Project Resilience

Gawler River Catchment, Adelaide Plains, SA

DISASTER RELIEF AUSTRALIA

DISCLAIMER: Please note that the information provided in this report on disaster resilience measures to a community is intended to be of a general nature and should not be considered as specific or comprehensive advice. The recommendations and strategies suggested may not be appropriate for all circumstances, and it is important to tailor any resilience measures to the specific needs and circumstances of the community concerned. Furthermore, the advice presented is based on the available information at the time and may not take into account any future changes or developments. Therefore, it is recommended that any decisions regarding disaster resilience measures be made only after careful consideration of all available information, consultation with relevant experts and stakeholders, and in compliance with applicable laws, regulations, and guidelines. The author and publisher of this advice cannot be held liable for any damages or losses that may arise from the use of this advice.

Our Intent

"Project Resilience" is a system (similar to a community) that is used to monitor disturbance and still retain a basic function and structure. Building resilience means to intentionally guide the system's process of adaptation to preserve some qualities and allow others to fade, while retaining the essence—or "identity"—of the system.

In a community, identity is determined by what people value about where they live. However, what a community collectively values is open to interpretation and subject to disagreement.

Although many resilience frameworks and tools for building community resilience are now available across Australia, it is unlikely a single approach will work for all communities and their varied social and economic contexts. The Project Resilience Team has identified six foundations that it considers essential, no matter where or how resilience-building efforts are undertaken, or what challenges are of most local concern.

These foundations support building community resilience rather than achieving resilience. Resilience is an ongoing process.

What DRA thinks Resilience is:

People: Resilient people are aware of situations, their own emotional reactions, and the behaviour of those around them. By remaining aware, they maintain control of a situation and think of new ways to tackle problems. In many cases, resilient people emerge stronger after such difficulties.

Making Sense: Making sense of a problem is essential for understanding the bigger picture. Making sense of things is a way to explore and develop effective future plans at a community level.

Bouncing Back: Resilient communities can bounce back from adverse situations. They can do this by actively influencing and preparing for economic, social and environmental change.

Striving Forward: As we look to the future, some challenges will be so big that it won't be possible for the community to simply adapt. Fundamental changes will be necessary, and the community will need to adapt.

Our Human Needs: A sustainable community is a place where people want to live and work, both now and in the future. The community needs of existing and future residents are sensitive to environment and contribute to a high quality of life. These communities are inclusive, well-planned, built and run, and offer equality of opportunity and good services for all.

Courage: Everyone within a community needs the courage to confront challenging issues and take responsibility for a collective future.

Based on: The Community Resilience Leader. Essential Resources for an Era of upheaval 2016

1. Disaster Relief Australia Resilience Process

The Disaster Relief Australia (DRA) Resilience Process is a four-stage process. Each stage is broken down into steps. Overall, the DRA Resilience Process provides effective guidance and direction to each Disaster Relief Team (DRT) across Australia. A future DRA Resilience Framework is in development. The purpose of the DRA Resilience Framework will be to:

- Support DRT Managers to assess and prioritise community-based resilience projects
- Establish a consistent approach across each DRT to recognise what vulnerabilities may exist within their regional operating areas
- Guide, lead, and mentor the Minderoo Foundation in the development of strategic and detailed analysis of where future resilience projects may be required
- With DRTs as the strategic lead, create a targeted approach to build resilience through clear principles for decision-making and prioritisation of future resilience workshops and adaption that can be applied across the public, private and community sectors
- Recognise national and international disaster risk reduction, mitigation, and adaptation approaches, including the Sendai Framework for Disaster Risk Reduction.

Increasing our knowledge and awareness of community vulnerabilities, strengthening our capability and capacity to provide relief when required and tightening our community bonds are all key to DRA and the DRA Resilience Process. As an emerging area of culture and practice, DRA is leading the way in understanding, working with and empowering community lead discussions and community-based forums. For many DRA members, these forms of community led discussions and forums are often second nature. This is because of their previous operational experience within the Australian Defence Force and trained ability to assimilate risk and operational effectiveness on a battlefield. For example, the large map discussion is based on a military wargame theory. The purpose of using wargaming models is to not emulate reality but to serve as a device for stimulating innovative thought.

2. Gawler River Catchment, Adelaide Plains SA

The Gawler River is formed by the confluence of the North Para and South Para in the town of Gawler. It is in the Adelaide Plains district of South Australia. The district surrounding the river produces cereal crops and sheep for both meat and wool, as well as market gardens, almond orchards, and vineyards.

Figure 1 displays the Gawler River Catchment in comparison to other Adelaide region River Catchments (as defined by the Bureau of Meteorology). Figure 2 depicts the Catchment (as defined by the GRFMA) overlaid with the Local Government Areas that overlap and dissect this area.

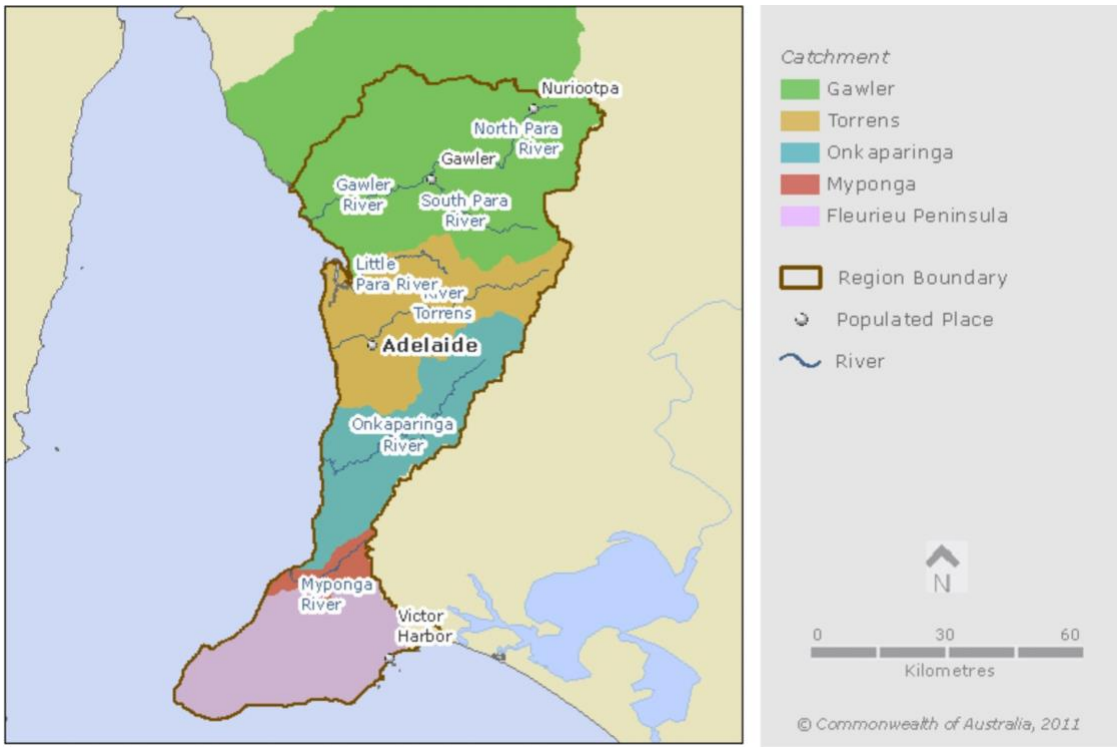


Figure 1: Adelaide Region River Catchments [1]

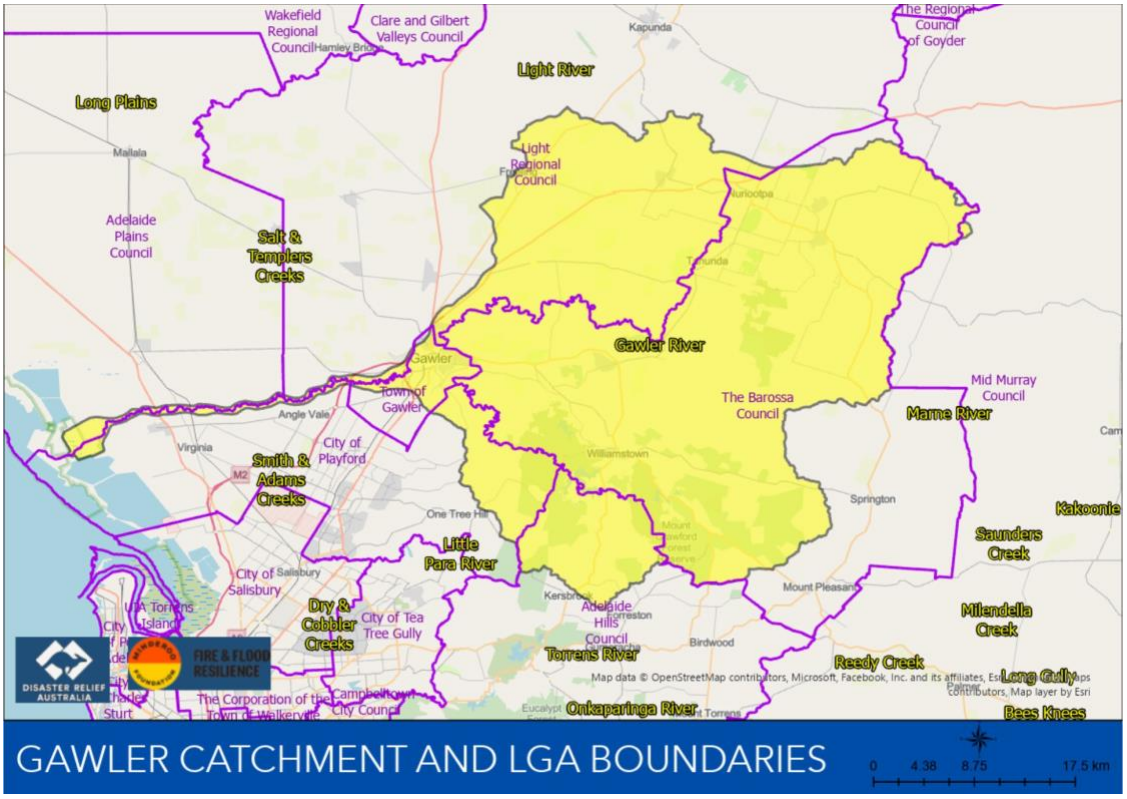


Figure 2: Gawler River Catchment and LGA Boundaries

The Gawler River Catchment lies within the Adelaide Superbasin geological province[2]. The North Para and South Para Rivers spring in the Mount Lofty Ranges and then join in the Adelaide Plains to form the Gawler River. The volcanic rock of the Mt Lofty ranges then becomes sandy plains in the lowlands before the Gawler empties into the Gulf of St Vincent. The town of Gawler resides above the Para Fault Zone, a geological area of increased seismic activity that is generated by activity across the Mount Lofty Ranges.

The geology of the region has resulted in abundancy of loamy soils. This makes the hills and alluvial plains around the Gawler River suitable for a range of agri-food businesses, inclusive of farming, crops and greenhouse facilities. The farm gate output of the Gawler River floodplain horticultural areas is estimated to be at least $355 million. The river is subject to periodic flood events and the catchment is identified in the state's flood hazard plan as a significant flood risk. The Gawler River has flooded on average every 10 years over the past 160 years (known records). Most recently, large floods occurred in 1992 (September, October, December), November 2005 and October 2016.[5]

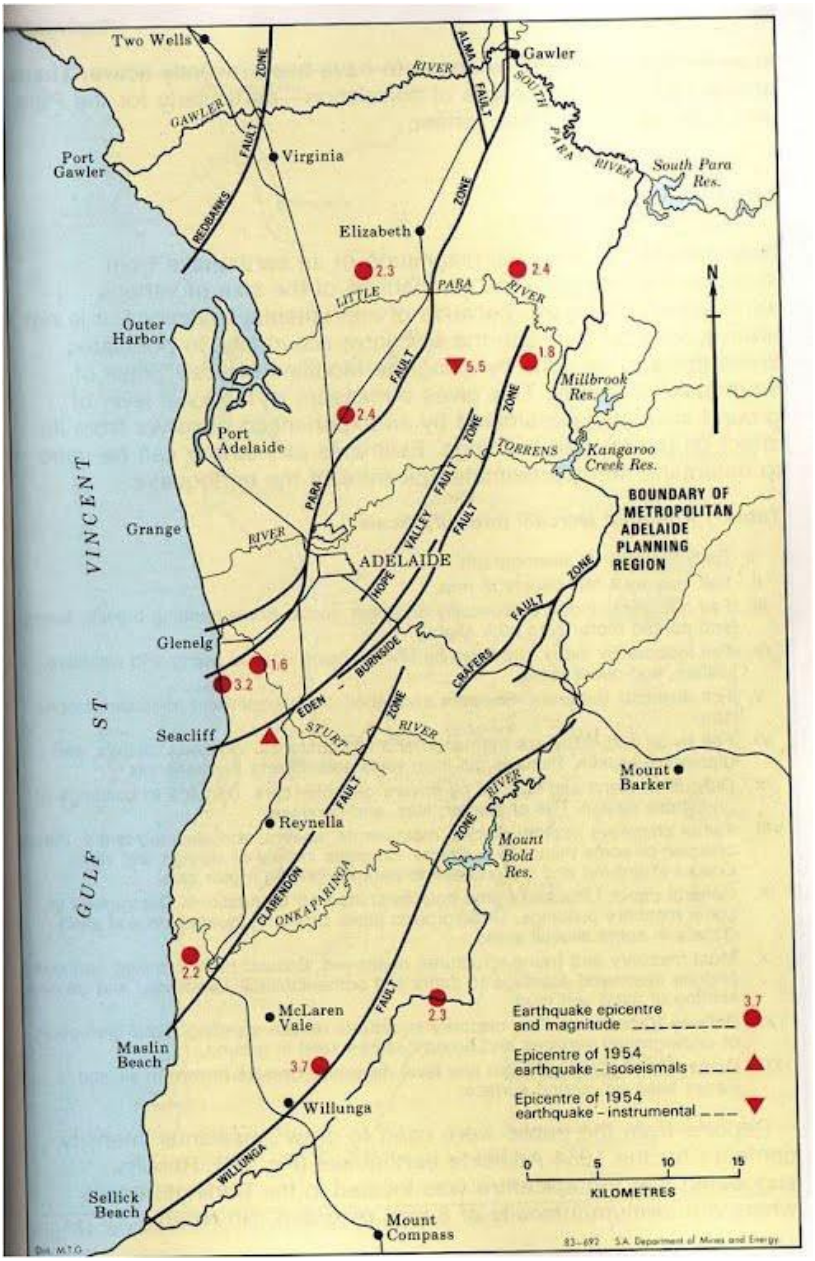


Figure 3: Gawler and the Para Fault (Top of Map)[3]

