

Real-time Flood Forecasting at Scale



THE CLIMATE IS CHANGING

Flooding is becoming **more frequent and more severe** each year.

Set to **double** by 2038

9^B

ANNUAL
DAMAGES

2019

80%

OCCURS IN
QLD

A photograph showing a road completely submerged in floodwater. The water is dark and murky, reflecting the overcast sky. In the background, there are several trees with green foliage, some of which are partially submerged. The road surface is visible in the foreground, showing a double yellow line that has been partially obscured by the water.

“At least 35% of damage from natural disasters is preventable with early warning systems.”

~ World Bank

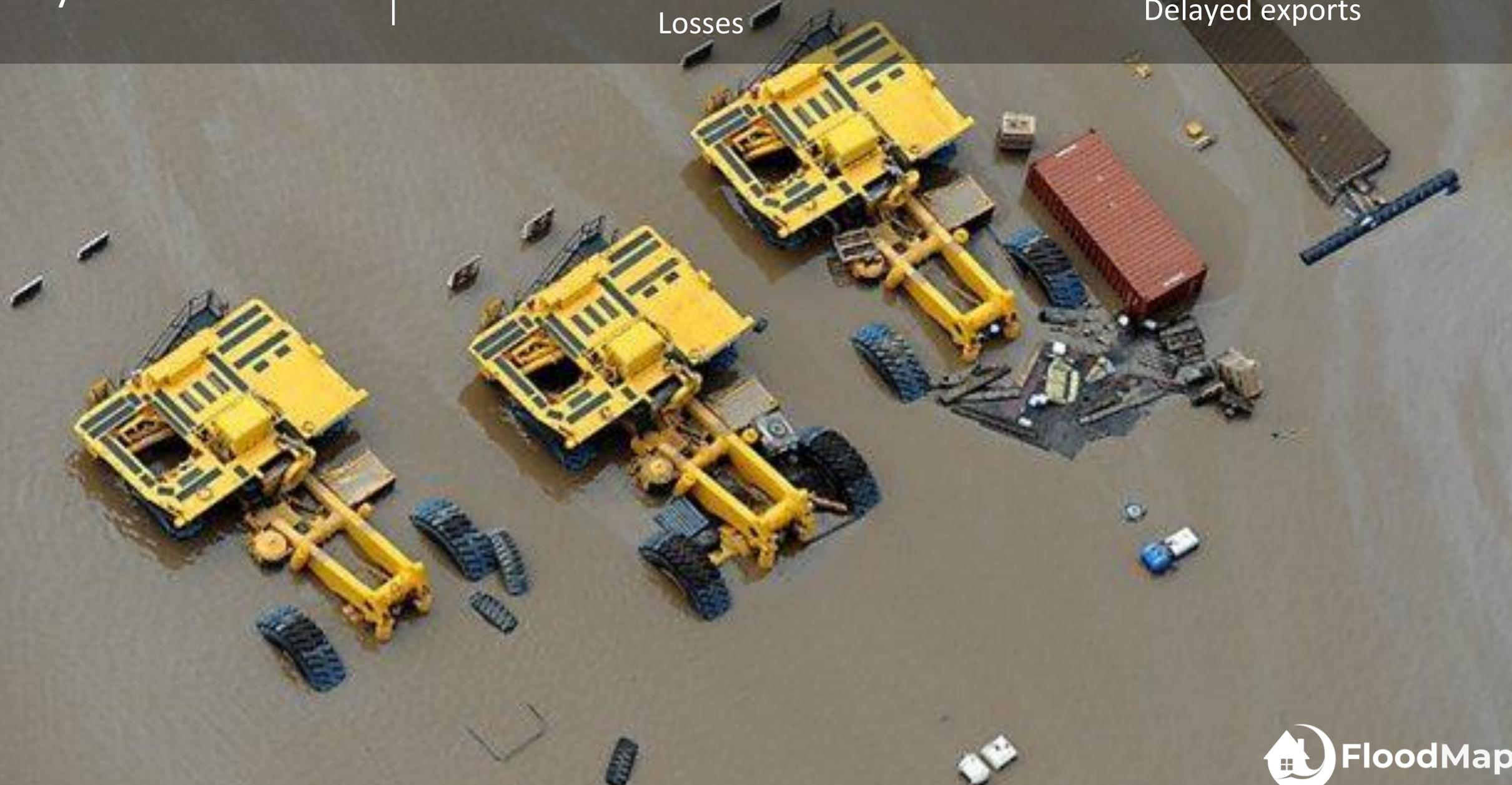


This is Cheryl. She lost everything in the 2011 Brisbane floods

Cyclone Debbie

\$ 1.5 Billion
Losses

Lost mining production
Delayed exports



Hurricane
Harvey

\$ 4 Billion
in auto claims

1 Million
flooded vehicles



Understanding the modelling question



Why aren't we preventing more damage?



How does this affect me?

- Current early warnings are broad
- Flood warnings communicated as peak flood height
- Individual action is unclear



>24 hours

- Powerful 2D flood models are computationally intensive
- Flood maps can't be generated fast enough for proactive response and loss prevention.



Changing environment.

- Flood studies & flood hazard maps are static and show the 1%, 0.1% AEP
- Not always indicative of a flood event unfolding

Will my property or site flood?



Should I move my valuables?



