

Great Lakes

Local Flood Plan



December 2011

To be reviewed no later than December 2013

GREAT LAKES LOCAL FLOOD PLAN

A Sub-Plan of the Great Lakes Local Disaster Plan (DISPLAN)

A handwritten signature in black ink, appearing to read "L. L. Thompson", written over a horizontal line.

*Chair, Local Emergency
Management Committee*

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*Great Lakes SES Local
Controller*



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DISTRIBUTION LIST

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

LIST OF ABBREVIATIONS

The following abbreviations have been used in this plan:

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AIIMS	Australasian Inter-service Incident Management System
ARI	Average Recurrence Interval (Years)
ALERT	Automated Local Evaluation in Real Time
AWRC	Australian Water Resources Council
Bureau	Australian Government Bureau of Meteorology
DCF	Dam Crest Flood
DPI	Department of Primary Industries
DSC	Dams Safety Committee
DISPLAN	Disaster Plan
DSEP	Dam Safety Emergency Plan
DVR	Disaster Victim Registration
FACS	Department of Family and Community Services
FRNSW	Fire and Rescue NSW
GIS	Geographic Information System
GRN	Government Radio Network
IAP	Incident Action Plan
IFF	Imminent Failure Flood
LEMO	Local Emergency Management Officer
LEOCON	Local Emergency Operations Controller
NOW	NSW Office of Water
OEH	Office of Environment and Heritage
PMF	Probable Maximum Flood

PMR	Private Mobile Radio
PMP	Probable Maximum Precipitation
RMS	Roads and Maritime Services (formerly Roads and Traffic Authority)
SECON	State Emergency Operations Controller
SERCON	State Emergency Recovery Controller
SES	NSW State Emergency Service
SEWS	Standard Emergency Warning Signal
VRA	Volunteer Rescue Association
WICEN	Wireless Institute Civil Emergency Network k

GLOSSARY

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

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

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

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

Catchment (river basin). The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.

Coastal Erosion. The loss of land along the shoreline predominantly by the offshore movement of sand during storms.

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

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

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

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

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

DisPlan (Disaster Plan). The object of a Displan is to ensure the coordinated response by all agencies having responsibilities and functions in emergencies.

Emergency Alert. A national telephony alerting based system available for use by emergency service agencies to send SMS and voice messages to landlines and/or mobile telephones (by billing address) in times of emergency.

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

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

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

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

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

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

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

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

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

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

Flood of record. Maximum observed historical flood.

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

Flood Plan. A response strategy plan that deals specifically with flooding and is a sub-plan of a Disaster Plan. Flood plans describe agreed roles, responsibilities, functions, strategies and management arrangements for the conduct of flood operations and for preparing for them. A flood plan contains information and arrangements for all floods whereas an OAP is for a specific flood/event.

Flood Rescue: the rescue or retrieval of persons trapped by floodwaters.

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

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

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

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

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

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

Geographic Information System (GIS). A computerised database for the capture, storage, analysis and display of locationally defined information. Commonly, a GIS portrays a portion of the earth's surface in the form of a map on which this information is overlaid.

Inundation. See definition for *Flood*.

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

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

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

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

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

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

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

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

Prescribed Dam. "Prescribed" dams are those listed in Schedule 1 of the Dams Safety Act 1978. The NSW Dam Safety Committee will prescribe those dams with the potential for a failure which could have a significant adverse effect on community interests.

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

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

Standing Operating Procedure (SOP).

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

Stream gauging station. A place on a river or stream at which the stage height is routinely measured, either daily or continuously, and where the discharge is measured from time to time so as to develop a relationship between stage and discharge or rating curve.

PART 1 - INTRODUCTION

1.1 PURPOSE

- 1.1.1 This plan covers preparedness measures, the conduct of response operations and the coordination of immediate recovery measures from flooding within the Great Lakes Council area. It covers operations for all levels of flooding within the council area.
- 1.1.2 The plan also covers arrangements for the management of coastal erosion in the council area.

1.2 AUTHORITY

- 1.2.1 This plan is issued under the authority of the State Emergency and Rescue Management Act 1989 and the State Emergency Service Act 1989. It has been accepted by the Mid North Coast SES Region Controller and the Great Lakes Local Emergency Management Committee.

1.3 AREA COVERED BY THE PLAN

- 1.3.1 The area covered by the plan is the Great Lakes Council area which includes: the towns and villages of Forster, Tuncurry, Hawks Nest, Tea Gardens, Pacific Palms, Smiths Lake, Seal Rocks, Stroud, Bulahdelah, Allworth, Coomba Park, Nahiab, Nerong, Bungwahl, Booral, Limeburners Creek, Stroud Rd, Pindimar and North Arm Cove and large intervening areas of forest and farmland.
- 1.3.2 The council area and its principal rivers and creeks are shown in Map [1]. The council area includes:
 - a. The Coolongolook, Wallingat, Wallamba, Myall and Karuah Rivers and their tributaries, and Split Yard, Boolambayte, Yalimbah, Bulga, Bundabah and Kore Kore Creeks.
 - b. Wallis, Smiths, Myall and Boolambayte Lakes and The (Bombah) Broadwater.
 - c. The coastline from just south of Hallidays Point to Providence Bay.
 - d. The northern shore of the Port Stephens estuary, from just east of Karuah to Yacaaba Head.
- 1.3.3 The council area is in the Mid North Coast SES Region and for emergency management purposes is part of the North Coast Emergency Management District.

1.4 DESCRIPTION OF FLOODING AND ITS EFFECTS

- 1.4.1 The nature of flooding in the Great Lakes Council area is described in Annex A.
- 1.4.2 The effects of flooding on the community are detailed in Annex B.

1.5 RESPONSIBILITIES

1.5.1 The general responsibilities of emergency service organisations and supporting services (functional areas) are listed in the Local and State Disaster Plans (DISPLAN). Some specific responsibilities are expanded upon in the following paragraphs. The extent of their implementation will depend on the severity of the flooding. Specific responsibilities of agencies and organisations as they relate to tsunami are detailed in the State Tsunami Emergency Sub Plan.

1.5.2 **Great Lakes SES Local Controller.** The Great Lakes SES Local Controller is responsible for dealing with floods as detailed in the State Flood Plan, and will:

Preparedness

- a. Maintain a Local Headquarters at the Forster/Pacific Palms SES Unit Headquarters, Lot 271 Charlotte Bay Street, Pacific Palms in accordance with the SES Controllers' Handbook and the SES Operations Manual.
- b. Ensure that SES members are trained to undertake operations in accordance with current policy as laid down in the SES Controllers' Handbook and the SES Operations Manual.
- c. Coordinate the development and operation of a flood warning service for the community.
- d. Participate in floodplain and coastal risk management initiatives organised by the Great Lakes Council
- e. Coordinate a public education program
- f. Identify and monitor people and/or communities at risk of flooding and coastal erosion
- g. Ensure that the currency of this plan is maintained.

Response

- h. The Great Lakes SES Local Controller will appoint an appropriate Incident Controller to undertake response roles.
- i. Control flood and storm response operations. This includes:
 - Directing the activities of the SES units operating within the council area.
 - Coordinating the activities of supporting agencies and organisations and ensuring that liaison is established with them.
 - Contribute to preparation of Region IAP
- j. Provide an information service in relation to:
 - Flood heights and flood behaviour.
 - Coastal erosion / inundation

- Road conditions and closures.
 - Advice on methods of limiting property damage.
 - Confirmation of evacuation warnings and evacuation orders.
- k. Direct the conduct of flood rescue operations.
- l. Direct the evacuation of people and/or communities.
- m. Provide immediate welfare support for evacuated people.
- n. Coordinate the provision of emergency food and medical supplies to isolated people and/or communities.
- o. Coordinate operations to protect property, for example by:
- Arranging resources for sandbagging operations.
 - Lifting or moving household furniture.
 - Lifting or moving commercial stock and equipment.
- p. Arrange for support (for example, accommodation and meals) for emergency service organisation members and volunteers assisting them.
- q. If SES resources are available, assist with emergency fodder supply operations conducted by Agriculture and Animal Services.
- r. If SES resources are available, assist the NSW Police Force, RMS and Council with road closure and traffic control operations.
- s. Exercise financial delegations relating to the use of emergency orders as laid down in the SES Controllers' Handbook.
- t. Coordinate the collection of flood and coastal erosion/inundation information for development of intelligence.
- u. Submit Situation Reports to the Mid North Coast SES Region Headquarters and agencies assisting within the council area. These will contain information on:
- Road conditions and closures.
 - Current flood behaviour.
 - Current operational activities.
 - Likely future flood behaviour.
 - Likely future operational activities.
 - Probable resource needs.
- v. Keep the Local Emergency Operations Controller advised of the flood situation and the operational response.
- w. Issue the 'All Clear' when flood operations have been completed.

Recovery

- x. Ensure that appropriate After Action Reviews are held after floods.
- y. Assist in the establishment and deliberations of the Recovery Coordinating Committee.

1.5.3 **Forster/Pacific Palms, Karuah Valley and Nabiac SES Unit Controllers:**

- a. Conduct flood and coastal erosion operations within the Great Lakes Council area as directed by the Great Lakes SES Incident Controller.
- b. Submit Situation Reports to the Great Lakes SES Local Headquarters, the Mid North Coast SES Region Headquarters and agencies assisting within the local area.
- c. Assist the Great Lakes SES Local Controller with flood preparedness activities, including:
 - Flood planning.
 - Training of unit members.
 - The development of flood and coastal erosion/inundation intelligence.
 - The development of warning services.
 - Floodplain and coastal risk management initiatives.
 - Public education.

1.5.4 **Forster/Pacific Palms, Karuah Valley and Nabiac SES Unit Members:**

- a. Carry out flood and coastal erosion response tasks. These may include:
 - The management of the Great Lakes SES Local and Forster/Pacific Palms, Karuah Valley and Nabiac Unit Headquarters Operation Centres.
 - Assist in the collection of flood and coastal erosion/inundation information for the development of intelligence.
 - Flood rescue.
 - Evacuation.
 - Providing immediate welfare for evacuated people.
 - Delivery of warnings and information.
 - Resupply.
 - Sandbagging.
 - Lifting and/or moving household furniture and commercial stock.
 - Animal rescue.
 - Assisting with road closure and traffic control operations.
 - Assisting with emergency fodder supply operations.

- b. Assist with preparedness activities.
- c. Undertake training in flood and storm response operations

1.5.5 Agricultural and Animal Services Functional Area

- a. When requested by SES;
- b. Activate the Agriculture and Animal Services Supporting Plan as required and coordinate the provision of required services which may include:
 - Supply and delivery of emergency fodder
 - Coordinate the management of livestock and farm animals
 - Advice on dealing with dead and injured farm animals
 - Financial, welfare and damage assessment assistance to flood affected farm people
 - Operation of animal shelter compound facilities for the domestic pets and companion animals of evacuees

1.5.6 Australian Government Bureau of Meteorology (The Bureau):

- a. Provide Flood Watches for the Karuah River Basin.
- b. Provide Flood Warnings, incorporating height-time predictions, for Bulahdelah and Wallis Lake.
- c. Provide severe weather warnings when large waves and/or storm surge conditions are forecast to result in coastal erosion/inundation.
- d. Provide severe weather warnings when flash flooding is likely to occur.

1.5.7 Caravan Park Proprietor(s), - Stroud Showground Caravan Park, Sandbar and Bushland Holiday Park (Smiths Lakes), Lani's Holiday Island (Forster), Forster Waters Caravan Park (Forster), Smugglers Cove Holiday Village (Forster), Twin Dolphin Holiday Park (Tuncurry), Shangri La Caravan Park (Tuncurry), Great Lakes Holiday Park (Tuncurry), Wallamba River Holiday Park (Failford) and River Inn Caravan Park (Failford) Great Lakes Caravan Park, Baird St Tuncurry, and Tuncurry Beach Caravan Park, Beach St Tuncurry.

- a. Prepare a Flood Management Plan for the Caravan Park.
- b. Ensure that owners and occupiers of caravans are aware that the caravan park is flood liable and what they must do to facilitate evacuation and van relocation when flooding occurs.
- c. Ensure that occupiers are informed of flood warnings and flood watches.
- d. Coordinate the evacuation of people and the relocation of moveable vans when floods are rising and their return when flood waters have subsided.
- e. Inform the SES of the progress of evacuation and/or van relocation operations and of any need for assistance in the conduct of these tasks.

1.5.8 Child Care Centres and Preschools:

- a. Childcare Centres are to be contacted by the SES in the event of possible flooding or isolation.
- b. When notified the child care centres should:
 - Liaise with the SES and arrange for the early release of children whose travel arrangements are likely to be disrupted by flooding and/or road closures.
 - Assist with coordinating the evacuation of preschools and child care centres

1.5.9 Wireless Institute Civil Emergency Network (WICEN):

- a. Provide communications assistance.

1.5.10 Communication Services Functional Area:

- a. When requested by SES;
 - Coordinate the restoration of telephone facilities damaged by flooding;
 - Coordinate additional telecommunications support for the SES Headquarters as required; and
 - Assist the SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.

1.5.11 Duralie Coal Mine Water, Duralie Coal Auxiliary Dam No.1 and Duralie Coal Auxiliary No. 2 Dams (Duralie Coal):

- a. Maintain and operate the Dam Failure Warning System for Duralie Coal Mine Water, Duralie Coal Auxiliary No. 1 and Duralie Coal Auxiliary No. 2 Dams.
- b. Contribute to the development and implementation of a public education program on flooding within the council area.
- c. Consult with SES on the determination of dam failure alert levels and notification arrangements when developing Dam Safety Emergency Plans.
- d. Maintain a Dam Safety Emergency Plan and provide copies to the SES.
- e. Provide information on the consequences of dam failure to the SES for incorporation into planning and flood intelligence.

1.5.12 Energy and Utility Services Functional Area (Essential Energy and Mid Coast Water)

- a. When requested by SES;
 - Implement the Energy and Utilities Services Functional Area Supporting Plan;

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

b. Essential Energy

- Provide advice to the Great Lakes SES Incident Controller of any need to disconnect power supplies or of any timetable for reconnection.
- Clear or make safe any hazard caused by power lines or electrical reticulation equipment.
- Assess the necessity for and implement the disconnection of customers' electrical installations where these may present a hazard.
- Advise the public with regard to electrical hazards during flooding and to the availability or otherwise of the electricity supply.
- Inspect, test and reconnect customers' electrical installations as conditions allow.
- Assist the SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.

c. Mid Coast Water

- Provide advice to the Great Lakes SES Incident Controller of any need to disconnect water supplies or of any timetable for reconnection.
- Clear or make safe any hazard caused by wastewater pipes or wastewater facilities.
- Assess the necessity for and implement the disconnection of customers' water supplies or wastewater pipes where these may present a hazard.
- Advise the public with regard to water and wastewater hazards during flooding and to the availability or otherwise of the water supply and wastewater facilities.

- Inspect, test and reconnect customers' water and wastewater installations as conditions allow.
- Assist the SES to identify infrastructure at risk of flooding for incorporation into planning and intelligence.

1.5.13 Engineering Services Functional Area:

- a. When requested by SES;
 - Provide engineering advice regarding the integrity of damaged structures;
 - Assist the SES with damage assessment;
 - Acquire and/or provide specialist technical engineering expertise;
 - Assist with property protection, including the construction of levees; and
 - Coordinate the restoration of critical public facilities.

1.5.14 Environmental Services Functional Area:

- a. When requested by SES;
 - Implement the Environmental Services Functional Area (Enviroplan) Supporting Plan if required; and
 - Activate the Hazmat/CBR Emergency Sub Plan if required.

1.5.15 Fire and Rescue NSW, Forster and Tea Gardens

- a. Assist the SES with the delivery of evacuation warnings and evacuation orders.
- b. Assist the SES with the conduct of evacuations.
- c. Provide equipment for pumping flood water out of buildings and from low-lying areas.
- d. Assist with clean-up operations, including the hosing out of flood affected properties.
- e. Deploy fire resources to Hawks Nest if access is expected to be lost.

1.5.16 Great Lakes Council:

Preparedness

- a. Establish and maintain floodplain and coastal risk management committees and ensure that key agencies are represented on such committees.
- b. Provide flood studies, floodplain management studies and coastal management studies to the SES.
- c. Provide information on the consequences of dam failure to the SES for incorporation into planning and flood intelligence.
- d. Maintain a plant and equipment resource list for the council area.

- e. Contribute to the development and implementation of a public education program.

Response

- f. At the request of the Great Lakes SES Incident Controller, deploy personnel and resources for flood and coastal erosion related activities.
- g. Ensure, by breaching the sandbar between Smiths Lake and the ocean, that flood waters in the lake can be drained.
- h. Close and reopen council roads (and other roads nominated by agreement with the RMS) and advise the Great Lakes SES Incident Controller and the Police.
- i. Provide information on the status of roads through Council's website <http://www.greatlakes.nsw.gov.au> and/or telephone the Customer Service Centre.
- j. Provide filled sandbags to urban and village areas in which flooding is expected.
- k. Assist with the removal of caravans from caravan parks.
- l. Provide back-up radio communications.
- m. In the event of evacuations, assist with making facilities available for the domestic pets and companion animals of evacuees.
- n. During periods of coastal erosion from ocean storms:
 - Assist the SES with reconnaissance of coastal erosion risk areas
 - Liaise with the SES Local Controller to determine the need for response actions by the SES such as evacuations.
 - Activate the Great Lakes Council Coastal Zone Management Plan – Emergency Action Plan.

Recovery

- o. Provide for the management of health hazards associated with flooding. This includes removing debris and waste.
- p. Ensure premises are fit and safe for reoccupation and assess any need for demolition.
- q. Arrange for storage of evacuees' furniture as required.

1.5.17 **Great Lakes Local Emergency Operations Controller (LEOCON):**

- a. Monitor flood operations.
- b. Coordinate support to the Great Lakes SES Incident Controller if requested to do so.

1.5.18 **Great Lakes Local Emergency Management Officer (LEMO):**

- a. Provide executive support to the Local Emergency Operations Controller in accordance with the Great Lakes Local Disaster Plan.

- b. At the request of the Great Lakes SES Local Controller, advise appropriate agencies and officers of the activation of this plan.

1.5.19 **Health Services Functional Area:**

- a. When requested by SES;
 - Activate Health plan if required;
 - Ensure that appropriate business continuity plans are developed for essential health infrastructure and are activated during floods;
 - Provide medical support to the SES;
 - Establish health surveillance in affected areas;
 - Assess potential public health risks that either acutely endanger the health of human populations or are thought to have longer term consequences;
 - Provide environmental health advice;
 - Provide public health warnings and advice to affected communities;
 - Assist the SES with the warning and evacuation of hospitals.
- b. The **Ambulance Service of NSW** will:
 - Assist with the evacuation of at risk communities (in particular elderly and/or infirm people)
 - Deploy ambulance resources to Hawks Nest if access is expected to be lost.
 - Assist the SES with flood rescue operations.

1.5.20 **Marine Rescue NSW, Forster:**

- a. Assist the SES with the delivery of evacuation warnings and evacuation orders.
- b. Assist the SES with the conduct of evacuations.

1.5.21 **NSW Office of Water**

- a. Collect and maintain flood data including data relating to flood heights, velocities and discharges;
- b. Provide the Bureau of Meteorology and SES real-time or near real-time access to river height gauges and height data for the development of official flood warnings;
- c. Provide flow rating charts for river height gauges; and
- d. Manage (with technical support from OEH) the approval process under the Water Act 1912 and Water Management Act 2000 for flood control works (earthworks, embankments and levees which can affect the distribution of floodwaters) including:

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

1.5.22 NSW Police Force, Manning-Great Lakes Local Area Command (LAC):

- Assist the SES with the delivery of evacuation warnings and evacuation orders.
- Assist the SES with the conduct of evacuation operations.
- Conduct road and traffic control operations in conjunction with council and/or RMS.
- Coordinate the registration of all evacuees.
- Secure evacuated areas.

1.5.23 NSW Rural Fire Service, Great Lakes

- Provide personnel in rural areas and villages to:
 - inform the Great Lakes SES Incident Controller about flood conditions and response needs in their own communities, and
 - disseminate flood information.
- Provide personnel and high-clearance vehicles for flood related activities.
- Assist the SES with the delivery of evacuation warnings and evacuation orders.
- Assist the SES with the conduct of evacuations.
- Provide equipment for pumping flood water out of buildings and from low-lying areas.
- Assist with the removal of caravans.
- Provide back-up radio communications.
- Assist with clean-up operations, including the hosing of flood affected properties.
- Deploy fire resources to areas if access is expected to be lost.

1.5.24 Office of Environment and Heritage (OEH)

- Provide specialist policy, engineering and scientific advice to councils and the SES on flood related matters including assistance with:
 - The identification of flood problems

- The preparation of Floodplain Risk Management Plans and associated studies
 - The implementation of floodplain risk management plans. This involves floodplain management projects which include flood mitigation works, flood warning, strategic land use planning and upgrade of evacuation routes
 - The exercising of Flood Sub Plans
- b. Provide specialist advice on flood related matters as follows:
- Provide the SES with access to relevant studies regarding flooding, including Flood Studies and Floodplain Risk Management Studies
 - Coordinate the collection of post event flood data, in consultation with the SES.
 - Provide advice to the SES about conditions which may lead to coastal flooding or retarded river drainage near the coast
 - Collect and maintain flood data relating to flood heights, velocities and discharges in coastal areas of NSW (through a contract with MHL as discussed separately)
 - Provide data to the Bureau of Meteorology and SES real-time or near real-time access to river height gauges and height data for the development of official flood warnings (through a contract with MHL as described in the Response section of this plan)
- c. **National Parks and Wildlife Service**
- Close and evacuate at risk camping grounds and public areas in National Parks managed areas.

1.5.25 Pacific Palms Dam (Calmjoy Pty Ltd):

- a. Maintain and operate the Dam Failure Warning System for **Pacific Palms Dam**.
- b. Contribute to the development and implementation of a public education program on flooding within the council area.
- c. Consult with SES on the determination of dam failure alert levels and notification arrangements when developing Dam Safety Emergency Plans.
- d. Maintain a Dam Safety Emergency Plan and provide copies to the SES.
- e. Provide information on the consequences of dam failure to the SES for incorporation into planning and flood intelligence.

1.5.26 Public Information Services Functional Area:

- a. When requested by SES;
 - Assist the SES in the establishment and operation of a Joint Media Information Centre.

1.5.27 **School Administration Offices (including Catholic Schools Office [Newcastle West], Department of Education & Communities [Lower North Coast Region - Forster] and Private Schools):**

- a. Liaise with the SES and arrange for the early release of students whose travel arrangements are likely to be disrupted by flooding and/or road closures (or where required, for students to be moved to a suitable location until normal school closing time).
- b. Pass information to school bus drivers/companies and/or other schools on expected or actual impacts of flooding.
- c. Assist with coordinating the evacuation of schools listed in Annex B when flooding or isolation is expected to occur
- d. Provide space in schools for evacuation centres where necessary.

1.5.28 **Surf Life Saving NSW - Foster, Cape Hawke, Pacific Palms and Hawks Nest Clubs:**

- a. Assist the SES with the warning and/or evacuation of at risk communities;
- b. Provide space in Surf Life Saving facilities for evacuation centres where required; and
- c. Assist the SES with flood rescue operations.

1.5.29 **Transport Services Functional Area:**

- a. When requested by SES;
- b. Assist with the coordination of transport for evacuation purposes.
- c. **The Roads and Maritime Services will:**
 - Close and reopen the Pacific Highway affected by flood waters and advise the SES of their status;
 - Facilitate the safe reliable access of emergency resources on RMS managed roads;
 - Assist the SES with identification of road infrastructure at risk of flooding;
 - Manage traffic; and
 - Assist the SES with the communication of warnings and information provision to the public through variable message signs.
- d. Assist with the resupply of isolated communities and/or properties
- e. The Rail Corporation New South Wales will close and reopen railway lines affected by flood waters and advise the SES.

1.5.30 **Welfare Services Functional Area:**

- a. When requested by SES;
 - Establish and manage evacuation and recovery centres; and

- Administer the Personal Hardship and Distress component of the NSW Disaster Relief Scheme established to provide financial assistance to people affected by emergencies.

1.5.31 **Volunteer Rescue Association (VRA), Bulahdelah:**

- a. Assist the Great Lakes SES Local Controller with flood operations, where equipment and training are suitable.

PART 2 - PREPAREDNESS

2.1 MAINTENANCE OF THIS PLAN

- 2.1.1 The Great Lakes SES Local Controller will maintain the currency of this plan by:
- a. Ensuring that all agencies, organisations and officers mentioned in it are aware of their roles and responsibilities.
 - b. Conducting exercises to test arrangements.
 - c. Reviewing the contents of the plan:
 - After each flood operation.
 - When significant changes in land-use or community characteristics occur.
 - When new information from flood studies become available.
 - When flood control or mitigation works are implemented or altered.
 - When there are changes that alter agreed plan arrangements.
- 2.1.2 In any event, the plan is to be reviewed no less frequently than every five years.

2.2 FLOODPLAIN AND COASTAL RISK MANAGEMENT

- 2.2.1 The Great Lakes SES Local Controller will ensure that:
- a. SES participates in local floodplain and coastal risk management committee activities in accordance with the protocols outlined in the SES Controllers handbook.
 - b. The Mid North Coast SES Region Headquarters is informed of involvement in floodplain and coastal risk management activities.

2.3 DEVELOPMENT OF FLOOD INTELLIGENCE

- 2.3.1 Flood intelligence describes flood behaviour and its effects on the community.
- 2.3.2 The SES maintains a centralised flood intelligence system.

2.4 DEVELOPMENT OF WARNING SYSTEMS

- 2.4.1 The SES may establish a total flood warning system for areas affected by flooding. This requires:
- a. An identification of the potential clients of flood warning information at different levels of flooding (ie. who would be affected in floods of differing severities).
 - b. Available information about the estimated impacts of flooding at different heights.

- c. Identification of required actions and the amounts of time needed to carry them out.
- d. Appropriate means of disseminating warnings to different clients and at different flood levels.

2.5 PUBLIC EDUCATION

- a. The Great Lakes SES Local Controller, with the assistance of the Great Lakes Council, the Mid North Coast SES Region Headquarters and SES State Headquarters, is responsible for ensuring that the residents of the council area are aware of the flood threat in their vicinity and how to protect themselves from it.

2.5.2 Specific strategies to be employed include:

- a. Dissemination of flood-related brochures and booklets in flood liable areas.
- b. Talks and displays orientated to community organisations, businesses and schools.
- c. Publicity given to this plan and to flood-orientated SES activities through local media outlets, including articles in local newspapers about the flood threat and appropriate responses.

2.6 TRAINING

2.6.1 Throughout this document there are references to functions that must be carried out by the members of the Forster/Pacific Palms, Karuah Valley and Nahiab SES. The Great Lakes SES Local Controller is responsible for ensuring that the members are:

- a. Familiar with the contents of this plan.
- b. Trained in the skills necessary to carry out the tasks allocated to the SES.

2.7 RESOURCES

2.7.1 The Forster/Pacific Palms, Karuah Valley and Nahiab SES Unit Controllers are responsible for maintaining the condition and state of readiness of SES equipment and their respective Unit Headquarters.

PART 3 - RESPONSE

CONTROL

3.1 CONTROL ARRANGEMENTS

- 3.1.1 The SES is the legislated Combat Agency for floods and is responsible for the control of flood operations. This includes the coordination of other agencies and organisations for flood management tasks.
- 3.1.2 The SES is the designated Combat Agency for damage control for storms. This includes damage control for coastal erosion and inundation from storm activity, specifically the protection of life and the coordination of the protection of readily moveable household goods and commercial stock and equipment. The SES is not responsible for planning or conduct of emergency beach protection works or other physical mitigation works.
- 3.1.3 The Local DISPLAN will operate to provide support as requested by the Great Lakes SES Incident Controller.

3.2 OPERATIONAL MANAGEMENT

- 3.2.1 SES utilises the Australasian Inter-service Incident Management System (AIIMS), which is based on three principles:
 - a. functional management;
 - b. management by objectives; and
 - c. span of control.
- 3.2.2 AIIMS provides for different incident levels based on the complexity of management.
- 3.2.3 The Local Government Area may be divided into sectors and divisions to manage the flood and/or coastal erosion event (divisions are usually a group of sectors).
- 3.2.4 Sectors and divisions may be based on floodplain classifications, geographical, physical or functional boundaries. A town, city or suburb may be one sector or spilt into several sectors and divisions.

3.3 START OF RESPONSE OPERATIONS

- 3.3.1 This plan is always active to ensure that preparedness actions detailed in this plan are completed.
- 3.3.2 Response operation will begin:
 - a. On receipt of a Bureau of Meteorology Preliminary Flood Warning, Flood Warning, Flood Watch, Severe Thunderstorm Warning or a Severe Weather Warning for flash flooding or damaging surf.

- b. On receipt of a dam failure alert.
 - c. When other evidence leads to an expectation of flooding or coastal erosion within the council area.
- 3.3.3 Contact with the Bureau of Meteorology to discuss the development of flood warnings will normally be through the Mid North Coast SES Region Headquarters.
- 3.3.4 The following persons and organisations will be advised of the start of response operations regardless of the location and severity of the flooding anticipated:
- a. Great Lakes Local Emergency Operations Controller (for transmission to the NSW Police Force Local Area Command Headquarters).
 - b. Forster/Pacific Palms, Karuah Valley and Nahiab SES Units.
 - c. Great Lakes SES Local Controller.
 - d. Forster/Pacific Palms, Karuah Valley and Nahiab SES Unit Controllers.
 - e. Mid North Coast SES Region Headquarters.
 - f. Great Lakes Local Emergency Management Officer (for transmission to appropriate council officers and departments).
 - g. Great Lakes Mayor.
 - h. Other agencies listed in this plan will be advised by the LEMO on the request of the Great Lakes SES Incident Controller and as appropriate to the location and nature of the threat.

3.4 RESPONSE STRATEGIES

- 3.4.1 The main response strategies for SES flood operations include:
- a. Information Provision and Warning
 - Provision of warnings, information and advice to communities
 - Inform the community regarding the potential impacts of a flood and what actions to undertake in preparation for flooding.
 - Inform the community regarding the potential impacts of coastal erosion and what preparatory actions to undertake
 - Provide timely and accurate information to the community.
 - b. Property protection
 - Protect the property of residents and businesses at risk of flood damage.
 - Assistance with property protection by way of sandbagging and the lifting or transporting of furniture, personal effects, commercial stock and caravans;

- Assistance with the relocation of readily moveable household goods and commercial stock and equipment from properties threatened by coastal erosion.
 - Assistance with the protection of essential infrastructure;
- c. Evacuation
- The temporary movement (relocation) of people from a dangerous or potentially dangerous place to a safe location, and their eventual return. It is a safety strategy which uses distance to separate people from the danger created by the hazard.
- d. Rescue
- The rescue or retrieval of persons trapped by floodwaters.
- e. Resupply
- Minimise disruption upon the community by resupplying towns and villages which have become isolated as a consequence of flooding.
 - Ensure supplies are maintained to property owners by coordinating the resupply of properties which have become isolated as a consequence of flooding.
- 3.4.2 The Great Lakes SES Incident Controller will select the appropriate response strategy to deal with the expected impact of the flood. The impact may vary, so a number of different strategies may to be selected and implemented across the whole operational area.
- 3.4.3 Supporting strategies include:
- a. Protect the community from incidents involving fire and hazardous materials
 - b. Maintain the welfare of communities and individuals affected by the impact of a flood.
 - c. Minimise disruption to the community by ensuring supply of essential energy and utility services.
 - d. Ensure coordinated health services are available to and accessible by the flood affected communities.
 - e. Maintain the welfare of animals affected by the impact of a flood.
- 3.4.4 The execution of these strategies is detailed in the Functional Areas section below.

3.5 OPERATIONS CENTRES

- 3.5.1 The Great Lakes SES Operations Centre is located at the Forster/Pacific Palms SES Unit Headquarters at Lot 271 Charlotte Bay Street, Pacific Palms.
- a. Karuah Valley SES Operations Centre is located at 2756 Booral Road, Booral.

- b. Nابیac SES Operations Centre is located at Clarkson St, Nابیac.
- c. The Great Lakes Emergency Operations Centre is located at the Great Lakes Council Complex, Breese Parade, and Forster.

3.6 LIAISON

- 3.6.1 At the request of the Great Lakes SES Incident Controller, each agency with responsibilities identified in this plan will provide liaison (including a liaison officer where necessary) to the Great Lakes SES Operations Centre.
- 3.6.2 Liaison officers are to:
 - a. have the authority to deploy the resources of their parent organisations at the request of the Great Lakes SES Incident Controller,
 - b. advise the Great Lakes SES Incident Controller on resource availability for their service, and
 - c. be able to provide communications to their own organisations.

3.7 ALL CLEAR

- 3.7.1 When the immediate danger to life and property has passed the Mid North Coast SES Region Incident Controller or the Great Lakes SES Incident Controller will issue an 'all clear' message signifying that response operations have been completed. The message will be distributed through the same media outlets as earlier evacuation messages. The relevant Controller will also advise details of recovery coordination arrangements, arrangements made for clean-up operations prior to evacuees being allowed to return to their homes, and stand-down instructions for agencies not required for recovery operations.
- 3.7.2 A template guide to the content of an all clear message is contained in Annex E – Template Evacuation Warning, Evacuation Order and All Clear.

PLANNING

3.8 COLLATING SITUATIONAL INFORMATION

Strategy

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

Actions

- 3.8.2 The Great Lakes SES Local Headquarters collates information on the current situation in the Great Lakes LGA and incorporates it in Situation Reports.
- 3.8.3 The Mid North Coast SES Region Headquarters collates Region-wide information for inclusion in Region SES Situation Reports.

- 3.8.4 Sources of situational information during times of flooding are:
- a. **Agency Situation Reports.** Agencies and functional areas provide regular situation reports (SITREPs) to the SES.
 - b. **Active Reconnaissance.** The Great Lakes SES Incident Controller is responsible for coordinating the reconnaissance of impact areas, recording and communicating observations. Reconnaissance can be performed on the ground and using remote sensing (more commonly aerial).
 - c. The **Bureau of Meteorology's Flood Warning Centre** provides river height and rainfall information, data can be available on the website <http://www.bom.gov.au/hydro/flood/nsw/>
 - d. The Department of Services, Technology and Administration's, **Manly Hydraulics Laboratory** automated river watch system funded by the Office of Environment and Heritage. This system provides river height and rainfall readings for a number of gauges as indicated in Annex C. Recent data from this system is available on the Manly Hydraulic Laboratory website: <http://www.mhl.nsw.gov.au>. A history of area floods is also available upon request via the website.
 - e. **NSW Office of Water.** This office advises flow rates and rates of rise for the Wang Wauk River, Mammy J River, Karuah River. Daily river reports containing information on gauge heights and river flows are available from the website: <http://waterinfo.nsw.gov.au/>
 - f. **Mid North Coast SES Region Headquarters.** The Region Headquarters provides information on flooding and its consequences, including those in nearby council areas (this information is documented in Bulletins and Situation Reports).
 - g. **Great Lakes Council.** Road closure information and condition of Smiths Lake berm.
- 3.8.5 During flood operations sources of information on roads closed by flooding include:
- a. Great Lakes Council
 - b. Manning-Great Lakes Police Local Area Command
 - c. Roads and Maritime Services: <http://livetraffic.rta.nsw.gov.au> and telephone on 132 701.
- 3.8.6 Situational information relating to consequences of flooding and/or coastal erosion should be used to verify and validate SES Flood Intelligence records.

3.9 PROVISION OF FLOOD INFORMATION AND WARNINGS

Strategy

- 3.9.1 The Great Lakes SES Local Headquarters provides advice to the Mid North Coast SES Region Headquarters on current and expected impacts of flooding in the Great Lakes LGA.
- 3.9.2 The Mid North Coast SES Region Headquarters issues SES Flood Bulletins, SES Livestock and Equipment Warnings, Evacuation Warnings and Evacuation Orders to media outlets and agencies on behalf of all SES units in the Region.