[1] Physical Information - National Water Account Online 2010 (bom.gov.au)

[2] https://doi.org/10.1016/j.precamres.2020.105849

[3] Fault Scarps in the Adelaide area of the Adelaide Geosyncline - Geohazards: Earthquakes

[4] SAWater - TERRAINS AND SOILS

[5] GRFMA Strategic Plan 2021 – 2026, Gawler River Flood Management Authority

History of Gawler River Floods

The Gawler River has been subject to major flooding on average every 10 years over the past 160 years. Earliest accounts date back to the mid-1800s with reports of the North and South Para and Gawler Rivers becoming "sweeping torrents" and washing away several houses at Buchesfeld (west of Gawler township). In recent history, major events have occurred in 1992 (September, October, December), November 2005 and October 2016.

The township of Gawler and its surrounding suburbs have also experienced numerous floods. Significant flooding occurred in 1917, 1947, 1983, and also, in 1992. The 1992 event was the largest and around 200 homes were damaged (The Advertiser, 2012).

Figure 4: Gawler River in flood west of Winckel Bridge 1947 [6]

This event was estimated to have an Average Recurrence Interval (ARI) of around 35 years.

[6] Flood History – Gawler River Flooding

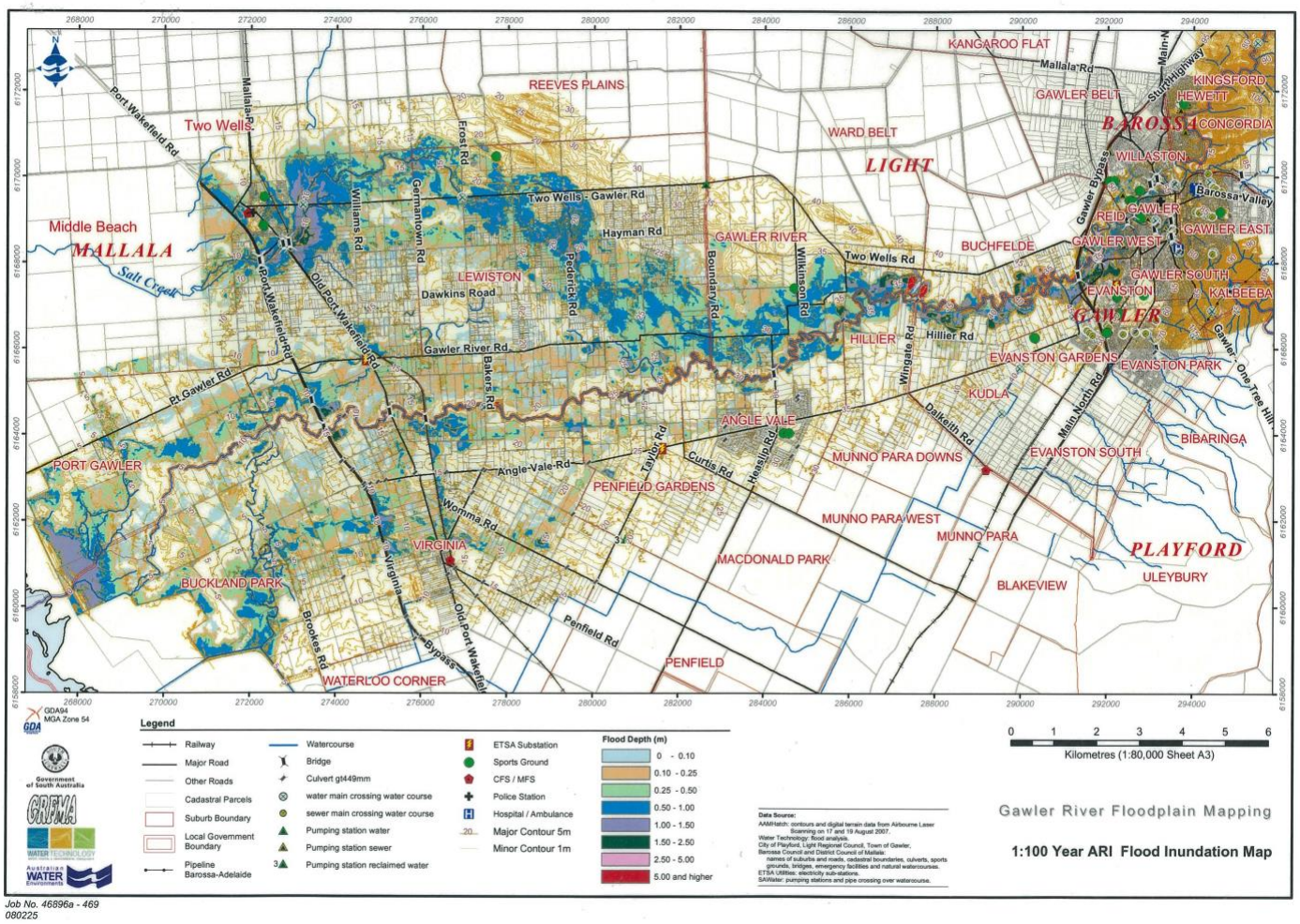


Figure 5: Gawler River Floodplain 1:100 Year Average Recurrence Interval Map [7]

[7] Gawler-River-Floodplain-Mapping-1-in-100-Year-ARI-Flood-Inundation-Map.pdf (apc.sa.gov.au)

3. Consequences of Flooding

The Big Map activity identified that agri-business, horticultural activities, and residential land development is increasing in the Adelaide Plains and, accordingly, so is the risk of damage and/or destruction during flood events. Although no homes were damaged when the Gawler River broke its banks in November 2005, around $40 million worth of crops were lost and there was significant damage to public infrastructure. Most recently, the Gawler River catchment experienced significant rainfall between late September and early October 2016. Falls ranged typically between 100 to 140 mm in the upper North and South Para River catchments, and this resulted in a major flood event in the lower reaches of the Gawler River, with an estimated ARI of 20 years.

Expanding Urban Presence

Although no homes were flooded during October 2016, approximately 250 private properties and state government infrastructure were severely affected. There was extensive loss of horticultural production and a significant damage repair bill of approximately $50 million[8]. Land use changes in the Adelaide Plains since the 2016 flood event include the construction of the Riverlea Estate, which is immediately to the West of the Angle Vale Rd[9]. This land development was approved in 2007 and began development in 2014. Over 25 years, approximately, 12,000 new homes and approximately 30,000 people are scheduled for the western area of the plains, which is inside the historic flood plain area.

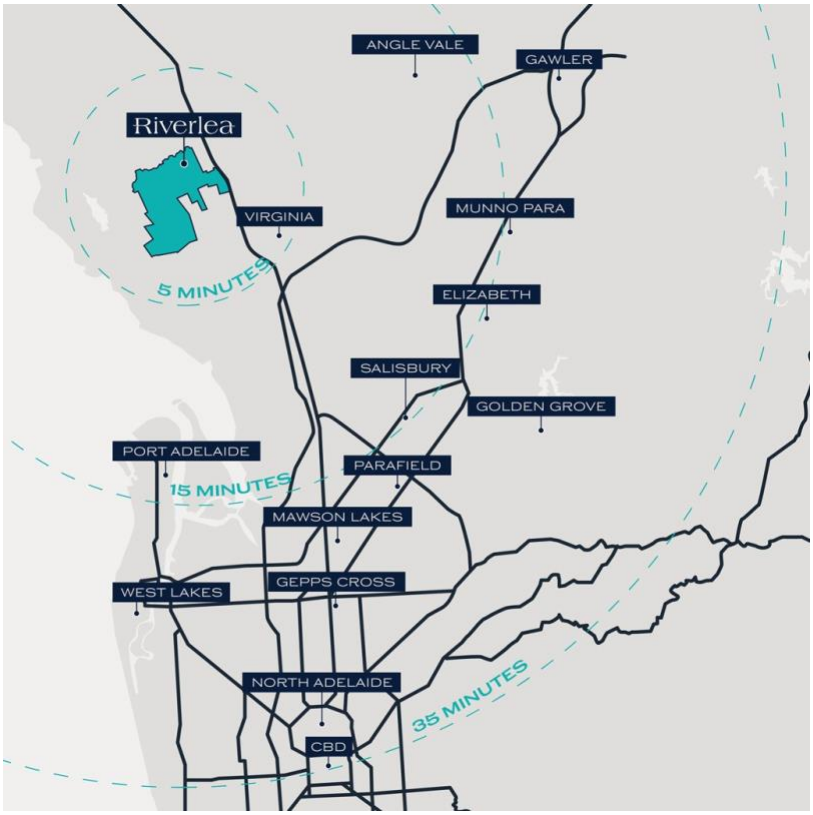


Figure 6: Riverlea Estate location relative to Gawler and Adelaide [10]

When flooding occurred in 2016, the decision to approve development of Buckland Park / Riverlea area was criticised[11]. The criticism related to the land's location within a floodplain and the lack of flood mitigation engineering solutions. The Masterplan design does include the creation of floodways, and lakes to enable movement of water into the Gulf to the West.

[8] Gawler River Catchment (South Australia) - 3rd February 2023 (arcgis.com)

[9] Vision – Riverlea

[10] [Land for Sale] Riverlea Estate, Buckland Park | OpenLot

[11] Adelaide planning expert says superstorm proved why $2 billion satellite suburb should not go ahead at Buckland Park | The Advertiser (adelaidenow.com.au)

Shaping Development for Existing Land Uses

The Adelaide Plains Council released its Allied Food Industries Land Supply Study in 2017. The Study speaks to the spatial separation of the horticultural land north of the Gawler River from a land use zoning perspective from Rural living and Animal Husbandry activities further north in Lewiston and Two Wells. Planning firm URPS conducted the study and noted the flooding presents development impacts and that there is a need to review Development Plan controls. The study also mentions adding of fill requirements to elevate facilities and structures above the flood[12].

It is reasonable to suggest that there are improvements underway in the development of land in flood affected areas. This grows increasingly important as land use changes in the region. These mitigation methodologies are dependent on the data collection that informs modelling of flood events. South Australia government agencies and Federal agencies need to ensure that this data is as accurate as it can reasonably be, along with ARI data for 1:100-year events.