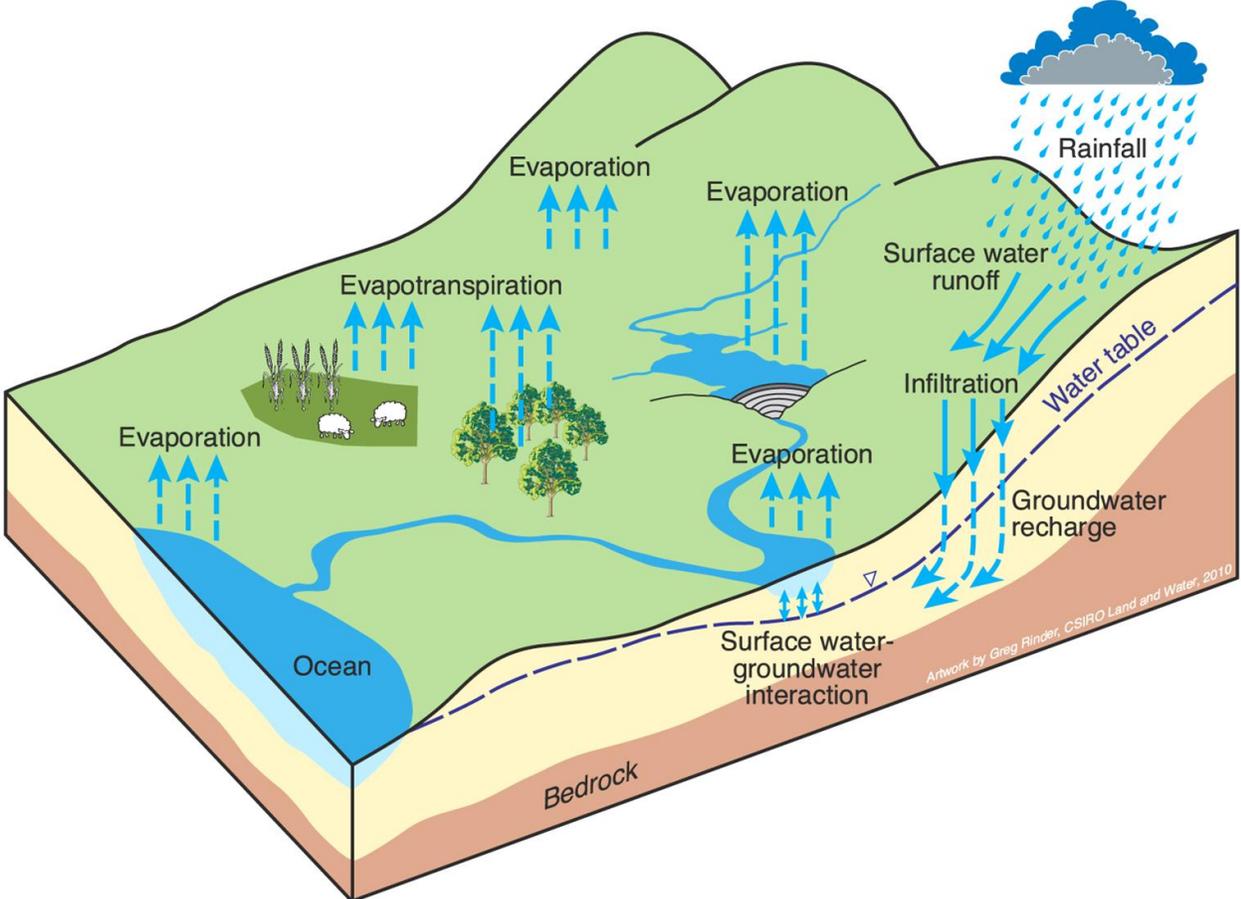
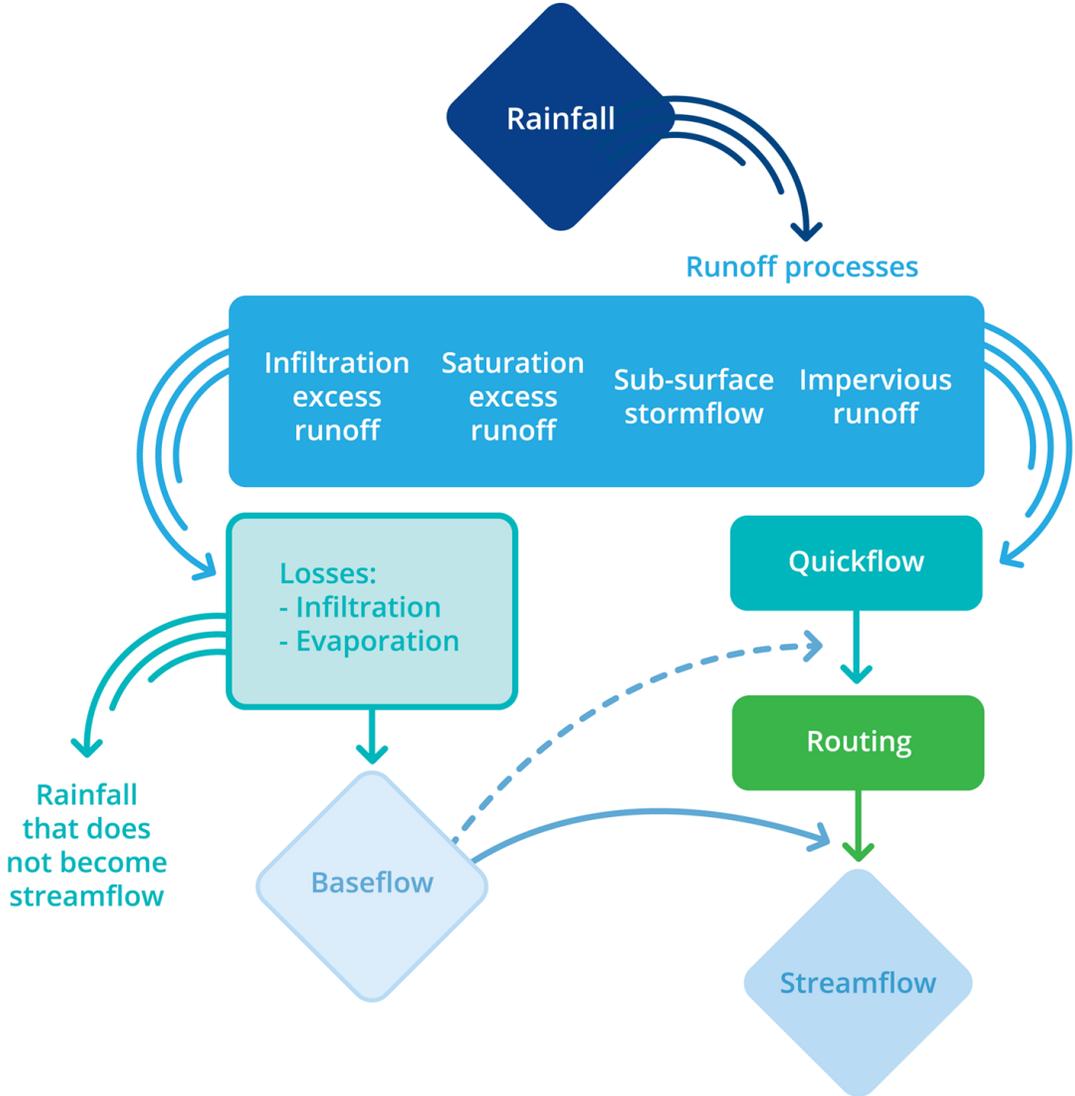
What assets are likely to be affected?



