



Australian Government  
National Emergency Management Agency

Australian Institute for  
Disaster Resilience 

# Major Incidents Report 2022–23



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AIDR creates, grows, and supports a range of networks; provides opportunities for learning, development, and innovation; shares knowledge and resources to enable informed decision making and action; and facilitates thought leadership through national conversations.

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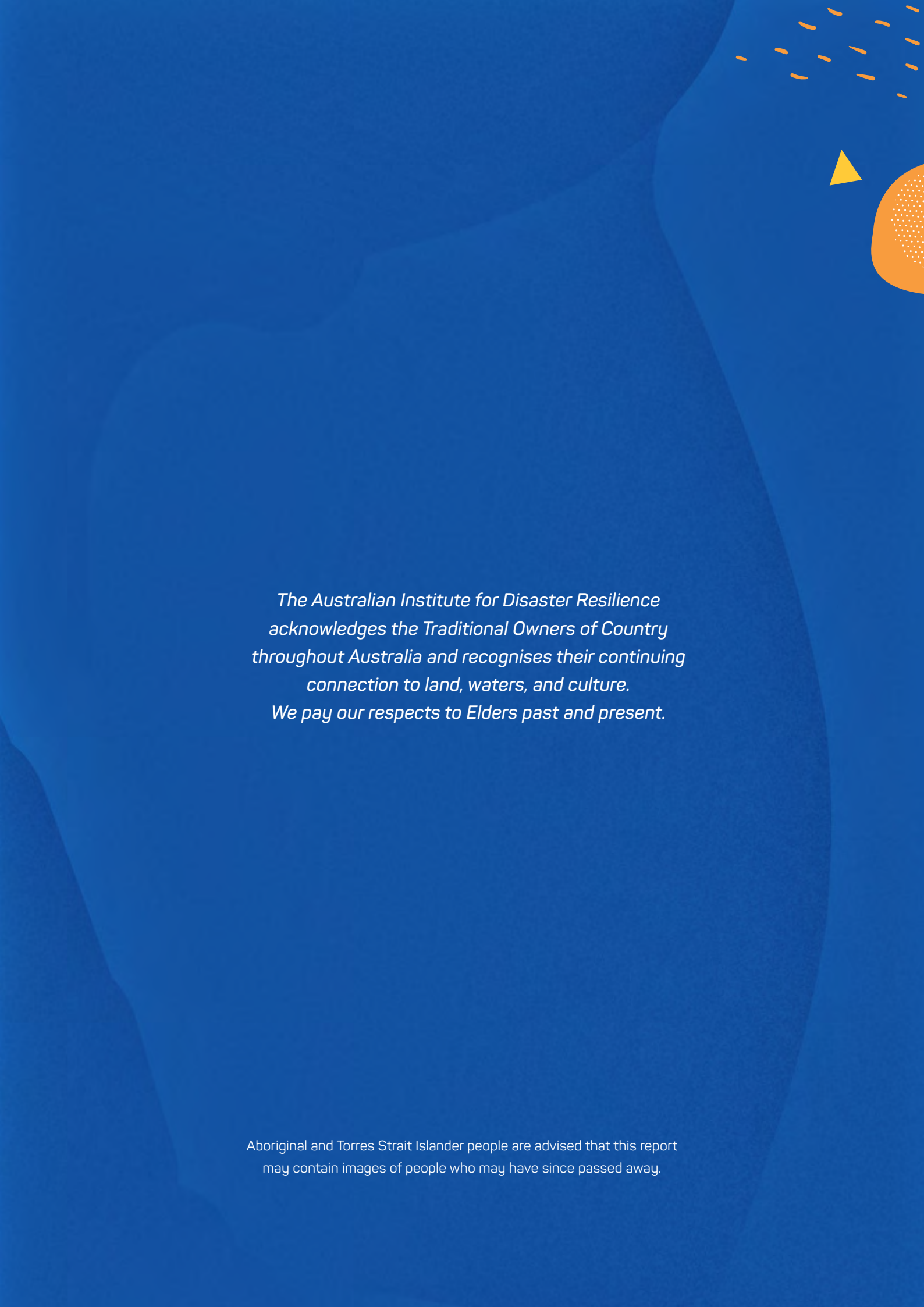
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*The Australian Institute for Disaster Resilience  
acknowledges the Traditional Owners of Country  
throughout Australia and recognises their continuing  
connection to land, waters, and culture.  
We pay our respects to Elders past and present.*

Aboriginal and Torres Strait Islander people are advised that this report  
may contain images of people who may have since passed away.

# Executive summary

This seventh Major Incidents Report provides an annual record of major incidents that have been identified as significant by the emergency management sector during the 2022–23 financial year. This report identifies 27 incidents, with nine case studies selected for in-depth discussion. The purpose of this report is to identify unique aspects of incidents and share what is observed from managing them so that the emergency management sector can plan for and improve practice.

## Context

A third La Niña climate pattern, a negative Indian Ocean Dipole (IOD) and the Southern Annular Mode (SAM), being mostly positive from mid-August 2022 to February 2023, contributed to the development and maintenance of wetter than average conditions and fuelled these high impact weather events. These climate drivers are being influenced by global warming. Many individuals and communities experienced ongoing recovery from the bushfires of 2019–20, COVID-19 and the major flooding events of 2021–22, as well as smaller scale incidents across the country. In addition, people were also experiencing a range of changing economic, health and wellbeing, environmental and geopolitical stressors that can impact on their capacity to deal with disruption.

## National overview

The Australian Government is well positioned to provide situational awareness, problem definition and rapid consequence management. In addition to the flooding events, Australia continued to face health and biosecurity challenges including Japanese encephalitis and mpox, and the emergence of the agricultural lumpy skin disease and foot-and-mouth disease.

The National Resourcing Sharing Centre (NRSC) was active for floods (five), bushfires (three), cyclone (one) and supported Canadian Wildfire and New Zealand flood deployments. In addition, the Australian Defence Force (ADF) resources responded with general and specialist capabilities during flooding in Western Australia, Northern Territory, New South Wales and Victoria, as well as overseas deployments to Türkiye and Vanuatu.

Joint state/territory and Australian Government funded Disaster Recovery Funding Arrangements (DRFA) relief and recovery grants were issued in response to 36 events across Australia in 2022–23. Funding was made available to 317 of Australia's 539 councils. The Australian Government Disaster Recovery Payment (AGDRP) was made available for seven events in 111 LGAs whilst

the Australian Government Disaster Recovery Allowance (DRA) was made available for nine events across 213 different LGAs. A total of \$2.23 billion has been committed in extraordinary assistance for these events, in addition to significant support provided under Categories A and B of the DRFA. The Australian Government also provided over \$1.4 billion directly to disaster affected individuals and families through the Australian Government Disaster Recovery Payment (AGDRP) and Disaster Recovery Allowance (DRA). Internationally, Australia's provided support to cyclone impacted Vanuatu, the transport of Australia's urban search and rescue (USAR) teams to support the Türkiye earthquake recovery and support flooding response in New Zealand. Australia received support from New Zealand and Singapore for the Murray–Darling Basin flooding events.

## Major incidents

Twenty-seven major incidents were identified for 2022–23. The following case studies have been selected by state and territory emergency services organisations for their unique nature.

### 1. Murray–Darling Basin flooding (New South Wales, Victoria and South Australia)

This multi-jurisdictional case study depicts the extent and scale of this massive event and explores how response, resourcing, incident management and cross-border coordination, community warnings and engagement, application of new technology and infrastructure, relief and resupply were achieved. New South Wales experienced 213 continuous days of flood operations between August 2022 and March 2023. Areas in southern and western New South Wales were significantly affected. There were multiple, and often concurrent Incident Management Teams (IMTs) in operation across the state. The Victorian state-wide flood event lasted 89 days (6 October 2022 to 3 January 2023) across 63 LGAs and one Alpine Resort Board. This was the most significant flooding event since 2010–11, due to its extent, duration, and complexity. The River Murray flood in South Australia was the largest flooding event in 50 years and is likely to incur the highest cost of any disaster event in South Australian history.

### 2. North coast storms and floods (Tasmania)

Northern Tasmania experienced four severe weather events during October 2022. These events became Tasmania's most significant floods since 2016. The storm event of October 12–17 with extreme rainfall, led to major flooding and causing evacuations in catchments across the northwest and northern regions.

### 3. Bushfires on the Western Downs (Queensland)

This case study describes the continuous response to the 522 fire incidents, including 38 bushfires exceeding four hours in duration in the Western Downs region from 6 January to 11 March 2023. This was notable as fire seasons have historically not extended into March.

### 4. Canberra recycling fire (Australian Capital Territory)

This case study explores how a structure fire on 26 December 2022 destroyed the Canberra Hume Materials Recovery Facility (MRF). The MRF provided waste management recycling services for the ACT and six surrounding regional New South Wales councils. The fire investigation report identified incorrectly disposed lithium batteries as the cause.

### 5. Bushfire Central Region (New South Wales)

The 17,900 ha Alpha Road fire on 5 March 2023 was the largest since Black Summer. Early community engagement during this incident improved fire response and community outcomes.

### 6. Northwestern Australia flooding (Western Australia and Northern Territory)

Cyclone Ellie was a short-lived tropical cyclone. However, as a tropical low, it spent two weeks causing enormous rainfall and flooding impacts on the landscape and communities, with some of the largest volumes of water and flows measured in Australia. The flooding of homes and destruction of the bridge at Fitzroy Crossing isolated the First Nations communities of the Martuwarra–Fitzroy River Valley and necessitated evacuations and complex resupply efforts including sea barges, aircraft and a 12,000 km road detour.

### 7. Tropical low flooding (Northern Territory)

The week of 21–28 February 2023 saw storms and heavy rain across the northern tropics. The consequences of this rainfall event were felt most strongly at Kalkarindji, Daguragu and Nitjpurru (communities in the Victoria River Valley). As Nitjpurru was not habitable for several months, residents were temporarily relocated to nearby Yarralin to remain close to Country. Residents were housed in NSW Rural Fire Service's (RFS) base camp temporary accommodation. A key feature of this incident was the extensive engagement undertaken between the Northern Territory Government, NSW RFS, Elders, Northern Land Council, Victoria Daly Regional Council, the Walangeri Ngumpinku Aboriginal Corporation and other community members to ensure cultural and personal needs were addressed during the planning process.

### 8. HAZMAT radiological incident (Western Australia)

The Gudai–Darri HAZMAT incident in the northwest of Western Australia captured international and national attention as technical specialists attempted to find a 'needle in a haystack' by searching for a hazardous radioactive capsule in a vast remote area. The Department of Fire and Emergency Services (DFES) led a multi-agency response effort engaging national expertise and utilising technology to successfully recover the capsule.

### 9. Echunga dam failure (South Australia)

After significant rainfall in September 2022, a dam on a private property in the Adelaide Hills showed signs of potential failure, threatening the small township of Echunga situated below the dam wall. The activation for this 'sunny day' event saw many complexities that need to be managed. This included activating the engineering functional support group and zone emergency support team, escalating the incident to the community, and implementing response actions with no previous on-ground experience.



Echunga SES, (ABC News - Dean Faulkner). Reproduced by permission of the Australian Broadcasting Corporation © 2023 ABC

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# Acronyms

ABC	Australian Broadcasting Corporation
ADF	Australian Defence Force
AFP	Australian Federal Police
AGDRA	Australian Government Disaster Recovery Allowance
AGDRP	Australian Government Disaster Recovery Payment
AHD	Australian Height Datum
AIDR	Australian Institute for Disaster Resilience
AUSASSISTPLAN	Australian Government Overseas Assistance Plan
AWS	Australian Warning System
CDINS	Communicable Disease Incidents of National Significance Plan
COMDISPLAN	Australian Government Disaster Response Plan
COVID-19	Coronavirus Disease
DFAT	Australian Government Department of Foreign Affairs and Trade
DFES	Department of Fire and Emergency Services
DRFA	Disaster Recovery Funding Arrangements
EB	Emergency Broadcasting
ENSO	El Niño–Southern Oscillation
ESA	Emergency Services Agency
HMA	Hazard Management Agency
IMT	Incident Management Team
IOD	Indian Ocean Dipole
JEV	Japanese Encephalitis Virus
LGA	Local Government Area
NCM	National Coordination Mechanism
NDRFF	National Disaster Risk Reduction Framework
NEMA	National Emergency Management Agency
NLAT	National Large Air Tanker
NRSC	National Resource Sharing Centre
NSR	National Situation Room
NTPFES	Northern Territory Police Fire and Emergency Services
QFES	Queensland Fire and Emergency Services
RAT	Rapid Assessment Team
RCC	Regional Control Centre
RFR	Register.Find.Reunite
RFS	Rural Fire Service
SAM	Southern Annular Mode
SCC	State Control Centre
SES	State Emergency Service
SOI	Southern Oscillation Index
TC	Tropical Cyclone
USAR	Urban Search and Rescue

# Foreword

The Major Incidents Report provides an annual record of major incidents from a national perspective that have been viewed as significant by the emergency management sector. This edition, the seventh Major Incidents Report, has been commissioned by the National Emergency Management Agency and published by the Australian Institute for Disaster Resilience.

This was the first time since 2020 where emergency management workers were not hindered by cross border COVID-19 related restrictions. This allowed for the amplified sharing of resources across borders, return of face-to-face training and exercises all contributing to increased preparedness for future years.

Each of the nine case studies featured in this report also outline significant learning points. The observations that have been identified will be invaluable for disaster management for future higher risk weather seasons. With several major exercises occurring at the national and state level in 2023–24 the emergency management community can incorporate these lessons and increase both our own and the community's preparedness and resilience.

I would like to acknowledge the significant impact of these incidents on communities and their resilience drawn upon in recovering from natural hazards that occurred this year. I would like to pay my respect to the families and friends of those that lost their lives in disasters both in Australia and overseas.

I would also like to acknowledge AIDR and the contribution of Darryl Glover in the development of this report, as well as the input provided by jurisdictional representatives from emergency management organisations and the Australian Government.

In closing, I would like to extend my thanks and profound gratitude to all volunteer and career emergency management personnel, who surrender time with their family and friends to work tirelessly to protect communities and help them recover from being threatened by natural hazards.

## **Joe Buffone PSM**

Deputy Coordinator-General,  
Emergency Management and Response Group,  
National Emergency Management Agency





# 1. Introduction

Each year Australia is affected by significant incidents that disrupt how people go about their lives, often having long term consequences beyond cleaning up and replacing property. The systemic nature of disaster risk tells us that hazards are not isolated from processes happening within communities and society.<sup>12</sup> Economic conditions, supply chain issues, health and wellbeing challenges, social cohesion, technological shifts and the state of the environment are among factors that may influence an individual's, organisations' or communities' resilience or capacity to take action and manage disruption.

Disasters can be complex in nature, cascade from one to the next, compound on top of each other and run consecutively, leaving little time for communities or those that support them to recover. The recovery time frames for many should be measured in years to decades.<sup>3</sup>

It was no different in 2022–23. Concurrent events saw clusters of significant incidents in Western Australia across the Christmas New Year holiday period with ex-Tropical Cyclone Ellie and associated flooding, fires in the Southwest and the search for the lost Caesium radioactive pellet. February 2023 also saw a cluster of events with storms in NSW, the Türkiye-Syria Earthquake USAR deployment and the New Zealand deployment, as well as major flooding in the Northern Territory. In addition, there was significant planning in the latter stages of 2022 as the potential for foot-and-mouth disease outbreak was heightened. This was against a background of a third La Niña climate pattern, recovering communities, and changes in economic, social, health, technical, geopolitical and environmental conditions.

Since 2017, the Australian Institute for Disaster Resilience has produced the Major Incidents Report as a compendium of incidents that have posed unique challenges for the emergency management sector to manage. This year's report compiles 27 incidents across Australia during the 2022–23 financial year. These were selected by a steering committee of state and territory emergency services organisations, the National Emergency Management Agency and, the Bureau of Meteorology. The criteria used to select the incidents include significance at a state or territory or national level, the level of damage or disruption cause, community sentiment and interest and uniqueness.

Disasters and disruptions provide an opportunity to learn. Lessons management has become a central part of how we learn from disasters.<sup>4</sup> The content in this report contains observations that have been drawn from working with lesson management specialists and operations specialists in each of the state-based emergency management organisations.

Nine case studies have been selected for in-depth discussion. Distilling the causes and sharing experiences of what contributed to each disaster, providing evidence or unpacking what happened, all provide important opportunities to learn so that measures can be taken to reduce the chance of the same thing happening again.<sup>5</sup>

While each of the case studies are unique, some common themes emerged around the challenge of resourcing sustained responses, the early use of specialised technical capabilities, the need to support and resupply isolated communities, the evacuation and temporary relocation of communities, and early, sustained and culturally appropriate community engagement, protection of cultural assets and the first-time use of the Australian Warnings System (AWS).

This report was made possible through the support of Commissioners and Chief Officers Strategic Committee, the National Emergency Management Agency and a steering committee of emergency management organisations from across Australia. The report is the result of multi-agency, nationwide collaboration and AIDR would like to sincerely thank all those who provided and reviewed written and visual content.

The report describes incidents that are, by their nature, stressful and potentially traumatic. Descriptions and images may be potentially a trigger for a stress reaction for those that have lived through the events, as well as those that have helped respond and recover from the events. We recommend that readers be aware of this and use strategies that work for them to help manage any distress that may arise. There is a range of help available, including resources available on Australian Red Cross' website: [www.redcross.org.au/emergencies](http://www.redcross.org.au/emergencies)

1 Australian Institute for Disaster Resilience (2020) *Systemic Risk Handbook*

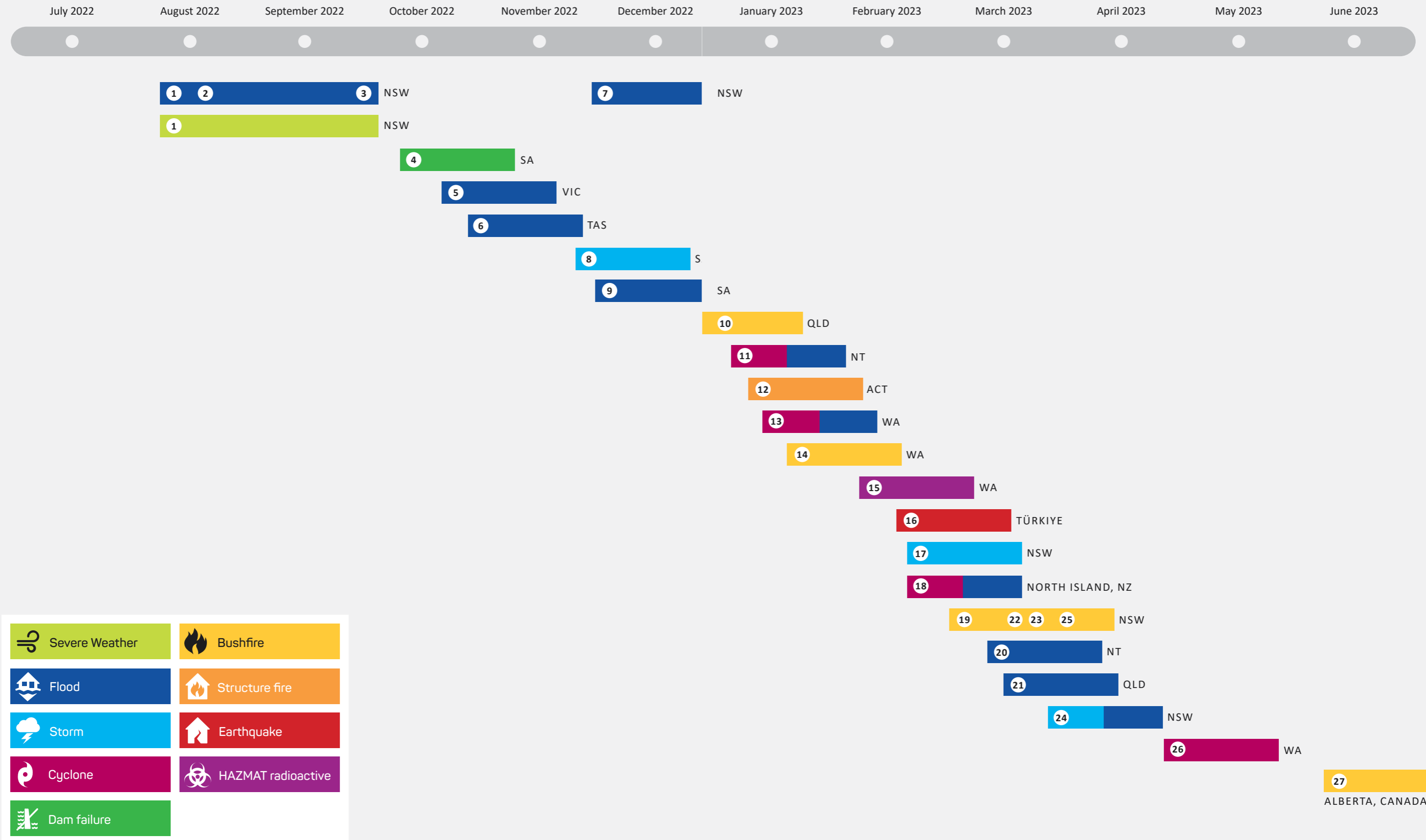
2 National Resilience Taskforce (2019) *Profiling Australia's Vulnerability: The interconnected and cascading nature of risk*

3 Gibbs L, Molyneux R, Harms L, Gallagher H C, Block K, Richardson J, Brandenburg V, O'Donnell M, Kellett C, Quinn P, Kosta L, Brady K, Ireton G, MacDougall C, Bryant R. *10 Years Beyond Bushfires Report 2020*. University of Melbourne, Australia

4 Australian Institute for Disaster Resilience (2019) *Lessons Management handbook*

5 National Resilience Taskforce (2019) *Profiling Australia's Vulnerability: The interconnected causes and cascading effects of systemic disaster risk*

## 2. Timeline of major incidents 2022–23



\*Positioning of numbers is approximate

Figure 1: Timeline of major incidents 2022–23

A summary of all 27 major incidents 2022–23 is on page 21.

# 3. Climate and weather overview

## 3.1 Climate drivers

Several climate drivers influenced Australia’s weather patterns over the 2022–23 period. The second half of 2022 was influenced by a negative Indian Ocean Dipole (IOD), La Niña emerged in September 2022 and lasted until late summer 2023, and the Southern Annular Mode (SAM) was mostly positive from mid-August 2022 to February 2023. All three of these climate drivers contributed to the development and maintenance of wetter than average conditions, and contributed to the weather events that cause sustained flooding in both the Murray–Darling Basin, and the northwest of Australia.

### La Niña

Signs of La Niña development appeared from late winter 2022. On 13 September, the Bureau of Meteorology raised its ENSO Outlook status to indicate a La Niña event was under way. La Niña is part of a cycle known as the El Niño–Southern Oscillation (ENSO), a naturally occurring shift in ocean temperatures and weather patterns along the equator in the Pacific Ocean.

In the tropical Pacific Ocean, sea surface temperatures had been cooling since July 2022 and crossed the La Niña threshold ( $-0.8^{\circ}$  in the NINO3.4 region) in September. Other atmospheric indicators including the Southern Oscillation Index (SOI), trade wind strength and equatorial cloudiness were also displaying patterns typical of a La Niña event. La Niña conditions gradually strengthened and matured during October and November (Figure 2), before easing in early 2023.

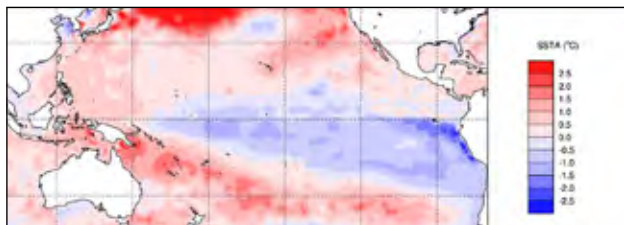


Figure 2: Monthly Sea surface temperature anomalies (relative to the 1961–1990 average) for October 2022 using the Bureau dataset

While back-to-back La Niña events are not uncommon and have occurred in approximately half of all past events since 1900, three consecutive La Niña events have previously occurred only three times: 1954–57, 1973–76, and 1998–2001. All three previous triple La Niña periods, and particularly 1973–76, were associated with extended periods of above average rainfall, and widespread and prolonged flooding.

The antecedent conditions from the two consecutive La Niña’s in 2020–2022 and the declaration of the third La Niña in September 2022 created an ideal environment for flooding to reoccur across eastern Australia.

### Indian Ocean Dipole (IOD)

The Indian Ocean Dipole (IOD) is the difference in sea surface temperatures between the west and east tropical Indian Ocean that can shift moisture towards or away from Australia. A negative IOD increases the chances of above average winter–spring rainfall for much of southern and eastern Australia. Maximum temperatures are also more likely to be below average across southern Australia during a negative IOD, while across northern Australia warmer than average temperatures are more likely. This temperature pattern was reflected in the June to November 2022 maximum temperatures observed.

During winter and spring, the IOD was in a negative phase and likely contributed to the above average rainfall observed during late winter and spring. Signs of negative IOD development began from late autumn 2022, with the IOD index tipping over negative IOD thresholds (i.e. at or cooler than  $-0.4^{\circ}$ ) by the end of June. The negative IOD event remained very strong from July through to September, before weakening over spring and dissipating by late November, consistent with the usual timing of IOD event breakdown.

### Southern Annular Mode (SAM)

The Southern Annual Mode refers to the (non-seasonal) north-south movement of the strong westerly winds that blow almost continuously in the mid-to-high latitudes of the southern hemisphere. The belt of westerly winds is associated with storms and cold fronts that move from west to east and affects rainfall and temperature across southern and eastern Australia. During a positive SAM in spring and summer, the belt of westerly winds contracts towards Antarctica and onshore flow from the east coast is drawn inland and typically increases the chance above average rainfall for eastern Tasmania, eastern Victoria, eastern New South Wales, and south-eastern Queensland. The southward movement of the westerly winds increases the chance of below average rainfall for western Tasmania.

The SAM was mostly positive from mid-August 2022 to February 2023. From March 2023 to the end of June 2023, SAM was closer to neutral, with periods of positive and negative values.

## El Niño

On 14 March 2023, an El Niño Watch was issued, followed by an El Niño Alert on 6 June, indicating an increased likelihood that El Niño could develop later in 2023. El Niño typically leads to below average winter-spring rainfall for eastern parts of Australia and a drier start to the northern wet season. The Bureau of Meteorology is monitoring this situation carefully.

## Global warming

In addition to the influence of climate drivers and natural variability, Australia's climate is increasingly affected by global warming. Based on the Bureau's temperature dataset, Australia's climate has warmed by  $1.47 \pm 0.24^\circ$  between 1910 (when national records began) and 2021, with most of the warming occurring since 1950. The ocean waters around Australia have also warmed significantly over the past century, being consistently very warm over the past two decades. This background warming trend can only be explained by human influence on the global climate.

Observations show that there has been an increase in the intensity of heavy rainfall events in Australia, with larger increases typically observed in the north of the country. A warmer atmosphere can hold more water vapour than a cooler atmosphere, and this relationship alone can increase moisture in the atmosphere by seven per cent for each  $1^\circ$  of global warming. Increased atmospheric moisture can also provide more energy for some processes that generate extreme rainfall events, which further increases the likelihood of heavy rainfall due to global warming.<sup>6</sup>

## 3.2 High impact weather events

The climate drivers outlined above set the scene for wetter conditions in many states and territories, as well as extreme fire and heat conditions.

