NSW STATE EMERGENCY SERVICE

Kyogle

Local Flood Emergency Sub Plan

FloodSafe

KYOGLE
FLOOD EMERGENCY
SUB PLAN

A Sub Plan of the Local Emergency Management Plan (EMPLAN)

Volume 1 of the Kyogle Council Flood Emergency Sub Plan

Endorsed by the Northern Rivers Local Emergency Management Committee

Endorsed Date: 1st September 2023

AUTHORISATION

The Kyogle Council Flood Emergency Sub Plan is a sub plan of the Kyogle Council 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)**.

Authorised

Signature: _____

NSW SES Local/Unit Commander

Print Name: Hayden Doolan

Date: 1st September 2023

Endorsed

Signature: _____

Chair, Local Emergency Management Committee

Print Name: SCOTT TURNER

Date: 22/8/2023

VERSION HISTORY

Version Number	Description	Date
1	**Kyogle Local Flood Plan**	**March 1994**
2	**Kyogle Local Flood Plan**	**July 2013**

AMENDMENT LIST

Suggestions for amendments to this plan should be forwarded to:

Manager Emergency Planning
NSW State Emergency Service
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Amendments in the list below have been entered in this plan.

Amendment Number	Description	Updated by	Date

DISTRIBUTION LIST

Available for general use and distribution on the NSW State Emergency Service website www.ses.nsw.gov.au

CONTENTS

1 OUTLINE AND SCOPE

1.1 PURPOSE

1.1.1 The purpose of this plan is to set out the multi-agency arrangements for the emergency management of flooding in the Kyogle Council Local Government Area (LGA).

1.2 AUTHORITY

1.2.1 This plan is written and issued under the authority of the *State Emergency and Rescue Management Act 1989* (NSW) ('SERM Act'), the *State Emergency Service Act 1989* (NSW) ('SES Act') and the NSW State Emergency Management Plan (EMPLAN).

1.2.2 This plan is a sub plan to the Northern Rivers Local Emergency Management Plan (EMPLAN) and is endorsed by the Northern Rivers Local Emergency Management Committee (LEMC).

1.3 ACTIVATION

1.3.1 This plan does not require activation. The arrangements set out in this plan are always active.

1.3.2 The Northern Rivers Emergency Management Plan (EMPLAN) is active at all times in anticipation of the need to coordinate support and resources requested by combat agencies, including the NSW State Emergency Service (NSW SES).

1.4 SCOPE

1.4.1 The area covered by this plan is the Kyogle Council LGA. The Kyogle Council LGA and its principal towns, villages, rivers and creeks are shown in Appendix A.

1.4.2 The Council area is in the NSW SES North Eastern Zone and for emergency management purposes, is part of the North Coast Emergency Management Region.

1.4.3 The plan sets out the Kyogle Council level emergency management arrangements for prevention, preparation, response and initial recovery for flooding in the Kyogle Council LGA.

1.4.4 In this plan a flood is defined as a 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 inundation resulting from super-elevated sea levels and/or waves (including tsunami) overtopping coastline defences.

1.4.5 This plan outlines the local level arrangements for the management of downstream consequences of flooding due to dam failure, however it does not cover the management of flooding of an underground mine by inrush or other cause, which should be covered by the Mine Emergency Sub Plan for the respective mine.

1.5 GOALS

1.5.1 The primary goals for flood emergency management in NSW are:

a. Protection and preservation of life.

b. Establishment and operation of flood warning systems.

c. Issuing of community information and community warnings.

d. Coordination of evacuation and welfare of affected communities.

e. Protection of critical infrastructure and community assets essential to community survival during an emergency incident.

f. Protection of residential property.

g. Protection of assets and infrastructure that support individual and community financial sustainability and aid assisting a community to recover from an incident.

h. Protection of the environment and conservation values considering the cultural, biodiversity and social values of the environment.

1.6 KEY PRINCIPLES

1.6.1 The protection and preservation of human life (including the lives of responders and the community) is the highest priority.

1.6.2 Evacuation is the primary response strategy for people impacted by flooding.

1.7 ROLES AND RESPONSIBILITIES

1.7.1 General responsibilities of emergency service organisations and functional areas are set out in the NSW State EMPLAN and NSW State Flood Sub Plan.

1.7.2 Specific roles and responsibilities for agencies, functional areas and organisations in relation to flooding within Kyogle Council are detailed within this plan, Appendix B and Appendix C.

1.7.3 Any agency with agreed responsibilities in this plan that are temporarily unable, or no longer able to fulfil their responsibilities in response operations must as soon as possible notify:

a. The NSW SES Incident Controller (for local or zone level responsibilities during response operations).

b. The NSW SES Zone Duty Commander (for regional level responsibilities outside of response operations).

1.8 PLAN MAINTENANCE AND REVIEW

1.8.1 NSW SES will maintain the currency of this plan by:

a. Ensuring that all supporting emergency services and functional areas, organisations and officers mentioned in it are aware of their roles and responsibilities.

b. Conduct a minimum of one exercise every five years or within two years of the plan being reviewed.

c. Reviewing the contents of the plan:

- When there are changes which alter agreed plan arrangements.
- When changes to land use strategic plans and policies increase the population at risk.
- After a flood including recommendations from after action reviews, reports, or inquiries.
- As determined by the NSW SES Commissioner.

d. The plan is to be reviewed no less frequently than every five years or after a significant flood event.

1.9 SUPPLEMENTARY DOCUMENTS

1.9.1 Supplementary and supporting material of the Local Flood Emergency Sub Plan is maintained on the NSW SES website Flood, Storm and Tsunami Plans including:

a. Flood Plan Glossary.

b. NSW SES Dam Failure Notification Flowchart.

c. NSW SES Resupply Flowchart.

2 OVERVIEW OF NSW FLOOD HAZARD AND RISK

2.1 THE FLOOD THREAT

2.1.1 NSW SES maintains information on the nature of flooding and effects of flooding on the community in the Kyogle Council LGA.

2.1.2 Declared dams in or upstream of the Kyogle Local Government Area.

Dam Name	Owner	High Risk Dam
Toonumbar Dam	Water NSW	No
Petrochilos Dam	Kyogle Council	No

3 PREVENTION/ MITIGATION

3.1 INTRODUCTION

3.1.1 The Flood Risk Management Manual outlines the NSW Government's Flood Prone Land Policy which details the framework for managing flood prone land in New South Wales. Incorporation of floodplain risk management into land use planning is one of the key means to limit the exposure to flood risks to our communities and help build long term resilience to future flood events.

3.2 LAND USE PLANNING

3.2.1 **Strategy:** Effective land use planning is a key focus for minimising the impacts of flooding. NSW SES will work with land use planning and consent authorities to inform and influence the consideration of the risks arising from flood, storm and tsunami, to prevent the creation of intolerable impacts of these hazards on the community.

Actions:

a. NSW SES will provide strategic input about land use planning matters which have or will create significant flood risk to life and/or property due to flooding.

b. NSW SES will provide responses to land use planning proposal referrals that have or will create significant flood risk to life and/or property due to flooding.

3.3 FLOODPLAIN RISK MANAGEMENT

3.3.1 **Strategy**: Advocate for consideration of emergency management in decision making to reduce risks to the existing community and minimise the growth in future, continuing and residual risk due to development through input to the floodplain management program.

Actions:

a. NSW SES will provide coordinated and consistent emergency management advice to councils and other agencies in relation to the management of land that is subject to flooding or inundation.

b. NSW SES will provide advice, support, technical resources and training for NSW SES representatives to contribute effectively on local Floodplain Management Committees.

4 PREPARATION

4.1 INTRODUCTION

4.1.1 Preparation includes arrangements or plans to deal with an emergency or the effects of an emergency.

4.2 FLOOD EMERGENCY PLANNING

4.2.1 **Strategy**: NSW SES develop, review and maintain Flood Emergency Sub Plans.

Actions:

a. Develop and review this NSW SES Local Flood Emergency Sub Plan as required. Local Flood Emergency Sub Plans outline the specific arrangements for management of flood events within an LGA and may include cross boundary arrangements.

b. Review plans as per Section 1.8.

4.2.2 Local EMPLAN Consequence Management Guides (CMG's) for flood are not required for communities covered by NSW SES Local Flood Emergency Sub Plans

however may be utilised in place of Local Flood Emergency Sub Plan if agreed to by NSW SES.

4.3 FLOOD INTELLIGENCE SYSTEMS

4.3.1 **Strategy**: NSW SES develop and maintain a flood intelligence system to identify flood behaviour, its impact on the community and required response actions.

Actions:

a. Gather and assess flood information for the full range of flood types and severities.

b. Collect, collate, and assess information on the characteristics of communities at risk and the potential effects of flooding on communities at risk.

c. Share flood intelligence information with supporting agencies.

4.4 DEVELOPMENT OF WARNING SYSTEMS

4.4.1 **Strategy**: Develop, maintain and prepare systems for the provision of flood warnings and associated warning services.

Actions:

a. All levels of government work in partnership to develop and maintain flood warning infrastructure.

b. NSW SES maintains a list of the requirements for flood warnings for flood gauges in NSW (including flood classifications, warning times required and key statistics) and can be found in the supplementary document to the NSW State Flood Plan (see Section 1.9).

c. NSW SES will recommend new warning services and changes to warning alert levels for gauges to the NSW and ACT Flood Warning Consultative Committee.

d. The State Government, in partnership with Local Government, is responsible for developing and maintaining flash flood warning systems for local catchments where required.

e. Dam Owners will provide Dam Emergency Plans (where required) and consult with NSW SES on alert levels and messaging. Alert level definitions are listed in Dam Emergency Plans.

f. NSW SES maintains a dedicated dam failure hotline and procedures to ensure priority dissemination of dam failure warnings.

g. NSW SES develops and maintains warning and flood information products by:

- Utilising flood intelligence data.
- Developing warning and flood information products.
- Continuously reviewing warning and flood information products.
- Consulting with affected communities, key stakeholders, Dam Safety NSW and the NSW and ACT Flood Warning Consultative Committee, and maintains Operational Readiness.

- Participating in the development of public information and warning systems.

h. Gauge owners adequately maintain flood warning gauges and systems, including those identified in the 'Service Level Specification' maintained by the Bureau of Meteorology (Bureau) and those identified in the 'Provision and Requirements for Flood Warning in New South Wales' maintained by NSW SES.

4.5 BRIEFING, TRAINING AND EXERCISING

4.5.1 **Strategy**: Ensure NSW SES, supporting agencies, functional areas and the community are prepared and familiar with the strategies and arrangements within the Flood Emergency Sub Plan and supporting documents.

Actions:

a. NSW SES will consult stakeholders throughout the development of plans.

b. NSW SES will inform stakeholders of content changes after revisions.

c. NSW SES will ensure their facilities and resources are maintained and operationally ready.

d. NSW SES will train personnel for their expected flood operation roles.

e. NSW SES will regularly brief stakeholders on the exercise arrangements contained in the NSW Flood Emergency Sub Plan.

4.6 COMMUNITY RESILIENCE TO FLOODING

4.6.1 **Strategy**: NSW SES provides and maintains a flexible volunteer workforce to support community resilience.

Actions:

a. Ensure ongoing recruitment and training of a diverse range of volunteers.

b. Ensure pre-planning to facilitate the management of spontaneous volunteers and community members during a flood.

4.6.2 **Strategy**: NSW SES works with individuals, communities, businesses and government agencies to build flood resilience.

Actions:

a. Partner with and engage communities to understand and manage the risks associated with floods, including providing business continuity guidance (NSW SES Business FloodSafe), family preparedness (NSW SES Home FloodSafe) and other engagement strategies.

b. Collate, assess and disseminate flood information to the community.

c. Collaborate with individuals, businesses, government agencies and communities when developing flood intelligence, preparedness and response information.

d. Plan for floods collaboratively with communities through community and stakeholder participation and engagement.

e. Collaborate with community sector and recognise the needs of individuals within communities who have an increased susceptibility during floods.

5 RESPONSE

5.1 INTRODUCTION

5.1.1 Flood response operations will begin:

a. On receipt of a Bureau Severe Weather Warning or Thunderstorm Warning that includes heavy rain or storm surge; or

b. On the receipt of a Bureau Flood Watch or Flood Warning; or

c. On receipt of warnings for flash flood; or

d. On receipt of a dam failure alert; or

e. When other evidence leads to an expectation of flooding.

5.2 INCIDENT MANAGEMENT ARRANGEMENTS

5.2.1 **Strategy**: Maintain effective control of flood operations across NSW.

Actions:

a. NSW SES uses the Australasian Inter-service Incident Management System (AIIMS) to manage the flood response.

b. Control of flood response will be at the lowest effective level and may be scaled to suit the incident.

c. The NSW SES State Controller (or delegate) will appoint Incident Controllers and establish Incident Control Centres (see NSW SES facilities on map in Appendix A).

d. The NSW SES Incident Controller, in consultation with participating supporting emergency services and functional areas will determine the appropriate breakdown of an Area of Operations into Divisions and/or Sectors in accordance with the principles of AIIMS.

5.2.2 **Strategy**: Maintain Incident Control Centre(s).

Actions:

a. NSW SES will operate Incident Control Centre(s) as required.

b. The NSW SES Incident Control Centre(s) will:

- Control resources from NSW SES and coordinate resources of supporting emergency services and functional areas.
- Manage Request for Assistance (RFA) tasking and ensure they are actioned in a timely manner.
- Undertake response planning and determine future resourcing requirements.

- Coordinate information flow, including warnings, public information and social media.

5.2.3 **Strategy**: Provide effective liaison between NSW SES and supporting agencies or functional areas in accordance with Local EMPLAN.

Actions:

a. Supporting emergency services and functional areas should provide Liaison Officers to NSW SES Incident Control Centre(s) and/or Emergency Operation Centres as required.

b. NSW SES will provide Liaison Officer(s) to Emergency Operations Centres as required.

c. Where possible Emergency Operation Centres to be co-located with NSW SES Incident Control Centres for Flood Emergency Response.

5.2.4 **Strategy**: Coordinate resources and logistics support to ensure operational effectiveness.

Actions:

a. The NSW SES Incident Controller will notify agencies of potential access issues between locations, for the consideration of pre-deploying of resources.

b. NSW SES may request resources and logistics support directly from a supporting emergency service or functional area.

c. Wherever possible, supporting organisations are to provide their own logistic support in consultation with NSW SES where appropriate.

d. The NSW SES Incident Controller will control air support operations and may utilise supporting agencies in the management of aircraft.

5.3 USE OF INFORMATION AND COLLECTION OF INTELLIGENCE

5.3.1 **Strategy**: Ensure flood information is effectively utilised, communicated and collected during and after a flood.

Actions:

a. Information relating to the consequences of flooding, response strategies, situational awareness and operational updates will be distributed by NSW SES to supporting emergency services and functional areas listed under this Plan.

b. All supporting emergency services , functional areas and Council will accurately record and report information relevant to their activities and any real time flood information (including road closure information) to the NSW SES Incident Controller. This may be in the form of a combined Emergency Operations Centre (EOC) report, or direct from agencies where an EOC has not been established.

c. NSW SES may establish and operate a Joint Intelligence Unit to coordinate the collection, collation, interpretation, mapping, actioning and dissemination of information.

d. Reconnaissance, mapping, damage assessments, intelligence validation and post flood evaluation will be coordinated by NSW SES. This may occur post impact and continue into the recovery phase.

e. NSW SES may request Engineering to assist with the gathering of flood intelligence including (not limited to) maximum flood extents, peak flood heights, recording major flood damage at key high velocity locations and preparation of After-Flood Report.

5.3.2 **Strategy**: Ensure flood intelligence is incorporated into operational decision-making.

Action: NSW SES will use flood intelligence, official forecasts, warnings, and flood scenario products to undertake an assessment of the predicted impact of a flood and to inform operational decision-making.

5.4 PROVISION OF INFORMATION AND WARNINGS TO THE COMMUNITY

5.4.1 **Strategy**: Timely and effective warnings are distributed to the community.

Actions:

a. The Bureau issues public weather and flood warning products before and during a flood. These may include:

- Severe Thunderstorm Warnings – Detailed - issued for all capital cities and surrounding areas when individual severe thunderstorms are within range of the capital city radars.
- Severe Thunderstorm Warnings - Broad-based - issued for the entire Australian State or territories affected highlighting broad areas where severe storms may occur within the next 3 hours.
- Severe Weather Warnings with reference to heavy rainfall and/or storm surge.
- Flood Watches.
- Flood Warnings.

b. Dam Owners will utilise the Dam Emergency Plan to provide warnings and information to NSW SES and communities (where appropriate).

c. NSW SES Incident Controllers will issue the following NSW SES Flood Warnings aligning to the Australian Warning System:

- Advice.
- Watch And Act.
- Emergency Warning.

d. NSW SES liaises with the Bureau to discuss the development of flood warnings as required.

e. NSW SES provides alerts and deliver flood information to affected communities using a combination of public information.

f. NSW SES may request supporting agencies redistribute NSW SES alerts and information, including through the provision of doorknocking teams.

g. Road closure information will be provided to the community through the following agencies/methods:

- Local Government Council websites.
- Transport for NSW 'Live Traffic' website: https://www.livetraffic.com/ or 'Transport InfoLine': 131 500. VMS messaging on roadways may also be used to advise motorists.

h. The Public Information and Inquiry Centre will be established by NSW Police Force where required to provide information regarding evacuees and emergency information. Contact details will be broadcast once the centre is established.

i. The Disaster Welfare Assistance Line will be established by Disaster Welfare Services where required to provide information on welfare services and assistance. Assistance line contact details will be broadcast once Disaster Welfare Services commence.

5.5 PROTECTION OF PROPERTY

5.5.1 **Strategy**: Coordinate the protection of property from destruction or damage arising from floods.

Action: NSW SES, supporting agencies, and community volunteers will assist the community (where resources are available, feasible and safe to do so) in:

a. The protection of properties including critical infrastructure through flood protection systems (e.g. sandbagging) to minimise entry of water into buildings.

b. The raising or moving of household furniture and commercial stock/equipment.

5.6 ROAD AND TRAFFIC CONTROL

5.6.1 **Strategy**: Coordinate the closing and re-opening of flood affected roads.

Actions:

a. Kyogle Council will coordinate the closure and reopening of council managed roads once inspections have been carried out by the relevant authority.

b. Transport for NSW will coordinate the closure and reopening of the state road network.

c. NSW Police Force may close and re-open roads but will normally only do so (if the Kyogle Council or Transport for NSW have not already acted and if public safety requires such action.

d. NSW SES will assist with erecting road closure signs and barriers when time and resources permit.

5.6.2 **Strategy**: Coordinate traffic control measures in flood affected areas.

a. The NSW SES Incident Controller may direct the imposition of traffic control measures into flood affected areas in accordance with the provisions of the

State Emergency Service Act, 1989 and the *State Emergency Rescue Management Act, 1989.*

b. The NSW SES Incident Controller may request the Local Emergency Operations Controller provide suitable personnel to assist with traffic coordination.

5.7 PROTECTION OF ESSENTIAL SERVICES

5.7.1 Arrangements for the protection of local assets are outlined in the NSW SES local Flood Emergency Sub Plan. In addition, Local and Region EMPLAN's contain infrastructure inventories.

5.7.2 **Strategy**: Minimise disruption to the community by ensuring protection of infrastructure and supply of essential energy, utility services and lifelines.

Actions:

a. Transport Services Functional Area is to coordinate the provision of information about the assessment and restoration of transport network infrastructure.

b. Energy and Utility Services Functional Area is to coordinate the assessment and restoration of essential energy and utility services (not including telecommunications).

c. Telecommunications Services Functional Area is to coordinate the assessment and restoration of telecommunications and the Public Safety Network.

d. Engineering Services Functional Area is to:

- Coordinate the assessment and restoration of critical public buildings for example hospitals.
- Assessment and operation of flood protection levees.
- Protection of property.
- Construction and repair of levees.
- Dam safety assessment and dam stability.
- Water supply and sewerage operations.
- Other critical infrastructure.

e. Functional Areas and Council will keep NSW SES informed of the status of utilities and infrastructure.