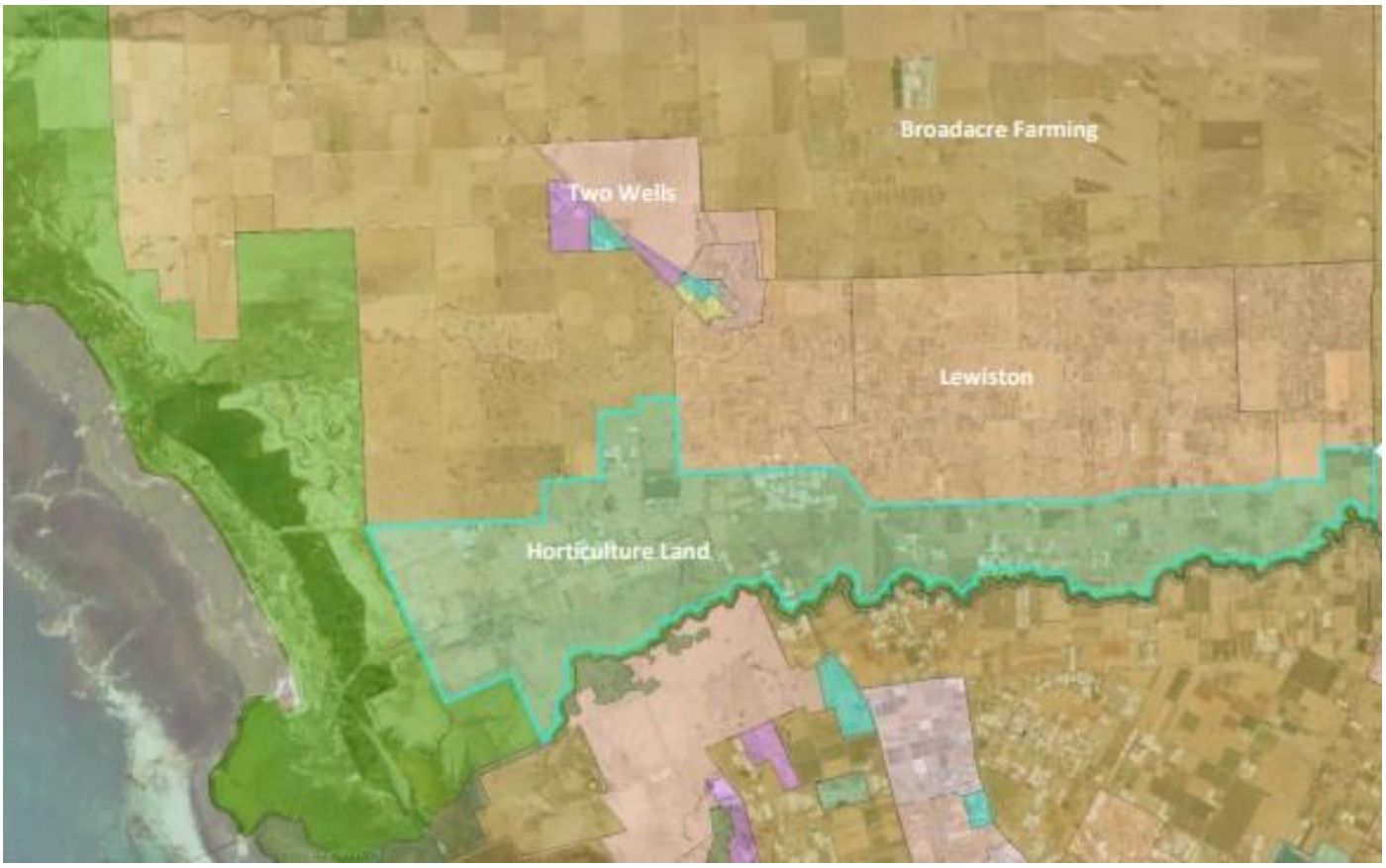


Figure 7: Horticultural Land North of the Gawler River [13]

[12] Allied-Food-Industries-Land-Supply-Study.pdf (apc.sa.gov.au)

[13] Allied-Food-Industries-Land-Supply-Study.pdf (apc.sa.gov.au)

Figure 8: Riverlea Estate Masterplan, note the Gawler River to the Northern boundary [14]

[14] Vision – Riverlea

4. Government and Stakeholders Involvement in Flood Management

Gawler River Floodplain Management Authority

The Gawler River Floodplain Management Authority (GRFMA) was formed as a Regional Subsidiary under Section 43 and Schedule 2 of the Local Government Act 1999 in August 2002. The GRFMA operates on a funding formula with the six constituent councils that comprise its operating area. The Authority has been established to coordinate the planning, construction, operation, and maintenance of flood mitigation infrastructure for the Gawler River, and for the following functions:

- to raise finance for the development, management, and operation and maintenance works approved by the Board;
- to provide a forum for the discussion and consideration of topics that relate to the Constituent Council's obligations and responsibilities in relation to management of flooding of the Gawler River;
- to advocate on behalf of the Constituent Councils and their communities where required to State and Federal Governments for legislative policy changes on matters related to flood mitigation and management and associated land use planning with Gawler River flood mitigation;
- to facilitate sustainable outcomes to ensure a proper balance between economic, social, environmental, and cultural consideration; and
- to provide advice as appropriate to the Constituent Councils in relation to development applications relevant to the Authority's roles and functions.

Since its formation, the GRFMA has released Annual Reports, Business Plans and Strategic Plans. The latest Strategic Plan that GRFMA released was the 2021-2026 Strategic Plan. It counts its key achievements as:

- Construction of the flood control Dam on the North Para River (Bruce Eastick North Para Flood Mitigation Dam) in 2007
- Facilitated Gawler River Open Space Strategy 2008
- Modification of the South Para Reservoir Dam and spillway in 2012.
- Extensive flood mapping and hydrology reports facilitated.
- Completed the Gawler River 2016 Flood Review.

Key projects to be undertaken in the following five years include:

- Management and Maintenance of the Bruce Eastick North Para Flood Mitigation Dam Drafting, and release, of the Gawler River Stormwater Management Plan
- Partnering with the SA Government to deliver the Gawler River Flood Mitigation initiatives (SA Government funding allocation of $9m over three years)
- Finalise the Gawler River Flood Mitigation Planning (GRUMP).

The success or failure of this Strategic Plan is yet to be judged given its timeframe. However, it is assessed that some of the key projects will achieve greater flood mitigation and preparation.

[15] Gawler River Floodplain Management Authority | Town of Gawler Council

[16] Gawler River Floodplain Management Authority | Town of Gawler Council

South Australian Water Authority (SA Water)

SA Water Guidelines for Recycled Water Storage in the Northern Adelaide Plains include mention of mitigation methods for flowing as part of Development Application approval in the Adelaide Plains area, west of the township of Gawler. These include impacts on surface water flow and safety measures for large dam walls. Last year, SA Water reassured the citizens of Gawler and Angle Vale that the Barossa Reservoir remains safe after incorrect media reporting which stated that the dam had failed a "critical safety test" .

SA Water is assisting in balancing the economic drive for growth in the Adelaide Plains region with the need to provide infrastructure that enables this growth, whilst mitigating the flood risk. From July 2020 it will create 4,500m of new water mains in the Plains region between Two Wells and Gawler . SA Water cooperates with the Bureau of Meteorology and other stakeholders in water management through the monitoring of the reservoirs in the region, with the South Para reservoir the second largest reservoir in South Australia.

Local Councils

Figure 2 shows the Gawler River Catchment and the six LGA's that intersect the area. These include:

- Light Regional Council
- Adelaide Plains Council
- Town of Gawler
- City of Playford
- The Barossa Council
- The Adelaide Hills Council.

The number of LGAs increases the complexity of coordination of Disaster Response over the Gawler River Catchment. Each respective council will have its own personnel it will want to be informed when the possibility of flood increases – this increases the overhead and time involved for South Australian organisations such as DEW and SES (SA) and national organisations such the Bureau of Meteorology.

[17] SAW-Guidelines-for-Recycled-Water-Storage.pdf (sawater.com.au)

[18] SAWater - SA Water confirms Barossa Reservoir's dam is safe

[19] SA-Water-2020-21-Annual-Report.pdf (sawater.com.au)

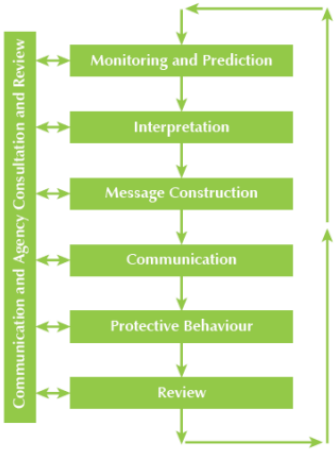
[20] South Para | Reservoir reserves (reservoirs.sa.gov.au)

5. Flood and Water Data Collection

The Bureau of Meteorology

The Bureau of Meteorology (The Bureau) provides generalised, qualitative, or quantitative flood predictions for agreed flood forecast locations across Australia. Information on flood conditions, heights and classifications are provided as per the Service Level Specification for Flood Forecasting and Warning Services for the Gawler River catchment.

The Bureau's flood forecasting, and warning services are provided within the context of the Total Flood Warning System as defined in the Australian Emergency Manuals Series, Manual 21 Flood Warning (Australian Government, 2009 and illustrated below):



The components of the Total Flood Warning System (Australian Emergency Manual Series, Manual 21 Flood Warning, Australian Government 2009)

The collection and publishing of rainfall and river level data is an important component of the overall service. Apart from use by the Bureau for data analysis and its hydrological modelling for flood predictions, the data is also used by the emergency service agencies, numerous operational agencies, businesses, and the public to monitor rainfall and river conditions. To assist in describing the service, the locations where river height; dam, weir, or lake level; and tidal observations are made are categorised into three types; namely forecast location (Schedule 2), information location (Schedule 3a and 3b) and data location (Schedule 4).

The Bureau of Meteorology monitors the Gawler River Catchment through several different monitoring stations and publishes this information on its website . Figures 5 & 6 show the rainfall monitoring stations with the Gawler River Catchment and the information that they display.

An example is located at Figure 5 – the grey dots are the locations of automated stations which present information to the observer as such:

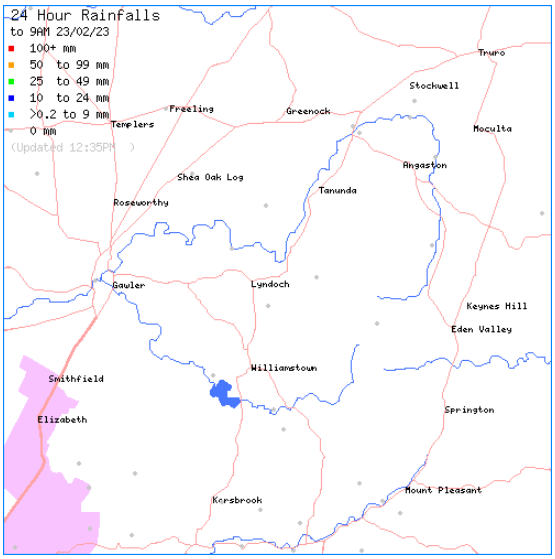


Figure 9: Gawler River Catchment BoM Rainfall Monitoring Stations

[21] Gawler River Rainfall and River Conditions (bom.gov.au)

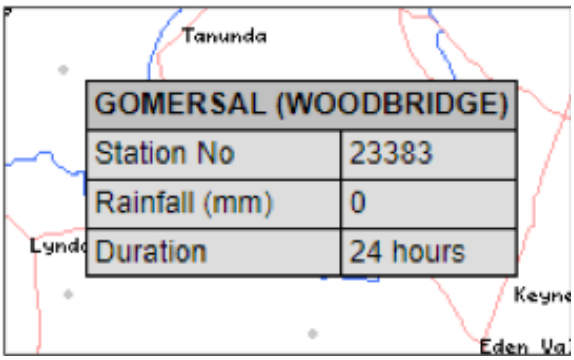


Figure 10: Automated Station Reporting from Bureau sensors. [22]

These stations report their data to the Bureau of Meteorology through a combination of satellite and fixed data infrastructure. They contribute to information collection about the likelihood of a flood event, but they cooperate with other government authorities like the SES and SA Water to deliver Flood Warnings. These warnings are issued through Flood Warning Centres in Bureau Regional Offices.

Flood Warnings and Flood Watch

The Bureau issues two kinds of warning, a Flood Warning, and a Flood Watch. A Flood Warning is issued when the Bureau is more certain that flood is expected, often when rainfall has started to fall. They are more targeted and issued for specific catchments, of which Gawler River is one as per Figure 7. A Flood Warning will generally include specific predictions of the severity of expect flooding.

Figure 11: Bureau Flood Watch Areas in South Australia. Gawler River Catchment is #24 [25]

A Flood Watch is issued when forecast rainfall information suggest that local and/or riverine flooding is possible across the Flood Watch area [26]. A Flood Watch may cover a large area due to uncertainty associated with the location and amount of forecast rainfall. A flood watch may also refer to the type of flooding that may be experienced in the catchment being highlighted.

The Bureau then uses three different types of Flood Classification:

Minor flooding

Causes inconvenience. Low-lying areas next to water courses are inundated. Minor roads may be closed and low-level bridges submerged. In urban areas inundation may affect some backyards and buildings below the floor level as well as bicycle and pedestrian paths. In rural areas removal of stock and equipment may be required.

[22] Gawler River Rainfall and River Conditions (bom.gov.au)

[23] Flood Warning Services: National flood forecasting and warning service: Water Information: Bureau of Meteorology (bom.gov.au)

[24] Flood Warning Services: National flood forecasting and warning service: Water Information: Bureau of Meteorology (bom.gov.au)

[25] BOM_Flood_Watch_Areas_map_SouthAustralia_2017.pdf

[26] Flood Warning Services: National flood forecasting and warning service: Water Information: Bureau of Meteorology (bom.gov.au)

Moderate flooding

In addition to the above, the area of inundation is more substantial. Main traffic routes may be affected. Some buildings may be affected above the floor level. Evacuation of flood affected areas may be required. In rural areas removal of stock is required.

Major flooding

In addition to the above, extensive rural areas and/or urban areas are inundated. Many buildings may be affected above the floor level. Properties and towns are likely to be isolated and major rail and traffic routes closed. Evacuation of flood affected areas may be required. Utility services may be impacted[27].

In addition to warning services for riverine flooding, the Bureau provide technical assistance to Councils establishing local flash flood warning systems through its Flash Flood Advisory Resource (FLARE). The Bureau maintains FLARE, which is an online resource created to assist agencies to design, implement and manage fit-for-purpose flash flood warning systems.

Gauges are essential for monitoring stream flow, water levels and rainfall. Data collected from gauges provides real-time data to the Gauge Owner and the Bureau.