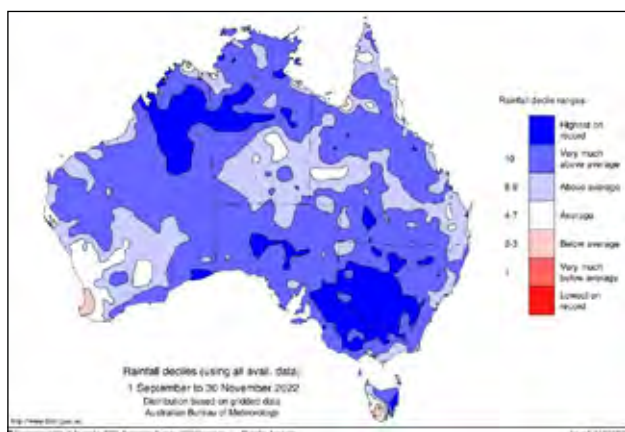


Figure 3: Rainfall deciles for spring (September to November) 2022 (relative to all spring periods since 1900)

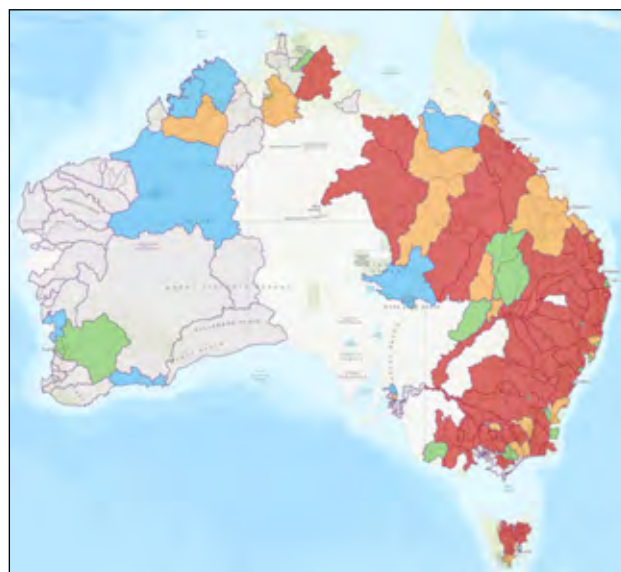


Figure 4: Nationwide warnings map

Figure 4 shows the highest flood classifications (the severity of flooding) reached in different areas across Australia in 2022. A large proportion of the country experienced major flooding (red) which meant that large areas were inundated by flood waters. Moderate (orange) and minor (green) flooding also occurred. The blue areas indicate where generalised flood warnings were provided (this is when there is insufficient data to make specific predictions, or in the developing stages of a flood).

During spring 2022, many slow-moving low-pressure systems and associated troughs and cold fronts moved across south-eastern Australia. When these systems combined with tropical air masses from the north, they produced extensive cloud, thunderstorms and heavy rain. In some areas, thunderstorms brought large hail, damaging winds, and flash flooding. Spring rainfall was 119 per cent above the 1961–1990 average for Australia as a whole, the second wettest on record nationally (behind spring 2010) (Figure 3). Spring was the wettest on record for New South Wales (previous record 2010), Victoria (previous record 1992), and the Murray–Darling Basin as a whole (previous record 2010). It was amongst the ten wettest springs on record for all other states and the Northern Territory, except Tasmania, which was still around 20 per cent above average (Figure 5).

Wet antecedent conditions combined with numerous days of heavy rainfall during spring and widespread and significant flooding was experienced across large areas of eastern Australia, particularly through inland New South Wales and parts of Victoria. Flooding has also affected Queensland, South Australia, and Tasmania (Figure 5). Case studies 1 and 2 detail the impacts of these weather events.

6 Bureau of Meteorology and CSIRO (2022) *State of the Climate Report*

Major flooding continued during December, as flood waters progressed through several inland rivers including the Darling, Lachlan, Macquarie and Murrumbidgee rivers, and the River Murray in South Australia (Figures 5, 6 and 7).

For the Australian Tropical Cyclone region, there were seven Tropical Cyclones that formed during the period from November to April. Only two tropical cyclones (Ellie and Ilsa) made landfall. Ellie crossed into the Northern Territory as a Category 1 system in late December, bringing heavy rain over the region and causing significant flooding in the Fitzroy River, while Ilsa crossed the Pilbara coast of Western Australia as a Category 5 system in mid-April. Ilsa was the first coastal crossing of Category 5 system in Australia since 2015 with an estimated maximum 10-minute mean wind intensity of 220 km/h causing severe damage to buildings.

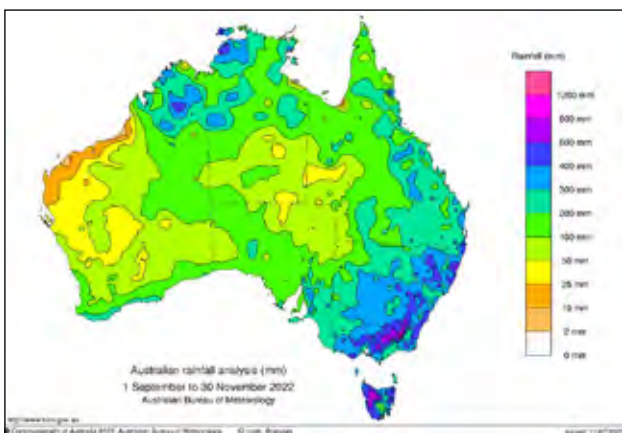


Figure 5: Spring (September to November) 2022 total rainfall (mm) for Australia

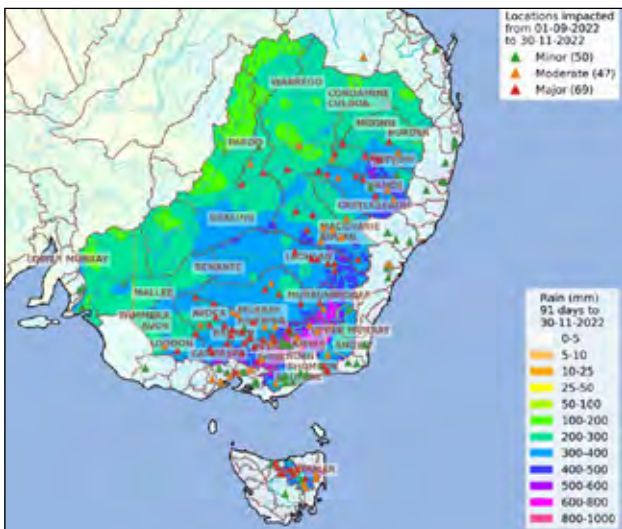


Figure 6: Spring 2022 rainfall totals and associated flood peaks in south-eastern Australia

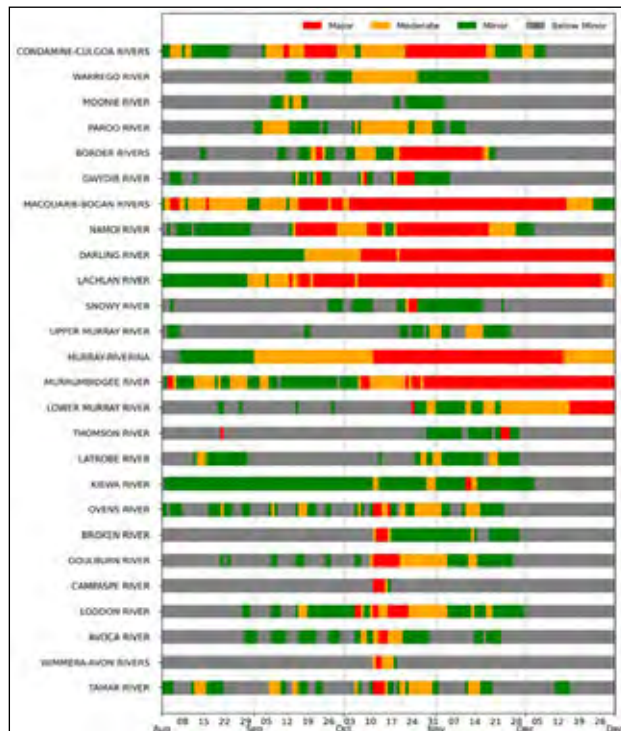


Figure 7: Timeline of the extent and severity of flood during August–December 2022 period. At least one site within the catchment is above the respective flood level shown. The Tamar River is the combined Tasmanian catchments of Meander, Macquarie, South Esk and North Esk rivers

Ex-Tropical Cyclone Ellie contributed to record rainfall and flooding in central and northern parts of the Northern Territory and parts of the Kimberley during the last part of December 2022, with daily totals exceeding 100 mm at several locations. This heavy rainfall resulted in flooding of the Fitzroy River, with further heavy rain continuing into the start of January 2023. The Fitzroy River reached its highest levels on record, peaking at 15.81 m on 4 January at Fitzroy Crossing, isolating the town and many other nearby communities and significantly damaging the Great Northern Highway bridge.

Several days of locally heavy falls of rain and thunderstorms affected many areas of Queensland in the first week of January 2023, leading to major flooding on the Georgina River, Burketown, Doomadgee rivers, and the Gregory River remained isolated into mid-January due to the high levels of the Nicholson/Gregory and Leichhardt river systems.

At the beginning of February 2023, low- to severe-intensity heatwave conditions affected eastern Australia in early February, particularly along the Queensland coast. Severe heatwave conditions affected south-eastern Queensland, including Brisbane and the Sunshine Coast. Mid-month, heatwave conditions affected many areas of Australia, including low-intensity heatwave conditions in northern and southern areas of South Australia, severe intensity in southern Victoria, and severe intensity in the Pilbara and central and southern areas of Western Australia. Several fires burnt across parts of New South Wales and in Queensland's Darling Downs near Tara and Miles, where multiple structures were damaged.

Storms and widespread heavy rain in the northern tropics, which were associated with a monsoon trough and a tropical low, started in the last week of February 2023 and continued throughout the first ten days of March. The highest daily totals were recorded across the northern interior of the Northern Territory and in north-western Queensland. Ten-day totals of 400 to 800 mm were recorded in an area of the Carpentaria and Barkly districts in the Northern Territory and in Queensland's Gulf Country and north-west districts (Figure 8). This event resulted in major flooding along the several rivers across the eastern Northern Territory and north-western Queensland, leading to the evacuation of some communities and the closure of many transport routes.

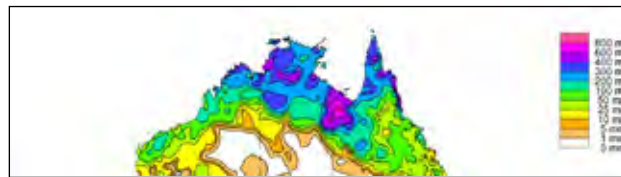
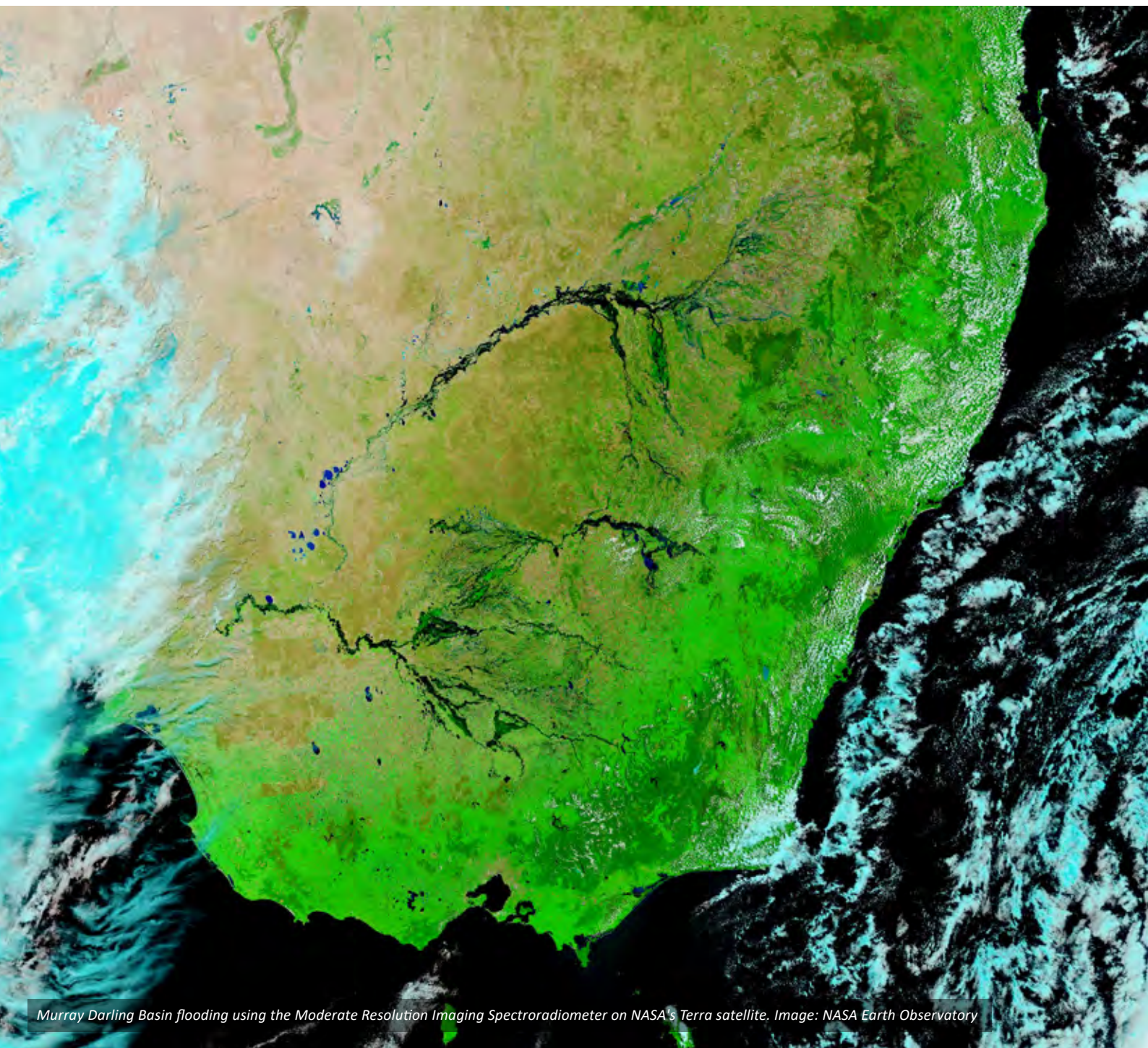


Figure 8: Rainfall totals (mm) (21 February to 10 March 2023) in northern Australia



Murray Darling Basin flooding using the Moderate Resolution Imaging Spectroradiometer on NASA's Terra satellite. Image: NASA Earth Observatory

# 4. National overview

The 2022–23 financial year continued to present significant weather, health and biosecurity challenges for Australia. This national overview presents the key activities taken at a national and nationwide level to prepare for and support states and territories and by extension the individuals and local communities at risk or affected. International support requested is also outlined in this section.

## 4.1 National Plan activations

Australia has a range of national plans that cover specific situations where Australian Government assistance or leadership is required.<sup>7</sup> The following plans were activated in 2022–23:

- Australian Government Disaster Response Plan (COMDISPLAN)
- Australian Government Overseas Assistance Plan (AUSASSISTPLAN)
- Emergency Response Plan for Communicable Disease Incidents of National Significance (CDINS).

### Australian Government Disaster Response Plan (COMDISPLAN)

The Australian Government Disaster Response Plan (COMDISPLAN) is the plan for the provision of Australian Government non-financial assistance to Australian states and territories in an emergency or disaster.

COMDISPLAN was activated six times in 2022–23 for the following events:

- Murray-Darling Basin flooding across NSW, Victoria, and South Australia – 12 October 2022 to 24 January 2023 (case study 2)
- Flooding – Northwest Australia ex-TC Ellie – 3 January to 23 February 2023 (case study 6)
- Gudai-Darri HAZMAT incident WA – 28 January to 4 February 2023 (case study 8)
- Tropical Cyclone Gabrielle (Norfolk Island) – 9 to 27 February 2023
- Tropical Low 16U – 1 to 15 March 2023 and
- Tropical Cyclone Ilsa (WA) – 12 to 18 April 2023.

A total of 41 requests for non-financial assistance were received by NEMA and tasked to various Australian Government agencies including:

- Australian Defence Force
- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)

The Joint Interagency Crisis Coordination Team was activated six times for domestic incidents for a total of 158 calendar days, often responding to concurrent incidents.

### Australian Government Overseas Assistance Plan (AUSASSISTPLAN)

AUSASSISTPLAN details the process for the provision of emergency Australian Government led physical assistance to overseas countries.

AUSASSISTPLAN was activated twice in 2022–23 for the following events:

- Urban Search and Rescue (USAR) capability to Türkiye in response to a 7.8 magnitude earthquake in Gaziantep in the south of Türkiye
- Rapid Assessment Team to Vanuatu to assess damage from Tropical Cyclones Judy and Kevin. The team consisted of the following Australian Government capabilities
- Australian Medical Assistance Team
- Disaster Assistance Response Team
- Deployable Energy Network Restoration Team.

### Emergency Response Plan for Communicable Disease Incidents of National Significance (CDINS)

The CDINS Plan describes the context within which the Australian Government Department of Health and Aged Care and state and territory government health departments will function during any national communicable disease related emergency. The activation of this plan was triggered or maintained three times for 2022–23 for:

- COVID-19 (Maintained, first declared 22 January 2020)
- Japanese encephalitis virus (JEV) (Maintained, first declared on 4 March 2022 until 25 November 2022)
- Mpox (Triggered on 4 March 2022 until 16 June 2023).

<sup>7</sup> AIDR (2023) *Australian Emergency Management Arrangements Handbook*

Disease	COVID-19	JEV	MPox
Measures	Continuing to support an extensive network of public and private pathology laboratories for the rapid detection and characterisation of SARS-CoV-2 as well for the active monitoring of circulating variants.	Engagement with experts to develop and revise clinical guidance and support JEV testing, diagnosis, and vaccination.	Enhanced national coordination to assist states and territories to effectively manage the outbreaks within their jurisdictions.
	Continuing to engage with and reassure the community on the safety and efficacy of vaccines and encouraging uptake. The 2023 Booster program formally commenced on 20 Feb 2023.	Enhanced surveillance and risk mapping to better understand the spread of JEV across Australia and potential risk of infection.	Ensuring access to new third-generation MPXV vaccines and other treatments such as antivirals via states and territories.
	Enhancing the availability of COVID-19 treatments for eligible cohorts, including expanding PBS eligibility criteria for oral antiviral treatments.	Delivery of a national Communications strategy, to raise awareness of the risks of JEV and importance of mosquito bite avoidance measures. Communications include targeted First Nations resources.	Delivery of leadership and policy advice on community engagement, clinical management, education, and prevention through a National MPXV Taskforce.

Table 1: National measures in support of CDINS activations

## 4.2 National Coordination Mechanism

The National Coordination Mechanism (NCM) as part of the Australian Government Crisis Management Framework, provides national leadership during preparation, response and recovery from crises of national significance.

The NCM met on 82 occasions during 2022–23 to ensure situational awareness, problem definition and rapid consequence management. This included coordinating the movement of food and other priority goods, temporary housing, road repair and reconstruction and financial assistance during severe weather and flooding across the east coast and northern parts of Australia.

The NCM also supported NEMA's Crisis Coordination Teams and the NSR to plan, coordinate and deploy multi-disciplinary rapid assessment teams to assist with offshore disaster responses, including supporting planning for the expected impacts of Tropical Cyclone Gabrielle on Norfolk Island and New Zealand and the Türkiye–Syria earthquake response.

## 4.3 Department of Defence

During 2022–23, Defence responded to requests for Australian Government assistance under the COMDISPLAN. Defence provided significant contributions to emergency response, relief, and general recovery efforts across the nation, especially during flooding in Northern Territory and Western Australia associated with ex-Tropical Cyclone Ellie. Support was also provided to Western Australia with the radiological incident and resupply of Northern Territory communities following effects of Tropical Low 16U.

From late 2022, Defence also provided support to South Australian and Victorian emergency authorities with respect to flood response measures, clean up assistance, search and rescue and aviation assets during the flood crisis.

During March and April 2023, following requests for assistance from the Government of Vanuatu, Defence provided support in response to Tropical Cyclones Judy and Kevin. This support comprised fixed-wing surveillance and transport aircraft, and HMAS Canberra. This included support personnel, rotary-wing aircraft, and specialist engineering capabilities. Defence also provided airlift support in response to the Türkiye earthquake, and flooding in New Zealand.



Jurisdiction	Incident	Activities
NSW	Murray Darling Basin Floods	<ul style="list-style-type: none"> <li>Night time rotary wing search and rescue assets</li> <li>General duties support including sandbagging, community assistance and support to SES resupply operations</li> <li>Aviation assets and general duties such as sandbagging and clean-up</li> </ul>
NT	Tropical Low 16U	<ul style="list-style-type: none"> <li>Air support to evacuate approximately 900 residents from impacted area</li> </ul>
WA	Flooding – Northwest Australia ex-TC Ellie	<ul style="list-style-type: none"> <li>Air support to evacuate 1500 people from the impacted area</li> <li>General duties support to assist with the assessment of infrastructure damage, removal of waste and emergency resupply</li> <li>Recovery planning support</li> </ul>
	Radiological Incident	<ul style="list-style-type: none"> <li>Specialist equipment and support to locate the capsule</li> </ul>
	Tropical Low 16U	<ul style="list-style-type: none"> <li>Resupply of impacted communities</li> </ul>
SA	Murray Darling Basin Floods	<ul style="list-style-type: none"> <li>Assistance to coordinate air transport of flood mitigation products</li> <li>Australian Defence High Clearance Vehicles and operators</li> </ul>
VIC	Murray Darling Basin Floods	<ul style="list-style-type: none"> <li>General duties support for sandbagging, community engagement and to assist agency evacuation efforts</li> <li>Engineering support to ensure safe access to property</li> <li>Logistical support to resupply isolated communities</li> <li>Aviation assets including search and rescue capabilities</li> <li>Supply of flood mitigation products (sandbags)</li> </ul>
DFAT NZ	Tropical Cyclone Gabrielle	<ul style="list-style-type: none"> <li>Aerial transportation for a Queensland Fire and Emergency Services Disaster Assistance Response Team (the ADF also provided separate nation-to-nation assistance)</li> </ul>
DFAT Vanuatu	Tropical Cyclones Judy and Kevin	<ul style="list-style-type: none"> <li>Aerial transportation for a Rapid Assessment Team and humanitarian supplies (the ADF also provided separate nation-to-nation assistance)</li> </ul>
DFAT Türkiye	Earthquake – 7.8 magnitude	<ul style="list-style-type: none"> <li>Aerial transportation for a Fire and Rescue NSW Urban Search and Rescue Team</li> </ul>

Table 2: Summary of Australian Defence support by jurisdiction

## 4.4 National resource sharing arrangements

The National Resourcing Sharing Centre (NRSC) was active for both national and international operations in 2022–23. The NRSC was active for five floods, three bushfires, one cyclone and to support the Canadian Wildfire deployments. The nine major interstate operations deployed 1,273 personnel, and 17 aviation assets were shared.

Line-scanners were the aviation assets most often requested, whilst the longest service period was for a B214 Helo deployed to South Australia to assist with flooding. Unfortunately, the National Large Air Tanker (NLAT) crashed early in its service

period while on deployment in Western Australia. The crew survived the crash. This crash is subject to investigation by the Australian Transport Safety Bureau.<sup>8</sup> A replacement NLAT was acquired however, there were gaps in service which meant the NLAT was only formally requested twice.

Flood rescue (on-water) teams were the most requested resource during the 2022–23 flood events, followed by swift water rescue (in-water) resources. Limited national resources meant just under a quarter of requests were cancelled or unable to be filled.

<sup>8</sup> [www.atsb.gov.au/publications/investigation\\_reports/2023/report/ao-2023-008](http://www.atsb.gov.au/publications/investigation_reports/2023/report/ao-2023-008)

## 4.5 Relief and recovery

Joint state/territory and Australian Government funded Disaster Recovery Funding Arrangements (DRFA) recovery assistance was activated in response to 39 events across Australia in 2022–23. The most being in New South Wales (thirteen) and Queensland (eight).

Of the 39 events, nine were activated for extraordinary assistance (Category C and D) under the DRFA, demonstrating the severity of these events. A total of \$2.23 billion has been committed in extraordinary assistance for these events, in addition to significant support provided under Categories A and B of the DRFA.

Funding was made available to 317 of Australia's 539 councils for a range of recovery measures, including emergency assistance for impacted individuals and families, support for councils for clean-up activities and to restore or replace damaged essential public assets, additional mental health support and recovery grants for primary producers, small businesses and non-profit organisations.

The Australian Government also provided over \$1.4 billion directly to disaster affected individuals and families through the Australian Government Disaster Recovery Payment (AGDRP) and Disaster Recovery Allowance (DRA):

- The AGDRP is a non-means tested payment of \$1,000 for eligible adults and \$400 for eligible children which is available to people whose homes or major assets have been lost or directly damaged, people who have been seriously injured or are an immediate family member of someone who has lost their life. The AGDRP was made available for seven events in 108 unique LGAs.
- The DRA is a short-term income support payment to assist individuals who have experienced a loss of income as a direct result of the flood. The DRA was made available for nine events across 213 unique LGAs.

