

# How GIS survey app's helped saved lives and livelihoods during South Australia's 2022/3 River Murray Floods

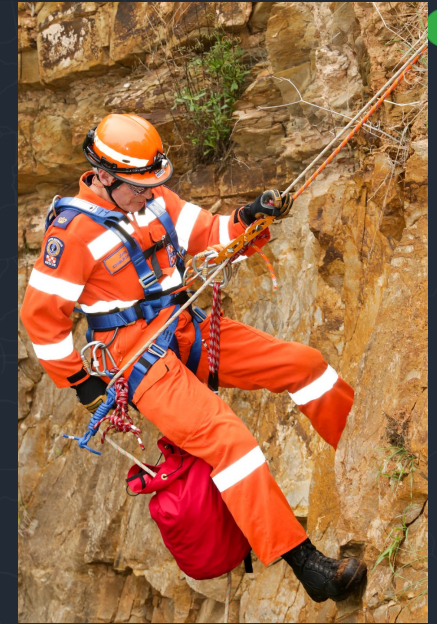
**Dr. Sara Pulford | SA SES**

Gordon Sumerling | Esri Australia

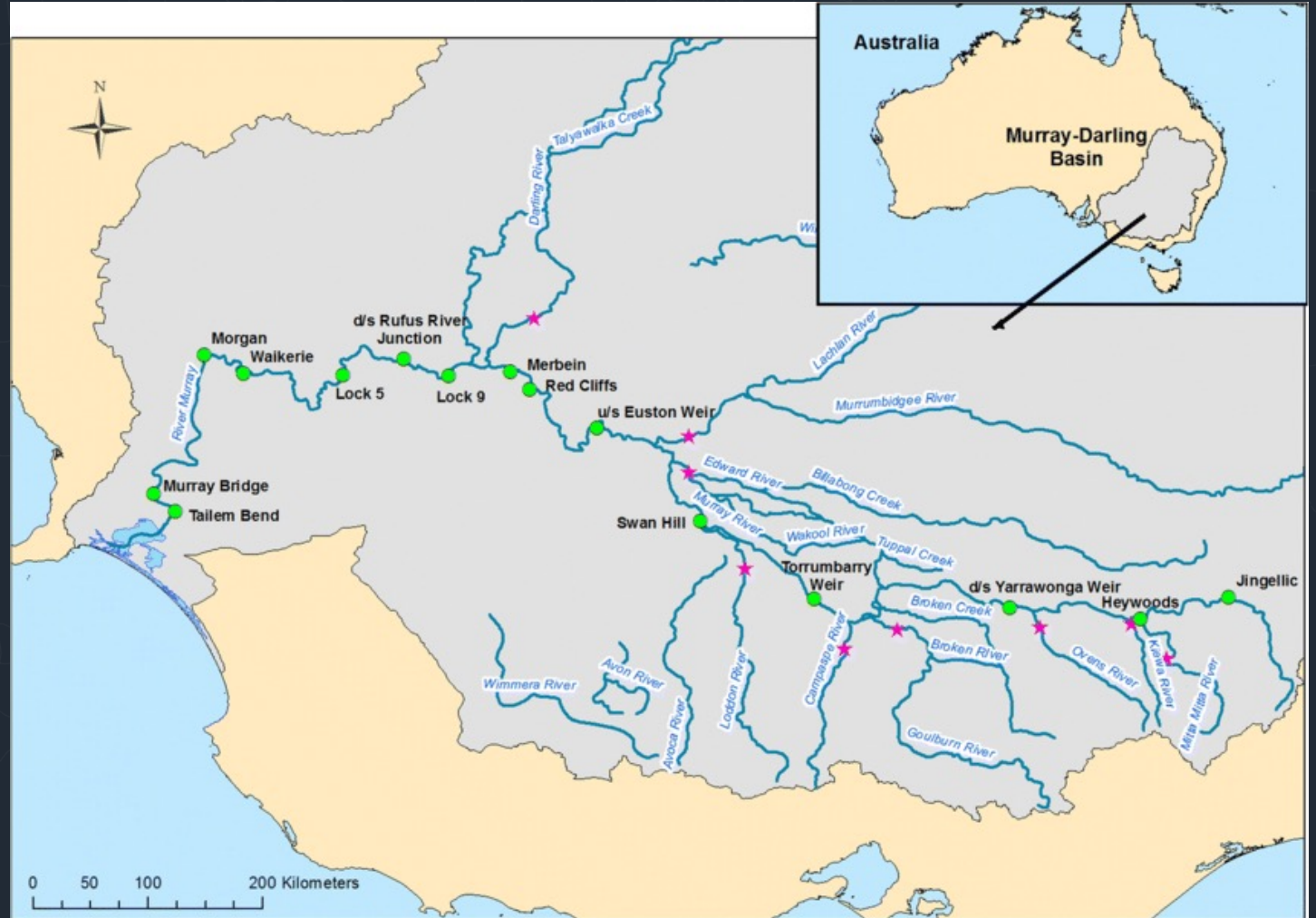