Department for Environment and Water (DEW)

The DEW runs the WaterConnect website which provides information about South Australia's Water Resources, inclusive of direct access to water-related publications and data[28].Water Connect has access to a Flood Awareness Mapping Tool which allows for GIS information to be overlaid on various locations within the Gawler Area; there two data sets, inclusive of 4 map layers from Gawler River Floodplain Mapping in 2008 and 2015:

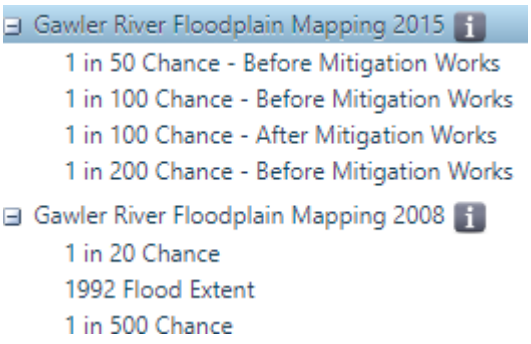


Figure 12: Water Connect Flood Awareness Map Data Sets for the Gawler River [29]

As Flood Hazard Leader, the Department for Environment and Water (DEW) takes a leadership and coordination role for the planning of activities relating to flood in South Australia. This role is led by the Fire and Flood Management Branch within DEW.

The Fire and Flood Management Branch coordinates flood management efforts and expertise within DEW and works with other agencies and stakeholders to deliver flood management in terms of prevention, preparedness, response, and recovery. These include the South Australian State Emergency Service (SASES), who is the Control Agency for flood, the Bureau of Meteorology, the Stormwater Management Authority, the South Australian Fire and Emergency Commission (SAFECOM) and other State and local Government and non-government organisations[30].

[27] Rainfall and Flood Map - additional notes (bom.gov.au)

[28] Home | WaterConnect

[29] Flood Awareness Map - Home (waterconnect.sa.gov.au)

[30] Flood Awareness - Home (waterconnect.sa.gov.au)

Data Collection – River Gauges

The Bureau of Meteorology publishes the river heights online – these can be accessed at any time. The information is sources from automated sites and is made available from the DEW, SA Water and Water Data Services (a privately owned Australian hydrometric consultancy based in SA).

South Para River						
Malcolm Creek (SAW)	4.35pm Fri	0.59	steady			Plot | Table
Warren Reservoir (SAW)	4.35pm Fri	6.94	steady	6.06 below spillway		Plot | Table
South Para Reservoir (SAW)	4.35pm Fri	26.56	steady	2.44 below spillway	below minor	Plot | Table
South Para R at SE Gawler (DEW)	4.05pm Fri	0.87	steady	0.13 below weir	below minor	Plot | Table
North Para River						
North Para R at Mt Mckenzie (DEW)	4.05pm Fri	0.96	steady	0.04 below weir		Plot | Table
North Para R at Penrice (DEW)	4.05pm Fri	0.87	steady	0.13 below weir		Plot | Table
Duckponds Ck at Stockwell (DEW)	4.05pm Fri	0.91	steady	0.09 below weir		Plot | Table
North Para R at Nuriootpa(Park Ave)	3.28pm Fri	-0.06	steady	1.06 below bridge	below minor	Plot | Table
Tanunda Ck at Bethany (DEW)	4.05pm Fri	0.87	steady	0.13 below weir		Plot | Table
Jacobs Ck at Barossa Highway	4.24pm Fri	-0.20	steady			Plot | Table
North Para R at Yaldara (DEW)	4.05pm Fri	0.98	steady	0.02 below weir		Plot | Table
Greenock Ck at Greenock (DEW)	4.05pm Fri	1.23	steady	0.23 above weir		Plot | Table
Greenock Ck at Shea-Oak Log	2.11pm Fri	-0.11	steady	0.11 below weir		Plot | Table
North Para R at Turretfield Dam	4.02pm Fri	58.93	steady	23.57 below spillway	below minor	Plot | Table
North Para R below Tur. Dam (DEW)	4.05pm Fri	0.68	steady	0.68 above weir		Plot | Table
Gawler						
Gawler R at Gawler West(Gosford St)	2.33pm Fri	0.09	steady		below minor	Plot | Table
Gawler R at Virginia (DEW)	4.05pm Fri	1.09	steady	0.09 above weir		Plot | Table

Figure 13:River Heights for Gawler, South and North Para Rivers [31]

Each individual data point can be transformed into a Plot or Table of the recorded heights over Time at the specific station. When the Data is overlaid with the Minor through Major heights as indicated on the Table, an idea of the elevation of the river during sustained rain periods can be used as a pre-emptive tool to inform actions to prevent damage from flooding events.

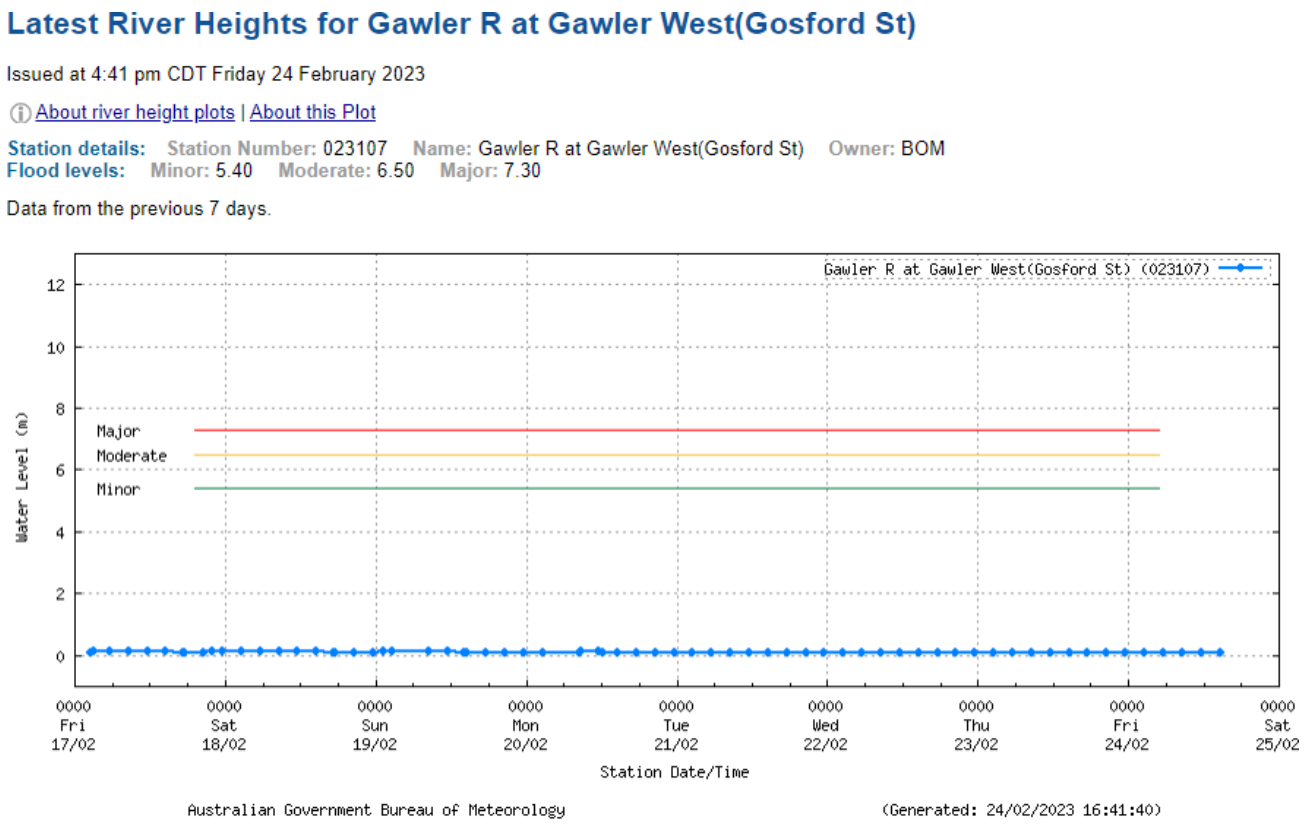


Figure 14: River Height Data Plot generated on BOM website [32]

[31] River Height Bulletin - Metropolitan Rivers (SA) (bom.gov.au)

The GRFMA has produced a graphical representation of the Gawler River which is a superior depiction of the gauges, time from gauge to gauge along the North and South Para Rivers, and the owner of the sensor or gauge.

All attendees at the Big Map Event commented on the utility of this graphic produced by the GRFMA. According to the GRFMA's analysis, it could take approximately 12 hours for heavy rainfall to be identified in the Mount Lofty Ranges before flow initiated by this rainfall would reach Gawler.

Many long-time residents said that some of the times between the Bureau of Meteorology forecast locations weren't accurate, based on the flooding that they have experienced Regardless, this graphic and the information represented is a fantastic baseline for educating the wider community about the amount of time available to assess likelihood of flood, confirm flood risk, and then inform residents fast enough to enable their preparations.

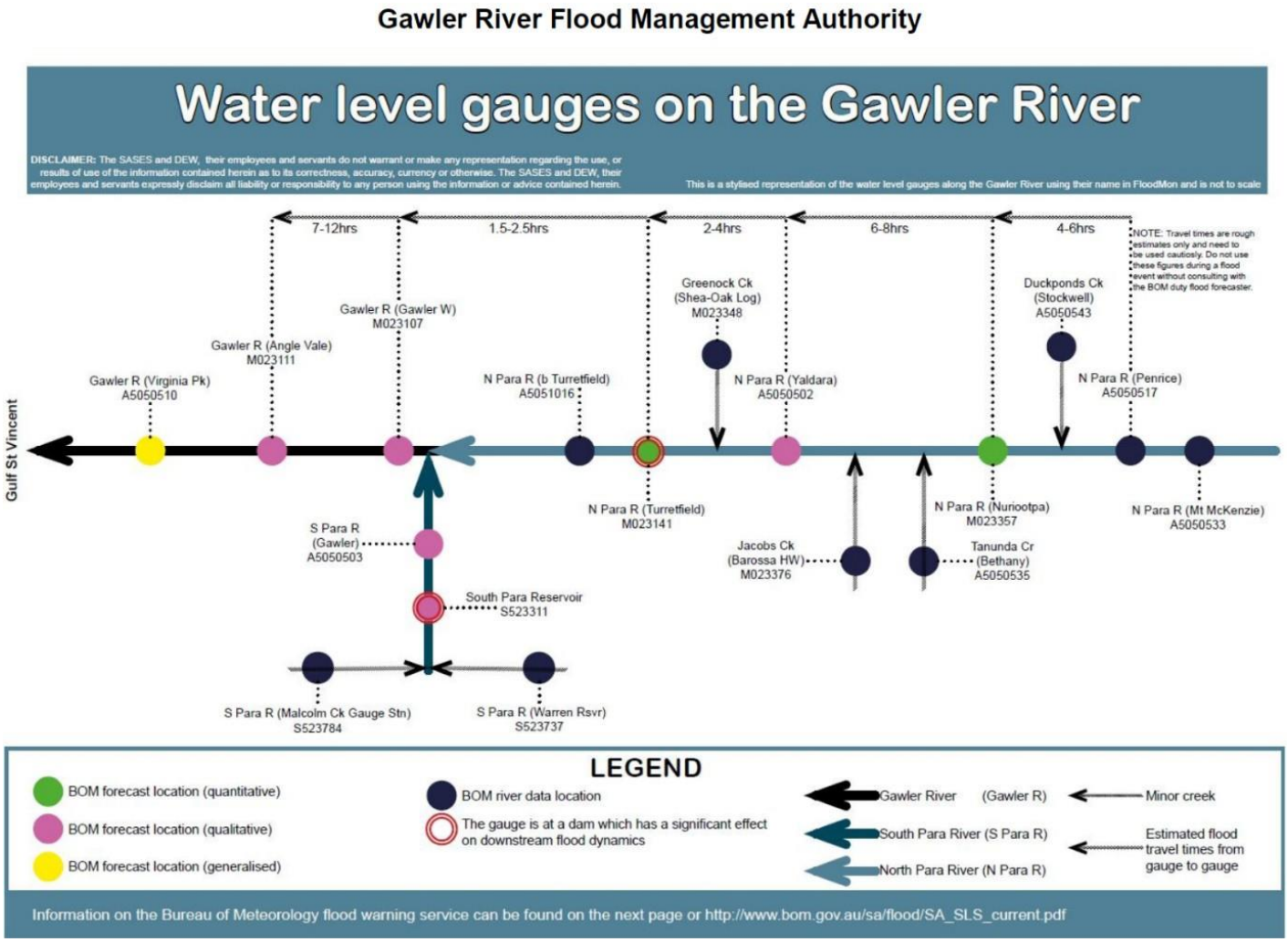


Figure 15: Water Level Gauges on the Gawler River [33]

[33] GRFMA

6. The Big MAP Event

Purpose:
Building resilience communities in the context of a disaster event integrates prevention, preparation, response, and recovery is a complex and continuous process, rather than a process with a definitive end point or 'destination' The purpose of the 'Big Map' Capability is to combine local knowledge with our disaster management expertise to better understand a community profile based on the community's exposure within an all-hazard environment[34].

By understanding how, when and where this region is impacted by flood is vital to those who live here. Not just for safety, but for protecting livelihoods, property, and people. Businesses operating within the region also need to know how it works to make risk-informed investment and operational decisions in line with future Local Council objectives.

Managing flood risk is a cooperative and coordinated effort between all sectors of the community including individuals, businesses, non-government organisations and governments.

Method:
Disaster Relief Australia (DRA) in collaboration with the Minderoo Foundation's Resilient Communities Initiative conducted the Big MAP Event in the Town of Gawler, South Australia.

The Gawler River Catchment 'Operational Big Map' was conducted on 03 Feb 2023.

Attendees included Local Government representatives, operational staff, key partners, and other stakeholders.

