NSW STATE EMERGENCY SERVICE

Clarence Valley

Local Flood Emergency Sub Plan

FloodSafe

CLARENCE VALLEY FLOOD EMERGENCY SUB PLAN

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

Volume 1 of the Clarence Valley Flood Emergency Sub Plan

Endorsed by the Emergency Management Committee

Endorsed Date 17th July 2023

AUTHORISATION

The Clarence Valley Council Flood Emergency Sub Plan is a sub plan of the Clarence Valley 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

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Date: 14-7-2023

Endorsed

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Date: 18/07/2023

VERSION HISTORY

Version Number	Description	Date
1	Clarence Valley Local Flood Plan	June 2012
2	Clarence Valley Local Flood Plan	June 2017

AMENDMENT LIST

Suggestions for amendments to this plan should be forwarded to:

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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 Clarence Valley 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 Clarence Valley Council Local Emergency Management Plan (EMPLAN) and is endorsed by the 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 Clarence Valley Council 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 Clarence Valley Council LGA. The Clarence Valley 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 Clarence Valley Council level emergency management arrangements for prevention, preparation, response and initial recovery for flooding in the Clarence Valley 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/or coastal inundation resulting from super-elevated sea levels and/or waves (including tsunami) overtopping coastline defences.

1.4.5 The arrangements for dealing with episodes of coastal erosion by severe weather, are described in the NSW State Storm Plan.

1.4.6 The arrangements for the emergency management of tsunami are dealt with in the NSW State Tsunami Emergency Sub Plan.

1.4.7 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 Clarence Valley 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 at: https://www.ses.nsw.gov.au/about-us/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 Clarence Valley Council LGA.

2.1.2 Declared dams in or upstream of the Clarence Valley Council Local Government Area.

Dam Name	Owner	High Risk Dam
Shannon Creek	Clarence Valley Council	No
Rushforth Road 100ML Reservoir	Clarence Valley 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 coastal 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. Partners 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. NSW SES will 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 warnings for flash flood; or

d. On receipt of a dam safety 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 post 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 and 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 Services Functional Area 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; and

- 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: 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. Clarence Valley 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 Clarence Valley 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.

e. Clarence River Ferries passenger service – 0408 664 556

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

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

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

d. The 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. The 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 the Welfare Services Functional Area as soon as possible. NSW SES will brief the Welfare Services Functional Area at the earliest opportunity regarding the level of assistance required.

b. The Welfare Services Functional Area will manage evacuation centres for affected residents and travellers in accordance with the 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 the Health Services Functional Area.

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

Actions:

a. The 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. The 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; and

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 the 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 the 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 Clarence Valley 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 Clarence Valley 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 Clarence Valley 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 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 are outlined in the NSW State Flood Plan.
Clarence Valley Council	**Preparedness** • Establish and maintain floodplain and coastal 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 Floodplain Development Manual. • Provide levee studies, flood studies and floodplain management studies to NSW SES. • Maintain Dam Emergency Plans for the Shannon Creek and Rushforth Road dams and provide copies to NSW SES. • Provide information on the consequences of dam failure to NSW SES for incorporation into planning and flood intelligence. • Coordinate the development of warning services for catchments prone to flash flooding (small catchments), where appropriate. • 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:

AGENCY	RESPONSIBILITIES
	– Traffic management on council managed roads. – Provision of assistance to NSW SES (plant, equipment and personnel where able and requested). – 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 flash flood warning systems, where appropriate. • 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

AGENCY	RESPONSIBILITIES
	for demolition. • Provide services, assistance and advice to State Government in accordance with the State Recovery Plan.
Caravan Park Proprietor(s)	• Ensure caravan parks have a current flood emergency plan. • 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: – 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

AGENCY	RESPONSIBILITIES
	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: • 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 coastal erosion/inundation. – Advise the public with regard to electrical hazards during flooding and coastal erosion/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

AGENCY	RESPONSIBILITIES
	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.
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	The roles and responsibilities for Owners of Declared Dams are outlined in the NSW State Flood Plan.

AGENCY	RESPONSIBILITIES
LGA	
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.
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 Bundjalung, Yaegl and Gumbainggir communities. • Disseminate flood information, including flood and evacuation warnings, to the Bundjalung, Yaegl and Gumbainggir communities.

NSW STATE EMERGENCY SERVICE

HAZARD AND RISK IN CLARENCE VALLEY

Volume 2 of the Clarence Valley Flood Emergency Sub Plan

Last Update: December 2023

FloodSafe

AUTHORISATION

The Hazard and Risk in Clarence Valley 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 Manager Emergency Planning / NSW SES Coordinator Planning

Print Name:

Date:

Approved

Signature: _____

NSW SES North Eastern Deputy Zone Commander or Zone Commander

Print Name Superintendent Joanna Jones (DZC)

Date: 04-12-2023

05-12-2023

Date Tabled at LEMC

VERSION LIST

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

Description	Date
Clarence Valley Local Flood Plan	June 2012
Clarence Valley Local Flood Plan	August 2017

AMENDMENT LIST

Suggestions for amendments to this Volume should be forwarded to:

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

Amendment Number	Description	Updated by	Date

Document Issue: Version 3-02052016

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1 THE FLOOD AND COASTAL EROSION THREAT

1.1 OVERVIEW

a. The Clarence Valley Local Government Area (LGA) is located in the Northern Rivers region of New South Wales, about 600 kilometres (km) north of Sydney and 300 km south of Brisbane. The LGA is bounded by the Kyogle and Richmond Valley Council areas in the north, the Coral Sea in the east, Coffs Harbour City and Bellingen Shire in the south and Glen Innes Severn Council area, Guyra Shire and Tenterfield Shire in the west (1).

b. The LGA includes numerous rural localities and the townships and villages including Alice, Angourie, Ashby, Baryulgil, Braunstone, Brooms Head, Clouds Creek, Coaldale, Copmanhurst, Coutts Crossing, Cowper, Dalmorton, Diggers Camp, Dundurrabin, Glenreagh, Grafton, Gulmarrad, Iluka, Jackadgery, Junction Hill, Lawrence, Maclean, Minnie Water, Newton Boyd, Nymboida, Palmers Island, Ramornie, Sandon, South Grafton, Southgate, Townsend, Tucabia, Ulmarra, Waterview Heights, Wooli, Wooloweyah, Woombah and Yamba (1).

c. The landscape is predominantly rural, with expanding residential areas and some industrial and commercial land uses. The LGA has a total land area of 10,440 km² with approximately 27% of the LGA composed of National Parks, Nature Reserves or environmental management (1).

d. Much of the rural area is used for forestry, agriculture and grazing, including beef cattle and sugarcane growing, as well as fishing. In more recent year's tourism has become a major industry, especially along the coast.

e. Settlement is based around the main town of Grafton and the townships of Iluka, Maclean and Yamba, with many small villages and localities along the coast and inland (1).

f. The Clarence Valley has a humid subtropical climate with hot, wet and humid summers, and mild, drier winters. Rainfall is lower inland of the LGA compared to on the coast. There is an annual average rainfall of up to 1,465 millimetres (mm) in coastal centres such as Yamba and 975 mm at Grafton (1).

g. The Clarence Valley LGA estimated resident population for 2021 is 54,180. Table 5 provides more detail regarding the specific areas of the Clarence Valley and the population numbers recorded in the 2021 Census.

h. The Valley is at the convergence of three major highways and the north-south rail network. The Clarence has its own regional airport and seaport. Grafton is linked to the Pacific Motorway via the Big River Way. The Pacific Motorway is the key road transport network linking the Clarence Valley north to Queensland and south to

Sydney. The Summerland Way is an inland highway network that provides important north-south connectivity and is an alternative route between Brisbane, Casino, Grafton and Coffs Harbour. The Gwydir Highway is an east-west corridor that links the inland plains to the Clarence via the New England region. Owned and operated by Council, the Clarence Valley Regional Airport is located 17 km south of Grafton along Big River Way (1).

1.2 LANDFORMS AND RIVER SYSTEMS

Clarence River Valley

a. The Clarence Valley Council area is part of the Clarence River catchment. The Clarence River is the largest coastal river in New South Wales in terms of both catchment area and discharge. The headwaters of the Clarence River system lie outside the Council area to the north, west and south. The Clarence River enters the Clarence Valley Council area between Tabulam and Cleveland Crossing, flowing in a southerly direction. It is joined by numerous creeks and streams draining the Great Dividing and New England ranges to the west (the Ewingar, Nogrigar, Washpool and Coombadjha creeks and the Mann River) and the Richmond Range to the east (the Dulgigin, Kungarrabar, Deep, Josephs, Fourteen Mile and Dumbudgery creeks). In these western and northern areas of the Council area, the land is rugged and forest covered and the watercourses are both fast-flowing and quick to rise (2). The catchment is comprised of four sections (see Map 1 and Annex 1 - Schematics):

   i. **The Upper Clarence section**, which drains the area from the Queensland border to the junction of the Clarence and Mann rivers. In this section the main streams are the Maryland, Bookookoorara, Booboo Booboo, Cataract and Timbarra (Rocky) Rivers and the Washpool, Koreelah and Tooloom Creeks which drain the Great Dividing Range to the north and west, and numerous small creeks draining the Richmond Range to the east (2).

   ii. **The Mann River section**, which drains the New England Tablelands and the Dorrigo Plateau to the south-west and south of the Clarence Valley Council area. The major tributaries of the Mann River are the Henry, Nymboida, Sara, Aberfoyle, Guy Fawkes and Boyd Rivers (2).

      - The Nymboida River system drains the New England Tablelands and the Dorrigo Plateau to the west and south of the LGA. The principal tributaries of the Nymboida are the Mann, Henry, Boyd and Guy Fawkes rivers, each of which forms part of the LGA's western boundary, and the Mitchell, Sara, Aberfoyle, Blicks and Little Nymboida rivers. The Nymboida River proper flows in a northerly direction to its confluence with the Mann River and Jackadgery Creek near Carnham. Most of the tributaries of the Nymboida join it from the west. Almost all of the Nymboida River's catchment area is

rugged, deeply-dissected and forest-covered. There are few areas of floodplain development (2).

- Below its confluence with the Mann River the Clarence River flows in a south-easterly direction towards the village of Copmanhurst. On this stretch the principal tributaries are the Gorden Brook and the Pulganbar, Smiths, Stockyard and Whiteman creeks. These streams drain the southern portion of the Richmond Range. Below Copmanhurst the Orara River joins the Clarence from the south (2).

iii. **The Orara River section**, which flows northward through a long, narrow valley drains parts of the Dorrigo Plateau and the Coastal Range. The headwaters are hilly but along its course the river traverses areas of relatively flat country interspersed by sections in which it is contained by steep banks. A number of major tributaries drain into the Orara River Basin, including Urumbillum River, Mirum Creek and Fridays Creek, discharging to the Orara River in Upper Orara; Wongiwomble Creek discharging to the Orara River near Karangi; Nana and Coldwater Creek discharging to the Orara River near Nana Glen; Kings and Finberg Creek discharging to Bucca Creek upstream of Nana Glen; Glenreagh Creek; and Tallawudjah creek discharging to Orara River near Glenreagh (3).

iv. **The Lower Clarence section**, begins at the village of Copmanhurst and marks the upper limit of tidal influence. Almost all this floodplain land lies downstream of Grafton. Below the villages, the valley gradually broadens into a wide, swampy plain. On this section Sportsmans Creek, Swan Creek, Shark Creek and Coldstream Rivers enters the Clarence River. Lesser watercourses include Bayldons, Alumy, Deep Gully, Bunyip, Warragai and Harrisons Creeks (2). The major tributaries include:

- Coldstream Basin, which drains the area to the east of Grafton, around Tucabia and Tyndale, which is approximately 160 km² (2).
- Shark Creek Basin, which covers the area between Tyndale and Maclean along Shark Creek is known as Shark Creek Basin and is approximately 30 square km. North and east of Maclean, the floodplain extends north across Harwood and Chatsworth Islands and south of the river around James Creek and Gulmarrad towards Lake Wooloweyah (2).
- The Esk River has a catchment area of 258 square km² (4) and is currently unmonitored. It extends approximately 19km north from Iluka Road draining wetland area in Bundjalung National Park. North Arm Creek drains into the Esk River around Esk Island before the Esk River meets the Clarence River at the Village of Iluka.

Coastal Rivers

b. Some minor coastal rivers rise on the eastern side of the coast range and flow directly to the Tasman Sea (2).

c. The Wooli River, with its main tributary the Bookram Creek, drains an area of about 200 square km. Tidal influence extends about 15 km upstream. The lower reaches are generally swampy (2).

d. Flood drainage on the Wooli River can be impeded by storm surge conditions produced by low pressure systems centred off the coast (2).

e. The Sandon River and its tributary the Toumbaal Creek drain an area of mostly National Park and State Forest (2).

1.3 STORAGE DAMS

a. Dam locations are shown on the River Basin Map.

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

Shannon Creek Dam (5)	
Owner / Operator	Clarence Valley Council
Description of Dam	Shannon Creek Dam forms part of the Clarence Valley and Coffs Harbour Regional Water Supply scheme. The Dam consists of a main embankment, a spillway and downstream valve house and pump station. The main earth and rock fill embankment is a 44 m high, and 405m long, with the spillway cutting through the left abutment. The spillway is an uncontrolled concrete lined structure with a concrete ogee crest. The Dam crest level is RL 91.65 m AHD. The storage capacity of the Dam at FSL (RL 83.27 m AHD) is 30,000 ML. The catchment area is approximately 37.5 square km.
Location	The Shannon Creek Dam Site is located 9 km due west of the township of Coutts Crossing, on Shannon Creek, 14.5 km upstream of the Orara River junction. It lies within the Clarence Valley LGA and Clarence River Basin.
Communities Downstream	Along Shannon Creek and the Orara River, there are several bridges and houses, as well as a number of developed areas along the banks of the Clarence River.

Dambreak Case	Dambreak Peak Discharge (m^3/s)	Inundated Houses	Population at Risk (PAR)	Estimated Loss of Life
No Inflow (Downstream Tributaries – Dry Weather Flow)				
Sunny Day Dambreak	17590	0	0	0
PMF (Downstream Tributaries – Dry Weather Flow)				
PMF No Failure	643	0	0	0
PMF Dambreak	24258	0	0	0
PMF (Downstream Tributaries - Flood of Record)				
PMF No Failure	643	2250	5625	3 - 20
PMF Dambreak	24258	2270	5675	3 - 20
Incremental PMF Dambreak		20	50	1 - 4
PMF (Downstream Tributaries – "Levee Crest" Flood)				
PMF No Failure	643	0	0	0
PMF Dambreak	24258	2270	5675	3 - 20
Incremental PMF Dambreak		2270	5675	3 - 20

The dambreak flooding resulting from the Sunny Day failure case produces arrival times of the flood wave front as follows:-

- Junction of Shannon Creek and Orara River - 45 minutes
- Bawden Bridge - 1 hour
- Tindal Bridge - 1 hour 45 minutes
- Old Grafton Bridge - 3 hours 30 minutes

Monitoring System

Automatic rain gauges, water level recorder, piezometers, seepage weir, settlement survey markers, visual inspections.

	Type of Instrument/ Monitoring	Locations	Monitoring Frequency
1	Vibrating Wire Piezometers	P1 to P18 located in the main embankment through the maximum section adjacent to the outlet conduit.	Continuous Monitoring
2	Main Embankment Seepage Monitoring	Seepage measurement weirs located either side of the valve house. The water level is read from a Vega Submersible Pressure Transmitter, or visual reading of the depth gauge.	Continuous Monitoring
4	Settlement Survey Markers.	Survey monitoring points located on the upstream & downstream faces of the dam.	2 Yearly
5	Dam Visual Inspections	Operator inspection to cover the Main Embankment, and Spillway. To include seepage weir and piezometer readings as part of the inspection.	Daily to Tri-weekly
6	Storage Level and Rainfall	Storage level gauges located along the boat ramp, and readings on the SCADA	Continuous Monitoring

Warning System

There is a SCADA system with pre-set alert levels. This is no additional alert system to warn downstream residents.

Rushforth Road 100ML Reservoir (6)	
Owner / Operator	Clarence Valley Council
Description of Dam	Rushforth Road Reservoir is a 8.5m high raw water reservoir with a storage capacity of 100ML.

Location	701 Rushforth Road, South Grafton. 6km south west of South Grafton.
Communities Downstream	Grafton District Golf Course and former abattoir are downstream, however impacts are downstream. 1. Northern Catchment (Southampton Creek) – • Population at Risk 0.5 • Dam breach will inundate Rushforth Road 2. North Eastern Catchment (musk Valley Creek) – • There is impact on the Grafton District Golf Course area as consequence of breaching of reservoir. The flood wave travel time is short, in the order of 20-25 minutes. The flood depths can be around 2m deep and velocities are in the order of 0.5-1 m/s. • There is significant impact in flood cases on inundation of Abattoir buildings (4 out of 7 buildings are impacted). The flood depths can be significant and pose hazard to properties in the vicinity of the creek. • Population at Risk (PAR) estimates are 5.4 3. Southern Catchment (Tea Tree Creek) – • There is impact on two dwellings and a horse shed for all the breach scenarios. The floor of dwellings is not impacted by breach flood but there is inundation in the area around the properties. • Dam breach flood will inundate Rushforth road at two locations. • Population at Risk (PAR) estimates are 0.5
Monitoring System	Telemetry and visual monitoring and inspections.
Warning System	Telephony-based.
Other	n/a

Other Major Water Storages

a. Lake Hiawatha and Minnie Water are located approximately 30 km east of Grafton and approximately 5 km north of Wooli. These two adjoining lakes are dune contact freshwater lakes. That is, they are located in depressions in the country rock but are in contact with a coastal dune. The lakes are 500 m apart and in times of extreme flooding they become joined and flow into the Wooli River. Lake Hiawatha is clear and sandy, while Minnie Water is turbid due to high organic matter content (7).

1.4 WEATHER SYSTEMS AND FLOODING

a. The heavy rain which produces floods in the Clarence Valley Council area tends to come from the following kinds of weather system:

   i. Monsoonal low-pressure systems moving across the Great Dividing Range from northern Australia, usually during the summer and autumn months. These systems are indicated on weather maps as elongated low-pressure troughs stretching from the Northern Territory to the north coast of NSW, and flooding from them usually originates on the upper Clarence and Mann Rivers (2).

ii. Rain depressions originating as tropical cyclones in the Gulf of Carpentaria or the Coral Sea and moving southwards. The flood of January 1974 was of this type, the 'tail' of ex-tropical cyclone Wanda causing heavy falls over south-eastern Queensland and north-eastern NSW. Two months later, the March 1974 flood resulted from a rain depression which had originated as Tropical Cyclone Zoe. Such depressions may be associated with storm surge conditions (temporarily elevated sea levels and large waves) which retard drainage and therefore worsen the effects of flooding at and near the coast (2).

iii. East Coast low-pressure systems which travel along the coast, usually during the cooler months and direct moist on-shore winds over the Clarence River basin. Orographic uplift of these air masses brings heavy rain over the Coast Range and the higher country to the west of Grafton. The May 1996 flood on the Clarence River was of this origin. Such events are normally associated with lower-river floods rather than floods originating in the western uplands sections of the catchment. They may also produce storm surge conditions which retard the draining of flood waters (2).

iv. High-intensity, short-duration convective thunderstorms occur frequently over the valley, especially during the summer months. The rain from such storms may cause village drainage systems or minor creeks to surcharge, creating short-duration local ponding of low-lying areas. No rise in the Clarence River or other main streams is likely from such events (2).

b. Rains from the first three types of weather systems can persist for some days, especially in the case of east-coast low pressure systems which can cause heavy rain over periods of three to five days. Sometimes, as in May 1996, there may be two or more separate rain events a few days apart, causing floods with multiple peaks on the Clarence River (2).

c. Very heavy rainfalls, in excess of 225 mm in 24 hours and more than 40 mm over the course of an event, are quite common in the Clarence River catchment. Dorrigo, in the far south of the catchment, has a recorded 24-hour rainfall of 809 mm and monthly total of 1395 mm and an average annual precipitation of nearly 2000 mm (2).

d. The most severe floods in the valley are generally the result of the passage of degraded ex-tropical cyclones from the north during summer and autumn or east coast low pressure systems occurring during autumn and winter. When depressions such as these are characterised by very low central pressures, raised sea levels (storm surges) can occur. This exacerbates flooding when sea waters invade coastal areas and when flows in the river are retarded (2).

e. North-eastern NSW experiences a distinct wet period between December and April, and more than two thirds of the recorded floods on the Clarence River have occurred during the summer and autumn months from January to May. The spring and early

summer months are relatively dry, and floods are infrequent during this time of year. No floods above the 'major flood' level of 5.4 m at Grafton have been recorded in the September-December months. Severe flooding has, however, occurred in the early winter months of June and July (2).

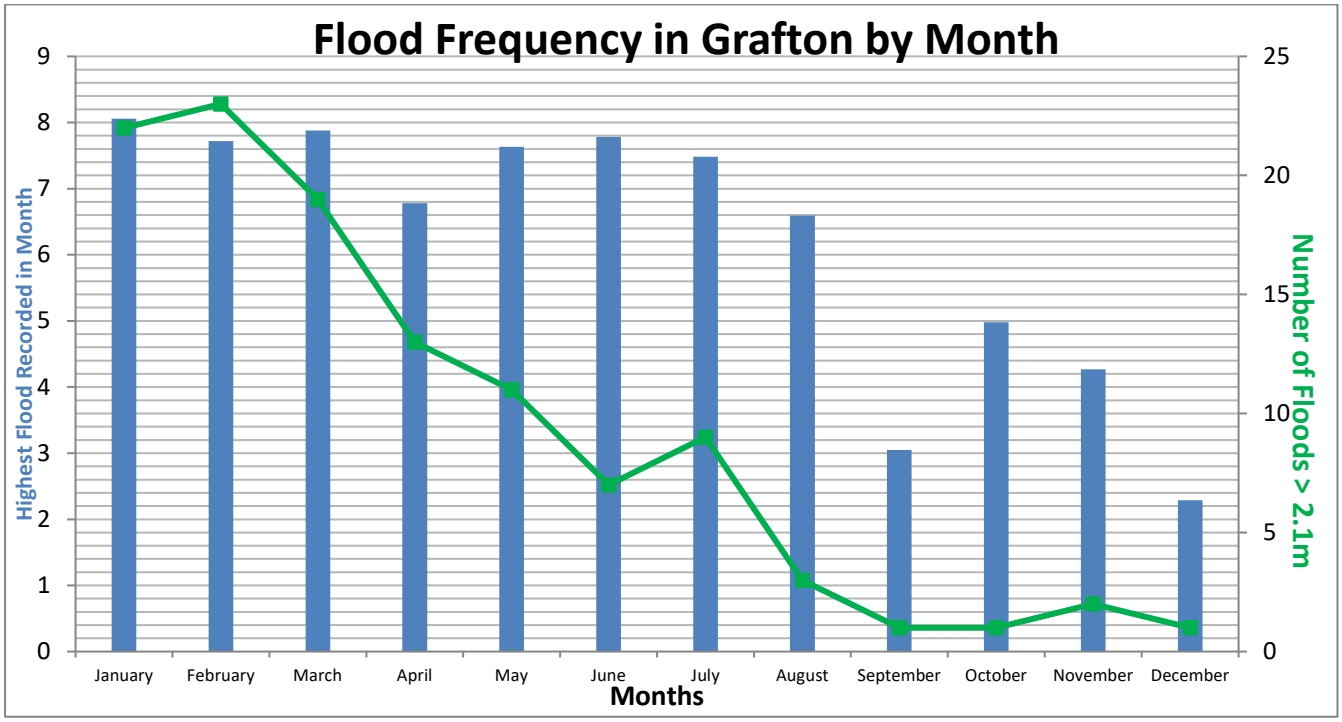


Figure 1: Monthly Distribution of Major Floods in Grafton (8)

1.5 CHARACTERISTICS OF FLOODING

a. Flooding often occurs as a result of rain which has fallen outside the Council area, and significant contributions to main-river flooding can be made by any of the upper sections of the Clarence River catchment (2).

b. Upstream of Grafton, flooding is usually confined to very small areas of floodplain in the immediate vicinity of stream channels and lasts for relatively short periods (2).

c. In the vicinity and downstream of Grafton, including the Carrs Island and Bakers Swamp areas, Southgate, Lower Southgate and the Everlasting Swamp, extensive areas of flat, swampy ground are liable to inundation when the Clarence River breaks its banks. This is the most significant flood regime within the area. The flooding is at its worst when backwater flow fills Bakers Swamp from the east, though local rain may also cause problems in this area. Flooding in the area can also be exacerbated when flood drainage is retarded, for example when oceanic storm surge conditions exist along the coast (2).

d. Maclean Area: Above Palmers Island, the severity of floodplain inundation is controlled primarily by the magnitude of Clarence River flows from catchments above Grafton. When flooding occurs within the LGA, natural riverside levees give partial protection to low-lying alluvial areas behind them. Backwater flows up tributary streams spill into the swamps behind the levees, eventually creating flooding of usually dry land. Inundation periods can last for some weeks, the natural levees acting to inhibit drainage (2).

e. Near the coast, unusually high tides can produce inundation of land which is usually dry. Thunderstorm activity, especially when it occurs in conjunction with such tides, can produce significant local ponding in Iluka and Yamba (2).

f. Between Palmers Island and the river's mouth there is an increasing influence of ocean storm tide conditions and peak flood levels at Yamba are dictated almost entirely by ocean storm tides. Storm activity over and off the coastline normally brings flood-producing rains over the land mass, with peak catchment runoff flows occurring sometime after the storm activity itself (2).

g. Refer to the River Basin Schematic in Annex 1.

Peak height flow times

h. Partly because of variations in flood levels on different tributary streams within the catchment, travel times of flood peaks can vary significantly from flood to flood. The times listed below need to be regarded, therefore, as approximations only. Particularly in periods of very severe flooding, it should be noted that flow times may be shorter than shown here. Equally, situations in which large volumes of water suddenly enter a low-flowing river tend to produce much faster flows than situations in which the inflow is gradual. Indicative flood travel times recorded are shown in Table 2 and Table 3 below (2).

Table 2: Indicative Flow Travel Time for the Clarence River for Grafton and Maclean (2)

Between Gauges	Travel Time
Tabulam to Grafton	16 - 20 hours
Towgan Grange to Grafton	6 - 14 hours
Lilydale to Grafton	4 -13 hours
Glenreagh to Grafton	12 - 18 hours
Grafton to Ulmarra	2 - 3 hours
Grafton to Maclean	6 - 24 hours

i. Flow times from Grafton to Maclean can be very variable, depending largely on ocean conditions and tidal influences. Times as far apart as 6 and 24 hours have been recorded (2).

Table 3: Indicative Flow Travel Time for the Clarence River for Tabulam to Baryulgil (2)

Locations	Travel Time
Tabulam to Baryulgil	7 hours
Nymboida to Buccarumbi (Nymboida River)	2 hours
Buccarumbi to Jackadgery (Nymboida and Mann Rivers)	4 hours
Jackadgery to Towgan Grange (Mann and Clarence Rivers)	12 hours
Baryulgil to Towgan Grange	7 hours
Towgan Grange to Copmanhurst	4 hours
Glenreagh to Coutts Crossing (Orana River)	10 hours
Coutts Crossing to Grafton (Orara River and the Clarence River)	4 hours
Copmanhurst to Grafton	4 hours
Grafton to Ulmarra	3 hours
Ulmarra to Brushgrove	3 hours

Flood design heights

j. Gauge heights for various gauges along the Clarence River are shown for a range of design flood levels in Table 4.

Table 4: Clarence River design flood levels (9) (10) (11)

Predicted Flood Frequency	Grafton Gauge 204400-58178 Height (m)	Maclean Gauge 204410-558022 Height (m)	Wooli Gauge 205463 - 558060 Height (m)	Ulmarra Gauge 204480-58188 Height (m)	Brushgrove Gauge 204406-558027 Height (m)	Lawrence Gauge 204409 Height (m)	Glenreagh Gauge 204907-59123 Height (m)	Iluka Gauge Height (m)
20% AEP	6.27	2.41	-	5.08	4.24	3.51	9.28	1.1
5% AEP	8.11	3.18	2.28	6.15	5.14	4.65	11.26	2.0
2% AEP	8.38	3.41	-	6.38	5.40	4.89	-	2.2
1% AEP	8.44	3.55	2.75	6.42	5.66	5.14	12.03	2.5
0.5% AEP	8.87	3.98	-	6.77	6.35	5.81	13.68	-
Extreme (e.g. 3.0 x 1% AEP)	13.58	8.56	4.44	12.71	12.50	12.10	14.85	3.5

- Note: Glenreagh gauge (204907-59123) is the forecast gauge however all reports have referenced Glenreagh DWR (204906-559066). A conversion of (DWR x 0.75 + 0.31) has been applied to relate all heights to the forecast gauge.

1.6 FLOOD HISTORY

a. Numerous flood events, some of them very severe, have been recorded at Grafton since records were first kept in 1839. Floods which have exceeded the present 'major flood' level (5.4 m at the Grafton (Prince Street) gauge (204400-58178) as shown in Figure 2). Some of the values are approximations, but the records since 1945 are considered to be accurate. These are compared to Copmanhurst (204903-058181) and Ulmarra (204480-58188) gauges (2).

b. Figure 2 highlights the irregularity of serious flood events on the lower Clarence River. Several bad floods may occur in a short period of time, as was the case in the periods 1887-93, 1946-54 and 1963-76, but equally there may be long periods in which few if any serious floods are experienced (for example, between 1893 and 1945). The same irregularity applies for floods of lesser significance (2).

c. On average, however, the major flood level has been reached at Grafton about once every two years over the past half century. This can be taken as roughly indicative of the frequency of significant flooding in areas below the village of Copmanhurst. At the village, a flood reaching or exceeding 20.0 m occurs, on average, once every 10-15 years (2).

Grafton

d. The worst flood ever recorded in the Clarence Valley Council area since the beginning of European settlement was the flood of March 1890, when flood waters stretched from Grafton to Junction Hill and covered the whole of the Southgate-Everlasting Swamp area. This flood occurred prior to the levee being built and would be significantly different if this flood were to occur today.

e. The highest flood (i.e. higher than 1890) was recorded in January 2013, reaching 8.08m at the Grafton (Prince Street) gauge (204400-58178). The consequences of this flood in Grafton were much less than that of 1890 due to the protection of the town by the levee. If this flood was to occur today it would reach approximately 8.4 m (12).

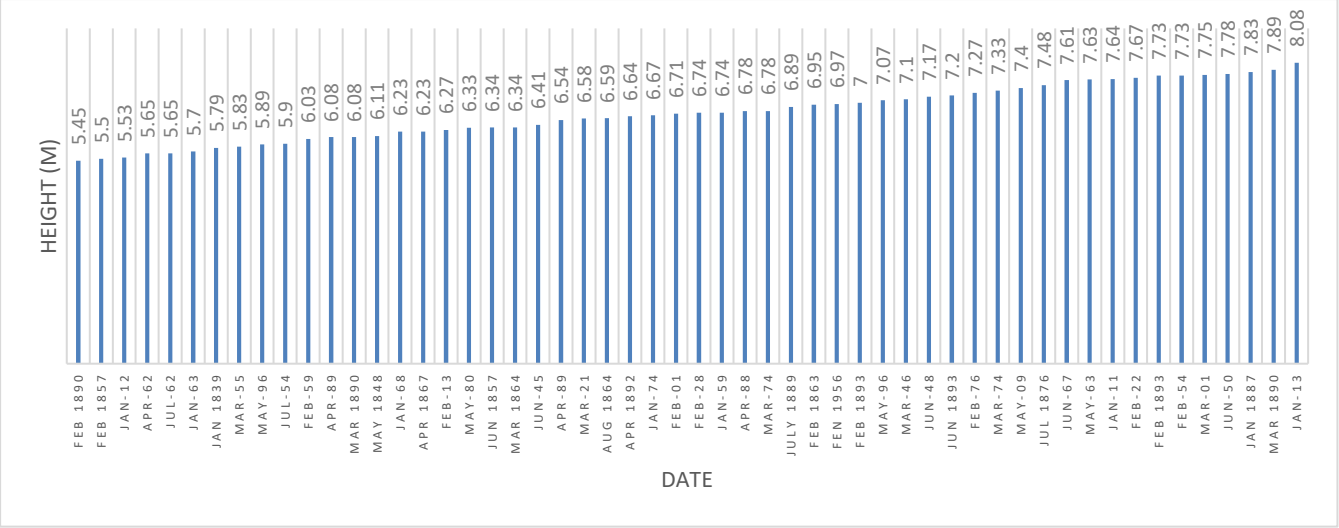


Figure 2: Flood history for Grafton Prince Street Gauge (204400 – 58178) – flood above Major (5.4m) (11)

Ulmarra

f. On average the record of the past 50 years suggests that a flood reaching or exceeding the 'major flood' level of 4.9 m at Ulmarra occurs once every three or four years. Floods exceeding the 'minor flood' level of 2.1 m at Ulmarra occur, on average, every one or two years (2).

g. The worst floods ever recorded at Ulmarra since the beginning of European settlement were the floods of 2022, 2013, 2011, 2001, 1950 and 1967 (2).

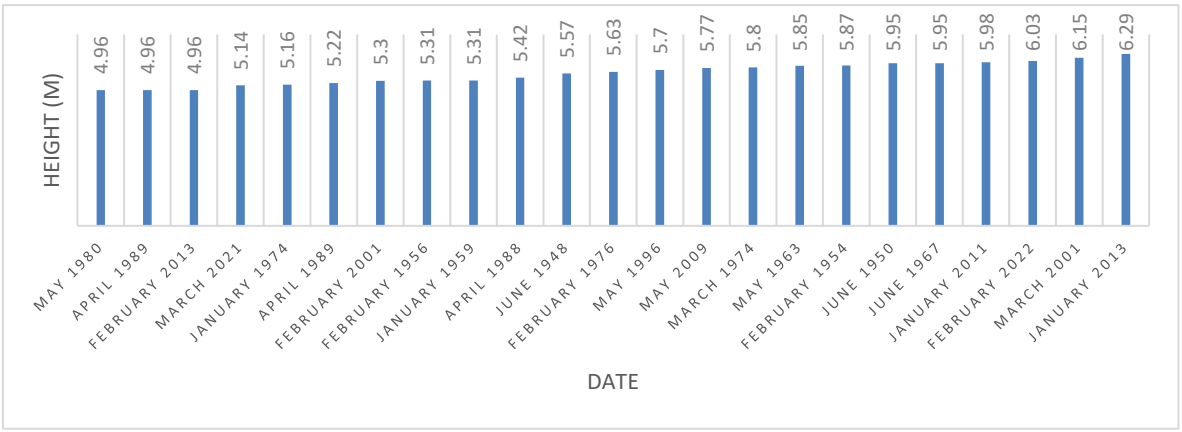


Figure 3: Flood history for Ulmarra Gauge (204480 -58188) – flood above Major (4.9m) (11)

Glenreagh

h. In March/April 2009, the most recent significant flood level was recorded since the start of the Glenreagh Gauge (204907-591123) (1972), in the Orara Valley. While this event was significant in many respects, anecdotal evidence, through discussions with local residents, note that the 1950 flood was significantly larger than the 2009 event.

One of the largest floods in the valley occurred on 24 June 1950, when 502 mm was recorded at the Aurania rainfall gauge in a single day and 916 mm fell from 18 to 25 June (3). Floods that are recorded as reaching heights above the major flood level height (10m) at the Glenreagh Bridge gauge (204907-59123) include:

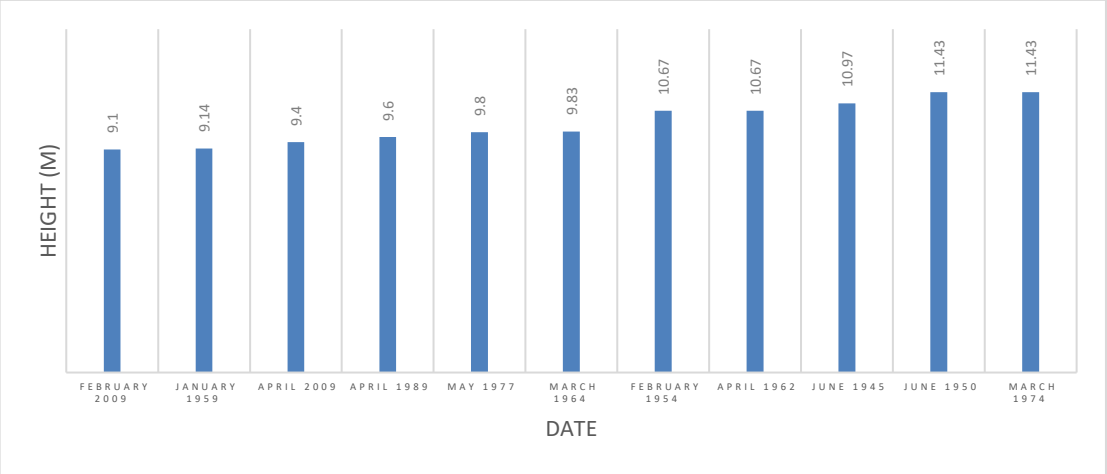


Figure 4: Flood history for Glenreagh Bridge (Orara River) Gauge (204907-59123) – flood above 9m. (11)

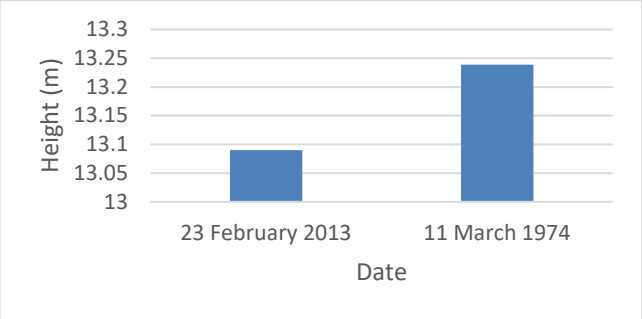


Figure 5: Flood history for Glenreagh (DWR TM) Gauge (204906-559066) – flood above Major (13m) (11)

Coutts Crossing

i. Below is a list of flood peaks recorded on the Orara River at Coutts Crossing since 1950, for floods exceeding the current 'moderate flood' threshold of 9.0 m, and major floods are represented in red. The information for Coutts Crossing however, is incomplete, with some floods during the 1970s having been excluded from the record (2).

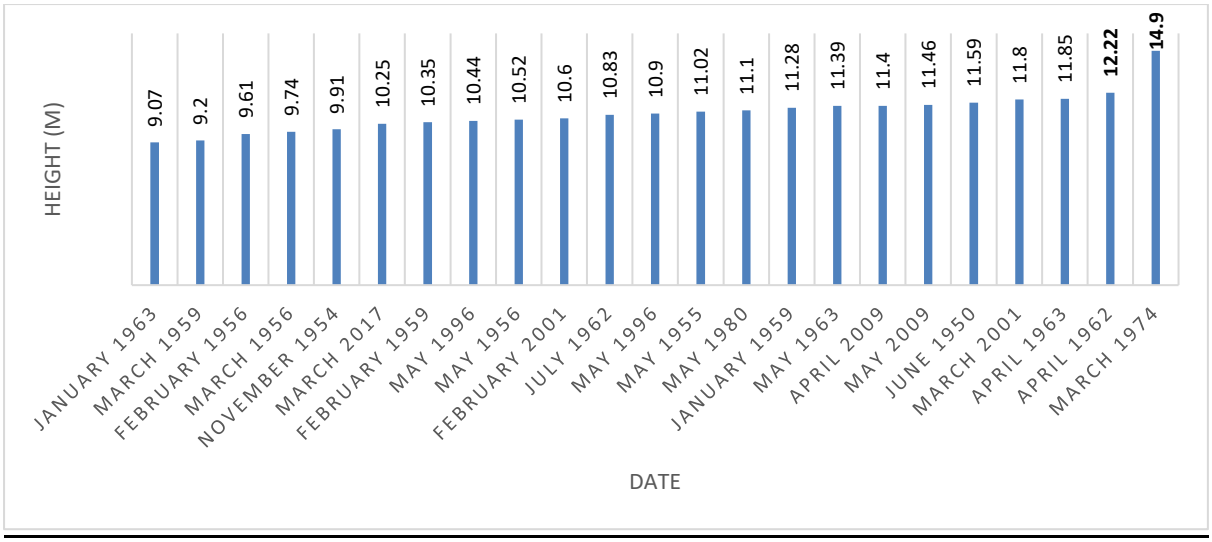


Figure 6: Flood history for Coutts Crossing Gauge (204909-558030) – including floods above Moderate (9m) and Major (12m) (13)

Other locations

j. The following tables summarise the peak heights on the Clarence River at Copmanhurst (upstream of Grafton) and Maclean (downstream of Grafton), where there is a long history of flooding.

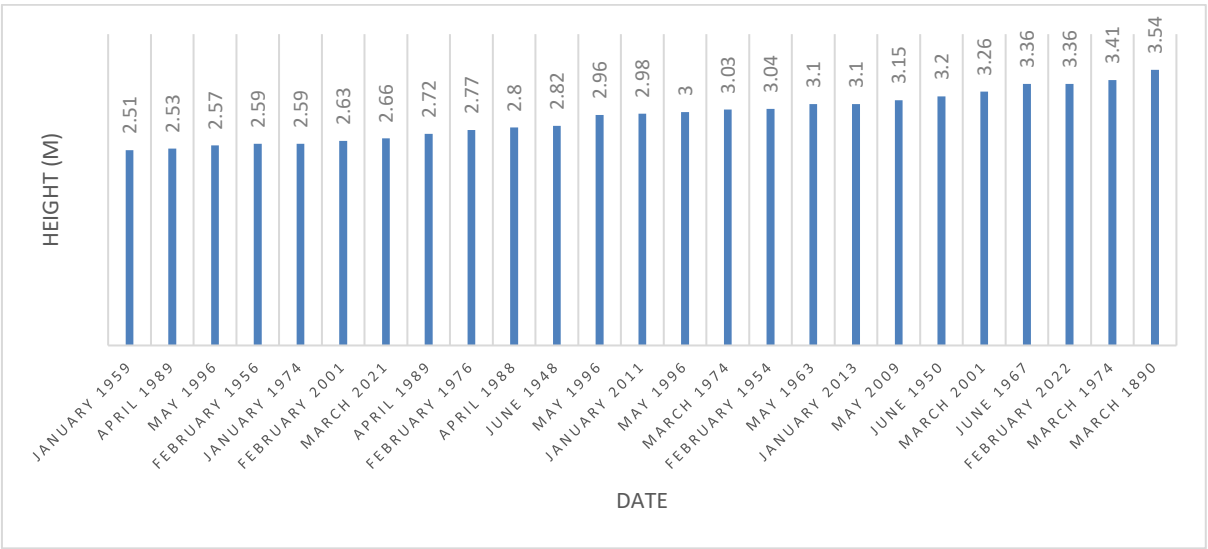


Figure 7: Flood history for Maclean Gauge (204410-558022) – flood above Major (2.5m) (13) (11)

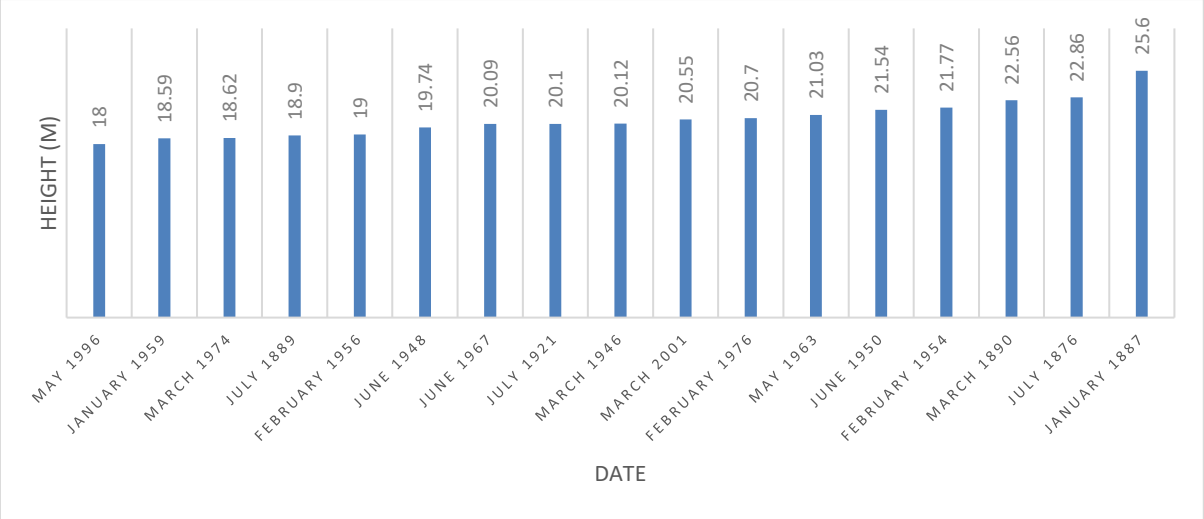


Figure 8: Flood history for Copmanhurst Gauge (204903-58181) – flood above Major (18m) (13)

1.7 FLOOD MITIGATION SYSTEMS

a. The levees are shown on the relevant town maps at the end of this plan.

b. Clarence Valley Council area has a number of mitigation works in place that aid in reducing the severity of flooding. These are explained under the headings Levees and Other Mitigation Systems and separated into their specific areas (2). It is important to note that levees are susceptible to failure for a variety of reasons, with identified historical occurrences of pipe and floodgate failures, slumping and sand boils.

c. Levees in Grafton and South Grafton may cause normal flood levels to be slightly higher in the Copmanhurst area upstream of Grafton. Downstream levels will be slightly lower (2). Further details are available in each community in Section 2 of this Volume 2 of the local flood plan.

Other flood mitigation works.

d. Rural flood mitigation works in the council area are confined to drainage works, floodgates and minor levees in the Southgate area and the Everlasting Swamp. These have reduced the frequency of flooding and sped up the after-flood drainage but they are not designed to keep out all floods. Large areas still experience inundation, as happened in 1996, 2001, 2011 and 2022 (11) (2).

e. There are no significant flood mitigation works on the Orara River or on the minor coastal streams, except for training walls at the mouth of the Wooli River (2).

1.8 EXTREME FLOODING

a. Floods larger than those experienced by the present residents of Grafton and the Clarence Valley should be regarded as inevitable (2).

b. At Grafton, the extreme flood is simulated to be 13.58 m at the Grafton (Prince Street) gauge (204400-58178) (11). It is expected that in such a flood, the flood would discharge approximately 20,000 cubic m per second (2).

c. The extreme flood in Grafton, Maclean, Copmanhurst and Ulmarra areas would cause severe flooding in the town as well as on the islands, in the villages and in the rural areas (2). Major overtopping of all levees would occur and the velocity and depth of flood water would be very high (2).

d. Extreme flood heights for the Maclean (204410-558022) and Ulmarra (204480-58188) gauges are 8.56m and 12.71m respectively (11). Major overtopping of the all levees (levee height 5.9m in Ulmarra and 3.3m in Maclean (13)) would occur and the velocity of flood water would be very high (9).

1.9 COASTAL EROSION

a. The most severe problems of coastal erosion occur as a result of oceanic storm conditions associated with the passage of ex-tropical cyclones and east coast low-pressure systems. These storms may cause temporary sea level rises with large associated waves. The worst erosion is likely when severe weather conditions occur in conjunction with unusually high tides (2).

b. The main areas identified as experiencing bank erosion can be summarised as:

- Clarence River entrance - Although the majority of the banks within lower estuary within the study area are protected with rock revetment/ training walls.
- Lake Cakora (Brooms Head)
- Sandon River
- Wooli Wooli River

Specific risk areas for coastal erosion can be found in Section 2.15.

Other areas

It's important to note that Slope instability is the critical issue for the Yamba coastline particularly the areas backing Main Beach and Convent Beach. Pilot Hill, Pippi Beach and Cakora Point were the areas considered to be at highest risk of slope instability/landslip in the first-pass risk assessment conducted by Hydrosphere Consulting in 2021 (14).

2 EFFECTS ON THE COMMUNITY

2.1 COMMUNITY PROFILE

a. Clarence Valley Council area is made up of a number of communities that can be affected in a flood. These include:

1. **Grafton Sector -** Grafton, Alumy Creek, Carrs Creek, Carrs Island, Carrs Peninsula, Eatonsville, Great Marlow, Junction Hill, North Grafton, Seelands, South Grafton, Southampton, Waterview and Waterview Heights.
2. **Copmanhurst Sector –** Baryulgil, Malabugilmah, Barretts Creek, Coaldale, Copmanhurst, Fine Flower, Gordonbrook, Koolkhan, Moleville Creek, Mountain View, Trenayr, Lilydale.
3. **Lawrence Southgate Sector -** Ashby, Ashby Heights, Ashby Island, Lawrence, Southgate, Lower Southgate, Tullymorgan and Woodford Island.
4. **Ulmarra Cowper Sector -** Clarenza, Calliope, Coldstream, Gillett's Ridge, Swan Creek, Tucabia and Ulmarra, Cowper
5. **Brushgrove Sector -** Brushgrove and Ilarwill.
6. **Maclean Sector -** Maclean, and Taloumbi, it also includes the villages of, South Arm, Shark Creek, Tyndale and extensive rural areas.
7. **Iluka Sector -** Iluka, Mororo, The Freshwater, Woody Head, Goodwood Chatsworth, Harwood, and Woombah.
8. **Yamba Sector -** Yamba, Angourie, Wooloweyah Palmers Channel and Palmers Island.
9. **Sandon Sector -** Bookram, Brooms Head, Sandon and Sandon River Village.
10. **Wooli Sector -** Calamia, Diggers Camp, Minnie Water, Pillar Valley, Sandy Crossing and Wooli.
11. **Cangai Sector -** Cangai, Carnham, Coombadjha, and Jackadgery.
12. **Coutts Crossing Sector -** Blaxlands, Flat/Creek, Billy's Creek, Braunstone, Buccarumbi, Chambigne, Clouds Creek, Coutts Crossing, Dundurrabin, Elland, Kangaroo Creek, Lanitza, Levenstrath, Lower Kangaroo Creek, McPherson Crossing, Middle Creek, Moonpar, Nymboida, Shannondale, Towallum, and Tyringham.
13. **Glenreagh Sector -** Glenreagh, Kremnos, Kungala and Wells Crossing.

b. Table 5, shows the 2021 Census 'usual resident' counts for key statistics for the Clarence Valley Local Government Area. Note these vary slightly from the Sector areas due to census data availability.

Table 5: Census of Housing and Population data (2021)

Census Description	LGA	Grafton	Copmanhurst	Lawrence	Ulmarra
Total Persons	**54,180**	**19,255**	**344**	**1,159**	**749**
Aged 0-4 yrs	2,578	1,122	16	68	32
Aged 5-14 yrs	6,073	2,508	50	121	92
Aged 65 + yrs	14,829	4,730	85	386	233
Of Indigenous Origin	4,391	2,010	31	83	54
Who do not speak English well	82	43	0	0	0
Have a need for assistance (profound/severe disability)	4,580	1,866	33	95	80
Living alone (Total)	6,054	2,508	40	105	78
Living alone (Aged 65+)	3,357	1,336	13	64	26
Residing in caravans, cabins or houseboats or improvised dwellings	577	77	0	0	0
Occupied Private Dwellings (Households)	**20,923**	**7,616**	**136**	**464**	**289**
No Motor Vehicle	994	580	0	10	15
Caravan, cabin, houseboat or improvised dwell	389	64	0	0	0
Rented via State or Housing Authority	297	256	0	0	0
Rented via Housing Co-Op or Community Church Group	219	137	0	0	3
Unoccupied Private Dwellings	**3,211**	**584**	**11**	**35**	**25**
Average persons per occup dwelling	**2.3**	**2.3**	**2.3**	**2.4**	**2.4**
Average vehicles per occup dwelling	**1.9**	**1.7**	**1.8**	**2**	**1.9**

Census Description	Brushgrove	Maclean	Iluka	Yamba	Wooli
Total Persons	**181**	**2,778**	**1,764**	**6,405**	**503**
Aged 0-4 yrs	7	130	49	254	16
Aged 5-14 yrs	8	259	125	576	34
Aged 65 + yrs	72	1,006	783	2,406	209
Of Indigenous Origin	12	283	56	289	3
Who do not speak English well	0	4	0	0	0
Have a need for assistance (profound/severe disability)	23	381	181	523	45
Living alone (Total)	26	388	308	875	94
Living alone (Aged 65+)	19	227	201	577	54
Residing in caravans, cabins or houseboats or improvised dwellings	0	14	113	36	82
Occupied Private Dwellings (Households)	**84**	**1,127**	**852**	**2,784**	**242**
No Motor Vehicle	4	73	49	136	5
Caravan, cabin, houseboat or improvised dwell	0	15	68	22	55
Rented via State or Housing Authority	0	14	0	17	0
Rented via Housing Co-Op or Community Church Group	0	36	0	32	3
Unoccupied Private Dwellings	**13**	**111**	**305**	**860**	**159**
Average persons per occup dwelling	**2**	**2.1**	**1.9**	**2.1**	**1.9**
Average vehicles per occup dwelling	**2**	**1.6**	**1.6**	**1.6**	**1.7**

Census Description	Cangai	Coutts Crossing	Glenreagh	Angourie
Total Persons	**166**	**1,053**	**1,005**	**192**
Aged 0-4 yrs	0	58	79	6
Aged 5-14 yrs	23	150	152	14
Aged 65 + yrs	29	244	185	84
Of Indigenous Origin	26	83	109	7
Who do not speak English well	4	0	0	0
Have a need for assistance (profound/severe disability)	8	74	60	8
Living alone (Total)	5	92	53	19
Living alone (Aged 65+)	4	41	31	4
Residing in caravans, cabins or houseboats or improvised dwellings	6	0	6	7
Occupied Private Dwellings (Households)	**8**	**391**	**309**	**81**
No Motor Vehicle	0	0	5	0
Caravan, cabin, houseboat or improvised dwell	0	0	0	3
Rented via State or Housing Authority	0	0	0	0
Rented via Housing Co-Op or Community Church Group	0	0	0	0
Unoccupied Private Dwellings	**6**	**17**	**18**	**77**
Average persons per occup dwelling	**2**	**2.6**	**2.8**	**2.3**
Average vehicles per occup dwelling	**2.3**	**2.1**	**2.2**	**1.8**

Census Description	Brooms Head	Gulmarrad	Tucabia	Waterview Heights	Wooloweyah
Total Persons	**271**	**1,950**	**354**	**1,364**	**419**
Aged 0-4 yrs	11	91	8	63	15
Aged 5-14 yrs	17	248	35	166	46
Aged 65 + yrs	97	540	104	341	87
Of Indigenous Origin	13	57	27	72	10
Who do not speak English well	0	0	0	0	0
Have a need for assistance (profound/severe disability)	19	119	31	102	10
Living alone (Total)	54	70	36	63	38
Living alone (Aged 65+)	25	36	21	43	16
Residing in caravans, cabins or houseboats or improvised dwellings	15	12	0	0	3
Occupied Private Dwellings (Households)	**118**	**696**	**150**	**473**	**160**
No Motor Vehicle	7	6	5	0	5
Caravan, cabin, houseboat or improvised dwell	9	4	0	0	0
Rented via State or Housing Authority	0	0	0	0	0
Rented via Housing Co-Op or Community Church Group	0	0	0	0	0
Unoccupied Private Dwellings	**98**	**32**	**20**	**30**	**23**
Average persons per occup dwelling	**2**	**2.7**	**2.2**	**2.7**	**2.4**
Average vehicles per occup dwelling	**1.8**	**2.3**	**2.1**	**2.5**	**2.2**

SPECIFIC RISK AREAS - FLOOD

2.2 GRAFTON SECTOR

Grafton and South Grafton

2.2.1 Community Overview

a. Grafton is the main urban centre in the Clarence Valley, located on the Clarence River. Population and dwelling figures below are for the entire sector.

Population	**22326**
Dwellings	**10188**

b. The population of Grafton City is over 19 000 (15).

c. **Grafton** has 18.9% of the population under 15 years of age and 24.5 % over 65. It has 10.4% indigenous population.

d. **South Grafton** has 21.2% of the population under 15 years of age and 21.2% over 65. It has 14% indigenous population (15).

e. **Junction Hill** is located 10 km north of Grafton on the Clarence River on Summerland Way. The population of Junction Hill is over 1500 (15). It has 18.6% of the population under 15 years of age and 29.6% over 65. It has 5.8% indigenous population.

f. A summary of demographics is shown in Table 5.

2.2.2 Characteristics of flooding

a. Grafton can expect three different kinds of flood regimes, which will have very different impacts on the community. These are:

   i. Outside-levee floods: these will occur frequently, probably in most years. They will affect farm properties, a small number of dwellings, and some business premises and recreational facilities (2).

   ii. Stormwater ponding within urban areas: these can be expected to occur less frequently but will affect low-lying areas within Grafton and South Grafton, usually for only short periods of time unless the Clarence River is in flood at the same time. Stormwater flooding can flood areas of Grafton as happened during the flood of March 1974 when several houses experienced over-floor inundation. Large areas to the south-east of Queen Street can experience inundation as a result of a severe storm, as can properties along the banks of Alumy Creek. Parts of the Central Business District can be affected, including the

Crossroads at the intersection of Bent Street and Ryan Street, however, the extent and depth of inundation from an extreme storm would be less than would occur from a levee-overtopping flood (2).

iii. Levee-Overtopping and/or breaching floods: these will be rare but may have devastating impacts and will require large-scale evacuations (2).

2.2.3 Flood Behaviour

a. Refer to section 1.5, as well as Table 8 and Table 9 for further information on the levee.

b. Alipou Basin can be flooded due to slowing of drainage of localised rainfall when Clarence River has elevated flood levels. It can also be flooded when the Alipou Basin Levee is overtopped (2).

c. Flood velocities in Alipou Basin are generally less than 1.5 m/s with the average overbank velocities of 0.5 square m/s. Higher velocities would be expected with the overtopping of the Clarenza, Heber Street and Alipou Basin Levees (2).

d. Flooding of Susan Island and the Clarenza area occurs in most floods and backwater flow up Cowans Creek can cause flooding of the South Grafton Common (2).

2.2.4 Classification of Floodplain

a. For emergency management purposes, Grafton Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
486	Grafton Sector C	Prince Street (Grafton)	204400-58178	8	2931	1292	2326	Low Flood Island
487	Grafton Sector B	Prince Street (Grafton)	204400-58178	8	6103	3019	5432	Low Flood Island
488	Grafton Sector A - Dovedale and surrounds	Prince Street (Grafton)	204400-58178	7.8	2091	940	1692	Low Flood Island
489	Sector D - South Grafton	Grafton (Prince st)	204400-58178	8	1004	491	884	Low Flood Island
46489	Grafton Ski Lodge	Grafton (Prince Street)	204400-58178	8	40	19	35	Low Flood Island
46490	Eastonville	Grafton (Prince Street)	204400-58178	8.2				High Flood Island
46491	South Grafton D	Grafton (Prince Street)	204400-58178	7.9	1023	504	907	Rising Road Access
46492	Carrs Island	Grafton (Prince Street)	204400-58178	4.4	50	20	36	Low Flood Island

46493	South Grafton City	Grafton (Prince Street)	204400-58178	8.2	122	58	104	Rising Road Access
46494	South Grafton Alipou	Grafton (Prince Street)	204400-58178	5.4	161	80	144	Low Flood Island
46495	Carrs Creek	Grafton (Prince Street)	204400-58178	7.95	575	243	437	Rising Road Access
46496	Northmeadow	Grafton (Prince Street)	204400-58178	5.45	179	77	139	Low Flood Island
46498	Clarenza	Grafton (Prince Street)	204400-58178	5.4	5	2	2	Low Flood Island
46887	South Grafton	Grafton (Prince Street)	204400-58178	8.2	1823	888	1599	Rising Road Access

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.2.5 Inundation

a. North Grafton and South Grafton utilise the Grafton (Prince Street) (204400-58178) gauge (12).

Table 6: All properties with floors below design flood levels in Grafton sector (17)

All Properties with Floors Below Design Flood Levels						
Suburb	13.58m (PMF)	8.44m (1% AEP)	8.38m (2% AEP)	8.11m (5% AEP)	6.27m (20% AEP)	**Totals**
ALUMY CREEK	36	19	12	9	0	**76**
CARRS CREEK	59	33	14	3	0	**109**
CARRS ISLAND	6	4	4	4	1	**19**
CARRS PENINSULA	6	5	5	4	0	**20**
GRAFTON	4596	2694	1458	32	2	**8782**
GREAT MARLOW	80	22	9	5	0	**116**
JUNCTION HILL	8	1	2	1	0	**12**
SEELANDS	68	24	17	8	0	**117**
SOUTH GRAFTON	566	150	35	16	0	**767**
WATERVIEW	31	11	3	0	0	**45**
WATERVIEW HEIGHTS	3	1	1	1	0	**6**
TOTALS	**5459**	**2964**	**1560**	**83**	**3**	

b. At 6.5 m two houses on Carrs Island are at risk of flooding (previously evacuated in May 1996) (13).

c. At 7.75 m houses outside the levee flood (two in Fitzroy Street and three in Butter Lane, one in Alipou Creek) (13).

d. Refer to Table 8 and Table 9 for levee overtopping consequences and sequence, from around 8 m.

North Grafton

e. Virtually all of Grafton north of the river (approximately 5251 properties and about 11,125 people) is protected by levees and there is little property exposure in most floods. In a flood slightly more severe than the record flood of 1890 (7.89 m), minor overtopping and levee erosion would begin along the southern reaches of the Ulster Lodge Levee between Pound Street and Dobie Street and inundation would occur in the Dovedale area (2).

f. In a flood resulting in the overtopping of the Grafton Levee, dwellings could be affected in the Back Lane, Carr Street, Marlow Street, Summerland Way and Lawrence Road areas between Grafton and Junction Hill. Jacaranda Grove Caravan Park on the Summerland Way could also be flooded. Bakers Swamp could be filled and the Summerland Way closed. Evacuations would be necessary from all these areas (2).

g. Such a flood would also be expected to result in the closure of most roads around Grafton and on the floodplain downstream around Southgate and beyond. Telephone, water supply, power and sewerage services would almost certainly fail and it is possible that large numbers of Grafton would be affected (2).

h. If flow in the river was sufficient to cause levels to continue to rise, overtopping would soon occur along much of the Alice Street Levee (between Turf and Clarence Streets) and eventually along the entire length of the levees including the Pine Street Levee north of North Street. Inundation would continue in Dovedale, where depths of more than three meters would be experienced at some locations. It would also spread to the north and west causing inundation of the Central Business District and large numbers of residential properties (2).

i. Eventually most of Grafton, including Westlawn, would be inundated, though to lesser depths in most areas than in Dovedale. Most of the land between Carr and North Streets and Junction Hill would also be under water (2).

j. Complete inundation of Grafton could occur if overtopping conditions were maintained for as little as ten hours. Complete inundation could occur more quickly (perhaps in as little as four to five hours) in more severe flood events reaching greater heights (2).

South Grafton

k. At around 7m, four dwellings outside the Heber Street Levee can be flooded in Butters Lane and along the Summerland Way. A caravan park (Glenwood) is also flood liable, as are some business and recreational premises (2).

l. A flood exceeding 7.9 m on the Grafton (Prince Street) gauge (204400-58178) would cause minor overtopping of the Heber Street Levee. There would be major overtopping between 7.9 and 8.3 m and approximately 600 properties (1800 occupants) would experience flooding and would have to evacuate. Under such conditions, the Wilsons Hill ('South Grafton Hill') island would still exist (2).