Describing the System

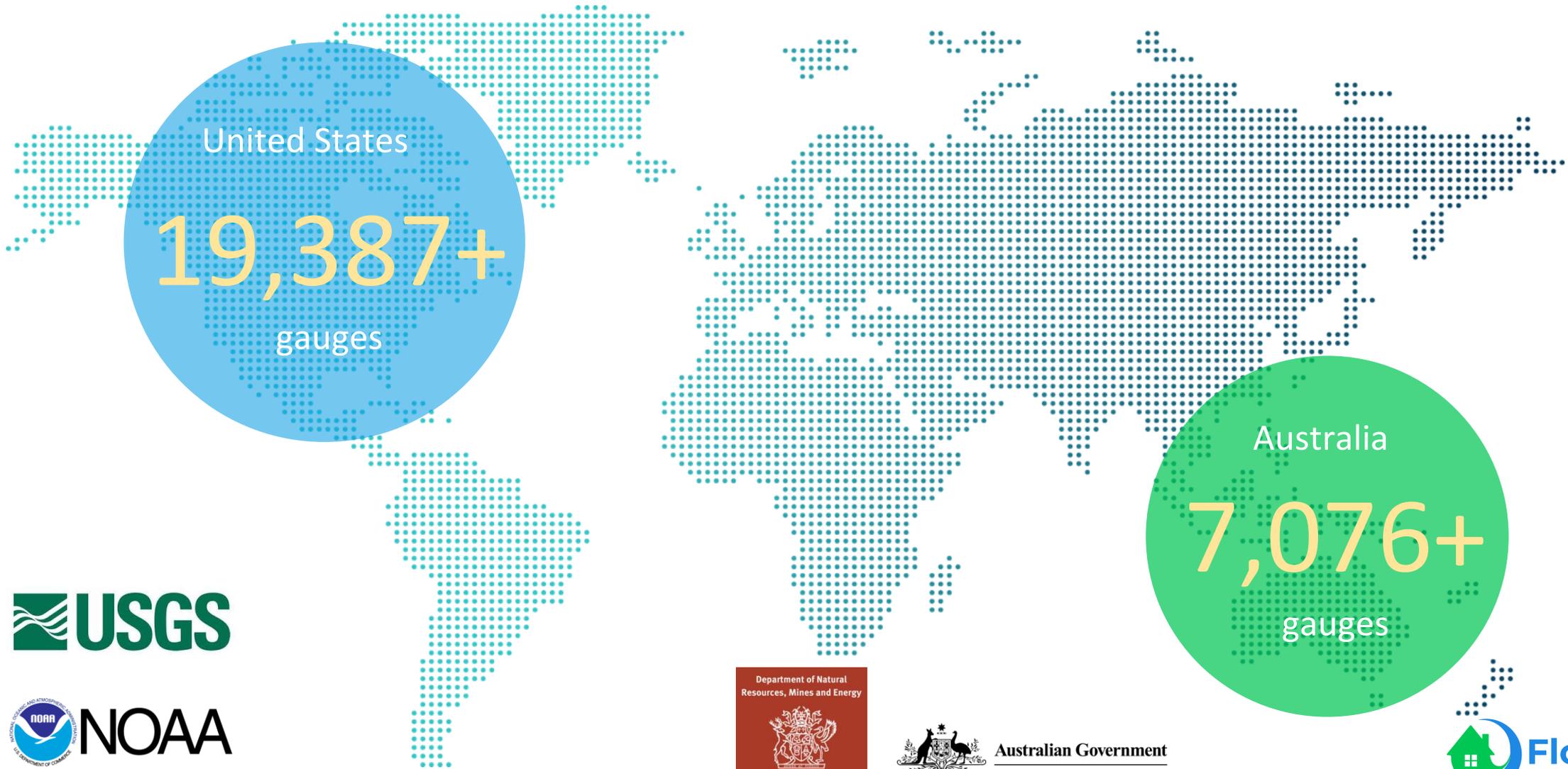


Hydrology



Input Data

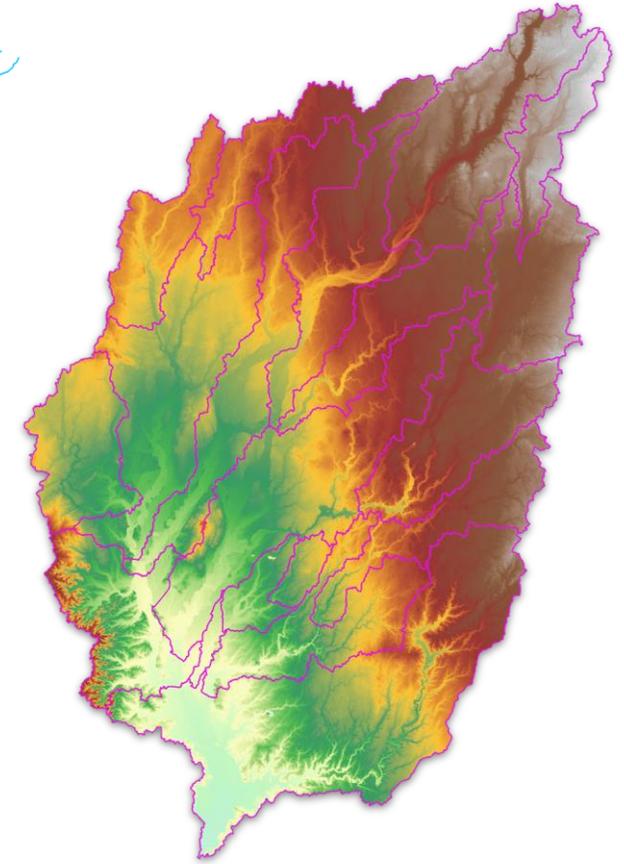
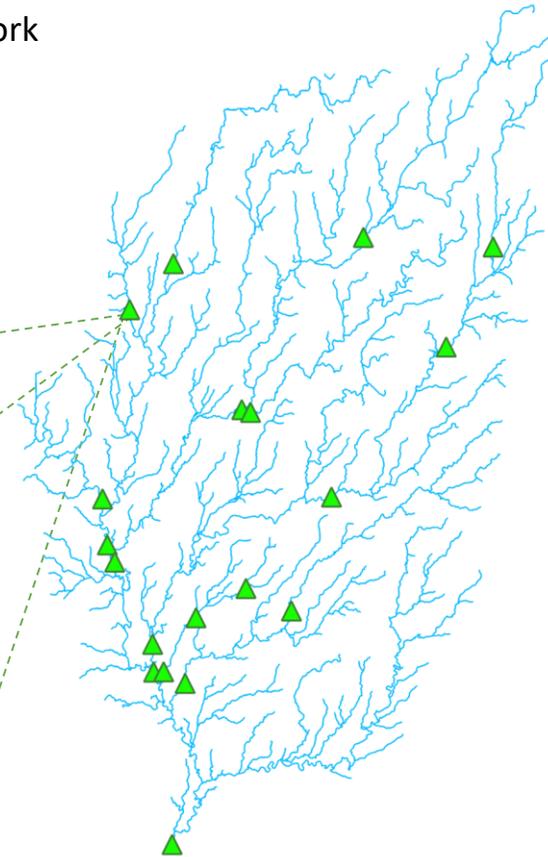
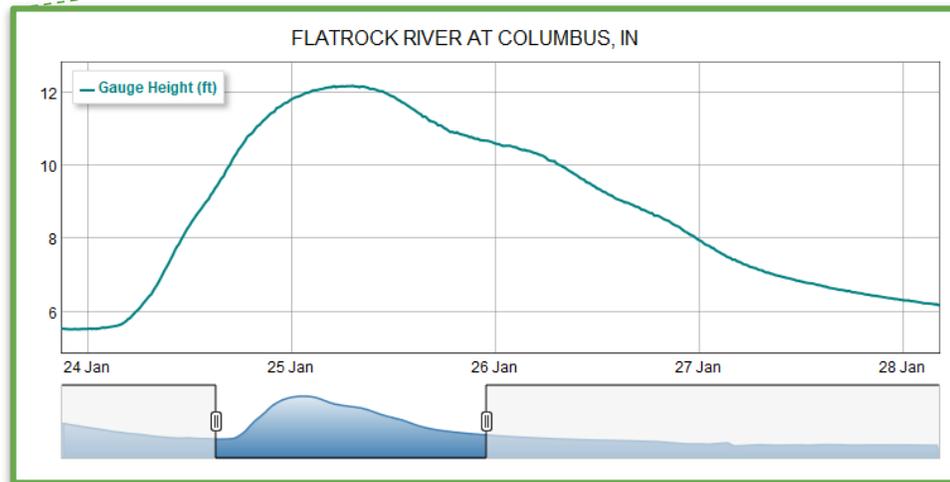
Real Time Rain, River and Tide Gauges



Hydrology

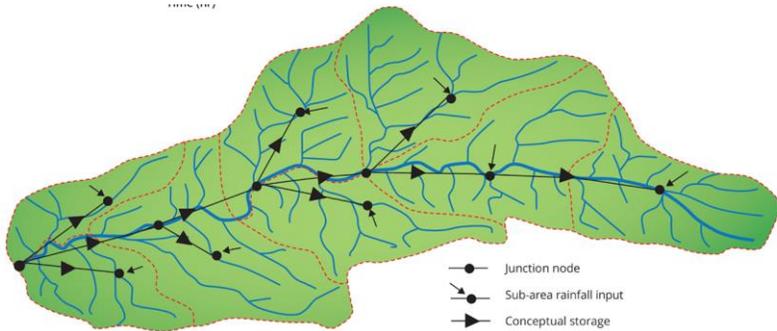
Automated delineation of Catchment & Sub-Catchment Boundaries