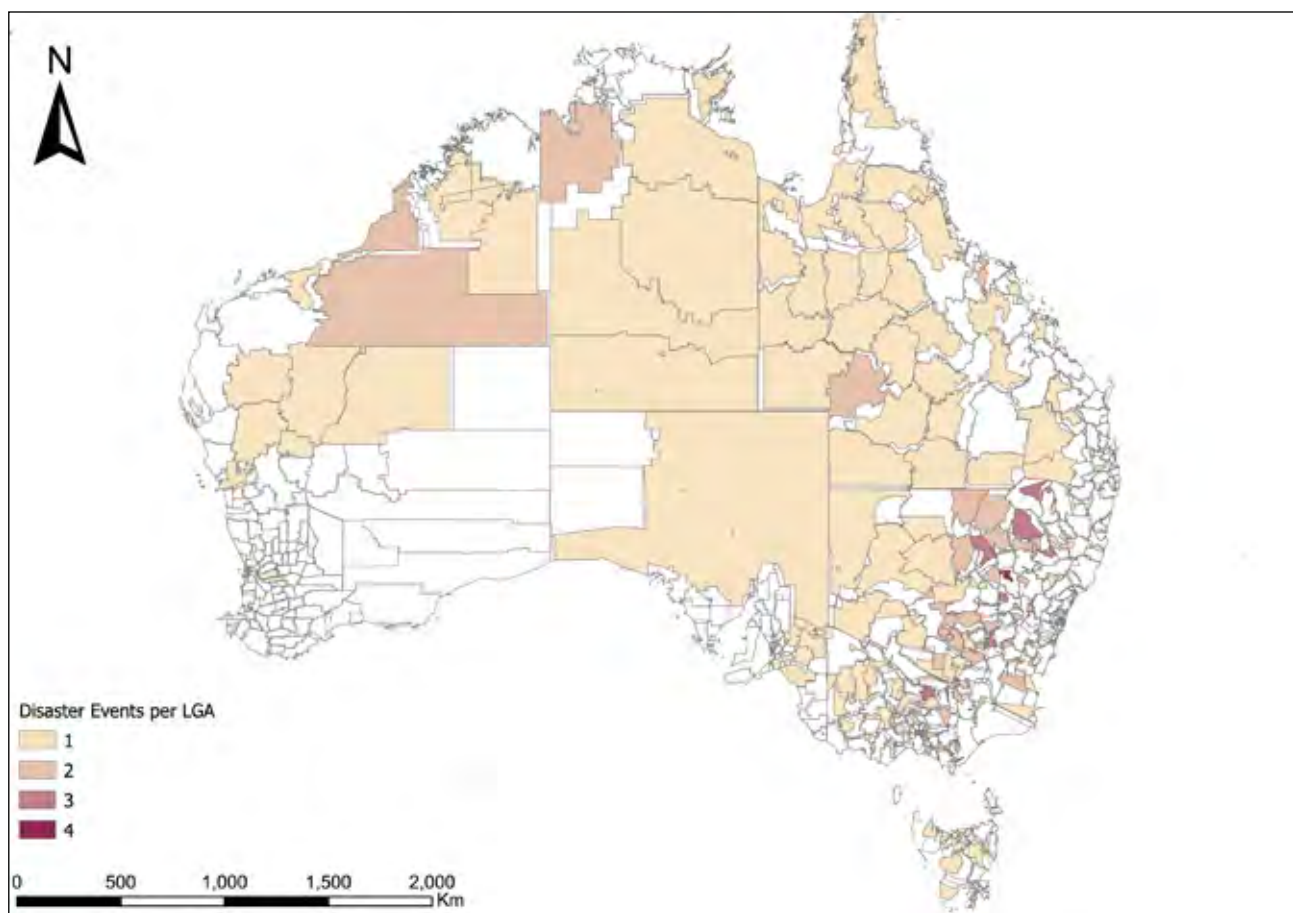


Figure 9: Disaster recovery funding arrangements activations by LGA across the country

## 4.6 Provision of international support

The devastating earthquake affecting Türkiye and Syria in February, and the dual cyclones to strike Vanuatu saw NEMA and DFAT coordinate two international deployments of Australian support. In addition, support for wildfires in Canada, and post cyclone Gabrielle in New Zealand saw bilateral resourcing arrangements activated and supported by the NRSC.

### Türkiye – 7.8 magnitude earthquake

On 6 February 2023, two 7.8 magnitude earthquakes occurred at Gaziantep in the south of Türkiye near the Syrian border and Elbistan, in central Türkiye. The earthquakes resulted in significant loss of life and damage to infrastructure in both countries. Damage covered some 350,000 km<sup>2</sup>, impacting an estimated 14 million people (16 per cent of population) and leaving 1.5 million people homeless. More than 59,000 people were confirmed dead across Türkiye and Syria. Damages are estimated at nearly US \$120 billion.

On 8 February 2023, AUSASSISTPLAN was activated to deploy an Urban Search and Rescue (USAR) capability. The full (heavy) USAR Aus2 team Fire and Rescue NSW (FRNSW) was deployed for two weeks to the Hatay Province in southern Türkiye to support the massive international search and rescue mission. 141,000 people from 94 countries joined the rescue efforts. Aus2 consisted of 72 members led by FRNSW, included 32 rescue technicians which included 28 firefighters from FRNSW, two firefighters from Queensland Fire and Emergency Services (QFES), two firefighters from Australian Capital Territory Fire and Rescue (ACTFR) and 11 Incident management personnel. The front-line team included Doctors and paramedics, HAZMAT technicians, engineers from NSW Departments of Health and Public Works, NSW Ambulance and NSW Police, as well as representatives from NEMA and DFAT. The team provided leadership of the USAR Coordination Cell (UCC), reporting directly to the Türkiye Disaster and Emergency Management Authority (AFAD). This is the first time an Australian team has taken over a coordination cell in a major international disaster and is in recognition of their capability and expertise.

Australia committed \$18 million in response to the earthquakes, including \$11.5 million in Türkiye and \$6.5 million in Syria. Australia's immediate humanitarian response helped partners in Türkiye and Syria provide lifesaving assistance, including delivery of food, tents, blankets, clean water and sanitation and other support services.

### Vanuatu – Tropical Cyclones Judy and Kevin

Tropical Cyclone (TC) Judy entered Vanuatu's territory on 27 February 2023 and moved south over the entire Vanuatu island chain as a Category 3 cyclone. Subsequently, TC Kevin formed on 2 March 2023 and followed a similar track, initially as a Category 3 cyclone and then strengthening to a Category 5 system.

Vanuatu declared a state of emergency due to the impacts of TCs Judy and Kevin, which caused widespread damage and impacted an estimated 250,000 people (around 80 per cent of the population). The worst-affected provinces were south of Port Vila, including Shefa, Penama and Malapa.

The AUSASSISTPLAN was activated upon a request from the Government of Vanuatu on 1 March 2023. A 15-person multi-disciplinary Rapid Assessment Team (RAT) was deployed from 5 to 12 March 2023. The team comprised specialists from five key areas as well as representatives from NEMA and DFAT:

- health (Australian Medical Assistance Team, or AUSMAT)
- infrastructure and hazardous materials (Disaster Assistance Response Team, or DART)
- logistics (DFAT's Standing Humanitarian Logistics Capability service)
- power supply technicians
- humanitarian experts (deployed by RedR through the Humanitarian Response Team).

The team supported Vanuatu's National Disaster Management office and informed planning for response and recovery support to Vanuatu. Australia announced \$12.77 million to meet humanitarian and early recovery needs. Assistance was delivered to local partners through the Australian Humanitarian Partnership, International Red Cross and Red Crescent Movement.

Australia also deployed the HMAS Canberra and eight ADF flights from Australia over a month-long period delivering 139.4 tonnes of humanitarian assistance, including 63.6 tonnes on behalf of the DFAT, 32.4 tonnes on behalf of the Australian Humanitarian Partnership, and 43.4 tonnes for UN agencies, Australian Red Cross and other partners.

### New Zealand ex-TC Gabrielle

Ex-Tropical Cyclone Gabrielle formed in the Coral Sea, passing over Norfolk Island, before making landfall in New Zealand on 13–14 February 2023. The devastation caused the loss of 11 lives, homes, possessions and livelihoods. Ex-TC Gabrielle was felt over a wide area, including Northland, Auckland, the Coromandel, Waikato, Bay of Plenty, Gisborne/Tairāwhiti and Hawke's Bay. However, Hawke's Bay and Gisborne/Tairāwhiti regions were hit the hardest. The cyclone came shortly after ex-Cyclone Hale and the Auckland Anniversary Weekend flood. A national state of emergency was announced for only the third time in New Zealand's history.<sup>9</sup>

New Zealand's National Emergency Management Agency requested damage assessment support from Australia. The NRSC fulfilled these requirements with the 27-person AUS-1 Disaster Assistance Response Team, with damage assessment specialists, management, and liaison officers, being deployed from Queensland on 17 February to Hawke's Bay, with a two-person liaison team based in Wellington. The team drew upon QFES and FRNSW. The team returned on 24 February.

9 Ministry of Foreign Affairs and Trade (2023) Cyclone Gabrielle's Impact on New Zealand's Economy and exports. [www.mfat.govt.nz/en/trade/mfat-market-reports/cyclone-gabrielles-impact-on-the-new-zealand-economy-and-exports-march-2023](https://www.mfat.govt.nz/en/trade/mfat-market-reports/cyclone-gabrielles-impact-on-the-new-zealand-economy-and-exports-march-2023)

## Canada Wildfires

A series of major wildfires have affected the Canadian Province of Alberta since May 2023. The NRSC have coordinated the deployment of Australasian personnel to assist wildfire suppression activities in Canada. A formal request for assistance was received from the Canadian Interagency Forest Fire Centre (CIFFC) on 17 May. On 26 May Australia deployed 221 personnel from all jurisdictions and NZ to Canada. Shortly after Canada requested a further 179 personnel across Australia and NZ, followed by a further request for an additional 14 person IMT. Spread across three contingents, the Australasian personnel included arduous firefighting crews, IMTs and specialist roles including supervision and aviation management. Fire, land management and state emergency management organisations representing all jurisdictions across Australia and New Zealand have contributed to the deployment. A total of 560 people were deployed to 30 June through further requests. Deployments have continued into the 2023–24 FY.

## 4.7 Reception of international assistance

The Murray-Darling Basin flooding garnered the attention of the international media. This resulted in multiple offers of assistance, several which Australia gratefully accepted.

New Zealand deployed four Incident Management Teams under the National Resource Sharing Arrangements which provided support in response to flooding in Parkes and central NSW. The teams provided operations support, planning, information and warnings, public information and community liaison.

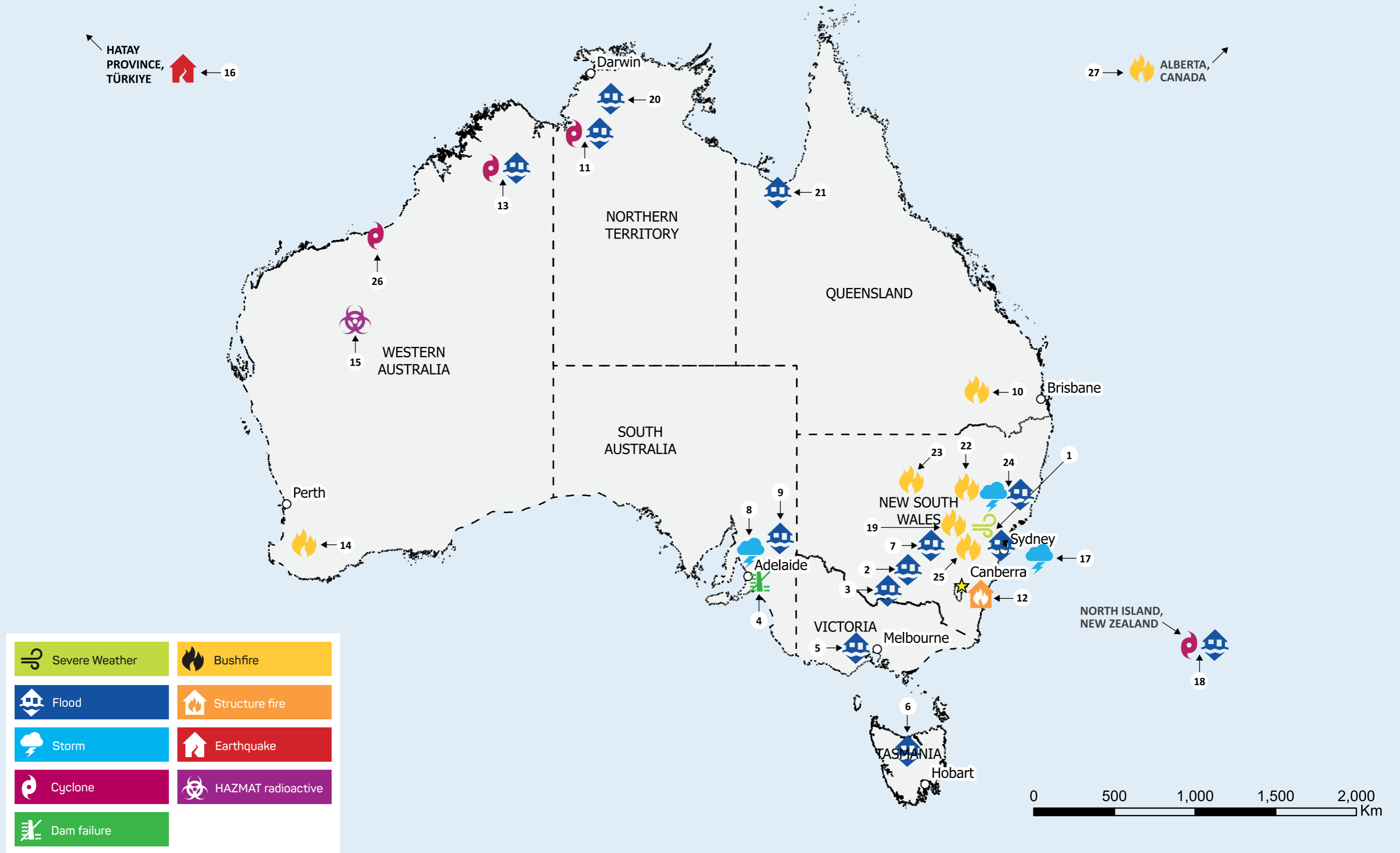
Singapore deployed two teams of flood rescue technicians which provided critical support in response to the flooding in Parkes, Wagga Wagga, Deniliquin and surrounding areas.

Several other countries extended support including Argentina, France, Indonesia Japan, Nauru, the United Kingdom and the United States.



Image: NSW SES






# 5. Map of major incidents 2022–23













\*Locations of symbols are approximate  
 Figure 10: Map of major incidents 2022–23

# 6. Summary of major incidents 2022–23

The following are 27 incidents that were selected for their scale, duration, community impact, media coverage and/or unique operational challenges. They are by no means the total number of incidents across the country in 2022–23. They represent a snapshot of the major incident that individuals, communities, agencies and governments had to deal with over the course of the year.

No.	Date	Incident	Locations	Jurisdiction and agency
1	27/06/22 - onwards	Severe weather and flooding	Hawkesbury Nepean, Illawarra, Greater Sydney	NSW SES
	<p>By 4 July 2022, 115 evacuation orders were in place in the Hunter region, Sydney northern, southern, and western region; and Illawarra South Coast region. Evacuation centres were set up in Canley Vale, Narellan, Gymea, Richmond, North Richmond, Castle Hill and West Gosford. There were 32,000 people impacted by evacuation orders and warnings.</p> <p>From 1–3 July, SES teams carried out 137 rescues and responded to over 3,100 requests for assistance. There were 1,105 registrations taken with Register.Find.Reunite, and five enquiries made.</p>			
2	04/08/22 - onwards	Flooding	Southern and western NSW	NSW SES
	<p>On 4–5 of August a significant cold front system crossed southern NSW, bringing storm and significant rainfall to many inland parts of the state. Alpine areas also experienced snow down to 1,100 m. The primary areas of impact were on the Murrumbidgee River with both North Wagga and Gumly Gumly evacuated. The Murrumbidgee River at Wagga Wagga peaked at 8.74 m on 9 August before floodwaters shifted downstream to Narrandera where a moderate flood peak was experienced (<b>see case study 1</b>).</p>			
3	15/09/22 - onwards	Flooding	Southern, western and north-west NSW	NSW SES
	<p>Between 15–20 September, cloud and embedded thunderstorms brought significant rainfall on the inland side of the ranges in north-eastern New South Wales and the Queensland border region. Renewed rises in river levels were observed in many catchments in inland New South Wales, with major flood levels reached in some rivers (<b>see case study 1</b>).</p>			
4	27/09/22 - 29/09/22	Dam failure	Echunga, Adelaide Hills, SA	SASES
	<p>After significant rainfall in September 2022, a dam on a private property in the Adelaide Hills showed signs of potential failure, threatening the small township of Echunga situated below the dam wall (<b>see case study 9</b>).</p>			
5	06/10/22 - 13/01/23	Flooding	Hume and Loddon Mallee, and Melbourne metro regions	VICSES
	<p>Several low-pressure systems or surface troughs crossed southern and eastern Australia and interacted with moist tropical air leading to heavy rainfall on already wet soils and full or close to full catchments. This caused widespread major flooding in southern New South Wales, Victoria, Queensland and northern Tasmania. Significant impacts included major flooding along the Maribyrnong River which resulted in evacuations of the inner-city Melbourne suburbs and flood waters inundating 535 homes, while major flooding led to the inundation in a number of other cities and towns in Victoria including Shepparton–Mooroopna, Rochester and Echuca. There was also a major road closed for almost a month in north-east Victoria due a landslip (<b>see case study 1</b>).</p>			

6	13/10/22	Flooding	Northern and north-west Tasmania	TAS SES
	The storm event of October 12–17 with extreme rainfall, led to major flooding on the Mersey, Meander, Macquarie and South and North Esk rivers and further widespread flooding in catchments across the Northwest and northern regions, and the River Ouse. Subsequently, there were evacuations of communities along the Gawler, Mersey, Meander, South Esk and North Esk rivers. The event resulted in widespread damage to properties, businesses, farmland (including crops) and infrastructure <b>(see case study 2)</b> .			
7	14/11/22	Flooding	Eugowra, central-west NSW	NSW SES
	Severe flooding in Eugowra on the banks of the Mandagery Creek resulted in 80 per cent of homes and businesses damaged and two people confirmed to have died. At least 150 people were airlifted from roofs and buildings <b>(see case study 2)</b> .			
8	12/11/22 - 13/11/22	Spring severe storms	Adelaide, Adelaide Hills	SASES
	An unstable air-mass associated with a low and trough moved over South Australia, triggering severe thunderstorms with up to 423,000 lightning strikes, large hail and wind gusts up to 100 km/h. Significant numbers of trees were down on properties, roads and numerous powerlines. Flash flooding also impacted many suburbs across these regions, with the communities of the eastern hills and southern suburbs bearing the brunt of the storm front. Private residences and businesses, transport, communications, public buildings, including schools, and power infrastructure, including the main Victoria/South Australia inter-connector were damaged. SA State Emergency Service (SASES) units with support from SA Country Fire Service, SA Metropolitan Fire Service and local government, attended to over 2,000 incidents. Many roads and 49 schools and preschools were closed for several days. Power outages impacted more than 85,000 customers, some of whom remained without power for six days. Of note, concurrent with this event was the ongoing flooding of the Murray River for which SASES had already established a Level 3 IMT.			
9	15/11/22 - onwards	Flooding	Riverlands, SA	SASES
	<b>(see case study 1)</b>			
10	12/12/22 - 24/03/23	Bushfires	Western Downs, QLD	QFES
	On 12 December 2022, high temperatures combined with significant fuel loads triggered bushfires in the Western Downs region that continued through to late March 2023. Bushfires were not limited to the Western Downs LGA, with significant bushfire activity occurring in areas contiguous to the Western Downs LGA, including Southern Downs, Goondiwindi and the Toowoomba LGA <b>(see case study 3)</b> .			
11	23/12/22	Ex-TC Ellie and Flooding	Western NT	NTPFES
 	Category 1 cyclone (Tropical Cyclone Ellie) crossed the western top end coast. Dropping to tropical low strength, the storm continued to produce heavy rainfall over central and northern parts of the Northern Territory and parts of the Kimberley during the last part of December, with daily totals exceeding 100 mm at several locations <b>(see case study 7)</b> .			
12	26/12/22	Structure fire	Materials Recovery Facility (MRF), Hume, ACT	ACT ESA
	A structure fire on 26 December 2022 destroyed the Canberra Hume Materials Recovery Facility <b>(see case study 4)</b> .			
13	28/12/22 - onwards	Ex-TC Ellie and Flooding	North-west WA	WA DFES
 	Heavy rainfall from ex-TC Ellie and additional rainfall in January, resulted in flooding of the Fitzroy River, which reached its highest levels on record, peaking at 15.81 m on the afternoon of 4 January at Fitzroy Crossing. The system eventually dissipated over south-west of the Northern Territory on 9 January <b>(see case study 7)</b> .			

14	09/01/23	Bushfires	North of Preston National Park, parts of Glen Mervyn, Mumballup, Noggerup and Yabberup southern WA	WA DFES
	300,000 lightning strikes ignite multiple bushfires across southern WA. Emergency warnings issued for communities. Evacuation centres were opened at Donnybrook and Boyup Brook.			
15	25/01/23 - 01/02/23	HAZMAT radioactive material incident	Pilbara region, WA	DFES
	A radiation emitting device, smaller than a 10 cent coin was lost during road transportation between the Newman and Perth between 12 January 2023 to 16 January 2023 <b>(see case study 8)</b> .			
16	6/02/23 - 25/02/23	Earthquake	Hatay Province, Türkiye	DFAT, NEMA, FRNSW
	On 6 February 2023, two 7.8 magnitude earthquakes occurred at Gaziantep in the south of Türkiye near the Syrian border and Elbistan, in central Türkiye. The earthquakes resulted in significant loss of life and damage to infrastructure in both countries. On 8 February 2023, AUSASSISTPLAN was activated to deploy an urban search and rescue (USAR) capability <b>(See 4.6 international support)</b> .			
17	09/02/23	Severe storm	South Coast, NSW	NSW SES
	Severe weather and thunderstorms in the Illawarra, South Coast and metropolitan areas, with concurrent severe storm in Central Tablelands. These storms produced damaging winds, intense rainfall and large hail. Local roads were blocked due to flash flooding in the Illawarra. Twenty-one schools were affected in Illawarra and Shoalhaven including six declared as non-operational in Wollongong. The NSW SES responded to 1,510 incidents including 66 flood rescues. There were 1,865 calls to the State Operations Centre for assistance.			
18	09/02/23 - 07/03/23	Ex-TC Gabrielle, Flooding	North Island, NZ	FENZ, NRSC, QFES
 	Ex-Tropical Cyclone Gabrielle formed in the Coral Sea, passing over Norfolk Island, before making landfall in New Zealand on February 13-14. The devastation caused the loss of 11 lives, homes, possessions and livelihoods. A 27-person AUS-1 Disaster Assistance Response Team, assessment were deployed from Queensland on 17 February to Hawke's Bay <b>(See 4.6 international support)</b> .			
19	17/02/23	Bushfires	Blayney, Cabonne, Cowra, Liverpool Plains and Upper Hunter LGAs, NSW	NSW RFS
	Bush Fire Emergency declared under Section 44 of the Rural Fires Act burnt through 320 ha near Conimbla National Park, turning into a fire generated vortex, the strong winds it generated knocked crews to the ground and lifted the roof off a house, sending debris flying. DFRA funding was made available to support LGAs affected.			
20	26/02/23	Flooding	Victoria Daly region, NT	NTPFES
	Storms and widespread heavy rain in the northern tropics associated with a monsoon trough and a tropical low (16U) started in the last week of February and continued throughout the first 10 days of March. Ten-day totals of 400 to 800 mm were recorded in an area of the Barkly districts in the Northern Territory, a number of communities were evacuated <b>(see case study 7)</b> .			
21	1-10/03/23	Flooding	Burketown, QLD	QFES
	The 16U tropical low also affected Queensland's Gulf Country and North West districts. Ten-day totals of 400 to 800 mm were recorded in an area in Queensland's Gulf Country and North West districts. This event resulted in major flooding along the several rivers across north-western Queensland, leading the closure of many transport routes. Burketown and Doomadgee were both isolated during the rainfall events, with both townships isolated by road for more than 12 weeks since November 2022. A total of 8,463 km of the state road network have been closed or had restricted access during the event. More than half a metre of rain in two days led to record-high flood levels around Burketown in the Gulf Country; most of Burketown's population, those more at risk from Doomadgee were evacuated to Mount Isa.			



22	01/03/23	Bushfires	North West Slopes, NSW	NSW RFS
	Bush Fire Emergency declared under Section 44 of the Rural Fires Act with impact in the communities of Gwydir, Moree Plains and Narrabri LGAs. DFRA funding was made available to support LGAs affected.			
23	06-23/03/23	Bushfires	Alpha Road, Tambaroora Central Region, NSW	NSW RFS
	The 17,900 ha Alpha Road fire on 5 March 2023 was the largest in NSW since Black Summer ( <b>see case study 5</b> ).			
24	12/03/23	Storm and Flooding	Western Slopes, NSW	NSW SES
	More than 100 mm fell in 24 hours at some locations in the South Western Slopes region of southern New South Wales, causing flash flooding. High daily rainfall totals lead to river rises and flooding along Muttama Creek. The SES issued an emergency evacuation order for 880 properties along the creek. Four registrations with <b>Register.Find.Reunite</b> were made. The most significant impacts were in the Cootamundra, Taree and Port Macquarie areas.			
25	16/03/23	Bushfires	Taralga, Southern Highlands, NSW	NSW RFS
	A fire burnt 4,437 ha, destroying one house, 17 outbuildings, and at least 200 sheep. About 140 firefighters and seven aircraft were used with multiple strike teams being brought from outside the area. Evacuation centres were set up at Crookwell and Taralga.			
26	13/04/23	Cyclone Isla	Pilbara region, WA	WA DFES
	Tropical Cyclone Isla made a landfall around midnight local time on 14 April between De Gray and Pardoo Roadhouse (Pilbara Coast) as a Category 5 system, causing extensive damage in the area. Fifty-eight registrations with Register.Find.Reunite were made, with one enquiry taken. The highest daily rainfall total was 194.8 mm at Bamboo Creek (near Marble Bar, WA) to 9.00am on the 14 April. The sustained wind speed (10 minute mean) of 218 km/h was the highest recorded by the Bureau of Meteorology observation network, as was the maximum wind-gust speed (three-second mean) of 289 km/h. A minimum mean sea-level pressure reading of 931.2 hPa was also recorded at Bedout Island.			
27	26/05/23 to present	Bushfires	Alberta, Canada	NRSC, all Australian and NZ jurisdictions
	A series of major wildfires have affected the Canadian Province of Alberta since May 2023. Australasian personnel have been deployed to assist wildfire suppression activities in Canada ( <b>See 4.6 international support</b> ).			

Table 3: Summary of 27 major incidents 2022–23



Flooding at the Blanchetown Caravan Park at Paisley, (ABC News - Brant Cumming). Reproduced by permission of the Australian Broadcasting Corporation © 2023 ABC

# 7. Major incidents 2022–23 case studies

The following case studies have been selected by state and territory emergency services organisations.

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Case study 1 –  
Murray–Darling Basin  
flooding (New South  
Wales, Victoria and  
South Australia)

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Case study 2 –  
North coast storms  
and floods (Tasmania)

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Case study 3 –  
Bushfires on the Western  
Downs (Queensland)

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Case study 4 –  
Canberra recycling fire  
(Australian Capital Territory)

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Case study 5 –  
Bushfire Central Region  
(New South Wales)

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Case study 6 –  
Northwestern Australia  
flooding (Western Australia  
and Northern Territory)

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Case study 7 –  
Tropical low flooding  
(Northern Territory)

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Case study 8 –  
HAZMAT radiological  
incident (Western  
Australia)

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Case study 9 –  
Echunga dam failure  
(South Australia)

# Case Study 1 – Murray–Darling Basin flooding (New South Wales, Victoria and South Australia)



The climatic conditions outlined in Chapter 3 produced higher-than-average rainfall across south-eastern Australia and saturated catchment conditions from August to late November 2022. Significant rainfall and flooding were experienced in the Murray–Darling Basin (the Basin), and more broadly across New South Wales and Victoria. Chapter 3 outlines the series of weather events from August to November 2022 that delivered the flooding events. This case study outlines the impacts across the three states, and the measures taken to manage the extensive and sustained flooding events.

## The New South Wales experience

The floods of 2022–23 built on a succession of flood events in previous years. The floods in New South Wales occurred on the lands of many First Nations Peoples, including the Wiradjuri, Yorta Yorta, Darug and Darkinjung, Wonnarua, Wongaibon, Gamilaraay/Kamilaroi, Barkindji, Ngyjambaa and Yuwaalaraay peoples.