The DRA End state:
Locally led and regionally coordinated resilience solutions will always address recent and emerging disaster risks and provide pathways for improving community resilience over time. Flood waters don't respect boundaries. Therefore, it is critical to investigate ways we can better prepare for the future and keep our communities safe by coordinating efforts, sharing knowledge and capability, and setting a proactive agenda for improving resilience over time.

First Activity: Discussion on Previous Flooding Events

The opportunity was taken at the start of the First Activity to highlight the importance of a "catchment response" to flood preparation, monitoring and response events. The catchment response sees all stakeholder working together to prepare for flood events with appropriate mitigations to prevent damage to infrastructure and loss of life, monitoring for the likelihood of a flood event and then taking evacuation actions accordingly.

One of the topics spoken about concerned the collection of data and dissemination of information about what that means to catchment stakeholders. As presented earlier in the report, there are several gauges and sensors which measure rainfall and river heights. One of the issues raised with this data was that when sensors or gauge readings were analysed to indicate a flood was impending, the warning given to the local councils wasn't fast enough to be able to effect preparatory actions amongst the local councils and SES. Some stakeholders at the event said that flood waters move faster than the GRFMA data suggests, and some mentioned that 12 hours is the minimum amount of time needed to prepare for floods.

Data collection of flood events is disjointed and separate and lacking synthesis, with collection methods differing across the stakeholders. Sensors and Gauges that remain functional during flooding events collect data for the Bureau, SA Water and DEW. They inform other data collection methods such as satellite imagery and drones which can be used to capture imagery of the flow extent for resources such as Floodmap. Long-time residents and council staff have their own data points which could be included into monitoring systems to make projection and anticipation of flooding events more precise.

Resilience of local industry to mitigate against flood-imposed losses was discussed. As mentioned earlier in this report, the land uses in the Adelaide Plains include significant horticultural and agri-business practices which contribute greatly to Adelaide's food supply. From a demographic point-of-view, a great deal of the people involved in this sector do not speak English as their first language. This means that some of the flood warning methods do not reach these people in a timely fashion, so they rely on members of their own community or industry group for warning.

Industry representatives mentioned that it can take up to 6 months for the industry to recover post the flood event; recovery efforts can be stymied by damp and flood affected terrain preventing movement of tractors to remove rotting food and debris.

Community understanding of the data available for flood anticipation.

Second Activity: Walking the MAP

In the second activity, the Big Map was used as a focal point for discussion. Attendees were invited to move to the locations of their interests: local government representatives to their LGA, landowners to their property, infrastructure representatives to their applicable structures etc. This enabled attendees to better understand the responsibilities of other people at the event, who they might be representing and what their interests might be.

One of the issues mentioned was that private landowners with dams on their property need to have emergency management plans. These dams can release their water in the event of flooding or heavy rainfall due to their earthen construction. Sometimes when land changes hands, the knowledge of the dam's construction and maintenance is not handed over. An attendees mentioned that there are approximately 720 farm dams around the North Para River. Dams may be built to a height of 5m without requirement for approval, although this requires a permit.

A representative from the SES mentioned that private dam failures occur, and that when they do, the SES partners with different agencies to coordinate the approach for advice and supervision. The SES will activate a zone emergency support team to monitor and response with failure occurs.

A key point raised was that the SES' zone emergency support team boundaries do not align with the LGA boundaries. This means that the Gawler River Catchment doesn't have a unified plan for emergency response that includes all the LGAs. It was suggested that flow or height triggers for the North and South Para Rivers could be implemented for activation of the SES as a pre-emptive measure. Given that flooding is more predictable than bushfires or other natural disasters, the response plan and evacuation options can be planned with greater fidelity.

Levees have changed the dynamics of the flood waters along the Gawler River. There is no single data repository for levees which have been constructed, and this lack of a database makes it difficult to understand when, how and who approved their construction. There is a construction standard for levees, but individuals can construct levees on their property without the consequences of their construction being considered as part of a development approval process. Some levees have been compromised by irrigation practices – in simple terms, irrigation pipes have been routed through the levee which means that water can flow freely for agricultural purposes, defeating the purpose of the levee.

One of the Local Governments, the City of Playford, stated that it has an incident management team that utilises the information from the State Emergency Centre to cue its own response. This includes emplacement of sandbags and measures to close roads. Another attendee asked about evacuation centres – highlighting a lack of knowledge across the Catchment Area about facilities that can be access for evacuation purposes.

The railway link between South Australia, Western Australia and the Northern Territory may be severed as part of a future flood event. The railway infrastructure will also act as a levee – modelling needs to be undertaken to understand flood impacts on the railway, but also on the nearby terrain.

Third Activity: Resilience in Action

Some issues for the recovery process were raised, and these refer to clean-up teams and environmental health post disaster. Clean-up teams made of well-intentioned citizens (like the "Mud Army" from the 2011 and 2022 Brisbane floods) can throw out belonging without the consent of their owners who may have been evacuated. This can damage the fabric of communities due to resentment and ill-will post the disaster Psychological support also needs to be made available to people harmed and impacted by the flood.

The likely community clean-up response after the flood event will place significant strain on supplies of tools and cleaning supplies – an issue that should be pre-empted and included in the Disaster Response Plan.

Environmental Health post a flood is crucial to the recovery of an area so important to Adelaide's food supply, and local agri-businesses. Dead cattle and septic tanks pose a significant biohazard and could bring disease into the recovery picture for additional complexity. Given the Gawler Catchments crucial role as part of the food supply of Adelaide, then significant disruption of the agricultural practices here will impact prices and availability of produce.

Some of the industries and land uses in the Gawler River Catchment include horses, cattle and household pets. Some of the owners of these animals are cooperating to find evacuation locations for these animals so they can be safe during floods. Horse South Australia is building a facility at Murray Bridge for residents who own horses.

The community has identified Evacuation Centres, including Everson Gardens Community Centre, and Northern Rivers Oval, but these locations might be small community or LGA specific, and not widely known amongst the wider Gawler Catchment.

[34] Gawler River Catchment (South Australia) - 3rd February 2023 (arcgis.com)

7. Critical Infrastructure identified by the community post a disaster event (Recovery)

Once the discussion around the flood gauge network finished, the discussion then turned to critical infrastructure. Participants from the workshops were asked to identify what they believed critical infrastructure was within the Gawler Catchment. Figure 15 shows what some of the interdepencies are post a disaster event, this shows the complexity of the system and how a community can be affected when only one of these factors is degraded.

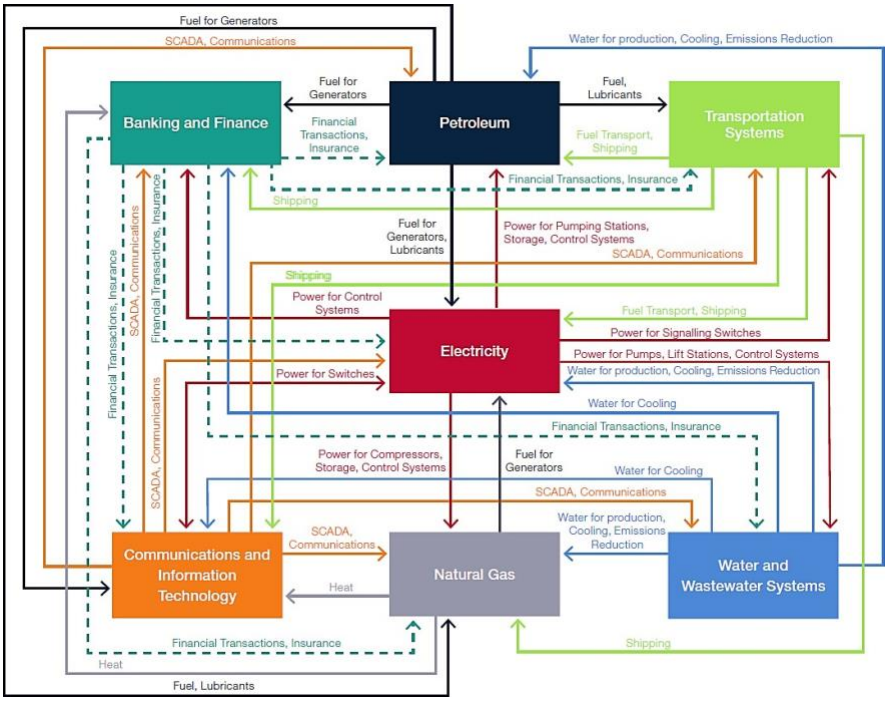


Figure 15: Example of interdependencies post a disaster event [35]

This sparked several conversations at various levels and to keep it community focussed and at a very localised level the following critical infrastructure was identified by the community post a disaster event (the relief and recovery):

Schools

Schools are seen as a critical enabler immediately post a disaster event. In the weeks post a disaster event, communities that self-serve and immediately start cleaning up and getting on with their life always appear stronger and more resilient. During this clean up phase allowing children to attend school removes the burden of children being around parents as they struggle to clean and deal with the impacts. In the Gawler River Catchment, some schools rely on an individual in the State Emergency Centre who informs families in the event of evacuations and school closures.

Supermarkets / food items

Access to food and essential items is critical in the early recovery phase. Supermarkets become the critical enabler within the community. The sooner these can be up and running the better the community will be in the long term. During this discussion, it was clear that the Lismore CBD is heavily impacted and access to these types of stores is difficult.

Doctors

Immediate access to medical is essential to the wellbeing of any community post a disaster event.

[35] https://naturaldisaster.royalcommission.gov.au/publications/html-report/chapter-09

Hospital

Immediate access to medical is essential to the wellbeing of any community post a disaster event.

In the immediate aftermath of a disaster, it is normal for many people to experience intense stress reactions. These reactions are not necessarily pathological. While most people eventually recover over time, a sizeable proportion will experience mental health problems in the months or even years after the initial event. The most common mental health conditions reported across a range of disaster events are post-traumatic stress disorder (PTSD), depression, anxiety, substance abuse, and complicated grief. Some may also experience heightened suicidal risk, intense negative affect, acute stress, physical health or somatic concerns, and poor sleep quality.

Waste Transfer Station

The collection, transport and disposal of solid, liquid and hazardous waste is an essential consideration during a disaster, particularly during the recovery phase. Traditionally, local governments have had the responsibility of managing waste and clean-up operations post-disaster. Typically, local governments manage this service professionally and to a high standard via the engagement of local waste contractors.

The waste streams from commercial and industrial facilities that are likely to require particular consideration following a flood impact are:

- Organic waste. Food waste if not collected early will putrefy and result in public health risks and will become progressively harder to manage. Odour is also a major issue for community reports/complaints which can result in redirecting resources to deal with these complaints from the vital needs of cleaning up. Sources of such waste include supermarkets, poultry farms, food processing operations, abattoirs, meat and freezer stores, cold rooms and organic material stores
- Liquid waste. A number of sources of liquid waste need to be considered during a disaster response these include, but are not limited to, petroleum waste particularly from petrol station sites and contaminated stormwater from electrical pits
- Hazardous waste. Although probably already known and identified, the places where hazardous materials are manufactured, stored and disposed of require special attention and management to ensure they are not disposed of in normal waste streams
- Domestic Waste. The types of domestic hazardous waste that are typically found following a natural disaster include:
  - » Asbestos from the demolition of houses.
  - » Chemical containers e.g. pesticide containers, paint tins.
  - » Other materials that look out of the ordinary compared to other materials being disposed of.
  - » Strategies need to be developed to identify large volumes of hazardous waste at the initial collection point to ensure the safety of the community and contractors collecting the waste at both the waste collection and receiving ends of the process.

Industrial Estate

When flooded, industrial facilities present direct (damage to buildings, tanks, pipes, storage of raw materials and finished products, pumps, electrical, thermal and mechanical equipment's) and indirect (business interruption, temporary unemployment, rising of insurance premium) consequences. The damages may cause major accidents within industrial plants. These include release of hazardous material, soil or water pollutions by hazardous substances for the environment, fires, explosions, dispersion of toxic clouds.

It is therefore necessary in the preparation preparedness phase of disaster management that industrial plant operators and owners improve their understanding of potential impact of flooding on their facility and analyse major accidents or release of hazardous materials that may be caused by such a natural event to prevent them.

Reserves and parks

Some reserves and or parks within a community may be built within flood prone locations and may well be within river flow diversions, and or the flood impacted area.

Land that adjoins rivers, creeks, estuaries, lakes, and wetlands is known as riparian land (often called 'frontage'). Riparian land can vary in width from a narrow strip to a wide corridor and is often the only remaining area of remnant vegetation in the landscape. Riparian corridors provide habitat for rare or threatened species, connecting larger patches of remnant vegetation and a corridor for the movement of animals and native plants.

Drinking water

Access to fresh running water is essential and a key requirement for a community dealing with flood.

Essential Services

Essential services are relied on by every individual, household, and community for meeting basic, everyday needs. The provision of essential services is especially critical before, during and after a natural disaster – when people are at their most vulnerable.

Essential services are especially important in the lead-up to, during and after a natural disaster. For example, electricity and telecommunications outages can prevent communities from receiving timely information, advice or warnings about the threat posed by nearby flood impacts and or fires. They can prevent communities from making informed decisions about how best to ensure their own safety, or the safety of those in their care (eg when to evacuate).

Supply chains, being the distribution of essential goods and services across the country, are critically important to our economy. Working supply chains deliver petrol to service stations, fresh food to supermarket shelves, household waste to landfill and essential pharmaceuticals to hospitals. In a natural disaster, the continuity, or rapid restoration, of supply chains is vital to the response and recovery phases.