2.2.6 Isolation

a. Junction Hill can be cut off from road access to Grafton as a result of prolonged periods of extremely heavy rainfall. Road cuts can occur due to overflows in the un-named drain north of Butterfactory Lane, and in extreme events the Koolkhan and Deep Gully Creeks. Flood free access is available to the north of the town via the Summerland Way (12).

b. At 4.4 m Carrs Island Bridge is flooded, isolating 5 houses on Carrs Island (13).

c. At 5.8 m water fills a dip in the road in Butters Lane, just outside the Heber Street levee, isolating three houses (13).

d. 5.9 m, the Big River Way closes north of Grafton with a high level by-pass available via Centenary Drive, Clarenza (13).

e. At 7.9 m seventy houses and some other buildings in the Back Lane, Carr Street, Summerland Way and Lawrence Road areas could be isolated, along with the Jacaranda Grove Caravan Park (13).

f. The New Grafton Bridge has additional benefits when it comes to evacuation, particularly during the early stages of evacuation when access may still be available to Big River Way and the Pacific Highway. Furthermore, having a second river crossing provides a level of redundancy should one crossing become compromised (e.g. due to a traffic incident). (18)

g. The new bridge can form a new component to the existing routes but ultimately does not form a new route outright; it still enters south Grafton near the existing route and traffic needs to re-join this existing route to reach the evacuation centre at the South Grafton High School. (18)

h. The following table summarises the timeframes available at various heights before evacuation routes are cut (post levee overtopping, noting that Grafton levee overtopping is approximately 16 hours when the height reaches 8.2m, and 11.7m in an extreme flood (PMF). South Grafton levee is estimated to overtop in 16.7 hours in a 2% AEP event, 16.5 in a 1% AEP and 12.2 in an extreme event (18). It's important to note that these timings may change if the areas within the levees receive high rainfall and localised flash flooding is already occurring.

Table 7: Time (hours) for evacuation routes to be cut after levee overtopping in a range of gauge heights on the Grafton (Prince Street) gauge (204400-58178) (18).

	Evacuation Routes	Hours Before Route Cut					
		8.2m		8.3m		9.7m	
		Post over-topping	Total	Post over-topping	Total	Post over-topping	Total
GRAFTON	Grafton Levee (between Bacon and Powell Street)		15.6 (16.0)		15.4 (16.1)		10.9 (11.7)
	SECTOR A						
	Clarence Street (between Fitzroy and Pound Street)	10.0 (not inundated)	25.6 (not inundated)	6.8 (4.8)	22.2 (20.9)	4.7 (4.0)	15.6 (15.7)
	Clarence Street (between Pound and Hoof St)	5.1 (4.0)	20.7 (20.0)	4.3 (3.2)	19.7 (19.3)	3.8 (3.2)	14.7 (14.9)
	Fitzroy Street	3.6 (2.5)	19.2 (18.4)	3.0 (1.9)	18.4 (18.0)	2.8 (2.0)	13.7 (13.7)
	Pound Street	5.2 (3.0)	20.8 (19.0)	4.0 (2.3)	19.4 (18.4)	3.3 (2.5)	14.2 (14.2)
	Prince Street (between Fitzroy and Pound Street)	7.6 (5.8)	23.2 (21.8)	5.7 (4.3)	21.1 (20.4)	3.9 (3.6)	14.7 (15.3)
	Prince Street (between Pound and Oliver Street)	7.5 (5.6)	23.1 (21.6)	5.6 (4.1)	21.0 (20.2)	3.9 (3.5)	14.7 (15.2)
	Prince Street (between Oliver and Dobie Street)	7.3 (5.8)	22.8 (21.8)	6.1 (4.6)	21.5 (20.7)	5.0 (4.4)	15.9 (16.0)
	Prince Street (between Dobie and Hoof Street)	8.0 (6.2)	23.6 (22.2)	6.5 (5.0)	21.9 (21.1)	5.2 (4.6)	16.1 (16.2)
	New Grafton Bridge Approach	4.0 (-)	19.6 (-)	3.3 (-)	18.7 (-)	3.2 (-)	14.0 (-)
	SECTOR B						
	Oliver Street	8.3 (6.2)	23.9 (22.2)	6.7 (4.5)	22.1 (20.6)	5.3 (4.0)	16.2 (15.7)
	Dobie Street	9.7 (7.1)	25.3 (23.1)	7.5 (5.7)	22.9 (21.8)	5.7 (5.0)	16.6 (16.7)
	Turf Street	not inundated (17.6)	not inundated (33.6)	19.9 (13.2)	35.3 (29.3)	8.0 (6.8)	18.9 (18.5)
	SECTOR C						
	Cranworth Street	14.0 (10.8)	29.6 (26.8)	12.7 (9.6)	28.1 (25.7)	7.4 (7.4)	18.3 (19.0)
SOUTH GRAFTON	South Grafton Levee		16.7 (16.7)		16.2 (16.5)		11.2 (12.2)
	SECTOR D						
	Grafton Bridge Southern Approach	not inundated (-)	not inundated (-)	12.5 (14.5)	28.7 (30.6)	-1.7 (6.6)	9.5 (18.3)
	Bent Street	not inundated (-)	not inundated (-)	11.7 (11.1)	27.9 (27.2)	-4.3 (6.6)	6.9 (18.2)
	Southern Approach (Iolanthe Street)	not inundated (-)	not inundated (-)	13.3 (-)	29.5 (-)	-0.9 (-)	10.3 (-)

Evacuation Routes	Hours Before Route Cut					
	8.2m		8.3m		9.7m	
	Post over-topping	Total	Post over-topping	Total	Post over-topping	Total
Big River Way 1	not inundated (-)	not inundated (-)	5.2 (-)	21.3 (-)	2.4 (-)	13.6 (-)
Big River Way 2	not inundated (-)	not inundated (-)	7.9 (-)	24.0 (-)	-0.6 (-)	10.7 (-)
Charles Street	not inundated (-)	not inundated (-)	11.7 (-)	27.8 (-)	-4.8 (-)	6.4 (-)

Inundation is defined to be a depth greater than 0.1m
'Total'= time from flood reaching Prince Street Gauge Major Flood Classification: 5.4mAHD
Values from previous assessment (BMT WBM, 2014) shown in brackets.

2.2.7 Flood Mitigation Systems

a. **North Grafton.** The existing levees at North Grafton consist of a combination of compacted fill embankments and concrete retaining walls. There are seven sections comprising 21 km around Grafton, protecting more than 3500 properties including residential and commercial areas and key infrastructure. In 2013 the levee was considered to be in a reasonable condition, with the exception of issues such as trees, erosion, drainage pipes and closure mechanisms. It was originally constructed in 1972 based on the 1890 and 1967 flood events. Since then, additional areas were added such as Dovedale. The current accepted safe flood height by council is 7.9-8.0m at the Grafton Prince Street gauge (204400-58178), however the freeboard level is not known (19). Details for each section of the levee is summarised in Table 8. In a flood of 8.2 m there is an estimated 16 hours prior to the levee overtopping, between Bacon and Powell Street. In a larger event (9.7 m) this is estimated to decrease to 11.7 hours (20).

b. In a flood of 8.2 m there is an estimated 16 hours prior to the levee overtopping, between Bacon and Powell Street. In a larger event (9.7 m) this is estimated to decrease to 11.7 hours (20).

c. **South Grafton.** The existing levees at South Grafton consist of a combination of compacted fill embankments and concrete levees. There are eight sections comprising 17 km around South Grafton and south of the Clarence River, protecting approximately 921 properties. Overtopping of the South Grafton Levee initiates west of the Gwydir Highway on the Waterview levee between Waterview and Seelands drain floodgates. The levee flood design was based on the 1890 and 1967 flood events, and was built in 1997, with the capacity of around 7.9-8.3m. Current freeboard is unknown, however the current accepted safe flood height by Council is 8.2 m (21; 12; 22). The levee system was determined to be in a sound condition by the Town Levee Audit conducted by the NSW Department of Public Works in 2014, apart from Westlawn levee in North Grafton and Urban and Heber Street levees in South Grafton

which show evidence of localised erosion and slips, slumping, cracking and scouring which will affect the heights to which the levees are overtopped or breached (2). Details for each section of the levee is summarised in Table 10. South Grafton levee is estimated to overtop in 16.7 hours in a 2% AEP event, 16.5 in a 1% AEP and 12.2 in an extreme event (20).

d. As the main 1% AEP Clarence River inflow has increased, this increases the flood levels along the Clarence River between the upstream limit of the model and Grafton. This causes additional overtopping of the levees, with most of the additional volume spilling into the South Grafton common area. As a result, parts of South Grafton Common see the largest increase in peak 1% AEP flood level of up to 2m. This is also partially attributed to the accounting of local rainfall within the South Grafton Common area which was previously not included. (11)

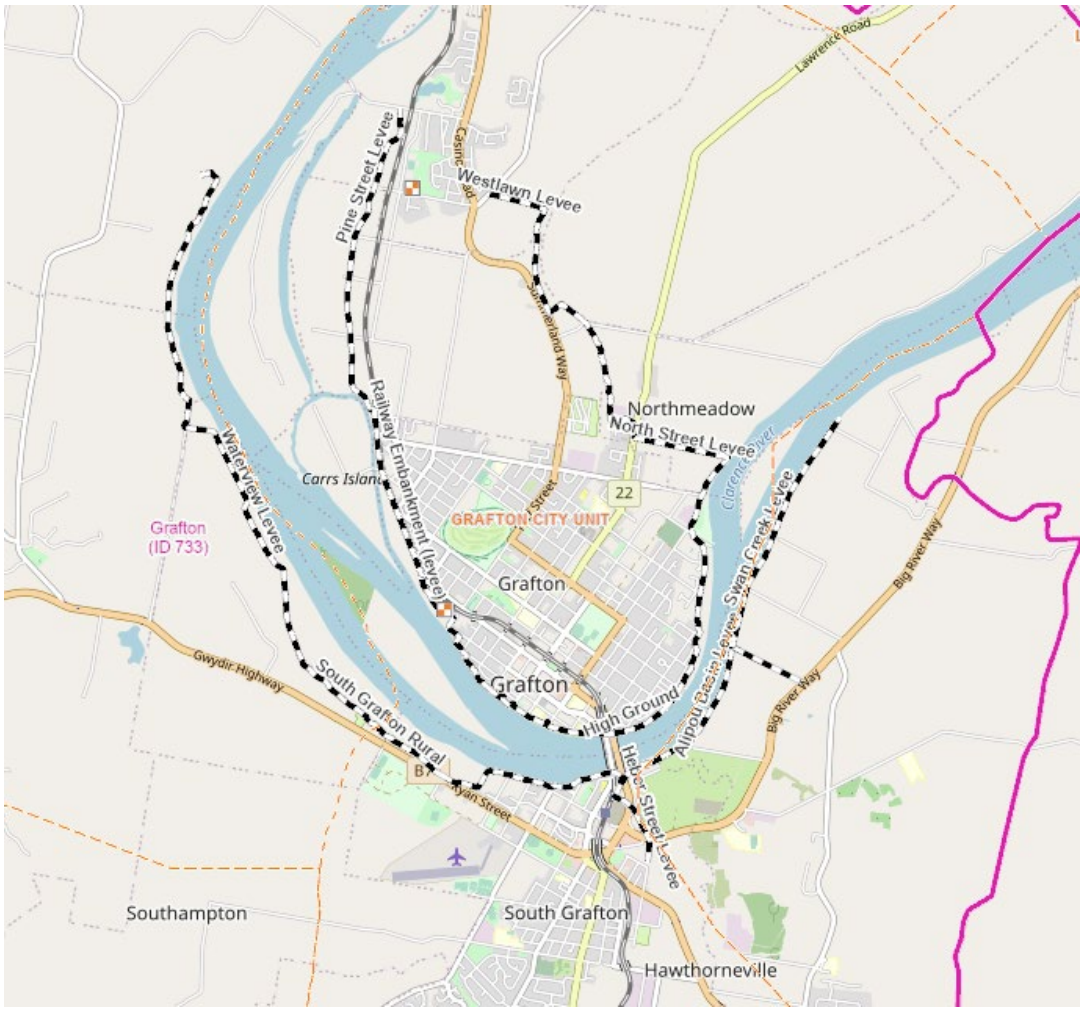


Figure 9: Grafton Levee system (23)

2.2.8 Dams

a. Refer to Section 1.3.

2.2.9 At Risk Facilities

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

2.2.10 Other Considerations

a. Historically rates of evacuation in Grafton are low.

b. Grafton has three peak seasons with potential for a 10% population increase:

   i. July Race Carnival – early July

   ii. Jacaranda Festival – late October / early November

   iii. Bridge to Bridge Ski Race – October long weekend.

Table 8: Levees in North Grafton; summary of information, from left to right in order of overtopping. All levees are part of a system owned by Clarence Valley Council, parallel to the Clarence River (19).

North Grafton Levees	Great Marlow	Trenayr	Grafton	Alice Street	Pine Street	Westlawn	North Street
Location	A rural earthen levee extends in a south easterly direction for about 1.7 km to the eastern end of North Street, east of Grafton towards Great Marlow Road.	Joins the Westlawn levee to the north of Grafton.	Located at the end of North Street and hugs the Clarence River for 3.1 km up to the old Grafton Bridge and then runs in a north-westerly direction for about 1.5 km to the south west end of Queen Street. It is the concrete section of the levee.	Begins at the south west end of Queen Street and runs in a north-north westerly direction for 1.4 km to where the levee ends.	Begins slightly south of North Street and runs alongside Pine Street along the Clarence River.	Starts at the North West end of Butterfactory Lane and runs along Alumy Creek in a northerly direction for 1.5 km, where it extends west for another 0.3 km.	Runs from the north end of Queen Street (approximately 0.5 km north of North Street) in an easterly direction for about 1.1 km where it joins the Great Marlow Levee.
Overtopping Height (204400-58178)	Approximately 5.45 m	Approximately 8.0 m	8.0 m The urbanised portions of the council area have a levee crest height.	8.2 m	8.3 m	8.3 m	8.3 m
Location and sequence of inundation	n/a	n/a	Overtopping initiates at Fry Street and Kirchner Street on Grafton Street around 7.9 m – properties are at risk including	The height of the low point of the levee is between 8.1 and 8.4 m AHD where the levee is located at the end of Turf Street. This is a similar height	Flood waters pond behind the North Coast Railway line north of Grafton and then overtops at 8.26 m. The flood water from the Clarence River	n/a	n/a

North Grafton Levees	Great Marlow	Trenayr	Grafton	Alice Street	Pine Street	Westlawn	North Street
			Summerland Way, between Grafton and Junction Hill, east of Clarence and north of Oliver Street. At 7.9 m on the Grafton, Prince Street gauge (204400-58178) there is approximately 15.5 hours to overtopping. At 7.9 m on the Prince Street gauge there is only minimal overtopping at the low points on the levee. At an 8.2 m height at the Prince Street gauge and an 8.3 m Prince Street gauge there is approximately 14 and 13.5 hours from the major flood level until there is major overtopping at low	at that point (Grafton, Prince Street Gauge (204400-58178); 7.9 m).	flows east and fills low land north of Grafton		

North Grafton Levees	Great Marlow	Trenayr	Grafton	Alice Street	Pine Street	Westlawn	North Street
			points on the levee respectively.				
Consequences of levee overtopping or failure	Fills the rural area and heads towards Southgate Village, resulting in inundation of the village.	Overtopping of this levee results in rural land inundation and the flooding is subsequently prevented from entering North Grafton by the Westlawn Levee	Inundation of up to 3500 properties, including Alice Street levee.	Inundates CBD area, up to 3500 properties, including the Grafton levee.	Water fills Carrs Creek/Bakers Street area causing flooding in the northern areas of the town in Westlawn and cutting of the town between Junction Hill and Grafton.	Flows enter Alumy Creek and also head to the west filling low lands north of Grafton. Fills Alumy Creek and may head west filling low lying land north of Grafton.	Flows enter Alumy Creek and also head to the west filling low lands north of Grafton.

Table 9: Levees in South Grafton; summary of information, from left to right in order of overtopping. All levees are part of a system owned by Clarence Valley Council

South Grafton Levees	Swan Creek	Clarenza	Alipou Basin	Waterview	Heber Street	South Grafton Rural	Old South Grafton	South Grafton Urban
Location	A low level levee that joins Alipou Basin Levee and Clarenza Levee to the east.	Located north of Alipou Creek and runs to the Clarence River from the Big River Way in an east-west direction. Here it joins to the Alipou Basin Levee and Swan Creek Levee.	Joins the Clarenza Levee in the north, bordering the Clarence River and runs to the south west towards the old Grafton Bridge where it ends and the Heber Street Levee begins. Alipou	Begins north east of Freemans Rd close to Clarence River and borders the Clarence River for approximately 5.5-6.0 km to McLennan's Lane and Cowans Creek.	Starts at the old Grafton Bridge and runs 0.9 km in a south-south easterly direction and ends about 0.2 km from the Big River Way.	Connects the Waterview Levee to the Urban Levee and begins at the junction of McLennan's Lane and Cowans Creek. It runs across the Gwydir Highway and	Earth levee that joins South Grafton Urban half way through the South Grafton Bowling Club and houses along Riverside Drive.	Begins about 1.8 km west of the old Grafton Bridge at Minden Street (near the Gwydir Highway) and runs easterly along the Clarence River to the old Grafton Bridge.

South Grafton Levees	Swan Creek	Clarenza	Alipou Basin	Waterview	Heber Street	South Grafton Rural	Old South Grafton	South Grafton Urban
			Creek traverses the levee about half way along.			finishes near Minden Street.		
Overtopping Height	Approximately 6.2 m	This overtops around 5.4-6 m, inundating rural land between Clarenza and Heber Streets.	Approximately 5.45 – 6.0 m	8.1 m	8.2 m The crest levee low point height for the Heber Street Levee is above 7.9 m at the Grafton Prince Street gauge (204400-58178) but below 8.3 m on the Grafton, Prince Street gauge.	8.2 - 8.5 m at the end adjacent to the Gwydir Highway.	After 8.3 m	8.3 m
Known low points	n/a	n/a	n/a	The levee low point is approximately 1.5 km west of the start of the levee, at approximately 8.6 m. This is equivalent to slightly below 7.9 m at the Grafton (Prince Street) gauge (204400-58178) (NSW State	The height of the levee has two main low points at 7.6 m AHD closer to the old Grafton Bridge and 7.8 m AHD near Heber Street/Pacific Highway (NSW State Emergency Service, 2012).	The levee low point is at a height of 8.21 m AHD at the end of James Street.	n/a	The height of the low point of the levee is 8.4 m AHD where the levee begins near Minden Street. This is above 8.2 m AHD (equivalent to 7.9 m at the Grafton, Prince Street gauge(204400-58178)), but

South Grafton Levees	Swan Creek	Clarenza	Alipou Basin	Waterview	Heber Street	South Grafton Rural	Old South Grafton	South Grafton Urban
				Emergency Service, 2012).				lower than 8.5 m AHD at that point (and equivalent to 8.3 m at the Grafton, Prince Street gauge(204400-58178)) (NSW State Emergency Service, 2012).
Location and sequence of inundation and consequence of overtopping or failure	Inundates rural areas south of Ulmarra	When a flood level of about 5.4 m is reached at the Grafton, Prince Street gauge(204400-58178), water flows over the Clarenza Levee and backs up towards South Grafton causing inundation of the Big River Way east of the Heber Street Levee. Rural land between the	Impacts rural properties and the Big River Way	Overtopping occurs on the levee in the rural areas initially to fill in 'The Common' through Cowans Swamp around Friars Lane. This did not occur in 2013 due to the speed of the rate of rise (1 metre a second). At 7.9 m Grafton, Prince Street gauge(204400-58178)there is	Significant overtopping of Heber St Levee would cause approximately 600 properties (1800 residents). At 8.3 m at Prince Street, there is approximately 15.5 hours from the time the flood level reaches approximately 6 m on the Grafton, Prince Street	Impacts rural properties behind the levee and fills in 'The Common' in South Grafton and comes in through Vere Street.	n/a	n/a

South Grafton Levees	Swan Creek	Clarenza	Alipou Basin	Waterview	Heber Street	South Grafton Rural	Old South Grafton	South Grafton Urban
		Clarenza and Heber Street levees becomes inundated. Several houses are also located in this area but they do not start to have over-floor flooding until 7.0m.		overtopping of approximately 5% of the South Grafton levee system occurs, causing a small amount of flooding with little impact on residential properties. In an 8.3m (Grafton gauge (204400-58178)) event there is approximately 14 hours from the major flood level until there is major overtopping at low points on the Waterview levee around Friars Lane, which is slightly North of McLennans Lane; 18 hours until there is major	gauge(204400-58178)until there is minor overtopping at low points on the Heber Street levee between Iolanthe Street and the Big River Way (NSW State Emergency Service, 2012).			

South Grafton Levees	Swan Creek	Clarenza	Alipou Basin	Waterview	Heber Street	South Grafton Rural	Old South Grafton	South Grafton Urban
				overtopping at low points on the Waterview levee near the Sunset Caravan Park and James Street. The velocity of flood water is very high and can be up to 3 square m/s; and 20.5 hours until there is major overtopping at low points on the Waterview levee near Skinner Street, and the velocity of flood water can be up to 0.3 square.				
Deficiencies	-	-	-	Erosion and trees and shrubs	-	Erosion and trees and shrubs	Flood gates leaking or damage	-

2.3 COPMANHURST SECTOR

Copmanhurst, Baryulgil and Malabugilmah

2.3.1 Community Overview

Population	**1480**
Dwellings	**718**

a. **Copmanhurst** is located on the Clarence River, approximately 40 km upstream of Grafton. The population of Copmanhurst is over 340 (15). It has 19.8% of the population under 15 years of age and 24.7 % over 65. It has 9% Indigenous population. A summary of demographics is shown in Table 5.

b. **Baryulgil - Malabugilmah** is an aboriginal settlement, on the range to north Baryulgil near the Clarence River and Bugilbah Creek. The population of Baryulgil-Malabugilmah is over 350 (15). It has 12% of the population under 15 years of age and 24.2% over 65.

2.3.2 Characteristics of Flooding

a. Flooding occurs from riverine flooding of the Clarence River and smaller creeks such as Josephs Creek Bugilbah, as well as overland flooding from intense rainfall.

b. Farm operations are disrupted, and floods can cut off numerous rural properties (2).

c. Flooding occurs from the Mann River and tributaries, as well as overland flooding from intense rainfall.

2.3.3 Flood Behaviour

a. The Upper Clarence drains the area from the Queensland border to the junction of the Clarence and Mann rivers.

b. The Nymboida River drains the New England Tablelands in the Dorrigo Plateau. The Nymboida River flows in a northerly direction to its confluence with the Mann River and Jackadgery Creek near Carnham. The Mann River flows into the Clarence River in the Copmanhurst Sector just north of Grange State Forest.

c. Below its confluence with the Mann River the Clarence River flows in a south-easterly direction towards the village of Copmanhurst.

d. The Lower Clarence begins at the village of Copmanhurst and marks the upper limit of tidal influence.

2.3.4 Classification of the Floodplain

a. For emergency management purposes, Copmanhurst Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
51194	Baryulgil Rural	Baryulgil	204900-57114	1.5	51	28	50	Indirectly Affected
51195	Malabugilmah	Baryulgil	204900-57114	1.5	31	17	31	Indirectly Affected
51196	Coaldale Rural	Copmanhurst	204903 - 58181	15.1	72	38	68	Indirectly Affected
51198	Copmanhurst	Grafton (Prince Street)	204400-58178	8	283	124	223	High Flood Island
51199	Upper Copmanhurst and Fine Flower Rural	Copmanhurst	204903-58181	13.8	247	130	234	Indirectly Affected
51205	Ewingar and the Balund-a Prison	Tabulam	204002-557000	7.5	82	45	81	Indirectly Affected
51589	Cangai	Jackadgery	204004-57113	5.72	30	20	36	Indirectly Affected
51590	Jackadgery north Rural	Grafton (Prince Street)	204400-58178	8	47	24	43	Indirectly Affected

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.3.5 Inundation

a. This area utilises the Copmanhurst gauge (204903-58181).

b. Around 5 houses are in a low-lying area of the village of Copmanhurst, in Grafton Street and Clarence Way and may become flooded (20.5m and above on the Copmanhurst gauge, 204903-58181) (2). Some of these were flooded up to the ceiling in January 2013 (22.76 m at Copmanhurst).

c. Many farms are affected by the inundation of low-lying areas, including those in the Copmanhurst and Whiporie area (2).

Table 10: Estimated number of properties inundated above floor level and over ground in these communities related to the Grafton gauge (204400-58178) as relevant (24)

Grafton (Prince Street) Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
8.11m (5% AEP)	n/a	2	n/a
8.44m (1% AEP)	n/a	5	n/a
Extreme flood	n/a	10	n/a

2.3.6 Isolation

a. The villages of Baryulgil, Malabugilmah and Copmanhurst are also prone to isolation, usually early in a flood event on the Clarence River. Upper Copmanhurst and Fineflower are isolated as Clarence Way floods (13.8 m at Copmanhurst gauge 204903-58181) (13).

b. Copmanhurst and Coledale are isolated at 15.1 m on the Copmanhurst gauge (204903-58181), consisting of 3451 residents (13).

c. The rugged country in the western part of the Clarence Valley Council contains several camping areas in which people can be stranded during floods. Except in very serious floods isolation tends to be short-term of up to three days and most people in the area are self-sufficient for this period of isolation (2).

d. Whiporie can be cut off from all ground access during severe floods. Isolation tends to be short-term of up to three days and most people in the area are self-sufficient for this period of isolation (2).

e. A large number of road closures occurs in this area including (13):

   i. Lilydale Road (2.9 m at Copmanhurst)

   ii. Rogans Bridge (6.0 m at Copmanhurst) – 11 km east of Copmanhurst

   iii. Whiteman Creek (8.0 m at Copmanhurst) – 6 km east of Copmanhurst

   iv. Clarence Way at Eaton Creek (13.3 m at Copmanhurst)

   v. Clarence Way at Chaselings Gully (14.4 m at Copmanhurst)

f. Some properties can become isolated when the Baryulgil Rd closes (1.5m Baryulgil gauge 204900-57114) (2).

g. The Cangai Road Bridge can close at 5.72 (Jackadgery gauge 204004-57113) cutting access to Grafton and isolating approximately 220 properties (500 residents) in the area including the localities of Cangai Baryulgil, Jackadgery, Coombadjha and Carnham (2).

h. There are potentially other road closures due to land slips (e.g. Gwydir Highway) which may also isolate properties in the area (2).

i. Isolation tends to be short-term of up to five days and most people in the area are self-sufficient for this period of isolation, if any medical evacuation is required it would need to be undertaken by helicopter due to the remoteness of the localities (2).

2.3.7 Flood Mitigation Systems

a. No known flood mitigation systems in Copmanhurst Sector.

2.3.8 Dams

a. There are no known consequences of dam failure in Copmanhurst Sector.

2.3.9 At Risk Facilities

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

2.3.10 Other Considerations

a. Copmanhurst has two peak seasons with potential population increase of more than 10%:

   i. Camp draft September.

   ii. Summer School Holidays - Public Lands within remote areas of this sector are utilized by campers.

2.4 LAWRENCE SOUTHGATE SECTOR

Lawrence, Ashby and Southgate Areas

2.4.1 Community Overview

Population	**1633**
Dwellings	**799**

a. **Lawrence** is located on the north bank of the Clarence River at the junction with Sportsmans Creek, approximately half way between Brushgrove and Maclean (2). The population of Lawrence is around 1159 (15). It has 16.3% of the population under 15 years of age and 24.3% over 65. It has 3% indigenous population. A summary of demographics is shown in Table 12.

b. **Southgate** is located opposite Ulmarra, on the northern floodplain of the Clarence River (2). The population of Southgate is around 198 (15). It has 16.5% of the population under 15 years of age and 13.1% over 65. It has 6.2% indigenous population.

c. **Ashby** is located opposite Maclean on the north bank of the Clarence River (2). The population of Ashby is around 316 (15). It has 17.2% of the population under 15 years of age and 23.2% over 65. It has 2.3% indigenous population.

2.4.2 Characteristics of Flooding

a. Flooding can occur from riverine flooding from Clarence River and Sportsman Creek, as well as overland flooding from intense rainfall.

2.4.3 Flood Behaviour

a. The low lying areas of Lawrence, Southgate and Ashby have significant floodway and flood storage areas due to the towns proximity to the Clarence as well as the expanse of low lying floodplains.

b. Lawrence and Ashby townships are built on a flood free ridge however perimeter buildings and some rural properties surrounding the town are subject to inundation 1%.

c. In a 20% AEP rural Properties around Lawrence, Southgate and Ashby start to experience isolation.

d. Lawrence is bounded by the Clarence River in the east, the Broadwater to the north and the everlasting swamp to the south.

2.4.4 Classification of Floodplain

a. For emergency management purposes, Lawrence Southgate Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
322	Southgate	Grafton (Prince Street)	204400-58178	4.5	27	12	22	Low Flood Island
445	345 Low Lying Southgate	Grafton (Prince Street)	204400-58178	4.5	82	38	68	Low Flood Island
46497	Lawrence South	Lawrence	204409	2.5	47	19	34	Low Flood Island
47710	Lawrence A	Lawrence	204409	2.5	119	67	120	Low Flood Island
47711	Lawrence B	Lawrence	204409	2.5	787	410	738	Rising Road Access
50788	Upper Southgate	Grafton (Prince Street)	204400-58178	4.5	63	28	50	Rising Road Access

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.4.5 Inundation

a. This area utilises the Lawrence (204409), Grafton (204400-58178) and Maclean (204410-558022) gauges.

b. **Lawrence** - At 4.4 m on the Lawrence gauge (204409), Lawrence Store, the Hall and several houses on Bridge Street, Lawrence are flooded (13). Nine houses on Kings Creek Road are inundated by 4.45 m. At 4.65 m, 12 houses are flooded above floor.

c. At 3.26 m on the Maclean gauge (204410-558022) 11 houses are inundated in Falconers Lane, Bridge Street, Richmond Street and Grafton Street.

d. There are 192 properties in this sector that have floor levels below the 1% AEP (17) (Lawrence gauge (204409)) 5.14 m, Brushgrove gauge 5.66 m (204406-558027)) (11). Further details are available in Table 12.

e. At 7.75 m on the Grafton gauge (202200-58178) houses outside the levee flood with 6 at Southgate (13).

f. The majority of **Southgate** would be inundated in a 1% AEP flood event 3.55 on the Maclean gauge (202210-558022), and the entire area would be inundated in a PMF. In a 1% AEP flood event there are 42 properties in Southgate flooded, along Lawrence Road and on the outskirts of town (17). Further details are available in Table 12 .

g. **Ashby –** Six houses in Ashby Heights are possibly inundated in a 1% AEP event (17) (3.55 m Maclean gauge (202210-558022)) (11). Further details are available in Table 12 .

h. Flooding of rural properties also occurs in the Southgate and Lower Southgate areas.

Table 11: All properties with floors below design flood levels in the Lawrence Southgate sector on the Lawrence gauge (204409) (17)

	All Properties with Floors Below Design Flood Levels					
Suburb	PMF – 12.10	1% AEP – 5.14	2% AEP – 4.89	5% AEP – 4.65	20% AEP – 3.51	**Totals**
ASHBY	1	0	0	0	0	**1**
ASHBY HEIGHTS	3	6	0	0	0	**9**
ASHBY ISLAND	9	0	4	2	0	**15**
LOWER SOUTHGATE	33	25	18	14	0	**90**
LAWRENCE	54	33	24	17	3	**131**
SOUTHGATE	65	42	39	36	2	**184**
WOODFORD ISLAND	113	86	67	47	7	**320**
TOTALS	**278**	**192**	**152**	**116**	**12**	

2.4.6 Isolation

a. **Southgate -** At 5.45 m (on the Grafton gauge 204400-58178) Lawrence Road floods isolating Southgate and Great Marlow rural properties. In a 1% AEP flood event there are high flood islands to the north that are identified in a PMF, which can be accessed via School Lane. Except in extreme floods isolation tends to be short-term of up to five days and most people in the area are self-sufficient for this period of isolation. Some elderly and infirm people could be isolated (2).

b. **Ashby -** The majority of land is above the PMF, however the town becomes isolated during major floods. Except in very serious floods isolation tends to be short-term of up to five days and most people in the area are self-sufficient for this period of isolation (2). The local General Store and Tavern are above PMF and normally continue to trade but remain isolated.

c. At 2.5 m (Lawrence gauge (204409)) Rutland Street is flooded between the Post Office and Richmond Street in the CBD, an alternative route is available via Richmond Street until 3.15m (13).

d. At 2.6 m (Lawrence gauge (204409)), Lawrence Road cuts at a number of locations isolating around 30 rural houses between Grafton and Lawrence (13).

e. At 3.15 m (Lawrence gauge (204409)) 18 houses are isolated in Lawrence Street, including the shop, tavern, service station and the hall (13).

f. Mantons Road is flooded, isolating 18 houses at 3.26 m at Lawrence gauge (204409).

g. **Lawrence** Ferry crosses the Clarence River at Rutland Street, and shuttles between Lawrence and Woodford Island as part of Tourist Drive 22. It usually closes at 1.5 m on the Maclean gauge (204410-558022), affecting school students.

2.4.7 Flood Mitigation Systems

a. No known flood mitigation systems in Lawrence.

2.4.8 Dams

a. No known dam failure consequences in Lawrence.

2.4.9 At Risk Facilities

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

2.4.10 Other Considerations

a. No additional considerations have been identified.

2.5 ULMARRA COWPER SECTOR

Ulmarra, Tucabia, Gilletts Ridge and Cowper

2.5.1 Community Overview

Population	**2781**
Dwellings	**959**

a. **Ulmarra** is located on the southern bank of Clarence River to the east of Grafton. The population of Ulmarra is around 749 (15). It has 17.5% of the population under 15 years of age and 21.8% over 65. It has 5.3% indigenous population. A summary of demographics is shown in Table 5.

b. **Tucabia** is located on the eastern side of the Coldstream River, to the east of Ulmarra. Tucabia The population of Tucabia is around 354 (15). It has 16.6% of the population under 15 years of age and 12.8% over 65. It has 5.9% indigenous population.

c. **Gilletts Ridge** is a small rural area with livestock and grain farming. It is located on the Coldstream River, opposite Tucabia.

d. **Cowper** is a small locality located to the south of Brushgrove on the South Arm of the Clarence River (2).

2.5.2 Characteristics of Flooding

a. Flooding can occur from riverine flooding from Clarence River and Coldstream River, as well as overland flooding from intense rainfall.

2.5.3 Flood Behaviour

a. Ulmarra, Tucabia, Gilletts Ridge and Cowper form part of the Lower Clarence section and the Coldstream Basin.

b. This area has significant floodway from the Clarence River and its tributaries as well as large tracts of flood storage.

c. Parts of Gilletts Ridge and Tucabia and flood free up to a 1% AEP, however, may still experience isolation due to flooding of surrounding roads.

d. Ulmarra and Cowper are located on the floodplain and may experience isolation and flooding from a 20% AEP flood and above.

2.5.4 Classification of Floodplain

a. For emergency management purposes, Ulmarra Cowper Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
330	Ulmarra Town	Ulmarra	204480-58188	5.5	458	214	385	Low Flood Island
368	Ulmarra Central	Ulmarra	204480-58188	5.5	195	126	227	Low flood island
447	Rathgar Lodge 5.0m	Ulmarra	204480-58188	5	14	6	11	Low Flood Island
46499	Ulmarra West	Ulmarra	204480-58188	5.5	484	288	518	Low Flood Island
532244	Tucabia	Ulmarra	204480-58188	4.7	225	121	218	Rising Road Access

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.5.5 Inundation

a. This area utilises the Ulmarra (204480-58188) and Grafton (204400-58178) gauges. Levee height 5.90.

Table 12: All properties with floors below design flood levels in Ulmarra Cowper sector on the Ulmarra gauge (204480-58188) (17)

	All Properties with Floors Below Design Flood Levels					
Suburb	PMF - 12.71	1% AEP – 6.42	2% AEP – 6.38	5% AEP – 6.15	20% AEP – 5.08	**Totals**
CLARENZA	12	8	6	4	0	**30**
COLDSTREAM	23	22	21	18	1	**85**
COWPER	56	45	39	23	1	**164**
CALLIOPE	40	38	35	25	0	**138**
GILLETTS RIDGE	9	7	6	2	0	**24**
SWAN CREEK	18	13	11	3	0	**45**
TUCABIA	89	31	25	15	0	**160**
ULMARRA	357	274	225	108	2	**966**
TOTALS	**604**	**438**	**368**	**198**	**4**	

b. Water from Swan Creek starts to inundate rural areas south of Ulmarra at 6.2 m on the Grafton gauge (204400-58178) (13).

c. Water enters Southgate village roads at 6.7 m on the Grafton gauge (204400-58178) (13).

d. **Ulmarra** has levee protection, but the eastern and southern portions of the town are not protected by this structure. Backwater inundation occurs in significant floods, with

one commercial premises inundated at 6.15 m on the Ulmarra gauge (204480-58188) (2). At 6.29 m the entire levee overtops, inundating the town including River Street, Coldstream Street, George Street, King Street, Goddger Lane, the Big River Way and Lynhaven Crescent.

e. In Ulmarra Rathgar Lodge, a retirement home accommodating up to 25 high dependency elderly people (32 total residents), must be evacuated before flood waters are likely to enter the village (at 5.5 m on the Ulmarra gauge (204480-58188)) (2).

f. During, very severe flood events (5.9 m on the Ulmarra gauge (204480-58188)), flood waters can overtop the Ulmarra Town Levee necessitating the evacuation of properties in and around Ulmarra (>660 properties). This occurred in the March 2001, May 2009 and January 2011 floods. During these events, most of the roads in the town experienced shallow inundation and the septic systems became unserviceable, posing a serious health hazard (2).

g. **Gilletts Ridge -** Most farm dwellings on the lower Clarence floodplain are on mounds but evacuations are necessary in some floods. In 1996, there were evacuations from the Gilletts Ridge. In an extreme event (8.4 m on the Ulmarra gauge (204480-58188)) it may be necessary to evacuate the residents of scores of houses from the floodplain east to the Pillar Range and Pine Bush State Forest and south to the Glenugie State Forest (2).

h. **Tucabia -** Tucabia is located on the east bank of the Coldstream and can be affected in a PMF, but the properties are generally only affected in a 1% AEP flood event but can be isolated, with similar isolation periods and arrangements for resupply as Gilletts Ridge (2).

i. **Cowper** – At 3.26 m on the Maclean gauge (204410-558022) 2 properties are flooded on the Big River Way. There are over 56 properties in Cowper of which 45 are known to have flood levels below the 1% AEP flood level and would require evacuation (2). Much of Cowper area will be inundated in a 20% AEP flood and floodwater will surround the majority of dwellings in a 5% AEP flood (2).

j. Most farm dwellings on the lower Clarence floodplain are on mounds but evacuations are necessary in some floods. In 1996, there were evacuations from Cowper areas.

k. Stock must be moved from this area and are a priority in the early warning stages.

2.5.6 Isolation

a. Floodwaters enter Ulmarra from the south east at 5.4 m on the Ulmarra gauge (204480-58188), with floodwaters flowing over the Big River Way at 5.9 m on the Ulmarra gauge (204480-58188) closing the evacuation route (13). The Big River Way on the northern side of Ulmarra is cut at 5.7 m, isolating Ulmarra from Maclean. The

depth of this water at 6.05 m on the Ulmarra gauge (204480-58188) has been observed to be 0.5 m (13).

b. Except in very serious floods isolation tends to be short-term of up to five days and most people in the area would require resupply by flood boat or helicopter operations to farm properties, to the villages of Tucabia and to people living in the hills to the east of the Coldstream River. Fodder drops to farm animals may also be necessary (2).

c. At 4.7 m on the Ulmarra gauge (204480-58188) (3m on the Tucabia gauge, 204403), most roads in the Coldstream area are flooded from back up flooding of the Coldstream River, isolating Tucabia, including Possum Hole Lane, Sherrys Lane, Coldstream Road, Gilletts Ridge Road, Wingfields Swamp, Old Coldstream Road and Deep Creek Road. Properties in **Tucabia** are generally only affected in a 1% AEP flood event but can be isolated, with similar isolation periods and arrangements for resupply as Gilletts Ridge (2).

2.5.7 Flood Mitigation Systems

Ulmarra Levee	
Location	Ulmarra, behind residential areas and along the Big River Way.
Type of Levee (ring etc.)	Levee system of a combination of earth-fill (4.7 km) embankment and concrete retaining wall (0.7 km). There are no spillways. Crest width varies between 1-4 m. The levee was constructed in 1978.
Owner	Clarence Valley Council, with Roads and Maritime Services having constructed 1.3 km during roadworks on the Big River Way.
Design Height and freeboard	RL 6 m AHD, including a freeboard allowance. Current estimate safe operating level is 5.5 m at Ulmarra gauge (204480-58188) (25).
Overtopping Height	5.8-6.0 m on the Ulmarra gauge (204480-58188)
No. of properties protected	Residential and commercial areas (660 properties)
Known low points	Near River Street
Location and sequence of inundation	Floods above the crest height of the levee at Ulmarra would flow directly out of the river and through the town at high velocity. Backwater flooding from the east and south of the town still occurs in floods below the levee-overtopping level, as happened in 1996 (2).
Consequences of levee overtopping or failure	When the levee overtops it flows through the town crossing the Big River Way to a residential area to the east, which is also flooded from Coldstream River backing up.
Deficiencies	In a reasonable condition in 2015, however a number of issues including issues with the existing flood gates, trees and shrubs, pump systems and outlets, temporary structure on levee batter and erosion (25).

a. There are a number of local private levees within Cowper.

2.5.8 Dams

a. No known dam failure consequences in Ulmarra.

2.5.9 At Risk Facilities

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

2.5.10 Other Considerations

a. No additional considerations have been identified.

2.6 BRUSHGROVE SECTOR

Brushgrove and Ilarwill

2.6.1 Community Overview

Population	**726**
Dwellings	**336**

a. **Brushgrove** is a rural village located on the southern tip of Woodford Island in the Clarence River floodplain, consisting of predominantly sugar cane farmland. There are over 84 residential and 5 commercial properties in Brushgrove (15) (2). The population of Brushgrove is around 181 (15). It has 17% of the population under 15 years of age and 19.1% over 65. It has 3.6% indigenous population.

b. **Ilarwill** is located upstream of Maclean on the south bank of the Clarence River (2). The population of Ilarwill is around 233 (15). It has 13.5% of the population under 15 years of age and 21.9% over 65. It has 6.5% indigenous population.

c. A summary of demographics is shown in Table 5.

2.6.2 Characteristics of Flooding

a. Flooding occurs from riverine flooding from the Clarence River and the South Arm.

2.6.3 Flood Behaviour

a. Brushgrove and Ilarwill lie between the floodways of the Clarence River and South Arm on Woodford Island.

b. Approx 50% of Woodford Island is a high flood island however a significant proportion of the population live on the floodplain and in Brushgrove, which is inundated during a 1% AEP event.

c. Local roads and access bridges can start to be inundated from a 20% AEP event causing isolation prior to inundation.

2.6.4 Classification of Floodplain

a. For emergency management purposes, Brushgrove Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
47713	Brushgrove B	Brushgrove	204406-558027	3.9	27	15	27	Low Flood Island

48104	Brushgrove A	Brushgrove	204406-558027	3.9	154	77	139	Low Flood Island

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.6.5 Inundation

a. This area uses the Brushgrove (204406-558027), Ulmarra (204480-58188) and Maclean (204410-558022) gauges.

Table 13: All properties with floors below design flood levels in Brushgrove sector (17)

	All Properties with Floors Below Design Flood Levels					
Suburb	PMF – 12.50	1% AEP-5.66	2% AEP-5.40	5% AEP-5.14	20% AEP-4.24	**Totals**
BRUSHGROVE	99	60	48	33	11	**251**
ILARWILL	12	10	10	9	6	**47**
TOTALS	**111**	**70**	**58**	**42**	**17**	

b. **Brushgrove** - The natural levee facing the Clarence River is overtopped in a 5% AEP flood event (Ulmarra gauge (204480-58188), 6.15 m and Brushgrove (204406-558027) 5.14 m. This floods most of the village, leaving only the high ground adjacent to the South Arm flood free (2). Most of the properties have floor levels above the 1% AEP flood event level (Brushgrove, 5.66m), but in an event of this magnitude there would likely to be in excess of 2 m of water under some properties, as many of the homes in Brushgrove are raised. During these events, most of the roads in the town experienced shallow inundation and the septic systems became unserviceable, posing a serious health hazard (2).

c. Three houses in Brushgrove and Brushgrove hotel are inundated at 4.3 m on the Brushgrove gauge (204406-558027) (13).

d. In Clarence Street, Brushgrove 4 houses are flooded at 4.9 m on the Brushgrove gauge (204406-558027) (13). From 5.3m additional houses in Clarence Street, Donaldson Street, Inmon Lane and River Street become progressively flooded (13).

e. At 3.26m on the Maclean gauge (204410-558022) 25 properties in Brushgrove are flooded in Donaldson Street, Clarence Street, South Arm Road, Woodford Street, River Street and Weir Road.

f. Extensive flooding of the islands and Ilarwill occurs at 3 m (13).

g. Stock must be moved from this area and are a priority in the early warning stages.

2.6.6 Isolation

a. Access roads are lost in and out of **Brushgrove** at 3.9 m at Brushgrove gauge (204406-558027), and evacuation needs to happen before this height is reached (2).

b. **Ilarwill -** The majority of Ilarwill is located above the extreme flood level and becomes isolated in a major flood event. Except in very serious floods isolation tends to be short-term of up to three to five days and most people in the area are self-sufficient for this period of isolation (2). The Ilarwill levee overtops at 2 m on the Maclean gauge (204410-558022) flooding Lawrence Road and isolating Ilarwill (13), 23 houses between Maclean and Yamba are also isolated. Numerous houses on Woodford Island are isolated at 3.04 m on the Maclean gauge (204410-558022) (13). At 3.26 m on the Maclean gauge (204410-558022) 10 houses are flooded in Lawrence Road, Woodford Dale Road and Roberts Creek Road.

2.6.7 Flood Mitigation Systems

a. **Brushgrove.** A short informal levee protects some properties at Brushgrove from flooding direct from the Clarence River but will not keep out severe floods (2).

2.6.8 Dams

a. No known dam failure consequences in Brushgrove.

2.6.9 At Risk Facilities

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

2.6.10 Other Considerations

a. No additional considerations have been identified.

2.7 MACLEAN SECTOR

Maclean, Townsend and Tyndale

2.7.1 Community Overview

Population	**6465**
Dwellings	**2900**

a. **Maclean** is located on the southern bank of the Clarence River, immediately downstream of its confluence with South Arm. The population of Maclean is around 2778 (15). It has 14% of the population under 15 years of age and 36.2% over 65. It has 10.1% indigenous population. A high proportion of the population in these areas is elderly and car ownership is low.

b. **Townsend** is located southeast of Maclean on the South Arm of the Clarence River (2). The population of Townsend is around 991 (15). It has 20.5% of the population under 15 years of age and 25% over 65. It has 10.3% indigenous population. Much of the town is above the PMF (15).

c. **Tyndale** is located on the Big River Way halfway between Cowper and Maclean. There are 99 residential properties and a number of businesses in the village (2). The population of Tyndale is around 190 (15) It has 12.6% of the population under 15 years of age and 28.9% over 65. It has 7.8% indigenous population (15).

d. A summary of demographics is shown in Table 5.

2.7.2 Characteristics of Flooding

a. Flooding can occur from riverine flooding of the Clarence River, South Arm and North Arm, as well as overland flooding from intense rainfall.

2.7.3 Flood Behaviour

a. Maclean is on the banks of the Clarence and the confluence of the Clarence River and South Arm.

b. Maclean is just east of the Broadwater and is influenced by the flood storage areas on the surrounding floodplain.

c. Townsend, which is just east of Maclean, is a high flood island with low lying perimeter streets that are influenced by rising water levels in surrounding flood storage areas.

d. Flow times from Grafton to Maclean can vary, depending on ocean conditions and tidal influences.

2.7.4 Classification of Floodplain

a. For emergency management purposes, Maclean Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
47707	Maclean A	Maclean	204410-558022	3	958	404	727	Low Flood Island
47708	Maclean B	Maclean	204410-558022	3.3	1967	995	1791	High Flood Island
47709	Maclean C	Maclean	204410-558022	3.3	1003	476	857	Rising Road Access
51598	Lake Arragan and Red Cliffs Campgrounds				471	157	0	High Flood Island
51602	Shelly Head campground				30	10	18	High Flood Island

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.7.5 Inundation

a. This area utilises the Maclean gauge (204410-558022). Levee design height: 3.3m.

b. **Maclean -** Maclean has a levee (3.3m) which protects the CBD and residential areas along the Clarence River on the town's western edge, but these areas (up to 481 properties in addition to a nursing home and CBD) would be inundated if the levee were to fail or be overtopped (above 3.4 m on the Maclean gauge (204410-558022)) (20). The caravan parks within the town are flood liable (2). At 3.26 m on the Maclean gauge (204410-558022) 2 houses are flooded at Shark Creek on Omars Lane and Shark Creek Road; 2 properties are flooded on the Big River Way and Yamba Road.

c. There are around 317 residential properties and 100 business premises in this area and many of them would have over-floor inundation in a flood between the 5% AEP (3.18 m on the Maclean gauge (204410-558022)) and 1% AEP flood (3.55 m on the Maclean gauge (204410-558022)). During a 1% AEP flood major overtopping of the levee would cause further inundation to these properties (2).

d. **Tyndale** - At 3.26 m on the Maclean gauge (204410-558022) one house is flooded on the Big River Way. Other properties in Tyndale that are expected to be flooded above floor are listed in Table 14 for each design height.

Table 14: All properties with floors below design flood levels in the Maclean sector (17)

All Properties with Floors Below Design Flood Levels						
Suburb	PMF – 8.56	1% AEP – 3.55	2% AEP – 3.41	5% AEP – 3.18	20% AEP – 2.41	**Totals**
MACLEAN	421	317	42	14	3	**797**
SHARK CREEK	3	3	2	2	1	**11**
SOUTH ARM	28	15	13	8	1	**65**

TYNDALE	29	16	14	6	1	**66**
TOTALS	**481**	**351**	**71**	**30**	**6**	

2.7.6 Isolation

a. **Maclean -** The nursing home in Maclean (Mareeba) has been raised above 1% AEP and will be isolated in an event of this magnitude (2). At 2.3 m on the Maclean gauge (204410-558022), the southern end of Maclean is cut at Ferry Park, preventing access south to Grafton via Big River Way (13).

b. Table 16 summarises the warning time available for various design flood events prior to levee overtopping and local evacuation routes are cut in Maclean (with the levee overtopping at 3.4 m (20).

c. Figure 10 and Table 15 highlight that despite Big River Way, Lawrence Road and South Arm Road closures, an evacuation route remains possible after the Maclean levee has overtopped and up to 3.43 on the Maclean Gauge (204410-558022) via the Pacific Highway to Grafton. Table 15 also identifies time of overtopping and duration in days.

d. The Yamba road to Pacific Highway on and off ramps close much earlier at 2.47 on the Maclean gauge (204410-558022).

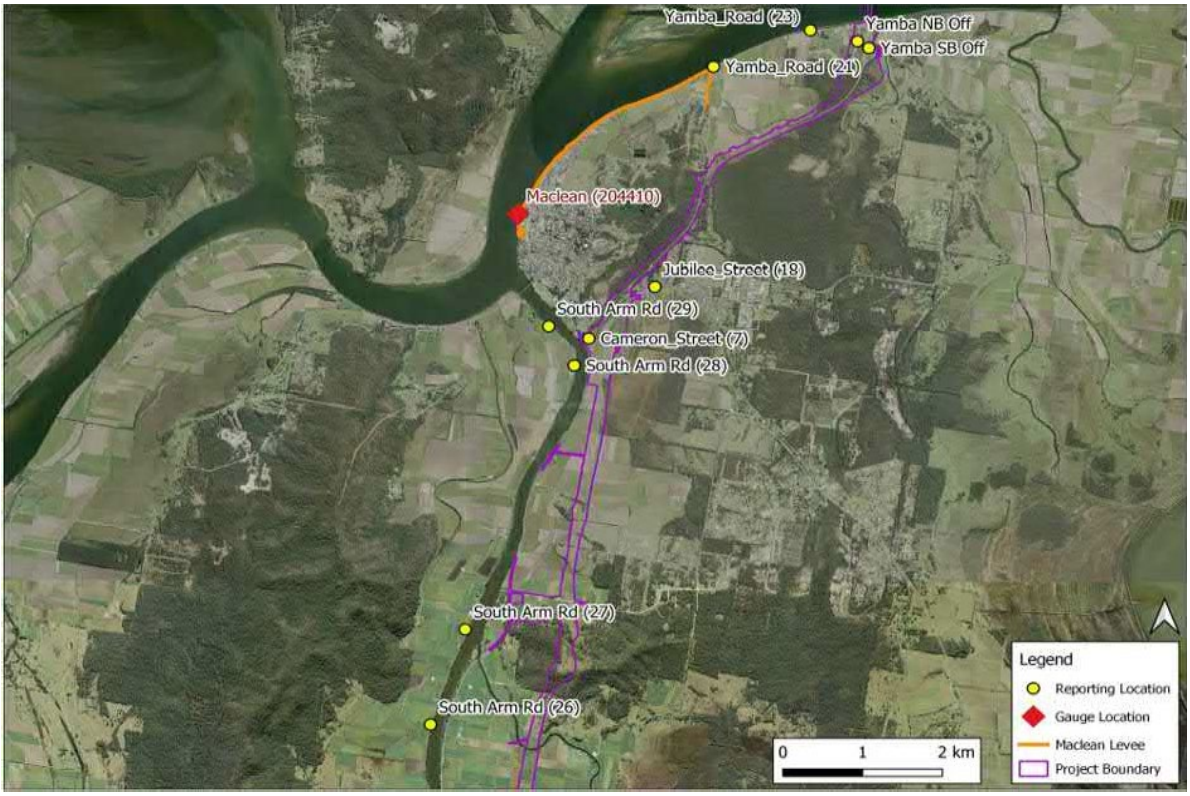


Figure 10: Reporting locations for road heights in Maclean Sector (26)

Table 15: Overtopping and duration of inundation for key locations in the Maclean sector (26)

Location	*Road Leve (mAHD)	Time of overtopping (hours)	Duration of Inundation (days)	Level at Grafton Gauge (204400)	Level at Ulmarra Gauge (204480)	Level at Brushgrove Gauge (204406)	Level at Maclean Gauge (204410)	Level at Harwood Gauge
7. Cameron Street - Maclean interchange - CH80600	3.9	61.0	2.3	-	6.34	5.46	3.43	2.95
18. Jubilee Street	4.1	35.0	3.0	-	-	-	2.84	2.51
26. South Arm Road	3.2	30	5.2	6.29	5.04	4.21	-	-
27. South Arm Road	3.5	50	3.7	8.36	6.36	5.16	-	-
28. South Arm Road	2.7	21	5.9	4.18	3.62	3.26	-	-
29. South Arm Road	3.0	60	2.1	8.07	6.34	5.40	-	-
Yamba Road SB Off Ramp - CH85920	2.2	19	5.5	-	-	-	2.47	2.44
Yamba Road NB Off Ramp - CH86020	2.0	19	6.3	-	-	-	2.47	2.44

(26)

e. **Townsend -** 13 residential properties and 4 businesses on the south side of Diamond and Jubilee Streets have flood water surrounding their properties in at 3.55 (1% AEP) event.

f. The majority of land at **Tyndale** is above the PMF but can be isolated. Except in very serious floods isolation tends to be short-term of up to five days and most people in the area are self-sufficient for this period of isolation (2).

g. Figure 11 shows the Inundation height and duration for pre-construction and built Pacific Highway - south of Shark Creek, Tyndale to Maclean. The graph shows that the new Pacific Highway will start to become inundated south of where it crosses Shark Creek at 3.9m AHD. The period of inundation during a 50 year ARI is 1.5 days with a maximum depth of approximately 40cm. During a 100 year ARI the time of inundation could be as long as 2.5 days with a maximum depth of approximately 75cm.

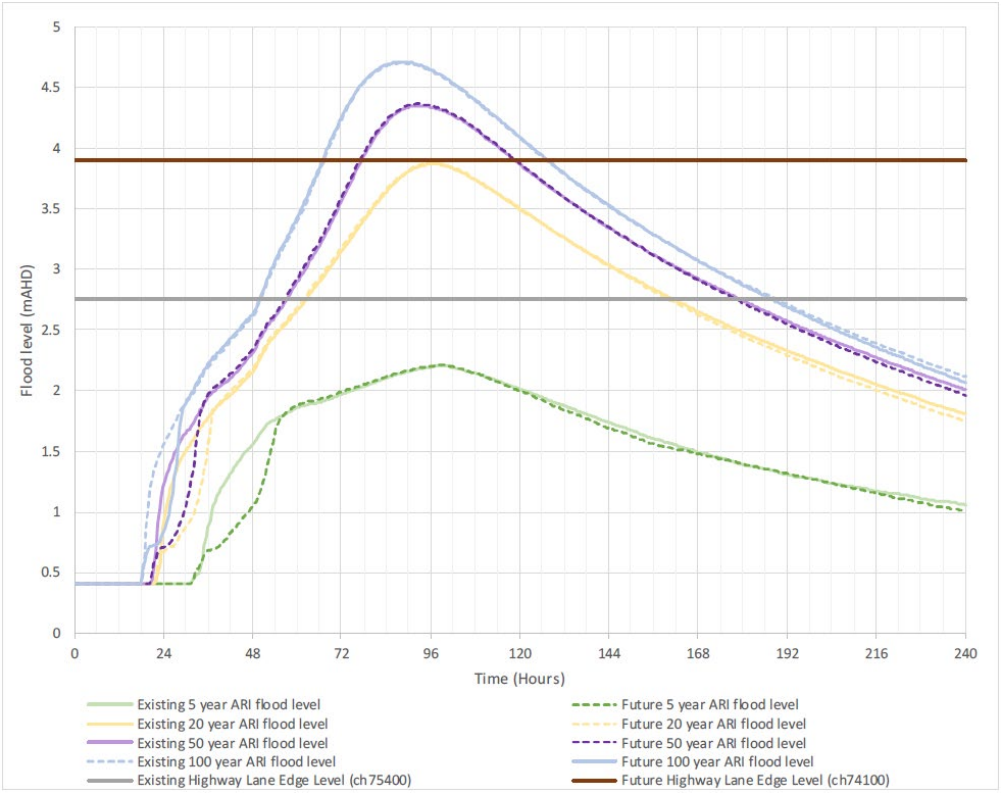


Figure 11: Road height and overtopping level and duration of the Pacific Highway– south of Shark Creek (27).

h. **Warregah Island** can become isolated, when the bridge approaches flood.

2.7.7 Flood Mitigation Systems

Table 16: Levees in Maclean; summary of information

Maclean Levee	
Location	Maclean, running parallel to the Clarence River terminating on higher ground at either end of Maclean adjacent to private property and parklands and road easements.
Type of Levee (ring etc.)	Single levee, with a total length of 3.7 km. Part-concrete retaining wall (1 km), part-earthen levee that is grassed (2.7 km) with no spillway. Constructed in 1975. Upgrade and maintenance was complete in 2007.
Owner	Clarence Valley Council
Design Height and freeboard	Design height is estimated to be 3.3 m on the Maclean gauge (204410-558022). The Maclean levee has an average crest height of approximately 3.5 m on the Maclean gauge (NSW State Emergency Service, 2012). Freeboard is unknown.
Overtopping Height	Modelling suggests the Maclean Levee is overtopped around 3.4 m (20). In the simulated 3.5m flood event the levee is overtopped near the end of Bakers Lane and near Hogues Lane. Velocities are less than 0.1 square m per second (NSW State Emergency Service, 2012).

	It is estimated to take 48 hours in a 3.5m flood, 46.9 hours in a 3.7m flood and 30.4 hours in a 5.2 m event to overtop (20).
No. of properties protected	Low-lying parts of Maclean, including the Central Business District and nearby residential areas and nursing homes. Crest height of 3.3 m on the Maclean gauge (204410-558022). Floods in 1967 and 1974 exceeded this level, as did the flood of 1890 and possibly other events in the nineteenth century. The levee is designed to keep out floods only up to about the 30% AEP flood and will be overtopped in larger events (2)
Known low points	Levee low points at the end of Bakers Lane and near Hogues Lane (low points are 250 m either side of Hogues Lane).
Location and sequence of inundation	The first areas to be overtopped are the rural areas to the north of Maclean, with water travelling south towards Maclean through sporting fields and parklands into urban areas. In the 1% AEP flood event (3.6 m on the Maclean gauge (204410-558022)) the levee is overtopped near the levee low points at the end of Bakers Lane and near Hogues Lane. In this event approximately 89% of the levee is overtopped.
Consequences of levee overtopping or failure	If the levee is overtopped (from approximately 3.3 -3.4m on the Maclean gauge (204410-558022) at the low points), the low-lying land on the western side of the town would be flooded (NSW State Emergency Service, 2012). If floodwaters continue to rise the levee will begin to overtop north of Stanley Street, inundating the River Street evacuation route. Major overtopping of the levee occurs in a 1% AEP flood and above, resulting in 317 properties flooded above floor. The flood water velocity can be up to 0.30 square m per second between Central and Union Streets (the grass area west of the Maclean District Hospital), but the average velocity is generally less than 0.1 square m per second. (2)
Deficiencies	Generally good condition as at 2015; however, a number of issues have been identified including a steep batter, trees and shrubs, permanent structure on levee (28).

2.7.8 Dams

a. No known consequences of dam failure in Maclean.

2.7.9 At Risk Facilities

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

2.7.10 Other Considerations

A. The Highland Gathering Festival is held in the Easter School Holidays at the Showgrounds, with an increase of more than 10% of the population.

2.8 ILUKA SECTOR

Iluka, Woombah, Harwood and Chatsworth

2.8.1 Community Overview

Population	**3106**
Dwellings	**1979**

a. **Iluka** is on the northern bank of the Clarence River opposite Yamba, at the river mouth. The population of Iluka is around 1764 (15). It is an aged population with 9.9% of the population under 15 years of age, 44.4% over 65. It has 3.2% indigenous population.

b. **Woombah** is on the north side of the Clarence River, north east of Iluka and approximately 8 km upstream from the ocean (2). The population of Woombah is around 965 (15). It has 13.9% of the population under 15 years of age and 34.6% over 65. It has 2% indigenous population.

c. **Harwood** is an island on the north bank of the Clarence River, predominantly sugar cane farming. The population of Harwood is around 346 (15). It has 17.6% of the population under 15 years of age and 21.4% over 65. It has 4.62% indigenous population. In Harwood there are 158 properties, 17 businesses and a sugar mill.

d. **Chatsworth** is located on a ridge of higher land adjacent to the North Arm of the Clarence River and is predominantly sugar cane farmland (2). The population of Chatsworth is around 157 (15). It has 7% of the population under 15 years of age and 36.9% over 65. It has no indigenous population.

e. **Warregah Island** is located between North Arm and Back Channel, with 17 houses (15).

f. A summary of demographics is shown in Table 5.