# South Australian State Emergency Service

Severe Weather - Storm, Flood, Heatwave  
Search and Rescue – Swift Water, Vertical, Road



# South Australia and the River Murray



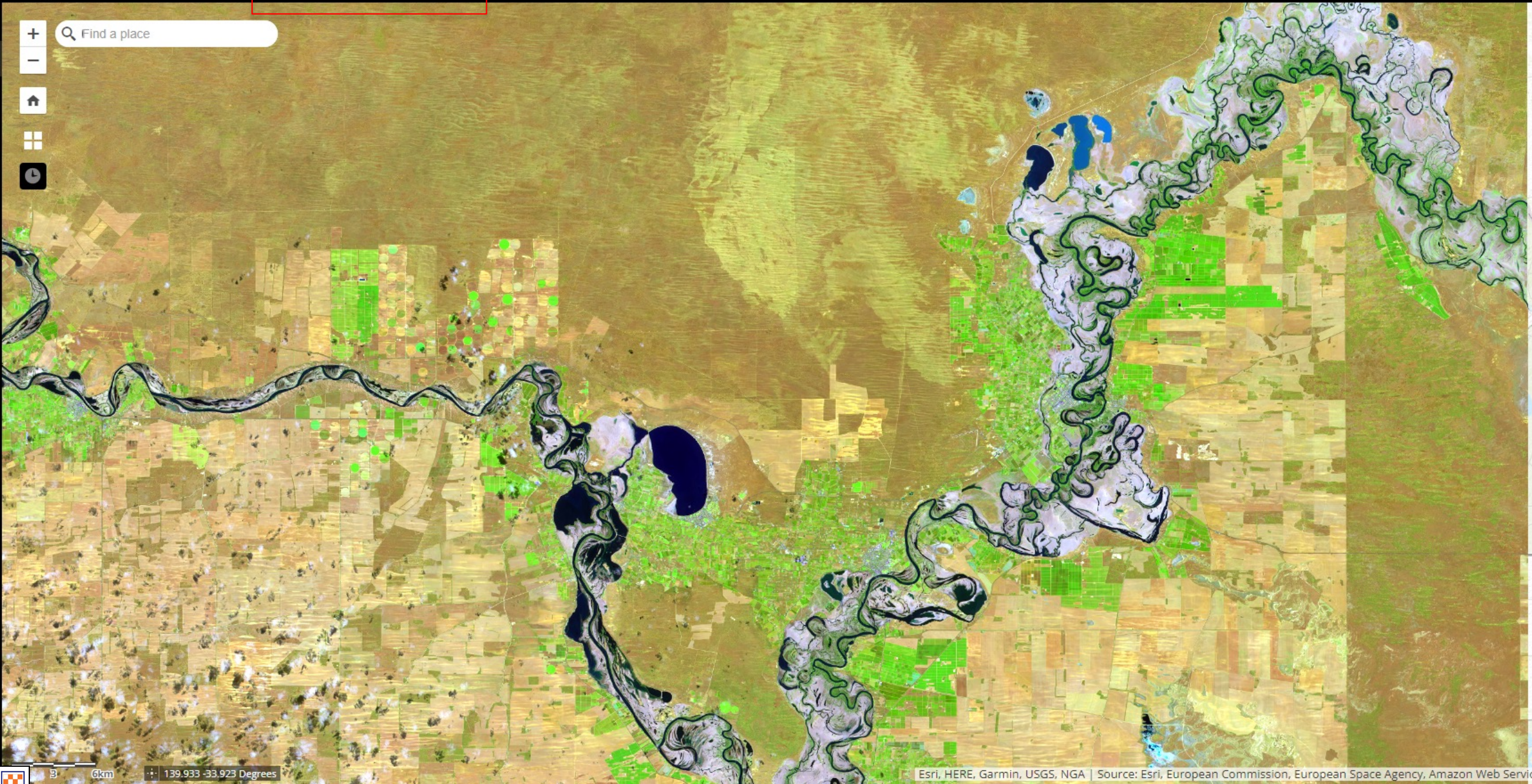
# “River Murray flooding to be worst in almost 70 years”