Natural disasters can interrupt transport routes. During the 2019-2020 bushfires, some firefighting assets could not be transported between communities due to fires and road closures, which had a direct impact on the emergency response. Road closures also impeded the ability for communities to evacuate during the bushfires and disrupted the transportation of essential goods, such as food, across the country – impacting relief and recovery efforts[36].

[36] https://naturaldisaster.royalcommission.gov.au/publications/html-report/chapter-09

8. Community Assessment & Prioritisation

Building Back Better - Looking to the Future

We formalise processes and systems to enable effective assessment of post-disaster damages and needs to more accurately quantify and characterise the recovery needs and to formulate broad recovery strategies across all communities.

Outcomes of the Community Assessment and Prioritisation Activity

The Community Assessment and Prioritisation Activity was designed to shape a holistic conversation and assessment about the communities within the Northern Rivers and the perceived strengths and weaknesses. This analysis is somewhat flawed however since not all communities that reside within the Gawler River Catchment could attend.

Light Regional Council

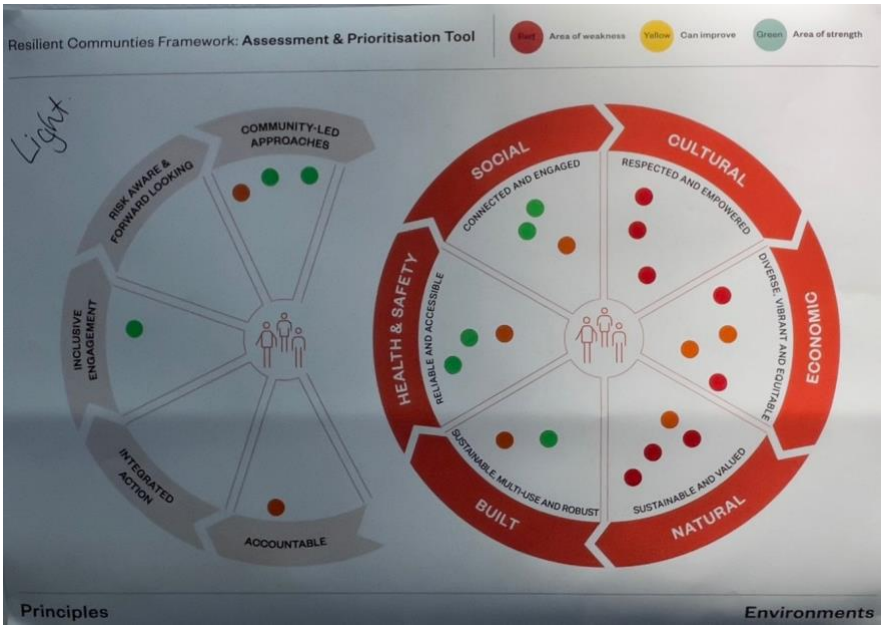


Figure 16: Resilient Communities Framework: Assessment and Prioritisation Tool completed by representatives from the Light Regional Council (LRC) at the Gawler Big Map Exercise

Principles

Activity participants representing the Light Regional Council (LRC) area identified inclusive engagement as a key strength, while being accountable appears to be an area of weakness. Interestingly, community-led approaches were identified as both an area of strength and an area for improvement.

Environments

Activity participants representing the LRC area identified their social, health and safety, and built environments as areas of strength. Although, these areas were simultaneously identified as needing improvement. The remaining three environments - cultural, economic, and natural, were all identified as areas of weakness.

Discussion

Activity participants representing the LRC area identified community-led approaches as a key strength, which aligns with the strength identified in their social environment. Inclusive engagement was also identified as a strength, although, this conflicts with the weakness identified in their cultural environment. All community environments have been identified as having room for improvement and/or being an area of weakness, with the cultural, economic, and natural environments requiring the most attention to maximise anti-fragility across the LRC area.

The Adelaide Hills Council

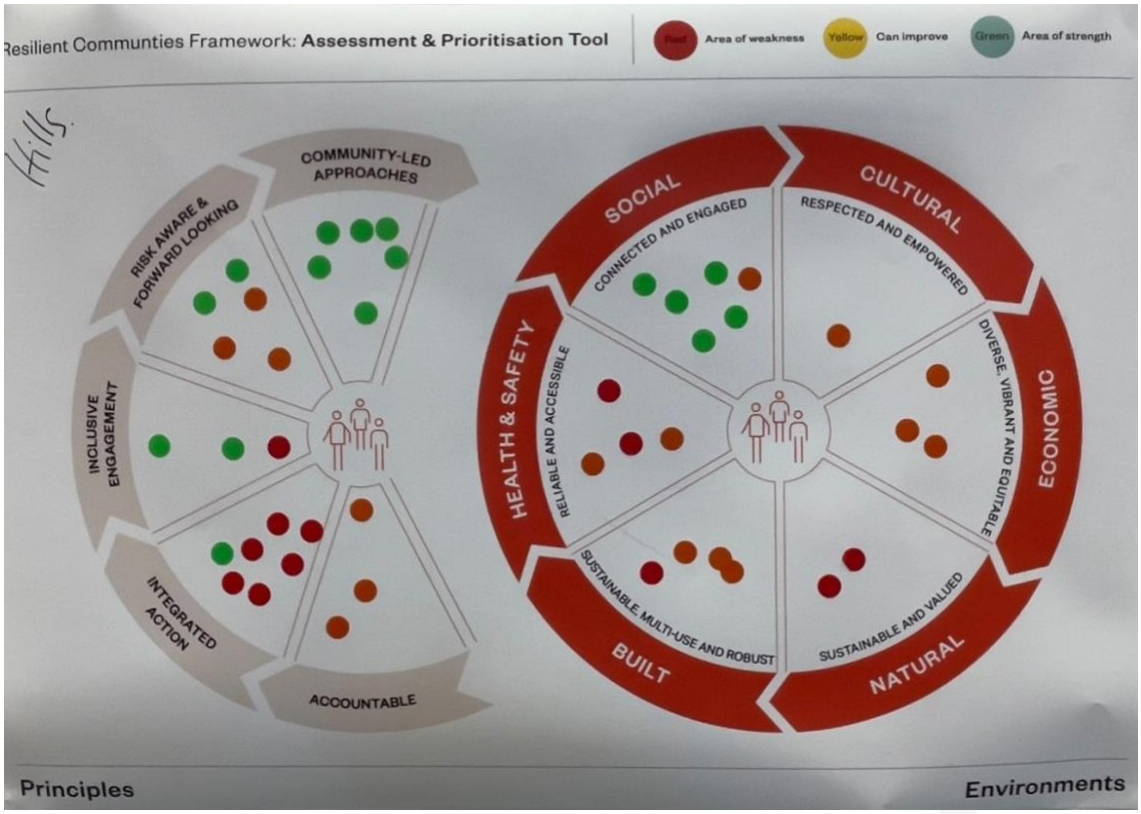


Figure 17: Resilient Communities Framework: Assessment and Prioritisation Tool completed by representatives from the Adelaide Hills Council (AHC)

Principles

Activity participants representing the AHC area identified community-led approaches and inclusive engagement as their key areas of strength. Both risk aware & forward looking, and accountable were identified as areas for improvements, while integrated action appears to be the key area of weakness.

Environments

Activity participants representing the AHC area identified their social environment as a key strength. The remaining environments: cultural, economic, natural, built and health & safety were all identified as areas for improvement and of weakness.

Discussion

Activity participants representing the AHC area identified community-led approaches as a major community strength, which aligns strongly with the strength identified in their social environment. Inclusive engagement has also been identified as a strength. However, this conflicts with the weakness identified in their cultural environment. Excluding community led approaches, all principles and environments were identified as having room for improvement and/or being a weakness. Thus, significant improvement must be made across most aspects of the AHC to increase its anti-fragility. The well-connected and engaged nature of the AHC community provides a solid foundation for collaboration between the council and community both in educational activities and integrated actions, through which identified shortfalls can be addressed, leading to enhanced anti-fragility of the AHC area.

Adelaide Plains Council

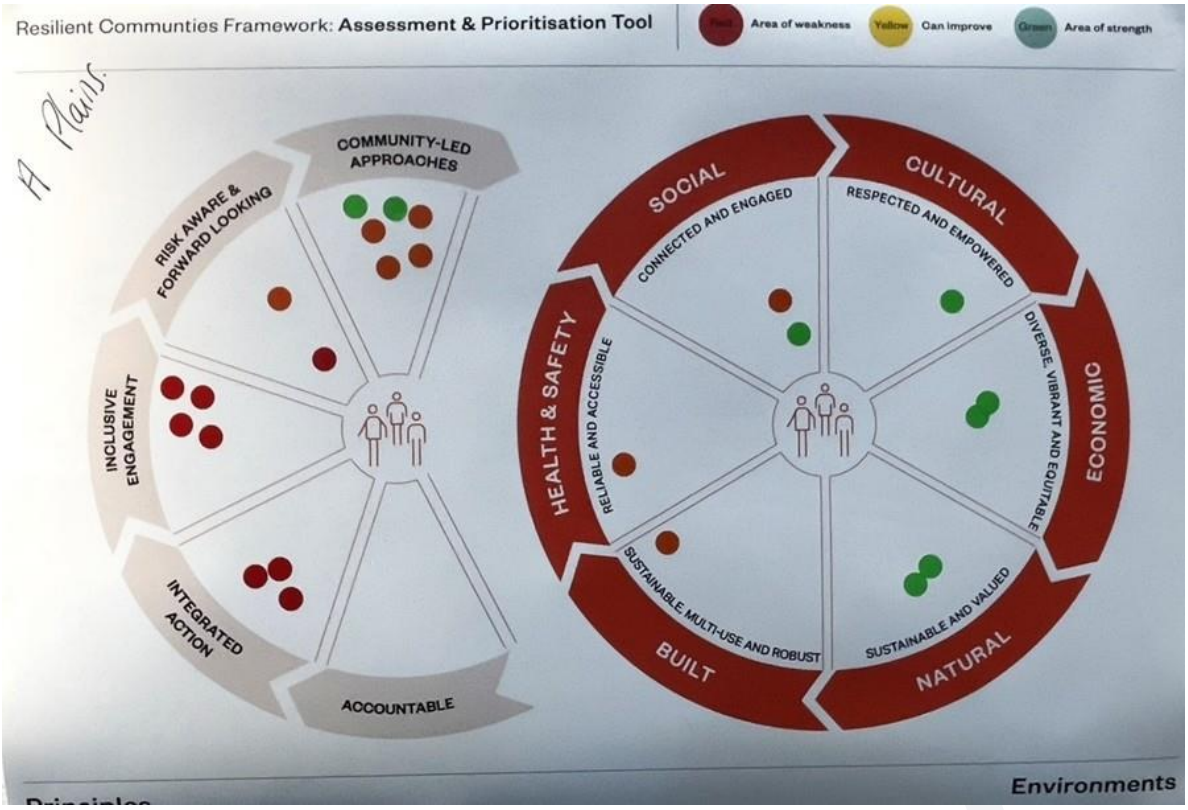


Figure 18: Resilient Communities Framework: Assessment and Prioritisation Tool completed by representatives from the Adelaide Plains Council at the Gawler Big Map Exercise.

Principles

Areas of weakness and requiring improvements were across all of the framework principles, except for Accountable where there was no response. For Community-Led Approaches, there was an indication of it being an area of strength, however, it is also an area for improvement.

Environments

Areas of strength were indicated across the Natural, Economic. Cultural, and Social Environments. The Built and Health & Safety Environments indicated improvement is required.

Discussion

From the responses given on the Framework activity, the Adelaide Plans Council LGA requires fixes and improvement across all listed framework principles. Education and awareness on roles and responsibilities as it relates to the impact of a natural hazard will increase knowledge and understanding of stakeholder accountability. The Built, Health & Safety, and Social Environments also need improvements and fixes to strengthen their anti-fragility and ensure steps are taken to help future proof the community to natural hazard consequences. More in-depth and equal collaboration between all stakeholders to heighten community hazard awareness is required to ensure community members are more aware and educated to help themselves in their own recovery.