2.8.2 Characteristics of Flooding

a. The effects on the towns and outlying areas in this sector are very much dependent on tidal influences. Tidal levels will need to be identified at the onset of main Clarence River flooding (2).

b. This area is subject to flooding either from elevated ocean levels, rain and waves or from the river.

2.8.3 Flood Behaviour

a. Warregah Island, Chatworth Island, Harwood Island and Goodwood Island are all Flood storage areas surrounded and dissected by floodways including the Clarence River and a network of tributaries.

b. The Islands are very low and influenced by flooding and isolation from 20% AEP Event.

c. Iluka is at the confluence of the Clarence and the Esk Rivers. The township can become isolated from 20% AEP and will start to experience flooding in a 1% AEP event.

d. Woombah has rising road access onto the Pacific Motorway with only low lying streets affected from 20% AEP.

2.8.4 Classification of Floodplain

a. For emergency management purposes, Iluka Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
47291	Chatsworth Island	Maclean	204410-558022	1.65	503	258	464	Low Flood Island
47704	Warregah Island	Maclean	204410-558022	1.65	31	13	23	High Flood Island
47705	The Anchorage Holiday Park	Yamba	204454-558062	2.1	73	45	81	Low Flood Island
47706	Iluka	Maclean	204410-558022	2.1	1595	1192	2146	High Flood Island
51605	Woody Head Campground	Maclean	204410-558022	2.1	285	95	171	High Flood Island

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.8.5 Inundation

a. This area utilises the Maclean gauge (204410-558022) with a gauge planned by Council to be installed on the Esk River bridge. Inundation in this area is influenced by the Esk River and the Clarence River.

b. Iluka contains a caravan park (The Anchorage Holiday Park) and 20 properties on low-lying land (2). The main areas subject to inundation are between Conrad Close in the north and Spencer Street in the south. The following streets have properties affected by Clarence River flooding: Marandowie Street, Conrad Close, Melville Street, Hemmingway Place, Loxton Avenue, Duke Street, Gundaroo Close, Riverview Street, Cave Street and Spenser Street.

c. **Woombah -** The eastern end of the village is below the 1% AEP flood level of 3.6 m (Maclean gauge (204410-558022)) (2).

d. **Goodwood Island -** A caravan park on Goodwood Island (Browns Rocks) is on low-lying land and is subject to flooding in flood events around 2m at the Maclean gauge

(204410-558022). Evacuation of the caravan park (to Woombah Village) is required (2).

e. **Harwood -** Many of the homes in Harwood are raised homes, however much of the land in Harwood will be inundated in a 20% AEP flood (2.05 Harwood gauge 204441, 2.41 Maclean gauge (204410-558022)), and floodwater will surround the majority of dwellings in a 5% AEP flood (3.18 Maclean gauge (204410-558022)) (2). Inundation of dwellings starts as early as 1.9 on the Maclean gauge (204410-558022). Up to 15 houses are flooded from 2.5 on the Maclean gauge (204410-558022) (13). At 3.26 m on the Maclean gauge (204410-558022) 4 properties are flooded in Martins Point Road, Morpeth Street and Cannons Lane. Fifteen (15) non-residential buildings and 87 residential properties in Harwood are below the 1% AEP flood level (Harwood gauge (204441) 3.23 m, Maclean gauge (204410-558022) 3.6 m (17).

f. **Chatsworth -** There are approximately 82 properties in Chatsworth of which 23 are below the 1% AEP flood level (3.19 Chatsworth gauge, 3.6 Maclean gauge (204410-558022)) (17). Much of Chatsworth Island will be inundated at 2.41 Maclean gauge (204410-558022) (20% AEP) flood and floodwater will surround the majority of dwellings in a 5% AEP flood which is 3.18 (Maclean gauge 204410-558022) (2). Further details are available in Table 17.

Table 17: All properties with floors below design flood levels in the Iluka sector by the Maclean gauge (204410-558022) (17)

	All Properties with Floors Below Design Flood Levels					
Suburb	PMF-8.56	1% AEP-3.55	2% AEP-3.41	5% AEP-3.18	20% AEP-2.41	**Totals**
GOODWOOD ISLAND	51	30	24	13	0	**118**
CHATSWORTH	82	23	14	4	0	**123**
ILUKA	392	55	29	19	0	**495**
MORORO	6	2	2	1	1	**12**
THE FRESHWATER	3	1	0	0	0	**4**
HARWOOD	170	87	65	34	0	**356**
WOOMBAH	8	1	1	1	0	**11**
TOTALS	**712**	**199**	**135**	**72**	**1**	

2.8.6 Isolation

a. **Iluka -** Some roads within Iluka can also be cut by flood waters, and access can be cut necessitating large-scale resupply by boat or air (2).

b. Iluka Road is closed at 2.1 m (Maclean gauge (204410-558022)) isolating Iluka in larger floods for periods up to five days; but this is dependent on tidal influences and could be longer (2).

c. **Woombah -** Woombah can become isolated when Big River Way closes at the Clover Leaf/Harwood Bridge (2.1 m on the Maclean gauge (204410-558022)) for periods up to five days; but this is dependent on tidal influences and could be longer (2).

d. **Harwood -** Access to the island cuts early and the village becomes isolated, and so evacuation would need to occur before road access to and from Harwood is cut around 2.2 m on the Maclean gauge (204410-558022) (2). Martins Point Road floods around 1.9 m on the Maclean gauge (204410-558022), with the north end of Harwood Village flooded by 1.95 m isolating properties in Cannon Lane.

e. **Chatsworth -** Access to Chatsworth Island cuts early and the village becomes isolated (Pacific Highway closure 2.2 m on the Maclean gauge (204410-558022)). Except in very serious floods isolation tends to be short-term of up to two days and most people in the area are self-sufficient for this period of isolation (2).

f. There is northbound access onto the Pacific Highway at Watts Creek on ramp, however that begins to be inundated at 2.47 on the Maclean Gauge (204410-558022) (26).

g. Figure 12 shows when the north and south bound lane edges start to become inundated on the Pacific Highway, just south of where it crosses Serpentine Channel. The Pacific Highway Northbound is the highest of the dual carriageways and starts to become inundated south of where it crosses Serpentine Channel at 2.6m AHD and will become inundated in a 50 and 100 year ARI event (26).

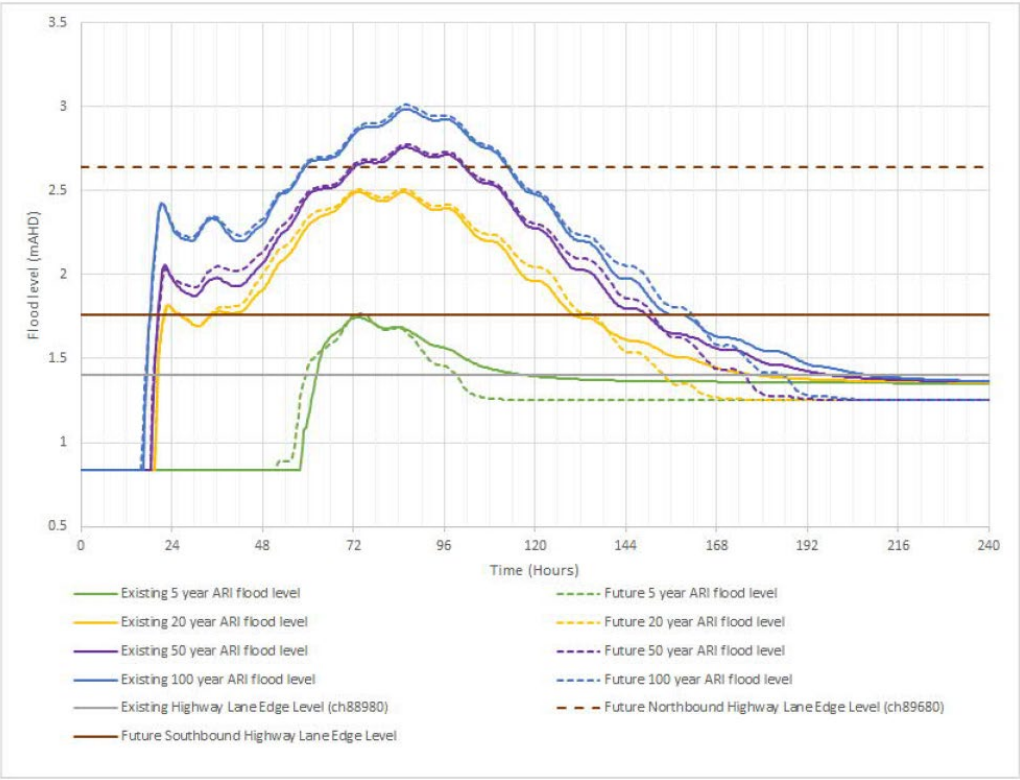


Figure 12: Road height and overtopping level and duration for the Pacific Highway– south of Serpentine Channel (27).

h. Figure 13 shows the reporting locations and Table 18 shows the corresponding overtopping heights and inundation durations for each reporting location.

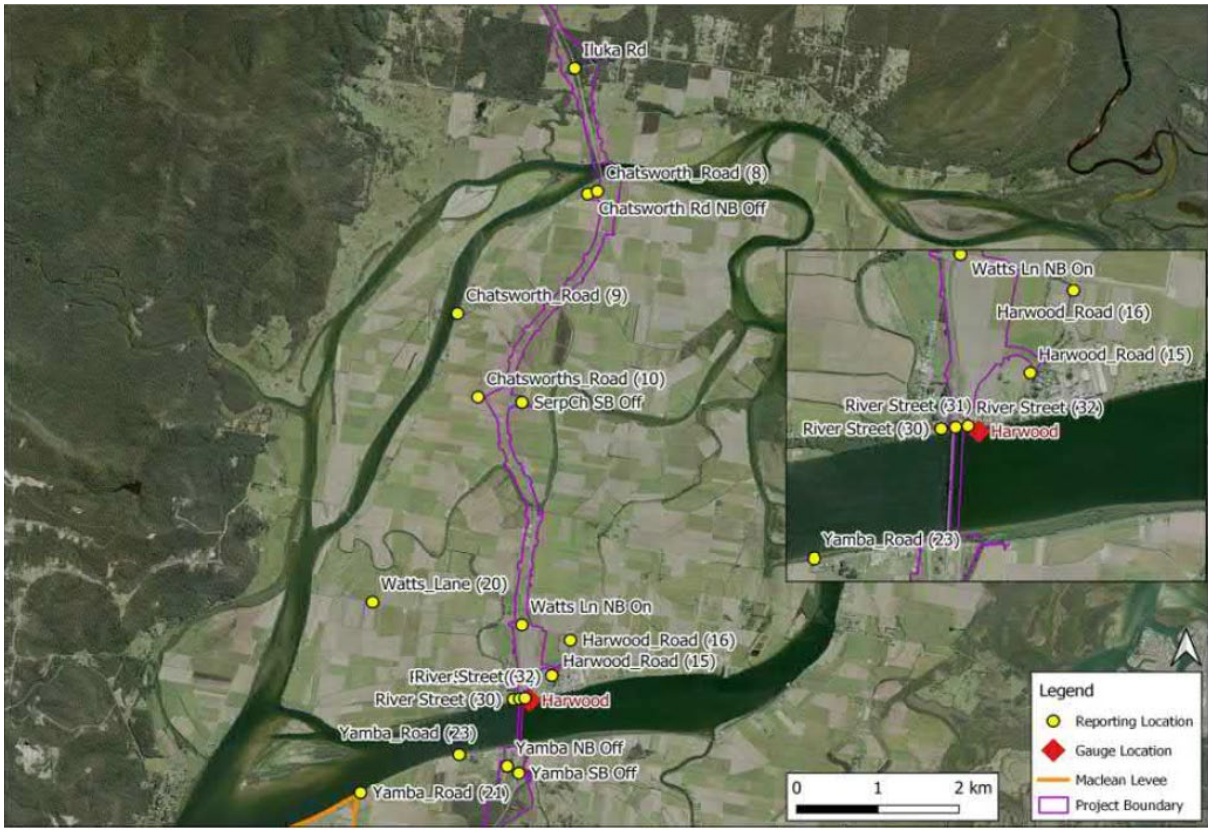


Figure 13: Reporting locations for road heights in Iluka Sector (26)

Table 18: Overtopping and duration of inundation for key locations in the Maclean sector (25)

Location	*Road Level (mAHD)	Time of overtopping (hours)	Duration of Inundation (days)	Level at Maclean Gauge (204410) (mAHD)	Level at Harwood Gauge (mAHD)
8. Chatsworth Road	1.8	0	6.5	0.00	0.00
9. Chatsworth Road	2.0	0	5.0	0.00	0.00
10. Chatsworth Road	1.6	221	6.4	2.65	2.56
Chatsworth Road NB Off Ramp - CH93800	1.8	0	5.3	0.00	0.00
Serpentine Channel Road SB Off Ramp- CH90760	1.4	20	7.3	2.60	2.55
Watts Lane NB On/SB Off Ramps - CH87825	2.2	19	4.7	2.47	2.44
20. Watts Lane	1.4	18	7.6	2.28	2.27

15. Harwood Road	2.4	0	4.8	0.00	0.00
16. Harwood Road	2.2	0	5.3	0.00	0.00
30. River Street	1.1	6	9.5	0.75	0.97

2.8.7 Flood Mitigation Systems

a. **Iluka.** There are a series of levees at Iluka, referred to as the Marandowie Drive Concrete Levee and Anchorage Caravan Park Levee protecting one area and the Duke Street Levee protecting another area. The system of levees protects 225 properties from flooding direct from the Clarence River, but will not keep out severe floods (2). Wave run up is likely to affect the levee, with the levee low point at 1.9 m (5% AEP event).

2.8.8 Dams

a. No known consequences of dam failure in Iluka.

2.8.9 At Risk Facilities

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

2.8.10 Other Considerations

a. Iluka has four peak seasons with a potential population increase of more than 10%:

   i. School Holidays Tourist Influx Late Dec/Jan

   ii. School Holidays Tourist Influx April

   iii. School Holidays Tourist Influx July

   iv. School Holidays Tourist Influx Sep/ Oct

2.9 YAMBA SECTOR

Yamba and Palmers Island

2.9.1 Community Overview

Population	**7428**
Dwellings	**4484**

a. **Yamba** is located at the mouth of the Clarence River on the coast, on the southern bank. The population of Yamba is around 6405 (15). It has 12.9% of the population under 15 years of age and 37.6% over 65, making it an aged community. It has 4.5% indigenous population.

b. **Palmers Island** is located 6 km up the Clarence River from Yamba (2), with a large tourist population including caravans. The population of Palmers Island is around 482 (15). It has 18.5% of the population under 15 years of age and 25.1% over 65. It has 2.3% indigenous population.

c. A summary of demographics is shown in Table 5.

2.9.2 Characteristics of Flooding

a. Flooding occurs due to riverine flooding from Clarence River, tides and overland flooding from intense rainfall.

2.9.3 Flood Behaviour

a. Yamba lies on the southern bank of the Clarence River at the entrance.

b. Yamba is heavily influenced by tides, with Yamba gauge (204454-558062) a tide gauge.

2.9.4 Classification of Floodplain

a. For emergency management purposes, Yamba Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
52789	Islands west of Yamba	Maclean	204410-558022	2.1	499	217	390	Low Flood Island
52790	Yamba East	Maclean	204410-558022	2.1	1242	1174	2113	Rising Road Access
52791	Yamba Central	Yamba	204454-558062	2.4	916	459	826	Low Flood Island
52792	Yamba	Yamba	204454-558062	2.1	4172	2276	4097	Low Flood Island

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.9.5 Inundation

a. Yamba and Palmers Island utilise the Maclean (204410-558022) and Yamba (204454-558062) gauges. In these areas riverine flooding can be heavily influenced by high tides and storm surges. (14)

b. In **Palmers Island** most of the land on the island is flood liable and in severe floods some islands are completely submerged.

   i. At 3.18 (Maclean gauge (204410-558022)) (5% AEP) flood event all of Palmers Island would be surrounded by flood water.

   ii. At 3.26 m on the Maclean gauge (204410-558022) 9 properties and 2 caravan parks are flooded in Yamba Road, River Street, Carrington Street, Dalley Street and McConnells Street.

   iii. Two hundred and twenty-four (224) properties are located within the Palmers Island Village and up to 65 would be inundated over floor in a 1% AEP flood event (Maclean gauge (204410-558022) 3.55 m (2).

c. In Yamba, inundation can occur from 2.4 m on the Yamba gauge (204410-558022) dependant on the tides. Streets affected include the Halyard, Telopea Street, Melalueca Drive, Wooli Street, Carrs Drive, Yamba Plaza, Endeavour Street, Deering Street, Golding Street, Cook Street and Shores Drive (13).

d. Estimates from Clarence Valley Council indicate that up to 429 properties may be flooded in a 3.55m, 1% AEP flood (Maclean gauge (204410-558022)) in Yamba and 1217 in an extreme event (8.56 m on the Maclean gauge (204410-558022)).

e. Rural land along the Clarence River and around The Broadwater and Wooloweyah Lagoon can also be inundated and substantial numbers of rural properties can be cut off from normal means of supply but are not flooded over floor. Few rural residents are elderly and generally have access to transport (2).

Table 19: All properties with floors below design flood levels in the Yamba sector on the Maclean gauge (204410-558022) (17)

	All Properties with Floors Below Design Flood Levels					
suburb	PMF- 8.56	1% AEP-3.55	2% AEP-3.41	5% AEP-3.18	20% AEP-2.41	**Totals**
PALMERS ISLAND	126	65	49	39	0	**279**
MICALO ISLAND	23	14	10	8	0	**55**
PALMERS CHANNEL	43	9	7	3	0	**62**
YAMBA	1217	429	182	85	0	**1913**
TOTALS	**1409**	**517**	**248**	**135**	**0**	

2.9.6 Isolation

a. **Crystal Waters -** Roads within the Crystal Waters area of Yamba can be cut by flood waters, and several residential and commercial properties can be inundated in severe floods. The Crystal Waters area is a recently-developed area of Yamba that has been reclaimed from a swamp, as such uncertainty exists about the effects of a combination of a severe flood and storm surge conditions in this area (2).

b. **Yamba and Palmers Island -** Access to the island cuts early and the village becomes isolated, evacuation needs to occur before road access to and from Yamba is cut at Clover Leaf/Harwood Bridge (2.1 m on the Maclean gauge (204410-558022)) (2). At 2.4 m on the Maclean gauge (204410-558022), Yamba is completely isolated.

c. Except in very serious floods isolation tends to be short-term of up to five days and most people in the area are self-sufficient for this period of isolation (2)

d. Three caravan parks on Palmers Island are flood prone and the caravans need to be relocated before the road closes at (2.1 m on the Maclean gauge (204410-558022)) (2).

e. **Rural areas -** Rural land along the Clarence River and around The Broadwater and Wooloweyah Lagoon can also be inundated and substantial numbers of rural properties can be cut off from normal means of supply, but are not flooded over floor. Few rural residents are elderly and generally have access to transport. Most people in the area are self-sufficient for this period of isolation (2).

2.9.7 Flood Mitigation Systems

a. No known flood mitigation systems in Yamba.

b. Property situated on the western side of Palmers Island has been troubled by river-bank erosion since at least the mid-1960s. Rock protection proved to be ineffective in addressing the problem (12).

2.9.8 Dams

a. No known dam failure consequences in Yamba.

2.9.9 At Risk Facilities

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

2.9.10 Other Considerations

a. Yamba “Rod Run” is a vintage car event held every year in November.

b. Yamba has four peak seasons with a potential population increase of more than 100%:

   i. School Holidays Tourist Influx Late December/January

ii. School Holidays Tourist Influx April

iii. School Holidays Tourist Influx July

iv. School Holidays Tourist Influx September/ October

2.10 SANDON SECTOR

Sandon and Brooms Head

2.10.1 Community Overview

Population	**213**
Dwellings	**181**

a. **Sandon** is located to the south of Yamba, either side of Sandon River. The access routes are long through national park to the south or north through Brooms Head. The population of Sandon is around 9, with a median age of 62 years (15). There are about 35 properties in Sandon and the majority of properties are vacation houses (2). There are no additional facilities in this location.

b. **Brooms Head** is located off Brooms Head Road south of Yamba on the coast. The population of Brooms Head is around 271 (15). It has 10.3% of the population under 15 years of age and 35.8% over 65, making it an aged community. It has 4.8% indigenous population.

c. A summary of demographics is shown in Table 5.

2.10.2 Characteristics of flooding

a. Flooding occurs from the Sandon River in Sandon. Both areas are susceptible to coastal inundation.

2.10.3 Flood Behaviour

a. Refer to section 1.5.

2.10.4 Classification of Floodplain

a. For emergency management purposes, Sandon Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
51192	Sandon	57	36	65	High Flood Island
51193	Sandon North	87	29	52	High Flood Island
51595	Brooms Head Caravan Park	N/A	N/A	N/A	Rising Road Access
51596	Brooms Head	155	144	260	Rising Road Access

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.10.5 Inundation

a. No flood warning gauge for this area.

b. Parts of the caravan park at Sandon can be flooded by storm surge flooding (2).

c. There are approximately 256 properties in **Brooms Head** (15)**,** but these are generally not affected by flooding (2). However, parts of the caravan park at Brooms Head can be flooded by storm surge flooding (2). There are approximately 14 residential properties and a caravan park in Brooms Head susceptible to coastal erosion/inundation (29).

2.10.6 Isolation

a. During storm surge/large tidal events Sandon River Road closes isolating **Sandon**. Most people in the area are self-sufficient for this period of isolation (2). Except in extreme floods, isolation tends to be short-term of up to three to five days and most people in the area are self-sufficient for this period of isolation (2).

b. The main access road out of **Brooms Head** is Brooms Head Road to Maclean, which can close during flooding (2).

2.10.7 Flood Mitigation Systems

a. No known flood mitigation systems in Sandon.

2.10.8 Dams

a. No known dam failure consequences in Sandon.

2.10.9 At Risk Facilities

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

2.10.10 Other Considerations

a. Brooms Head and Sandon have 4 peak seasons with potential for a population increase of more than 10%:

   i. School Holidays Dec/Jan

   ii. School Holidays April

   iii. School Holidays July

   iv. School Holidays Sept/Oct

b. The majority of holiday makers in this sector are campers.

2.11 WOOLI SECTOR

Wooli-Minnie Water

2.11.1 Community Overview

Population	**1265**
Dwellings	**903**

a. **Wooli** is located on the coast half way between Sandon and Corindi Beach, on the Wooli Wooli River and on Wooli Road. The population of Wooli is around 503 (15). It has 9.9% of the population under 15 years of age and 41.6% over 65, making it an aged community. It has 0.6% indigenous population. Wooli has a high proportion of retirees, with many of the residents elderly and infirm (2).

b. **Minnie Water** is located to the north of Wooli on the coast, surrounded by Yuraygir National Park. The population of Minnie Water is around 212 (15). It has 13.7% of the population under 15 years of age and 33.9% over 65. It has 3.8% indigenous population.

c. A summary of demographics is shown in Table 5.

2.11.2 Characteristics of flooding

a. Flooding occurs from the Wooli Wooli River in Wooli. Both areas are susceptible to coastal inundation and erosion, particularly Wooli.

2.11.3 Flood Behaviour

a. The confluence of Bookram Creek and Wooli Wooli River occurs 3.2km north west of the Solitary Islands Resort on Wooli Road. This marks the start of the village of Wooli which is built on the northern banks of the Wolli Wooli River before it exits to the ocean south of the village.

b. Inundation of several roads and underfloor flooding can commence from 1.59m when floodwaters break out along Riverside Drive.

c. Access in and out of Wooli begins to be compromised from 1.83m (Wooli Caravan Park gauge (205463-558060)) and is completely cut at 2.43m.

d. This area is heavily influenced by tides.

2.11.4 Classification of Floodplain

a. For emergency management purposes, Wooli-Minnie Water Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
331	Solitary Islands Resort	220	145	261	Low Flood Island
51189	Wooli Residential	98	188	338	High Flood Island
51191	Minnie Water	207	176	317	Indirectly Affected
51593	Wooli Heights	222	143	257	Low Flood Island
51594	Diggers Camp	75	44	79	Indirectly Affected
51597	Illaroo Campground	207	69	69	Indirectly Affected
51601	Rocky Point Campground	6	2	2	Indirectly Affected
51606	Boorkoom Campground	42	14	14	Indirectly Affected

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.11.5 Inundation

a. Wooli utilises the Wooli River at Wooli Entrance gauge (MHL) 205462-559044 and Wooli River at Wooli Caravan Park (Council) gauge 205463-558060.

b. The Solitary Islands Marine Park Resort floods at 1.5 m on the Wooli Caravan Park gauge (205463-558060), dependant on tides. At 1.59m (Wooli Caravan Park gauge (205463-558060)) (10% AEP), floodwaters begin to break out along Riverside Drive causing inundation of the commercial premises to the west of Riverside Drive, e.g. Wooli Seafood Coop, and Inundation to the rear of properties at east Lawson Close. Greater inundation occurs around Little River Close, with floodwaters spreading into Olen Close and adjacent 8 properties. Greater inundation to the north and centre of the Wooli Solitary Island Marine Park Resort, with water backing up to the rear of the Wooli Store (30).

c. At 1.83m (Wooli Caravan Park gauge (205463-558060)) (5% AEP), greater inundation of private property occurs, causing inundation of 3 dwellings immediately south of the Main Street/Riverside Drive junction, inundation of 5 dwellings along north Carraboi Street. Inundation at the Wooli Store, adjacent to the Wooli Solitary Island Marine Park Resort. Inundation is now experienced to 59 residential lots and 4 commercial lots (30).

d. At 2.24m (Wooli Caravan Park gauge (205463-558060)) (2% AEP), widespread flooding occurs, with the majority of the northern riverside community experiencing flooding, including inundation to 4 properties around southern Main Street, inundation of the majority of the Wooli Solitary Island Marine Park, however the Wooli Hotel remains flood free and may serve as a safe refuge. Inundation of the majority of Little River Close and adjacent property, inundation crosses northern Carraboi Street, inundating

the properties on either side, inundation is experienced to 88 residential lots and 4 commercial lots (30).

e. At 2.43m (Wooli Caravan Park gauge (205463-558060)) (1% AEP) the extent of flooding is similar to the 2% AEP event, with a greater depth and hazard. Including inundation of new properties along southern Olen Close, Wooli Sportsground is completely inundated, greater inundation along Carraboi Street, inundation is experienced to 111 residential lots and 4 commercial lots.

f. At 2.68 m on the Wooli Caravan Park gauge (205463-558060) flooding of residential areas including Wooli Council Caravan Park, Riverside Drive, Firth Lane, Durlington Lane, O'Keefe Lane, Braithewaite Lane, Scope Street, Cyril Ellem Place, Olen Close and North Street.

g. Floods up to 2.28 m on the Wooli Caravan Park gauge (205463-558060); (roughly the height reached in 1954 and 1974) are largely confined to the main channel with some minor flooding in the Carraboi Street, Cyril Ellem Place and Olen Close areas and over floor flooding in the northern caravan park (Solitary Islands Marine Park Resort) (2).

h. Floods up to 2.75 m on the Wooli Caravan Park gauge (205463-558060), properties in Carraboi Street, Cyril Ellem Place, Olen Close, Firth Lane, Durlington Lane, O'Keefe Lane, Braithwaite Lane, Scope Street and North Street will be surrounded by flood water. This is estimated to be approximately 100 properties (2).

i. In an extreme event Wooli can be cut into two by the closure of Main Street near the intersection of Riverside Drive (5.96 m on the Wooli gauge (205463-558060) (30)). Evacuation of properties in low lying areas in the North of Wooli will need to occur before this closure (226 properties). Almost all of the houses are of only one storey (2). Over floor flooding would occur in the properties in Carraboi Street, Cyril Ellem Place, Olen Close, Firth Lane, Durlington Lane, O'Keefe Lane, Braithwaite Lane, Scope Street and North Street and in the northern caravan park (Solitary Islands Marine Park Resort). This is estimated to be around 226 properties (2).

j. At 2.63m (Wooli Caravan Park gauge (205463-558060)) (0.5% AEP), event the floodwaters exceed the typical immunity level of infrastructure, with water breaking over the central roadway in new locations. Inundation overtops Main Street (south Wooli Road) behind Olen Close and begins to inundate the eastern residential zone. Access is continuously cut along local roads and as events increase in severity, progressive inundation to private property occurs, with the Possible Maximum Flood (PMF) (5.96m Wooli Caravan Park gauge (205463-558060)) (30).

k. In the extreme event on the South side of Wooli, lower areas of the southern caravan park (Wooli Council Caravan Park) would be inundated and the low-lying portions of Riverside Drive (2). Depths over individual floors could be as much as 2.5 m and structural damage would be expected despite the fact that velocities would not be high (2).

l. The section of Wooli beach in front of the Wooli village has been declared a 'coastal erosion hotspot', which could potentially impact 6 properties (31).

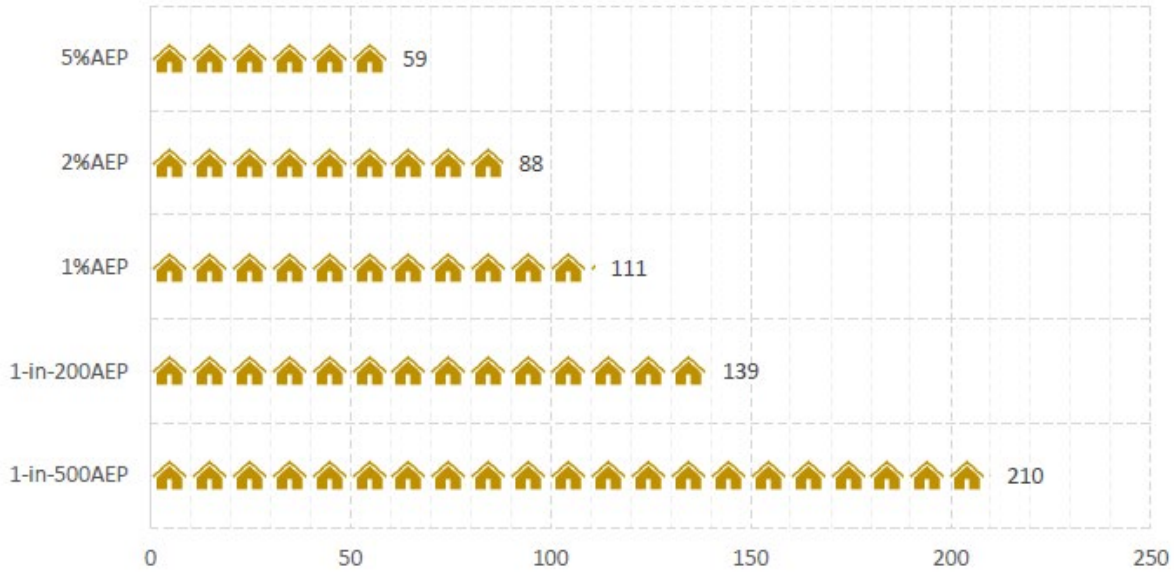


Figure 14: Residential buildings exposed to flooding across the floodplain in Wooli (30)

2.11.6 Isolation

a. In **Minnie Water** (approximately 200 properties) and **Wooli** (600 properties) becomes isolated when Wooli Road closes at Sandy Crossing with localised heavy rainfall. This road is closed during flood events at Lake Hiawatha, by 2.55 m on the Wooli gauge (205463-558060). In large floods isolation tends to be short-term of up to three to five days and most people in the area are self-sufficient for this period of isolation (2).

b. At 1.59m (Wooli Caravan Park gauge (205463-558060)) (10% AEP), floodwaters begin to break out along Riverside Drive with property and several other local roadways experiencing low-level flooding. Road access along North Street at the showground begins to be cut, limiting access from Main Street (30).

c. At 1.83m (Wooli Caravan Park gauge (205463-558060)) (5% AEP), floodwaters begin increasing along Wooli Road and North Street, which may start limited access in and out of Wooli (30).

d. At 2.24m (Wooli Caravan Park gauge (205463-558060)) (2% AEP), widespread flooding occurs, with the majority of the northern riverside community experiencing flooding, in addition several areas within the southern village become isolated from the northern village. Road access becomes completely cut at the Main Street/Riverside Drive junction, isolating all properties south of there. (30)

e. At 2.43m (Wooli Caravan Park gauge (205463-558060)) (1% AEP), the extent of flooding is similar to the 2% AEP event, with a greater depth and hazard. Road access into Wooli is cut, with the greatest floodwater depths occurring upstream of Wooli along Wooli Road (30).

f. For events exceeding 2.63m (Wooli Caravan Park gauge (205463-558060), 0.5% AEP) the floodwaters exceed the typical immunity level of infrastructure, with water breaking over the central roadway in new locations. Inundation overtops Main Street (south Wooli Road) behind Olen Close and access is continuously cut along local roads (30)

2.11.7 Flood Mitigation Systems

a. Downstream of the Wooli village the rivermouth has been trained. Prior to construction of the training walls, flood waters have been reported to overtop the sand spit at the entrance, scouring an enlarged passage for flood water to the ocean. Subsequent coastal wind and wave action would see the spit re-build until the next flood or fresh occurred. Over long dry spells the tidal entrance channel would significantly reduce in size. The entrance works were constructed between January 1970 and December 1971 (and modified in 1974) to stabilise the entrance location and provide safe navigation for fishing vessels. (30)

2.11.8 Dams

a. No known consequences of dam failure.

2.11.9 At Risk Facilities

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

2.11.10 Other Considerations

a. Wooli and Minnie Waters has four peak seasons with potential for a 10% population increase:

   i. School Holidays Tourist Influx Late Dec/Jan

   ii. School Holidays Tourist Influx April

   iii. School Holidays Tourist Influx July

   iv. School Holidays Tourist Influx Sep/ Oct

2.12 COUTTS CROSSING SECTOR

Coutts Crossing and Nymboida

2.12.1 Community Overview

Population	**2067**
Dwellings	**860**

a. **Coutts Crossing** is located on the Orara River to the south of Grafton, predominantly livestock farming. The population of Coutts Crossing is around 1053 (15). It has 19.8% of the population under 15 years of age and 23.2% over 65. It has 7.9% indigenous population.

b. **Nymboida** is located in the Hinterland on the Nymboida River, to the south west of Grafton. The population of Nymboida is around 268 (15). It has 7.5% of the population under 15 years of age and 25.4% over 65. It has 2.2% indigenous population.

c. There are two camping reserves located along the Nymboida River that are considered to be at risk during flood events. They are Black Mountain Reserve and Cartmill Park located at Nymboida. Both reserves are only available to canoeists for camping (2).

d. A summary of demographics is shown in Table 5.

2.12.2 Characteristics of flooding

a. Coutts Crossing area is susceptible to riverine flooding from the Orara River tributaries and overland flooding.

b. Flooding occurs from the Nymboida River and tributary Creeks, as well as overland flow during intense rainfall.

2.12.3 Flood Behaviour

a. Refer to section 1.5.

2.12.4 Classification of Floodplain

a. For emergency management purposes, Coutts Crossing Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
51201	Fiddlers Creek	Coutts Crossing	204909-558030	7.4	31	12	22	High Flood Island
51202	Shannondale	Coutts Crossing	204909-558030	7.9	81	31	56	High Flood Island
51203	Braunstone	Coutts Crossing	205909-58030	10	57	22	40	High Flood Island
51204	Coutts Crossing				952	385	693	High Flood Island
51588	Levenstrath	Coutts Crossing	204909-558030	8.5	52	20	36	High Flood Island
51992	Laytons Range Road North	Nymboida	204001-59124	7	N/A	N/A	N/A	High Flood Island
52388	Lower Kangaroo Creek	Coutts Crossing	204909-558030	6.6	109	50	90	High Flood Island

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.12.5 Inundation

a. This area refers to the Coutts Crossing (204909-558030) gauge.

b. Floods can cause considerable damage to fences and pastures as well as causing stock losses. A small river rise of as little as 2m on the Orara River can result in a need for farmers to shift pumps and move cattle to higher ground (2).

c. There is no known dwelling inundation in the Nymboida area.

d. There are 2 primitive campgrounds which do not receive mobile reception and are at risk of not receiving and warnings issued by BOM or SES. The Junction campground and Nymboida River Campground.

2.12.6 Isolation

a. Coutts Crossing (approximately 1000 properties) contains many rural properties which become isolated with progressive road closures from 3.2 m – 7 m (Nymboida River gauge) and 6.6 m – 10 m Orara (Coutts Crossing) gauge) (2).

b. Buccarumbi Bridge may close (approximately 17km northwest of the village of Nymboida at GR601994). The closure also depends critically on flows on the Boyd (Little) River, which joins the Nymboida just upstream of Buccarumbi. If the bridge is closed, 30 to 40 properties to the north of Buccarumbi are isolated for up to a week.

c. Floodwaters from the Nymboida River back up Copes Creek, closing Boundary Creek Rd at GR729848. This isolates six properties on the western side of the Nymboida River (across from the village of Nymboida), usually for only a few days.

d. At 6.6 m on the Coutts Crossing gauge, 30 properties in the Middle Creek area and 70 properties in the Lower Creek area are isolated (13).

e. At 7.4 m on the Coutts Crossing gauge, 12 properties at Fiddlers Creek are isolated (13).

f. At 7.9 m on the Coutts Crossing gauge 20 properties in Shannondale are isolated (13).

g. At 8.5 m on the Coutts Crossing gauge 15 properties at Levenstrath are isolated (13).

h. At 10 m on the Coutts Crossing gauge 6 properties in Braunston are isolated (13).

i. Isolation tends to be short-term of up to five days, except in prolonged floods and most people in the area will need resupply, if any medical evacuation is required it would need to be undertaken by helicopter due to the remoteness of the localities (2).

j. There is no known isolation in the Nymboida area.

2.12.7 Flood Mitigation Systems

a. No known flood mitigation systems have been identified in Coutts Crossing or Nymboida.

2.12.8 Dams

a. No known dam failure consequences in Coutts Crossing or Nymboida.

2.12.9 At Risk Facilities

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

2.12.10 Other Considerations

a. No additional considerations have been identified.

2.13 GLENREAGH SECTOR

2.13.1 Community Overview

Population	**1034**
Dwellings	**400**

a. **Glenreagh** is a small town near the southern boundary of the Clarence Valley on the Orara River, a tributary of the Clarence River. The population of Glenreagh is 1005 (15) made up of 22.9% under 15 years and 18.4% over 65. It has 10.8% aboriginal population.

b. This area is predominantly rural, with villages of Karangi, Coramba and Nana Glen nearby.

c. A summary of demographics is shown in Table 5.

2.13.2 Characteristics of flooding

a. The Glenreagh area is susceptible to riverine flooding from the Orara River and Bucca Bucca Creek catchments and overland flooding. These catchments flow in a general north west direction (3).

b. Floodwaters have been known to rise quickly (3).

2.13.3 Flood Behaviour

a. In the 20% and 5% AEP events, flood flows are expected to surcharge the Orara River and Tallawudjah Creek channels, and spill onto the floodplain (3). Flood velocities are generally below 2 m/s, in the 20% and 5% AEP flood events in the flood plains. However, in creeks which are steep and confined, flood velocities greater than 2 m/s could be expected. For example, the areas upstream of the Glenreagh Gauge (204907-59123) and downstream of the Glenreagh Bridge have narrow creek channels and elevated flood velocities would be expected in these locations (3).

b. In the 1% AEP event, large areas of the floodplain would be expected to have flood velocities below 2 m/s. However, flood velocities within many of the creek channels would be expected to be in excess of 2 m/s (3).

c. In a PMF flood levels are expected to be approximately 3 to 4 m deeper than the 1% AEP. This would result in significant and widespread flooding (3).

d. Many of the tributaries, which are generally steep in grade, exhibit flood velocities in excess of 2 m/s (3).

e. The majority of the Orara River and Tallawudjah Creek are designated as being high hazard, due to the excessive flow depths. In the 20% and 5% AEP events, only small areas on the floodplain are designated as low or medium hazard; and in a 1% AEP event, almost the entire valley, with exception of a few areas, is considered high hazard. This would mean that a number of access tracks to rural properties and road crossings would be expected to be isolated by high hazard flood waters (3).

2.13.4 Classification of Floodplain

a. For emergency management purposes, Glenreagh Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
52389	Glenreagh East	Glenreagh (DWR TM)	204906-559066	14.61	145	54	97	Rising Road Access
52390	Glenreagh North	Glenreagh (DWR TM)	204906-559066	15.63	303	111	200	Rising Road Access
52788	Glenreagh West	Glenreagh (DWR TM)	204906-559066	7.3	175	68	122	High Flood Island

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.13.5 Inundation

a. Glenreagh utilises the Glenreagh (DWR TM) (204906-559066), Glenreagh Bridge (204907-59123) and Karangi (204025-559023) stream gauges. The Glenreagh bridge gauge (204907-59123) has a predictive service from the Bureau of Meteorology (transferred from the manual gauge in 2016). The telemetered gauge is upstream of the town and shows a different height during floods to the manual gauge in town. This can cause confusion during floods, where the manual reading is observed, which varies from the height reported by the Bureau.

Table 20: Gauges and gauge heights (m) for flood classifications on the Orara River (32)

Gauge	Minor (m)	Moderate (m)	Major (m)
Karangi (205025-559023)	-	-	-
Orange Grove (204068-559018)	-	-	-
Glenreagh Bridge (204907-59123)	4.0	7.0	10.0
Glenreagh DWR (204906-559066)	5.0	9.0	13.0

b. A small river rise of as little as 2m on the Orara River can result in a need for farmers to shift pumps and move cattle to higher ground (2).

c. From 9.28 to 11.26m (Glenreagh bridge gauge (204907-59123)) (20% and 5% AEP), properties to the north of Glenreagh, in the vicinity of the confluence of Tallawudjah Creek and the Orara River would be expected to be at risk, the majority of Glenreagh would largely be unaffected by flood waters (3).

d. From 12.03 (1% AEP), flood waters are expected to inundate large areas of the floodplain on the Orara River, Tallawudjah Creek and associated tributaries. Flood waters are expected to inundate properties north of Connell Street, Glenreagh and in the vicinity of the Tallawudjah Creek Road intersection. Flooding is also expected along Kookaburra Drive and Lorikeet Place in the vicinity of the railway line to the east of Glenreagh. This is estimated to be around 30 properties (3).

e. Table 19 indicates the number of residential and commercial properties that may experience flooding at the various design heights.

Table 21: Residential and commercial properties that would experience flood damages. (33)

Flood Event (AEP)	Number of properties
20%	25
5%	61
1%	84
0.2%	116
PMF	136

2.13.6 Isolation

a. A large number of rural properties are expected to be isolated by flood waters across all catchments.

b. Glenreagh, including Braunstone-Mulquinney's Road and Kungala (approximately 550 properties in total) contains many rural properties and during floods there are progressive road closures in the area from 5.8 m (Glenreagh gauge (204907-59123)) – Orara Way at the Bluff Bridge, until the closure of the last access out of Glenreagh (1.6 km east of Glenreagh at Glenreagh Creek) at 7.6 m (Glenreagh gauge (204907-59123)) cutting access to Coffs Harbour, isolating Glenreagh (2).

c. At 5.8 m on the Glenreagh DWR gauge 150 properties in Kremnos and Kungala are isolated. Bluff Bridge on Orara Way closes, preventing access to Grafton (13).

d. At 9.75 m on the Glenreagh DWR gauge Glenreagh town is isolated, from Orara Way flooding 1.6 km south of Glenreagh (13).

e. While flood waters can recede quickly, isolation remains for up to five days. In prolonged floods most people in the area are self-sufficient for this period of isolation, if any medical evacuation is required it would need to be undertaken by helicopter due to the remoteness of the localities (2).

f. Rural landowners can be cut off when local roads are closed by flood waters. Floods can cause considerable damage to fences and pastures as well as causing stock losses (2).

g. Sherwood Creek Bridge and eastern approaches are inundated at 9.28 on the Glenreagh (204907-59123) which is as frequent as the 20% AEP flood. This leads to road closure of the access into Glenreagh. Residents would need to use Sherwood Creek Road for access. During rarer floods, the access along Sherwood Creek Road is also severed leading to isolation of residents on the east bank. Local isolation also occurs near East Bank Road, where residents have been forced to evacuate along the railway embankment. (33).

h. From 9.28 (20%) and 11.26 (5% AEP) on the Glenreagh Bridge (204907-59123) several bridges and roads are expected to be inundated. This includes (3):

   i. Orara Way near Lurlocks Road flooded by 3 m in a 20% AEP event.

   ii. Orara Way near Shipmans Road flooded by 0.5 m in a 5% AEP event.

   iii. Glenreagh Bridge flooded by 2 m in a 20% AEP event.

   iv. Tallawudjah Creek Bridge flooded by 0.3 m in a 20% AEP event.

   v. Orara Way north of Tallawudjah Creek Bridge flooded by 3 m in a 20% AEP event.

2.13.7 Flood Mitigation Systems

a. No known flood mitigation systems have been identified in Glenreagh.

2.13.8 Dams

a. No known dam failure consequences in Glenreagh.

2.13.9 At Risk Facilities

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

2.13.10 Other Considerations

a. No additional considerations have been identified.

2.14 CANGAI SECTOR

2.14.1 Community Overview

Population	**559**
Dwellings	**286**

a. **Cangai** is located on the Mann River in the ranges to the west of Grafton. The population of Cangai is around 154 (including Cangai, Jackadgery & Coombadjha) (15) with predominantly rural and livestock farms.

2.14.2 Characteristics of flooding

a. Flooding occurs from the Mann River and tributaries, as well as overland flooding from intense rainfall.

2.14.3 Flood Behaviour

a. Refer to section 1.5.

2.14.4 Classification of Floodplain

a. For emergency management purposes, Cangai Sector can be further broken down into subsectors for floodplain classification, these classifications are as follows:

OBJECTID	Polygon Name	Population Estimate	Dwelling Estimate	Vehicle Estimate	Comment
51591	Leytons Range Road South	2	1	2	Indirectly Affected
51599	Nymboida River Campground	30	10	10	Rising Road Access
51603	The Junction Campground	27	9	9	Indirectly Affected
51988	Black Mountain Reserve Camping	N/A	N/A	N/A	Indirectly Affected
51989	Cartmill Park Camping Area	N/A	N/A	N/A	Indirectly Affected
51990	Buccarumbi	2	1	2	High Flood Island
51991	Nymboida West	4	2	4	Indirectly Affected
51992	Leytons Range Road Road North	N/A	N/A	N/A	High Flood Island

- **further reference will be provided in Volume 3 as part of the Mapping.**

2.14.5 Inundation

a. No known dwelling inundation.

b. No warning gauges in the area.

2.14.6 Isolation

a. The Cangai Road Bridge can close at 5.72m (Jackadgery gauge 204004-057113) cutting access to Grafton and isolating approximately 220 properties (500 residents) in the

area including the localities of Cangai, Baryulgil, Jackadgery, Coombadjha and Carnham (2).

b. There are potentially other road closures due to land slips (e.g. Gwydir Highway) which may also isolate properties in the area (2).

c. Isolation tends to be short-term of up to five days and most people in the area are self-sufficient for this period of isolation, if any medical evacuation is required it would need to be undertaken by helicopter due to the remoteness of the localities (2).

2.14.7 Flood Mitigation Systems

a. No known flood mitigation systems have been identified in Cangai.

2.14.8 Dams

a. No known dam failure consequences in Cangai.

2.14.9 At Risk Facilities

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

2.14.10 Other Considerations

a. Cangai has one peak season with potential population increase of more than 10%:

   i. Summer School Holidays - Public Lands within remote areas of this sector are utilized by campers.

b. Camping also occurs along the Clarence River at the Cangai Recreation reserve (Cangai Bridge and Cangai Broadwater) (2). Mann River free campground is located at: **Lat: 29.45065° S Lon: 152.49298° E**

c. Camping at these locations is informal and is not authorised or unauthorised (2).

SPECIFIC RISK AREAS – COASTAL EROSION

2.5 WOOLI WOOLI RIVER

a. The most recent assessment of bank condition at Wooli Wooli River was undertaken in 2006. The majority of the catchment is located within Yuraygir National Park and the tidal reaches are part of the Solitary Islands Marine Park. Erosion hot spots at the South Terrace boat ramp and the banks adjoining the Solitary Islands Marine Park Resort Caravan Park (noted in the first-pass risk assessment) have since been remediated. Other erosion hot spots were noted on the southern bank approaching "The Forks" and isolated areas along Bookram Creek. Bank erosion was attributed to a variety of causes but mostly related to removal of riparian vegetation combined with tidal and flood flows or boat wake and wind waves. The first-pass risk assessment found that the risk of bank erosion was moderate in parts of the Wooli Wooli River (14).

b. Wooli Coastal Reserve and Wooli Public Recreation Reserve are expected to be periodically impacted by inundation from Lake Cakora, Sandon River and Wooli Wooli River respectively (during at least present day 10% EP scenarios) (14).

c. The Wooli peninsula is threatened by coastal erosion/ recession from the east and from the west by inundation from the estuary. Mapping (JBP, 2022; JBP, 2023) indicates that there are locations where erosion risk and inundation risk overlap, where there is a further risk of potentially broader scale, more permanent implications, if the two hazards occur simultaneously. This could result in a 'break through' where longer-term or permanent estuary-ocean exchange would occur leading to the complete loss of land and assets within the area. (14)

d. Undercutting of dunes on their seaward sides can occur at Wooli threatening the collapse of dwellings and other buildings. There is also potential for the sea to break through of the dunes, causing flooding and isolation of property on the landward side of the dunes (2).

e. Storm activity is sometimes accompanied by heavy rain, causing flooding on the Wooli River behind the sand dunes. This flooding can be exacerbated by an elevated sea level preventing the escape of flood waters to the sea (2).

f. The whole village of Wooli is at risk from erosion and/or associated flooding. Several hundred dwellings, two caravan parks and a small number of commercial buildings are at risk (2).

g. Wooli Beach suffered severe storm damage in 1954, 1974, 1996 and 2009. More recent erosion events have eroded the frontal dune leaving a high, steep escarpment along much of the beachfront (2).

h. The steep escarpment remains unstable and has continued to recede due to slumping (2).

i. A review of coastline hazard lines for Wooli (34) has identified that 44 lots are located in the zone of wave impact for a severe storm (although a few dwellings on these lots are located landward of the immediate impact line). These beachfront properties are all located north of the boat ramp on South Terrace (2).

j. Approximately 20 beachfront dwellings located within the 'zone of reduced foundation capacity' (less than 18 m from the dune crest) have also been identified as susceptible to structural damage due to the reduced bearing capacity of sand in this zone. Of the 20 properties, the nine most at risk were located around 13 to 14 m from the dune crest (35).

2.6 SANDON RIVER

a. The most recent assessment of bank condition was undertaken in 2010. Bank erosion was found to be occurring throughout the estuary on outside bends along 30 - 100 m of river bank, ranging from minor to severe. The majority of the Sandon River catchment is located within Yuraygir National Park and the tidal reaches are part of the Solitary Islands Marine Park. Due to high vegetation cover on banks and the undeveloped nature of the catchment, all erosion is considered to be natural and due to the ongoing lateral adjustment of the waterway. Some minor ad hoc erosion control works have been undertaken on the southern bank of the entrance adjacent to the residential properties at Sandon Village and along Sandon River Road near the entrance to the campground (14).

b. Periodic inundation is predicted to impact on the campground, access road and surrounding Yuraygir National Park in the current timeframe with extents increasing over time.

c. Sandon beach is vulnerable to erosion with Sandon River Road and the Sandon River campground at risk from rare (2% EP) events at present.

d. The Sandon peninsula is threatened by coastal erosion/ recession from the east and from the west by inundation from the estuary. Mapping (JBP, 2022; JBP, 2023) indicates that there are locations where erosion risk and inundation risk overlap, where there is a further risk of potentially broader scale, more permanent implications, if the two hazards occur simultaneously. This could result in a 'break through' where longer-term or permanent estuary-ocean exchange would occur leading to the complete loss of land and assets within the area (14).

2.7 LAKE CAKORA

a. Lake Cakora (located at Brooms Head) is an intermittently closed and open lake or lagoon (ICOLL) with an untrained entrance. The first-pass risk assessment in the Scoping Study found that the risk of bank erosion was moderate at the Lake Cakora bridge. Brooms Head foreshore where a seawall has been constructed along the southern foreshore of the campground. There is no protection provided along the northern section of the foreshore and seawall end effects are resulting in increased erosion in this section near the Lake Cakora entrance. (14)

b. The village of Brooms Head (south of Lake Cakora entrance) is vulnerable to coastal inundation with inundation extents increasing over time within the northern and eastern boundaries of the residential areas. North of the entrance, inundation may potentially impact Ocean Road and residential areas at present with inundation becoming more frequent over time.

Other areas

a. Infrastructure at Pilot Hill includes the Pacific Hotel, neighbouring buildings along Pilot Street, the Yamba Surf Life Saving Club (SLSC) and vehicle access, zig zag walkway, public and private walkways, Marine Parade and drainage infrastructure. The site is subject to ongoing geological processes and in the long term it is expected that the slope would continue to regress. Historical landslide events have been recorded around the Pacific Hotel since May 1921. The Pacific Hotel suffered extensive damage due to a historical landslide in 1950, with additional damage occurring on the slope below the building over the ensuing years (14).

b. In accordance with recommendations from the above assessments, Council currently implements an Emergency Management Plan to respond to the risks associated with rainfall events, which is aimed at identifying possible rainfall conditions that may trigger a landslide event. Rainfall is monitored to identify conditions that may give rise to an emergency as follows:

    1. A period of prolonged high rainfall, up to periods of 90 days.
    2. A period of high daily rainfall after previous wet periods.
    3. High intensity rainfall over short periods of say 1 day or less (14).

ROAD CLOSURES AND ISOLATED COMMUNITIES

2.6 ROAD CLOSURES

a. Table 21 lists roads liable to flooding in the Clarence Valley LGA.

Table 22: Roads liable to flooding in Clarence Valley LGA (22) (18).

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height	Approximate time to flooding from levee overtopping[1]
Clarence Street	Between Fitzroy and Pound Streets	** Sub Sector A	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	6.8 hours
Clarence Street	Between Pound and Hoof Streets	** Sub Sector A	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	4.3 hours
Fitzroy Street	Between Prince and Clarence Streets	** Sub Sector A	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	3.0 hours
Pound Street	Between Prince and Clarence Streets	** Sub Sector A	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	4.0 hours
Prince Street	Between Fitzroy and Pound Streets	** Sub Sector A	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	5.7 hours
Prince Street	Between Pound and Oliver Streets	** Sub Sector A	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	5.6 hours
Prince Street	Between Oliver and Dobie Streets	** Sub Sector A	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	6.1 hours
Prince Street	Between Dobie and Hoof Streets	** Sub Sector A	N/a	8.35m Grafton Prince Street Gauge	6.5 hours

[1] The timeframes assume 1% flood and extreme flood (8.44) **rate of rise.

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height	Approximate time to flooding from levee overtopping[1]
				(204400-58178)	
New Grafton Bridge (Summerland Way)	North and South approaches	** Sub Sector A	Yes old Grafton Bridge	8.35m Grafton Prince Street Gauge (204400-58178)	3.3 hours
Oliver Street	Between Queen and King Streets	** Sub Sector B	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	6.7 hours
Dobie Street	Between Prince and Queen Streets	** Sub Sector B	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	7.5 hours
Turf Street	Corner of Hoof Street	** Sub Sector B	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	19.9 hours
Cranworth Street	Between North and Hoof Streets	** Sub Sector C	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	12.7 hours
Bent Street	Between Queen and King Streets	** South Grafton	N/a	8.35m Grafton Prince Street Gauge (204400-58178)	11.7 hours
Summerland Way (MR83)	Deep Gully Creeks between Grafton and Junction Hill, at various locations between Junction Hill and Whiporie	Closure of this road is not a frequent occurrence but will prevent access to Casino	No	Levee overtopping at Grafton Prince Street Gauge (204400-58178) 8.34m. Other locations nominated along road are affected by significant local rainfall.	
Grafton-Coaldale-Baryulgil Road	Whiteman Creek	Access from Baryulgil to Grafton.	Clarence Way if not affected by flooding.	Area affected by significant local rainfall.	
Clarence Way (MR150)	Double Swamp Creek, Moleville Creek and Chaselings Gully.	Access to Grafton is cut from Copmanhurst.	No	Road cut at 8.0m on Copmanhurst Gauge (204903-	

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height	Approximate time to flooding from levee overtopping[1]
				58181). (204903-58181).	
Rogans Bridge Rd (Grafton-Copmanhurst) via Seelands at Rogans Bridge	Rogans Bridge	Access to Grafton is cut from Copmanhurst	Clarence Way if not affected by flooding.	Road cut at 6.0m on the Copmanhurst Gauge (204903-58181).	
Lawrence Rd (MR152)	Sportsman's Creek Bridge	Access from Lawrence to Grafton.	Pringles Way via Summerland Way	Road cut at 2.5m on the Lawrence Gauge (204409).	
Orara Way Grafton to Coffs Harbour	Bluff Bridge	Access to Grafton from Glenreagh	Pacific Highway	Road Cut at 5.8m on Glenreagh Gauge (204907-59123).	
Pacific Highway	Maclean to Grafton at Shark Creek	Access to Grafton from Maclean Also closes access from Queensland to Sydney	No	Highway cut at 3.9m on the Maclean Gauge (204410-558022).	
Pacific Highway	Maclean to Grafton at Serpentine Channel	Access north on the Pacific Highway. Also closes access from Queensland to Sydney.	No	Highway cut at 2.6m on the Maclean Gauge (204410-558022)..	
Big River Way	Ulmarra to Grafton	Swan Creek	No	Big River Way cut at 5.5m on the Ulmarra Gauge (204480-58188).	
	Grafton-Coffs Harbour	This road can be closed at Alipou Creek (South Grafton	A high-level bypass is available at Lilypool Road.	Big River Way cut at 5.4m on the Grafton Prince Street Gauge (204400-58178).	
Grafton to Nymboida on Armidale Road	3 bridges south of Coutts Crossing	No through traffic to Grafton	No	Area affected by significant local rainfall.	

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height	Approximate time to flooding from levee overtopping[1]
Maclean-Yamba road	Harwood Bridge, Palmers Island Bridge and Oyster Channel	Access from Yamba to Maclean and Grafton.	No	Yamba Road cut at Cloverleaf Harwood Bridge at 2.1m.	
Iluka road	Esk River	Access from Iluka to Ballina/Grafton		Road cut at 2.1m on Maclean Gauge (204410-558022).	
Eight Mile Lane (to Wooli via Airport road)	Sandy Crossing	Access from Wooli to Airport.	Wooli / Tucabia Road	Local significant Rainfall in excess of 100mm+	
Wooli Road (Ulmarra to Wooli via Tucabia and Pillar Valley)	Whites Bridge	Access Ulmarra to Wooli	No	Local significant Rainfall in excess of 100mm+.	
Wooli Road is cut				2.43 (Wooli Caravan Park gauge (205463-558060))	1% AEP

2.7 SUMMARY OF ISOLATED COMMUNITIES AND PROPERTIES

a. Table 22 lists communities liable to isolation and potential periods of isolation. Information presented here is based on historical and design events and does not reflect the duration of isolation expected in larger and extreme events.

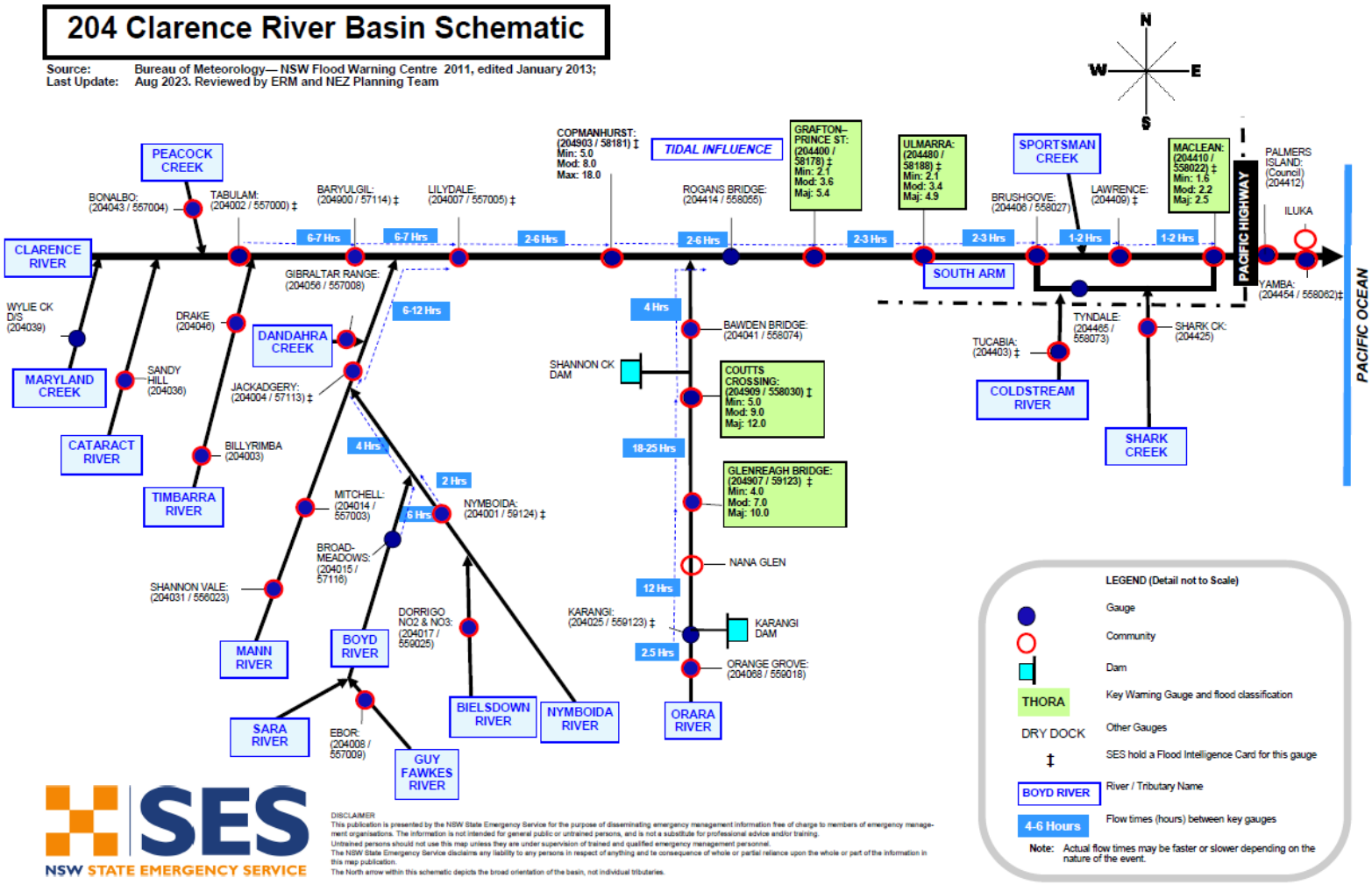
Table 232: Potential Periods of Isolation for communities in the Clarence Valley LGA during a Major flood.