Actions

- 3.9.3 The Great Lakes SES Incident Controller will ensure that the Mid North Coast SES Region Incident Controller is regularly briefed on the progress of operations.
- 3.9.4 Great Lakes SES Local Headquarters operations staff will be briefed regularly so that they can provide information in response to inquiries received in person or by other means such as phone or fax.
- 3.9.5 The Great Lakes SES Local Headquarters will operate a “phone-in” information service for the community in relation to:
- a. river heights,
 - b. flood behaviour,
 - c. road conditions,
 - d. closures of local and main roads and advice,
 - e. advice on safety matters and means of protecting property.
- 3.9.6 **Bureau of Meteorology Severe Thunderstorm Warning.** These are issued direct to the media by the Bureau when severe thunderstorms are expected to produce dangerous or damaging conditions, including flash flooding. Severe thunderstorms are usually smaller in scale than events covered by Flood Watches and Severe Weather Warnings.
- 3.9.7 **Bureau of Meteorology Severe Weather Warnings for Flash Flooding.** These are issued direct to the media by the Bureau and provide a warning of the possibility for flash flooding as a result of intense rainfall. These warnings are issued when severe weather is expected to affect land based communities with 6 to 24 hours. Severe Weather Warnings may also include other conditions such as Damaging Surf, Dangerous Surf or tides, or Damaging Winds.
- 3.9.8 **Bureau of Meteorology Flood Watches.** Flood Watches are issued by the Bureau to advise people of the potential for flooding in a catchment area based on predicted or actual rainfall. Flood Watches will be included in SES Flood Bulletins issued by the Mid North Coast SES Region Headquarters.
- 3.9.9 **Bureau of Meteorology Flood Warnings.** The Mid North Coast SES Region Headquarters will send a copy of Bureau Flood Warnings to the Great Lakes

- SES Unit. On receipt the Great Lakes SES Incident Controller will provide the Mid North Coast SES Region Headquarters with information on the estimated impacts of flooding at the predicted heights for inclusion in SES Region Flood Bulletins.
- 3.9.10 **SES Livestock and Equipment Warnings.** Following heavy rain or when there are indications of significant creek or river rises (even to levels below Minor Flood heights); the Great Lakes SES Incident Controller will advise the Mid North Coast SES Region Headquarters which will issue SES Livestock and Equipment Warnings.
- 3.9.11 **SES Local Flood Advices.** The Great Lakes SES Incident Controller may issue Local Flood Advices for locations not covered by the Bureau Flood Warnings. They may be provided verbally in response to phone inquiries but will normally be incorporated into SES Region Flood Bulletins. They will be distributed to agencies listed in Annex D.
- 3.9.12 **SES Flood Bulletins.** The Mid North Coast SES Region Headquarters will regularly issue SES Flood Bulletins which describe information on the estimated impacts of flooding at the predicted heights (using information from Bureau Flood Warnings and SES Local Flood Advices) to SES units, media outlets and agencies on behalf of all SES units in the Region. When operations relating to coastal erosion/inundation are being undertaken, SES Region Bulletins will contain information and advice about property damage mitigation measures and evacuation in affected areas.
- 3.9.13 **SES Evacuation Warnings and Evacuation Orders.** These are usually issued to the media by the SES Region Incident Controller on behalf of the Great Lakes SES Incident Controller. A template guide to the content of evacuation warning and evacuation order messages is at Annex E.
- 3.9.14 **Dam Failure Alerts.** Dam failure alerts are issued to SES by the dam owner, in accordance with arrangements in the Dam Safety Emergency Plan (DSEP), the system involves the Dam Owner notifying SES State Headquarters Communications Centre, who in turn distribute the warning to the SES Region Headquarters and SES Unit Headquarters.
- 3.9.15 **Emergency Alert Warning System:** The Emergency alert can directly alert communities in imminent danger via a voice message on landline and a text message on mobile phones based on the subscribers billing address
- 3.9.16 A flow chart illustrating the notification arrangements for potential dam failure is shown in Annex H.
- 3.9.17 Dam failure alert levels are set in consultation with the SES and are used to trigger appropriate response actions. The conditions that define each of the alert levels are listed in the relevant DSEP. Responses escalate as the alert level migrates from white to amber to red. Table 3-1 briefly outlines example defining conditions and appropriate SES responses associated with each alert.

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

Table 1: Dam Failure Alert levels

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

- 3.9.18 The SES / Dam Owner will disseminate warnings to the population at risk of dam failure (these arrangements are specific to each dam, are negotiated between the Dam Owner and SES, and are documented in the DSEP).
- 3.9.19 **Standard Emergency Warning Signal (SEWS).** This signal may be played over radio and television stations to alert communities to Evacuation Warnings, Evacuation Orders, Special Warnings or Dam-Failure Warnings. Approval to use the signal is associated with who approves the warning/order message.
- 3.9.20 **The Public Information and Inquiry Centre** (operated by the Police Force) will answer calls from the public regarding registered evacuees.
- 3.9.21 **The Disaster Welfare Assistance line** is a central support and contact point for disaster affected people inquiring about welfare services advice and assistance.
- 3.9.22 **The RMS Traffic Information Line** (132 701) will provide advice to callers on the status of roads. The RMS website (<http://livetraffic.rta.nsw.gov.au>) also lists road closure information.
- 3.9.23 **Great Lakes Council** will provide information on the status of roads via its website <http://www.greatlakes.nsw.gov.au> and/or telephone the Customer Service Centre.
- 3.9.24 Collation and dissemination of road information is actioned as follows:

- a. As part of Situation Reports, the Great Lakes SES Incident Controller provides road status reports for main roads in the council area to the Mid North Coast SES Region Headquarters.
- b. The Mid North Coast SES Region Headquarters distributes information on main roads to SES units, media outlets and agencies as part of SES Flood Bulletins.

OPERATIONS

3.10 AIRCRAFT MANAGEMENT

- 3.10.1 Aircraft can be used for a variety of purposes during flood operations including evacuation, rescue, resupply, reconnaissance and emergency travel.
- 3.10.2 Air support operations will be conducted under the control of the SES Region Headquarters, which may allocate aircraft to units if applicable.
- 3.10.3 **Helicopter Landing Points.** Suitable landing points are located at
 - a. Booti Booti National Park, Lakes Way, Pacific Palms
 - b. Tuncurry Sports Area, South Street, Tuncurry
 - c. Playing Fields, Lake Street Forster
 - d. Nabiac Showground, Showground Lane, Nabiac,
 - e. Bulahdelah Showground, Prince Street, Bulahdelah,
 - f. Stroud Showground, The Bucketts Way, Stroud.
 - g. Memorial Park, Hough Street, Tea Gardens.

3.11 ASSISTANCE FOR ANIMALS

- 3.11.1 Matters relating to the welfare of livestock, companion animals and wildlife are to be referred to Agriculture and Animal Services.
- 3.11.2 Requests for emergency supply and/or delivery of fodder to stranded livestock, or for livestock rescue, are to be referred to Agriculture and Animal Services.
- 3.11.3 Requests for animal rescue should be referred to the SES.

3.12 COMMUNICATION SYSTEMS

- 3.12.1 The primary means of communications between fixed locations is by telephone, email and facsimile.
- 3.12.2 The primary means of communication to and between deployed SES resources is by GRN and / or SES PMR.
- 3.12.3 All liaison officers will provide their own communication links back to their parent agencies.

- 3.12.4 All other organisations will provide communications as necessary to their deployed field teams.
- 3.12.5 Back-up communications can be provided by the Great Lakes VHF radio system and Wicen.

3.13 PRELIMINARY DEPLOYMENTS

- 3.13.1 When flooding is expected to be severe enough to cut road access to towns, within towns and/or rural communities, the Great Lakes SES Incident Controller will ensure that resources are in place for the distribution of foodstuffs and medical supplies to the areas that could become isolated.
- 3.13.2 When access between Hawks Nest and Tea Gardens is expected to be cut, the Great Lakes SES Incident Controller will advise appropriate agencies so that resources (including sandbags, fire fighting appliances, ambulances, etc.) are deployed to Hawks Nest to ensure that operational capability is maintained.

3.14 ROAD AND TRAFFIC CONTROL

- 3.14.1 A number of roads within the council area are affected by flooding. Details are provided in Annex B.
- 3.14.2 The council closes and re-opens its own roads, and acting as agent for the RMS, closes and re opens Bucketts Way, Lakes Way and the Bulahdelah-Booral road.
- 3.14.3 The RMS closes and re-opens the Pacific Highway.
- 3.14.4 The NSW Police Force has the authority to close and re-open roads but will normally only do so (if the council or the RMS have not already acted) if public safety requires such action.
- 3.14.5 In flood events, the Great Lakes SES Incident Controller may direct the imposition of traffic control measures. The entry into flood affected areas will be controlled in accordance with the provisions of the State Emergency Service Act, 1989 (Part 5, Sections 19, 20, 21 and 22) and the State Emergency Rescue Management Act, 1989 (Part 4, Sections 60KA, 60L and 61).
- 3.14.6 Police, RMS or Council officers closing or re-opening roads or bridges affected by flooding are to advise the Great Lakes SES Local Headquarters, which will then provide a road information service to local emergency services, the public and the Mid North Coast SES Region Headquarters. All such information will also be passed to the Police, RMS and the Council.

3.15 MANAGING PROPERTY PROTECTION OPERATIONS

Strategy

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

Actions

- 3.15.2 The SES is the responsible agency for the coordination of operations to protect property.
- 3.15.3 Property may be protected from floods by:
- a. Lifting or moving of household furniture
 - b. Lifting or moving commercial stock and equipment
 - c. Sandbagging to minimise entry of water into buildings
- 3.15.4 The Forster/Pacific Palms, Karuah Valley and Nahiack SES Unit Headquarters all maintain small stocks of sandbags. Back-up supplies are available through the Mid North Coast SES Region Headquarters.
- 3.15.5 Property protection measures for the threat of coastal erosion involves the relocation of readily moveable household goods and commercial stock and equipment. The SES is not responsible for planning or conduct of emergency beach protection works or other physical mitigation works.

3.16 MANAGING FLOOD RESCUE OPERATIONS

Strategy

- 3.16.1 Rescue of people from floods.

Actions

- 3.16.2 The Great Lakes SES Incident Controller controls flood rescue in Great Lakes local government area.
- 3.16.3 Flood rescues, may be carried out by accredited units in accordance with appropriate standards.
- 3.16.4 Additional flood boats and crews can be requested through the Mid North Coast SES Region Headquarters.

3.17 MANAGING EVACUATION OPERATIONS

Strategy

- 3.17.1 When there is a risk to public safety, evacuation is the primary strategy. Circumstances may include:
- a. Evacuation of people when their homes or businesses are likely to flood.
 - b. Evacuation of people who are unsuited to living in isolated circumstances, due to flood water closing access.
 - c. Evacuation of people where essential energy and utility services have failed or where buildings have been made uninhabitable.
 - d. Evacuation of people when their homes or business are at threat of collapse from coastal erosion

Actions

- 3.17.2 The evacuation operation will have the following stages:
- a. Decision to evacuate
 - b. Mobilisation (mobilisation may begin prior to the decision to evacuate)
 - c. Evacuation Warning/Order Delivery
 - d. Withdrawal
 - e. Shelter
 - f. Return
- 3.17.3 During floods evacuations will be controlled by the SES. Small-scale evacuations will be controlled by the Great Lakes SES Incident Controller. Should the scale of evacuation operations be beyond the capabilities of local resources control may be escalated to the Mid North Coast SES Region Incident Controller.

Decision to evacuate

- 3.17.4 In most cases the decision to evacuate rests with the Great Lakes SES Incident Controller who exercises his/her authority in accordance with Section 22(1) of The State Emergency Service Act 1989. However, the decision to evacuate will usually be made after consultation with the Mid North Coast SES Region Incident Controller and the Local Emergency Operations Controller.
- 3.17.5 In events that require large scale evacuations, the decision to evacuate may be escalated to the Region or the State Incident Controller.
- 3.17.6 Some people will make their own decision to evacuate earlier and move to alternate accommodation, using their own transport. This is referred to as self-motivated evacuation.

Mobilisation

- 3.17.7 The Great Lakes SES Incident Controller will mobilise the following to provide personnel for doorknock teams for designated Sectors/locations:
- a. Forster/Pacific Palms, Karuah Valley and Nabiac SES Unit members,
 - b. RFS Great Lakes District members via the RFS Fire Control Officer,
 - c. Local Police Force officers
- 3.17.8 The Mid North Coast SES Region Incident Controller will mobilise any additional personnel required to assist with doorknock teams using:
- a. SES members from the Mid North Coast SES Region and surrounding SES Regions
 - b. FRNSW personnel arranged via the FRNSW Liaison Officer located at Mid North Coast SES Region Headquarters

- c. RFS personnel arranged via the RFS Liaison Officer located at Mid North Coast SES Region Headquarters
- 3.17.9 The Great Lakes SES Incident Controller will request the Great Lakes LEMO to provide Council personnel to assist with traffic coordination.
- 3.17.10 The Mid North Coast SES Region Incident Controller will mobilise the required number of buses for Sectors via the Transport Services Functional Area Coordination Centre.

Delivery of Evacuation Warnings and Evacuation Orders

- 3.17.11 The SES will advise the community of the requirements to evacuate. The SES will issue an **Evacuation Warning** when the intent of an SES Incident Controller is to warn the community of the need to prepare for a possible evacuation. The SES will issue an **Evacuation Order** when the intent of the SES Incident Controller is to instruct a community to immediately evacuate in response to an imminent threat. A template guide to the content of evacuation warning and evacuation order messages is provided at Annex E.
- 3.17.12 The Great Lakes SES Incident Controller will distribute Evacuation Warnings/Orders to:
- a. Sector Command Centres (where established)
 - b. Great Lakes Local Emergency Operations Centre
 - c. Great Lakes Council
 - d. Manning - Great Lakes Police Local Area Command
 - e. Great Lakes Rural Fire Service Control Centre
 - f. Other local agencies and specified individuals
- 3.17.13 The Mid North Coast SES Region Incident Controller will distribute Evacuation Warnings/Orders to:
- a. The SES State Operations Centre
 - b. The Great Lakes SES Incident Controller
 - c. Metropolitan media outlets via the Joint Media Information Centre
 - d. Affected communities via dial-out warning systems where installed or applicable
 - e. Media outlets and agencies as identified in Annex D.
- 3.17.14 Evacuation Warnings and Orders may be delivered through:
- a. Radio and television stations (see Annex D)
 - b. Doorknocking by emergency service personnel
 - c. Public address systems (fixed or mobile)
 - d. Telephony-based systems (including Emergency Alert)
 - e. Two-way Radio

- 3.17.15 The Standard Emergency Warning Signal (SEWS) may be used to precede all Evacuation Orders broadcast on Radio Station [insert details].
- 3.17.16 Sector Command Centres, where established, will distribute Evacuation Orders via Emergency Service personnel in doorknock teams to areas under threat of inundation.
- 3.17.17 Doorknock teams will work at the direction of:
- a. The relevant Unit Incident Controller
 - b. The Sector Commander if a Sector Command Centre is established.
 - c. The relevant Division Commander where a Sector Command Centre has not been established
- 3.17.18 Field teams conducting doorknocks will record and report back the following information to their Unit Incident Controller/Sector Commander/Division Commander:
- a. Addresses and locations of houses doorknocked and/or evacuated.
 - b. The number of occupants.
 - c. Details of support required (such as transport, medical evacuation, assistance to secure house and/or property and raise or move belongings).
 - d. Details of residents who refuse to comply with the Evacuation Order.
- 3.17.19 Refusal to evacuate. Field teams cannot afford to waste time dealing with people who are reluctant or refuse to comply with any Evacuation Order. These cases are to be referred to the NSW Police Liaison Officer who will arrange for Police to ensure their evacuation.

Withdrawal

- 3.17.20 In each Sector/community, evacuations will generally be carried out in stages starting from the lowest areas, low flood islands and low trapped perimeters; and progressively from higher areas.
- 3.17.21 The most desirable method of evacuation is via road using private transport. This may be supplemented by buses for car-less people. However, other means of evacuation may also be used if available and as necessary (eg by foot, rail, air).
- 3.17.22 Evacuees who require accommodation or welfare assistance will be directed to designated evacuation centres. Evacuees who have their own accommodation arrangements will not be directed to Evacuation Centres. It is not possible to determine in advance how many will fall into this category.
- 3.17.23 Evacuees will:
- a. Move under local traffic arrangements from the relevant locations eg. via managed evacuation routes;

- b. Continue along the suburban/regional/rural road network to allocated Evacuation Centres.
- 3.17.24 **Health Services.** The Health Services Functional Area will coordinate the evacuation of hospitals, health centres and aged care facilities (including nursing homes).
- 3.17.25 **Schools.** School administration offices (Department of Education and Communities, Catholic Schools Office and Private Schools) will coordinate the evacuation of schools if not already closed.
- 3.17.26 If there is sufficient time between the start of response operations and the evacuation of communities, the Mid North Coast SES Region Incident Controller will discuss the temporary closure of appropriate schools with the Regional Director, Lower North Coast Region, Department of Education and Communities. This will enable pupils to stay at home or be returned home so they can be evacuated (if required) with their families.
- 3.17.27 Note that in the Great Lakes LGA, school principals may close some schools affected by flooding in the early stages of flooding.
- 3.17.28 **Caravan parks.** The caravan parks known to be flood liable are listed in Annex F, along with arrangements relating to the evacuation of residents and the removal of caravans.
- 3.17.29 **Assistance Animals, Pets and Companion Animals of Evacuees:** Assistance animals (guide dogs, hearing assistance animals, etc) will remain in the care of their owners throughout the evacuation. This includes transport and access into evacuation centres etc. Due to safety restrictions, it may not be possible to allow companion animals to accompany their owners when being transported via aircraft or flood rescue boats. Agriculture and Animal Services will make separate arrangements for the evacuation and care of companion animals.
- 3.17.30 **Transport and storage:** Transport and storage of furniture from flood and/or coastal erosion threatened properties will be arranged as time and resources permit.
- 3.17.31 **Security:** The NSW Police Force will provide security for evacuated areas.
- 3.17.32 The SES Incident Controller is to provide the following reports to the SES Mid North Coast SES Region Headquarters:
- a. Advice of commencement of the evacuation of each Sector;
 - b. Hourly progress reports (by Sectors) during evacuations;
 - c. Advice of completion of the evacuation of each Sector.

Shelter

- 3.17.33 **Evacuation centres / assembly areas.** The usual purpose of evacuation centres is to meet the immediate needs of disaster affected people following evacuation from an emergency situation, not to provide them with accommodation. Evacuees will be advised to go to or be taken to the nearest

accessible evacuation centre, which may initially be established at the direction of the Great Lakes SES Incident Controller, but managed as soon as possible by Welfare Services.

3.17.34 The following locations may be used as flood evacuation centres:

- a. Bulahdelah Bowling Club, Jackson Street, Bulahdelah
- b. Bulahdelah Golf Club, Pacific Hwy Bulahdelah
- c. Bulahdelah Central School, Meade St, Bulahdelah
- d. Club Forster, Strand Street, Forster
- e. School of Arts Hall, Little Street, Forster
- f. Hawks Nest Community Centre, Booner Street, Hawks Nest
- g. Nabiac Showground, Nabiac Street, Nabiac
- h. School of Arts, Berkeley Street, Stroud
- i. St Peters Catholic Church, Witt Street, Tea Gardens.
- j. Sporties Club, Beach Street, Tuncurry.

3.17.35 **Registration:** The NSW Police Force will ensure that all evacuees are registered on arrival at the designated evacuation centres.

3.17.36 **Animal shelter compounds:** Animal shelter compounds will be set up for the domestic pets and companion animals of evacuees if required. Facilities will be managed by Agriculture and Animal Services.

Return

3.17.37 Once it is considered safe to do so, the SES Incident Controller will authorise the return of evacuees to their normal or alternative place of residence. This decision will be made in consultation with the following:

- a. Health Service Functional Area Coordinator (public health),
- b. Engineering Services Functional Area Co-coordinator (electrical safety of buildings, structural integrity of levees/dams),
- c. Transport Services Functional Areas Coordinator (status of State roads),
- d. Great Lakes Council (public health, status of local roads).
- e. Mid North Coast SES Region Incident Controller

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

3.18 INITIAL EVACUATIONS

3.18.1 In most floods, no evacuations are necessary. Severe floods on the creeks, rivers and lakes of the council area may create a need for small numbers of evacuations from houses and caravan parks. Extreme floods at Forster-

Tuncurry or Hawks Nest-Tea Gardens may necessitate large numbers of evacuations. Details are provided in Annex B.

3.19 MANAGING RESUPPLY OPERATIONS

- 3.19.1 The SES is responsible for the coordination of the resupply of isolated communities and properties.
- 3.19.2 If isolation is expected to occur, residents should be encouraged to consider their needs and suitability for an unknown period of isolation.
- 3.19.3 If properties/communities are going to remain in locations expected to become isolated, households/retailers should be encouraged to stock up on essential supplies.
- 3.19.4 Where practicable, once supplies are delivered to the SES designated loading point, the SES Incident Controller will arrange for the delivery of essential foodstuffs, fuels or urgent medical supplies required by an isolated property or community.
- 3.19.5 All reasonable effects will be made to deliver supplies, however where necessary the SES will prioritise the delivery of items.

Resupply of Isolated Towns and Villages

Strategy

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

Actions

- 3.19.7 The SES is responsible for the coordination of the resupply of isolated communities.
- 3.19.8 If flood predictions indicate that areas are likely to become isolated, the SES Incident Controller should advise retailers that they should stock up.
- 3.19.9 When isolation occurs, retailers will be expected to place orders with suppliers where they have a line of credit and to instruct those suppliers to package their goods and deliver them to loading points designated by the SES.
- 3.19.10 The SES is prepared to deliver mail to isolated communities but may not be able to do so according to normal Australia Post timetables.
- 3.19.11 The SES will assist hospitals with resupply of linen and other consumables where able.

Resupply of Isolated Properties

Strategy

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

Actions

- 3.19.13 The resupply of isolated properties is a common requirement during floods and coordination can be difficult because requests can emanate from a variety of sources. Isolated properties may call their suppliers direct, place their orders through their own social networks or contact the SES.
- 3.19.14 The principles to be applied when planning for the resupply of isolated properties are:
- a. The SES will coordinate resupply and establish a schedule.
 - b. Some isolated households will not have the ability to purchase essential grocery items due to financial hardship. If an isolated household seeks resupply from the SES and claims to be, or is considered to be, in dire circumstances, he/she is to be referred to Welfare Services for assessment of eligibility. Where financial eligibility criteria are met, Welfare Services will assist with the purchase of essential grocery items. Welfare Services will deliver the essential grocery items to the SES designated loading point for transport.
 - c. Local suppliers will liaise with the SES regarding delivery of resupply items to the designated loading point.
 - d. Local suppliers are responsible for packaging resupply items for delivery.
- 3.19.15 A flowchart illustrating the Resupply process is shown at Annex G. Please note that the flowchart outlines the resupply process but does not encompass all potential situations and/or outcomes

PART 4 - RECOVERY

4.1 RECOVERY COORDINATION AT THE LOCAL LEVEL

- 4.1.1 The Great Lakes SES Incident Controller will ensure that planning for long-term recovery operations begins at the earliest opportunity, initially through briefing the Local Emergency Management Committee (LEMC). As soon as possible the LEMC will meet to discuss recovery implications including the need for a Local Recovery Committee. The LEMC will consider any impact assessment in determining the need for recovery arrangements. This is conveyed in the first instance to the State Emergency Operations Controller (SEOCN) for confirmation with the State Emergency Recovery Controller (SERCON).
- 4.1.2 Once the need for recovery has been identified, the SERCON, in consultation with the SEOCN, may recommend the appointment of a Local Recovery Coordinator and nominate an appropriate candidate to the Minister for Emergency Services.
- 4.1.3 The SERCON may send a representative to the LEMC and subsequent recovery meetings to provide expert recovery advice and guidance.
- 4.1.4 The Great Lakes SES Incident Controller and Local Emergency Operations Controller (LEOCN) attend recovery meetings to provide an overview of the emergency response operation.
- 4.1.5 The Mid North Coast SES Region Incident Controller, the District Emergency Management Officer (DEMO) and appropriate District Functional Area Coordinators will be invited to the initial local meeting and to subsequent meetings as required.
- 4.1.6 The recovery committee will:
- a. develop and maintain a Recovery Action Plan with an agreed exit strategy
 - b. monitor and coordinate the activities of agencies with responsibility for the delivery of services during recovery
 - c. ensure that relevant stakeholders, especially the communities affected, are involved in the development and implementation of recovery objectives and strategies and are informed of progress made
 - d. provide the SERCON with an end of recovery report
 - e. ensure the recovery is in line with the National Principles of Disaster Recovery and the NSW tenets

4.2 RECOVERY COORDINATION AT THE DISTRICT AND STATE LEVEL

- 4.2.1 In the event that an emergency affects several local areas, a District Emergency Management Committee (DEMC) will meet to discuss recovery

implications including the need for a District Recovery Committee. This is conveyed in the first instance to the SEOCN for confirmation with the SERCON.

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

4.3 ARRANGEMENTS FOR DEBRIEFS / AFTER ACTION REVIEWS

- 4.3.1 As soon as possible after flooding has abated, the Great Lakes SES Local Controller will advise participating organisations of details of response operation after action review arrangements.
- 4.3.2 The Great Lakes SES Local Controller will ensure that adequate arrangements are in place to record details of the after action review and each item requiring further action is delegated to an organisation or individual to implement.
- 4.3.3 Follow-up to ensure the satisfactory completion of these actions will be undertaken by the Great Lakes Local Emergency Management Committee.

HAZARD AND RISK IN GREAT LAKES

Volume 2 of the Mid Coast Local Flood Plan

Last Update: March 2017

AUTHORISATION

The Hazard and Risk in Great Lakes 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



Manager Emergency Risk Management

Date:

1/3/17

Approved



NSW SES Mid North Coast Region Controller

Date:

2.3.17

Tabled at LEMC

14 March 2017

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VERSION LIST

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

Description	Date
Great Lakes Local Flood Plan as amended	December 2011

AMENDMENT LIST

Suggestions for amendments to this Volume should be forwarded to:

Mid North Coast Region Controller

NSW State Emergency Service

14 Arkwright Crescent, TAREE NSW 2430

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

Amendment Number	Description	Updated by	Date

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1 THE FLOOD AND COASTAL EROSION THREAT

1.1 OVERVIEW

Karuah River Basin Valley

- a. The Great Lakes area has a complex flood problem, with flooding occurring on numerous creeks and rivers as well as on the coastal lakes. At times, flooding is worsened by heavy seas and tidal conditions and on rare occasions by the impacts of elevated ocean levels. Flash flooding occurs on the minor creeks, especially in the higher terrain, but longer warning times characterise flooding on the lower reaches of the principal rivers and on the various lakes. Severe flooding within the area has, however, been infrequent, with only low-level flooding being recorded in recent decades in most areas (1).
- b. The major streams of the area are the Karuah, Myall, Wallamba, Wang Wauk, Coolongolook and Wallingat Rivers. Of these the Karuah, with a catchment of 1040 square kilometres, drains the largest area (1).

1.2 LANDFORMS AND RIVER SYSTEMS

Karuah River

- a. The Karuah River, which drains the area's western portion, rises in the rugged upland country of the Chichester and Avon River State Forests. It flows in a north-west to south-east direction between the Dixies Top Ridge and Black Bulga Range to the west and the Lawlers Range and Linger and Die Ridge to the east. The main tributaries are Lawlers, Scotters, Andersons, Farleys, Mill, Lamans, Sawpit, Washpool and Deep Creeks and Mammy Johnsons and The Branch Rivers. In the lower reaches, the valley is wide and swampy and the river discharges into Port Stephens just to the south (1).

Wallis Lake

- b. Wallis Lake is a broad, shallow, tidal lake commanding a catchment area of 1200 square kilometres and itself covering 80 square kilometres. Flows enter the lake from Wallamba River, Wang Wauk River, Coolongolook River and Wallingat River. It features considerable deltaic development from the streams which enter it on its northern and north-western edges. The lake has a narrow outlet to the sea via a permanent entrance channel between Forster and Tuncurry (1).

Myall River

- c. The Myall River, which has a catchment area of 780 square kilometres, rises at elevations of about 460 metres in the Kyle, Meyers and Koolonock Ranges and the Craven, Myall River and parts of Myall Lakes National Park. In its upper reaches the

river is deeply incised within steep gorges and much of the catchment is timbered. The main tributary, the Crawford River, enters near Bulahdelah, but Bourkes and Black Camp Creeks are also significant tributaries. Frys Creek's confluence with the Myall River is approximately three kilometres upstream of the Pacific Highway Bridge at Bulahdelah, and has a catchment area of approximately 18 square kilometres. From about Bulahdelah the floodplain is broad and marshy to the point at which it discharges to The Broadwater. The river flows in a meandering course from The Broadwater through flat, low-lying land to Port Stephens at Hawks Nest-Tea Gardens (1).

Myall Lakes and Smiths Lake

- d. The Myall Lakes system is made up of Myall and Boolambayte Lakes and The (Bombah) Broadwater, which are linked by narrow necks of water. The only outlet is the Myall River to Port Stephens. The tidal limit is Tamboy, where the river leaves The Broadwater (1).
- e. Minor creeks drain to Smiths Lake, the Myall Lakes system and to the Port Stephens estuary between the Karuah and Myall Rivers. Most of these drain flat or undulating and largely forested land. Boolambayte Creek flows to Boolambayte Lake, and Split Yard Creek to The Broadwater. Yallimbah, Bulga, Bundabah and Kore Kore Creeks drain the low hills to the north of Port Stephens (1).
- f. Smiths Lake is approximately 25 kilometres south of Forster. The catchment is small, 34 square kilometres including the lake, and is relatively undeveloped land in Myall Lakes National Park and State Forest. The catchment is drained by several small creeks including Wamwarra Creek, Bramble's Creek and Tarbuck Creek. The ocean entrance is a wide sandy beach (Sandbar Beach). The entrance is normally closed, but may be opened by Council when the lake level reaches around 2.1 metres AHD, or every 1.25 years (2) (1).

Port Stephens

- g. Port Stephens is a large tidal estuary with a total catchment of 2900 square kilometres. The northern side is part of the Great Lakes area and the southern side part of the Port Stephens Council Area. It has a surface area of 140 square kilometres and is fed by the Karuah River (1500 square kilometres), the Myall River (780 square kilometres) and other smaller creeks including the Yallimbah, Bulga, Bundabah and Kore Kore creeks which drain the low hills to the north of Port Stephens (1).

Wallamba River

- h. The Wallamba River drains an area of around 500 square kilometres extending west to the Great Dividing Range. Most of the catchment in the north is steep and forested, but the river's gradient is low and the floodplain is wide and low-lying as it moves toward the coast. Nabiac, Failford and Minimbah are located in the Wallamba

River catchment. The river is tidal to a causeway just upstream of Nabisac. Below Failford, where the river turns south before discharging to Wallis Lake, flow is through swampy country and the channel includes a number of midstream islands (1).

- i. Town Creek flows through the Nabisac township, where there are a number of crossings including a road bridge, a foot bridge, and a pipe culvert crossing near the industrial area. The creek then enters private rural land, where it eventually joins with the Wallamba River (1).
- j. Woosters Creek originates north of the Pacific Highway with a larger catchment area than Town Creek and crosses Clarkson Street at the opposite end from Town Creek. Woosters Creek flows through crown reserve bushland, roughly parallel with Hoskins Street and Donaldson Street. In the lower lying areas, the waterway becomes swampy and marshy. Woosters Creek joins the Wallamba River near the end of Wharf Street. Pipeclay Creek flows through the eastern portion, originating upstream of the Pacific Highway. Pipeclay Creek has the largest catchment area of all three creeks. It meanders through private rural lands, before joining with the Wallamba River in the south. A number of smaller unnamed tributaries exist within the study area, which connect up with the three major tributaries of Town Creek, Woosters Creek and Pipeclay Creek. These tributaries were also included in the analysis (3) (1).

1.3 STORAGE DAMS

- a. Dam locations are shown on the Karuah River Basin map.

Duralie Coal Mine Water (1)

Table 1: Prescribed Dams in Great Lakes area; summary of information about each storage.

Duralie Coal Dams (three)	
Owner / Operator	Duralie Coal Pty Ltd
Description of Dam	<p>The Main Water Dam was constructed in 2003. The dam is earthfill, 18m in height, and has a capacity of 1100 ML. The spillway has a design flood capacity of 47.8 cubic metres per second, a full supply level of RL 73.0 m and crest level at RL 74.6 m AHD (1).</p> <p>Duralie Coal Auxiliary Dam No. 1 was constructed in 2009. The dam is earthfill, 20 m in height, and has a capacity of 500 ML. It has a design flood capacity of 20.7 cubic metres per second, a full supply level of RL 99.5 m AHD and crest level of RL 100.5 m AHD (1).</p> <p>Duralie Coal Auxiliary Dam No. 2. The dam is earthfill, 30m in height, and has a capacity of 2700 ML. It has a design flood capacity of 16.0 cubic metres per second, a full supply level of RL 98.5 m AHD and crest level of RL 100.0 m AHD (1).</p> <p>The purpose is to provide water supply storage and storm runoff management for ongoing mining operations.</p>
Location	They are located upstream (north) of Stroud Road between Karuah River and Mammy Johnsons River, on an unnamed tributary within the lower catchment of Coal Shaft Creek, which flows into Mammy Johnsons River.
Communities Downstream	Stroud Road
Monitoring System	Duralie Mine maintains several automatic water monitoring stations.
Warning System	White, Amber and Red alerts are issued for this dam in accordance with the Dam Safety Emergency Plan
Other	No further details are currently available

1.4 WEATHER SYSTEMS AND FLOODING

- a. Flooding in the Great Lakes area can occur at any time of year, but more floods have been recorded in the January-June months than between July and December. Rain along the coastal fringe is distributed more regularly across the seasons than is the case in the upland areas where the summer-autumn concentration is slightly more clear. The highest annual rainfalls occur over the higher (western) areas, demonstrating the orographic triggering effect of the upland country (1).
- b. Two flood-producing weather mechanisms are responsible for most of the serious flooding which can occur within the area. These are:

- i. East coast low-pressure systems: When these depressions are deep and stationary, a cool, moist, south-easterly airstream produces heavy rain over the coast and orographic enhancement causes even heavier rain over the hilly country. This mechanism is especially prevalent in the autumn and winter months. A recent example was in March, 1995, when some low-level flooding occurred in the area. East coast low-pressure systems frequently migrate in a northerly direction parallel to the coast (1).
- ii. Ex-tropical cyclonic systems originating in the Coral Sea during the summer and early autumn months and moving southwards. Occasionally, such systems move far enough south to bring heavy rain to the Great Lakes area as occurred in February, 1990 with ex-tropical cyclone Nancy (1).
- c. During summer, high-intensity but short-duration convective thunderstorms cause intense rain for very short periods over limited areas. 'Flash' flooding can result on minor creeks or from the surcharging of artificial drainage systems in built-up areas. Such storms do not last long enough or cover sufficiently large areas to cause significant rises on the major rivers or on the coastal lakes, however (1).
- d. Systems of both types can cause heavy seas or elevated ocean levels and heavy rain over the area at the same time. Riverine flooding often occurs, therefore, when the passage of water to the ocean is retarded and this exacerbates flooding on those lakes which have outlets to the sea. Neither of these types of weather system occurs frequently, however, and years can pass without severe floods occurring within the area (1).

1.5 CHARACTERISTICS OF FLOODING

- a. The Great Lakes has a variety of flooding characteristics. Broadly they can be divided into upper catchment characteristics and lower catchment and lakes characteristics.
- b. The upper parts of the catchments are dominated by flash flooding of creeks and streams and short duration flooding of the larger rivers. Flooding generally occurs with little warning and rapidly peaks and falls. Depending on the catchment and rainfall received flooding lasts generally for a few hours and no longer than 24 hours (1).
- c. In the lower parts of the catchments and the lakes, oceanic processes are also important. High tide and storm surge can prevent flood waters escaping and lengthen the period of flooding. High ocean levels can also inundate coastal areas. At Tea Gardens-Hawks Nest, high water levels on Port Stephens caused by coastal processes are the dominant flooding source except in extreme events where the Myall River can increase the flood level by up to 0.5 metres. At Forster-Tuncurry flooding on the Wallis lakes caused by river runoff is dominant (1).