With multiple successive rain events between March and November 2022, combined with a significantly large catchments and slow-moving peaks, multiple minor to major flood peaks were experienced throughout the Basin in 2022, extending into 2023, as well as in the Murrumbidgee, Macquarie, and Lachlan river catchments.

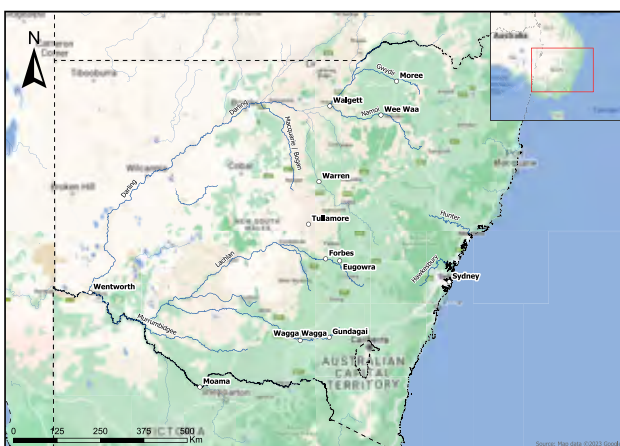


Figure 11: Locations of major flood events

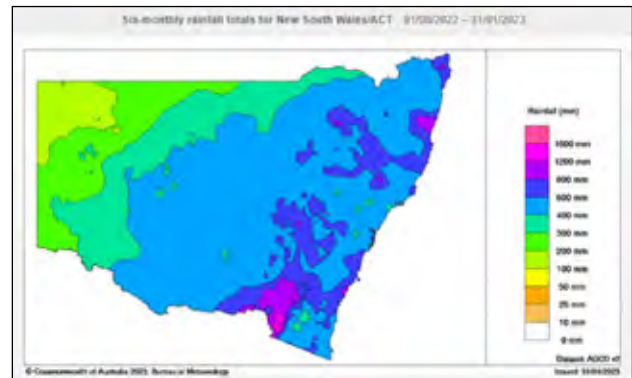


Figure 12: Six-month rainfall totals for NSW/ACT

The first flood warning for the Barwon–Darling River was issued on 14 May 2022, and the final flood warning was issued on 7 March 2023. Already saturated catchments across in southern and western New South Wales were significantly affected, with some places experiencing record amounts of water. A total of 165 warnings were issued between May 2022 and March 2023.

New South Wales experienced 213 continuous days of flood operations between August 2022 and March 2023. There were multiple, and often concurrent IMTs in operation across the state.



Image: NSW SES

Flood response operations continued until the final Barwon–Darling River flood warning was issued on 7 March 2023. The final NSW SES warning product lifted on 8 March 2023.

Throughout the period, flooding occurred across all major river systems in inland New South Wales. At one point, on 10 November, eight major flood warnings were in place. Major flooding was experienced on areas of the Barwon, Bogan, Darling, Gwydir, Macquarie, Namoi, Lachlan, Murray and Murrumbidgee river systems. Other inland systems experienced minor to major flooding, with flooding also seen east of the ranges in the Hunter and Hawkesbury–Nepean Valley.

Large numbers of communities along these river systems were affected by flooding and/or isolations. Several towns experienced multiple flood peaks in this period, and many communities were devastated by the flooding.

A cold front bringing heavy rain, saw the Murrumbidgee River peak at 8.74 m at Wagga Wagga on 9 August. This triggered evacuations in North Wagga and Gumly Gumly. Heavy rains on 31 October caused the Murrumbidgee River to rise faster than anticipated. This resulted in evacuation orders being issued on 2 November for Wagga Wagga including for properties within the levee. Gundagai received its third and highest major flood peak of this event at 9.77 m, with Wagga Wagga also reaching major flooding for the first time at 9.72 m on 4 November.



Image: NSW SES

Further west, on the Lachlan River, Forbes and surrounds were significantly affected between August and November, having recorded six moderate and three major flood peaks, with the second major flood peak at 10.68 m on 17 November being the highest. Severe weather conditions exacerbated flooding through September with additional flooding along the Lachlan River and the Bogan River north of Tullamore. The community of Warren, already affected by flooding of the Macquarie River earlier in the year, experienced a major flood peak in August. Flooding at Warren and at Wellington was prolonged due to releases from Burrendong Dam which was at 135 per cent capacity. Properties between Warren and Carinda experienced lengthy isolations. Extensive rural isolations in the south and west saw local SES units providing ongoing resupply operations. SES resources including High Clearance Vehicles and aircraft were also deployed to support resupply of Wee Waa township.

Similar dam levels to Burrendong Dam were replicated across regional New South Wales, and NSW SES worked with Water NSW to develop release strategies at the Burrinjuck and Wyangala dams, as well as managing the long-term flood levels at the Menindee Lakes. The ongoing water release strategy at Menindee remained a focus of planning efforts. However, in October, planning by NSW SES began for Wentworth as it became increasingly apparent that flooding was likely despite the release control strategy from the Menindee Lakes.

Flooding also occurred in the Hawkesbury–Nepean Valley River system in early and mid-October. Several communities were isolated, and some evacuations occurred in early October. There was low level riverine and flash flooding, with some flood rescue activations.

In October attention turned to the Mid Murray River, in addition to the areas already experiencing ongoing or recent flooding. Moama was at risk from a flood peak moving down river from Albury intersecting with predicted further rainfall and significant inflows from the Victorian Ovens, Broken, Goulburn, Campaspe and Loddon rivers (see below). By 18 October the flood peak at Moama had already exceeded the 2016 level at 94.98 m AHD and was the highest flood since 1975.

Following extensive engagement with the Victorian SES, the Cross-Border Commissioner and other key stakeholders, NSW SES made a formal 'Emergency Area' declaration under the SES Act 1989 to close the Murray River downstream of the Tocumwal Road Bridge to the Barham Bridge. From 26 October the emergency area was extended to Tooleybuc Bridge to reflect the evolving flood situation. This directive applied to all commercial and recreational users of the river advising them to leave and not enter the emergency area until the emergency was resolved.

Many areas were of concern in October, in particular Bathurst with the expected influx of visitors for the Bathurst 1000 motor race. Additional resources were deployed to the area to manage any flood impacts. In the west, flooding continued at Moree, Coonamble, Nyngan, Wee Waa and Warren – with the latter two having dealt with prolonged isolations. Planning was underway for further flooding to cause isolations around Walgett, Collarenebri and New Angeldool.



Image: NSW SES

By November, the number of communities isolated in western New South Wales also continued to increase with the Castlereagh Highway closing around Walgett and Coonamble. This contributed to the broader isolation of the area around Lightning Ridge, Walgett and Collarenebri. Major road closures contributing to isolations were also seen with the Kamilaroi Highway closed between Bourke and Narrabri, and the Gwydir Highway around Walgett and Moree. A significant resupply plan for these communities was developed by NSW SES in partnership with local supermarkets and fuel providers. In Bourke, the Alice Edwards Village Aboriginal settlement was a particular concern with a 'prepare to evacuate' warning issued on 1 November. Other Indigenous communities impacted at this time included the Namoi Village and Gingie at Walgett, the Walli Community and Collarenebri.

## A focus on the Eugowra flooding event

During the peak of New South Wales flooding, the town of Eugowra, 350 km west of Sydney and 35 km east of Forbes received widespread heavy rainfall through the early morning of 14 November 2022. The highest rainfall totals exceeded 150 mm from 11.00pm to 2.00am. The rain fell into the Mandagery Creek catchment. Upstream of Eugowra on the Mandagery Creek and its tributaries, rises were unprecedented. Elsewhere in the area, Molong (on the Molong Creek) and Canowindra (on the Belubula River) were experiencing extreme and record-breaking flooding resulting in multiple evacuations and flood rescues. At approximately 9.30am the rush of water struck Eugowra, destroying fixed and mobile communications, and forced houses off their stumps. NSW SES and RFS crews described the oncoming volume of water like looking 'uphill'. Rescuers and evacuees were caught between the waters of the Mandagery Creek in major flood, and the flash flood impacting them from behind. The flash flooding knocked out communications and mobile resources of local first responders from SES, RFS, ambulance and police who were onsite evacuating residents. The flood damaged over 200 homes and necessitated the evacuation of 700 residents. Eighty percent of homes and businesses in the town were damaged.

NSW SES with the assistance of multiple emergency services partners responded quickly to help the community of Eugowra. By the afternoon of 14 November over 100 NSW SES personnel were on site, supported by another 100 personnel from other agencies. Between 9am and 3pm that day NSW SES received over 155 flood rescue activations through 000. Flood rescue operations were supported by 14 aircraft, with helicopters completing 124 winch rescues. One airframe alone completed 21 winch rescues that day. This is one of the largest helicopter rescues in Australian history. Sadly, two people could not be saved and died in the flood waters.

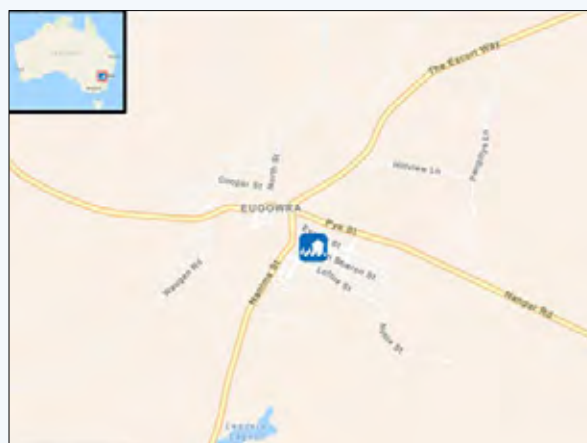
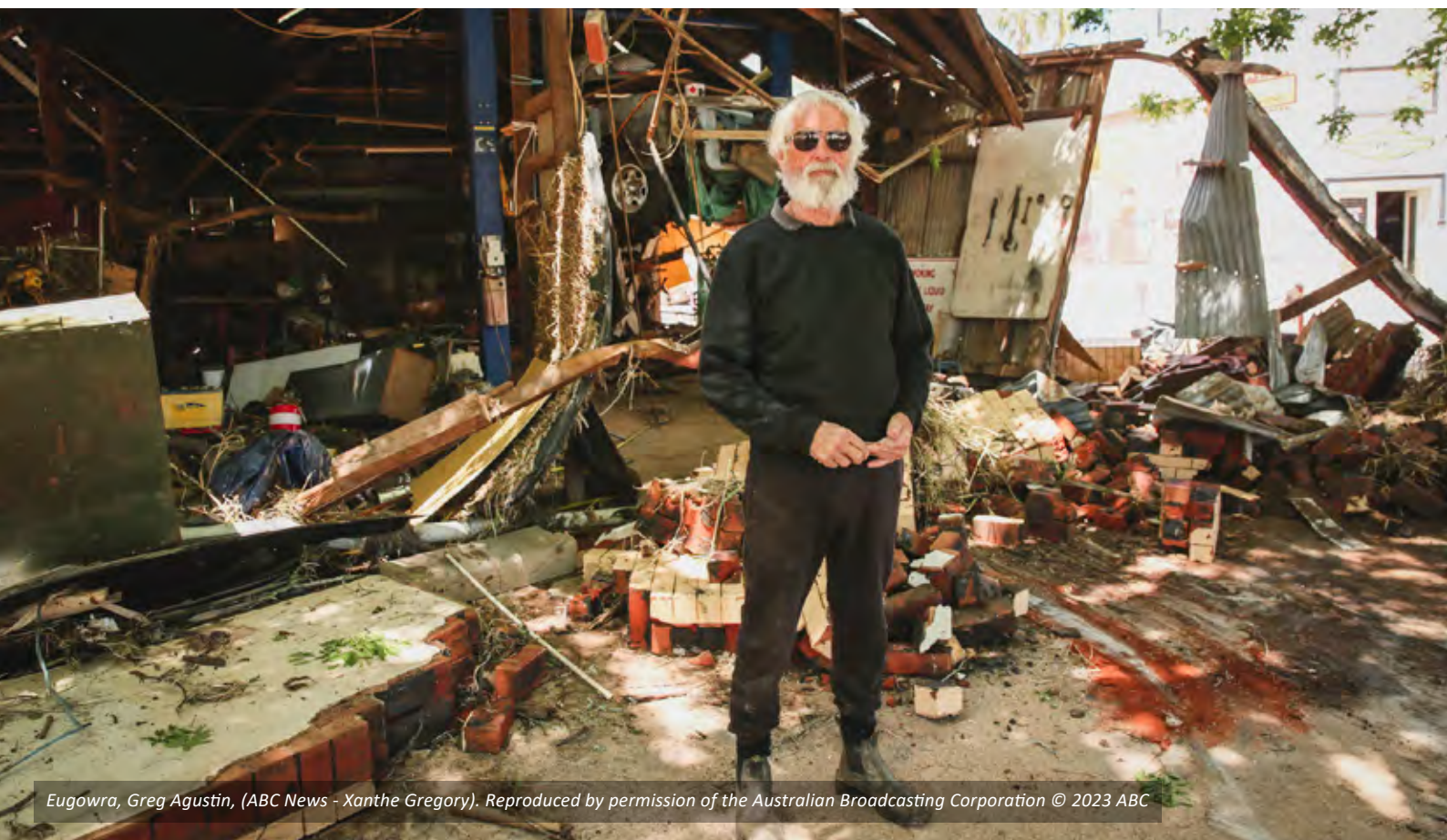


Figure 13: Location of Eugowra, New South Wales



Eugowra, Greg Agustin, (ABC News - Xanthe Gregory). Reproduced by permission of the Australian Broadcasting Corporation © 2023 ABC

Indications are that the following areas experienced floods of record.



Figure 14: Locations of major flood events

\*Locations of numbers are approximate

River / Catchment	Location	Height	Date
1 Murray River	Boundary Bend	9.14 m	4 Dec 2022
2 Belubula River	Canowindra	5.79 m	14 Nov 2022
3 Lachlan River	Condobolin	7.6 m	20 Nov 2022
4 Lachlan River	Euabalong	7.82 m	23 Nov 2022
5 Murray River	Euston Weir	52.09 m	9 Dec 2022
6 Lachlan River	Forbes	10.68 m	17 Nov 2022
7 Murrumbidgee Catchment	Hay Weir	10.34 m	16 Nov 2022
8 Lachlan River	Hillston Weir	3.3 m	2 Dec 2022
9 Mirrool Creek	Griffith/Leeton/Yanco	2.08 m	6 Nov 2022
10 Murray River	Moulamein	6.24 m	30 Nov 2022
11 Lachlan River	Nanami	13.79 m	15 Nov 2022

## Impacts and consequences

Tragically, seven people died during the New South Wales flooding and their deaths are currently subject to Coronial investigation. Overall, over 10,000 damage assessments indicated at least 5,309 properties were damaged, with 3,259 inundated and 3,011 assessed as being uninhabitable. The Insurance Council of Australia report that insurance claims were 3,200 costing \$60.2 million.

The NSW Department of Primary Industry has reported a total of over \$432.4 million of damage to agriculture state-wide. Over \$252.4 million of that was damage to crops with a further \$92.8 million of infrastructure damage reported and \$4.4 million dollars' worth of livestock lost.

The Young-Lithgow Gas Pipeline was damaged on 3 November affecting gas supply to Bathurst, Wallerawang, Lithgow, and Oberon. Gas supply was quickly restored to Bathurst, while supply to Wallerawang, Lithgow and Oberon remained affected for several days. A significant number of people across the state were affected by these events.

## Response activities

NSW SES was engaged in 213 continuous days of flood operations between August 2022 and March 2023. More than 24,400 incidents were recorded, including over 889 flood rescue activations. Over 7,400 NSW SES volunteers and staff were recorded as providing support for a total of approximately 712,000 personnel hours.

The scale of resupply and property protection operations was calculated on the 11 of November 2022 as covering an area of 40,000 km<sup>2</sup>, approximately half the size of Tasmania. By 11 November 2022 over one million sandbags had been issued to protect communities across the state. This was the largest issue of sandbags in NSW SES history.



Figure 15: Community engagement activities during flooding

The NSW SES State Operations Centre received more than 62,435 calls. On occasions, NSW SES had five Incident Control Centres operating simultaneously, as well as the State Command Centre. Resourcing was a challenge during this large scale and protracted event. Significant interagency support was provided by the other emergency management organisations in NSW including NSW Police Force, Ambulance NSW, Rural Fire Service, Volunteer Rescue Association, Marine Rescue, National Parks and Wildlife Service, NSW Reconstruction Authority (formerly Resilience NSW), Dept Communities & Justice, Surf Lifesaving NSW and all functional areas. There was also significant interstate support provided through the NRSC, with support from ACT, Queensland, Western Australia, Tasmania and the Northern Territory. In a first for NSW SES, several NSW RFS personnel were seconded to NSW SES for several months filling key roles in IMTs.

With resources from across Australia depleted by the scale and duration of the flooding in NSW and incidents in other states, international support was provided for flood operations for the first time in Australia. Incident management personnel from New Zealand staffed the Incident Control Centre established at Parkes for a period of six weeks. In addition, 18 Singapore Civil Defence personnel assisted with flood rescue operations in the Parkes area.

In mid-November to better coordinate the extensive statewide flood rescue operations, a Multiagency Flood Rescue Coordination Cell was activated in the SES State Operations Centre (SOC) with NSW Police Radio and NSW Ambulance supporting NSW SES.

Several capabilities were used to capture flood intelligence and damage data. This included remotely piloted aircraft systems, aircraft with optical and thermal scanning and satellite imagery.

The ADF provided aviation assets and a significant number of personnel to assist with response activities and transition to recovery, including resupply of isolated communities and damage assessment. ADF liaison officers were assigned to the State Command Centre and Incident Control Centres.

## Early recovery

The NSW Government made Natural Disaster Declarations for 75 LGAs and for the unincorporated area. Assistance was made available under the Commonwealth-State DRFA, including personal hardship and distress assistance, counter disaster operations, restoration of essential public assets, support for small businesses, primary producers and non-profit organisations and a Central West Caravan and Modular Housing Program.



Tim Townsend, (ABC News - Xanthe Gregory). Reproduced by permission of the Australian Broadcasting Corporation © 2023 ABC

In addition, the Australian and New South Wales Governments committed to cost-share the following assistance measures:

- recovery grants for primary producers, small businesses and not-for-profit organisations
- rural landholder grants
- local council grants
- clean-up assistance program
- medium size business support grant
- community volunteer and non-government organisations program
- back home grants
- rental support scheme
- property damage assessment program.

<sup>10</sup> [www.nsw.gov.au/emergency/hazards-near-me-app](http://www.nsw.gov.au/emergency/hazards-near-me-app)



The Australian Government made the Disaster Recovery Payment available for 26 LGAs.

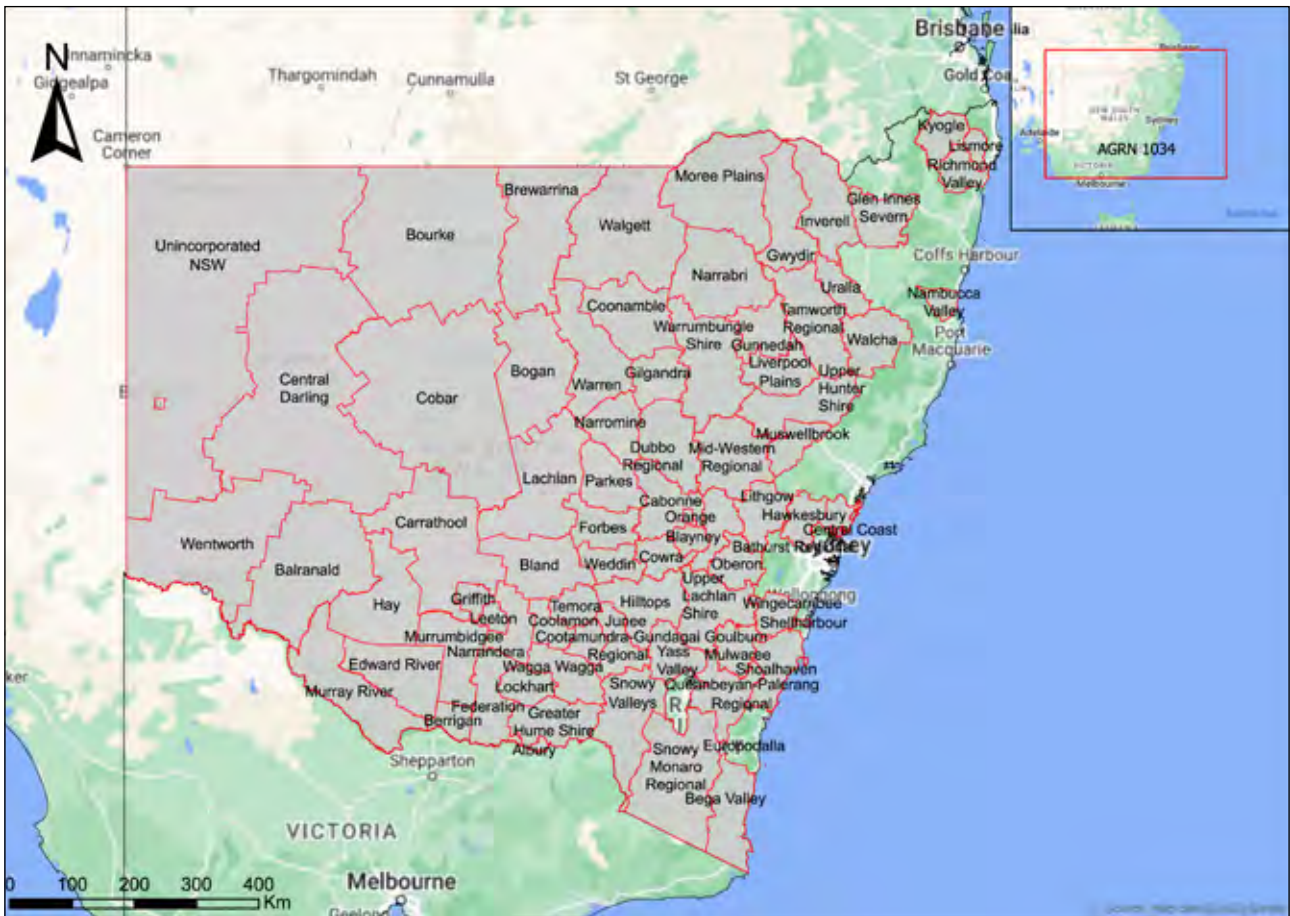


Figure 16: Map of affected LGAs in NSW (Disaster Recovery Funding Arrangements)

## What we observed

### 1. Interoperability is essential in resourcing of large scale, long duration events

Resourcing large scale, complex and long duration responses to weather events requires significant interagency, inter-jurisdictional and international support. This can only occur effectively when there are commonalities in approaches to incident management (e.g. the use of AIIMS or a similar incident control system), similarities in capabilities, capability definition and training.

### 2. Adoption of new and expanding capabilities facilitates effective incident management, response and recovery

The adoption of new and expanding capabilities including remotely piloted aircraft, helicopters with optical and thermal scanning and satellite imagery, provided previously unavailable real time flood intelligence and damage data. This was an asset in planning and decision making for both incident management, field operations and informing recovery planning.

### 3. Benefits of nationally consistent public information system

The introduction of the Australian Warning system during this campaign flood event improved the provision of public information and warnings to impacted communities. The nationally consistent language and icons used in the system helped ensure that messages were consistent and more readily understood, no matter which state or territory they were issued in. Positive feedback from the public reinforced the benefits that the system has brought.

### 4. Importance of consistent cross-border public information

Both NSW and VICSES recognise that the provision of public information is a challenge during events that occur in state border areas. In NSW border communities, much of the media and television coverage comes from Victoria. The two agencies worked closely to try and address this and ensure that communities received consistent and relevant information. There is still work to be done to improve this and ensure that communities understand the challenges and receive information relevant to the situation and services in their area.

## The Victorian experience

The Victorian flood event lasted 89 days from 6 October 2022 to 3 January 2023, across 63 LGAs and one Alpine Resort Board. Flooding occurred on the lands of the Wiradjuri, Yorta Yorta, Dja Dja Wurrung, Wemba Wemba, Barkindji, Latji Latji, Taungurung and Wurundjeri peoples. This was the most significant flooding event since 2010–11, due to its extent, duration and complexity. There were significant numbers of people affected by these ongoing events. It isolated people and communities, damaged homes, disrupted essential services, disrupted and disconnected social supports and systems, and impacted mental health, wellbeing, personal property, businesses and livelihoods.



Figure 17: Map of Murray River Catchment flooding

## What happened

Climatic conditions meant large parts of northern and western Victoria experienced their wettest spring on record. October rainfall was the highest for any month since records began in 1900, and November rainfall was the fifth highest on record for that month.

In October 2022, a low-pressure system brought heavy rainfall and storms. Already high rivers, creeks and sodden catchments had little capacity to absorb the rain. From 13 to 14 October parts of Victoria experienced rainfall totals between 150–300 mm, including the highest falls of:

- 222 mm in Strathbogie North
- 210 mm at Charnwood
- 166 mm on the Goulburn River at Seymour.

The initial rain event was followed by several smaller, storm driven, heavy rain events that caused localised flash flooding and kept river levels high.

The Murray River is one of Victoria's largest water catchments and in many parts is the border between Victoria and New South Wales. The first flood warning for the Murray River was issued on 5 August 2022 and the final flood warning was issued on 26 January 2023, with a total of 147 warnings issued between August 2022 and January 2023. Flooding in the Murray River was driven by major flooding in rivers in northern Victoria and in the downstream parts by the Murrumbidgee River. Major flooding was experienced along the Murray River at most forecast locations from downstream of Lake Hume to Wentworth.

On 14 October, the town of Rochester on the banks of the Campaspe River, and Seymour on the Goulburn River, were inundated with flood peaks higher than those recorded in 2011 and 1974. Over the remainder of October and November, rain continued to fall and major flooding continued across much of Victoria. The Goulburn, Murray, Campaspe, Loddon, Avoca, King and Kiewa rivers in northern Victoria, the Maribyrnong River in metropolitan Melbourne, and the Barwon River in the southwest were among those that flooded. Townships and suburbs that saw major flooding, evacuations, and inundation of properties included:

- Shepparton, Mooroopna, and Murchison (Greater Shepparton LGA)
- Seymour (Mitchell LGA)
- Benalla (Benalla LGA)
- Barmah (Moirra LGA) and Wodonga (Wodonga LGA)
- Rochester and Echuca (Campaspe LGA)
- Kerang (Gannawarra LGA)
- Bridgewater on Loddon (Loddon LGA)
- Baringhup and Campbells Creek (Mount Alexander LGA)
- Heathcote (Greater Bendigo LGA)
- Mildura (Mildura LGA)
- Maribyrnong (Maribyrnong LGA).

Floodwaters continued to move through the river systems well into December. Standing water remained, and many other townships across the state saw minor to major flooding, impacting residential and commercial properties.

## Impact and consequences

The 2022 flood event caused devastation across much of Victoria and affected thousands of people. Two people tragically lost their lives.