5.8 EVACUATION

5.8.1 Evacuation is NSW SES's primary response strategy for managing the population at risk of flooding.

5.8.2 **Strategy**: Conduct planning to ensure all evacuation constraints are considered.

Actions:

a. Evacuations will take place when there is a risk to public safety. Circumstances may include:

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

- Evacuation of people who are unsuited to living in isolated circumstances, due to flood water closing access.
- Evacuation of people where essential energy and/or utility services are likely to fail or where buildings have been or may be made uninhabitable.

b. NSW SES will consider the following in evacuation decisions:

- Duration of evacuation.
- Characteristics of the community.
- Numbers requiring evacuation.
- Availability of evacuation routes and transport.
- The ability for existing levees or other flood protection works to fulfil their intended function.
- Time available for evacuation.
- Evacuee management requirements.
- Resources and delivery of evacuation information.
- Length of isolation.

c. NSW SES Incident Controllers, planning and intelligence officers will carefully consider the risks involved in conducting evacuations.

d. All evacuation decisions will be made as per the current NSW SES policies and procedures, and consistent with the NSW Evacuation Management Guidelines.

e. Potential Evacuation Centres are located in the local EMPLAN.

f. NSW Police Force will coordinate the provision of overall security for evacuated areas.

5.8.3 **Strategy**: Evacuate people pre-emptively from dangerous or potentially dangerous places and or locations created by the flood hazard to safe locations away from the hazard.

a. NSW SES will control and coordinate the evacuation of affected communities.

b. The NSW SES Commissioner (or delegate) will warn communities to prepare for a possible evacuation, where circumstances allow such lead time.

c. The NSW SES Commissioner (or delegate) will order any necessary evacuations and provide information to the community about when and how to evacuate.

d. Support to evacuation operations may be requested from other emergency services and supporting agencies using arrangements in the local EMPLAN and supporting plans.

e. Health Services Functional Area will coordinate the evacuation of hospitals, and assist where appropriate with health centres and aged care facilities (including nursing homes) in consultation with NSW SES and Welfare Services and ensure that appropriate business continuity plans are developed for essential health infrastructure and are activated during the floods as per the NSW Health Services Supporting Plan (HEALTH PLAN, 2013).

In the event of an emergency impact of any magnitude or type affecting a Residential Aged Care Facility or private hospital facility, the decision making and resolution regarding the requirement to evacuate will be the responsibility of the facility management in consultation with the relevant combat agency.

f. School administration offices (Government and Private) will coordinate the evacuation of schools in consultation with NSW SES and Welfare Services, if not already closed.

g. Caravan Park proprietors will inform the NSW SES Incident Controller when caravan park evacuations have been completed.

h. People who are reluctant or refuse to comply with any Emergency Warning will be referred to NSW Police Force.

5.9 EVACUEE MANAGEMENT AND WELFARE

5.9.1 Research and experience in flood operations shows that most evacuees go to family, friends and commercial accommodation outside the impact area.

5.9.2 **Strategy**: Maintain the welfare of communities and individuals affected by the impact of a flood.

Actions:

a. NSW SES will provide initial welfare for evacuees where required but will hand the responsibility over to Welfare Services Functional Area as soon as possible. NSW SES will brief Welfare Services Functional Area at the earliest opportunity regarding the level of assistance required.

b. Welfare Services Functional Area will manage evacuation centres for affected residents and travellers in accordance with Welfare Services Functional Area Supporting Plan.

c. Schools Administration (Government and Private) will manage the safety of students directly affected by flooding and will work with NSW SES in the temporary closure of schools and will coordinate with NSW SES, Transport and Welfare Services in the management of school evacuees.

d. Disaster Victim Registration will be controlled and coordinated by NSW Police Force with the assistance of NSW SES and the Welfare Services Functional Area.

e. NSW SES will provide details of all residents assisted in evacuations to the Welfare Services Functional Area as early as possible.

f. Where the expected remaining number of evacuees and the duration of evacuation is assessed to be beyond the capability and capacity of the established evacuation centre arrangements the SEOCON may establish Major Evacuation Centres or Mass Care facilities.

g. The decision to establish Major Evacuation Centres or Mass Care Facilities will be made by NSW SES and SEOCON in consultation with members of the State Emergency Management Committee.

5.9.3 **Strategy**: Coordinate available and accessible health services for flood affected communities.

Action: The provision of environmental health advice, assessment of public health risks and coordination of immediate mental health support will be provided by Health Services Functional Area.

5.9.4 **Strategy**: Maintain the welfare of animals impacted by a flood.

Actions:

a. Agriculture and Animal Services Functional Area will coordinate the welfare of livestock, pets, companion animals and wildlife including support to primary producers, animal holding establishments and community members.

b. Agriculture and Animal Services Functional Area role will coordinate the evacuation, emergency care of animals and assessment, humane destruction and disposal of affected animals, and supply of emergency fodder, water and aerial support where necessary.

5.10 FLOOD RESCUE

5.10.1 **Strategy**: Control and coordinate flood rescue of people and domestic animals.

Actions:

a. NSW SES will perform flood rescue, where training and equipment is suitable and where a risk assessment has indicated that the risk to rescuers is acceptable.

b. Flood rescue operations will be conducted in accordance with the State Rescue Board NSW State Rescue Policy which sets out the framework, governance, responsibilities and requirements for the management and conduct of flood rescue in NSW.

c. NSW SES may request other supporting emergency services to undertake flood rescues on behalf of NSW SES. Agencies must be authorised/accredited to undertake flood rescue operations in accordance with State Rescue Board requirements, as prescribed by NSW SES. Supporting emergency services must supply information regarding rescues performed to NSW SES. Notification arrangements with NSW Police Force are outlined in the State Rescue Board NSW State Rescue Policy.

d. Rescue agencies will conduct rescue of domestic small and large animals as per the State Rescue Board NSW State Rescue Policy (and may include Large Animal Rescue of family horses and cows at a residence or property). The rescue of livestock (which includes commercial animals found on farming and breeding enterprises) will be coordinated through Animal and Agriculture Services Functional Area.

5.11 RESUPPLY

5.11.1 **Strategy**: Coordinate resupply to towns and villages isolated by flooding to minimise disruption to the community.

Actions:

a. NSW SES will advise communities and businesses if flood predictions indicate that areas are likely to become isolated, and indicative timeframes where possible.

b. Retailers should be advised to ensure sufficient stock is available for the duration of the flood.

c. When isolation occurs, NSW SES will establish loading points where retailers can instruct suppliers to deliver goods.

d. NSW SES will endeavour to support the delivery of mail to isolated communities but may not be able to do so according to normal Australia Post timetables.

e. NSW SES will assist hospitals with resupply of linen and other consumables where able.

f. NSW SES may request resupply assistance from supporting agencies.

g. NSW SES may conduct resupply operations as per the designated resupply plan for the event.

h. Where additional supplies are required Engineering Services Functional Area be requested to coordinate the supply of goods and services in response to and recovery from the emergency.

5.11.2 **Strategy**: Coordinate resupply to rural properties isolated by flooding.

Actions:

a. When requested, NSW SES will establish a resupply schedule and coordinate the resupply for isolated rural properties.

b. NSW SES will provide local suppliers with designated loading points. Resupply items are to be packaged by the supplier.

c. Isolated households unable to afford resupply items will be referred to Welfare Services Functional Area for assistance.

5.12 RETURN

5.12.1 **Strategy**: Coordinate the safe return of communities to flood affected areas when the immediate danger to life and property has passed.

Actions:

a. The NSW SES Incident Controller will determine when it is safe to progressively return in consultation with the relevant Emergency Operations Controller and supporting agencies considering the ongoing risk to public safety.

b. The NSW SES Incident Controller will specify the level of access to affected communities as the following:

- Not suitable for access; or
- Limited access by emergency services and response agencies; or
- Limited access by residents and/or business operators; or
- Full access.

c. The NSW SES Incident Controller will issue an Advice Warning advising 'Reduced Threat: Return with Caution' when the immediate danger to life and property has passed for areas.

d. NSW SES will facilitate the return of evacuees to their homes.

5.13 END OF RESPONSE OPERATIONS

5.13.1 **Strategy**: Conclude response operations.

Actions:

a. Response operations will conclude when:

- There is a reduced likelihood of additional flooding within the Area of Operation and flood waters have receded.
- All requests for assistance related to the flood have been completed.
- The need for warning and evacuation no longer exist.
- There is no further likelihood of rescuing people.
- Resupply is no longer required (resupply operations may occur concurrently with the recovery phase).
- Response to fire and hazardous material incidents have concluded (not including subsequent clean-up of contaminated sites).
- All affected areas have had a 'Reduced Threat: Return with Caution' issued.

5.14 POST IMPACT ACTIONS

5.14.1 **Strategy**: Learnings from the event are used to inform recovery and future events.

Actions:

a. NSW SES will continue to engage with communities after significant floods through convening one or more community forums, workshops or other opportunities to provide communities a chance to provide feedback, address any concerns and provide input into the recovery process. These will typically include other agencies such as the Bureau, Welfare Services and Kyogle Council representatives.

b. NSW SES will conduct After Action Reviews, at the conclusion of response operations, which will involve all stakeholders. Findings will be shared and incorporated into improved disaster resilience planning.

c. NSW SES will provide information and data throughout the emergency response to inform community recovery. A report will be developed at the request of the SERCON at the conclusion of the response within an area. Should a response summary report be required it will include the following:

- The emergency action plan in place at conclusion of the response emphasising any continuing activities including community meetings/ engagement activities.

- Resources allocated to the emergency response and associated exit strategies.
- Details of any areas or situations with potential to re-escalate the emergency.
- A recommendation for the conclusion of NSW SES as lead agency to transition to NSW Reconstruction Authority as the lead agency for Recovery.
- Any actions that are incomplete or outstanding.
- Damage Assessment Data and Information obtained throughout the response phase which will further support the long-term recovery of communities.

d. NSW SES will undertake/coordinate a comprehensive review of intelligence and plans following significant flood events.

5.14.2 **Strategy:** Participate in post flood data collection analysis.

Actions: NSW SES works with relevant stakeholders and Kyogle Council Council(s) on post flood data collection analysis including review of flood intelligence where necessary.

6 RECOVERY OPERATIONS

6.1 INTRODUCTION

6.1.1 Recovery is the process of returning an affected community to its proper level of functioning after an emergency. It will generally commence simultaneously with the Response phase.

6.1.2 Recovery operations will be initiated and conducted as outlined in the NSW State EMPLAN and as further detailed in the NSW Recovery Supporting Plan.

6.2 NSW SES RECOVERY ROLE

6.2.1 **Strategy**: NSW SES will support recovery operations and established Recovery Committees.

6.2.2 **Actions**:

a. NSW SES will provide representation to Recovery Committees as required and may have an ongoing role in the Recovery phase.

b. NSW SES roles on Recovery Committees may include providing information about any continuing response, guidance on mitigation strategies and general advice and assistance to the committee as a subject matter specialist and/ or expert.

c. NSW SES will provide information to NSW Reconstruction Authority to support applications to Treasury for Natural Disaster Relief and Recovery Arrangements.

d. NSW SES, in conjunction with a Recovery Committee, will provide a service to support the information needs of a community immediately following a flood.

e. NSW SES and where required supporting agencies will assist with clean-up operations after floods, where possible when resources and personnel permit.

f. NSW SES may coordinate immediate relief in collaboration with SEOCON and SERCON.

7 ABBREVIATIONS

For a full list of abbreviations refer to the NSW State Flood Plan - Abbreviations

8 GLOSSARY

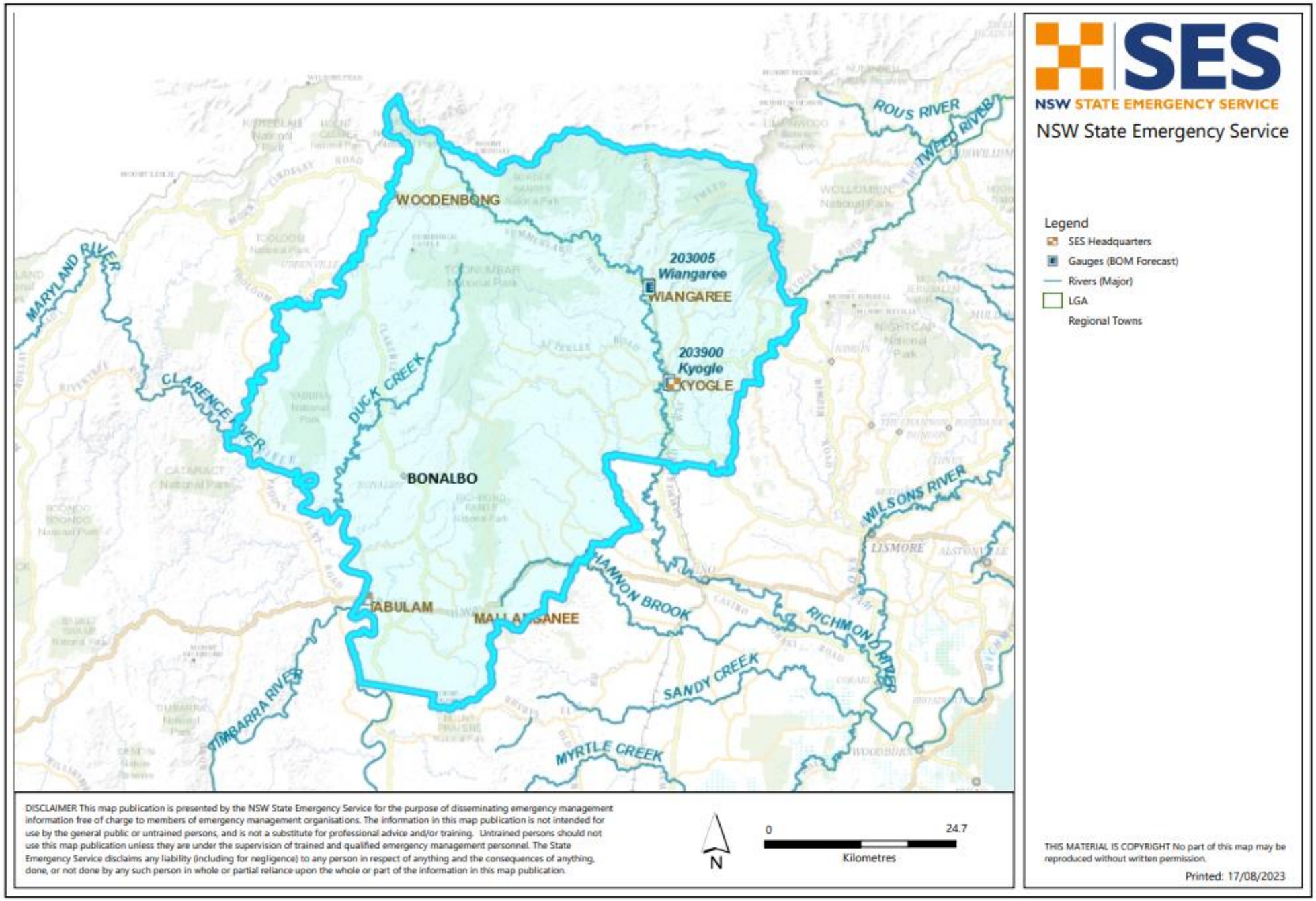
Common emergency service terminology can be found within the Australian Disaster Resilience Glossary.

Readers should refer to EMPLAN Annex 9 – Definitions.

Refer to the NSW State Flood Plan for a complete glossary of terminology used throughout this plan and within NSW SES Flood Plans.

For a full list of definitions refer to the Supporting Document - State Flood Plan Glossary https://www.ses.nsw.gov.au/media/2650/glossary.pdf

9 Appendix A – Map of Kyogle Council Area



10 Appendix B – Roles and Responsibilities

AGENCY	RESPONSIBILITIES
NSW State Emergency Service	NSW SES is the designated Combat Agency for floods, storms and tsunami and controls response operations. NSW SES roles and responsibilities in relation to floods are outlined in the NSW State Flood Emergency Sub Plan.

AGENCY	RESPONSIBILITIES
Agriculture and Animal Services Functional Area	The roles and responsibilities for Agriculture and Animal Services are outlined in the Agriculture and Animal Services Supporting Plan and NSW State Flood Plan.
Australian Government Bureau of Meteorology	The roles and responsibilities for the Australian Government Bureau of Meteorology (Bureau) are outlined in the NSW State Flood Plan.
Kyogle Council	**Preparedness** • Establish and maintain floodplain and risk management committees and ensure that key agencies are represented. • Develop and implement floodplain risk management plans in accordance with the NSW Government's Flood Prone Land Policy and the Flood Risk Management Manual. • Provide levee studies, flood studies and floodplain management studies to NSW SES. • Maintain a Dam Emergency Plan for the Petrochilos Dam and provide copies to NSW SES. • Provide information on the consequences of dam failure to NSW SES for incorporation into planning and flood intelligence. • Maintain council-owned flood warning networks and flood mitigation works. • Participate in NSW SES-led flood emergency planning meetings, to assist in the preparation of Flood Sub Plans. • Maintain a plant and equipment resource list for the council area. • Contribute to community engagement activities. **Response** • Subject to the availability of council resources, assist NSW SES with flood operations including: – Traffic management on council managed roads. – Provision of assistance to NSW SES (plant, equipment and personnel where able and requested).

AGENCY	RESPONSIBILITIES
	– Property protection tasks including sandbagging. – Assist with the removal of caravans from caravan parks. – Warning and/or evacuation of residents and other people in flood liable areas. – Provision of back-up radio communications. – Resupply of isolated properties. – Technical advice on the impacts of flooding. – Close and reopen council roads (and other roads nominated by agreement with Transport for NSW) and advise NSW SES, NSW Police Force and people who contact the council for road information. – Assist NSW SES to provide filled sandbags and filling facilities to residents and business in areas which flooding is expected. • Assist with making facilities available for domestic pets and companion animals of evacuees during evacuations. • Operate flood mitigation works including critical structures such as detention basins and levees and advise NSW SES regarding their operation. • Manage and protect council-owned infrastructure facilities during floods. • Provide advice to NSW SES and the Health Services Functional Area during floods about key council managed infrastructure such as sewerage treatment and water supply. • Advise the Environmental Protection Authority of any sewerage overflow caused by flooding. • Work with NSW SES and NSW Department of Planning and Environment to collect flood related data during and after flood events. **Recovery** • Provide for the management of health hazards associated with flooding including removing debris and waste. • Ensure premises are fit and safe for reoccupation and assess any need for demolition. • Provide services, assistance and advice to State Government in accordance with the State Recovery Plan.
Caravan Park Proprietor(s)	• 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 and displaying this notice and emergency management arrangement within the park. • Ensure that owners and occupiers of movable dwellings are aware that if they are expecting to be absent for extended periods, they should:

AGENCY	RESPONSIBILITIES
	– Provide the manager 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). • 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. – Listen to a local radio station for updated flood information. – Prepare for evacuation and movable dwelling (cabins) relocation. • Ensure that owners and occupiers of caravans are aware of what they must do to facilitate evacuation and movable dwelling relocation when flooding occurs. • 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 the park managers. • Secure any movable dwellings that are not able to be relocated to prevent floatation. • Inform 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.
Childcare Centres and Preschools	• When notified of possible flooding or isolation, childcare centres and preschools should. – Liaise with 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 childcare centres.
Dams Safety NSW	The roles and responsibilities for Dams Safety NSW (formerly NSW Dam Safety Committee) are outlined in the NSW State Flood Plan.
Department of Defence	Arrangements for Defence Assistance to the Civil Community are detailed within the State EMPLAN (section 448).
Energy and Utilities Services Functional Area	The roles and responsibilities for Energy and Utilities Services are outlined in the Energy and Utility Services Supporting Plan (EUSPLAN). Roles and responsibilities in addition to the Supporting Plan are:

AGENCY	RESPONSIBILITIES
	• Assist NSW SES with identification of infrastructure at risk of flood damage where resources are available. • Facilitate local utility service distribution providers (electricity, gas, water, wastewater) to: – Provide advice to NSW SES of any need to disconnect power/gas/water/wastewater supplies or of any timetable for reconnection. – Advise NSW SES of any hazards from utility services during flooding and inundation. – Advise the public with regard to electrical hazards during flooding and inundation, 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 NSW SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.
Engineering Services Functional Area	The roles and responsibilities for Engineering Services are outlined in the Engineering Services Supporting Plan and NSW State Flood Plan.
Environmental Services Functional Area	The roles and responsibilities for Environmental Services are outlined in the Environmental Services (ENVIROPLAN) Supporting Plan.
Floodplain Management Australia	The roles and responsibilities for Floodplain Management Australia are outlined in the NSW State Flood Plan**.**
Fire and Rescue NSW	The roles and responsibilities for Fire and Rescue NSW are outlined in the NSW State Flood Plan.
Forestry Corporation of NSW	The roles and responsibilities for Forestry Corporation of NSW are outlined in the NSW State Flood Plan.
Health Services Functional Area	The roles and responsibilities for Health Services are outlined in the Health Services (HEALTHPLAN) Supporting Plan and NSW State Flood Plan.
Local Emergency Operations Controller (LEOCON)	• Monitor flood operations. • If requested, coordinate support for the NSW SES Incident Controller.
Local Emergency Management Officer (LEMO)	• If requested by the NSW SES Incident Controller, advise appropriate agencies and officers of the start of response operations.
Manly Hydraulics Laboratory (MHL)	The roles and responsibilities for Manly Hydraulic Laboratory are outlined in the NSW State Flood Plan.
Marine Rescue NSW	The roles and responsibilities for Marine Rescue NSW are outlined in the NSW State Flood Plan.