- d. Some allowance needs to be made for the effect of wind on top of the rainfall generated water levels. No calculation of wind setup on Wallis Lake has been made, though it is likely to be small compared to the effects of wave run-up (1).
- e. Waves can also run up onto land. This is more likely where shorelines are gently sloping, and where trees and other obstructions are absent (1).
- f. The Wang Wauk, Coolongolook and Wallingat Rivers drain a large, mostly forested area to the west of Wallis Lake and east of the Kyle and Meyers Ranges. All are tidal in their lower reaches, which are flat and swampy and which constitute large flood storage areas experiencing frequent inundation (1).
- g. Behind the coastal dunes of the area is a series of lakes, most of them subject to tidal influence. Floods on these lakes are usually slow to rise, but variations in water level of 1.0-1.5 metres can occur over a period of a few days when heavy rain occurs (1).
- h. Flood behaviour on Wallis Lake (Forster/Tuncurry) is complex, being governed by both discharges into it from the rivers and by the prevailing ocean levels. The latter can by themselves cause lake levels to rise by a combination of tidal effects, storm surge and wave set-up. Wave set up is estimated to be between 2.4 metres (for 5% AEP ocean conditions) to 4.8 metres (for extreme ocean conditions) in the areas around the Sailing Club, Elim and Tiona with lesser heights (0.5-1 metre less) around Coomba, Elizabeth Beach, Tuncurry Point Road and Forster Keys (4) (1).
- i. As Port Stephens is large and moderately deep (less than 10 metres), significant local wind waves can be generated to inundate the foreshore area (5) (1).
- j. Smiths Lake is a much smaller lake which is landlocked by sandbar development. Rises in the lake from local creek discharges usually cause the sandbar to be breached, or is breached mechanically by council allowing flood waters to escape to the ocean (1).
- k. The bulk of the inundated areas along the Karuah River (either floodway or flood storage) are classed as “high hazard”. Areas of “low” and “medium hazard” are quite small in the total inundated area (6) (1).

1.6 FLOOD HISTORY

- a. The most serious floods on the **Karuah River** occurred in 1913, 1927, 1946, 1956, 1963, 1971, 1978, 1985 1990, 2001 and 2007 with peak levels at Booral between 11.78 metres AHD and 8.92 metres AHD. Detailed information on these events is lacking, however, as is the case for floods on other river systems in the area (6) (1).
- b. Prior to the installation of gauges, flooding at **Forster Tuncurry** (Wallis Lake) has previously occurred in 1927, 1929, 1943, 1949, 1955, 1956, 1957, 1963, 1974, 1976, 1977 and 1983 (7). The flood of record was in 1927 and an approximate peak of 2.25 metres AHD recorded at Point Road Tuncurry. This was attributed to some form of

- blockage such as a sand bar at the entrance as well as wave set up and storm surge. The highest level since automatic recorders were installed was 1.17 metres at Bells Island, and for tidal conditions 1.0 metre at Forster and 1.34 metres at Port Stephens (7) (1).
- c. Flooding at **Bulahdelah** (Myall River) has come within 0.1-0.5 metres of the 1% AEP flood on 3 noted occasions in 1897, 1927 and 1947. The most severe flood recorded on the Myall River at Bulahdelah was in 1897 when more than a third of the present town area was inundated. This flood is taken as approximately the 1% AEP flood event at Bulahdelah (a level of 5.5 metres). Another serious flood occurred in 1927 (1). Minor flooding occurred on ANZAC Day in 2008, June 2007, March 2013 and April 2015, from low pressure systems off the NSW coast. The ANZAC day event saw 155 millimetres fall in one day, with a total of 218 millimetres falling over five days at Nabiac and 206 millimetres at Bulahdelah, and 189 millimetres at Tuncurry over five days. This was mainly nuisance flooding, closing roads and bridges and inundating yards. At least one business in Bulahdelah did experience over floor flooding where the flood peaked at 3.83 metres (4pm 8 June), 11.01 metres at Nabiac (1pm 8 June), 0.89 metres at Tuncurry and 0.62 metres at Tiona (2am-3am on 9 June) (1). In 2013, approximately five dwellings were flooded Alexandra Street and Jackson Street when the Myall River reach 3.71-3.75 metres at Bulahdelah (8).
 - d. Flooding at **Nabiac** (Wallamba River) has not occurred for a number of years. Significant local floods in records at Nabiac occurred in 1927, 1929, 1947, 1957, 1978 and 1983. The flood of 1927 on the reach from Nabiac to Failford reached levels higher than would be expected in the 1% AEP event; that is, there is a less than 1% chance each year of a flood of a severity of that of 1927 occurring there. Floods also occurred in February 2002 (with a rainfall ARI of approximately 100 years 21.6 millimetres an hour over 9 hours) (3) and in June 2007. These floods were localised floods with above floor flooding experienced due to tributaries to the Wallamba River, such as Town Creek, rather than from flooding from the Wallamba River. The influence of the Wallamba River was not significant as the flood levels in the river were lower than those in town and the peak of river flooding happened well after the peak flood levels in the township (8) (1).
 - e. **Mill and Lamans Creeks** have experienced several significant floods in the past century, although no regular flood records exist. Some recorded flood levels exist for Mill and/or Lamans Creek from February 1956, October 1985, June 2007, and April 2015 (7) (1). **Stroud** experienced one of its worst flash flood events on record on the 21 April 2015. With the estimated 1% AEP being around 0.9 metres at the showground, this event was rarer with a depth of 1.8 metres and potentially rare than 0.2% AEP (9). In this event, a minor flood warning was provided by the Bureau for the adjacent Myall River catchment at Bulahdelah, with 138 millimetres of rain falling in two hours at Crawford River, and anecdotal reports of 180 millimetres in six

hours around Stroud. During this event, the showground was inundated with over a metre of fast flowing floodwater resulting in a number of flood rescues and causing extensive damage to the showground’s infrastructure, including the grandstand. Floodwater rose 0.3 metres in a few seconds outside one caravan on the showground. At least 13 residential properties opposite the Showground in Cowper Street (Bucketts Way) and Britton Court Road were also impacted by over floor flooding and an 1860’s homestead opposite the showground where a family took refuge on the verandah roof (9), with one home requiring demolition. During the event the aged care facility known as Stroud Community Lodge (with 31 residential care units and three self care units) became isolated, and evacuated residents to higher ground as Mill Creek and neighbouring Mill Brook rose quickly. Floodwaters extend to the external grounds of the facility but did not enter the building. In the 2015 event both the Lamans Creek Bridge at Berkley Street (Bucketts Way) and Mill Creek Bridge at Cowper Street (Bucketts Way) were inundated, isolating the centre of Stroud (9).

- f. Little data is available on flooding on Wang Wauk, Coolongolook and Wallingat Rivers, but the flood of record was in 1927. Recent, lower-level flooding occurred in 1978 and 1983 (1).

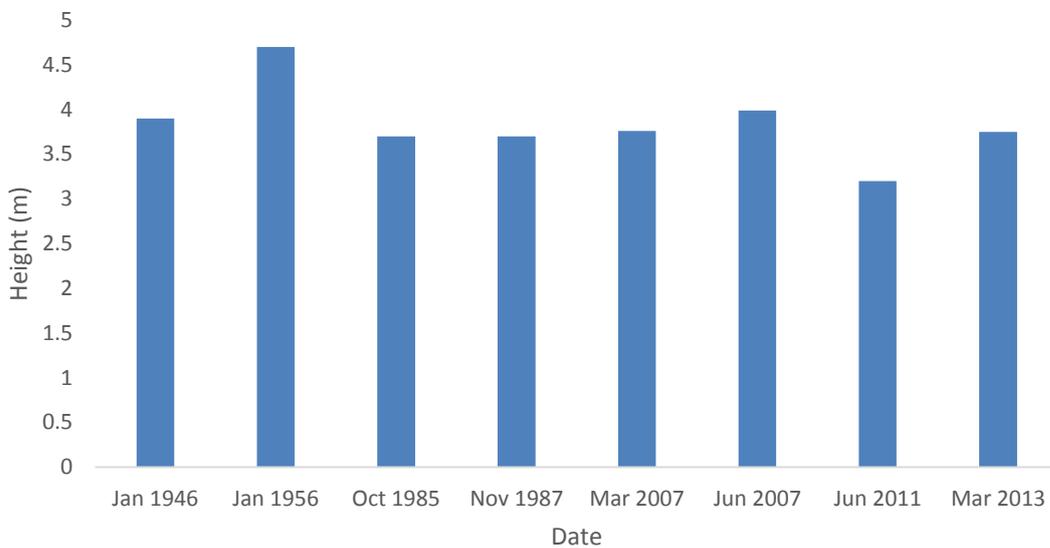


Figure 1: Flood History of floods above minor level (3.0m) at Bulahdelah (AWRC#209460) (1)

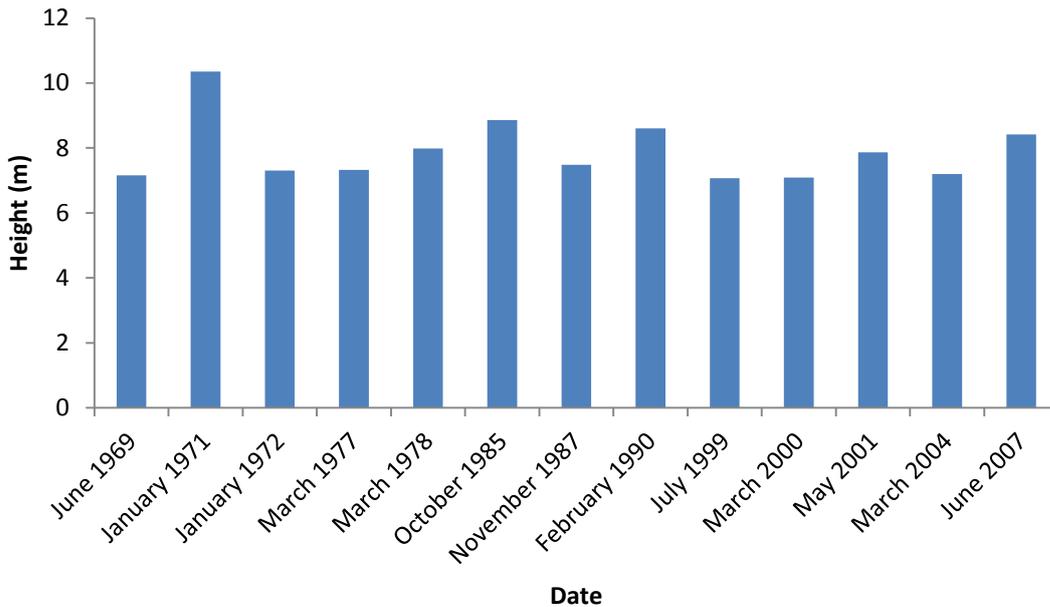


Figure 2: Flood History of floods above 7.0m at Booral (Karuah River) AWRC#209003

1.7 FLOOD MITIGATION SYSTEMS

- a. No flood mitigation systems have been identified.

1.8 EXTREME FLOODING

- a. While the Great Lakes area has experienced some flooding in recent years, it is a long time since genuinely severe flooding occurred. The worst floods recorded in living memory should not be regarded as the most severe which can occur. Worse floods than have been seen by present residents are possible (1).
- b. Such floods will be rare, but they may reach considerably greater heights than have previously been experienced. In addition, they are likely to be both faster to rise and more dangerous in terms of depth and velocity than previous events (1).
- c. Floods in Wallis Lake may occur from 168 millimetres in 24 hours (for a 20% AEP flood around 1.5 metres), with 277 millimetres in 24 hours equivalent to a 1% AEP flood (2.17 metres) (1).
- d. The design flood levels for locations in the catchment are summarised in Table 3 (1).

Table 2: Estimated design heights at various Gauges (10), (11), (8), (12), (6) (1) (14)

Location	Minor	Moderate	Major	5% AEP	1% AEP	Extreme
Tea Gardens (209480)*	-	-	-	1.34-1.43 m AHD	1.40-1.53 m AHD	2.24 m AHD
Hawks Nest*	-	-	-	1.5 m AHD	1.7 m AHD	2.0 m AHD
Mallabula Gauge*	-	-	-	1.70 m AHD	1.80 m AHD	1.83 m AHD
Bombah Point (209475)	-	-	-	1.95 m	2.38 m	4.85 m
Tuncurry (209401)	0.9 m	1.5 m	1.9 m	1.4 m	2.0 m	4.4 m
Wallis Lake Coast‡	-	-	-	2.2 m	2.6 m	2.6 m
Wallis Lake‡ (209906)	-	-	-	1.54 m	1.96 m	4.36 m
Nabiac Street Woosters Creek	2.8 m	4.2 m	5.6 m	-	5.6 m	-
Nabiac Town Creek	3.5 m	5.5 m	3.5 m	-	7.5 m	-
Wallamba River (209404)	6.5 m	9.5 m	12.5 m	-	-	-
Lee Street Myall River	-	-	-	5.2 m	6.1 m	7.9 m
Bulahdelah Bridge Gauge Myall River (209460)	3.0 m	-	-	4.8 m	5.5 m	6.8 m
Tarbucket Bay (Smiths Lake)	-	-	-	2.3 m (rainfall induced)	2.6 m (ocean induced)	3.5 m AHD (rainfall induced)
Booral Karuah River (209003)	-	-	-	10.45 m AHD	11.48 m AHD	18.08 m AHD
Stroud Road (209008)	-	-	-	39.78 m AHD	41.01 m AHD	45.25 m AHD
Stroud (Mill Creek confluence)	-	-	-	24.61 m AHD	25.67 m AHD	32.05 m AHD
Allworth	-	-	-	3.7 m AHD	4.59 m AHD	9.59 m AHD
Karuah	-	-	-	1.76 m AHD	1.91 m AHD	1.98 m AHD
Washpool RTA Bridge	-	-	-	37.29 m AHD	38.26 m AHD	42.46 m AHD

*From elevated ocean levels noting that readings on the Mallabula Gauge are given as m AHD +0.9m, so the 5% AEP level as read on the gauge would be 2.6m. ‡ plus 0.1 m for wind and wave activity on the lake.

1.9 COASTAL EROSION

- a. The following locations have property at risk of coastal erosion.
 - i. Winda Woppa - Jimmys Beach is identified by OEH as one of 15 coastal erosion hot spots in NSW (13) (1), shown on Map 1 The risk is expanded upon in section 2.9.
 - ii. Blueys and Boomerang Beaches are located 18 kilometres south of Forster extending from Sugarloaf Point in the south to Cape Hawke in the north. Up to 10 dwellings along the seaward side of Boomerang Drive south of Carramatta Close may be at risk of coastal erosion and shoreline recession. As many as 16 properties at Blueys Beach could potentially be inundated due to wave action, with the likely duration of less than 2 hours (14).

2 EFFECTS ON THE COMMUNITY

2.1 COMMUNITY PROFILE

Table 7: Census of Housing and Population data (2011) (15)

Census Description	Great Lakes (A)	Bulahdelah	Coomba Park	Forster-Tuncurry	Green Point	Hawks Nest
Total Persons	34,430	1,519	915	19,233	598	1,211
Aged 0-4 yrs	1,620	68	46	829	43	63
Aged 5-14 yrs	3,673	184	101	1,878	66	93
Aged 65 + yrs	10,547	348	236	6,684	126	436
Of Indigenous Origin	1,325	30	25	751	15	49
Who do not speak English well	53	3	0	15	0	3
Have a need for assistance (profound/severe disability)	2,633	116	78	1,605	41	94
Living alone (Total)	4,345	166	106	2,786	50	184
Living alone (Aged 65+)	2,420	80	41	1,679	19	85
Residing in caravans, cabins or houseboats or improvised dwellings	581	24	6	415	6	21
Occupied Private Dwellings (Households)	14,306	589	377	8,308	225	542
No Motor Vehicle	1,010	34	14	781	4	44
Caravan, cabin, houseboat or improvised dwelling	367	13	0	264	0	10
Rented via State or Housing Authority	225	3	0	205	0	0
Rented via Housing Co-Op or Community Church Group	127	6	0	101	0	0
No Internet Connection	4,434	193	94	2,857	47	179
Unoccupied Private Dwellings	5,674	65	235	2,300	58	965
Average persons per occup dwelling	2.2	2.3	2.1	2.0	1.3	1.6
Average vehicles per occup dwelling	1.5	1.7	1.7	1.4	1.7	1.5

Census Description	Nabiac	North Arm Cove	Pacific Palms-Blueys Beach	Pindimar	Smiths Lake	Stroud	Tea Gardens
Total Persons	1,513	713	665	230	1,534	1,022	2,345
Aged 0-4 yrs	99	33	27	4	105	66	86
Aged 5-14 yrs	244	110	86	19	200	143	203
Aged 65 + yrs	273	208	139	73	289	222	982
Of Indigenous Origin	87	22	14	3	55	34	80
Who do not speak English well	0	3	0	0	6	0	0
Have a need for assistance (profound/severe disability)	87	41	39	16	81	93	156
Living alone (Total)	108	66	70	39	169	90	246
Living alone (Aged 65+)	56	27	23	16	65	52	153
Residing in caravans, cabins or houseboats or improvised dwellings	27	5	6	0	9	0	3
Occupied Private Dwellings (Households)	544	277	250	104	597	376	1,016
No Motor Vehicle	24	15	14	9	19	10	44
Caravan, cabin, houseboat or improvised dwelling	9	4	3	0	10	0	4
Rented via State or Housing Authority	3	0	0	0	0	0	3
Rented via Housing Co-Op or Community Church Group	0	3	0	0	0	0	8
No Internet Connection	129	62	54	35	130	108	239
Unoccupied Private Dwellings	79	157	599	67	436	87	284
Average persons per occup dwelling	2.7	2.2	2.3	2.1	2.4	2.5	2.2
Average vehicles per occup dwelling	1.9	1.7	1.5	1.7	1.6	2.0	1.5

SPECIFIC RISK AREAS - FLOOD

Karuah River Valley

- a. Flooding can affect large parts of the Great Lakes area, disrupting farming, closing roads and, especially in severe events, inundating parts of villages and towns. Farmers in various parts of the area have lost pumps, other machinery and livestock, and machinery at the gravel quarries near Allworth has been damaged by flood waters. Evacuations have not been required from rural areas in recent times, and resupply has also not been necessary though both may be required in severe events. Some farm dwellings in lower-lying areas may be isolated for short periods when flood waters which have backed up from the lakes or Port Stephens are slow to drain (1).
- b. In the upland and forested areas, there is little developed land in flood prone areas and the effects of flooding there are limited. Urban areas are generally little affected until severe flooding occurs. Several caravan parks within the area can be affected during flood periods with vans and tents needing to be moved from low to high ground. Warning time for these tasks is usually sufficient and the relocation usually occurs within individual caravan parks (1).

2.2 BULAHDELAH

2.2.1 Community Overview

- a. The township of Bulahdelah is approximately 70 kilometres north of Newcastle where the Pacific Highway crosses the Myall River at its confluence with the Crawford River (1).
- b. It has a population of 1519, with 348 persons aged over 65. There is an average of 2.3 persons and 1.7 vehicles per dwelling (15).
- c. There are approximately 30 persons of indigenous origin. There are approximately three persons who do not speak English well (15).

2.2.2 Characteristics of flooding

- a. Bulahdelah is susceptible to flooding from the Myall River and from the open drain running through town.
- b. Flooding generally occurs with little warning and rapidly peaks and falls. Depending on the catchment and rainfall received flooding lasts generally for a few hours to 24 hours.

2.2.3 Flood Behaviour

- a. The Myall River and the Crawford River have its confluence at Bulahdelah.

- b. In an extreme flood some low points could be inundated by up to 5 metres of fast flowing water making these areas extremely dangerous (1).

2.2.4 Classification of Floodplain

- a. Rising Road Access (1).

2.2.5 Inundation

- a. Bulahdelah utilises the Bulahdelah gauge (209460) (1).
- b. Even in relatively minor floods (3.5 metres) some low points in the town can experience flooding and buildings can be inundated. These low points would be flooded first and include (1):
 - i. Park land adjacent to the bridge, which often hosts campers;
 - ii. Stroud Street between Jackson and Meade Streets;
 - iii. Jackson Street between Prince and Alexander Streets; and
 - iv. Stuart Street between Prince and Alexander Streets.
- c. Many of the streets in Bulahdelah are flooded as a consequence of the open drain and therefore, the heights on the gauge varies.
- d. Streets in Bulahdelah that have properties in them that could be flooded above floor level include as measured at the Bulahdelah Bridge Gauge (1).
 - i. By a flood level of 3.71 metres approximately six houses located on Jackson, Short and Alexandra Streets flooded above floor (18).
 - ii. By a flood level of 4.8 metres: 21 properties in Blanch, Prince (south of Stuart Street), Alexandria (south of Richmond Street) and Jackson Streets as well as Crawford and Stroud Streets between Jackson and Meade Streets (1).
 - iii. By a flood level of 5.2 metres: A total of 31 properties as above plus River Street (1).
 - iv. By a flood level of 5.5 metres (1% AEP and 1897 flood): A total of 52 buildings (45 residences and 7 non-residential buildings) as above plus Crawford and Stroud Streets between Meade and Stuart Streets. Prince Street (south of Richmond Street) (16) (1).
 - v. By the extreme flood at a level of 6.8 metres, a total of 109 houses and 11 non residential buildings as above plus Myall, Edgar, Prince and Alexandria Streets south of Lee Street (1).

Table 3: Estimated number of properties inundated above floor level and over ground in Bulahdelah related to the Bulahdelah gauge (16)

Bulahdelah Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
4.8m (5% AEP)	n/a	21 residential	n/a
5.2m (2% AEP)	n/a	31 residential	n/a
5.5m (1% AEP)	n/a	45 residential 7 non-residential	n/a
6.8m	n/a	109 residential 11 non-residential	n/a

2.2.6 Isolation

- a. The difficulties posed by water in these low points during an evacuation should be slight as alternative routes to the evacuation centre exist (1).
- b. Two raised houses on Stroud Street can be surrounded by floods around 3.7 metres, and up to the verandah (19).
- c. The following intersections flood in relatively small events (around 3.5 metres on the Bulahdelah gauge):
 - i. Alexandra and Jackson Streets
 - ii. Blanch and Stroud Streets

2.2.7 Flood Mitigation Systems

- a. No flood mitigation systems have been identified (1).

2.2.8 Dams

- a. No consequences from dam failure have been identified (1).

2.2.9 At Risk Facilities

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

2.2.10 Other Considerations

- a. There are two peak seasons with potential for a 10% population increase associated with tourism:
 - i. Christmas holidays December –January.
 - ii. Easter long weekend (1).

2.3 FORSTER-TUNCURRY

2.3.1 Community Overview

- a. Forster and Tuncurry (combined population 19,233), situated on either side of the entrance to Wallis Lake, are rapidly-growing towns which have experienced flooding. High proportions of the populations of these towns are elderly (6684) or have need for assistance (1605). There is an average of 2 persons and 1.4 vehicles per dwelling. A significant proportion (2857) does not have access to internet, and 781 do not have access to a motor vehicle (15; 1).
- b. There are approximately 750 persons of indigenous origin. There are approximately 15 persons who do not speak English well (15) (1).

2.3.2 Characteristics of Flooding

- a. This area is susceptible to flash flooding, high lake levels and storm surge.
- b. Flooding generally occurs with little warning and rapidly peaks and falls. Depending on the catchment and rainfall received flooding lasts generally for a few hours to 24 hours.
- c. Rates of rise are estimated to be up to 0.2m/h for a PMF (20).

2.3.3 Flood Behaviour

- a. In most areas the depth of inundation would be relatively shallow. Some areas could experience deep fast flowing water. They include (1):
 - i. Low lying areas near Beach Street and Wharf Street, Tuncurry.
 - ii. Low lying areas across the Point Road Peninsula, Tuncurry
- b. The normal water level in Wallis Lake is around 0.1 metres AHD.
- c. Oceanic processes are also important. High tide and storm surge can prevent flood waters escaping and lengthen the period of flooding. High ocean levels and waves can also inundate coastal areas. This is more likely where shorelines are gently sloping, and where trees and other obstructions are absent. At **Forster-Tuncurry** flooding on the Wallis lakes caused by river runoff is dominant (1). Some allowance needs to be made for the effect of wind on top of the rainfall generated water levels (1).
- d. Wave set up is estimated to be between 2.4 metres (for 5% AEP ocean conditions) to 4.8 metres (for extreme ocean conditions) in the areas around the Sailing Club, Elim and Tiona with lesser heights (0.5-1 metre less) around Coomba, Elizabeth Beach, Tuncurry Point Road and Forster Keys (4) (1).
- e. High hazard flood areas are the lower areas of Beach Street and Wharf Street, and Point Road and Bay Street Tuncurry. Velocities are in the order of 2.28-2.34 metres a

second at the Foster Tuncurry Bridge around floods in the order of 5.5 metres (11) (1).

2.3.4 Classification of Floodplain

- a. Rising road access (1).
- b. Forster Keys and Point Road are Low Flood Islands, becoming isolated between 0.68 and 1.5 metres.

2.3.5 Inundation

- a. This area uses the Tuncurry gauge for predictions.
- b. Residential and other property in low-lying areas adjacent to the lake and Cape Hawke Harbour can be threatened by high lake and sea levels (between 0.92 metres-0.96 metres), though these are not common occurrences (around Bay Street, Point Road, Recreation Lane, Taree Street and Big4). Very occasionally, the aerodrome on Wallis Island could become unusable because of flooding (1).
- c. A large number of dwellings would be inundated from 1.4 metres flood including Coomba Park, Charlotte Bay, Whoota, Yarric, Tiona, Pacific Palms, Elizabeth Beach, Elim, Wallis Island, Booti Booti, Green Point, Forster, and to a greater extent Forster Keys, Point Road Tuncurry and Tuncurry (Table 4) (11) (1). The numbers are even larger when considering sea level rise. Just over half of the properties affected in the 1% AEP flood are high hazard. The Wallis Lake Floodplain Risk Management Study and Plan spatially identifies individual properties affected in each design event (figure 6a-6c) (17).

Table 4: Estimated number of properties inundated above floor level and over ground in Forster-Tuncurry related to a design flood at the Tuncurry gauge (17)

Tuncurry Gauge design height (AEP)	Total No. buildings with over floor flooding								Total No. properties with over-ground flooding
	Caravan Parks	Coomba Park – Booti Booti	Forster	Forster Keys	Green Point	Tuncurry	Point Road Tuncurry	Total	
20% (1.4m)	1	1	0	7	0	9	26	44	346
10% (1.5m)	11	2	0	11	0	19	32	75	436
5% (1.5m)	15	3	0	14	0	29	33	94	452
2% (1.8m)	17	5	3	37	4	128	43	237	998
1% AEP (2.0 m)	30	11	8	86	4	224	54	417	1400
0.5%	42	17	14	270	10	329	76	758	1712
PMF	135	76	742	734	28	1202	80	2997	3021

- d. Areas likely to be flooded within 2 metres include (11) (1):
- i. In Tuncurry: Chapmans Road (west end), the rear of properties on Tulloch Road, Bahama Place, Montego Place, Mayers Road (west of Parkway Drive), Parkway Village, Eden Place, South Street (west end), the Twin Dolphin Caravan Park, Mirage Drive, Wallamba Close, Bonveti Close, Lachlan Avenue, Huntley Close, Bramble Parade, Bent Street, Peel Street, Manning Lane, Parkes Street, Wharf Street, Little Street, Lake Street, Beach Street, Milliken Street, Wallis Street (at Avery's Lane), Rockpool Road, Point Road, Coral Avenue, Palm Street, Recreation Lane, Taree Street, the TAFE, Rebecca Jane Close, Annette Place, Susella Crescent, Anne Marie Place, Regency Circuit, Windsor Place, Rest Point Parade, Sunset Place, Hibiscus Place, Jonnel Place, Harbour View Place, Mount View Parade, Guy Place, Palmway Crescent, Bay Street and Baird Street.
 - ii. In Forster: Areas on the lake side of Little Street, Townsend Street, Helen Street, Middle Street, Smugglers Cove Caravan Park, The Lakes Way, Goldens Road, Hind Avenue, Aurum Place, The Southern Parkway, parts of the Golden Palms Retirement Village and the Forster High School. All areas west of a line drawn along The Lakes Way, Pindari Avenue and Pipers Bay Road, including Forster Keys are within flooding reaching 2 metres at the Tuncurry gauge (1).

2.3.6 Isolation

- a. Both Forster Tuncurry may become isolated due to flash flooding causing road closures. The northern side of the Lakes Way remained closed for some 5 hours during the 2013 flood event where the Southern end was closed for a short period due to overland flooding of low lying roads at Cape Hawke (1).
- b. Point Road, Tuncurry may begin to become flooded from 0.68 metres (as occurred in 2013) (1).
- c. Evacuations may also be difficult from areas off Taree Street, due to flood extent, distance to flood free land and the single access point for this area.
- d. Forster Keys becomes isolated when King George Parade cuts between a minor and moderate flood (0.9 and 1.5 metres), flooding dwellings in a 2.2 metre flood (12).

2.3.7 Flood Mitigation Systems

- a. No flood mitigation systems have been identified (1).

2.3.8 Dams

- a. No consequences from dam failure have been identified (1).

2.3.9 At Risk Facilities

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

2.3.10 Other Considerations

- a. There are two peak seasons with potential for a 10% population increase associated with tourism:
 - i. Christmas holidays December –January.
 - ii. Easter long weekend.
- b. In addition to this, Lakeside Festival is usually held in October-November, which brings an additional transient population (1).
- c. This area is susceptible to coastal inundation.

2.4 HAWKS NEST, TEA GARDENS AND PINDIMAR

2.4.1 Community Overview

- a. Hawks Nest, Tea Gardens and Pindimar are located on Port Stephens (1).
- b. Hawks Nest has a population of 1123, with a significant aged population (38%) (15).
- c. Tea Gardens has a population of 2,345, with over 40% being over 65 (15).
- d. Pindimar has a population of 230, with over 29% being over 65 (15).
- e. Hawks Nest has an indigenous population of 44, Tea Gardens has 86 and Pindimar has zero (15).

2.4.2 Characteristics of Flooding

- a. Some parts of Tea Gardens, in particular the low point on Marine Parade and the Public Reserve at Budgeree Street are susceptible to flash flooding, which occurred during June 2007 (1).
- b. Flooding generally occurs with little warning and rapidly peaks and falls. Depending on the catchment and rainfall received flooding lasts generally for a few hours to 24 hours.
- c. Upstream of Monkey Jacket is rainfall dominant, downstream is ocean flooding dominant, including Tea Gardens, Hawks Nest and Pindimar (19).
- d. Elevated water levels occur in Port Stephens mainly as a result of ocean influences - tides and storm surges, wind and wave activity within the estuary, rainfall from the local catchment – Karuah River and Myall Lakes (this factor provides the least influence on levels). The most significant factor affecting the peak water levels within the estuary is the direction of the local wind setup. This factor can increase water levels by up to 0.3 metres (5).

2.4.3 Flood Behaviour

- a. Oceanic processes are also important. High tide and storm surge can prevent flood waters escaping and lengthen the period of flooding. High ocean levels and waves can also inundate coastal areas. This is more likely where shorelines are gently sloping, and where trees and other obstructions are absent. At **Tea Gardens-Hawks Nest**, high water levels on Port Stephens caused by coastal processes are the dominant flooding source except in extreme events where the Myall River can increase the flood level by up to 0.5 metres. At Forster-Tuncurry flooding on the Wallis lakes caused by river runoff is dominant (1).
- b. Velocities in Tilligerry Creek are between 0.4 and 1.5 metres a second from smaller floods to the PMF (17).

2.4.4 Classification of Floodplain

- a. Tea Gardens has rising road access.
- b. Hawks Nest becomes a low flood island when access is cut along The Anchorage (in a severe event) (1).

2.4.5 Inundation

- a. This areas uses the Hawks Nest gauge.
- b. Waves have been known to break across the sand dune at Winda Woppa and this could cause water to enter houses (1).
- c. Hawks Nest and Tea Gardens, on the lower Myall River, could have numerous residential blocks at risk in a severe flood associated with elevated ocean levels. Again, many of the residents are elderly. Large parts of both towns are below 2 metres AHD, but their sites are undulating and there are areas of greater elevation. Many buildings are on mounds or are of two or three storeys (2).
- d. Other areas to the south are also at risk of flooding. A breakdown of properties inundated in various flood events for the Northern shore of Port Stephens is provided in Table 9 (1).

Table 5: A breakdown of properties inundated in various flood events for the Northern shore of Port Stephens. Figures given are for over floor flooding with figures in brackets (*) are for yard flooding (10) (1).

Location	5% AEP (1.5m at Hawks Nest)		1% AEP (1.7m at Hawks Nest)		Extreme (2.0m at Hawks Nest)	
	Stillwater	Wave Run-up	Stillwater	Wave Run-up	Stillwater	Wave Run-up
Carrington	0	0(4)	0	3(6)	0	3(6)
Baromee Point	0	1(2)	0	1(2)	0	1(2)
Baromee Hill	1	6(9)	2	7(9)	2	7(10)
Bundabah	2	2(2)	2	2(2)	2	2(2)
Lower Pindimar	1	20(33)	3	22(33)	3	31(33)
Pindimar	4	9(18)	4	9(18)	4	13(24)
Limestone	1	1(2)	1	1(4)	1	1(4)
Tea Gardens	7	7(30)	18	18(39)	36	39(51)
Hawks Nest	0	0(8)	1	2(8)	8	8(9)
Jimmy's Beach West	3	3(16)	7	7(23)	16	16(36)
TOTAL	19	49(124)	38	78(144)	72	121(177)

2.4.6 Isolation

- a. Access between the towns could be cut in a very severe event, with Tea Gardens isolated when The Anchorage is cut in an extreme event (10). Pindimar can become isolated due to Pindimar Road and Myall Way flooding from overland and flash flooding.

2.4.7 Flood Mitigation Systems

- a. No flood mitigation systems have been identified (1).

2.4.8 Dams

- a. No consequences from dam failure have been identified (1).

2.4.9 At Risk Facilities

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

2.4.10 Other Considerations

- a. There are two peak seasons with potential for a 10% population increase associated with tourism:
 - i. Christmas holidays December –January.
 - ii. Easter long weekend.
- b. In addition to this, Myall River Festival is usually held in October, which brings an additional transient population (1).
- c. This area is subject to coastal erosion and inundation. Refer to section 2.10 on details of coastal erosion and 2.9 for further details on coastal inundation.

2.5 NABIAC

2.5.1 Community Overview

- a. Nabiac is located on the northern bank of Nabiac River where the Pacific Highway crosses the River (1).
- b. It has a population of 1508, with approximately 18% of the population aged 65 or older (15) and an indigenous population of 90 (15).

2.5.2 Characteristics of Flooding

- a. Nabiac can be flooded from overland, backwater and mainstream flooding from the Wallamba River and local flooding from Town Creek, which runs through the town and joins the Wallamba River, Pipeclay Creek and Woosters Creek (1). No gauges exist on the smaller creeks.
- b. Flooding generally occurs with little warning and rapidly peaks and falls. Depending on the catchment and rainfall received flooding lasts generally for a few hours to 24 hours.
- c. There is typically 5 hours for Nabiac and 6 hours for Failford and Minimbah between the occurrence of the maximum rainfall intensity in the upstream catchment and the peak flood level at Nabiac due to catchment runoff. However shorter times can occur due to shorter storms producing water levels of a similar magnitude, more severe storm intensities will result in water levels approaching critical levels (8).

2.5.3 Flood Behaviour

- a. Pipeclay Creek conveys a significant volume of the flow, with a peak discharge of 575 cubic metres a second in 5.8 metre flood. The flooding associated with this flow is contained within rural properties, and does not affect any of the houses in this area. There are a number of locations where the flows of Pipeclay Creek combine with those of Woosters Creek and its tributaries (3).
- b. Local flooding on the tributaries can occur without rises on the main river. Nabiac is known to have experienced substantial inundation in 1927, 1929 and 1947 (8).
- c. Flood depths may exceed 1 metre in properties and roads adjacent to the creek, even from the 5% AEP flood (5.0 metres) and up to 2.5 metres in an extreme flood in the channel. Velocities are generally 0.05-0.99 metres a second in properties, but exceed 2.0 metres a second in a PMF (3).
- d. The highest risk areas, in terms of risk to property and risk to life, are focused around Clarkson Street, around the crossings of Town Creek and Woosters Creek. Town Creek tends to be controlled by a set of pipe culverts near the Industrial area, which can cause a backwater to form along Nabiac Street and Clarkson Street (3).