The Barossa Council

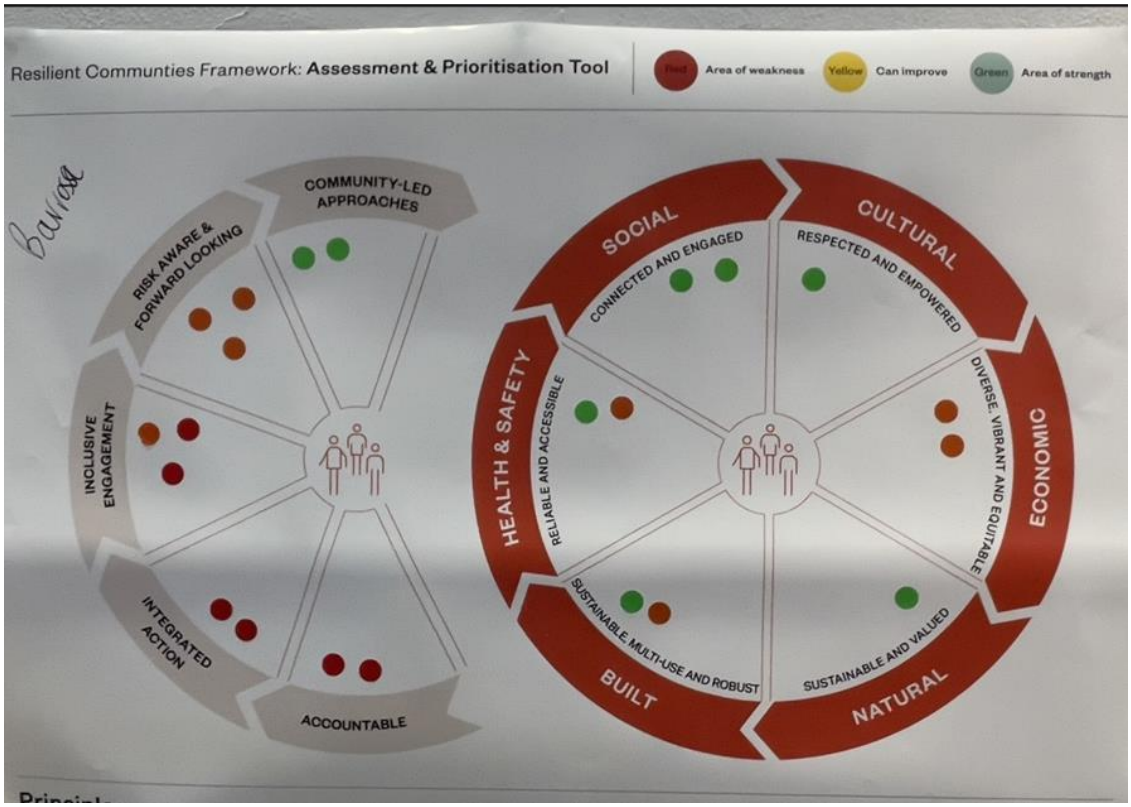


Figure 19 Resilient Communities Framework: Assessment and Prioritisation Tool completed by representatives from the Barossa Council at the Gawler Big Map Exercise.

Principles

Community-Led Approaches were indicated as an area of strength. Areas of weakness and improvement were across Accountable, Integrated Action, Inclusive Engagement, and Risk Aware & Forward Looking.

Environments

The Natural, Built, Health & Safety, Social, and Cultural Environments all showed areas of strength. Although being indicated as an area of strength, the Health & Safety and Built Environments could also be improved. The Economic Environment is seen as an area for improvement.

Discussion

Improvements and fixes are required across all framework principles to aid in the Barossa Council LGA strengthening their anti-fragility against a natural hazard event. Noting the area of strength in the Community-Led Approaches, this could be expanded upon to increase confidence across the other principles of the framework. A greater level of proactive engagement between all stakeholders will strengthen integrated action, lead to a great level of inclusivity, and allow accountability to spread across groups.

This awareness and education will support community members in understanding their risks against natural hazards and how best to prepare and support themselves. Increasing risk awareness through public messaging, communication, and education along with how best to support themselves and each other, will assist community members in both being prepared for and being able to recover from natural events.

The City of Playford

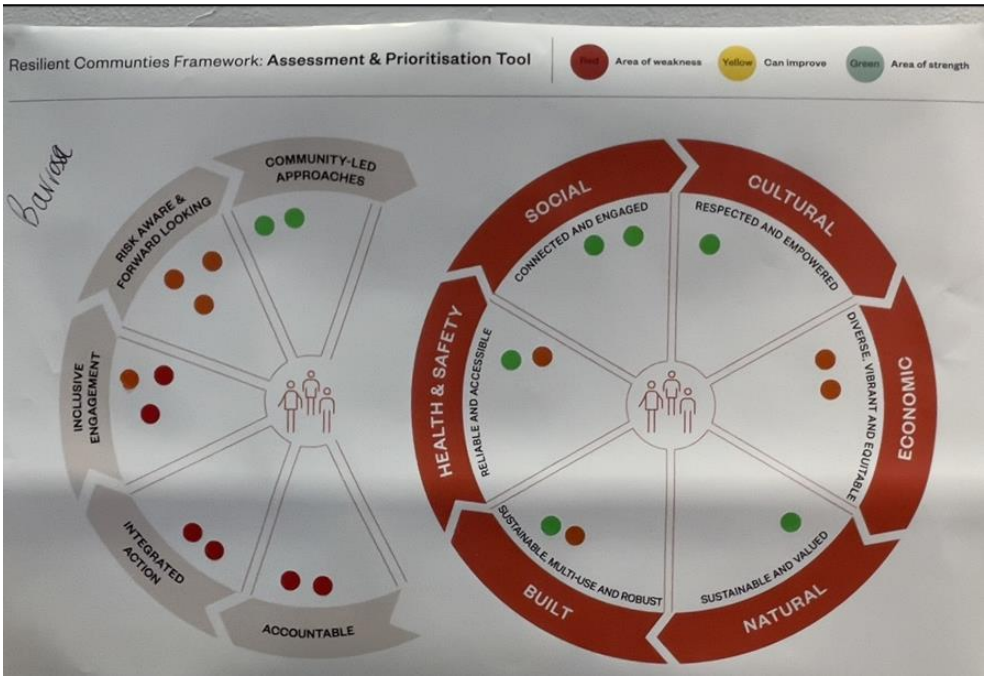


Figure 20: Resilient Communities Framework: Assessment and Prioritisation Tool completed by representatives from the City of Playford (CoP) at the Gawler Big Map Exercise.

Principles

Activity participants representing the CoP area identified their strengths as being risk aware and forward looking, and accountable. Community-led approaches and inclusive engagement were identified as having room for improvement, while integrated action appears to be an area of weakness. Interestingly, all areas identified as areas of strength were simultaneously identified as areas for improvement or areas of weakness.

Environments

Activity participants representing the CoP area identified strength in their health & safety and social environments. Playford's built and natural environments were identified as areas of strength, improvement, and weakness, indicating conflicting views among representatives. The remaining two environments - cultural and economic, were identified as areas for improvements / areas of weakness.

Discussion

Activity participants representing the CoP area identified health and safety as a major community strength, which aligns with their strength of being risk aware and forward-looking. While the social environment was also identified as a major strength, it appears that this does not currently translate into community-led approaches or integrated actions.

Empowering what has been identified as a connected and engaged community through creating opportunities for both education and collaboration with council may enhance outcomes in this area. In creating these opportunities, accounting for diversity (cultural, socio-economic, religious, age, physical ability, etc.) will facilitate more inclusive engagement and in turn aid in improving the cultural environment. Besides health and safety, room for improvement has been identified across all framework areas, indicating the CoP has a long way to go in maximising its anti-fragility.

Interestingly, there appears to be conflicting views between representatives in most framework areas with many simultaneously identified as a strength and a weakness. This may indicate variable understanding of the activity itself (i.e., what each principle/environment represents), and/or variable focus on the differing aspects of each area. Ensuring activity participants are clear on what each area represents will minimise the effect of variable understanding levels on activity data. Additionally, post-activity discussion that delves further into each area may facilitate the identification of where work is required with greater specificity.

The Town of Gawler

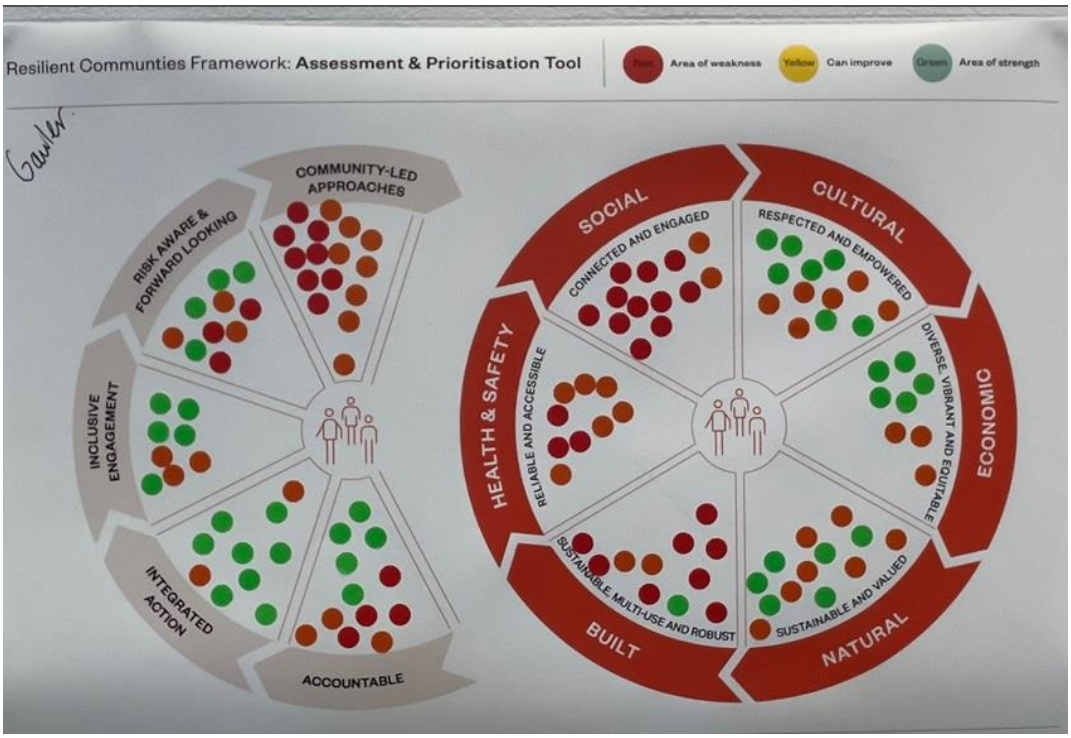


Figure 21: Resilient Communities Framework: Assessment and Prioritisation Tool completed by representatives from the Town of Gawler at the Gawler Big Map Exercise.

Principles

Areas of strength include Integrated Action and Inclusive Engagement. Areas of weakness and improvement are focussed on Community-Led Approaches. Mixed results where both areas of weakness and improvement and areas of strength are highlighted is seen in the Accountability and Risk Aware & Forward-Looking categories.

Environments

Areas of strength have been highlighted in the Cultural, Economic, and Natural Environments. It is of note however, these Environments also have been selected, by some, as areas of both weakness and improvement. The Social, Health & Safety, and Built Environments highlight significant areas of both perceived weakness and improvement.

Discussion

Although the Town of Gawler LGA have highlighted areas of strength in the Principles of Integrated Action and Inclusive Engagement, they are weak in Community-Led Approaches. This corresponds with weakness in the Social and Health & Safety Environments, along with a mixed result in the Cultural Environment. Accountability is mixed, which can highlight the differing perspectives between the category of participants giving the score i.e., local council vs business vs community member, of who has roles and responsibilities in the natural hazard event space.

To increase the anti-fragility of the Town of Gawler, areas of improvement require more in-depth and equal collaboration between all stakeholders to heighten community hazard awareness. This will allow community members to drive, and have buy-in to, the activities involved in the prevention/mitigation and recovery aspects of a natural hazard event. This will ensure accountability is given across all stakeholder groups and improve and strengthen the Social, Cultural, and Health & Safety Environments.

A more aware stakeholder group, as it relates to the interaction consequences of a natural event, will also improve the Built Environment to incorporate sustainable and hazard resistant infrastructure, giving further strength in the Economic Environment and the ability to shorten the recovery phase and return to business as usual in a strengthened state.

Resilience Survey

No Understanding			Some Understanding				I have a thorough understanding		
1	2	3	4	5	6	7	8	9	10

People	Score AM	Score PM
I have strong social connections in my community, and I have people I can rely on in times of need.	7.5	8.1
I know who the lead agencies are during certain events	7.8	8.5
I am aware of my vulnerabilities and have plans to mitigate them	7.4	8.1
Making Sense		
I have a clear understanding of the emergency procedure in my area	6.5	7.9
I have an understanding of the bigger picture around me and that fire and flood are a natural hazard in the region I live.	8	8.5
I have a clear understanding of what alerts and communications may go out in an event and what they mean for me	7.5	8.3
I understand flood classifications and where to find them on the Bureau of Meteorology web page	6	7.9
I have an understanding of all the risks that could potentially impact me and my community	7.1	8.5
Bouncing Back		
My household has an emergency plan, and everybody is familiar with it	6	6.4
I am capable of moving forward after adverse situations	7.8	8.1
Striving Forward		
I am open to different ways of doing things	8.3	8.7
I have good understanding of what I can do to mitigate the risks to my family and myself	7.8	8.5
Our Human Needs		
I know what I need to have on hand if there is a need to ride out certain events	7.7	8.1
My household has emergency evacuation pack ready to go and it is regularly checked	5.3	6.3
I know where to go to find information of threats as they arise, and situations change	7.2	8
Courage		
I have the ability to continue on even in tough times and when things seem overwhelming	8.1	8.5
I know where to go to find information of threats as they arise, or I can ask in need	7.8	8.5
I know that its ok to have a range of emotions in stressful situations and I know to reach out for help	8.4	8.7

The Survey results highlight a successful growth of understanding across almost every index, with improvement from “Some Understanding” to “I have a Thorough Understanding” being achieved in almost every field. This reinforces the bolstering to community resiliency able to be achieved via Big MAP events, but this is the start of a process that has many different facets and component parts.

Establishing a Community Core

At the end of the workshop the idea of developing a localised community - led Community Core was discussed. Community members run a Core without official assistance - it's essentially a place for neighbours to help neighbours in a coordinated way. Each Core is based at the community level, and it explains how to organise an emergency relief and recovery effort based on community expectations, needs, and associated local requirements. It also sets out and describes the different roles needed.

The primary role of the Community Core however is to act as the link between the associated Local Government and the community.

