NSW STATE EMERGENCY SERVICE

Provision and Requirements for Flood Warning in New South Wales

Supplementary Document to the State Flood Plan

V2.0

Updated November 2019

Contents

1. Introduction

1.1. PURPOSE

The purpose of this document is to inform the communities of New South Wales (NSW) on:

- The development of flood warning system processes within NSW,
- The roles and responsibilities for operations and maintenance of warning systems, and the dissemination of the associated warning products,
- The types of flood warning products issued,
- The locations of flood warnings and local flood advices that are issued.

This document is supplementary to the *NSW State Flood Plan*.

1.2. BACKGROUND

Flood warning products provide vital information to the communities of NSW on how to appropriately respond to flood threats. Warning systems are developed to inform communities of possible riverine or flash flooding, and flooding downstream of dams.

DEFINITION
Flood or flooding means the covering of normally dry land by water that has escaped or been released from the normal confines of:

1. Any lake, or any river, creek or other natural watercourse, whether or not altered or modified; or
2. Any reservoir, canal or dam.

The development of flood warning products and their associated systems is guided by the *Total Flood Warning System* concept.

1.2.1 Total Flood Warning System

The *Total Flood Warning System* concept recognises that a fully effective gauge network and associated flood warning service is multi-faceted in nature. Its development and operation involves input from a number of stakeholders with specialised roles in the process. The key components of a Total Flood Warning System include:

- Monitoring and prediction
- Interpretation
- Message construction
- Communication
- Predictive behaviour
- Review.

All components must be present and integrated for the system to be effective.

Further information on the *Total Flood Warning System* can be found in the *National Arrangements for Flood Forecasting and Warning*.

1.2.2 Flood Warning Consultative Committee

The NSW and Australian Capital Territory (ACT) Flood Warning Consultative Committee (FWCC) advises and reports to the Bureau of Meteorology (the Bureau) to ensure the integrated development of flood warnings within NSW. Its purpose is to coordinate the development and operation of flood forecasting and warning services across the state. Committee membership comprises:

- The Bureau of Meteorology (Bureau)
- NSW State Emergency Service (NSW SES)
- NSW Office of Environment and Heritage (OEH)
- Australian Capital Territory State Emergency Service (ACT SES)
- WaterNSW
- NSW Local Government (Council)
- Sydney Water
- Floodplain Management Australia (FMA).

1.2.3 Forecasting and Warning Services

The *Intergovernmental Agreement on the provision of Bureau of Meteorology Hazard Services to the States and Territories* (Intergovernmental Agreement) outlines the agreed responsibilities for forecasting and warning services for riverine and flash flooding. While noting that in practice, the responsibility for flood preparation and monitoring, developing forecasts and warnings, and the dissemination of warnings is shared between all levels of government, specific detail is provided for riverine and flash flooding services.

Furthermore, it states that the Bureau has historical and statutory responsibility for the issuing of warnings of weather conditions likely to cause flooding. Specifically, the Bureau is responsible for the provision of forecasting and warning services for riverine flooding across the state.

The Agreement states that in areas where the Bureau does not provide flash flood warnings (for small catchments), the responsibility for flash flood warnings and systems lies with the states and territories in partnership with councils within their jurisdictions.

In NSW, councils have taken the lead in developing local flash flood warning systems within their local government areas. This is typically undertaken through the Floodplain Management Program, which is administered by NSW OEH, who provides technical advice and grant funding assistance to councils.

The Bureau provides technical assistance to councils establishing local flash flood warning systems through its Flash Flood Advisory Resource (FLARE). FLARE is an online resource

created to assist agencies to design, implement and manage fit-for-purpose flash flood warning systems.

NSW SES is the legislated agency responsible for emergency flood response the control of flood operations. The *State Emergency Service Act 1989* states that NSW SES is also responsible for establishing flood warning systems. NSW SES works with the Bureau and councils to develop warning systems and to ensure warning products and messaging are consistent across the state.

Dam Failure Warning Systems and accompanying arrangements have been established for communities situated below dams that have been identified as the highest risk by the Dam Safety Committee.

2. The Role of Key Stakeholders

2.1. THE BUREAU OF METEOROLOGY (BUREAU)

The Bureau has historical and statutory responsibility for the issuing of warnings of weather conditions likely to cause flood. The Bureau provides forecasting and warning services for riverine flooding across the state.

The Bureau provides generalised, qualitative or quantitative flood predictions for agreed flood forecast locations. Information on flood conditions, heights and classifications are provided in line with the *Service Level Specification for Flood Forecasting and Warning Services for New South Wales and the Australian Capital Territory*.

The Bureau uses gauges to provide predictions and warnings. The Bureau relies on accurate gauge information and metadata to ensure these services are provided correctly. The Bureau owns and maintains gauges and utilises externally owned and maintained gauges to provide the above service.

In addition to warning services for riverine flooding, the Bureau provides technical assistance to councils establishing local flash flood warning systems through FLARE.

2.2. NSW STATE EMERGENCY SERVICE (NSW SES)

NSW SES is the legislated agency responsible for emergency flood response operations. The *SES Act 1989* states that NSW SES has the function for the establishment of flood warning systems. NSW SES works with the Bureau and councils to develop warning systems and to ensure warning products and public messaging are consistent across the state. These requirements of the Act are met by NSW SES by issuing flood warning products and identifying the need for flood warning classifications and the associated warning services.

NSW SES utilises gauge information to prepare flood intelligence, issue warning products and to respond to flooding. NSW SES is responsible for maintaining its Flood Intelligence System that documents gauge and associated warning information, consequences at varying gauge water levels, and the recommended response actions.

2.3. NSW OFFICE OF ENVIRONMENT AND HERITAGE

The NSW Office of Environment and Heritage (OEH) administers the NSW Floodplain Management Program by providing financial support and technical advice to councils to investigate the potential for new gauges/networks, to install gauges/networks, and to develop new flood warning services.

OEH is a gauge owner, maintaining a gauge network within the coastal zone of catchments east of the Great Dividing Range. On behalf of OEH, Manly Hydraulics Laboratory operates, upgrades and maintains this network, and provides public access to all data.

2.4. NSW LOCAL GOVERNMENT (COUNCIL)

The Intergovernmental Agreement states that in areas where the Bureau does not provide flash flood warnings for small catchments, the responsibility lies with the states and territories in partnership with councils within their jurisdictions.

Councils are responsible for implementing the NSW Floodplain Management Process. A Floodplain Risk Management Committee is established as part of this process to assist councils in the development and implementation of Floodplain Risk Management Plans. A Plan may recommend the installation of gauges or the establishment of a gauge network or warning system. These recommendations may be for riverine or flash flood catchments. For riverine flooding, councils work with the Bureau and NSW SES to establish this in addition to the state-wide service. Councils lead the development of flash flooding systems that they would own and maintain.

Through the Floodplain Management Process, councils may identify the need to revise existing flood classification levels if required.

2.5. WATERNSW

WaterNSW owns a major gauge network west of the Great Dividing Range. WaterNSW is responsible for the maintenance and any necessary upgrades to the network and for the management of permanent archiving of and public access to the state's dataset.

2.6. DAM OWNERS AND OPERATORS

Dam Failure Warning Systems and accompanying arrangements have been established for communities below dams identified as the as the highest risk by the Dam Safety Committee. Arrangements for these are specified in individual Dam Safety Emergency Plans (DSEP).

Dam owners and operators are responsible for the ongoing management of dams, and for maintaining and operating associated Dam Failure Warning Systems. It is the responsibility of dam owners and operators to:

- State the arrangements governing the operation of these systems.
- Develop warnings and notification processes in consultation with NSW SES.
- Notify downstream emergency managers and warn communities.

- Document these processes and arrangements in the DSEP.

The Dam Failure Hotline is to be used to ensure dam failure warnings are disseminated with priority to the NSW SES.

2.7. OTHER STAKEHOLDERS

There may be additional gauge owners to those stated above. Gauge owners may be federal, state, or local government agencies. Gauge owners are responsible for the installation and maintenance of water level and rain gauges, and for providing real-time or near real-time access to gauge data to the Bureau. Gauge owners are responsible for the ongoing provision of service to forecast locations and key warning gauges.