- e. The areas around Hoskins Street generally experience issues with ponding (1).
- f. Additional flooding of Clarkson Street, between Town Creek and Woosters Creek, is caused by flows from a relatively small catchment near the Motorcycle Museum. This overland flow path causes flooding of Clarkson Street, as well as the properties which are located adjacent to this overland flow path (3).
- g. Woosters Creek does not generally create a risk to property, although there is some inundation of properties near Clarkson Street. Woosters Creek does, however, overtop Clarkson Street in a flood around 7.18 metres at the town creek gauge by with depths of around 0.15 metres and approximately 0.40 metres in a 1% AEP event (5.8 metres). This creates a potential hazard, and cuts off access for residents between Town Creek and Clarkson Street (3).

2.5.4 Classification of Floodplain

- a. A small area in town, including Hoskins Street, Farnell Street, Farnell Lane, Cowper Street and Stuart Street as well as the south east of the town adjacent to Wallamba River become a low flood islands in an extreme flood, with access cut as early as a 5% AEP (1; 18).
- b. The Clarkson Street and west of Nabic Street area become a high trapped perimeter areas (18).
- c. The areas along the Pacific Highway to the east of Woosters Creek and to the west of Town Creek have rising road access up to and including the PMF (18).

2.5.5 Inundation

- a. The Nabic gauge on the Wallamba River is available on the Bureau website (BoM 560048 or AWRC 209404), and has historically been referred to as the “Nabic Bakery” gauge. There are also gauges in Nabic on Town Creek and Woosters Creek, although the levels are not visible publically. The flood studies generally refer to levels at the town gauges rather than the Wallamba River gauge.
- b. Houses in Wharf, Byron, Donaldson, Martin and Stuart Streets and at the intersection of Nabic and Clarkson Streets can be affected in floods below the 1% AEP (8).
- c. Of particular concern is the Donaldson Street area which can be isolated prior to being flooded (1).
- d. In extreme floods much of the town west of Parkes Street and south of Cowper Street can be inundated in Nabic (77 buildings) (3).
- e. The numbers of properties are inundated over flood level in various design events are summarised in Table 12. Additional properties will be affected, with over 110 cadastral lots affected in a PMF (3).

- f. The Nabiac Showground on Nabiac Street and the area north of Clarkson Street and west of Hoskins Street remain flood free up to and including a PMF (18).

Table 6: Estimated number of properties inundated above floor level and over ground in Nabiac related to the Nabiac gauge (3).

Nabiac Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP (7.18m at Town Creek gauge)	n/a	1 residential 2 non-residential	12 residential 4 non-residential
10% AEP	n/a	2 residential 2 non-residential	20 residential 4 non-residential
2% AEP	0-1	5 residential 2 non-residential	29 residential 4 non-residential
1% AEP (7.65m at Town Creek gauge)	n/a	5 residential 2 non-residential	210 cadastral blocks (90 in high hazard)
0.2% AEP	n/a	6 residential 2 non-residential	34 residential 5 non-residential
Extreme	n/a	69 residential 9 non-residential	106 residential 9 non-residential

2.5.6 Isolation

- In floods approximating the magnitude of the 0.2% AEP a floodwaters can cross Nabiac Street and flow towards the Town Creek cutting the town in two (1).
- The town's main evacuation centre, the showground is a high flood island being isolated in an extreme flood (1).

2.5.7 Flood Mitigation Systems

- No flood mitigation systems have been identified (1).

2.5.8 Dams

- No consequences from dam failure have been identified (1).

2.5.9 At Risk Facilities

- The facilities that are at risk of flooding and/or isolation within the Great Lakes area including schools, child care centres, hospitals, aged and infirm, infrastructure and caravan parks are shown in Annex 2.

2.5.10 Other Considerations

- No other considerations have been noted.

2.6 SMITHS LAKE

2.6.1 Community Overview

- a. Smiths Lake is Located on the northern bank of Smiths Lake, close to the entrance. It has a population of around 1076, with an average of 2.4 people per household and 1.6 motor vehicles per dwelling. 22% of the population is aged 65 or older (15).
- b. Pacific Palms - Blueys Beach area and Sandbar-Bungwahl-Seal Rocks are located near-by, with respective populations of 665 and 254. There is an average of 2.4 and 2.2 people per household and 1.6 and 1.7 motor vehicles per dwelling respectively. 22% of the population is aged 65 or older (15)
- c. Smiths Lake has a total indigenous population of 33 and Bungwahl has eight. There are six persons who do not speak English well in Smiths Lake (15).

2.6.2 Characteristics of Flooding

- a. Smiths Lake has a relatively minor flood problem, provided that it is artificially opened. Council will normally do this when the lake level reaches 2.1 metres.
- b. Floods on the lakes are usually slow to rise, but variations in water level of 1.0-1.5 metres can occur over a period of a few days when heavy rain occurs (1).
- c. Rates of rise in the most extreme case were estimated to be around 0.3 metres an hour (23).

2.6.3 Flood Behaviour

- a. As Smiths Lake is an intermittently closed and open lagoon (ICOLL), rises in the lake from local creek discharges usually cause the sandbar to be breached, or is breached mechanically by council allowing flood waters to escape to the ocean (1).
- b. Up to the 0.2% AEP event water levels should not exceed 2.2 metres if Council opens the berm according to its policy (1). However if the berm is left to open naturally water levels can be higher. The PMF is 3.5 metres, even if artificial opening of the berm is undertaken due to the high inflow rates (2).

2.6.4 Classification of Floodplain

- a. Some areas close to the lake become low flood islands following the closure of The Lakes Way and Sandbar Road. The remaining is a high flood island with limited public facilities (2).

2.6.5 Inundation

- a. This area uses the Smiths Lake gauge.

- b. There are 30 commercial and industrial buildings that are at the level of 2.2 metres (1)(2) (20). This increases to one residential and 82 commercial or industrial in a PMF (3.5 metres) (Table 7).
- c. Smiths Lake has two caravan parks (the Sandbar and Bushland caravan parks) which can also be threatened by high lake levels. Vans and tents have had to be moved in the past (1). There is also UNSW Smiths Lake Field Study Centre that is at risk of floodin, which is a 56 bed dormitory.

Table 7: Estimated number of properties inundated above floor level and over ground in Smiths Lake related to the Smiths Lake (Tarbuck Bay) gauge (20)

Smiths Lake Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
2.2-3m	n/a	1 residential 2 non-residential	n/a
3.5m	n/a	1 residential 33 non-residential	n/a

2.6.6 Isolation

- a. Roads in low lying areas around the lake could also be inundated, isolating the community. The lowest road levels from Tarbuck to Smiths Lake along The Lakes Way is 2.5-3 metres AHD, with the majority above 3 metres AHD (2).
- b. Sandbar Road may get cut toward the southern distal end, as well as near The Lakes Way (2), and Dogwood Road near Horse Point. These closures result in access and egress being cur for residents and visitors to the Sandbar, Bushland Holiday Park, Golfcourse and residents of Dogwood Road near Horse Point.

2.6.7 Flood Mitigation Systems

- a. No flood mitigation systems have been identified.

2.6.8 Dams

- a. No consequences from dam failure have been identified, however it is possible that Pacific Palms Dam has local consequences on Boomerang Road (Charlotte Bay) to the North (1).

2.6.9 At Risk Facilities

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

2.6.10 Other Considerations

- a. There are two peak seasons with potential for a 10% population increase associated with tourism:

- i. Christmas holidays December –January.
- ii. Easter long weekend (1).

2.7 STROUD AND STROUD ROAD

2.7.1 Community Overview

- a. Stroud is located at the confluence of Mill Creek and Lamans Creek before flowing into Karuah River one kilometre further downstream. Bucketts Way is the main thoroughfare through town, crossing Mill Creek to the north and Lamans Creek to the south (1).
- b. Stroud has a population of approximately 1022 (15) and has undergone moderate growth over the last 10 years. Continued growth may result in expansion of existing urban areas and development of previously un-developed or rural land, some of which is likely to be on the fringes of the floodplain (12). The average people per household is 2.5, the average vehicles per dwelling is 2.0. 21% of the population is aged 65 or older, and 93 persons requiring assistance (15).
- c. Stroud Road is located on Bucketts Way upstream from Stroud just above the confluence of Karuah River and Mammy Johnsons River (1).
- d. Stroud Road has a population of 280, with an average number of 2.4 persons per dwelling. 18% of the population is aged 65 or older (15).
- e. Stroud and Stroud Road have approximately 32 and 9 Aboriginal and Torres Strait Islander people respectively (15).

2.7.2 Characteristics of Flooding

- a. Stroud can be flooded from Mill Creek and Lamans Creek (1).
- b. Much of the flooding which takes place in Stroud occurs as flash flooding (1).
- c. Flooding generally occurs with little warning and rapidly peaks and falls. Depending on the catchment and rainfall received flooding lasts generally for a few hours to 24 hours.

2.7.3 Flood Behaviour

- a. The bulk of the inundated areas along the Karuah River (either floodway or flood storage) are classed as “high hazard”. Areas of “low” and “medium hazard” are quite small in the total inundated area (6) (1).
- b. A flood runner (Mill Brook) breaks out of Mill Creek approximately 500 metres upstream of Bucketts Way and flows around the southern part of the town Recreation Centre, also crossing Bucketts Way via a large culvert, before rejoining Mill Creek (12).
- c. Downstream of Stroud the bed slope of Mill Creek and Lamans Creek is relatively flat, and flood levels in the low-lying south-western areas downstream of the Mill and Lamans Creek confluence are primarily driven by backwater effects from the

Karuah River in large flood events. In Lamans Creek, the backwater flood mechanism from the Karuah River plays a more significant role than for Mill Creek. The Karuah River has a major influence on Lamans Creek flood levels for the reach from Bucketts Way to the Mill Creek confluence, even in relatively small events (12).

2.7.4 Classification of Floodplain

- a. Rising Road Access (1), with Stroud becoming a high flood island in major floods, for example in 2015.
- b. The Showground and Stroud Community Lodge can become low flood islands in extreme events.

2.7.5 Inundation

- a. No predictive gauge exists for this area.
- b. The Showground and Caravan Park, next to Mill Creek are at risk of flooding, with depths of around 1.8 metres in 2016 (9).
- c. Three properties west of the main road on Lamans Creek are at risk of flooding (1).
- d. At least 13 properties opposite the showground in Britton Court Road, Cowper Street (Bucketts Way), Millbrook Road, Avon Street and Maytom Street is at risk of over floor flooding, as occurred in 2015 when anecdotally 180 millimetres of rain fell over six hours.
- e. The Stroud Community Lodge in Bucketts Way is at risk of flooding, adjacent to Mill Creek (1).
- f. Laman Street is also prone to flooding (1).

Table 8: Estimated number of properties inundated above floor level and over ground in Stroud related to design floods (18)

Design Flood	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding	No. Properties with Over-ground Flooding
20% AEP	n/a	0	2
10% AEP	n/a	0	6
2% AEP	n/a	2	18
1% AEP	n/a	2	23
0.2% AEP	n/a	9	30
Extreme	n/a	27	55

2.7.6 Isolation

- a. In the 2015 event both the Lamans Creek Bridge at Berkley Street (Bucketts Way) and Mill Creek Bridge at Cowper Street (Bucketts Way) were inundated, isolating the centre of Stroud (8).

- b. Flash flooding can also see the Stroud Community Lodge (with 31 residential care units and three self care units), located opposite the Showground become isolated and become a shrinking island (9).

2.7.7 Flood Mitigation Systems

- a. No flood mitigation systems have been identified.

2.7.8 Dams

- a. Duralie Coal Dams (x3) may have flooding impacts on the area (1).

2.7.9 At Risk Facilities

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

2.7.10 Other Considerations

- a. There are two peak seasons with potential for a 10% population increase associated with tourism and camping:
 - i. Christmas holidays December –January.
 - ii. Easter long weekend.
- b. In addition to this, the Stroud Show is held in April, the Brick Throwing Festival in July and the Stroud Rodeo in September (1).

2.8 RURAL AREAS

2.8.1 Community Overview

- a. Nerong is built largely on low-lying land south of Bulahdelah on Split Yard Creek, a tributary to The Broadwater. It has a population of 349, with 144 occupied dwellings (15).
- b. Coolongolook is located to the west of Forster on either side of the Pacific Highway adjacent to the Coolongolook River. It has a population of 417, with 146 occupied dwellings (15).
- c. Bungwahl is located to the east of Buladelah bound by Myall Lake to the south, Wattley Hill Road to the west, Wallingat River and Wallingat National Park to the north and Wamwarra Bay (Smiths Lake) to the east. It has a population of 254, with 105 occupied dwellings (15).
- d. Minimbah is located to the west of Tuncurry, bound by the Coolongolook River to the south, Wang Wauk River to the west and the Pacific Highway to the north-west.
- e. Failford is located to the north-east of Nabic on the northern bank of the Wallamba River, to the east of the Pacific Highway. It has a population of 495, with 200 occupied dwellings (15).

2.8.2 Characteristics of Flooding

- a. The extent of flooding on the south side of the Wallamba River is largely unknown but it may cover large areas in extreme events (1).
- b. Flooding on the creeks and rivers generally occurs with little warning and rapidly peaks and falls. Depending on the catchment and rainfall received flooding lasts generally for a few hours to 24 hours.
- c. Floods on the lakes are usually slow to rise, but variations in water level of 1.0-1.5 metres can occur over a period of a few days when heavy rain occurs (1).

2.8.3 Flood Behaviour

- a. The Wang Wauk, Coolongolook and Wallingat Rivers drain a large, mostly forested area to the west of Wallis Lake and east of the Kyle and Meyers Ranges. All are tidal in their lower reaches, which are flat and swampy and which constitute large flood storage areas experiencing frequent inundation (1).
- b. This area is largely ungauged, and can experience fast flowing water.

2.8.4 Classification of Floodplain

- a. Rising Road Access.
- b. Some areas may become high flood islands (with refuges only) (1).

2.8.5 Inundation

- a. No detailed study of rural areas exists and there is little historical information on flood effects in rural areas (1).
- b. Inundation and/or isolation of several properties in Nerong is possible as a result of rising levels on the Broadwater (1).
- c. Most areas between Failford Road and the Wallamba River are flood liable up to the 1% AEP (5.8 metres at Nabiac). The extent of extreme flooding in the area is unknown (1).
- d. The number of properties that could be inundated over floor level in the Failford and Minimbah areas during various design events are summarised in Table 17 (8). These occur in Elliotts Road, Point Road, Failford Road, The Lakes Way, and Drut Road (1).

Table 9: Estimated number of properties inundated above floor level and over ground in Failford and Minimbah related to the Nabiac gauge (8)

Nabiac Gauge Height (m)	Range of Over Floor Depths (m)	No. Properties with Over floor Flooding in Failford	No. Properties with Over floor Flooding in Minimbah
5% AEP (5m)	n/a	2 residential	2 residential 1 non-residential
2% AEP	n/a	5 residential	3 residential 1 non-residential
1% AEP (5.8m)	n/a	6 residential	5 residential 1 non-residential
0.2% AEP	n/a	17 residential	9 residential 2 non-residential
Extreme (7.6m)	n/a	59 residential; 2 non-residential	16 residential 2 non-residential

- e. In addition, three properties to the west of Bulahdelah on Emu Creek Road have been known to flood above floor by over a metre (in 2015 and 2016). One is no longer occupied.

2.8.6 Isolation

- a. In the June 2007 flood affected rural areas included Darawak, areas near Failford and the Booral, Cromarty and Washpool Creeks. Some roads were closed for up to 24 hours (1).
- b. Failford Road is cut west of Bullocky Way and at Bungwahl Creek and the Lakes Way is cut for a large distance south of the Failford Road intersection.
- c. Bullocky Way has several low points which may be affected by local drainage, however, this access to the highway is generally high and would appear viable (8).

- d. Minimbah may be cut off from flooding from the Wallamba River in a number of places. Significant depths of floodwater would overtop sections of Glen Ora Road and Elliotts Road. In addition this area would be cut off from Nahiab when the Pacific Highway cuts. Therefore evacuation from Minimbah would need to be early in a flood event due to inundation of the access roads and could be either to the north to Nahiab or Taree, dependant upon flooding of the Pacific Highway or to the south to Wang Wauk or Coolongolook (8). Alternative routes may be available via farm tracks, but these could be impassable even using four wheel drives due to the volume of rainfall (1).
- e. To the west of Bulahdelah, Emu Creek can become isolated for several hours to days due to overland and flash flooding of Booral Road in several locations, isolating several residents on Emu Creek Road, as occurred in 2015.

2.8.7 Flood Mitigation Systems

- a. No flood mitigation systems have been identified.

2.8.8 Dams

- a. No consequences from dam failure have been identified.

2.8.9 At Risk Facilities

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

2.8.10 Other Considerations

- a. There is very little detail available on the consequences in these rural communities and should be monitored.

2.9 SPECIFIC RISK AREAS – COASTAL EROSION

Mid North Coast Forecast District

2.9.1 Jimmys Beach

- a. Jimmys Beach is located on the northern shoreline of Port Stephens, Winda Woppa.
- b. Jimmys Beach has been identified by OEH (previously DECCW) as one of 15 coastal erosion hot spots in NSW, as shown in Map 1 (11).
- c. Property managed by Council is directly affected by the potential effects of storm erosion. Community infrastructure (road allotment), and approximately 25 private allotments are adjacent to the property directly affected and so are also potentially at risk from coastal erosion (1). These are located between Kurrurma Crescent and Gemalla Street.
- d. Waves have been known to break across the sand dune at Winda Woppa and this could cause water to enter houses (1).
- e. It is a narrow reflective estuarine beach (19). Erosion problems have been occurring along Jimmys Beach for many years, the erosion has increased over the last 30 years due to a sediment budget imbalance. Historically, sand renourishment of the beach has been used as a means to protect the public infrastructure during severe storm events (20).
- f. Trigger points for emergency action initiate when sand is within 10 metres and 5 metres from the road edge (20).

2.10 ROAD CLOSURES

- a. Numerous roads within the area can be cut by flooding, though usually only for a few hours except on the lower reaches of the major streams and in severe events. Many minor roads can be cut even in relatively low-level floods. The following table lists the more important roads liable to flooding in the Great Lakes area.

Table 10: Roads liable to flooding in Great Lakes area (1).

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height
Laman Street, Stroud	Causeway over Mill Creek at western edge of town	Restricts access to and from Stroud from the west	Briton Court Road	n/a
Gortons Crossing, Stroud	Britton Court Road, 2 km west of Stroud at bridge over Karuah River	Restricts access between Stroud and Booral-Washpool Road residents	Via Booral or Stroud Road	n/a
Mill Creek Road (Stroud - Maybush), Stroud Road	At bridge over Mill Creek, at northern edge of Stroud	Restricts resident access/egress along Mill Creek Road, isolating residents	no	n/a
Mill Creek Road, Stroud Road	Saggers Crossing, Mill Creek	Restricts resident access/egress along Mill Creek Road, isolating residents	no	n/a
Gap Hill Road (Stroud Road - Mill Creek Road), Stroud Road	At bridge over Mill Creek	Restricts resident access/egress along Mill Creek Road, isolating residents	no	n/a
Stroud Road-Dungog (Dungog Road or Stroud Hill Road), Stroud Road	At bridge over Karuah River, at edge of Stroud Road; at bridge over Barnes Creek (Washpool vicinity); at bridge over Ramstation Creek.	Restricts access/egress between Dungog and Stroud	Via Clarence Town	n/a
Bucketts Way, Weismantels	At Groom Creek, between Stroud Road and Monkerai turnoff (major route between Stroud and Gloucester) and at corner of Bucketts Way and Forest Glenn Road.	Restricts access/egress between Gloucester (to the north) and Stroud	Via Bulahdelah	n/a
Monkerai Road (MR101),	Andersons Creek bridge, 2km west of Bucketts Way	Restricts access between Mokerai and Gloucester or Stroud	Via Stroud Hill	n/a

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height
Monkerai				
Booral Road, Booral	Booral Creek Bridge	Restricts access between Booral and the Branch or Crawford River/Bulahdelah	Via Karuah	n/a
Booral - Washpool Road, Booral	Washpool Creek Bridge	Restricts access for Booral-Washpool Road residents	Via The Bucketts Way	n/a
Failford Road (Pacific Hwy- The Lakes Way), Failford	Bungwahl Creek	Restricts access between Tuncurry and the Pacific Highway	Via The Lakes Way to the north or south	n/a
Failford Road (Pacific Hwy- The Lakes Way), Failford	At the 3 culverts west of Bullocky Way	Restricts access between Tuncurry and the Pacific Highway	Via The Lakes Way to the north or south	n/a
Willow Point Road, Failford	At the culvert	Restricts access to the south of Failford for residents along Willow Point Road, isolates Willow Point Road		n/a
Glen Ora Road, Nabiac	A number of low points on the road are cut in minor floods and very early in major floods.	Restricts access/egress for Glen Ora Road residents, isolates Minimbah		n/a
The Lakes Way, Darawank	Darawank (adjacent to Wallamba River, severe events only)	Restricts access to and from Tuncurry from the north	Via Forster	n/a
Coomba Road (The Lakes Way - Coomba Park), Charlotte Bay	Duck Creek	Restricts access for Coomba Road residents, isolates Coomba Park if forest roads also cut	To the north or south	n/a
Violet Hill Road (Boolambayte to Violet Hill), Violet Hill	100m off The Lakes Way, at low causeway	Isolates Violet Hill and Myall Lakes National Park, isolates several rural dwellings and Violet Hill camping area	Potentially via Mayers Range Trail for 4WD	n/a
Bombah Point Road (Bombah Point - Bulahdelah Road), Bombah Point	2km NW of Bombah Point	Isolates Bombah Point	no	n/a
Viney Creek	300 m south-east of	Restricts access to	Via Myall Way	n/a

Road	Closure location	Consequence of closure	Alternate Route	Indicative gauge height
Road (Pacific Highway to Tea Gardens Road), Nerong	Pacific Highway	Viney Creek Road residents		
Myall Road (Pacific Highway to Tea Gardens Road), Tea Gardens	At Kore Kore Creek	Isolates Tea Gardens	no	n/a
Hawks Nest - Tea Gardens Bridge, Tea Gardens	In severe events only.	Restricts access between Tea Gardens and Hawks Nest, isolates Hawks Nest	no	n/a
Markwell Road (Bulahdelah-Gloucester Road), Upper Myall	Dorneys Bridge (Myall River, Upper Myall)	Restricts access between Gloucester and Bulahdelah	Via Nabic	n/a

2.11 SUMMARY OF ISOLATED COMMUNITIES AND PROPERTIES

- a. Table 11 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.

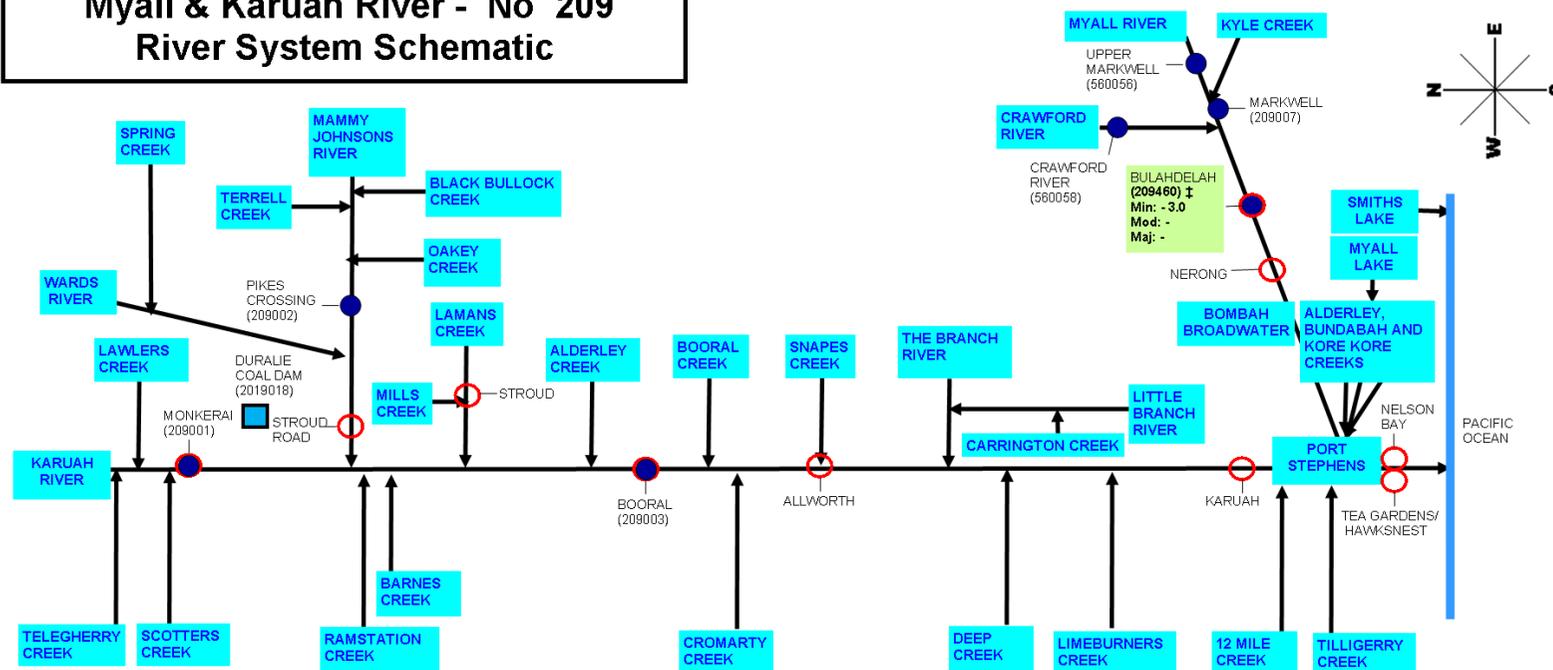
Table 11: Potential Periods of Isolation for communities in the Great Lakes area during a Major flood.

Town / Area (River Basin)	Population/ Dwellings	Flood Affect Classification	Approximate period isolation	Days								NOTES	
				1	2	3	4	5	6	7	8		
Failford	200 dwellings	High flood island	1 – 5 days	1	2	3	4	5					
Forster and Tuncurry	8308 dwellings	Low flood island	Several hours	1									Resupply unlikely. Flash flooding.
Smiths Lake	597 properties	Low flood island	Several hours	1	2								Resupply unlikely. Flash flooding.
Tea Gardens	1016 properties	Low flood island	Several hours	1									Resupply unlikely. Flash flooding.
Nabiac	544 properties	High flood island	1 – 5 days	1	2	3	4						

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 1A: MYALL AND KARUAH RIVER BASIN SCHEMATIC

**Myall & Karuah River - No 209
River System Schematic**



**NOT TO SCALE
KEY:**

- Gauge
- Community
- Dam
- UKI Key Warning Gauge and flood classification
- DRY DOCK Other Gauges
- ‡ SES hold a Flood Intelligence Card for this gauge
- BOYD RIVER River / Tributary Name
- 4-6 Hours → Flow times (hours) between key gauges

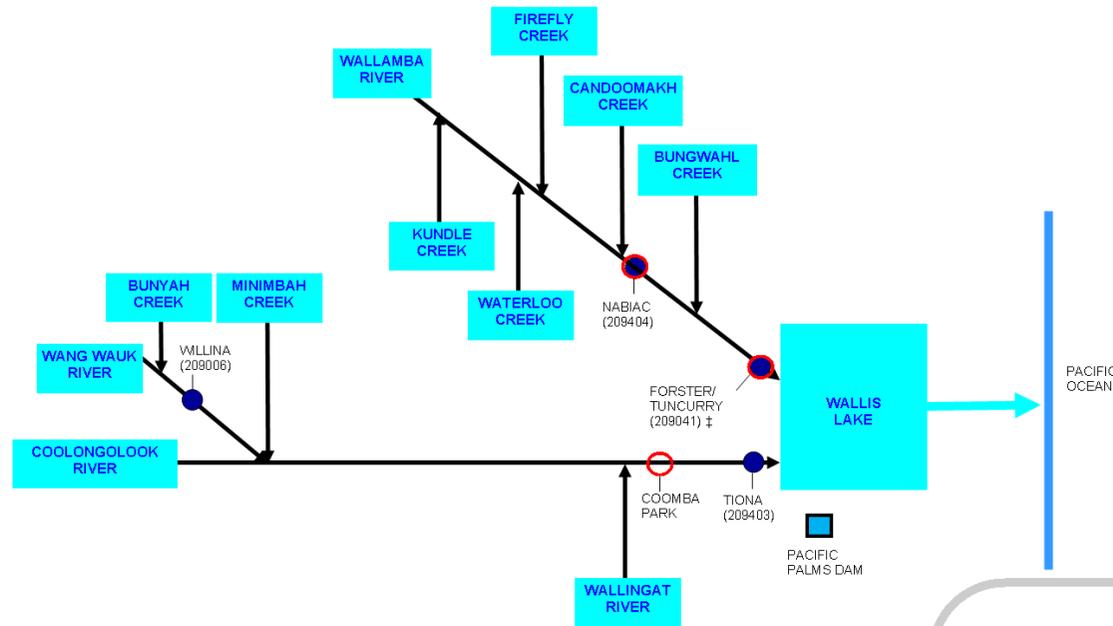
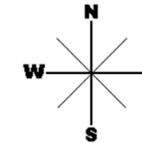
Note: Flow times may be faster/slower depending on the nature of the event.
Source: Bureau of Meteorology— NSW Flood Warning Centre 2011
Updated August 2013 by Elspeth Rae (ERM)



DISCLAIMER
 This 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 is not intended for general public or untrained persons, and is not a substitute for professional advice and/or training. Untrained persons should not use this map unless they are under supervision of trained and qualified emergency management personnel. The NSW State Emergency Service disclaims any liability to any persons in respect of anything and the consequence of whole or partial reliance upon the whole or part of the information in this map publication.

ANNEX 1B: MYALL AND WALLIS LAKE SCHEMATIC

Myall & Wallis Lake - No 209 River System Schematic



NOT TO SCALE KEY:

- Gauge
- Community
- Dam
- UKI Key Warning Gauge and flood classification
- DRY DOCK Other Gauges
- ‡ SES hold a Flood Intelligence Card for this gauge
- BOYD RIVER River / Tributary Name
- 4-6 Hours → Flow times (hours) between key gauges

Note: Flow times may be faster/slower depending on the nature of the event.

Source: Bureau of Meteorology— NSW Flood Warning Centre 2011

Updated August 2013 by Elspeth Rae (ERM)



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

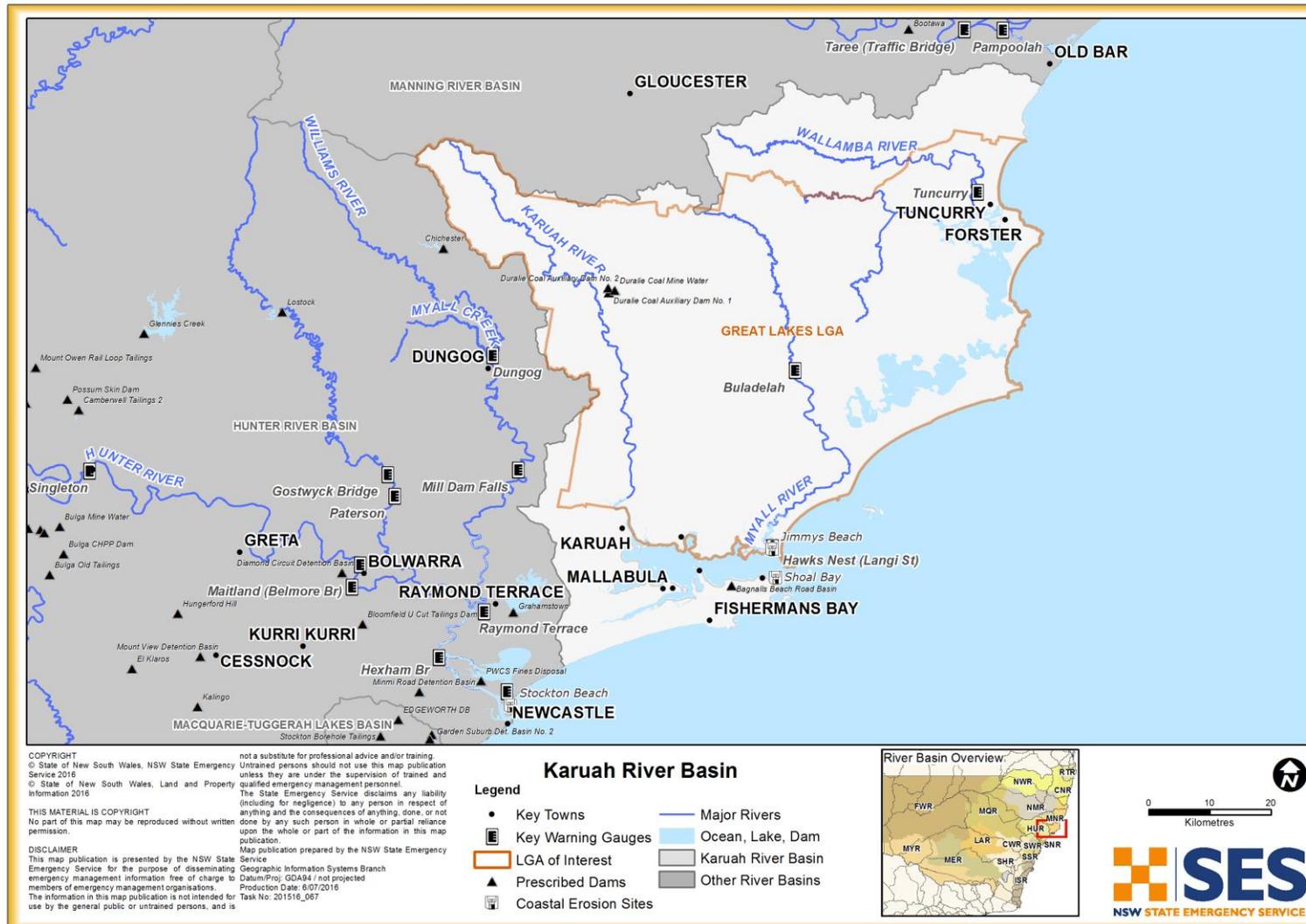
Karuah River Basin Valley (1)

Facility Name	Street	Suburb	Comment
Schools			
Forster High School	Head Street		Parts of the school are flood liable in the 1% AEP, though it is not likely to be significantly affected except in an extreme event
Holy Name Primary School	41 Lake Street	Forster	
Great Lakes College/TAFE	Cape Hawke Drive	Forster and Northern Parkway, Tuncurry	(risk unknown)
Tuncurry Primary School	Tuncurry Street	Tuncurry	(risk unknown)
Tea Gardens Public School	Witt Street	Tea Gardens	(risk unknown)
Nabiac Public School	Clarkson Street		(in an extreme event)
Pacific Palms Public School	Boomerand Drive	Boomerang Beach	(risk unknown)
Stroud Road Public School	Bucketts Way	Stroud Road	(risk unknown)
Stroud Public School	Erin Street	Stroud	(risk unknown)
Coolongolook Public School	Pacific Highway	Coolongolook	(risk unknown)
Bungwahl Public School	Seal Rocks Road	Bungwahl	(risk unknown)
Child Care Centres			
Bulahdelah Preschool			5.6 metres (Bulahdelah)
Dolphins Child Care Centre, Tuncurry.		Tuncurry	
King of the Castle Child Care Centre, Forster.		Forster	
Pokey Possum Preschool	47 Godwin Street	Forster	(risk unknown)
Manning & Great Lakes Early	Chapel Street		(risk unknown)