Automated mapping of Stream system Network



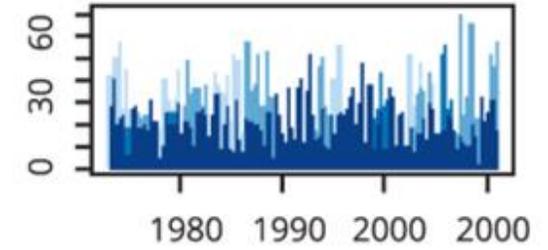
Machine Learning & Hydrology

Land use type

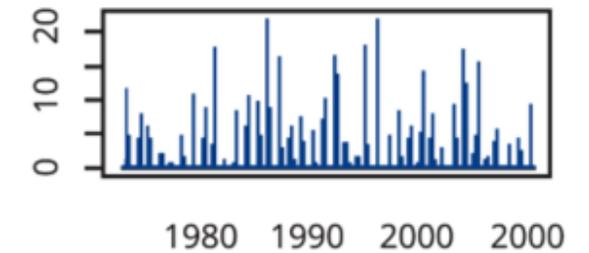


Evapotranspiration

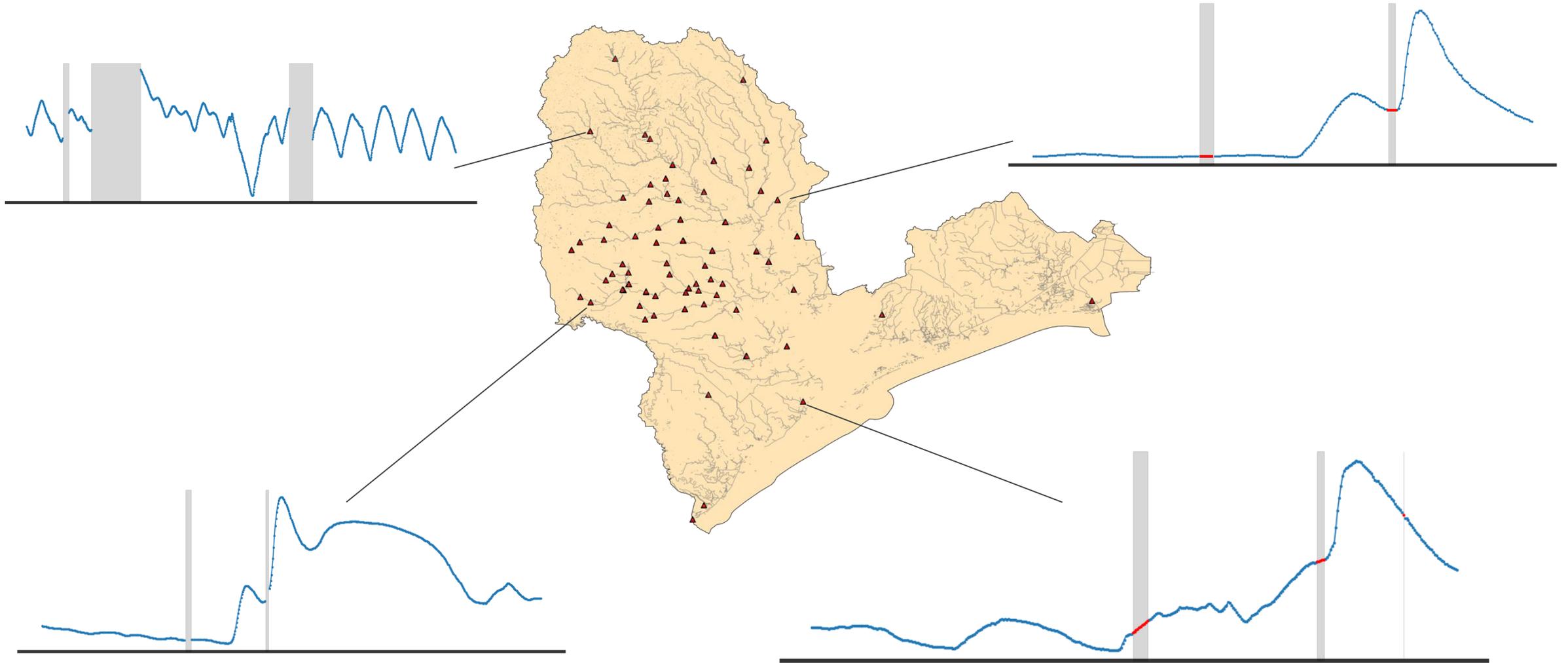
Observed and/or simulated rainfall

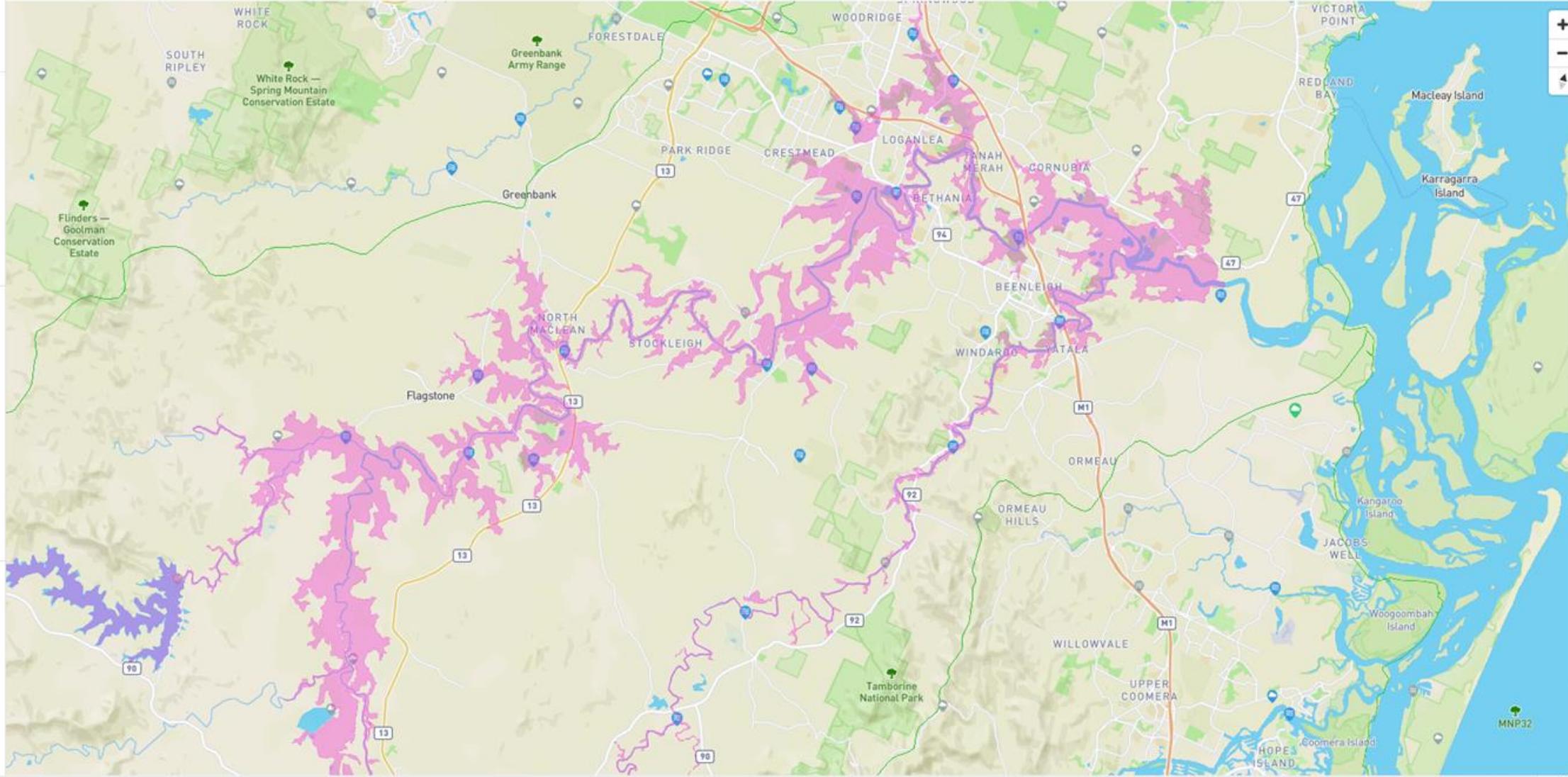


Modelled flow



Machine Learning & Data Cleaning





Flood Layers

- Historical Floods
- Predicted Floods (Demo)

River Conditions

- Normal
- Minor
- Moderate
- High

Rain Stations

- 0-1 mm
- 1-10 mm
- 10-25 mm
- 25-50 mm
- 50+ mm

Case Study

Logan-Albert Flooding 2017

IDQ20815 Australian Government Bureau of Meteorology, Queensland Media: Transmitters serving the Logan and Albert Rivers are REQUESTED TO USE THE STANDARD EMERGENCY WARNING SIGNAL BEFORE BROADCASTING THIS MESSAGE.