3. Components of the Flood Warning System

3.1. FLOOD GAUGE NETWORKS

Gauges are essential for monitoring stream flow, water levels and rainfall. Data collected from gauges provides real-time information to the gauge owner and the Bureau. When provided to the Bureau, the data can be used to provide flood warnings as a component of the Total Flood Warning System as defined in the *Australian Emergency Manuals Series, Manual 21 Flood Warning*.

In addition, near-live data can be provided to NSW SES, the community and other stakeholders. This is utilised to inform preparation and response to flooding.

Gauges may be stand-alone or connected to a gauge network. A gauge network could be locally owned and maintained by council and/or connected to the broader state wide network.

A locally owned gauge network may be established when the need for a local flash flood warning system is identified. This need may be identified through the Floodplain Management Process and would be listed as a recommendation in a council-adopted Floodplain Risk Management Plan. Alternatively, the need may be identified if a gap is found in an existing network, or when gauge data is required to calibrate flood intelligence for a community at risk.

The owners of gauges who have flood warnings with local flood advices attached are stated in Table 1 of this document.

Gauge data from the respective owners can be found online from the below links:

- Bureau of Meteorology
- Manly Hydraulics Laboratory
- WaterNSW

3.2. FLOOD WARNING CLASSIFICATIONS

To determine the impact of potential riverine flooding and the associated consequences, flood warning classifications are determined for forecast locations and key warning gauges.

Flood warning classifications describe three severity levels of riverine flooding: minor, moderate and major.

1. Minor Flooding – causes inconvenience. Low-lying areas next to watercourses are inundated. Minor roads may be closed and low-level bridges submerged. In urban areas, inundation may affect some backyards and buildings below the floor level as well as bicycle and pedestrian paths. In rural areas, removal of stock and equipment may be required.
2. Moderate Flooding – in addition to the above, the area of inundation is more substantial. Main traffic routes may be affected. Some buildings may be affected above the floor level. Evacuation of flood affected areas may be required. In rural areas, removal of stock is required.
3. Major Flooding – In addition to the above, extensive rural areas and/or urban areas are inundated. Many buildings may be affected above the floor level. Properties and towns are likely to be isolated and major rail and traffic routes closed. Evacuation of flood affected areas may be required. Utility services may be impacted.

NSW SES determines flood warning classifications. Classifications are informed by findings of Floodplain Risk Management Studies or flood intelligence analysis and the associated consequences.

3.3. WARNING PRODUCTS

Flood warning products communicate the potential risks and associated consequences of flooding. Warning products communicate the actions needed to be taken in response to the flood threat. The Bureau, NSW SES and councils issue flood warning products.

The Bureau issues the following warning products:

- **Severe Thunderstorm Warnings** range in character from short-lived events causing patchy localised damage to more organised systems producing widespread damage across broader areas. The most intense and long-lived supercell thunderstorms generate long swathes of destruction over several hours. Weather phenomena accompanying these storms include any combination of large hail, damaging or destructive winds, tornadoes and intense rainfall leading to local flash flooding.

- **Regional Severe Thunderstorm Warnings** are issued when severe thunderstorms are already occurring or are expected to develop within or move into the specified area over the next few hours. The warnings describe the area under threat and the particular hazards likely to be associated with the thunderstorms. These warnings are distributed widely to the media and emergency services, and are available to the

public via the internet and various telephone and fax based services. An image is available with the warning on the internet to show in a map format the area at risk. This service is provided for all parts of NSW. Typical lead-times between issue and impact are up to the order of several hours with specific areas under threat being broadly defined.

- **Detailed Severe Thunderstorm Warnings - Sydney/Newcastle/Wollongong** – are issued when severe thunderstorms are already occurring, or are expected to develop within or move into the heavily populated regions around Sydney, Newcastle and Wollongong. High quality, full-time weather radar coverage in this area allows these warnings to describe the current location of individual thunderstorms, and the places likely to be affected within the next 30 to 60 minutes. Again, an image is available with the warning showing in map format the location of the severe thunderstorms and their forecast tracks. The more detailed warnings are available for Sydney, Newcastle, Wollongong and surrounds. Typical lead-times between issue and impact range up to 30-60 minutes with areas under threat being more precise and tightly defined than Regional warnings.

- **Severe Weather Warnings** are issued when severe weather is expected to affect land-based communities and Lord Howe Island within the next 24-36 hours; and
    - it is not directly the result of severe thunderstorms; and
    - it is not covered by tropical cyclone or fire weather warnings

- **Flood Watches** are an early advice of increased flood risk over a catchment by the Bureau up to four days in advance of large-scale weather systems that have the potential to cause flooding. The Flood Watch covers all catchments in NSW including catchments without flood forecasting systems and data networks, and also covers inland and desert areas, and areas without well-defined rivers and streams where local flooding is the dominant flood risk. Flood Watches are distributed to the media by the Bureau and are published on the Bureau website.

- **Flood Warnings** provide advance notice that a flood may occur in the near future at a certain location or in a certain river basin or catchment. The list of locations where the Bureau provides Flood Warnings is provided in Table 1. For locations where the Bureau provides quantitative predictions, warnings normally include predicted flood heights at the forecast location. Flood Warnings are renewed at regular intervals until the relevant river level gauge drops to below the minor flood level. Flood Warnings are distributed to the media by the Bureau and are published on the Bureau website.

The NSW SES issues the following flood warning products:

- **Livestock and Equipment Warnings** are issued when there is evidence of significant rises in stream levels below minor flood heights. NSW SES may seek advice from the Bureau on probable rises.

- **Local Flood Advices** are issued based on localised valley watch information for locations the Bureau does not issue Flood Warnings. They normally predict which class of flooding will occur (minor, moderate or major) and must not contradict any flood warnings provided by the Bureau for other gauges on the same river. A Local Flood Advice must clearly identify that it has been issued by NSW SES.

- **Flood Bulletins** are issued by NSW SES to inform the public on what is expected during a flooding event. Flood Bulletins contain information on the flood consequences that are likely to occur and what actions must be taken to protect persons and property.

  Flood Bulletins include verbatim, the first paragraph of the predictions section of the latest warning products issued by the Bureau. Flood Bulletins may also include:

  - What the predicted height means in terms of areas likely to be flooded and the depth and nature of the expected flooding.
  - Local Flood Advices.
  - Advice on what actions the public should take to protect themselves and their property, and indicate the appropriate time to undertake these actions).
  - Areas of danger to be avoided.

  Furthermore, the data section of the latest flood warning issued by the Bureau should note:
    - If later river and rainfall gauge readings are available, they may be inserted with the time of reading.
    - Data can be condensed to include key sites only.
    - Additional gauges of local importance may be inserted.
    - Locally accepted names may be used for gauges if the NSW SES and the Bureau are aware of the local name.
  - All road closure details including current closures, possible closures and roads that will not be affected.
  - The NSW SES emergency assistance number (132 500).

- **NSW SES Evacuation Warnings** are messages advising the community to prepare for a likely evacuation. Evacuation warnings provide advice on how to prepare and what the public should take with them.

- **NSW SES Evacuation Orders** communicate the need for a community (or parts of) to evacuate by a specified time in response to an imminent threat. An Evacuation Order also provides advice on where to go and the best evacuation route to take.

Warnings are also provided for:

- Severe thunderstorms or severe weather with heavy/very heavy rainfall that may lead to flash flooding, provided by the Bureau as Severe Weather Warning.
- Flooding from storm-induced large waves and coastal inundation, provided by the Bureau as Severe Weather Warnings.
- Gated dam release. Dam owners provide advice on the impacts of such releases to NSW SES. A distinction should be made between dam releases and dam safety alerts. Dam owners are responsible for the provision of information on routine operational releases. When releases occur during flood events and are likely to cause minor flood levels to exceed at downstream locations, Bureau flood warnings will be issued.
- Local overland and creek flooding. Although the Bureau does not provide a specific service for these events, local overland and creek flooding may at times be captured by the ***heavy rainfall*** statement in severe weather and severe thunderstorm warnings provided by the Bureau.