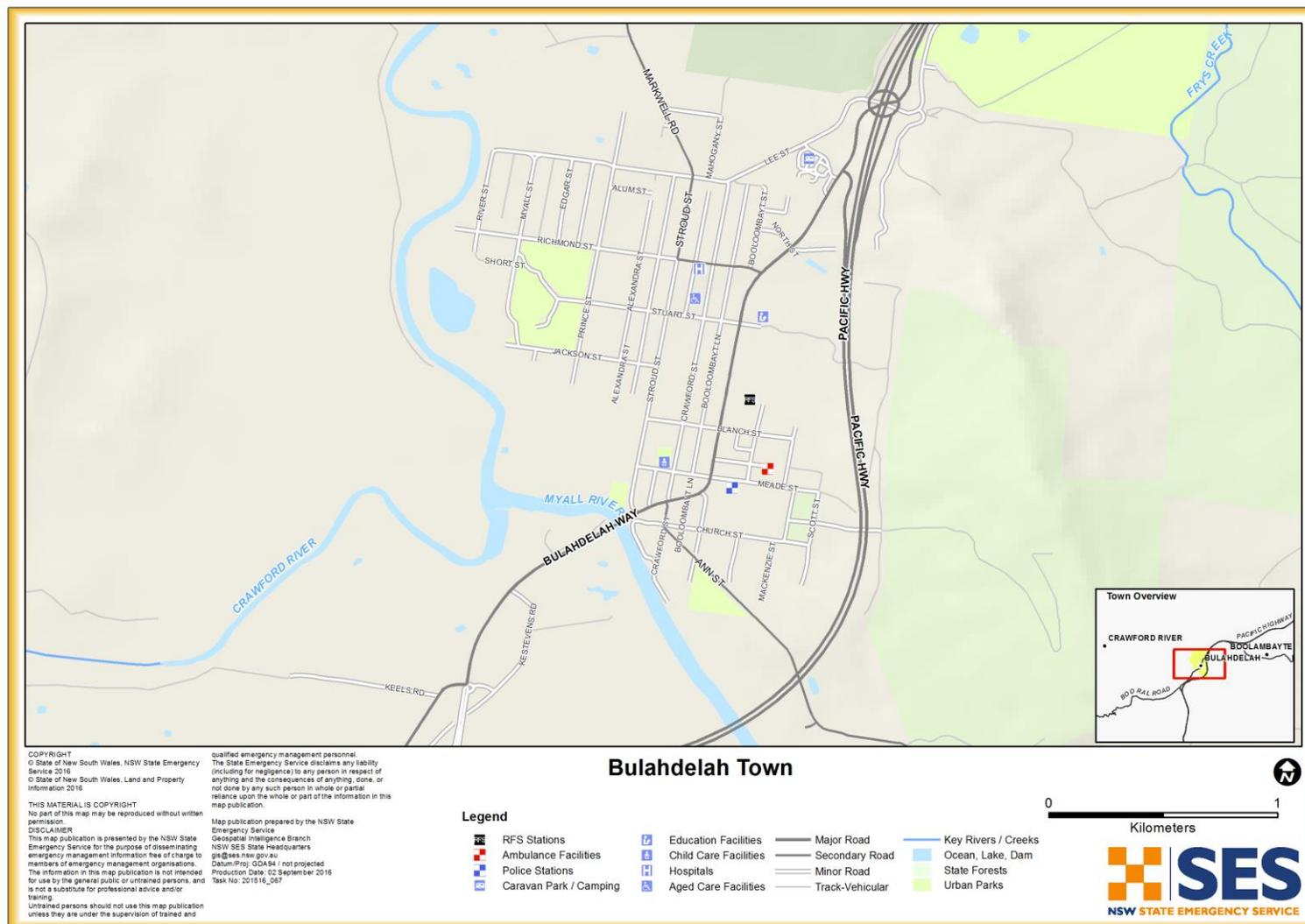
Facility Name	Street	Suburb	Comment
Intervention (Outreach Forster)			
Giggles Child Care Centre	Water Street	Forster	(risk unknown)
Blossoms	33 Chapmans Road	Tuncurry	(risk unknown)
Little Beaver Pre School	2 Cross Street	Forster	(risk unknown)
Brighter Beginnings Early Learning Centre	44 Coupland Avenue		(risk unknown)
Nabiac Pre-school	12 Martin Street		(in an extreme event)
Jitterbugs Pre-school			(in an extreme event)
Annabeles Long Day Care	13 Coomba Road	Pacific Palms	(risk unknown)
Seashells Child Care Centre	Paradise Drive	Smiths Lake	(risk unknown)
Stroud Pre-school	8 Berkeley Street	Stroud	
Facilities for the aged and/or infirm			
Kularoo Centre For Aged Care	Cnr Kularoo Drive & Boundary St	Forster	(risk unknown)
Beaumont Terrace	4 Bonventti Close	Tuncurry	(risk unknown)
Glaica House	22 Flora Parade	Tuncurry	
Myall Lodge Hostel	2 Mirreen Street		(risk unknown)
Stroud Community Lodge	Bucketts Way	Stroud	(risk unknown)
Utilities and infrastructure			
Nabiac SES			(in an extreme event)
Nabiac-Great Lakes RFS			(in an extreme event) thought the Nabiac-Taree station should not be flood affected.
Nabiac Police Station			(in an extreme event)
Buladelah substations		Buladelah	5.5 metres (Buladelah)
Camping Ground / Caravan			

Facility Name	Street	Suburb	Comment
Parks			
Wallamba River Holiday Park		Failford	
River Inn Caravan Park		Failford	
Great Lakes Caravan Park		Tuncurry	
Great Lakes Holiday Park		Tuncurry	
Shangri La Caravan Park		Tuncurry	
Tuncurry Beach Caravan Park		Tuncurry	
Twin Dolphin Caravan Park		Tuncurry	
Forster Waters Caravan Park		Forster	
Lani's Holiday Park		Forster	
Smugglers Cover Holiday Village		Forster	
Stroud Showground Caravan Park		Stroud	

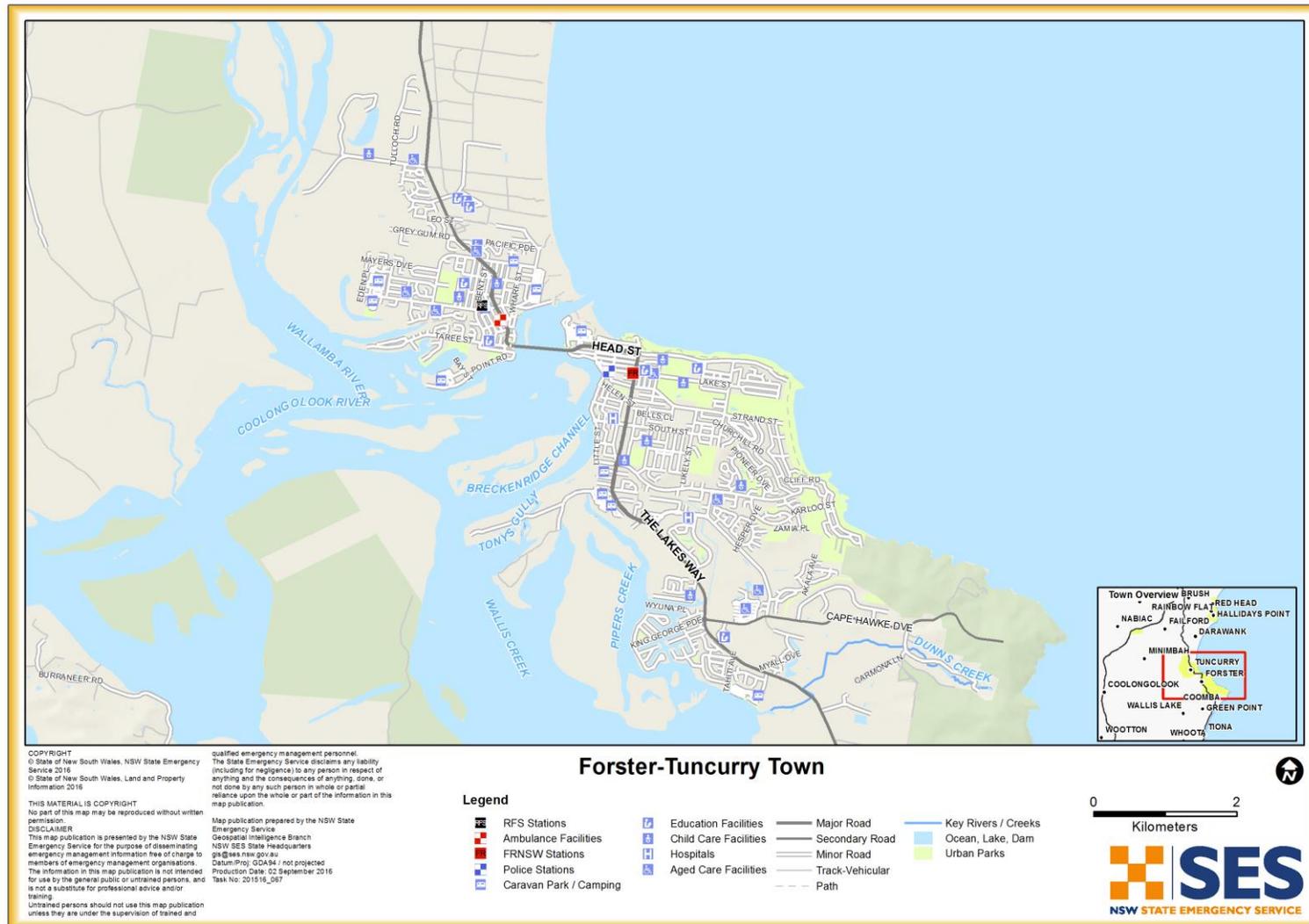
MAP 1: KARUAH RIVERBASIN



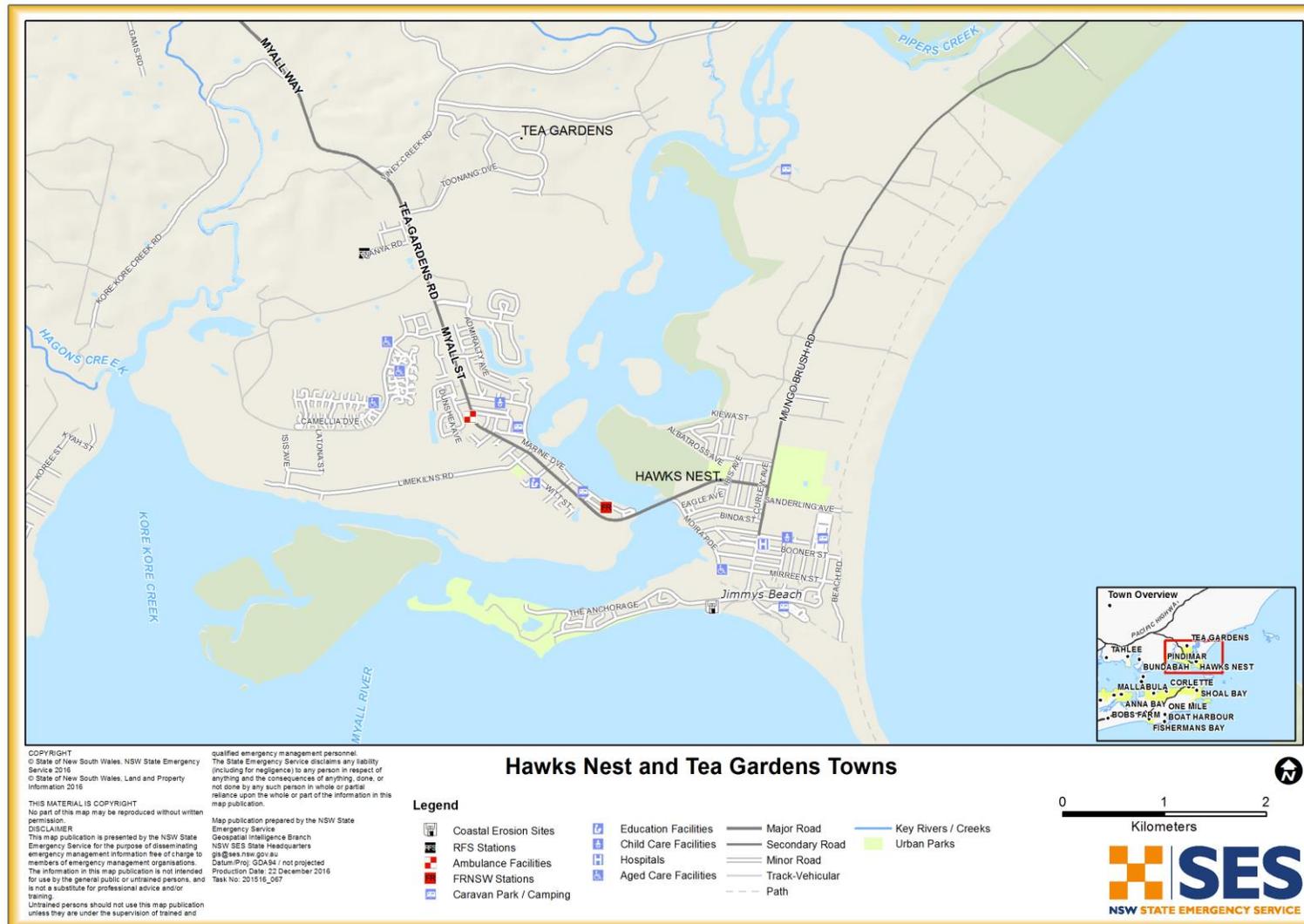
MAP 2: BULAHDELAH TOWN MAP



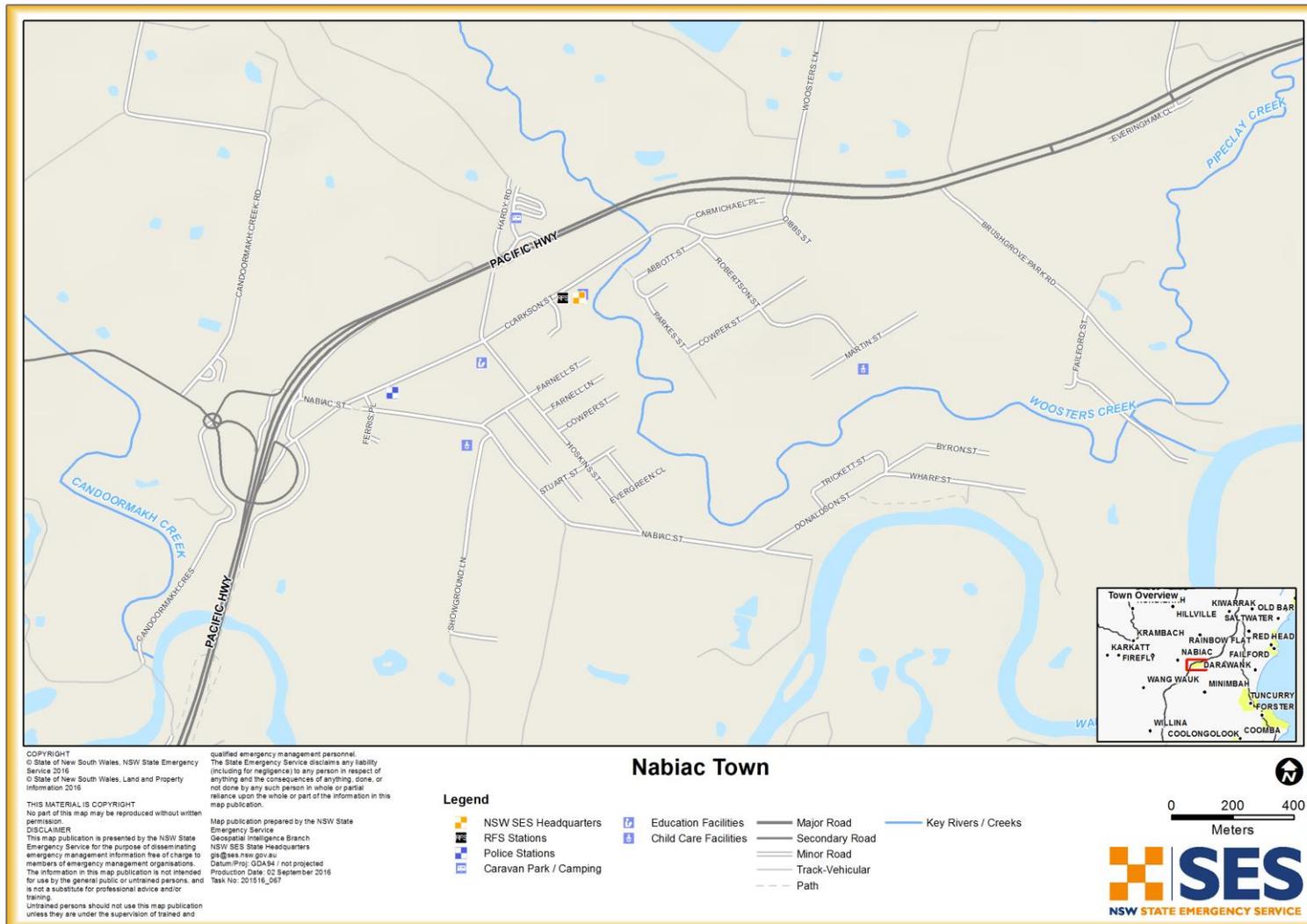
MAP 3: FORSTER TUNCURRY TOWN MAP



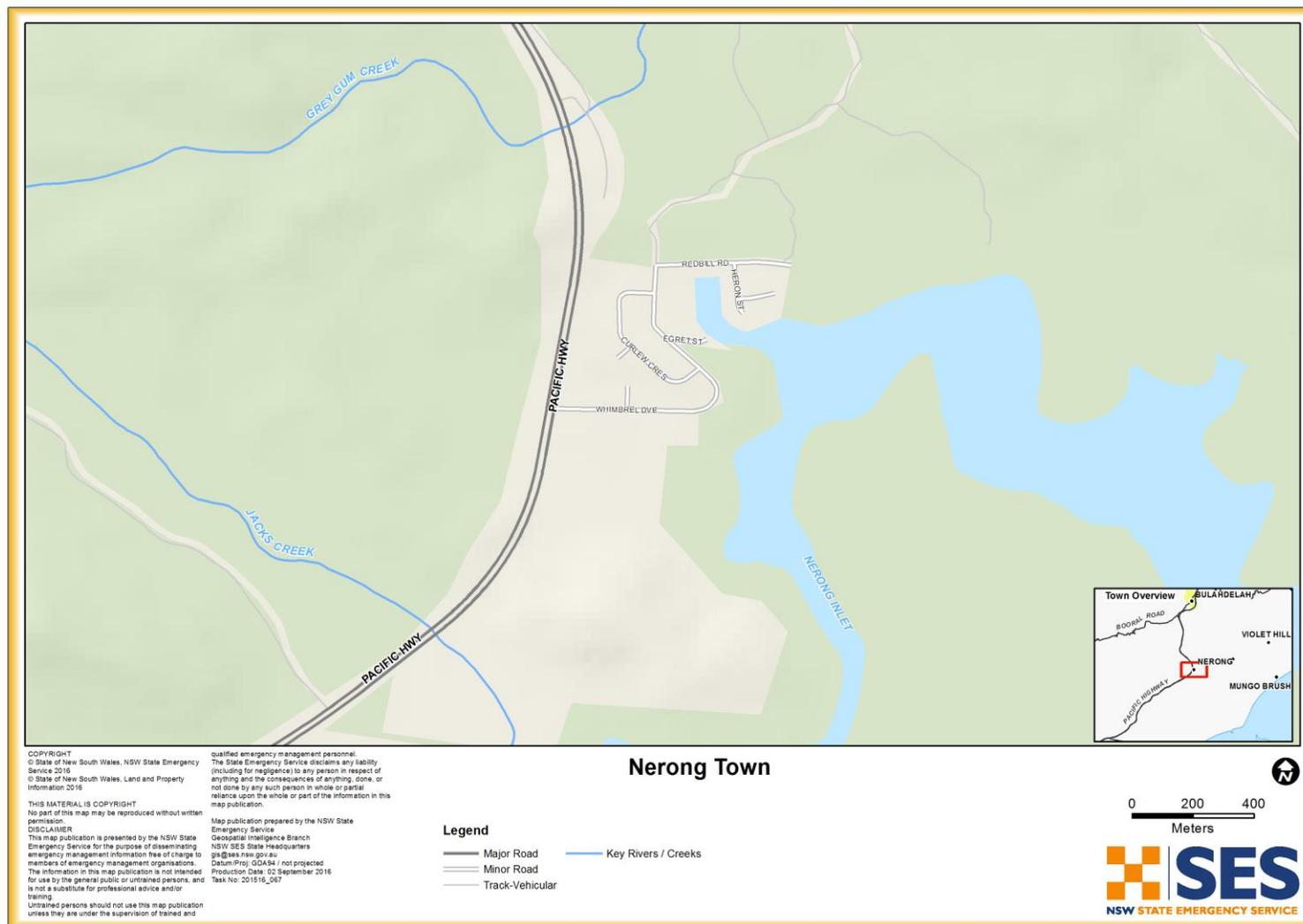
MAP 4: HAWKS NEST TOWN MAP



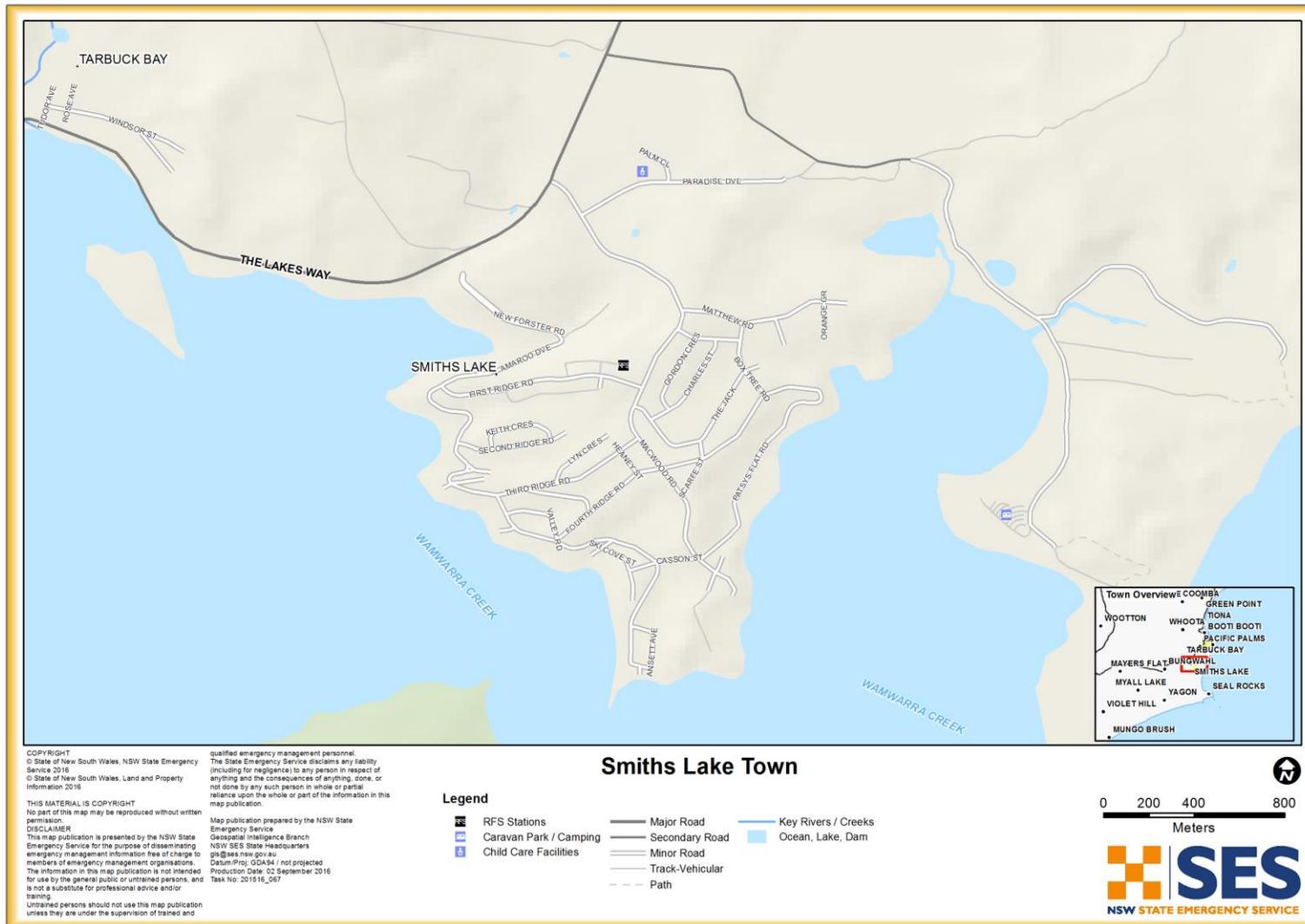
MAP 5: NABIAC TOWN MAP



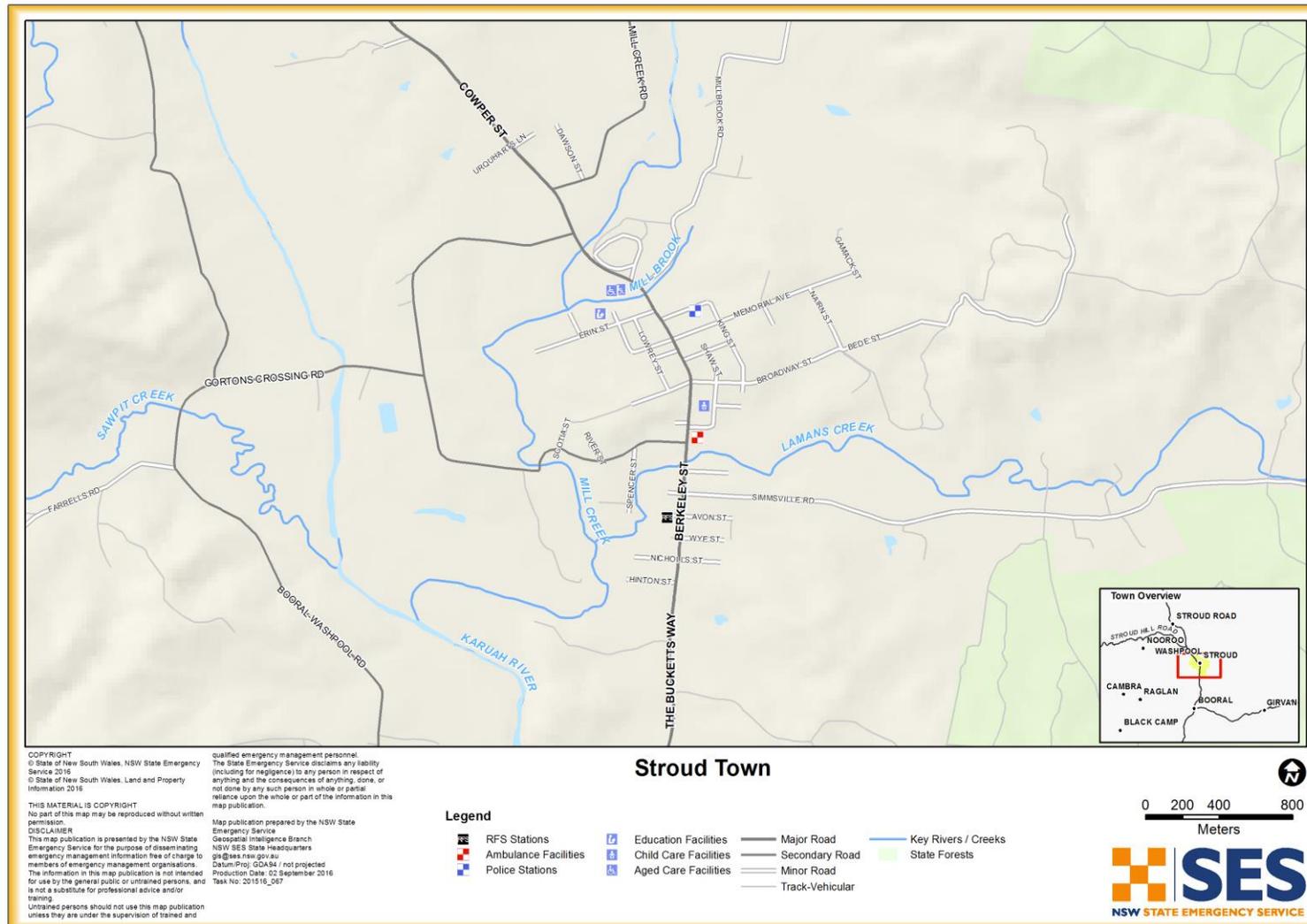
MAP 6: NERONG TOWN MAP



MAP 7: SMITHS LAKE TOWN MAP



MAP 8: STROUD TOWN MAP



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SES RESPONSE ARRANGEMENTS FOR GREAT LAKES

Volume 3 of the Mid Coast Local Flood Plan

CONTENTS

Chapter 1: Flood Warning Systems and Arrangements

- *Dissemination options for NSW SES flood information and warning products.*
- *Gauges monitored by the NSW SES within the LGA.*

Chapter 2: SES Locality Response Arrangements

- *NSW SES flood response arrangements by individual sector within the LGA.*

Chapter 3: SES Dam Failure Arrangements

- *Not Applicable*

Chapter 4: SES Caravan Park Arrangements

- *Arrangements for the Evacuation of flood liable Caravan Parks within the LGA.*
- *Specific arrangements for individual parks likely to be affected by flooding.*

GREAT LAKES FLOOD WARNING SYSTEMS AND ARRANGEMENTS

**Chapter 1 of Volume 3 (NSW SES Response Arrangements for Great
Lakes) of the Mid Coast Local Flood Plan**

Last Update: March 2017

AUTHORISATION

Great Lakes: Flood Warning Systems and Arrangements has been prepared by the NSW State Emergency Service (NSW SES) as part of a comprehensive planning process.

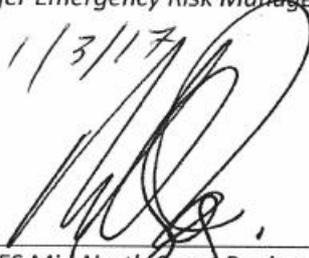
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Manager Emergency Risk Management

Date: 1/3/17

Approved



NSW SES Mid North Coast Region Controller

Date: 2.3.17

Tabled at LEMC

14 March 2017

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1. GAUGES MONITORED BY THE NSW SES GREAT LAKES LOCAL HEADQUARTERS

Table 1: Gauges monitored by the NSW SES Great Lakes Local Headquarters

Wallis Lake Catchment									
Gauge name	Type	AWRC No	Bureau/DPI Gauge No.	Stream	MIN	MOD	MAJ	Special Reading Arrangements	Owner
Wallamba River at Nabic	Tele	209404	560048	Wallamba River downstream of Nabic	n/a	n/a	n/a	None	PWS
Wang Wauk at Willna	Tele		560049	Wang Wauk River (infow to Wallis Lake)	n/a	n/a	n/a	None	
Coolongolook at Coomba Park	Tele		560059	Coolongolook River (infow to Wallis Lake)	n/a	n/a	n/a	None	
Wallis Lake at Tuncurry	Tele	209401	560053	Wallamba River (infow to Wallis Lake)	n/a	n/a	n/a	None	
Wallis Lake at Tuncurry (Point Road) * ‡	Tele		560057	Wallis Lake	0.9	1.5	1.9	NSW SES	Council
Wallis Lake at Tiona	Tele	209403	560055	Wallis Lake	n/a	n/a	n/a	None	PWS
Wallis Lake at Forster	Tele		560044	Wallis Lake	n/a	n/a	n/a	None	PWS
Tarback Bay	Tele		209465	Smiths Lake	n/a	n/a	n/a	None	MHL

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 (‡).

Myall Catchment									
Gauge name	Type	AWRC No	Bureau/DPI Gauge No.	Stream	MIN	MOD	MAJ	Special Reading Arrangements	Owner
Myall River at Upper Markell	Tele		560056	Myall River	n/a	n/a	n/a	None	
Myall River at Markwell	Tele	209007	561104	Myall River	n/a	n/a	n/a	None	DWR
Crawford River at Bulahdelah	Tele		560058	Crawford River (inflow to Myall)	n/a	n/a	n/a	None	MHL
Myall River at Bulahdelah * ‡	Tele	209460	560040	Myall River	3.0m			NSW SES	PWS
Myall River at Bombah Point	Tele		209475	Bombah Broadwater	n/a	n/a	n/a	None	MHL
Myall River at Tea Gardens	Tele		209480	Water level at entrance of Myall River	n/a	n/a	n/a	NSW SES	MHL
Shoal Bay	Tele		561153	Water level southern shore of Port Stephens	n/a	n/a	n/a	None	

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 (‡).

Karuah River Catchment									
Gauge name	Type	AWRC No	Bureau/DPI Gauge No.	Stream	MIN	MOD	MAJ	Special Reading Arrangements	Owner
Mammy JR @ Pikes Crossing	Tele		209002	Mammy Johnsons River	n/a	n/a	n/a	None	DPI
Karuah River at Dam Site	Tele		561106	Karuah River (upstream of Stroud)	n/a	n/a	n/a	None	
Karuah River at Booral	Tele		561040	Karuah River (downstream of Stroud)	n/a	n/a	n/a	None	

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

The NSW SES Mid North Coast Region Headquarters will distribute NSW SES Flood Bulletins, General Media Releases, Flood Advice, Evacuation Warnings and Evacuation Orders via Social Media and through the following regional media outlets and agencies:

Television Stations:

Station	Location
Southern Cross Ten	Coffs Harbour
Prime	Newcastle
NBN	Newcastle
ABC	Sydney

Radio Stations:

Station	Location	Frequency	Modulation
2RE	Taree	100.3	FM
Great Lakes FM	Forster	105.1	FM
ABC Newcastle	Newcastle West	1233	AM
ABC Mid North Coast	Port Macquarie	95.5	FM
2HD	Sandgate	1143	AM
NEW FM	Sandgate	105.3	FM
KO-FM	Charlestown	102.9	FM
NX-FM	Charlestown	106.9	FM
2NUR-FM	Callaghan	103.7	FM

Newspapers:

Name	Location
Manning River Times	Taree
Great Lakes Advocate	Forster
Port Stephens Examiner	Raymond Terrace
Myall Coast Messenger	Tea Gardens
Stroud Community Web	Stroud

Other Agencies:

Flood bulletins will be issued by the Region Headquarters to the following;

- Region Emergency Management Officer (REMO)
- Local Emergency Operations Controller (LEOCON)
- Local Emergency Management Office (LEMO)
- Community Service NSW – District Manager (CS)
- NSW Ambulance – Operation Centre Newcastle (for distribution to own stations)
- NSW Police Force – Operations Centre Newcastle (for distribution to own stations)
- Fire and Rescue NSW – Operations Centre Newcastle (for distribution to own stations)
- Essential Energy
- NSW Rural Fire Service
- Hunter New England Health
- NSW Police Force – Gloucester
- Department of Primary Industries
- Transport for NSW

Emergency Alert (EA):

Predefined areas for utilising EA have been developed for Great Lakes

GREAT LAKES: NSW SES LOCALITY RESPONSE ARRANGEMENTS

**Chapter 2 of Volume 3 (NSW SES Response Arrangements for the former
Great Lakes LGA) of the Mid Coast Local Flood Plan**

Last Update: March 2017

AUTHORISATION

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

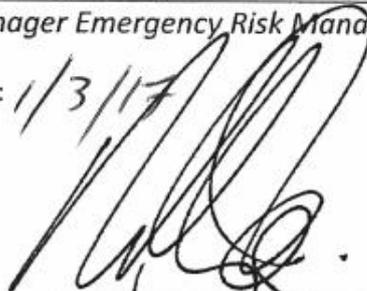
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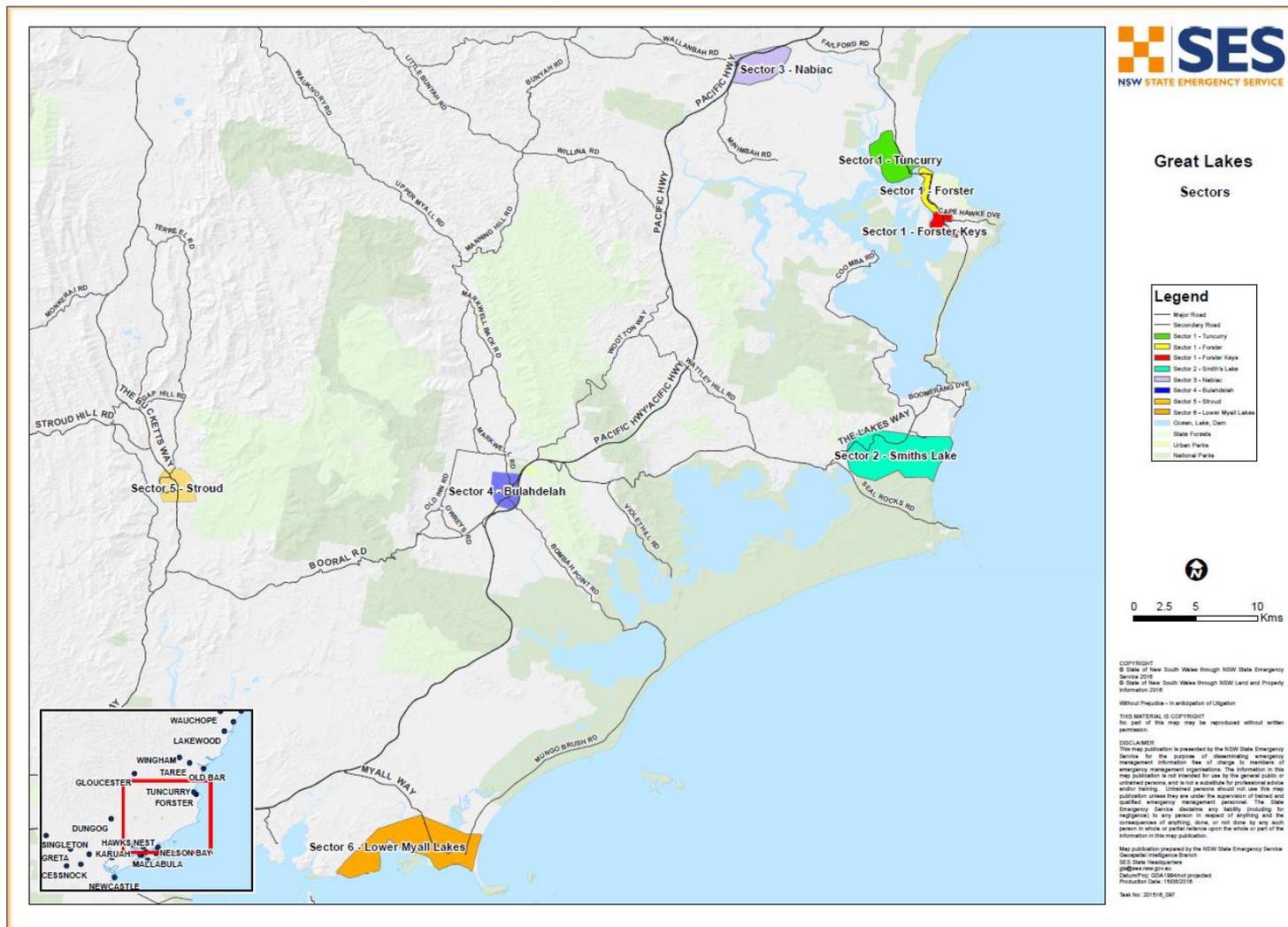
SECTOR OVERVIEW

Table 1: Overview of Sectors in the former Great Lakes LGA. These Sectors provide further detail of the planned response strategies within Communities in the former Great Lakes LGA. The sectors are based on geographic communities.