AGENCY	RESPONSIBILITIES
NSW Ambulance	The roles and responsibilities for NSW Ambulance are outlined in the Health Services (HEALTHPLAN) Supporting Plan and NSW State Flood Plan.
NSW Department of Education, Association of Independent Schools of NSW, and National Catholic Education Commission	The roles and responsibilities for NSW Department of Education, Association of Independent Schools of NSW, and National Catholic Education Commission are outlined in the NSW State Flood Plan.
NSW Department of Planning and Environment (Environment and Heritage Group)	The roles and responsibilities for NSW Department of Planning and Environment (Environment and Heritage Group) are outlined in the NSW State Flood Plan (referred to as DPIE EES).
NSW Department of Planning and Environment (Water)	The roles and responsibilities for NSW Department of Planning and Environment (Water) are outlined in the NSW State Flood Plan.
NSW Food Authority	The roles and responsibilities for NSW Food Authority are outlined in the Food Safety Emergency Sub Plan.
NSW National Parks and Wildlife Services	The roles and responsibilities for NSW National Parks and Wildlife Services are outlined in the NSW State Flood Plan.
NSW Police Force	The roles and responsibilities for NSW Police Force are outlined in the NSW State Flood Plan.
NSW Rural Fire Service	The roles and responsibilities for NSW Rural Fire Service are outlined in the NSW State Flood Plan.
Owners of Declared Dams within or upstream of the LGA	The roles and responsibilities for Owners of Declared Dams are outlined in the NSW State Flood Plan.
Public Information Services Functional Area	The roles and responsibilities for Public Information Services are outlined in the Public Information Services Supporting Plan and NSW State Flood. Plan**.**
NSW Reconstruction Authority	The roles and responsibilities for NSW Reconstruction Authority are outlined in the NSW State Flood Plan.
SEOCON/SEOC	The roles and responsibilities for the SEOCON/SEOC are outlined in the NSW State Flood Plan**.**
Surf Life Saving NSW	The roles and responsibilities for Surf Life Saving NSW are outlined in the NSW State Flood Plan.
Telecommunications Services Functional Area	The roles and responsibilities for Telecommunications Services are outlined in the Telecommunications Services (TELCOPLAN) Supporting Plan.

AGENCY	RESPONSIBILITIES
Transport for NSW (TfNSW)	• Transport for NSW (TfNSW) coordinates information on road conditions for emergency services access. • Transport for NSW (TfNSW) coordinates the management of the road network across all modes of transport. • Transport for NSW (TfNSW) in conjunction will assist NSW SES with the evacuation of at-risk communities by maintaining access and egress routes. • Assist NSW SES with the communication of flood warnings and information provision to the public through Live Traffic and Social Media according to the VMS protocols and procedures. • Assist NSW SES with identification of road infrastructure at risk of flooding.
Transport Services Functional Area	The roles and responsibilities for Transport Services are outlined in the Transport Services Functional Area Supporting Plan and NSW State Flood Plan.
VRA Rescue NSW	The roles and responsibilities for VRA Rescue NSW are outlined in the NSW State Flood Plan.
Water NSW	The roles and responsibilities for Water NSW are outlined in the NSW State Flood Plan.
Welfare Services Functional Area	The roles and responsibilities for Welfare Services are outlined in the Welfare Services Functional Area Supporting Plan and NSW State Flood Plan.

11 Appendix C – Community Specific Roles and Responsibilities

Community Members	**Preparedness** • Understand the potential risk and impact of flooding. • Prepare homes and property to reduce the impact of flooding. • Understand warnings and other triggers for action and the safest actions to take in a flood. • Households, institutions and businesses develop plans to manage flood risks, sharing and practicing this with family, friends, employees and neighbours. • Have an emergency kit. • Be involved in local emergency planning processes. **Recovery** • Assist with community clean-up if required and able to do so. • Participate in After Action Reviews if required.
Aboriginal organisations or groups	• Act as the point of contact between NSW SES and the Bundjalung community. • Disseminate flood information, including flood and evacuation warnings, to the Bundjalung community.

NSW STATE EMERGENCY SERVICE

HAZARD AND RISK IN KYOGLE

Volume 2 of the Kyogle Flood Emergency Sub Plan

Last Update: November 2023

FloodSafe

AUTHORISATION

The Hazard and Risk in the Kyogle Council 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

NSW SES Coordinator Planning

Print Name: Michael Stubbs

Date: 17 November 2023

Approved

Signature:

NSW SES North Eastern Zone Commander

Print Name: Joanna Jones

Date: 17 November 2023

Date Tabled at LEMC 21 November 2023

CONTENTS

LIST OF TABLES

VERSION LIST

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

Description	Date
Kyogle Local Flood Plan	March 1994

AMENDMENT LIST

Suggestions for amendments to this Volume should be forwarded to:

Manager, Emergency Risk Manager

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

Document Issue: Version 3-02052016

1 THE FLOOD THREAT

1.1 OVERVIEW

a. The Kyogle Council Local Government Area (LGA) includes the township of Kyogle and the villages of Tabulam, Wiangaree, Woodenbong, Bonalbo and Old Bonalbo, The Border Ranges National Park, State Forests and surrounding rural areas (1).

b. For operational purposes, the area includes the Urbenville township and the rural areas of Koreelah and Beaury Creek which are located within the Tenterfield Shire Council LGA (1).

c. It has a population of 9359, with approximately 26% of its population aged 65 and over and 5.6% of Aboriginal or Torres Strait Islander origin (2).

d. The urban centre of Kyogle and other main villages (Bonalbo, Tabulam, Woodenbong, Urbenville, Mallanganee, Mummulgum, Old Bonalbo, Grevillia and Wiangaree) contain approximately 41% of the population. The majority of the population, approximately 59%, live rurally (3).

e. The Kyogle LGA spans the upper reaches of both the Clarence and Richmond River basins (1).

1.2 LANDFORMS AND RIVER SYSTEMS

Richmond River Basin

a. Kyogle is situated at the confluence of the Richmond River and Fawcetts Creek within the Richmond River Valley of New South Wales. The Richmond River flows in a general south-easterly direction from its source on the Queensland/New South Wales border in the McPherson Ranges. Fawcetts Creek is an easterly tributary comprising 129.1km^2 of the 886.2km^2 total catchment area upstream of Kyogle.

b. The Richmond River is initially a series of steep mountain streams, which combine forming a major flow path at Wiangaree. Downstream of Wiangaree bed slopes decrease, the floodplain becomes a flow path at Wiangaree. Downstream of Wiangaree bed slopes decrease, the floodplain becomes more pronounced and the river exhibits meandering patterns. It is not until downstream of Kyogle township that major floodplains start to develop. Fawcetts Creek has a similar terrain profile.

c. The major urban areas of the Kyogle Township are located on higher ground to the south-east of the confluence of the watercourses. The suburb of Geneva, located on the western side of the Richmond River, is also mostly on higher ground. However, a considerable number of properties in the area known as ‘The Flats’, which is bounded to the north by Fawcetts Creek and to the west by the Richmond River, are located on flood prone land. Properties along the western side of Fawcett St in the north of Kyogle are also subject to flooding (4).

Clarence River Basin

Peacock Creek and George Creek Catchments

a. Upstream of the Clarence Way Bridge at Bonalbo, Peacock Creek has a catchment area of 121 km². The catchment comprises two large catchments of Peacock Creek and Gorge Creek which each have an area of about 105 m² to their confluence. A river gauge is located on Peacock Creek about 7 km upstream of the confluence and gauges a catchment area of about 48 km². The Gorge Creek catchment drains about 45 km².

b. A number of smaller sub-catchments of Peacock Creek drain an area of about 5 km² through the town (5).

Tooloom Creek and Boomi Creek Catchments

a. The Toolom Falls combined catchment area is 312.6 km². Their confluence is near Urbenville, where Tooloom Creek and Boomi Creek have catchment areas of approximately 170.9 km² and 114.8 km² respectively. Smaller sub-catchments drain through the towns.

b. At Urbenville, an unnamed tributary flowing into Tooloom Creek flows southwest of the town draining a catchment area of about 2.3 km².

c. At Woodenbong, a tributary flowing into Tooloom Creek, known as Black Gully flows east to west along the north side of the town. A smaller tributary of Black Gully flows through the town east of properties on Richmond Street. A levee was constructed in Richmond Street to provide some protect from flooding during minor flood events. Overland flows also occur within the town from stormwater runoff. The local catchment of Woodenbong is 8.4 km² and the catchment area of Tooloom Creek upstream of Woodenbong is 112 km² (6).

Little Creek Catchment

a. The Mallanganee township is located directly upstream of the Little Creek catchment which is a tributary of the much larger Clarence River. Mallanganee Township receives headwaters from mountain ranges on the western side of Mallanganee National Park and some small tributaries south of Bruxner Highway. The upstream catchment terminating at Deep Creek Road is approximately 8.8 km². The Bruxner Highway and Deep Creek Road form the key hydraulic controls for local overland flow. The current land use zoning within Mallanganee is residential and agricultural land use (7).

1.3 STORAGE DAMS

a. Dam locations are shown on River Basin Map 1 and River Basin Map 2.

Table 1: Prescribed Dams in Kyogle LGA; summary of information about each storage.

Toonumbar Dam (8)	
Owner / Operator	Water NSW
Description of Dam	Toonumbar Dam is a 44 m high earth and rockfill embankment constructed to store water for the benefit of riparian users and the future development of irrigation by private pumping from the stream. Its spillway is an ungated concrete lined spillway chute with flip bucket.
Location	Toonumbar Dam is located on Iron Pot Creek, 20km west of Kyogle, in the Richmond River Basin.
Communities Downstream	Its downstream communities are Ettrick, Doubtful Creek, Dobies Bight, Casino, Ghinni Ghi. Key consequences of a dam break are increased levels in Iron Pot Creek and Richmond River.
Monitoring System	The monitoring systems are Hydraulic Piezometers, Seepage Points, Cross Arms, Pin Pairs, and Reservoir Level Gauge.
Warning System	WaterNSW will issue alerts to SES via SES State Operations.
Other	

Bonalbo (Petrochilos) Dam (9)	
Owner / Operator	Kyogle Council
Description of Dam	Bonalbo (Petrochilos) Dam is an off-creek water storage for Bonalbo. Water is pumped from bores in Peacock Creek to Bonalbo Dam from where it is pumped via a chlorinator house to a concrete reservoir for distribution. It is a homogeneous earthfill embankment dam. The main embankment has a maximum height of 13.3m, a crest length of 140m and a crest width of 6m. There is an internal drainage system comprised of a partial blanket filter and a rock toe drain. The Dam consists of a drop inlet and an emergency by-wash spillway on the right abutment. The reservoir has a storage capacity at FSL (RL 98.3m or 194.15m AHD) is 55ML and the catchment area is 16ha.
Location	The dam is in Bonalbo, which is located on the Clarence Way approximately 24 kilometres north of the Bruxner Highway. The dam is located on the outskirts of Bonalbo approximately 0.5 kilometres north- west of the town. It lies within Kyogle Council and the Clarence River Basin.
Communities Downstream	Approximately 31 houses would be inundated in downstream Bonalbo in a Sunny Day Failure, and 46 during a PMF and 51 in a PMF Dambreak.
Monitoring System	Bonalbo (Petrochilos) Dam is monitored by a network of instrumentation comprising: Storage Level Manual Indicators, Storage Level Automatic Level, Standpipe, Piezometers, Seepage pipe outlet V- notch weir, Rain gauge. There are also routine visual inspections.
Warning System	An automatic storage level recorder is installed at the dam with pre-set alert levels.

	The Human Machine Interface (HMI) operates the automatic warning system for the water and sewerage systems in Bonalbo and Woodenbong. This includes the WTP and dam level monitoring site. The seepage weir system at Bonalbo Dam is not yet telemetered and is manually checked daily.
Other	

b. Two prescribed dams in Queensland, Maroon Dam (Gauge ID 40677) and Moogerah (Gauge ID 40135), located north and north-west of Woodenbong have been identified (6). No dam failure consequences for Woodenbong have been identified (10) (11).

1.4 WEATHER SYSTEMS AND FLOODING

a. Flooding in Kyogle shows strong seasonality, with the majority of recorded floods occurring between December and March. This seasonality of flooding is the result of two distinct weather patterns; tropical cyclones and intense depressions close to the coast.

b. In the early months of the year, tropical cyclones originating near the equator may move south. While it is rare for a cyclone to enter north-eastern New South Wales, those that approach southern Queensland, or which travel southwards past the coast of northern New South Wales may bring rain of sufficient intensity and duration to cause flooding. There are also occasions when a heavy rain area advances well ahead of the cyclone which may be 200 to 300 kilometres away.

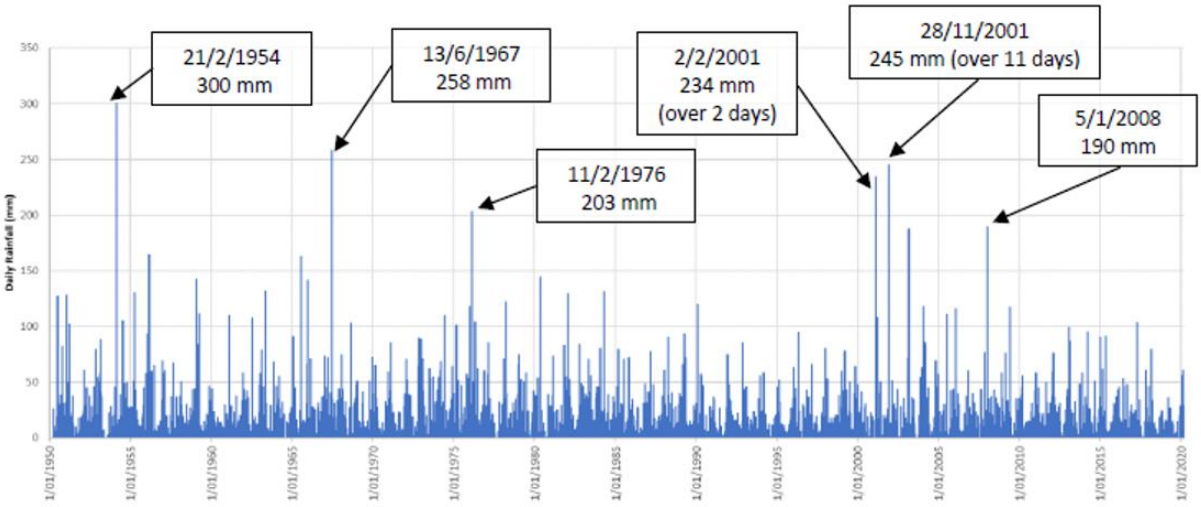
c. The most frequent origin of flooding rain events is the development of intense depressions close to the coast. Generally, these systems maintain a supply of deep moisture as they move southwards in proximity to the coast.

d. These depressions may develop at any time, but the flood rain events are most likely during that part of the year when sea surface temperatures are high, and the air is humid. As tropical cyclones can also be expected at this time, most flood events in the Richmond and Clarence River catchments occur in the first half of the year.

Bonalbo

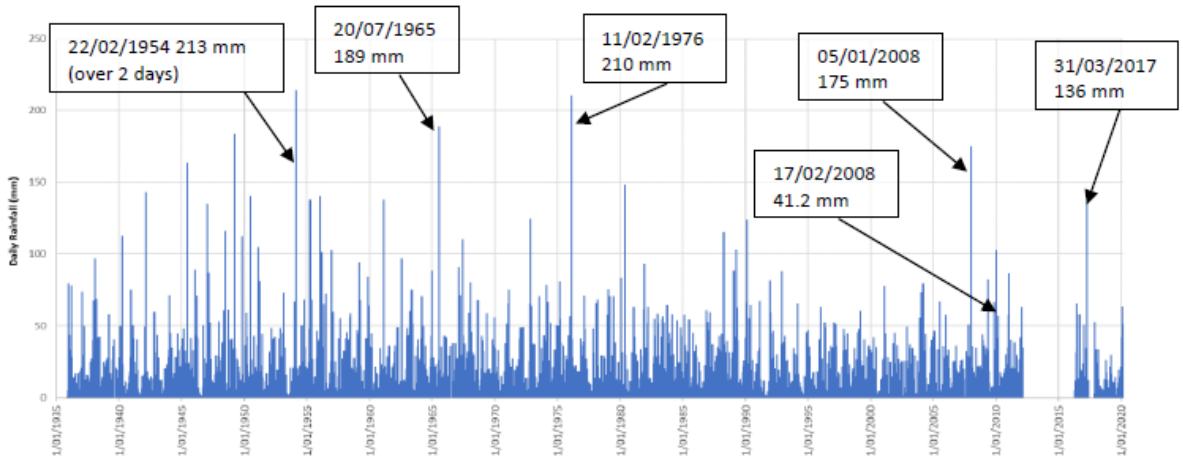
a. There is some variation in the rainfall Intensity-Frequency-Duration across the catchment. Higher intensity rainfalls are likely in the upper catchment areas where the steeper hillslopes are likely to have orographic effects on rainfall patterns. Rainfall at Bonalbo town is likely to be less intense than across other areas of the catchment (5).