Currently, there is no standard flash flood warning message template or content for councils to use. NSW SES can provide guidance to councils during the development of message systems and content.

3.4. SMALL CATCHMENT / FLASH FLOOD WARNING SERVICES

Riverine Flooding is flooding when the rain-to-flood delay time is relatively high - typically more than six hours, but excludes flooding caused by:

- Elevated sea levels
- Storm surge
- Flash floods
- Urban overland flow
- Failure of any artificial infrastructure (dams or levees).

Flash Flooding or Small Catchment Flooding, is flooding of a short duration with a relatively high peak discharge, with a time interval between the observable causative event and the flood less than six hours. The Bureau does not provide riverine flood warnings for small catchments when there is less than six hours between heavy rainfall and flooding.

The Bureau Flood Watch product broadly covers small catchments across NSW, referring to possible impacts in these areas as local flooding, however the Bureau does not provide gauge-specific flash flood warnings in these areas. The Bureau provides warnings for the small catchments listed below under legacy arrangements.

Warnings for catchments marked with an asterisk (*) will be transitioned to an automated system. At this time, the responsibility for the provision of warning services in NSW will return to NSW SES. Areas with local small catchment warning systems include:

- Blackmans Swamp Creek*, Orange
- Brunswick River Valley*
- Camden Haven*, Kendall
- Coffs Creek*, Coffs Harbour
- Cooma Creek* and Cooma Back Creek, Cooma
- Cootamundra* and Stockinbingal (Cootamundra Shire)
- Dora Creek, Lake Macquarie
- Dumaresq Creek*, Armidale
- Kingdon Ponds*, Scone
- Lower Cooks River*
- Molong Creek*, Molong
- Myall River*, Bulahdelah
- Newcastle City, Newcastle
- Wooli River*, Wooli
- Woronora River*, Sutherland.

A Floodplain Risk Management Plan may identify the need for a local flash flood warning system. In NSW, councils have taken the lead in developing flash flood warning systems within their local government areas. Councils can work with OEH, NSW SES and the Bureau to develop these systems.

3.5. DAM FAILURE WARNING SYSTEMS

Dam failure is the uncontrolled release of a water storage. The failure may consist of the collapse (or part of) the dam, excessive seepage or discharge. The most likely causes of dam failure is:

- **Flood Induced Dam Failure -** dam failure caused by flood due to overtopping erosion or structural failure.
- **Sunny Day Dam Failure -** dam failure caused by factors other than flood flows into the reservoir. Causes of Sunny Day dam failure can include internal erosion, landslide, piping issues, earthquake, structural weaknesses or sabotage.

Dam Failure Warning Systems have been installed by some dam owners to provide advance notice of any imminent failure. As emergency planning for potential dam failure proceeds, further dam failure warning systems, gauges, sensors and telemetry may be established. The focus for establishing dam failure warnings systems should be on high risk dams whose risks are intolerable as outlined by the NSW Dam Safety Committee Societal Risk requirements.

Dam owners, in consultation with NSW SES, established arrangements governing the operation of these systems, the notification of downstream emergency managers, and the warning of communities at risk.

Dam Safety Emergency Plans (DSEP) outline the required actions of owners and personnel at dams in response to a range of possible emergencies. The NSW Dam Safety Committee requires a quality controlled DSEP, including associated dam break warning procedures, to be prepared for prescribed dams where persons/property may be at risk downstream, if the dam was to fail.

3.6. WARNING DISSEMINATION

NSW SES pre-writes Flood Bulletins for forecast locations, key warning gauges, flash flood environments, downstream of highest risk dams, and for areas susceptible to coastal inundation.

NSW SES delivers flood warning information directly to the public in addition to utilising the media. A combination of the following warning methods may be utilised:

- Mobile and fixed public address systems
- Two-way radio
- Emergency Alert
- Telephone/fax
- Doorknocking
- Mobile and fixed sirens
- Variable message signs
- Community notices in identified hubs
- Distribution through established community liaison networks/partnerships
- Internet - including authorised social media and the official NSW SES website.

Emergency Alert is a national telephony-based alert system used by emergency service agencies to send voice messages and short message service (SMS) to landline/mobile telephones in times of emergency.

Where appropriate and usually in conjunction with other warning messages, Emergency Alert is used to send SMS/voice alerts to landline and mobile telephones in a specified geographic area. The short warning times associated with flash flooding precludes the use of emergency alert in that instance. The emergency alert system should be used in conjunction with Evacuation Warnings and Evacuation Orders.

The Standard Emergency Warning Signal (SEWS) is a distinctive audio signal that has been adopted by the NSW SES to broadcast an urgent safety message, thereby alerting the community about a major emergency. It is usually declared on public media mediums including radio, television and public address systems. Mobile sirens are used to attract the attention of the public and alert them about the pending emergency message. Its use is limited to very severe flooding conditions (for example: leading to residential inundation and involving evacuations, especially when time is limited and urgent action is necessary).

The use of a SEWS is detailed in the SEWS National Guidelines. Requests to the media to broadcast a SEWS should include details of the text of the message, information stating when the broadcasts are to commence, the required frequency and the geographic location for broadcast.

3.7. REVIEWING AND IMPROVING FLOOD WARNING SERVICES

Warning products may need to be reviewed, amended and reissued during a flood event. When the Bureau issues a warning product, NSW SES maintains regular contact with the

Bureau until the flood potential has lifted. NSW SES will advise the Bureau when local information indicates a need for a review of information within its warning products. Owners and managers of gauge networks connected to a forecast location or a key warning gauge are responsible for notifying the Bureau and NSW SES when systems and gauges are not operating as stated.

NSW SES continuously reviews the state's flood warning requirements during all flood planning phases. The initial process includes a complex review of all warnings and their associated systems after any flood events and during the Local Flood Sub Plans revision process. Additional ongoing reviews are undertaken when reviewing flood intelligence, flood warning classifications and when reviewing listed warning time requirements.

Reviews may lead to changes to flood warning classifications however, changes will only be made after:

- Consultation is undertaken with the affected community, through local council liaison), the Bureau and the Flood Warning Consultative Committee (FWCC).
- Council, through local media channels provides official notification of the changes.

The FWCC also oversees review and improvements to existing warning systems and arrangements and provides advice on any future development.

4. Provision of and Requirements for Flood Warning

Table 1 details locations warnings that are issued in NSW, and the associated provision requirements for each location. For Bureau issued warnings, the table replicates information within the Bureau's *Service Level Specification for Flood Forecasting and Warning Services for New South Wales and the Australian Capital Territory*. The current version of this document is available from the Bureau's website www.bom.gov.au

Additional locations are detailed in the table; these are for locations where NSW SES issues Local Flood Advices and these are completed independently of Bureau flood warnings.

The headings within the table are detailed below:

- **Bureau Number:** Refers to the unique number assigned to a particular station by the Bureau. N/A refers to locations where NSW SES provides a Local Flood Advice, however no gauge is present and the Bureau provides no warning.
- **AWRC Number:** Refers to the unique number assigned to a particular station by the Australian Water Resources Council. Each gauge within Australia is assigned a unique AWRC number. N/A refers to locations when NSW SES provides a Local Flood Advice, however no gauge is present and the Bureau provides no warning.
- **Forecast location:** Is the specific location that will be referred to in flood warnings.
- **Station Owner:** Is the owning and operating agency of the station.
- **Gauge type:** Either manual (read by human) or automatic.