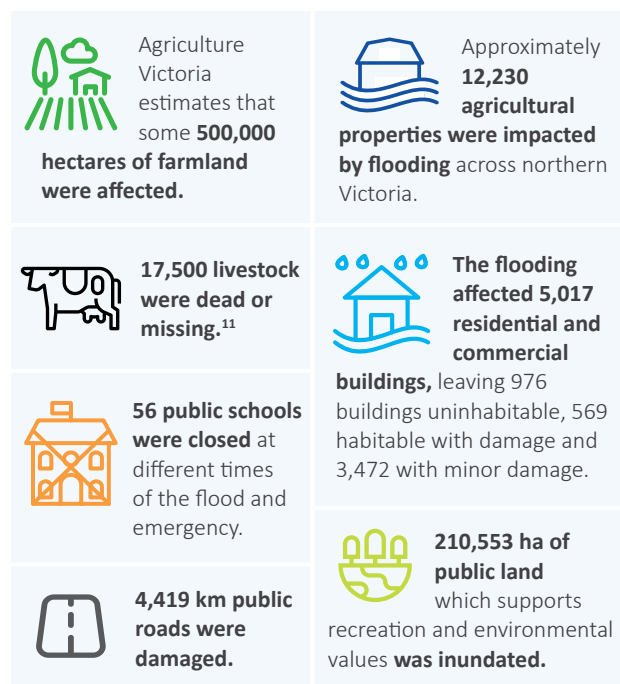


Figure 18: Reported impacts of floods across Victoria

11 [agriculture.vic.gov.au/farm-management/emergency-management/floods/flood-and-storm-impacts-late-2022](https://agriculture.vic.gov.au/farm-management/emergency-management/floods/flood-and-storm-impacts-late-2022)

Both short- and long-term service disruptions of communications, power and water were experienced by communities. Road closures and road damage isolated towns and properties. These disruptions were particularly complex in communities isolated by floodwaters.



Figure 19: Bureau of Meteorology flood warnings

## Response

Between October 2022 to January 2023, VICSES declared an operation that became a campaign emergency response for widespread severe weather and associated flash and riverine flooding. Between 6 October 2022 and 3 January 2023, VICSES received 20,062 requests for assistance. VICSES attended to these requests with support from other emergency management organisations including the Country Fire Authority (CFA), Forest Fire Management Victoria, Fire Rescue Victoria (FRV), Life Saving Victoria (LSV), Shepparton Search and Rescue Squad, Echuca Moama Search and Rescue Squad and Victoria Police. In October, VICSES volunteers responded to a record number of requests for assistance – 13,689. This eclipsed the previous record of 10,740 in June 2021, and the 9,674 during the floods and storms of February 2011.

More than 2,500 volunteers from 147 VICSES units provided 145,000 hours collectively to the response, supported by staff deployed to control centres across the state. Responders undertook critical water rescues, flood monitoring, levee management, community evacuations, sandbagging, community information and warnings, coordination and planning, specialist transport and relief supply.

Record numbers of sandbags were requested during this event. Sandbags were received from interstate, internationally and through the ADF. Over 1.2 million sandbags were deployed by VICSES during this event, in addition to the sandbags already held at units or in communities taking this total to around 1.5 million.

As control agency VICSES received significant support from other Victorian emergency management organisations including Country Fire Authority (CFA), Forest Fire Management Victoria (FFMVic), Fire Rescue Victoria (FRV), Life Saving Victoria (LSV), Victoria Police, Agriculture Victoria, Emergency Management Victoria and other departments in on-ground roles and in incident regional and state control centres. In addition, important contributions came from interstate, including 70 personnel from QFES, 24 personnel from South Australia Country Fire Service (SACFS), 31 personnel from Western

Australia DFES and five personnel from ACT Emergency Services (ACTES). These people undertook liaison roles in the State Control Centre and were also deployed at Incident level, particularly in the boating and swift water rescue functions and in IMT roles.

Aircraft and personnel deployed by the ADF provided support to flood operations, conducting flood reconnaissance, assisting with evacuation and relocation of community members, logistical support and resupply of food supply and fodder to isolated communities and isolated livestock.

## Flood rescue and flood rescue coordination

VICSES participated in more than 1,500 flood rescues in support of Victoria Police, the control agency for water rescue. Other partners, including LSV and FRV also provided support, as did boat crews from the Victorian Fisheries Authority, Transport Safety Victoria, Shepparton Search and Rescue and Echuca Moama Search and Rescue. More than 95 per cent of these rescues were undertaken by VICSES land-based swift water rescue teams and boats, demonstrating the benefits of building flood rescue skills and capacity since the 2010–2011 floods. VICSES deployed 85 flood rescue boats during the flood event, along with around 20 rescue boats provided by LSV.

VICSES worked closely with Victoria Police on flood rescue coordination, including protocols for positioning of flood rescue managers during major emergencies under the SEMP Flood Sub-Plan. Flood rescue managers were positioned in the Shepparton and Swan Hill ICCs. In addition, having the Marine Coordinator at the regional control centre (RCC) was pivotal in the overall command, control, and coordination of the water rescue cell.

The October 2022 floods saw the further operational development of the VICSES water rescue cell in both ICCs and the Victoria Police Rescue Coordination Centre. This became critical during mass rescues at Rochester and Shepparton–Mooroopna. It was the first time the Rescue Coordination Centre has operated at this level, providing clear task directions for field crews, boats, rescue helicopters and swift water rescue teams across all organisations. As demand for rescues increased, it was decided to establish water rescue cells at the Shepparton ICC and subsequently at the Swan Hill ICC, each looking after defined areas while the RCC managed the rest of Victoria.

In the lead-up to the floods, VICSES led a multi-agency project to introduce a dedicated water rescue event category in ESTA's computer aided dispatch system (CAD) on 23 August 2022. This allowed for easy identification of each water rescue event, and for quick and effective triaging of more than 1,500 water rescues during the flood event.

Australian Red Cross reported that 1,894 registrations were made with Register.Find.Reunite, with 35 enquiries made.

## Community engagement and public information

Throughout the prolonged event, all channels in Victoria's integrated warning system were deployed to inform communities of risks and advise them of appropriate action to protect lives and minimise impacts. In addition to Vic Emergency channels, localised and state-wide direct engagement with media outlets (print, radio and TV) were undertaken, further promoting the public information and warnings.

Community officers were deployed to ensure effective two-way communication between effected communities and the IMTs by undertaking door knocks, setting up community information points at local landmarks/community points of interests as well as more formalised community meetings. This event marked the first time that new consistent AWS protocols were utilised for widespread flooding in Victoria.

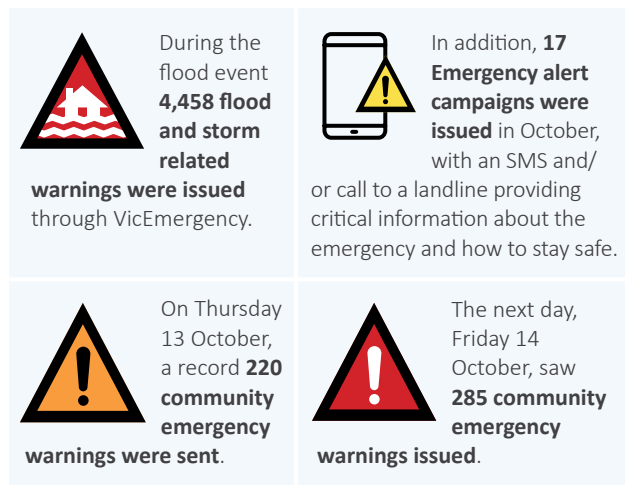


Figure 20: Community engagement activities during flooding

Emergency broadcasting saw ABC radio and social updates increasing with the threat to community along the Murray River as Emergency warnings were issued or updated by SES/EMV. For the Darling system, regular updates on radio and social for Broken Hill and Menindee, along with significant news coverage.

### Cross-border coordination

Shared responsibility between states improved communications and planning for cross border communities, and enabled access to inter-jurisdictional relief support. Planning and communication between jurisdictions were needed during the floods to ensure consistent decision making that would not further impact border residents or cause additional consequences. The different needs of cross border communities also required equal consideration.

The Victorian Cross Border Commissioner (the Commissioner) was engaged to connect with ICCs and State Relief leads and communicate proactively on behalf of border residents. This enabled the Commissioner to advocate for issues and to provide support and connections as required. The Commissioner’s engagement in this event reflected the lessons learnt from the 2019–20 fires.

An important area of advocacy was for reciprocal access to relief centres. This approach was supported by the NSW Cross Border Commissioner and ensured border residents had access to relief centres and support that was most practical, regardless of their home state. Through the engagement of the Cross Border Commissioner, the Victorian and NSW State Relief leads were able to connect and agree to:

- coordinate relief efforts along the Murray River
- monitor attendance of cross border community members at interstate relief centres to ensure that the closest relief centres remained available to those communities during times of evacuations

- joint media statements, joint radio ads, social media posts and reciprocal listings on government websites regarding cross border relief and recovery arrangements. Joint community messaging was a key learning from the 2019–20 fires, and this was the first time it was successfully implemented during a major emergency.

Relationships and planning arrangements on the Murray had developed through collaboration and exercising between NSW and Victorian agencies since flooding events in 2016. In the two months preceding the flood event, regular engagement between VICSES and NSW SES enabled further collaboration through:

- training and familiarisation with field observation platforms
- common social media tiles with clear messaging on the warnings applicable to each side of the border
- a community and stakeholder virtual meeting chaired by the Murray–Darling Basin Authority, which facilitated information sharing and awareness among caravan park and tourism business operators and other landholders
- updating a formal joint Public Information and Warnings protocol for cross-border communities.

To enable consistent warning and media messages, coordinate response activities and coordinate community meetings, Victorian and NSW ICCs connected by daily teleconferences from 12 October through to 12 December, with South Australian emergency services joining in from 18 November. From 12 to 30 December, teleconferences were held every third day.

### Relief and resupply

VICSES members conducted relief operations in partnership with a range of local relief agencies and the Australian Red Cross. VICSES crews delivered medical and food supplies via high-clearance vehicles, rescue boats and aviation to isolated communities across flood-affected parts of the state. VICSES members also assisted local government relief centres at various stages of the emergency.



Image: VICSES

## Early recovery

Demand for key Victorian Government relief and recovery support remained high. The Flood Recovery Hotline and recovery case support program was established. In the period ending 31 March 2023, demands on recovery services included:

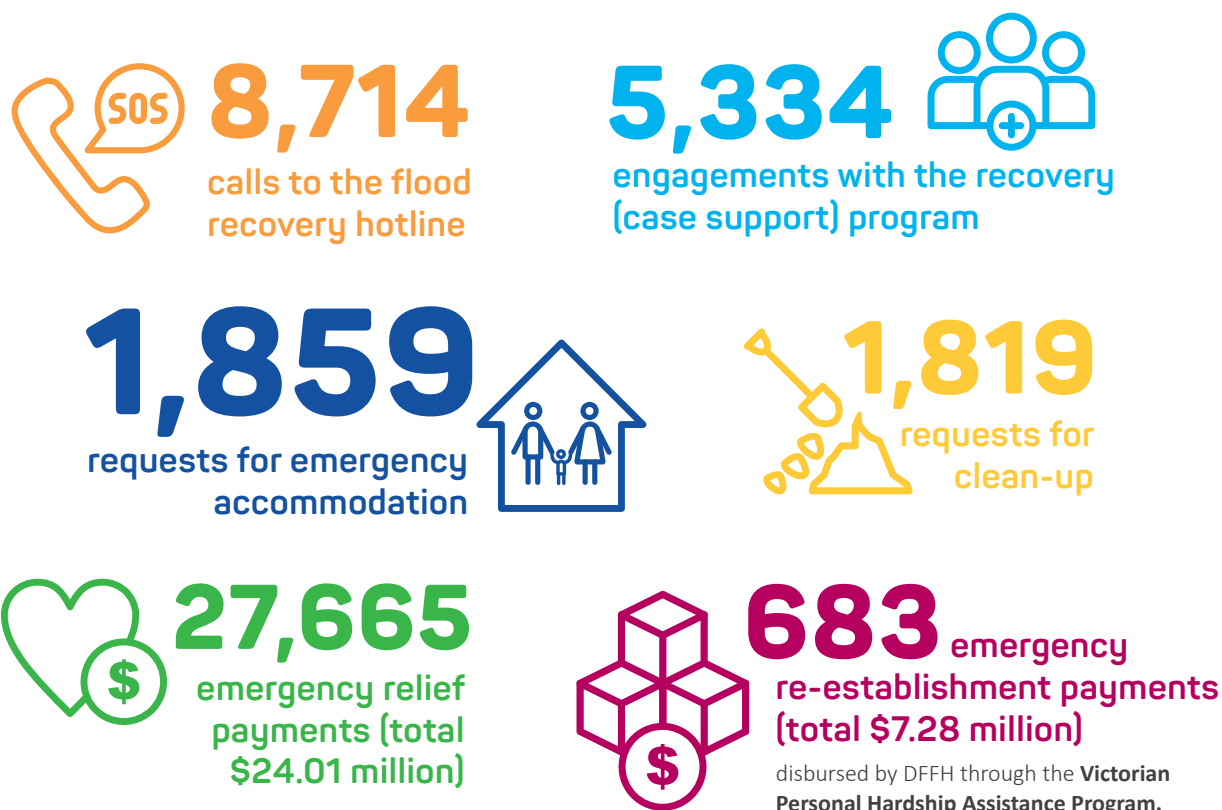


Figure 21: Provision of early recovery support

The Australian Government activated the Australian Government Disaster Recovery Payment in 31 LGAs and the Disaster Recovery Allowance in all 63 LGAs and one Alpine Resort. Applications and grants for direct financial assistance up to 3 July included:

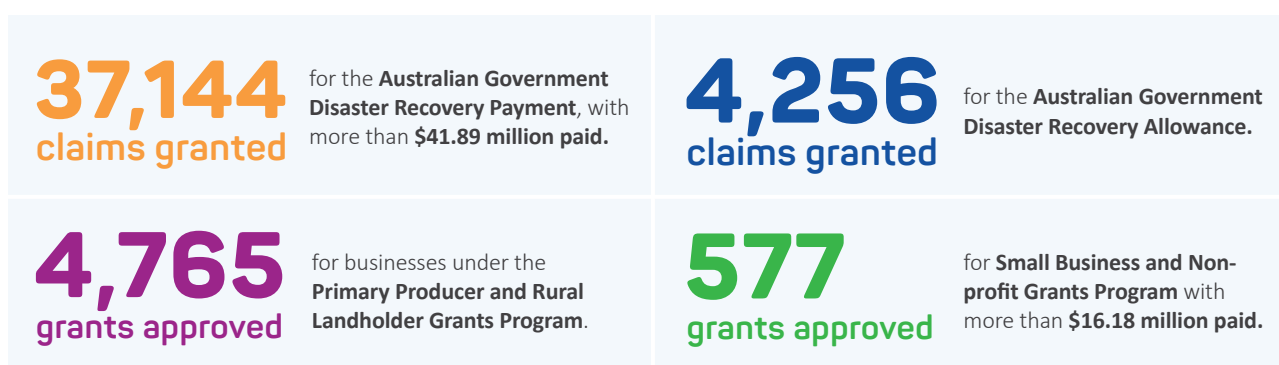


Figure 22: Financial assistance provided

The joint Victorian and Australian Government DRFAs were activated for 63 local government areas and one alpine resort, with \$1.17 billion provided by Australian and Victorian Governments to assist individuals, households, businesses and communities. Advance payments were provided to 12 councils.

This support included personal hardship and distress assistance, counter disaster operations, restoration of essential public assets and support for small businesses, primary producers and non-profit organisations.



Figure 23: Map of affected LGAs in Victoria (Disaster Recovery Funding Arrangements)

In addition, the Australian and Victorian Governments committed to cost-share the following assistance measures:

- Clean-up Package
- Community Recovery Officers
- Business Recovery Support Package – recovery grants for small and medium-sized businesses, business chamber and trader groups, financial counselling and mental health support
- Primary Producer Recovery Support Package – recovery grants for primary producers and rural landholders, and additional support services such as financial counselling
- Environmental Recovery Support Package
- Community Support Package – including expanded legal assistance, family violence and housing and homelessness services, establishment of recovery hubs and technical support for secondary impact assessments, expansion of mental health support for emergency service workers and support to Rochester Taskforce and Rochester Community House
- Health Support Package
- Council Support Fund.



Image: VICSES

## What we observed

The floods of 2010–11 had led to the Victorian Government commissioning a review of arrangements for flood response, flood recovery, emergency warnings and evacuations. Implementation of the recommendations has led to improvements in the 2022 response. Several multi-agency reviews and inquiries have been established to learn from this event. As part of Victoria's lessons management system this included more than 40 lessons identified through a Coordinated Real Time Learning Approach. This was achieved through deployments, debriefs, interviews, observations and submissions from incident, region and state tiers. This multi-agency program ran throughout the response, relief and early recovery phases of the event. A high-level summary of some of the trends identified from this process are included below. This process ran in conjunction with a range of other agency reviews.

### Scope and scale

Where impacts occurred as forecast, the initial scale-up of EM activities at local level in response to the event was generally effective. In some locations the rapid onset, scale and widespread nature of the event impacted response on a local level, reducing personnel's ability to effectively implement plans and processes in a timely manner, and impacting on the ability of personnel to respond. Reduced availability of response personnel and the long duration of the flood event contributed to cumulative fatigue of response staff, including VICSES members.

The size and complexity and duration of the event necessitated concurrent activation of multiple ICCs and RCCs for extended periods, requiring high numbers of IMT personnel and agency liaisons, often with specialist skillsets. Continued/repeat deployments over the extended event contributed to fatigue of responders, control centre personnel and community. There were several instances in which requests for resources were delayed or unable to be filled, leading to insufficient resourcing, further impacting on capability of functional areas or fatigue of available personnel.

### Water rescue and rescue coordination

Trialling of new initiatives for water rescue led to greater success in coordination and joint capability, with learnings identified in previous events contributing to a more inclusive, collaborative multi-agency approach. Coordination of water-based search and rescues during the 2022 Victorian State-wide flooding event supported localised and consistent decision making, flexibility and promoted greater transparency when shared platforms and technology systems were utilised.

Initiatives such as embedding an Emergency Services Telecommunication Authority (ESTA) representative within a Rescue Coordination Cell at the Incident Control Centre level to assist in water request triage were effective, further

demonstrating the benefits associated with clarity of water rescue roles, responsibilities and arrangements, refinement of interagency communication procedures and the development of capability and capacity to enhance resources and expertise.

Observations also highlighted the value in undertaking a broader collaborative approach through utilisation of intrastate and interstate resources during major flood events.

### Resources

Complexities were experienced resourcing a wide scale, complex and prolonged event across all tiers. Resourcing at the state, region and incident levels during the event was difficult due to the unanticipated impact, scale and duration of the event, and the significant resources required to fill operational roles across all tiers. Extensive support from Victorian response agencies was well received, though inefficiencies were noted where IMT members were unfamiliar with the flood environment, or had limited awareness of, or access to plans, resources or platforms used to inform operations. Gaps in understanding of flood or agency specific management or coordination processes were observed from some agency personnel, with incident functions most effective when containing team members that possessed the required knowledge, skills, and experience in the hazard.

The prolonged nature of the event exacerbated resourcing complexities, with personnel supporting emergency response also trying to meet agency business priorities, reducing availability of external agency personnel.

### Use of SME and specialist skillsets

The embedding of VICSES flood analysts, Bureau of Meteorology (BoM) hydrologists and meteorologist experts in the SCC, as well as embedding flood analysts and CMA liaisons at ICCs, enhanced the quality of predictive services, shared understanding of consequence and provided greater clarity about flood risk and uncertainty. This supported effective decision making at the incident, region and state tiers, through better access to resources and information, improved efficiency and confidence in incident response with greatest benefits noted when the representatives were located within the control centre rather than operating remotely.

### Cross border relationships

Multi-agency cross border relationships created during previous events and maintained through regular meetings and exercises were beneficial for more cohesive event management. Cross border meetings in preparedness supported collaboration, information sharing and planning, with continued operational meetings throughout the incident enabling a more consolidated and unified approach to the management during the flood event.

## The South Australian experience

In South Australia, major floods of the River Murray are rare. A South Australia River Murray flood is considered 'exceptional' if the water level is five or more metres above pool level. Historically this has occurred just four times, in 1931, 1956, 1973 and 1974. The 1956 flood, which peaked at 341,000 ml/day, is the largest River Murray flood on record.

The river is a big economic driver in SA with the Riverland district (north-east) known for its irrigated cropping of grapes, citrus, nuts and stone fruit, and extensive riverside communities. River recreation and tourism is popular, and the area includes the Sturt Highway part of the national road network.

## What happened

As a result of high rainfall across the Upper Murray–Darling Basin, water flows in the River Murray increased over the second half of 2022 to reach major flood levels in December 2022. The floods occurred on the lands of the people of the Ngarrindjeri Nation and the First Peoples of the River Murray and Mallee Region.

The dynamics of a River Murray flood provide South Australia with an extended period to prepare. The flood was declared a major emergency on 21 November 2022, the peak reached 185 gl/day at the border on 23 December and reached the Lower Lakes on 11 January 2023. It was the largest flooding event for fifty years, likely to incur the highest cost of any disaster event in South Australian history.

## Impacts and consequences

Property impacts included damage to 3,295 residential properties, including 103 primary residential homes. Many of these residential properties are part of the extensive lease hold 'shack' developments along the River Murray. Impacts to essential infrastructure included 3,646 South Australia Power Network connections points being disconnected and 15 powerlines de-energised. The Insurance Council of Australia reported that 100 claims totalling \$1.6 million were made.

Other impacts included economic consequences, particularly to tourism with numerous riverside caravan and camping parks being closed, and to the agricultural sector with over 79,000 ha of high value agricultural production affected. Impacts to transport, included 1,188 km of roads, nine of 11 ferry crossings closed, and only six of 162 boat ramps remaining open. The unique role of Murray River ferries in SA saw the Government provide one off compensation payment for some persons affected by the additional distances to travel.

The flooding directly impacted eight LGAs and the pastoral unincorporated area, Alexandrina, Berri Barmera, Coorong, Karoonda East Murray, Loxton Waikerie, Mid Murray, Murray Bridge, Renmark Paringa and Pastoral Unincorporated Area, all areas directly abutting the River Murray. This includes eleven major towns and covered over 900 km.



Figure 24: Map of affected LGAs in South Australia (Disaster Recovery Funding Arrangements)



## Response and relief

The declaration of a major emergency, revoked on 9 February 2023, was in effect for a total of 80 days. The SASES was the control agency for managing the event, working with people from a broad range of SA Government agencies as well as local councils, several utilities, authorities, ADF and emergency management organisations from interstate. A NSW RFS helicopter was engaged by SASES for several weeks to provide SAR and reconnaissance capability.

Approximately 120 people per day were involved in the coordination and response over an extended period, with over 1,000 people in total contributing. Specialist resources involved in the response to the flooding included swiftwater rescue teams, aerial observation resources, marine skippers and crews, ADF40M personnel trucks and Unimog high clearance vehicles from NSW SES. The State Control Centre was operational from 19 October 2022 to early February 2023, comprising 1,158 person days.

SASES undertook significant community engagement activities throughout the event to support its public information function.

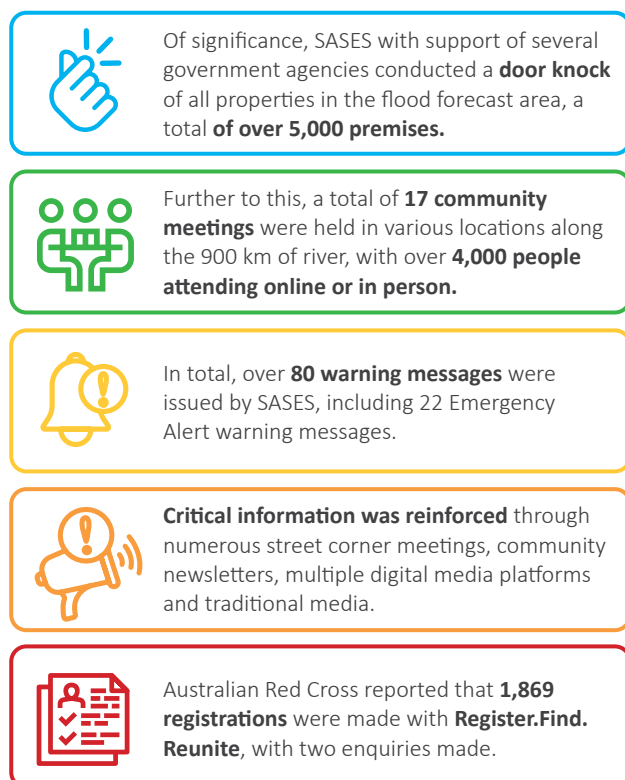


Figure 25: Community engagement activities during flooding

Emergency broadcasting (EB) for SA picked up from 22 November when the SA police commissioner declared a major emergency. With Watch and Act warnings for moderate flood in place, and the slow pace of the event, radio warnings were read at regular times and increased with emergency warnings, issued most often for levee failures. EB coverage continued until the threat to communities had passed.

South Australia has a prepared set of flood maps of the River Murray that describe the extent of flood upcoming events. This includes boundaries of the keystone 1956 incident.

High resolution aerial imagery from the NSW Linescan Fixed Wing Platform and from European Copernicus and ADO satellites supported mapping of impacts and inundation.

The use of information systems and technology, particularly those developed and implemented throughout the event, proved critical to the events successful management. 'Just In Time' software and application development occurred for levee monitoring and reconnaissance, as well as the development of information sharing systems within the SASES incident and information system – SESIIMS.

Some of the just-in-time tools developed included:

**Information Decision Task Log (IDT)** – This tool allowed personnel involved in the event to record operational logs, record decisions made including who was consulted and the rationale, and to allocate tasks to positions across the event including a record of status and history. The IDT allowed personnel to tie decisions to tasks and information, provide notifications on task assignment via email and text message to relevant personnel, and track task assignment, completion and outstanding numbers. In all, over 1,500 tasks were created and completed through the IDT.

**Boat Ramp Board** – This tool was developed to determine the operational status of individual boat ramps right along the River Murray.

**Deployments Board** – This board was designed to support and manage people being received into South Australia in support of the event, as well as those being deployed intra and interstate. This board was the first of its kind for SASES, allowing for simplified management of personnel information and deployment tasks.

**Levee GeoHub** – When the requirement was identified for the regular checking of levees, both existing and temporary, the Esri Disaster Response Program was initiated to provide a GeoHub dedicated to this function, the second GeoHub to exist within SASES. The Levee GeoHub provided all data relating to levees. Levee inspection personnel would collect data, enter this into a custom-built application on a tablet, with that information immediately sent to the GeoHub for use by incident management personnel and decision makers. Information such as levee defects, including imagery, could easily be provided to key personnel to assist with all facets of incident management. Supporting this data was mapping, and a dashboard for easy tracking of data trends.

A further piece of technology that proved critical during the response was remotely piloted aircraft (RPA). A total of 101 flights took place, totalling 183 personnel hours. Tasks included reconnaissance, damage assessment, levee inspection and missing persons searches. The use of RPAs for levee inspection assisted in identifying potential vulnerabilities, track erosion patterns and provided valuable data for maintenance and repair initiatives. Where real-time assessments were vital, RPAs were deployed and provided live streaming to the IMT. By collaborating with engineers remotely, critical levee assessments were conducted in a timely and efficient manner, enabling prompt decision-making and response.