Post a disaster event the community will naturally come together to support one another after as required. Strong, connected communities are better prepared to respond to and recover from disasters when they occur. In a major emergency, official responders will always need to prioritise the most urgent issues, so it is likely that for the first few days the community will need to help each other within the disaster. The Community HUB is a designated place where they can gather, connect with one another, and solve problems using the skills and resources which already exist among their community.

During this workshop it was clear that if a Community Core was established the Five Pillars of the DRA Recovery model could easily be lead and fully utilised. The Five Pillars of the DRA Recovery model are as follows:

Human and Social - This relates to the emotional, social, physical, and psychological health and well-being of individuals, families and communities following a disaster. The Human and Social pillar within a community aims to:

- Gain access to timely information from the Local Government
- Aids in providing assistance to reconnect with families, friends, and community networks
- Enables community members to manage their own recovery through access to information and the knowledge of where to find Local, Regional and State services and/or practical assistance, including financial assistance for those individuals and households who are most vulnerable and do not have the means to finance their own recovery.
- Acts as the lead for the community and the vital link between Local Government and the community to access emotional, psychological, and mental health support at individual, family, and community levels (psychosocial support).

Tasks include:

- Identify and select a Community HUB leader
- Identify a suitable location and secondary location to act as a community HUB / community centre immediately post a disaster event
- Understand the roles and responsibilities of the Red Cross, Vinnies, Disaster Relief Australia, other Community Groups, GIVIT, State and Federal Recovery and Funding Arrangements, and Local Government Relief and Recovery arrangements.
- Understand and identify the location of the critical care members of the Community, and
- Lead and interpret the needs and requirements of the community when outside assistance arrives.

Economic - The effects of a disaster on the economic environment can be classified in terms of direct and indirect impacts. The tangible impacts can usually be given a monetary value and may include loss of tourism, employment opportunities and reduction in cash flow for businesses. Each community has a business lead and chamber of commerce established. A community member from these groups is always very well connected and fully understands the community in which they live. A Community Hub with this type of leading community member is always a great asset to have.

Tasks include:

- Identify and understand the key economic drivers of the community. What's unique to this community and if its impacted how will this impact the community over the next 3, 6 months if lost or damaged?
- Understand the State and Federal Recovery and Funding Arrangements.

Environmental – Impacts to the environment may include damage or loss of flora and fauna, poor air quality, reduced water quality, land degradation and contamination, or damage to heritage listed places. A representative from the community who understands these impacts and is willing to step forward and guide the Local Government as required.

Tasks include:

- Identify and understand the environmental impacts across the community
- What do these impacts have on farming, businesses and or private landowners
- Understand localised flood mitigation options, bushfire mitigation strategies etc

Building - The effects of a disaster on the built environment often result in damage and disruption which inhibits the capacity of essential services and services such as housing, accommodation, education, and health facilities. A representative from the community (local builder, plumber etc.) who understands these impacts and is willing to step forward and guide the Local Government as required.

Tasks include:

- What has been damaged or impacted in the community (Minor, Moderate Major)
- Are there likely to be insurance issues?
- Will outside contractors impact the community if utilised?
- What building capabilities exists within the community?

Roads and Transport - The effects of a disaster on transport networks, including road, rail, aviation and maritime normally result in difficulty accessing communities and disruption to critical supply chains (both within and outside of the impacted area). Restoration of these networks, or the identification of alternatives, is a priority in disaster recovery. A representative from the community who understands these impacts and is willing to step forward and guide the Local Government as required.

Tasks include:

- What local roads, bridges and or access routes have been impacted?
- What is the result of these impacts (can't access property, roads damaged, bridges damaged etc)?

Group Activities

No group activities were conducted for the Gawler Resilience Workshop.

Utilising the DRA Resilience Framework

In the last decade, resilience has evolved from a specialist term used largely in materials science and environmental studies to become a concept employed frequently and passionately by policymakers, practitioners, and academics in various disciplines. The concept has become embedded in laws, government, doctrines, and plans, and universities across the world have established resilience centres, institutes, and research programs.

Within DRA, we believe a resilient community is one whose members are connected to one another and work together in ways that enable it to function in the face of stress and trauma. A resilient community can adapt to changes in the physical, social, or economic environment, and the potential to learn from experience and improve over time. A resilient community can also be self-sufficient, at least for a time, if external assistance is limited or delayed.

As communities are complex and dynamic social structures, levels of community resilience are not static. It is important that those utilising the concept of community resilience make efforts to regularly measure it.

The first step towards enhancing the resilience of a community involves understanding the community's strengths and vulnerabilities, as well as its physical characteristics (e.g., local infrastructure), procedural characteristics (e.g., disaster policies and plans) and social characteristics (e.g., level of community cohesion).

People: Resilient people are aware of situations, their own emotional reactions, and the behaviour of those around them. By remaining aware, they maintain control of a situation and think of new ways to tackle problems. In many cases, resilient people emerge stronger after such difficulties.

What does success look like?	We are resilient within a community when: We have access to people that can assist when required and provide situational awareness when we need it We understand the weaknesses and vulnerabilities across our community Our community understands and is involved in disaster risk management Our community is at its strongest when we work together.
Our commitments to the community	We act with every possible kindness and humanity, and no matter what, hold ourselves to a higher standard. Be respectful: Be respected. Swift mobilisation to rapidly deploy Disaster Relief Teams in the wake of a natural disasters to assist the community. Increase community awareness and preparedness for all hazards through community engagement. Show, through action, how the latent leadership and service potential of our nation's veterans and emergency service specialists can be harnessed to build disaster resilience and relief capability.

Making Sense: Making sense of a problem is essential for understanding the bigger picture. Making sense of things is a way to explore and develop effective plans at a community level.

What does success look like?	We are resilient within a community when: We know that beyond the next hill is a river and beyond the river another hill. Yet we will march undaunted until we reach those who need us. We understand that the community is connected and or influenced by internal and external factors. We understand the Local economic activity, relationships among different social groups, local cultural patterns… they all influence the community from the inside out. The challenges we face are complex, we understand that we cannot approach them as if they were linear problems. Systems thinking helps us understand the complex crises before us.
Our commitments to the community	Identify and connect with change leaders in the NGO and disaster relief sectors to ensure we are constantly at the cutting edge of both technology, practice, and the community. The conduct of disaster risk mitigation and preparedness activities in Australia and overseas, particularly in under resourced and high-risk areas of operation. Recognised leader in spontaneous volunteer management throughout Australia and a proven track record of connecting businesses to communities through corporate volunteering.

Bouncing Back: Resilient communities can bounce back from adverse situations. They can do this by actively influencing and preparing for economic, social and environmental change.

What does success look like?	We are resilient within a community when: Our disaster management systems are scalable to accommodate the future changes and risk. Our community looks to the future and continuous improvement. we take a proactive approach to resilience building, rather than a reactive one
Our commitments to the community	Operating within existing international disaster relief frameworks across the Asia Pacific Region, supported by established relationships with government, industry, and local communities. We act without fear or favour in the best interests of the communities we serve and each other. we embrace a culture of ongoing improvement through regular monitoring and information sharing.

Striving Forward: As we look to the future, some challenges will be so big that it won't be possible for the community to simply adapt. Fundamental changes will be necessary, and the community will need to adapt.

What does success look like?	We are resilient within a community when: We know that transformation must occur. Our ability to transform as a community will not be successful unless the community involved recognise the need for it. We will need options for change. New ideas for dealing with new situations will only be available if there is room for them to be developed and tested. Transformative change needs support from higher scales and depends on having high levels of all types of capital—natural, human, built, financial, and social.
Our commitments to the community	We serve without expectation of personal gain, recognition, or reward. Provide a steady-state engagement model that provides continuous touch points with our Tribe between disaster relief missions. Deploy highly trained personnel in the wake of natural disasters to deliver timely and effective disaster relief wherever and whenever it is needed.

Our Human Needs: A sustainable community is a place where people want to live and work, both now and in the future. The community needs of existing and future residents are sensitive to environment and contribute to a high quality of life. These communities are inclusive, well-planned, built and run, and offer equality of opportunity and good services for all.

What does success look like?	We are resilient within a community when: Sustainability helps us understand in a more general sense our extremely complex relationship with the natural world, and the consequences of getting that relationship wrong. Identify adaptation opportunities following disasters and in anticipation of climate change We explore how our actions impact the biosphere, how the biosphere in turn impacts us, and how our actions need to change over the long term.
Our commitments to the community	Promote a culture of creativity, continuous learning, a bias for action and trust over control. Ensure we have mechanisms to listen to the views of our stakeholders, communicate effectively and continuously learn to improve our performance. A world class provider of Remotely Piloted Aircraft capability, aerial damage assessment, mapping, and Geographic Information Systems (GIS), in Australia and overseas.

Courage: Everyone within a community needs the courage to confront challenging issues and take responsibility for a collective future.

What does success look like?

We are resilient within a community when:
We know that we need to face problems head on. Resilience building makes us grapple with complex problems that don't have easy or obvious answers.
We know it's hard enough to work on these issues as individuals and households; it's harder still to work on them as a community, with people who may see things differently.

Our commitments to the community

We act without fear or favour in the best interests of the communities we serve and each other.
we embrace a culture of ongoing improvement through regular monitoring and information sharing.
Courage brings us back around to the first foundation, People, because it is the people of the community who will build resilience—and they are the ones who need courage for all the pieces of resilience building.

9. Recommendations

Combination of data driven flood monitoring and local knowledge

It may be advantageous for stakeholders in the Gawler to meaningfully combine local knowledge of Gawler, South and North Para River behaviour with the data that is collected by the sensors and gauges. An opportunity exists for local council representatives, landowners, SA Water and Bureau representatives to discuss how this may occur to inform preparation, monitoring, and anticipation of flood events.

Refinement of flood warning timeliness

There appears to be an issue with flood alert timeliness, specifically, that notification of a flood event is not sent out with enough time for stakeholders to prepare. It is difficult to discern when conditions are going to cause a flood, or if the weather will change and preparatory actions will occur without a flood happening. A solution may be refinement of the notification systems (i.e who is told, and under what conditions, that a flood may be likely with enough time to allow for preparations). This will require multiple stakeholders from SA Water, DEW, Local Councils, the BoM and SES.

Synthesis of data from different collection sources

Synthesis of different data collection sources to include local knowledge of river heights would improve the precision and quality of the flood predictions made by the Bureau, SA Water and DEW. This will assist local councils in advising citizens and businesses to take preparatory actions.

Multilingual flood alerts

The languages other than English spoken in the horticultural industry within the Catchment need to be identified. This can be done with industry groups that these people are part of, and with the cooperation of the LGAs. Once the predominate language groups are identified, flood alerts in these languages can be crafted.

Flood proofing of new land developments

The Riverlea development is an example of the increasing residential land development that is expected to occur in the Gawler River Catchment. However, this land development must have due regard and design elements incorporated that mitigate the impact of stormwater and floodwater.

Development of a catchment profile

A Catchment profile for disaster management needs to be linked to State authorities for triggers for federal response options and to compel coordination across LGAs and State authorities. This includes integration of LGAs with the Local Government Response Group to assist them in recovery post a disaster event.

Implementation of a levee development approval process

Levee development approval process and levee survey in the Catchment is needed to document where they are currently emplaced and uplift the oversight from LGAs on their construction. This will assist in modelling of water flows and prevent levees from being compromised by irrigation practices, undermining their effectiveness.

Implementation of multi-stakeholder disaster rehearsals

Local Government Disaster rehearsals to include liaison with SES representatives. LGAs in the Gawler River Catchment need to conduct liaison with other agencies as part of the disaster response. When rehearsals and exercises to refine procedures are conducted, the involvement of the SES will be crucial to ensure their support can strengthen the disaster response.

Utilising social media as an information source before and during a flood emergency

Social media and the communications infrastructure in the catchment is one of the most accessible means for LGAs, the SES and the State Emergency Centre to distribute information to citizens on the flood situation and what actions they should take to protect themselves, their families and their property. Media and communications advice should be sought on the most suitable means for mass communications.

Engaging landowners in flood and water management

Landowners in the catchment need to be engaged about how they can assist in flood and water management. Landowners interact with the Gawler and Para rivers through the use of their properties. Construction of dams and levees, use of the water for irrigation, and recreation are all ways that the Gawler River interacts with landowners – but their uses also affect how the River can behave during floods.

Modelling of flood water impacts on the railway infrastructure in the Gawler Catchment

The railway lines leading North from Adelaide to the Northern Territory and Western Australia are a vital infrastructure link for Adelaide and the wider South Australian state. Their possible disruption during a flood event needs to be understood. The key question is: what is the possible flood water impact and how can this be mitigated without transferring the problem to another part of the Catchment?

Accounting for hazardous materials

A survey of hazardous materials, dangerous goods and chemical locations within the Catchment will assist in understanding the environmental hazards caused by their disruption or damage by floodwaters. The floodwater may carry some of these hazardous materials and chemicals into the St Vincent's Hulf and wider Elizabeth Gulf ecosystem. The possible impacts need to be understood to identify other possible ways for the likelihood of impact to be mitigated.

Prioritising services, power, and communications towers for mobile phones in recovery efforts

Any damage to communications infrastructure will slow the rate of response and affect the coordination of the response and emergency services. Accordingly, communications sites need to be located in areas without floodwater impact, and if they are impacted, need to be hardened to mitigate the risk of the destruction or damage during a flood.

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