Town / Area (River Basin)	Population/ Dwellings	Flood Affect Classification	Approximate period isolation	Days								NOTES
				1	2	3	4	5	6	7	8	
Copmanhurst Sector	1400 properties	High flood island	3- 5 days									Resupply to local service station and hotel (Junction Hill) and general store at Copmanhurst
Lawrence Sector	1100 properties	High flood island	3- 5 days									Resupply to Lawrence general store.
Ulmarra Sector	50 (Tucabia); 4 (Bostock); 2 (Gilletts Ridge) properties	High flood island	3-5 days									Resupplied to Tucabia general store; Remainder of resupply to individual properties
Brushgrove Sector	25 properties (Tyndale); Other rural properties	High flood island	3-5 days									Resupply to Tyndale service station; Some resupply to individual properties
Maclean Sector	2300 properties	High flood island	2-4 days									Resupply to Maclean Base hospital and Spa supermarket; local bakery
Iluka Sector	1100 properties	High flood island	3-5 days									Resupply to local stores by boat from Yamba.
Yamba Sector	3000 properties	High flood island	3-5 days									Resupply supermarkets.
Wooli – Minnie Water Sector	750 properties	High flood islands	3-5 days									Resupply to local stores in Minnie Waters and Wooli.

Town / Area (River Basin)	Population/ Dwellings	Flood Affect Classification	Approximate period isolation	Days								NOTES
				1	2	3	4	5	6	7	8	
Coutts Crossing Sector	220 properties including: Middle Creek (30 properties); Kangaroo Creek(70 properties); Mulquinney's (12 properties); Shannondale (20 properties); Levenstrath (15 properties); Braunstone (6 properties); Buccarumbi (40 properties); Copes Creek (6 properties); Poley's Bridge (20 properties)	High flood islands	3-5 days									Resupplied by flood boat to central location
Cangai Sector	220 properties	high flood island	2 – 8 days									Potential resupply to individual properties on request.

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: CLARENCE RIVER BASIN SCHEMATIC



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

Facility Name	Street Address	Locality	Population	Telephone	Accommodation Facility Type	Impact
Iluka Sector						
The Anchorage Holiday Park	Marandowie Drive	Iluka			Caravan Park	Inundation
Iluka Riverside Caravan Park	Charles Street	Iluka			Caravan Park	Inundation
Iluka Clarence Head Caravan Park	Charles Lane	Iluka			Caravan Park	Isolation
Woody Head Campground	Woody Point Camping Area Road	Bundjalung National Park	285 Occupants		Camping Ground	Inundation
Chatsworth Island Public School	136 Chatsworth Road	Chatsworth	67 Students	66464346	Primary	Inundation
Iluka Public School	Charles St	Iluka			Primary	Inundation
Harwood Public School	11 Morpeth Street	Harwood	71 Students	66464213	Primary	Inundation
ACE Early Learning	6 River Street	Harwood	57 Approved Places	1300262180	Preschool	Inundation
Yamba Sector						
Blue Dolphin Caravan Park	Yamba Road	Yamba			Caravan Park	Inundation
Yamba Waters Caravan Park	Golding Street	Yamba			Caravan Park	Inundation

Calypso Caravan Park	Harbour Street	Yamba			Caravan Park	Inundation
Big 4 Saltwater @ Yamba	286 Okeefes Lane	Palmers Island			Caravan Park	Inundation
Fishing Haven Caravan Park	35 River Street	Palmers Island			Caravan Park	Inundation
St James' Primary School	Lot 1, Carrs Drive	Yamba			Primary	Inundation
Palmers Island Public School	Maclean-yamba Rd	Palmers Island			Primary	Inundation
Yamba Public School	Angourie Road	Yamba	376 Students	66462420	Primary	Inundation
Yamba Preschool	6 Phoenix Cl	Yamba	29 Approved Places	66462800	Preschool	Inundation
Yamba Early Learning Centre	2 Providence Court YAMBA	Yamba	58 Approved Places	66468988	Preschool	Inundation
Willy Wagtails (Yamba)	7-9 Shores Drive	Yamba	69 Approved Places	66468168	Preschool	Inundation
St James Outside Hours Care	St James School, Lot 1 Carrs Drive	Yamba			OOSH	Inundation
Uniting Caroona Yamba	4 Freeburn Street	Yamba			Aged Care and Residence	Inundation
Maclean Sector						
Maclean Riverside Caravan Park	115 River Street	Maclean			Caravan Park	Inundation

Lake Arragan and Red Cliff Campground	Red Cliffs Road	Yuraygir National Park	471 Occupants		Camping Ground	Inundation
Maclean High School	Woombah Street	Maclean			High School	Isolation
Clarence Care & Support	50 River Street	Maclean			Aged Care and Residence	Inundation
The Whiddon Group Maclean Retirement Village	27 Union Street	Maclean	113 Residents	66424333	Aged Care and Residence	Inundation
Mareeba Aged Care	6 Rannoch Avenue	Maclean	115 Residents	66452966	Aged Care and Residence	Inundation
Maclean District Hospital	21 Union Street	Maclean			Hospital General	Inundation
Cubbyhouse (Townsend)	8 Cypress Street	Townsend			Preschool	Isolation
Maclean Community Preschool	15 Scullin Street	Townsend			Preschool	Isolation
Wooli Sector						
Wooli Camping and Caravan Park	25 Riverside Drive	Wooli			Caravan Park	Inundation
Bookroom Camp Ground	Off Diggers Camp Road	Diggers Camp	42 Occupants		Caravan Park	Inundation
Illaroo Campground	Illaroo Road	Yuraygir National Park	207 Occupants		Camping Ground	Inundation
Rocky Point campground	Angophora Grove Circuit	Yuraygir National Park	6 Occupants		Camping Ground	Inundation
Minnie Water Holiday Park	Minnie Water Road	Minnie Waters			Caravan Park	Inundation

Solitary Island Marine Park Resort	383 North Street	Wooli			Caravan Park	Inundation
Lawrence-Southgate Sector						
Camping ground	Bridge Street	Lawrence			Caravan Park	Inundation
Ulmarra-Cowper Sector						
Rathgar Lodge	26-30 Lynhaven Crescent	Ulmarra	32 Residents	66445475	Aged Care and Residence	Inundation
Ulmarra Public School	2476 Big River Way	Ulmarra	75 Students	66445266	Primary	Inundation
Tucabia Public School	Mookin Street	Tucabia			Primary	Inundation (PMF)
Cowper Public School	Clarence St	Cowper	29 Students	66476339	Primary	Inundation
Coldstream Community Preschool	Clarence Street	Tucabia	20 Approved Places	66448244	Preschool	Inundation
Copmanhurst Sector						
Baryulgil Public School	7135 Clarence Way	Baryulgil			Primary	Isolation
Copmanhurst Pre School	61 Grafton Street	Copmanhurst			Preschool	Isolation
Copmanhurst Public School	13 Prescott Street	Copmanhurst			Primary	Isolation
Coutts Crossing						

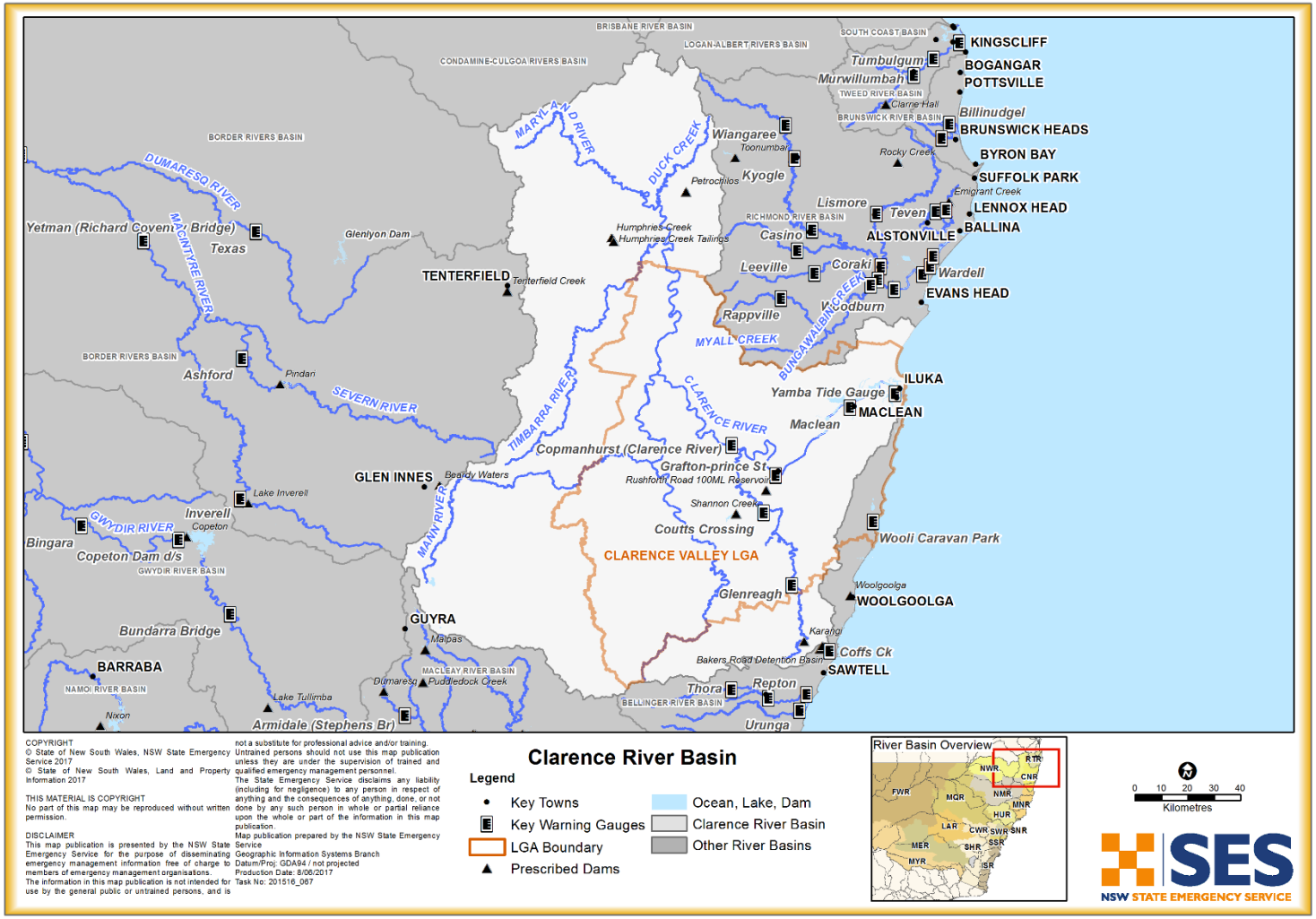
Coutts Crossing Preschool	8 Black Swan Drive	Coutts Crossing	20 Approved Places	66493422	Preschool	Inundation
Glenreagh Sector						
Glenreagh Community Preschool	2 Coramba Street	Glenreagh			Preschool	Isolation
Glenreagh Public School	Bridge Street	Glenreagh			Primary	Isolation
Sandon Sector						
Brooms Head Caravan Park	Ocean Road	Brooms Head			Caravan Park	Inundation
Sandon Camping Area	Sandon River Road	Sandon	87 Occupants		Camping Ground	Inundation
Grafton Sector						
Grafton Sunset Caravan Park	Gwydir Highway	Grafton			Caravan Park	Inundation
Grafton Showgrounds	Prince Street	Grafton			Caravan Park	Inundation
Glenwood Tourist Park	Heber Street	Grafton			Caravan Park	Inundation
Grafton Ski Lodge	Ski Lodge Road	Grafton			Caravan Park	Inundation
Grafton High School	97 Mary Street	Grafton	940 Students	66423355	Secondary	Inundation

St Andrews Christian School	84 Washpool Road	Clarenza			Primary & Secondary	Isolation
South Grafton Public School	Vere St	South Grafton			Primary	Inundation (PMF)
Mcauley Catholic College	4 Hennessy Drive	Clarenza			Secondary	Isolation
Westlawn Public School	North St	Grafton	496 Students	66427466	Primary	Inundation
St Mary's Primary School	171 Turf Street	Grafton	165 Students	66422262	Primary	Inundation
Clarence Valley Anglican School Grafton Campus	39 Victoria Street	Grafton	179 Students	66422011	Primary	Inundation
Grafton Public School	Queen St & Mary St	Grafton	670 Students	66421000	Primary	Inundation
Aruma Community Hub	1 Duke Street	Grafton		0414202475 or 0429556028	Disability support	Inundation
Bright Sparks Child Development Centre	124 Bacon Street	Grafton	50 Approved places	66433711	Preschool	Inundation
Clarence Family Day Care	162 Turf Street	Grafton	100 Approved Places	66431002	Early Learning	Inundation
Westlawn Preschool	54 Milton Street	Grafton	24 Approved Places	66422942	Preschool	Inundation
Jacaranda Preschool	61 Kelly Street	South Grafton			Preschool	Inundation (PMF)
Goodstart Early Learning Grafton	58 Duke Street	Grafton			Early Learning	Inundation

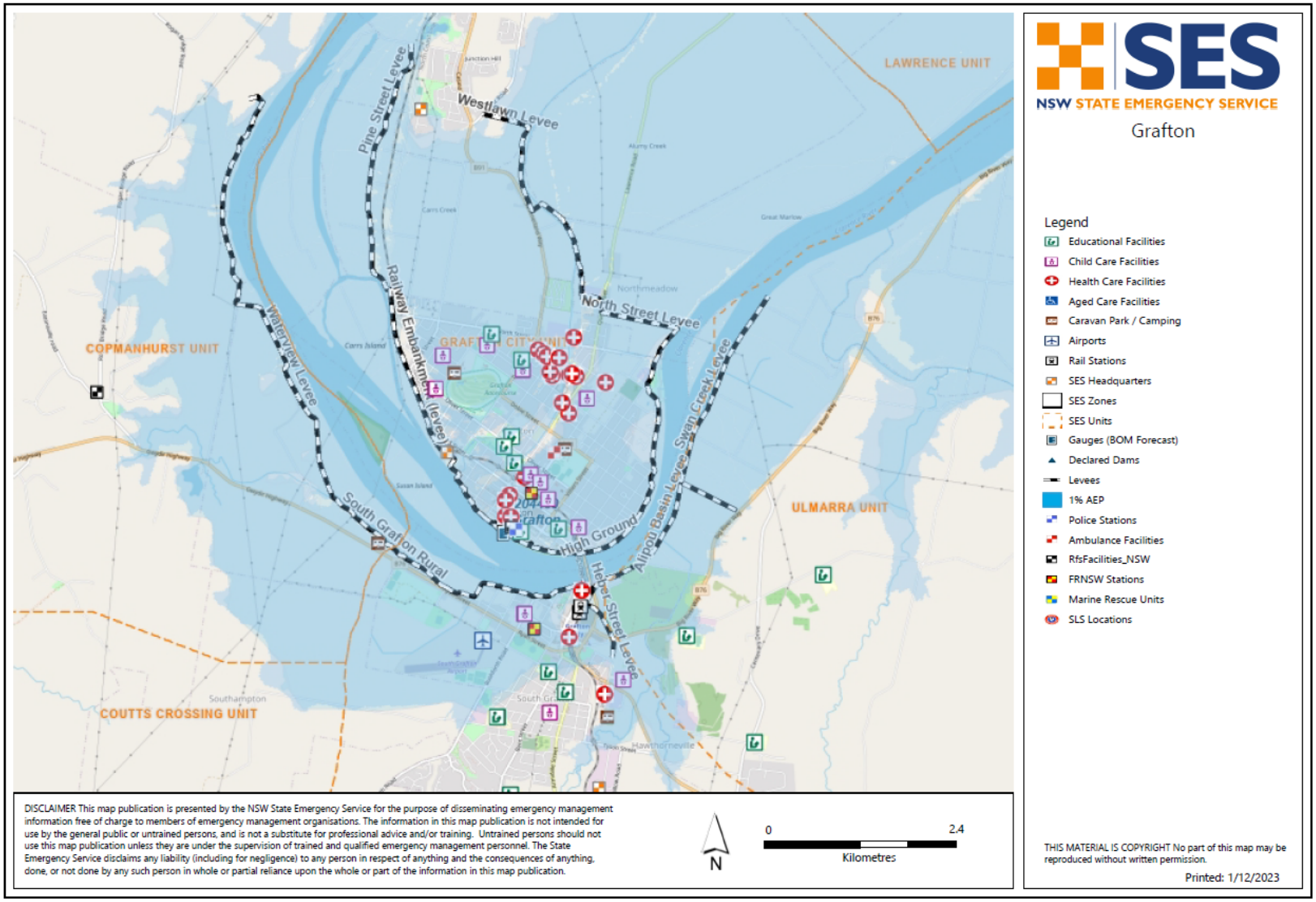
			90 Approved Places	66433530		
Community OOSH Services Grafton	295-301 Hoof St	Grafton	150 Approved Places	66589757	Early Learning	Inundation
Uniting Preschool Grafton/Jack and Jill Preschool	126 Prince Street	Grafton	25 Approved Places	66422319	Preschool	Inundation
Milestones Early Learning	15 Heber Street	South Grafton	80 Approved Places	66564664	Early Learning	Inundation
Gummyaney Aboriginal Corporation	30 Pound Street	Grafton	38 Approved Places	66422048		Inundation
Blinky's Children's Centre	21 Cranworth Street	Grafton	38 Approved Places	66427773	Early Learning	Inundation
Nurture One Arthur Street Children's Centre	141-143 Arthur Street	Grafton	71 Approved Places	66433774	Early Learning	Inundation
South Grafton Multipurpose Childcare Centre (New School of Arts)	Corner Skinner Street & Spring Streets	South Grafton	60 Approved Places	6642 6843	Early Learning	Inundation
Catholic Healthcare St Francis Aged Care	226 Arthur Street	Grafton	48 Residents	66403300	Aged Care and Residence	Inundation
Grafton Base Hospital	174 Arthur Street	Grafton	140 Beds	66402222	Hospital General	Inundation

Jacaranda Grove Caravan Park (over 50's Lifestyle Community)	598 Summerland Way	Grafton				Inundation
Southern Cross Care St Catherine's Residential Aged Care	126 North Street	Grafton	63 Residents	66424255	Aged Care and Residence	Inundation
Dougherty Villa	206 Arthur Street	Grafton	74 Residents	66432377	Aged Care and Residence	Inundation
Cangai Sector						
Nymboida River Campground	T-Ridge Road	Nymboida National Park			Camping Ground	
Dundurrabin Public School	70 Mount Street	Dundurrabin			Primary	Isolation
The Junction Campground	Junction Road	Nymboida-Binderay National Park			Camping Ground	

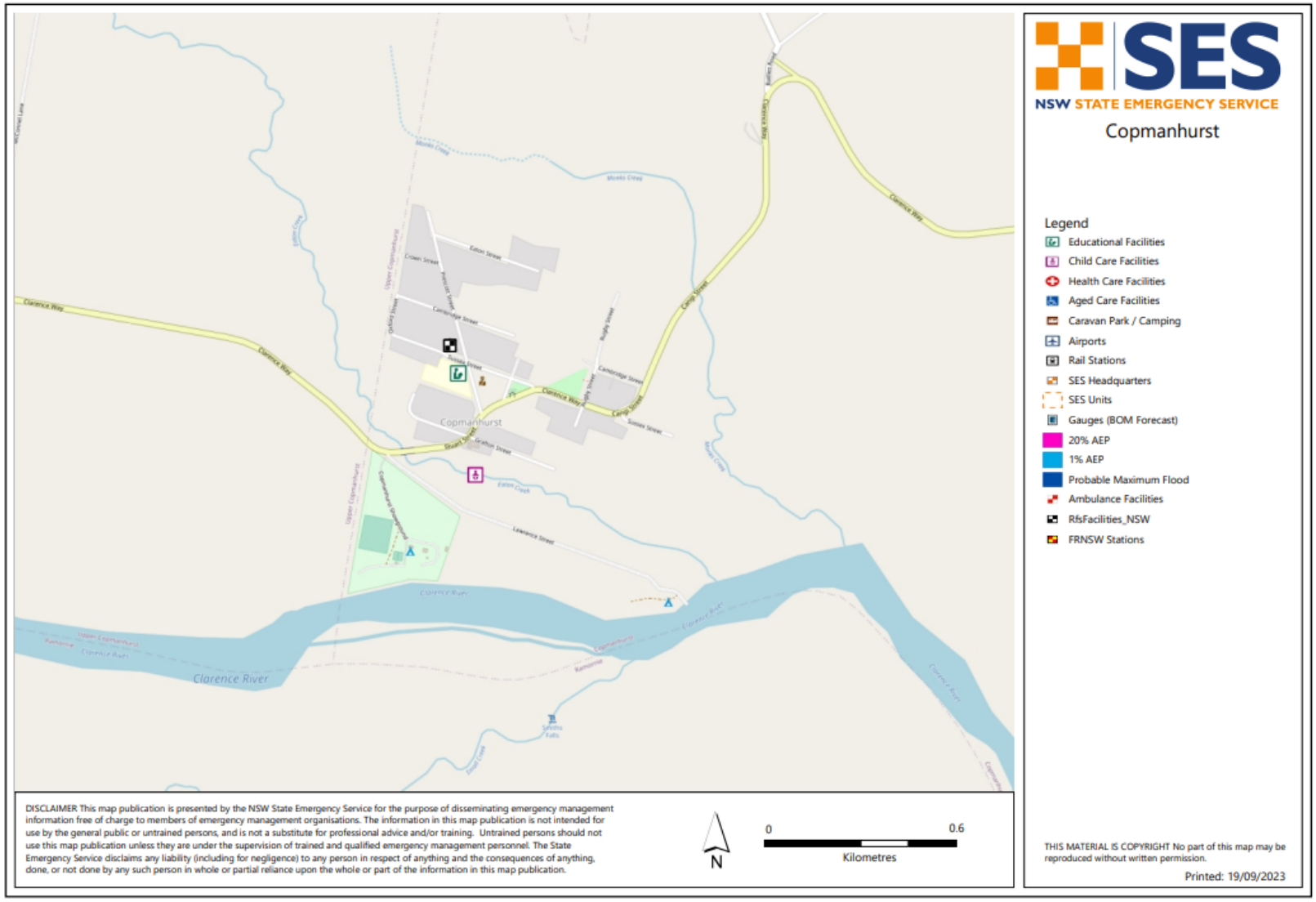
MAP 1: CLARENCE RIVER BASIN



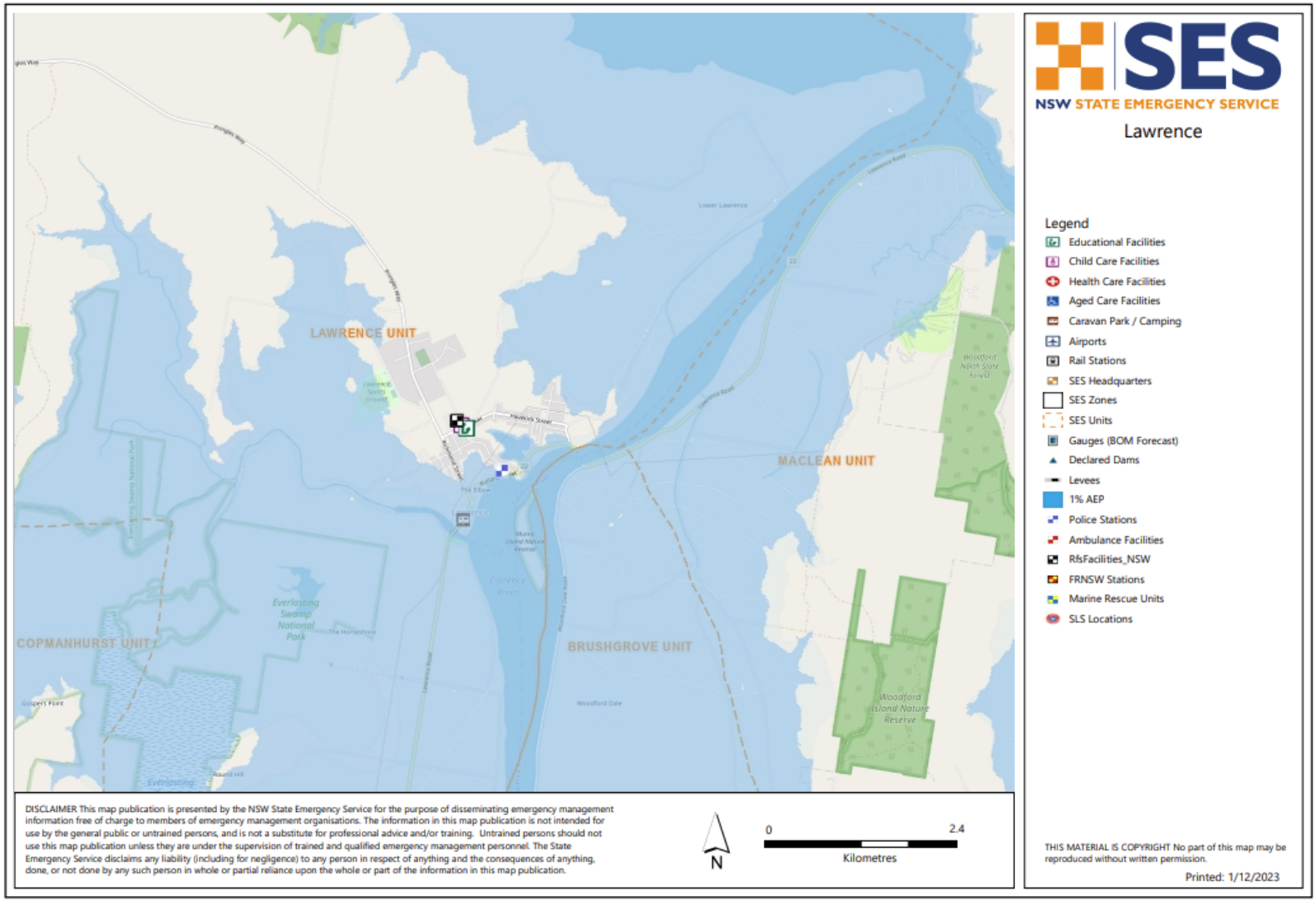
MAP 2: GRAFTON TOWN MAP



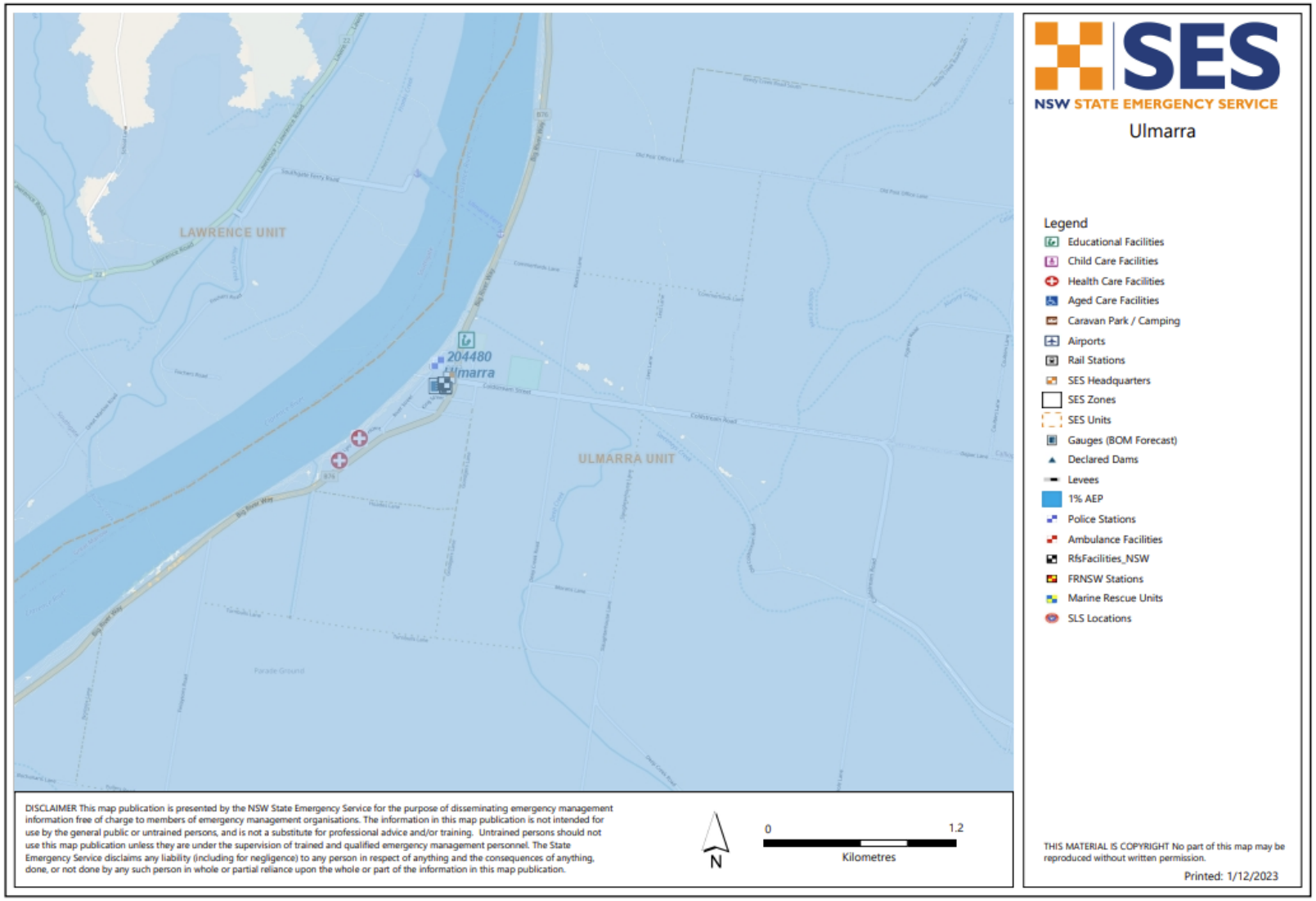
MAP 3: COPMANHURST TOWN MAP



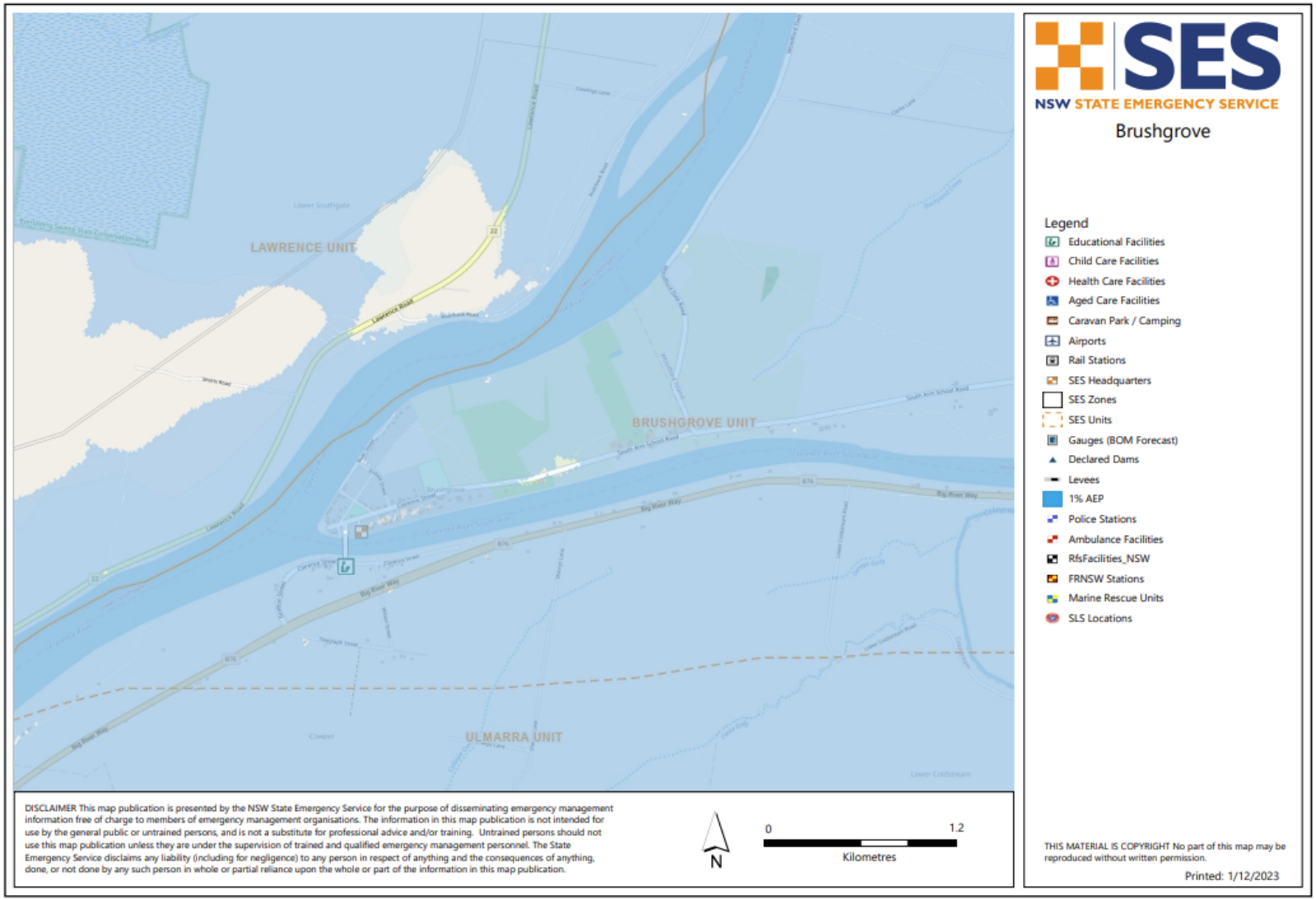
MAP 4: LAWRENCE TOWN MAP



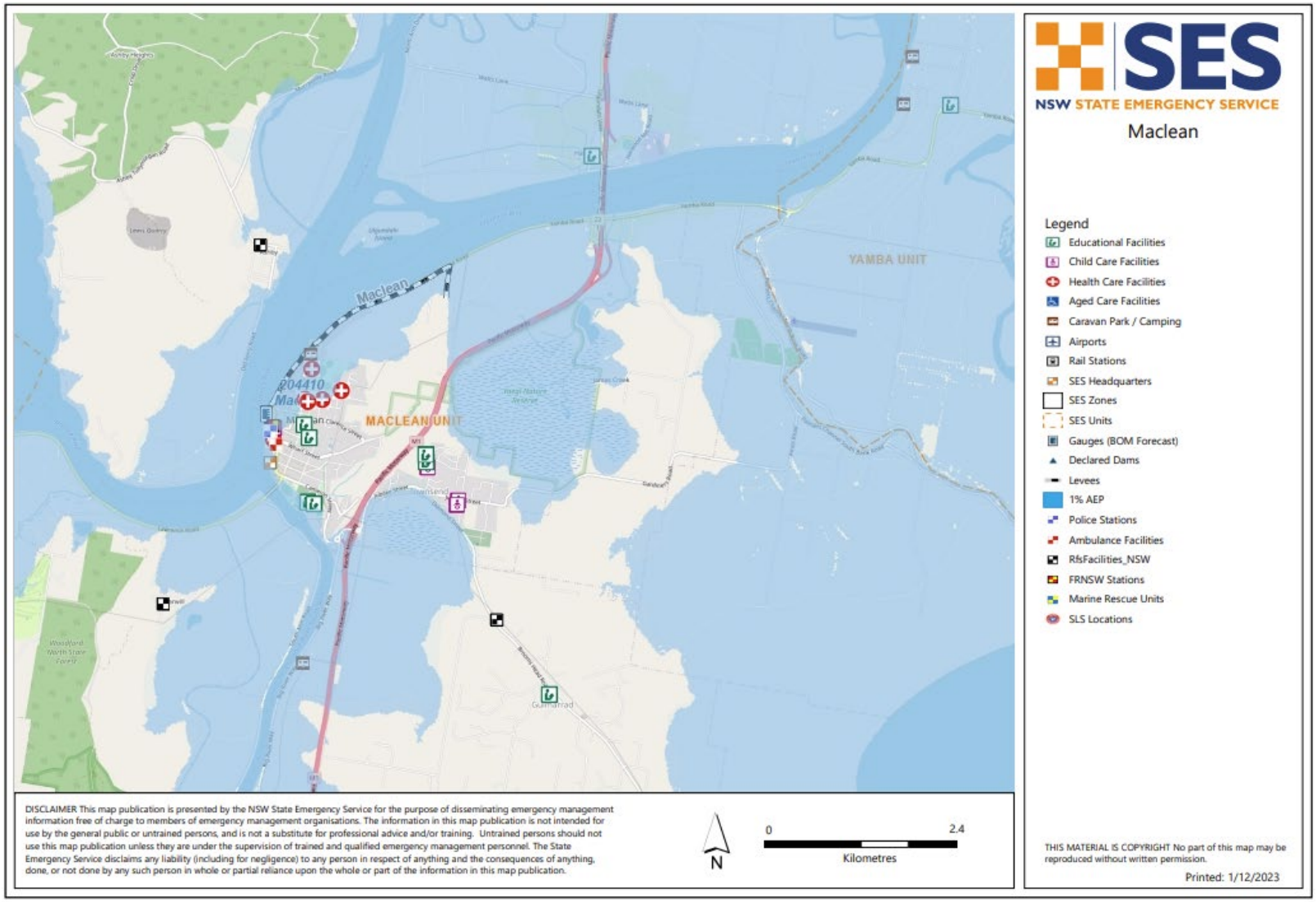
MAP 5: ULMARRA TOWN MAP



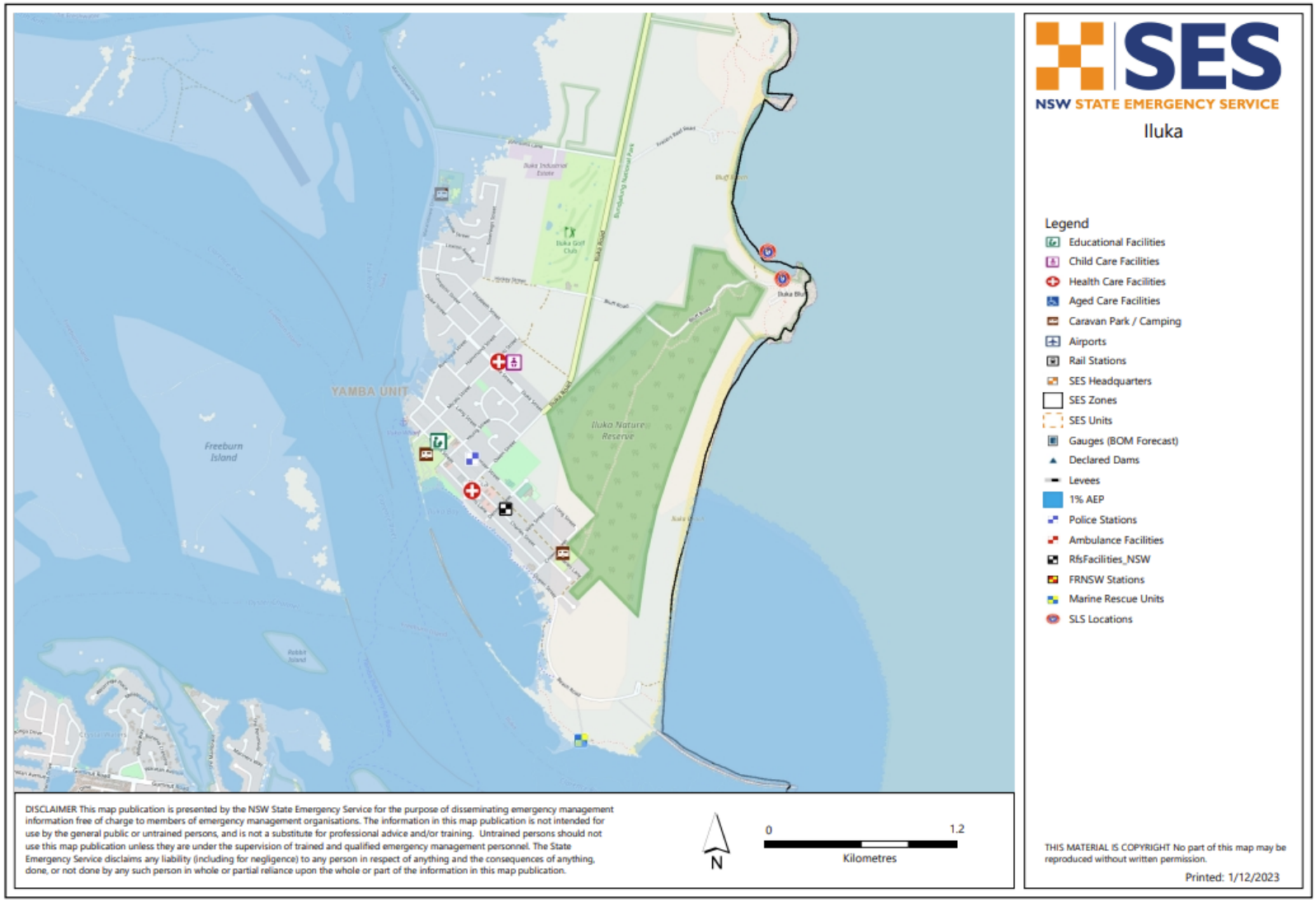
MAP 6: BRUSHGROVE TOWN MAP



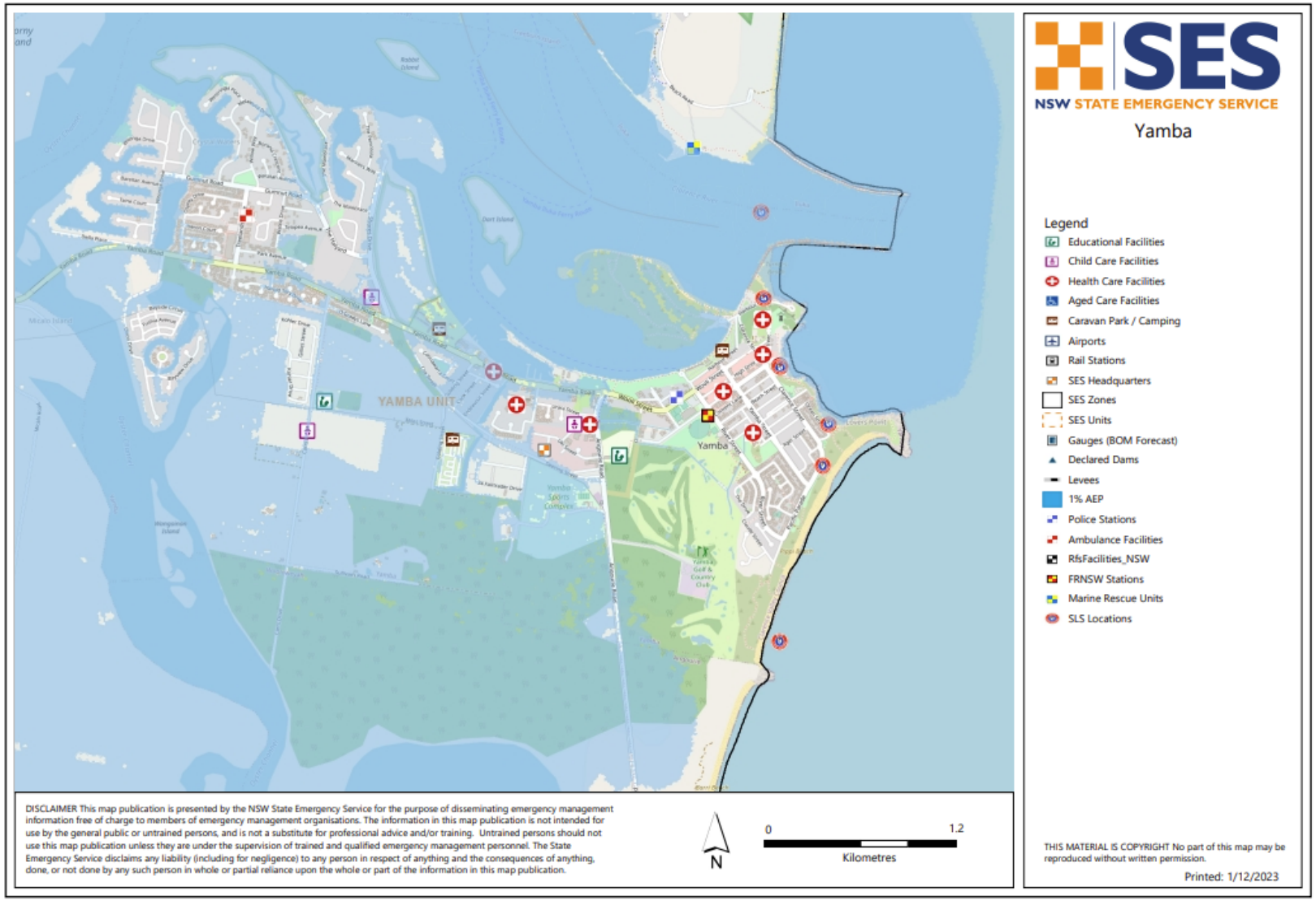
MAP 7: MACLEAN TOWN MAP



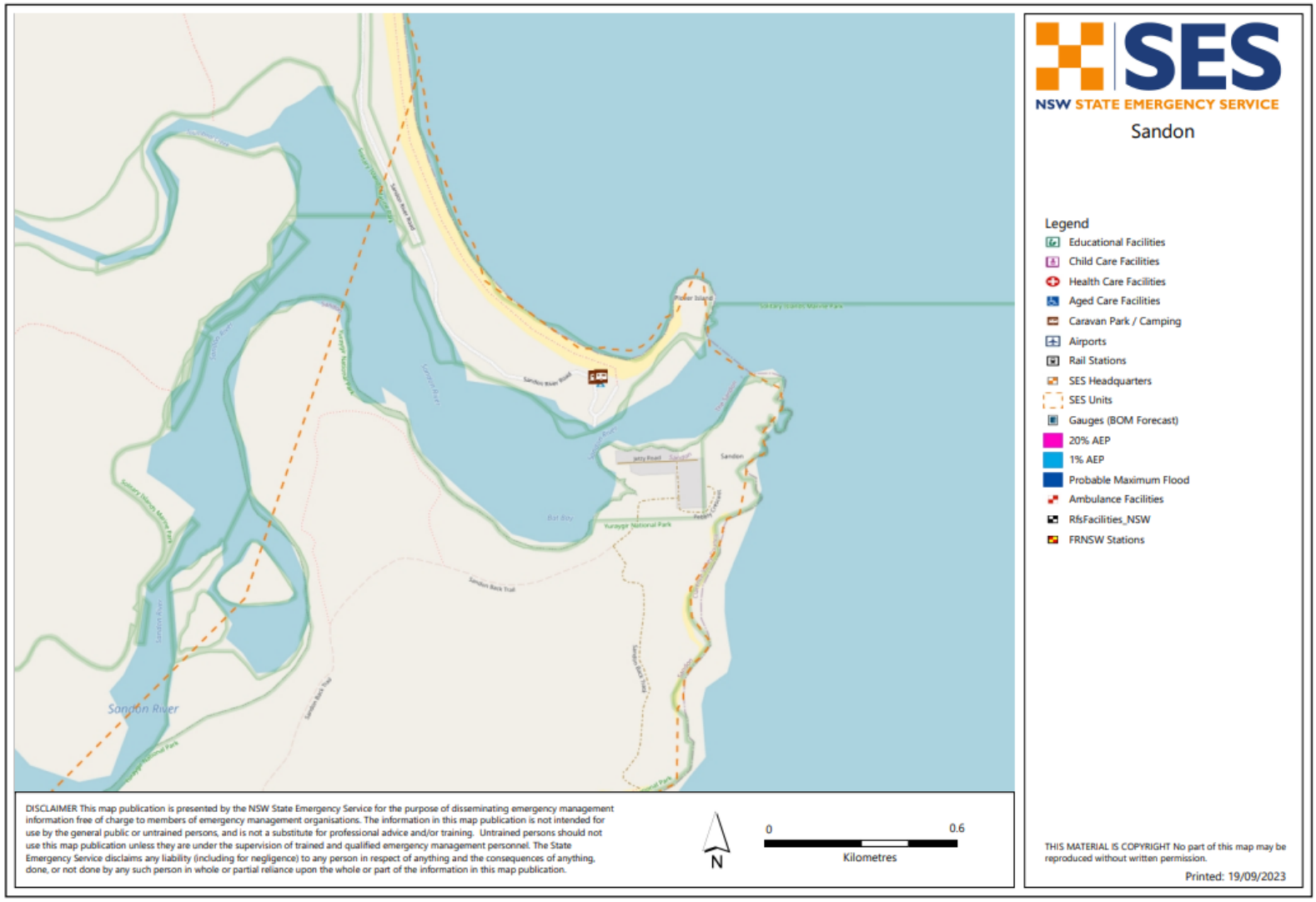
MAP 8: ILUKA TOWN MAP



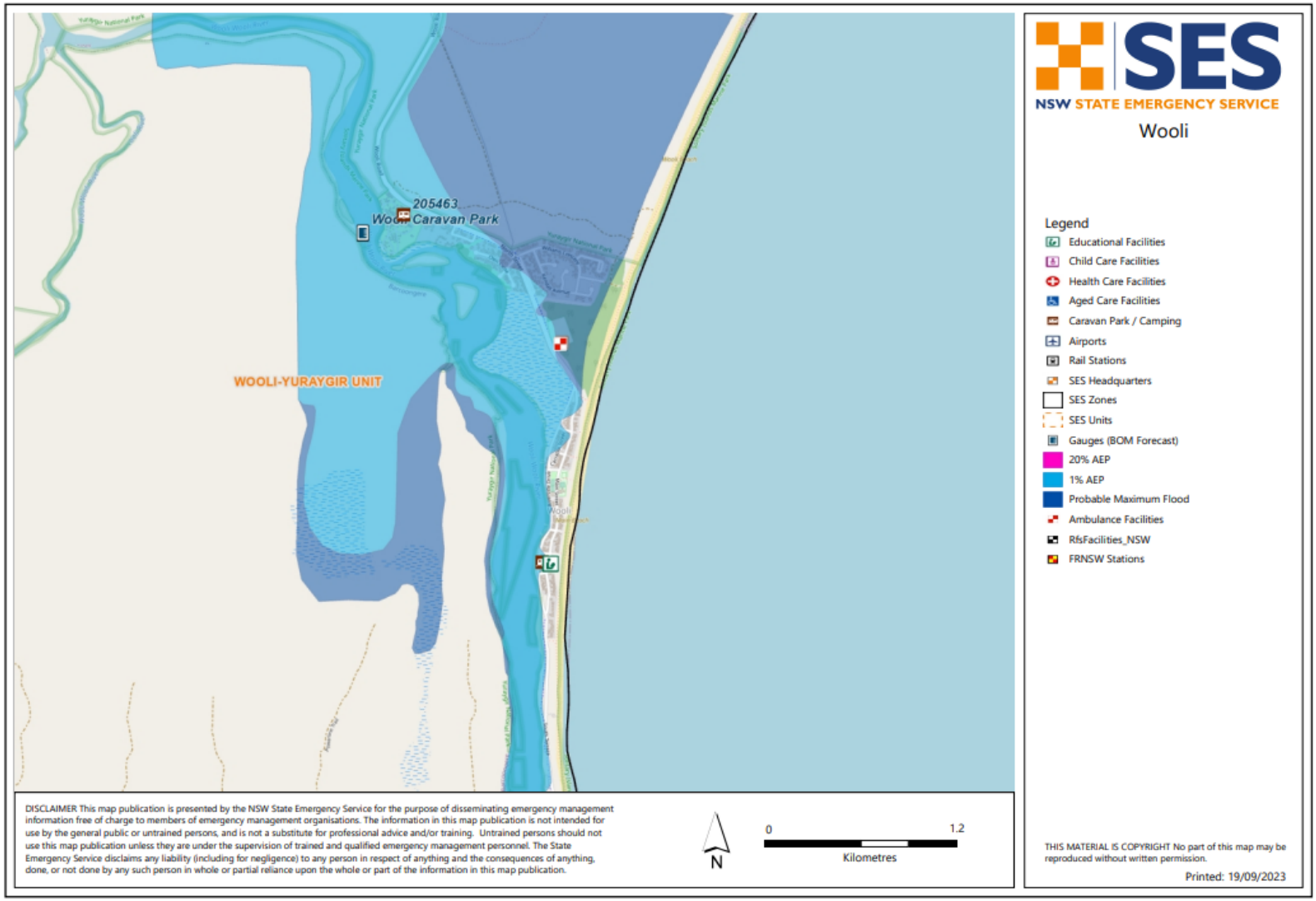
MAP 9: YAMBA TOWN MAP



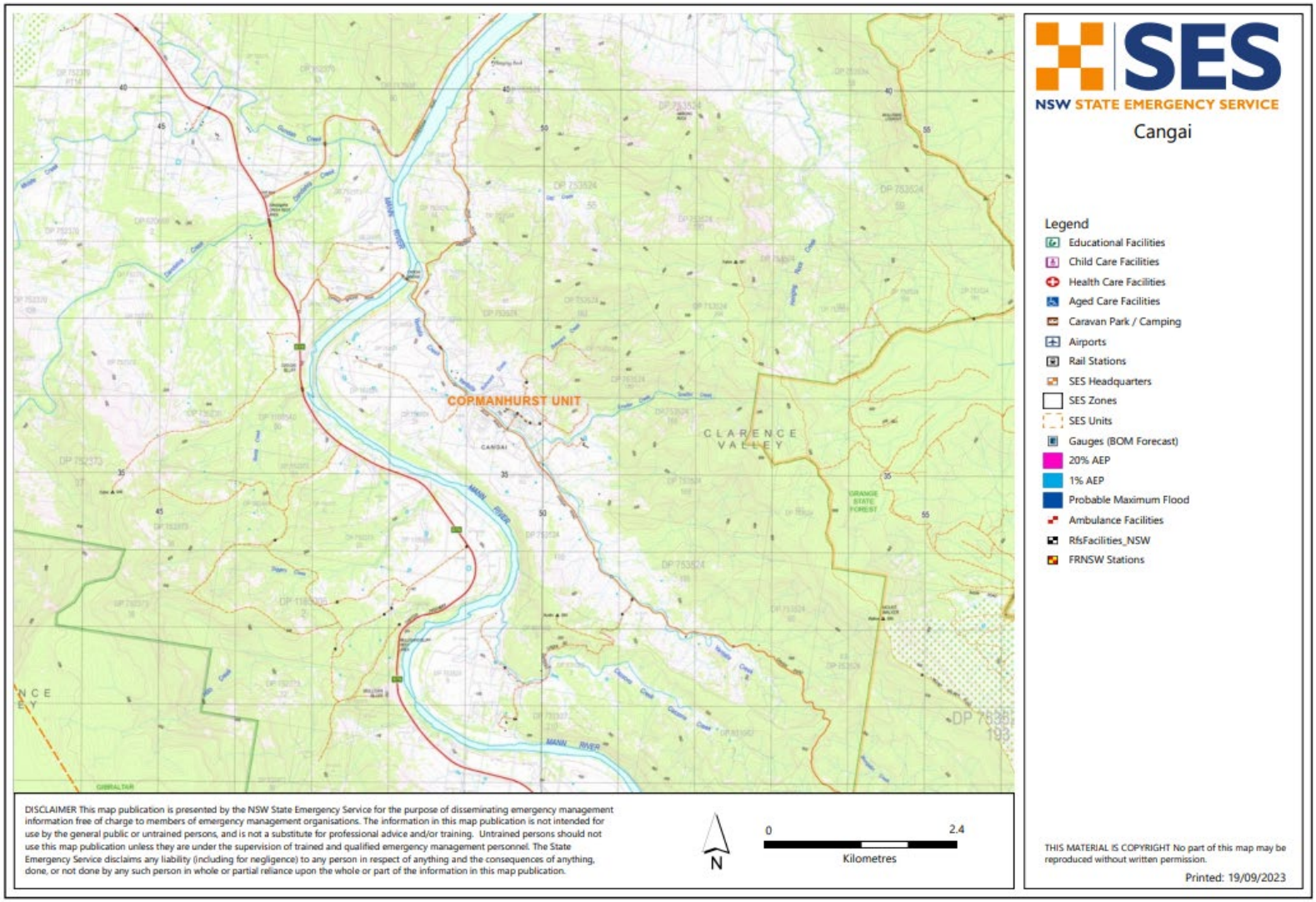
MAP 10: SANDON TOWN MAP



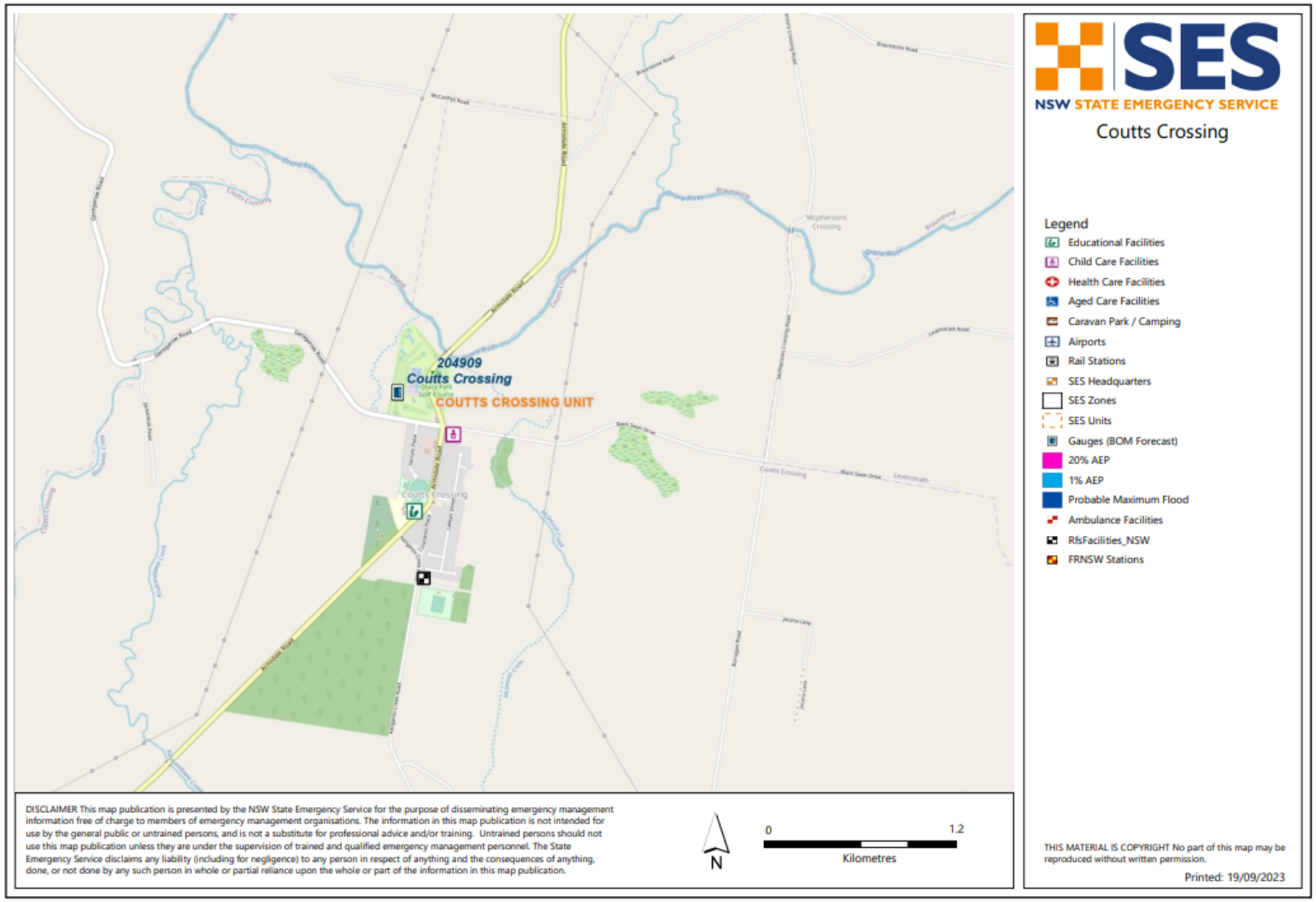
MAP 11: WOOLI-MINNIE WATER TOWN MAP



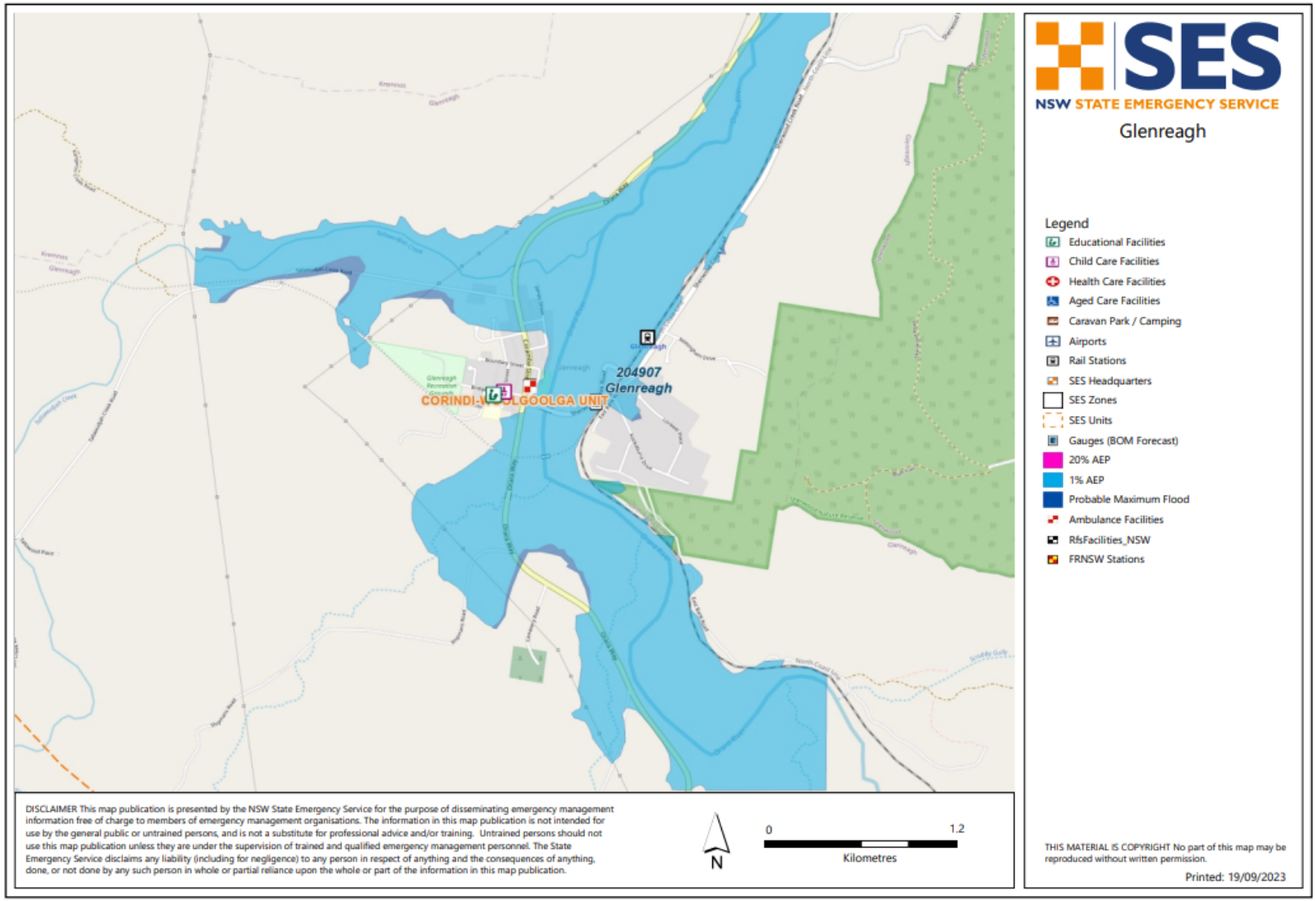
MAP 12: CANGAI TOWN MAP



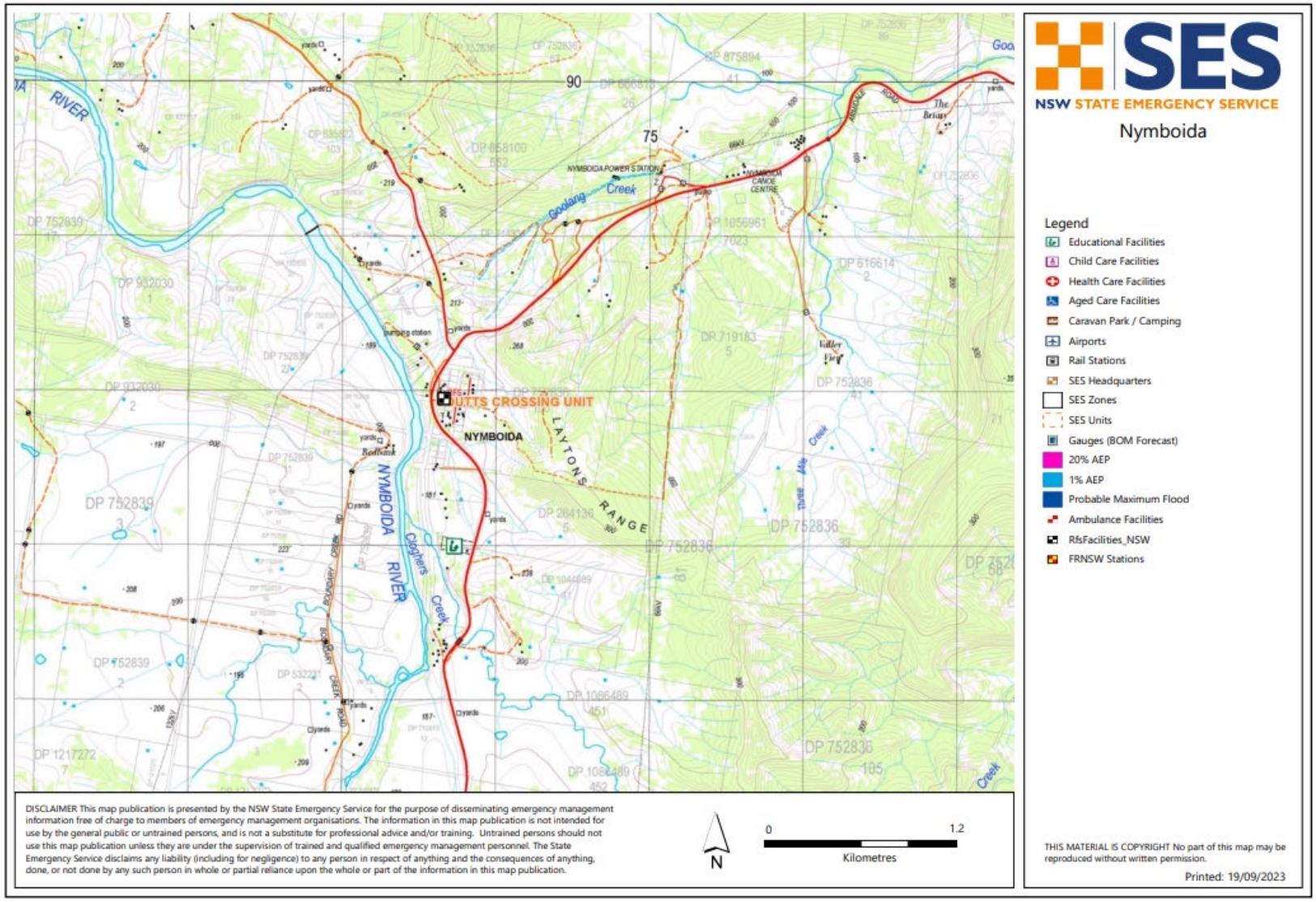
MAP 13: COUTTS CROSSING TOWN MAP



MAP 14: GLENREAGH TOWN MAP



MAP 15: NYMBOIDA TOWN MAP



LIST OF REFERENCES

1. **Clarence Valley LEMC.** *Clarence Valley Local Emergency Management Plan.* 2023.