Flood mitigation supplies, namely sandbags, were becoming increasingly challenging to source following the flood impacts to Queensland, NSW, and Victoria. Prior to the forecast of flooding

in the River Murray, the SASES had already supplied almost 200,000 sandbags to Victoria and NSW in their emergency flood response. Future sandbag supply needed to be managed responsibly and strategically.

Faced with the task of protecting thousands of homes, hectares of farming land, entire townships, commercial properties and critical community assets and infrastructure, the SASES went looking outside the box, examining the use of DefenCell, a product that has been used primarily by defence forces around the world. Its use as a flood mitigation product is relatively new.

The 'built-to-order' product came in two types, gabions – a galvanised box shaped steel mesh cage and geotextiles – a flatpack concertina design with individual cells. Each has significantly different physical attributes but share the common characteristics of portability, durability, stackability and speed to construct. One of the greatest time saving elements of using the DefenCell product was the sand could be inserted using heavy machinery.

The SASES immediately placed several orders for the product for arrival by November 2022, taking the extra step of arranging the product to be flown to SA, instead of shipped. A 'just in time' training approach was undertaken at the facility, resulting in six senior SASES personnel undertaking a two-day training course. Training covered the different types of DefenCell products, ranging from small LITE and Ranger units to the larger T2 units, filling techniques, joining sections, repairs and stacking the units.

It soon became apparent installing the DefenCell was much quicker, more effective and required far less people than creating a comparable, traditional sandbag wall. The six trained SASES personnel were then able to plan the deployment of DefenCell and oversee and direct SASES personnel and external agencies and contractors through the construction of the product.

The SASES had been liaising regularly with local governments to identify and prioritise areas requiring flood protection including high value community assets such as hospitals and critical infrastructure, including water and power supply. Time frames, geographical and topographical restrictions which may preclude other flood mitigation options such as earthen levees, were taken into account.

Within two weeks the flood mitigation product was being deployed at key sites in several River Murray communities. A total of 16 installations were completed during the River Murray flood. In the township of Mannum, home to about 4,000 permanent residents, a 5 km long DefenCell wall was created in the main street to protect homes and businesses. On each occasion the product provided a positive flood mitigation result, taking into account expected seepage, in some cases the product was left in situ for more than two months.



*The DefenCell flood levee near the Renmark Club on Murray Avenue, (ABC News - Evelyn Manfield). Reproduced by permission of the Australian Broadcasting Corporation © 2023 ABC*

## Early recovery

Recovery is still underway. Importantly SA planning and building regulations have been amended to reduce vulnerability of replacement homes. This will coincide with the start of community consultation to shape the final, long-term code amendment – the River Murray Flood Resilience Code Amendment – which seeks to enhance the region's resilience and reduce the impact of any future flooding events or declared emergencies.<sup>12</sup> Nine Councils and the Pastoral Unincorporated Area were eligible for immediate financial support through the joint Commonwealth-State DRFA.

DRFA Assistance included personal and financial assistance, counter disaster operations, restoration of essential public assets, and support for small businesses, personal hardship grants, accommodation grants, re-establishment grants (household and personal effects) and re-establishment grants (structural repair).

In addition, the Commonwealth and SA Governments committed to cost-share the following assistance measures:

- Property Assessment and Essential Services Reconnection Program
- Small Business Recovery Grants
- Primary Producer Grants
- Coordinated Waster Management Program
- Blackwater Program
- Legal Assistance Program.

The Australian Government made the Disaster Recovery Allowance available for eight LGAs and the Pastoral Unincorporated Area.

<sup>12</sup> [www.recovery.sa.gov.au/active-recoveries/river-murray-flood/recovery](http://www.recovery.sa.gov.au/active-recoveries/river-murray-flood/recovery)

## What we observed

The River Murray floods have led to SASES conducting significant debrief and lessons management processes. To date, over 3,000 observations have been collected from internal and external stakeholders through over 40 debrief sessions. Whilst at the time of the AIDR Major Incident Report being authored the final SASES report was still to be completed, several early themes were identified.

Of note, the SASES did not wait until the end of the emergency to implement new practices from its learnings. The length of the event allowed the agency to drive positive change throughout the event, and the mantra of continuous improvement was evident at all levels of the event.

## The need for, and benefits of, multi-agency exercising

For the River Murray event, although some exercising of flood events had occurred prior, it was identified that certain components of the response were new to not only SASES, but all emergency management organisations, and exercising of these prior to their implementation would have been beneficial. Examples of this included the large-scale doorknocking campaign initiated by SASES, as well as the exercising of significant evacuation plans that were written for this event. Incident management personnel were given an opportunity on shift to exercise some plans, noting these were often interrupted by real life issues. Observations showed that personnel involved in the event would have benefited from further time being taken to exercise some of these activities outside of their incident management roster to ensure the systems worked, and they had the confidence to execute plans.

It was also identified that organisations often exercise for their own hazards, but rarely for hazards where they will carry out a significant support role. For the River Murray, SASES was well supported by organisations who combat other hazards, such as bushfire, however their personnel had not had the opportunity to understand the management of a flood incident through their exercising. Although just in time familiarisation, training and ongoing mentoring was provided, observations collected show that support organisations exercising hazards they are not the lead for would be advantageous to future events.

## Continuous improvement of information systems and technology

The SASES business unit of Information Systems played a critical role in the River Murray event, undertaking extensive development of new tools for the use of incident management personnel, first responders, and external stakeholders.

The SASES information system for incident management is known as SESIIMS – State Emergency Service Incident and Information Management System. It was SESIIMS that received significant upgrades to keep up with the events scale, extent, and demands of information and record keeping. The new tools developed were key to providing a single point of truth about emerging and critical issues.

Onboarding processes – It became evident very early in the event that SASES would need to be able to provide access to information systems for personnel from other organisations, not just within SA but across the country. Processes were developed to enable quick onboarding and access to SESIIMS, the Geohub, Microsoft 365 including generic function email accounts, Microsoft Teams and SharePoint.

The continuous improvement of information systems for the River Murray event was a significant positive lesson for the SASES. Information systems created during the event, supported by just in time training, proved critical to the successful management of the incident.

## DefenCell

Following an in-depth review of the successful emergency response to the flooding, the SA State Government announced a \$1.3 million investment to buy a stockpile of DefenCell and establish a strategic flood barrier reserve to assist in future responses to flooding events in the state.

The SASES will create a cache of 10,000 of DefenCell to be stored in different sites around the state to allow for rapid deployment.

# Case study 2 – North coast storms and floods (Tasmania)

Significant floods occurred in the north and northwest of Tasmania on the traditional lands of the Punnilerpanner peoples, affecting 62 residential properties. The areas affected by this flooding event were similar to the catastrophic 2016 flooding.

## What happened

Northern Tasmania experienced four severe weather events through October 2022. These events became Tasmania's most significant flood since 2016. The storm event of 12–17 October, with extreme rainfall, led to major flooding on the Mersey, Meander, Macquarie, South Esk and North Esk rivers and further widespread flooding in catchments across the Northwest and Northern regions and the River Ouse. Subsequently, there were evacuations of communities along the Gawler,

Mersey, Meander, South Esk and North Esk rivers. A dam safety emergency at Lake Isandula on the Gawler River above Ulverstone had the potential to threaten 42 residents below the dam. The record rainfalls (around 400 mm) saw new record peak heights around 14 October, including:

- Meander River at Meander – 3.75 m
- Meander River at Deloraine Train Bridge – 4.44 m
- Meander River at Strathbridge – 9.45 m
- Lake River at Parknook – 4.88 m
- Macquarie River at Cressy Pumps – 5.73 m
- The St. Patricks River at Nunamara – the gauge failed around the time of the flood peak but anecdotally was higher than other known flood events.

The event resulted in widespread damage to properties, businesses, farmland (including crops) and infrastructure.



Figure 26: Local Government Areas in Tasmania affected by the floods and eligible for funding under the DFRA

## Impacts and consequences

The storm event and subsequent flooding impacted locations within a similar footprint to the catastrophic floods of 2016. During the October 2022 events, 62 properties were affected. The total population of the areas that were at risk was 25,433. The Insurance Council of Australia estimates the number of claims was 600 and the costs of claims of this flood were \$12.4 million.

## Response and relief

Research, analysis, planning and practice development was undertaken after the 2016 floods. The TASSES, and its partnerships in the Regional and Municipal Emergency Management Committees developed new capabilities and approaches, including strategic flood mapping and modelling, community level flood planning, multi-hazards State Operations Centre and new warning systems. These new capabilities allowed for improved response in 2022, and reduced impacts and consequences. In 2016 three lives were lost, while in 2022 no lives were lost. In 2016 there was significant loss of livestock and farm equipment. In 2022 it was much less. Roads that were rebuilt after the 2016 floods were largely undamaged in 2022.

TASSES, as the Response Management Authority for flood, put in place its flood arrangements including the newly established Australian Warning System (AWS) through TasAlert and stood up the new Tasmanian multi-hazard State Operations Centre.

Under the new AWS, TASSES issued Emergency Alert warnings, and Watch and Act messages for multiple locations, including warnings to complement the Bureau of Meteorology's riverine flood warnings and additional messages for flash flooding in the Western Creek, Dampers Creek, Mole Creek, Lobster Rivulet and Leven River. At its peak, evacuation centres were set up in Deloraine, Latrobe, Railton, Newnham and West Ulverstone and evacuations were ordered across 17 LGAs.

In emergency broadcasting (EB), warnings for severe weather and flood watch covered in regular radio and social programs from 12 October, then significant coverage of flood warnings and impact including overnight updates and an earlier start for the Launceston breakfast program.

## Early recovery

The TAS Alert and TAS Recovery social media pages provided public information about the range of recovery measures available for people affected. The Disaster Assist website also provided information regarding available recovery assistance.

Eighteen LGAs were activated for immediate financial support through the joint Australian Government-State funded DRFA. Assistance included the provision Emergency Assistance Grants for people affected by the floods, counter disaster operations costs, repair of essential public assets and a community recovery officer.

In addition, the Australian and Tasmanian Governments committed to cost-share the following assistance measures:

- primary producer and small business recovery grants
- community and recreational assets clean-up and reconstruction package
- community and sporting organisations recovery grants
- private landholders' recovery grants.

The Australian Government made the AGDRP available in six LGAs and the Disaster Recovery Allowance in all 18 LGAs.

## What we observed

Since the 2016 flood event, work to establish the TASSES statewide strategic flood mapping enabled TASSES early prediction of areas likely to be impacted in this event. This informed operational response decision making, the issuance of warnings, evacuation planning and rapid impact assessments to inform recovery planning.

The use of the Specialist Intelligence Gathering (SIG) helicopter was of great benefit in providing real time video and still footage to the Regional Operations and State Operation Centres helping to inform incident intelligence, operational planning, and resource deployment.

The development of draft community level flood response plans provided key insights that assisted operational response planning, such as the positioning of the helicopter in the northern region to provide rapid rescue response and support. The additional staff employed as part of this initiative also played key roles in fulfilling the intelligence function at state and regional levels.

TASSES successfully applied the AWS for a flood event for the first time. This enabled the issuing of targeted community level warnings with clear calls to action before, during and after the flooding.

TASSES successfully utilised the new multi-hazard State Operations Centre. To sustain on-ground and incident management capabilities at local, regional and state levels, the TASSES staff and volunteers were supported and supplemented by skilled and experienced personnel from multiple government and private sector organisations.

Enhanced swift water rescue capabilities delivered by Tasmania Police and Surf Life Saving Tasmania enabled the provision of improved tactical level response capabilities at the local level.

# Case study 3 – Bushfires on the Western Downs (Queensland)

On 12 December 2022, high temperatures combined with significant fuel loads triggered bushfires in the Western Downs region that continued through to late March 2023. Bushfires were not limited to the Western Downs LGA, with significant bushfire activity occurring in areas contiguous to the Western Downs LGA, including Southern Downs, Goondiwindi and the Toowoomba LGA.

A continuous firefighter response was established and maintained from 6 January to 11 March 2023. The region sustained 522 fire incidents, including 38 bushfires exceeding four hours in duration. The final deployment was completed on 27 March 2023.

## What happened

The Western Downs LGA is approximately 2.5 hour drive west of Brisbane. With a population of approximately 35,000, it comprises a geographical area of 37,937 km<sup>2</sup> and includes the towns of Dalby, Chinchilla, Miles, Tara and Taroom. Major industries in the Western Downs region are agriculture and forestry. Western Downs boundaries fall across the Barunggam, Iman (Yiman), Bigambul, Wakka Wakka and the Jarowair Traditional Lands. Below to very much below average rainfall was recorded in the Darling Downs and Granite Belt District in February 2023. Dalby reported around 10 per cent of its average February rainfall in 2023. Low-to-severe intensity heatwave conditions affected large parts of the east coast of Queensland at the start of the month, and then the central to south-east coast around 12 to 14 February.



Figure 27: Western Downs region, Queensland

Drought conditions in late 2022 saw the canopies of cypress pine and eucalypt forests in the region opened, allowing prolific grass growth and rapid curing to 100 per cent by December 2022. All fine fuels became fully available to ignition by the middle of that month. All these factors combined resulted in a landscape that was predisposed for a bushfire season that commenced late in 2022 and lasted through to Autumn 2023.

The 2022–23 Queensland bushfire season (Operation Ochre) commenced in July 2022 and ended in April 2023. Conditions leading into the bushfire season were significantly affected by the La Niña climatic influence, with above average rainfall occurring across much of the state, leading to high soil moisture and significant growth of grass and vegetation. The conditions changed significantly from November 2022 onwards when there was a sudden rainfall deficiency across (totals in the lowest 10 per cent of observations since 1900) south-east Queensland.<sup>13</sup> Increased grass fuel loads from wet conditions earlier in the year resulted in a heightened bushfire risk. During the ensuing three months, the average daily rainfall in the Western Downs region was 2 mm and between 15 January to 7 March 2023, average daily temperatures exceeded 34°.

From 12 December 2022 to 27 March 2023, the Western Downs and surrounding regions sustained approximately 428 vegetation fires and 94 vegetation fires with exposure.

The Wieambilla and Tara areas were affected by multiple fires that swept through the region during December 2022 and January 2023. On 9 January 2023, the Queensland Police Service (QPS) made an emergency declaration regarding a bushfire in the Millmerran area and an exclusion zone was established between the Gore Highway and Millmerran Woods Road near the Wondul Range National Park. Several residents were subsequently evacuated, while on the morning of 31 January 2023, the Wieambilla and Tara areas were issued with a 'prepare to leave' order and four water bombers were deployed to assist in response activities.

On 12 February 2023, extreme fire danger was forecast for the Darling Downs and Granite Belt. In Channel Country and Central West in Queensland high fire danger was forecast. QPS made an emergency declaration for the Tara area, urging people to avoid the area. Temperature reached 41° and several bushfires started, including the largest fire of the season at Miles, resulting in 45,000 ha being burnt. In response to the bushfires, an evacuation centre was opened at the Tara Council Chambers.

On 13 February 2023, emergency evacuation warnings were issued to residents in Myall Park and Hookwood, near Miles, due to a fast-moving fire, placing properties under threat.

At 6.30pm the following day, Watch and Act Alerts were issued to Fairyland and Burra Burri residents because of a fire travelling from Nudley State Forest.

On 1 March 2023, another Watch and Act Alert was distributed to residents around Weir River at Moonie, in response to a large, fast moving vegetation fire. Queensland Parks and Wildlife Service (QPWS) and Department of Agriculture and Fisheries (DAF) joined firefighting efforts, deploying around 40 staff both on the front lines and in planning and support roles, after the fires entered state forests. QPWS and the DAF utilised heavy machinery to build containment lines, while six water-bombing aircraft and fire spotting planes were used to attack the flames from above.

On 3 March 2023, in response to a bushfire at Cattle Creek and a large slow-moving fire travelling towards Crowders Creek Road at Moonie, another Watch and Act Alert was issued to residents. A large air tanker from the NSW RFS was requested but it was deemed unsafe to fly in the dangerous conditions and a decision was made to cancel the drop. The Moonie bushfires continued for several days afterwards.

<sup>13</sup> [www.bom.gov.au/climate/drought/archive/20230306.archive.shtml](http://www.bom.gov.au/climate/drought/archive/20230306.archive.shtml)



Tara, (ABC News - Peter Gunders). Reproduced by permission of the Australian Broadcasting Corporation © 2023 ABC

## Impact and consequence

In total, there were an estimated 500 people impacted and 70 people displaced because of the bushfires. Evacuation centres were established at Miles and Tara to support their needs.

Throughout the period from 16 December 2022 to 27 March 2023, 119 damage assessments were undertaken, predominantly in Miles, Fairyland and between Tara and Kogan. The 119 damage assessments identified that 30 structures (22 structures and 8 sheds) were destroyed.

Many structures were uninsured and undefendable. Some people were treated for smoke inhalation or heat exhaustion and 22 injuries were sustained by firefighters. No disaster declarations were issued for the region.

Some economic losses were realised to graziers through pasture damage. There were short term disruptions to power supply during the Wallaby Track fire, however full power supply was restored, and people allowed back to their properties

within 48 hours of the fire. Overall, only minor disruptions to power were sustained in the region due to the rapid response from Ergon Energy.

## Response and relief

From 16 December 2022 to 27 March 2023, QFES officers and volunteers, including two fire behaviour analysts, from across Queensland were deployed to the region, with 1,600 deployments occurring overall.

The duration and severity of bushfires was mitigated through the strategic use of QFES Air Operations, providing mapping, reconnaissance, and line scanning. Air observers provided real time intelligence and mapping from aircrafts back to the Incident Controller. Between the period 6 January to 16 March 2023, warnings were issued from the south-western Regional Operations Centre and QFES' Fire Communications Centres logged triple zero calls and dispatched appliances to respond to bushfires in the region.

Event scale 12 December 2022 – 27 March 2023	
 <ul style="list-style-type: none"> <li>522 fire incidents</li> <li>428 vegetation fires</li> <li>94 vegetation fires with exposures</li> </ul>	 <ul style="list-style-type: none"> <li>119 damage assessments</li> <li>30 structures destroyed</li> </ul>
 <ul style="list-style-type: none"> <li>90,000 hectares burnt</li> </ul>	 <ul style="list-style-type: none"> <li>347 aircraft dispatched</li> </ul>
 <ul style="list-style-type: none"> <li>988 personnel deployed</li> </ul>	 <ul style="list-style-type: none"> <li>1,311 hours flown</li> </ul>
 <ul style="list-style-type: none"> <li>1,535 appliances responded to incidents</li> </ul>	 <ul style="list-style-type: none"> <li>1,582 triple zero calls logged</li> </ul>
 <ul style="list-style-type: none"> <li>6 emergency alert campaigns</li> <li>14,135 text/voice messages sent</li> </ul>	 <ul style="list-style-type: none"> <li>215 bushfire community warnings issued</li> </ul>

Table 5: Event scale 12 December 2022 – 27 March 2023

## Early recovery

On 14 February 2023 assistance under the jointly funded Australian and Queensland Government DRFA was activated for the period 30 January 2023 to 24 March 2023 for communities within the Western Downs region. Assistance included:

- Personal Hardship Assistance Scheme, including:
  - Emergency Hardship Assistance Grant, Essential Services Hardship Assistance, Essential Household Contents Grant, Structural Assistance Grant
- Counter Disaster Operations to assist agencies meeting costs associated with their response efforts
- Essential Services Safety and Reconnection Scheme, assisting residents with the inspection and reconnection of essential services that have been damaged by an eligible disaster. The scheme provides financial assistance to individuals and families as a contribution

- Reconstruction of Essential Public Assets, providing for emergency works, immediate reconstruction work, and reconstruction of public assets.

In February 2023, Western Downs Regional Council partnered with state and local organisations and non-government organisations including the Australian Red Cross, Arrow Energy, the Tara Shire State College and Department of Communities, Housing and Digital Economy, to activate the Western Downs Local Recovery Group and establish two recovery hubs in Tara and Miles to deliver support for residents impacted by the bushfires.<sup>14</sup>

Joint QFES and Western Downs Regional Council Community recovery sessions, facilitated by Southern Queensland Landscapes, were conducted on 26 and 27 July 2023 in Miles and Tara respectively.

<sup>14</sup> Western Downs Regional Council website 23 February 2023



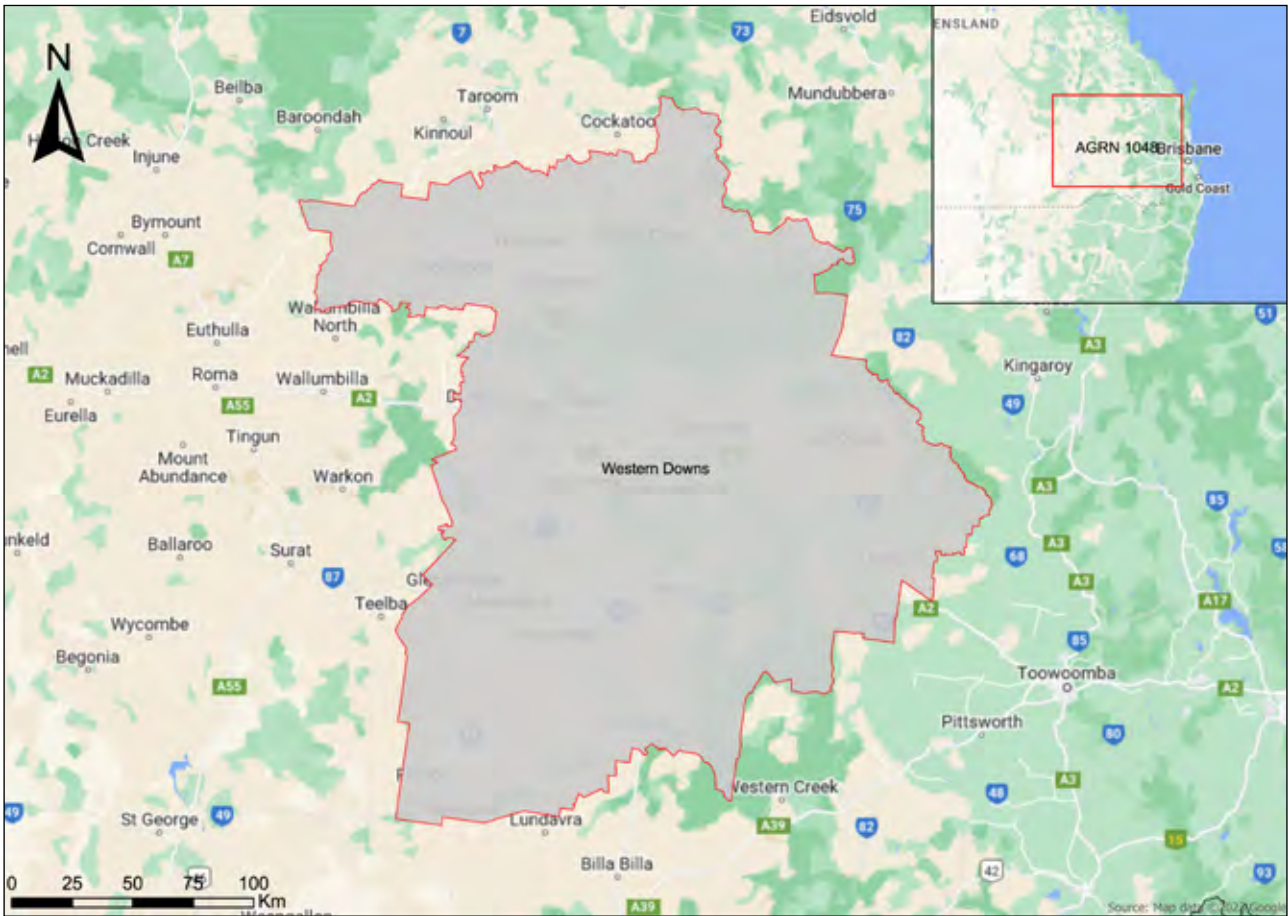


Figure 28: Map of affected LGA in Queensland (Disaster Recovery Funding Arrangements)

## What we observed

A review of the Western Downs Bushfires, applying a lessons management lens, is currently underway. The review will draw on after-action reviews, incident forms, debriefs and targeted surveys to examine QFES' response activities for the period 16 December 2022 to 27 March 2023.

One general observation, however, was the number of fires that were managed under four hours. The region's key response strategy of heavily weighted initial attack incorporating aircraft was extremely successful.

This event was notable because fire seasons have historically not extended into March. Bushfire seasons do not usually extend past January as late summer rains and storms arrive. The high volume of cured grasses and drought affected forest country greatly impacted on the fire behaviour coupled with a high number of ignitions caused by deliberately lighting of bushland.

# Case study 4 – Canberra recycling fire (Australian Capital Territory)

The Materials Recycling Facility at Hume in the ACT, located on the lands of the Ngunnawal people, provided waste management recycling services for the ACT and six surrounding regional NSW councils. A fire destroyed the facility on Boxing Day 2022.

## What happened

A structure fire on 26 December 2022 destroyed the Canberra Hume Materials Recovery Facility (MRF), located on the lands of the Ngunnawal people. The MRF provided waste management recycling services for the ACT and six surrounding regional NSW councils. The fire investigation report identified incorrectly disposed lithium batteries as the cause.



Figure 29: Location of materials recovery facility

## Impact and consequences

The recycling centre was destroyed with the loss of some recycling material. The bulk of the 1,270 tonnes of material on site was saved. The loss of the facility significantly disrupted the management of recycled material in the ACT and created an urgent need to adapt to less efficient and significantly more costly processes.<sup>15</sup> Since the fire, the ACT Government has been transporting the ACT's recycling material to three materials recovery facilities in Western Sydney and one in Victoria for processing. On average nine truck movements a day transport 229 tonnes of loose, unbaled material. Transport to Sydney was costed at \$75 tonne plus other fees.<sup>16</sup>

## Response

The fire was fully extinguished after four hours by 18 firefighting resources from ACT Fire and Rescue Service (ACTF&R). Complete extinguishment was not achieved until all recyclable material was removed from the building on 29 December 2022 (three days later). Community warnings and messaging were issued for smoke through social media and the ACT Emergency Incidents map for the surrounding suburbs including the neighbouring NSW suburb of Jerrabomberra. The messaging was aligned with incident development, evolving from providing advice to 'avoid the area', 'remain inside if smoke affected' in the initial response, to ongoing local road closures and continuation of rubbish collection services 12 hours later. Three updates were issued.

