012, 2016, and 2022, the community's flood awareness and preparedness are considered high. Although additional consideration needs to be given to targeting the vulnerable population with targeted doorknocking and additional provisions of transport.

Classification of Floodplain

For emergency management purposes, the Greater Wagga Wagga floodplain consists of low-flood islands closer to the river that gradually transitions to rising roads and overland escape routes closer to the floodway fringe at its edges, depending on infrastructure.

These floodplain classifications are described in depth for specific locations within the floodplain in Volume 3 - sub-sectors.

Inundation

Gumly Gumly:

The area consists of approximately 50 rural acreages, 30 residential houses, and a small number of motels and other businesses, all of which are prone to flooding. Gumly Gumly was affected during the March 2012 flood with over-floor flooding on Graham Avenue.

At heights above 9.6m, the Gumly Gumly levee will be overtopped, and a large flow will occur across Pioneer Avenue down to Henwood Causeway. Access will be cut off to 38 residences, and houses will commence to be flooded. The floor heights of houses in the village vary, and many are elevated.

East Wagga Wagga:

Flooding within East Wagga Wagga is expected during floods expected to exceed the 20% AEP level, where premises down along the banks are isolated or inundated prior to the rest of East Wagga Wagga being affected.

With floods that exceed 10% AEP, the suburb will see flooding start to breakout to the south on the banks of Marshalls Creek. With floods that exceed the 5% AEP, there will be widespread flooding throughout East Wagga Wagga as flooding of Marshalls Creek joins flooding of the wider floodplain and inundates large portions of the area.

For East Wagga Wagga, the Council's planning policy requires that non-residential floor levels be built above the 5% AEP level plus a freeboard, which reduces flood effects for smaller events. However, in the 1% AEP, 149 non-residential and 34 residential properties are flooded above floor level by depths of up to 2m.

Lake Albert:

While Lake Albert is not susceptible to flooding from riverine flooding, it is susceptible to overland flooding from Stringybark Creek and Crooked Creek, which may, during times of riverine flooding, impact the houses downstream of the lake towards joining Marshalls Creek, if the lake was at full capacity, and unable to retain and mitigate flooding in the area.

Works are being planned to increase the level of diversion of flood waters from Stringybark and Crooked Creeks in to the lake, in order to mitigate overland flooding of the premises along Plumpton Road and the lar lot residential to the west of the lake.

Kooringal:

Kooringal, situated behind the Wagga Wagga City Levee, is susceptible to floods as the spill way is activated during floods greater than 11.4m on the Hampden bridge gauge, inundating unused land along the disused Wagga Wagga to Tumbarumba Rail line embankment. As the level of water in Kooringal increases, there is likely to be inundation of the industrial area towards the Sturt Highway (Edwards St), where water may enter the storm water network and begin flooding locations of Central Wagga Wagga behind the levee.

Wagga Wagga CBD:

The Wagga Wagga CBD, situated behind the City Levee, is protected from flooding up to a 1% AEP flood (11m) with a freeboard to allow for environmental factors that may impact the heights of the water.

The low-lying areas in the Wagga wagga CBD, including the shopping centre basement carparks, the Council Offices, and the Art Gallery and Library (approximately 2000 properties that are a mix of residential and light industrial), are susceptible to flooding from stormwater runoff through the Wollundry Lagoon. The effects of this can be compounded if the river is also in flood.

In March 2012, the water level peaked at 10.6 meters on the Wagga Wagga Hampden Bridge gauge (410001). Despite this high-water level, the township did not experience over-floor flooding due to the protection provided by the main town levee.

Hampden Avenue links Wagga Wagga CBD and North Wagga Wagga via Wiradjuri Bridge. During moderate flooding (events greater than 5% AEP), floodwaters flow over Hampden Avenue preventing egress from North Wagga Wagga to Wagga Wagga CBD. This occurs prior to the overtopping of the Wagga Wagga City and North Wagga Wagga levees.

Significant flood affectation would also occur during the 0.5% and 0.2% events with 1,500 and 2,400 residential and non-residential buildings flooded above the floor in these events.

During a PMF event, 4,700 residential and non-residential buildings are estimated to flood above floor level behind the Wagga Wagga City Levee.

Ashmont:

Situated behind the Wagga Wagga City Levee, small sections of this suburb are susceptible to riverine flooding in events greater then the 1% AEP, when the Flowerdale spillway is activated. This may affect areas south of the Sturt Highway (Edward St), at the intersection of Moorong Street and Pearson Street.

At a PMF flood, the extent may reach past Ashmont Avenue in selected locations.

Flowerdale:

Flowerdale Island, part of Moorong suburb, is susceptible to isolation of flood events past 7.6m on the Hampden Bridge Gauge, isolating seven residences in the area. The Island is required to be evacuated if the flood peak is expected to exceed 9.5m on the Hampden Bridge gauge.

Flowerdale is also the location of the levee spill way, which is expected to be activated at 11.7m on the Hampden Bridge gauge, inundating the wetlands behind the levee before potentially affecting Mooring Street.

Moorong:

Flooding in Moorong is known to begin early along with Flowerdale, with some houses within the wider floodplain being isolated. During floods greater than the 10% AEP, the

residences on river view drive may become isolated from direct road access, although some access may be retained through Pomingalarna Park or the Wagga City Golf Club.

Estella, Boorooma and Gobbagombalin:

Situated on the hills to the north of the Wagga Wagga floodplain, Estella, Boorooma and Gobbagombalin are outside the floodplain and are not subject to being inundated. Although they are affected by the indirect impacts of flooding within the Wagga Wagga LGA. Such as being disconnected from medical services, supplies and general services, by the Gobbagombalin bridge which at times is known to take over two hours to cross.

Table 8: Estimated number of properties inundated above floor level[9].

Hampden Bridge Gauge Height (m)	No. Properties with Over-floor flooding			
	Wagga CBD	East Wagga	West Wagga	Gumly Gumly
10% AEP – 9.7m	0	5	14	2
5% AEP - 10.1m	0	17	23	5
2% AEP – 10.8m	0	89	32	16
1% AEP - 11.3m	0	189	37	38
0.5% AEP – 11.8m	1832	245	41	62
0.2% AEP – 12.3m	2987	260	51	67
PMF – 16.1m	Residential 2893 Non-Residential 1069	Residential 74 Non-Residential 250	Residential 56 Non-Residential 22	Residential 65 Non-Residential 7

Isolation

Isolation did not occur in the previous flood events of 1974, 2010 or 2012. It is expected that a PMF event is likely to isolate Wagga Wagga for at least a week.

Immediately to the west of Central Wagga Wagga approximately 20 properties are located outside the Wagga Wagga levee in Edward Street West and Flowerdale Road. Floodwater begins to enter this area before approximately 7.6 metres on the Wagga Wagga Hampden Bridge gauge. Initially, properties in this area would be isolated, with the Flowerdale Road evacuation route cut during minor flooding.

Gumly Common, is cut at the Graham Avenue culvert at about 8.2m on the Wagga Wagga gauge, isolating 6 dwellings, and the entire area north of low points on Pioneer Avenue and the western end of Gumly Road, cut at about 8.5m on the Wagga Wagga gauge isolating 43 dwellings.

Characteristics of flooding

Wagga Wagga and its surrounding suburbs are mainly susceptible to riverine flooding. However, there is a high risk of overland flooding due to the volumes of water that fall within the catchment and the topography of the community, making it susceptible to flash flooding.

During high river flows, the risks presented by overland flooding are increased due to the typical stormwater management systems being curtailed to limited releases and requiring pumps to manage the volumes of water behind the Main city levee.

The Gobbagombalin Lagoon impacts flooding in the Wagga Wagga Floodplain by serving as a storage area for excess water flows. Depending on whether the regulator is open or closed, the closure of the regulator has the potential to result in elevated river heights by impeding or delaying the inflow of water into the lagoon.

Water enters Parken Pregan Lagoon and then follows the low-lying area to the southeast, passing above Wilks Park and under the Parken Pregan Lagoon bridge, ultimately filling the lagoon to the east/northeast. This may have implications for approximately three properties referred to as "The Island," situated beyond the levee and susceptible to isolation.

During periods of flooding, Flowerdale Lagoon becomes inundated, encircling five residential properties and causing isolation for the occupants.

Malebo Gap is a bottleneck constriction point on the Murrumbidgee River in West Wagga intensifying the impact of the floodplain.

Flood Behaviour

The Murrumbidgee River typically exceeds its banks at 7.8m on the Hampden Bridge gauge. Subsequent backflow enters Parken Pregan lagoon from North Wagga Wagga flood runner at approximately 6m. During minor flooding, the adjacent lagoon fills with water, causing a backup in Dukes Creek and eventual overflow into Bomen lagoon. The backflow initiates at approximately 6.5m in the event of the gates open at Gobbagombalin Weir, and 8.5m if the weir gates are closed. In the event of a flood surpassing 9.3m, breakouts occur from Kurrajong Lagoon and converge near the railway viaduct on Mill Street.

Flood Mitigation Systems

Wagga Wagga has numerous flood mitigation systems and infrastructure as detailed in the tables below:

Table 9: Wagga Wagga City Levee[25]	
Location	Follows the Murrumbidgee River from near Kooringal Road in the east to the Olympic Highway in the west, approximately 9.6km
Type of Levee	Wagga's City Levee is a linear levee system with two spillways along the south bank of the Murrumbidgee River.
Owner	Wagga Wagga City Council
Design Height and freeboard	The design height is 11.3m with a 0.9m freeboard (on the Hampden Bridge gauge). Two spillways are located on the levee, and they activate at 11.4m (East Wagga) and 11.7m (Flowerdale).
Overtopping Height	1% AEP design event.
No. of properties protected	Residential: 2893 and Non-residential: 1069
Known low points	The corner of Kooringal Road and Copland Street (East Wagga Spillway) and the corner of Edward Street and Moorong Street (Flowerdale Spillway).
Location and sequence of inundation	Upon activation of the spillways, a controlled overtopping of the levee will take place, inundating the town in a predictable and safe manner that initially inundates empty land.
Consequences of levee overtopping or failure	If a peak flood exceeding the levee's design height is predicted, the Wagga CBD must be evacuated completely.
Deficiencies	Spillways have not been tested during a flood, so their usage and designed impacts may change depending on overland flow and the stormwater systems. Backflow through the stormwater system may allow for inundation in other parts of Wagga Wagga.

Table 10: Gumly Gumly Levee	
Location	Situated east of Gumly Road and protects for flood breakouts from an oxbow north of Lamprey Avenue for events up to approximately 10% AEP.
Type of Levee (ring etc.)	Partial Levee – non-engineered
Owner	Wagga Wagga City Council
Design Height and freeboard	The levee's design height is 9.6m (on the Hampden Bridge gauge) plus 0.15 to 0.3m of freeboard.
Overtopping Height	9.6 m

No. of properties protected	No known properties are protected, although the levee does pretect the communities access and egress.
Known low points	Pioneer Avenue down to Henwoods Causeway.
Location and sequence of inundation	Not a formal levee. Levee overtops, and the area behind the levee begins to fill, allowing for Pioneer Avenue and Gumly Road to be overtopped
Consequences of levee overtopping or failure	Possible isolation of the community of Gumly Gumly.
Deficiencies	It is not a formal levee. The overtopping height is an estimate and may be subject to change, although WWCC will monitor the levee.

Dams

There are a number of WaterNSW and Snowy Hydro dams upstream. If any of the declared dam failures were to occur, the entire Murrumbidgee floodplain within the LGA and outside would require evacuation.

Refer to 1.3 Storage Dams for further details.

At-Risk Facilities

Annex 2 - Greater Wagga Wagga shows the facilities in Greater Wagga Wagga that are at risk of flooding and/or isolation, including schools, childcare centres, hospitals, aged and infirm care homes, infrastructure, and caravan parks.

Other Considerations

- The Wagga Wagga Gold Cup is held on the first Thursday and Friday in May.
- Food and Wine Festival is held in March.
- The Lake to Lagoon Fun Run is held in September.
- The Henty Field Day week is held in September.
- The Wagga Wagga Show is held in mid-September.
- Gears and Beers Event, held early October - Big event.
- Junior State Cup Touch Football – Southern Chapter – third weekend of February.

3.2 NORTH WAGGA WAGGA

Community Overview

North Wagga Wagga is an inner northern suburb of Wagga Wagga, situated on the floodplain of the Murrumbidgee River, directly across from the city's Central Business District. According to the 2021 Census, North Wagga Wagga had a population of 679 people, with 18% of the population being aged 65 years and over. There were 247 occupied private dwellings in the area[15].

Characteristics of Flooding

Flooding of the North Wagga Floodplain consists of multiple breakouts of the Murrumbidgee river to the north, such as Wheel of Fortune creek, Eunony Bridge, Parken Pragan, Bomen lagoon, Wilks park, Gobbagombalin lagoon, and Long Waterhole before rejoining the river.

During large events flooding of North Wagga can be worsened by floodwater travelling east from the Dukes Creek system. [13]

Flood Behaviour

Flooding begins in the Parkan Pregan Lagoon area at about 7.0 metres on the Wagga Wagga gauge. The majority of the floodplain northwest of North Wagga Wagga floods at approximately 8.7 to 8.85 metres on the Hampden bridge gauge. Flooding upstream of North Wagga Wagga occurs between 8.9 metres and 9.3 metres on the Hampden Bridge gauge when breakouts occur upstream of the Eunony Bridge. Livestock and equipment in these areas will need to be moved to high ground[12].

Increased vegetation around the river is thought to have influenced the flood behaviour during the 2010 and 2012 events, by reducing the flow capacity of the floodplain.

Classification of Floodplain

North Wagga Wagga is protected by a series of levees to a height of 9.9 metres on the Hampden Bridge gauge. Behind the levee North Wagga Wagga becomes a High-flood Island from about 9.0m on the gauge and a low-flood island from approximately 9.6m when the levee begins to overtop.

Inundation

North Wagga Wagga consists of approximately 200 residential properties and several businesses which are prone to flooding.

The North Wagga Wagga public school is afforded the protection of the levee for events up to and including the 10% AEP. For events larger than this, the levee is overtopped, and the school property is significantly affected by the 5% AEP event. During the PMF, the school is flooded to a depth of approximately 6m.

During the March 2012 flood, the North Wagga Wagga levee was overtopped leading to inundation of the entire suburb of North Wagga Wagga. Approximately 270 homes were flooded above floor level.

Table 11: Estimated number of properties inundated above floor level[9]

Hampden Bridge Gauge Height (m)	No. Properties with Over-floor flooding	Depth over floor
10% AEP – 9.7m	12	
5% AEP - 10.1m	174	1.6m
2% AEP – 10.8m	215	
1% AEP - 11.3m	215	2.7m
0.5% AEP – 11.8m	219	
0.2% AEP – 12.3m	220	
PMF – 16.1m	Residential 203 Non-Residential 17	7.5m 7.1m

Isolation

Road access may be lost between North Wagga Wagga and Central Wagga Wagga at a height of 9.3m on the Hampden Bridge gauge, requiring pre-deployment, resupply operations or evacuation of the community. Although Council may reinforce the Hampden Avenue levee to allow protection to a higher level.

People failing to evacuate prior to inundation of the evacuation route will possibly be isolated for 2 to 3 days. If floodwaters overtop the levee, they could be forced to retreat to refuge areas spectator mounds at the oval, landing zone on Hampden Avenue and/or rooftops to require boat and helicopter rescue.

In addition to North Wagga village there are approximately 25 rural properties located outside the levee. These properties will require warning of the likely effects of flooding and the necessary response actions required.

Two helicopter landing zones areas have been identified and developed for residents who become stranded in North Wagga Wagga and require evacuation by helicopter.

- McPherson Oval
- The elevated area at the intersection of McGrath and Hurst Streets, which is incorporated into the levee, thus allowing the top of the bank to be utilised.