- **Flood Classification:** Flood warning classifications are locally defined flood levels used in flood warning products to give an indication of the severity of the impact of expected flooding. These impacts are defined as minor, moderate and major. Definitions for minor, moderate and major can be found in the Glossary. N/A refers to locations where flood classifications have not yet be defined by NSW SES.
- **Flood Warnings provided by the Bureau:** Flood warnings may include quantitative predictions at forecast locations or a statement about future flooding in more generalised terms. The type of prediction included is commensurate with user requirements, the availability of real time rainfall and river level data, and the capability of available flood prediction systems. 'No' refers to locations where NSW SES provides a Local Flood Advice, no warning is provided by the Bureau. This field may also state when warnings are issued not from NSW BOM (i.e. QLD BOM)
- **Target warning lead time:** The minimum lead time that will be provided before the height or the flood class level given is exceeded. N/A refers to locations where NSW SES provides a Local Flood Advice, no warning is provided by the Bureau.
- **Time (hours):** The minimum time prior to flooding a warning product will be released.
- **Trigger height (m):** The minimum height forecast that triggers the issuing of a warning product.
- **Seventy percent of peak forecasts within:** The percentage listed shows the Target Peak Accuracy. Target Peak Accuracy is the error where peak river level height is predicted.
- **Local flood advices provided by SES:** Yes indicates a Local Flood Advice is provided by NSW SES. Local Flood Advices are provided in locations the Bureau does not issue flood warnings. The location where the Local Flood Advice is issued in known as a Key Warning Gauge.

Below is the Table Key:

^ = Small catchments described in 5.6.

***** = key location for downstream predictions, critical for the provision of a quantitative flood forecasting service to downstream sites marked with +.

+ = key locations for prediction that are based on a telemetered gauge proxy

U/S = upstream levels acting as a trigger for forecasts at given location.

All levels are in metres to local gauge datum unless indicated otherwise.

Table 1: Provision and requirements for flood warning in NSW

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
201 – Tweed River Valley												
58186	201420	North Murwillumbah*	Tweed Shire Council NSW Office of Environment and Heritage	Automatic	3.0	4.0	4.8	Quantitative	6 hrs 12 hrs	>3.5 m >6.6 m	+/- 0.3 m	
558014	201432	Tumbulgum	Tweed Shire Council NSW Office of Environment and Heritage	Automatic	1.4	1.8	2.5	Quantitative	6 hrs	>1.4 m	+/- 0.3 m	Yes
558010	201426	Chinderah	Tweed Shire Council	Automatic	1.3	1.7	2.0	Quantitative	6 hrs	>1.3 m	+/- 0.3 m	
202 –Brunswick River Valley												
558020	202400	Billinudgel * ^	NSW Office of Environment and Heritage Byron Shire Council	Automatic	2.5	3.0	3.5	Quantitative	3 hrs	>2.5 m	+/- 0.3 m	Yes
558006	202402	Mullumbimby	NSW Office of Environment and Heritage Byron Shire Council	Automatic	2.5	3.5	4.5	Quantitative	3 hrs	>2.5 m	+/- 0.3 m	
203 – Richmond and Wilsons River Valley												
58176	203904	Lismore	Lismore Local Council	Automatic	4.2	7.2	9.7	Quantitative	12 hrs	>10 m	+/- 0.3 m	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
558001	203005	Wiangaree *	WaterNSW	Automatic	11.0	15.5	n/a	Quantitative	6 hrs	>11 m	+/- 0.3 m	
558002	203900	Kyogle *	WaterNSW	Automatic	12.0	14.4	16.0	Quantitative	6 hrs	13.0 m	+/- 0.3 m	
58179	203907	Casino Road Bridge *	Richmond Valley Council	Manual	9.2	12.2	15.0	Quantitative	6 hrs	>9.2 m	+/- 0.3 m	
58175	203403	Coraki *	NSW Office of Environment and Heritage	Automatic	3.4	5.0	5.7	Quantitative	24 hrs	3.8	+/- 0.3 m	
58184	203450	Bungawalbin *	NSW Office of Environment and Heritage	Automatic	3.0	4.5	5.0	Quantitative	24 hrs	4.5	+/- 0.3 m	
n/a	203029	Leeville			n/a	n/a	n/a	No	n/a	n/a	n/a	Yes
n/a	n/a	Tintenbar			n/a	n/a	n/a	No	n/a	n/a	n/a	Yes
n/a	n/a	Ellengowan			n/a	n/a	n/a	No	n/a	n/a	n/a	Yes
558070	203039	Teven	Ballina Shire Council WaterNSW	Automatic	n/a	n/a	n/a	No	n/a	n/a	n/a	Yes
n/a	203415	Broadwater			n/a	n/a	n/a	No	n/a	n/a	n/a	Yes
n/a	203468	Wardell	NSW Office of Environment and Heritage	Automatic	n/a	n/a	n/a	No	n/a	n/a	n/a	Yes
558097	203425	Ballina Breakwall (Tide gauge)	NSW Office of Environment and Heritage	Automatic	n/a	n/a	n/a	No	n/a	n/a	n/a	Yes
558015	203030	Rappville	WaterNSW	Automatic	n/a	n/a	n/a	No	n/a	n/a	n/a	Yes

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
n/a	n/a	Cabbage Tree Island			n/a	n/a	n/a	No	n/a	n/a	n/a	Yes
58061	203412	Woodburn	NSW Office of Environment and Heritage	Automatic	3.2	3.7	4.2	Quantitative	12 hrs	>3.2 m	+/- 0.3 m	
204 – Clarence River Valley												
58178	204400	Grafton *	NSW Office of Environment and Heritage	Automatic	2.1	3.6	5.4	Quantitative	6 hrs 24 hrs	>3.6 m >8.2 m	+/- 0.3 m	
558030	204909	Coutts Crossing	Clarence Valley Council	Manual	5.0	9.0	12.0	Generalised	6 hrs	>9.0m	+/-0.3 m	
58188	204480	Ulmarra *	NSW Office of Environment and Heritage	Automatic	2.1	3.4	4.9	Quantitative	6 hrs 12hrs	>3.4 m >5.8 m	+/- 0.3 m	
558022	204410	Maclean	NSW Office of Environment and Heritage	Automatic	1.6	2.2	2.5	Quantitative	6 hrs 24 hrs	>2.2 m >3.3 m	+/- 0.3 m	
59123	204907	Glenreagh Bridge *	NSW Office of Environment and Heritage	Manual	4.0	7.0	10.0	Quantitative	6 hrs	>5.8 m	+/- 0.3 m	
205 – Bellinger River Valley												
59121	205002	Thora *	WaterNSW Bellingen Shire Council	Automatic	3.0	4.3	5.8	Quantitative	3 hrs	>3.0 m	+/- 0.3 m	
59126	205442	Bellingen *	NSW Office of Environment and Heritage Bellingen Shire Council	Automatic	3.7	6.7	8.2	Quantitative	6 hrs	>4.9 m	+/- 0.3 m	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
559024	205403	Repton	NSW Office of Environment and Heritage Bellingen Shire Council	Automatic	2.0	n/a	3.0	Quantitative	6 hrs	>2.0 m	+/- 0.3 m	
559011	205407	Urunga	NSW Office of Environment and Heritage Bellingen Shire Council	Automatic	1.5	2.0	2.4	Quantitative	6 hrs	>1.5 m	+/- 0.3 m	
559012	205439	Coffs Creek (Highway Bridge) ^	NSW Office of Environment and Heritage	Automatic	3.0	n/a	4.7	Quantitative	1 hr	>3.0 m	+/- 0.3 m	
558060	205463	Wooli (Caravan Park) ^	NSW Office of Environment and Heritage Clarence Valley Council	Automatic	1.9	2.2	2.5	Quantitative	6 hrs	>1.9m	+/- 0.3 m	
205 – Nambucca River Valley												
559001	205006	Bowraville * (Lane's Bridge)	-	No gauge	5.5	5.8	10.1	Quantitative	3 hrs	>5.5 m	+/- 0.3 m	
559006	205416	Macksville	Nambucca Shire Council NSW Office of Environment and Heritage	Automatic	1.7	2.1	2.6	Quantitative	6 hrs 12 hrs	>2.0 m >3.0 m	+/- 0.3 m	Yes
206 – Macleay River Valley												
556017	206032	Armidale – Stephens Bridge ^	WaterNSW	Automatic	2.9	n/a	n/a	Quantitative	1 hr	>2.9 m	+/- 0.3 m	
557001	206024	Georges Creek *	Kempsey Shire Council WaterNSW	Automatic	6.0	8.0	10.0	Quantitative	6 hrs	>8.0 m	+/- 0.3 m	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
59122	206019	Bellbrook *	Kempsey Shire Council	Automatic	6.5	10.5	13.5	Quantitative	6 hrs	>6.5 m	+/- 0.3 m	
59127	206402	Kempsey	Kempsey Shire Council NSW Office of Environment and Heritage	Automatic	4.5	5.7	6.6	Quantitative	12 hrs 24 hrs	4.5 m >5.7m	+/- 0.3 m	
559040	206406	Smithtown	NSW Office of Environment and Heritage	Automatic	3.4	4.0	4.2	Quantitative	12 hrs	>4.0m	+/- 0.3 m	
207 – Hastings and Camden Haven River Valleys												
60116	207004	Kindee Bridge *	WaterNSW	Automatic	4.7	6.8	8.1	Quantitative	6 hrs	>8.7 m	+/- 0.3 m	
60124	207401	Wauchope Railway Bridge *	NSW Office of Environment and Heritage	Automatic	2.5	4.3	5.5	Quantitative	6 hrs 12 hrs	>2.5 m >5.5 m	+/- 0.3 m	
60133	207418	Settlement Point	NSW Office of Environment and Heritage	Automatic	1.2	1.5	1.75	Quantitative	12 hrs	>1.2 m	+/- 0.3 m	
560017	207428	Logans Crossing * ^	Hastings Council NSW Office of Environment and Heritage	Automatic	7.0	7.6	7.9	Quantitative	3 hrs	>7.0 m	+/- 0.3 m	
560018	207425	Laurieton	Hastings Council NSW Office of Environment and Heritage	Automatic	1.1	1.5	1.7	Quantitative	3 hrs 6 hrs	>1.1 m >1.5 m	+/- 0.3 m	
208 – Manning River Valley												