Sector Name	Key triggers	Warning strategy	High risk areas	Flood risk	Total properties (1)	Properties potentially at risk (extreme)
Tuncurry, Forster	Wallis Lake at Point Road gauge predicted to reach or exceed 1.3 m –first stage of evacuations completed by this height. Second stage of evacuations completed by 1.5 m.	Pre-emptive evacuation warnings and orders based on riverine triggers.	Point Road – Tuncurry Taree, Beach and Wharf Street areas – Tuncurry Forster Keys	Ocean/Storm Surge (tides/swells) Riverine (Wallamba, Wang Wauk, Wallingat and Coolongolook Rivers).	8308	3021
Smith's Lake	Smith's Lake water levels at Tarbuck Bay Gauge reach or exceed 1.9 m and failure to mechanically open the entrance.	Isolation advice for holiday parks, UNSW Field centre and Dogwood Road residents	Bushland and Sandbar Holiday Parks UNSW Field Study Centre Dogwood Road residents	Ocean/Storm Surge (tides/swells) Failure to mechanically open entrance of lake to ocean.	597	34
Nabiac	Observed rises in local creeks plus rises in the Wallamba River (Wallamba River at Nabiac gauge reach or exceed 6.0 m). Evacuations completed under these circumstances.	Evacuation of low lying properties in Nabiac	Clarkson and Nabiac Streets	Town, Wooster's and Pipeclay Creeks Wallamba River in large events.	544	115
Bulahdelah	Myall River at Bulahdelah gauge predicted to reach or exceed 3.5 m, first stage of evacuations completed by this height. Second stage of evacuations completed by 4.8 m.	Pre-emptive evacuation warnings and orders based on riverine triggers	Western side of the town	Riverine from Myall and Crawford Rivers. Flash flooding.	589	120
Stroud	Flood Watches for Myall and or Karuah River	Inclusion in Flood Watches as reminder for Stroud	Showground Cowper Street (Bucketts	Mill and Lamans Creeks and Karuah River in large	376	27

	catchments. Severe weather warning(s) for heavy rain.	residents about the areas flash floods risk as per the April 2015 event.	Way between Stroud Lodge and Mill Creek Road). North east section of Briton Court Road.	events. Flash flooding.		
Tea Gardens, Hawks Nest, Pindimar	Consideration of storm surge, high tides, current/ predicted rainfall and rates of rise – together with: Bombah Broadwater at Bombah Point by 3.0m and Myall River at Tea Gardens by 1.4m - evacuations completed by these heights.	Pre-emptive evacuation warnings and orders based on triggers.	Tea Gardens Peninsular (Marine Parade), Low foreshore areas of Hawks Nest and South (Lower) Pindimar.	Ocean/storm surge, riverine effects very low south of Monkey Jacket.	1662	121

1.1. SECTOR OVERVIEW MAP



2. BULAHDELAH SECTOR

2.1. BULAHDELAH RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in former Great Lakes LGA for more information about this Community.

Sector Description	<p>Bulahdelah is situated 235 kilometres (km) north of Sydney along the eastern and northern banks of the Myall River, approximately 480 metres (m) east of the confluence of the Myall and Crawford rivers. The eastern sector of the township is built on the foot of the Alum Mountain.</p> <p>Even in minor floods low lying parts of the town are susceptible inundation and warning times for rises in the Myall can be quite limited (April 2015 event).</p> <p>The Myall River has a catchment area of 365 km² at the Pacific Highway. The Crawford River, its major tributary, has a catchment area of 125 km² (2).</p>					
Hazard	<p>Bulahdelah is situated near the confluence of the Myall and the Crawford Rivers meaning that floodwater generated from either catchment has the potential to cause flooding.</p> <p>The town is affected by flooding from both the Myall River and drainage paths transferring water from the eastern of the urban area and the urban area itself to the Myall River on the west as well as flash flooding (2).</p> <p>Flooding at Bulahdelah has come within 0.1-0.5m of the 1% AEP flood on 3 noted occasions in 1897 (5.5m), 1927 (5.1m) and 1947 (4.7m) (3).</p> <p>The most severe flood recorded on the Myall River at Bulahdelah was in 1897 when more than a third of the present town area was inundated. Recently there has been minor to moderate flooding in 2015 and 2016.</p> <p>Major floods can have a reasonable impact on the town resulting in significant damage and the need for a number of dwellings to be evacuated (2).</p>					
Flood Affect Classification	Rising Road Access					
At risk properties	120	Total number of properties within Sector/Community			589	
Sector Control	<p>The NSW SES Mid Coast Local Controller will control evacuations in this sector.</p> <p>NSW SES will conduct storm and flood operations in the sector with assistance from NSW Police, Fire and Rescue NSW and Rural Fire Service (RFS).</p> <p>An Incident Control Facility will be established at the NSW SES Nabic Unit, Clarkson Street, Nabic.</p> <p>For Level 2 and 3 events Incident Control is likely to scale up to LGA level, with the Local Controller Nabic Unit Controller becoming a Division Commander.</p> <p>In large scale events the Mid Coast Council Emergency Operations Centre Facility (Tuncurry) may provide facilities for incident control separate to a supporting Emergency Operations Centre.</p>					
Key Warning Gauge Name	Name	Watercourse	AWRC No.	Min (m)	Mod (m)	Maj (m)
	Myall River at Upper Markwell	Myall River	560056	n/a	n/a	n/a
	Myall River at Markwell	Myall River	561104	n/a	n/a	n/a
	Myall River at Bulahdelah	Myall River	560040	3.0m	n/a	4.5m

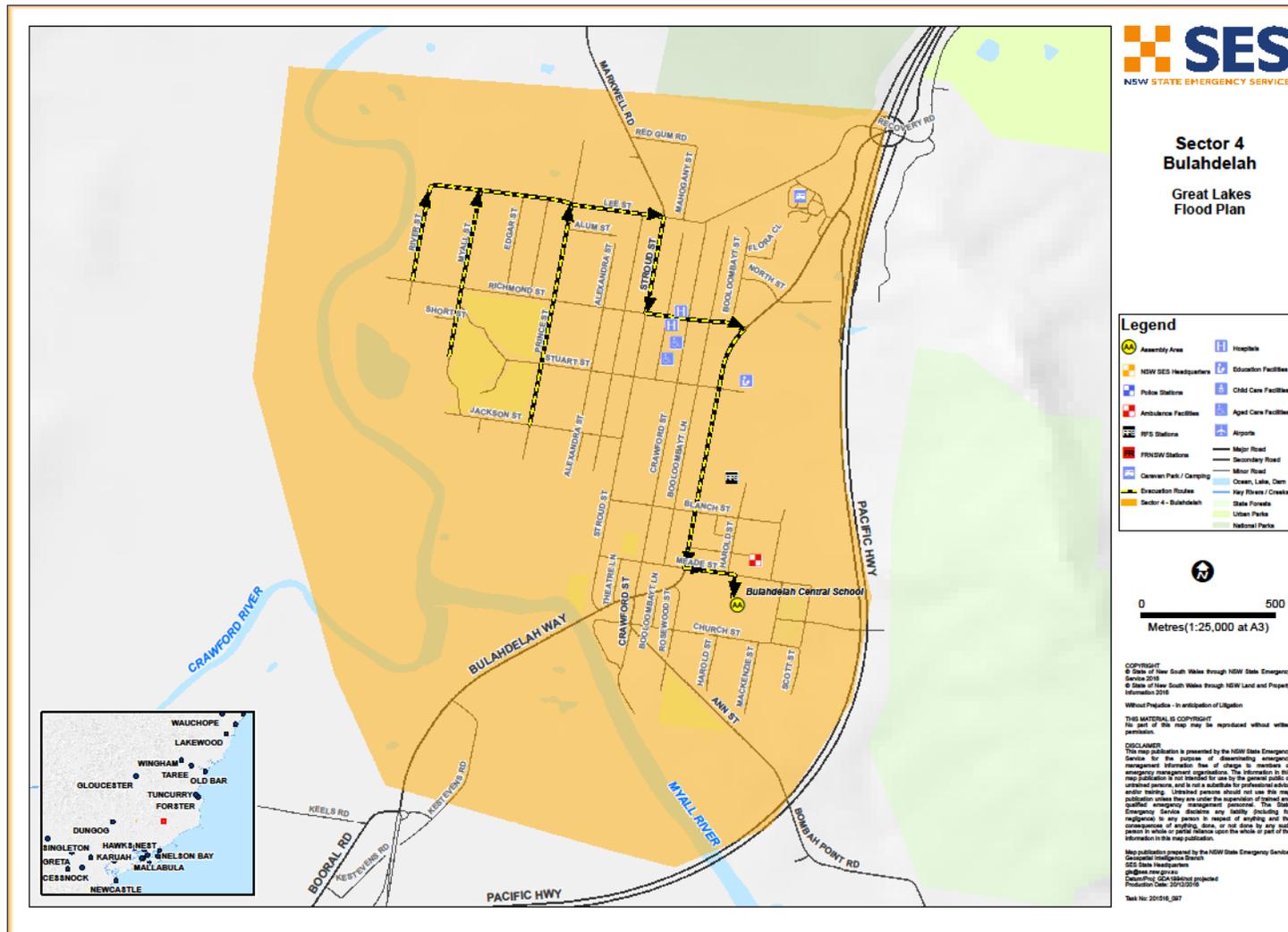
	Crawford River at Bulahdelah	Crawford River	560058	n/a	n/a	n/a
Key Rain Gauges	Crawford (Station Number - 560048)					
	Markwell (Station number – 561104)					
	Bulahdelah (Station number – 560040)					
	Cabbage Tree Mountain (Station number – 60099)					
General Strategy	<p>Property protection measures</p> <ul style="list-style-type: none"> ▪ Based on requests for assistance from 132 500 <p>Evacuation of at risk population:</p> <ul style="list-style-type: none"> ▪ At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. ▪ Primarily self-evacuation by private transport to family and friends outside the flood affected area. ▪ Primarily self-evacuation by private transport to nominated assembly areas. <p>Establishment of an Assembly Area at:</p> <ul style="list-style-type: none"> ▪ Bulahdelah Central School, 8 Meade Street, Bulahdelah <p><i>Where a major PMF occurs evacuees will either remain at the assembly area or an established evacuation centre until the threat has past.</i></p> <p>Rescue</p>					
Key Risks / Consequences	<p>Inundation</p> <p>Potential threats to people’s safety and property from riverine flooding from the Myall River and overland flows from drainage causing inundation.</p> <p>Inundation of Bulahdelah occurs in the western part of the town that is located near the Myall River.</p> <p>Early and possible rapid inundation of the Lions Park Camping ground on the western bank of the Myall River poses threats to user’s safety.</p> <p>Flooding from the Myall River around 5.5 m will inundate around 45 houses and 7 non-residential properties (2).</p> <p>Isolation</p> <p>Land in Bulahdelah township to the east of the old Pacific Highway and north of the bridge over the Myall will not be affected by flooding from the Myall in all river events, including an extreme flood events (2).</p> <p>Those areas on the western side of the town that are subject to inundation do have rising road access.</p> <p>The difficulties posed by flood waters in these low western areas of the town during an evacuation should be slight as alternative routes to the evacuation centre exist (3).</p> <p>Interruption to electricity supply</p> <p>In recent minor to moderate flood events in April 2015 and January 2016 power supply to some sections of the town was disrupted for a number of hours.</p>					
Information and Warnings	<p>The NSW SES will undertake a variety of different actions to ensure the community are informed of potential impacts, these include:</p> <ul style="list-style-type: none"> ▪ Flood Watch ▪ Flood Bulletins ▪ Evacuation Warning ▪ Evacuation Order 					

	<ul style="list-style-type: none"> ▪ Sequenced door knocking of evacuation sectors ▪ Media announcements ▪ Social Media use ▪ Emergency Alert (SMS, Landlines) ▪ SEWS
Property Protection	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> ▪ Monitoring rising flood waters. ▪ Relocation of livestock. ▪ Relocation of farm machinery and valuable goods ▪ Control of surface water through sandbagging measures. ▪ Assist in the lifting of furniture to residents in need. ▪ Monitoring integrity of dwellings surrounded by flood waters. <p>Property protection measures are limited due to the nature of flooding (i.e. flash flood /fast rising / depths of flooding).</p> <p><i>Protection of essential infrastructure:</i></p> <p>Bulahdelah substations may require protection in floods equal to or greater than 5.5 metres at Bulahdelah.</p>
Evacuation and/or Isolation Triggers	<p>The key evacuation triggers based on Bureau of Meteorology flood height predictions at the Myall River at Bulahdelah Gauge (560040):</p> <ol style="list-style-type: none"> 1. Flood watch or minor flood warning for the Myall River or severe weather warning for flash flood risk in the area Targeted evacuation of Lions Park on the western bank of Myall River 2. Prediction to reach and/or exceed 3.5m. Targeted evacuation of low lying properties in and around the following streets must be complete by this height: <ul style="list-style-type: none"> ▪ Myall Street ▪ Richmond Street (West of Alexandra Street) ▪ Stuart Street (West of Alexandra Street) ▪ Stroud Street (South of Stuart Street) ▪ Blanch Street (West of Crawford Street) ▪ Prince Street (South of Richmond Street) ▪ Jackson Street ▪ Alexandra Street (South of Stuart Street) ▪ Bulahdelah Showground <p><i>Route:</i> Residents in affected areas to travel east using Lee, Richmond, Stuart, Jackson and Blanch Streets to Assembly Area at Bulahdelah Central School (8 Meade Street).</p> 3. Prediction to reach and/or exceed 4.80m. Targeted evacuation of low lying properties in and around the following streets must be completed by this height: <ul style="list-style-type: none"> ▪ Prince Street (South of Alum Street) ▪ Alexandria Street ▪ Crawford and Stroud Streets between Jackson and Meade Streets <p><i>Route:</i> Residents in affected areas to travel east using Lee, Stuart and Blanch Streets to Assembly Area at Bulahdelah Central School (8 Meade Street)</p>

	An event of a 5.5 m is likely to result in approximately 52 properties experiencing over floor inundation.
Sequencing of evacuation	Evacuation sequencing will be based on the above triggers for evacuation. The aged care facility, schools and community health campus/small hospital are located outside of the predicted of the 5.5 m and Possible Maximum Flood extents (6.8m).
Evacuation Routes	General strategy will be for affected residents and visitors to use roads traveling east to access higher ground and evacuation/assembly areas on the eastern side of the town.
Evacuation Route Closure	The western area of Bulahdelah is the area affected by flood waters. Inundation of low lying sections of these streets can begin at 2.0 metres at Myall River at Bulahdelah gauge. Majority of these streets are undulating in nature with high and low points that provide rising road access.
Method of Evacuation	<ul style="list-style-type: none"> ▪ Primarily self-evacuation by private transport before road closures ▪ Evacuation/Relocation information to residents disseminated via broadcast media, social media and via doorknock (depending on available resources)
Evacuation Centre/Assembly Point	People should be encouraged to stay with friends/relatives outside the flood affected areas of Bulahdelah. Where this is not possible the nominated Assembly Area/Evacuation Centres is: <ul style="list-style-type: none"> ▪ Bulahdelah Central School, 8 Meade St, Bulahdelah
Large scale evacuations	When large-scale evacuations are likely, NSW SES Mid Coast Local Controller Local Controller will liaise with the Local Emergency Management Committee and request the deployment of additional transportation resources into Bulahdelah.
Rescue	Accredited flood rescue technicians from NSW SES and other agencies will undertake Flood Rescue operations as per the Flood Rescue Operations Policy and Incident Action Plan for the event. There is no NSW SES Unit in Bulahdelah. In the event of predictions for severe weather and riverine flooding for Bulahdelah, it is possible that NSW SES Mid North Coast Region will seek to deploy out of area flood rescue resources into Bulahdelah.
Resupply	Resupply will be provided by the NSW SES through the 132500 call out system. The town of Bulahdelah has rising road access so protracted resupply operations in the sector are unlikely. Table 2, in Volume 2 provides information about isolated communities in the former Great Lakes area and potential periods of isolation. A flowchart illustrating the Resupply process is shown in Volume 1 of the Local Flood Plan, Attachment 1
Aircraft Management	<p>Helicopter Landing Points:</p> <p>Suitable landing points are located at:</p> <ul style="list-style-type: none"> ▪ Sports oval at Bulahdelah Central School, 8 Meade St, Bulahdelah (-32.413, 152.210) ▪ Sport oval at St Joseph’s Primary School, Bulahdelah Way, Bulahdelah (-32.406, 152.213) <p>Note – Bulahdelah Showground is located on the western side of the town in flood prone land next to Myall River.</p> <p>Airports:</p> <ul style="list-style-type: none"> ▪ No airport exists at Bulahdelah ▪ In the event that aviation resources are required to support flood operations,

	<p>it is likely that aircraft would operate out of the Taree Airport .</p> <ul style="list-style-type: none"> ▪ Functionality of the Taree Airport is threatened once Manning River at the Taree Gauge reaches 5.43 m.
<p>Other</p>	<p>Special considerations relating to the evacuation:</p> <ul style="list-style-type: none"> ▪ Closure of Schools –the NSW SES will coordinate closures through the school principals on each affected school. ▪ Evacuation of residential institutions, nursing homes and aged care facilities will occur where these are threatened by predicted flood waters. ▪ Security. Police patrols to be established to maintain law and order after evacuation has occurred. ▪ Bulahdelah has 2 peak seasons with potential for in population increases: <ol style="list-style-type: none"> (1) School Holidays – December/ January (2) Easter Holidays – March /April (3) Bulahdelah Rock, Rattle and Roll Festival – first weekend in November <p>These arrangements will stay in place until the ALL CLEAR is provided by the NSW SES to residents to return to their premises.</p>

2.2. BULAHDELAH SECTOR MAP



3. NABIAC SECTOR

3.1. NABIAC RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Mid Coast for more information about this Community.

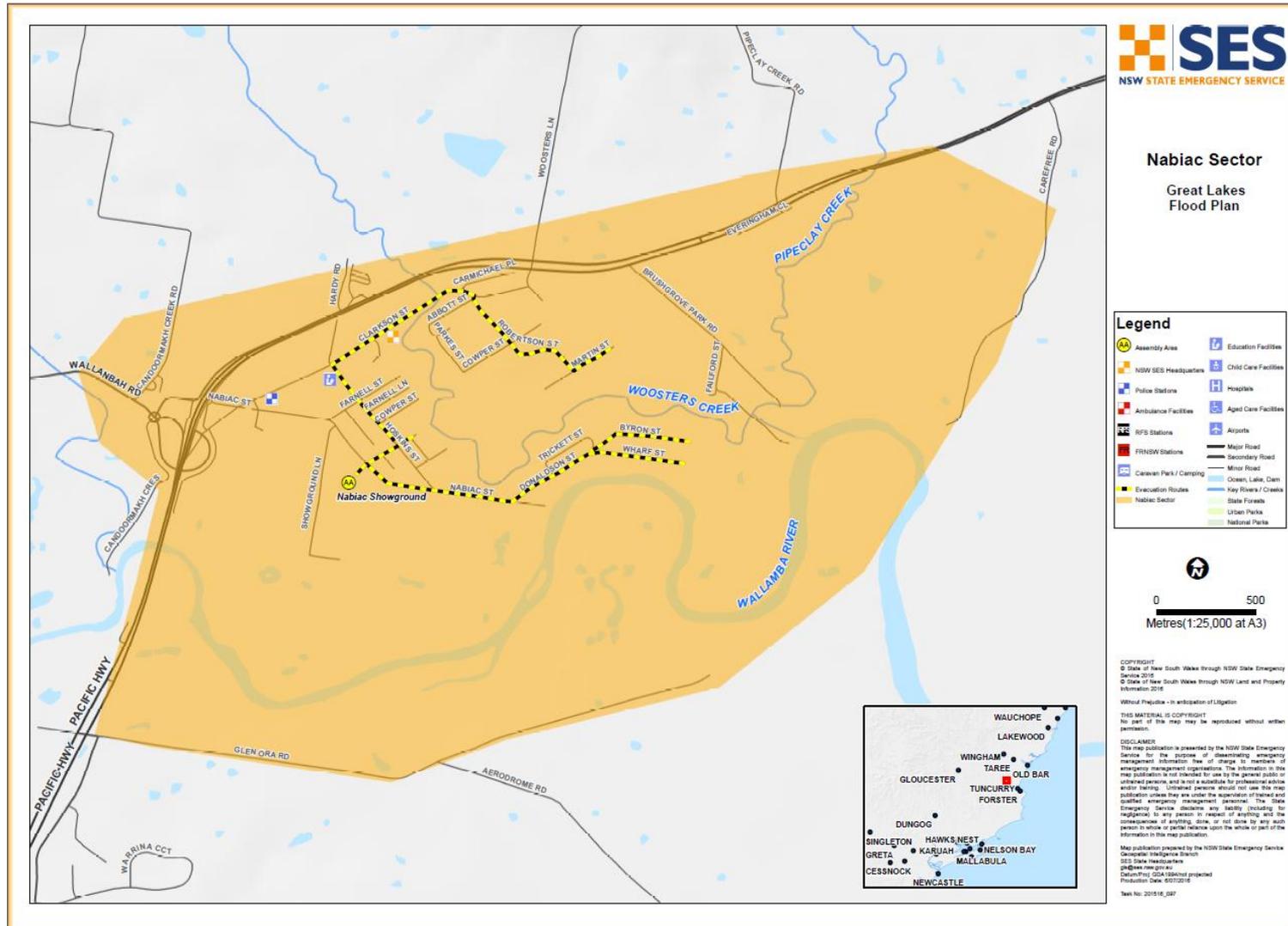
Sector Description	<p>Nabiac is a small town situated 29 km south of Taree. The village is located within the Mid Coast Council local government area and is approximately 281 km north of Sydney and is situated near the Wallamba River.</p> <p>Land use within the village comprises mainly low density residential development with commercial buildings in the north-west part of the town.</p> <p>The Wallamba River flows in an eastwards direction passing approximately 1 km to the south of Nabiac, with a contributing upstream catchment area of approximately 325 km², out of a total area of 495 km² including the southern section to Wallis Lake.</p>	
Hazard	<p>Three creeks (Town, Wooster's and Pipeclay) flow from a northerly direction southwards through the town and into the Wallamba River.</p> <p>The highest risk areas, in terms of risks to property and life, are focused around Clarkson Street, around the crossings of Town Creek and Wooster's Creek (4).</p> <p>Town Creek tends to be controlled by a set of pipe culverts near the Industrial area, which can cause a backwater to form along Nabiac Street and Clarkson Street.</p> <p>Flooding at Nabiac (Wallamba River) has not occurred for a number of years. However significant local floods at Nabiac occurred in 1927, 1929, 1947, 1957, 1978, 1983, 2002 and 2007 (4).</p> <p>The flood of 1927 on the reach from Nabiac to Failford peaked at levels higher than would be expected in the 1% AEP event; that is, there is a less than 1% chance each year of a flood of a severity of that of 1927 occurring there.</p> <p>The most severe flooding in recent times occurred in February 2002, as a result of intense (with a rainfall ARI of approximately 100 years 21.6mm/hr over 9 hours) local rainfall and elevated Wallamba River levels (5).</p> <p>There are several historical recorded floods on the Wallamba River that resulted in flood heights at Nabiac Bridge above 7 mAHD, high enough to cause backwater flow up Town Creek as far as Clarkson Street (5).</p>	
Flood Affect Classification	<p>In an event that features flooding from the Wallamba River plus local catchment run off, sections of Nabiac have the following flood affect classifications (5):</p> <ul style="list-style-type: none"> ▪ Southern section of Nabiac – Low Flood Island ▪ Northern section of Nabiac – Rising Road Access ▪ Western section of Nabiac – Overland Refuge on High Flood Island or High Trapped perimeter area. ▪ Clarkson Street Area – High Trapped Perimeter <p>All of Nabiac becomes a Low Flood Island in an extreme flood, including major rises on the Wallamba River (4).</p>	
At risk properties in an extreme flood	115	Total number of properties within Sector/Community 544
Sector Control	<p>The NSW SES Mid Coast Local Controller will control evacuations in this sector.</p> <p>NSW SES will conduct storm and flood operations in the sector with assistance from NSW Police, Fire and Rescue NSW and Rural Fire Service (RFS).</p> <p>An Incident Control Facility will be established at the NSW SES Nabiac Unit, Clarkson Street, Nabiac.</p> <p>For Level 2 and 3 events Incident Control is likely to scale up to LGA level, with the</p>	

	Local Controller Nابیac Unit Controller becoming a Division Commander. In large scale events the Mid Coast Council Emergency Operations Centre Facility (Tuncurry) may provide facilities for incident control separate to a supporting Emergency Operations Centre.					
Key Warning Gauge Name	Name	Watercourse	AWRC No.	Min (m)	Mod (m)	Maj (m)
	Wallamba River at Nابیac	Wallamba River	209404	n/a	n/a	n/a
	The Bureau of Meteorology monitors the Wallamaba River catchment via an ALERT rainfall gauge and two river height gauges near Nابیac, primarily using this information for flood warning at Wallis Lake rather than to provide detailed flood warnings for Nابیac (5). There is no warning system currently in place for the three local creek catchments with current weather forecast technology not being sufficient to accurately provide lead times for responding to such floods.					
Key Rain Gauge	Nابیac (Station number - 560048)					
General Strategy	<p>Property protection measures.</p> <ul style="list-style-type: none"> ▪ Based on requests for assistance from 132 500 <p>Evacuation of at risk population:</p> <ul style="list-style-type: none"> ▪ At risk residents may be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. ▪ Primarily self-evacuation by private transport to family and friends outside the flood affected area. <p>Establishment of an Assembly Area at:</p> <ul style="list-style-type: none"> ▪ Nابیac Showground, Showground Lane, Nابیac <p>Rescue</p>					
Key Risks / Consequences	<p>Inundation</p> <p>Properties in Wharf, Byron, Donaldson, Martin and Stuart Street and at the intersection of Nابیac and Clarkson Streets can be affected in floods below t5.8m at the Nابیac Street gauge on Town Creek (4). Of particular concern is the Donaldson Street area which can be isolated prior to being flooded. In 5.8m flood at Nابیac Street gauge, 7 houses, and 2 non-residential buildings may be flooded above floor. In extreme floods (7.6 m at Nابیac Street gauge) much of the town west of Parkes Street and south of Cowper Street can be inundated in Nابیac (77 buildings).</p> <p>Isolation</p> <p>In floods approximating the magnitude of 6.5m at Nابیac Street gauge a floodwaters can cross Nابیac Street and flow towards the Town Creek cutting the town in two. The town's main evacuation centre, the showground is a high flood island being isolated around 6.5m at Nابیac Street gauge (4).</p>					
Information and Warnings	<p>The NSW SES will undertake a variety of different actions to ensure the community are informed of potential impacts, these include:</p> <ul style="list-style-type: none"> ▪ Flood Watches for Wallamba River and Wallis Lake ▪ Flood Bulletins for Wallamba River ▪ Provision of flood advice about evacuation of residents in large flood events to an Assembly Area at the Nابیac Showground ▪ Sequenced door knocking of low lying properties in Nابیac that may need to evacuate during large events 					

	<ul style="list-style-type: none"> ▪ Media announcements ▪ Social media ▪ Possible use of Emergency Alert System ▪ Liaison between key community stakeholders and the NSW SES Nabitac Unit
Property Protection	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> ▪ Monitoring rising flood waters. ▪ Relocation of livestock. ▪ Relocation of farm machinery and valuable goods ▪ Control of surface water through sandbagging measures. ▪ Assist in the lifting of furniture to residents in need. ▪ Monitoring integrity of dwellings surrounded by flood waters. <p>Proactive property protection measures are limited due to the flash flood nature of the local creek systems, lack of local warning systems and scarcity of emergency service resources.</p>
	<p><i>Protection of essential infrastructure:</i></p> <p>Emergency Services in located in Clarkson Street Nabitac such as RFS, NSW SES and Police buildings are at risk of flooding in an extreme event.</p> <p>The Telstra phone exchange, sewerage pump station and a number of electricity substations are threatened with inundation in 1% AEP (5.8 m at Nabitac Street gauge) and Probable Maximum Flood (PMF) events.</p>
Evacuation and/or Isolation Triggers	<p>The key evacuation triggers for Nabitac sector include:</p> <ul style="list-style-type: none"> ▪ Heavy rainfall in the local catchment leading to rises in Town, Wooster's and Pipeclay Creeks causing flash flooding. ▪ Rises in the Wallamba River causing riverine/backwater flooding. <p>Evacuations</p> <p>Although there is a river level gauge on the Wallamba River it should be noted that no warnings are available for Wallamba River at Nabitac and there are no warning systems on local creeks (5).</p> <p>For large floods on the Wallamba River it may be necessary to evacuate residents, with low flood islands as priority areas (5).</p> <p>Should the Wallamba River at Nabitac Gauge reach or exceed the estimated moderate height of 9.5 metres, combined with elevated local creek levels - NSW SES would issue a Flood Advice – suggesting that residents in the low lying properties in the following streets may choose to self-evacuate to the Nabitac Showground where an Assembly Point has been established:</p> <p>Wharf, Byron, Donaldson, Trickett, Martin, Stuart Street, Farnell, Hoskins Street, Nabitac and Clarkson Streets</p>
Sequencing of evacuation	<p>Southern end of Nabitac as a low flood Island would be a priority area in terms of initiating evacuations.</p> <p>Evacuation of the Nabitac Public School, Nabitac Kids Shack, and Nabitac Pre School would also be prioritised.</p>
Evacuation Routes	<p>General strategy will be for affected residents and visitors to use Nabitac Street and Showground Lane to access higher ground and evacuation/assembly area at the Nabitac Showground.</p>
Evacuation Route Closure	<p>Evacuation routes may become inundated in the event of combined flash flooding from local creeks plus large scale riverine flooding from the Wallamba River.</p>
Method of Evacuation	<ul style="list-style-type: none"> ▪ Primarily self-evacuation by private transport before road closures ▪ Evacuation/relocation information to residents disseminated via broadcast

	media, social media and via doorknock (depending on available resources)
Evacuation Centre/Assembly Point	<p>People should be encouraged to stay with friends/relatives outside the flood affected areas of Nabiac.</p> <p>Where this is not possible the nominated Assembly Area is:</p> <ul style="list-style-type: none"> ▪ Nabiac Showground, Showground Lane, Nabiac
Large scale evacuations	If large-scale evacuations are required, NSW SES Mid Coast Local Controller can liaise with the Local Emergency Management Committee and request the deployment of additional resources into Nabiac.
Rescue	<p>The NSW SES Nabiac Unit will undertake Flood Rescue operations as per the Flood Rescue Operations Policy and Incident Action Plans for the event.</p> <p>Large scale rescues are considered unlikely in this sector due to the characteristics of flooding in the area. i.e. Incremental/low velocity/lack of over floor residential property inundation.</p>
Resupply	<p>Pre-positioning of flood rescue resources</p> <ul style="list-style-type: none"> ▪ NSW SES level 3 flood rescue resources are limited in the Nabiac area ▪ On receiving a severe weather warning for heavy rain and a flood watch for Wallamba River/Wallis Lake, and/or the Myall catchment, that consideration be given to requesting OAAA flood rescue resources. <p>Nabiac Unit assisting Stroud Unit in Flood operations at Bulahdelah</p> <ul style="list-style-type: none"> ▪ As there is no NSW SES Unit at Bulahdelah, NSW SES Nabiac Unit can be called upon to support storm and flood field operations in the Bulahdelah sector. <p>Resupply will be provided by the NSW SES through the 132 500 request for emergency assistance system.</p> <ul style="list-style-type: none"> ▪ Large scale prolonged resupply operations are considered unlikely in this sector. ▪ Requests for resupply in the sector would be more likely to come from nearby rural properties isolated by flash flood waters/rises in the Wallamba River. <p>Table 2, in Volume 2 provides information about isolated communities in the former Great Lakes area and potential periods of isolation.</p> <p>A flowchart illustrating the Resupply process is shown in Volume 1 of the Local Flood Plan, Attachment 1</p>
Aircraft Management	<p>Helicopter Landing Points:</p> <p>Suitable landing points are located at:</p> <ul style="list-style-type: none"> ▪ Nabiac Showground, Showground Lane, Nabiac (-32.102, 152.383) <p>Due to the limited Airport facilities in the sector, aviation management would be coordinated from Taree Airport.</p> <p>Airports:</p> <ul style="list-style-type: none"> ▪ No airport exists at Nabiac ▪ In the event that aviation resources are required to support flood operations, it is likely that aircraft would operate out of the Taree Airport. ▪ Functionality of the Taree Airport is threatened once Manning River at the Taree Gauge reaches 5.43m.
Other	<p>Nabiac is a stopover point for people travelling along the Pacific Highway, which can result in an increase in the number of people in Nabiac.</p> <p>No other considerations have been noted.</p>

3.2. NABIAC SECTOR MAP



4. SMITHS LAKE SECTOR

4.1. SMITHS LAKE RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Mid Coast for more information about this Community.