Flood Mitigation Systems

Table 12: North Wagga Wagga and Mill St Levee/s[25]	
Location	Surrounding North Wagga for approximately 4.3km, following Hampden Avenue, Wall Street, Gardiner Street, Hopkirk Street, Brotherwood Street, Marah Street, incorporating Dunn Street, Hayes Street, Hurst Street and McGrath Street Mill Street Levee surrounds the houses along East Street to the corner of Oura Road and Mill Street. This levee is disconnected from the North Wagga Wagga Levee by a floodway that engages at 9.3m.
Type of Levee	Ring levee
Owner	Wagga Wagga City Council
Design Height and freeboard	The design height is 9.9 metres with 0.75 metres freeboard. (on the Hampden Bridge gauge).
Overtopping Height	*9.7m - 12% AEP*
No. of properties protected	203 dwellings
Known low points	Mill Street, Between the North Wagga and Mill Street levees.
Location and sequence of inundation	Levee is being redesigned at this time and will feature a spillway that will activate first.
Consequences of levee overtopping or failure	Due to the design of the levee, Mill Street is isolated from the rest of North Wagga at 9.3 meters, isolating the 21 properties inside the levee. These should be evacuated before this point.
Deficiencies	No known deficiencies.

Dams

There are a number of WaterNSW and Snowy Hydro dams upstream. If any of the declared dam failures were to occur, the entire Murrumbidgee floodplain within the LGA and outside would require evacuation.

Refer to 1.3 Storage Dams for further details.

At Risk Facilities

Annex 2 - Greater Wagga Wagga shows the facilities in Greater Wagga Wagga that are at risk of flooding and/or isolation, including schools, childcare centres, hospitals, aged and infirm care homes, infrastructure, and caravan parks.

Other Considerations

- There is a campsite located in Wilks Park on the southwest side of North Wagga that is popular during the holiday period.

3.3 OURA

Community Overview

Oura is a village of 78 dwellings, located 15 kilometres east of Wagga Wagga, with a population of 246, 13% of residents are over the age of 65. The village abuts high land, which for most of the village provides Rising Road Access to flood-free land, even though during larger floods Oura is likely to be isolated from Wagga Wagga to the west and possibly also from Wantabadgery and Junee to the east[16].

Characteristics of flooding

The flood characteristic is classified as a floodway extending northwest along Wagga Wagga Street in both the 1% AEP and PMF events. The floodway region encompasses a large number of houses, with the remainder of the town mainly classified as flood storage or situated beyond the PMF event.

Flood Behaviour

The flood behaviour for Oura is primarily driven by riverine flooding.

Classification of Floodplain

For emergency management purposes, the Oura floodplain consists of a low-flood island west of Wagga Wagga Street that gradually transitions to Rising Road Access and Overland Escape Routes closer to the floodway fringe.

These floodplain classifications are described in depth for specific locations within the floodplain in Volume 3 - sub-sectors.

Inundation

Approximately 25 residential properties within the village are prone to flooding. Low-lying areas to the south of the village are affected by river heights greater than 8.0 metres at Wagga Wagga Hampden Bridge gauge. Some buildings within the village begin to become affected when flood heights rise above 10 metres at Wagga Wagga Hampden Bridge gauge. A large proportion of the village was flooded in August 1974, and 2012 with buildings in Short, Mitchell, Adams, Oura, Wagga Wagga, Davidson and Barney Streets affected. Surrounding farmland to the east and west of Oura is also prone to flooding and should be warned to relocate livestock and equipment[12].

Oura was affected during the March 2012 flood with over-floor flooding in Wagga Wagga Street.

Table 13: Estimated number of properties inundated above floor level in Oura[9].

Hampden Bridge Gauge Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding
10% AEP – 9.7m	-	0
5% AEP – 10.1m	0.5m	2
2% AEP – 10.8m	-	31
1% AEP – 11.3m	1.3m 1.7m	31 residential 3 non-residential
0.5% AEP 11.8m	-	36
0.2% AEP 12.3m	-	41
PMF – 16.1m	6.5m 6.8m	44 residential 3 non-residential

Isolation

High ground is available immediately to the east of Oura and although access to Wagga Wagga may be lost for several days or longer, access to Junee usually remains open provided that it's not flooded by localised heavy rainfall.

Flood Mitigation Systems

There are no known flood mitigation systems in this area.

Dams

There are a number of WaterNSW and Snowy Hydro dams upstream. If any of the declared dam failures were to occur, the entire Murrumbidgee floodplain within the LGA and outside would require evacuation.

Refer to 1.3 Storage Dams for further details.

At Risk Facilities

The facilities that are at risk of flooding and/or isolation within Oura including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex. 2 - Oura.

Other Considerations

There is a campsite located the southern side of Oura, which is popular in holiday periods. Access road to Oura Beach is cut at 6.95 metres on the Hampden Bridge gauge Wagga Wagga, all campers and visitors are cleared as access to this area cannot be gained if the river continues to rise.

3.4 LADYSMITH

Community Overview

Ladysmith is a small village located on the east bank of Kyeamba Creek about 16km south-east of Wagga Wagga. At the 2021 Census the village had a population of 215 people, of whom 16% were aged 65 years and over. There were 81 occupied private dwellings[26].

Ladysmith has several streets of residential properties, a combined petrol station, post office and general store on the main road (Tumbarumba Road) a primary school on Tywong Street and a community hall (Ladysmith Memorial Hall).

The Ladysmith gauge (410048) is located immediately upstream of the disused Wagga Wagga to Tumbarumba railway line bridge over Kyeamba Creek.

Characteristics of flooding

Ladysmith experiences flooding from two main causes: heavy rainfall causing overland flow from the east and southeast of the town, and rainfall over the Kyeamba Creek, O'Briens Creek, and Tywong Creeks' catchments to the south of the town causing flooding of Kyeamba Creek, which flows from south to north along the town's western boundary.

The time it takes for flood peaks to travel between the Book Book and Ladysmith gauges has varied from about 3 to 12 hours, with the variation possibly due to inflows from tributaries, especially O'Briens Creek. The travel times are notably shorter for the second peak in two-peaked floods, such as the events of 15 October 2010 and 4 March 2012, as the catchments would be saturated.

During the October 2010 flood, Kyeamba Creek rose 1.6m over four hours to peak at Ladysmith – a rate of 0.4m/hour. The water remained above 5.0m at Ladysmith for almost three days. Reported depths of inundation reached 1.0m, and flow velocities were generally slow for mainstream floodplain inundation.

Flooding at the Ladysmith gauge is strongly influenced by its location just upstream of the disused Wagga Wagga to Tumbarumba railway line, which has an embankment several metres above the floodplain and acts as a major control. This tends to raise flood levels upstream and suppress flood levels downstream of this de facto control. A large amount of flow bypasses the gauge via a flood runner to the west which flows under a separate bridge. Each flood is reportedly eroding more of the embankment, decreasing its influence over time.

Flood Behaviour

Kyeamba Creek flows from south to north, and Tywonk Creek joins Kyeamba Creek just upstream of the town. Ladysmith experiences minimal flooding from Kyeamba Creek for events up to and including the 0.5% Annual Exceedance Probability (AEP), with the floodplain generally separate from the urban area. Above-floor flooding due to mainstream flooding

only occurs for the 0.2% AEP and Probable Maximum Flood (PMF) events. The town does not have a levee, but there are two main overland flow paths that cause flooding of yards and roads in frequent flood events of 20% AEP and greater.

Classification of Floodplain

Ladysmith is situated on the eastern side of Kyeamba Creek, with the land sloping up to the east. Many properties would have Overland Escape Routes and may also have Rising Road Access. During the October 2010 flood, many properties effectively developed into High Trapped Perimeter areas. Some properties, such as 'Brunagee', could potentially become Low-flood islands during severe floods. The village of Ladysmith generally has Rising Road Access to higher ground on the eastern side of the village.

Inundation

Ladysmith is prone to flooding from Kyeamba Creek, particularly affecting low-lying areas and necessitating the relocation of livestock and equipment. Major floods impact the western sections of Tywong Road and Keajura Street, with up to eight houses potentially needing evacuation.

The highest recorded flood occurred in October 2010 at 6.67 meters, and the second highest was in March 2012 at 6.13 meters. In the October 2010 event, Kyeamba Creek rose by 2.4 meters over three hours, resulting in flooding of three houses and numerous sheds and other buildings. This event also caused the closure of Tumbarumba Road near Riverdene Horse Stud, preventing access to the Sturt Highway.

During the 2012 flood, one property on Tumbarumba Road was flooded, and multiple roads were closed, rendering all creek crossings impassable.

The western end of Twyong Street experiences flooding during significant flood events. Building inundation is estimated to occur in the 0.2% Annual Exceedance Probability (AEP) event and larger, while yards are flooded in the 10% AEP event. Ladysmith Public School is severely affected by flooding during the Probable Maximum Flood (PMF) event, with depths reaching 3-4 meters. The school also faces significant flooding in the 1% AEP event on its western half closer to the creek.

Creek crossings in the area pose a high hazard due to high-velocity flows, leading to a high likelihood of road damage. Ladysmith does not currently have a formal flood warning system.

Monitoring the Book Book gauge can provide several hours' warning of potential flooding, but significant inflows between the two gauges can occur from O'Briens and Tywong Creeks.

Table 14: Estimated number of properties inundated above floor level and over ground in Ladysmith[27].

Ladysmith Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
10% AEP – 6.2m	-	2	23
5% AEP – 6.59m	-	2	26
2% AEP – 7.02m	-	3	32
1% AEP – 7.17m	-	5	35
0.5% AEP – 7.31m	-	5	35
0.2% AEP – 7.46m	-	8	35
PMF – 11.41m	-	35	42

Isolation

Isolation for moderate to major flooding is expected to be short, less than 24 hours, however access may be impeded due to road damage at the numerous creek crossings[28].

The village of Ladysmith can be isolated for a few hours if Tumbarumba Road is flooded south and north of the village[29].

Several rural properties in the Kyeamba Creek catchment could be isolated for up to a few days, especially those requiring access over low-level creek crossings. This includes 'Brunagee' (7011 Tumbarumba Road, Book Book) and 'Mona Vale' (75 Mona Vale Road, Ladysmith)[30].

Flood Mitigation Systems

There are no formal flood mitigation systems in this area, however Tumbarumba Road and adjacent railway line may influence flood behaviour.

It is reported that a levee was built to protect 'Brunagee' homestead at Book Book following the floods of March 2010 and October 2010. (No details of the level of protection afforded by the levee are known)[30].

Dams

There are no dams located upstream of Ladysmith, as the town is affected by overland flow due to rainfall within the catchment.

At Risk Facilities

The facilities that are at risk of flooding and/or isolation within Ladysmith including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2 - Ladysmith.

3.5 TARCUTTA

Community Overview

Tarcutta is located approximately 40 kilometres southeast of Wagga Wagga on the Hume Highway. The population is 206, of whom 23% are aged 65 years and over. There are 83 occupied private dwellings, with an average of 2 cars per household[26].

Tarcutta village has a manual gauge at the Hume Highway bridge.

Characteristics of flooding

The main source of flooding in the Tarcutta area is Tarcutta Creek. Flooding can be caused by one, two, or all three sub-catchments (Oberne, Umbango, Keajura) that feed into it.

Flooding in this area is characterised by flash flooding resulting from high rainfall in the surrounding hills. The situation is made more complex by the merging of Oberne Creek and Umbango Creek into Tarcutta Creek about 30km upstream of Tarcutta. Additionally, Keajura Creek also joins Tarcutta Creek about 1km upstream of Tarcutta.

The village of Tarcutta experiences overland flows from the hilly land on its eastern side. Some of these flows may become trapped inside the main Tarcutta levee, causing problems with flooding.

Flood peak travel times between Belmore Bridge and Tarcutta for some historical events are reported in Table 4. These have varied between about 3 and 12 hours but for some significant floods including the largest in October 2010, it appears as though the flood peaked at Tarcutta prior to peaking at Belmore Bridge. This can happen when the major input to flooding at Tarcutta is from the Umbango Creek catchment. Based on the recent history, the duration of major flooding at Tarcutta is about 12-24 hours, floodwaters in some areas may reach depths of over 1.0m but would typically be shallower[30].

The construction of the elevated Hume Highway Bypass, located a short distance downstream of the village, is believed to cause floodwaters to back up, leading to slightly higher flood levels and longer flood durations in the village. The rise of floodwater will be relatively slow, and the flow velocity will be low.

In severe floods, the floodwater can overtop the main Tarcutta levee. However, when this occurred in October 2010, it was reported that it did not significantly increase flood depths in Centenary Avenue, which was already inundated from backwater flooding, although the flow velocities were increased.

Flood Behaviour

Flooding in Tarcutta occurs from two mechanisms: localised rainfall causing overland flow that originates to the east and north-east of the town, and rainfall over the Tarcutta Creek

catchment to the south of town causing flooding of Tarcutta Creek, which flows south to north along the town's western boundary.

In large floods the town can be flooded from the direction of the oval, before the levee is overtopped. Once the levee is overtopped, the flow tends to create a wide flow path moving north over Sydney Street, moving parallel to the creek flow.

Floods are most frequent in winter and spring, and major flooding at Tarcutta typically lasts 12-24 hours with water depths reaching over 1.0m in some areas[30].

Classification of Floodplain

The majority of the flood extent is floodway, with small areas of flood storage and fringe on the periphery. The floodway extends into the town where the main levee is overtopped near Centenary Avenue, and at properties on Sydney Street. There is also a floodway on one overland flow path through town, the rest of the town is mostly flood fringe.

The village of Tarcutta generally has Rising Road Access to high ground including the Tarcutta RSL and Citizens Club in Sydney Street[30].

The Old Tarcutta Inn (now used as a residence) is surrounded by a flood wall and represents a High/Low-flood Island)[30].

Inundation

The major source of floodwaters is the Tarcutta Creek, though minor flooding of the south eastern portion of the village can occur independently of Tarcutta Creek when Keajura Creek over-flows its banks[12].

A levee bank is in place to protect the town against floods from Tarcutta Creek up to a level of 3.7 meters on the Tarcutta gauge. Tarcutta experiences severe flooding when Tarcutta Creek overflows for floods of 5% AEP and greater, resulting in inundation of Sydney Street and Centenary Avenue. During the 20% AEP Event, the main road, Sydney Street, becomes impassable.

The existing levee is at risk of being overtopped during a 2% Annual Exceedance Probability (AEP) event, leading to potential flooding of properties along Centenary Avenue. The levee has the potential to cause flooding if its cross-drainage structures block overland flow draining to the creek or allow creek flow into the town area. In such an event, the water pumping station, the hotel, shops, a service station, and about six residences could be inundated, necessitating the evacuation of around 40 people. It is recommended that surrounding farmland adjacent to the creeks relocate livestock and equipment to mitigate any possible impact.

The October 2010 flood peak at Tarcutta gauge was the highest on record at 4.49m. All the levees were overtopped, resulting in flooding above floor level at 4 houses in Centenary

Avenue, Hambledon, and the Old Tarcutta Inn residences[30]. Following this event, the Hume Highway has been upgraded, which is likely to change the flood patterns in the area.

In March 2012, the flood at the Tarcutta gauge peaked at 3.86 meters. The main Tarcutta levee did not overflow. However, one house on Centenary Avenue experienced flooding above the floor level, with two yards also flooding. Additionally, five yards on Sydney Street were affected by the flood. Houses at the western end of Centenary Avenue, on the southern side, are prone to flooding. The Old Tarcutta Inn and Hambledon homestead are also at risk, despite having some flood protection structures. The Tarcutta Hotel, the service station, and tennis courts to its north have been flooded. Additionally, the Riverina Water treatment plant in Sydney Street is also susceptible to flooding, which may lead to a loss of service[30].

After heavy rainfall, flooding may occur in Centenary Avenue properties behind the Tarcutta levee due to trapped overland flows. When Tarcutta Creek rises, water backs up from the road embankment associated with the Hume Highway Bypass of Tarcutta, affecting areas west of Sydney Road near the Hotel and potentially crossing Sydney Road and impacting Centenary Avenue. Severe flooding of Tarcutta Creek may lead to the overtopping of the main Tarcutta levee[30].

There is currently no formal flood warning system for Tarcutta. Monitoring the Belmore Bridge gauge can provide some warning of potential flooding, but it's not reliable for predicting flood peaks in Tarcutta[30].