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
560062	208020	Gloucester	WaterNSW	Automatic	4.3	4.9	5.2	Quantitative	3 hrs	>4.0 m	+/- 0.3 m	
60120	208400	Wingham *	NSW Office of Environment and Heritage	Automatic	4.9	8.9	11.9	Quantitative	12 hrs	>5.0 m	+/- 0.3 m	
									24 hrs	>12 m		
60119	208410	Taree *	NSW Office of Environment and Heritage	Automatic	1.8	2.4	3.7	Quantitative	12 hrs	>2.1 m	+/- 0.3 m	
									24 hrs	>4 m		
560008	208404	Croki *	NSW Office of Environment and Heritage	Automatic	1.5	n/a	n/a	Quantitative	12 hrs	>1.5m	+/- 0.3 m	
560027	208425	Harrington	NSW Office of Environment and Heritage	Automatic	1.9	2.2	2.8	Quantitative	12 hrs	>1.9 m	+/- 0.3 m	
209 – Karuah River Valley												
560057	209906	Tuncurry (Point Road)	Great Lakes Council	Automatic	0.9	1.5	1.9	Quantitative	3 hrs	>0.9 m	+/- 0.3 m	
560040	209460	Bulahdelah ^	Great Lakes Council NSW Office of Environment and Heritage	Automatic	3.0	n/a	4.5	Quantitative	3 hrs	>3.0 m	+/- 0.3 m	
210 – Hunter River Valley												
61360	210904	Scone ^	Upper Hunter Shire Council	Automatic	3.2	3.5	3.7	Quantitative	3 hrs	>3.2 m	+/- 0.3 m	Yes
561005	210002	Muswellbrook *	WaterNSW	Automatic	7.2	8.0	10.0	Quantitative	4 hrs	>7.2 m	+/- 0.3 m	
									12 hrs	>10.0 m		

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
561015	210055	Denman *	WaterNSW	Automatic	6.5	7.9	9.0	Quantitative	8 hrs	9.0 m	+/- 0.3 m	
561024	210056	Aberdeen	WaterNSW	Automatic	7.2	9.8	10.0	Quantitative	6 hrs	7.2 m	+/- 0.3 m	
561032	210406	Paterson	NSW Office of Environment and Heritage	Automatic	6.1	7.6	9.1	Info location				Yes
561022	210448	Hexham Bridge	NSW Office of Environment and Heritage	Automatic	1.9	2.9	3.8	Info location				Yes
61347	210028	Bulga *	WaterNSW	Automatic	3.0	3.7	4.6	Quantitative	12 hrs	3.0 m	+/- 0.3 m	
561010	210001	Singleton *	WaterNSW	Automatic	10.0	11.5	13.0	Quantitative	6 hrs	>10 m	+/- 0.3 m	
									24 hrs	>14.2 m		
61268	210458	Maitland (Belmore Bridge) *	NSW Office of Environment and Heritage	Automatic	5.9	8.9	10.5	Quantitative	12 hrs	>5.9 m	+/- 0.3 m	
									24 hrs	>7.1 m		
61349	210402	Gostwyck	NSW Office of Environment and Heritage	Automatic	9.1	10.7	12.2	Quantitative	12 hrs	>9.1 m	+/- 0.3 m	
61267	210903	Dungog * (Williams River)	WaterNSW	Automatic	4.9	7.6	8.5	Quantitative	3 hrs	>4.9m	+/- 0.3 m	
61339	210010	Mill Dam Falls *	WaterNSW	Automatic	6.1	7.6	9.1	Quantitative	12 hrs	6.1 m	+/- 0.3 m	
561037	210452	Raymond Terrace	NSW Office of Environment and Heritage	Automatic	2.5	3.1	3.5	Quantitative	6 hrs	>2.5 m	+/- 0.3 m	
									18 hrs	>3.5 m		

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
211 – Lake Macquarie, Tuggerah Lake and Wyong River												
561025	211002	Wyong (Downstream of bridge) *	Wyong Shire Council	Automatic	2.7	3.8	4.0	Quantitative	6 hrs	>2.7m	+/- 0.3 m	
561080	211418	Long Jetty	NSW Office of Environment and Heritage	Automatic	0.9	1.8	2.2	Quantitative	6 hrs	>0.9 m	+/- 0.3 m	
n/a	n/a	Dora Creek			n/a	n/a	n/a	No				Yes
561070	211461	Belmont	NSW Office of Environment and Heritage	Automatic	0.7	0.9	1.1	Quantitative	6 hrs	>0.7 m	+/- 0.3 m	
212 – Hawkesbury Nepean River Valley												
68216	212904	Menangle Bridge*	BoM	Automatic	5.2	9.2	12.2	Quantitative	6 hrs	>5.2 m	+/- 0.3 m	
570066	n/a	Lansdowne Bridge (Mulwaree River)	Goulburn Mulwaree Council	Automatic	n/a	n/a	n/a	No				Yes
570070	n/a	Marsden Weir	Goulburn Mulwaree Council	Automatic	n/a	n/a	n/a	No				Yes
563074	212011	Lithgow (Farmers Creek)	WaterNSW	Automatic	n/a	n/a	n/a	No				Yes
568154	212216	Camden Weir *	WaterNSW	Automatic	6.8	8.3	13.8	Quantitative	12 hrs	>6.8 m	+/- 0.3 m	
68214	212900	Camden Bridge^{+}		Manual	6.8	8.3	13.8					

