NSW STATE EMERGENCY SERVICE

PROVISION AND REQUIREMENTS FOR FLOOD WARNING IN NEW SOUTH WALES

Supplementary Document to the State Flood Plan

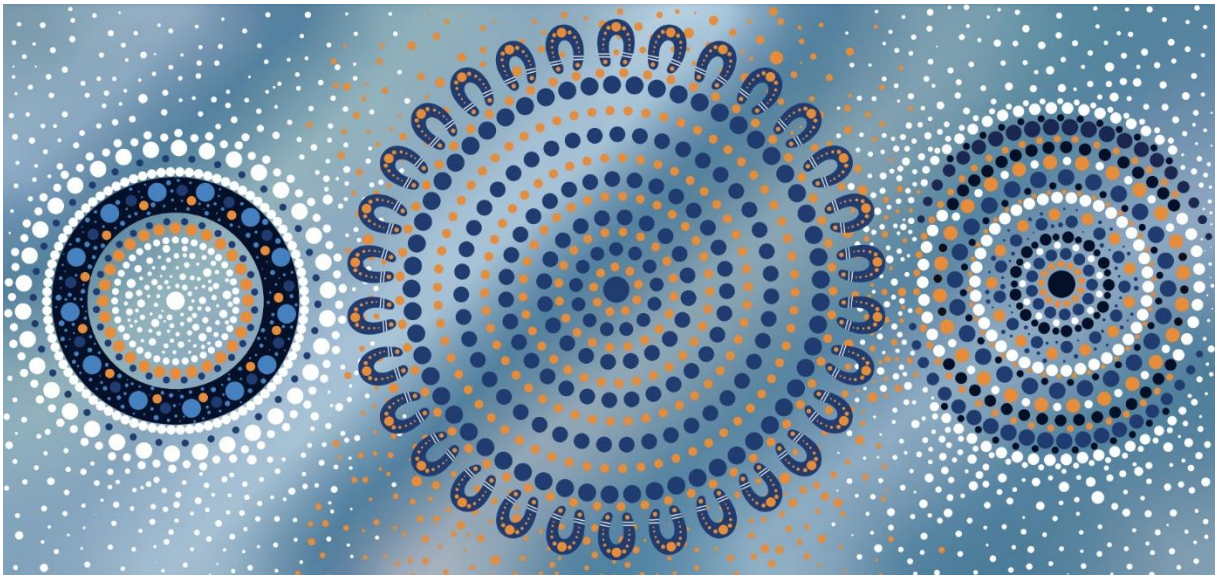
V3.0

June 2025

Contents

Acknowledgement of Country

The NSW State Emergency Service acknowledges the Traditional Custodians of the lands where we work and live. We celebrate the diversity of Aboriginal and Torres Strait Islander peoples and their ongoing cultures and connections to the lands and waters of NSW. We pay our respects to Elders past, present and emerging. We acknowledge the Aboriginal and Torres Strait Islander people who contributed to the development of this plan.



'Journey After the Storm' 2016
Commissioned artwork by Lani Balzan for the NSW State Emergency Service

"My name is Lani Balzan, and I am a proud Aboriginal woman form the Wiradjuri people. My family comes from Mudgee, but I was born in Penrith. Having lived in many different towns, including Illawarra, I feel I grew up all over Australia. Today I live in Figtree NSW with my husband John and our three beautiful boys. I am a recognised Indigenous artist, an Aboriginal Education Officer and conduct art therapy within my community. Painting is my passion, it's a means of showcasing and sharing our beautiful and amazing culture. In 2016, a fire tore through our home and destroyed everything we owned, including all the paintings I had lovingly created over many years. While this was a devastating time in my life, I felt it was important to use this experience as an inspiration to create new art and to push myself to learn more about my culture."

Copyright and Disclaimer

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 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 of 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 inundation resulting from super-elevated sea levels and/or waves (including tsunami) overtopping coastline defences. Any vehicle or pedestrian access way is deemed to be an artificial bank.

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

1.3 Total Flood Warning System

The *Total Flood Warning System* concept recognises that a fully effective gauge network andassociated 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*.