Table 15: Estimated number of properties inundated above floor level and over ground in Tarcutta[27]

Tarcutta Manual Gauge Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP	-	0	47
10% AEP - 3.12m	-	1	51
5% AEP	-	6	52
2% AEP	-	12	56
1% AEP	-	17	57
0.5% AEP	-	23	59
0.2% AEP	-	23	59
PMF	-	48	59

Isolation

Most of the town is unaffected by mainstream flooding and there is evacuation access for most flooded properties.

During large floods, the Hume Highway may close potentially stranding motorists travelling between Sydney and Melbourne[12].

In October 2010, Sydney Street (the then Hume Highway), closed for around 13 hours[31].

Flooding of Sydney Road at the Tarcutta Creek Bridges cuts access to the south (including direct access to the southbound lanes of the Hume Highway)[31].

Depending on other river systems, it is likely that access via the Hume Highway to Gundagai would be possible[32].

Access to Wagga Wagga could potentially be cut at sites along the Sturt Highway[32].

Many rural properties in the Tarcutta Creek catchment could be isolated for up to a few days[32].

Flood Mitigation Systems

Tarcutta's levees protect parts of the town from small flood events while being overtopped or circumvented by floodwaters in larger events. There are three levees of note in or adjacent to the town.

At this stage there is no formal flood warning system for Tarcutta, hence the levees (especially the main Tarcutta levee) must be carefully monitored to assess the risk of overtopping during flood events[32].

No detention basins are known in or upstream of Tarcutta.

Table 16: Tarcutta Levee	
Location	Tarcutta Creek South boundary of the town extending from near the school, parallel to Centenary Avenue and then along the south side of Sydney Street.
Type of Levee	Levee system
Owner	Wagga Wagga City Council
Design Height and freeboard	Crest height is 3.9m with no designated freeboard value
Overtopping Height	3.9 to 4.1m Approximately 2% AEP

No. of properties protected	The main Tarcutta levee protects up to about six houses and the Riverina Water treatment plant from direct inundation from Tarcutta Creek, up to a gauge height of about 3.7 metres on the Tarcutta gauge.
Known low points	Localised low points require sandbagging
Location and sequence of inundation	Creek flow over Sydney Street heading towards Centenary Ave occurs at gauge depth of 4.06m, at which point flooding of Centenary Ave properties start to occur.
Consequences of levee overtopping or failure	If the Tarcutta levee, which has no freeboard, was to be overtopped, the water pumping station, the hotel, a service station and up to six residences would be inundated. About forty people could require evacuation. Surrounding farmland, adjacent to the creeks should be warned to relocate livestock and equipment
Deficiencies	The levee has an uneven crest level and so may over top unpredictability.

Old Tarcutta Inn levee is an earth embankment ring levee around the Old Tarcutta Inn property. It is on private property and not maintained by council. Old Tarcutta Inn levee is overtopped at 3.27m.

Hambledon Levee is an earth embankment ring levee around the Hambledon property approximately 1km south west of the town centre, it is on private property and not maintained by council. Hambledon levee is overtopped at a gauge level of 4.00m.

Dams

There are no dams located upstream of Tarcutta, as the town is affected by overland flow due to rainfall within the catchment.

At Risk Facilities

The facilities that are at risk of flooding and/or isolation within Tarcutta including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2 - Tarcutta.

3.6 COLLINGULLIE

Community Overview

Collingullie is a village located approximately 26 kilometres northwest of Wagga Wagga on the Sturt Highway. The population is 258, of whom 17% are aged 65 years and over. There are 93 private dwellings, with an average of 2.6 cars per household[22].

A general store, hotel, and oval support the Collingullie community. Although the Collingullie Public School closed in 2018, it remains a landmark for local families.

The main section of the village on the southern side of the Sturt Highway is not subject to flooding[12].

Characteristics of flooding

Beavers Island Creek is a stream on the northern side of the Sturt Highway that passes through Collingullie. The creek system is activated during riverine flooding of the Murrumbidgee River; as the flood breaks its banks, the creek acts as an anabranch to pass the additional floodwater into the broader flood plain where it joins Beaver Creek in the Murrumbidgee Valley National Park.

The risk to the community is primarily isolation, as the Sturt Highway is known to be inundated west of the Malebo Gap and to the west of Collingullie. Mundowy Lane is cut during a flood, which isolates the community from being able to cross the Murrumbidgee River and requires the community to travel to Wagga Wagga to cross safely.

This limited community access and egress to roads further inland, which may be susceptible to overland flooding from Burkes Creek, Sandy Creek, and Bullenbung Creek.

Flood Behaviour

Flooding in Collingullie is riverine flooding that isolates the town from its primary connection to the region for days to weeks, as floodwater flows further down the Murrumbidgee River.

Classification of Floodplain

While a few homesteads are in the floodplain on what would be considered a Low-flood Island, the township is situated on terrain that is considered Rising Road Access.

Inundation

Land on the northern perimeter of the village is subject to flooding from Old Man Creek. Some farmhouses in the area required evacuation in 1974. Residences are minimally flooded up to a 1% AEP, but floods above this level will cause them to become inundated and require evacuation to high ground.

Surrounding farmland should be warned to relocate livestock and equipment.

Isolation

As mentioned, the village can become isolated from Wagga Wagga, Coolamon and Narrandera during large floods, as Mundowy Lane and the Sturt Highway east and west of town are inundated, although access to The Rock should remain open during riverine flooding but may be impacted by overland flooding.

Flood Mitigation Systems

There are no formal flood mitigation systems or detention basins in this area.

Dams

There are a number of WaterNSW and Snowy Hydro dams upstream. If any of the declared dam failures were to occur, the entire Murrumbidgee floodplain within the LGA and outside would require evacuation.

Refer to 1.3 Storage Dams for further details.

At Risk Facilities

Annex 2 - Facilities at Risk of Flooding shows the facilities that are at risk of flooding and/or isolation within the Wagga Wagga LGA, including schools, childcare centres, hospitals, aged and infirm care homes, infrastructure, and caravan parks.

3.7 CURRAWARNA

Community Overview

Currawarna is a rural village located approximately 33 kilometres northwest of Wagga Wagga on the Old Narrandera Road. The population is 199, of whom 13% are aged 65 years and over. There are 65 occupied private dwellings, with an average of 3 cars per household and consists of farming properties and acreages[21].

Characteristics of Flooding

The impact of previous floods on Currawarna has been Riverine flooding. The Murrumbidgee River breaks its banks and gradually inundates the floodplain, and depending on the volume of flood water, the houses on the south side of the Old Narrandera Road can be inundated.

Flood Behaviour

Flooding within Currawarna is riverine driven by the Murrumbidgee River, where the community is situated on its northern bank.

Classification of Floodplain

While a few homesteads are in the floodplain on what would be considered a Low-flood Island, the township is situated on terrain that is considered Rising Road Access.

Inundation

The village area is not subject to flooding, however, adjoining farmland to the perimeter of the village is flood prone. Two houses in the area were evacuated in 1974.

Surrounding farmland should be warned to relocate livestock and equipment.

Isolation

The village can become isolated from Wagga Wagga during large floods; however, road access should still be available to Coolamon, via Ganmain.

Flood Mitigation Systems

There are no known flood mitigation systems in this area.

Dams

There are a number of WaterNSW and Snowy Hydro dams upstream. If any of the declared dam failures were to occur, the entire Murrumbidgee floodplain within the LGA and outside would require evacuation.

Refer to 1.3 Storage Dams for further details.

At Risk Facilities

The facilities that are at risk of flooding and/or isolation within Currawarna including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2 - Facilities at Risk of Flooding.

3.8 URANQUINTY

Community Overview

Uranquinty is located approximately 15 kilometres south of Wagga Wagga on the Olympic Way. At the 2021 Census the village had a population of 767 persons, of whom 16% were aged 65 years and over. There were 280 occupied private dwellings[19].

Uranquinty is located on the east bank of Sandy Creek. Coloboralli Creek and its tributaries meet Sandy Creek approximately 4km upstream of Uranquinty near Oxley Bridge Road.

Characteristics of flooding

Uranquinty is affected by overland flows and flooding from Sandy Creek. The main problem in the town occurs when water ponds behind the high levee[32].

Overland flows affect the town during and shortly after heavy rain. These flow from the northeast. In October 2010, inundation depths of up to about 0.3m over the ground were reported for some areas including at the Public School's Covered Outdoor Learning Area (COLA). Stormwater inflows disrupted the operation of the small sewer pump station at the bottom of King Street. Overland flows are typically of short duration[31].

A significant influence over the direction of overland flows is the Main Southern Railway, which is slightly raised and obstructs the flow from east to west. There is a culvert northeast of Gradys Road which together with an earth embankment conveys water around the northern side of the town. Another culvert is located near the Yarragundry Street railway crossing, but this has reportedly been reduced in size over the years[32].

The Uranquinty levee scheme was designed to protect the town from more frequent Sandy Creek flows (up to about the 50-year ARI event), but the Deane Street portion of the levee does not include a freeboard and so represents a low-point in the eastern levee. This part of the levee was overtopped in the October 2010 flood, probably for the most part by floodwaters escaping Sandy Creek upstream of the town. Floodwater on the outside of the Deane Street levee although relatively shallow was fast flowing, sufficient to erode road surfaces and knock over solid fences[31].

Since completion of the levee scheme in the 1980s, the main problem at Uranquinty occurs when water whether from overland flows or floodwater overtopping the Deane Street levee, becomes trapped on the inside of the high levee. The council is currently redesigning the levee to increase its protection to the community.

This occurs when Sandy Creek is sufficiently high to close the gates on the pipes that carry this storm water under the levee to the creek, or at least impede the release of this water. Especially on the eastern side of the railway, the high levee at the southern end of Morgan Street and the raised Main Southern Railway effectively represents dam walls so that as water

is trapped inside it begins to rise and back up through the town. In the October 2010 event, the water extended northeast up Morgan Street almost to Yarragundry Street {see the flood extent plotted in the Bewsher flood intelligence review)[29]. Flood levels show that the surface was virtually flat as expected for this type of flooding. This water reached depths of up to 1.2m and was trapped for some 12 hours until Sandy Creek fell sufficiently for the flood gates to open fully. Pumping water over the levee may speed up this process[32].

Flood Behaviour

Shallow overland flows can affect much of the town. It is not clear that any streets would be free of shallow inundation in severe events, though many building floors should be above water[32].

Classification of Floodplain

With sufficient warning and early evacuations, Rising Road Access to higher ground within the town is expected to be available for overland flooding events where water is trapped on the inside of the main Uranquinty levee[32]

Inundation

Flooding can also occur inside the levee due to storm runoff, from the North East[12].

A good example of inundation patterns during a severe flood is the October 2010 event (see the Bewsher[29] flood intelligence review for the flood extent). At least 22 houses in the town were flooded above floor. Some 65 or so yards were flooded from ponding of water behind the eastern levee, while many others would have received some inundation from overland flows. A few houses were first inundated by overland flows during or soon after the rainfall event, including in Connorton and Yarragundry Streets. Then, as water flowed across the Deane Street levee, it became trapped at the lower end of Morgan Street and backed up towards Ben and Ryan Streets. On the western side of the Main Southern Railway, water can also get trapped behind the levee at the lower end of King and Baker Streets[31].

Table 17: Estimated number of properties inundated above floor level and over ground in Uranquinty[27]

Calculated Event	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP	-	0	95
10% AEP	-	12	122
5% AEP	-	16	160
2% AEP	-	57	206
1% AEP	-	73	231
0.5% AEP	-	96	246
0.2% AEP	-	115	257
PMF	-	250	281

Isolation

Flooding of Uranquinty would also close the Olympic Way, which is the main traffic route between Wagga Wagga and Albury[12].

It is understood that Uranquinty was accessible from Wagga Wagga at all times during the October 2010 event but flooding of the Olympic Highway at Uranquinty cut access to the south beyond the village[31].

Several rural properties in the Sandy Creek catchment could be isolated for several hours. This includes two properties outside the town levee in Castle Street, Uranquinty[32].

Flood Mitigation Systems

Uranquinty levee is made up of a levee along the Sandy Creek floodplain on the west and south sides of the town, and secondary levees on Connorton Street and near Churches Plains Road. There is no flood warning system on Sandy Creek, hence the levee must be carefully monitored to assess the risk of overtopping during flood events[27].

The Uranquinty levee scheme is located on the south side of Uranquinty on both sides of the Olympic Highway and Main Southern Railway. It is designed to prevent inundation from Sandy Creek up to about the 50-year ARI flood level[27].

A number of other earth embankments have been built to address the threat of overland flows, including one on the northern side of town intended to divert flows from the north to the west, and one on the eastern side of Connorton Street to divert flows from the northeast around the south-eastern corner of the town (this is only about 200mm high)[31].

At this stage, there is no flood warning system on Sandy Creek, hence the levees (especially at Deane Street) must be carefully monitored to assess the risk of overtopping during flood events[31].

The village is protected on its south side from flooding on Sandy Creek by a levee, which is designed to hold out the 1% AEP flood. South of the levee, three residences are frequently isolated.

Table 18: Uranquinty Levee[27]	
Location	Town levee (south) – from the south end of Deane Street to the highway bridge Town levee (north) – from the highway bridge to Uranquinty Cross Road Connorton Street drain and levee – from Connorton Street to the north end of Deane Street Churches Plain Road Levee – to the north of the town
Type of Levee	Levee system
Owner	Wagga Wagga City Council
Design Height and freeboard	The main levee crest height is 1.6m with less than 0.2m freeboard. Deane Street to Connorton Street has no freeboard so that represents a low point.
Overtopping Height	Town Street levee (south) Connorton Street – Overtopping is predicted to occur across a length of approximately 400m, to depths of up to 1m. Deane Street – Overtopping of Deane Street Levee occurs along a 150m section, to depths of around 0.4m.
No. of properties protected	Approximately 250 properties
Known low points	Localised low points reduce the level of protection to the 20% AEP
Location and sequence of inundation	The Connorton Street section is overtopped by overland flow, particularly in the section just west of the neighbourhood centre at Uranquinty Street. Deane Street is overtopped by the 20% AEP and larger events. The section between Deane Street and the highway bridge is overtopped by the 10% AEP event just upstream of Read Street. If low points are sandbagged, it will protect against a 2% AEP event. A low point ~150m downstream of the railway bridge is overtopped in the 2% AEP event, all design events will overtop the section near Baker Street. The Churches Plain Road levee is overtopping in various points, particularly at Churches Plain Road, starting in a 20% AEP event.
Consequences of levee overtopping or failure	If the levee was over-topped, at least 60 residences would require evacuation
Deficiencies	The levee has an uneven crest level and so may over top unpredictability. WWCC will monitor the levee.

Dams

There are no dams located upstream of Uranquinty, as the town is affected by overland flow due to rainfall within the catchment.

At Risk Facilities

The facilities that are at risk of flooding and/or isolation within Uranquinty including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2 - Uranquinty.

3.9 GALORE

Community Overview

Galore is a rural community in the central east part of the Riverina on the Sturt Highway. It is situated by road, about 22 kilometres northwest of Collingullie and 28 km southeast of Sandigo. At the 2021 census, Galore had a population of 70, with 12% of those being aged 65 years and over and 27 private dwellings[20].

Characteristics of Flooding

The intimate community of Galore is situated some distance from the banks of the Murrumbidgee River, although it is close to the banks of Old Mans Creek, which during times of flood, convey flood waters from the Murrumbidgee river along the floodplain.

Flood Behaviour

Flooding around Galore is predominantly Riverine, which flows down Old Mans Creek before making its way to rejoin the Murrumbidgee River. During times of significant flooding, the community may become isolated as water breaks out from Old Mans Creek and flows into wetlands south of the community.

Classification of Floodplain

At this time there haven't been any models to identify the classification of the floodplain, but it is estimated to be a low flood island for planning purposes.

Inundation

Galore and its surrounds would be partly flooded in an extreme event, a quarter of the settlement being inundated and about four households would have to be evacuated. No evacuations were necessary in 1974. Surrounding farmland, adjacent to the river should be warned to relocate livestock and equipment.