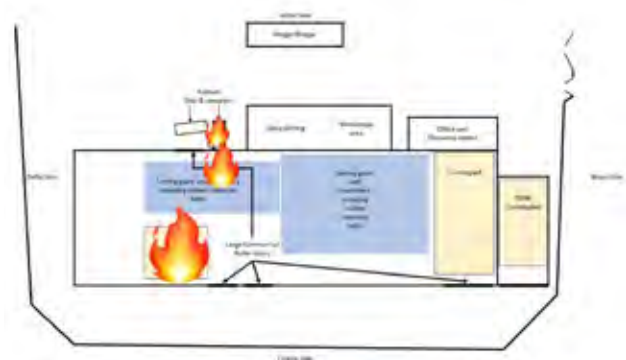


Figure 30: MRF structure layout. Image: ACTESA

<sup>15</sup> [www.abc.net.au/news/2023-01-06/act-recycling-being-sent-to-sydney-cost/101833064](http://www.abc.net.au/news/2023-01-06/act-recycling-being-sent-to-sydney-cost/101833064)

<sup>16</sup> [www.abc.net.au/news/2023-01-06/act-recycling-being-sent-to-sydney-cost/101833064](http://www.abc.net.au/news/2023-01-06/act-recycling-being-sent-to-sydney-cost/101833064)

Investigators later discovered that multiple batteries in the remains of the waste compacter had caused a thermal runaway which ignited the fire. The fire had quickly spread from the waste chute, igniting the conveyor belt and any remaining contents on the belt. The fire then transferred along the conveyor belt through the opening in the external of the wall into the internal of the building. The smoke was contained within the building, allowing it to spread throughout and preheating a nearby pile of cardboard located approximately 30 m away from the breaching point. Firefighting crews arrived as this pile was preheating.

Crews commenced operations on the Alpha side (see figure 30), attacking the active fire. As these operations were underway, the cardboard pile ignited and added to the smoke that was preheating other contents inside the facility. Due to the winds travelling in an easterly direction, the smoke was pushed down where two very large piles of co-mingled materials were stored (approximately 50–60 m away). These piles contained all items placed into the yellow kerbside recycling bins, predominantly consisting of cardboard, glass and hard plastics, such as plastic drink bottles and packaging. The smoke built up, preheated these materials to their ignition point, and once ignited, the fire was active in approximately 80 per cent of the MRF structure.

## Recovery

Completing the new recycling facility is a priority and it is anticipated the new MRF will be operational in 2025. Following the fire, the ACT Government is working with the NSW Government and NSW regional councils through the Canberra Region Joint Organisation to develop a communications campaign about the safe disposal of all types of batteries at B-cycle drop off points and other locations.<sup>17</sup>

## What we observed

There is a need to work more closely with the waste management sector to reduce future similar events.

The need for ACTF&R to build community knowledge through:

- increased community messaging regarding lithium battery hazards including making this a major theme of the Winter Home Fire Safety Campaign
- working with 'ACT NOWaste', to update the informative 'Recyclopedia' on correct disposal of lithium battery items
- updating the emergency services agency web page with current information regarding lithium battery hazards.

ACTF&R to work with the waste regulator:

- in assessing fire safety at waste facility sites
- to ensure waste facilities meet the AFAC guideline for stockpiling at waste facilities (a licence condition when new waste licences are issued)
- in making recommendations for storage and stockpiles of E-waste at E-waste processing sites to minimise risk.

ACTF&R to improve operational procedures by distributing lithium battery hazard tape to operations to identify battery hazards at incidents and notify battery owners of correct disposal methods.

<sup>17</sup> [www.qprc.nsw.gov.au/Council/Council-Business/Canberra-Region-Joint-Organisation-CRJO](http://www.qprc.nsw.gov.au/Council/Council-Business/Canberra-Region-Joint-Organisation-CRJO)

# Case study 5 – Bushfire Central Region (New South Wales)

A bushfire along Alpha Road, Tambaroora burnt from 6 to 23 March 2023. It was the largest bushfire in NSW since the fires of 2019–20 and the first since the introduction of the Australian Fire Danger Rating System. The value of early engagement with fire-affected communities was put on display as the NSW RFS worked to contain the Alpha Road Fire.

## What happened

Large parts of western NSW had seen record-breaking rain following the devastating fires of 2019–20, with the intense rainfall bringing prolific grass growth across the region. Tambaroora is a locality in Central NSW. It is on the lands of the Wiradjuri people. It has 32 dwellings. As of 2021, Tambaroora had a population of 30 people, with a median age of 60.<sup>18</sup> It

is the site of extensive historic goldfields, with gold being discovered in 1851.<sup>19</sup>

In the days and weeks leading up to the Alpha Road fire being reported on 5 March 2023, temperatures had been in the low-thirties, with low humidity and strong variable winds. Conditions were aggravated by significant fronts coming through which produced lightning storms with very little or no rainfall. This weather saw the rapid curing of grass and drying of undergrowth in the forested areas.

As a result of intense fire activity which impacted on rural properties and communities, heavy fuel loads and complex terrain, a declaration was made under the Rural Fires Act 1997 for the Mid-Western Regional Council area and part of the Bathurst Council area. NSW RFS was supported by other fire-fighting agencies including NSW National Parks and Wildlife Service, Fire Rescue NSW and Forestry Corporation NSW.

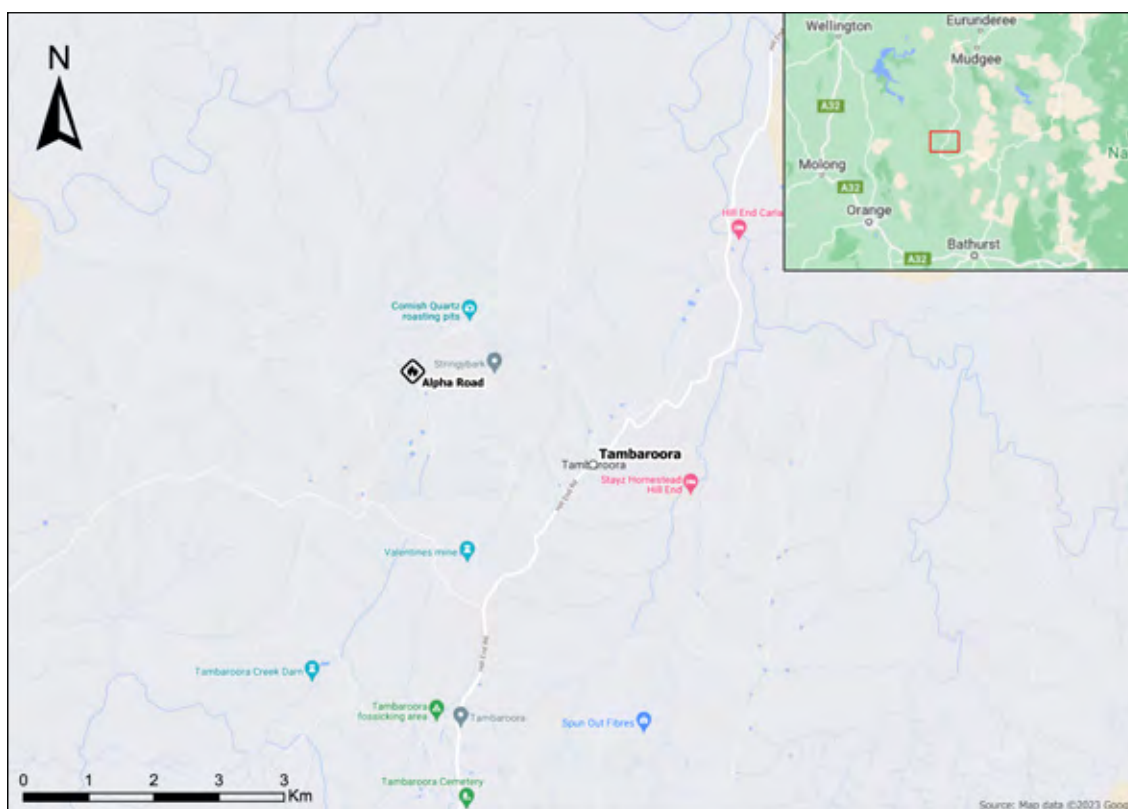


Figure 31: Location of Alpha Road fire

18 Australian Bureau of Statistics (2022) Tambaroora, 2021 Census QuickStats

19 Hodge, B (2013) Hill End and Tambaroora- A brief history

## Impacts and consequences

This fire significantly impacted the area burning over 17,900 ha and destroyed over 855 km of fencing. Six houses and one facility were destroyed, four homes damaged with over 550 livestock recorded as deceased. The emergency declaration was revoked on 23 March 2023. Many of the affected landowners had previously experienced devastating fires in the area and hence were understandably anxious about the severity of the Alpha Road fire. There was a notably positive response though from landowners, as they felt informed, and their concerns had been heard through the early and consistent engagement. Australian Red Cross reports that 20 people were registered in Register.Find.Reunite.

## Response

The Incident Management Team (IMT) made a concerted effort to engage with the community and provide regular updates on conditions and threats. This involved direct, regular engagement with local media, a strong social media presence and the scheduling of community meetings.

This engagement was further enhanced by the early activation of rural liaison officers and community liaison officers. These personnel were tasked with engaging with landowners in the immediate and surrounding areas to provide updates,

as well as to seek their input into firefighting operations and the prioritisation of asset protection – as they know their land better than anyone. Seven community meetings were held across the region, which were attended by hundreds of landowners. As the focus shifted from response into recovery, additional organisation representatives also attended meetings, including NSW Police Force, NSW Reconstruction Authority and Local Land Services.

## Early Recovery

On 21 March 2023, assistance under the jointly funded Australian and New South Wales Government DRFA was announced for the bushfires across Central and Central West NSW commencing on 6 March 2023. Assistance was made available for Bathurst, Bogan, Brewarrina, Coonamble, Dubbo, Mid-Western, Walgett and Warren, including:

- personal hardship and distress assistance
- counter disaster operations
- restoration of essential public assets
- concessional interest rate loans for small businesses, primary producers and non-profit organisations who have suffered direct damage
- freight subsidies for primary producers
- grants for non-profit organisations.



Hill End Sheep, (ABC News - Xanthe Gregory). Reproduced by permission of the Australian Broadcasting Corporation © 2023 ABC

# Case study 6 – Northwestern Australia flooding (Western Australia and Northern Territory)



Cyclone Ellie was a short-lived tropical cyclone (TC). However, as a tropical low, it spent two weeks over the Northern Territory and the Kimberley region of Western Australia where it caused enormous rainfall and flooding impacts on the landscape and communities, with some of the largest volumes of water and flows measured in Australia. The Kimberley and particularly the Martuwarra–Fitzroy River have a history of floods having experienced increasingly record floods in 1983, 1986, 2002 and 2022, with the latter being the biggest on record.

A tropical low formed within the monsoon trough to the northwest of Darwin in the Timor Sea on 21 December and intensified quickly as it moved south. The low reached TC intensity on the evening of 22 December 2022. TC Ellie crossed the Northern Territory coast just south of Daly River at 11.30pm. TC Ellie continued moving inland and weakened below tropical cyclone intensity during the morning of 23 December.<sup>20</sup>



Figure 32: Path of Ex Tropical Cyclone Ellie

As a tropical low, Ellie continued moving south-east across central parts of the Northern Territory, where heavy rainfall led to flooding in many communities, most notably Timber Creek, and cut major roads. From 27 December it steered to the northwest and moved into the Kimberley on 29 December. The low became slow moving over the inland Kimberley. Aided by a strong monsoon flow to the north, it produced multiple days of exceptionally heavy rainfall.

On 3 January the low slowly moved further west towards Broome. The ongoing rainfall resulted in the largest flooding of Martuwarra–Fitzroy River in recorded history. The Martuwarra–Fitzroy River reached its highest levels on record, peaking at 15.81 m at Fitzroy Crossing on the afternoon of 4 January,

isolating the town and many other nearby communities. This peak exceeded all previous records by nearly two metres at both Fitzroy Crossing and Willare, and by smaller margins at Dimond Gorge, Noonkanbah, Fitzroy River Barrage and Looma. At its peak the flow rate reached about 60,000 m<sup>3</sup>/s —well above the 23,000 m<sup>3</sup>/s usually seen during floods on this river, and one of the highest flow rates ever observed for any Australian river.

Heavy rainfall continued and Broome became cut-off by road due to flooding across the Roebuck Plains. The system began moving southeast on 6 January, eventually dissipating over the south-west of the Northern Territory on 8 January. The subsequent floods were extensive enough to be visible from space.<sup>21</sup>

Highest daily rainfall records were noted in the Northern Territory on 24 December at Timber Creek Victoria Highway 241.5 mm, Bradshaw Range Control 208.0 mm, Townsend Creek 193.2 mm and Victoria River Downs 184.6 mm. Dimond Gorge in Western Australia recorded 355.6 mm on 2 January. Further weekly records were set in Western Australia that week at Dimond Gorge 830.2 mm, Napier Downs 701.8 mm, and Broome Airport 570.8 mm. Limited telemetry in the region however means there are uncertainties as to the rainfall's full extent.

## The Western Australia experience

The Martuwarra–Fitzroy River has a large catchment of nearly 94,000 km<sup>2</sup> in the north-west of Western Australia. The river rises on the Durack Range before spreading across the broad Fitzroy River Valley and on to King Sound at Derby. It includes a major tributary in the Mary River. The valley is centred on the Shire of Derby West Kimberley and is home to 70 Aboriginal Communities. Administration and service centres are focused on Derby and Fitzroy Crossing. The area is remote, with Fitzroy Crossing being 260 km east of Derby and 300 km west of Halls Creek. It is approximately 2,524 km from the state capital of Perth.

As of 2021 population of the Fitzroy Crossing town-site was 1,022, with 552 dwellings<sup>22</sup> with a further 2,000 people living in Aboriginal communities throughout the Fitzroy Valley. About 80 per cent of the Fitzroy Valley population are Indigenous and most non-Indigenous persons live in Fitzroy Crossing, Derby or on pastoral leases.<sup>23</sup> The Martuwarra–Fitzroy River provides a strong cultural identity to the ten language groups in its vicinity.

<sup>20</sup> [www.bom.gov.au/cyclone/history/pdf/Ellie\\_2022\\_report.pdf](http://www.bom.gov.au/cyclone/history/pdf/Ellie_2022_report.pdf)

<sup>21</sup> [earthobservatory.nasa.gov/images/150814/flooding-along-australias-fitzroy-river](https://earthobservatory.nasa.gov/images/150814/flooding-along-australias-fitzroy-river)

<sup>22</sup> Australian Bureau of Statistics (2022) Fitzroy Crossing, 2021 Census QuickStats. [www.abs.gov.au/census/find-census-data/quickstats/2021/UCL515014](http://www.abs.gov.au/census/find-census-data/quickstats/2021/UCL515014)

<sup>23</sup> [www.wa.gov.au/system/files/2021-06/ABL-AboriginalCommunities\\_Map2\\_A4\\_r.pdf](http://www.wa.gov.au/system/files/2021-06/ABL-AboriginalCommunities_Map2_A4_r.pdf)



Figure 33: Map of the Martuwarra/Fitzroy River catchment showing Native Title boundaries and corresponding language groups

The economy of the Derby West Kimberley region is underpinned by community services, mining, oil and gas production, and food production on broadscale pastoral leases. Seasonal tourism on the Gibb River Road, National Parks and across the top end into the Northern Territory is popular. The Martuwarra Fitzroy valley is the natural conduit for the national land transport network, the Great Northern Highway, and communication and supply chains.

## Impacts and consequences

Communities were impacted in two ways, through direct water damage to property and infrastructure and/or subsequent isolation due to damage to roads and transport networks. The flood physically split the town of Fitzroy Crossing with the loss of the bridge.

Communities impacted in early January included Kupungarri near Mount Barnett, Muludja, DarIngunaya, Bungardi, Burawa, Junjuwa, Mindi Rardi, Kurnangk and Parukupan around Fitzroy Crossing.<sup>24</sup> The communities that were most significantly impacted were Fitzroy Crossing Noonkanbah, Looma, Kupingurri and Camballin. Road damage isolated all communities, stations and mines in the valley placing extreme pressure on essential supplies.

Infrastructure in and around Fitzroy Crossing were impacted the heaviest. The Great Northern Highway Bridge at Fitzroy River (herein referred to as the FX Bridge) and associated communications lines were destroyed, and wastewater and water supply assets were damaged at Fitzroy Crossing and Camballin. Power supplies and road access were impacted

across the region. The Great Northern Highway to the west of the Willare bridge was extensively damaged.

Damage to property and business was extensive. DFES received 251 requests for assistance (RFA). DFES Rapid Damage Assessment teams undertook assessment of 435 structures in Fitzroy Crossing and surrounds of these 150 were identified as unaffected or undamaged. Within the remaining 285 damaged structures, 85 were categorised as ‘total damage’, and 47 as ‘severe damage’, while 101 were classed as ‘moderate’, and 47 as ‘slightly damaged’. As well as engineering assessments of the badly damaged structures, 45 required specialist health assessments due to the presence or potential of hazardous materials. More than 120 homes owned by the state require repair or rebuild.



Tarunda IGA, (ABC News - Dylan Storer). Reproduced by permission of the Australian Broadcasting Corporation © 2023 ABC

<sup>24</sup> [www.bom.gov.au/cyclone/history/pdf/Ellie\\_2022\\_report.pdf](http://www.bom.gov.au/cyclone/history/pdf/Ellie_2022_report.pdf)

During the peak of the flooding more than 200 people were evacuated and 1,500 people displaced. Damage to property led to 117 displaced people being housed in Derby and 54 displaced persons were housed in Broome by the Department of Communities. Community members relocated from Noonkanbah were quickly returned home. Distance and isolation meant relocation was heavily reliant on air transport, sourced from ESD commercial and ADF aircraft. There were seven registrations with Register.Find.Reunite.

It was not only people who were displaced or moved to safety. Objects of cultural importance were moved to safety also, including the great Ngurrara Canvas that was moved to safety from Mangkaja Arts by young Traditional Owners, Bnuba rangers and artists. The great Ngurrara Canvas was painted by senior Traditional Owners of the Great Sandy Desert of northern Western Australia for presentation to the National Native Title Tribunal in 1997 as part of the case for Native Title. It has been shown in the National Gallery of Australia.



Fitzroy Meeting, (ABC News - Dylan Storer). Reproduced by permission of the Australian Broadcasting Corporation © 2023 ABC

The consequential impacts on wellbeing included the separation of families disrupted access to health services, the trauma of community member drownings and the renewed presence of mosquito born disease. The Bunuba, Gooniyandi, Nyikaina Mangala, Walmajarri and Ngarinyin – Wilinggin peoples experienced direct impacts from flood waters in homes and communities. Some Traditional Owners have described their grief and the extent of the damage and change to the river and landscape.



Image: Andrea Myers/Yanunijarra Aboriginal Corporation

Disruption is a regular occurrence during the wet season, but the intense nature of this event led to significant disruption to supply chains. Essential services were unavailable for one month due to both the FX Bridge being destroyed and the Great Northern Highway west of Willare being damaged. Special arrangements for supply were put in place involving air and sea transport, power and communications and the redirection of road transport through South Australia and Northern Territory.



Figure 34: Detour route for the supply areas to the northeast of Fitzroy Crossing



The FX Bridge is the only all-weather road connection between the west and east Kimberley. Road transport to Fitzroy Crossing was rerouted 12,000 km across the Nullarbor and through Central Australia to Katherine in the NT and onto the Kimberley, while a barge and low-level floodway solutions were implemented. To maintain the security of this supply chain, on days of high threat of fire risk in the area of the Great Eastern Highway additional firefighting resources were deployed by DFES to the Nullarbor. This supply route in the north was disrupted by the highway closure in the Daly River region caused by flooding in late February. Main Roads WA anticipate that it will take two years to rebuild the Fitzroy Crossing bridge. Recovery planning estimated a minimum five months to re-establish road supply chains at costs of greater than \$3 million per month.

The Derby–West Kimberley mining sector saw limited disruption from the flood and managed their own relief and recovery.

The pastoral industry of the Kimberley is predominantly cattle and is reliant on the annual ‘wet’ for seasonal fodder production. The extent of this year’s events has led to reported damage and livestock losses across the Fitzroy Valley at more than 50 stations. Initial assessments indicate the stations at Brooking, Nookanbah and Fossil/Liveringa appear to be most heavily impacted. Livestock losses are anticipated to exceed 10,000 head.

Losses to the tourism industry are anticipated at greater than \$50 million over the next two years.

The power and scale of this flood event could potentially have impacted rare and threatened species, caused the spread of weeds and pests and damaged culturally significant sites.

The Australian Wildlife Conservancy facility at Mornington was extensively damaged, but researchers have returned to document the response of the purple-crowned fairy wren to the floods. The purple-crowned fairy wrens proved to be resilient, with most birds having survived the floods. The population was estimated to be at 242 in May 2023, a slight decline compared to 256 birds in November 2022 (one month pre-flooding).<sup>25</sup>

## Response and relief

The response and emergency relief activities for the Martuwarra–Fitzroy River flood required an immense state and national level response which included human and physical resources, logistics and culturally appropriate community support. This scale of incident is complex and requires close cooperation and coordination at all levels of the emergency services, government sector, private industry, business, not-for-profit organisations and the community.

While DFES and the state provided significant resourcing, additional support from interstate organisations was needed. These resources were limited in availability and difficult to immediately deploy. The utilisation and mobilisation of all resources was heavily affected by the persistence of the tropical low and the impacts on ground and air travel to the region. Over 2,700 people were formally involved in the response activities.

Agency / Service	Total
DBCA	65
DFES	1310
External	53
Interstate	607
Volunteer	567
Australian Defence Force	150
<b>Grand Total</b>	<b>2752</b>

Table 6: Personnel numbers

The Shire of Derby West Kimberley, Aboriginal Corporations, DFES, other state and Australian Government agencies, have all been heavily involved in planning and delivering flood response and relief works. Along with DFES, state government included Department of Communities, WA Police Force, Department of Biodiversity, Conservation and Attractions, Department of Primary Industries and Regional Development. Federal government included Department of Defence and National Emergency Management Agency.

Immediate assistance was made available under the Australian-State Government DRFA including personal hardship and distress assistance, counter disaster operations, restoration of essential public assets, support for small businesses and primary producers. Significant, subsequent recovery packages have been jointly funded by the Australian Government and Western Australian Government, totalling more than \$258 million.

The Shire of Derby–West Kimberley advocated on behalf of the community and responded with mosquito fogging, local road repair and response and extensive rubbish disposal. Some of these activities may be jointly funded by Australian-State Governments under the DRFA. Environmental health officers worked with affected communities to determine strategies to ensure community safety.

Support for community and cultural needs included:

- establishing evacuation centres and relocation of evacuees to Derby and Broome
- property loss notifications
- community walk-throughs to facilitate escorted moves into community
- engagement of Department of Health to ensure repatriated persons are medically supported when returning home
- survey of Indigenous heritage sites
- development of an Indigenous Community Engagement strategy and appointment of community navigators by 30 January 2023, funded under the DRFA.

Emergency broadcasting (EB) was underway on the ABC from Thursday 22 December, following the tropical cyclone warning being issued with radio updates covering the cross-border warning zone for both NT and WA, beginning just after noon. EB coverage continued to track the impact of the system until major flood warnings for Fitzroy Creek began to ease to moderate on January 7. Local Indigenous languages were

25 [www.australianwildlife.org/angered-purple-crowned-fairy-wren-population-withstands-kimberley-flooding](http://www.australianwildlife.org/angered-purple-crowned-fairy-wren-population-withstands-kimberley-flooding)

incorporated into warnings during the entire event. Coverage included longer EB updates during the day at around every three hours at scheduled times 9am, midday, 3pm and 6pm, during this period until the threat eased and local programs took over with regular 'recovery' updates and coverage on radio, digital and social.

A feature of the response, relief and recovery activities has been the appointment of community navigators to support flood relief efforts within First Nations communities in the Kimberley. A unit leader and three community navigators worked with the Bunuba, Gooniyandi, Walmajarri and Nyikina communities in the Fitzroy Valley, which were all impacted. The community navigators are equipped with local knowledge and an understanding of the complexities of their communities, including kinship systems and languages. They will support community engagement in the flood response, disseminating important information relating to assistance from the state government and helping coordinate repatriations.

The initiative has been jointly funded under the DRFA and has been established in partnership with the Department of Biodiversity, Conservation and Attractions. It is designed to complement DFES' focus on a region-led response, with community navigators acting as a bridge between affected communities and government.<sup>26</sup>



Minister for Emergency Services Hon Stephen Dawson meeting with community leaders. Image: Marra Warra Warra Aboriginal Corporation

DFES staff provided the Incident Management Team whilst staff and volunteers undertook washouts and clean ups of flooded buildings and supported other services and agencies, such as Western Australia Country Health Service with specialised transport to deliver essential health support.

## Resupply

The logistics challenges for the response were of a national scale and involved close coordination between the Department of Defence and DFES. Initially DFES relied on its own and state managed aerial assets for resupply and evacuation. Further commercial transport from the private sector was accessed through the Emergency Situation Declaration to source heavy lift rotor aircraft for evacuation and resupply missions. This arrangement was not sustainable.

To sustain the response and relief effort, DFES facilitated the trucking of food and essential supplies to the town of Broome. These supplies were then barged 224 nautical miles to the port of Derby. Three barges undertook 14 voyages carrying up to seven road train trailers of assorted goods from 23 January to 5 February. These included foodstuffs, vehicles, fuel and essential goods. In the same time period, the ADF provided 27 relief flights in their Spartan aircraft from Broome to the key centres of Derby, Fitzroy Crossing or Halls Creek. Flights included cold store foodstuffs, evacuees, essential workers and dignitaries.

Supplies from Derby were generally airlifted for further distribution, by DFES or Department of Defence resources to communities, pastoral stations and those communities isolated by the loss of road access. Initial priority supply was to the communities of Kupungarri, Camballin, Looma and Fitzroy Crossing. This resupply effort was sustained continuously for ten weeks.



Emergency barges helping to resupply Kimberley communities. Image: DFES Media<sup>27</sup>

Whilst food and supplies were coming in, aircraft were the primary option for bringing support people in and evacuating impacted community members out. Limited accommodation meant that response personnel, tradespeople and support workers would need to be airlifted daily. Nearly the entire teacher community for Fitzroy Crossing were airlifted in to reopen the school after the Christmas school holidays.<sup>28</sup>

The ADF has played a significant role, with the movement of 14,000 people across 400 repatriation missions, and the moving of 1,000,000 pounds of total payload/cargo, including essential food, equipment and fodder to pastoral stations and vehicles.<sup>29</sup> Over 300 ADF personnel assisted with recovery and evacuation efforts using multiple fixed and rotary wing aircraft to such an extent that a mobile air traffic control centre was deployed to manage over 200 air movements a day from Fitzroy Crossing.<sup>30</sup>

26 [www.wa.gov.au/government/media-statements/McGowan-Labor-Government/Aboriginal-Community-Navigators-appointed-in-wake-of-Kimberley-floods-20230217](http://www.wa.gov.au/government/media-statements/McGowan-Labor-Government/Aboriginal-Community-Navigators-appointed-in-wake-of-Kimberley-floods-20230217)

27 [www.farmweekly.com.au/story/8041998/emergency-barges-sent-to-restock-kimberley-communities](http://www.farmweekly.com.au/story/8041998/emergency-barges-sent-to-restock-kimberley-communities)

28 [www.defence.gov.au/news-events/news/2023-02-02/teachers-flown-home-time-school](http://www.defence.gov.au/news-events/news/2023-02-02/teachers-flown-home-time-school)

29 [govhouse.wa.gov.au/2023/02/supporting-the-flood-affected-kimberley](http://govhouse.wa.gov.au/2023/02/supporting-the-flood-affected-kimberley)

30 [www.bom.gov.au/cyclone/history/pdf/Ellie\\_2022\\_report.pdf](http://www.bom.gov.au/cyclone/history/pdf/Ellie_2022_report.pdf)

## Early recovery

The early recovery process is expected to extend beyond two years, with the replacement of the Fitzroy Crossing bridge scheduled for completion in 2024. The appointment of a state recovery coordinator has led to a recovery plan with immediate, medium- and long-term objectives.