ABC December 2022



Find a place

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- About



# The Requirements

## Overview

3 use cases for centralised, electronic form based GIS

- Planning – Emergency Response properties effected
- Response – Ongoing Levee Assessment
- Recovery – Understanding of Impact



# Planning - Property Door Knock – 7 day timeline

Needed to understand the properties to be affected by inundation

- Sunday 27<sup>th</sup> November Premier announced Assessment of Properties
  - Collection of information to be electronic by emergency personnel
- Monday 28<sup>th</sup> Planned and designed
- Tuesday 29<sup>th</sup> App deployed
- Sunday 4<sup>th</sup> December 3000 properties inspected



# Planning - Property Door Knock – The solution

Needed to understand the properties to be affected by inundation

- Deliver an ArcGIS Survey123 form which
  - Provided property location
  - Inundation status (current and expected)
  - Relief accommodation required?
- Operational Emergency focussed
- 100+ field collectors from SASES, SAPOL and other agencies
- Centralised operational dashboard providing up-to-date status



Accessing the SA State Emergency Service

River Murray Impacted Residents  
Questionnaire

To access this questionnaire, open your preferred browser on your phone, tablet or PC. Type in the link:

[https://bit.ly/SASES\\_RMIRQ](https://bit.ly/SASES_RMIRQ)

Or scan the QR code below with your phone/tablet camera and accept the offer to open it in your default browser.



Once the questionnaire opens, just type in your answers. Items marked with a red star are required to be filled in. As you start to type your address in the search bar you should see a list of suggestions to choose from. Once you have completed your answers, please don't forget to submit the form.