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
67093	212202	Wallacia Weir *	WaterNSW	Automatic	5.0	8.7	11.0	Quantitative	12 hrs	> 5.0 m	+/- 0.3 m	
567047	212201	Penrith *	WaterNSW	Automatic	3.9	7.9	10.4	Quantitative	6 hrs 8 hrs	>8.9 m >11.3m	+/- 0.3 m	
063282	212902	North Richmond Bridge+		Manual	4.3	8.4	11.0	Quantitative	6hrs 15hrs	>16m >18m	+/- 0.3 m	
567098	212200	North Richmond (WPS) *	WaterNSW	Automatic	3.8	7.9	10.5	Quantitative	6hrs 15hrs	>16m >18m	+/- 0.3 m	
567044	212426	Windsor (PWD)*	NSW Office of Environment and Heritage	Automatic	5.8	7.0	12.2	Quantitative	6hrs if peak>16 15hrs if peak>16 12-18 hrs	9.6m 13.7m Peak	+/- 0.3 m	
67095	212903	Windsor+		Manual	5.8	7.0	12.2				+/- 0.3 m	
63280	212406	Sackville *	Water NSW NSW Office of Environment and Heritage	Automatic	4.6	7.3	9.7	Quantitative	18 hrs	>4.6	+/- 0.3 m	
67094	212407	Lower Portland*	NSW Office of Environment and Heritage	Automatic	4.6	6.1	7.6	Quantitative	18 hrs	>4.6	+/- 0.3 m	
63288	212908	Putty Road		Manual	2.7	5.7	10.7	Quantitative	12 hrs	>5.7	+/- 0.3 m	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
561004	212408	Webbs Creek (Wisemans Ferry)	NSW Office of Environment and Heritage WaterNSW	Automatic	n/a	3.5	4.2	Quantitative	12hrs	>3.5 m	+/- 0.3 m	
213 – Georges River and Sydney Coast												
566054	213400	Liverpool *	NSW Office of Environment and Heritage Sutherland Shire Council	Automatic	2.0	3.0	4.5	Quantitative	6 hrs	>2.0 m	+/- 0.3 m	
									12 hrs	>4.0 m		
66168	213405	Milperra *	NSW Office of Environment and Heritage Sutherland Shire Council	Automatic	2.0	3.3	4.2	Quantitative	6 hrs	>2.0 m	+/- 0.3 m	
									12 hrs	>4.0 m		
566011	213410D	Picnic Point	NSW Office of Environment and Heritage	Automatic	2.0	n/a	n/a	Quantitative	6 hrs	>2.0m	+/- 0.3 m	
566045	213482	Woronora Bridge ^	Sutherland Shire Council	Automatic	1.5	3.4	3.9	Quantitative	3 hrs	>1.5 m	+/- 0.3 m	
n/a	n/a	Parramatta River	No specific forecast location exists – forecast based on exceedance of a rainfall threshold as per trigger height column.					Generalised	3 hrs	>1%	n/a	
566012	213415	Tempe Bridge ^	NSW Office of Environment and Heritage	Automatic	1.3	n/a	n/a	Quantitative	3 hrs	>1.3 m	+/- 0.3 m	
n/a	213408D	Ocean Street	Council		n/a	n/a	n/a	Local flood warning system				Yes

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
215 – Shoalhaven River Valley												
68213	215411	Nowra*	NSW Office of Environment and Heritage	Automatic	2.3	3.3	4.3	Quantitative	6 hrs 9 hrs	>2.3m >3.3 m	+/- 0.3 m	
68221	215420	Terara	NSW Office of Environment and Heritage	Automatic	2.2	3.0	3.9	Quantitative	6 hrs	>3.0m	+/- 0.3 m	
216 – Clyde River Valley – St Georges Basin												
568200	216415	Island Point	Shoalhaven City Council NSW Office of Environment and Heritage	Automatic	1.2	1.5	1.8	Quantitative	3 hrs	>1.2m	+/- 0.3 m	
568198	216412	Sussex Inlet	Shoalhaven City Council NSW Office of Environment and Heritage	Automatic	0.9	1.2	1.8	Quantitative	3 hrs	>0.9m	+/- 0.3 m	
217 – Moruya River Valley												
69136	217002	Wamban*	-	Manual	4.4	6.2	8.0	Quantitative	3 hrs	>4.4 m	+/- 0.3 m	
69130	217410	Moruya Bridge	NSW Office of Environment and Heritage	Automatic	2.0	2.6	3.2	Quantitative	6 hrs	>2.6 m	+/- 0.3 m	
219 – Bega River Valley												
069120	219900	Bega	WaterNSW	Automatic	4.6	7.0	8.0	Quantitative	3 hrs	>4.6m	+/- 0.3 m	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
222 – Snowy River Valley												
570020	220019	Bombala	WaterNSW	Automatic	3.0	5.0	8.0	Quantitative	3hrs	>3.0m	+/- 0.3 m	
401 – Upper Murray												
72156	401201	Jingellic	Northern RWMP	Automatic	4.0	5.5	7.0	Warnings issued in conjunction with BoM Victoria office	9 hrs	>4.0m	+/- 0.3 m	
582015	401012	Biggara	WaterNSW	Automatic	2.0	2.6	3.0	Snowy Mountains Authority (Khancoban) advises of outflows likely to cause flooding. Warnings issued in conjunction with BoM Victoria office	n/a	n/a	n/a	
572004	401001	Bringenbrong	WaterNSW	Automatic	3.0	3.4		Snowy Mountains Authority (Khancoban) advises of outflows likely to cause	n/a	n/a	n/a	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
								flooding. Warnings issued in conjunction with BoM Victoria office				
422 – Culgoa River Valley												
48212	422016	Brenda *	WaterNSW	Automatic	4.9	5.5	5.9	Quantitative	3days	>5.9m	+/- 0.3 m	
48230	422017	Weilmoringle *	WaterNSW	Automatic	5.2	n/a	5.8	Quantitative	2 days 3 days	>5.6m >6.2m	+/- 0.3 m	
48052	422006	Collerina (Kenebree)	WaterNSW	Automatic	4.7	5.7	6.3	Quantitative	2 days 3 days	>6.1m >6.5m	+/- 0.3 m	
48215	422032	Goodooga (Bokhara River) *	WaterNSW	Automatic	2.7	3.4	4.2	Quantitative	2 days	>3.7m	+/- 0.3 m	
548011	422013	Goodooga (Birrie River) *	WaterNSW	Automatic	3.2	4.0	5.0	Quantitative	2 days	>4.0m	+/- 0.3 m	
548012	422005	Goodwins *	WaterNSW	Automatic	2.0	2.6	3.5	Quantitative	2 days	>2.0 m	+/- 0.3 m	Yes
48223	422030	New Angledool No.2	WaterNSW	Automatic	3.3	3.5	3.8	Quantitative	2 days	>2.8m	+/- 0.3 m	
423 – Warrego River Valley												