PRIORITY: The Bureau and Emergency Services would appreciate this message being broadcast regularly.

Major Flood Warning for the Logan and Albert Rivers Issued at 2:41 am EST on Friday 31 March 2017

Flood Warning Number: 6 Widespread areas of significant major flooding are occurring in the Logan and Albert River catchments. Record major flood levels are occurring at Beaudesert along the Logan River on Friday morning.

Widespread rainfall totals of 100–230 mm were recorded overnight across the Logan and Albert River catchments, with isolated higher totals of up to 280 mm. The rainfall associated with ex-Tropical Cyclone Debbie has mostly cleared from the South East and Logan–Albert catchments.

Logan River to Yarrahappini: Moderate to major flood levels remain high or have commenced to slowly ease during Friday morning across the Logan River to Yarrahappini. The Logan River at Beaudesert is currently at 13.91 metres and steady at major.

This level equivalent to the record flood level in 1991. The Logan River at Beaudesert is likely to remain at current major flood levels until late Friday afternoon, and then commence to slowly ease. Logan River downstream of Yarrahappini: Significant major flooding is occurring along the Logan River downstream of Yarrahappini. The Logan River at Maclean Bridge is currently at 15.96 metres and rising just below the major flood level. The Logan River at Maclean Bridge will exceed the major flood level (16.00 m) in the next few hours. The river level is likely to peak near 19.50 metres early Friday evening.



March 31, 2017 · 🌐

ALERT - MOVE TO HIGHER GROUND - LOGAN RIVER

Residents in flood prone areas along the Logan River in #scenicrim are advised to move to higher ground due to rising flood waters. Record flood levels above the 1991 peak of 13.9m are expected. Residents can use Beaudesert Uniting Church in William St and Tamborine Memorial Hall on Tamborine-Waterford Rd as safer places if needed. Be advised there is NO evacuation alert for Beaudesert township.



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💬 Comment

➦ Share



👍 🧑 12

Most Relevant ▾

[Bureau Home](#) > [Australia](#) > [Queensland](#) > [Rainfall & River Conditions](#) > Queensland Rainfall and River Height Data

Queensland Rainfall and River Height Data

 View the current warnings for Queensland

Latest River Height Data (including plots and tables)

- [Nerang, Coomera, Pimpama, Logan-Albert, Tingalpa Creek](#)
- [Stanley, Brisbane, Bremer, Ipswich/Brisbane Creeks, Pine/Caboolture](#)
- [Mooloolah, Maroochy, Noosa, Mary](#)
- [Burrum-Cherwell, Burnett, Kolan](#)
- [Baffle, Boyne, Calliope, Dawson, Mackenzie, Fitzroy](#)
- [Pioneer, Proserpine, Don, Burdekin, Haughton, Ross/Bohle, Black R/Bluewater Ck](#)
- [Herbert, Tully, Johnstone, Mulgrave-Russell, Barron, Daintree/Endeavour](#)
- [Macintyre, Dumaresq, Weir, Moonie](#)
- [Condamine, Myall Creek, Balonne, Maranoa, Wallam/Mungallala Creeks](#)
- [Warrego, Paroo, Bulloo](#)
- [Thomson, Barcoo, Cooper, Diamantina, Georgina](#)
- [Leichhardt, Nicholson/Gregory, Flinders, Norman, Gilbert, Cape Rivers](#)
- [All Queensland Rivers](#)

Rainfall Bulletins

- [Daily Bulletin](#)
- [Weekly Bulletin](#)
- [Recent Rainfall Maps](#)

Hourly and 24 hour rainfall bulletins

River Basin	Rainfalls		
	1 Hour	3 Hour	24 Hour
Gold Coast streams, Nerang, Coomera, Pimpama Logan-Albert	1hr	3hr	24hr
Brisbane, Bremer, Ipswich Cks, Brisbane Cks, Pine, Caboolture	1hr	3hr	24hr
Coochin Ck, Mooloolah, Maroochy, Noosa, Mary	1hr	3hr	24hr
Burrum, Cherwell, Burnett, Kolan	1hr	3hr	24hr
Baffle, Boyne, Calliope, Dawson, Mackenzie, Fitzroy	1hr	3hr	24hr
Pioneer, Proserpine, Don, Burdekin, Haughton, Ross, Bohle, Black	1hr	3hr	24hr
Herbert, Tully, Johnstone, Mulgrave-Russell, Barron, Daintree	1hr	3hr	24hr
Macintyre, Dumaresq, Weir, Moonie	1hr	3hr	24hr
Condamine, Balonne, Maranoa, Wallam, Mungallala	1hr	3hr	24hr
Warrego, Paroo, Bulloo	1hr	3hr	24hr
Thomson, Barcoo, Cooper, Diamantina, Georgina	1hr	3hr	24hr
Gulf and Cape Rivers	1hr	3hr	24hr

Zoom in to:

- ▶ Gulf & Peninsula
- ▶ Daintree to Townsville
 - ▶ Cairns to Ingham
 - ▶ Townsville
- ▶ Central Coast
 - ▶ Townsville to Mackay
- ▶ Mackay to Maryborough
- ▶ Maryborough to Gold Coast
 - ▶ Albert/Logan Rivers
 - ▶ Brisbane River
 - ▶ Mary River
 - ▶ Greater Brisbane
- ▶ South West
- ▶ Border Rivers
 - ▶ Macintyre River

Zoom out to:

- ▶ Queensland
- ▶ Australia

Other Links:

- ▶ [Rain & River Data](#)
- ▶ [Forecast Rainfall](#)
- ▶ [Recent Rainfall Maps](#)
- ▶ [Queensland Service Level Specification](#)
- ▶ [About Flood Warning in Queensland](#)
- ▶ [About Flood Watch in Queensland](#)
- ▶ [Flood Gauge Information](#)
- ▶ [Queensland Flood History](#)
- ▶ [Heaviest Reported Rainfalls](#)
- ▶ [River Brochures](#)
- ▶ [Catchment Maps](#)
- ▶ [Flash Flood Advisory Resource \(FLARE\)](#)
- ▶ [Flood FAQ](#)

External links



IDQ60285

Latest River Heights for the Gold Coast Rivers, Logan-Albert Rivers, Tingalpa Creek and tributaries

Issued at 10.40am on Wednesday, 7 November 2018

[About river heights](#) | [About this table](#) | [Flood Warning Centre](#) | [Rain and River Data](#)

[Nerang](#) | [Coomera](#) | [Pimpama](#) | [Logan-Albert](#) | [Tingalpa Creek](#) | [Stradbroke Islands](#)