2. **NSW State Emergency Service.** *Clarence Valley Local Flood Plan.* 2017.

3. **GHD.** *Glenreagh Flood Study.* s.l. : Clarence Valley Council, 2013.

4. **Australia, WBM Oceanics.** *Lower Clarence River Flood Study Review.* s.l. : Clarence Valley Council, 2004.

5. **NSW Public Works (Dams & Civil).** *Shannonn Creek Dam Dam Safety Emergency Plan.* August 2022 update.

6. **Council, Clarence Valley.** *Modified Dam Safety Emergency Plan - 100ML and 32MG Rushforth Reservoirs.* s.l. : Clarence Valley Council, 2015.

7. **Australian Heritage Commission.** 1998.

8. **Mashiah, Greg.** Historical Flood Peak Heights. s.l. : Clarence Valley Council, 2023.

9. **BMT WBM.** *Lower CLarence Flood Model Update.* s.l. : Clarence Valley Council, 2013.

10. **WBM.** *Lower Clarence Flood Study Review.* 2004.

11. **BMT.** *Lower Clarence Flood Model Update 2022.* s.l. : Clarence Valley Council, 2023.

12. **Bewsher.** *GRAFTON AND LOWER CLARENCE FLOODPLAIN RISK MANAGEMENT PLAN.* s.l. : Clarence Valley Council, 2007.

13. **NSW SES.** *Flood Intelligence.*

14. **Consulting, Hydrosphere.** *DRAFT Clarence Valley Coastline and Estuaries Coastal Management Program.* s.l. : Clarence Valley Council, 2023.

15. **Statistics, Australian Bureau of.** Census. *Australian Bureau of Statistics.* [Online] Australian Government, 2021.

16. **Australian Bureau of Statistics.** *2011 Census data.* s.l. : Australian Bureau of Statistics, 2011.

17. **Mashiah, Greg.** *Floor Level Data Summary.* s.l. : Clarence Valley Council, 2023.

18. **BMT.** *Grafton Evacuation Assessment Update.* s.l. : BMT, 2020.

19. **Public Works Department.** *Visual Audit of North Grafton Levee.* 2015.

20. **BMT WBM.** *Grafton levee overtopping study - SES evacuation report.* 2013a.

21. **Public Works Department.** *Visual Audit of South Grafton Levee.* 2015.

22. **BMT WBM.** *Grafton, South Grafton and Maclean Emergency Management Report.* s.l. : Clarence Valley Council, 2014.

23. **Service, NSW State Emergency.** GEMS mapping. 2023.

24. **McAndrew, K.** *The number of premises with floor levels below design floods.* s.l. : Clarence Valley Council, 2016.

25. **Public Works Department.** *Ulmarra Flood Mitigation - Levee Study Audit.* 2015.

26. **Rob Leslie, Nicole Geale (PC Flooding Team).** SES Flood Data Request for Clarence and Richmond River Models from the W2B Project. *Memorandum.* s.l. : Pacific Complete, 2022.

27. **Complete, Pacific.** *Woolgoolga to Ballina Pacific Highway Upgade Hydrological Mitigation Report Glenugie to Devils Pulpit.* s.l. : Pacific Complete, 2022.

28. **Public Works Department.** *Visual Audit of Maclean Levee.* 2015.

29. **Clarence Valley Council.** *Brooms Head Emergency Action Sub-Plan.* 2012.

30. **Engineers, JBP Scientists and.** *Wooli Wooli River Flood Study.* s.l. : Clarence Valley Council, September 2023.

31. **Clarence Valley Council.** *Draft - Wolli Emergency Action Sub Plan.* 2012.

32. **GHD.** *Orara River Flood Study.* s.l. : Coffs Harbour City Council, June 2012.

33. —. *Glenreagh Floodplain Risk Plan.* s.l. : Clarence Valley Council , 2018.

34. **WorleyParsons.** *Wooli Beach Village Review of Coastal Hazards.* s.l. : Clarence Valley Council, 2010.

35. **Royal Haskoning DHV.** *Wooli Beach Coastal Zone Management Plan.* s.l. : Clarence Valley Council, 2015.

36. **Statistics, Australian Bureau of.** Census. [Online] Australian Government, 2021.

CLARENCE VALLEY FLOOD WARNING SYSTEMS AND ARRANGEMENTS

Chapter 1 of Volume 3 (NSW SES Response Arrangements for Clarence Valley) of the Clarence Valley Flood Emergency Sub Plan

Last Update: February 2024

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LIST OF TABLES

1. GAUGES MONITORED BY THE NSW SES CLARENCE VALLEY LOCAL HEADQUARTERS

Table 1: Gauges monitored by the NSW SES Clarence Valley Local Headquarters

Gauge Name	Type	AWRC No.	Bureau Gauge No.	Stream	Flood level classification in metres			Special Reading Arrangements	Owner
					MIN	MOD	MAJ		
Grafton (Prince Street) *‡†	Automatic	204400	58178	Clarence River	2.1	3.6	5.4		NSW OEH
Ulmarra *‡†	Automatic	204480	58188	Clarence River	2.1	3.4	4.9		NSW OEH
Maclean *‡†	Automatic	204410	558022	Clarence River	1.6	2.2	2.5		NSW OEH
Glenreagh Bridge *‡†	Manual	204907	59123	Orara River	4.0	7.0	10.0	Manual read by local unit or local commander	NSW OEH
Glenreagh ‡†	Automatic	204906	559066	Orara River	5.0	9.0	13.0		WaterNSW
Coutts Crossing *‡†	Manual	204909	558030	Orara River	5.0	9.0	12.0	Manual read by local unit or local commander	Clarence Valley Council
Wooli (Caravan Park)* ‡†	Automatic	205463	558060	Wooli Wooli River	1.9	2.2	2.5		Clarence Valley Council
Lawrence ‡†	Automatic	204409		Clarence River					CRC
Baryulgil ‡	Automatic	204900	057114	Clarence River					WaterNSW
Bawden Bridge	Automatic	204041	558074	Orara River					WaterNSW
Billyrimbah	Automatic	204033	560032	Timbarra River					WaterNSW
Bonalbo	Automatic	204043	557004	Peacock Creek					WaterNSW
Broadmeadows	Automatic	204015	057116	Boyd River					WaterNSW
Brushgrove ‡†	Automatic	204406	558027	Clarence River					OEH
Copmanhurst ‡†	Manual	204903	058181	Clarence River					Clarence Valley Council
Dorrigo No. 2 & 3	Automatic	204017	559025	Bielsdown River					WaterNSW
Drake	Automatic	204046	557007	Timbarra River					WaterNSW
Ebor	Automatic	204008	557009	Guy Fawkes River					WaterNSW

Gibraltar Range	Automatic	204056	557008	Dandahra Creek					WaterNSW
Heifer Station ‡	Manual	204902	058185	Clarence					Clarence Valley Council
Jackadgery ‡	Automatic	204004	057113	Mann River					WaterNSW
Karangi ‡	Automatic	204025	559023	Orara River					WaterNSW
Lilydale ‡	Automatic	204007	557005	Clarence River					WaterNSW
Mitchell	Automatic	204014	557003	Mann River					WaterNSW
Nymboida ‡†	Automatic	204001	059124	Nymboida River					WaterNSW
Orange Grove ‡	Automatic	204068	559018	Orara River					WaterNSW
Rogans Bridge	Automatic	204414	558055	Clarence River					OEH
Sandy Hill	Automatic	204036	556024	Cataract River					WaterNSW
Shannon Vale	Automatic	204031	556023	Mann River					WaterNSW
Tabulam ‡†	Automatic	204002	557000	Clarence River					WaterNSW
Tyndale	Automatic	204465	558073	South Arm					OEH
Maryland River Downstream Wylie Creek	Automatic	204039	556026	Maryland Creek					WaterNSW
Yamba (Tide gauge) ‡†	Automatic	204454	558062	Southern Yamba Breakwall					OEH
Wooli Entrance	Automatic	205462	559044	Wooli Wooli River					OEH

Notes: The Bureau of Meteorology provides flood warnings for the gauges marked with an asterisk (*).

NSW SES Local Flood Advices are provided for the gauges marked with a single cross (†).

The NSW SES holds a Flood Intelligence Card for the gauges marked with a double cross (‡)

2. DISSEMINATION OPTIONS FOR NSW SES FLOOD INFORMATION AND WARNING PRODUCTS

As the combat agency for flood, storm and tsunami NSW SES has a statutory responsibly to issue warnings and public information to affected communities (NSW SES Act s 8). Warnings include advice about options and likely impacts of an event. The Incident Controller is accountable for preparing and disseminating accurate warning products during an incident.

2.1 DISSEMINATION OF WARNINGS:

NSW SES disseminates warnings through the following platforms: (Please note that this is not an exhaustive list and not all the following may be used during any or all events)

- NSW SES Website
    - www.ses.nsw.gov.au
- HazardWatch
    - HazardWatch is currently online at www.hazardwatch.gov.au .
    - Warnings are automatically updated/removed as managed through this platform.
- Hazards Near Me NSW App
- Doorknocking
- Emergency Alert
- Social Media
    - The following are some social media accounts:
        - Facebook (@NSWSES)
        - Facebook (@Northern Rivers NSW SES)
        - Facebook (@Clarence Valley NSW SES)
        - Facebook (Local community pages, Local business pages)
        - Twitter (@NSWSES
        - Instagram (@NSWSES)
- Community Meetings

Television Stations:

Station	Location
ABC TV (Channel 2, 20 & 21)	Northern NSW
ABC NEWS, (Channel 24)	Northern NSW
NBN (Channel 8, 81)	Northern NSW
SBS (Channel 3)	Northern NSW
WIN/10 (Channel 5)	Northern NSW
Seven West (Channel 6, 61)	Northern NSW
SkyNews (Channel 53)	Northern NSW

Radio Stations:

Station	Location	Frequency	Modulation
ABC Radio	North Coast	738 AM 94.5 FM	
ABC News	Richmond / Tweed Grafton / Kempsey	98.5 FM Channel; 204	
2GF	Grafton	1206 AM	
Vision Christian Radio	Grafton	1611 AM	
2GF	Grafton	104.7 FM	2GF
FM 104.7	Grafton	105 FM	
Loving Life FM	Grafton	103.1 FM	
Raw FM	Grafton	87.6 FM	Raw FM
Yamba Radio	Maclean	93.5 FM	
Raw FM	Maclean	87.6 FM	
RawFM	Yamba	87.6 FM	Raw FM
Yamba Community radio station	Yamba	93.5 FM	

Digital/On-Line Services

- Streaming Services
- Podcasts
- YouTube Channels

Other Agencies:

Stakeholders include:

- Chamber of Commerce
- Business Owners
- NFP's
- NDIS and Community Care Providers
- Aged Care Providers
- Emergency Services
- Schools and Child Care
- Clarence Valley Council
- NSW Health
- Media Outlets
- Others where appropriate

CLARENCE VALLEY: NSW SES LOCALITY RESPONSE ARRANGEMENTS

Volume 3, Chapter 2 of the Clarence Valley Flood Emergency

Sub Plan

(NSW SES Response Arrangements for Clarence Valley)

Last Update: February 2024

AUTHORISATION

NSW SES Locality Response Arrangements in Clarence Valley has been prepared by the NSW State Emergency Service (NSW SES) as part of a comprehensive planning process.

Approved

NSW SES North Eastern Zone Coordinator Planning

Date: 26th Feb 2024

Approved

NSW SES North Eastern Zone Commander

Date: 26th Feb 2024

Tabled at LEMC

Date: 26th Feb 2024

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SECTOR OVERVIEW

Table 1: Overview of Sectors in the Clarence Valley LGA.

Sector Name	Community	Sector Basis	Total properties	Properties potentially at risk
Sector 1 - Grafton Sector	Grafton and South Grafton and includes: Alumy Creek, Carrs Creek, Carrs Island, Carrs Peninsula, Eatonsville, Great Marlow, Junction Hill, Seelands, Southampton, Waterview and Waterview Heights.	North Grafton is a low flood island during an extreme flood. South Grafton has rising road access to South Grafton Hill.	7679	5162 properties are at risk of over floor flooding in Grafton. Areas within Grafton are at risk of isolation. Junction Hill is at risk of isolation from Grafton, with access to the north.
Sector 2 – Copmanhurst Sector	Copmanhurst, Baryulgil and Malabugilmah	High flood island.	201	At risk of isolation. 10 properties at risk of over floor flooding in Copmanhurst.
Sector 3 -Lawrence Sector	Lawrence, Lower Southgate and Southgate	Lawrence has rising road access to a high flood island. Southgate has rising road access until the Lawrence Road is flooded, thereafter becoming a low flood island.	Lawrence 464 Southgate and Lower Southgate 144	54 properties at risk of over floor flooding in Lawrence. 98 properties at risk of over floor flooding in Southgate. Southgate at risk of isolation.
Sector 4 – Ulmarra Sector	Ulmarra, Tucabia (village), and Gilletts Ridge	Ulmarra is Low flood island Tucabia and Gilletts Ridge have rising road access.	Ulmarra 332 Tucabia 174	89 properties at risk of over floor flooding in Tucabia. More than 357 properties at risk of over floor flooding in Ulmarra. Villages also at risk of isolation.
Sector 5 – Brushgrove Sector	Brushgrove, Woodford Island, South Arm and Ilarwill. Cowper	Brushgrove and Cowper are low flood island. The area of Ilarwill and the western side of Woodford Island and the eastern side of South Arm, is a high flood island. .	Brushgrove 99 Ilarwill 103 Woodford Island 133 Cowper 62	99 properties at risk of over floor flooding in Brushgrove. Ilarwill 12 (above floor) Woodford Island 113 (above floor) 56 properties at risk of over floor inundation in Cowper.

Sector Name	Community	Sector Basis	Total properties	Properties potentially at risk
Sector 6 – Maclean Sector	Maclean, Tyndale, Townsend, Ashby and Palmers Channel.	Maclean has rising road access between 2.5 and 2.7 metres (m), thereafter becoming a high flood island with the levee overtopping heights at 3.3-3.4 m.	Maclean 1127 Shark Creek 19 Tyndale 99 Townsend 436 Ashby 161	421 properties (and 102 Commercial) at risk of over floor flooding in Maclean. Shark Creek 3 Tyndale 29 Ashby 13 All areas at risk of isolation.
Sector 7 – Iluka Sector	Iluka, Harwood, Chatsworth, Warregah Island and Woombah	Iluka becomes a high flood island following the flooding of access roads at 2.1 m (Maclean gauge).	Iluka – 1314 Harwood – 158 Chatsworth Island 79	Iluka – 392 Harwood – 170 Chatsworth Island – 51 Chatsworth - 82 3 Caravan Parks and a Campground Also at risk of isolation.
Sector 8 – Yamba Sector	Yamba, Angourie and Palmers Island	Yamba becomes a low flood island at 2.1m (Maclean gauge) and has rising road access in the east. Palmers Island is a low flood island.	Yamba 4054 Palmers Island 224	Yamba 1217 Palmers Island 126
Sector 9 – Sandon Sector	Sandon and Brooms Head	Sandon is a high flood island. Brooms Head is a high flood island.	Sandon 35 Brooms Head 271	At risk of isolation. At risk of storm surge and coastal erosion and inundation.
Sector 10 – Wooli-Minnie Water Sector	Wooli and Minnie Water	Both are a high flood island, and then Wooli becomes a low flood island.	Pillar Valley 187 Wooli 463 Minnie Water 183	At risk of isolation. 210 properties at risk of over floor flooding in Wooli, as well as coastal erosion and inundation.
Sector 11 – Cangai Sector	Cangai	High flood island.	Cangai 13 Jackadgery 62	At risk of isolation approximately 220 properties.
Sector 12 – Coutts Crossing Sector	Coutts Crossing and Nymboida township	High flood island.	Coutts Crossing 426 Nymboida 146	All at risk of isolation.
Sector 13 – Glenreagh Sector	Glenreagh	High flood island.	363	Approximately 136 at risk of over floor flooding. Remainder at risk of isolation.

1. GRAFTON SECTOR

1.1. GRAFTON SECTOR

See Map Attached

Sector Description	This sector covers Alumy Creek, Carrs Creek, Carrs Island, Carrs Peninsula, Eatonsville, Great Marlow, Junction Hill, North Grafton, Seelands, South Grafton, Southampton, Waterview and Waterview Heights. Areas of this sector are protected by a system of levees which will over top at different heights.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	North Grafton is a low flood island during extreme floods. South Grafton is classified as rising road access to South Grafton Hill.		
At risk properties in a PMF	North Grafton 4596 South Grafton 566	**Total number of properties**	North Grafton 4854 South Grafton 2825
Population	North Grafton 10563 (2021 Census)	South Grafton 6288 (2021 Census)	
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauge Name: Grafton (Prince Street) (204400/58178)	Minor: 2.10 m	Moderate: 3.60 m	Major: 5.40 m
General Strategy	• Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area at South Grafton High School auditorium (Tyson Street), where evacuees are able to gather while flood situation is monitored. • Where a major levee overtopping and/or failure occurs, evacuees will either remain at the South Grafton High School or be transported to Coffs Harbour.		
Key Risks / Consequences	• Overtopping and/or failure of Grafton and/or South Grafton levees resulting in inundation behind the levees. • Potential loss of life from rapid and potentially high velocity inundation in levee overtopping/failure scenario. • Potential isolation of thousands of people estimated to be for a number of days. • Potential failure of essential services.		
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)		

Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock where resources are available. • Relocation of farm machinery and valuable goods where resources are available. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need where resources are available. • Monitoring integrity of dwellings surrounded by flood waters. • Assist Council engineers to monitor integrity of existing levee system. • Control of surface water inside levee.
	Protection of essential infrastructure: • Grafton's potable water supply reservoir is located on high ground 5 kilometres (km) south of Grafton above the Probable Maximum Flood (PMF). • Grafton Base Hospital at 184 Arthur Street, Grafton will be impacted by overfloor flooding during a PMF event (13.58m Grafton Prince Street gauge 204400/58178). During a 1% AEP event (8.44m Grafton (Prince Street) gauge 204400/58178) the main building remains on a flood free island. The hospital floor begins to be inundated when flood waters exceed 9 m on Grafton (Prince Street) gauge (204400/58178). • The Clarence Valley bulk power supply point is the Transgrid Koolkhan 330kv Substation site which is located on Summerland Way X Boneyard Lane and is above the mapped PMF (13.58m Grafton (Prince Street) gauge 204400/58178). • Electricity substations in South Grafton, North Grafton and adjoining the Koolkhan supply point are all within the PMF (13.58m Grafton Prince Street gauge 204400/58178). North Grafton, South Grafton and Koolkhan supply points are all flood free at 1% AEP (8.44m Grafton (Prince Street) gauge 204400/58178). • The Sewage Ponds at Clarenza are impacted at 7.7m. • Pump stations throughout north Grafton behind the main levee will all be progressively inundated when the levee overtops from 8m. Selected sewer pump stations will be switched off upon levee overtopping as part of Councils internal procedure. • The Telstra exchange for Grafton is located on Pound Street, between Prince and Queen Streets. This exchange is powered by mains electricity. If electricity was lost during a flood, then the generator (located above PMF height) will automatically start. The generator will last between 24-48 hours before refueling is required.

Evacuation Triggers	There are four key scenarios for evacuation triggers based on Bureau of Meteorology flood height predictions at the Grafton (Prince Street) gauge (204400/58178): **1. Prediction to reach or exceed 4.4 m** Carrs Island Bridge closes isolating residents on island (approximately 5 properties). **2. Prediction to reach or exceed 5.4 m** Flood waters enter Alipou Creek area starting to pond around rural properties (Approximately 5 properties). Big River Way closes at Alipou Creek. Alternate route high level bypass Via Centenary Drive and Lilypool Road. **3. Prediction to reach or exceed 5.7 m** Lawrence Road and Great Marlow Road cut near Butterfactory Lane isolating properties in the Alumy Creek and surrounding areas (approximately 30 properties). Water enters low lying areas of Glenwood Tourist Park. **4. Prediction to reach or exceed 7.8 m or greater** Targeted Emergency Warning issued (evacuate before (hh:mm)) for Grafton Sub Sector A – Dovedale and surrounds (area bordered by Clarence Street, Bacon Street, Prince Street and the Clarence River) (GEMS ID 488) including owners of livestock to relocate livestock outside of the impact area. **5. Prediction to reach or exceed 7.9 to 8.0 m** Based on monitoring and assessment of levee condition, A Targeted Emergency Warning (move to higher ground) will be issued for Sub Sector A Dovedale and surrounds (GEMS ID 488) (area bordered by Clarence Street, Bacon Street, Prince Street and the Clarence River) and other low lying areas. Another 70 houses and some other buildings in the Back Lane, Carr Street, and Lawrence Road areas could be isolated. Targeted Emergency Warning issued for Grafton Sub Sectors B,C,D (GEMS ID 487, 486 and 489) **6. Prediction to reach or exceed 8.0 m or greater** Targeted Emergency warning issued (evacuate before (hh:mm)) for Sub Sectors B, C, D and all low-lying areas in North and South Grafton.

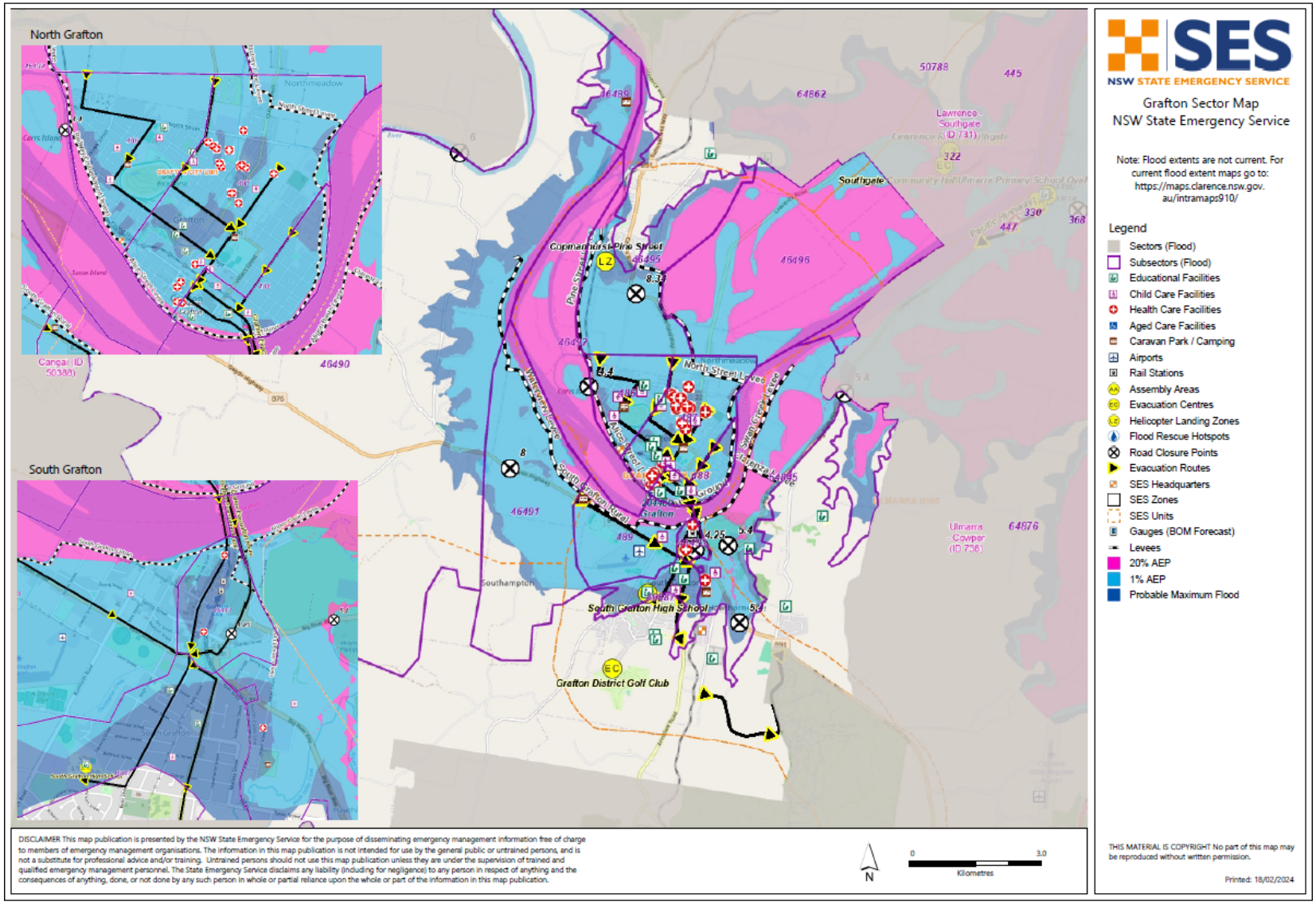
Sequencing of evacuation	**For Prediction 5**, the areas of Dovedale and surrounds in Sub Sector A (GEMS ID 488) will be systematically evacuated. **For Prediction 6**, North Grafton will be divided into Sub Sectors B and C, while South Grafton becomes Sub Sector D. Evacuation will commence with Sub Sector B, Sub Sectors C and D will follow. **Grafton:** Order for Sub Sectors is A, B, then C. • Sub Sector A: Clarence Street, Bacon Street, Prince Street including Dovedale and surrounds, • Sub Sector B: west of Clarence Street, Bacon Street, and Prince Street to Turf Street. • Sub Sector C: west of Turf Street, including Westlawn, and Back Lane, Carr Street, Marlow Street, and Summerland Way to Junction Hill. **South Grafton:** • Sub Sector D: Low–lying areas of South Grafton including Bent, Ryan, Cowan, Abbott, Spring, Through, Skinner, Wharf, Armidale, Beetson, Bligh, Edward, James, Kelly, Kennedy, New, Orr and Vere Streets) Evacuation will occur simultaneously to Sub Sector A. Evacuation of vulnerable facilities (e.g. aged care facilities, schools, child care facilities) will require higher priority.
Evacuation Routes	**Sub Sector A:** **Route 1** Clarence Street, Craig Street (Old Grafton Bridge), Bent Street and Tyson Street **Route 2** Clarence Street, Summerland Way and Tyson Street. **Sub Sector B:** **Route 1** Dobie Street, Prince Street, Fitzroy Street, Craig Street (Old Grafton Bridge), Bent Street, and Tyson Street. **Route 2: Note:** ***Relies on pumps extracting water from this area back over the levee:*** Dobie Street, Prince Street, Pound Street, Summerland Way, Iolanthe Street, Charles Street, Bent Street and Tyson Street. **Route 3** Oliver Street, Prince Street, Fitzroy Street, Craig Street (Old Grafton Bridge), Bent Street and Tyson Street. **Route 4: Note:** ***Relies on pumps extracting water from this area back over the levee:*** Oliver Street, Prince Street, Pound Street, Summerland Way, Iolanthe Street, Charles Street, Bent Street and Tyson Street. **Sub Sector C:** **Route 1** Marlow Street, North Street, Cranworth Street, Oliver Street, Prince Street, Fitzroy Street, Craig Street (Old Grafton Bridge), Bent Street and Tyson Street. **Route 2: Note:** ***Relies on pumps extracting water from this area back over the levee:*** Marlow Street, North Street, Cranworth Street, Oliver Street, Prince Street, Pound Street, Summerland Way, Iolanthe Street, Charles Street, Bent Street and Tyson Street. **Route 3** Turf Street, Dobie Street, Prince Street, Fitzroy Street, Craig Street (Old Grafton Bridge), Bent Street, and Tyson Street. **Route 4: Note:** ***Relies on pumps extracting water from this area back over the levee*** Turf Street, Dobie Street, Prince Street, Pound Street, Summerland Way, Iolanthe Street, Charles Street, Bent Street and Tyson Street. **Sub Sector D:** Ryan Street**,** Bent Street, Tyson Street. See attached map.

	It is likely that the Big River Way south to Coffs Harbour will remain open to high level clearance vehicles, via Lilypool Road.
Evacuation Route Closures	Road closures affecting the sequenced evacuation of subsectors A,B,C,D: • There is variability when local roads inside the Grafton levee will close, the closure will be dependent on local rainfall conditions. The time available after overtopping has been estimated and is summarised in Volume 2, Section 2.2.6. • The pumps inside the levee at the corner of Charles Street and Gwydir Highway need to be operational to stop pooling and road closure of Iolathe Street which is the secondary evacuation route. • Craig Street approach to the Grafton Bridge closes (8.25 m Grafton (Prince Street) gauge (204400/58178)). • The Bent Street X Charles/Ryan Streets South Grafton remain open beyond 8.3m Grafton (Prince Street) gauge (204400/58178). Other known road closures include: • Big River Way closes (5.4 m Grafton (Prince Street) gauge (204400/58178)). at Alipou Creek, Alternate route high level bypass Centenary Drive. • Lawrence Road Closes (5.0 Grafton (Prince Street) gauge (204400/58178)). Alternate route Summerland Way. • Orara Way Closes at Bluff Bridge at (5.8 m on the Glenreagh DWR TM gauge 204906/559066). Other roads where closure is dependent on local rainfall and events (e.g. landslips) include: • Summerland Way closes on Grafton levee overtopping at (8.3 m on the Grafton (Prince Street) gauge (204400/58178)). • Gwydir Highway (road susceptible to land slippage) • Armidale Road.
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • Public transport to the Assembly Area on South Grafton Hill will be available to members of the community without private vehicles. An estimated 10% of evacuees will not have private transport (20 Buses are estimated for transport). Agreements to be in place with private bus operators. • Buses could also operate around South Hill picking people up from their parked cars to take them to assembly area or evacuation centre. Car parking capability unlimited. • Grafton bridge's will be closed by Police to North bound traffic ensuring maximum expedience of traffic flow over the bridge and access for emergency vehicles. • If the Iolanthe Street and Bent Street South Grafton are cut, railway transport becomes the main method of evacuation. Evacuation access to the railway is via the Grafton Railway Yard platform and the South Grafton Railway station. A temporary platform can be erected at the corner of Federation and Ryan Street, (the Tin Bridge) South Grafton for an evacuation route up George Street to Bent Street and onto South Grafton High School.

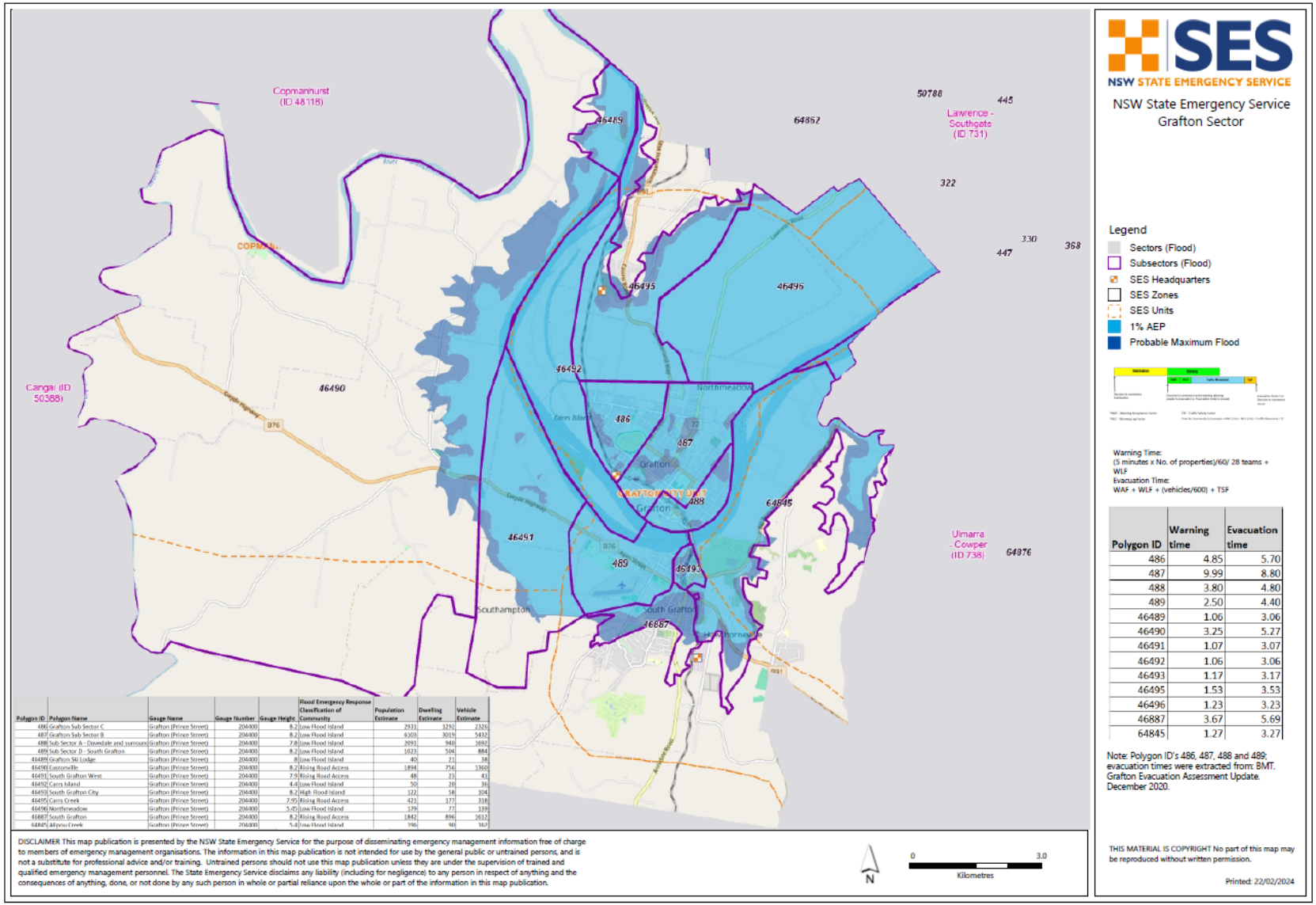
Evacuation Centre/Assembly Point	• People should be encouraged to stay with friends/relatives in high areas such as South Hill, Clarenza, Junction Hill or Waterview Heights. Note some of these areas may become isolated with further river rises. • Where this is not possible the nominated assembly area is the South Grafton High School Auditorium, Tyson Street. This can be used as an assembly point in the short term but could also double as an evacuation centre should the need arise. • An additional evacuation Centre is located at the Grafton District Golf Club in Bent Street South Grafton. • There are a number of other schools and buildings located in flood free areas in South Grafton and Clarenza which are available for use as Assembly Area/Evacuation Centres. These schools will be nominated by Department of Communities and Justice as the need arises.
Large scale evacuations	In the event that evacuee numbers exceed the South Grafton evacuation centre capacity, evacuees will either be transported to alternative evacuation centres or transported by bus, rail or private transport to Coffs Harbour.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Grafton Base Hospital will be resupplied if required. The hospital floor begins to be inundated when flood waters exceed 9 m on Grafton (Prince Street) gauge (204400/58178).
Aircraft Management	Helicopter Landing Zones • Grafton Airport (S29° 45' 30.56", E153° 1' 45.45") • Junction Hill (S29° 38' 37.43", E 152° 55' 12.73") – Flooded from PMF • SES North Eastern Zone Grafton Office (S29° 43' 24.53", E 152° 56' 37.78") • Grafton Base Hospital (S29° 40' 31.89", E 152° 56' 27.66")

Other	Special considerations relating to evacuation:
	
	• Closure of schools - coordinated through the Department of Education and Training.
	• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.
	• Closure of licensed premises. All hotels and licensed clubs will be closed if required.
	• Security. Police patrols to be established to maintain law and order after evacuation has occurred.
	• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.
	• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.
	• The Grafton Base Hospital will only be evacuated in extreme circumstances. Current floor height 9 m AHD. (1% AEP 8.44m. PMF 13.58m - Grafton (Prince Street) gauge (204400/58178)
	• Rail Transport. Suspension of normal transport Operations through Grafton would be required, in anticipation of the deployment of rail Operations to assist with evacuees.
	• These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises.
	• Grafton has three peak seasons with potential for a 10% population increase:
	  • July Race Carnival – early July.
	  • Jacaranda Festival – late October / early November.
	  • Bridge to Bridge Ski Race – October long weekend.
	Links to external flood monitoring cameras and dashboards:
	• https://www.clarence.nsw.gov.au/Emergency-management/Respond/Flood-monitoring-stations

1.2. GRAFTON SECTOR MAP



1.3 EVACUATION PLANNING



Polygon ID	Warning time	Evacuation time
486	4.85	5.70
487	9.99	8.80
488	3.80	4.80
489	2.50	4.40
46489	1.06	3.06
46490	3.25	5.27
46491	1.07	3.07
46492	1.06	3.06
46493	1.17	3.17
46495	1.53	3.53
46496	1.23	3.23
46887	3.67	5.69
64845	1.27	3.27

Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
486	Grafton Sub Sector C	Grafton (Prince Street)	204900	8.2	Low Flood Island	2931	1292	2326
487	Grafton Sub Sector B	Grafton (Prince Street)	204900	8.2	Low Flood Island	6203	3019	5432
488	Sub Sector A - Dovedale and surrounds	Grafton (Prince Street)	204900	7.8	Low Flood Island	2091	948	1692
489	Sub Sector D - South Grafton	Grafton (Prince Street)	204900	8.2	Low Flood Island	1023	504	884
46489	Grafton Ski Lodge	Grafton (Prince Street)	204900	8	Low Flood Island	40	21	38
46490	Eastonville	Grafton (Prince Street)	204900	8.2	Rising Road Access	1894	756	1360
46491	South Grafton West	Grafton (Prince Street)	204900	7.9	Rising Road Access	48	23	41
46492	Carrs Island	Grafton (Prince Street)	204900	8.4	Low Flood Island	50	28	36
46493	South Grafton City	Grafton (Prince Street)	204900	8.2	High Flood Island	122	58	104
46495	Carrs Creek	Grafton (Prince Street)	204900	7.95	Rising Road Access	423	177	318
46496	Northmeadow	Grafton (Prince Street)	204900	5.45	Low Flood Island	179	77	139
46887	South Grafton	Grafton (Prince Street)	204900	8.2	Rising Road Access	1842	896	1612
64845	Alipou Creek	Grafton (Prince Street)	204900	5.4	Low Flood Island	796	90	162

2. COPMANHURST SECTOR

2.1. COPMANHURST SECTOR

See Map Attached

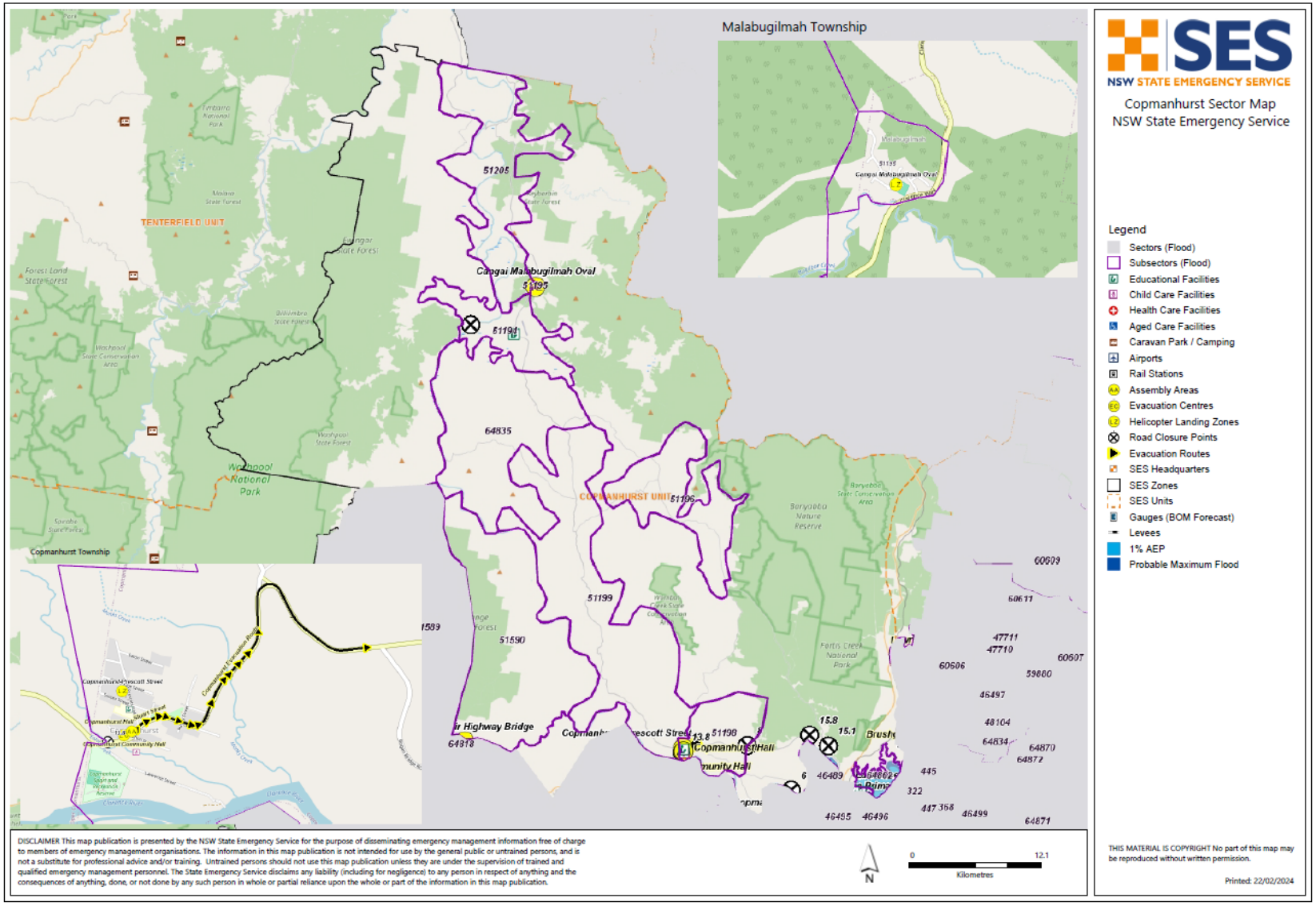
Sector Description	This sector covers Barretts Creek, Coaldale, Copmanhurst, Fine Flower, Gordonbrook, Baryulgil, Malabugilmah, Moleville Creek, Mountain View, and Trenayr.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	High Flood Island		
At risk properties in a PMF	10	**Total number of properties**	201 (2021 Census)
Population (Copmanhurst and Upper Copmanhurst)	443 (2021 Census)		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauge Name: Copmanhurst (204903/58181)	Minor: - 5m	Moderate: - 8m	Major: - 18m
General Strategy	• Evacuation of at-risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area/Evacuation Centre at the Copmanhurst Hall Stuart Street, Copmanhurst where evacuees are able to gather while flood situation is monitored.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential isolation of hundreds of people for a number of days.		
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)		
Property Protection	**Specific property protection measures:** • Relocation of livestock where resources are available. • Relocation of farm machinery and valuable goods where resources are available. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need where resources are available. • Monitoring integrity of dwellings surrounded by flood waters.		

	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • Essential Energy have a ground mounted regulator but this is out of flood areas. • No sewerage, evacuation may be required for sanitary reasons if septic systems overflow.
Evacuation Triggers	The Bureau of Meteorology does not provide predictions for the Copmanhurst gauge, however the predicted flood levels at the Grafton (Prince Street) Gauge 204400/58178 provides a historical indicative height of the impacts likely to be seen in Copmanhurst. **Copmanhurst gauge (204903/58181)** 1. **Reach and/or exceed 8.0 m (historical equivalent height to reach/or exceed 2.7 m on the Grafton (Prince Street) gauge (204400/58178) (access to Grafton is lost):** Clarence Way closes at Whiteman Creek causeway, approximately 6km east of Copmanhurst. Access to Grafton lost (main access to supplies). 2. **Reach and/or exceed 13.3 m (historical equivalent height to reach/or exceed 4.4 m on the Grafton (Prince Street) gauge (204400/58178) (isolation):** Clarence Way closes due to back waters from Clarence River at Eton Creek western edge of Copmanhurst. Localities of Upper Copmanhurst and Fine flower isolated. 3. **Reach and/or exceed 15.1 m (historical equivalent height to reach/or exceed 5 m on the Grafton (Prince Street) gauge (204400/58178):** Clarence way closed at Double Swamp, 7 km north of Junction Hill. The village of Copmanhurst and Coaldale now isolated. 4. **Reach and/or exceed 20 m (historical equivalent height to reach/or exceed 6.7 m on the Grafton (Prince Street) gauge (204400/58178):** Two houses in Copmanhurst village experience over-floor inundation at 20 Grafton Street Copmanhurst.
Sequencing of evacuation	• A number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case-by-case situation in conjunction with Department of Communities and Justice.

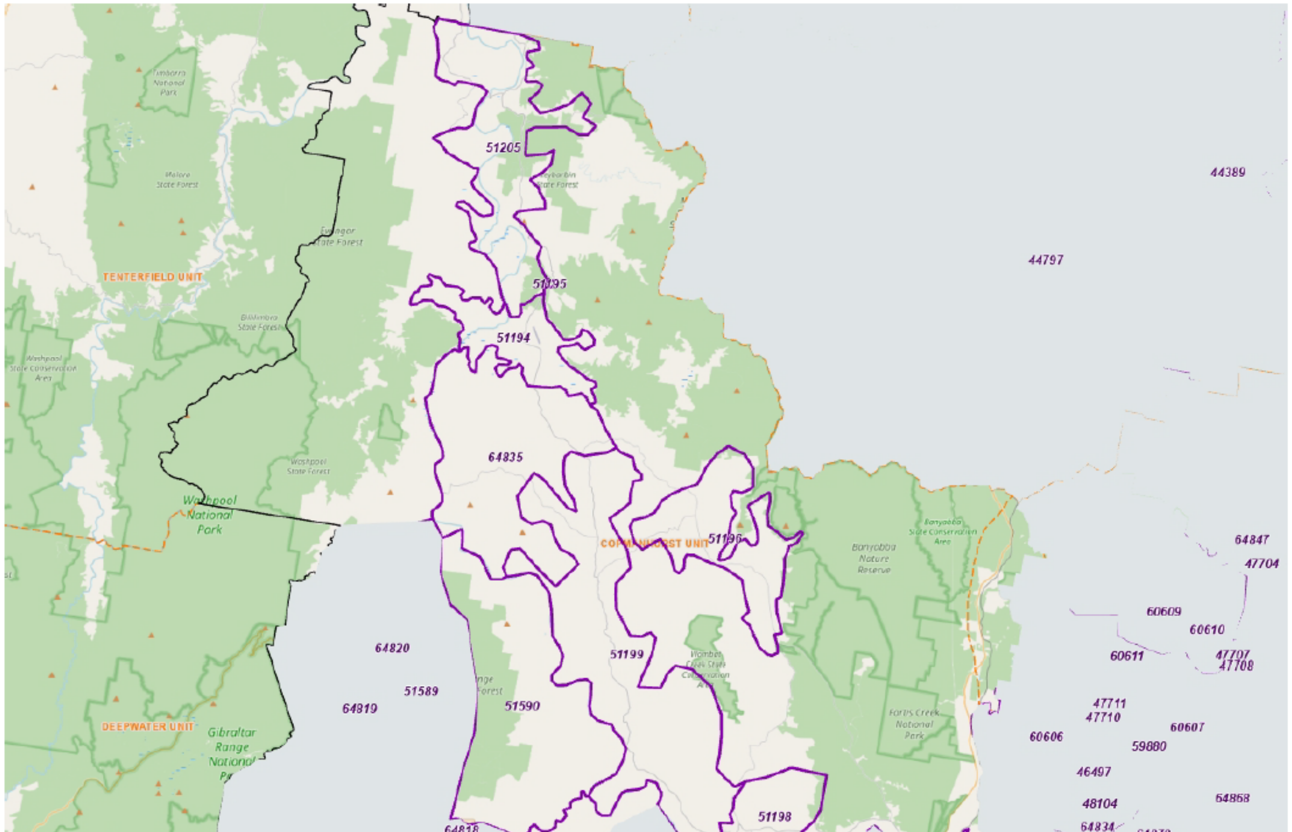
Evacuation Routes	• The local Evacuation Routes will be chosen in consideration of current road conditions. These routes will direct residents to the local assembly area/evacuation centre in the town. See attached map.
Evacuation Route Closures	Every flood in the Grafton area is different and thus road conditions are unpredictable. Common road closures include: • Rogan's Bridge closes cutting access to Waterview Heights (6.0 m Copmanhurst gauge). Alternative routes available via Clarence Valley Way. • Clarence Way closes at Whiteman Creek causeway (8.0 m Copmanhurst gauge), approximately 6 km east of Copmanhurst. • Clarence Way closes at Chaselings Gully approximately 10 km east of Copmanhurst. (14.4 m Copmanhurst gauge). • Clarence Way closed at Moleville Creek (15.8 m Copmanhurst gauge). Other roads where closure is dependent on local rainfall and events (e.g. landslips) include: • Big River Way Closes (5.4 m Grafton (Prince Street) gauge (204400/58178)) at Alipou Creek, Alternate route high level bypass Centenary Drive. • Summerland Way closes on Grafton levee overtopping at (8.3m on the Grafton (Prince Street) gauge 204400/58178).
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details.
Evacuation Centre/Assembly Point	• Copmanhurst Community Hall 61 Grafton Street Copmanhurst. Capacity is 28 people.
Large scale evacuations	• Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • Resupply to the Copmanhurst Local Store and Copmanhurst Hotel, will mean residents in these areas will have access to basic food supplies.
Aircraft Management	**Helicopter Landing Points.** • Copmanhurst NSW SES Unit Headquarters Prescott Street Copmanhurst (S29°34'98.8", E152°46'52.3") – Not Flooded

Other	Special considerations relating to evacuation:
	
	• Closure of schools - coordinated through the Department of Education and Training.
	• The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services.
	• Closure of licensed premises. All hotels and licensed clubs will be closed if required.
	• Security. Police patrols to be established to maintain law and order after evacuation has occurred.
	• The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible.
	• These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises.
	• Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters.
	• Copmanhurst has two peak seasons with potential population increase of more than 10%:
	  • Camp draft September.
	  • Summer school holidays – Public lands within remote areas of this sector are utilized by campers.

2.2. COPMANHURST SECTOR MAP



2.3 EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
51194	Baryulgil Rural	Baryulgil	204900	1.5	High Flood Island	51	28	50
51195	Malabugilmah	Baryulgil	204900	1.5	High Flood Island	31	17	31
51196	Coaldale Rural	Copmanhurst	204903	15.1	High Flood Island	72	38	68
51198	Copmanhurst	Grafton (Prince Street)	204400	8	High Flood Island	283	124	223
51199	Upper Copmanhurst and Fine Fl	Copmanhurst	204903	13.8	High Flood Island	247	130	234
51205	Ewingar and the Balund-a Prison	Tabulam	204002	7.5	High Flood Island	82	45	81
51590	Jackadgery north Rural	Grafton (Prince Street)	204400	8	High Flood Island	47	24	43
64835	Carnham	Jackadgery	204004	5.72	High Flood Island	14	9	16
64862	Experiment Farm Road	Grafton (Prince Street)	204400	6.27	Rising Road Access	7	3	5

DISCLAIMER This map publication is presented by the NSW State Emergency Service for the purpose of disseminating emergency management information free of charge to members of emergency management organisations. The information in this map publication is not intended for use by the general public or untrained persons, and is not a substitute for professional advice and/or training. Untrained persons should not use this map publication unless they are under the supervision of trained and qualified emergency management personnel. The State Emergency Service disclaims any liability (including for negligence) to any person in respect of anything and the consequences of anything, done, or not done by any such person in whole or partial reliance upon the whole or part of the information in this map publication.

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SES
NSW STATE EMERGENCY SERVICE

NSW State Emergency Service
Copmanhurst Sector

Legend
- Sectors (Flood)
- Subsectors (Flood)
- SES Headquarters
- SES Zones
- SES Units
- 1% AEP
- Probable Maximum Flood

Warning Time:
(5 minutes x No. of properties)/60/
28 teams + WLF
Evacuation Time:
WAF + WLF + (vehicles/600) + TSF

Polygon ID	Warning time	Evacuation time
51194	1.08	3.08
51195	1.05	3.05
51196	1.11	3.11
51198	1.37	3.37
51199	1.39	3.39
51205	1.13	3.14
51590	1.07	3.07
64835	1.03	3.03
64862	1.01	3.01

Printed: 22/02/2024

3. LAWRENCE SOUTHGATE SECTOR

3.1. LAWRENCE SOUTHGATE SECTOR

See Map Attached

Sector Description	This sector covers: Lawrence, Southgate, Lower Southgate and Tullymorgan.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	Rising road access to a high flood island for Lawrence. Southgate has rising road access and then becomes a low flood island.		
At risk properties Lawrence in a PMF AEP	54 dwellings including 3 businesses	**Total number of properties**	464 (2021 Census)
At risk properties Southgate and Lower Southgate in a PMF AEP	98 dwellings	**Total number of properties**	144 (2021 Census)
Population Lawrence, Southgate, Lower Southgate	1469 (2021 Census)		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauges Name: **Lawrence (204409)** **Grafton (Prince Street) (204400/58178)**	Minor:-	Moderate:-	Major:-
	Minor: 2.10m	Moderate:3.60m	Major:5.40m
General Strategy	Evacuation of at risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area/Evacuation Centre at Lawrence Golf Club, March Street Lawrence, Lawrence where evacuees are able to gather while flood situation is monitored. • Establishment of an Assembly Area at Southgate Village Hall; School Lane Southgate where evacuees are able to gather while flood situation is monitored.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity flooding inundation. • Potential isolation of thousands of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch (BOM) • Flood Warning (BOM) • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)		

Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock where resources are available. • Relocation of farm machinery and valuable goods where resources are available. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need where resources are available. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • Electricity infrastructure in this area include poles wires and pole mounted substations and reclosers. These are not affected by flooding due to the height of the wires; clearances are reduced depending on river heights. • Sewer system only in township of Lawrence, most of sector is on septic tank, evacuations may be required in rural areas for sanitary reasons if septic systems overflow.

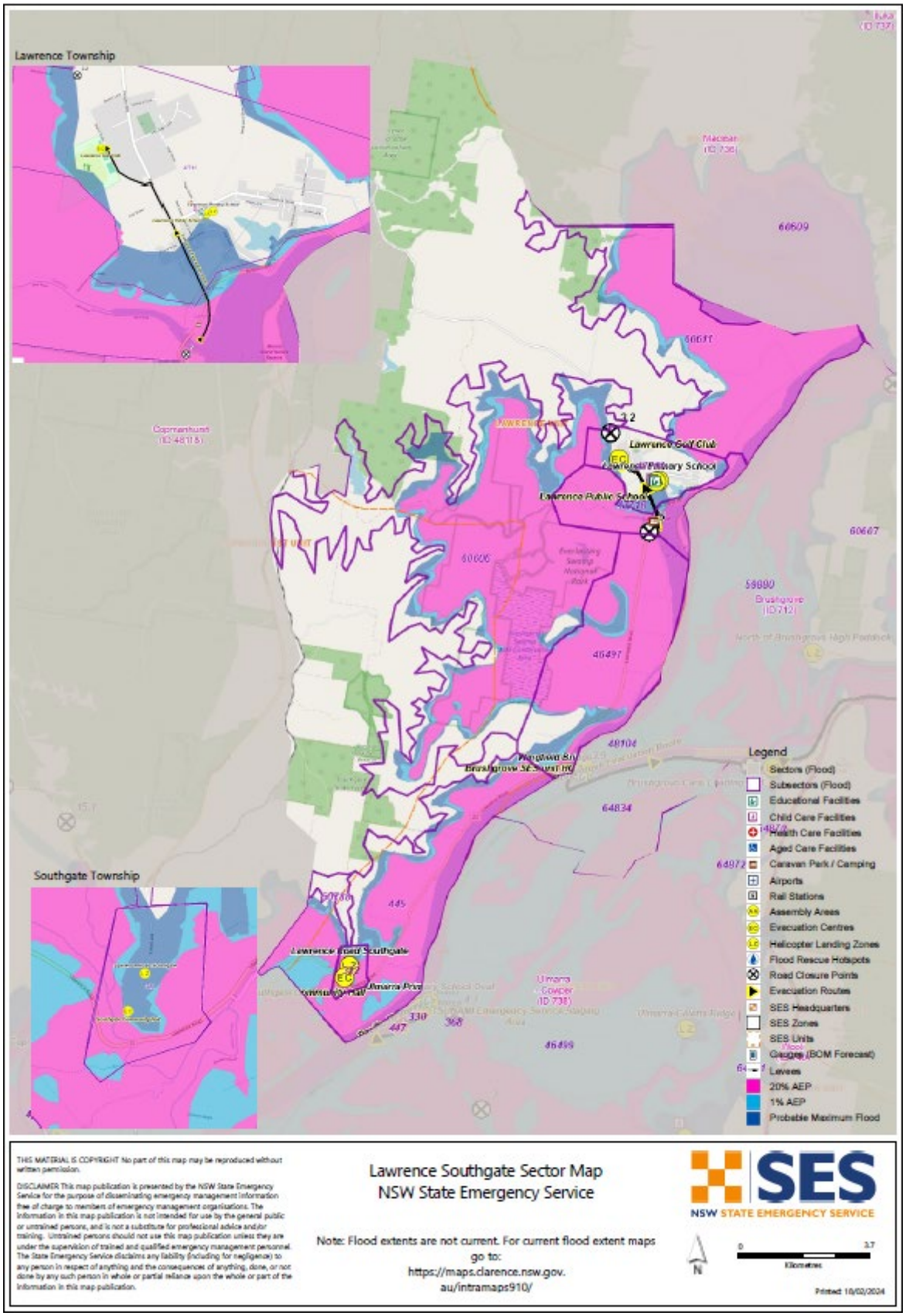
Evacuation Triggers	The effect of flooding on the town and outlying areas in this sector could be dependent on tidal influences. Tidal levels will need to be identified at the onset of main Clarence River flooding. The key evacuation triggers based on Bureau of Meteorology flood height predictions at the Grafton (Prince Street) gauge (204400/58178) in reference to **Lawrence gauge (204409)** are**:** **Note Flow time from Grafton (Prince Street) gauge to Lawrence gauge is between 5-8hrs.** **1. Prediction to reach and/or exceed 1.0 m (Grafton (Prince Street) gauge (204400/58178) historical equivalent height 1.70 m;** Access to Maclean/Brushgrove lost: Lawrence Ferry ceases to operate. Access to Macleay Valley Way via Maclean is affected. **2. Prediction to reach and/or exceed 2.0 m (Grafton (Prince Street) gauge (204400/58178) historical equivalent height 3.40 m):** Flood waters begin to encroach on top end of Weir Road, approximately 10 houses isolated. Water crosses low spots on Kings Creek Road isolating several rural properties. **3. Prediction to reach and/or exceed 2.5 m (Grafton (Prince Street) gauge (204400/58178) historical equivalent height 4.25 m):** Emergency Warning issued for some Lawrence Residents living in low lying areas. Flood waters enter the village. Rutland Street between Post Office Lane and Richmond Street cut. Grafton – Lawrence Road cut at Boothby's Bridge and Shorts Lane, approximately 30 houses isolated along the road for up to a week. **4. Prediction to reach and/or exceed 3.0 m (Grafton (Prince Street) gauge (204400/58178) historical equivalent height 5.10 m):** River Bank Road cut, approximately 15 houses isolated. **5. Prediction to reach and/or exceed 3.1 m (Grafton (Prince Street) gauge (204400/58178) historical equivalent height 5.27 m):** Emergency Warning needs to be issued a minimum of 7.5 hours before this height (3.1m) is reached and will be issued to Lawrence Residents living in low lying areas (approximately 10). Water over Road Bridge and Richmond Street approximately 18 houses isolated including the local store, hall and Lawrence Tavern. **6. Prediction to reach and/or exceed 3.2 m (Grafton (Prince Street) gauge (204400/58178) historical equivalent height 5.44 m)** Mantons Road cut, approximately 18 houses isolated. **7. Prediction to reach and/or exceed 4.2 m (evacuation) (Grafton (Prince Street) gauge (204400/58178) historical equivalent height 7.14 m)** Over floor flooding may occur in Weir Street.