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
548003	423004	Barringun No. 2 *	WaterNSW	Automatic	2.8	3.8	5.0	Quantitative	24 hrs	>2.8m	+/- 0.3 m	
48039	423942	Enngonia *	-	Manual	2.0	2.5	3.0	Quantitative	24 hrs	>2.0m	+/- 0.3 m	
									2 days	>3.1 m		
548002	423002	Ford's Bridge (Bywash)	WaterNSW	Automatic	1.7	2.3	3.2	Quantitative	24 hrs	>2.3m	+/- 0.3 m	
424 – Paroo River Valley												
548008	424002	Willara Crossing *	WaterNSW	Automatic	0.7	n/a	n/a	Quantitative	1 day	>0.7m	+/- 0.3 m	Yes
48181	424001	Wanaaring	-	Manual	2.4	3.3	4.0	Quantitative	3 days	>4.0 m	+/- 0.3 m	
416 – Macintyre River Valley												
56227	416009	Inverell (Ross Hill Bridge) *	Inverell Shire Council	Manual	3.0	4.3	5.2	Quantitative	3 hrs	>3.0 m	+/- 0.3 m	
54145	416006	Ashford *	WaterNSW	Automatic	2.2	4.0	6.0	Quantitative	3 hrs	>2.2 m	+/- 0.3 m	
554014	416058	Yetman	WaterNSW	Automatic	5.0	7.6	9.1	Quantitative	6 hrs	>5.0 m	+/- 0.3 m	
41500	416201A	Goondiwindi	DNRM	Automatic	4.00	6.0	8.5	Quantitative	15hrs	>6.0 m	+/- 0.3 m	
	n/a	Boomi	Border Rivers Commission		n/a	n/a	n/a	No				Yes
53101	416002	Boggabilla *	WaterNSW	Automatic	5.0	11.5	12	Quantitative	6 hrs	>5.0 m	+/- 0.3 m	
425 – Barwon Darling River												
052068	416001	Mungindi *	WaterNSW	Automatic	6.1	6.7	7.2	Quantitative	24 hrs	>6.1m	+/- 0.3 m	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
548000	422004	Mogil Mogil *	WaterNSW	Automatic	7.5	n/a	8.3	Quantitative	24 hrs	>7.5m	+/- 0.3 m	
48226	422003	Collarenebri *	WaterNSW	Automatic	5.8	7.9	8.5	Quantitative	24 hrs	>5.8m	+/- 0.3 m	
552014	422001	Walgett *	WaterNSW	Automatic	10.5	12.0	12.5	Quantitative	24 hrs	>10.5m	+/- 0.3 m	
48214	422002	Brewarrina *	WaterNSW	Automatic	6.4	7.0	9.5	Quantitative	3 days	>10m	+/- 0.3 m	
548004	425003	Bourke *	WaterNSW	Automatic	9.5	11.4	12.7	Quantitative	3 days	>13.2 m	+/- 0.3 m	
548005	425004	Louth *	WaterNSW	Automatic	8.6	10.0	12.0	Quantitative	3 days	>13.6 m	+/- 0.3 m	
48213	425900	Tilpa *	WaterNSW	Automatic	9.0	10.5	11.5	Quantitative	3 days	>12.2 m	+/- 0.3 m	
546010	425008	Wilcannia *	WaterNSW	Automatic	9.0	9.7	10.4	Quantitative	3 days	>10 m	+/- 0.3 m	
47101	425001	Menindee *	WaterNSW	Automatic	8.5	9.1	9.7	Quantitative	2 days	>8.8 m	+/- 0.3 m	
47103	425005	Pooncarie *	WaterNSW	Automatic	6.8	7.6	8.7	Quantitative	2 days	>6.8m	+/- 0.3 m	
547015	425007	Burtundy *	WaterNSW	Automatic	6.1	n/a	7.7	Quantitative	2 days	>6.1m	+/- 0.3 m	
418 – Gwydir River Valley												
556007	418008	Bundarra *	WaterNSW	Automatic	8.0	9.1	10.7	Quantitative	3 hrs	>8 m	+/- 0.3 m	
54141	418013	Gravesend *	WaterNSW	Automatic	6.1	9.4	12.0	Quantitative	12 hrs	>6.1 m	+/- 0.3 m	
553000	418001	Pallamallawa *	WaterNSW	Automatic	6.0	9.5	10.4	Quantitative	12 hrs	>6 m	+/- 0.3 m	
553002	418004	Yarraman Bridge	WaterNSW	Automatic	4.0	6.5	7.0	Quantitative	12 hrs	5.5 m	+/- 0.3 m	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
									24 hrs	>7 m		
554009	418025	Bingara	WaterNSW	Automatic	5.5	7.6	9.1	Local				
553001	418002	Moree	WaterNSW	Automatic	5.5	7.6	8.8	Quantitative	12 hrs 24 hrs	>5.5 m >7.0 m	+/- 0.3 m	
419 – Namoi and Peel River Valley												
55277	419022	Manilla *	WaterNSW	Automatic	6.1	9.7	10.7	Quantitative	7 hrs	>6.1 m	+/- 0.3 m	
55307	419009	Tamworth *	WaterNSW	Automatic	3.0	4.2	6.0	Quantitative	6 hrs	>3 m	+/- 0.3 m	
555024	419909	Carroll Village	Gunnedah Shire Council	Manual	8.2	8.8	9.3	Quantitative	6 hrs	>8.2 m	+/- 0.3 m	
555000	419001	Gunnedah *	WaterNSW	Automatic	7.3	7.6	7.9	Quantitative	24 hrs	>7.3 m	+/- 0.3 m	
555004	419012	Boggabri (Namoi River)	WaterNSW	Automatic	7.0	n/a	n/a	Quantitative	12 hrs	>7.0m	+/- 0.3 m	
54152	419003	Narrabri (Narrabri Creek) *	WaterNSW	Automatic	4.9	6.4	6.7	Quantitative	6 hrs	>4.9m	+/- 0.3 m	
53105	419900	Wee Waa (Glencoe) *	WaterNSW	Automatic	5.3	6.4	6.7	Quantitative	12 hrs	>5.3m	+/- 0.3 m	
552000	419021	Bugilbone *	WaterNSW	Automatic	4.9	5.5	n/a	Quantitative	12 hrs	>4.9m	+/- 0.3 m	
055310	419027	Breeza	WaterNSW	Automatic	n/a	3.9	4.8	Local				Yes
552011	419026	Goangra *	WaterNSW	Automatic	5.5	6.7	7.8	Quantitative	12 hrs	>5.5 m	+/- 0.3 m	
420 – Castlereagh River Valley												

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
564000	420004	Mendooran *	WaterNSW	Automatic	3.3	5.0	9.0	Quantitative	6 hrs	>3.3m	+/- 0.3 m	
51144	420001	Gilgandra *	Gilgandra Shire Council	Manual	5.0	6.4	7.9	Quantitative	6 hrs	>5.0m	+/- 0.3 m	
564005	420022	Coonabarabran	WaterNSW	Automatic				No				Yes
51143	420005	Coonamble	Coonamble Council	Manual	n/a	4.9	5.2	Quantitative	6 hrs	>4.9m	+/- 0.3 m	
421 – Macquarie River Valley												
63287	421908	Bathurst	Bathurst Regional Council	Automatic	3.0	4.5	5.7	Quantitative	12 hrs	>6m	+/- 0.3 m	
565002	421003	Wellington (Macquarie River)*	WaterNSW	Automatic	4.0	9.1	12.2	Quantitative	3 hrs	>4.0m	+/- 0.3 m	
562006	421008	Wellington (Bell River) *	WaterNSW	Automatic	3.4	5.9	8.4	Quantitative	3 hrs	>3.4m	+/- 0.3 m	
563026	421049	Molong (Molong Creek) ^	Cabonne Shire Council	Manual	n/a	3.3	3.9	Quantitative	1 hr	>3.3m	+/- 0.3 m	
n/a	n/a	Orange	No specific forecast location exists – forecast based on exceedance of a rainfall threshold as per trigger height column.					Generalised	1 hr	>70mm in 6hrs	n/a	
565001	421001	Dubbo *	WaterNSW	Automatic	5.5	7.9	11.0	Quantitative	6hrs	>5.5m	+/- 0.3 m	
551000	421006	Narromine *	Narromine Shire Council	Manual	5.5	9.1	13.7	Quantitative	6hrs	>5.5m	+/- 0.3 m	
n/a	n/a	Geurie			n/a	n/a	n/a	No				Yes
51145	421014	Warren	WaterNSW	Manual	7.5	8.5	9.0	Quantitative	12hrs	>7.5m	+/- 0.3 m	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
421 – Bogan River Valley												
550001	421076	Peak Hill *	WaterNSW	Automatic	2.5	4.6	6.0	Quantitative	3 hrs	>2.5m	+/- 0.3 m	
551002	421083	Dandaloo *	WaterNSW	Automatic	4.1	5.2	6.0	Quantitative	12 hrs	>4.1m	+/- 0.3 m	
51155	421905	Mudall *	-	Manual	2.7	3.0	3.6	Quantitative	24 hrs	>2.7m	+/- 0.3 m	
51156	421138	Nyngan *	WaterNSW	Automatic	n/a	3.5	4.2	Quantitative	24 hrs	>3.5m	+/- 0.3 m	
48225	421902	Mulgawarrina *	-	Manual	4.2	5.0	5.5	Quantitative	24 hrs	>4.2m	+/- 0.3 m	
548010	421023	Gongolgon *	WaterNSW	Automatic	0.8	1.0	1.3	Quantitative	24 hrs	>0.8m	+/- 0.3 m	
412 – Lachlan River Valley												
63278	412002	Cowra *	WaterNSW	Automatic	8.5	10.7	13.4	Quantitative	6 hrs	>8.5 m	+/- 0.3 m	
565013	412195	Canowindra (Upstream) *	WaterNSW	Automatic	2.6	3.3	4.5	Quantitative	3 hrs	>2.6m	+/- 0.3 m	
565007	412057	Nanami *	WaterNSW	Automatic	7.4	9.7	10.7	Quantitative	6 hrs 12 hrs	>7.4m >10.7m	+/- 0.3 m	
65086	412904	Eugowra	-	Manual	8.0	n/a	9.0	Quantitative	6 hrs	>8.0m	+/- 0.3 m	
65088	412901	Forbes Iron Bridge*	WaterNSW	Automatic	8.8	9.5	10.55	Quantitative	12 hrs 24 hrs	>8.8 m >10.4 m	+/- 0.3 m	
565003	412004	Cottons Weir *	WaterNSW	Automatic	3.5	5.3	6.6	Quantitative	24 hrs	>3.5m	+/- 0.3 m	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
565000	412036	Jemalong Weir * (Downstream)	WaterNSW	Automatic	7.2	7.5	7.7	Quantitative	48 hrs	>7.2 m	+/- 0.3 m	
550000	412006	Condobolin * (Lachlan River)	WaterNSW	Automatic	5.2	5.9	6.7	Quantitative	48 hrs	>5.2 m	+/- 0.3 m	
49125	412903	Euabalong *	Bureau	Manual	6.4	n/a	6.8	Quantitative	3 days	>5.8 m	+/- 0.3 m	
		Ungarie			n/a	n/a	n/a	No	n/a	n/a	n/a	Yes
575013	412039	Hillston Weir *	WaterNSW	Automatic	2.4	2.8	3.0	Quantitative	3 days	>2.4 m	+/- 0.3 m	
n/a	n/a	Ardlethan			n/a	n/a	n/a	No				Yes
n/a	410146	Barellan			n/a	n/a	n/a	No				Yes
n/a	n/a	Beckom			n/a	n/a	n/a	No				Yes
575006	412011	Lake Cargelligo	WaterNSW		1.5	1.9	2.0	Info location	n/a	n/a	n/a	Yes
75171	412005	Booligal Weir	WaterNSW	Automatic	2.4	n/a	n/a	Quantitative	3 days	>2.4 m	+/- 0.3 m	
410 – Queanbeyan Molonglo River Valley												
570033	410901	Queanbeyan	Local Council	Manual	4.2	7.4	8.2	Quantitative	6 hrs	>4.2m	+/- 0.3 m	
410 – Murrumbidgee River Valley												
n/a	n/a	Cootamundra	No specific forecast location exists – forecast based on exceedance of a rainfall threshold as per trigger height column.					Generalised	1 hr	>50mm in 6hrs	n/a	
n/a	n/a	Stockinbingal^	No specific forecast location exists – forecast based on exceedance of a rainfall threshold as per trigger height column					Generalised	1hr	>50mm in 6hrs	n/a	Yes