Station Name	Time/Day	Height	Tendency	Crossing	Flood Class	Recent Data
Nerang						
Lt Nerang Ck at Little Nerang Dam #	9.07am Wed	-0.30	steady	0.30 below Spillway	below minor	Plot Table
Nerang R at Numinbah Valley #	10.10am Wed	1.07	steady			Plot Table
Nerang R at Numinbah Valley *	10.00am Wed	0.50	steady			Plot Table
Nerang R at Hinze Dam #	8.25am Wed	-0.58	falling	0.58 below Spillway	below minor	Plot Table
Nerang R at Clearview #	8.46am Wed	0.44	steady		below minor	Plot Table
Nerang R at Clearview *	10.00am Wed	0.22	steady		below minor	Plot Table
Nerang R at Carrara #	10.26am Wed	1.15^	falling		below minor	Plot Table
Bonogin Ck at Hardys Rd #	9.03am Wed	0.02	falling	1.12 below Bridge		Plot Table
Worongary Ck at Worongary #	10.12am Wed	0.72	steady			Plot Table
Mudgeeraba Ck at Neranwood C'way#	9.45am Wed	-1.65	falling	1.65 below Causeway		Plot Table
Mudgeeraba Ck at Springbrook Rd *	10.00am Wed	0.45	steady			Plot Table
Mudgeeraba Ck at Mudgeeraba #	9.27am Wed	0.96^	rising	3.64 below Bridge	below minor	Plot Table
Boobegan Ck Lock #	9.54am Wed	0.66^	steady			Plot Table
Nerang R at Evandale #	10.36am Wed	0.38^	falling		below minor	Plot Table
Biggera Ck Dam #	8.26am Wed	3.32^	steady			Plot Table
Loder Ck Dam #	9.11am Wed	5.44^	steady			Plot Table
Loder Ck #	10.32am Wed	0.38^	falling			Plot Table
Nerang R at Air Sea Rescue #	10.29am Wed	-0.17^	falling			Plot Table
Southport Spit Tide *	9.55am Wed	1.06	falling			Plot Table
Burleigh Waters at Miami Lake #	10.22am Wed	-0.10	rising			Plot Table
Lake Orr at Burleigh Waters #	8.09am Wed	0.20	steady			Plot Table
Lake Orr TW at Burleigh Waters #	10.38am Wed	0.58	falling			Plot Table
Tallebudgera Ck at Dam #	8.17am Wed	0.19	steady			Plot Table
Tallebudgera Ck at Robinson Pk #	10.19am Wed	0.90	falling		below minor	Plot Table
Tallebudgera Ck at Robinson Pk *	9.00am Wed	0.92	steady		below minor	Plot Table
Tallebudgera Ck at Coplicks Br #	10.35am Wed	0.17^	steady		below minor	Plot Table
Oyster Ck at Township Dr #	10.10am Wed	0.95^	falling			Plot Table
Tallebudgera Ck at Mouth #	10.37am Wed	1.08	falling			Plot Table
Currumbin Ck at Currumbin Valley #	10.24am Wed	0.50	steady			Plot Table
Currumbin Ck at Nicolls Br *	9.00am Wed	0.59	steady			Plot Table
Coomera						
Coomera R at Canungra Army #	9.14am Wed	0.56	steady		below minor	Plot Table
Coomera R at Canungra Army *	10.00am Wed	0.80	steady		below minor	Plot Table
Back Creek at Beechmont *	10.00am Wed	0.19	steady			Plot Table





IDQ65388

Latest River Heights for Logan R at Beaudesert

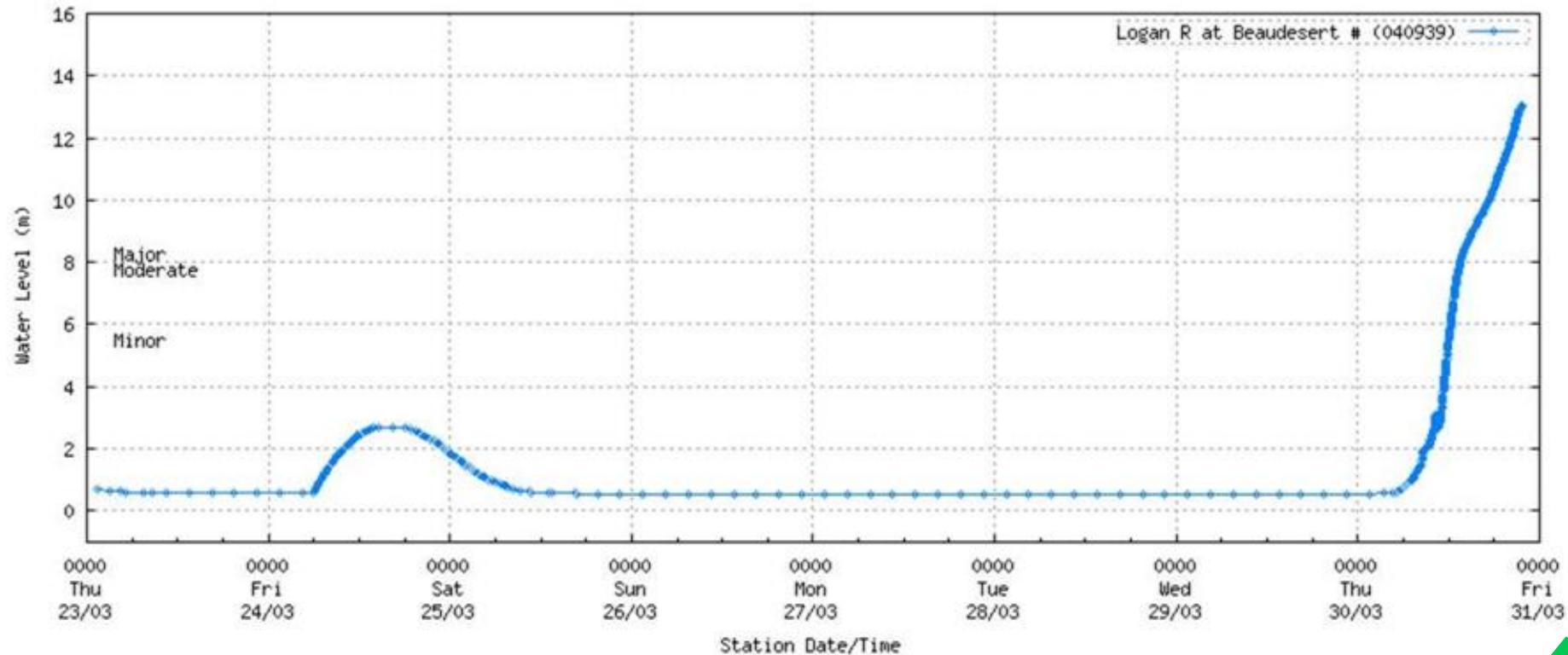
Issued at 9:41 pm EST Thursday 30 March 2017

[About river height plots](#) | [About this Plot](#)

Station details: Station Number: 040939 Name: Logan R at Beaudesert # Owner: BOM:145918