Figure 1: Daily Rainfall Data Recorded at Bonalbo Post Office Gauge since 1950 (5)



Urbenville

Figure 2: Daily Rainfall Data Recorded at Urbenville Gauge (57020) since 1935 (6)



Woodenbong

Figure 3: Daily Rainfall Data Recorded at Woodenbong Gauge (57024) since 1933 (6)

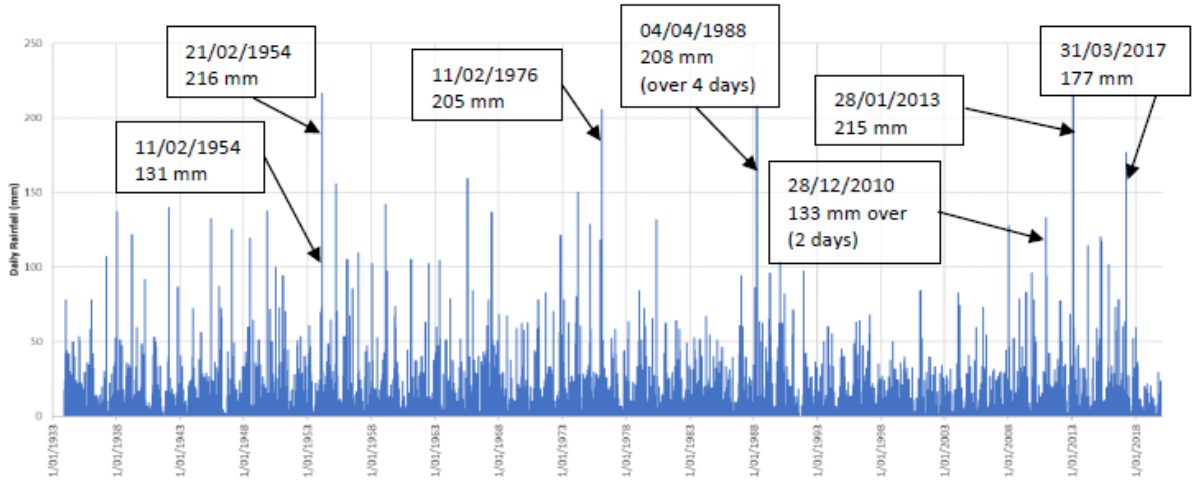
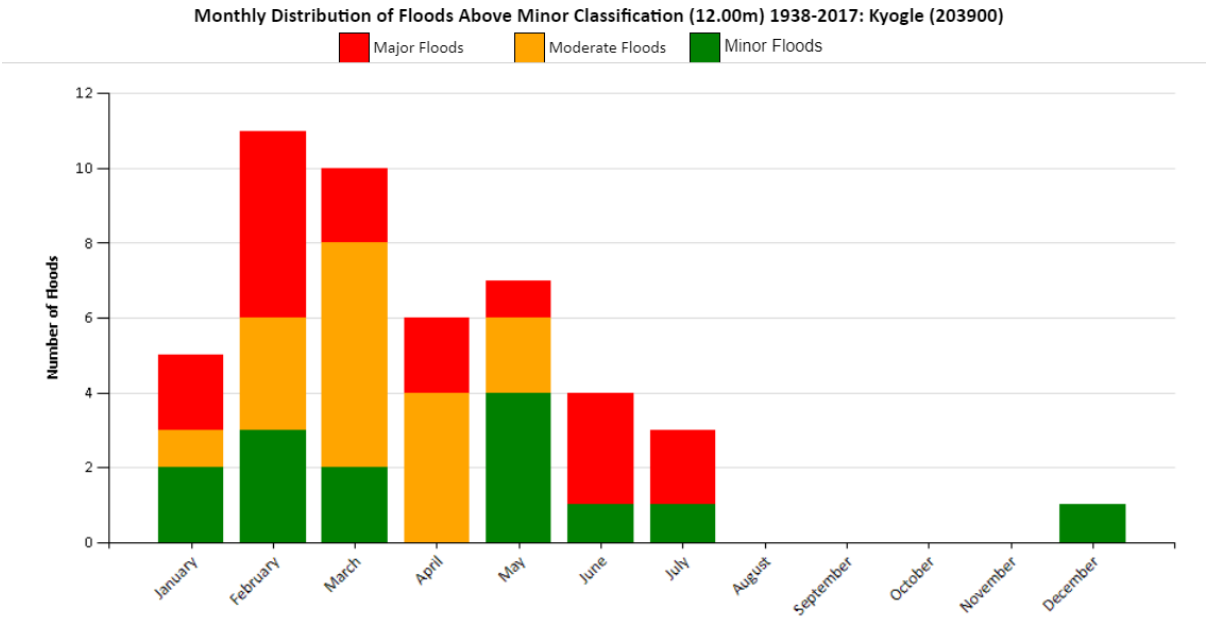


Figure 4: Monthly Flood Distribution, Kyogle Gauge (203900-558002)



1.5 CHARACTERISTICS OF FLOODING

Richmond River Basin

a. Within the upper reaches of the Richmond River catchment, flash flooding can occur at all tributaries upstream of Wiangaree and in the Fawcett's Plain area at Fawcetts Creek.

b. Very little flooding occurs along the Richmond River itself until downstream of the township of Kyogle except in Wiangaree and Kyogle. Flooding in these upper reaches is of short duration, but quickly rising flood waters allow little warning time. Road closures and transport disruptions are the principal difficulties experienced.

Table 2: Indicative Flow Travel Time for the Richmond River

Locations	Travel Time
Wiangaree to Kyogle	6-8 hours

Clarence River Basin

a. Within the upper reaches of the Clarence River catchment, flash flooding can occur in the Urbenville area at Tooloom Creek, the Old Bonalbo area at Bonalbo Creek and in the Bonalbo area at Peacock Creek (1).

b. At Woodenbong, flooding is affected by local overland flows due to the terrain and Woodenbong sitting on a high point in comparison to Tooloom Creek. Overland flows join Black Gully which overtops Roseberry Street and affects properties to the south in severe events. This tributary then drains into Tooloom Creek. The local

catchment of Woodenbong is 8.4 km² and the catchment area of Tooloom Creek upstream of Woodenbong is 112 km².

c. At Urbenville, flooding is dominated by Tooloom Creek especially in the larger events. There is overland flow flooding throughout the town in smaller events and in the northeast of the town in larger events between Beaury Street and Stephen Street. The catchment of Tooloom Creek upstream of Urbenville is 170.9 km², the local catchment of Urbenville is 2.6 km², and the catchment of Boomi Creek which intersects with Tooloom Creek downstream of the Urbenville is 114.8 km² (6).

1.6 FLOOD HISTORY

Richmond River Basin

Kyogle

a. During the major flood that occurred along the entire length of the Richmond River on the 20th of February 1954, 10 people lost their lives within Kyogle. Additionally, 10 houses were swept away and a further 159 homes were damaged by floodwaters. Since this time, flood events of a smaller magnitude have been experienced in 1974, 1976, 1978, 1980, 1987, 1989, 1996, 2001 and 2008. The 2008 event represents the second largest flood on record (12). The 2022 flood reached a peak height of 17.86m making it the third largest flood on record (13), whilst the 2017 flood peaked at 17.39m (14).

b. During the 2008 event, inundation of approximately 100 properties occurred. Fortunately, no lives were lost. This is possibly in part related to the timing of the event, which reached its peak level at midday on the 5th of January. The 2008 flood event highlighted the need for flood management in the Kyogle area (4).

Clarence River Basin

Bonalbo

a. Major flooding affecting Bonalbo from Peacock Creek occurred in 1967; the event was estimated as about a 1% Annual Exceedance Probability (AEP) event. Events in the 1950s washed away the Woodenbong Road / Clarence Way bridge crossing on Peacock Creek and damaged a replacement bridge. Other than these events, there has not been major flooding from Peacock Creek in recent years.

b. Recent flooding has not been as significant as the events in the 1950s and 1960s. Following events in 2008, 2010, 2012, 2020, as well as others, flash flooding in streets was reported in local news and social media. Flash flooding has also been described in the community consultation responses.

c. The summer months of December to March typically receive the highest rainfall. Flooding on Peacock Creek and some of the largest events (1954, 1976, 2008) have

all occurred during these summer months with the exception of the 1967 event which occurred in June (5).

d. In February 2022 a flood event occurred in Bonalbo with flooding reported by residents throughout the town. The peak occurred on 28 February and followed a period of prolonged rainfall over the course of the month. This was the second highest flood on record at 4.46m (12).

Table 3: Historic Flood Events in Bonalbo (5)

Date	Description	AEP estimate (if known)
1967		1% AEP (FFA)
January 2008	• Approximated as 2% AEP event (Kyogle Council based on Kyogle Flood Study) though data at Peacock Creek and Bonalbo Gauges, this was estimated as an approximate 5% AEP at Bonalbo. • Level of 166.930 m at Butter Factory and assumed level of 100.81 m at Preschool with about 400 mm of above floor flooding (Kyogle Council) • Bonalbo Hardware store on Sandilands Street affected by some 150 mm of floodwater (Northern Star, 29 December, 2010) • Mapped flood extent provided by Council shows flooding reaching the south side of Woodenbong Road / Clarence Way and inundated properties at the eastern end of Sandilands street east of Peacock Street and also properties on Capeen Street (refer Figure 3-3).	5% AEP (FFA and Bonalbo Post Office daily-read gauge)
2010	• Council's prior clearing of a drain either side of Farm Road and through the golf course and bowling club successfully reduced flooding (Northern Star, 29 December, 2010)	50% AEP
January 2020	• Approximated as a 50% AEP • 300 mm depths at Woodenbong Road Bridge and Sandilands Street Bridge • Flooding over Farm Road • 300 mm of water in front yard of 1A Sandliands Street	50% AEP
Unknown	• 167.820 mAHD at Butter Factory (Kyogle Council)	

Tabulam

a. Significant flood events occurred in 1976 and 2011. During the 2011 event a number of houses and their occupants were evacuated as floodwaters peaked, resulting in the village being isolated for a period (13).

Urbenville and Woodenbong

a. In events such as December 2010, January 2011, January 2013, March 2016, March 2017 rising flood waters from Tooloom Creek cut of the road between Urbenville and Woodenbong resulting in isolation of residents.

b. Damage to the road during flood events prolongs the period of closure. For example, following the January 2011 the road about 9 km south of Urbenville was severely damaged meaning the road had to be closed to traffic until it could be repaired.
c. Recent flooding occurred in 2010, 2011 2013, 2016 and 2017. Although roads were cut and the villages isolated, no floor levels were reported as being inundated. However, elevated homes in the low-lying areas of Urbenville were surrounded by flood waters. These flood events were smaller and more frequent than a 20% AEP event on the Tooloom Creek catchment and larger flood events could occur.
d. While a number of small floods have occurred in recent years, it has been some time since the Tooloom Creek catchment has suffered from a major flood. Flooding in 1950 and 1954 is thought to be some of the highest on record although there is limited available observed data. From rainfall gauges these events were estimated to be in the order of a 45% to 5% AEP rainfall event (6).

1.7 FLOOD MITIGATION SYSTEMS

a. There are three levees within Kyogle LGA:
    i. Kyogle Levee located to the north-west of McDougal St running north of McDougall St before running partially along Anzac Drive.
    ii. Bonalbo Levee located parallel to Oak Street.
    iii. Woodenbong Levee located on Bonalbo Lane between Dalmorton Street and Unumgar Street.
b. Each levee is further described within Part 2 - Specific Risk Areas.
c. There are no prescribed detention basins within Kyogle LGA.

1.8 EXTREME FLOODING

a. The PMF flood in Kyogle LGA is likely to cause significant inundation in both towns and rural areas.
b. The PMF flood is estimated to be 21.5m at the Kyogle Gauge (203900-558002) (14) and 26.65m at the Tabulam Gauge (202002-557000) (15).

2 EFFECTS ON THE COMMUNITY

2.1 COMMUNITY PROFILE

2.1.1 The Kyogle Council LGA is made up of a number of communities that can be affected in a flood. These can be classified into the following sectors:

1. **Kyogle Sector** – Kyogle, Geneva, Wiangaree
2. **Bonalbo Sector** – Bonalbo, Old Bonalbo, Tabulam, Mallanganee
3. **Urbenville Sector** – Urbenville, Woodenbong, Muli Muli

Table 4: Census of Housing and Population data (2021)

Census Description	Kyogle LGA	Kyogle Town	Wiangaree	Old Bonalbo
Total Persons	**9359**	**2804**	**161**	**73**
Aged 0-4 years	402	141	18	6
Aged 5-14 years	1084	382	16	12
Aged 65 + years	2491	856	47	24
Of Indigenous Origin	525	156	12	13
Who do not speak English well	18	9	0	0
Have a need for assistance (profound/severe disability)	697	236	6	3
Living alone (Total)	1209	423	12	11
Living alone (Aged 65+)	594	654	6	8
Residing in caravans, cabins or houseboats or improvised dwellings	64	19	0	0
Occupied Private Dwellings (Households)	**3736**	**1147**	**54**	**33**
No Motor Vehicle	138	82	4	0
Caravan, cabin, houseboat or improvised dwell	37	12	0	0
Rented via State or Housing Authority	39	0	0	0
Rented via Housing Co-Op or Community Church Group	16	0	0	0
Unoccupied Private Dwellings	**559**	**104**	**9**	**10**
Average persons per occupied dwelling	**2.2**	**2.2**	**2.6**	**2**
Average vehicles per occupied dwelling	**1.9**	**1.6**	**2.4**	**1.6**

Census Description	Bonalbo	Tabulam	Urbenville	Woodenbong
Total Persons	**338**	**508**	**331**	**390**
Aged 0-4 years	11	23	11	12
Aged 5-14 years	27	47	36	38
Aged 65 + years	103	107	112	128
Of Indigenous Origin	37	146	48	22
Who do not speak English well	0	0	0	0
Have a need for assistance (profound/severe disability)	54	39	50	34
Living alone (Total)	75	65	61	62
Living alone (Aged 65+)	32	27	24	32
Residing in caravans, cabins or houseboats or improvised dwellings	4	0	3	9
Occupied Private Dwellings (Households)	**186**	**185**	**141**	**174**
No Motor Vehicle	12	12	8	10
Caravan, cabin, houseboat or improvised dwell	5	0	3	0
Rented via State or Housing Authority	0	0	0	4
Rented via Housing Co-Op or Community Church Group	0	4	0	3
Unoccupied Private Dwellings	**30**	**40**	**27**	**22**
Average persons per occupied dwelling	**1.8**	**2.2**	**2.1**	**2**
Average vehicles per occupied dwelling	**1.6**	**1.7**	**1.7**	**1.8**

SPECIFIC RISK AREAS - FLOOD

Richmond River Basin

2.2 KYOGLE SECTOR

2.2.1 Community Overview

a. The Kyogle Sector is located within the Richmond River Basin, bordering Queensland to the north, Tweed Shire and Lismore City to the east and the Richmond Valley and Clarence Valley to the south.

b. The main population centre of Kyogle has a population of 2804 people living in 1147 dwellings. It has an Indigenous population of 5.6% (2).

2.2.2 Characteristics of flooding

a. In Kyogle, flooding is usually of a short duration and principally originating from Richmond River floodwater. This causes Fawcett's Creek to back up and then flood the low-lying areas of the town. The Richmond and Fawcett's Creek can peak almost simultaneously however. This occurred in 1954 and resulted in high flood discharges from both sources (1).

2.2.3 Flood Behaviour

a. “The Flats”, which is bound to the north by Fawcetts Creek and to the west by the Richmond River, is now provided with increased flood immunity up to the 10% AEP event following the construction of the Kyogle Levee.

b. During flood events larger than the 10% AEP event (when levee overtopping is predicted to occur) the levee structure will increase flood warning and evacuation time for “the Flats” by 2 to 4 hours to 10 to 12 hours depending on the magnitude of the event. Additionally, flood flows passing through “the Flats” during moderate sized flood events will be significantly reduced.

c. The additional Fawcetts Creek flood breakout provides an outlet for floodwaters from Fawcetts Creek into the Richmond River. It also reduces flood levels in Fawcetts Creek. In combination with the partial ring levee the additional Fawcetts Creek flood breakout successfully offsets the possible increase in flood levels to residents upstream of the proposed partial ring levee of “the Flats” (4).

2.2.4 Classification of Floodplain

a. The Kyogle Sector can be further broken into down into subsector for floodplain classification, these classifications are as follows:

Polygon ID	Polygon Name	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
18	Low Lying Kyogle	Low Flood Island	11	5	9
19	The Flats	Low Flood Island	218	94	169
59076	Kyogle West	Rising Road Access	604	280	504
59077	Kyogle East	Indirectly Affected Area	2151	1039	1870
59078	Kyogle North	Low Flood Island	99	53	95
59079	Kyogle South	Low Flood Island	23	10	18
59080	Golf Course Estate	Overland Escape Route	11	5	9
59081	Wiangaree Central	Low Flood Island	100	47	85
59082	Wiangaree East	Indirectly Affected Area	21	9	16
59083	Doubtful Creek	Indirectly Affected Area	11	5	9
59084	Fawcetts Plain Road	Low Flood Island	22	10	18
59085	Summerland Way	Low Flood Island	92	46	83
59086	Wiangaree West	Low Flood Island	12	7	12
59087	Kyogle Rural	Indirectly Affected Area	62	28	50
59088	Cedar Point and Rural	Low Flood Island	81	34	61
59089	Ettrick Rural	Low Flood Island	88	39	70
59090	The Risk Public School	Low Flood Island	4	2	4
59091	Rukenvale Public School	Low Flood Island	4	2	4
59092	Old Grevillia	Low Flood Island	4	2	4

b. Eastern Kyogle is a High Flood Island along Summerland Way between Geneva Street and Andrew Street.

2.2.5 Inundation

a. Kyogle utilises both the Kyogle Gauge (203900-558002) and Wiangaree Gauge (203005-558001), the latter provides flood warning time for Kyogle of 6-8 hours (16). The Wiangaree Flood Intelligence card should be utilised with the Kyogle Flood Intelligence card (19).

b. Historically, various areas of Kyogle have experienced high flood risk during small to moderate sized flood events.

c. **Wiangaree Gauge (203005 - 558001)**

d. **Minor Floods** (11m)

e. At 12.25m on the Wiangaree Gauge (203005-558001), this usually results in a river height of 15.5m -15.8m on the Kyogle Gauge (203900-558002) approximately 6-8 hours later. This is the height at which the river breaks across “The Flats” at Kyogle and cuts off evacuation routes into the main part of Kyogle (14).

f. **Moderate Floods** (15.5m)

g. Summerland Way is cut at 15.5m (19)

h. **Kyogle Gauge (203900 - 558002)**

i. **Minor Floods (12m)**

j. At between 13m – 13.5m Summerland Way is cut by flood water at the intersection of Murwillumbah Road and the evacuation route for Kyogle Caravan Park is lost.

k. At 14m the Kyogle Caravan Park experience over ground flooding and Murwillumbah Road is cut at the Fawcetts Plain turnoff.

l. **Moderate Floods (14.4m)**

m. At 14.5m Summerland Way is cut at the railway viaduct north of Fawcetts Creek Bridge.

n. In historic floods at 15.5m "The Flats" have become affected (17).

o. **Major Floods (16m)**

p. At approximately 17.5m, when the levee begins to overtop, "The Flats" starts to become affected.

q. Following the construction of the Kyogle Levee and additional Fawcetts Creek flood breakout, the number of properties inundated has been significantly reduced in a 10% AEP event and somewhat reduced in a 5% AEP event. There is, however, little change in the number of properties inundated from the 2% AEP event (16).

r. In other parts of Kyogle, properties are also inundated during small to moderate sized events, incurring significant flood damages. Fortunately, these properties have access to high, flood free ground which reduces the flood risk to the residents of these properties (4).

Table 5: Estimated number of properties inundated above floor level in Kyogle (4)

- These numbers are based on post-levee projections from the 2009 Kyogle Flood Risk Management Plan (4).

Design Event	No. Properties with Over floor Flooding
50% AEP	0
20% AEP	0
10% AEP	12
5% AEP	54
2% AEP	91
1% AEP	98
0.2% AEP	110
PMF	146

2.2.6 Isolation

a. Kyogle Gauge (203900-558002)

b. Minor Floods (12m)

c. At 2m -5m some rural properties become isolated.

d. At 14m rural residents to the north and east of Kyogle are isolated (14).

e. Moderate Floods (14.4m)

f. At 14.7m residents of the Golf Course Estate are isolated (14).

g. During a 5% AEP flood, properties along Summerland Way between Geneva Street and Andrew Street will become isolated.

h. Properties along Kyogle Road between Geneva Street and Kindergarten Lane will also become isolated during a 5% AEP event (18).