	8. Prediction to reach and/or exceed 4.4 m (evacuation) (Grafton (Prince Street) gauge (204400/58178) historical equivalent height 7.48 m) Water enters the Lawrence store, the hall, the Tavern, on Bridge Street, and several houses in Lawrence. **9. Prediction to reach and/or exceed 4.6 m (Evacuation) (Grafton (Prince Street) gauge (204400/58178) historical equivalent height 7.82 m)** Inundation of homes on Sportsman Creek and Kings Creek Rd. NB. If the Bureau issues a flood warning to **reach and/or exceed 7.82 m** on the Grafton (Prince St) gauge, evacuation will need to be considered for all of the above areas in Lawrence. **Southgate area** The four key evacuation triggers based on Bureau of Meteorology flood warning predictions at the Grafton (Prince Street) gauge (204400/58178) include: **6. Prediction to reach and/or exceed 4.5 m** Emergency Warning issued for Southgate Residents living in low lying areas. Low Lying areas of farmland in Southgate start to become inundated. **7. Prediction to reach and/or exceed 5.4 m** Isolation of properties begins when the Grafton- Lawrence road closes. **8. Prediction to reach and/or exceed 6.1 m** Over-floor inundation commences for residences on the Grafton – Lawrence Road. **9. Prediction to reach and/or exceed 7.7 m** Over-floor flooding commences in Southgate village, approximately 6 houses. NB. If the Bureau issues a flood warning to reach and/or exceed 7.7 m on the Grafton (Prince Street) gauge (204400/58178), evacuation will need to be considered for all of the above areas in Southgate due to over-floor flooding.

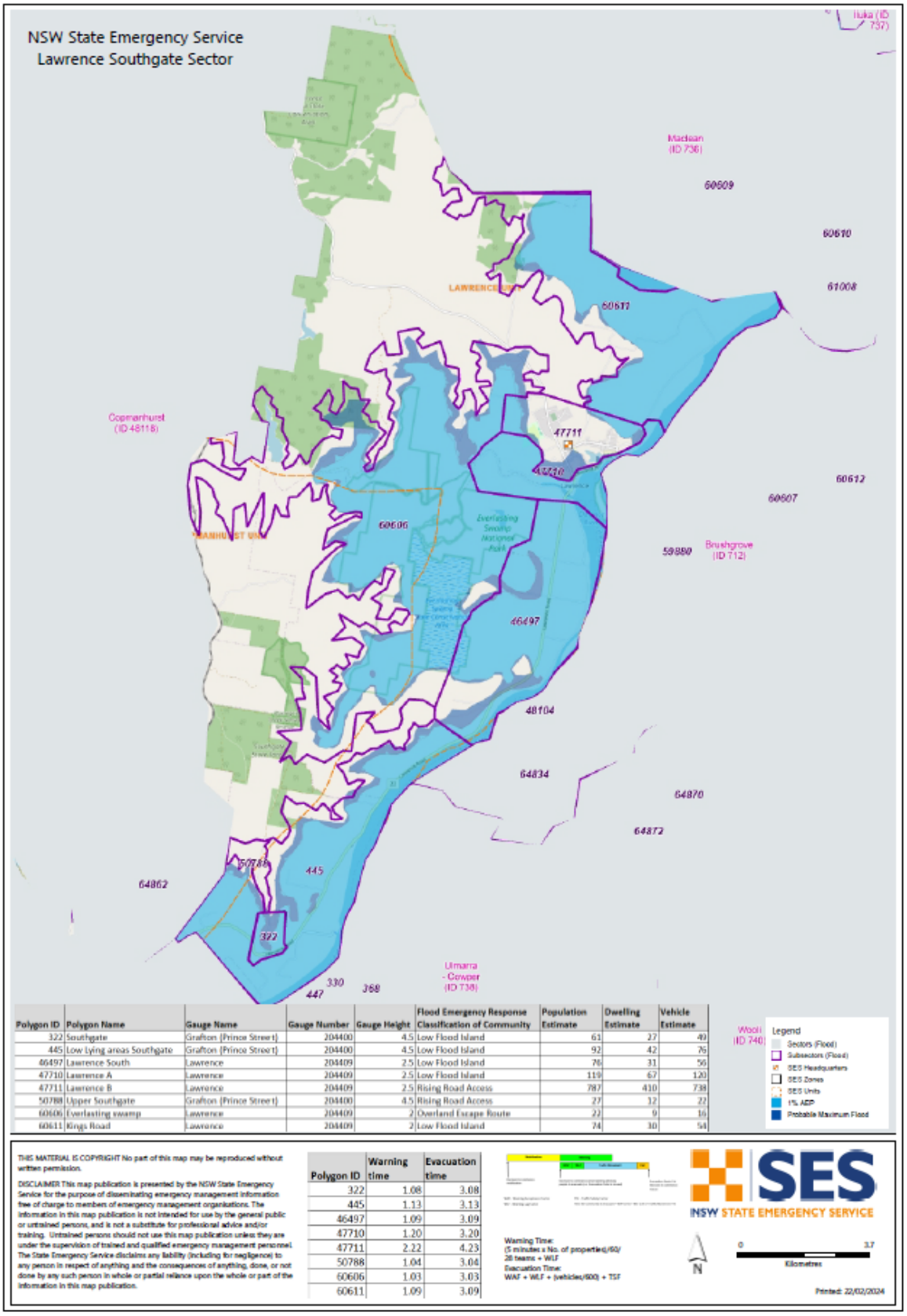
Sequencing of evacuation	• Evacuation of residents in low lying properties in Lawrence Village. • Evacuation of residents in low lying properties in Southgate. • Outside the identified sequenced evacuation areas, a number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case situation in conjunction with Department of Communities and Justice.
Evacuation Routes	• Properties around Lawrence: Pringles Way to Summerland Way and then onto either Grafton or Casino. • Properties around Southgate: Meet at Assembly Area/Evacuation Centre Southgate Village Hall
Evacuation Route Closures	Road closures affecting the evacuation: • The Bluff Point Ferry ceases to operate (1.0 m Lawrence gauge). • Grafton – Lawrence Road closes (5.0m on the Grafton (Prince Street) gauge (204400/58178)). Alternate route via Pringles Way and Summerland Way. • Summerland Way closes on Grafton levee overtopping at (8.3 m on the Grafton (Prince Street) gauge (204400/58178)).
Method of Evacuation	• Primarily self-evacuation by private transport to high parts of Lawrence. • Primarily self-evacuation by private transport to Lawrence Golf Club. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details.
Evacuation Centre/Assembly Point	• Evacuation Centre is at Lawrence Golf Club, March Street Lawrence. • The Assembly Area is at Lawrence Primary School Cook Street Lawrence.
Large scale evacuations	• Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy
Resupply	Resupply will be provided by the NSW SES through the 132500 call out system. The local stores will be supplied by boat from Maclean, if required.
Aircraft Management	Helicopter Landing Zones • Lawrence Primary School (S29°29’ 31.6”, E153°06’0.06”) – not flooded • Lawrence Road Southgate (S29° 37' 11.12”, E153° 0' 21.91”) – Flooded in PMF
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education

	and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises.

3.2. LAWRENCE SECTOR MAP



3.3 EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
322	Southgate	Grafton (Prince Street)	204400	4.5	Low Flood Island	61	27	49
445	Low Lying areas Southgate	Grafton (Prince Street)	204400	4.5	Low Flood Island	92	42	76
46497	Lawrence South	Lawrence	204409	2.5	Low Flood Island	76	31	56
47710	Lawrence A	Lawrence	204409	2.5	Low Flood Island	119	67	120
47711	Lawrence B	Lawrence	204409	2.5	Rising Road Access	787	410	738
50788	Upper Southgate	Grafton (Prince Street)	204400	4.5	Rising Road Access	27	12	22
60606	Everlasting swamp	Lawrence	204409	2	Overland Escape Route	22	9	16
60611	Kings Road	Lawrence	204409	2	Low Flood Island	74	30	54

Polygon ID	Warning time	Evacuation time
322	1.08	3.08
445	1.13	3.13
46497	1.09	3.09
47710	1.20	3.20
47711	2.22	4.23
50788	1.04	3.04
60606	1.03	3.03
60611	1.09	3.09

Warning Time:
(5 minutes x No. of properties/60)/
28 teams + WLF
Evacuation Time:
WAF + WLF + (vehicles/600) + TSF

NSW STATE EMERGENCY SERVICE

N

0 3.7 Kilometres

Printed: 22/02/2024

4. ULMARRA SECTOR

4.1. ULMARRA SECTOR

See Map Attached

Sector Description	This sector covers the villages of Clarenza, Calliope, Coldstream, Gillett's Ridge, Swan Creek, Tucabia and Ulmarra.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	Ulmarra is a low flood island (partially protected by a levee). Tucabia and Gilletts Ridge have rising road access.		
At risk properties in a PMF AEP	Ulmarra 357 Tucabia 89	**Total number of properties**	Ulmarra 668 Tucabia 221 (GNAF)
Population	Ulmarra 749 Tucabia 354 (2021 Census)		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauge Name: Ulmarra (204480/58188)	Minor: 2.10 m	Moderate: 3.40 m	Major: 4.90 m
General Strategy	• Evacuation of at-risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area at Ulmarra Police Station where evacuees are able to gather while flood situation is monitored. This becomes a central location for picking up residents who require transport to the evacuation centres. • If there is potential for major levee overtopping and/or failure, evacuees will be transported to the South Grafton High School; Tyson Street, South Grafton.		
Key Risks / Consequences	• Overtopping and/or failure of Ulmarra levee resulting in inundation behind the levee. • Potential loss of life from rapid and potentially high velocity inundation in levee overtopping/failure scenario. • Potential isolation of hundreds of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)		

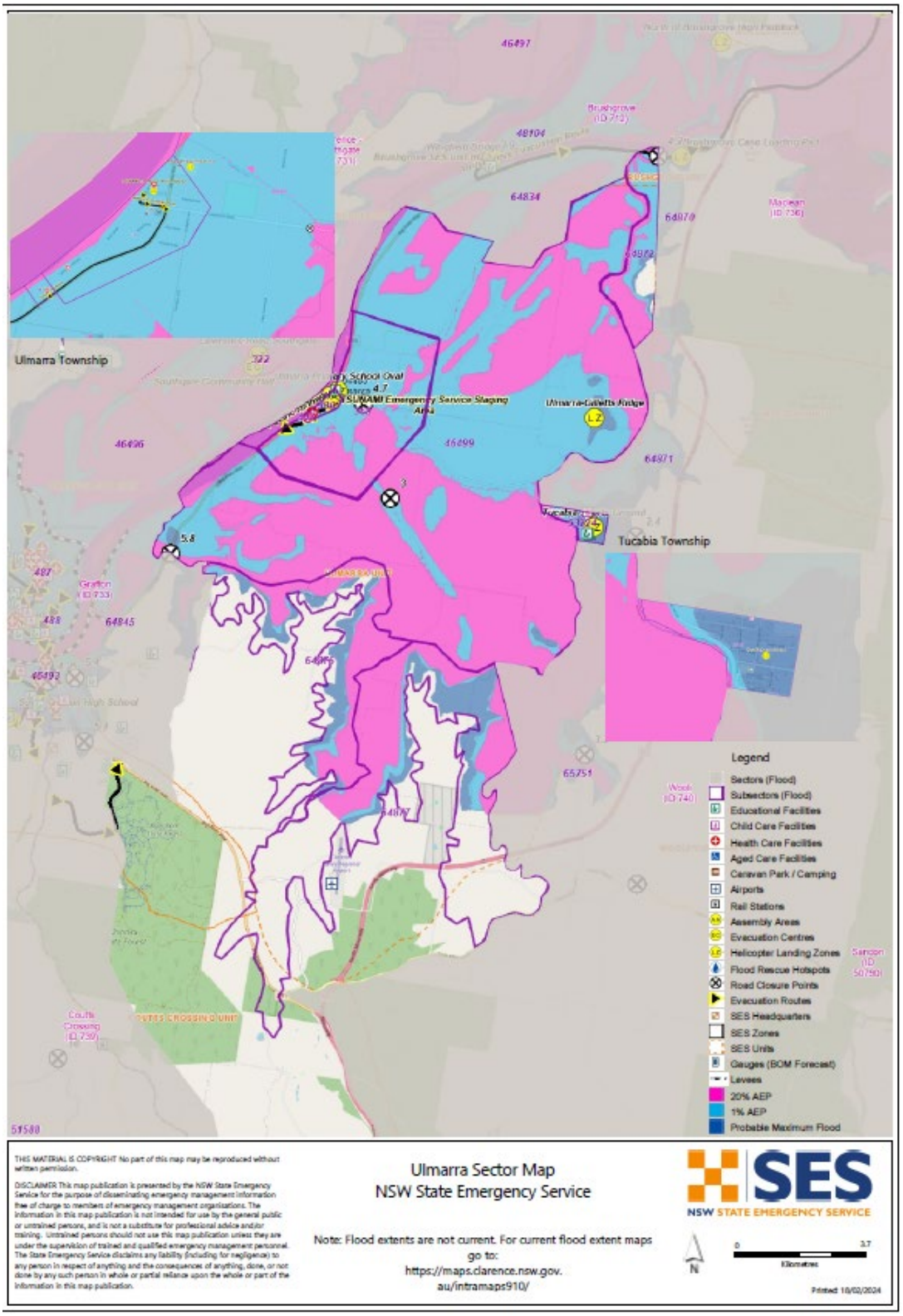
Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock where resources are available. • Relocation of farm machinery and valuable goods where resources are available. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need where resources are available. • Monitoring integrity of dwellings surrounded by flood waters. • Assist Council engineers to monitor integrity of existing levee system. Control of surface water inside levee.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • Electricity reclosers are above flood levels. Essential Energy have a number of river crossings in which clearances are reduced depending on river heights. • No sewerage, evacuation may be required for sanitary reasons if septic systems overflow.

Evacuation Triggers	The key evacuation triggers based on Bureau of Meteorology flood height predictions at the **Ulmarra gauge (204480/58188)** **1. Prediction to reach and/or exceed 1.0 m** Ulmarra Ferry ceases to operate. **2. Prediction to reach and/or exceed 2.4 to 3.8m** Tucabia – Tyndale Road will close in several locations including Chaffin Swamp 2km East of Tucabia and Champion Creek 4 km north of Tucabia. Bostock and Somerville Road may also cut isolating approximately 20 families. **3. Prediction to reach and/or exceed 4.7 m** Most roads in the Coldstream area are closed from the Coldstream River. Tucabia isolated (population 354). **4. Prediction to reach and/or exceed 5.0 m** Emergency Warning issued for Ulmarra residents living behind the levee system and residents in low lying areas to prepare to relocate outside of the impact area. **5. Prediction to reach and/or exceed 5.5 m** Evacuation of residents from Rathgar Lodge needs to be carried out before this height is reached. Water breaks across the Big River Way at the Ulmarra Ferry Approach, unless sandbagged. Eastern and southern parts of Ulmarra residential area are inundated by backwaters. **6. Prediction to reach and/or exceed 5.8 m** Big River Way closes at Swan Creek. No access to Grafton. **7. Prediction to reach and/or exceed 5.9 m** Ulmarra Levee overtopping is predicted. NB. If the Bureau issues a flood warning to **reach and/or exceed 5.9 m** on the **Ulmarra gauge**, evacuation will need to be considered for all of the above areas in Ulmarra due to over-floor flooding.
Sequencing of evacuation	• Evacuation of vulnerable facilities such as (e.g. aged care facilities, schools, and child care facilities) will require a higher priority. • Outside of the identified sequenced evacuation areas, a number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case-by-case situation in conjunction with Department of Communities and Justice.

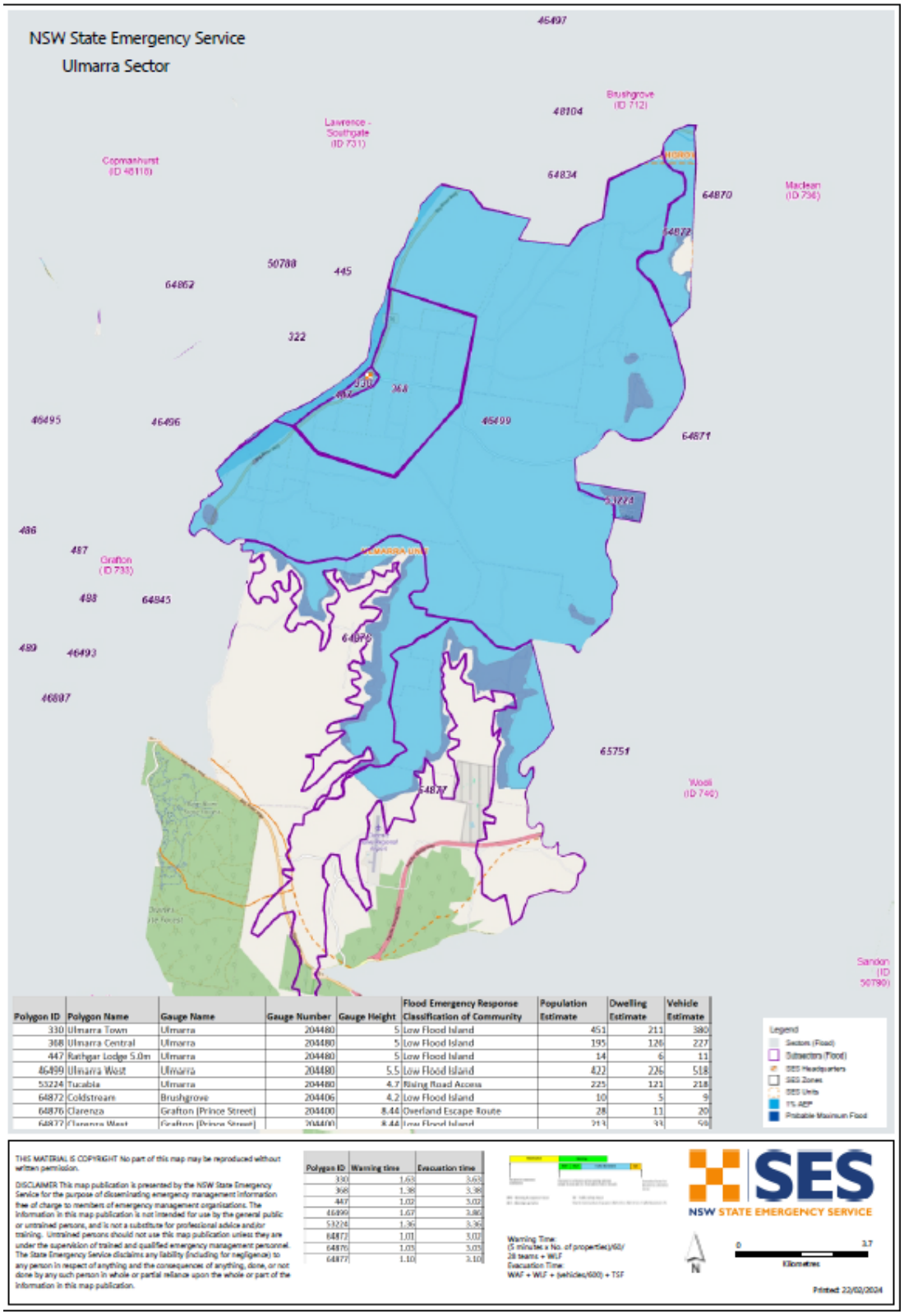
Evacuation Routes	**Route 1** Big River Way to the South, then turn left Centenary Drive, left Big River Way, right Old Lilypool Road, continue onto Lilypool Road, right Armidale Road, left Tyson Street (able to use High Clearance Vehicles). **Route 2** In the event that the Big River Way has already closed Evacuees will be transported by Flood boat from Ulmarra boat ramp to Fry Street or to Butter Lane at Heber Street Levee then bus to South Grafton Hill. See attached map. It is likely that the Big River Way south to Coffs Harbour will remain open to high level clearance vehicles.
Evacuation Route Closures	Road closures which may affect evacuations: • Big River Way closes (5.4 m Grafton (Prince Street) gauge (204400/58178)) at Alipou Creek, Alternate route high level bypass Centenary Drive. • Big River Way at Swan Creek Closes (at 5.8m Ulmarra gauge). • Big River Way at Ulmarra Ferry Closes, unless sandbagged (at 5.7 m Ulmarra gauge). • Big River Way closes (4.2 m Brushgrove gauge) at Tyndale just north of Tucabia-Tyndale Road. • Big River Way closed at Ferry Park, Maclean (2.5 m Maclean gauge). • Yamba Road closes (2.1 m Maclean gauge) at the "Cloverleaf" (Southern approach to Harwood Bridge 5 km North of Maclean). Other known road closures: • The Cross Roads South Grafton remain open up to a flood height of 8.3 m at the Grafton (Prince Street) gauge (204400/58178). • Summerland Way closes on Grafton levee overtopping at (8.3 m on the Grafton (Prince Street) gauge (204400/58178) Other roads where closure is dependent on local rainfall and events (e.g. landslips) include: • Gwydir Highway (road susceptible to land slippage). • Armidale Road.
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. • Public transport from the Assembly Area to South Grafton High School will be available to members of the community without private vehicles. An estimate of 5% of evacuees will not have private transport (3 Buses are estimated for transport). Agreements to be in place with private bus operators.
Evacuation Centre/Assembly Point	The nominated assembly area is the Ulmarra Police Station before being transported to South Grafton High School Auditorium, Tyson Street, South Grafton.
Large scale evacuations	In the event that evacuee numbers exceed the South Grafton High School, other evacuation centres will be nominated when required.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations

	and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy.
Resupply	Resupply will be provided by the NSW SES through the 132 500 call out system.
Aircraft Management	Helicopter Landing Zones • Ulmarra Primary School Oval. (S29° 37' 74.1" E153° 1' 85.5") – Flooded from 1% AEP • Tucabia Cricket Ground (S29° 39' 36.0" E153° 6' 20.0") - Flooded from 1% AEP • Gillett's Ridge (S29° 38' 03.6" E153° 06' 62.4") – Flooded in PMF
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises.

4.2. ULMARRA SECTOR MAP



4.3 EVACUATION PLANNING



5. BRUSHGROVE SECTOR

5.1. BRUSHGROVE SECTOR

See Map Attached

Sector Description	This sector covers Brushgrove, Woodford Island, South Arm, Ilarwill and Cowper.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	Brushgrove and Cowper are low flood islands. Tyndale is a high flood island.		
At risk properties in a PMF	Brushgrove 99 (above floor) NOTE: most houses in Brushgrove have the main living area above 5.9m 1% AEP (raised) Ilarwill 12 (above floor) Woodford Island 113 (above floor) Cowper 56 (above floor)	**Total number of properties**	Brushgrove 99 Ilarwill 103 Woodford Island 133 Cowper 62
Population	Brushgrove 181 Ularwill 233 Woodford Island 306 Cowper 88		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauge Name Brushgrove (204406) and (Grafton (Prince Street) gauge (204400/58178) historical equivalent height)	Minor: -	Moderate: -	Major: No classification
General Strategy	• Evacuation of at-risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area at Brushgrove NSW SES Unit (Clarence Street), where evacuees are able to gather while flood situation is monitored. • If extreme flooding is likely to occur, affected residents will be transported to the Evacuation Centre at Maclean Showground; Cameron Street, Maclean.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential isolation of hundreds of people for a number of days.		

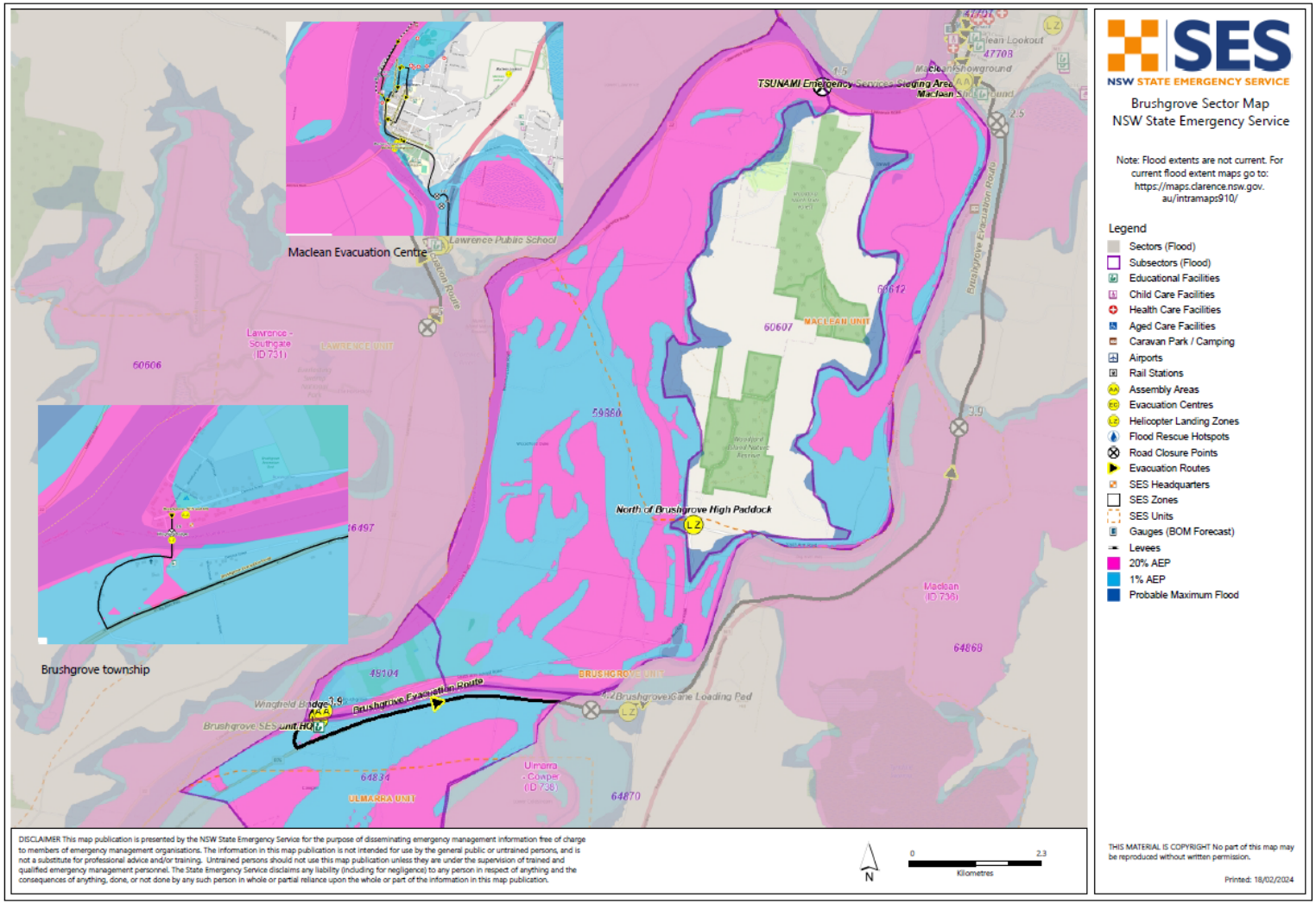
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)
Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock where resources are available. • Relocation of farm machinery and valuable goods where resources are available. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need where resources are available. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection.

Evacuation Triggers	Local warnings commence when there is a prediction of 5.0 m on the Grafton (Prince Street) gauge (204400/58178). The key evacuation triggers based on Bureau of Meteorology flood height predictions at the Grafton (Prince Street) gauge (204400/58178). In reference to **Brushgrove gauge (204406/558027)**: **1. Prediction of 3.7 m (Grafton (Prince Street) gauge (204400/58178) historical equivalent height: reach and/or exceed 5.0 m)** Emergency Warning issued for Brushgrove and Cowper Residents living in low lying areas. **2. Prediction of 3.9 m (Grafton (Prince Street) gauge (204400/58178) historical equivalent height: to reach and/or exceed 6.0 m)** The approach at the Wingfield Bridge is covered by flood waters. **3. Prediction of 4.2 m (Grafton (Prince Street) gauge (204400/58178) historical equivalent height: to reach and/or exceed 7.2 m)** Flood waters can enter the island from the Main Arm overtopping or by backing up a drainage channel that links in the common. Floods of this size correspond to roughly 5.3m on the Grafton (Prince Street) gauge (204400/58178) about six hours earlier and 4.3m at Ulmarra about three hours earlier. **4. Prediction of 4.3 to 5.5 m (Grafton (Prince Street) gauge (204400/58178) historical equivalent height: to reach and/or exceed 7.9 m)** 3 Houses along Donaldson Street, 7 houses in Clarence Street, 3 houses in River Street, 2 along Inmon Lane start to experience over floor flooding. The town of Cowper will be inundated. Remaining houses in Brushgrove have main living floor level above 5.9m on the Brushgrove gauge but access out of Brushgrove will be lost before this height.
Sequencing of evacuation	• Evacuation of residents in low lying properties along River Street, Donaldson Street, Inmon Street and Clarence Street. • Outside of the identified sequenced evacuation areas, a number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case situation in conjunction with Department of Communities and Justice.

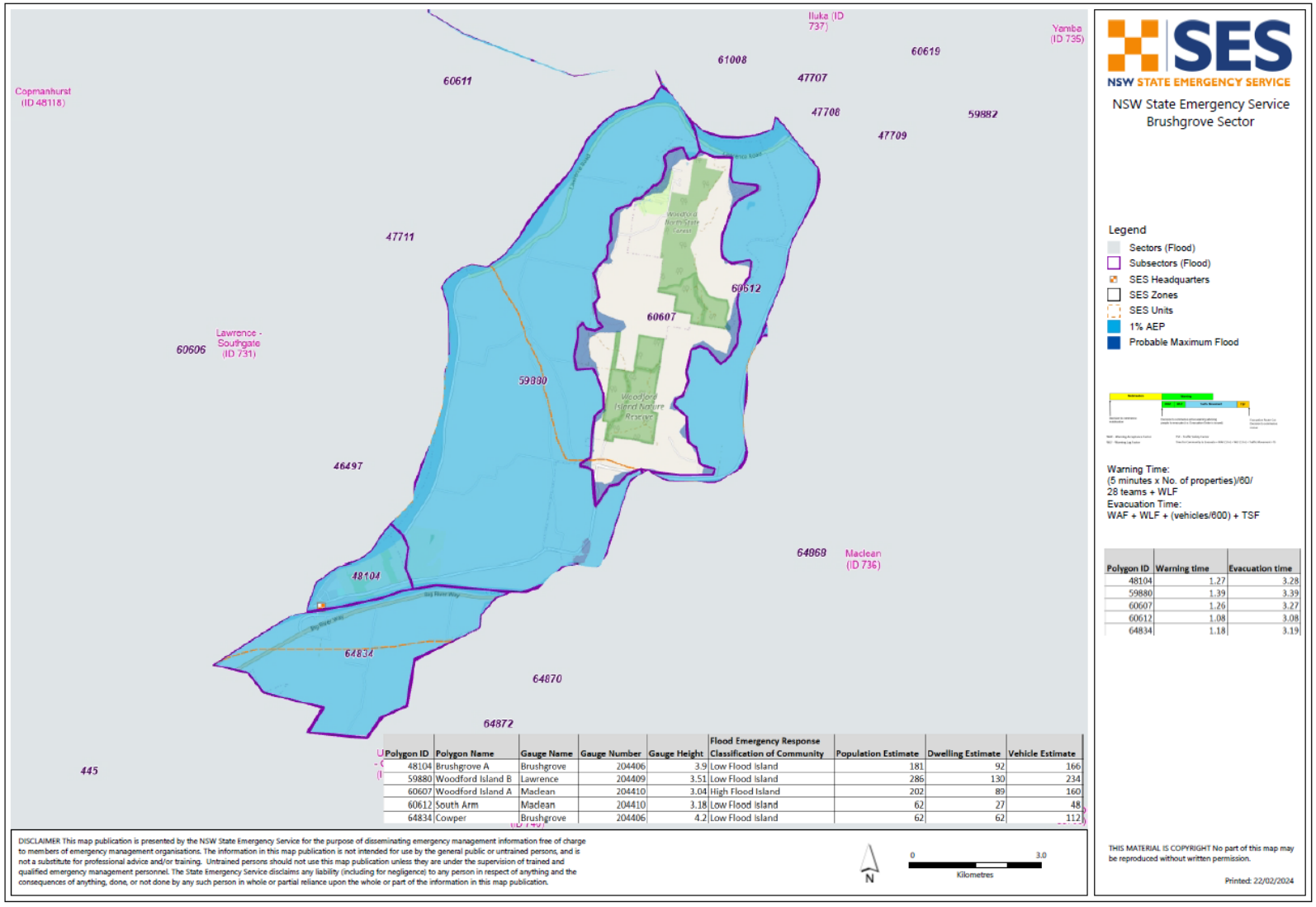
Evacuation Routes	• Early activation will allow residents to travel north or south to friends and family at private residences. • Early activation will also enable residents to travel along the Big River Way onto the Pacific Highway, then north to Maclean evacuation centre. Noting that the Pacific Highway closes at Shark Creek at 3.9m (Maclean gauge 204410/558022). • Following closure of the approach to Wingfield Bridge, residents will be transported from NSW SES Brushgrove headquarters to Cowper boat ramp, or another appropriate location determined at that time, by boat, then travel by road to the Evacuation Centre at Maclean. • Closure of the Big River Way at Tyndale (closure of Big River Way at 4.2 m on the Maclean gauge) will require the final movement of residents north of the Coldstream River by boat. Big River Way is closed approximately 200m from the assembly area on Big River Way. • See attached Map
Evacuation Route Closures	Road closures affecting the evacuation: • Big River Way closes at 4.2 m (Brushgrove gauge) at Tyndale just north of Tucabia-Tyndale Road. • Big River Way closes at (5.5 m Ulmarra gauge) south of Ulmarra at Swan Creek. • Big River Way closes (5.4 m Grafton (Prince Street) gauge (204400/58178)) at Alipou Creek, alternate route high level bypass Centenary Drive. • Big River Way closed at Ferry Park, Maclean (2.5 m (Maclean gauge 204410/558022). • Yamba Road closes (2.1 m Maclean gauge) at the "Cloverleaf" (Southern approach to Harwood Bridge 5km north of Maclean).
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. • Transport by road from Brushgrove NSW SES Unit to The Plantation Hotel, Tyndale.
Evacuation Centre/Assembly Point	• Brushgrove NSW SES Unit (Assembly Area only) • Maclean Showground Cameron Street Maclean
Large scale evacuations	• Evacuation centre at Maclean Showground.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy

Resupply	Resupply will be provided by the NSW SES through the 132500 call out system.
Aircraft Management	Helicopter Landing Zones • Wingfield Bridge (S29°34'05.7" E153° 04'39.5") - Flooded from 1% AEP • High Paddock to the north of Brushgrove (S29°32'19.7" E153°08'88.8") – Not Flooded • Cane loading pad at Tyndale beside Pacific Highway (S29°33'60.5" E153°08'94") - Flooded from 1% AEP
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises.

5.2. BRUSHGROVE SECTOR MAP



5.3 EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
48104	Brushgrove A	Brushgrove	204406	3.9	Low Flood Island	181	92	166
59880	Woodford Island B	Lawrence	204409	3.51	Low Flood Island	286	130	234
60607	Woodford Island A	Maclean	204410	3.04	High Flood Island	202	89	160
60612	South Arm	Maclean	204410	3.18	Low Flood Island	62	27	48
64834	Cowper	Brushgrove	204406	4.2	Low Flood Island	62	62	112

Polygon ID	Warning time	Evacuation time
48104	1.27	3.28
59880	1.39	3.39
60607	1.26	3.27
60612	1.08	3.08
64834	1.18	3.19

6. MACLEAN SECTOR

6.1. MACLEAN SECTOR

See Map Attached

Sector Description	This sector covers the towns of Maclean, Townsend, and Taloumbi, it also includes the villages of Tyndale, Gulmarrad, Palmers Channel, Ashby, Shark Creek and extensive rural areas.		
Hazard	Clarence River riverine flooding.		
Flood Affect Classification	Maclean has rising road access between 2.5 and 2.7 m, thereafter, becoming a high flood island with the levee overtopping heights at 3.3-3.4 m.		
At risk properties in a PMF	Maclean 421 and (102 Commercial) Shark Creek 3 Tyndale 29 Ashby 13	**Total number of properties**	Maclean 1127 Shark Creek 19 Tyndale 99 Townsend 436 Ashby 161 (2021 Census)
Population	Maclean 2711 Shark Creek 30 Tyndale 190 Townsend 991 Ashby 316		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauge Name: Maclean (204410/558022)	Minor: 1.60 m	Moderate: 2.20 m	Major: 2.50 m **Levee Height 3.3**
General Strategy	• Evacuation of at-risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area/Evacuation Centre at the Maclean Showground Cameron Street, Maclean, where evacuees are able to gather while flood situation is monitored.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity flooding inundation. • Overtopping and/or failure of Maclean levee resulting in inundation behind the levees. • Potential loss of life from rapid and potentially high velocity inundation in levee overtopping/failure scenario. • Potential isolation of thousands of people estimated to be for a number of days.		

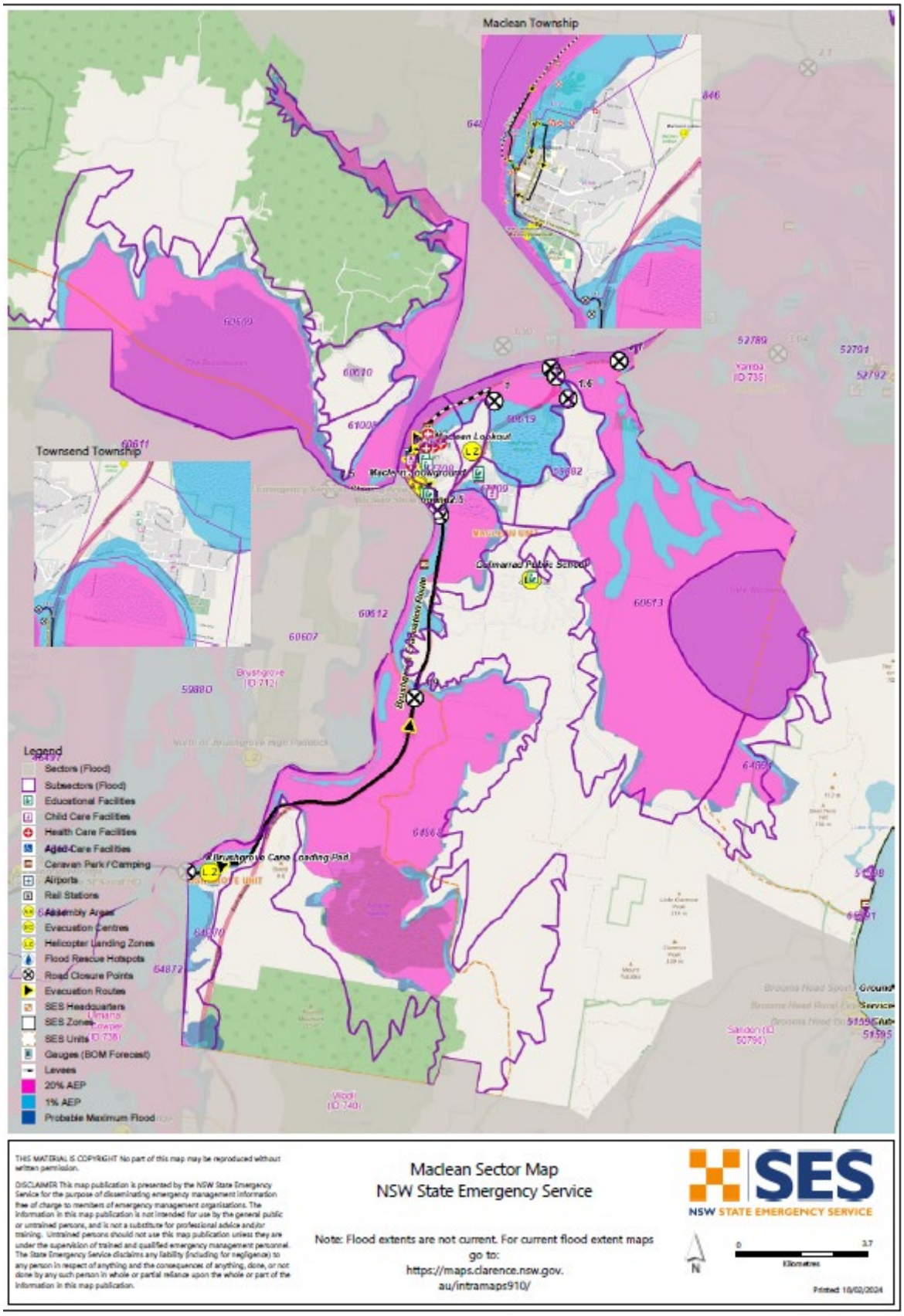
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sub sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)
Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock where resources are available. • Relocation of farm machinery and valuable goods where resources are available. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need where resources are available. • Monitoring integrity of dwellings surrounded by flood waters. • Assist Council engineers to monitor integrity of existing levee system. • Control of surface water inside levee.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • The electricity substation located at Cameron X Ulmarra Street is within the PMF flood extent. • Sewer system in urban areas of sector in Maclean, Townsend, rural areas of sector are on septic tank. Evacuations may be required in rural areas for sanitary reasons if septic systems overflow. • Clarence Valley Council Water and Sewerage Flood Plan addresses procedures for sewerage system.

Evacuation Triggers	The key evacuation triggers based on Bureau of Meteorology flood height predictions at the **Maclean gauge (204410):** **1. Prediction to reach and/or exceed 1.5 m** Advise schools of possible Lawrence Ferry closure affecting students returning home. **2. Prediction to reach and/or exceed 2.1 m** Advise schools of possible Yamba Road Closure affecting students returning home. **3. Prediction of between 2.5m to 2.7m (Isolation)** The town of Maclean becomes progressively isolated by flood waters. **4. Prediction to reach and/or exceed 3.0 m** Emergency Warning issued for Maclean residents living behind the levee system to prepare to relocate outside of the impact area. **5. Prediction to reach 3.3 m** At 3.3m the levee design height is thought to be exceeded and it likely that the low points in the levee will begin to be overtopped. Based on monitoring and assessment of levee condition, consideration for evacuation of: Argyle Street, (13 houses 1 business) Bakers Lane, (4 houses) Bank Lane, (1 house 1 business) Basin Street, (1 business) Cameron Street, (6 houses) Centenary Drive, (15 businesses) Central Avenue, (14 houses) Church Street, (3 houses 1 business) Clyde Street, (9 houses, 2 businesses) Diamond Street, (17 houses)** Dunoon Crescent, (18 houses) Dwartes Lane, (1 house) Emerald Street, (8 houses)** Houghs Lane, (10 houses) Howard Street, (12 houses) Iona Close, (9 houses) John Street, (5 houses) Jubilee Street, (10 houses) McLachlan Street, (84 houses, 3 businesses) McNaughton Place, (2 houses, 4 businesses) Morven Street, (17 houses) Rannoch Ave, (13 houses, 1 business) River Street, (70 houses) River Street, Shops, (66 businesses) Rush Lane, (8 houses) Sapphire Close, (17 houses)** Stanley Street, (1 house, 5 businesses) Taloumbi Street, (12 houses) Union Street, (8 houses, 2 businesses) and other low lying areas. ** Isolation only not flooded over-floor.

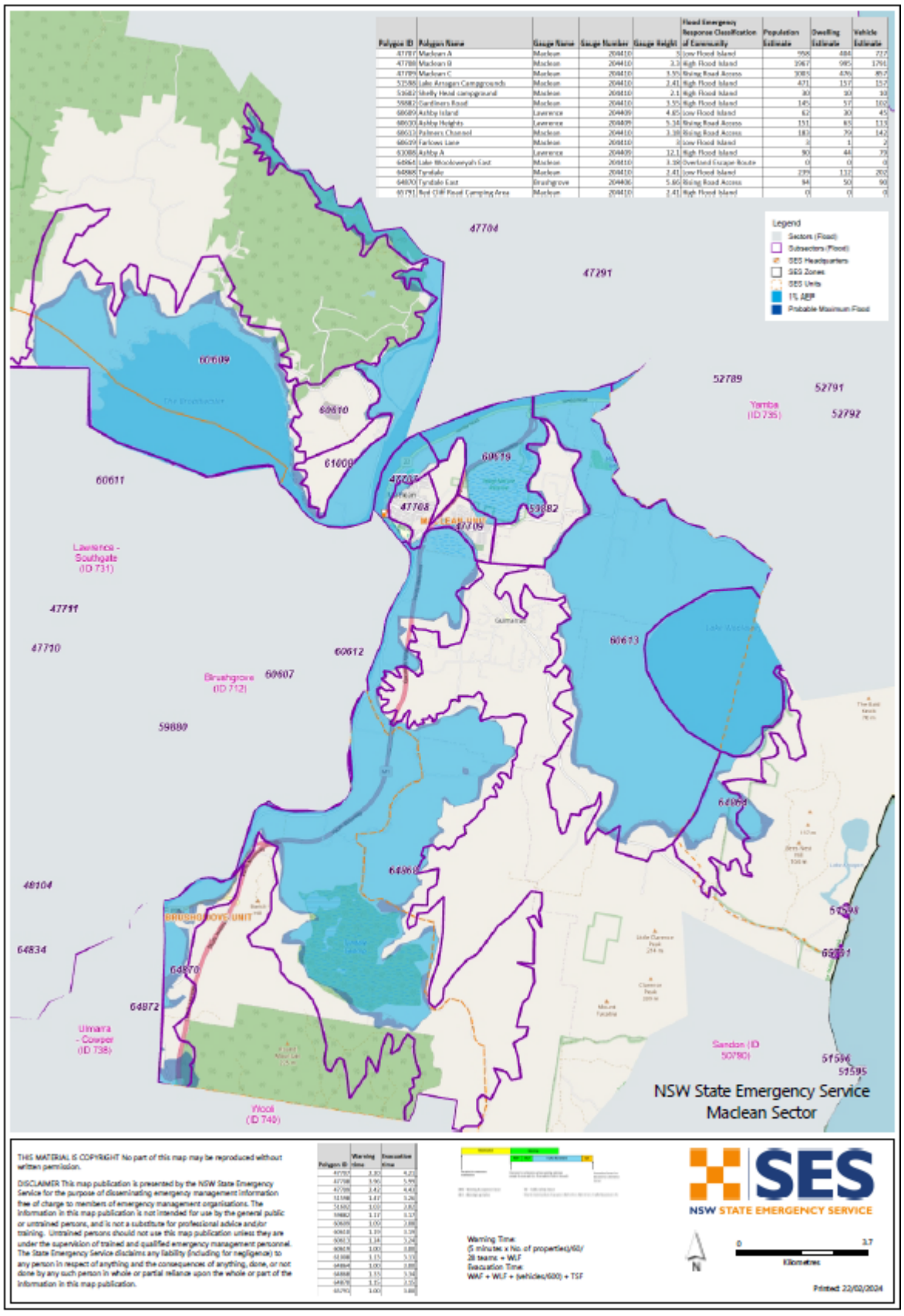
	5. Prediction to exceed 3.3 m Emergency Warning – move to higher ground issued for all impacted residences mentioned above to commence evacuation (overtopping likely to commence at 3.4 m). Cameron Street, Maclean Interchange remains open up to 3.43m on the Maclean gauge (204410/558022) The Pacific Highway south to Grafton closes at Shark Creek at approximately 3.9m on the Maclean gauge (204410/558022) Note: 1% AEP in Maclean is 3.55 m Maclean gauge (204410/558022)
Sequencing of evacuation	• Evacuation of vulnerable facilities such as (e.g. aged care facilities, schools, and child care facilities) will require a higher priority. • Outside of the identified sequenced evacuation areas, a number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case situation in conjunction with Department of Communities and Justice.
Evacuation Routes	**Option 1:** River Street to Cameron Street. **Option** 2: McLachlan Street, Short Street, River Street, then Cameron Street. **Option 3:** McLachlan Street, Union Street, Woodford Street, Church Street, River Street, then Cameron Street. See attached map.
Evacuation Route Closures	Road closures affecting the evacuation: • The closure of local roads will be dependent on local rainfall conditions. • Known streets affected once overtopping has commenced are shown in the "EVACUATION TRIGGER SECTION" of annexure. • Yamba Road closes (2.1 m Maclean gauge) at the "Cloverleaf" (Southern approach to Harwood Bridge 5 km north of Maclean). It also closes at 2.1m just north of South Bank Palmers Channel Road. • Big River Way closed at Ferry Park, Maclean (2.5 m Maclean gauge). Other known road closures: • Big River Way closes (5.4 m Grafton (Prince Street) gauge (204400/58178)) at Alipou Creek, Alternate route high level bypass Centenary Drive.
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. • Public transport will be available to transport the public without private transport to the Evacuation Centre/Assembly Area at the Maclean Showground. • Car parking capability on the Maclean Hill is unlimited.

Evacuation Centre/Assembly Point	• Maclean Showground buildings, Cameron Street, Maclean.
Large scale evacuations	In the event that large scale evacuations are required residents will be transported to where an Assembly Area/evacuation centre will be established. The following stages will occur; • **Stage 1:** Evacuation of the elderly, sick and frail as well as families with young children. This evacuation would be by private vehicles or school buses if possible. If roads are inundated flood boats and helicopters will be utilised. • **Stage 2:** Evacuation of all people not required for emergency Operations. • **Stage 3:** Evacuation of emergency personnel by flood boat.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Maclean Base Hospital, Spar Supermarket, Local Bakery and Fruit & Vegetable Store will be resupplied if required. This will ensure residents are continually provided with essential food items.
Aircraft Management	Helicopter Landing Zones • Maclean Showground (S29°27'88.7", E153°11'91.7") - Flooded from 1% AEP • Maclean Lookout (S29°27'32.0", E153°12'93.6") – Not Flooded • Gulmarrad Public School oval for larger helicopters (S29°29'98.2", E153°14'16.6") – Not Flooded
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. • Maclean has one peak season with potential population increase of more than 10% - Highland Gathering – Easter long weekend.

6.2. MACLEAN SECTOR MAP



6.3 EVACUATION PLANNING



7. ILUKA SECTOR

7.1. ILUKA SECTOR

See Map Attached

Sector Description	This sector covers, Iluka, Mororo, The Freshwater, Woody Head, Goodwood, Harwood, Chatsworth, Warregah Island and Woombah.		
Hazard	Clarence River riverine flooding		
Flood Affect Classification	Iluka and Woombah become a high flood islands following the flooding of access roads at 2.1 m on the Maclean gauge.		
At risk properties in a PMF AEP	Iluka – 392 Harwood – 170 Chatsworth Island – 51 Chatsworth - 82 3 Caravan Parks and a Campground	**Total number of properties**	Iluka – 1314 Harwood – 158 Chatsworth Island 79 (2021 Census)
Population	Iluka – 1764 Harwood – 346 Chatsworth Island - 157		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauge Name: Maclean (204410/558022)	Minor: 1.60 m	Moderate: 2.20 m	Major: 2.50 m
Gauge Name: Yamba (204454)	Minor: 1.60 m	Moderate: 2.20 m	Major: 2.50 m
General Strategy	• Evacuation of at-risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area/Evacuation Centre at the Iluka Community Hall 54 Spencer Street, Iluka, or Club Iluka 75-79 Spencer Street, Iluka where evacuees are able to gather while flood situation is monitored.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential isolation of hundreds of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sub sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)		

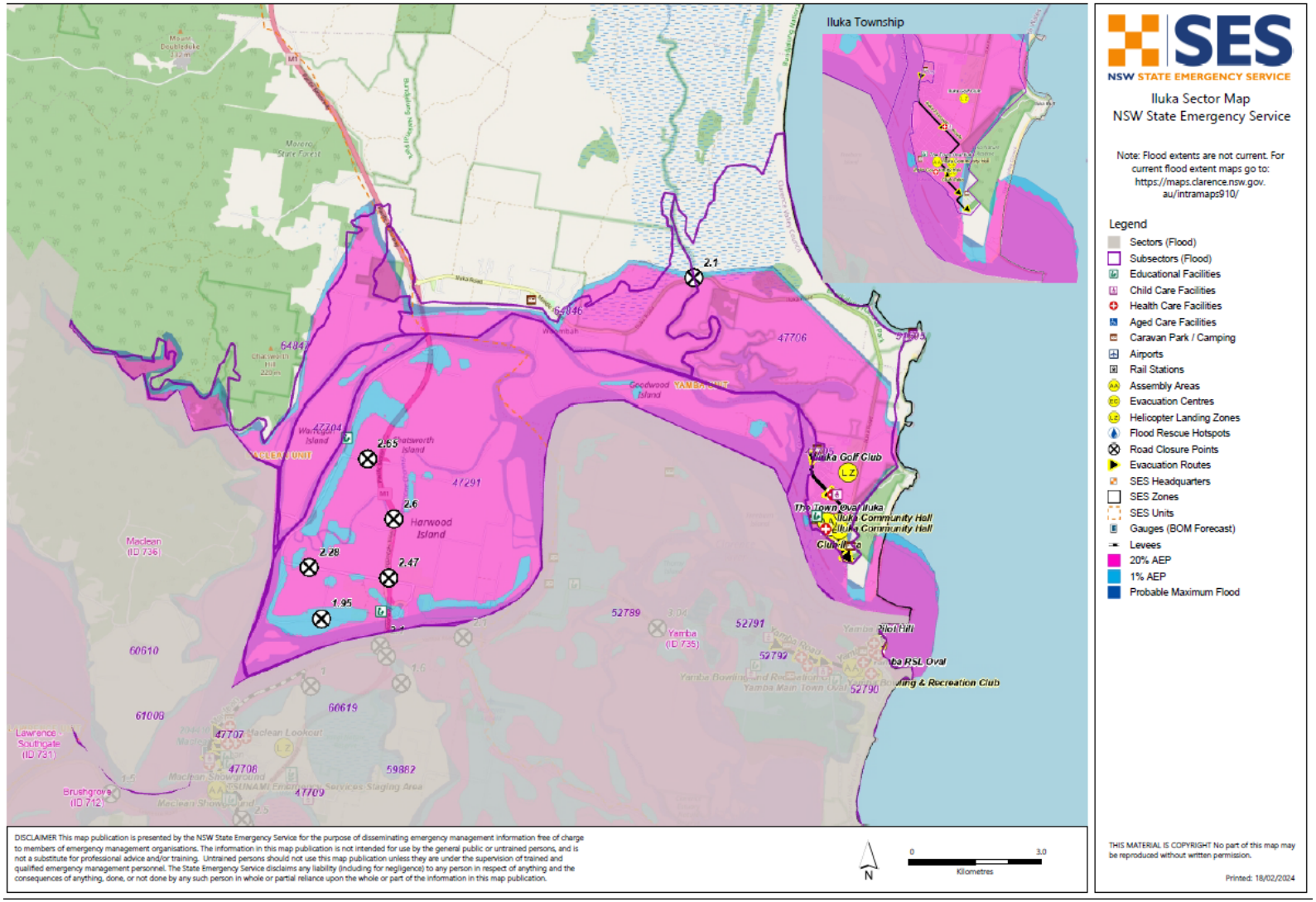
Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock where resources are available. • Relocation of farm machinery and valuable goods where resources are available. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need where resources are available. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • The Sewerage Treatment Plant is located in Johnsons Lane, Iluka. This area is subject to flooding during a PMF event. • Clarence Valley Council Water and Sewerage Flood Plan address procedures for sewerage treatment plant.

Evacuation Triggers	The effects on the towns and outlying areas in this sector are very much dependent on **tidal influences**. Tidal levels will need to be identified at the onset of main Clarence River flooding. **Maclean gauge (204410/558022):** **1. Prediction to reach and/or exceed 2.0 m** Local Warnings will commence, including notification to: • The Anchorage Holiday Park Iluka • Browns Rocks Caravan Park Goodwood Island **2. Prediction to reach and/or exceed 2.1 m (isolation)** The Iluka Road at the Esk River may be cut, causing isolation of the town. Based on monitoring and assessment known locations of flooding are: Marandowie Drive, Melville Street, Sovereign Street and Conrad Close. **3. Prediction to reach and/or exceed 2.4 m** Targeted Emergency Warning of a number of houses around Iluka may be considered. **4. Prediction of between 2.5m to 2.7m (Isolation)** Targeted Emergency Warning for residents in Harwood. The village of Harwood is totally flooded, most houses in this area are raised preventing over floor flooding. **6. Prediction to reach and/or exceed 3.0 m** Extensive flooding of Chatsworth, Harwood and Warregah Islands. Evacuations of low-lying houses may be necessary. **7. Prediction to reach and/or exceed 3.5 m** Water starts to flow around Harwood Sugar Mill. **7. Prediction to reach and/or exceed 3.6 m (isolation)** The village of Woombah may become isolated; however, land is above the PMF.
Sequencing of evacuation	A number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case situation in conjunction with Department of Communities and Justice.
Evacuation Routes	• The local Evacuation Routes will be chosen in consideration of current road conditions. These routes will direct residents to the local Assembly Area/evacuation centres in the town. See Attached Map

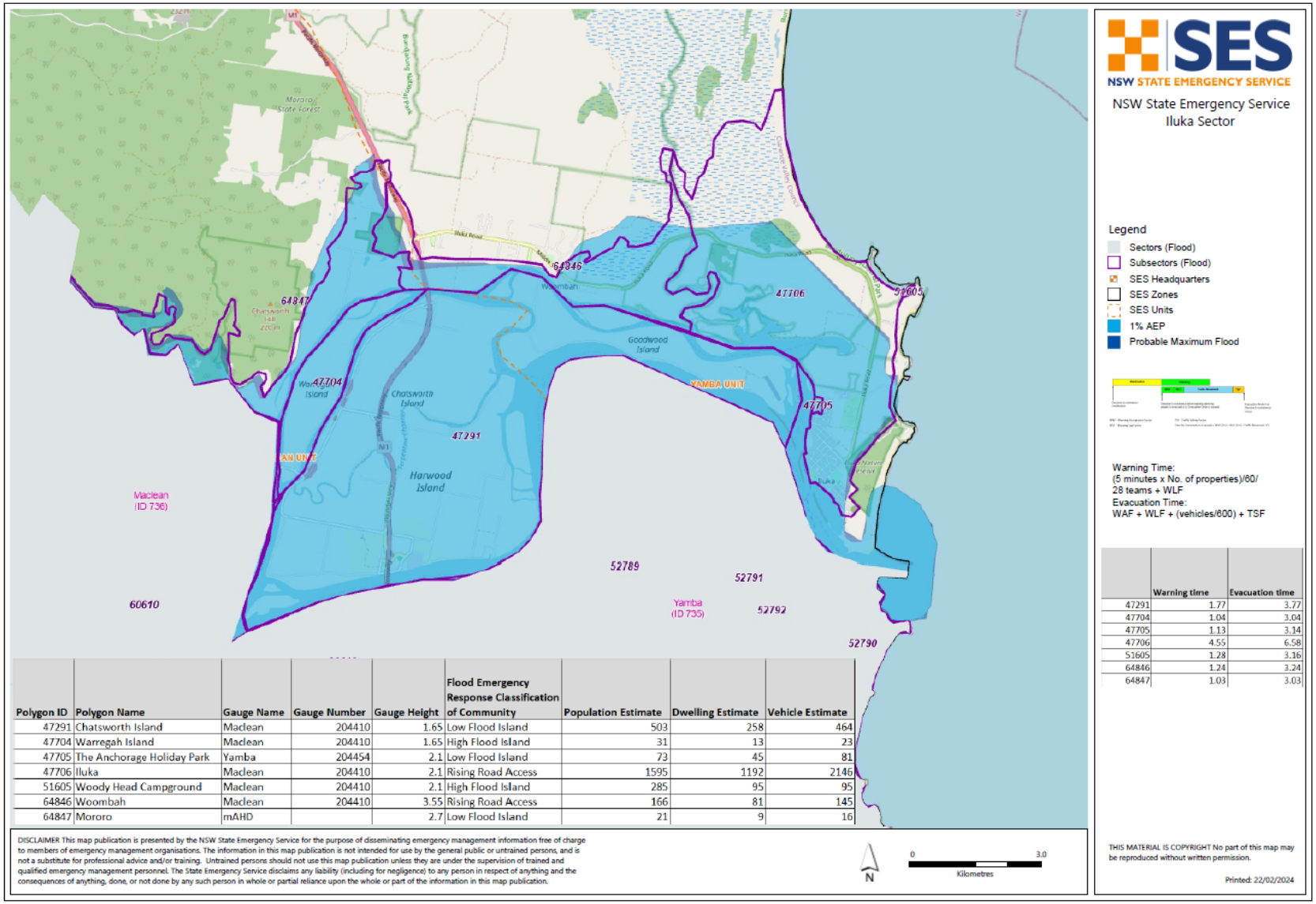
Evacuation Route Closures	Road closures which may affect the isolation of the town of Iluka: • The closure of local roads will be dependent on local rainfall and tidal conditions. • The only route in and out of Iluka is the Iluka Road which can be cut at the Esk River (2.1 m Maclean gauge 204410/558022). • Yamba Road closes (2.1 m Maclean gauge204410/558022) at the "Cloverleaf" (Southern approach to Harwood Bridge 5 km north of Maclean). • Big River Way closed at Ferry Park, Maclean (2.5 m Maclean gauge 204410/558022). Road closures which may affect evacuation of the Chatsworth and Harwood Island areas: • Watts Lane closes (2.28m Maclean gauge 204410/558022) • Chatsworth Road Closes near the south bound off ramp at Serpentine Channel (2.65m Maclean gauge 204410/558022) • Localised road closures on Chatsworth Road northbound onto the Pacific Highway may also impact evacuation in these areas. Other known road closures: • Big River Way Closes (5.4m Grafton (Prince Street) gauge (204400/58178)) at Alipou Creek, Alternate route high level bypass Centenary Drive. • Pacific Highway, Southbound to Grafton remains open up to 2.6m on the Maclean Gauge (204410/558022). Closure at Serpentine Channel. • Pacific Highway Northbound from Iluka road remains open.
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details.
Evacuation Centre/Assembly Point	• Iluka Community Hall 54 Spencer Street, Iluka; and • Club Iluka 75-79 Spencer Street, Iluka. Both of these Evacuation Centres are within the PMF extent. During a PMF event Thompson Street remains accessible and above flood level. Suggest resourcing this area with marquees, water and basic essentials.
Large scale evacuations	• If large scale evacuations are likely, additional sites will be identified as an Assembly Area/evacuation centres to accommodate residents of Iluka, Woody Head and any outlying areas.

Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system.
Aircraft Management	Helicopter Landing Zones: • Iluka Golf Course (S29° 23' 73.2" E153° 21'39.0") – Flooded in a PMF • The Town Oval (S29° 24' 38.9" E153° 21'24.2") - Flooded from 1% AEP
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. Iluka has four peak seasons with a potential population increase of more than 10%: • School holidays tourist influx late December/January • School holidays tourist influx April • School holidays tourist influx July • School holidays tourist influx September/ October .

7.2. ILUKA SECTOR MAP



7.3 EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
47291	Chatsworth Island	Maclean	204410	1.65	Low Flood Island	503	258	464
47704	Warregah Island	Maclean	204410	1.65	High Flood Island	31	13	23
47705	The Anchorage Holiday Park	Yamba	204454	2.1	Low Flood Island	73	45	81
47706	Iluka	Maclean	204410	2.1	Rising Road Access	1595	1192	2146
51605	Woody Head Campground	Maclean	204410	2.1	High Flood Island	285	95	95
64846	Woombah	Maclean	204410	3.55	Rising Road Access	166	81	145
64847	Mororo	mAHD		2.7	Low Flood Island	21	9	16

	Warning time	Evacuation time
47291	1.77	3.77
47704	1.04	3.04
47705	1.13	3.14
47706	4.55	6.58
51605	1.28	3.16
64846	1.24	3.24
64847	1.03	3.03

8. YAMBA SECTOR

8.1. YAMBA SECTOR

See Map Attached

Sector Description	This sector covers Yamba, Angourie, Wooloweyah and Palmers Island		
Hazard	Clarence River riverine flooding		
Flood Affect Classification	Yamba becomes a low flood island at 2.1m and has rising road access in the east. Palmers Island is a low flood island.		
At risk properties at PMF AEP	Yamba 1217 Palmers Island 126 3 Caravan Parks.	**Total number of properties**	Yamba 4054 Palmers Island 224 (Census 2021)
Population	Yamba 6405 Palmers Island 482		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauge Name: Maclean (204410/558022)	Minor:1.60 m	Moderate: 2.20 m	Major: 2.50 m
Gauge Name: Yamba (204454)	Minor: 1.60 m	Moderate: 2.20 m	Major: 2.50 m
General Strategy	• Evacuation of at-risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area/Evacuation Centre at the Yamba Bowling Club Wooli Street Yamba, where evacuees are able to gather while flood situation is monitored.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity flooding inundation. • Potential isolation of thousands of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sub sectors. • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)		

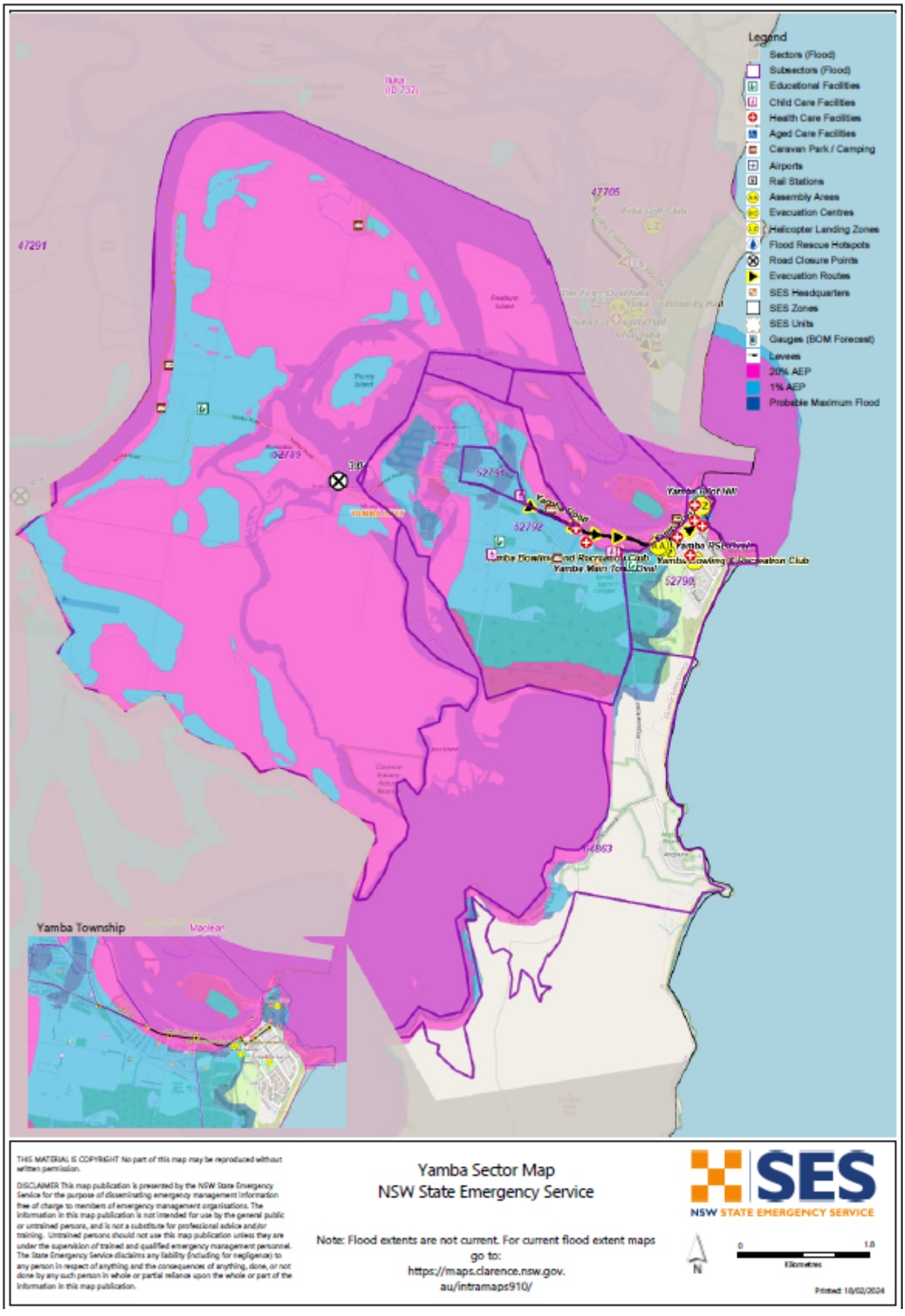
Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock where resources are available. • Relocation of farm machinery and valuable goods where resources are available. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need where resources are available. • Monitoring integrity of dwellings surrounded by flood waters. **Protection of essential infrastructure:** • No identified essential infrastructure requiring protection. • Electricity substation located along Angourie Road is within the PMF but not the 1% AEP flood extent. • Sewer system in Urban areas of sector in Yamba, Angourie, Wooloweyah. This is located within the PMF flood extent at 97 Angourie Road, Yamba. All other areas of sector are on septic tank, evacuations may be required in rural areas for sanitary reasons if septic systems overflow. • Clarence Valley Council Water and Sewerage Flood Plan address procedures for sewerage system.
Evacuation Triggers	The effect of flooding on the town and outlying areas in this sector is very much dependent on tidal influences. Tidal levels will need to be identified at the onset of main Clarence River flooding. The key evacuation triggers based on Bureau of Meteorology flood height predictions at the **Maclean gauge (204410/558022):** **1. Prediction to reach and/or exceed 2.1 m** Local Warnings will commence, including notification to Caravan Parks and low lying houses. Yamba becomes isolated at the Cloverleaf and also the intersection of Yamba Road and Palmers Channel South Bank Road, depending on tidal conditions (760 Yamba Road). Palmers Island begins to experience flooding. **2. Prediction to reach and/or exceed 2.4 m** Low lying areas of Shores Drive, the Halyard and 4 houses on Yamba Drive near Coles are subject to flooding. Other areas affected are Golding Street, Cook Street, and Endeavour Street, Deering Street. **3. Prediction to reach and/or exceed 3.6 m** Emergency Warning to be considered for Palmers Island and targeted areas of Yamba based on local conditions. A 1% AEP flood event at Palmers Island village would see 54 properties affected and 10 would have over floor flooding.

Sequencing of evacuation	• Evacuation of vulnerable facilities such as (e.g. aged care facilities, schools, and child care facilities) will require a higher priority. • Outside of the identified sequenced evacuation areas, a number of residences and properties may need to be evacuated during periods of significant flooding. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case-by-case situation in conjunction with Department of Communities and Justice.
Evacuation Routes	• Residents wishing to leave Yamba need to do so before a height of 2.1 m is reached on the Maclean gauge (204410) • Local roads around Yamba will open and close, depending on local rainfall and tidal conditions. See attached map.
Evacuation Route Closures	Road closures which may affect the isolation of the town: • The closure of local roads will be dependent on local rainfall and tidal conditions. • Yamba Road closes at (2.1m Maclean gauge 204410/558022) • Pacific Highway closes (2.1m Maclean gauge 204410/558022) at the "Cloverleaf" (Southern approach to Harwood Bridge 5km north of Maclean). • Pacific Highway closed at Ferry Park, Maclean (2.5m Maclean gauge 204410/558022) • Brooms Head Road can be cut at Taloumbi by localized flooding. Other known road closures: • Pacific Highway Closes (5.4m Grafton (Prince Street) gauge (204400/58178)) at Alipou Creek, Alternate route high level bypass Centenary Drive.
Method of Evacuation	• Primarily self-evacuation by private transport before road closures. • At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. • Other outlying areas such as Palmers Island and Palmers Channel may require evacuating on a case-by-case basis and can be transported by boat to the Assembly Area/Evacuation Centre at the Yamba Bowling Club.
Evacuation Centre/Assembly Point	• Yamba Bowling & Recreation Club, Wooli Street, Yamba. This is within the PMF. An alternative is to higher ground in Clarence and Pilot Street where additional accommodation maybe sourced with assistance from the Department of Communities and Justice.

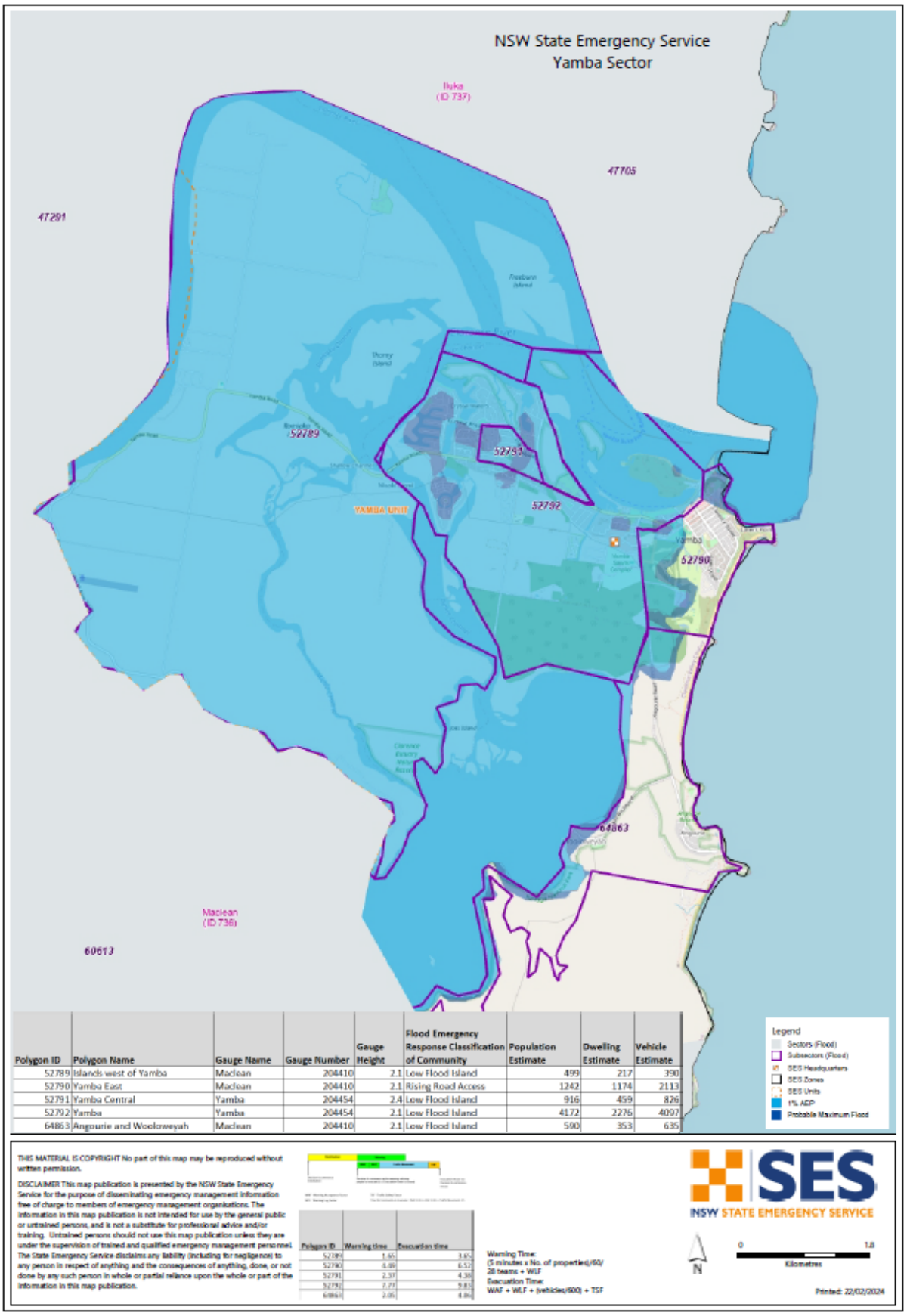
Large scale evacuations	In the event that large scale evacuations are required residents will be transported to areas where an Assembly Area/Evacuation Centre will be established. The following stages will occur; • **Stage 1:** Evacuation of the elderly, sick and frail as well as families with young children. This evacuation would be by private vehicles or school buses if possible. If roads are inundated flood boats and helicopters will be utilised. • **Stage 2:** Evacuation of all people not required for emergency Operations • **Stage 3:** Evacuation of emergency personnel by flood boat.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Coles supermarket will be resupplied if required; this will ensure that Yamba residents are continually provided with essential food items.
Aircraft Management	Helicopter Landing Zones • Pilot Hill (S29° 25' 96.6", E153° 21' 82.9") – Not Flooded • RSL Sub Branch Oval (S29° 26' 24.0", E153° 21' 76.6") – Not Flooded • Main Town Oval, Coldstream Street (S29° 26' 34.1", E153° 21' 50.5") – Flooded during PMF

Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. • Evacuation of residential institutions, nursing homes and age care facilities will occur where these are threatened by predicted flood waters. Yamba has four peak seasons with a potential population increase of more than 10%: • School holidays tourist influx late December/January. • School holidays tourist influx April • School holidays tourist influx July • School holidays tourist influx September/ October

8.2. YAMBA SECTOR MAP



8.3 EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
52789	Islands west of Yamba	Maclean	204410	2.1	Low Flood Island	499	217	390
52790	Yamba East	Maclean	204410	2.1	Rising Road Access	1242	1174	2113
52791	Yamba Central	Yamba	204454	2.4	Low Flood Island	916	459	826
52792	Yamba	Yamba	204454	2.1	Low Flood Island	4172	2276	4097
64863	Angourie and Wooloweyah	Maclean	204410	2.1	Low Flood Island	590	353	635

Polygon ID	Warning time	Evacuation time
52789	1.65	3.65
52790	4.09	6.52
52791	2.37	4.38
52792	7.77	9.81
64863	2.05	4.86

Warning Time:
(5 minutes x No. of properties/60/
28 teams + WLF
Evacuation Time:
WAF + WLF + (vehicles/600) + TSF

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Printed: 22/02/2024

9. SANDON SECTOR

9.1. SANDON SECTOR

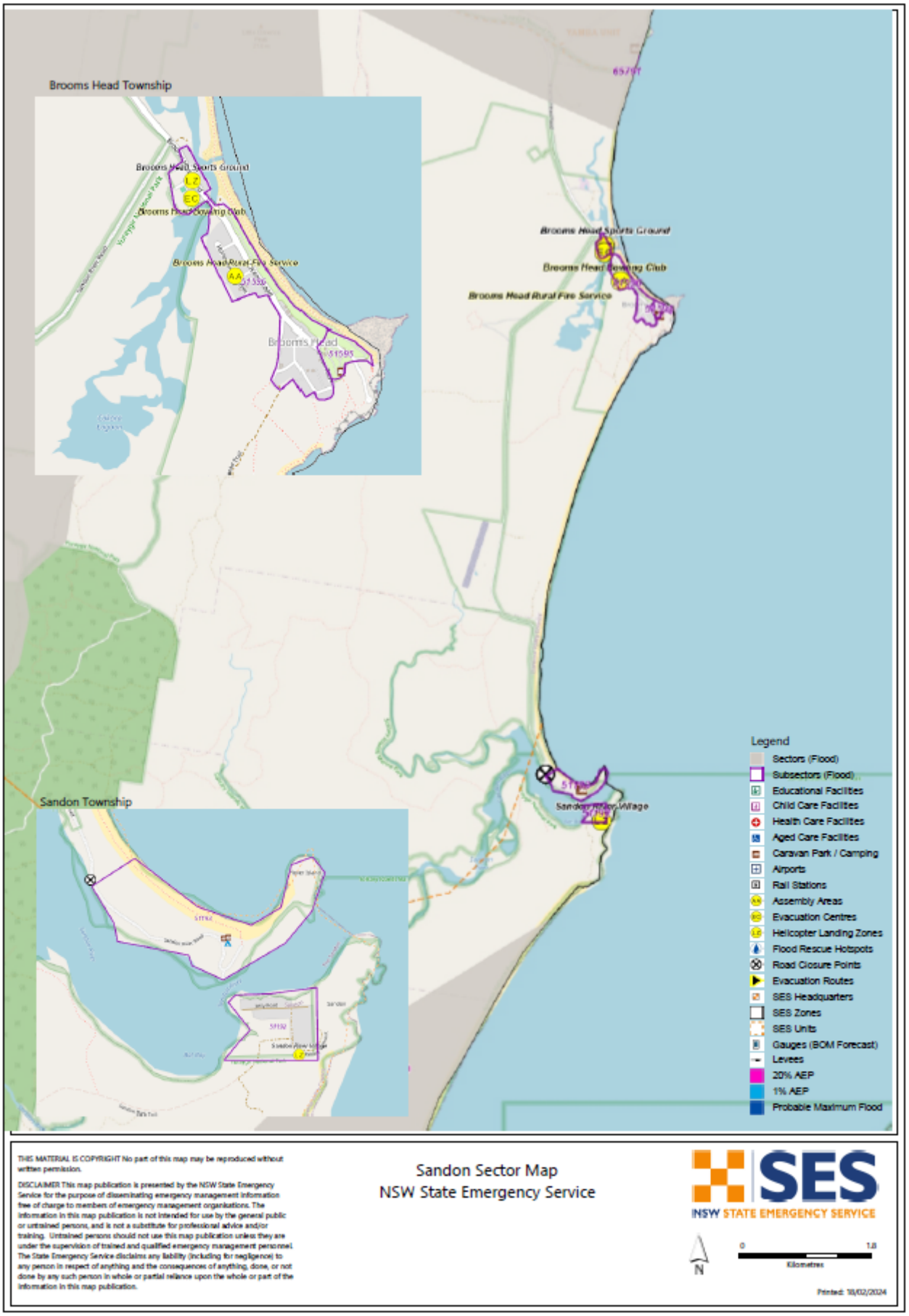
See Map Attached

Sector Description	This sector covers Bookram, Brooms Head, Sandon and Sandon River Village.		
Hazard	Flooding by ocean influences and riverine and overland flooding causing isolation.		
Flood Affect Classification	High flood island.		
At risk properties in a PMF AEP event	Isolation of all properties	**Total number of properties**	Sandon 35 Brooms Head 271 (Census 2021)
Population	Sandon 9 Brooms Head 256 (Census 2021)		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, Marine Rescue, and NSW Rural Fire Service (RFS) volunteers.		
NO Key Warning Gauge	-	-	-
General Strategy	• Evacuation of at-risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area at Brooms Head Bowling Club, 30 - 36 Ocean Road, Brooms Head where evacuees are able to gather while flood situation is monitored. • Establishment of an Assembly Area at Sandon River Village RFS/ Library Building to accommodate village residents.		
Key Risks / Consequences	• Potential loss of life from tidal surges and large ocean seas. • Potential isolation of more than 200 people estimated to be for a number of days.		
Information and Warnings	• Storm Surge Warning • Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)		
Property Protection	**Specific property protection measures:** • Monitoring integrity of dwellings affect by ocean influences.		
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection		

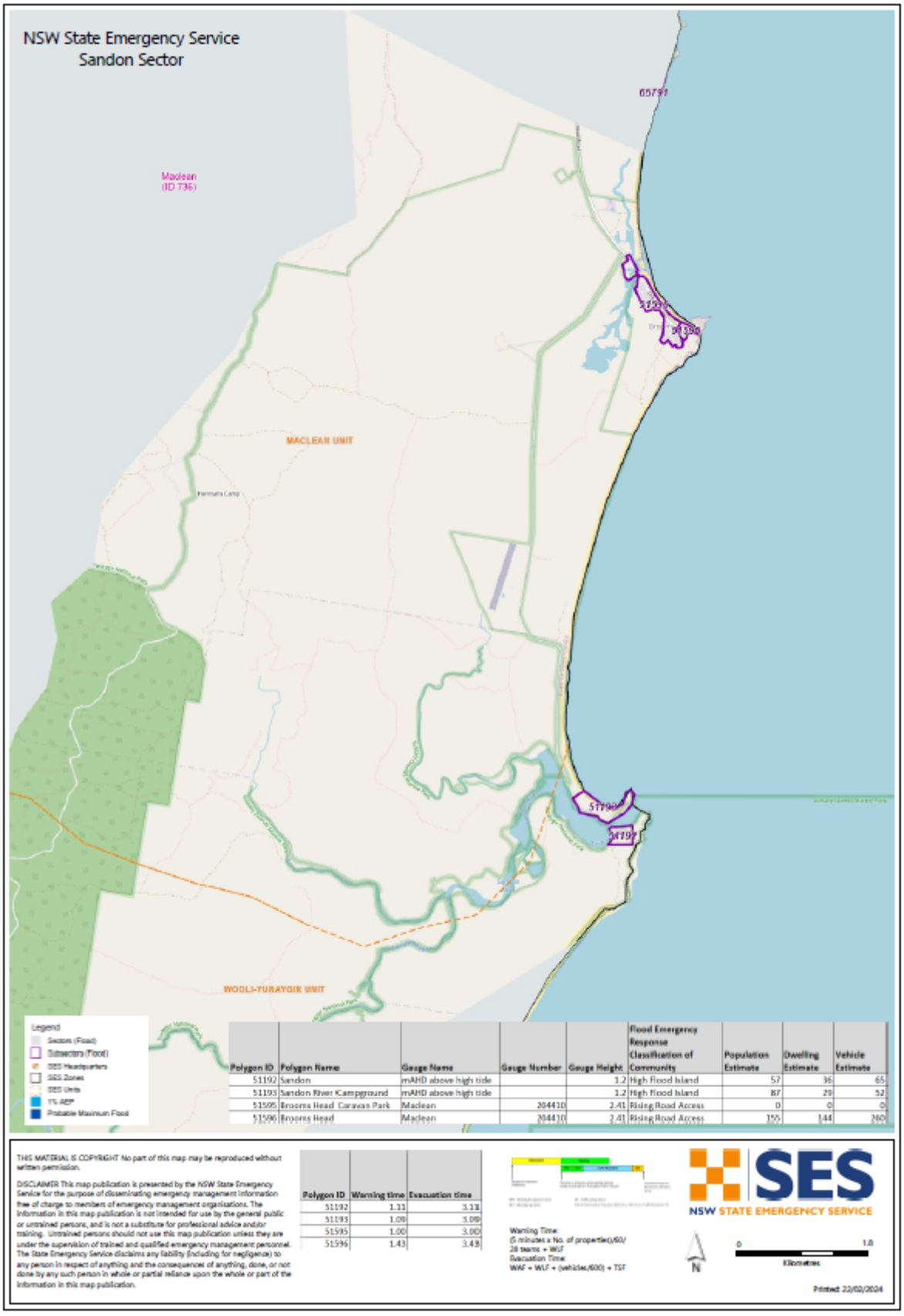
Evacuation Triggers	• There is no river height gauge on the Sandon River. The river is tidal with a small catchment area. A river level 1.2 m over high tide can cover access road to Sandon from the north. • Storm surge/large wave events may impact areas within this sector.
Sequencing of evacuation	**Sandon** • 35 houses in Sandon village will require door knocking. **North Sandon** • A potential for 40 camp sites and 12 occasionally occupied houses at Sandon River camping ground will require door knocking in the event of possible flooding. **Brooms Head** • Low lying parts of Brooms Head Caravan Park may require door knocking. • Low lying houses at Ocean Street may require assistance in Storm Surge/Large Wave events.
Evacuation Routes	• Brooms Head Road to Maclean. • Sandon River Village has access via main inland track to Minnie Water. See attached map.
Evacuation Route Closures	• 1.2 m flood height over the high tide can close Sandon River Road. • Main beach track used to travel to Minnie Water may not be passable during high tides or storm surge events.
Method of Evacuation	• Affected residents may be transported by helicopter in the event of road closures.
Evacuation Centre/Assembly Point	• Brooms Head Bowling Club 30-36 Ocean Road, Broom Head. Capacity short term 350, long term 200. (Evacuation Centre). • Sandon River Village RFS/ Library Building. (Assembly Area)
Large scale evacuations	• It is not anticipated that large scale evacuations could occur with limited residents affected in this sector.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Brooms Head local store will be resupplied if required, where residents can access essential food supplies for the period of isolation.
Aircraft Management	Helicopter Landing Zones • Brooms Head Sports Ground (S29° 38’ 40.8”, E 153° 19’ 91.5”) - Flooded from 1% AEP • Sandon River Village (S29° 40’ 41.0”, E153° 19’ 46.3”) – Not Flooded

Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. • Brooms Head and Sandon have four peak seasons with potential for a population increase of more than 100%: ○ School holidays December/January ○ School holidays April ○ School holidays July ○ School holidays September/October The majority of holiday makers in this sector are campers.

9.2. SANDON SECTOR MAP



9.3 EVACUATION PLANNING



10. WOOLI-MINNIE WATER SECTOR

10.1. WOOLI MINNIE SECTOR

See Map Attached

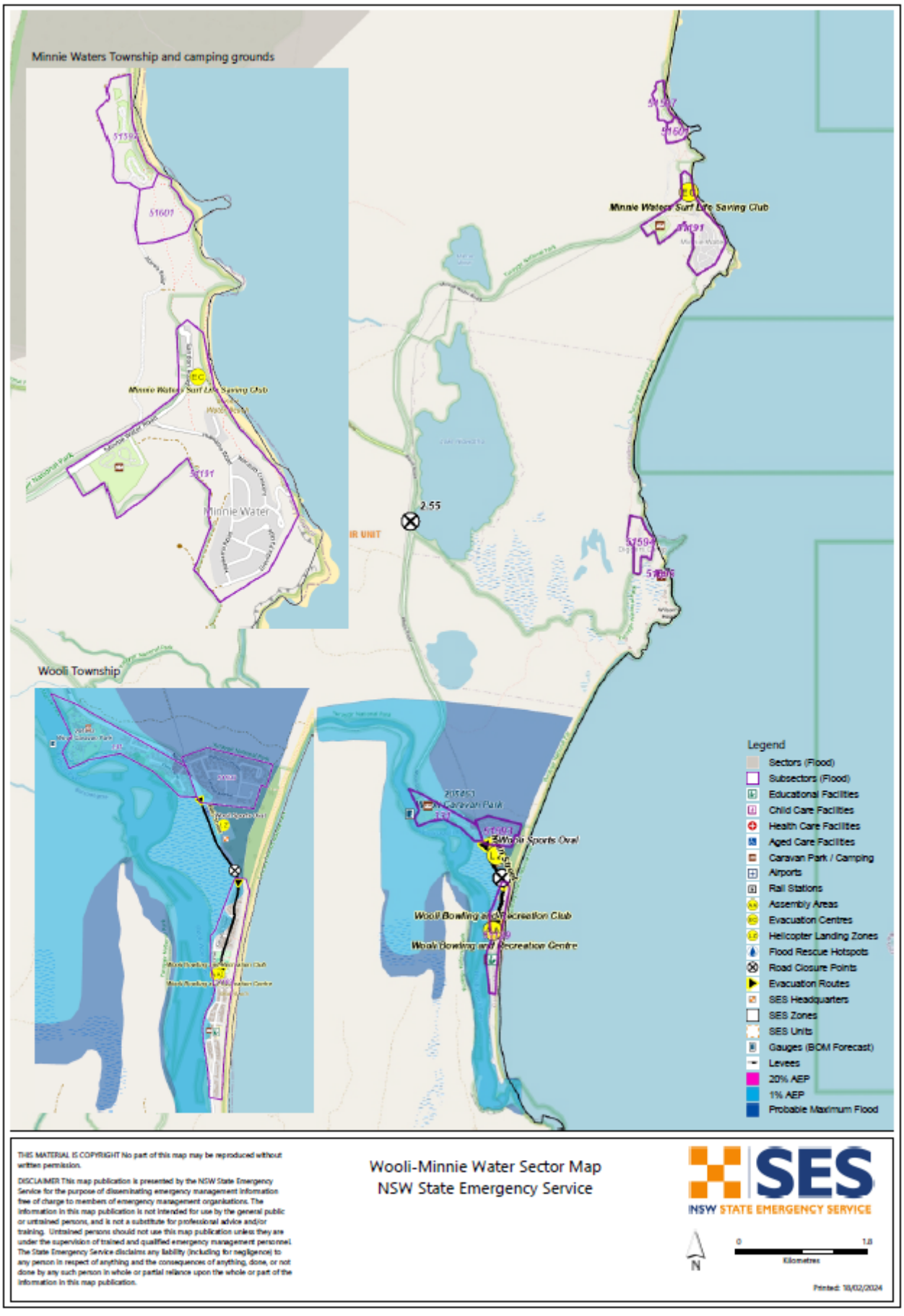
Sector Description	This sector covers Calamia, Diggers Camp, Minnie Water, Pillar Valley, Sandy Crossing and Wooli.		
Hazard	Riverine flooding on the Wooli and Coldstream Rivers.		
Flood Affect Classification	High flood islands, with Wooli becoming a low flood island.		
At risk properties in a PMF	Wooli 210 at risk of inundation All at risk of isolation.	**Total number of properties**	Pillar Valley 187 Wooli 463 Minnie Water 183 (Census 2021)
Population	Pillar Valley 352 Wooli 503 Minnie Water 212 (Census 2021)		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauge Name: Wooli (Caravan Park) (205463/558060)	Minor: - 1.9	Moderate: - 2.2	Major- 2.5
General Strategy	• Evacuation of at-risk population. • Self-evacuation to friends/family outside of the impact area. • Establishment of an Assembly Area at Wooli Bowling Club, Main Street, Wooli where evacuees are able to gather while the flood situation is monitored.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential isolation of thousands of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)		
Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock where resources are available. • Relocation of farm machinery and valuable goods where resources are available. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need where resources		

	are available. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • No sewerage, evacuation may be required for sanitary reasons if septic systems overflow.
Evacuation Triggers	The effects of flooding on the town and outlying areas in this sector is very much dependent on tidal influences. Tidal levels will need to be identified at the onset of Wooli River flooding. The key evacuation triggers based on Bureau of Meteorology flood height predictions at the **Wooli (Caravan Park) River gauge (205463):** **1. Prediction to reach and/or exceed 1.5 m** Evacuations will be considered when the predicted height of the Wooli River (Resort) gauge at The Solitary Islands Marine Park reaches 1.5 m. With 100 mm of rain Lake Hiawatha can commence overflowing into the swamp behind village. Water becomes visible behind Williams Crescent. When this occurs Sandy Crossing and White Bridge may be cut. Large swells, king tides and heavy rain affect low lying areas along Riverside Drive from forks in road to Wooli Oyster supply with no.11 Carraboi Street lowest dwelling. Houses 154 and 156 Main Street over floor flooding from storm water during heavy rain.
Sequencing of evacuation	The following stages will occur: **Stage 1** • Evacuation of the elderly, sick and frail as well as families with young children. This evacuation would be by private vehicles or school buses if possible. If roads are inundated flood boats and helicopters will be utilised. **Stage 2** • Evacuation of all people not required for emergency operations. • Use of RFS trucks, at Wooli and Pillar Valley, Hotel bus, Bowling Club bus and Wooli Freight Service truck used to evacuate people from the village.

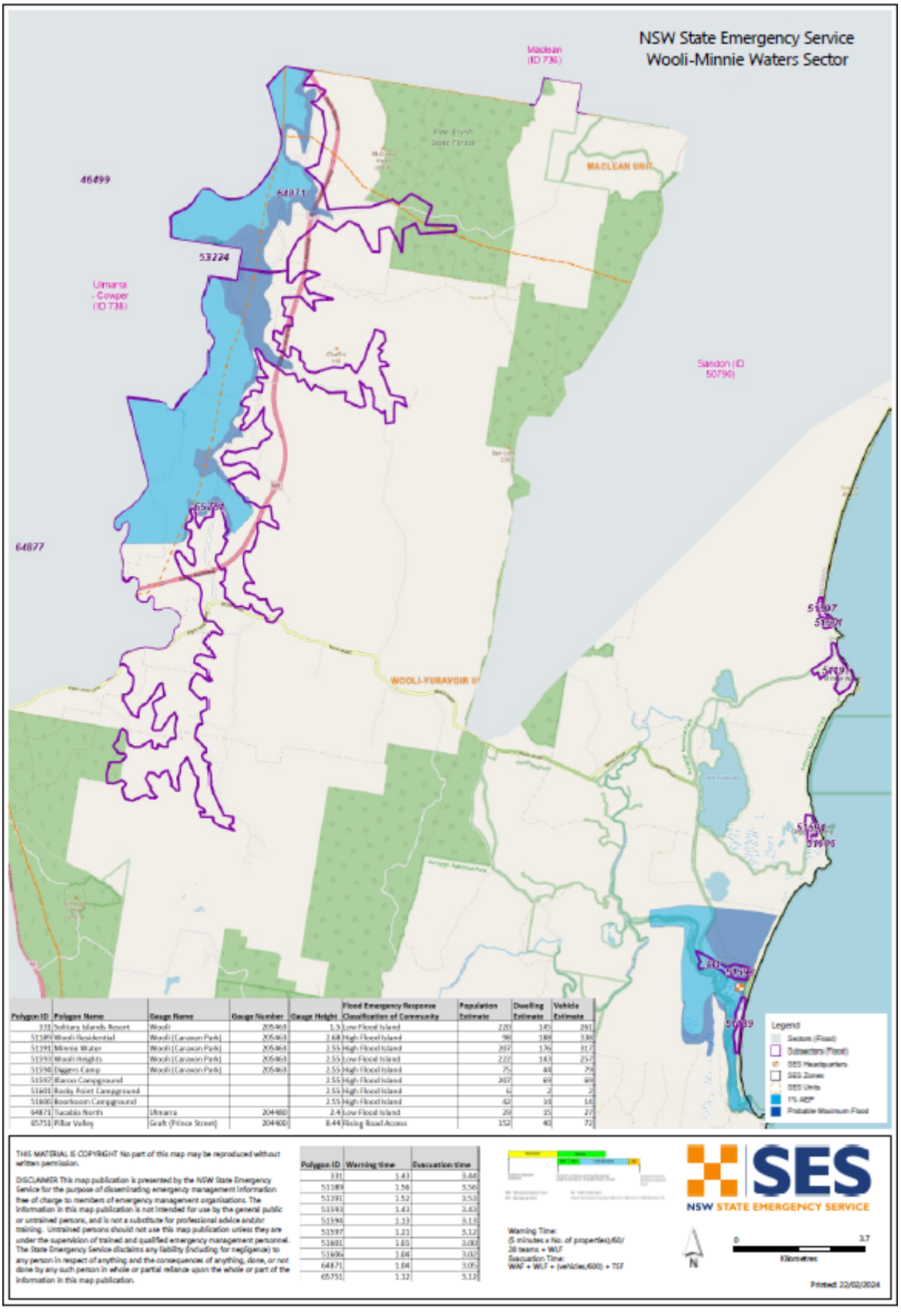
Evacuation Routes	• Local roads around Wooli will open and close, depending on local rainfall and tidal conditions. • Evacuation route for Wooli is travel along Riverside Drive until you come to the Bowling Club. Alternately if this road is underwater travel along Main Street turn right at Bowling Club into Riverside Drive and on to Bowling Club. Access and Egress from Wooli maybe possible during flooding via Firth Heinz Road out to the Pacific Highway. Access onto the highway is at **Lat:** 29° 41' 46.35896" S, **Lon:** 153° 7' 24.95189" E.
Evacuation Route Closures	Local and heavy rainfall close roads • If Eight Mile Lane closes at Sandy Crossing, the towns of Wooli, Minnie Water and Diggers Camp will be isolated. This situation occurs quite regularly and the residents are aware of this The Eight Mile Lane to the Pacific highway may close at Sandy crossing. • White Bridge on Wooli Road to Tucabia • The towns are often isolated from local storm events as well. Other known road closures include: • Firth Heinz Road Pillar Valley • Diggers Camp Road. • Eight Mile Lane at Sandy Crossing closes • White Bridge closes. • Big River Way Closes (5.4 m Grafton (Prince Street) gauge (204400/58178)) at Alipou Creek, Alternate route high level bypass Centenary Drive.
Method of Evacuation	• When flooding is expected the NSW SES, RFS and other Emergency Services will conduct a door knock of the areas to be effected. • Known affected locations are: Riverside Drive, Wooli Road, Olen Close, Little River Close, Main Street
Evacuation Centre/Assembly Point	• Wooli Bowling Club Main Street Wooli (evacuation Centre) To be confirmed. • Minnie Waters Surf Life Saving Club, Minnie Waters Road (Evacuation Centre) – Capacity 10 people
Large scale evacuations	• If large scale evacuations are likely, the Wooli Community will be directed to the Wooli Bowling Club (Assembly Area), to register and be advised which evacuation centre is open to accommodate the residents.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy

Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Local Stores in Wooli and Minnie Water will be resupplied if required; this will ensure that local residents are continually provided with essential food items. NSW SES informs shops of when the boat will be working at Sandy Crossing. • Supplies can be lowered or lifted from Somerville Road and Bostock Road from the Champions Creek Bridge on the Pacific Highway.
Aircraft Management	Helicopter Landing Zones • Wooli Sports Oval next to Yuraygir NSW SES building (S29° 30' 52.596" E153° 9' 35.2794") - Flooded from 1% AEP
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. • Wooli and Minnie Waters has four peak seasons with potential for a 10% population increase: ○ School holidays tourist influx late December/January ○ School holidays tourist influx April ○ School holidays tourist influx July ○ School holidays tourist influx September/ October

10.2. WOOLI AND MINNIE WATER SECTOR MAP



10.3 EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
331	Solitary Islands Resort	Wooli	205863	1.3	Low Flood Island	220	145	281
51389	Wooli Residential	Wooli (Caravan Park)	205863	1.68	High Flood Island	96	188	188
51391	Minnie Water	Wooli (Caravan Park)	205863	1.55	High Flood Island	207	136	317
51592	Wooli Heights	Wooli (Caravan Park)	205863	1.55	Low Flood Island	222	143	257
51598	Diggers Camp	Wooli (Caravan Park)	205863	1.55	High Flood Island	75	48	79
51597	Barcoo Campground			1.55	High Flood Island	207	69	69
51601	Rocky Point Campground			1.55	High Flood Island	6	2	2
51600	Boarkoom Campground			1.55	High Flood Island	42	10	14
64871	Tucabia North	Ulmarra	204400	2.4	Low Flood Island	20	15	27
65751	Pillar Valley	Grafton (Prince Street)	204400	8.44	Rising Road Access	152	40	72

Polygon ID	Warning time	Evacuation time
331	1.43	3.44
51389	1.58	3.56
51391	1.52	3.53
51592	1.43	3.42
51598	1.13	3.13
51597	1.22	3.12
51601	1.01	3.00
51600	1.04	3.02
64871	1.04	3.05
65751	1.12	3.12

Warning Time:
(5 minutes x No. of properties)/60/
26 teams + WLF
Evacuation Time:
WAF + WLF + (vehicles/600) + TSF

NSW STATE EMERGENCY SERVICE

N

0 3.7 Kilometres

Printed: 22/02/2024

11. CANGAI SECTOR

11.1. CANGAI SECTOR

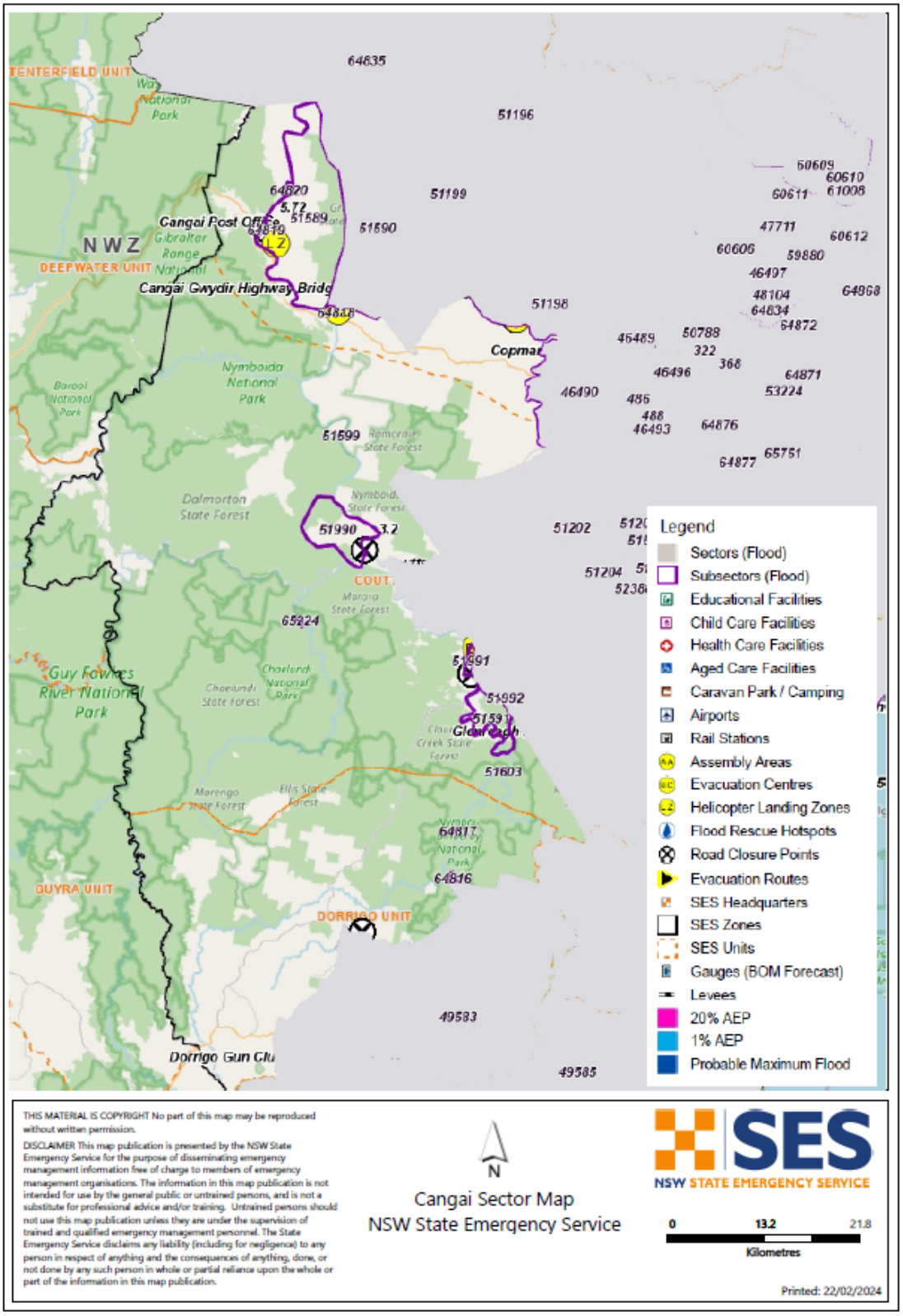
See Map Attached

Sector Description	This sector covers Cangai, Coombadjha, Dalmorton, Tyringham, Dundurrabin, Billys Creek and Jackadgery.		
Hazard	Clarence River and Mann River riverine flooding.		
Flood Affect Classification	High flood island.		
At risk properties in a PMF AEP event	No known risk of inundation Isolation of 220 properties (500 residents)	**Total number of properties**	Cangai Sector 571 (GNAF)
Population	Cangai Sector 1142 (Census 2021 av. Ppl per household)		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauges Name: **Baryulgil (204900)** **Jackadgery (204004)** **Tabulam (204002)**	Minor: -	Moderate: -	Major: -
General Strategy	• Evacuation of at-risk population. • Generally, evacuations would not be considered in this sector other than for medical reasons. • Properties become isolated and resupply is required for extended periods.		
Key Risks / Consequences	• Potential isolation of a number of people estimated to be for a number of days. • Primitive camping grounds along the Nymboida River		
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)		
Property Protection	**Specific property protection measures:** • Properties are not directly affected by flooding in this sector. • Residents are encouraged to remain in their houses.		
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • No sewerage or reticulated water supply.		

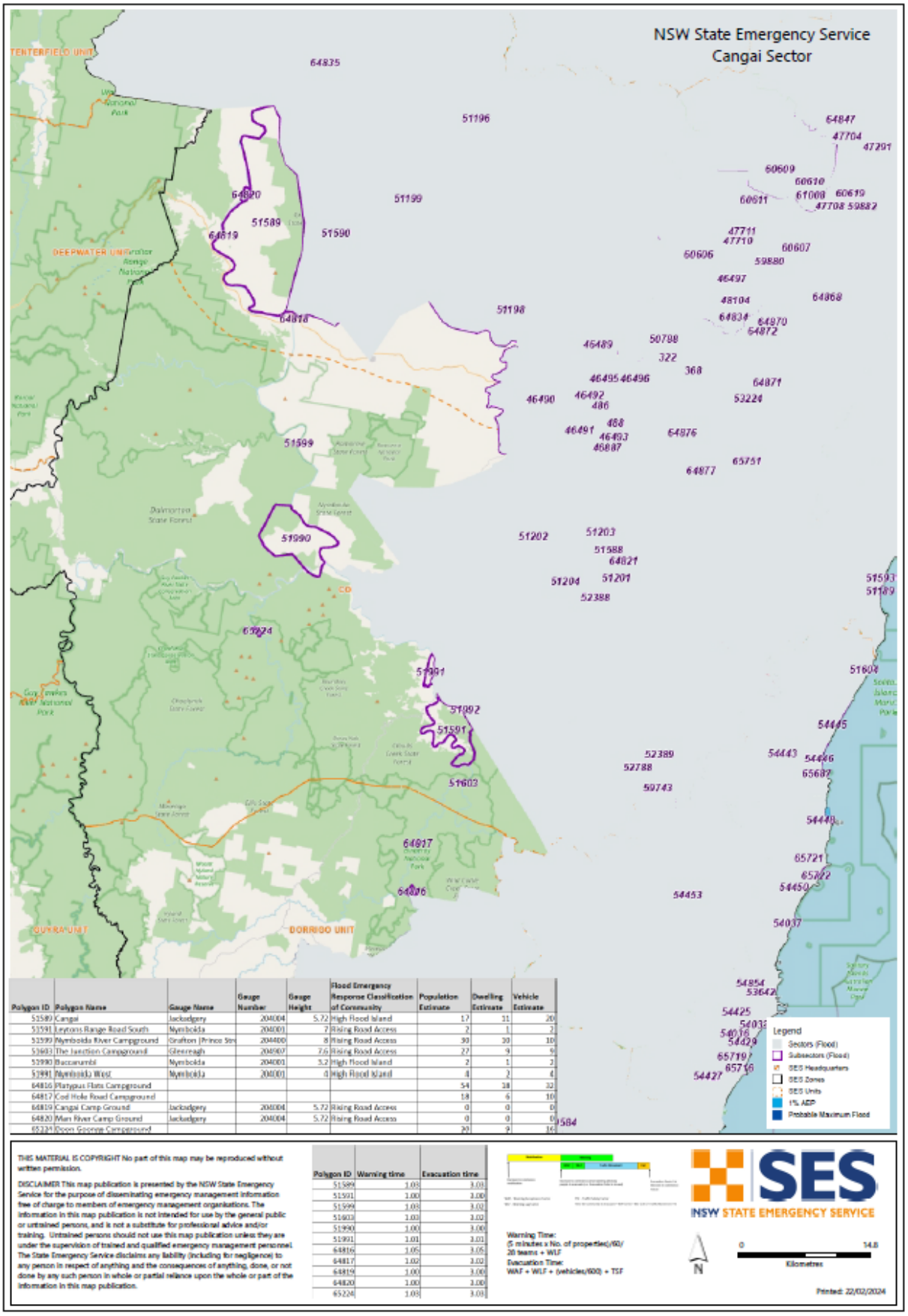
Evacuation Triggers	The key evacuation triggers based on the **historical equivalent height** flood height at the Tabulam gauge (204002): 1. **Reach and/or exceed 1.5 m: Baryulgil gauge (204900); (historical equivalent height to reach and/or exceed 2.5m** at the **Tabulam gauge (204002)**; with flow time between gauges of three hours) The Baryulgil Crossing can be cut causing some property isolations. 2. **Reach and/or exceed 5.72 m: Jackadgery gauge (204004); (historical equivalent height to reach and/or exceed 6.72 m** at the **Tabulam gauge** with flow time between gauges of 10-12 hours) The Cangai Road Bridge can be cut causing isolation from Grafton.
Sequencing of evacuation	• Properties may need to be evacuated for medical reasons during periods of significant flooding over an extended period; these properties would be dealt with on a single case by case situation in conjunction with Department of Communities and Justice.
Evacuation Routes	• Gwydir Highway west to Glen Innes (caution - road is subject to land slippage). • Gwydir Highway east to Grafton (caution - road is subject to land slippage). • Clarence Way. See attached map.
Evacuation Route Closures	**Road closures affecting the isolation of residents in this sector:** • There is uncertainty when local roads around the Cangai area will close, the closure will be dependent on local rainfall conditions. Other known road closures include: • Clarence Way closes at Whiteman Creek causeway (8.0m Copmanhurst gauge), approximately 6km east of Copmanhurst • Gwydir Highway to Grafton (road susceptible to land slippage) Other roads where closure is dependent on local rainfall and events (e.g. landslips) include: • Summerland Way closes on Grafton levee overtopping at (8.3 m on the Grafton (Prince Street) gauge (204400/58178)). • Armidale Road • Old Glen Innes Road • Carnham Road • Dandahra Road
Method of Evacuation	Property owners are recommended to remain at their properties. Primarily self-evacuation by private transport before road closures. Access is dependent on road conditions; best option for access to evacuate residents is by helicopter when the area is isolated.

Evacuation Centre/Assembly Point	No formal evacuation centre or assembly point in place. If required, locations will be determined at the time. These could include: • Mann River Caravan Park (20 sites available to service areas of Cangai and outlying areas of Coombadjha). • Baryulgil Primary School can service remaining outlying areas.
Large scale evacuations	• Large scale evacuations would be unlikely in this sector but if required additional locations will be identified.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • Local store "The Mann River Caravan Park" will be resupplied if required.
Aircraft Management	Helicopter Landing Zones • Cangai Post Office (S29° 30' 30.1", E152° 28' 45.2") – Not Flooded • Car park at the Gwydir highway bridge over the Mann River (S29° 34' 38.6", E152° 33' 24.0") – Not Flooded • Malabugilmah Oval (S29° 10' 55.4", E152° 37' 37.9") – Not Flooded
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. • Cangai has one peak season with potential population increase of more than 10%: ○ Summer school holidays - Public lands within remote areas of this sector are utilized by campers.

11.2. CANGAI SECTOR MAP



11.3 EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
51589	Cangai	Jackadgery	204004	5.72	High Flood Island	17	11	20
51591	Leyburn Range Road South	Nymboida	204001	7	Rising Road Access	2	1	2
51599	Nymboida River Campground	Grafton (Prince Str	204400	8	Rising Road Access	30	10	10
51603	The Junction Campground	Glenreagh	204907	7.6	Rising Road Access	27	9	9
51990	Baccarumbi	Nymboida	204001	5.2	High Flood Island	2	1	2
51991	Nymboida West	Nymboida	204001	4	High Flood Island	4	2	4
64816	Platypus Flats Campground					54	18	32
64817	Cod Hole Road Campground					18	6	10
64819	Cangai Camp Ground	Jackadgery	204004	5.72	Rising Road Access	0	0	0
64820	Mars River Camp Ground	Jackadgery	204004	5.72	Rising Road Access	0	0	0
65224	Doon Goonie Campground					20	9	16

Polygon ID	Warning time	Evacuation time
51589	1.03	3.03
51591	1.00	3.00
51599	1.03	3.03
51603	1.03	3.03
51990	1.00	3.00
51991	1.01	3.01
64816	1.05	3.05
64817	1.02	3.02
64819	1.00	3.00
64820	1.00	3.00
65224	1.03	3.03

12. COUTTS CROSSING SECTOR

12.1. COUTTS CROSSING SECTOR

See Map Attached

Sector Description	This sector covers Blaxlands, Flat/Creek, Braunstone, Buccarumbi, Chambigne, , Coutts Crossing, Elland, Kangaroo Creek, Lanitza, Levenstrath, Lower Kangaroo Creek, McPherson Crossing, Nymboida, Shannondale and Towallum.		
Hazard	Orara River and Nymboida riverine flooding.		
Flood Affect Classification	High flood island.		
At risk properties	Areas in Nymboida at risk of isolation.	**Total number of properties**	Coutts Crossing 426 Nymboida 146 (Census 2021)
Population	Coutts Crossing 1053 Nymboida 268 (Census 2021)		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauge: Coutts Crossing (204999/558030)	Minor: 5.00 m	Moderate: 9.00 m	Major: 12.00 m
Glenreagh Bridge (204907) ***Manual***	Minor: - 4	Moderate: - 7	Major: - 10
Glenreagh (DWR TM) (204906) ***Automatic***	Minor – 5	Moderate – 9	Major – 13
Nymboida (204001)	n/a	n/a	n/a
General Strategy	• Evacuation of at-risk population. • Self-evacuation to friends/family outside of the impact area. • A number of residences and properties may need to be evacuated during periods of significant flooding because of isolation. In most floods, the evacuation tasks will only involve a small number of people.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential isolation of hundreds of people estimated to be for a number of days.		

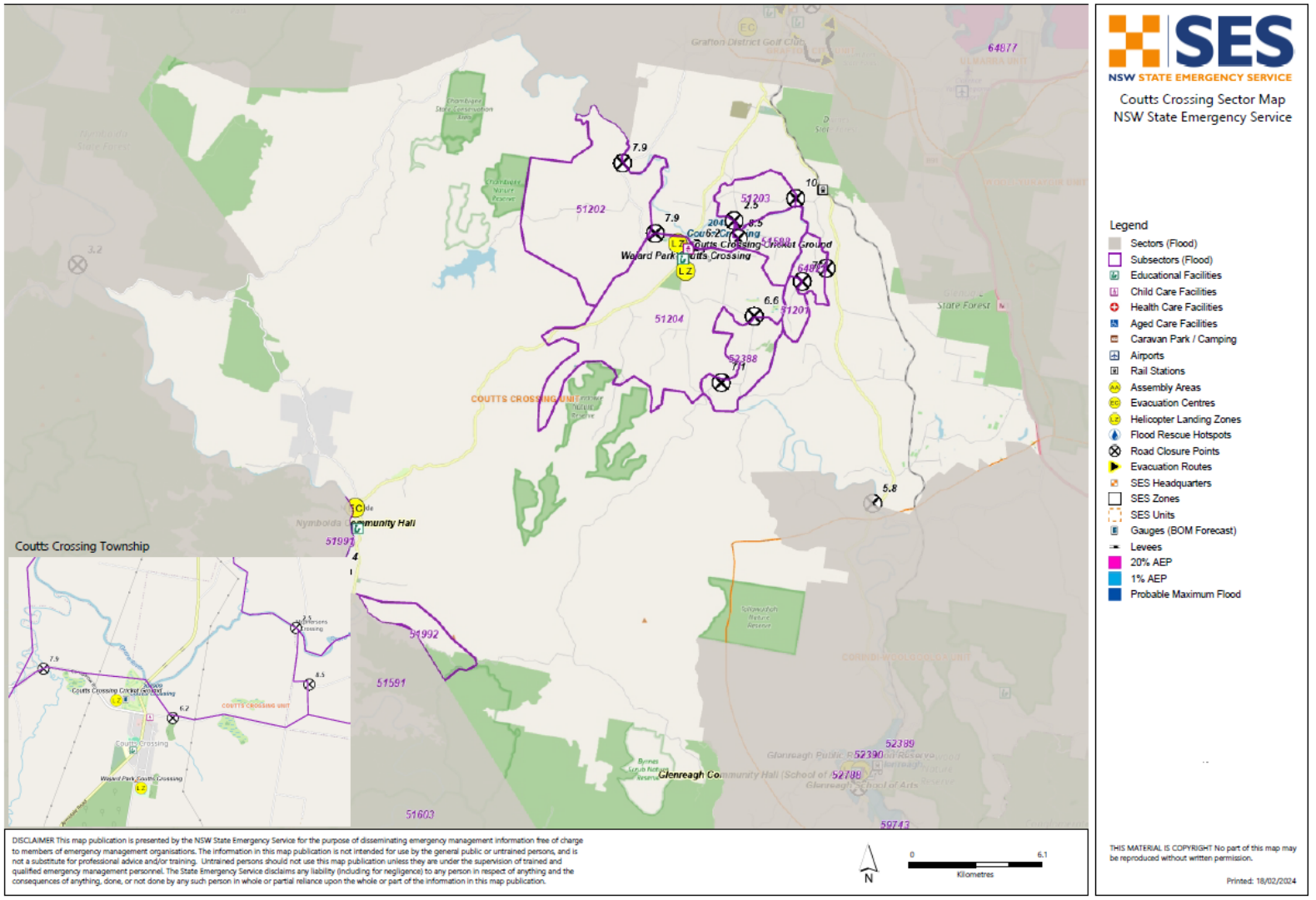
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)
Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock where resources are available. • Relocation of farm machinery and valuable goods where resources are available. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need where resources are available. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • Essential Energy have a pole mounted regulator at McPhersons Crossing and this can be difficult to access during times of flood. • Sewer system only in township of Coutts Crossing, most of sector is on septic tank, evacuations may be required in rural areas for sanitary reasons if septic systems overflow. • Clarence Valley Council Flood Procedures Manual addresses procedures for sewerage treatment plant.

Evacuation/Isolation Triggers	**Nymboida River area** There are no upstream river gauges that have warnings relative to the **Nymboida River gauge (204001).** Local rainfall gauges can provide an indication of the likely affects in relation to the Nymboida gauge. The following trigger heights related to the Nymboida gauge indicate the point when the communities will be isolated: **1. Reach and/or exceed 3.2 m** Families in the Buccarumbi Area become isolated (approximately 40 families). **2. Reach and/or exceed 4.0 m** Water backs up Copes Creek closing Boundary Road isolating approximately 6 families. **3. Reach and/or exceed 7.0 m** Pollock's Bridge on Leighton's Range Road may be cut at Pollock's Bridge causing isolation to residents (approximately 20 Families). **Orara River (Glenreagh area) The Orara River passes through Glenreagh approximately 40km north of Coutts Crossing. The flow time between gauges is 18-25 hours.** **1. Reach or exceed 5.8m** Bluff Bridge closes on the Orara Way. Isolating Coutts Crossing from Glenreagh. **Orara River (Coutts Crossing area)** The key evacuation triggers below are based on **Flood warnings provided for the Coutts Crossing gauge (204999). Bureau of Meteorology Warnings are provided after the flood peaks at the Glenreagh gauge (204907), allowing approximately 18-24 hours warning time.** **1. Prediction to reach and/or exceed 6.6 m on the Coutts Crossing gauge (204999)** Middle Creek Road will close isolating the Middle Creek and Kangaroo Creek areas (approximately 30 families). **2. Prediction to reach and/or exceed 7.1 m on the Coutts Crossing gauge (204999)** The Lower Kangaroo Creek Road may be cut causing isolation to residents in the Lower Kangaroo Creek area (approximately 70 families). **3. Prediction to reach and/or exceed 7.4 m on the Coutts Crossing gauge (204999)** Mulquinney's Road may close causing isolation in the Fiddlers Creek area past School Lane (approximately 12 families). **4. Prediction to reach and/or exceed 7.9 m on the Coutts Crossing gauge (204999)** Geregarow Road may close causing isolation in the

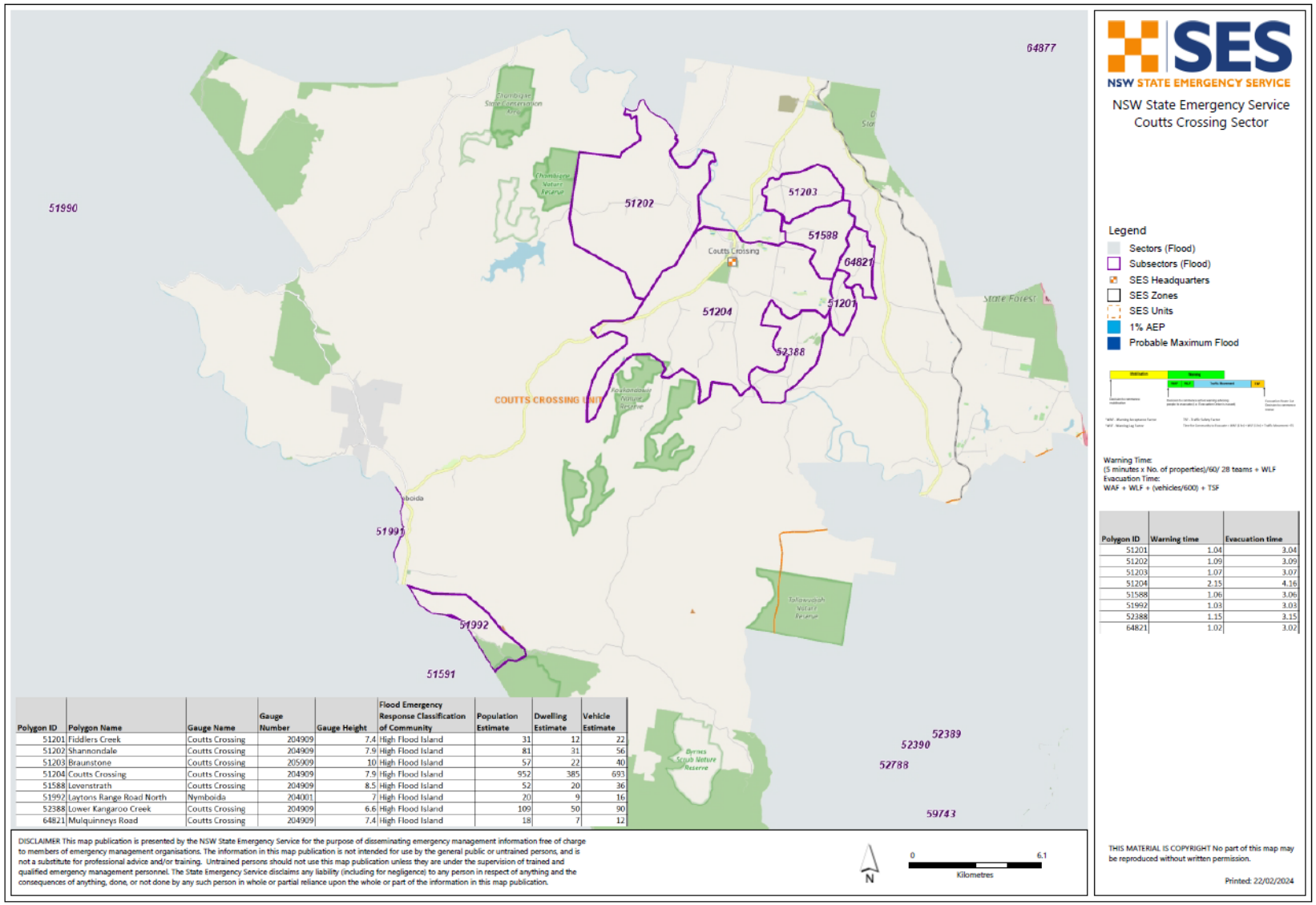
	Shannondale area (approximately 20 families). **5. Prediction to reach and/or exceed 8.5 m on the Coutts Crossing gauge (204999)** Levenstrath Road will close causing isolation in the Levenstrath area (approximately 15 families). **6. Prediction to reach and/or exceed 10.0 m on the Coutts Crossing gauge (204999)** Lower Braunstone Road may close causing isolation in the Braunstone area (approximately 6 families).
Sequencing of evacuation	• A number of residences and properties may need to be evacuated during periods of significant flooding because of isolation. In most floods, the evacuation tasks will only involve a small number of people. These properties would be dealt with on a case by case basis in conjunction with Family and Community Services.
Evacuation Routes	• Armidale Road is normally open to Grafton or Dorrigo (However local flash flooding could impact this route for short periods of time).
Evacuation Route Closures	Road closures affecting the isolation/evacuation of residents in this sector: • There is uncertainty when local roads around the Coutts Crossing area will close, the closure will be dependent on local rainfall conditions. Other known road closures include: • Big River Way Closes (5.4m Grafton (Prince Street) gauge (204400/58178)) at Alipou Creek, Alternate route high level bypass Centenary Drive. • Orara Way Closes at Bluff Bridge at (5.8 m on the Glenreagh gauge (SWR TM)(204906)) • Closure may also occur on low lying parts of the Orara Way between School Lane at Braunstone and Parker Road at Wells Crossing. Alternate route Pacific Hwy.
Method of Evacuation	• Property owners are recommended to remain at their properties. • Primarily self-evacuation by private transport before road closures. • In the event of residents on isolated properties requiring evacuation. The arrangements will be made by the NSW SES dependant on conditions at that time. Options to evacuate residents will be by flood boat or helicopter.
Evacuation Centre/Assembly Point	• People are encouraged to stay with friends/relatives outside the affected areas.
Large scale evacuations	• No Large scale evacuations are anticipated for this sector.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State

	Rescue Policy
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The Local Stores in this sector will be resupplied if required.
Aircraft Management	Helicopter Landing Zones • Oval adjacent to Nymboida NSW SES Unit at Coutts Crossing - 'Wajard Park' (S29°.50'.20.7", E152°.53'.47.3") – Not Flooded • Coutts Crossing Cricket Oval (S 29°.49'. 50.72", E152°. 53'. 24.68") – Not Flooded
Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises.