Flood levels: Minor: 5.50 Moderate: 7.80 Major: 8.30

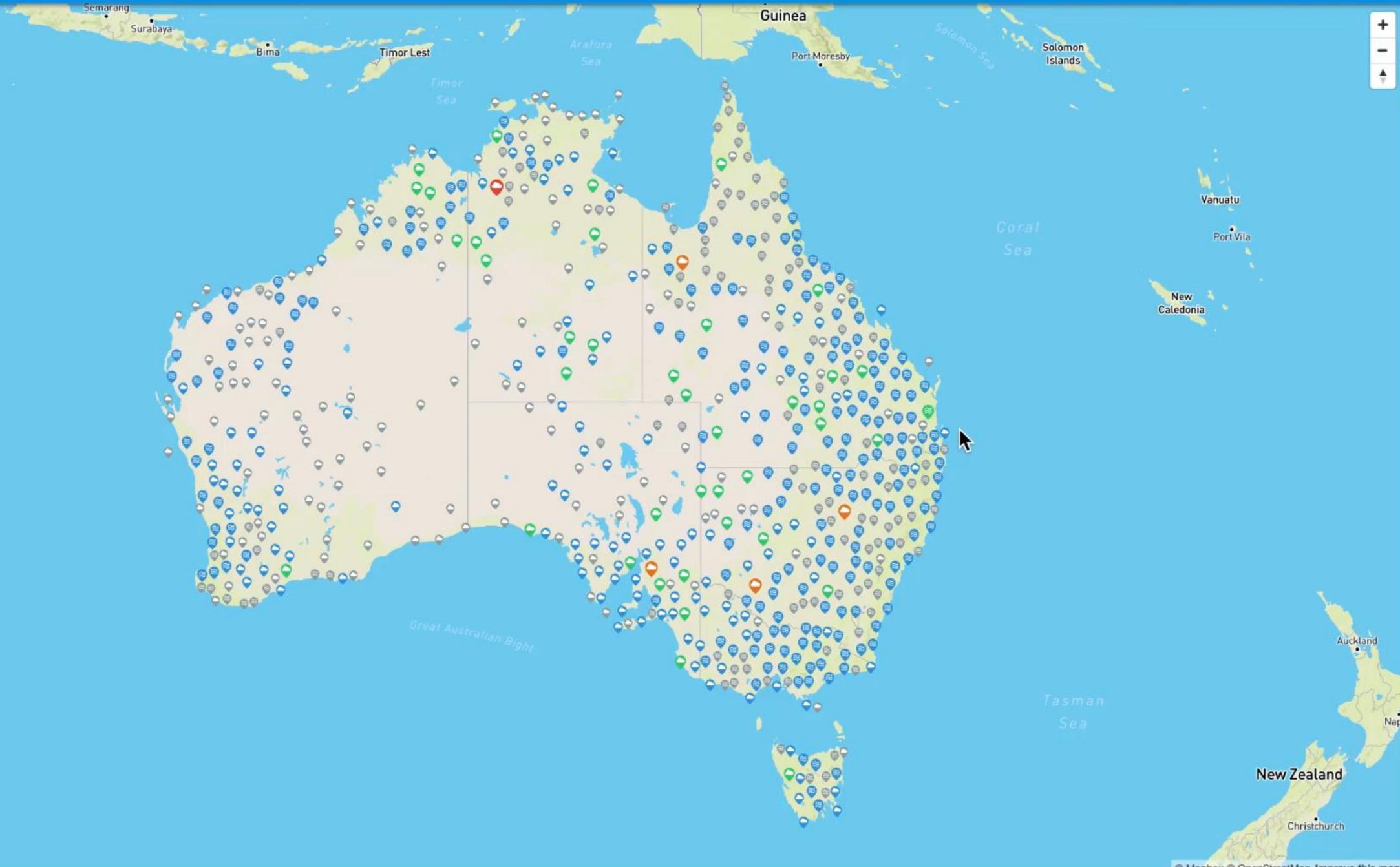
Data from the previous 7 days.