Isolation

The village can become isolated from Wagga Wagga during large floods, requiring resupply.

Flood Mitigation Systems

There are no known flood mitigation systems in this area.

Dams

There are a number of WaterNSW and Snowy Hydro dams upstream. If any of the declared dam failures were to occur, the entire Murrumbidgee floodplain within the LGA and outside would require evacuation.

Refer to 1.3 Storage Dams for further details.

At Risk Facilities

The facilities that are at risk of flooding and/or isolation within the Galore including schools, childcare centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2: Facilities at Risk of Flooding.

3.10 MANGOPLAH

***A flood study is currently being undertaken by the Wagga Wagga City Council, and this information is subject to change upon completion of this study.**

Community Overview

Mangoplah is a town approximately 36 kilometres south of Wagga Wagga. At the 2021 Census, It had a population of 291, of whom 16% were aged 65 years and over. There were 117 occupied private dwellings[23].

Characteristics of flooding

Mangoplah is situated on the banks of the junction of Burkes Creek, where Paper Forest Creek joins. Due to the topography of the area, the creek system is quite deep and fast flowing during times of flood.

Flood Behaviour

It is estimated that the majority of the flooding that occurs at Mangoplah is contained within the steep banks of Burkes Creek, with the majority of the flooding effects felt further downstream.

Classification of Floodplain

The town of Mangoplah may not be in the flood plain, as it is protected by steep banks along Burkes Creek; it could be considered as rising road access.

Inundation

The only recorded inundation at Mangoplah has been the Holbrook Road bridge, which gets overtopped during significant floods[31].

Isolation

The community may be isolated during significant events, as the main connections to Wagga Wagga and The Rock are cut during floods. Although there may be alternative routes to these destinations.

Flood Mitigation Systems

There are no known flood mitigation systems in this area.

Dams

There are no identified dams located upstream of Mangoplah, as the town is affected by overland and riverine flow due to rainfall within the catchment.

3.11 HUMULA

***A flood study is currently being undertaken by the Wagga Wagga City Council, and this information is subject to change upon completion of this study.**

Community Overview

Humula is a town approximately 54 kilometres south-east of Wagga Wagga. At the 2021 Census, It had a population of 124, of whom 27.1% were aged 65 years and over. There were 68 occupied private dwellings[24].

Characteristics of flooding

Humula is situated on the banks of the confluence of the Umbango Creek, where Carabost creek, Shockeroo Creek and Deep creek joins the Umbango Creek, prior to it joining the Tarcutta Creek.

Flooding in this area is primarily driven by overland flow from the slopes to the south and east of town, which accumulates to riverine flooding.

Humula may have been subjected to flooding when the Tarcutta Creek catchment was in flood, which may have been among the following floods, 1870, 1891,1916, 1923, 1931, 1932, 1935, 1936, 1939, 1948, 1950, 1955, 1970, 1974, 1983, 1986, 1991, 1992, 2000, 2005, 2010, 2011, 2012, 2020, 2021 and 2022[33].

Flood Behaviour

Not much is recorded about the flooding, within the community of Humula, although a flood study is currently being undertaken by the council to understand the floodplain and flood dynamics within the area.

The catchment is relatively steep, with the terrain flattening out closer to the banks of the Umbargo Creek, close to the town centre.

Classification of Floodplain

The town of Humula is close to the floodplain and may be subjected to flooding from anyone of the tributaries it resides on.

Further details on the Flood Emergency Risk Classification of Community will be available throughout the ongoing flood study.

Although, for planning purposes, parts of the community may be considered as overland escape routes, as they are required to move to higher ground.

Inundation

While there is not much recorded evidence of flooding within the community at this time, there is evidence of the Carabost Creek and Umbargo Creek's bridges being underwater during the 2010 floods[33].

With significant damage being caused to the both the Carabost and Umbargo Creek bridge being observed, as well as feedback that the Humula Citizens Sports club having been flooded.

Isolation

The community may be isolated during significant events, as the main connections to Wagga Wagga, Tarcutta, Tumbarumba and Holbrook may be cut during floods. Although there may be alternative routes to these destinations.

Flood Mitigation Systems

There are no known flood mitigation systems in this area.

Dams

There are no identified dams located upstream of Humula, as the town is affected by overland and riverine flow due to rainfall within the catchment.

3.12 RURAL AREAS

Farmland along the Murrumbidgee River and its tributaries including Tarcutta Creek, Sandy Creek, the Collingullie Watercourse and Kyeamba Creek can be flooded.

Houlaghans Creek has several road crossings that are affected by overland flow and not necessarily riverine flooding.

During minor floods low-lying farmland can be inundated, requiring the movement of livestock and equipment.

In severe floods farm buildings and farmhouses may be inundated and evacuation necessary.

In larger floods, rural properties may become isolated for several weeks[32].

3.13 CAMPING RESERVES

- There are numerous camping reserves along the Murrumbidgee River. These are affected by low levels of flooding and require warning and evacuation.

Table 19: Popular campgrounds along the Murrumbidgee River[34]

Campsite	Campsite location
Sandy Beach Reserve	River Road, Wantabadgery
Oura Beach	Oura Beach Road, Oura
Shanty Reserve	River Road, Alfredtown
Wilks Park, Wagga	20-24 Hampden Avenue, North Wagga Wagga
Kohlhagens Beach	Kohlhagens Road, Yarragundry
Beavers Weir Campsite	82 Mundowy Lane, Collingullie
Currawarna State Forest	Currawarna
Murrumbidgee Valley National Park – Berry Jerry	Beevers Creek, Sturt Highway, Collingullie
Galore Reserve	Old Man Creek, Weir Road, Galore
Pipers Reserve	Murrumbidgee River, Lot 89 Weir Road Galore Sturt Highway Turnoff,

4 ROAD CLOSURES AND ISOLATED COMMUNITIES

4.1 ROAD CLOSURES

Table 20: Roads liable to flood in Wagga Wagga LGA

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height
Horseshoe Road	-	Water over Road Water over Road	Yes No	2.32m 7.33m Hampden Bridge Gauge (410001)
Tenandra Road	Mundarlo Bridge	Bridge underwater	Yes	4.60m Hampden Bridge Gauge (410001)
Kilpatrick Street	Gumly Gumly	Road Closed	No	7.8m Hampden Bridge Gauge (410001)
Graham Avenue	Gumly Gumly	Road Closed	No	7.8m Hampden Bridge Gauge (410001)
Maslins Culvert	Gumly Gumly	Water over Bridge	No	8.2m Hampden Gauge (410001)
Henwoods Causeway	Gumly Gumly	Road Closed	No	9.6m Hampden Bridge Gauge (410001)
Sturt Highway/Hammond Ave	Marshalls Creek	Water on road	-	8.09m Hampden Bridge Gauge (410001) Depending on flow in Marshalls Creek
Copland Street	Copland Street & Kooringal Road intersection	Water on road	-	10.5m Hampden Bridge Gauge (410001) Depending on flow in Marshalls Creek
Johnston Street	Between Caravan Park and the Beach entrance	Water on road	-	8.2m Hampden Bridge Gauge (410001)
Sturt Highway	Sturt Highway & Copland Street	Water on road	-	10.5m Hampden Bridge Gauge (410001)

Sturt Highway	Murray Cod Hatchery	If the river exceeds this height water will join with Marshalls Creek and the area around Bakers Lane, Tasman Road and Copland Street will be under threat.	-	10.4-10.6m Hampden Bridge Gauge (410001)
Edward Street West / McNickle Road	Sturt Hwy to Roach Road	Property Isolations	-	Overland flow 7.6 Hampden Bridge Gauge (410001)
Forsyth Street	Between Sturt Mall & Marketplace	Overland flow behind the levee	-	*Subject to further Intelligence confirmation.
Mundowy Road	South of Beavers Creek Bridge	This road may stay underwater for several weeks.	Yes	6.1m Hampden Bridge Gauge (410001) 5.5m Beavers Creek gauge (410137)
Arajoel Road	2.2km from the Sturt Highway	Can be flooded by Bullenbong Creek and may spend up to four months underwater in low-lying areas	-	*Subject to further Intelligence confirmation.
Lockhart Road	causeways	Can be underwater for extended length through the causeways.	-	*Subject to further Intelligence confirmation.
Oura Beach Road	-	No access	No	7.8m Hampden Bridge Gauge (410001)
Oura Road	West of Oura near the dairy crossing	No access	Yes	8.2m Eringoarrah Gauge (410143)
Hampden Ave Levees	Wilks Park	Requires monitoring	No	8.5m Hampden Bridge Gauge (410001)
East Street	North Wagga Wagga	Water flows out of Parken Pregan Lagoon and cuts Marah Street & Mill Street causeway	No	8.7m Hampden Bridge Gauge (410001)
Mill Street	North Wagga Wagga	Water flows out of Parken Pregan Lagoon and cuts Marah Street & Mill Street causeway	No	9.0m Hampden Bridge Gauge (410001)
River Road	Causeway	Property Isolations	No	6.9m

				Hampden Bridge Gauge (410001)
Kneebones Road	-	-	-	7.2m Hampden Bridge Gauge (410001)
Old Narrandera Road (Wagga Wagga to Narrandera)	From North Wagga to Dukes Creek Bridge and other locations to the west	At multiple point along the road.	Yes	8.5m Derrain 8.8m East Matong 9.0m Roping Pole 9.5m Dukes Creek Hampden Bridge Gauge (410001)
Collingullie to Lockhart Road	-	-	-	*Subject to further Intelligence confirmation.
Sturt Hwy	Sandy Creek		-	*Subject to further Intelligence confirmation.
Sturt Hwy	Between Wagga Wagga and Forest Hill	-	-	9.8m
Hampden Avenue	Between Wiradjuri Bridge and Cartwrights Hill	-	-	7.5m Hampden Bridge Gauge (410001)
Coolamon Road (Collingullie)	Mundowie Bridge	-	-	*Subject to further Intelligence confirmation.
Eunony Bridge Road	Sturt Hwy to Wagga Wagga (Oura Road)	Alongside the road and the roundabout	Yes	8.10m Hampden Bridge Gauge (410001)
Boorooma Street	Old Narrandera Road to Davidson Street	-	-	8.9m Hampden Bridge Gauge (410001)
Flowerdale Road	Behind the Co-Op	Road closed and residents to be evacuated if flood height exceeds 9.5m	-	7.6m Hampden Bridge Gauge (410001)
TARCUTTA CREEK DISTRICT				
Humula Eight Mile Road	at Carabost Creek Bridge?	(Requires confirmation) No access – Peak height	-	3.86m Tarcutta Manual Gauge
Murraguldrie Road	at Murraguldrie Creek crossing near Murraguldrie Station	(Requires confirmation) No access – Peak height	-	3.86m Tarcutta Manual Gauge

Oberne Umbango Road	at Oberne Creek Bridge	(Requires confirmation) No access – Peak height	-	4.49m Tarcutta Manual Gauge
Humula Road Tarcutta	at Umbango Creek Bridge and near Keajura Creek	(Requires confirmation) No access – Peak height	-	4.49m Tarcutta Manual Gauge
Sydney Road (old Hume Hwy)	at Tarcutta	(Requires confirmation) No access – Peak height	-	4.49m Tarcutta Manual Gauge
Lower Tarcutta Road	-	(Requires confirmation) No access – Peak height	-	4.49m Tarcutta Manual Gauge
Mundarlo Road	Mundarlo Bridge	(Requires confirmation) No access – Peak height	-	4.49m Tarcutta Manual Gauge
Martins Road, Coreinbob	at Coreinbob Creek crossing	(Requires confirmation) No access – Peak height	-	4.49m Tarcutta Manual Gauge
Windemarra Road	at Tarcutta Creek crossing	(Requires confirmation) No access – Peak height	-	4.49m Tarcutta Manual Gauge
Borambola North Road	at Tarcutta Creek crossing	(Requires confirmation) No access – Peak height	-	4.49m Tarcutta Manual Gauge
KYEAMBA CREEK DISTRICT				
Palmers Road	near Kyeamba Creek crossing	-	-	4.78m Ladysmith Gauge (410048)
Woods Lane	near Kyeamba Creek crossing	-	-	4.78m Ladysmith Gauge (410048)
Killicks Road	near Kyeamba Creek crossing	-	-	4.78m Ladysmith Gauge (410048)
Tumbarumba Road	at Book Book	Loss of access to Hume Highway	-	4.78m Ladysmith Gauge (410048)

Brooklyn Lane	near Kyeamba Creek crossing	-	-	4.78m Ladysmith Gauge (410048)
O'Briens Creek Road	at Big Springs Bridge	-	-	4.78m Ladysmith Gauge (410048)
Livingstone Gully Road	near O'Briens Creek crossing	-	-	4.78m Ladysmith Gauge (410048)
Gregadoo East Road	-	-	-	4.78m Ladysmith Gauge (410048)
Gregadoo-Ladysmith Road	at Macleays Bridge over Kyeamba Creek	-	-	4.78m Ladysmith Gauge (410048)
Tywong Street	bridge over Kyeamba Creek	-	-	4.78m Ladysmith Gauge (410048)
Mona Vale Road	near Kyeamba Creek crossing	-	-	4.78m Ladysmith Gauge (410048)
Brunskill Road		-	-	4.78m Ladysmith Gauge (410048)
Tumbarumba Road	near Riverdene Horse Stud	Loss of access to Sturt Highway	-	4.78m Ladysmith Gauge (410048)
URANQUINTY DISTRICT				
Oxley Bridge Road	at Sandy Creek	-	-	*Subject to further Intelligence confirmation.
Ben Street	Uranquinty	Closed between Bridge Street and O'Conner Street	-	*Subject to further Intelligence confirmation.
Bridge Street	Uranquinty	closes adjacent to the Olympic Highway	-	*Subject to further Intelligence confirmation.
Morgan Street	Uranquinty	-	-	*Subject to further Intelligence confirmation.
O'Connor Street	Uranquinty	-	-	*Subject to further Intelligence confirmation.
Olympic Way	Uranquinty	Loss of access between Wagga Wagga and Albury	Via Sturt and Hume Highways	*Subject to further Intelligence confirmation.
Rodhams Road	at Sandy Creek	-	-	*Subject to further Intelligence confirmation.

Uranquinty Cross Road	Between Hanging rock road and Rodhams Road	Loss of access to Power Station	-	*Subject to further Intelligence confirmation.
BURKES CREEK DISTRICT				
Burrandana Road	Bridge over Burkes Creek	-	-	*Subject to further Intelligence confirmation.
Holbrook Road	Mangoplah Bridge over Burkes Creek	Loss of access between Wagga Wagga and Holbrook	Via Sturt and Hume Highways	*Subject to further Intelligence confirmation.
Rocky Falls Road	Crossing over Burkes Creek	-	-	*Subject to further Intelligence confirmation.
BULLENBONG CREEK DISTRICT				
Lockhart-Collingullie Road	Bullenbong Creek	Loss of access between Wagga Wagga and Lockhart	-	*Subject to further Intelligence confirmation.
Rohans Road	Near Bullenbong Creek	-	-	*Subject to further Intelligence confirmation.