1.4 Australian Warnings System

The Australian Warning System (AWS) is a nationally consistent multi hazard warning system for emergency services to use when warning communities of expected consequences and required hazards. The warning system comprises of warning levels, calls to action, hazard icons, colours and shapes, and was endorsed by the Australia New Zealand Emergency Management Committee (ANZEMC) in March 2021. Refer to section 3.3 for how NSW SES warns communities in line with the AWS.

1.5 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 Department of Climate Change, Energy, the Environment and Water – Conservation Programs, Heritage and Regulation (NSW DCCEEW CPHR)
- Australian Capital Territory State Emergency Service (ACT SES)
- NSW Reconstruction Authority
- WaterNSW
- Sydney Water
- Floodplain Management Australia (FMA)
- Murray-Darling Basin Authority (MDBA)
- Australian Capital Territory Government.

1.6 Forecasting and Warning Services

The *Intergovernmental Agreement on the provision of Bureau of Meteorology Hazard Servicesto 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 DCCEEW, 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 and 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 Dams Safety NSW.

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 floodforecast locations. Information on flood conditions, heights and classifications are provided in line with the *Service Level Specification for Flood Forecasting and Warning Services for NewSouth 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 Bureauowns 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 assistanceto 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 identifyingthe need for flood warning classifications and the associated warning services.

NSW SES utilises gauge information to prepare flood intelligence, issue warning products andto 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 Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW)

NSW DCCEEW 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.

NSW DCCEEW is a gauge owner, maintaining a gauge network within the coastal zone of catchments east of the Great Dividing Range. On behalf of NSW DCCEEW, 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 territoriesin 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 councilsin 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 highest risk by Dams Safety NSW. Arrangements for these are specified in individual Dam Emergency Plans (DEP).

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 ofdam 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 DEP.

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 fromgauges provides real-time information to the gauge owner and the Bureau. When provided tothe Bureau, the data can be used to provide flood warnings as a component of the Total Warning System as defined in the *Australian Disaster Resilience Handbook Collection, Public Information and Warnings*.

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.

Gauge data 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.

- **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.

- **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.

- **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. Severe thunderstorms can produce damaging wind gusts, large hail, tornadoes and heavy rain which may cause flash flooding and these phenomena can all cause significant damage. The Bureau provides 2 types of Severe Thunderstorm Warnings:

    - **Detailed** - issued for all capital cities and surrounding areas. They are issued when individual severe thunderstorms are within range of the capital city radars. They provide more specific information on individual severe thunderstorm locations. The warning includes a map depicting any existing thunderstorms and the forecast direction of movement for up to 60 minutes and an Immediate Threat area.

    - **Broad-based statewide** - issued for the entire Australian states or territories affected highlighting broad areas where severe storms may occur within the next three hours. They are issued as an alert to the public, emergency services and other organisations that severe thunderstorms are likely to develop, or extend into, a specified area over the next few hours (usually in the next 3-hour period).

- **Severe Weather Warnings** are provided for potentially hazardous or dangerous weather that is not solely related to severe thunderstorms, tropical cyclones or bushfires. They are issued whenever severe weather is occurring in an area or is expected to develop or move into an area. The warnings describe the area under

threat and the expected hazards. Warnings are issued with varying lead-times, depending on the weather situation, and range from just an hour or two to 24 hours or sometimes more.

- **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 Schedule 2 of the Service Level Specification for Flood Forecasting and Warning Services for New South Wales and the Australian Capital Territory. 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 untilthe 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 in line with the Australian Warning System:

Advice – Issued when there is a heightened level of threat and the community needs to stay up to date as the situation changes.

Watch and Act – Issued when conditions are changing and the community needs to start taking action now to protect themselves and their family.

Emergency Warning - The highest level of warning. Issued when community may be in danger and need to take action immediately.

Flood warnings from the Bureau of Meteorology will not automatically align to a particular warning level in NSW SES products, rather the warning level will be determined based on the expected consequence to the community.

The Australian Warnings System, provides flexibility for the NSW SES to issue warnings for each gauge location or individual community within the catchment, providing greater clarity and targeted information for impacted communities.