12.2. COUTTS CROSSING SECTOR MAP



12.3 EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
51201	Fiddlers Creek	Coutts Crossing	204909	7.4	High Flood Island	31	12	22
51202	Shannondale	Coutts Crossing	204909	7.9	High Flood Island	81	31	56
51203	Braunstone	Coutts Crossing	205909	10	High Flood Island	57	22	40
51204	Coutts Crossing	Coutts Crossing	204909	7.9	High Flood Island	952	385	693
51588	Levenstrath	Coutts Crossing	204909	8.5	High Flood Island	52	20	36
51992	Laytons Range Road North	Nymboida	204001	7	High Flood Island	20	9	16
52388	Lower Kangaroo Creek	Coutts Crossing	204909	6.6	High Flood Island	109	50	90
64821	Mulquinneys Road	Coutts Crossing	204909	7.4	High Flood Island	18	7	12

Polygon ID	Warning time	Evacuation time
51201	1.04	3.04
51202	1.09	3.09
51203	1.07	3.07
51204	2.15	4.16
51588	1.06	3.06
51992	1.03	3.03
52388	1.15	3.15
64821	1.02	3.02

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13. GLENREAGH SECTOR

13.1. GLENREAGH SECTOR

See Map Attached

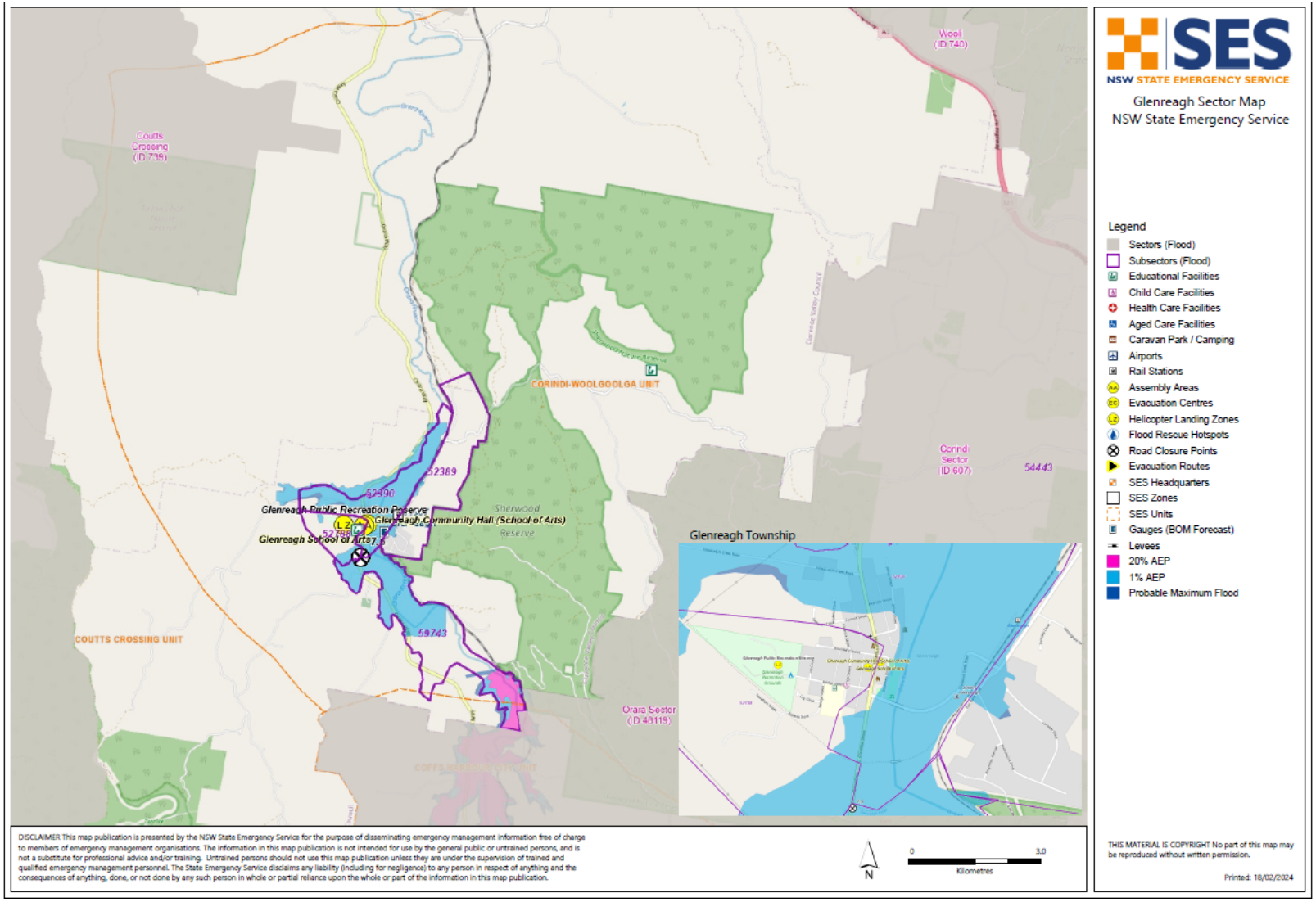
Sector Description	This sector covers Glenreagh, Kremnos, Kungala and Wells Crossing.		
Hazard	Orara riverine flooding.		
Flood Affect Classification	High flood island.		
At risk properties in a PMF AEP	136 residential and commercial properties that may be damaged. All at risk of isolation.	**Total number of properties**	Glenreagh 363 (Census 2021)
Population	Glenreagh 1005 (Census 2021)		
Sector Control	The Incident Controller will nominate a Sector Commander to control evacuations in this Sector. The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW, and NSW Rural Fire Service (RFS) volunteers.		
Key Warning Gauge Name: Glenreagh Bridge (manual gauge) (204907/59123)	Minor 4.00 m	Moderate: 7.00 m	Major: 10.00 m
Glenreagh (DRW TM) (204906/559066) (Automatic gauge)	Minor: 5.00 m	Moderate: 9.00 m	Major: 13.00m
General Strategy	• Evacuation of at-risk population. • Self-evacuation to friends/family outside of the impact area. • A number of residences and properties may need to be evacuated during periods of significant flooding because of isolation. In most floods, the evacuation tasks will only involve a small number of people. • In extreme events Glenreagh Community Hall (School of Arts), 62 Coramba Street, Glenreagh will form the Assembly Area/Evacuation Centre.		
Key Risks / Consequences	• Potential loss of life from rapid and potentially high velocity inundation. • Potential isolation of hundreds of people estimated to be for a number of days.		
Information and Warnings	• Flood Watch • Flood Warning • AWS Advice • AWS Watch & Act • AWS Emergency Warning • Sequenced door knocking of evacuation sectors • Media announcements (including social media) • Emergency Alert (SMS, Landlines) • Standard Emergency Warning Signal (SEWS)		

Property Protection	**Specific property protection measures:** • Monitoring rising flood waters. • Relocation of livestock where resources are available. • Relocation of farm machinery and valuable goods where resources are available. • Control of surface water through sandbagging measures. • Assist in the lifting of furniture to residents in need where resources are available. • Monitoring integrity of dwellings surrounded by flood waters.
	Protection of essential infrastructure: • No identified essential infrastructure requiring protection. • No sewerage, evacuation may be required for sanitary reasons if septic systems overflow.
Evacuation/Isolation Triggers	The key evacuation triggers based on Bureau of Meteorology flood height predictions at the **Glenreagh gauge (204907) are**: **1. Prediction to reach and/or exceed 5.8 m** The Bluff Bridge will close on the Orara Way preventing residents in Glenreagh, Kremnos and Kungala access to Grafton. Kungala Road is closed at Dundoo Creek and Sherwood Creek. Alternate Access to Grafton via Bucca Road may also be cut by the Orara River at Nana Glen. **2. Prediction to reach and/or exceed 7.6 m** Orara Way closed 1.6km east of Glenreagh at Glenreagh Creek cutting access to Coffs Harbour. **3. Prediction to reach and/or exceed 13.24 m** Major Riverine flooding on the Orara River will occur but not expected to involve over floor flooding this sector. Evacuations may need to be undertaken due to long periods of isolation or medical conditions.
Sequencing of evacuation	• A number of residences and properties may need to be evacuated during periods of isolation. The evacuation tasks will only involve a small number of people these properties would be dealt with on a single case by case basis in conjunction with Department of Communities and Justice.
Evacuation Routes	• All roads within this sector are expected to be flood affected. • Transport in and out of this sector will be by Rail or Helicopter only.

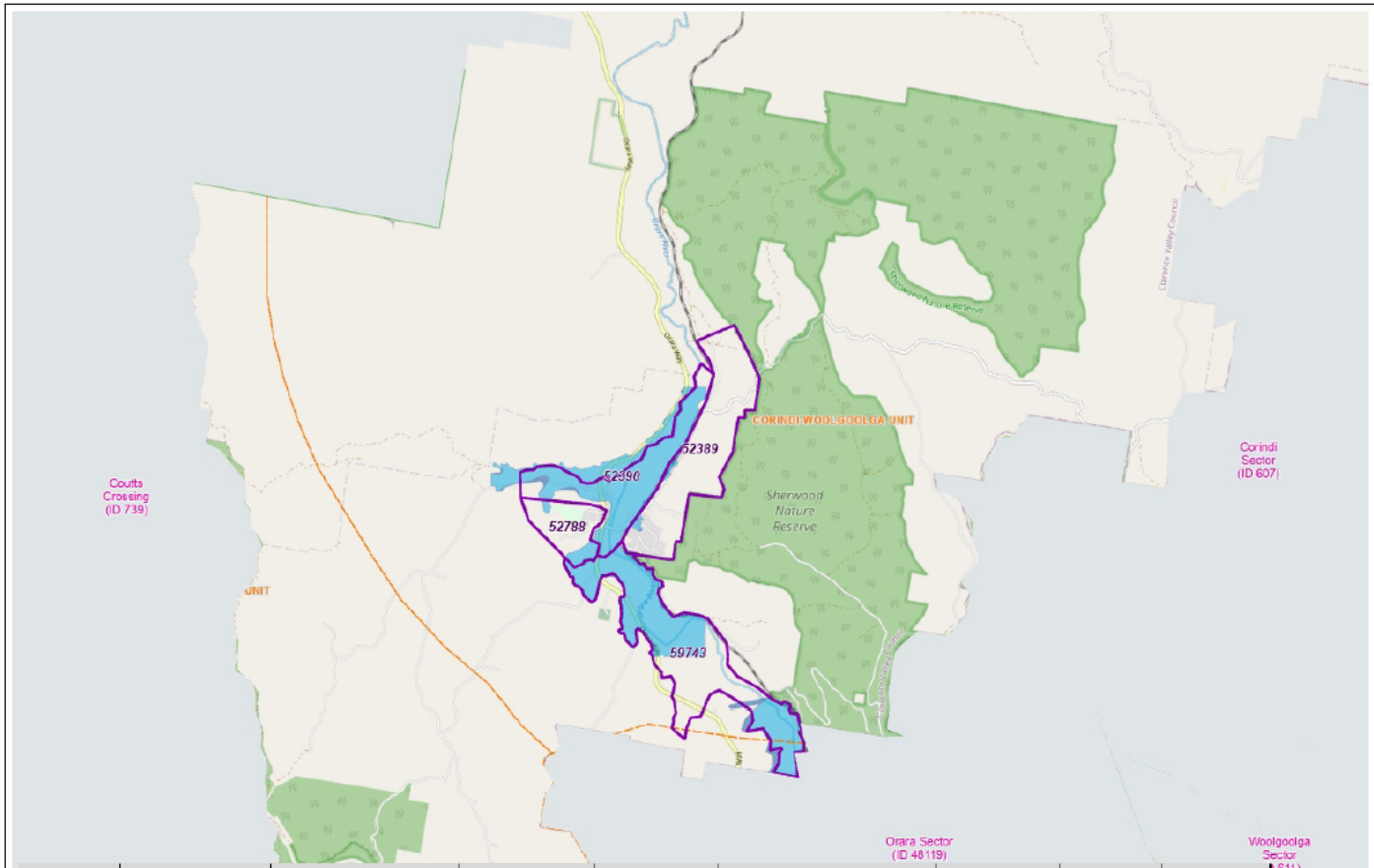
Evacuation Route Closures	Road closures affecting the isolation/evacuation of residents in this sector: • The closure of local roads will be dependent on local rainfall conditions. • Orara Way closes at Bluff Bridge at 5.8 m on the Glenreagh gauge which closes access to Grafton on Orara Way. An alternate route may be available east via Sherwood Creek Road. Other known road closures include: • Big River Way Closes (5.4 m Grafton (Prince Street) gauge (204400/58178)) at Alipou Creek, Alternate route high level bypass Centenary Drive. • Summerland Way closes as Grafton levee overtopping at 8.3m on the Grafton (Prince Street) gauge (204400/58178). Other roads where closure is dependent on local rainfall and events (e.g. landslips) include: • Gwydir Highway (road susceptible to land slippage) • Armidale Road (road closes intermittently with local flooding) • Bucca Road Nana Glen (road closes intermittently with local flooding)
Method of Evacuation	• Property owners are recommended to remain at their properties. Primarily self-evacuation by private transport before road closures. • In the event of residents on isolated properties requiring evacuation, the arrangements will be made by the NSW SES dependent on conditions at that time. Options to evacuate residents will be by flood boat or helicopter.
Evacuation Centre/Assembly Point	• People should be encouraged to stay with friends/relatives in the Glenreagh sector. • Glenreagh Community Hall (School of Arts) 62 Coramba Street Glenreagh
Large scale evacuations	• Large scale evacuations would be unlikely in this sector.
Rescue	• The flood rescue management process adopted will be determined by the Incident Controller, based on the scale of the flood rescue operations. • The Incident Controller may declare a flood rescue area of operations and establish a flood cell to assist with the management of flood rescues. • All Flood Rescue Operations will be undertaken as per the State Rescue Policy
Resupply	• Resupply will be provided by the NSW SES through the 132500 call out system. • The local stores in this sector will be resupplied if required.
Aircraft Management	Helicopter Landing Zones • The Glenreagh Public Recreation Reserve in Bridge Street (S30° 03' 10.6, E152° 58' 40.7) – Not Flooded

Other	Special considerations relating to evacuation: • Closure of schools - coordinated through the Department of Education and Training. • The evacuation of domestic animals, horses and livestock to the appropriate facility to be managed by Department of Primary Industries and Local Land Services. • Closure of licensed premises. All hotels and licensed clubs will be closed if required. • Security. Police patrols to be established to maintain law and order after evacuation has occurred. • The NSW SES will use flood boats, aircraft, community contacts and other agencies to monitor the safety of individuals, where feasible. • These arrangements will stay in place until the "Return with Caution" is provided by the NSW SES to residents to return to their premises. Links to external flood monitoring cameras and dashboards: • https://www.clarence.nsw.gov.au/Emergency-management/Respond/Flood-monitoring-stations

13.2. GLENREAGH SECTOR MAP



13.3 EVACUATION PLANNING



Polygon ID	Polygon Name	Gauge Name	Gauge Number	Gauge Height	Flood Emergency Response Classification of Community	Population Estimate	Dwelling Estimate	Vehicle Estimate
52389	Glenreagh East	Glenreagh (DWR TM)	204906	14.61	Rising Road Access	145	54	97
52390	Glenreagh North	Glenreagh Bridge	204907	7.58	Rising Road Access	303	111	200
52788	Glenreagh West	Glenreagh (DWR TM)	204906	7.3	High Flood Island	175	68	122
59743	Glenreagh South	Glenreagh	204907	7.6	Low Flood Island	24	8	14

N

0 3.0 Kilometres

NSW STATE EMERGENCY SERVICE

NSW State Emergency Service
Glenreagh Sector

Legend
- Sectors (Flood)
- Subsectors (Flood)
- SES Headquarters
- SES Zones
- SES Units
- 1% AEP
- Probable Maximum Flood

Warning Time:
(5 minutes x No. of properties)/60/ 28 teams + WLF
Evacuation Time:
WAF + WLF + (vehicles/600) + TSF

Polygon ID	Warning time	Evacuation time
52389	1.16	3.16
52390	1.33	3.33
52788	1.20	3.20
59743	1.02	3.02

Printed: 22/02/2024

CLARENCE VALLEY NSW SES
DAM FAILURE ARRANGEMENTS

Chapter 3 of Volume 3 (NSW SES Response Arrangements for Clarence Valley of the Clarence Valley Flood Emergency Sub Plan

Last Update: February 2024

CONTENTS

LIST OF TABLES

1 DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR SHANNON CREEK DAM

This Section describes the downstream consequences and specific notification and warning arrangements for the failure of Shannon Creek Dam and should be read in conjunction with the response arrangements detailed in the Clarence Valley Flood Emergency Sub Plan, Volume 1 of the Clarence Valley Flood Emergency Sub Plan.

1.1 INTRODUCTION

1.1.1 The Shannon Creek Dam Site is located 9 km due west of the township of Coutts Crossing, on Shannon Creek, 14.5 km upstream of the Orara River junction. It lies within the Clarence Valley LGA and Clarence River Basin.

Shannon Creek Dam forms part of the Clarence Valley and Coffs Harbour Regional Water Supply scheme. The Dam consists of a main embankment, a spillway and downstream valve house and pump station. The main earth and rock fill embankment is a 44 m high, and 405m long, with the spillway cutting through the left abutment. The spillway is an uncontrolled concrete lined structure with a concrete ogee crest. The Dam crest level is RL 91.65 m AHD. The storage capacity of the Dam at FSL (RL 83.27 m AHD) is 30,000 ML. The catchment area is approximately 37.5 square km.

1.1.2 The two most likely causes of dam failure are:

a. Failure due to flood levels overtopping the embankment

b. Failure due to rapidly deteriorating structural deficiency such as may be induced by an extreme earthquake, internal erosion, piping, landslide or sabotage. (This is the so-called “Sunny Day” failure, ie not induced by an inflow flood).

1.1.3 Although the dam is currently in good condition, an unsafe or emergency condition could occur at any time due to extreme natural events. Failure from a cause not related to extreme natural events is always a possibility although the probability of occurrence is extremely low.

1.1.4 The Shannon Creek Dam is estimated to be able to withstand a design flood level of RL 91.05m AHD.

1.2 CONSEQUENCES OF FAILURE

1.2.1 Dam failure could result in the following:

a. Both the PMF (Flood of Record in downstream tributaries) and PMF Dambreak (Flood of Record in downstream tributaries) cases produce similar flooding conditions. Even for the non-dam failure cases, much of the downstream area is submerged. The PMF flood (without dambreak) inundates approximately 2,250 houses and the PMF Dambreak case

inundates approximately 2,270 houses. Most of these houses are located at Grafton, between Eatonsville and Rogans Bridge and at Avaman. Approximately 2270 dwellings could be inundated by failure of Shannon Creek Dam.

Table 1: Number of houses at risk of inundation for the Shannon Creek Dam

Modelled Event	Number of Houses	Population at Risk
Sunny Day Dambreak	0	0
PMF No failure (Flood of Record)	2250	5625
PMF Dambreak (Flood of Record)	2270	5675

1.2.2 The number of houses at risk of inundation in three (3) modelled scenarios is shown in the table above. The study area of the model extends from the dam downstream to Grafton Bridge.

1.2.3 The DSEP identifies properties at risk. In the event of an Alert being issued to SES for Shannon Creek Dam, some or all of these properties may require evacuation.

1.2.4 During a PMF Dambreak with "flood of record" in downstream tributaries it is likely that Bawden Bridge and Rogans Bridge will fail.

1.3 FLOW TRAVEL TIMES

1.3.1 The dambreak flooding resulting from the Sunny Day failure case produces arrival times of the flood wave front as follows:-

- Junction of Shannon Creek and Orara River - 45 minutes
- Bawden Bridge - 1 hour
- Tindal Bridge - 1 hour 45 minutes
- Grafton Bridge - 3 hours 30 minutes

1.3.2 It should be noted that the travel times listed relate to only one component of the lead-up time before downstream flooding commences and should be considered indicative only.

1.4 INUNDATION AREA

1.4.1 Downstream flood inundation could occur as the result of a dam failure due to a 'Flood' or a 'Sunny Day' failure.

Flood Failure

1.4.2 The "Sunny Day" failure would be from causes other than from flood related failures. Piping failure for the "Sunny Day" case has been included for comparison with other dambreak parameters.

Sunny Day Failure

1.4.3 In the unlikely event of the dam failing under normal inflow conditions, downstream flood inundation would result from water held in the storage.

1.4.4 Failure due to a rapidly deteriorating structural deficiency such as may be induced by an extreme earthquake or internal erosion. (This is the so-called "Sunny Day" failure, i.e. not induced by an inflow flood).

1.4.5 The non-flood failure is considered to have the most potential for loss of life as it is likely to occur when there are no flood warnings and hence emergency services are not on standby and the public is unprepared.

1.5 INUNDATION MAPPING

1.5.1 Dam break flood inundation mapping has been prepared for Shannon Creek Dam and is contained in the Shannon Creek Dam Safety Emergency Plan.

1.5.2 Below the Shannon Creek Dam, Shannon Creek flows through undulating country before meeting the Orara River 13.8km downstream. Bridges in the flow path are Poley, Bawden, Tindal, Rogans and lastly Grafton Bridge

1.6 MONITORING

1.6.1 The dam owner/operator is responsible for monitoring and managing any potential emergency at the dam site.

1.6.2 The dam is monitored by automatic rain gauges, water level recorders, piezometers, seepage weir, settlement survey markers, visual inspections.

Type of Instrument/ Monitoring		Locations	Monitoring Frequency
1	Vibrating Wire Piezometers	P1 to P18 located in the main embankment through the maximum section adjacent to the outlet conduit.	Continuous Monitoring
2	Main Embankment Seepage Monitoring	Seepage measurement weirs located either side of the valve house. The water level is read from a Vega Submersible Pressure Transmitter, or visual reading of the depth gauge.	Continuous Monitoring
4	Settlement Survey Markers.	Survey monitoring points located on the upstream & downstream faces of the dam.	2 Yearly
5	Dam Visual Inspections	Operator inspection to cover the Main Embankment, and Spillway. To include seepage weir and piezometer readings as part of the inspection.	Daily to Tri-weekly
6	Storage Level and Rainfall	Storage level gauges located along the boat ramp, and readings on the SCADA	Continuous Monitoring

1.7 NOTIFICATION PROCEDURES

1.7.1 The primary contact for dam failure warning notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations Centre will subsequently notify the NSW SES North Eastern Zone On Call Officer or nominated After Hours Duty Officer who will contact the NSW SES Local Commander. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail. This number should only be used if primary SES contact cannot be contacted.

1.8 WARNING

1.8.1 Dam failure alerts are issued to NSW SES and are used to trigger appropriate response actions. Alerts from the DSEP for flood failure have been reproduced in Table 3 against NSW SES responses. Responses escalate as the alert migrates from white to red. The conditions that define each of the alerts (as identified in the DSEP) are listed in Table 2. The meaning of each alert is as follows:

a. **White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.

b. **Amber:** Alert necessitating the warning of the population at risk to prepare for evacuation.

c. **Red:** Alert requiring the immediate evacuation of the downstream population at risk.

1.8.2 Actions indicated as occurring at particular alerts may be brought forward if the development of a flood warrants.

Table 2: Shannon Creek Dam Flood Failure Alerts for a PMF

Alert	Defining Conditions – Water Level (RL m AHD)	Indicative Time to Reach Alert (approx)
White Alert	86.3	3:00
Amber Alert	89.7	5:00
Red Alert	91.0	7:00
Dam Crest Level (DCL)	91.65	

1.8.3 The NSW SES/ Clarence Valley Council will disseminate dam failure warnings.

1.8.4 Clarence Valley Council Staff will keep the NSW SES informed of defining conditions. The dam alerts will be activated in sequence as the storage level rises during the course of a major flood event and will be sent to the NSW SES as they occur.

1.8.5 The following tables outline the notification, warning and evacuation arrangements for a potential failure of Shannon Creek Dam.

Table 3: Notification, Warning and Evacuation Arrangements for a potential failure of Shannon Creek Dam.

WHITE ALERT	
Defining Conditions:	86.3m AHD (3.00m flow over spillway)
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES Operations Communications Centre of White Alert Level being reached and provide regular updates on the situation at the dam.
SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Receive notification from NSW SES SHQ. ▪ Advise NSW SES Unit Commander or Zone On Call Officer/ Nominated After Hours Duty Officer. ▪ Advise the Regional Emergency Management Officer (REMO). ▪ Consider need for OOAA for warning and evacuation operations. ▪ Refer to Clarence Valley Flood Emergency Sub Plan for agencies to notify that the White Alert Level has been reached. (See Volume 1)
NSW SES Local Commander and/or Grafton Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES North Eastern Zone has been notified. ▪ Refer to the Clarence Valley Flood Emergency Sub Plan for agencies to notify that the White Alert Level has been reached. (See Volume 1).
LEOCON/Other Agencies	▪ When requested by NSW SES Incident Controller, coordinate support. ▪ Activation of the Clarence Valley Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ No action required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

AMBER ALERT	
Defining Conditions:	89.70m AHD (6.40 flow over spillway)
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES Operations Communications Centre of Amber Alert Level being reached and provide regular updates on the situation at the dam. ▪ Closely monitor the condition of Shannon Creek Dam and implement preventative measures to return it to a safe condition as soon as possible.
NSW SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and Unit Commander or Duty Officer, NSW SES units. ▪ Provide NSW SES AWS warnings to the media organisations listed in Volume 3: Chapter 1, of this Clarence Valley Flood Emergency Sub Plan. ▪ Coordinate provision of out of area assistance for warning and evacuation operations. ▪ Coordinate the notification of other agencies as listed in the Clarence Valley Flood Emergency Sub Plan.
NSW SES Local Commander and/or Grafton Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES North Eastern Zone has been notified Coordinate the delivery of Emergency Warnings to at-risk residents. ▪ Coordinate the notification of other agencies as listed in the Clarence Valley Flood Emergency Sub Plan.
LEOCON/Other Agencies	When requested by the NSW SES Incident Controller, coordinate support. Activation of the Clarence Valley Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ Prepare homes for inundation, remember your emergency pack, valuables, medications and pets and prepare to evacuate. ▪ Notify NSW SES doorknockers if transport to evacuation centres will be required.

	▪ Some evacuations may be necessary due to mainstream riverine flooding.

RED ALERT	
Defining Conditions:	91.0m AHD (7.70m AHD flow over spillway – NB Dam Crest Level is 91.65m AHD).
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES Operations Communications Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.
SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and Unit Commander or Duty Officer, NSW SES Units. ▪ Advise the REMO/LEMO. ▪ Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached. ▪ Activate the Standard Emergency Warning Signal (SEWS) and ensure that the Emergency Warning is broadcast over the radio stations listed in Volume 3: Chapter 1 of this Clarence Valley Flood Emergency Sub Plan. ▪ Coordinate provision of out of area assistance for evacuation operations.
NSW SES Local Commander and/or Grafton Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES Zone HQ has been notified. ▪ Evacuate at-risk residents. ▪ Coordinate the notification of other agencies as per the Clarence Valley Flood Emergency Sub Plan. ▪ Ensure that evacuation centres are ready to receive evacuees. ▪ Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles. ▪ Coordinate transport of evacuees without their own vehicles.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Clarence Valley Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN

People at Risk	▪ Evacuate to nearest evacuation centre or assembly area as determined by the EOC/LEOCON.

DAM FAILURE ALERT CANCELLATION	
Defining Conditions:	Dam owner assesses threat and advises whether the risk to the dam structure has passed.
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES OCC of the outcome of the risk assessment
SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Commander or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Commander or Incident Controller	▪ Following risk assessment of the dam, decide in consultation with NSW SES Local and State Duty Commander whether to issue a 'Return With Caution". ▪ Issue 'Return With Caution' message to NSW SES Unit Commander or Duty Officer, NSW SES units, NSW SES Local HQ and NSW SES State HQ. ▪ Advise the REMO/LEMO that 'Return With Caution' has been issued. ▪ Issue 'Return With Caution' message over radio stations listed in Volume 3: Chapter 1, of this Clarence Valley Flood Emergency Sub Plan.
NSW SES Local Commander and/or Grafton Unit Commander or After Hours Duty Officer	▪ Coordinate issue of 'Return With Caution' message at evacuation centres or by phone/doorknock. ▪ Deliver 'Return With Caution' message to other agencies as necessary.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	▪ Stay home, return home or await further advice.

1.9 EVACUATION PLANNING

Modelled Event	Number of Houses	Population at Risk	Warning time	Evacuation time
Sunny Day Dambreak	0	0	0	0
PMF No failure (Flood of Record)	2250	5625	7.7	9.7
PMF Dambreak (Flood of Record)	2270	5675	7.8	9.8

** Based on 28 doorknocking teams, an average of 1.8 cars per household and a single road evacuation route (this may overestimate the evacuation time of Grafton with the two bridges)

2. DETAILS OF THE DAM FAILURE WARNING SYSTEM FOR RUSHFORTH ROAD 100ML RESERVOIR

This Section describes the downstream consequences and specific notification and warning arrangements for the failure of Rushforth Road Reservoir and should be read in conjunction with the response arrangements detailed in the Clarence Valley Flood Emergency Sub Plan, Volume 1 of the Clarence Valley Flood Emergency Sub Plan.

2.1 INTRODUCTION

2.1.1 Rushforth Road Reservoir is located at 701 Rushforth Road, South Grafton, 6km south west of South Grafton. Rushforth Reservoir is a 8.5m high raw water reservoir with a storage capacity of 100ML. The 100 ML "turkey nest" storage stores raw water pumped from Shannon Creek Dam/gravity fed from Nymboida River whilst the 32 ML storage is used for storage of treated chlorinated water. The main storage (100 ML) is about 6m deep whilst the 32 ML storage is about 5.2 m deep.

Storage	100 ML	32 ML
Operating water level (TWL)*	134.20m	122.8m
Top Crest Level	135.20m	123.4m
Bottom Level#	128.20	117.6m

*Based on Clarence Valley WS Datum (Refer drawings No. 84041/20-22x)

Bottom level varies.

2.1.2 The two most likely causes of dam failure are:

a. Failure due to rapidly deteriorating structural deficiency such as may be induced by an extreme earthquake, internal erosion, piping, landslide or sabotage. (This is the so-called "Sunny Day" failure, ie not induced by an inflow flood).

2.1.3 Although the reservoir is currently in good condition, an unsafe or emergency condition could occur at any time due to extreme natural events. Failure from a cause not related to extreme natural events is always a possibility although the probability of occurrence is extremely low.

2.2 CONSEQUENCES OF FAILURE

2.2.1 Dam failure could result in the following:

a. At the North Eastern Catchment (Musk Valley Creek) there is impact on the Grafton District Golf Course area as consequence of breaching of the reservoir. The flood depths can be around 2m deep and velocities are in the order of 0.5-1 m/s. There is significant impact in flood cases on inundation of Abattoir buildings (4 out of 7 buildings are impacted). The

flood depths can be significant and pose hazard to properties in the vicinity of the creek.

At the Southern Catchment (Tea Tree Creek), there is impact on two dwellings and a horse shed for all the breach scenarios. The floor of dwellings is not impacted by breach flood but there is inundation in the area around the properties. Dambreach flood will inundate Rushforth Road at two locations.

b. Population at risk (PAR) is at the Northern Catchment (Southhampton Creek) by failure of Rushforth Road Reservoir is 0.5. At the North Eastern Catchment (Musk Valley Creek), PAR is 5.4 and at the Southern Catchment (Tea Tree Creek) 0.5.

Table 4: Number of houses at risk of inundation for the Rushforth Road Reservoir.

Modelled Event	Number of Houses	Population at Risk
SDF (Northern Eastern Catchment)	0	5.4
PMF (North Eastern Catchment)		1.84
SDF (Northern Catchment)	0	0.5
PMF (Northern Catchment)		0.5
SDF (Southern Catchment)	0	0.5
PMF (Southern Catchment)		0.5

2.2.2 The number of population at risk (PAR) of inundation in Sunny Day Failure modelled scenarios is shown in the table above. PMF PAR were less due to the catchments and areas of impact including a Golf Course and abattoir. The dwelling that are within the impacted area have floor levels higher than the modelled peak flood level.

2.2.3 The DSEP identifies properties at risk. In the event of an Alert being issued to SES for Rushforth Road Reservoir, some or all of these properties may require evacuation.

2.3 FLOW TRAVEL TIMES

2.3.1 It should be noted that the travel times listed relate to only one component of the lead-up time before downstream flooding commences and should be considered indicative only.

2.3.2 Area 1 – North of Reservoir (Southhampton Creek):

	Sunny Day Failure	100 year ARI Failure	Extreme Design Flood Failure	
Peak Flood Depth, m	0.18 ***2.98***	0.25 ***2.73***	0.39 ***3.89***	Min ***Max***
Flood wave travel time, hours	0.40 ***1.50***	0.33 ***1.42***	0.33 ***1.00***	Min ***Max***
Duration of flooding, hours	0.25 ***1.58***	0.67 ***1.92***	1.08 ***2.00***	Min ***Max***
Peak Velocities, m/s	0.26 ***2.10***	0.32 ***2.30***	0.44 ***2.61***	Min ***Max***

2.3.3 Area 2 North East of Reservoir:

	Sunny Day Failure	100 year ARI Failure	Extreme Design Flood Failure	
Peak Flood Depth, m	0.10 ***2.72***	0.15 ***3.48***	0.22 ***3.55***	Min ***Max***
Flood wave travel time, hours	0.40 ***2.15***	0.35 ***1.60***	0.35 ***1.55***	Min ***Max***
Duration of flooding, hours	0.15 ***1.65***	0.25 ***2.60***	0.50 ***2.80***	Min ***Max***
Peak Velocities, m/s	0.26 ***2.10***	0.19 ***3.14***	0.20 ***3.20***	Min ***Max***

2.3.4 Area 3 South of Reservoir:

	Sunny Day Failure	100 year ARI Failure	Extreme Design Flood Failure	
Peak Flood Depth, m	0.13 ***2.59***	0.19 ***3.02***	0.20 ***3.16***	Min ***Max***
Flood wave travel time, hours	0.20 ***0.75***	0.77 ***1.10***	0.75 ***1.10***	Min ***Max***
Duration of flooding, hours	0.13 ***1.20***	0.25 ***1.25***	0.30 ***1.50***	Min ***Max***
Peak Velocities, m/s	0.23 ***1.79***	0.59 ***1.92***	0.59 ***1.95***	Min ***Max***

2.4 INUNDATION AREA

2.4.1 Downstream flood inundation could occur as the result of a dam failure due to a 'Flood' or a 'Sunny Day' failure.

Flood Failure

2.4.2 A failure is defined as "the uncontrolled release of the contents of a dam. The failure may consist of the collapse of the dam or some part of it, or excessive seepage or discharges".

2.4.3 Some hazards or incidents that could jeopardise the integrity of the embankment (and therefore increase the likelihood of dam failure in a flood event) are listed below:

- earthquake
- deterioration of the reservoir
- unauthorised works
- sabotage

Sunny Day Failure

2.4.4 In the unlikely event of the dam failing under normal inflow conditions, downstream flood inundation would result from water held in the storage.

2.4.5 Rushforth Reservoir Dambreak Study examined the Sunny Day Failure scenario of piping.

2.4.6 The non-flood failure is considered to have the most potential for loss of life as it is likely to occur when there are no flood warnings and hence emergency services are not on standby and the public is unprepared.

2.5 INUNDATION MAPPING

2.5.1 Dam break flood inundation mapping has been prepared for Rushforth Road Reservoir and is contained in the Rushforth Road Reservoir Safety Emergency Plan.

2.6 MONITORING

2.6.1 The dam owner/operator is responsible for monitoring and managing any potential emergency at the dam site.

2.6.2 Besides regular inspections and level monitoring by telemetry, there is no remote sensing warning system at the Rushforth Road Reservoirs.

2.7 NOTIFICATION PROCEDURES

2.7.1 The primary contact for dam failure warning notification by the dam owner to the NSW SES is the NSW SES 24hr Operations Centre. The NSW SES Operations Centre will subsequently notify the NSW SES North Eastern Zone On Call Officer or nominated After Hours Duty Officer who will contact the NSW SES Local Commander. An alternate NSW State Emergency Operations Centre (SEOC) contact is available if this notification procedure was to fail.

2.7.2 A flow chart illustrating the notification arrangements for potential dam failure is shown in Attachment 2 of Volume 1 of the Clarence Valley Flood Emergency Sub Plan.

2.8 WARNING

2.8.1 Dam failure alerts are issued to NSW SES and are used to trigger appropriate response actions. Alerts from the DSEP for flood failure have been reproduced in Table 3 against NSW SES responses. Responses escalate as the alert migrates from white to red. The conditions that define each of the alerts (as identified in the DSEP) are listed in Table 2. The meaning of each alert is as follows:

a. **White:** Preliminary alert to assist the NSW SES in its preparation. This is not a public alert. It indicates a potential issue/condition has been observed at the dam and is being investigated.

b. **Amber:** Alert necessitating the warning of the population at risk to prepare for evacuation.

c. **Red:** Alert requiring the immediate evacuation of the downstream population at risk.

2.8.2 Actions indicated as occurring at particular alerts may be brought forward if the development of a flood warrants.

Table 5: Rushforth Road Reservoir Flood Failure Alerts

Alert	Defining Conditions	Indicative Time to Reach Alert (approx)
White Alert	• The embankment is damaged in some way but the risk of flooding downstream is extremely unlikely • The emergency situation is substantially under control and likely to reduce • The emergency/incident is restricted to the site; AND • able to be rectified by normal plant and operating or maintenance staff under normal supervision using their own resources; AND • unlikely to generate media interest.	unknown
Amber Alert	• The embankment is damaged and there is risk of flooding downstream • The emergency situation is uncertain. • Response is likely to be required beyond the bounds of the site; AND/OR • Requires specialised staff, supervision or resources to rectify; AND/OR • Is likely to generate media interest	unknown
Red Alert	• The embankment has failed releasing discharge uncontrollably; OR • The embankment is damaged and the risk of flooding downstream is high; • The emergency situation is substantially not under control and is unlikely to reduce; • Response is required beyond the bounds of the site; AND/OR • Requires specialised staff, supervision or resources to rectify; AND/OR • Is likely to generate media interest.	unknown

2.8.3 The NSW SES/Clarence Valley Council will disseminate dam failure warnings.

2.8.4 Clarence Valley Staff will keep the NSW SES informed of the structural integrity of the dam and associated discharge. The dam alerts will be activated in sequence as the storage level rises during the course of a major flood event and will be sent to the NSW SES as they occur.

2.8.5 The following tables outline the notification, warning and evacuation arrangements for a potential failure of Rushforth Road Reservoir.

Table 6: Notification, Warning and Evacuation Arrangements for a potential failure of Rushforth Road Reservoir

WHITE ALERT

Defining Conditions:

- The embankment is damaged in some way but the risk of flooding downstream is extremely unlikely
- The emergency situation is substantially under control and likely to reduce
- The emergency/incident is restricted to the site; AND
- able to be rectified by normal plant and operating or maintenance staff under normal supervision using their own resources; AND
- unlikely to generate media interest.

Stakeholder	Arrangements and Actions
Dam Owner	▪ Advise NSW SES Operations Communications Centre of White Alert Level being reached and provide regular updates on the situation at the dam.
SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Receive notification from NSW SES SHQ. ▪ Advise NSW SES Unit Commander or Zone On Call Officer/ Nominated After Hours Duty Officer. ▪ Advise the Regional Emergency Management Officer (REMO). ▪ Consider need for OOAA for warning and evacuation operations. ▪ Refer to Clarence Valley Flood Emergency Sub Plan for agencies to ▪ notify that the White Alert Level has been reached. (See Volume 1)
NSW SES Local Commander and/or Grafton Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES North Eastern Zone has been notified. ▪ Refer to the Clarence Valley Flood Emergency Sub Plan for agencies to notify that the White Alert Level has been reached. (See Volume 1). ▪
LEOCON/Other Agencies	▪ When requested by NSW SES Incident Controller, coordinate support. ▪ Activation of the Clarence Valley Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting arrangements within the local EMPLAN
People at Risk	▪ No action required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

AMBER ALERT	
Defining Conditions: • The embankment is damaged and there is risk of flooding downstream • The emergency situation is uncertain. • Response is likely to be required beyond the bounds of the site; AND/OR • Requires specialised staff, supervision or resources to rectify; AND/OR • Is likely to generate media interest	
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES Operations Communications Centre of Amber Alert Level being reached and provide regular updates on the situation at the dam. ▪ Closely monitor the condition of Shannon Creek Dam and implement preventative measures to return it to a safe condition as soon as possible.
SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and Unit Commander or Duty Officer, NSW SES units. ▪ Provide NSW SES AWS warnings to the media organisations listed in Volume 3: Chapter 1, of this Clarence Valley Flood Emergency Sub Plan. ▪ Coordinate provision of out of area assistance for warning and evacuation operations. ▪ Coordinate the notification of other agencies as listed in the Clarence Valley Flood Emergency Sub Plan.
NSW SES Local Commander and/or Grafton Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES Zone HQ has been notified ▪ Coordinate the delivery of Emergency Warnings to at-risk residents. ▪ Coordinate the notification of other agencies as listed in the Clarence Valley Flood Emergency Sub Plan.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. Activation of the Clarence Valley Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting ▪ arrangements within the local EMPLAN
People at Risk	▪ Prepare homes for inundation, remember your emergency pack, valuables, medications and pets and prepare to evacuate. ▪ Notify NSW SES doorknockers if transport to evacuation centres will be required. ▪ Some evacuations may be necessary due to mainstream riverine flooding.

RED ALERT

Defining Conditions:

- The embankment has failed releasing discharge uncontrollably; OR
- The embankment is damaged and the risk of flooding downstream is high;
- The emergency situation is substantially not under control and is unlikely to reduce;
- Response is required beyond the bounds of the site; AND/OR
- Requires specialised staff, supervision or resources to rectify; AND/OR
- Is likely to generate media interest.

Stakeholder	Arrangements and Actions
Dam Owner	▪ Advise NSW SES Operations Communications Centre of Red Alert Level being reached and provide regular updates on the situation at the dam.
SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Incident Control Centre or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Incident Control Centre or After Hours Duty Officer	▪ Notify NSW SES Local Commander and Unit Commander or Duty Officer, NSW SES Units. ▪ Advise the REMO/LEMO. Confirm that residents immediately downstream of the dam have been notified of Red Alert Level being reached. ▪ Activate the Standard Emergency Warning Signal (SEWS) and ensure that the Emergency Warning is broadcast over the radio stations listed in Volume 3: Chapter 1 of this Clarence Valley Flood Emergency Sub Plan. ▪ Coordinate provision of out of area assistance for evacuation operations.
NSW SES Local Commander and/or Grafton Unit Commander or After Hours Duty Officer	▪ Confirm NSW SES Zone HQ has been notified. ▪ Evacuate at-risk residents. ▪ Coordinate the notification of other agencies as per the Clarence Valley Flood Emergency Sub Plan. ▪ Ensure that evacuation centres are ready to receive evacuees. ▪ Conduct Evacuation of downstream residents by doorknock and public address systems from emergency service vehicles. ▪ Coordinate transport of evacuees without their own vehicles.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support. ▪ Activation of the Clarence Valley Flood Emergency Sub Plan includes notification to the LEOCON and activation of supporting ▪ arrangements within the local EMPLAN
People at Risk	▪ Evacuate to nearest evacuation centre or assembly area as determined by the EOC/LEOCON.

DAM FAILURE ALERT CANCELLATION	
Defining Conditions:	Dam owner assesses threat and advises whether the risk to the dam structure has passed.
Stakeholder	**Arrangements and Actions**
Dam Owner	▪ Advise NSW SES OCC of the outcome of the risk assessment
SES SOC	▪ Receive notification from dam operator. ▪ Advise NSW SES Zone Commander or After Hours Duty Officer. ▪ Advise SEOC.
NSW SES Zone Commander or Incident Controller	▪ Following risk assessment of the dam, decide in consultation with NSW SES Local and State Duty Commanders whether to issue an 'Return With Caution'. ▪ Issue 'Return With Caution' message to NSW SES Unit Commander or Duty Officer, NSW SES units, NSW SES Local HQ and NSW SES State HQ. ▪ Advise the REMO/LEMO that 'Return With Caution' has been issued. Issue 'Return With Caution' message over radio stations listed in Volume 3: Chapter 1, of this Clarence Valley Flood Emergency Sub Plan.
NSW SES Local Commander and/or Grafton Unit Commander or After Hours Duty Officer	▪ Coordinate issue of 'Return With Caution' message at evacuation centres or by phone/doorknock. ▪ Deliver 'Return With Caution' message to other agencies as necessary.
LEOCON/Other Agencies	▪ When requested by the NSW SES Incident Controller, coordinate support.
People at Risk	▪ Stay home, return home or await further advice.

CLARENCE VALLEY NSW SES
CARAVAN PARK ARRANGEMENTS

Chapter 4 of Volume 3 (NSW SES Response Arrangements for Clarence Valley) of the Clarence Valley Flood Emergency Sub Plan

Last Update: February 2024

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1 ARRANGEMENTS FOR THE EVACUATION OF CARAVAN PARKS AND THE RELOCATION OF MOVABLE DWELLINGS

1.1 GENERAL

1.1.1 The following caravan parks are flood liable:

a. The Anchorage Holiday Park
b. Iluka Riverside Caravan Park
c. Iluka Clarnece Head Caravan Park
d. Woody Head Campground
e. Blue Dolphin Caravan Park
f. Yamba Waters Caravan Park
g. Calypso Caravan Park
h. Big 4 Saltwater @ Yamba
i. Fishing Haven Caravan Park
j. Maclean Riverside Caravan Park
k. Lake Arragan and Red Cliff Campground
l. Wooli Camping and Caravan Park
m. Bookroom Campground
n. Illaroo Campground
o. Rocky Point Campground
p. Minnie Water Holiday Park
q. Solitary Island Marine Park Resore
r. Camping Ground (Lawrence)
s. Brooms Head Caravan Park
t. Sandon Camping Area
u. Grafton Sunset Caravan Park
v. Grafton Showgrounds
w. Glenwood Tourist Park
x. Grafton Ski Lodge
y. Nymboida River Campground
z. The Junction Campground

1.1.2 For more information on individual caravan parks see Table 1 and Table 2 at the end of this Chapter.

1.2 ADVISING PROCEDURES

1.2.1 Caravan Park proprietors will ensure that the owners and occupiers of movable dwellings are:

a. Made aware that the caravan park is flood liable by:

- Providing a written notice to occupiers taking up residence. The notice will indicate that the caravan park is liable to flooding and designate the location of flood liable land within the park (1).
- Displaying this notice and the emergency arrangements for the Caravan Park prominently in the park.

b. Made aware that if they are expecting to be absent for extended periods, they should:

- 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).

c. Informed of Flood Warning Information. At this time, occupiers will 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 relocation.

1.2.2 The NSW SES Local Commander will ensure that the managers of caravan parks are advised of Flood Information (described in Volume 1 of the Clarence Valley Local Flood Plan).

1.3 EVACUATION OF OCCUPANTS AND RELOCATION OF MOVEABLE DWELLINGS

1.3.1 When an Emergency Warning is given caravan park occupants should follow the flood evacuation procedures for the park under the direction of the caravan park management. This should include advice to:

a. Isolate power to moveable dwellings.

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

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

d. Move to friends, relatives or a designated evacuation centre if they have their own transport, or move to the caravan office to await transport.

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

1.3.2 Where possible, movable dwellings that can be moved will be relocated by their owners. Park managers will arrange for the relocation of movable dwellings as required. Council and NSW SES personnel may assist if required. Vans are to be moved to the locations outlined in Tables 1 and 2 at the end of this Chapter.

1.3.3 Caravan park managers will:

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

b. Ensure that their caravan park is capable of being evacuated in a timely and safe manner.

c. Advise the NSW SES Local Commander of:

- The number of people requiring transport.
- Details of any medical evacuations required.
- Whether additional assistance is required to effect the evacuation.

d. Check that all residents and visitors are accounted for.

e. Inform the NSW SES Local Commander when the evacuation of the caravan park has been completed.

f. Provide the NSW SES Local Commander with a register of people that have been evacuated.

1.4 RETURN OF OCCUPANTS AND MOVEABLE DWELLINGS

1.4.1 The NSW SES Local Commander, using council resources as necessary, will advise when it is safe for the caravan parks to be re-occupied.

1.4.2 Moveable dwellings will be returned back to the caravan park(s) by owners or by vehicles and drivers arranged by the park managers.

1.4.3 Council and NSW SES personnel may assist by request where resources are available.

Table 1: Caravan Parks at risk of Inundation and/or Isolation from Flooding.

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Evacuation centre	Notes
Iluka Sector									
The Anchorage Holiday Park	Marandowie Drive	Iluka	116	Inundation. Evacuation would be required at 2.4m on the Maclean gauge coinciding with high tide.	Marondowie Drive to Duke Street to Owen street to Spenser Street	Isolation may occur at 2.1m on the Iluka road at the Esk River.	1% AEP Iluka Community Hall PMF Thompson Street	1% AEP Iluka Community Hall PMF Thompson Street	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.
Iluka Riverside Caravan Park	4 Charles Street	Iluka	20 permanent dwellings 23 semi-permanent 6 cabins Approx. 95 caping sites	Inundation	Young Street, Spencer Street	Isolation may occur at 2.1m on the Iluka road at the Esk River.	1% AEP Iluka Community Hall PMF Thompson Street	1% AEP Iluka Community Hall PMF Thompson Street	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.

Iluka Clarence Head Caravan Park	113 Charles Street	Iluka	6 cabins 18 permanent holiday vans Approx. 39 camping sites	Isolation	Charles Street, Owen Street, Spenser Street.	Isolation may occur at 2.1m on the Iluka road at the Esk River.	1% AEP Iluka Community Hall PMF Thompson Street	1% AEP Iluka Community Hall PMF Thompson Street	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.
Woody Head Campground	Woody Point Camping Area Road	Bundjalung National Park	285	Inundation	Onto Iluka road into Iluka. Owen Street, Spenser Street	Isolation may occur at 2.1m on the Iluka road at the Esk River.	1% AEP Iluka Community Hall PMF Thompson Street	1% AEP Iluka Community Hall PMF Thompson Street	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.
Yamba Sector									
Blue Dolphin Caravan park	Yamba Road	Yamba	250	Inundation. Caravan park is affected by tidal conditions. Evacuations may occur due to King Tides.	Yamba Road to Wooli Street	Isolation occurs at the Clover leaf at Harwood Bridge at 2.1m on the	Yamba Hill	Yamba Bowling & Recreation Centre	Early notification by Caravan Parks owners to park residences to vacate the region before

				Peak season December to February		Maclean gauge			isolation occurs. Which could be up to 7days.
Yamba Waters Caravan park	36 Golding Street	Yamba	217	Inundation. Caravan park is affected by tidal conditions Evacuations may occur due King Tides. Peak season December to February	Golding Street to Yamba Road to Wooli Street	Isolation occurs at the Clover leaf at Harwood Bridge at 2.1m on the Maclean Gauge	Yamba Hill	Yamba Bowling & Recreation Centre	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.
Calypso Caravan Park	14 Harbour Street	Yamba	179	Inundation. Caravan park is affected by tidal conditions Evacuations may occur due King Tides. Peak season December to February	Wooli Street	Isolation occurs at the Clover leaf at Harwood Bridge at 2.1m on the Maclean Gauge	Yamba Hill	Yamba Bowling & Recreation Centre	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.
Big 4 Saltwater @ Yamba	286 Okeefes Lane	Palmers Island	64	Inundation. Caravan Park is advised when	Yamba Road to Wooli Street	Access closes at 2.1m on	Yamba Hill	Yamba Bowling &	Early notification by Caravan

				Clarence River Flood Warning is issued to allow visitors to evacuate before road closures commence. Peak season December to February.		Yamba Road to Maclean		Recreation Centre	Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.
Fishing Haven Caravan Park	35 River Street	Palmers Island	54	Inundation. Caravan Park should be advised when Clarence River Flood Warning is issued to allow visitors to evacuate before road closures commence. Peak season December to February	Yamba Road to Wooli Street	Access closes at 2.1m on Yamba Road to Maclean	Yamba Hill	Yamba Bowling & Recreation Centre	Early notification by Caravan Parks owners to park residences to vacate the region before isolation occurs. Which could be up to 7days.
Maclean Sector									
Maclean Riverside Caravan Park	115 River Street	Maclean	34	Inundation may occur at levee overtopping at 3.3m. Majority sites permanent residents and	River Street to Cameron Street	Isolation occurs at the Clover leaf at Harwood Bridge at 2.1m.	Maclean Showground	Maclean Showground	Peak seasons over Christmas and Easter school holidays

				overnight travellers.		An evacuation route remains possible after the Maclean levee has overtopped and up to 3.43 on the Maclean Gauge (204410-558022) via the Pacific Highway to Grafton.			
Lake Arragan and Red Cliff Campground	Red Cliffs Road	Yuraygir National Park	471	Inundation	Lake Arragan Road, Red Cliff Road then Brooms Head Road to Maclean Evacuation Centre	Brooms Head Road should remain open up to a 3.55m (1% AEP) but will close before 8.56m in a PMF.	Maclean Showground	Maclean Showground	Peak seasons over Christmas and Easter school holidays
Wooli Sector									
Wooli Camping and Caravan Park	25 Riverside Drive	Wooli	64	Inundation. Evacuation may be required at 2.75m on the Wooli Solitary	Isolation occurs at Sandy Crossing when significant	Main Street	Wooli Bowling and recreation centre or Wooli sports oval	Wooli Bowling and Recreation Centre	Peak seasons over Christmas and Easter school holidays

				Islands Marine Park Gauge. Area also affected by tidal conditions.	rain event of 100mm+.				
Bookram Campground	Off Diggers Camp Road	Diggers Camp	42	Inundation of low lying areas and Isolation if Diggers Camp road becomes inundated.	Move to higher ground or Diggers Camp Road, south to Wooli on Wooli Road	Diggers Camp Road and Wooli Road. Susceptible to flash flood impacts.	Move to higher ground or Diggers Camp Road, south to Wooli on Wooli Road	Move to higher ground or Diggers Camp Road, south to Wooli on Wooli Road	Peak seasons over Christmas and Easter school holidays
Illaroo Campground	Illaroo Road	Yuraygir National Park	207	Isolation	Illaroo Road, east on Minnie Water Road onto Sandon Road	East on Minnie Water Road	Minnie Waters Surf Life Saving Club	Minnie Waters Surf Life Saving Club	Peak seasons over Christmas and Easter school holidays
Rocky Point Campground	Angophora Grove Circuit	Yuraygir National Park	6	Isolation	Illaroo Road, east on Minnie Water Road onto Sandon Road	East on Minnie Water Road	Minnie Waters Surf Life Saving Club	Minnie Waters Surf Life Saving Club	Peak seasons over Christmas and Easter school holidays
Minnie Water Holiday Park	646 Minnie Water Road	Minnie Waters	6 cabins Approx. 65 permanent sites Approx. 72 camp sites	Inundation	Minnie Water Road onto Sandon Road	East on Minnie Water Road	Minnie Waters Surf Life Saving Club	Minnie Waters Surf Life Saving Club	Peak seasons over Christmas and Easter school holidays

Solitary Island Marine Park Resort	383 North Street	Wooli	179	Inundation. Evacuation may be required at 1.5m on the Wooli Solitary Islands Marine Park Gauge. Area also affected by Tidal conditions. Peak season during school holidays.	Isolation occurs at Sandy Crossing when significant rain event of 100mm+.	North Street	Wooli Bowling and recreation centre or Wooli sports oval	Wooli Bowling and Recreation Centre	Peak seasons over Christmas and Easter school holidays
Lawrence – Southgate Sector									
Camping Ground	Bridge Street	Lawrence		Inundation	Richmond Street, Anne Street and March Street to the Lawrence Golf Club	At intersection of Bridge Street and Richmond Street at 4.4m on the Lawrence gauge (204409)	Lawrence Golf Club	Lawrence Golf Club	
Sandon Sector									
Brooms Head Caravan Park	Ocean Road	Brooms Head	269	Inundation. Caravan Park not affected by Riverine Flooding but	Brooms Head Road to Maclean Evacuation Centre	Brooms Head Road should remain open up to a	Maclean Showground	Maclean Showground	Peak seasons over Christmas and Easter school holidays

				will be affected by Storm Surge and large ocean seas		3.55m (1% AEP) but will close before 8.56m in a PMF.			
Sandon Camping Area	Sandon River Road	Sandon	87	Inundation. Parts of Sandon Caravan Park can be flooded from storm surge.	Move to higher ground.	Isolation may occur	Higher Ground	Higher Ground	
Grafton Sector									
Grafton Sunset Caravan Park	302 Gwydir Highway	Grafton	76	Inundation may occur at levee overtopping at 8.2m. Majority sites permanent residents and overnight travellers.	Gwydir Hwy to Ryan Street to Bent Street then Tyson Street	8.36m at the Cross Roads Gwydir Hwy and Bent street.	South Grafton Hill	South Grafton High School	Permanent Residences.
Grafton Showgrounds	Prince Street	Grafton	40	Inundation. Evacuation would be required on levee overtopping at 8.2m.	Dobie Street to Villers Street to Fitzroy Street, Craig Street to Bent Street then Tyson Street	Access closes at Fitzroy and Carr Street at 8.24m	South Grafton Hill	South Grafton High School	Peak seasons over Christmas and Easter school holidays

Glenwood Tourist Park	Heber Street	Grafton	125	Inundation. Inundation of low-lying areas of park commence at 5.70m Majority sites permanent residents and overnight travellers.	Big River Way to Ryan Street to Bent Street and Tyson Street	5.4m Pacific Hwy Alipou Creek, Alt route high level bypass Centenary Drive	South Grafton Hill	South Grafton High School	Peak seasons over Christmas and Easter school holidays
Grafton Ski Lodge	166 Ski Lodge Road	Grafton	126	Inundation. Isolation occurs at the beginning of moderate level.	Ski Lodge Road to Seelands Hall Road to Rogans Bridge Road	Access closes at Seelands Hall Road at moderate flood level.	South Hampton RFS Rogans Bridge Road Waterview Heights	South Grafton High School	Peak seasons over Christmas and Easter school holidays
Cangai Sector									
Nymboida River Campground	T-Ridge Road	Nymboida National Park	30	Low lying camping areas will be inundated. Remote camping. Likely to be isolated.	Remote 4WD tracks likely to be through low causeways and water crossings.	Likely a number of unsafe crossings			
The Junction Campground	Junction Road	Nymboida-Binderay National Park	27	Low lying camping areas will be inundated.	Remote 4WD tracks likely to be through low	Likely a number of unsafe crossings			

				Remote camping. Likely to be isolated.	causeways and water crossings.				

Table 2: Caravan Parks at risk from Coastal Erosion and/or Coastal Inundation.

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwellings relocation location	Evacuation centre	Notes
Brooms Head Caravan Park	Ocean Road	Brooms Head	269	Caravan Park not affected by Riverine Flooding but will be affected by Storm Surge and large ocean seas.	Isolation may occur on Brooms Head at Taloumbi due to local flooding.				
Wooli Caravan Park	25 Riverside Drive	Wooli	64	Evacuation may be required at 2.75m on the Wooli Solitary Islands Marine Park Gauge. Area also affected by tidal conditions.	Isolation occurs at Sandy Crossing when significant rain event of 100mm+.				

LIST OF REFERENCES

1. **NSW Government.** *Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005 Part 3 Division 3 Subdivision 7 Clause 123.* 2005.

2. NSW SES. *Volume 3, Chapter 4: Clarence Valley Local Flood Plan*. August 2017.