2.2.7 Flood Mitigation Systems

Table 6: Levees in Kyogle Sector; summary of information (19)

Kyogle Levee	
Location	The Kyogle Levee starts to the north-west of McDougal St running north of McDougall St before running partially along Anzac Drive
Type of Levee (ring etc.)	Partial ring levee
Owner	Kyogle Council
Design Height and freeboard	Levee design height is 57.75m AHD which equates to 17.53m on the Kyogle Gauge (203900-558002) on the Richmond River
Overtopping Height	57.75m AHD which equates to 17.53m on the Kyogle Gauge (203900-558002)
No. of properties protected	60 properties are protected by the levee
Known low points	The approximately 50m section opposite the natural lagoon in Anzac Park on the southern bank of Fawcetts Creek is 50mm lower than the main body of the levee bank to allow for initial overtopping through the lateral lagoon. There is a section of bank excavated to the west of the levee between Fawcetts Creek and the Richmond River that allows for flood waters to be diverted from Fawcetts Creek to the Richmond River. The base of the channel is at 52.5m AHD and the channel is approximately 30m wide and 5m deep
Location and sequence of inundation	Inundation is from downstream in-fill flood waters rising from the southern end of the watershed downstream of the natural lagoon in Anzac Park. Levee is designed to provide full downstream flooding against levee face prior to overtopping. Refer “Post-levee” inundation mapping in Floodplain Risk Management Plan
Consequences of levee overtopping or failure	Levee is designed to provide full downstream flooding against levee face prior to overtopping to avoid failure of levee due to excess scouring following overtopping. Main consequence of overtopping is increased flow velocities downstream of levee. Refer “Post-levee” inundation mapping in Floodplain Risk Management Plan
Deficiencies	No deficiencies are known

2.2.8 Dams

a. Toonumbar Dam is located on Iron Pot Creek, 20km west of Kyogle, in the Richmond River Basin. Its downstream communities are Ettrick, Doubtful Creek, Dobies Bight, Casino and Ghinni Ghi. Key consequences of a dambreak are increased levels in Iron Pot Creek and Richmond River (8).

b. See Section 1.3

2.2.9 At Risk Facilities

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

2.2.10 Other Considerations

a. Kyogle holds an annual one-day Pumpkin and Watermelon festival in January.

b. The Kyogle Show is held for two days in October.

c. These events need to be taken into account in relation to possible Flood Outlook Scenarios issued by the Bureau of Meteorology (BOM).

Clarence River Basin

2.3 BONALBO SECTOR

2.3.1 Community Overview

a. The Bonalbo Sector is located within the Clarence River Basin, to the west of Kyogle Sector and southeast of the Urbenville Sector. Larger villages within the sector include Bonalbo and Tabulam, as well as numerous smaller settlements.

b. The village of Bonalbo has a population of 338 people living in 186 dwellings, and an indigenous population of 10.9% (2).

c. The village of Tabulam has a population of 508 people living in 186 dwellings, and an indigenous population of 28.7% (2).

2.3.2 Characteristics of Flooding

Bonalbo

a. Bonalbo is subject to two forms of flooding, riverine flooding from Peacock Creek as well as overland flows from the smaller catchments which drain though the town.

b. At the southern end of the town flooding is dominated by riverine flooding from Peacock Creek. Peacock Creek is a winding creek system with approximately 121 km² catchment size as it passes Bonalbo. In some areas, there is only a small distance between the creek and surrounding properties of less than 100 m. In high flow events it is prone to exceeding its channel capacity into the surrounding floodplain.

c. Overland flows drain from the urban catchment through the existing stormwater network and discharges into two natural detention basins on the downstream side of the village.

d. The local catchment for Bonalbo is quite small in comparison to the catchment of Peacock Creek; approximately 5 km². Catchments are characterised by steep upper slopes with the town located on the flatter areas. The town is located at the bottom of these catchments and receives flows from these ranges. The town itself has two major channels running through it, Capeen Street drain and one parallel to Bonalbo Street from the hospital catchment. Both channels hydraulic capacity can be exceeded in large storm events cutting road access in the town.

e. A levee, which is located parallel to Oak Street, directs flows from the catchment to the northwest into the Capeen Street Drain. Runoff from the catchments to the north flows down the hills and can build up behind Woodenbong Road. Even in more frequent events such as the 20% AEP, floodwaters have the potential to cross Woodenbong Road and flow across properties along Lunar Lane. The rest of the

flows from these catchments continues along Woodenbong Road to the channel that runs parallel to Bonalbo Street.

f. Flows and ponding of water near to the Bowling Club and sporting fields along Tooloom Street affects properties at the south-eastern end of the town. In the more frequent events this area is subject to inundation from the local catchments north of Woodenbong Road as flows move southwest towards a tributary to Peacock Creek. In the 1% AEP event and greater, flows from Peacock Creek spill into the floodplain and flow through this area exacerbating flooding further.

g. In larger flooding events such as the 1% AEP and onwards the flooding from the Creek is dominant on the southeastern edges of the town. When the creek spills out into the floodplain it inundates areas of the town along Woodenbong Road and Peacock Street. The remainder of the town is typically affected by shallow overland flows. However, localised areas of high hazard floodways can develop near to the two town channels and where the channels are exceeded and also where road cross drainage is exceeded. This can cause streets to become unsafe for people and vehicles (5).

Tabulam

a. The main source of flooding in Tabulam is Riverine flooding from the Clarence River. The Clarence River has a catchment area upstream of the village of 4,550km², while the Timbarra River, a major tributary which joins the Clarence River 2km downstream of Tabulam (catchment area upstream of the junction of 2,000km²), may contribute with backwater flooding from its own catchment. The Tabulam Rivulet (catchment area 315km²) located immediately north of the village may also contribute to flooding.

b. Tabulam may also be affected by localised flooding caused by heavy rainfall in the village (13).

Mallanganee

a. Mallanganee is subject to flooding from the Little Creek catchment upstream as well influence from the breakout flows from the larger southern flow path (7).

2.3.3 Flood Behaviour

Bonalbo

a. Bonalbo is subjected to flooding from both local overland flows and riverine flooding from Peacock Creek. For events up to an including 5% AEP Peacock Creek flows typically stay within the Creek. For these events, flooding in the town is dominated by local overland flows from the local catchments and the Capeen Street and hospital and dam catchment drains being exceeded.

b. At the southern end of the town local catchments from north on Bonalbo Road pass over the road and through the open area and properties at the lower end of Sandilands Street and adjacent streets. Flows follow a route which is a natural flood runner of the creek in larger magnitude events.

c. In the town the critical duration storm is relatively short; typically one hour. However, in the more frequent events the Bowling Club and sports field areas area affected by longer duration events as flatter areas act as flood storage.

d. For riverine flooding the critical duration storm is longer given the larger catchment areas. In larger events such as the 1% AEP and greater, Peacock Creek spills into the floodplain downstream of the Woodenbong Bridge at the Bowling Club and Tourist Park and Camping ground following the natural flood runner and becomes the dominant source of flooding at the south-eastern end of the town.

e. In the 20% AEP event flows from Peacock Creek typically remain in channel and the majority of flooding within the Bonalbo township is from the overland flows coming from the town catchment. Depths are typically shallow and less than 300 mm however some localised areas of high hazard and floodways can occur in particular on Koreelah Street between Sandilands and Capeen Streets.

f. Some flooding occurs from near the Bonalbo Bowling Club and sports field from local catchments and the small catchments north of Woodenbong Road. Flows move towards the drain near Tooloom Streets and towards the tributary to Peacock Creek at the south of the town.

g. Flooding behaviour in the 5% AEP event is similar to the 20% AEP event. The creek exceeds its main channel but does not extend significantly into the floodplain. The town flooding is dominated by the local catchment flooding.

h. In the 1% AEP event flows from Peacock Creek spill into the floodplain and contributes to flooding within the town. Areas east of Peacock Street and south of Woodenbong Road are dictated by overbank flooding of Peacock Creek. Flows move through the flood runner from the Bowling Club area forming a floodway towards the tributary and back to the creek at downstream of the town.

i. In the town area affected by overland flood depths are typically less than 0.5m, with the exception of localised areas where flooding from the drainage or exceedance of cross drainage structures occurs. With the exception for these areas flood hazard is typically H1 and H2.

j. In the 0.2% AEP event the flood behaviour is similar to the 1% AEP event in terms of areas affected by Creek and overland flow flooding. Flood depths are increased, in particular at the south-eastern portion of the town where the creek flows have the greater influence on the flood levels.

k. In the PMF event the Peacock Creek flooding is the main driver for peak flood levels up to Dyraaba street. Floodwaters from Peacock Creek extent slightly north of Woodenbong Road, and south of Sandilands Street and east of Dyraaba Street and east of Peacock Street. Depths become significant in this area and are in excess of 1m up to more than 5 m south of the town. High velocity and high hazard flows affect most of study area (5).

Tabulam

a. In the 20% AEP event (122.57mAHD at the Tabulam Gauge), flows break out from the river into minor flow paths at and north of Court Street which then flow south and south-east.

b. Parts of the village are impacted by low to moderately high hazard flooding (H3- H4 classification, meaning unsafe for most up to all people and vehicles) up to and including the 5% AEP event (126.06mAHD at the Tabulam Gauge).

c. In the 2% AEP event (128.62mAHD at the Tabulam Gauge), flooding occurs both north and south of the Bruxner Highway, creating a High Flood Island in the village. Flood hazard varies from H2-H5 throughout, with the highest hazard (H5, or unsafe for all people and vehicles, with buildings requiring special engineering design and construction) experienced at the highway to the west of the Clarence River.

d. In the 1% AEP event (129.29mAHD at the Tabulam Gauge), flooding is extensive through the village. A high flood island remains in the village in the 1% AEP event. The Bruxner Highway is cut off between Clarence Street and Lawrence Street.

e. The village is fully inundated from the 0.5% AEP design flood event (130.87mAHD at the Tabulam Gauge), and in the design extreme flood event, flood depths in the village range from 8-15m. It should be noted this modelled event is dominated by Clarence River flooding (16).

Table 7: Flood Design Heights for the Tabulam Gauge (204002-557000) (16)

Predicted Flood Frequency	Tabulam Gauge Height (m AHD)
20% AEP	122.57
10% AEP	124.21
5% AEP	126.06
2% AEP	128.62
1% AEP	129.29
0.5% AEP	130.87
0.2% AEP	132.75
Extreme	138.99

Table 8: Modelled Flood level rates of rise for Design Events in Tabulam (16)

Design Event	Maximum rate of rise (m/hr)	Rate of rise from start of flood to peak (m/hr)
20% AEP	1.3	0.1
10% AEP	1.9	0.3
5% AEP	1.5	0.2
2% AEP	1.6	0.2
1% AEP	2.8	0.9
0.5% AEP	3.3	0.9
0.2% AEP	3.7	1.0
Extreme Flood Clarence River	3.9	1.1
Extreme Flood Tabulam Rivulet	2.8	1.0

2.3.4 Classification of Floodplain

a. The Bonalbo Sector can be further broken into down into subsector for floodplain classification, these classifications are as follows:

Polygon ID	Polygon Name	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
59065	Mallanganee south	High Flood Island	2	1	2
59066	Mallanganee A	Low Flood Island	7	4	7
59067	Tabulam Centre	High Flood Island	23	12	22
59068	Tabulam North	Low Flood Island	25	13	23
59069	Tabulam South	Low Flood Island	74	39	70
59070	Bonalbo A	Low Flood Island	32	20	36
59071	Bonablo B	Rising Road Access	235	151	272
59072	Bonalbo C	Overland Escape Route	31	22	40
59073	Bonalbo D	Indirectly Affected Area	31	20	36
59074	Bonlbo E	High Trapped Perimeter	N/A	N/A	N/A
59075	Bonalbo G	Overland Escape Route	2	1	2
59262	Mallanganee North	Rising Road Access	85	49	88
59263	Bonalbo F	High Trapped Perimeter	2	1	2
59093	Old Bonalbo	Low Flood Island	78	55	99

Bonalbo

a. Within Low Flood Island and Rising Road Access areas, the first areas to be cut-off are the properties south of Peacock Street when Peacock Creek breaks it banks and goes across the flood runner. These areas would be Peacock Street when Peacock Creek breaks it banks and goes across the flood runner. These areas would be priority for evacuation. For areas subject to overland flows, the short duration of the critical storms mean that flooding is flash flooding type, and the areas can be cut suddenly. For minor local storms most properties of those towards the south of Bonalbo town) would remain safe within their homes (5).

Tabulam

a. Tabulam is classified as a High Flood Island up until the 1% AEP event, after which the town becomes completely inundated (13).

2.3.5 Inundation

Bonalbo

a. Bonalbo does not have a BOM forecast gauge. Currently, the only available gauges within the catchment of Bonalbo are the daily rainfall gauge within town and the water level gauge on Peacock Creek (204043 – 557004), which has been acknowledged by WaterNSW as inaccurate.

b. Overland flooding is predicted by forecasting and measuring the amount of rainfall falling within the town typically through BOM rainfall radar.

c. Riverine flooding can be measured predicted by the upstream water level gauge on Peacock Creek. However, this gauge has a low level of accuracy for larger flood events, with the highest level on the current rating curve being 1.3m above the datum.

d. The gauge is 7km upstream of Bonalbo, providing up to 1-2 hours warning time, if the peak and size of the flow can be accurately measured.

e. Within Bonalbo, properties can begin to become inundated from the 20% AEP event.

f. In the 5% properties along Woodenbong Road down to the southeastern end of Sandilands Street start to become inundated (12).

Table 9: Estimated number of properties inundated above floor level and over ground in Bonalbo (12)

Design Event	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP	13	80
5% AEP	23	99
1% AEP	34	113
0.2% AEP	42	125
PMF	101	148

Tabulam

a. Tabulam does not have a BOM forecast gauge, however the Tabulam Gauge (204002–557000) can provide an indication of inundation.

b. Existing dwellings in the village are not impacted in the 20% AEP flood. Overall, fringe flooding begins to encroach on some dwellings in the 10% and 5% AEP flood events but there is generally no over floor flooding.

c. In the 5% AEP event there is one property on Harry Mundine Place with over floor flooding over 0.8m deep.

d. Flooding of the village occurs both north and south of the Bruxner Highway in the 2% AEP event, creating a high flood island in the village. More than half of the buildings are inundated. The highway is inundated between Clarence Street and Lawrence Street but remains passable for larger vehicles (depths up to 0.4m).

e. Tabulam Rivulet bridge, with deck level of 127.6m AHD, is above the 5% AEP event and submerged to depths of 1.3m in the 2% AEP event.

f. The new bridge deck is not overtopped in the 2% AEP event.

g. In the 1% AEP event, flooding is extensive through the village, with many properties affected by flooding of 1 – 3m deep above ground, and a number of properties in the south of the village with 3 – 5m deep flooding above ground. A high flood island remains in the village in the 1% AEP event. The highway is cut off between Clarence Street and Lawrence Street to depths of 1.7m. The new bridge deck is partly submerged to 0.3m depth, on its western side.

h. In the 0.5% AEP event the entire village is fully inundated with property flooding of 0.5m on the low flood island (i.e. a high point in the landscape which is a dry island at early stages of the flood but which then becomes submerged) up to 6.7m on low properties adjoining the floodway. There are several dwellings above the 0.5% AEP flood to the east of Lawrence Street. The new bridge deck is submerged to depths of 0.7 – 2m.

Mallanganee

a. During the 10% AEP event, properties north of Sandilands Street are generally unaffected excepting one property between Culverts 21 and 22.

b. However, properties on the eastern side of Pine Street are affected by local flooding during the 10% AEP event (7).

2.3.6 Isolation

Bonalbo

a. Bonalbo township becomes frequently isolated from the wider community. During events in the last 15 years including 2010 and 2011, roads such as the Clarence Way between Urbenville and Bonalbo were cut by floodwaters while much of the town remained unaffected by direct flooding (5).

Tabulam

a. During significant flood events, such as the 2011 event, Tabulam can become isolated for a short period of time (13).

2.3.7 Flood Mitigation Systems

Table 10: Levees in Bonalbo, summary of information (19)

Bonalbo Levee	
Location	Parallel to Oak Street on the western side between Capeen Street and Sandilands Street
Type of Levee (ring etc)	Diversion drain
Owner	Kyogle Council
Design Height and freeboard	Approximately 600mm high diversion mound
Overtopping Height	Not known
No. of properties protected	6 properties
Known low points	
Location and sequence of inundation	Not known
Consequences of levee overtopping or failure	Overland flow through properties between Capeen Street and Sandilands Street
Deficiencies	No formal design basis for the construction, initially constructed ad hoc to address frequent overland flows causing nuisance

2.3.8 Dams

a. The Bonalbo (Petrochilos) Dam is located upstream of the town and used for water supply. The dam comprises an earth embankment and piped outlet spillway and bywash overflow channel. Water is pumped to the dam from an intake well from Peacock Creek and a groundwater bore adjacent to the creek.

b. The 2004 Bonalbo Dam Dambreak Study found that the dambreak wave travel time to the populated area is in the order of five minutes which gives no time for warning and evacuation. The 2005 Bonalbo Dambreak Study Addendum re-assessed the consequence categories for the various dambreak cases. The dam failure consequence was defined as "High C" for both Sunny Day Dambreak Consequence Category (SDCC) and Incremental Flood Consequence Category (IFCC). The Addendum report suggests 46 properties downstream of the dam would be affected in the PMF event with a Population at Risk (PAR) of 124, increasing to 51 properties in a dam failure scenario with a PAR of 138 (5).

2.3.9 At Risk Facilities

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

2.3.10 Other Considerations

a. No other considerations have been identified.

2.4 URBENVILLE SECTOR

Clarence River Basin

2.4.1 Community Overview

a. Whilst Urbenville is situated within the Tenterfield Shire Council LGA, local agreements have been agreed to for the SES Urbenville Unit (Richmond Tweed Command) to manage flood operations in Urbenville and Woodenbong and their vicinities (3).

b. Urbenville has a population of 331 people living 141 dwellings and an indigenous population of 14.5%.

c. Woodenbong has a population of 390 people living in 174 dwellings and an indigenous population of 5.6% (2).

2.4.2 Characteristics of Flooding

a. Woodenbong and Urbenville are subject to two types of flooding; overland flows from local catchments and riverine flooding from Tooloom Creek and its tributaries.

b. At Urbenville, flooding is dominated by Tooloom Creek especially in the larger events. There is overland flow flooding throughout the town in smaller events and in the northeast of the town in larger events between Beaury Street and Stephen Street. The catchment of Tooloom Creek upstream of Urbenville is 170.9 km², the local catchment of Urbenville is 2.6 km², and the catchment of Boomi Creek which intersects with Tooloom Creek downstream of the Urbenville is 114.8 km².

c. At Woodenbong, flooding is affected by local overland flows due to the terrain and Woodenbong sitting on a high point in comparison to Tooloom Creek. Overland flows join Black Gully which overtops Roseberry Street and affects properties to the south in severe events. This tributary then drains into Tooloom Creek. The local catchment of Woodenbong is 8.4 km² and the catchment area of Tooloom Creek upstream of Woodenbong is 112 km².

d. The Tooloom Creek and Boomi Creek valleys that connect Urbenville and Woodenbong are subject to flooding causing inundation of the roads and isolating the community. Flooding also can occur in the towns from the local creeks and overland flows (6).

2.4.3 Flood Behaviour

Urbenville

a. At Urbenville, flooding from Tooloom Creek is the dominant source of flooding. This is due to the winding nature of the creek slowing down the conveyance of floodwaters within the natural creek bed. The intersection of the Boomi and

Tooloom Creek occurs just downstream from Urbenville which also contributes to the higher creek levels.

b. During the 20% AEP event, floodwaters largely remain within Tooloom Creek, although there are breakout flows downstream of Clarence Way Road bridge into the open areas behind Tooloom Street. Depths are between 200 to 300 mm and inundate some lots south of Tooloom Street. Floodwaters also overtop Clarence Way near to the showground with depths of 200 mm over the road. There is no culvert crossing at this location, although drainage channels are evident either side of the road. The flooding that occurs in the town is dominated by flow from the local catchments. The majority of flooding occurs in the natural flow path as water travels from the hill slopes west of the town. Minor flow paths form between the Welch and Urben Street as overland flows downhill. When the overland flows join the Tooloom Creek they overtop Tooloom Street with depths up to 400 mm. Flood levels here are dominated by flows from Tooloom Creek.

c. During the 5% AEP event, floodwaters have broken out of the Tooloom Creek, with up to 1m depths on the floodplain south of Tooloom Street. There are flood water depths of up to 600 mm on the lots on the south side of Tooloom Street. Clarence Way road is overtopped with depths of 400 mm on the road. Tooloom Street is overtopped from tailwaters of Tooloom Creek with depths of 1m over the road. The flooding in the town is caused from flows in local catchments with floodwaters travelling downhill between Welch and Urben Street.

d. During the 1% AEP event, depths of up to 1.6m are predicted to occur on lots on Tooloom Street. Floodwaters from Tooloom Creek cross Tooloom Street to properties on the north side of the street. There are predicted depths of up to 0.8m on Clarence Way and backwaters from the creek cause depths of 2.6m on Tooloom Street near the Old Saw Mill, the flooding from Tooloom Creek reaches the south end of Boomi Street. The flooding within the town is from overland flows besides the floodwaters south of Boomi Street.

e. During the 0.2% AEP event the flood behaviour is similar to the 1% AEP event in terms of areas affected by creek and overland flow flooding asides from the creek floodwaters have crept further into the town crossing further over Tooloom Street and approaching Stephen Street.

f. During the PMF event all the floodwaters are predominantly from Tooloom Creek. Depths become very significant and reach up to 9 m on Tooloom Street. High hazard affects most of the study area (6).