4.2 SUMMARY OF ISOLATED COMMUNITIES AND PROPERTIES

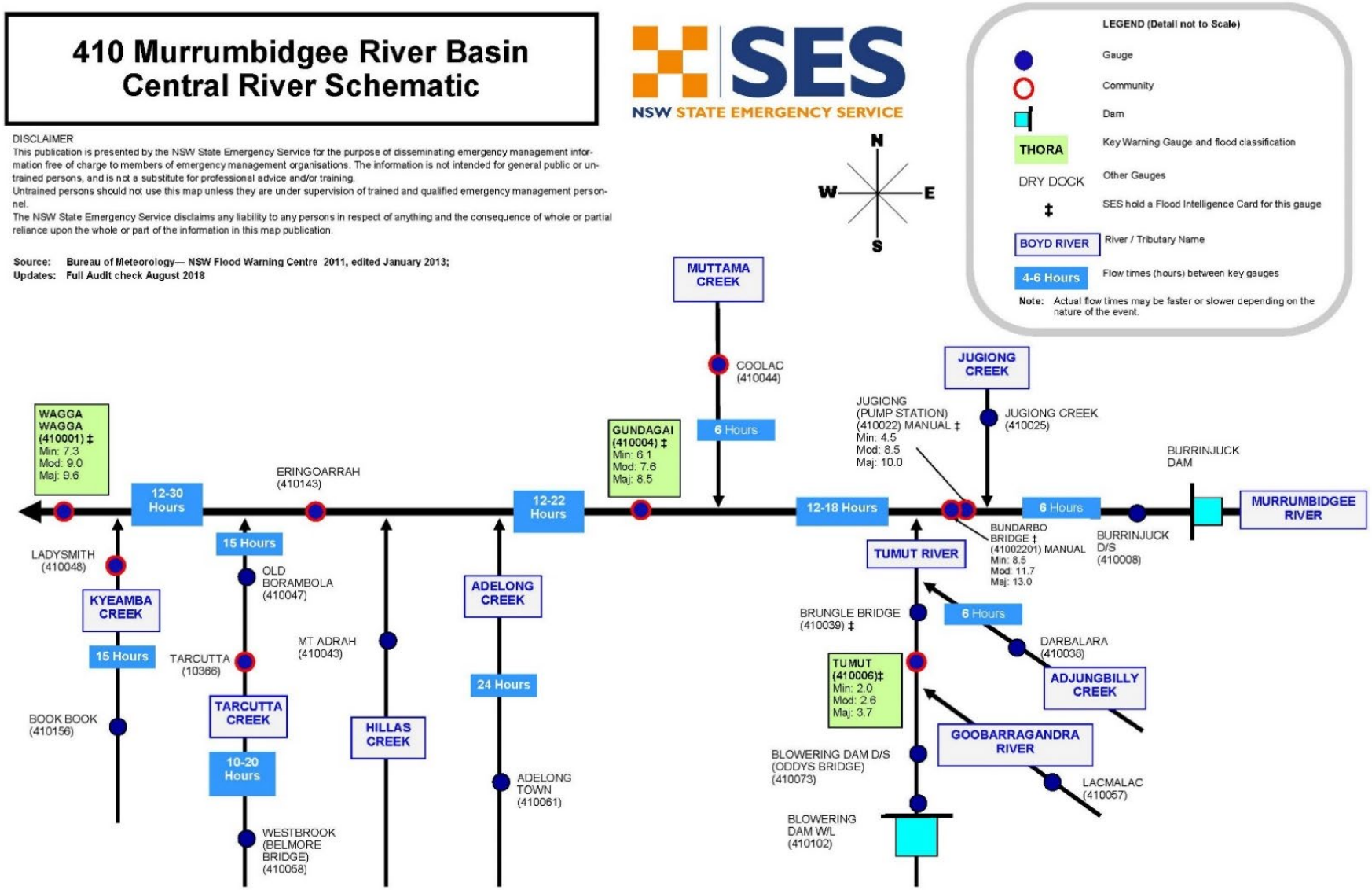
Table 21 lists communities liable to isolation and potential periods of isolation. Information presented here is based on historical and design events and does not reflect the duration of isolation expected in more significant and extreme events.

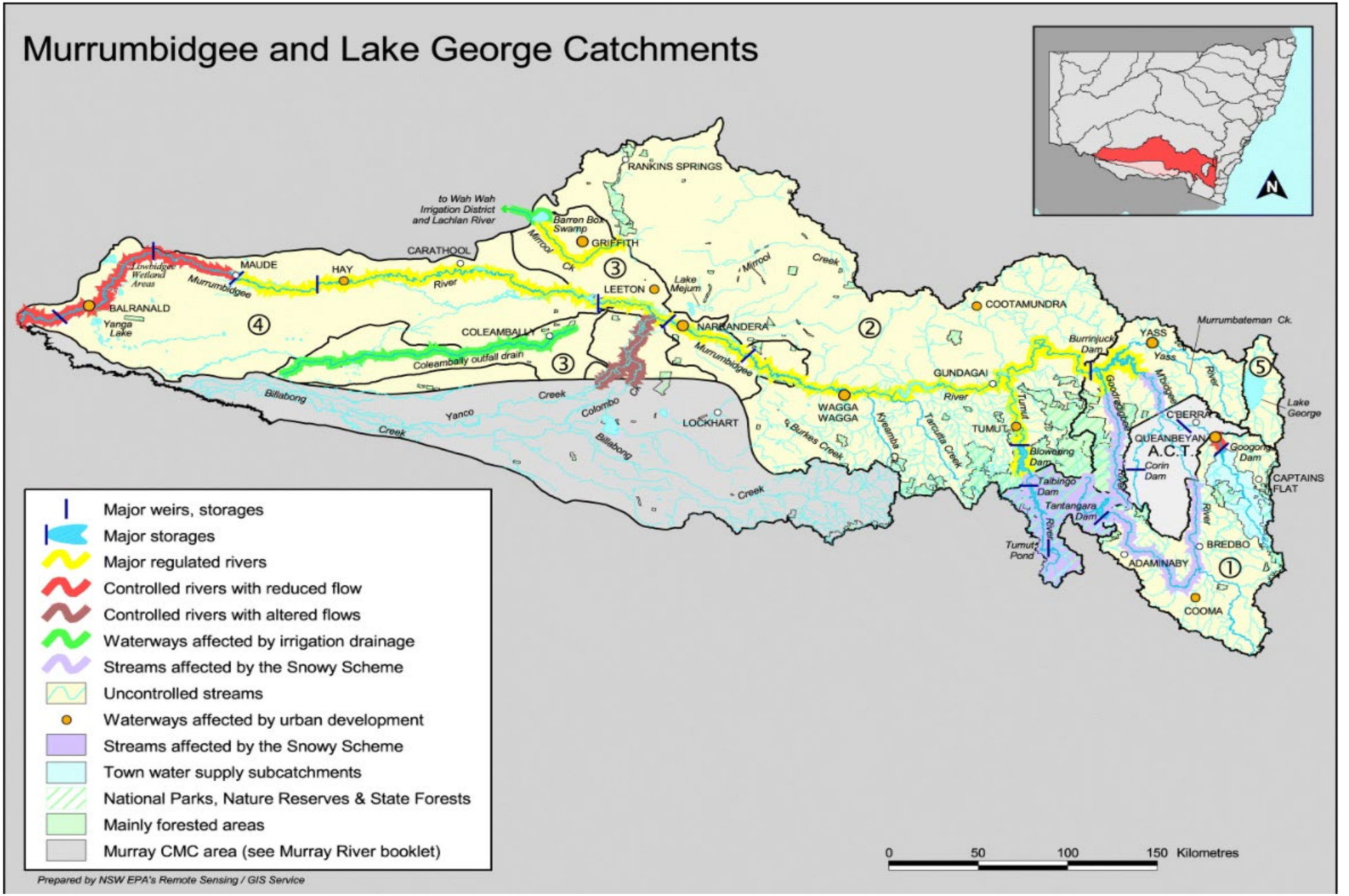
Table 21: Potential periods of isolation for communities in the Wagga Wagga City LGA during a major flood[28]

Town/Area	Population/ Dwellings	Flood Affect Classification	Approximate isolation	Day 1	Day 2	Day 3	Day 3+	NOTES
North Wagga Wagga	510 persons, 232 private dwellings	Low Flood Island	2-3 days					Potential resupply, on request - requires boat access.
Edward St West / Flowerdale Rd	Approximately 48 persons, 16 private dwellings	Low Flood Island	2-3 days					Potential resupply, on request - requires boat access.
Gumly Gumly	49 dwellings	Low Flood Island	2-3 days					Potential resupply, on request - requires boat access.
Tarcutta	206 persons, 83 private dwellings	Rising Road Access	Possibly isolated from Wagga for 2-3 days - if Sturt Highway flooded.					Many rural properties in the Tarcutta Creek catchment could be isolated for up to a few days.
Ladysmith	215 persons, 81 private dwellings	Rising Road Access	It takes a few hours - if Tumbarumba Road floods.					Several rural properties in the Kyeamba Creek catchment could be isolated for up to a few days, especially those requiring access over low-level creek crossings
Uranquinty	767 persons, 280 private dwellings	Rising Road Access	Not isolated from Wagga Wagga					Several rural properties in the Sandy Creek catchment could be isolated for several hours. This includes two properties outside the town levee in Castle Street, Uranquinty.

Note: Periods of isolation are a guide only. Liaison with the Local Controller and communities/residents involved is essential during potential and actual isolation periods.

5 ANNEX: RIVER SCHEMATICS AND CATCHMENT MAP




Murrumbidgee and Lake George Catchments
RANKINS SPRINGS
to Wah Wah Irrigation District and Lachlan River
Barren Box Swamp
GRIFFITH
CARATHOOL
MAUDE
HAY
Murrumbidgee River
Lowbidgee Wetland Areas
BALRANALD
Yanga Lake
LEETON
Lake Mejum
Mirrool Ck
Mirrool Creek
COLEAMBALLY
Coleambally outfall drain
NARRANDERA
COOTAMUNDRA
GUNDAGAI
WAGGA WAGGA
LOCKHART
TUMUT
YASS
Murrumbateman Ck.
Yass River
Burrinjuck Dam
Lake George
CBERRA
QUEANBEYAN
A.C.T.
Googong Dam
Corin Dam
Blowering Dam
Talbingo Dam
Tantangara Dam
Tumut Pond
CAPTAINS FLAT
BREDBO
ADAMINABY
COOMA
Billabong Creek
Yanco Creek
Colombo Ck
Billabong Creek
Kyeamba Creek
Tarcutta Creek
Burkes Creek
Major weirs, storages
Major storages
Major regulated rivers
Controlled rivers with reduced flow
Controlled rivers with altered flows
Waterways affected by irrigation drainage
Streams affected by the Snowy Scheme
Uncontrolled streams
Waterways affected by urban development
Streams affected by the Snowy Scheme
Town water supply subcatchments
National Parks, Nature Reserves & State Forests
Mainly forested areas
Murray CMC area (see Murray River booklet)
Prepared by NSW EPA's Remote Sensing / GIS Service
0 50 100 150 Kilometres

6 ANNEX: FACILITIES AT RISK OF FLOODING

6.1 GREATER WAGGA WAGGA

Facility Name	Street	Suburb	Comment
Schools			
South Wagga Public School	140 Edward Street	Wagga Wagga	Is flood affected by event approaching the PMF. During the PMF, the school building is flooded over the floor to a depth of approximately 2.5m.
Wagga Wagga Public School	Gurwood Street	Wagga Wagga	Is first affected by the 0.2% AEP event with relatively minor flooding in the school grounds. The school becomes isolated once the CBD levee is overtopped. The school property and buildings are completely inundated during the PMF event to a depth of 2.5m.
St Joseph's Primary School	Cnr Johnston and Tarcutta Streets	Wagga Wagga	The grounds are first affected by the 0.2%AEP, and some of the school buildings are also flooded above floor level. Once the CBD levee is overtopped, the school becomes isolated. The PMF inundates the school to a depth of approximately 5m.
Wagga Wagga Christian College	401 Kooringal Road	Kooringal	1% AEP floodwater begins to creep onto the north boundary. 0.2% some access impairment' PMF Majority of grounds and buildings inundated.
North Wagga Public School	54 Hampden Ave	North Wagga Wagga	Protected by the North Wagga levee up to and including the 10% AEP. Once the North Wagga levee is overtopped by the 5% AEP school property is significantly affected. During the PMF, the school is flooded to a depth of approximately 6m.
Child Care Centres			
Central Wagga Childcare Centre	58 Evans Street	Wagga Wagga	Floods to a level of 1.5m during the 0.5% AEP. Becomes completely inundated to approximately 2m during the PMF event.
Wiradjuri Aboriginal Community Childcare Centre	155 Docker Street	Wagga Wagga	Access via Docker Street restricted during a 0.2% AEP event with the road inundated to 1m depth. The entire property flooded up to 6m during a PMF event.
Goodstart Early Learning	184 Morgan Street	Wagga Wagga	Access is blocked during the 0.5% AEP event with 1m depths on Morgan Street. Completely inundated to depths of 5m during the PMF
Goodstart Early Learning	6-10 Station Place	Wagga Wagga	Flooded to depths of 2.5m during the PMF event.

Possums Playground Occasional Child Care	7 Forsyth Street	Wagga Wagga	Surrounding roads become inundated and the Centre has minor over-floor flooding at the 0.5% AEP event isolating the centre.
Koala Pre-School	61 Murray Street	Wagga Wagga	Access is restricted during the 0.2% AEP as Murray Street, Morgan Street and Oates Ave are flooded to depths of approximately 0.5m. The entire property is inundated to depths of 5m during a PMF event.
St Luke's Pre-School	70 Docker Street	Wagga Wagga	Areas of the property first flooded during the 0.5%AEP event to minor depths of 0.25m and access via Shaw and Docker Street is blocked by floodwater, Flooded over-floor to 5m depth during the PMF event.
Shaw Street Children's Centre	6 Kent Crescent	Wagga Wagga	Inundated up to 1m during the 0.5% AEP The entire property is flooded up to 6m during a PMF event.
St Mary's Rainbow Pre-School	2 George Street	North Wagga Wagga	Becomes isolated during the 5% AEP event with depths up to 1m on George and Wiliam Street. Completely inundated to 7m during the PMF event.
Pe4K Childcare Wagga	117 Ashmont Ave	Wagga Wagga	Entire property inundated to depths of approximately 5m during the PMF event and access via Sturt Highway and Ashmont Ave is cut.
Facilities for the aged and/or infirm			
Baptist Care Watermark	14-20 Church Street	Wagga Wagga	This village is situated very close to the river and has minor flood effects before the levee overtops. It becomes isolated in the 0.2% AEP as surrounding roads are inundated. In the PMF event, the entire village is flooded to approximately 5m depth.
Gumleigh Chauncey Retirement Village Gumleigh Gardens – UPA Riverina and Gumleigh Gardens Hostel	21-23 Albury Street 29-35 Shaw Street	Wagga Wagga Wagga Wagga	Surrounding roads, including Albury Street, Shaw Street, Bolton Street, and Docker Street, become inundated up to 1m depth in the 0.5% AEP event, isolating the property. Areas of the facility are also flooded over the floor in this event. The entire area is flooded to 6 m depth during the PMF event.
Wagga Gardens	52-54 Travers Street	Wagga Wagga	The northern boundary of the property and the northern buildings become inundated during the 0.5% AEP event. During the PMF event the entire facility is inundated to depths of 6m.
Lillier Lodge Cancer Clinic	317-321 Edward Street	Wagga Wagga	Areas of the grounds and carparks are impacted at 0.5% AEP. Depths of up to 1m during the PMF event. Access and evacuation is restricted with surrounding access roads inundated.

Wagga Wagga Referral Hospital	260-280 Edward Street	Wagga Wagga	The majority of the hospital grounds first become inundated by events approaching the magnitude of the PMF, with flood depths of up to 4 m experienced. The hospital is also flooded above floor level during a PMF event. It is also noted that the hospital becomes completely isolated during this event with all surrounding roads covered to a depth of 2 – 4 m.
Calvary Riverina Hospital	26-36 Hardy Avenue	Wagga Wagga	Calvary Riverina Hospital is not flooded above floor by Murrumbidgee River flood events; however areas of the grounds and carparks are impacted by depths of up to 1m during the PMF event. Access and evacuation is restricted as Hardy Avenue, Emblen Street, Meurant Avenue and Lewisham Avenue are inundated by up to 4 m in places.
Rosebank Retirement Village	12 Thomas Street	Wagga Wagga	The majority of the grounds and buildings are flooded during the 0.5% AEP event to approximately 1.5 m depth. The entire village is inundated to approximately 7 m depth during the PMF event.
Abbeyfield Australia	29 Wiradjuri Crescent	Wagga Wagga	Surrounding roads become inundated during the 0.5% AEP event isolating the retirement village. Many houses also flood over floor during this event. During the PMF event, the entire village is flooded to approximately 9 m depths.
Village life Retirement Village	52-54 Travers Street	Wagga Wagga	0.5% AEP areas of the grounds and carpark impacted and will becomes isolated with surrounding access roads inundated. 0.2% AEP majority of grounds and building flooded. PMF entire village will be inundated.
Utilities and infrastructure			
Water Treatment Plant	Hammond Avenue near Marshals Creek	Wagga Wagga	Flood Liability 1% AEP Protection. Hampden Bridge Gauge height 11.3m.
Water Treatment Plant	West Wagga at Olympic Highway / McNickle Road	Wagga Wagga	Flood Liability 0.2% AEP. Flooded by 2m depth when gauge height is at 16.1m.
Water Treatment Plant	North Wagga off East Street	Wagga Wagga	Flood Liability ~ 10% AEP Hampden Bridge Gauge height 9.7m
Sewerage Treatment Plant	Narrung street	Wagga Wagga	Affected by the 20% AEP event with flood depths of approximately 1.5m
Sewerage Treatment Plant	Vincent Road	Kooringal	Unaffected by the Riverine PMF event but may be subject to significant overland flow.