# Planning - Property Door Knock – The solution

## Needed to understand the properties to be affected by inundation

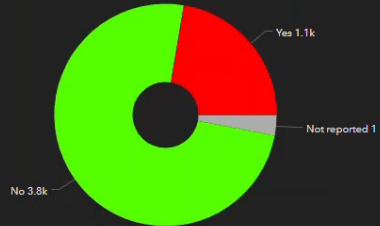
Questionnaires submitted  
**5,107**

Emergency accommodation  
**303**

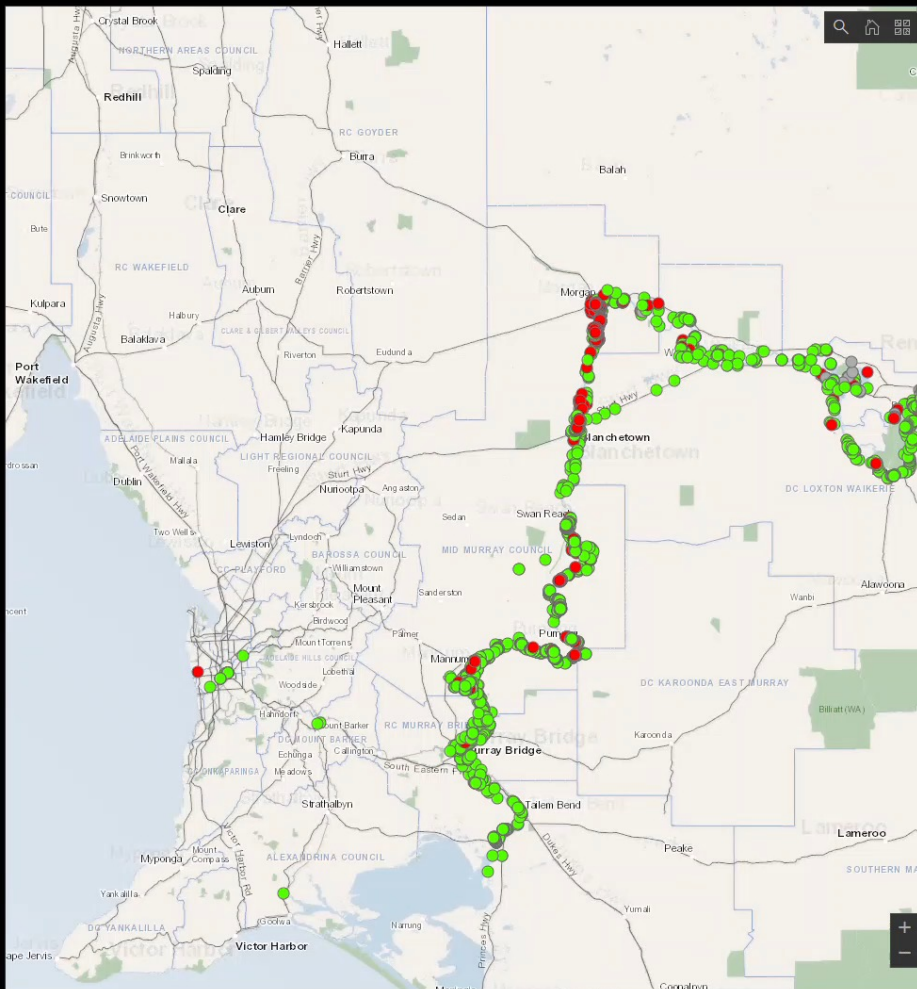
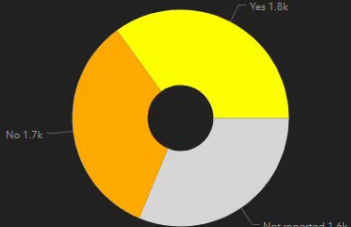
**259**

**68**

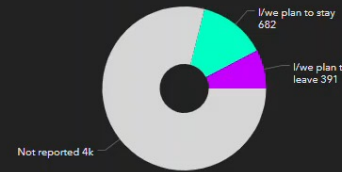
Properties already impacted by water



Properties likely to be impacted by water



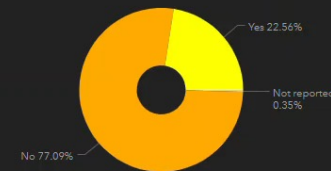
Plan to leave or stay



Method of collection



Property occupied?



**Questionnaire Impacted Residents**

**Instructions**  
This questionnaire is designed to capture information for members of the community who may become isolated as a result of a flood event.  
The collection of this data will provide intelligence for response planning ensuring that access and egress points and vessels and/or vehicles are appropriate. The data may also inform locations for impact assessments to be carried out.

**1. Personal details**  
Please provide your best contact details and the location of the impacted or isolated residence.

First name\*

Family name\*

Phone number\*

Impacted Address\*

How many other adults live at this address?

Other adults details (0)

How many children live at this address?

Children's details (0)

**2. Impact**  
Please provide details on current or expected impact.

Has the property been impacted by risk?

Telstra 3:34 pm 58%

**Doorknock Impacted Residents Questionnaire**

**1. Personal details**  
Please provide your best contact details and the location of the impacted or isolated residence.

Is property occupied?  
 Yes  No

First name \*

Family name \*

Phone number \*

Address \*

Location  
34°56'S 138°35'E ± 35.0 m

# Response – protection of assets

River Murray flood was a 5 month Blue Sky flood

- Infrastructure and property needed protection
- 172 levees – over 200km in total inspected
- Needed to continually check integrity of levees as high water level for 3 months
- Many organisations needed to feed field data to a centralised dashboard



# Levee Assessment – the solution

## River Murray flood was a 5 month Blue Sky flood

- More than 200km of levees to monitor
- 1<sup>st</sup> stage field collectors many non-technical
- 2<sup>nd</sup> stage technical engineers to assess red flags
- Esri Australia deployed DRP in ArcGIS Online
  - 500 named users
- Centralised Dashboards
  - summarises whole of River Murray status