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
570031	410902	Cooma (SMEC)	Cooma Monaro Regional Council	Automatic	n/a	n/a	1.8	Quantitative	1 hr	>1.8 m	+/- 0.3 m	
570035	410081	Cooma (Koolaroo)	Cooma Monaro Regional Council	Automatic	n/a	n/a	3.8	Quantitative	1 hr	>3.8m	+/- 0.3 m	
572014	410006	Tumut *	WaterNSW	Automatic	2.0	2.6	3.7	Quantitative	3 hrs	>2.0 m	+/- 0.3 m	
73132	410004	Gundagai *	WaterNSW	Automatic	6.1	7.6	8.5	Quantitative	12 hrs	>6.1 m	+/- 0.3 m	
573000	410001	Wagga Wagga *	WaterNSW	Automatic	7.3	9.0	9.6	Quantitative	12 hrs	7.3 m	+/- 0.3 m	
									24 hrs	9.0 m		
									30 hrs	>9.6 m		
574020	410005	Narrandera *	WaterNSW	Automatic	6.7	7.3	8.2	Quantitative	5 days	6.7 m	+/- 0.3 m	
575011	410021	Darlington Point *	WaterNSW	Automatic	5.5	7.0	7.3	Quantitative	7 days	5.5 m	+/- 0.3 m	
75170	410078	Carrathool *	WaterNSW	Automatic	7.0	7.5	8.5	Quantitative	10 days	7.0 m	+/- 0.3 m	
575010	410002	Hay Town *	Hay Shire Council	Manual	6.5	7.5	8.0	Quantitative	10 days	6.5 m	+/- 0.3 m	
574039	410169	Yanco Bridge	WaterNSW		n/a	n/a	n/a	No	n/a	n/a	n/a	Yes
n/a	n/a	Ganmain			n/a	n/a	n/a	No				Yes
n/a	n/a	The Rock (Burke Creek)			n/a	n/a	n/a	No				Yes
570009	410026	Yass	WaterNSW	Automatic	n/a	n/a	n/a	No	n/a	n/a	n/a	Yes
549001	410130	Balranald Weir (Downstream)*	WaterNSW	Automatic	6.7	6.9	7.1	Quantitative	10 days	>6.7 m	+/- 0.3 m	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
409 – Murray River Valley												
572000	409001	Albury *	WaterNSW	Automatic	4.3	4.9	5.5	Quantitative	12 hrs	>5.5 m	+/- 0.3 m	
582003	409002	Corowa *	WaterNSW	Automatic	4.6	5.9	8.6	Quantitative	24 hrs	>6.0 m	+/- 0.3 m	
74246	409025	Yarrawonga (Downstream)*	WaterNSW	Automatic	6.4	6.7	7.8	Quantitative	24 hrs	>6.4 m	+/- 0.3 m	
574004	409202	Tocumwal *	Northern RWMP	Automatic	6.4	6.7	7.3	Quantitative	24 hrs	>6.4 m	+/- 0.3 m	
574000	409200	Moama / Echuca *	Northern RWMP	Automatic	93.5	93.9	94.4	Quantitative	24 hrs	>93.5 m	+/- 0.3 m	
574003	409207	Torrumbarry Weir *	Northern RWMP	Automatic	7.3	7.6	7.8	Quantitative	24 hrs	>7.3 m	+/- 0.3 m	
575000	409005	Barham *	WaterNSW	Automatic	5.5	5.8	6.1	Quantitative	24 hrs	>5.5 m	+/- 0.3 m	
76112	409204	Swan Hill *	Northern RWMP	Automatic	4.5	4.6	4.7	Quantitative	24 hrs	>4.5 m	+/- 0.3 m	
574010	409003	Deniliquin *	WaterNSW	Automatic	4.6	7.2	9.4	Quantitative	24 hrs	>4.6 m	+/- 0.3 m	
575001	409014	Moulamein *	WaterNSW	Automatic	4.6	5.2	6.1	Quantitative	24 hrs	>4.6 m	+/- 0.3 m	
574024	409023	Stevens Weir *	WaterNSW	Automatic	5.5	5.8	6.6	Quantitative	24 hrs	>5.5 m	+/- 0.3 m	
49115	414203	Euston Weir *	Northern RWMP	Automatic	9.1	9.8	10.3	Quantitative	24 hrs	>9.1m	+/- 0.3 m	
76124	414210	Mildura *	Northern RWMP	Manual	36.0	37.5	38.5	Quantitative	24 hrs	>36.0 m	+/- 0.3 m	
47100	425010	Wentworth (Lock 10) *	WaterNSW	Automatic	7.3	7.9	9.1	Quantitative	24 hrs	>7.3 m	+/- 0.3 m	

Bureau number	AWRC number	Gauge Name	Station owner	Gauge type	Flood classification (m)			Flood Warnings provided by the Bureau	Target warning lead time		70% of peak forecasts within	Local Flood Advice provided by NSW SES
					Minor	Moderate	Major		Time	Trigger height		
76120	414200	Wakool Junction *	Northern RWMP	Automatic	8.8	10.5	11.5	Quantitative	24 hrs	>8.8 m	+/- 0.3 m	
76135	414201	Boundary Bend *	Northern RWMP	Automatic	8.0	8.5	9.0	Quantitative	24 hrs	>8.0 m	+/- 0.3 m	

5. Document Control

It is the responsibility of NSW SES to maintain the currency of this plan by:

- Ensuring all supporting emergency services and functional areas, organisations and officers mentioned are aware of their roles and responsibilities.
- Conducting exercises to test arrangements.
- Reviewing the contents of the plan:
  - After flood operations
  - When changes are made to the use of land
  - When there are changes that alter agreed plan arrangements
  - Following the review of the Bureau's *Service Level Specification for Flood Forecasting and Warning Services for New South Wales and the Australian Capital Territory*.