Sewerage Treatment Plant	Treatment access Road	Forest Hill	First affected by the 20% AEP
VRA Headquarters	5 Bolton Street	Wagga Wagga	Inundated up to 1m during the 0.5% AEP Entire property flooded up to 6m during a PMF event.
FRNSW Station	The Esplanade	Wagga Wagga	The station is protected by the levee for floods up to the 1% AEP event. During the 0.5% AEP event, the front grounds of the property are flooded to minor depths, and access to the station is cut off as The Esplanade, Thorne Street, and Tompson Street experienced flood depths of up to 0.5 m at these roads. The station first floods over the floor in the 0.2% AEP event and is completely inundated to 5 m depth during the PMF event.
Wagga Wagga Police Station	Sturt Street	Wagga Wagga	Wagga Wagga Police Station is un-affected in events up to the 1% AEP event due to the protection afforded by the levee. During the 0.2% AEP event the station is flooded over floor to approximately 1m depth. The station becomes isolated during this event as Tarcutta and Johnston Street are flooded by depths exceeding 1 m.
Wagga Wagga Exchange	Sturt Street	Wagga Wagga	Wagga Wagga exchange is located behind the levee. Inundation will impact recovery.
Culturally Significant Sites			
Wiradjuri Reserve and Gobba Beach	-	Wagga Wagga	Aboriginal camping and meeting area, associated with a traditional Wiradjuri story.
Bomen Lagoon	-	North Wagga Wagga	This aboriginal Place is culturally sensitive.
Flowerdale Lagoon	-	Wagga Wagga	The Lagoon displays the cultural values of billabongs and wetlands of the Murrumbidgee River system and is a valuable place for cultural activities, education, and natural play.
Wollundry Lagoon and Tony Ireland Park	-	Wagga Wagga	Wollundry Lagoon is important for its spiritual, historical, social and aesthetic values.
Wagga City Council Art Gallery and Library	Baylis and Morrow Street	Wagga Wagga	
Wagga Court House Holding Cells	Tarcutta & Sturt Street	Wagga Wagga	
St Michael's Roman Catholic Cathedral	10 Johnston Street	Wagga Wagga	Sandstone Cathedral built in 1887
St Mary's Anglican Church and Hall	15 William Street	North Wagga Wagga	St Mary's is significant for its association with Anglican worship in North Wagga for almost one hundred years. The church hall

			is a focus for community activities. Local significance.
North Wagga Wagga Hall	76 Hampden Avenue	North Wagga Wagga	The North Wagga Hall significant as a community facility which was constructed as a result of fundraising efforts and has served the community for almost ninety years.
Camping Ground / Caravan Parks			
Caravan Parks are listed in Volume 3, Chapter 4 of this Local Flood Plan (SES Caravan Park Arrangements).			

6.2 OURA

Facility Name	Street	Suburb	Comment
Oura Fire Brigade	6 Barney Street	Oura	
Oura Hall	4 Barney Street	Oura	

6.3 LADYSMITH

Facility Name	Street	Suburb	Comment
Ladysmith Public School	Tywong Street	Ladysmith	The property and buildings of Ladysmith Public School are affected by severe flooding during the PMF event with depths up to 3-4m. The school has significant flooding in the 1% AEP event on its western half closer to the creek, away from the school buildings.

6.4 TARCUTTA

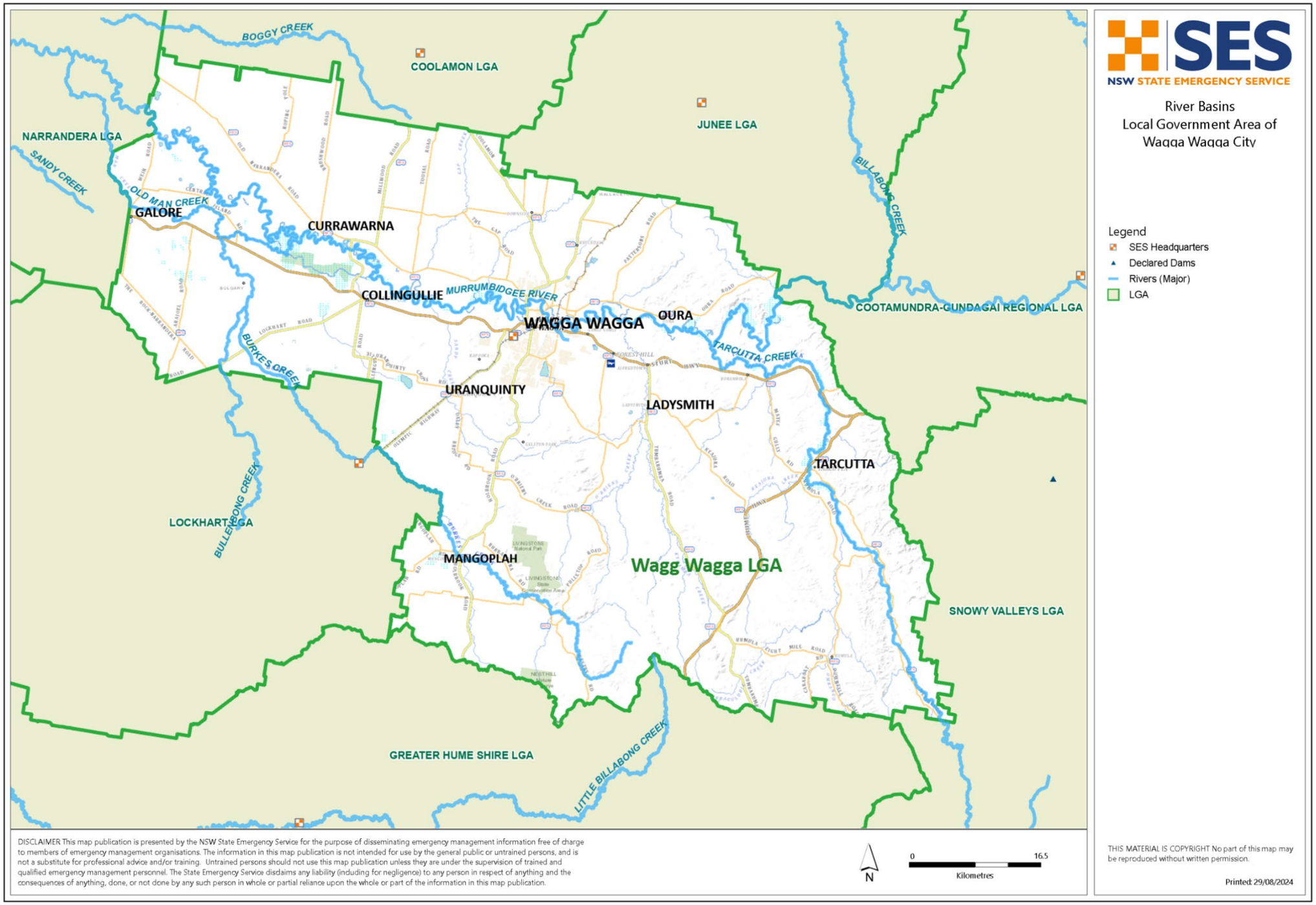
Facility Name	Street	Suburb	Comment
Police Station	Centenary Avenue	Tarcutta	Flooded above the floor in 0.5% AEP

6.5 URANQUINTY

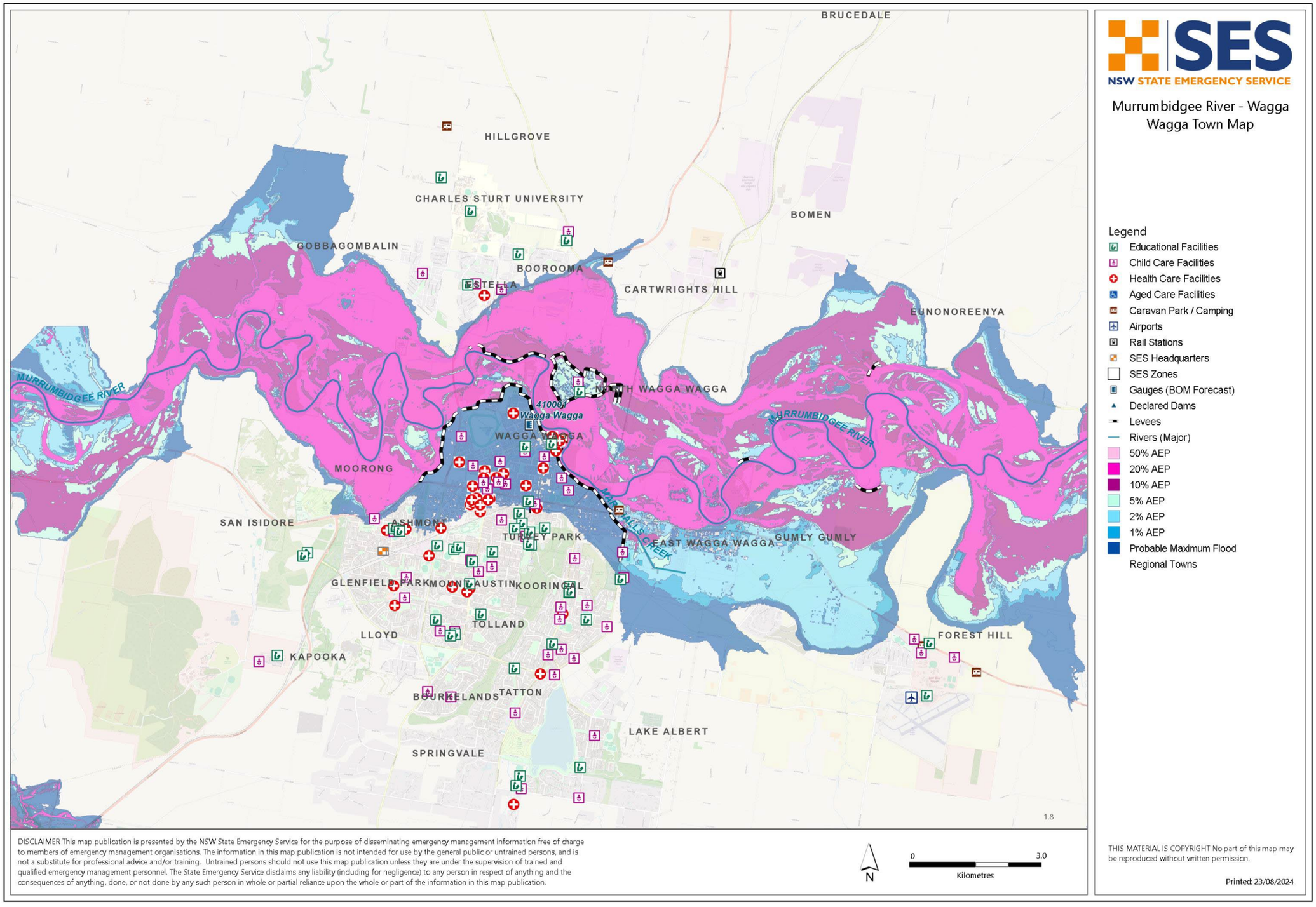
Facility Name	Street	Suburb	Comment
Uranquinty Public School	Cnr Pearson and Uranquinty Streets	Uranquinty	0.3m in the October 2010 event

Main Southern Railway		Uranquinty	Only 0.05m from overtopping in October 2010 event.
Sewage Pump Station	Lower end of King Street	Uranquinty	Stormwater flowed into plant in October 2010 event, affecting some houses and with some loss of service.
Electricity substation	20 Castle Street	Uranquinty	A 250mm high concrete slab was overtopped by 20mm in the October 2010 flood.
St Patricks Roman Catholic Church	22 Morgan Street	Uranquinty	Flooded over floor in October 2010 event.
Uranquinty General Store	26 Morgan Street	Uranquinty	Flooded over floor in October 2010 event.
Uranquinty Hotel	30 Morgan Street	Uranquinty	Almost flooded over floor in October 2010 event.