Sector Description	<p>Smith's Lake is a small village in the Mid North Coast region, located within the Mid Coast Council local government area, approximately 274 km north of Sydney.</p> <p>The township of Smiths Lake is located on the northern side of the Smiths Lake itself. A number of other villages boarder the lake including Tarbuck Bay and parts of Bungwahl.</p> <p>Within the sector there are also two caravan parks (Sandbar and Bushland) and a University research centre at Horse Point.</p> <p>Drawing its catchment from within Wallingat National Park and the Wamwarra and Tarbuck creeks, Smiths Lake has a relatively small catchment area of 34 km² and a surface area of 12 km². The Lake is classified as an Intermittently Open and Closed Lake or Lagoon (ICOLL).</p>	
Hazard	<p>Flooding can occur along the foreshore areas of Smiths Lake and on the eastern edge of Symes Bay due to catchment rainfall and elevated ocean levels.</p> <p>An example of the type of weather system that can cause both elevated river/lake and ocean levels was the June 2016 East Coast Low.</p> <p>Most of the time the lakes entrance is closed to the ocean.</p> <p>Periodically the lakes entrance is opened mechanically by Council in accordance with floodplain management protocols.</p> <p>The current trigger for opening Smiths Lake is set at 2.1 mAHD, however the entrance can be opened any time from 1.9 mAHD.</p>	
Flood Affect Classification	<p>Sandbar and Bushland Holiday Parks and Golf Course (low trapped perimeter area)</p> <p>The residents and visitors to the Sandbar and Bushland holiday parks and golf course have been identified in the Smiths Lake Flood Risk Management Study as being vulnerable to isolation during major flood events due to the inundation of access roadways prior to floodwaters reaching permanent and temporary structures/buildings (6).</p> <p>Therefore the area in the holiday parks could be considered as a low trapped perimeter area as it is likely that the holiday parks (particularly Bushland Holiday Park) do not have enough land above the limit of flooding to cope with the number of people in the area (6).</p> <p>Residents Dogwood Road (rising road access)</p> <p>Residents of Dogwood Road (south western side of the Lake) are likely to experience inundation of access routes during minor flood events and when levels in Smiths Lake are high. However people in the area still have rising road access (6).</p>	
At risk properties in an extreme flood	34	Total number of properties within Sector/Community 597
Sector Control	<p>The NSW SES Mid Coast Local Controller will control evacuations in this sector.</p> <p>NSW SES will conduct storm and flood operations in the sector with assistance from NSW Police, Fire and Rescue NSW and Rural Fire Service (RFS).</p> <p>An Incident Control Facility will be established at the NSW SES Forster Pacific Palms Unit, Charlotte Bay Road, Charlotte Bay.</p> <p>For Level 2 and 3 events Incident Control is likely to scale up to LGA level, with the Local Controller Forster/Pacific Palms Unit Controller becoming a Division Commander.</p> <p>In large scale events the Mid Coast Council Emergency Operations Centre Facility</p>	

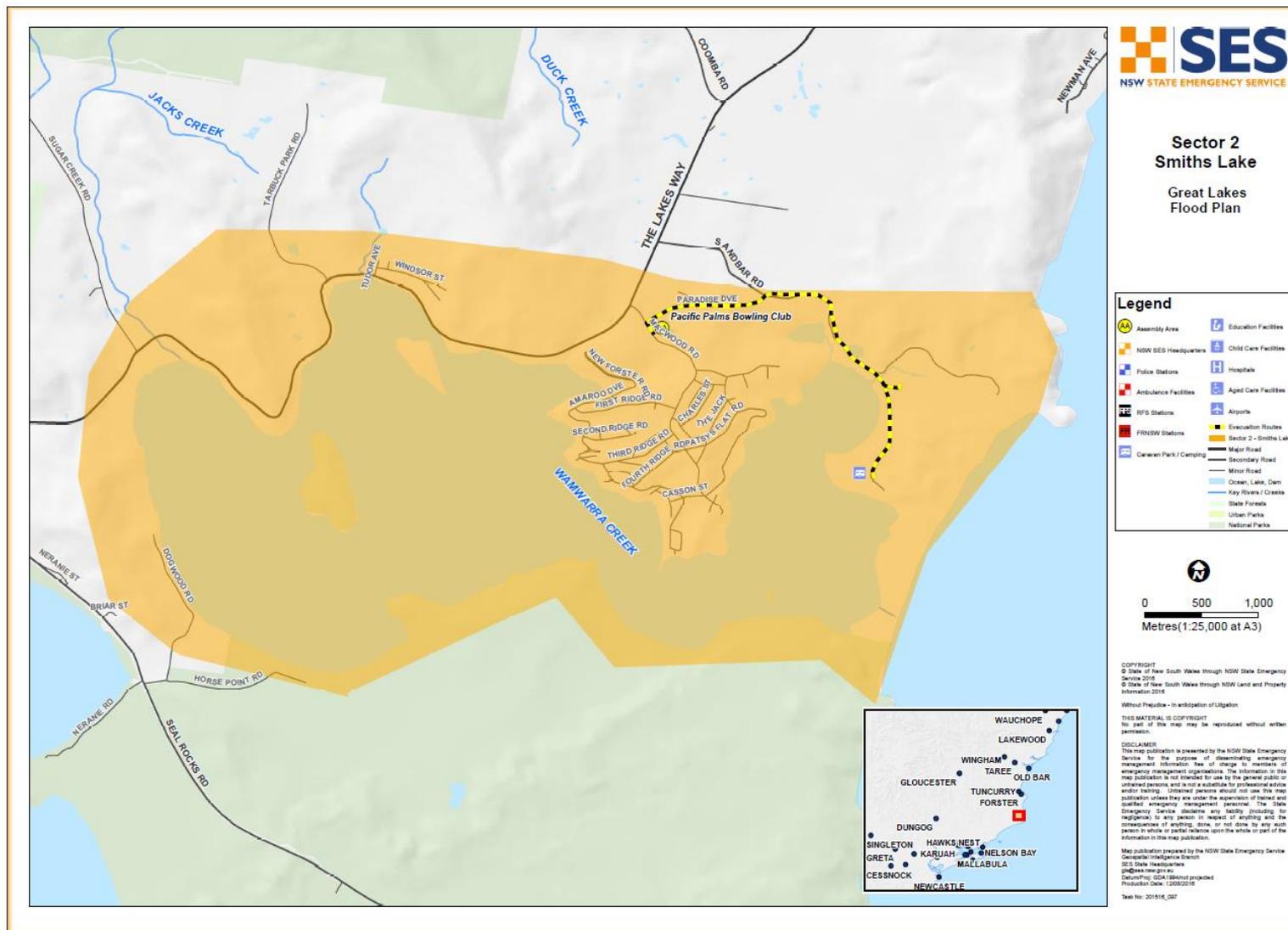
	(Tuncurry) may provide facilities for incident control separate to a supporting Emergency Operations Centre.
Key Warning Gauge	<p>There are no river based warning gauges for this sector.</p> <p>The tributaries to the lake include Wamwarra and Tarbuck creeks. The creeks originate in the elevated areas of the Wallingat National Park.</p> <p>Water levels in Smiths Lake have been measured at the Manly Hydraulics gauge located at Tarbuck Bay (station number 209465).</p>
Key Rain Gauges	<p>Forster (Station number - 60013)</p> <p>Bungwahl (Station number – 60095)</p>
General Strategy	<p>Property protection measures:</p> <ul style="list-style-type: none"> ▪ Based on requests for assistance from 132 500 <p>Warning of risk areas about potential isolation:</p> <ul style="list-style-type: none"> ▪ According to the Smiths Lake Flood Risk Management Study there are no residential properties inundated due to flooding in all events except for the PMF (3.5 mAHD) (6). ▪ It is not envisaged that large scale flood evacuations are required. ▪ Residents in Dogwood Road, UNSW Field Centre and Sandbar/Bushland Holiday parks will be encouraged to prepare for isolation which may also include self-evacuation. <p>Rescue</p>
Key Risks / Consequences	<p>Tarbuck Bay and Smith Lake</p> <p>Results of flood modelling from the Smith Lake Floodplain Risk Management Study indicate that flood hazards in the villages of Smith Lake and Tarbuck Bay are relatively minor as most dwellings lie outside of the extent of the probable maximum flood (PMF) (6).</p> <p>Furthermore those properties that are affected in the PMF will still have rising road access allowing evacuation. The exception being the Frothy Coffee Boatshed at Smiths Lake.</p> <p>Sandbar and Bushland Holiday Parks</p> <p>The Symes Bay/eastern area of Smiths Lake is where the majority of floodplain inundation occurs (6).</p> <p>Within this area the Flood Risk Study has identified residents and visitors to the Sandbar and Bushland Holiday Park and Golf Course as being at risk of isolation due to inundated roads that would prevent evacuations.</p> <p>The Study suggest that in 2.6 mAHD floods the key access route (un sealed Sandbar Road) for the Sandbar and Bushland holiday parks is inundated at its lowest point approximately 2.5 hours after the commencement of rainfall in the catchment (6).</p> <p>During peak holiday season it is estimated that the combined capacity of the two caravan (Sandbar and Bushland) parks is approximately 800 people, utilising 200 camping/caravan sites.</p> <p>Residents of Dogwood Road</p> <p>Eight (8) properties along Dogwood Road on the south western foreshore of the Lake are likely to experience inundation of access routes (Dogwood Road) during minor flood events and when levels in Smiths Lake are high (6).</p> <p>University of NSW Smiths Lake Field Study Centre</p> <p>The field centre is located on Horse Point Road at the southern end of Smiths Lake. The one hectare property contains a number of buildings including a 56 bed dormitory facility and has been identified in the Smiths Lake Flood Risk Management Study as being potentially at risk from flooding. However it is envisaged that staff and visitors at the Centre would have rising road access to evacuation along Uni Road (6).</p>

	<p>The above risks are likely to be increased in the event of a failure to mechanically open the entrance of the Smiths Lake to the ocean.</p>
<p>Information and Warnings</p>	<p>The NSW SES will undertake a variety of different actions to ensure the community are informed of potential impacts, these include:</p> <ul style="list-style-type: none"> ▪ Flood Watches for Myall Lake ▪ Media announcements ▪ Social media ▪ Possible use of Emergency Alert System ▪ Liaison between key community stakeholders and the NSW SES Forster Pacific Palms Unit
<p>Property Protection</p>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> ▪ Monitoring rising flood waters. ▪ Relocation of livestock. ▪ Relocation of farm machinery and valuable goods ▪ Control of surface water through sandbagging measures. ▪ Assist in the lifting of furniture to residents in need. ▪ Monitoring integrity of dwellings surrounded by flood waters. <p>Proactive property protection measures are limited due to the gradual and low velocity nature of ocean derived flood events in the area and the scarcity of emergency service resources.</p> <hr/> <p><i>Protection of essential infrastructure:</i></p> <p>No known infrastructure at risk</p>
<p>Evacuation and/or Isolation Triggers</p>	<p>The key isolation triggers are based on:</p> <ul style="list-style-type: none"> ▪ Manly Hydraulics Tarbuck Bay water level gauge (station number 209465). ▪ Predictions for above average astronomical tides high tides ▪ Predictions for damaging surf above 2 metres ▪ Severe weather warnings for heavy rainfall <p>Triggers for issuing isolation advice:</p> <p>NSW SES may issue flood isolation advice for the following areas/facilities:</p> <ul style="list-style-type: none"> ▪ Sandbar and Bushland Holiday Parks ▪ Residents of Dogwood Road – Smiths Lake ▪ The UNSW Field Study Centre – Horse Point <p>This local flood advice will be in the form of a media release that will advise residents/visitors to these facilities about the potential for isolation.</p> <p>The issuing of this advice will be carried out by NSW SES Mid North Coast Region in consultation with the Mid Coast Local Controller, Mid Coast Council and community stakeholders.</p> <p>The advice can be issued when:</p> <ul style="list-style-type: none"> ▪ Water levels in Smith Lake at the Tarbuck Bay gauge reach 1.9 mAHD (trigger for mechanical opening of the lake). ▪ Predictions for above average astronomical tides ▪ Predictions for damaging surf above 2 metres ▪ Severe weather warnings for heavy rainfall ▪ A failure to open the lake entrance
<p>Sequencing of</p>	<p>Evacuations in this sector are considered unlikely.</p>

evacuation	However in the event of a failure to mechanically open Smiths Lake combined with continued heavy rain, storm surge and abnormally high tides, it maybe become necessary to evacuate the Sandbar and Bushland Holiday Parks.
Evacuation Routes	Evacuation route for Sandbar and Bushland Holiday Parks is via Sandbar Road, Paradise Drive and then Macwood Road to Pacific Palms Bowling Club.
Evacuation Route Closure	During a 2.6 mAHD the key access route (un sealed Sandbar Road) for the Sandbar and Bushland holiday parks is inundated at its lowest point approximately 2.5 hours after the commencement of rainfall in the catchment (6).
Method of Evacuation	<ul style="list-style-type: none"> ▪ Primarily self-evacuation by private transport before road closures. ▪ Evacuation/relocation information to residents of the affected areas will be disseminated via broadcast media, social media, direct liaison with holiday park management and through doorknocks (depending on available resources).
Evacuation Centre/Assembly Point	<p>Assembly Area:</p> <ul style="list-style-type: none"> ▪ Pacific Palms Bowling Club - Lot 58 Macwood Road, Smiths Lake
Large scale evacuations	<p>Large scale evacuations of this sector are considered unlikely.</p> <p>If large-scale evacuations are required of the Holiday Parks during peak season, NSW SES Mid Coast Local Controller can liaise with the Local Emergency Management Committee and request the deployment of additional resources into Smiths Lake.</p>
Rescue	<p>Pre-positioning of flood rescue resources</p> <ul style="list-style-type: none"> ▪ NSW SES level 3 flood rescue resources are limited in the Forster/Tuncurry area. ▪ On receiving a severe weather warning for heavy rain and a flood watch for Wallamba River/Wallis Lake, and/or the Myall catchment, that consideration be given to requesting OAAA flood rescue resources. ▪ These resources would be deployed at the Forster/Pacific Palms Unit for tasking. <p>The Forster/Pacific Palms NSW SES Unit will undertake Flood Rescue operations as per the Flood Rescue Operations Policy.</p> <p>Large scale rescues would be unlikely in this sector due to the characteristics of flooding in the area. i.e. Incremental/low velocity/lack of over floor residential property inundation.</p>
Resupply	<p>Resupply will be provided by the NSW SES through the 132500 request for emergency assistance system.</p> <ul style="list-style-type: none"> ▪ Large scale prolonged resupply operations are considered unlikely in this sector. ▪ Villages of Smith Lake and Tarbuck Bay retain rising road access during 1% AEP events. ▪ Requests for resupply in the sector would be more likely to come from nearby rural properties isolated by flash flood waters or from the isolated Sandbar and Bushland Holiday Parks. <p>Table 2, in Volume 2 provides information about isolated communities in the former Great Lakes area and potential periods of isolation.</p> <p>A flowchart illustrating the Resupply process is shown in Volume 1 of the Local Flood Plan, Attachment 1</p>
Aircraft Management	<p>Helicopter Landing Points:</p> <p>Due to the limited Airport facilities in the sector, aviation management would be coordinated from Taree Airport.</p>

	<p>Suitable landing points are located at:</p> <ul style="list-style-type: none"> ▪ Pacific Palms Bowling Club – Lot 58 Macwood Road, Smiths Lake (-32.372, 152.500) <p><i>Airports:</i></p> <ul style="list-style-type: none"> ▪ No airport exists at Smith Lake. ▪ In the event that aviation resources are required to support flood operations, it is likely that aircraft would operate out of the Taree Airport. ▪ Functionality of the Taree Airport is threatened once Manning River at the Taree Gauge reaches 5.43 m.
<p>Other</p>	<p>Special considerations relating to sector management:</p> <ul style="list-style-type: none"> ▪ The Smiths Lake area has 3 peak seasons with potential for in excess of 10% population increase: <ol style="list-style-type: none"> (1) School Holidays – December/ January (2) Easter Holidays – March /April (3) School Holidays – September/October ▪ Liaison is required between NSW SES Incident Controller/Incident Management Team and Mid Coast Council around the mechanical opening of the lake entrance to the ocean. ▪ Liaison and planning is required with the management/ownership of the Sandbar and Bushland Holiday Parks

4.2. SMITHS LAKE SECTOR MAP



5. STROUD SECTOR

5.1. STROUD RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Mid Coast for more information about this Community.

Sector Description	Stroud is located 226 km north of Sydney in the heart of the Karuah Valley. Stroud town lies near the confluence of Mill and Lamans Creeks, which join approximately 1 km downstream from the centre of the township and then flow into the Karuah River. Stroud has a population of approximately 1022 residents.					
Hazard	<p>Stroud can be flooded from Mill Creek and Lamans Creek (4).</p> <p>Mill Creek has a catchment area of 120 km² and Lamans Creek an area of 20 km² (7). Much of the flooding which takes place in Stroud occurs as flash flooding.</p> <p>The highest risk areas are properties located in the western and southern parts of Stroud around the confluences of Mill Creek and Mill Brook and Mill Creek and Lamans Creek.</p> <p>Mill and Lamans Creek have experienced several significant floods in the past century, although no regular flood records exist.</p> <p>Some recorded flood levels exist for Mill and Lamans Creek from February 1956, October 1985, June 2007 and April 2015, with the 1956 and 2015 events being remembered as the largest on record.</p> <p>Local anecdotal reports indicate that the April 2015 event was larger than the 1956 event.</p>					
Flood Affect Classification	Rising Road Access					
At risk properties in an extreme flood	>27	Total number of properties within Sector/Community				376
Sector Control	<p>The NSW SES Mid Coast Local Controller will control evacuations in this sector.</p> <p>NSW SES will conduct storm and flood operations in the sector with assistance from NSW Police, Fire and Rescue NSW and Rural Fire Service (RFS).</p> <p>An Incident Control Centre will be established at the NSW SES Stroud Unit, Booral Road, Booral.</p> <p>For Level 2 and 3 events Incident Control is likely to scale up to LGA level, with the Stroud Unit becoming a Division.</p> <p>In large scale events the Mid Coast Council Emergency Operations Centre Facility (Tuncurry) may provide facilities for incident control separate to a supporting Emergency Operations Centre.</p>					
Key Warning Gauge Name	Name	Watercourse	AWRC No.	Min (m)	Mod (m)	Maj (m)
	Karuah River at Dam Site	Karuah River (upstream of Stroud)	561106	n/a	n/a	n/a
	Karuah River at Booral	Karuah River (downstream of Stroud)	561040	n/a	n/a	n/a
	Mammy Johnsons River at Pikes Crossing	Mammy Johnsons River	NSW DPI gauge 209002	n/a	n/a	n/a

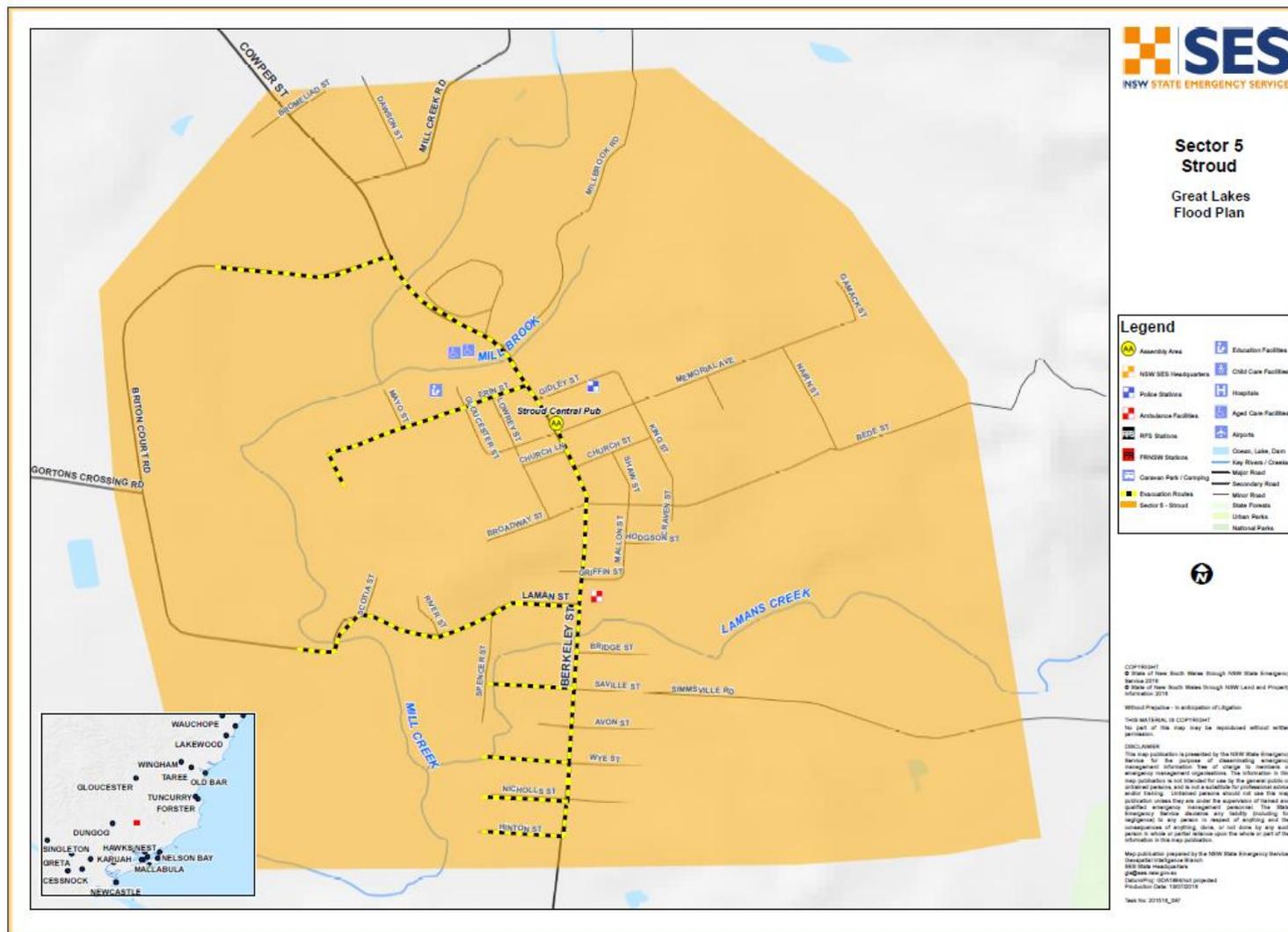
	<p>Flooding in Stroud is primarily a function of Mill and Lamans Creek.</p> <p>There are no warning system(s) in place for the Mill and Lamans Creek catchments.</p> <p>Flooding in Stroud can be made worse by back waters from the Karuah River.</p> <p>However there have been no recorded floods on the Karuah River larger than the estimated 2% AEP design event (10.7 m at Booral), which is approximately the height at which significant backwater flooding at Stroud will begin to occur (7).</p>
Key Rain Gauges	Stroud Post Office (Station Number - 61071)
	Crawford (Station Number - 560048)
	Chichester (Station Number – 61302)
	Gloucester (Station Number – 60015)
General Strategy	<p>Property protection measures:</p> <ul style="list-style-type: none"> ▪ Based on requests for assistance from 132 500 <p>Evacuation of at risk population:</p> <ul style="list-style-type: none"> ▪ At risk residents may be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. ▪ Primarily self-evacuation by private transport to family and friends outside the flood affected area. <p>Establishment of an Assembly Area at:</p> <ul style="list-style-type: none"> ▪ Stroud and District Country Club, 164 Bucketts Way , Stroud ▪ Stroud School of Arts, 2/18 Berkeley Street (Bucketts Way), Stroud <p>Establishment of an evacuation/assembly area stage point at:</p> <ul style="list-style-type: none"> ▪ Stroud Central Pub, 52 Cowper Street, Stroud <p><i>Where a PMF occurs evacuees will either remain at the assembly area, an established evacuation centre or staging point until the threat has past.</i></p> <p>Rescue</p>
Key Risks / Consequences	<p>Inundation</p> <p>The Stroud Showground is located on the Bucketts Way near Mill Creek and Mill Brook.</p> <p>During the April 2015 event the Showground was inundated with over a metre of fast flowing floodwater resulting in a number of flood rescues and causing extensive damage to the showground’s infrastructure.</p> <p>At least 13 residential properties opposite the Showground in Cowper Street (Bucketts Way) and Briton Court Road were also impacted by over floor flooding, with one home requiring demolition.</p> <p>In the 2015 event the aged care facility know as Stroud Community Lodge prepared to evacuate residents to higher ground as Mill Creek and neighbouring Mill Brook rose quickly. Floodwaters extend to the external grounds of the facility but did not enter the building.</p> <p>In addition to the Showground, flood liable areas in Stroud include properties in Britton Court Road, Erin, Scotia and Mayo Streets (7).</p> <p>In the southern part of the town floodwaters near the confluence of Mill and Lamans Creek can cause the inundation of Lamans Creek Bridge at Berkley Street (Bucketts Way), Avon Street, Spencer Street and the western low lying sections of Hinton, Nicolas, Saville and Bridge Streets.</p> <p>Isolation</p> <p>In the 2015 event both the Lamans Creek Bridge at Berkley Street (Bucketts Way) and Mill Creek Bridge at Cowper Street (Bucketts Way) were inundated effectively isolating Stroud.</p>

	<p>These closures meant the Rural Fire Service Station and the Great Lakes Council depot were cut off from the centre of the town, and each other.</p> <p>The availability of rising road access and the flash flood nature of the risk in Stroud means that inundation generally causes only short term isolations with flood waters rising and falling quickly.</p>
<p>Information and Warnings</p>	<p>The NSW SES will undertake a variety of different actions to ensure the community are informed of potential impacts, these include:</p> <ul style="list-style-type: none"> ▪ Flood Watches for Karuah and Myall Valleys ▪ Flood Bulletins for Karuah River and Myall Rivers ▪ Provision of flood advice about relocation of residents in large flood events to an Assembly Area at Stroud and District Country Club or Stroud School of Arts ▪ Sequenced door knocking of low lying properties in Stroud that may need to relocate during large events ▪ Media announcements ▪ Social media ▪ Possible use of Emergency Alert System ▪ Liaison between key community stakeholders and the NSW SES Stroud Unit
<p>Property Protection</p>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> ▪ Monitoring rising flood waters. ▪ Relocation of livestock. ▪ Relocation of farm machinery and valuable goods ▪ Control of surface water through sandbagging measures. ▪ Assist in the lifting of furniture to residents in need. ▪ Monitoring integrity of dwellings surrounded by flood waters. <p>Proactive property protection measures are limited due to the quick flash flood nature of the Mill/Lamans Creek catchment and the scarcity of emergency service resources.</p> <p><i>Protection of essential infrastructure:</i></p> <p>Sewerage treatment plant on Simmsville Road and water treatment plant on southern end of Briton Court Road are located out of the predicted 1% AEP flood extent (11.48 m at Booral gauge (8)).</p> <p>Telstra phone exchange is located on the edge of the 1% AEP and probable maximum flood levels (was threatened by inundation in the April 2015 flash floods).</p>
<p>Evacuation and/or Isolation Triggers</p>	<p>Evacuations</p> <p>Although there are gauges on the Karuah River to the north (Dam Site) and south (Booral) of Stroud, there are no gauges on the Karuah River that provide specific warnings for Stroud.</p> <p>The Karuah River is only likely to have a major influence on flooding in Stroud during a 2% AEP event (9) (equivalent 10.70 m AHD at Booral).</p> <p>There are no warning systems in place for the primary drivers of flooding in Stroud, Mill and Lamans Creek.</p> <p>Warnings</p> <p>In the event of a Flood Watch for moderate to major flooding on the Karuah or Myall Rivers and the issuance of associated severe weather warnings for heavy rain, the Stroud Unit may undertake a community liaison/"heads up" doorknock of residents in the following areas to highlight the potential risk of flash flooding and need to evacuate:</p> <ul style="list-style-type: none"> ▪ Stroud Showground camping areas ▪ The section of Cowper Street (Bucketts Way) from the Stroud Community

	<p>Lodge (Aged Care facility) through to Mill Creek Road</p> <ul style="list-style-type: none"> ▪ The north east section of Briton Court Road
Sequencing of evacuation	<p>The flash flood nature of the catchments combined with no warning systems means that proactive and accurate evacuations warnings will be difficult.</p> <p>Priority evacuation locations/facilities include:</p> <ul style="list-style-type: none"> ▪ Stroud Showground camping areas ▪ The section of Cowper Street (Bucketts Way) from the Stroud Community Lodge (Aged Care facility) through to Mill Creek Road ▪ The north east section of Briton Court Road.
Evacuation Routes	From Stroud north along Bucketts Way to the Stroud Country Club.
Evacuation Route Closure	Central Stroud can become isolated by flash flooding closing the Bucketts Way (Cowper Street) just north of Mill Creek Bridge and the Bucketts Way south of the Lamans Creek Bridge (Berkeley Street).
Method of Evacuation	<ul style="list-style-type: none"> ▪ Primarily self-evacuation by private transport before road closures. ▪ Evacuation/relocation information to residents disseminated via broadcast media, social media and via doorknock (depending on available resources).
Evacuation Centre/Assembly Point	<p>Assembly Area at:</p> <ul style="list-style-type: none"> ▪ Stroud and District Country Club, 164 Bucketts Way , Stroud ▪ Stroud School of Arts, 2/18 Berkeley Street (Bucketts Way), Stroud <p>An additional evacuation/assembly area at:</p> <ul style="list-style-type: none"> ▪ Stroud Central Pub, 52 Cowper Street, Stroud
Large scale evacuations	<p>Large scale evacuations of this sector are considered unlikely.</p> <p>If required the Stroud Country Club would be the preferred venue for an assembly/evacuation centre for large scale evacuations.</p>
Rescue	<p>Pre-positioning of flood rescue resources</p> <ul style="list-style-type: none"> ▪ NSW SES flood rescue resources are limited in Stroud. ▪ Flooding in Stroud can result in the closure of the Bucketts Way at Cowper Street (Mill Creek) and Bucketts Way at Berkeley Street (Lamans Creek). ▪ The closure of Berkeley Street at Lamans Creek prevents NSW SES Stroud Unit and NSW RFS Stroud Brigade from accessing the flood affected central parts of Stroud. ▪ The Stroud Unit Headquarters is located in the village of Booral (10 km south of Stroud) and can be isolated from Stroud by flashing flooding and road closures. ▪ The Stroud Unit may consider pre-positioning a response team and flood boat in the central part of Stroud on receiving a Flood Watch for the Karuah and Myall Valleys and severe weather warning for heavy rain. <p>The NSW SES Stroud Unit will undertake Flood Rescue operations as per the Flood Rescue Operations Policy and Incident Action Plans for the event.</p> <p>On the issuing of a Flood Watch for the Myall or Karuah catchments, NSW SES Gloucester Unit flood rescue resources can be placed on stand-by to assist operations in Stroud.</p>
Resupply	<p>Resupply will be provided by the NSW SES through the 132 500 request for emergency assistance system.</p> <ul style="list-style-type: none"> ▪ Large scale prolonged resupply operations are considered unlikely in this sector. ▪ Requests for resupply in the sector would be more likely to come from nearby rural properties isolated by flash flood waters/rises in the number of local creeks along Booral Road.

	<p>Table 2, in Volume 2 provides information about isolated communities in the former Great Lakes area and potential periods of isolation.</p> <p>A flowchart illustrating the Resupply process is shown in Volume 1 of the Local Flood Plan, Attachment 1.</p>
<p>Aircraft Management</p>	<p><i>Helicopter Landing Points:</i></p> <p>Due to the limited Airport facilities in the sector, aviation management would be coordinated from Taree Airport.</p> <p>Regular emergency helicopter landing zone is flood prone Stroud Showground</p> <p>Suitable landing points are located at:</p> <ul style="list-style-type: none"> ▪ Gidley Street, Stroud (next to Police Station on high ground) (-32.402, 151.967) ▪ Corner of Gloucester Street and Memorial Avenue, Stroud (on high ground) (-32.405, 151.965) <p><i>Airports:</i></p> <ul style="list-style-type: none"> ▪ No airport exists at Stroud. ▪ In the event that aviation resources are required to support flood operations, it is likely that aircraft would operate out of the Taree Airport. ▪ Functionality of the Taree Airport is threatened once Manning River at the Taree Gauge reaches 5.43m.
<p>Other</p>	<p>There are two peak seasons with potential for a 10% population increase associated with tourism and camping:</p> <ol style="list-style-type: none"> i. Christmas holidays December –January. ii. Easter long weekend. <p>In addition to this, the Stroud Show is held in April (1), Rodeo in September and Stroud Brick Throwing Festival in July each year increasing population by up to 1000.</p>

5.2. STROUD SECTOR MAP



6. TEA GARDENS/HAWKS NEST/PINDIMAR SECTOR

6.1. TEA GARDENS/HAWKS NEST/PINDIMAR RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Mid Coast for more information about these Communities.