Woodenbong

a. At Woodenbong floodwaters from Tooloom Creek are predicted to exceed capacity of the creek channel in the 20% AEP or more frequent events. These inundate the floodplain which includes the sporting fields and showground. Floodwaters from the

creek do not encroach into the town until the PMF where it affects the northern most lots of Roseberry Lane.

b. Local catchment flows at Woodenbong affect properties along Richmond Street as flows from the township and the natural channel in this area encroach into backyards of properties in as frequent as the 20% AEP event. Mount Lindsay Road also becomes inundated to the east of Richmond Street intersection. Within the town there is minimal flooding within properties as local flows are typically contained within the drainage channels alongside the roads.

c. During the 5% AEP event the flooding is very similar except the flood extents caused by the creek backwaters have expanded. At Richmond Street floodwater from the local catchments travel in the natural channel behind Richmond Street and overtop the levee.

d. The 1% AEP event is very similar to the 5% AEP event, with greater flood depths on the showground, playing fields and Lindsay Creek Road from Tooloom Creek backwaters.

e. The 0.2% AEP event is very similar to the 1% AEP event. Additionally, the industrial sheds along Roseburry Road are inundated from these floodwaters. Here town still remains predominantly flood free with minor flow paths alongside the roads. The majority of flows from the external catchment travel through the flowpath behind Richmond Street and overtopping the levee into the properties, all properties north of Dalmorton Street are inundated in this event with depths up to 1.0 m. Across the Tooloom and Boomi Creeks between the two towns in the 0.2% AEP event the connecting roads between towns are inundated in multiple areas.

f. In the PMF event at Woodenbong there are greater flood depths on the showground, playing fields and Lindsay Creek Road from Tooloom Creek backwaters. Properties up to Roseberry Lane are inundated by floodwaters. The town still remains predominantly flood free with flow paths alongside the roads and crossing a small amount of properties. The majority of properties behind Richmond Street are now inundated from floodwater in the channel behind the properties (6).

Tooloom and Boomi Creeks

a. Throughout the Tooloom Creek catchment, the Tooloom Creek expands into the floodplain in the 20% AEP or more frequent event. There are a number of areas where Clarence Way is overtopped in particular near to Muli Muli.

b. Boomi Creek runs alongside Boomi Creek Road until it joins Tooloom Creek downstream of Urbenville. In events more frequent than the 20% AEP event, floodwaters spread out of creek channel and into the floodplain. Boomi Creek overtops Boomi Creek Road where the road is in a close vicinity to the creek and

where Boomi Creek Road crosses the creek. Local tributaries also overtop the road however, these depths typically are less significant than the creek flooding.

c. In the 5% AEP for the Tooloom Creek catchment between the towns, the creek remains mainly within its channel with minor locations of breakout flows such as at Woodenbong. There is a small number of locations where the road is are flooded with the major flooding of the roadway occurring near Muli Muli. The town of Muli Muli is above the creek flood level in this flood event. The road is not passable with the path to the north and south with a hazard rating of unsafe for vehicles.

d. In the 1% AEP event between the two towns the connecting roads are inundated at multiple locations near Muli Muli and Urbenville. Further inundation occurs from mainstream flooding of the creeks and connecting tributaries flooding the roads (6).

Muli Muli

a. Muli Muli is located near to Tooloom Creek on an area of high ground. The town is not affected from flood waters in the 0.5% AEP event but in events greater than this up to the PMF event, Muli Muli Crescent, the street closest to Tooloom Creek, is inundated. Clarence Way to the north and the south is predicted to be flooded events more frequent than the 20% AEP flood event. This road is the only road access way to Muli Muli (6).

2.4.4 Classification of Floodplain

a. The Urbenville Sector can be further broken into down into subsector for floodplain classification, these classifications are as follows:

Polygon ID	Polygon Name	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
59094	Urbanville A	Rising Road Access	114	63	113
59691	Urbanville B	Low Flood Island	0	0	0
59095	Urbanville D	High Trapped Perimeter	4	2	3.6
59096	Urbanville C	High Trapped Perimeter	77	43	77
59097	Woodenbong A	High Trapped Perimeter	6	3	5
59098	Woodenbong B	Low Flood Island	81	47	85
59099	Woodenbong C	Indirectly Affected Area	254	138	248
59100	Muli Muli Crescent	Low Flood Island	19	6	11
59101	Muli Muli Hillside	High Trapped Perimeter	25	8	14

Urbenville

a. The Old Saw Mill on Tooloom Road is classified as Area with Overland Escape Route, the roads are cut off from the local catchment overland paths. This area is within the PMF extent and could be subject to inundation. There are overland escape routes via foot, however this would be to no habitable areas to evacuate to only the surrounding bushland which is classified as High Trapped Area.

Woodenbong

a. At Woodenbong, the majority of the town is classed as Indirectly Affected. There is an escape route from the town through Boomi Creek Road and Old Bruxner Creek Road. This is an unsealed road, which may not be passable to all vehicles in an extreme weather event. This road joins Mount Lindesay Road further east of the town outside of the flooding from Tooloom Creek.

b. Areas within the flood extent are classed as Rising Road Access as they have road access to move to higher ground before being inundated.

Tooloom and Boomi Creek

a. Throughout the Tooloom Creek catchment areas in the floodplain are typically considered as High Trapped Perimeter Areas. Areas outside of the flood extents could be cut from vehicular or overland on foot access to areas of safety.

b. Areas within the PMF flood extent are classified as Areas with Overland Escape Routes, these areas are able to leave before being flooded, however can only travel to the High Trapped Perimeter Areas.

Muli Muli

a. Muli Muli is a High Trapped Perimeter area due to inundation of the Clarence Way to the north and south in the 20% AEP event.

b. The town itself is not flooded until events larger than the 0.05% AEP event however has no means of evacuation or self-resupply (6).

2.4.5 Inundation

Urbenville

a. Urbenville does not have a BOM forecast gauge. There is however a BOM rainfall gauge (57020).

b. Comparison of flood model results and anecdotal flooding evidence from community at Urbenville indicates that the following areas can become inundated.

c. Over ground flooding at 6 Urben Street with depths of 150mm.

d. Water over road at Toolom Road at the Old Saw Mill with varying depths from 300mm to 1.5m.

e. Water over road on Clarence Way bridge heading to Bonalbo, with depths of up to 400mm (6).

Woodenbong

a. Woodenbong does not have a BOM forecast gauge.

b. Comparison of flood model results and anecdotal flooding evidence from community at Woodenbong indicates that the following areas can become inundated.

c. Over ground flooding at 31 Richmond Street with varying depths of 400mm to 500mm.

d. Knee deep slow flowing water at Woodenbong Caravan Park with depths between 300mm and 600mm.

e. Over ground flooding at Recreation Road with depths of up to 1.2m inundating lower paddocks.

f. Over ground flooding at 29 Richmond Street affecting properties with depths of up to 500mm.

g. Overground flooding at 25 and 27 Richmond Street with depths of up to 200mm.

h. Over road flooding at Black Gully Culvert on Lindsay Creek Road with depths over road between 1m and 1.7m (6).

2.4.6 Isolation

a. In Urbenville, up to 129 properties to the west of Urben Street and north of Beaury Street can become isolated. This area is above the PMF extent of the creek but has no route for evacuation.

b. In Woodenbong up to 184 properties are indirectly affected but is not expected to become isolated (6).

2.4.7 Flood Mitigation Systems

Table 11: Levees in Woodenbong summary of information (19)

Woodenbong Levee	
Location	Bonalbo Lane between Dalmorton Street and Unumgar Street
Type of Levee (ring etc)	Diversion drain
Owner	Kyogle Council
Design Height and freeboard	Approximately 600mm high diversion mound with 2.5m wide crest
Overtopping Height	Not known
No. of properties protected	6 properties
Known low points	The drainage channel under Unumgar Street near the intersection with Richmond Street
Location and sequence of inundation	Not known

Consequences of levee overtopping or failure	Overland flow through properties on Richmond Street and Bonalbo Lane
Deficiencies	No formal design basis for the construction, initially constructed ad hoc to address frequent overland flows causing nuisance

2.4.8 Dams

a. Two prescribed dams in Queensland, Maroon Dam (Gauge ID 40677) and Moogerah (Gauge ID 40135), located north and north-west of Woodenbong have been identified (6). No dam failure consequences for Woodenbong have been identified (10) (11).

2.4.9 At Risk Facilities

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

2.4.10 Other Considerations

a. Urbenville hosts an annual one-day camp draft event in May.

b. Woodenbong host the Woodenbong Show annually in September.

c. These events need to be taken into account in relation to possible Flood Outlook Scenarios issued by BOM.

ROAD CLOSURES AND ISOLATED COMMUNITIES

2.5 ROAD CLOSURES

a. Table 12 lists roads liable to flooding in Kyogle LGA.

Table 12: Roads liable to flooding in Kyogle LGA.

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height or design event
Kyogle Sector				
Summerland Way	Intersection of Kyogle Road	Evacuation route for Kyogle Caravan Park is lost and evacuation must be completed before flood expected to reach or exceed 14.5m	Nil	13m -13.5m Kyogle Gauge (203900-558002)
Kyogle Road	At the Fawcett's Plain turnoff	Rural residents to north and north east of Kyogle isolated	Nill	14m on Kyogle Gauge (203900-558002)
Summerland Way	Northern end of the town - at the Railway viaduct	Kyogle Caravan Park isolated and/or inundated.	Nil	14.5m Kyogle Gauge (203900-558002)
Summerland Way	Reynold's Bridge about 9km south of Kyogle	Access to Casino cut	Nill	Gauge height not known
Bonalbo and Tabulam Sector				
Koreelah St	Between Sandilands and Capeen St	Can be a high hazard floodway. May cut off access from southern portion of town to main access roads.	Alternate route may be possible via Peacock St towards Woodenbong Rd	Approx. 20% AEP event
Farm Road	Near Golf Course	Loss of single road access in and out of Bonalbo for Lower Peacock area.	Nil	Has occurred in previous events as frequent as 50%AEP
Woodenbong Road	Intersection of Woodenbong Road and Cope Street intersection	May disrupt main access route in and out of Bonalbo.	Local roads may provide alternate route to flood free parts of Woodenbong Rd, however may	Shallow inundation (<0.2m) from a 20% AEP. Would be cut

			also be subject to inundation in a PMF.	off in a PMF at 173.24mAHD.
Woodenbong Road	Hospital Road intersection	May disrupt main access route in and out of Bonalbo. May cut off access route to Bonalbo Multi-Purpose Service .	No other direct access roads to Bonalbo MPS.	Shallow inundation (<0.2m) from a 20%AEP, cut off in a PMF at approx 171.1mAHD.
Clarence Way	Between Bonalbo and Urbenville	Bonalbo isolated	Eastern route along Clarence Way viable before PMF	Gauge height not known
Woodenbong Road	Woodenbong Road Bridge	May disrupt main access route in and out of Bonalbo.	Nil	Overtopped in a PMF event of approximately 168.4mAHD, however shallow depths above deck. Both approaches to bridge would be overtopped in a PMF.
Urbenville and Woodenbong Sector				
Clarence Way	Between Urbenville and Woodenbong	Loss of access between both Urbenville and Woodenbong.	Nill	Inundation for up to 8 hours in the 20% AEP event and 15 hours in 1% AEP event
Clarence Way	Near Urbenville Showgrounds	Loss of access into Urbenville for areas to the east.	Nil	Not trafficable from a 5%AEP
Boomi Creek Road	East of the intersection of Boomi Creek Road and Clarence Way Road	Loss of access towards Urbenville for rural properties around Boomi Creek.	Nil	Inundation up to 15 hours during 20% AEP event and 20 hours in 1% AEP event
Lindsay Creek Road	Black Gully Culvert	Loss of access into Woodenbong/isolation for properties along Lindsay Creek Rd	Nil	Depths over road between 1m and 1.7m
Muli Muli Crescent	Muli Muli	Isolation for Muli Muli	Nil	Inundation begins from a 0.5%AEP

Clarence Way	To the North and South of Muli Muli	Loss of single road access in and out of Muli Muli	Nil	Flooded in events more frequent than a 20% AEP. Length of inundation varies from 8-15hours.

2.6 SUMMARY OF ISOLATED COMMUNITIES AND PROPERTIES

a. Table 13 lists communities liable to isolation and potential periods of isolation. Information presented here is based on historical information and design events and does not reflect the duration of isolation expected in larger and extreme events.

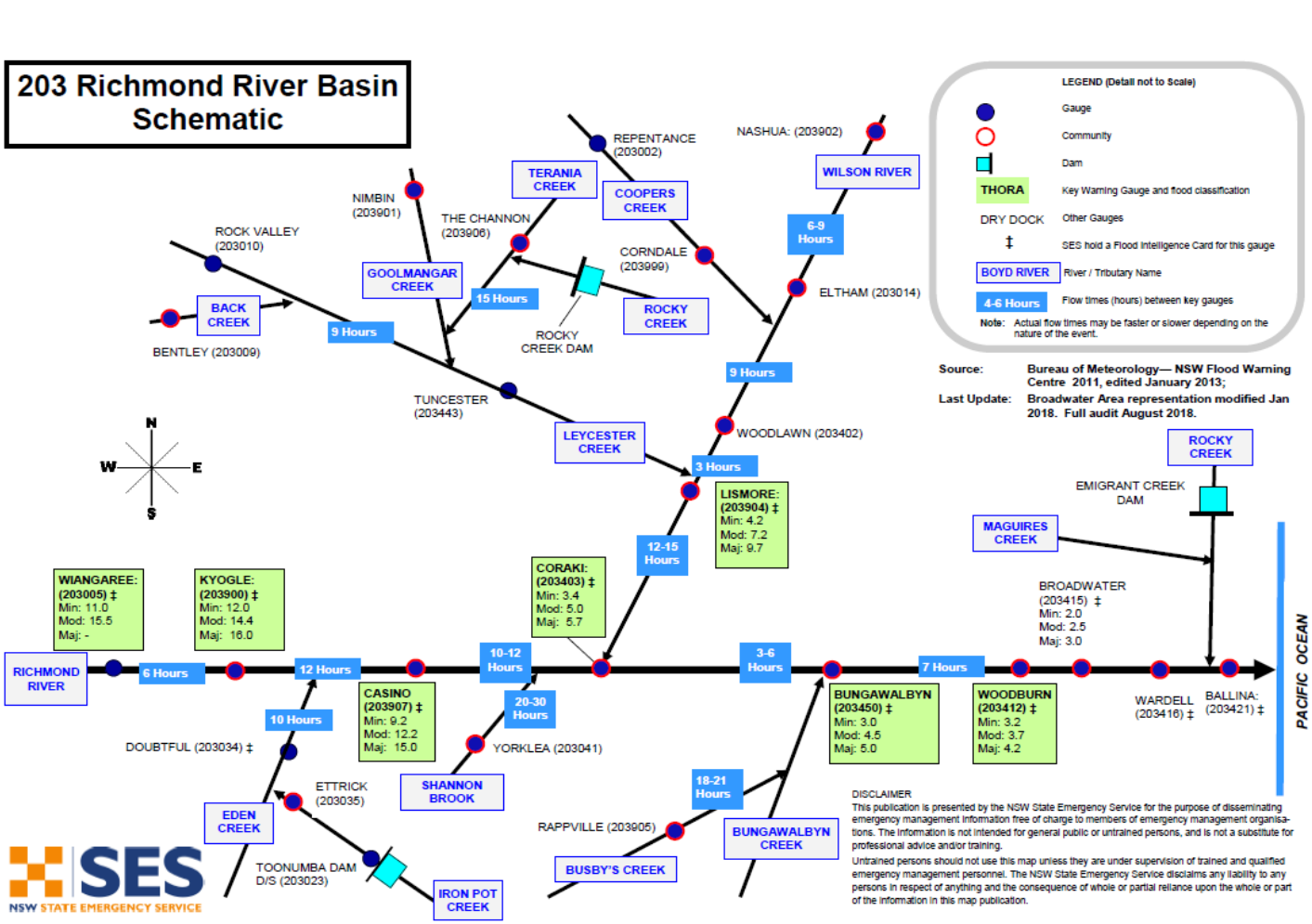
Table 13: Potential Periods of Isolation for communities in Kyogle LGA during a Major flood.

Town / Area (River Basin)	Population/ Dwellings	Flood Affect Classification	NOTES
Kyogle Sector			
Kyogle	Rural residents to the north and east of Kyogle		At 14m on the Kyogle Gauge (203900-558002) rural residents to the north and east of Kyogle are isolated (14)
Golf Course Estate	25 dwellings		Residents of the Gold Course Estate become isolated at 14.7m on the Kyogle Gauge (203900-558002) (14)
Bonalbo and Tabulam Sector			
Bonalbo	Bonalbo township, approximately 338 people, 186 dwellings	High Trapped Perimeter	Bonalbo township becomes frequently isolated from the wider community. During events in the last 15 years including 2010 and 2011, roads such as the Clarence Way between Urbenville and Bonalbo were cut by floodwaters while much of the town remained unaffected by direct flooding (5)
Balund-a Prison (Tabulam)	Approximately 1500 inmates and staff		Becomes isolated at 7.5 m on the Tabulam Gauge (204002 – 557000) (15)
Ewingar community	Approx 70		Becomes isolated at 7.5 m on the Tabulam Gauge (204002 – 557000) (15)
Tabulam	Tabulam township, approximately 508 people, 186 dwellings	High Flood Island up until 1% AEP event.	During significant flood events, Tabulam can become isolated for a short period of time (13)

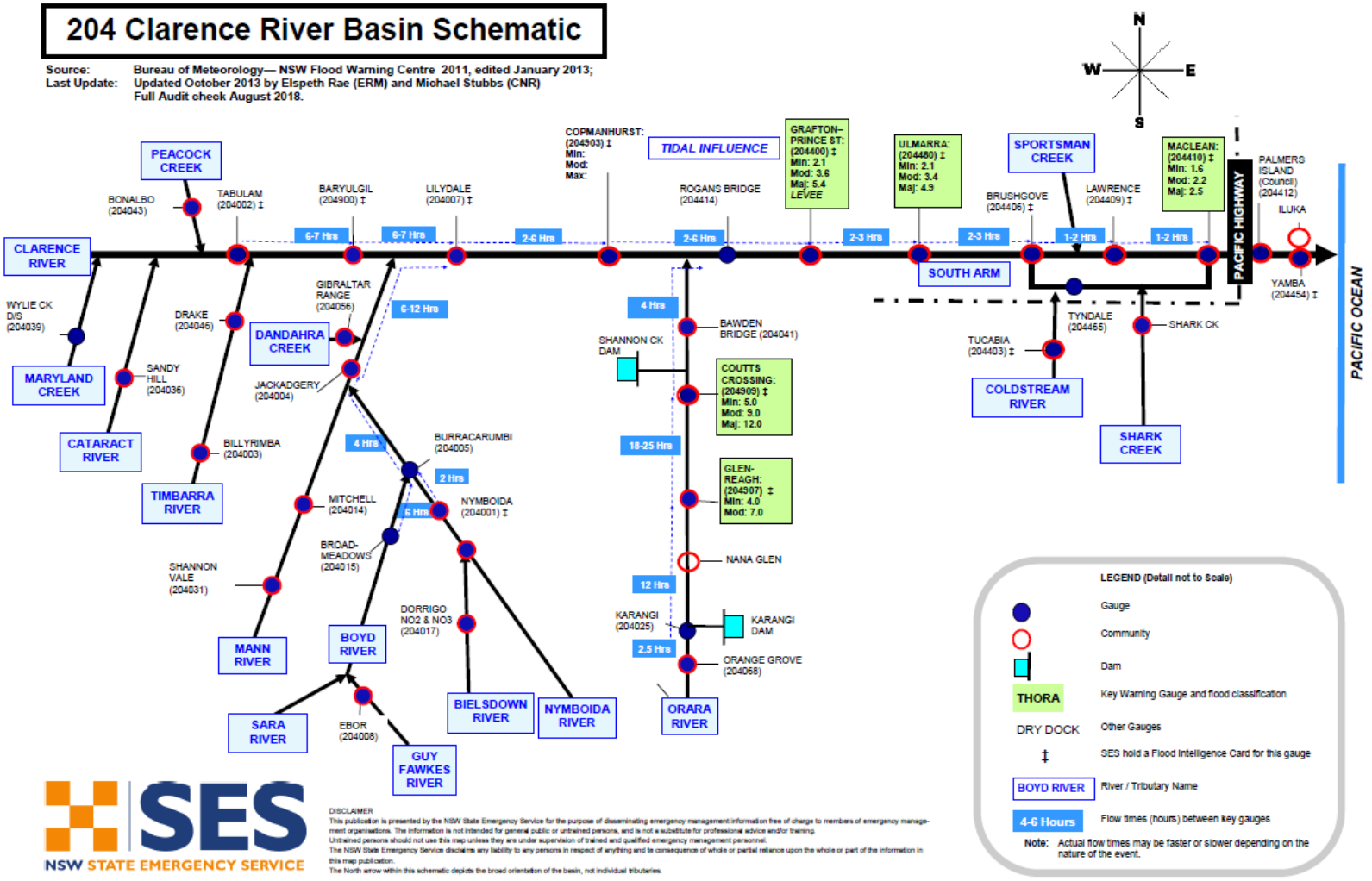
Urbenville and Woodenbong Sector			
Urbenville	Approximately 300 people, 129 properties	High Trapped Perimeter	Up to 129 properties to the west of Urben Street and north of Beaury Street can become isolated (6)
Woodenbong		Indirectly Affected	In Woodenbong up to 184 properties are indirectly affected but is not expected to become isolated (6)