While communities should be provided with as much warning as possible starting from Advice and escalating up (as required) to Watch and Act and Emergency Warning, in some situations a higher-level warning may need to be issued immediately – for example a dam failure, or sudden escalation in river levels as a result of localised heavy rainfall.

In line with the Australian Warning System, NSW SES warnings have three core elements:

- Location + Hazard: The location and the type of hazard impacting the community (e.g. Lismore flooding).
- Action statements: For each warning level there are a range of action statements to guide protective action by the community. These statements evolve as the warning levels increase in severity. Statements range from 'stay informed' at the Advice level, to 'prepare to evacuate' at the Watch and Act level, to 'evacuate now' at the Emergency Warning level. As the situation changes and the threat is reduced, the level of warning will decrease accordingly.
- The warning level: The severity of the natural hazard event based on the consequence to the community.

The NSW SES uses the following ordering for their warning headlines:

location + hazard + action statement + warning level

Action statements provide consistency and empower communities to make safer decisions when warnings are issued. The following action statements are used for Riverine Flooding:

AWS Warning Level		Action Statements
	Advice	Stay Informed
		Monitor Conditions
		Reduced Threat – Return with Caution
	Watch and Act	Do not Enter Floodwater
		Prepare to Evacuate
		Prepare to Isolate
		Avoid the Area
	Emergency Warning	Evacuate Now / Before [time]
		Shelter Now
		Move to Higher Ground

The following action statements are used for Dam Failure:

AWS Warning Level		Action Statements
	Advice	Monitor Conditions
		Reduced Threat – Return with Caution
	Watch and Act	Prepare to Evacuate
		Avoid the Area
	Emergency Warning	Evacuate Now / Before [time]
		Shelter Now
		Move to Higher Ground

The following action statements are used for Severe Weather:

AWS Warning Level		Action Statements
	Advice	Monitor Conditions
		Prepare Now
		Reduced Threat – Return with Caution
	Watch and Act	Stay Indoors
		Avoid the Area
	Emergency Warning	Shelter Now

Warnings are also provided for:

- 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 (*) may be transitioned to an automated system in the future. 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)
- Dumaresq Creek*, Armidale
- Kingdon Ponds*, Scone
- Lower Cooks River* Tempe
- Molong Creek*, Molong
- Myall River*, Bulahdelah
- 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 withintheir local government areas. Councils can work with NSW DCCEEW, 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. Thefocus for establishing dam failure warnings systems should be on high risk dams whose risks are intolerable as outlined by the Dams Safety NSW Societal Risk requirements.

Dam owners, in consultation with NSW SES, establish arrangements governing the operation of these systems, the notification of downstream emergency managers, and the

warning of communities at risk.

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

3.6 Warning Dissemination

NSW SES pre-writes Flood Warnings for gauge locations or individual communities within a community based on expected consequences such as riverine flooding, flash flooding, downstream of high-risk dams and 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:

- NSW SES Website (https://www.ses.nsw.gov.au/)
- Hazard Watch (https://www.hazardwatch.gov.au/)
- Hazards Near Me App
- Doorknocking
- Emergency Alert
- Social Media
- Community meetings
- Broadcast media
- Distribution lists (direct to media outlets and stakeholders)
- Standard Emergency Warning Signal (SEWS)

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 Alertis 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 emergencyalert in that instance. The emergency alert system should be used in conjunction with Emergency Warnings.

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 andinvolving 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 whenthe 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/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, floodwarning classifications and when reviewing listed warning time requirements.

Reviews may lead to changes to flood warning classifications however, changes will only bemade 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

The Bureau's *Service Level Specification for Flood Forecasting and Warning Services for New South Wales and the Australian Capital Territory* documents and describes the flood forecasting and warning services provided by the Bureau. The forecast locations listed in Schedule 2 of this document are NSW SES's key warning gauges. In addition to these key warning gauges, NSW SES may issue warnings to other gauge locations or communities based on the required need during an event. This allows for greater clarity and targeted information for impacted communities.

NSW SES are currently compiling a list of all Flash Flood Warning Systems within NSW. A comprehensive list of Flash Flood Warning Systems will be included in the next version of this document.

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*.