Sector Description	<p>The towns of Tea Gardens and Hawks Nest are located on the northern shores of Port Stephens at the entrance to the Myall River.</p> <p>These small towns are located approximately 220 km north of Sydney in the southern portion of the Mid Coat Council Local Government Area (LGA).</p> <p>Tea Gardens (population 2,434) is on the western banks of the Myall River with a bridge connecting the town to Hawks Nest (population 1123) on the eastern banks of the River. The two towns are joined by the two lane Singing Bridge.</p> <p>Pindimar is village approximately 230 residents. It is located 5 km to the south of Tea Gardens on the northern shores of Port Stephens.</p> <p>The Lower Myall River catchment covers an area of 909 km² extending north-east from Port Stephens to cover the Myall Lakes and northwards along the Myall River 30 km to the west to Bulahdelah (10).</p> <p>The Lower Myall drains through the townships of Tea Gardens and Hawks Nest before discharging at Corrie Island via Corrie Creek and Paddy Marrs Inlet into Port Stephens.</p>	
Hazard	<p>One the key drivers of floods in the sector are oceanic processes (waves, wind, tides). High tide and storm surge can prevent flood waters escaping and lengthen the period of flooding. High ocean levels can also inundate coastal areas (4).</p> <p>Flood modelling conducted as part of the Lower Myall River and Myall Lakes Flood Study shows that that peak flood levels upstream of Monkey Jacket are attributed to catchment derived design flood events, while below (downstream of) Monkey Jacket (location of Tea Gardens/Hawks Nest Pindimar), ocean derived flood events are more significant (10).</p> <p>A number of historic floods and their associated peaks are identified in the Lower Myall River and Myall Lakes Flood Study these include; 1890s - 3.7 m AHD; 1927 - 2.7 m AHD; 1963 – 2.2 m AHD; May 1978 - 1.3m. More recent floods include April 2008 – 1.45 m AHD and June 2011 1.20 m AHD (10).</p>	
Flood Affect Classification	<p>Tea Gardens has rising road access in the 5% and 1% AEP floods (equivalent to 1.95 m and 2.38 m respectively at Bombah Point gauge).</p> <p>In the design Possible Maximum Flood (PMF) catchment event, the Tea Gardens peninsula would be classified as a Low Flood Island (10).</p> <p>In the design PMF catchment event Hawks Nest is classified as having Rising Road Access due to the ability to evacuate to the higher ground east of the Myall River, while Winda Woppa is classified as a High Flood Island as access along Tuloa Avenue may be lost.</p>	
At risk properties in an extreme flood	121	Total number of properties within Sector/Community 1016, 542, 104
Sector Control	<p>The NSW SES Mid Coast Local Controller will control evacuations in this sector.</p> <p>The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW and Rural Fire Service (RFS) volunteers.</p> <p>An NSW Fire and Rescue brigade is located in at Marine Parade and Rural Fire Service brigade is located at Wanya Road near the Council Depot.</p> <p>For Level 1 events an Incident Control Facility will be established at the NSW SES Stroud Unit at Booral, alternatively the Incident Controller may wish to establish of a</p>	

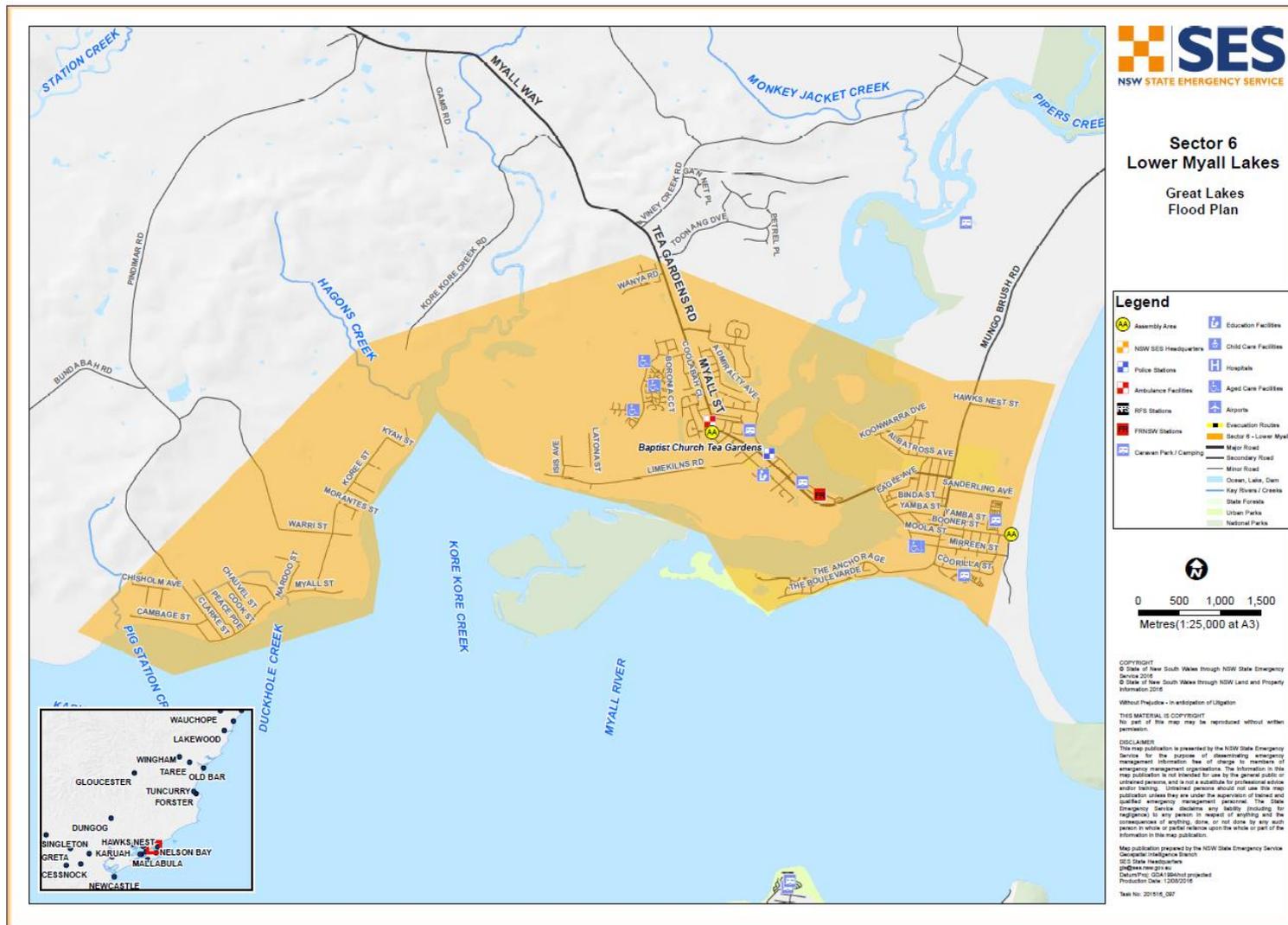
	Forward Command/Staging Area at Tea Gardens Rural Fire Service Station. For Level 2 and 3 events Incident Control is likely to scale up to LGA level, with the Local Controller Stroud Unit Controller becoming a Division Commander.					
Key Warning Gauge Name	Name	Watercourse	AWRC No.	Min (m)	Mod (m)	Maj (m)
	Bulahdelah	Myall River	560040	3.0m	n/a	n/a
	Myall River at Bombah Point MHL	Bombah Broadwater, Boolambyate and Myall Lakes	209475	n/a	n/a	n/a
	Myall River at Tea Gardens MHL	Myall River at entrance (ocean levels)	209480	n/a	n/a	n/a
	Shoal Bay	Levels southern shores of Port Stephens	561153	n/a	n/a	n/a
	Flooding in Tea Gardens, Hawks Nest and Pindimar are more likely to be caused by wind and ocean conditions rather than riverine/catchment drivers.					
Key Rain Gauges	Bulahdelah (Station Number - 560040)					
	Bungwahl (Station Number - 60095)					
	Hawks Nest Golf Club (Station Number – 61416)					
General Strategy	<p>Property protection measures:</p> <ul style="list-style-type: none"> Based on requests for assistance from 132 500 <p>Evacuation of at risk population:</p> <ul style="list-style-type: none"> At risk residents may be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. Primarily self-evacuation by private transport to family and friends outside the flood affected area. <p>Establishment of an Assembly Area at:</p> <ul style="list-style-type: none"> Hawks Nest Golf Course, Sanderling Ave, Hawks Nest Hawks Nest Community Centre, 71-73 Booner Street, Hawks Nest <p><i>Where a major PMF occurs evacuees will either remain at the assembly area or an established evacuation centre until the threat has past.</i></p> <p>Rescue</p>					
Key Risks / Consequences	<p>Some parts of Tea Gardens, in particular low lying areas on Marine Parade and the reserve at Budgerie Street are susceptible to flash flooding (June 2007) and storm surge (April 2015) (4).</p> <p>Low lying properties in South Pindimar are susceptible to flash flooding from local creek run off and storm surge.</p> <p>The Tea Gardens/Hawks Nest can be isolated by road closures caused by flash flooding. In extreme events Tea Gardens can be isolated from Hawks Nest.</p>					
Information and Warnings	<p>The NSW SES will undertake a variety of different actions to ensure the community are informed of potential impacts, these include:</p> <ul style="list-style-type: none"> Flood Watches for Myall River catchment Flood Bulletins for Myall River Sequenced door knocking of low lying properties in Tea Gardens, Hawks Nest and Pindimar that may need to relocate during large events Media announcements 					

	<ul style="list-style-type: none"> ▪ Social media ▪ Possible use of Emergency Alert System ▪ Liaison between key community stakeholders and the NSW SES Stroud Unit
<p>Property Protection</p>	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> ▪ Monitoring river, ocean, lake heights and rainfall totals ▪ Control of surface water through sandbagging measures ▪ Assist in the lifting of furniture to residents in need ▪ Monitoring integrity of dwellings surrounded by flood waters ▪ Responding to requests for assistance via Beacon <p>Proactive property protection measures are limited due to the gradual and low velocity nature of ocean derived flood events in the area and the scarcity of emergency service resources.</p> <p><i>Note: Jimmy’s Beach at Winda Woppa is a designated Coastal Erosion “Hot Spot within this sector”</i></p> <p>Property protection measures for the threat of coastal erosion involves the relocation of readily moveable household goods and commercial stock and equipment depending on available resources and operational priorities.</p> <p><i>The NSW SES is not responsible for planning or conduct of emergency beach protection works or other physical mitigation works. The former Great Lakes Council is responsible for the activation of the Mid Coast Council Coastal Zone Management Plan – Emergency Action Plan.</i></p> <hr/> <p><i>Protection of essential infrastructure:</i></p> <p><i>No known essential infrastructure at risk</i></p>
<p>Evacuation and/or Isolation Triggers</p>	<p>Evacuations</p> <p>In the extreme event (PMF) design catchment event, flood levels up to 2.4 m AHD will flood low lying land in Tea Gardens and Hawks Nest and will necessitate evacuations to prevent the potential loss of life due to the occurrence of high risk (flood conditions i.e. deep, high velocity) (10).</p> <p>Evacuation of the Tea Gardens peninsula and low lying areas of Hawks Nest and Pindimar should be considered if:</p> <ul style="list-style-type: none"> ▪ Bombah Broadwater levels is likely to reach or exceed 3 m AHD at the Myall River at Bombah Point Gauge ▪ Tea Gardens gauge level is likely to reach or exceed 1.4 m ▪ Occurrence of large astronomical tides ▪ Large seas and swell (storm surge) ▪ Continued heavy rain is predicted (10).
<p>Sequencing of evacuation</p>	<p>Southern end of the Tea Gardens Peninsular area, south of Maxwell Street, would be an evacuation priority in large ocean derived floods.</p> <p>Consideration will need to be given to the possible evacuation of the Tea Gardens Public School, which is located just to the north of this area.</p> <p>Low lying areas of Hawks Nest and Pindimar should be considered in the second stage of evacuations.</p>
<p>Evacuation Routes</p>	<p>From the Tea Garden Peninsular east along Myall Street, Kingfisher Avenue, Mungo Brush onto Sanderling Drive to Hawks Nest Golf Club.</p> <p>Due to road closures caused by flash flooding affected residents in Pindimar would not be asked travel to Hawks Nest Club.</p> <p>Instead affected residents would be encouraged to assemble at the Pindimar Rural Fire station at corner of Wyree and Koree Streets, Pindimar where an evacuation staging point would be established.</p>

	Residents requiring evacuation in Hawks Nest will travel to the evacuation/assembly area via Kingfisher then Sanderling Avenues to the Hawks Nest Golf Club
Evacuation Route Closure	Undulating nature of the local road network, flash flooding, combined with storm surge and abnormally high tides may cause the closure of roads around foreshore areas.
Method of Evacuation	<ul style="list-style-type: none"> ▪ Primarily self-evacuation by private transport before road closures ▪ Evacuation/relocation information to residents disseminated via broadcast media, social media and via doorknock (depending on available resources)
Evacuation Centre/Assembly Point	<p>People should be encouraged to stay with friends/relatives outside the flood affected areas.</p> <p>Where this is not possible the nominated Assembly Area(s) are:</p> <ul style="list-style-type: none"> ▪ Hawks Nest Golf Course, Sanderling Ave, Hawks Nest ▪ Hawks Nest Community Centre, 71-73 Booner Street, Hawks Nest
Large scale evacuations	<p>Large scale evacuations of this sector are considered unlikely.</p> <p>If large-scale evacuations are required, NSW SES Mid Coast Local Controller can liaise with the Local Emergency Management Committee and request the deployment of additional resources in the sector.</p> <p>If large scale evacuations are required the Hawks Nest Golf Club and Hawks Nest Surf Lifesaving Club would be the preferred venue for an assembly/evacuation centre(s).</p>
Rescue	<p>The NSW SES Stroud Unit will undertake Flood Rescue operations as per the Flood Rescue Operations Policy and Incident Action Plans for the event.</p> <p>Known flood rescue risk areas have been identified at Viney Creek Road and Myall Way (Tea Gardens Road) at Kore Kore Creek.</p> <p>Large scale flood rescues considered unlikely in this sector with parts areas having rising road access from low velocity flood waters.</p>
Resupply	<p>Resupply will be provided by the NSW SES through the 132 500 request for emergency assistance system.</p> <ul style="list-style-type: none"> ▪ Large scale prolonged resupply operations are considered unlikely in this sector. ▪ Requests for resupply in the sector would be more likely to come from nearby rural properties isolated by flash flood waters/rises a number of local creeks. <p>Table 2, in Volume 2 provides information about isolated communities in the former Great Lakes area and potential periods of isolation.</p> <p>A flowchart illustrating the Resupply process is shown in Volume 1 of the Local Flood Plan, Attachment 1</p>
Aircraft Management	<p>Helicopter Landing Points:</p> <p>Due to the limited Airport facilities in the sector, aviation management would be coordinated from Taree Airport.</p> <p>Suitable landing points are located at:</p> <ul style="list-style-type: none"> ▪ Myall Park, Yamba Street, Hawks Nest (Lat: -32.671707 Long: 152.181468) ▪ Waterfront Reserve, Curlew Avenue, South Pindimar (Lat: -32.685028 Long: 152.145556) <p>Airports:</p> <ul style="list-style-type: none"> ▪ No airport exists at Tea Gardens/Hawks Nest ▪ In the event that aviation resources are required to support flood operations, it is likely that aircraft would operate out of the Taree Airport. ▪ Functionality of the Taree Airport is threatened once Manning River at the Taree Gauge reaches 5.43m.

Other	<p>Coastal Erosion</p> <p>During a significant ocean derived flood event it is possible that coastal erosion may occur at Jimmy's Beach Winda Woppa.</p> <ul style="list-style-type: none">▪ Jimmys Beach has been identified by OEH (previously DECCW) as one of 15 coastal erosion hot spots in NSW (4).▪ Property managed by Council is directly affected by the potential effects of storm erosion. Community infrastructure (road allotment), and approximately 25 private allotments are adjacent to the property directly affected and so are also potentially at risk from coastal erosion. These are located between Kurrurma Crescent and Gemalla Street.▪ Waves have been known to break across the sand dune at Winda Woppa and this could cause water to enter houses.▪ Erosion problems have been occurring along Jimmys Beach for many years, the erosion has increased over the last 30 years.▪ Historically, sand renourishment of the beach has been used as a means to protect the public infrastructure during severe storm events.▪ Trigger points for emergency action initiate when sand is within 5m to 10m from the road edge.
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6.2. TEA GARDENS/HAWKS NEST/PINDIMAR SECTOR MAP



7. TUNCURRY/FORSTER SECTOR

7.1. TUNCURRY/FORSTER RESPONSE ARRANGEMENTS

Refer to Volume 2: Hazard and Risk in Mid Coast for more information about this Community.

Sector Description	<p>The towns of Forster and Tuncurry are situated either side of the entrance to Wallis Lake, 308 km north of Sydney. Recently the area has experienced significant population growth, with the retirement and tourism industries now dominating the economy.</p> <p>Flooding occurs as a combination of inflows from river tributaries, wind wave action and inflows from the ocean. There should be potential for effective warnings due to the generally slow rate of lake level rises (11).</p> <p>Residential and other property in low-lying areas adjacent to Wallis Lake, Cape Hawke Harbour (Tuncurry and Forster CBDs) and Forster Keys and can be threatened by high lake and sea levels.</p>	
Hazard	<p>The sector is susceptible to flash flooding, high lake levels and storm surge</p> <p>Flooding within Wallis Lake is caused by:</p> <ul style="list-style-type: none"> ▪ Elevated ocean levels due to storm surge and/or high astronomical tides ▪ Rainfall over the lake and river tributaries ▪ Wind action within the lake itself <p>Wallis Lake has four main tributaries, the Wallamba, Wang Wauk, Wallingat and Coolongolook Rivers</p> <p>Flooding of Wallis Lake has occurred very infrequently, with the largest recorded flood being the 1927 flood that peaked at 2.27 mAHD. Since 1927 the highest water level recorded in the lake has been 1.1 mAHD in 1978, 0.94 mAHD in 2013 and 0.88 mAHD in 2016.</p> <p>Community awareness of flooding is low.</p> <p>Depth and velocity of flooding is relatively low except for Point Road Tuncurry (11).</p>	
Flood Affect Classification	<p>Rising road access</p> <p>Forster Keys and Point Road are Low Flood Islands, becoming isolated between 0.68 and 1.5 metres.</p>	
At risk properties	3021	Total number of properties within Sector/Community 8308
Sector Control	<p>The NSW SES Mid Coast Local Controller will control evacuations in this sector.</p> <p>The NSW SES will conduct evacuations in this sector with assistance from NSW Police, Fire and Rescue NSW and Rural Fire Service (RFS) volunteers.</p> <p>The sector is divided into the following three sub sectors:</p> <p>Subsector 1 – Tuncurry</p> <p>Subsector 2 – Forster CBD and Lake Foreshore</p> <p>Subsector 3 – Forster Keys</p> <p>For Level 1 incidents an Incident Control Facility will be established at the NSW SES Forster Pacific Palms Unit, Charlotte Bay Road, Charlotte Bay.</p> <p>For Level 2 and 3 events Incident Control is likely to scale up to LGA level, with the Local Controller Forster/Pacific Palms Unit Controller becoming a Division Commander.</p> <p>In large scale events the Mid Coast Council Emergency Operations Centre Facility (Tuncurry) may provide facilities for incident control separate to a supporting Emergency Operations Centre.</p>	

Key Warning Gauge Name	Name	Watercourse	AWRC No.	Min (m)	Mod (m)	Maj (m)
	Wallamba River at Nabiatic	Wallamba River	560048	n/a	n/a	n/a
	Wang Wauk at Willina	Wang Wauk	560049	n/a	n/a	n/a
	Coolongolook at Coomba Park	Coolongolook River	560059	n/a	n/a	n/a
	Wallis Lake at Tuncurry (Upstream of lake inflows Wallamba River)	Wallamba River /Wallis Lake	560053	n/a	n/a	n/a
	Wallis Lake at Tuncurry (Point Road) (water level - Wallis Lake)	Wallis Lake	560057	0.9	1.5	1.9
	Wallis Lake at Forster (influenced by tides)	Wallis Lake	560044	n/a	n/a	n/a
	Wallis Lake at Tiona (water level - Wallis Lake)	Wallis Lake	560055	n/a	n/a	n/a
Key Rain Gauges	Nabiatic (Wallamba River upstream)					
	Willina (Wang Wauk River)					
	Tuncurry (Wallamba downstream)					
General Strategy	<p>Property protection measures:</p> <ul style="list-style-type: none"> Based on requests for assistance from 132 500 <p>Evacuation of at risk population:</p> <ul style="list-style-type: none"> At risk residents will be door knocked by NSW SES, RFS and other emergency personnel and advised on the evacuation details. Primarily self-evacuation by private transport to family and friends outside the flood affected area. Primarily self-evacuation by private transport to nominated assembly areas. <p>Establishment of an Assembly Area at:</p> <ul style="list-style-type: none"> Great Lakes College – Tuncurry Campus – Northern Parkway, Tuncurry Great Lakes College – Forster Campus – Corner of The Lakes Way and Cape Hawke Drive, Forster Club Forster, Strand Street, Forster <p><i>Where a major PMF occurs evacuees will either remain at the assembly area or an established evacuation centre until the threat has past.</i></p> <p>Rescue</p>					
Key Risks / Consequences	<p>High hazard flood areas are the lower areas of Beach Street and Wharf Street, and Point Road and Bay Street Tuncurry. Velocities are in the order of 2.28-2.34m/s at the Foster Tuncurry Bridge in a 1% AEP flood (4).</p> <p>Both Forster and Tuncurry may become isolated due to flash flooding causing road closures. The northern side of the Lakes Way remained closed for some 5 hours during the 2013 flood event where the southern access to Forster was closed for a short period due to overland flooding of low lying roads at Cape Hawke (4).</p>					
Information and Warnings	<p>The NSW SES will undertake a variety of different actions to ensure the community are informed of potential impacts, these include:</p> <ul style="list-style-type: none"> Flood Watch 					

	<ul style="list-style-type: none"> ▪ Flood Bulletins ▪ Evacuation Warning ▪ Evacuation Order ▪ Sequenced door knocking of evacuation sectors ▪ Media announcements ▪ Social Media use ▪ Emergency Alert SEWS (SMS, Landlines)
Property Protection	<p><i>Specific property protection measures:</i></p> <ul style="list-style-type: none"> ▪ Monitoring rising flood waters ▪ Control of surface water through sandbagging measures ▪ Assist in the lifting of furniture to residents in need ▪ Monitoring integrity of dwellings surrounded by flood waters <p>Proactive property protection measures are limited due the significant number of properties affected by moderate/major flooding in the area and the scarcity of emergency service resources.</p> <p>In past recent flood events the Point Road area of Tuncurry has been an early source of request for sandbags.</p> <p><i>Protection of essential infrastructure:</i></p> <p>A number of electricity substations would be under threat in the following areas:</p> <ul style="list-style-type: none"> • Point Road Peninsular – Tuncurry • Taree Street Peninsular – Tuncurry • Forster Keys – Forster <p><i>In addition, the sewerage treatment plant at Sweet Pea Road Forster, could be threaten by flood waters in large scale events as it is located only 1.5 kilometres away from the Pipers Bay foreshore.</i></p>
Evacuation and/or Isolation Triggers	<p>The key evacuation triggers are based on:</p> <ul style="list-style-type: none"> ▪ Predictions for high tides and large seas/swells (storm surge) ▪ Bureau of Meteorology flood height predictions at the Wallis Lake at Tuncurry (Point Rd) Gauge (205416) <p>1. Prediction to reach and/or exceed 1.20m Targeted Evacuation of Point Road area of Tuncurry to occur by this height Including Point Road, Baird, Mariners, Lakeview, Pelican, Sunlovers, Bay and Leisure Streets, Coral Lane & Recreational Lane</p> <p>2. Prediction to reach and/or exceed 1.50m Targeted Evacuation of Taree/Wharf/Beach Street areas of Tuncurry is to occur by this height Taree Street west from Bent Street, Rebecca Jane Close, Annette Place, Anne Marie Place, Susella Crescent, Windsor Place, Regency Crescent, Rest Point, Sunset Place, Mount View Place, Palmway Crescent, Mirage Ave, Wallamba Close, Lachlan Avenue and low lying parts of Wharf and Beach Streets</p> <p>Targeted Evacuation of Forster Keys area is to occur by this height, noting that road access via King George Parade is lost between the minor (0.9m) and moderate (1.5m) flood heights and that the majority of properties in the area do not experience inundation until 0.5% AEP event levels (2.2m).</p>

	Including Kenrose Street, Wyuna Place, Murray Avenue, King George Parade, Allen Avenue, Eloura Circuit, Cavit Avenue, Elizabeth Parade, Friendship Key, Blundell Avenue, Bounty Key, Victor Avenue, Discovery Drive, Endeavour Circuit, Royal Circuit, Pipers Bay Drive, and Caribbean Avenue.
Sequencing of evacuation	Evacuation sequencing will be based on the above triggers for evacuation. The aged care facility, schools and community health campus/small hospital are located outside of the predicted of the 1 in 100 flood prediction extent; however a number of vulnerable facilities would be affected in a Possible Maximum Flood (PMF).
Evacuation Routes	Point Road area of Tuncurry Route: Manning Street to north to Great Lakes College Tuncurry Campus. Taree/Wharf/Beach Street areas of Forster Route: Manning Street to north to Great Lakes College Tuncurry Campus. Forster Keys area Route: King George Parade, The Lakes Way then Cape Hawke Drive to Great Lakes College Forster Campus
Evacuation Route Closure	Road Closures affecting the sequenced evacuation of the sector: <ul style="list-style-type: none"> ▪ Point Road at Tuncurry may begin to become inundated from 0.90 m at Wallis Lake at Tuncurry Gauge (as occurred in March 2013 event) ▪ King George Parade at Forster Keys between 1.2 and 1.5 metres. Other roads where closure is dependent on local rainfall include: <ul style="list-style-type: none"> ▪ Failford Road at Bungwahl Creek, between Pacific Highway-and The Lakes Way (North west of Tuncurry) ▪ The Lakes Way at Darrawank (north of Tuncurry) ▪ The Lakes Way south of Tea Tree Road at Dunns Creek (south of Forster)
Method of Evacuation	<ul style="list-style-type: none"> ▪ Primarily self-evacuation by private transport before road closures ▪ Evacuation/relocation information to residents disseminated via broadcast media, social media and via doorknock (depending on available resources)
Evacuation Centre/Assembly Point	People should be encouraged to stay with friends/relatives outside the flood affected areas of Tuncurry and Forster. Where this is not possible the nominated Assembly Area/Evacuation Centres are: <ul style="list-style-type: none"> ▪ Great Lakes College – Tuncurry Campus - Northern Parkway, Tuncurry ▪ Great Lakes College – Forster Campus - Cape Hawk Drive, Forster ▪ Club Forster – Strand Street, Forster (inundated in PMF) There are a number of other buildings located in flood free areas in Forster which are available for use as Evacuation Centres. These buildings will be nominated by Department of Family & Community Services as the need arises.
Large scale evacuations	When large-scale evacuations are likely, the Mid Coast NSW SES Local Controller will liaise with the Local Emergency Management Committee and request the deployment of resources into Tuncurry/Forster. There are a significant number of older people and caravan parks in flood affected areas. Operational evacuation planning should consider peak holiday times around Easter, Christmas and long weekends.
Rescue	Pre-positioning of flood rescue resources <ul style="list-style-type: none"> ▪ NSW SES level 3 flood rescue resources are limited in the Forster/Tuncurry area ▪ On receiving a severe weather warning for heavy rain and a flood watch for Wallamba River/Wallis Lake, and/or the Myall catchment, that consideration be given to requesting OOAA flood rescue resources. ▪ These resources would be deployed at the Forster/Pacific Palms Unit for

	<p>tasking.</p> <p>The Forster/Pacific NSW SES Unit will undertake all Flood Rescue operations as per the Flood Rescue Operations Policy.</p> <ul style="list-style-type: none"> ▪ Large scale rescues would be unlikely in this sector due to the large storage capacity of Wallis Lake itself, the rate of rise of flood waters is likely to be slow and occur some hours after the rainfall event itself (11).
Resupply	<p>Resupply will be provided by the NSW SES through the 132 500 request for emergency assistance system.</p> <ul style="list-style-type: none"> ▪ Large scale prolonged resupply operations are considered unlikely in this sector. <p>Requests for resupply in the sector would be more likely to come from nearby rural properties isolated by flash flood waters/rises a number of local creeks.</p>
	<p>Table 2, in Volume 2 provides information about isolated communities in the former Great Lakes area and potential periods of isolation.</p> <p>A flowchart illustrating the Resupply process is shown in Volume 1 of the Local Flood Plan, Attachment 1</p>
Aircraft Management	<p>Helicopter Landing Points:</p> <p>Due to the limited Airport facilities in the sector, aviation management would be coordinated from Taree Airport.</p> <p>Suitable landing points are located at:</p> <ul style="list-style-type: none"> ▪ North Tuncurry Regional Sports Complex, Beach Street, Tuncurry (-32.166, 152.503) ▪ Tuncurry Sports Centre, South Street Oval, Corner South Street and Stewart Parade, Tuncurry (-32.171, 152.493) ▪ Great Lakes College – Forster Campus – Corner of The Lakes Way and Cape Hawke Drive (-32.216, 152.528) ▪ Forster Aquatic Centre, Lake Street, Forster (-32.181, 152.521)
	<p>Airports:</p> <ul style="list-style-type: none"> ▪ No airport exists at Tuncurry or Forster ▪ In the event that aviation resources are required to support flood operations, it is likely that aircraft would operate out of the Taree Airport. ▪ Functionality of the Taree Airport is threatened once Manning River at the Taree Gauge reaches 5.43m.
Other	<p>Special considerations relating to the evacuation:</p> <ul style="list-style-type: none"> ▪ Significant numbers of older people and caravan parks will require evacuation in large scale events ▪ Closure of Schools –the NSW SES will coordinate closures through the school principals on each affected school. ▪ Evacuation of residential institutions, nursing homes and aged care facilities will occur where these are threatened by predicted flood waters. ▪ The Forster Private Hospital will only be evacuated in extenuating circumstances. ▪ Security: Police patrols to be established to maintain law and order after evacuation has occurred. ▪ The NSW SES will use flood boats and helicopters to monitor safety of individuals. ▪ Forster/Tuncurry has 3 peak seasons with potential for in excess of 10% population increase: <ul style="list-style-type: none"> • School Holidays – December/ January

	<ul style="list-style-type: none">▪ Easter Holidays – March /April▪ School Holidays – September/October▪ Forster Triathlon (early October)
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GREAT LAKES: NSW SES CARAVAN PARK ARRANGEMENTS

**Chapter 4 of Volume 3 (NSW SES Response Arrangements for Great
Lakes) of the Mid Coast Local Flood Plan**

Last Updated: March 2017

AUTHORISATION

The Great Lakes NSW SES Caravan Park Arrangements have been prepared by the NSW State Emergency Service (NSW SES) as part of a comprehensive planning process.

Approved

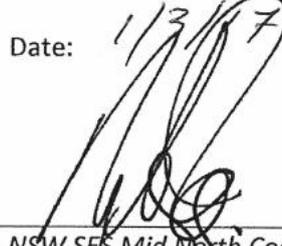


Manager Emergency Risk Management

Date:

1/3/17

Approved



NSW SES Mid North Coast Region Controller

Date:

2.3.17

Tabled at LEMC

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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. Twin Dolphins Holiday Park
- b. Tuncurry Lakes Resort
- c. Big 4 Great Lakes Holiday Park Tuncurry
- d. North Coast Holiday Park – Foster Beach Park
- e. Lanis Caravan Park
- f. Smugglers Cove Holliday Village
- g. Lifestyle Lakeside Foster
- h. Discovery Parks - Forster
- i. Riverside Holiday Park
- j. Stroud Showground
- k. Sandbar and Bushland Holiday Parks

1.1.2 For more information on individual caravan parks see Table 1 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 Great Lakes Local Controller will ensure that the managers of caravan parks are advised of Flood Information (described in Volume 2 of the Great Lakes Local Flood Plan).

1.3 EVACUATION OF OCCUPANTS AND RELOCATION OF MOVEABLE DWELLINGS

- 1.3.1 When an evacuation order 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 and if resources are available. 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 Great Lakes Local Controller 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 Great Lakes Local Controller when the evacuation of the caravan park has been completed.
- f. Provide the NSW SES Great Lakes Local Controller with a register of people that have been evacuated.

1.4 RETURN OF OCCUPANTS AND MOVEABLE DWELLINGS

- 1.4.1 The NSW SES Great Lakes Local Controller, 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 from Flooding.

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Notes
Twin Dolphins Holiday Park	134 South street, Tuncurry 02 6554-7015 Available 24/7	Subsector 1 Tuncurry (Point Road Gauge)	Permanent sites:- 63 Short term sites:- 5	Trigger for evacuation Tuncurry Point Road Gauge to reach or exceed 1.3m	South Street onto Manning Street heading north to Great Lakes College Tuncurry	South Street closes at 1.5m Point Road Gauge	Vans moved to Great Lakes College Tuncurry Campus car park	Peak seasons are:- Dec – Jan 100% 50% rest of year
Crystal Waters Estate Over 50s Relocable Home Estate	133 South Street, Tuncurry 02 6554-8522 Office hours 0433226922 Private managers number 24/7	Subsector 1 Tuncurry (Point Road Gauge)	Permanent 150 sites as of 09/08/16 Further sites being developed	Trigger for evacuation Tuncurry Point Road Gauge to reach or exceed 1.3m	South Street onto Manning Street heading north to Great Lakes College Tuncurry	South Street closes at 1.5m Point Road Gauge	Structures too large to easily relocate	Over 50s estate all dwellings are permanent sites
Tuncurry Lakes Resort	End of Chapmans Road, Tuncurry (02) 65545366 office hours only 0412999446 Private managers number 24/7	Subsector 1 Tuncurry (Point Road Gauge)	All sites Short term Camp 25 Units 48	Trigger for evacuation Tuncurry Point Road Gauge to reach or exceed 1.3m	Champman Street south onto Manning Street then to Great Lakes College Tuncurry	Manning Street closes at 1.5m Point Road Gauge	Vans moved to Great Lakes College Tuncurry Campus car park	Peak season are:- Dec – Jan 80% 60%
Big 4 Great Lakes Holiday Park,	1 Baird Street, Tuncurry (02) 65546827	Subsector 1 Tuncurry	Short term sites:- 211 No	Trigger for evacuation Tuncurry	Point Road onto Manning Street north	Manning Street closes at 1.5m	Vans moved to Great Lakes	Peak season is:- Sep to April 80%

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Notes
Tuncurry	number available 24/7	(Point Road Gauge)	permanent sites	Point Road Gauge to reach or exceed 1.3m	to Great Lakes College Tuncurry Campus	Point Road Gauge	College Tuncurry Campus car park	December 95% Rest of the year 50%
North Coast Holiday Park - Foster Beach Park	1 Reserve Road, Foster (02) 6554-6269 Business hours 0401731160 managers private number: 24/7	Subsector 2 (Point Road Gauge)	Short term sites:- 246 No permanent sites	Trigger for evacuation Tuncurry Point Road Gauge to reach or exceed 1.3m	Head Street then south on Macintosh Street/The Lakes Way to Great Lakes College Forster	Manning Street closes at 1.5m Point Road Gauge	Vans relocated to Great Lakes College Forster Campus car park	Peak season is:- Dec – Jan 100% Oct – Nov 60% Feb – March 80%
Lanis Holiday Island	33 The Lakes Way, Foster (02) 6554-6273 Business hours 0408553225 managers private number 24/7	Subsector 2 (Point Road Gauge)	Permanent sites:- 28 Short term sites:- 176	Trigger for evacuation Tuncurry Point Road Gauge to reach or exceed 1.3m	The Lakes Way south to Great Lakes College Forster	Manning Street closes at 1.5m Point Road Gauge	Vans relocated to Great Lakes College Forster Campus car park	Peak season are:- Dec – jan 100% Ester 100% Sep – may 60%
Smugglers Cove Holiday Village	45 The Lakes way, Foster (02) 6554-6666 office hours	Subsector 2 (Point Road Gauge)	Permanent sites:- 30 Short term sites:-	Trigger for evacuation Tuncurry Point Road Gauge to	The Lakes Way south to Great Lakes College Forster	Lakes Way can be closed at 1.5 at Point Road Gauge	Vans relocated to Great Lakes College Forster	Peak season are:- Dec – jan 100%

Name	Address/Location description	Town/Sector	Number of sites	Risk	Evacuation route	Evacuation route closure	Moveable dwelling relocation location	Notes
	0432210609 managers private number 24/7		50 cabins 115 camp sites	reach or exceed 1.3m			Campus car park	Holiday times 70% Rest of year 30%
Lifestyle Lakeside Foster	13 Tea Tree Road, Forster (02) 6555-5511 available 24/7	Subsector 2 (Point Road Gauge)	Permanent sites:- 35 Short term sites:- 55	Trigger for evacuation Tuncurry Point Road Gauge to reach or exceed 1.3m	Tea Tree Road north onto Lakes Way then to Cape Hawke Drive to Great Lakes College Forster Campus	Lakes Way can be closed at 1.5 at Point Road Gauge	Vans relocated to Great Lakes College Forster Campus car park	Peak season is:- Dec – Jan 100% 75% rest of year
Discovery Holiday Parks – Forster formerly “Wallamba River Holiday Park”	99 Aquatic Road, Darrawank (02) 6554 3123	15km north west from Tuncurry	300 Sites Mix of Short term and permanent sites	Trigger for evacuation Tuncurry Point Road Gauge to reach or exceed 1.3m	Aquatic Road onto Lakes Way – then to Black Head. Lakes Way going south likely to be closed	Lakes Way can be closed at 1.5 at Point Road Gauge	Vans relocated to Black Head Bowling Club	Possible isolation from Tuncurry with closure of The Lakes Way at Darrawank

Name	Address/location description	Sector	Number of sites	Risk	Evacuation Route	Evacuation Route closures	Moveable dwelling relocation	Notes
Riverside Holiday Park	5 Mill Rd, Failford (02) 6554 3144	15km north west from Tuncurry	289 Sites	Trigger for evacuation Tuncurry Point Road Gauge to reach or exceed 1.3m	Mill Road, onto Failford Rd, onto Lakes Way – then to Black Head. Lakes Way going south likely to be closed	Lakes Way and Failford Road at Bungwahl Creek can be closed at 1.3 at Point Road Gauge	Vans relocated to Black Head Bowling Club	Isolated earlier due to road closure at Failford Road at Bungwahl Creek -
Sandbar and Bushland Holiday Parks	3434 The Lakes Way, Smiths Lake (02) 6554 4095	Sector 2 (Tarbuck Bay gauge)	200 sites	Isolation and limited inundation of low lying areas of the parks in ocean derived flood events	Sandbar Road north onto Paradise Drive then Macwood Road to Pacific Palms Bowling Club	In a 1% AEP flood event (2.6 mAHD) the Sandbar Road is inundated at its lowest point	Vans relocated to Pacific Palms Bowling Club and near by netball courts	Flood risk reduced when Council opens the lake – opening trigger is 2.1 mAHD
Lions Park Camping Ground – Bulahdelah	Intersection of western side of Myall River and northern side of Pacific Highway/Bridge over Myall River (Nan Syron Bridge)	Sector 4 (Myall River at Bulahdelah)	Approx. 20 unregulated sites	Inundation and isolation	Pacific Highway north into higher ground at Bulahdelah	Inundation starts at 2m at the Myall River @ Bulahdelah gauge	Bulahdelah Central School	Popular with Motor Homes
Bulahdelah Showground camping area	Stuart Street, Bulahdelah (02) 6591 7222	Sector 4 (Myall River at Bulahdelah)	Approx. 40 unregulated sites	Inundation and isolation	Stewart Street heading east towards Pacific Hwy	Inundation starts at 2.5m at the Myall River @ Bulahdelah gauge	Bulahdelah Central School	Managed by Mid Coast Council

Stroud Showground camping area	52 Cowper Street, Stroud (02) 4994 5204 – Mid Coast Council Stroud Office number	Sector 5	Approx. 20 sites	Flash Flooding (April 2015)	Cowper Street north to Stroud Country Club	Flash Flooding can cut Cowper Street north of Lamens Creek.	Stroud Country Club	Managed by Mid Coast Council Stroud Office
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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.