In addition to the early support provided under the DRFA for things like temporary accommodation and personal hardship grants, the Australian and Western Australian Governments have committed to cost share the following assistance measures:

- Freight Assistance program
- Temporary Accommodation program - Phases 1 and 2
- Community and Industry Recovery Officer program
- Clean-up program
- Temporary Workers Accommodation program
- Community Housing and Access Roads program
- Recovery grants for primary producers and small and medium businesses
- Homeowners Recovery and Resilience Grants program.

The Australian Government made the Disaster Recovery Allowance available for four LGAs and the Australian Government Disaster Recovery Payment available for one LGA.

Community programs and additional support for local community and business is being provided under the DRFA through dedicated recovery officers and cultural navigators. They are stationed in the region at Fitzroy Crossing and Derby Recovery hubs, pop-ups and conduct outreach to smaller communities.

The Lord Mayors Distress Relief Fund that was run, has closed with total donations received to the amount of \$12,024,393.57 (31 May 2023).

## The Northern Territory experience

Timber Creek is a township of 278 people with 43 dwellings.<sup>31</sup> It lies 285 km west of Katherine on the lands of the Ngaliwurra people. Nearly 60 per cent of inhabitants are Indigenous. Local government is the largest employer.



Figure 35: Locality map for Timber Creek, Northern Territory

31 Australian Bureau of Statistics (2022) Timber Creek, 2021 Census QuickStats

## Impact and consequence

A significant rain event in Timber Creek led to flash flooding and the subsequent displacement of some residents in Timber Creek and nearby homeland communities, including Gilwi, Myatt and Muruning, where floodwaters affected housing.



Figure 36: Rainfall at Timber Creek on 23 December 2022

The flooding forced the closure of several roads in the Victoria River District, including the Victoria Highway, which was impassable from Timber Creek to the WA border. Further heavy rain in central NT caused closure of the Stuart and Barkly Highways, cutting the Northern Territory 'top end' off from the remainder of the country.

## Response and relief

Timber Creek experienced flash flooding, with several properties and surrounding Aboriginal communities inundated. More than 100 residents and people visiting for ceremony from other

communities were displaced. There were some challenges in conducting an appropriate local response using NT and local government resources given that it was the Christmas period.

The community of Ampilatwatja located about 350 km north-east of Alice Springs and home to about 500 people, was cut off by both road and air for ten days due to the flooding.

On 30 December 2022, an assessment of the need for the powers under the emergency situation were considered by TEMC. At 9.00am on 31 December 2022, the response was officially handed over from Incident Controller to Regional Recovery Coordinator to commence recovery efforts. A coordinated recovery transitioned to a 'business as usual' model on 6 January 2023, with government and non-government organisations continuing to work along normal lines.

## Early Recovery

Six LGAs were activated under the joint Australian-Territory DRFA. Assistance provided included support for the immediate needs of affected residents. The funding also assisted councils to cover the costs of clean-up, repairing flood-damaged infrastructure back to a usable condition, and undertaking counter disaster operations.

### What we observed

The floods of the Fitzroy River are subject to a Major Incident Review where DFES works with partners and stakeholders to better understand their experiences and opportunities for adaptation or change.

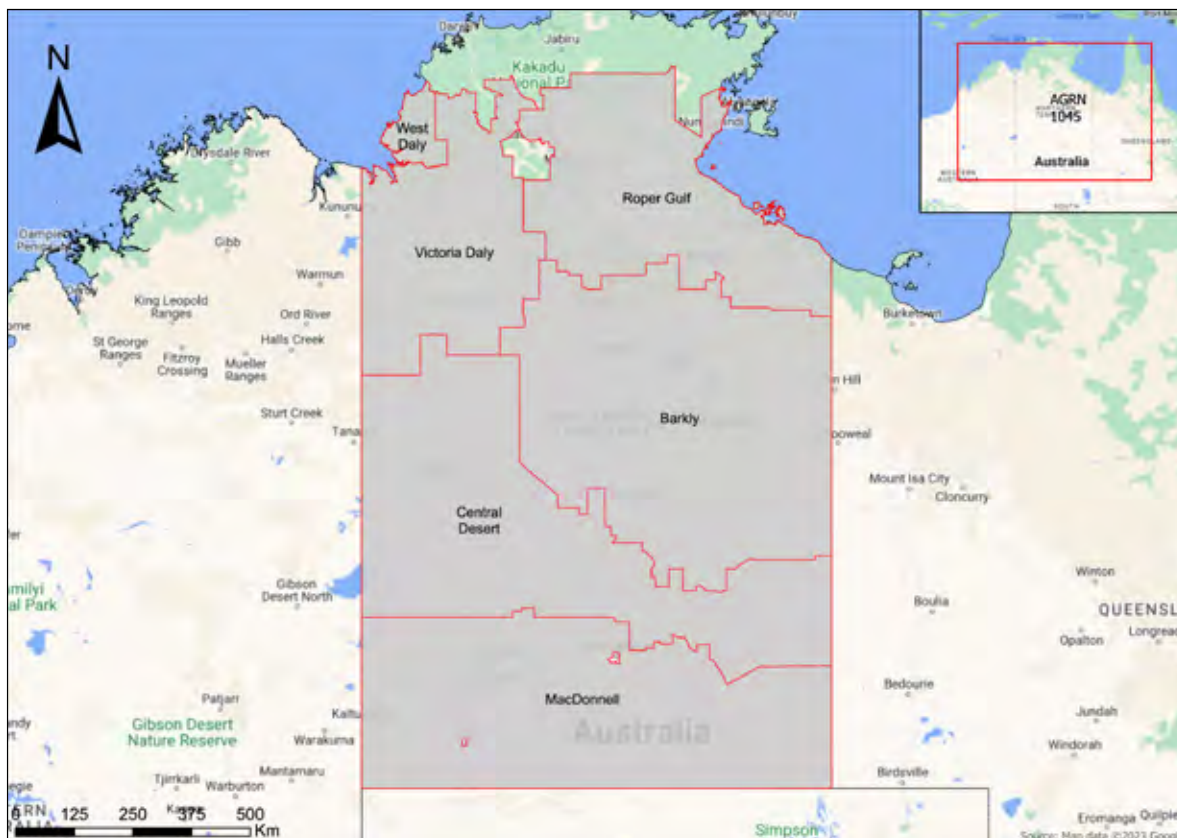


Figure 37: Affected Local Government areas, Northern Territory

# Case study 7 – Tropical low flooding (Northern Territory)



Significant rainfall caused flooding and long-term evacuation of a remote community. Extensive engagement with traditional owners of lands led to the establishment of a temporary village.

## What happened

Heavy rain fell in the Daly and Victoria rivers in late February 2023. The week of 21 to 28 February saw storms and heavy rain across the northern tropics, with weekly totals of 150 to 300 mm from the eastern Kimberley (Western Australia), through the Northern Territory top end and the Cape York Peninsula (Queensland). Minor to moderate flooding resulted in some areas, leading to the closure of the Victoria Highway in the Katherine region. Several stations in the Kimberley and the west of the Northern Territory had their wettest February day on record at the end of the month.



Figure 38: Victoria River Valley

The consequences of this rainfall event were felt most strongly at Kalkarindji, Daguragu and Nitjpurru communities in the Victoria River Valley, on the lands of the Gurindji people. These First Nations communities are remotely located southwest of Katherine. Kalkarindji is situated approximately 460 km from Katherine on the Buntine Highway, adjacent to the Victoria River, with Daguragu, 8 km north-west of Kalkarindji, alongside Wattie Creek. Nitjpurru is located 350 km south-west of Katherine.

Kalkarindji and Daguragu are the population centres of the land formerly held under the Wave Hill Cattle Station and are important historic centres in Australian history.<sup>32</sup>

Nitjpurru is home to 150 people. Located on the Victoria River, Nitjpurru was formerly part of the Pigeon Hole Station. The community is regularly impacted by floods with most of the community adjacent to the banks of the Victoria River.

## Impacts and consequences

The flooding of rivers and roads resulted in the main highway between the NT and WA being closed. This route was being used to supply the Kimberley with road freight, as the highway between Broome and Fitzroy Crossing was closed in January due to severe flood damage caused by ex-TC Ellie in December. Damage was extensive at the Kalkarindji, Daguragu and Nitjpurru communities with essential services being destroyed and homes inundated to roof level in some cases.

In Nitjpurru all properties were affected, with seven houses demolished and replaced under an accelerated housing replacement program. Power and water infrastructure were significantly affected. Repair work was slowed by months due to damage to the Pigeon Hole road.

In Kalkarindji 79 buildings were undamaged, 38 had moderate damage, and 18 had severe damage. The power and water infrastructure were undamaged. However, the police station was severely damaged by water inundation. The store in Kalkarindji was undamaged but did not operate for almost two weeks. A bridge on the Buntine Highway at Gordy Creek was structurally compromised by flood waters.

In Daguragu, the water supply infrastructure had been destroyed and was subsequently replaced, as was power infrastructure. There were 41 properties with severe damage and only six properties not affected by flood waters.



A temporary camp was set up by NSW RFS for Nitjpurru flood evacuees on the Yarralin oval, (ABC News - Pete Garnish). Reproduced by permission of the Australian Broadcasting Corporation © 2023 ABC

32 [www.nma.gov.au/defining-moments/resources/wave-hill-walk-off](http://www.nma.gov.au/defining-moments/resources/wave-hill-walk-off)

## Response and relief

Community members at Kalkarindji, Daguragu and Nitjpurru were evacuated to Katherine by air due to essential services and homes being inundated with floodwaters. Approximately 700 people were initially displaced, and around 300 were displaced for over a month. From Katherine, community members were taken by bus to the Centre for National Resilience in Darwin. Australian Red Cross reports that 769 people were registered in Register.Find.Reunite.

As pets and camp dogs could not be evacuated with their owners, a tonne of dry dog food was provided to contractors to keep dogs fed until their owners returned.<sup>33</sup>

Precious artworks and historical artefacts, kept in the Kalkarindji Art Centre, were saved from flood damage by moving them to safe storage.

## Recovery

Assistance under the jointly funded Australian-State DRFA was made available in two LGAs, as was the Australian Government Disaster Recovery Payment and Disaster Recovery Allowance.

By late April, the NT Government had established temporary emergency accommodation to facilitate the return to Country for people displaced from Kalkarindji, Daguragu and Nitjpurru. In Kalkarindji and Daguragu, 16 demountable 'pods' were installed in late April to house residents while major housing repairs were undertaken. The pods, of varied design, contain lockable bedrooms, shared living, cooking, laundry space and covered breezeways. The pods were installed on existing serviced lots providing access to power, water and sewerage connections, with all demountables sourced from local NT businesses.

With Nitjpurru being uninhabitable for several months, residents were temporarily relocated to nearby Yarralin to remain close to Country. Residents were housed in Western Shelter Emergency Accommodation Shelters (EAS) established on the community oval and maintained by NSW RFS. This was funded through the DRFA. NSW RFS is well-versed having supplied similar humanitarian support on Elcho Island in the wake of Tropical Cyclone Lam in 2015 and during major flooding in Deniliquin in 2011.

Traditional Owners and residents were extensively consulted before agreeing to establish the EAS on their lands. This was supported by the Northern Land Council, Victoria Daly Regional Council and the Walangeri Ngumpinku Aboriginal Corporation. An NSW RFS advance party arrived in the Northern Territory on 26 March. This initial mission was to discuss the scope of assistance available from NSW RFS and identify possible locations.

Extensive engagement continued between NT Government, NSW RFS, Elders Northern Land Council, Victoria Daly Regional Council and the Walangeri Ngumpinku Aboriginal Corporation and other community members to ensure cultural and personal needs were addressed during the planning process.

A formal 'request for assistance' was received on 20 April, prompting the uplift of resources from the NSW RFS Logistics Centre at Glendenning in Western Sydney. The transportation of all the required equipment was by road, from Western Sydney to Yarralin, via Dubbo and Katherine.

The construction of the temporary emergency accommodation was undertaken by NSW RFS personnel, who established the site in just two and a half days, in oppressive heat and humidity. The site accommodated up to 200 displaced residents each night which included catering, ablutions and other support services.

The effort enabled the residents of Nitjpurru to move into the Yarralin site by the end of April. This move allowed the communities to get back on Country and connected to their cultural ties while recovery work was undertaken.

The site was in operation for several months and saw strong relationships forged between the NSW RFS personnel operating the facility and the Nitjpurru community. The community has now returned as housing repairs are completed.

### What we observed

Case studies 6 (NT experience) and 7 are the subject of a full review and the findings will be released in due course.

<sup>33</sup> [www.abc.net.au/news/2023-03-09/nt-one-tonne-dog-food-for-flooded-remote-community/102070990](http://www.abc.net.au/news/2023-03-09/nt-one-tonne-dog-food-for-flooded-remote-community/102070990)



Tent School, (ABC News - Evelyn Manfield). Reproduced by permission of the Australian Broadcasting Corporation © 2023 ABC



# Case study 8 – HAZMAT radiological incident (Western Australia)



The Gudai-Darri HAZMAT incident in the northwest of Western Australia captured international and national attention as technical specialists attempted to find a 'needle in a haystack' by searching for a highly hazardous capsule in an extensive remote area.

## What happened

A radiation emitting device, smaller than a ten-cent coin at 6 mm x 8 mm in size, was lost during road transportation between the Rio Tinto Gudai-Darri mine site north of Newman and the repairer's depot in Malaga in the metropolitan area of Perth between 12 January 2023 to 16 January 2023. It was discovered missing on 25 January. The device included a small quantity of radioactive material Caesium-137 (Cs-137) and fell out from inside a density gauge and its transportation container.



Image: DFES (WA)

The device was packed on 10 January and fell out during the journey through a loosened bolt hole in the transport container, and then from the trailer onto the road. WA Police Force advised DFES on 25 January as the hazard management agency (HMA) responsible for HAZMAT incidents. This event occurred concurrently with the DFES state response to the Kimberley floods.

## Response

DFES assumed control of the HAZMAT Incident and was declared Level 2 at 3.00pm Thursday 26 January. Incidents of this type are not common in Australia and require specialist expertise. An Australian Government Physical Request for Assistance (AGPRA) for resources to support the HAZMAT incident was submitted. The request was to assist in the search, location of, and render safe of the lost Cs-137 source. The request was fulfilled by ADF and the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). ARPANSA partnered with the Australian Nuclear Science and Technology Association (ANSTO), which was approved by DFES as the HMA and NEMA the national coordinator. Specialised radiation detection equipment was provided to support the search.



Figure 39: Map of truck route and search area

Given the specialised nature of the incident and its location, a 12-person integrated IMT was established to support 40 roadside searchers. The multi-disciplinary team came from DFES, Department of Health – Radiation Health; ARPANSA, ANSTO, ADF, WA Police Force and Main Roads WA. The challenge was likened to a needle in a haystack as the potential search area was 1,400 km long and ten metres either side of the transport route, in summer conditions of high temperature and humidity. Assuming a 30 m average search width, this was an approximate 4,200 ha search area.



Planning the 1400 km search. Image: DFES (WA)

Given the potential harm of the radiation source, a HAZMAT general warning was put in place for a 'Radioactive Substance Risk' for parts of the Pilbara, Midwest Gascoyne, Goldfields-Midlands and Perth Metropolitan regions, advising:

*"There is a radioactive substance risk in parts of the Pilbara, Midwest Gascoyne, Goldfields-Midlands and Perth Metropolitan regions."*

The WA Department of Health (DoH) further released a health advice urging people not to touch the device if found.

Seven days after the initial advice and scaling up the search, the device was found at 11.13am 1 February. The source was located approximately 74 km south of the town of Newman on the Great Northern Highway, two metres off the road. The device was then transported to Perth's QEII Medical Centre (Radiation Health Storage Facility) for handover to the DoH Radiation Health branch. The area surrounding the source was surveyed and was declared contaminate free.



"Needle in a haystack" searching by foot for small radioactive pellet Image: DFES (WA)

Rio Tinto undertook its own internal investigation on the loss. As a form of recompense to the WA State Government for the costs associated with the search exercise, Rio Tinto donated a 40-person mobile workers camp to the state government and delivered it to Fitzroy Crossing to support the recovery efforts in the wake of the recent Kimberley floods.

## What we observed

A key success factor was early and decisive decision making at the state level, given the unique and challenging nature of the event, and the commensurate response effort required. After initial investigations conducted by WA Police Force and DoH, DFES was alerted to the incident. This triggered DFES to convene high level multi-agency consultation to better understand the risks and potential impacts of this event. The outcome of this consultation led to the establishment of the DFES led, state level multi-agency response effort which engaged national expertise and technology to resolve the event. While the response scope was overwhelming in a geographical and technological context, a clear decision was made to move quickly to bring specialists together with a clear purpose and strategy to deliver the required outcome.

Significant national and international media interest resulted from this incident. Social media re-posts and influencers commented on the story, and social media views were in the tens of millions across multiple platforms (Facebook, Instagram, TikTok, YouTube and traditional media networks and affiliates globally).



# Case study 9 – Echunga dam failure (South Australia)



There are more than 30,000 privately owned dams in South Australia, some of which would pose a significant threat to downstream communities if they were to fail during a flood event.<sup>34</sup> After significant rainfall in September 2022, a dam on private property in the Adelaide Hills showed signs of potential failure, threatening the small township of Echunga situated below the dam wall.

## What happened

Echunga is a small town in the Adelaide Hills on the lands of the Peramangk people, about 34 km south-east of Adelaide with a population of around 1,219 people and 473 private dwellings.<sup>35</sup>

Following persistent rain through the winter of 2022, the ground of the Adelaide Hills was saturated and run off was filling most dams in the Adelaide Hills region.



Figure 40: Map of Echunga

<sup>34</sup> [www.ses.sa.gov.au/flood/during-a-flood/dams](http://www.ses.sa.gov.au/flood/during-a-flood/dams)

<sup>35</sup> Australian Bureau of Statistics (2022) Echunga, 2021 Census QuickStats

The 10 ML earthen dam was located on farming land between Marianna Street and Churchill Road. This dam was approximately 500 m immediately uphill of the Echunga township.

On the afternoon of 27 September 2022, SASES was alerted by a property owner about the large private dam showing signs of slippage.

## Impact and consequences

In this instance the disaster was averted. Had the dam wall failed a flash flood would have inundated properties through the centre of the Echunga Township and caused damage and disruption to the community.

Whilst disaster was averted in this event, it has drawn a closer focus on the extent of the risk posed by private dams in SA and the importance of the promotion and education about good dam maintenance.<sup>36</sup> In late June 2023 the SES issued 'Watch and Act' messages for a further two dams at high risk of failure at Basket Range and Hope Forest.

## Response and relief

An immediate response was provided by SASES volunteers to assess the situation, including high volume pumping and swift water rescue resources. Initial assessments identified options for the trenching of the dam's spillway which had silted over, as well as reducing the water level of the dam through pumping.

Complexity was found in the challenge of reducing water levels from the dam to achieve a safe water level. The dam was full due to the winter rains however, this meant the surrounding lands were also saturated. Access to the dam with high volume pumps was severely inhibited by boggy ground.

When pumps were able to commence pumping, the restraints of stormwater capacity added to the complexities. The stormwater network throughout Echunga had limited capacity to handle water commensurate to the amount of water that could be pumped from the dam. This reduced the amount of pumping that could occur, extending the time to pump and leaving pressure on the highly compromised dam wall.

A 'Watch and Act' message was issued for at risk areas of Echunga. However, recognising that the community may not be actively monitoring those channels, the IMT chose to undertake door knocking of high-risk areas. This was supported with several proactive mainstream media notifications, via the ABC.

SASES, supported by many government and non-government organisations, worked around the clock to reduce water levels in the dam. This was done under the control of a Level 2 IMT.

In the early hours of 28 September 2022 further slippage of the dam wall was observed, and an emergency warning message was issued. This warning message came in the early hours of the morning, a time when people would likely be asleep. An Emergency Alert message was sent in conjunction. However, it was noted many people may not be woken by a notification of a message on their phone. Again, door knocking became a critical tool for public information with approximately 60 properties door knocked to inform them of the escalating emergency.

The Engineering Functional Support Group sourced engineers to provide ongoing advice on the structural integrity and technical guidance on safe draw down actions. A zone emergency support team (ZEST) was activated to ensure all the key stakeholders were engaged. Through continued pumping efforts the water level started to drop and slowly pressure was taken off the dam wall. The threat continued to be monitored and was continually reviewed by dam engineers on site. After a daylight inspection on the 29 September 2022 the dam was declared safe as pumping efforts saw water levels reduce below the slippage level.

State relief and recovery organisations accommodated two residents and facilitated an evacuation centre for 20 attendees at the local Echunga Football Club, where local community volunteers were providing food and offering support.<sup>37</sup>

## Recovery

The landowner is working with state and local government authorities to make the dam safe for the future. New guidelines aim to provide information for private dam owners regarding their responsibility to maintain their dams to reduce the risks they pose to downstream communities and what to do if a dam threatens to fail or spill.

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<sup>36</sup> [www.ses.sa.gov.au/flood/during-a-flood/dams](http://www.ses.sa.gov.au/flood/during-a-flood/dams)

<sup>37</sup> [www.abc.net.au/news/2022-09-28/sa-echunga-dam-fails/101480452](http://www.abc.net.au/news/2022-09-28/sa-echunga-dam-fails/101480452)

## What we observed

### A better understanding of the complexity of dam failure incidents

SASES had not faced a dam failure incident since 2016. In response to the 2016 events, an agency Dam Response Plan was written and exercised, but thankfully no incidents had been recorded.

The Echunga Dam incident is considered a 'sunny day' event for the SASES. That is, although the incident occurred at the end of a particularly wet winter, the incident did not occur during an extreme weather or flood event. These conditions provided SASES with its first complexity, which was establishing appropriate incident management and rostering.

During extreme weather or flood events, SASES has established structures for incident management at the local, regional, and state level. Each of these levels would have around the clock rosters. Outside of these events SASES has well-embedded operational structures for the management of day-to-day incidents. At volunteer level, each unit has volunteers available to respond to incidents, and assist with the management of Level 1 incidents. At staff level, a cohort of staff are rostered 24/7 to aid volunteers in the management of incidents, provide public information and warnings functions, and provide regional and state level control and coordination of incidents.

The Echunga Dam incident commenced in the late afternoon. With this type of incident being a new experience for everyone involved, the true scale of the incident was not understood early. Volunteers and staff commenced the response. As the incident escalated overnight and the scale of the incident became clearer, those involved in the control and coordination commenced strategic rostering whilst also focussing on community safety.

SASES has taken the learnings about the complexities of dam failure and embedded them into their practices for future incidents. With a better understanding of the timeframes to manage and resolve incidents, and the equipment and pumping restraints, dam failure incidents are resourced much more appropriately.

### Public information strategies and community engagement

The 'sunny day' nature of the Echunga Dam incident also contributed to challenges in the public information space. Unlike a day of extreme weather or total fire ban as examples, members of the community were not at a heightened level of vigilance or preparedness. People were not monitoring their usual outlets for advice or warnings about an emergency.

Consideration throughout the escalation of the event was given to the community's understanding of dam failures. As outlined in other learnings, SASES were beginning to understand the complexity of these incidents, so it would be reasonable to expect community members would have less understanding of dam failures and how they should act. Residents of Echunga were further informed about the situation through cooperation with the mainstream media via press conferences, and established community meetings.

### The importance of partnerships, especially the ZEST

Well established partnerships at local, regional, and state levels with external stakeholders ensured the response to the Echunga Dam incident saw a successful resolution. Even with the 'sunny day' event challenges, external stakeholders provided critical support to the incident, with many being able to be contacted and involved through pre-established partnerships and relationships.

Department of Environment and Water (DEW) are the hazard leader for floods in South Australia, and support SASES during flood incidents with mapping and hydrology services. The importance of having a well-established partnership with DEW was highlighted during this incident, as those involved in the management of the incident were already familiar with DEW staff, the products they provide, the timeframe for these products, and what else they could ask of the agency.

South Australia Police (SAPOL) play a critical role in all emergency incidents as the legislated coordinating agency for the state. Although many would say the partnership with such an agency is a given, in this case it was the well-established relationships and understanding between key contacts that proved the most beneficial. With an escalating incident and the need to involve SAPOL, SASES personnel knew exactly who to call and how to reach them. The involvement of SAPOL ensured the coordination of other state government resources occurred efficiently, the activation of the zone emergency support team (ZEST). The ZEST is where agencies such as education and health are provided briefings, and the opportunity to let SASES know what implications the emergency has for them. Through active participation in zone level planning meetings and exercises, the ZEST was able to be used effectively to help resolve the incident.

The day-to-day business for SASES personnel in establishing and maintaining partnerships and relationships paid dividends in this incident. SASES has also been able to identify those organisations where partnerships and relationships need to be fostered for better results.

# Appendix

The production of the Major Incidents Report is guided by a Steering Committee convened by the Australian Institute for Disaster Resilience and selected by the Commissioners and Chief Officers Strategic Committee.

## Steering Committee Membership 2022–23

Australian Capital Territory Emergency Services Agency	Robert Kilpatrick
Australian Institute for Disaster Resilience	Isabel Cornes (Secretariat)
Australian Institute for Disaster Resilience	John Richardson (Chair)
Bureau of Meteorology	Karen McPaul
Darryl Glover Planning	Darryl Glover (Writer)
Emergency Management Victoria	Zed Senbergs
Fire and Rescue New South Wales	Trent Lawrence
National Emergency Management Agency	David Long
National Emergency Management Agency	Joe Buffone
New South Wales State Emergency Service	Daniel Austin
New South Wales Rural Fire Service	Ben Millington
Northern Territory Emergency Service	Gemma Bellenger
Northern Territory Emergency Service	Robert Evans
Queensland Fire and Emergency Services	Kevin Thom
South Australia State Emergency Service	David O'Shannessy
Tasmania State Emergency Service	Cheryl Ames
Victoria State Emergency Service	Gerabeth Abbott
Western Australia Department of Fire and Emergency Services	Rick Curtis

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Australian Red Cross	Amanda Aridi, Eleanor Carter
Department of Fire and Emergency Services	Clint Kuchel, Darryl Ray, David Cowdell, Dave Gill, Gareth Cornish, Gemma McLachlan, Kate Vivian, Leon Gardiner, Nathan Hall, Phil Brandrett
Emergency Management Victoria	Lisa Marie Jackson
Insurance Council of Australia	Ajinka Gaikwad
Marra Worra Worra Aboriginal Corporation	Ruth McIntyre
National Emergency Management Agency	Alina Green, Damien Shearer, Jacqui Cristiano, Yaba Odaro
National Resource Sharing Centre	Barry Gray, Gabriel Scamozzon, Paul Considine
NSW Rural Fire Service	Tim Williams
NSW State Emergency Service	Heather Stuart
NT Department of Chief Minister and Cabinet	Scott Perry
NT Emergency Service	Brian Hennessy
SA State Emergency Service	Liz Connell
TAS State Emergency Service	Bianca Campbell, Lynley Hocking
VIC State Emergency Service	Tim Wiebusch
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