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

ANNEX 1: RICHMOND RIVER BASIN SCHEMATIC



CLARENCE RIVER BASIN SCHEMATIC



ANNEX 2: FACILITIES AT RISK OF FLOODING AND/OR ISOLATION

Richmond River Basin (3)

Facility Name	Street	Suburb	Comment
Schools			
Afterlee Public School	2085 – 2089 Afterlee Road	Afterlee	16 Students 2 Staff
Collins Creek School	480 Collins Valley Way	Collins Creek	14 students, 2 staff
Doubtful Creek Public School	2436 Sexonville Road	Doubtful Creek	11 students, 2 staff
Ayurveda College Pty Ltd	27 Campbell Road	Kyogle	Training Centre
Kyogle High School	189-201 Summerland Way	Kyogle	376 Students 45 Staff
Kyogle Public School	192 Summerland Way	Kyogle	315 Students 22 Staff
St Brigid's Primary School - Kyogle	22-30 Groom St	Kyogle	126 students, 20 staff
Rainbow Ridge Steiner School	279 Lillian Rock Road	Lillian Rock	94 students, 9 staff
Mummulgum Public School	5815 Bruxner Highway	Mummulgum	20 students, 2 staff
Rukenvale Public School	2303 Summerland Way	Rukenvale	14 students, 2 staff
The Risk Public School	122 Gradys Creek Road	The Risk	27 students, 2 staff
Barkers Vale Public School	4501 Kyogle Road	Wadeville	51 Students 3 Staff
Wiangaree Public School	Kunghur Street	Wiangaree	23 students, 2 staff
Child Care Centres			
Cawongla Playhouse	2474 Kyogle Rd	Kyogle	20 children, 5 staff

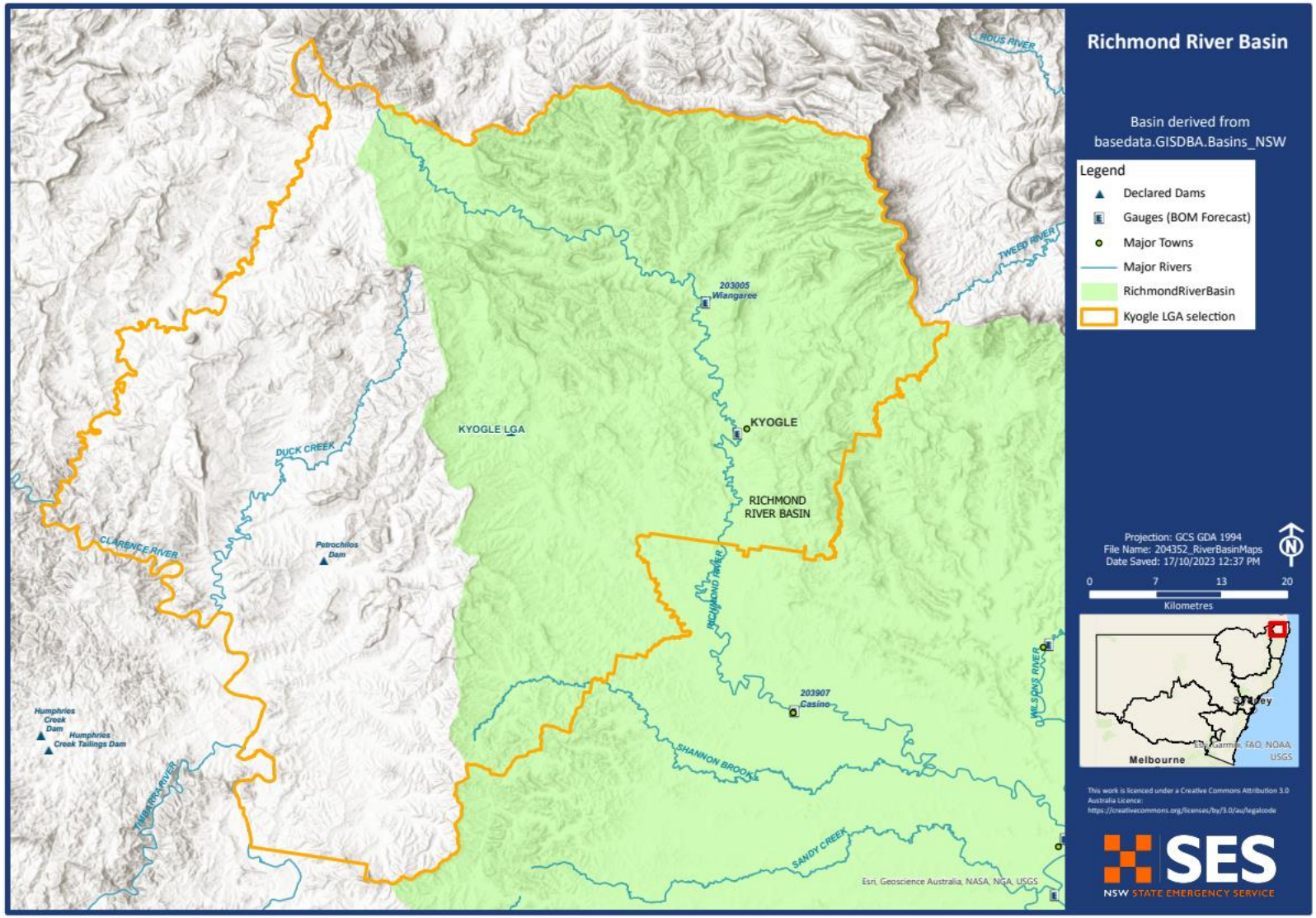
Eden Creek Fairymount Pre School	176 Summerland Way	Kyogle	20 children, 5 staff
Kyogle Early Learning	13 Short St	Kyogle	
Kyogle Preschool	62 Fawcett St	Kyogle	25 children, 7 staff
Bundgeam Pre School	35 Terrace Rd	Terrace Creek	20 children, 5 staff
Facilities for the aged and/or infirm			
Kyogle Memorial Multi-Purpose Service (MPS)	Summerland Way	Kyogle	12 Acute Beds / 3 Emergency Beds / 28 Aged Care Beds
The Whiddon Group – Kyogle (Aged Care Facility)	207 – 253 Summerland Way	Kyogle	40 Clients Staff: (0800-1700hrs) 16 & 8 on Weekends / (1700-2200hrs) 6 / (2200-0600hrs) 2
Utilities and infrastructure			
Essential Energy Power Station	Craig St	Kyogle	02 66233393
Kyogle Substation	11 Craig St	Kyogle	
Kyogle Water Treatment Plant	1 Plant St	Kyogle	
Telstra Kyogle Exchange	153-155 Summerland Way	Kyogle	
Camping Ground / Caravan Parks			
Sheepstation Creek campground	Sheepstation Creek Road	Border Ranges National Park	Up to 75 occupants
Iron Pot Creek Campground	Murray Scrub Road	Toonumbar National Park	Up to 30 occupants
Forest Tops Campground	Tweed Scenic Drive	Tweed Ranges	Up to 9 occupants

Clarence River Basin (3)

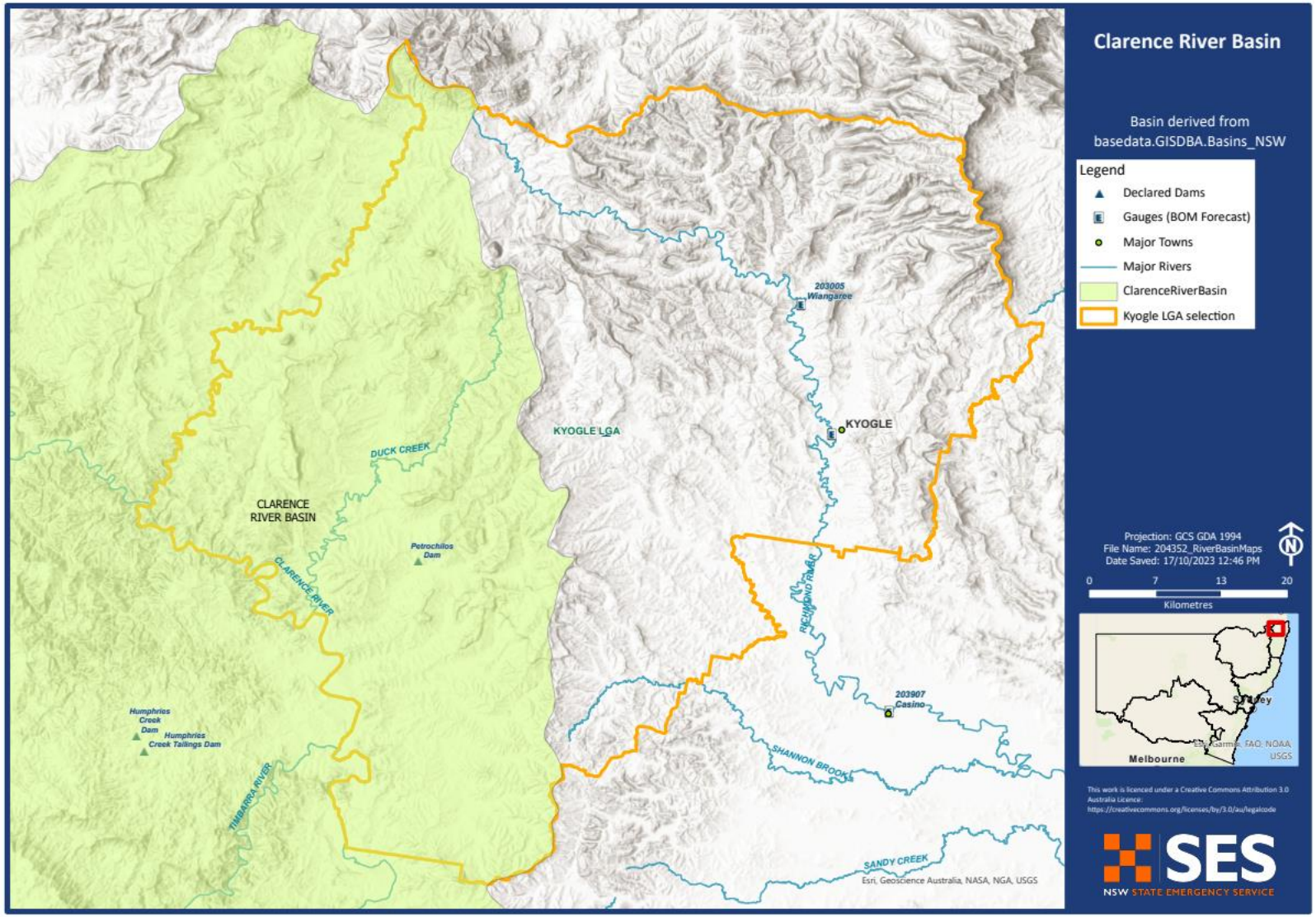
Facility Name	Street	Suburb	Comment
Schools			
Bonalbo Pre-School	35 Woodenbong Street	Bonalbo	Hazard rating of H3 in 5% AEP event, H5 in 1% AEP event.
Bonalbo Pre-School (Jumbunna)	37 Woodenbong Street	Bonalbo	25 students, 4 staff
Bonalbo Central School (K-Y12)	Yabbra St	Bonalbo	145 students, 22 staff
Old Bonalbo Public School	Duck Creek Road	Old Banalbo	22 students, 2 staff
Tabulam Public School	Clarence Street	Tabulam	46 students, 2 staff
Woodenbong Central School	Unumgar Street	Tabulam	46 students, 8 staff
Child Care Centres			
Ngallingee Jarjum Tabulam & District Community Pre- School	3 Barnes St	Tabulam	20 children, 5 staff
Facilities for the aged and/or infirm			
Bonalbo Multi-Purpose Service (MPS)	Hospital Rd	Bonalbo	
Uniting Caroona Bonalbo	61 Woodenbong Rd	Bonalbo	
Urbenville Multi-Purpose Service	45 Beaury St	Urbenville	
Utilities and infrastructure			
Bonalbo Substation	13 Peacock St	Bonalbo	
Mallanganee Substation	6679 Bruxner Hwy	Mallanganee	

Urbenville Substation	Cnr. of Clarence Way & Boomi Creek Rd	Urbenville	
Urbenville Water Treatment Plant	87 Tooloom Falls Rd	Urbenville	Note: There is approximately 17km of water pipeline associated with the Tooloom Falls Road Water Plant Facility. 4Km Water Pipeline from Tooloom Falls Road Water Plant Facility to Urbenville. 13km Water Pipeline from Urbenville to Woodenbong.
Bonalbo Water Treatment Plant	5 High St	Bonalbo	
Camping Ground / Caravan Parks			
Tooloom Falls Campground	Bandahngan Loop	Bandahngan Aboriginal Area	Temporarily closed. Normally up to 51 occupants
Peacock Creek Campground	Peacock Creek Road	Peacock Creek	Up to 21 occupants