# Levee Assessment – the solution

River Murray flood was a 5 month Blue Sky flood



# Levee Assessment – the solution

Levee Inspections

Council \*

- Renmark Paringa
- Loxton Waikerie
- Mid Murray
- Berri Barmera
- Lower Murray/DEW
- Alexandrina
- Coorong
- Other

Defect assessor

Inspection Type

- Visual Assessment
- Drone

Defect Type \*

- Overtopping
- Overtopping - Floodwater level exceeds 600mm freeboard
- Levee breach
- Seepage - water exiting from a point on the embankment's land-side batter
- Seepage - Water exiting foundation
- Seepage - Water exiting near a pipe
- Longitudnal crack
- Transerve Crack
- Cracking due to drying
- Slide, Slump or slip
- Sinkhole in crest or upstream slope
- Low are or dip in crest
- Erosion Gully on crest or bank slopes

Defect Comments

Levee Defects

**598**  
Total

Waiting Review

**205**

Defect Added

**0**  
In last 24 hours

Catastrophic **90** Levee Defects

Major **344** Levee Defects

Moderate **73** Levee Defects

Minor **91** Levee Defects

General Inspections

**1.6k**  
Total

Total

Waiting Review

Catastrophic Levee Defects

Object ID: 792

Defect ID: 792

Defect Classification: Catastrophic

Defect Date: 4 February 2023

Council: Mid Murray

Levee Name: Other

Defect Name: Major - Seepage - Water exiting foundation

Defect Type: Visual Assessment

Defect Description: Seepage - water exiting from a point on the embankment's land-side batter

Defect Comments:

Inspection Type: Visual Assessment

Defect Status: Open Problem

Defect Severity: Catastrophic

Defect Category: Major

Defect Status: Catastrophic

Defect Status: Major

Defect Status: Moderate

Defect Status: Minor

**90** Catastrophic Levee Defects

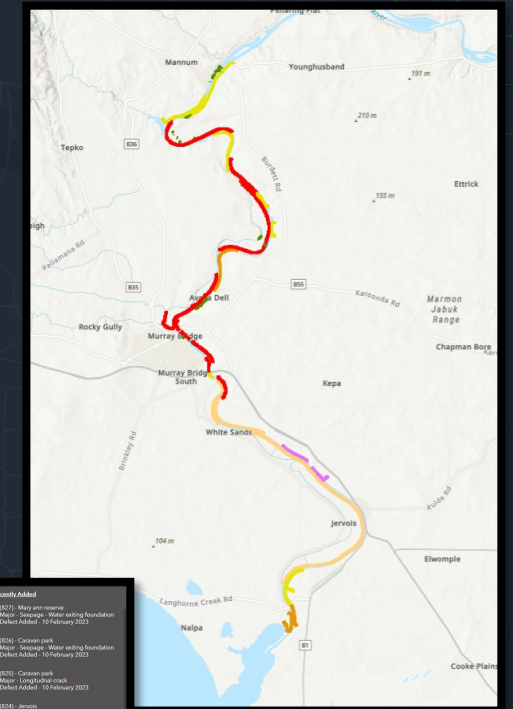
**344** Major Levee Defects

**73** Moderate Levee Defects

**91** Minor Levee Defects

**0** Levee Defects

**1.6k** Total



## River Murray SA Collaboration

# Levee Assessment – the solution

Without centralised online GIS this would not have been possible

## Esri Disaster Response Program:

- Centralised database
- Web Services enabled
- Easy to build and use form based mobile applications
- Intuitive Dashboards
- Additional licences
- Support from Esri Australia