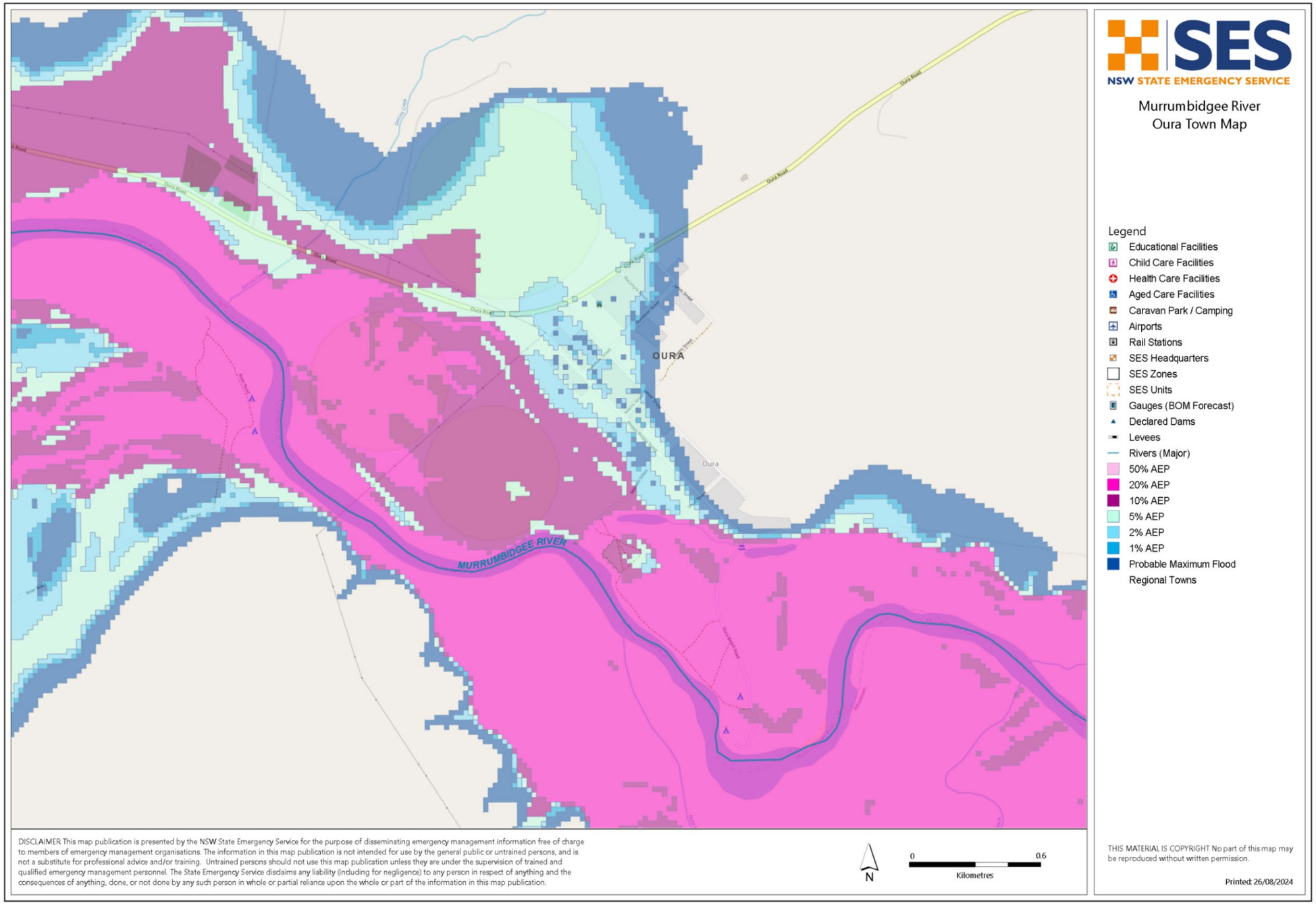
7 ANNEX LGA AND TOWN MAP/S



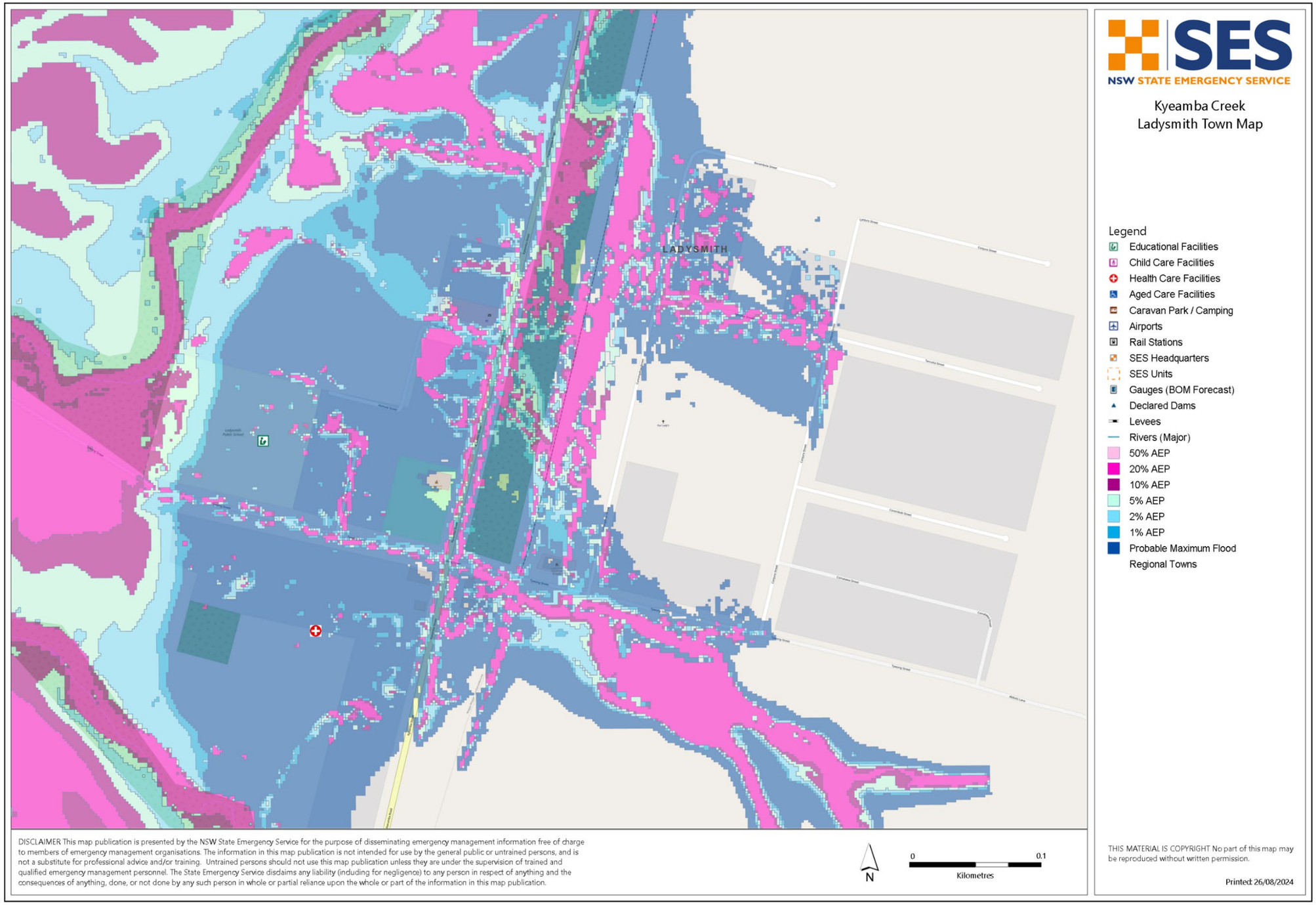
7.1 ANNEX: GREATER WAGGA WAGGA TOWN MAP



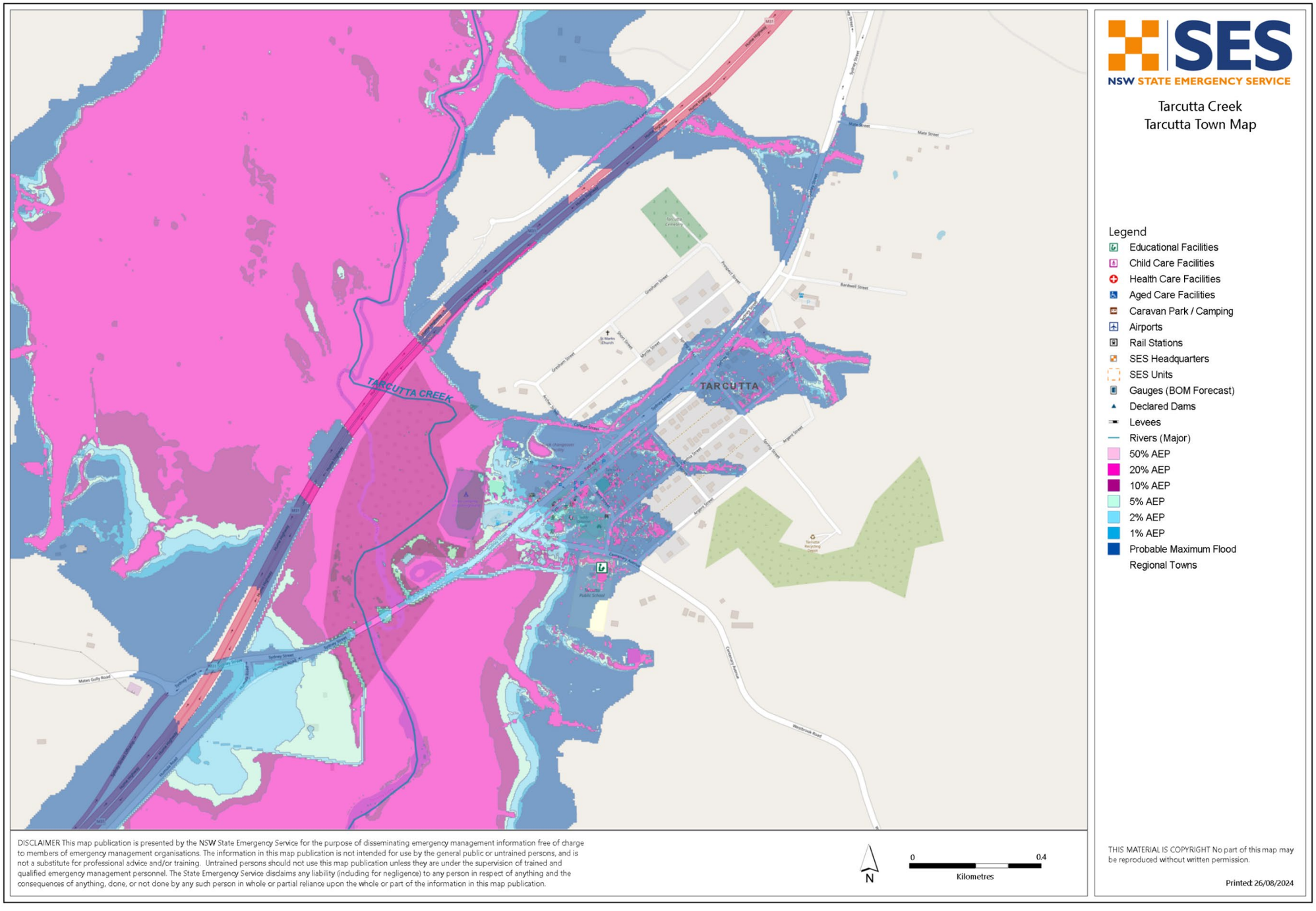
7.2 ANNEX OURA TOWN MAP



7.3 ANNEX: LADYSMITH TOWN MAP

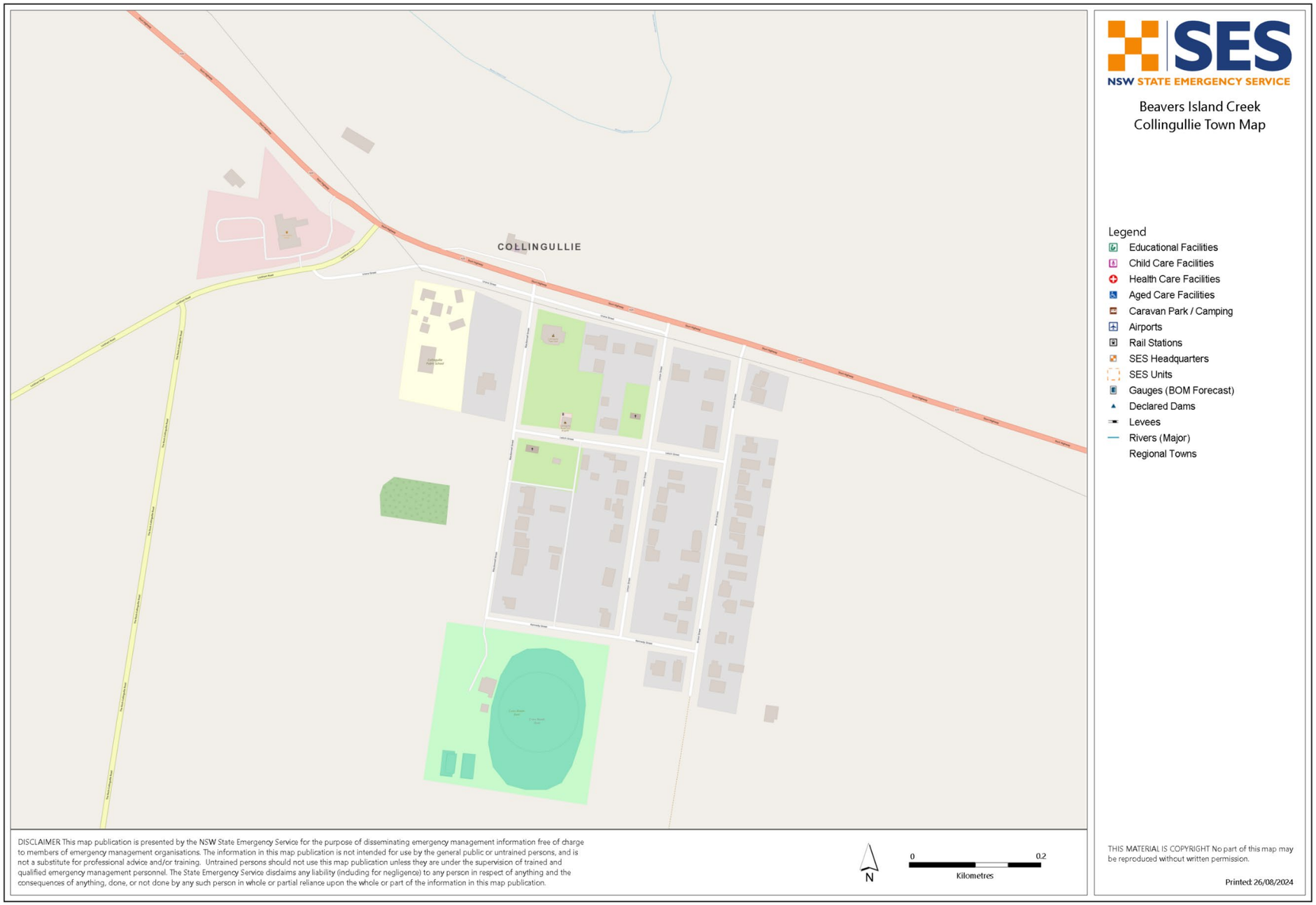


7.4 ANNEX: TARCUTTA TOWN MAP



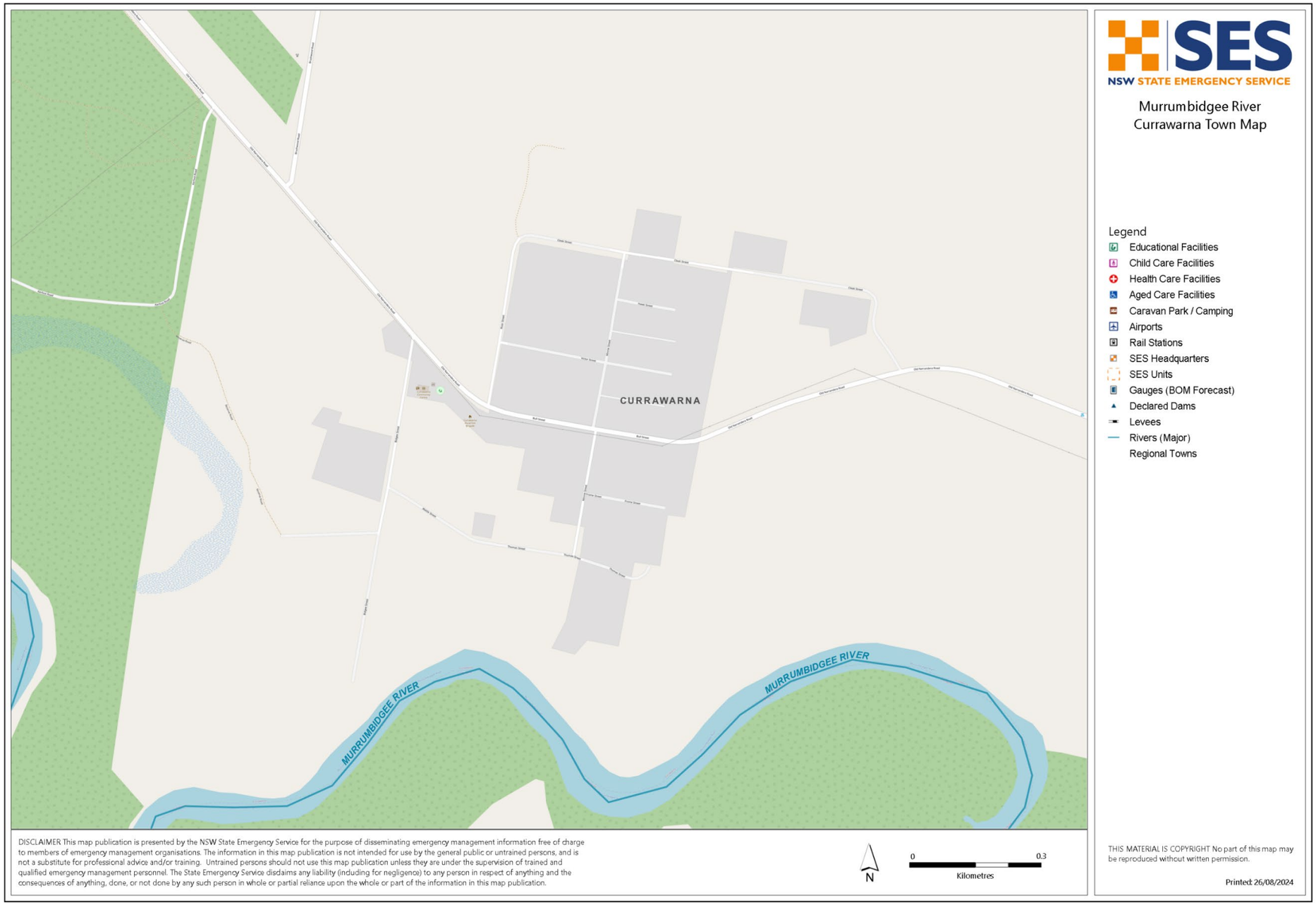
7.5 ANNEX: COLLINGULLIE TOWN MAP

(Note: Collingullie was not included in a flood study and therefore flood extent layers are unavailable at this time).