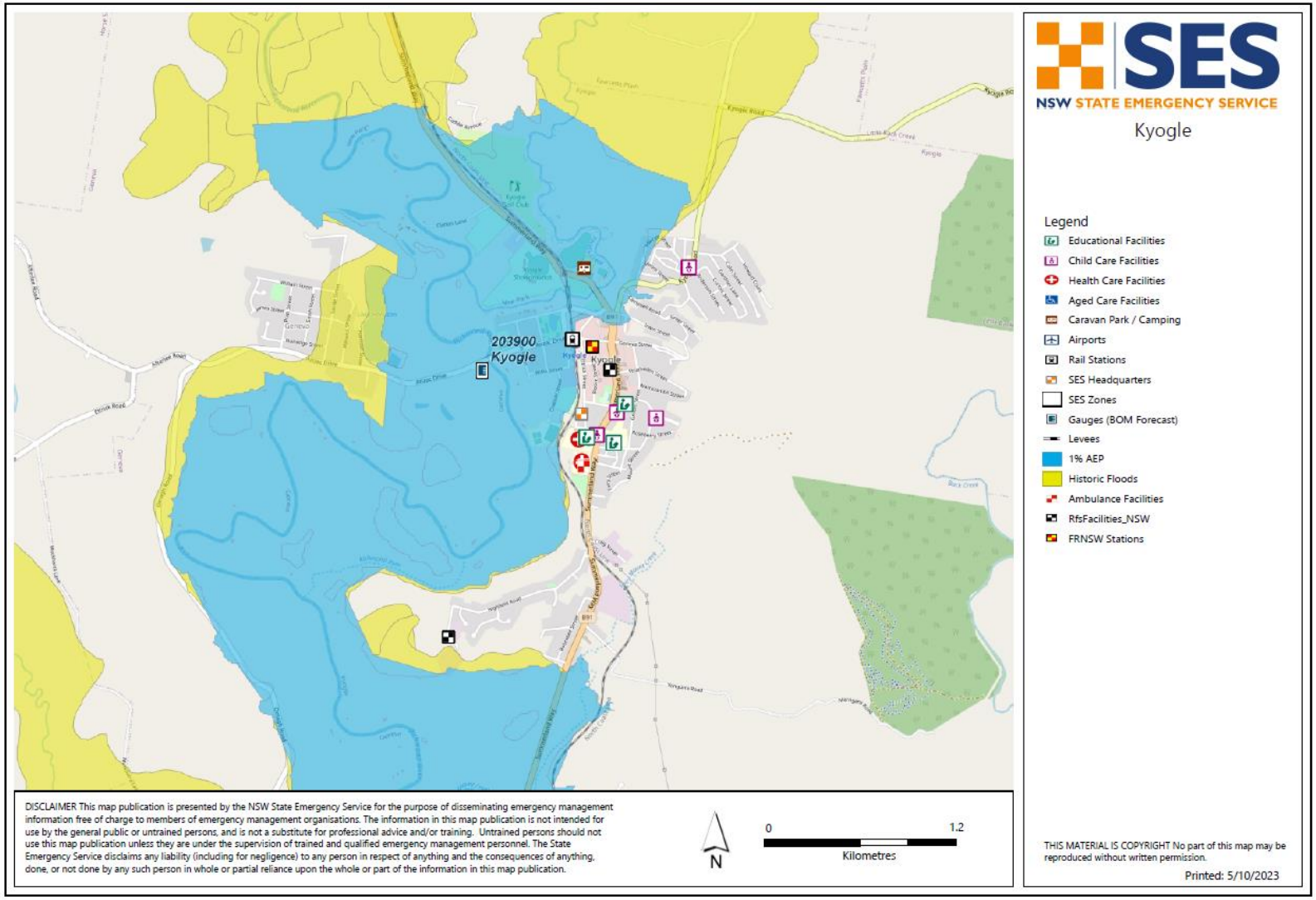
MAP 1: RICHMOND RIVER BASIN



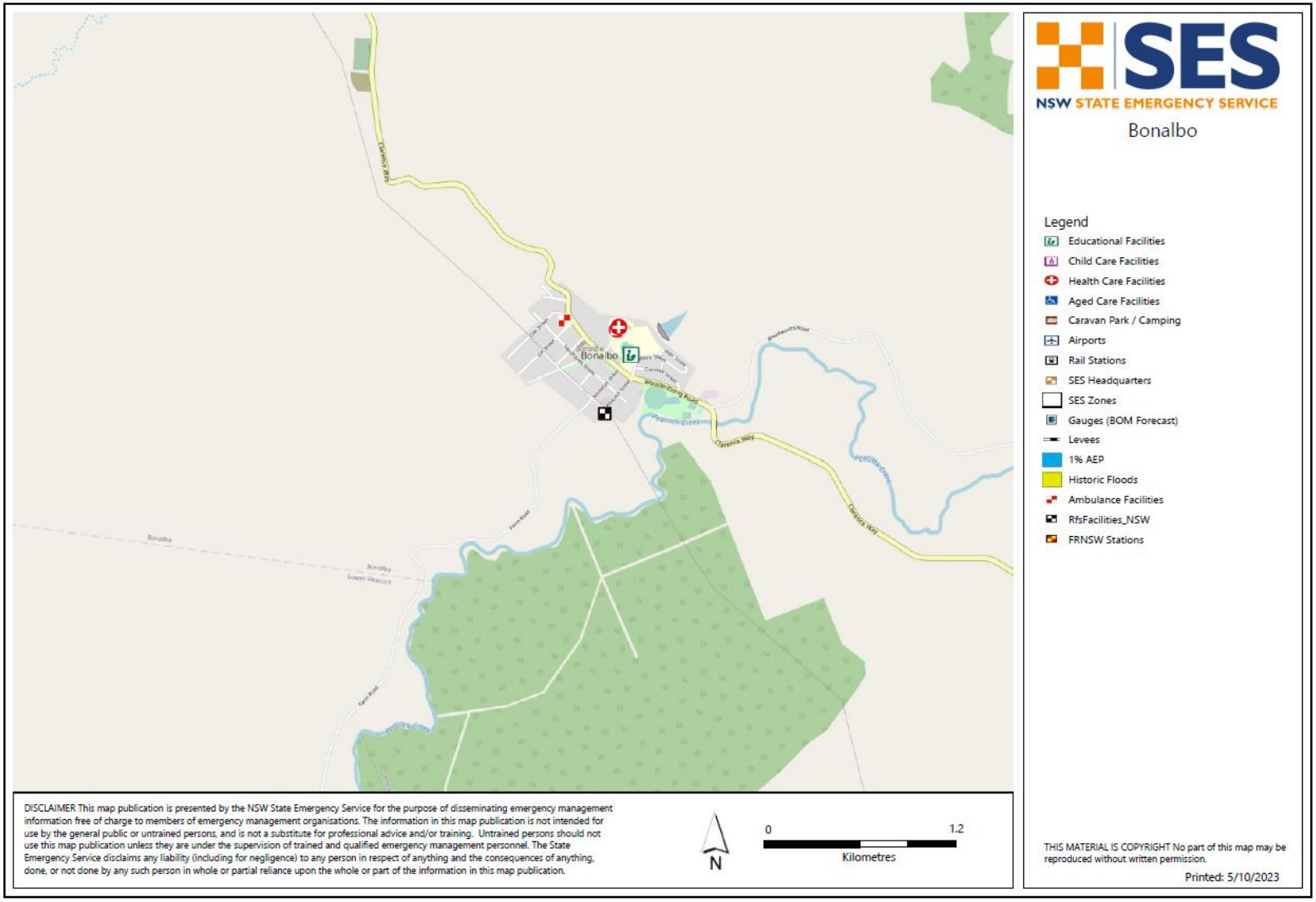
MAP 2: CLARENCE RIVER BASIN



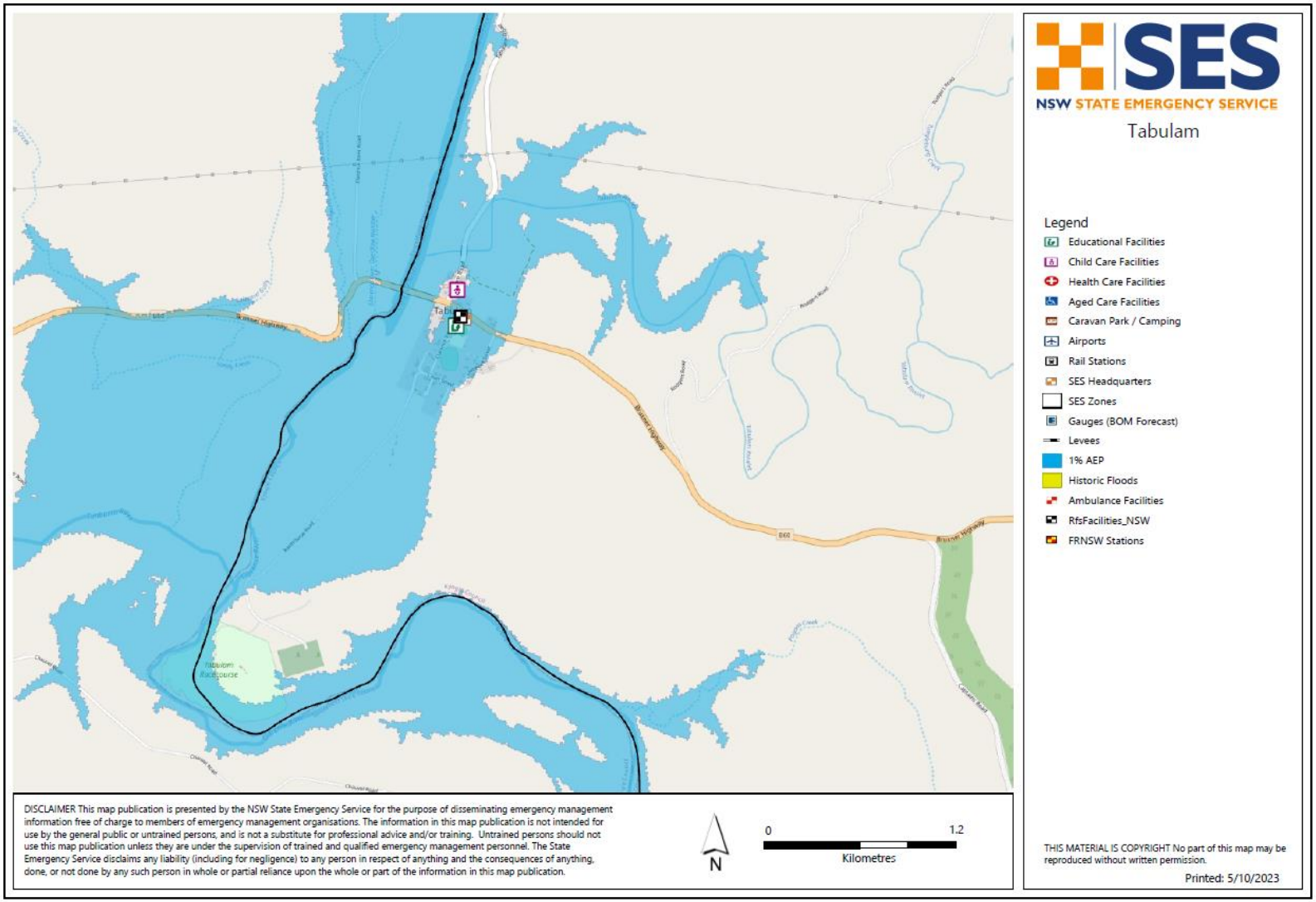
MAP 3: KYOGLE TOWN MAP



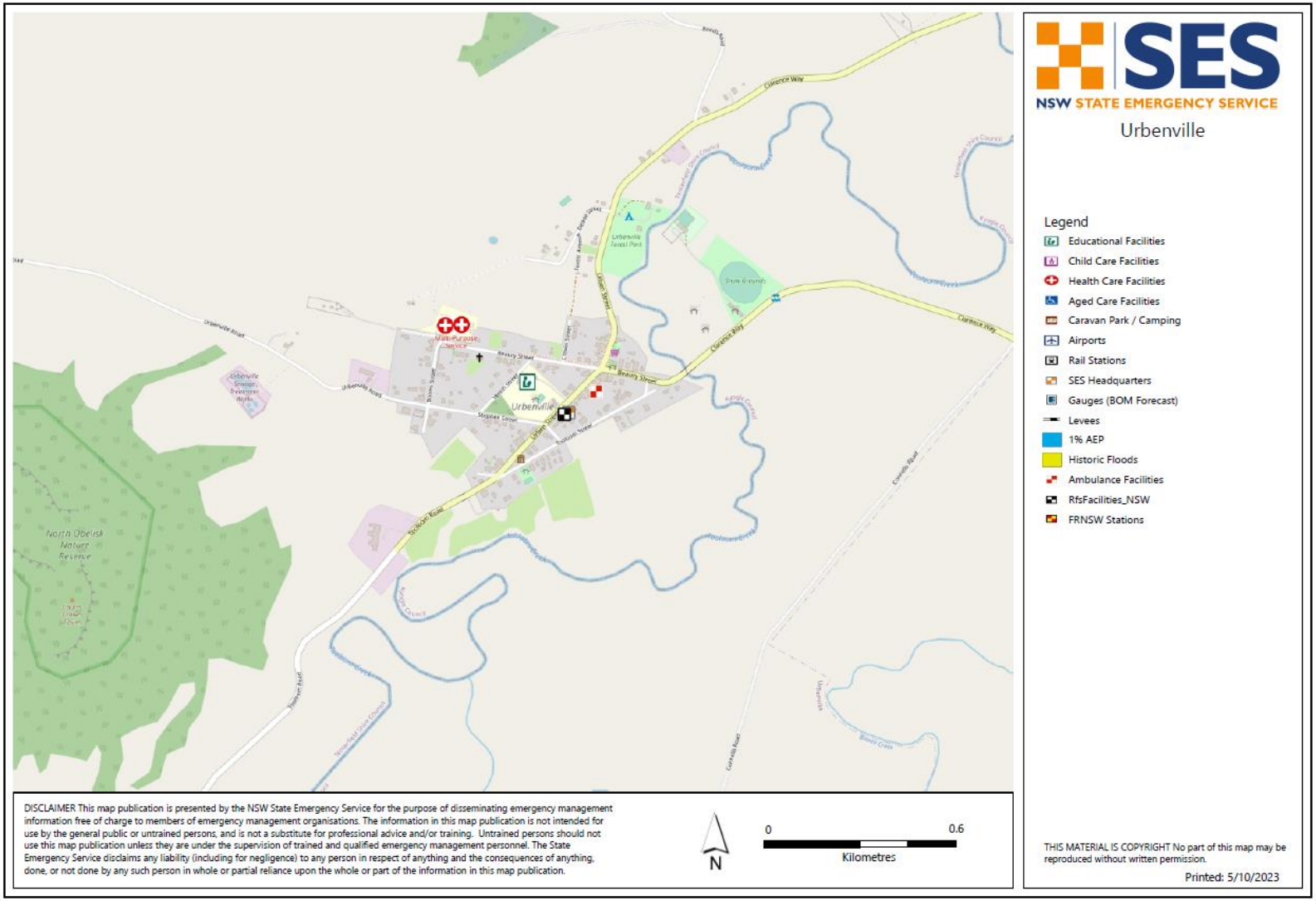
MAP 4: BONALBO TOWN MAP



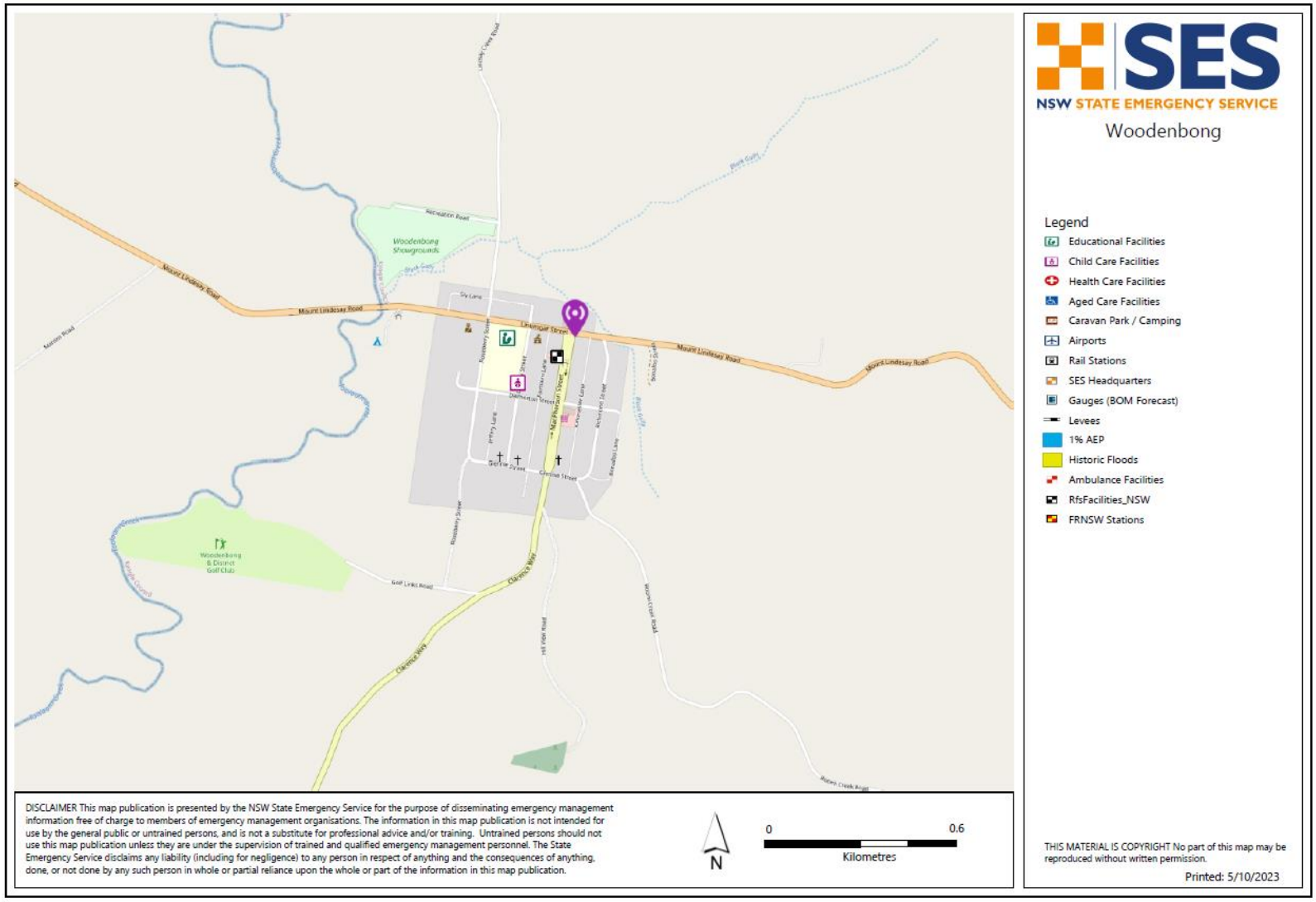
MAP 5: TABULAM TOWN MAP



MAP 6: URBENVILLE TOWN MAP



MAP 7: WOODENBONG TOWN MAP



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NSW STATE EMERGENCY SERVICE

SES RESPONSE ARRANGEMENTS FOR KYOGLE

Volume 3 of the Kyogle Local Flood Plan (Draft)

Last Update: March 1994

FloodSafe

ANNEX C TO
KYOGLE LOCAL
FLOOD PLAN

RIVER HEIGHT GAUGES MONITORED BY THE KYOGLE SES LOCAL CONTROLLER

GAUGE NUMBER	LOCATION	RIVER/CREEK	OWNER
203005	Wiangaree	Richmond	DWR
203900	Kyogle	"	"
_	Green Pigeon	Fawcett's Creek	Kyogle Council
203028	Fawcett's Plain (Mahoneys Lane)	" "	DWR

ANNEX D TO
KYOGLE LOCAL
FLOOD PLAN

GAUGES FOR WHICH THE BUREAU OF METEOROLOGY ISSUES FLOOD WARNINGS

RIVER	STATION	FLOOD CLASSIFICATION		
		MINOR	MODERATE	MAJOR
Richmond	Wiangaree	11.0	15.5	-
"	Kyogle	12.0	14.4	16.0

ANNEX E TO
KYOGLE LOCAL
FLOOD PLAN

DISSEMINATION OF FLOOD WARNINGS

1.Richmond/Tweed SES Division Headquarters will distribute Flood Warnings to the following:

a.The ABC (Lismore Regional Office).

a.Radio Stations 2LM (Lismore), 2NCR (FM) (Lismore), Radio 97 (Tweed Heads) and 2ZZZ-FM (Lismore).

c.Television Stations - Prime, NBN, ABC, NRTV.

d. Northern Rivers Police District Headquarters.

e.Appropriate SES Local Controllers (for further distribution to Local Emergency Operations Controllers and Councils).

f.Lismore Regional Ambulance Superintendent.

g.Northern Rivers Electricity.

h.Department of Community Services (Lismore Regional Office).

i.Telecom.

j.Public Works Department (Lismore Regional Office).

k.NSW Agriculture.

l.Department of School Education (Lismore Regional Office).

m.Catholic Education Office (Lismore).

n.`Lifesaver 4' Helicopter (Lismore).

o.HQ 41st Battalion RNSWR (Lismore).

ANNEX F TO
KYOGLE LOCAL
FLOOD PLAN

GUIDE TO THE CONTENT OF EVACUATION WARNING MESSAGES

1.Time of issue and title of Authorising Officer.

2.Description of the area to which the warning applies and the flood threat to that area.

3.Information to be given to evacuees on:

a.Location of and route to evacuation centre.

b.Time by which evacuation should take place.

c.Arrangements for those without their own transport.

4.Evacuees to be advised to:

a.Raise furniture and furnishings above likely flood level.

b.Gather personal documents and mementoes and those belongings that can be fitted within own means of transport (or within a suitcase if travelling by bus).

c.Listen to radio for confirmation of message and for further information.

d.Assist neighbours if necessary.

5.Evacuees to be advised that Police will provide security for properties in the evacuated area.

6.Phone number for confirmation of warnings.

ANNEX G TO
KYOGLE LOCAL
FLOOD PLAN

ARRANGEMENTS FOR EVACUATION OF KYOGLE CARAVAN PARK

1. When the Richmond River reaches an approximate height of 12.5 metres at Wiangaree Flood gauge, and flooding of the Fawcett's Creek and flood prone areas of the Kyogle Township is likely, the Kyogle Shire SES Controller will inform the Kyogle Shire Health Surveyor, or in his absence, the Works Engineer.

2. The Health Surveyor, or in his absence, the Works Engineer, will inform the Caravan Park Manager of the current situation, and of changes in situations.

3. When the height of the Richmond River reaches 14 metres at the Geneva Bridge flood gauge, evacuation at Kyogle Caravan Park will commence.

4. The following vehicles and personnel will be utilised in the evacuation of the Caravan Park:

   - Kyogle Shire Council authorised personnel plus three Council vehicles fitted with tow bars.
   - One Kyogle Shire Council lorry and authorised personnel .
   - SES personnel.

5. The evacuation will take place in the following order:

   - Vans sited on the western roadway followed by the northern roadway, then eastern roadway.

6. The vans will be towed to the following locations:

   - The Roxy Car Park.
   - Bloore Street between Stratheden Street and Geneva Street.
   - Stratheden Street between Summerland Way and Bloore Street.

7. Furniture removed from van annexes may be stored in the Supper Room of the Kyogle Memorial Institute.

8. The Kyogle SES Controller will inform the Health Surveyor, or in his absence, the Works Engineer, when it is safe to re-occupy the Caravan Park.

9. The vehicles and personnel utilised in (6) will tow vans back to the Caravan Park sites.

10. A copy of the "NOTIFICATION TO CARAVAN PARK USERS" is to be handed to occupiers when taking up residency at the Caravan Park.

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NOTIFICATION TO CARAVAN PARK USERS

1.The Kyogle Caravan Park may be subject to flooding during periods of heavy rain.

2.Occupiers are required to inform the Park Manager of a contact address/phone number if they are to be absent from their van for an extended period.

3.If occupiers are to be absent for any extended period, a key to their van is to be left in a sealed envelope with the Manager and their vans should be left in a condition that the van may be moved in an emergency, i.e., tyres inflated, jacks to be wound up, and personal effects in annexes to be placed in vans.

4.In the likelihood of flooding, occupiers are to inform the Manager if they require a vehicle to tow their van from the Park and arrangements will be made by the Manager.

5.The evacuation of the Park will commence when the Richmond River at Geneva Bridge reaches a height of 14 metres and further rises are imminent in Fawcett's Creek. Occupiers will be notified by the Manager.

6.In the event of evacuation of the Park, vans sited along the western road will be moved first, followed by the northern road, then eastern road.

7.In the event of evacuation, vans may be temporarily sited at the following locations:

- ♦Roxy Car Park, corner of Bloore and Stratheden Streets.
- ♦Stratheden Street between Summerland Way and Bloore Street.
- ♦Bloore Street between Geneva and Stratheden Streets.
- ♦Toilet facilities are available in the Roxy Car Park and Kyogle Memorial Institute.

8.Cooking facilities, refrigeration and hot water will be available in the kitchen of the supper room at the Kyogle Memorial Institute and annex furniture may also be stored at this location.

9.The Manager will inform residents when they may return to the park and suitable arrangements will be made to tow vans back to the Park.