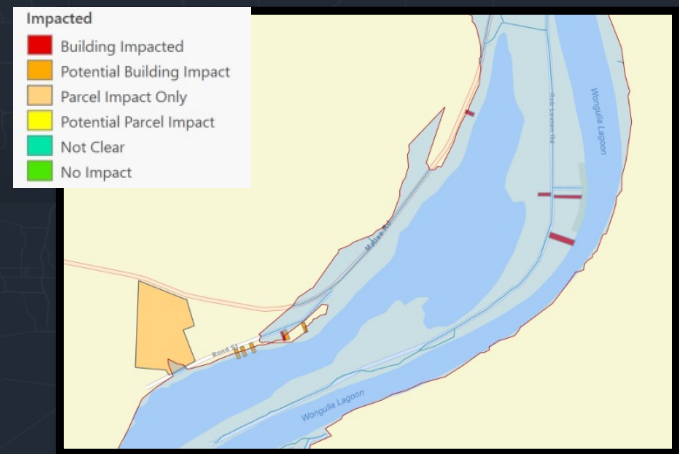
# Recovery – understanding the impact

Over 300 primary residences inundated for 3 months

- Needed to understand what properties were impacted
- Performed analysis of line scan imagery of whole river, captured at peak for SASES by NSW RFS to produce flood extent polygon
- Refined using high resolution satellite imagery provided by AGO over townships and Sentinel satellite imagery.
- Intersected with residential properties layer provided to SASES by DPC-ODA
- Identified 3295 properties impacted, including 367 primary residences
- Over 1100km roads: 800+km access tracks plus 350km of roads
- Ground truthed with field app 30% of properties

# Recovery – understanding the impact

## Over 300 primary residences inundated for 3 months



SA State Emergency Service - Damage Assessment

Select date range of interest: All Today Last 2 days Last 7 days

Assessments completed	Persons deceased	Persons evacuated	Persons missing
935	0	0	0
<small>Last update: a few seconds ago</small>	Persons injured	Persons displaced	
	0	0	

**Damage Level**

**Habitable?**

**Building type**

**Business status**

Total damaged

# 802

Total isolated

# 27

**Latest data points**

- Residential - Moderate damage - collected 14/2/2023, 5:05 PM
- Residential - Moderate damage - collected 14/2/2023, 5:04 PM
- Residential - Moderate damage - collected 14/2/2023, 5:04 PM
- Residential - Moderate damage - collected 14/2/2023, 5:04 PM
- Residential - Severe damage - collected 14/2/2023, 5:04 PM
- Residential - Severe damage - collected 14/2/2023, 5:03 PM
- Residential - Moderate damage - collected 14/2/2023, 5:03 PM
- Residential - Moderate damage - collected 14/2/2023, 5:03 PM
- Residential - Moderate damage - collected 14/2/2023, 5:03 PM
- Residential - Moderate damage - collected 14/2/2023, 5:02 PM

Last update: a few seconds ago

Damage Assessment

9:31 am 90%

Structure type: Fixed

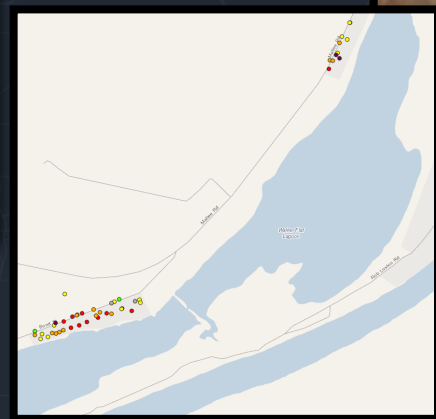
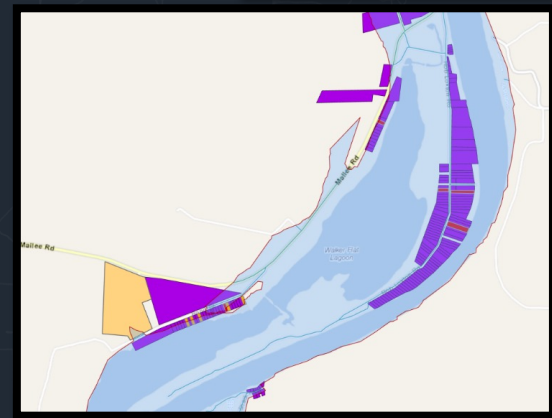
External wall materials:

Roof materials:

Number of levels (Ground level and above):

For buildings on sloping terrain, consider the lowest level of egress to be ground level - 1. The level number recorded may not correspond to the numeral displayed near the lifts or on directories. Mezzanine levels should be counted as a whole level (see figure below).

Damage \*





# For more information contact:

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