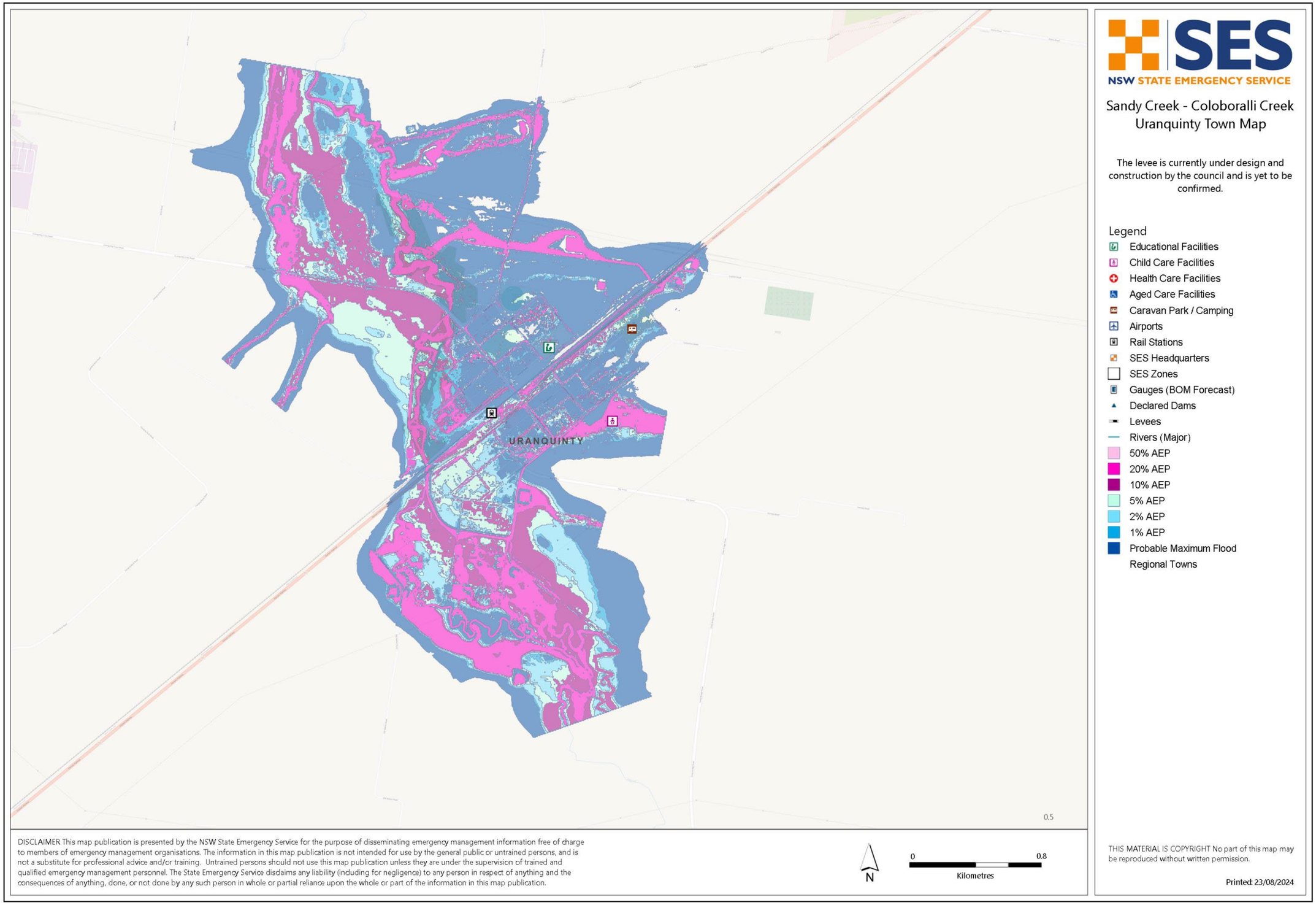


7.6 ANNEX: CURRAWARNA TOWN MAP

(Note: Currawarna was not included in a flood study and therefore flood extent layers are unavailable at this time).

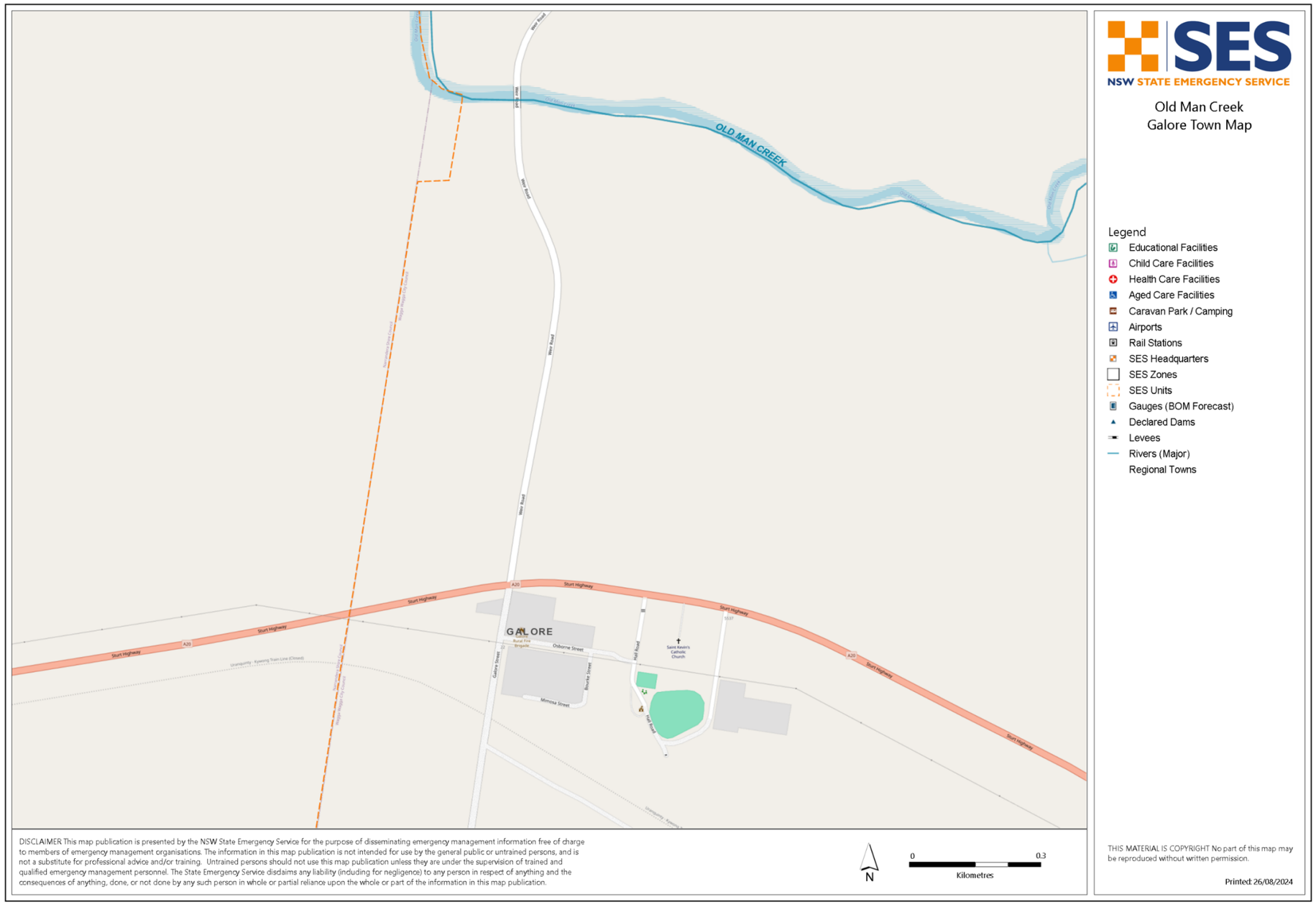


7.7 ANNEX: URANQUINTY TOWN MAP



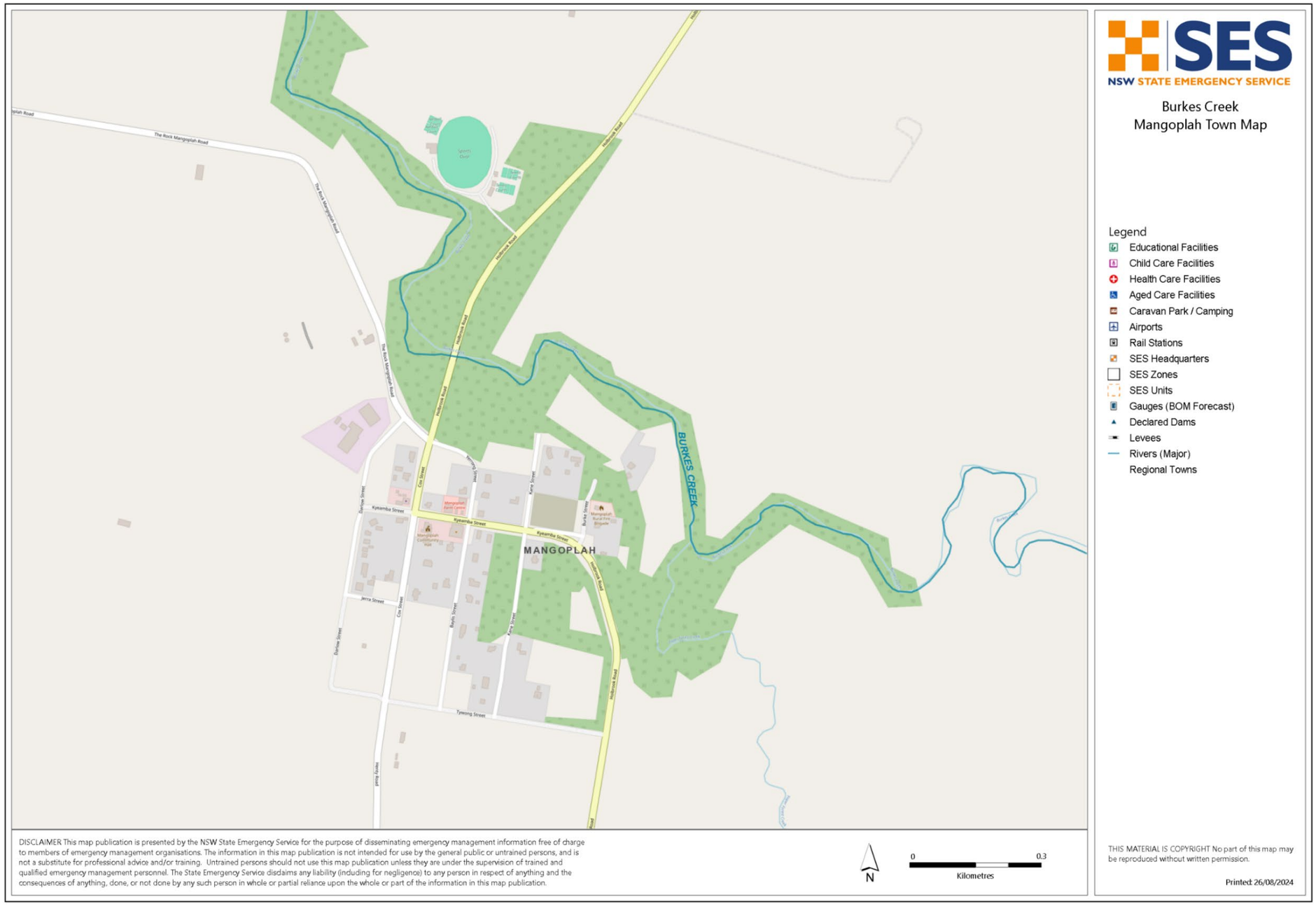
7.8 ANNEX: GALORE TOWN MAP

(Note: Galore was not included in a flood study and therefore flood extent layers are unavailable at this time).



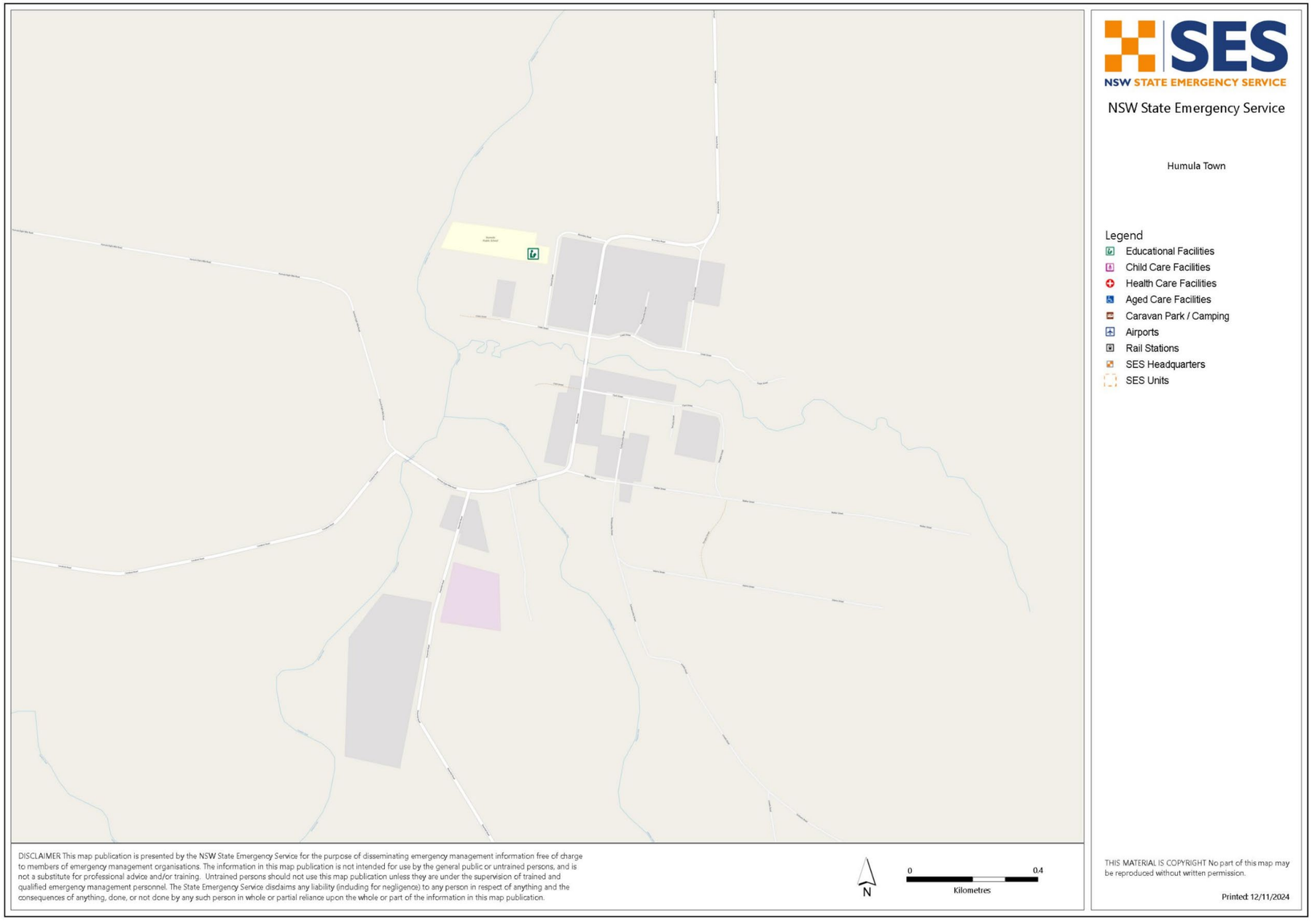
7.9 ANNEX: MANGOPLAH TOWN MAP

(Note: Mangoplah was not included in a flood study, and therefore, flood extent layers are unavailable at this time).



7.10 ANNEX: HUMULA TOWN MAP

(Note: HUMULA was not included in a flood study, and therefore, flood extent layers are unavailable at this time).



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