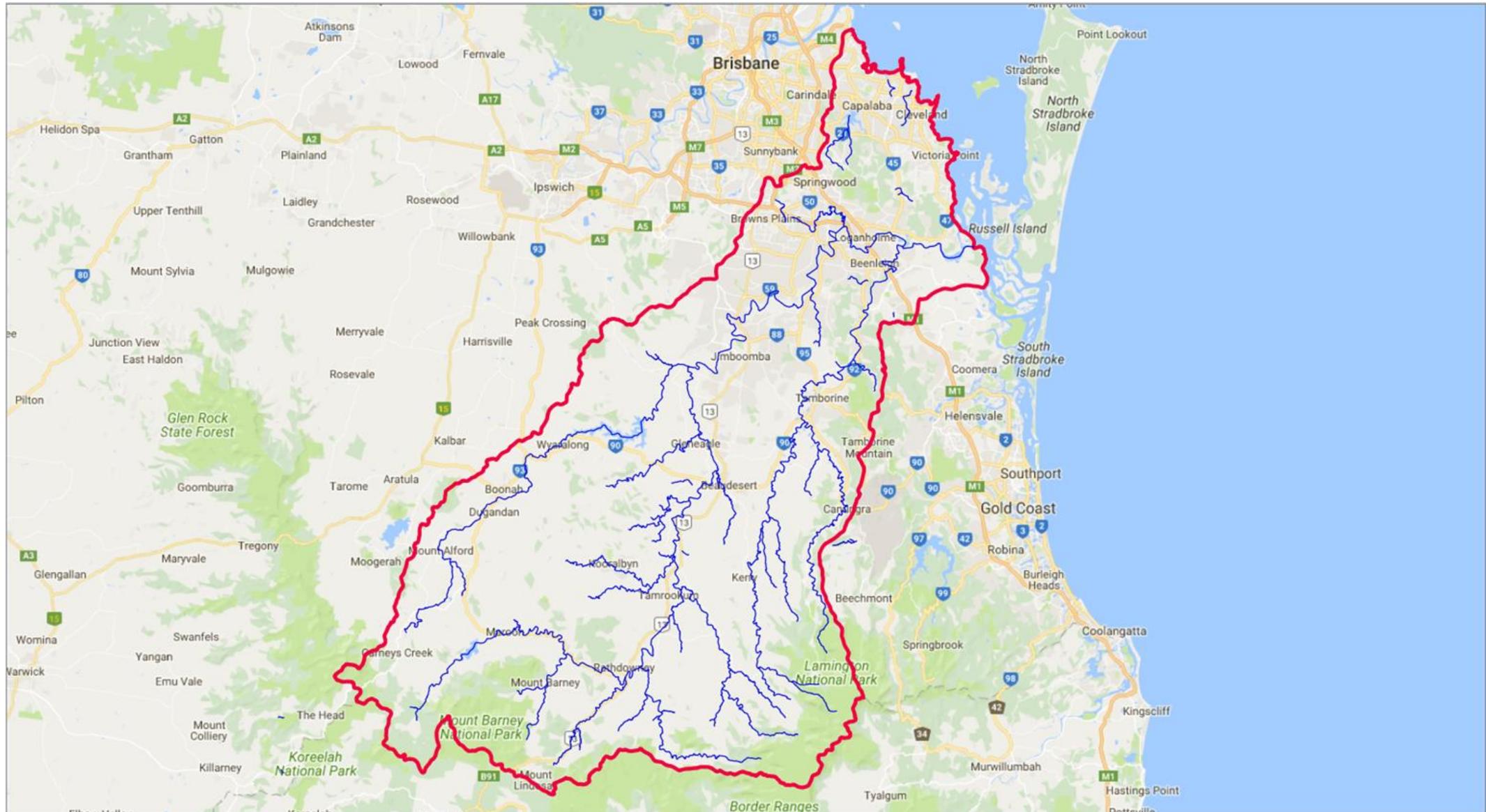


Answering the question

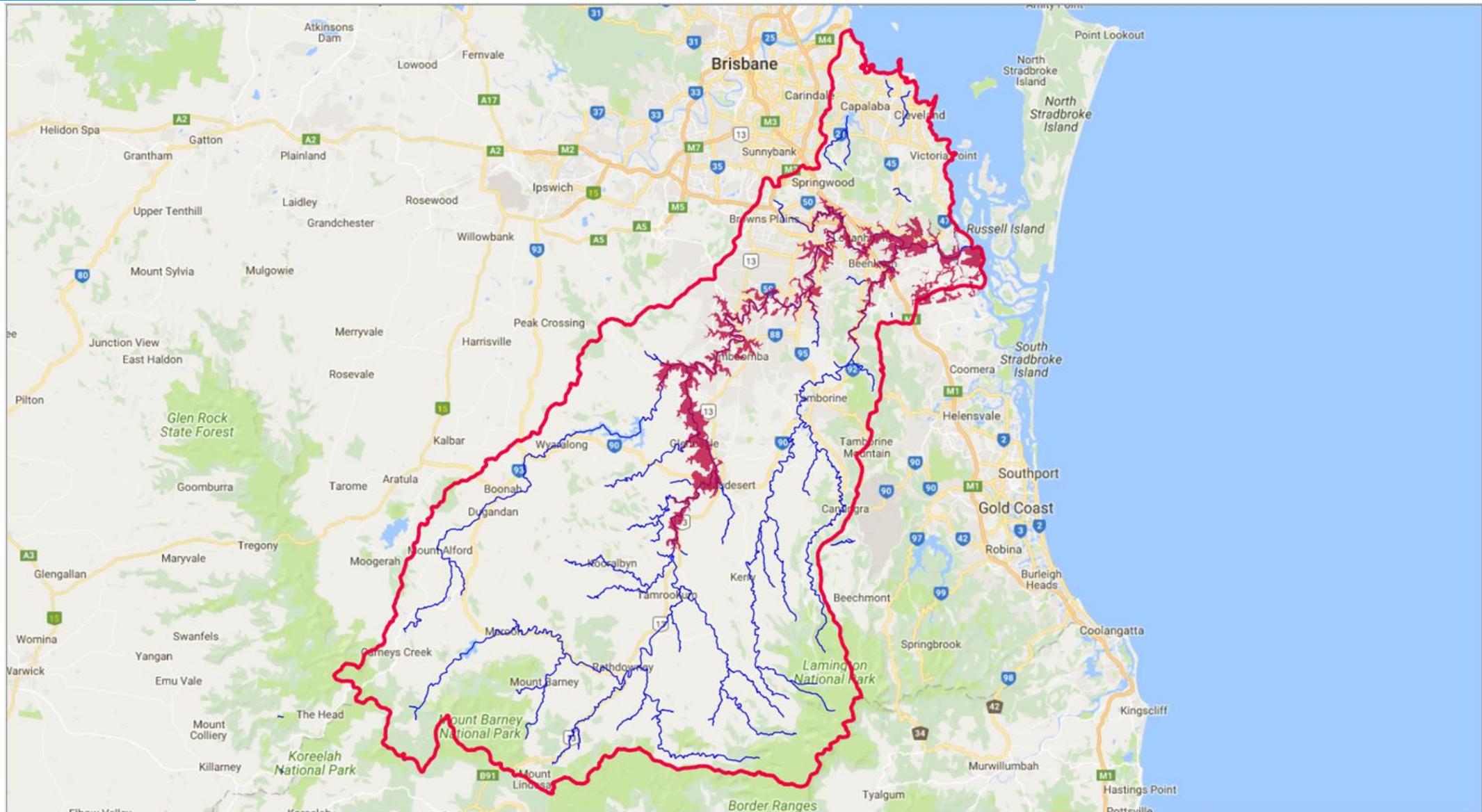




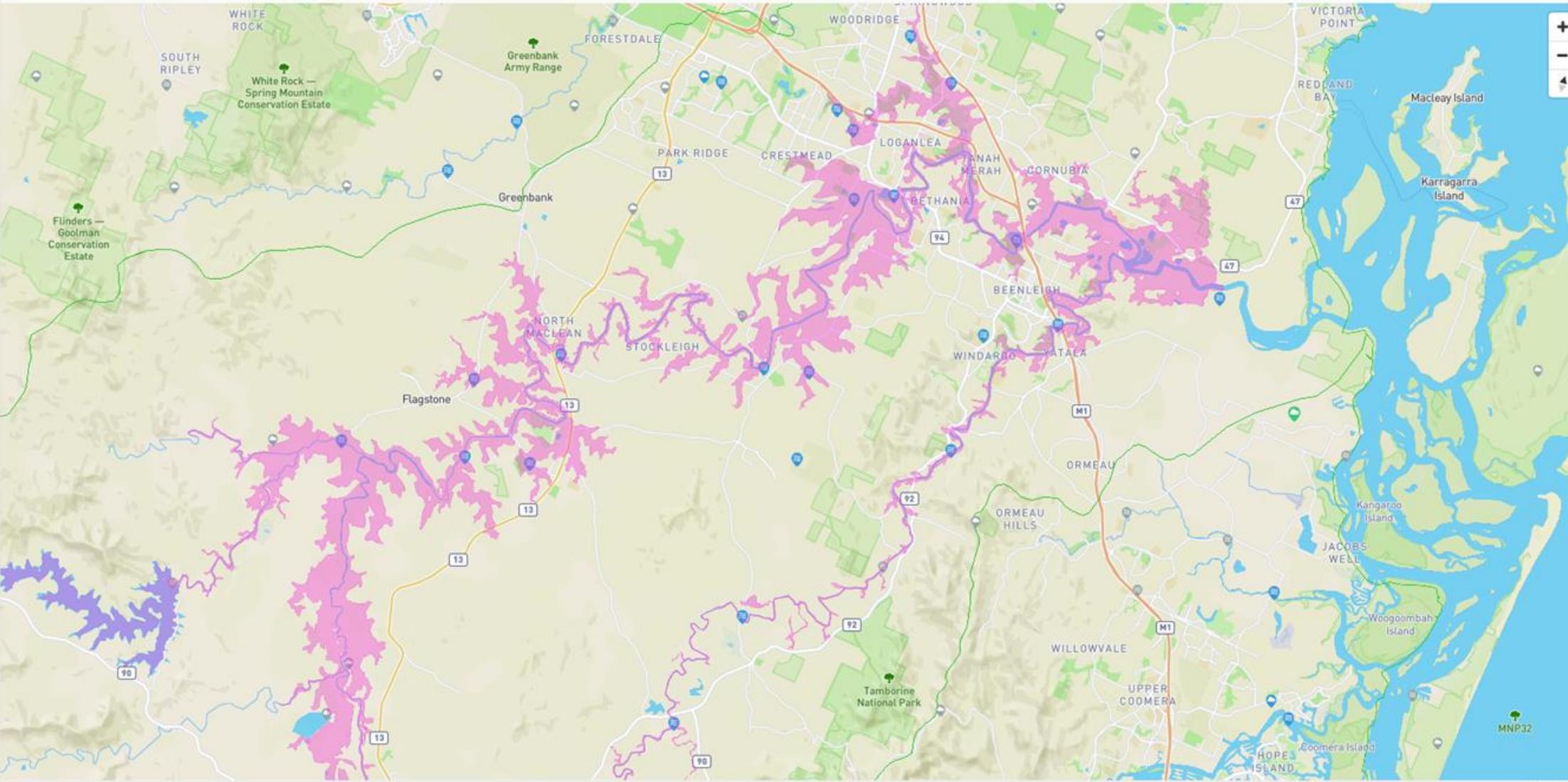
Typical warning polygon



FloodMapp warning polygon



- Flood Layers
 - Historical Floods
 - Predicted Floods (Demo)
- River Conditions
 - Normal
 - Minor
 - Moderate
 - High
- Rain Stations
 - 0-1 mm
 - 1-10 mm
 - 10-25 mm
 - 25-50 mm
 - 50+ mm



Flood prediction using hydraulic model

Flood Layers

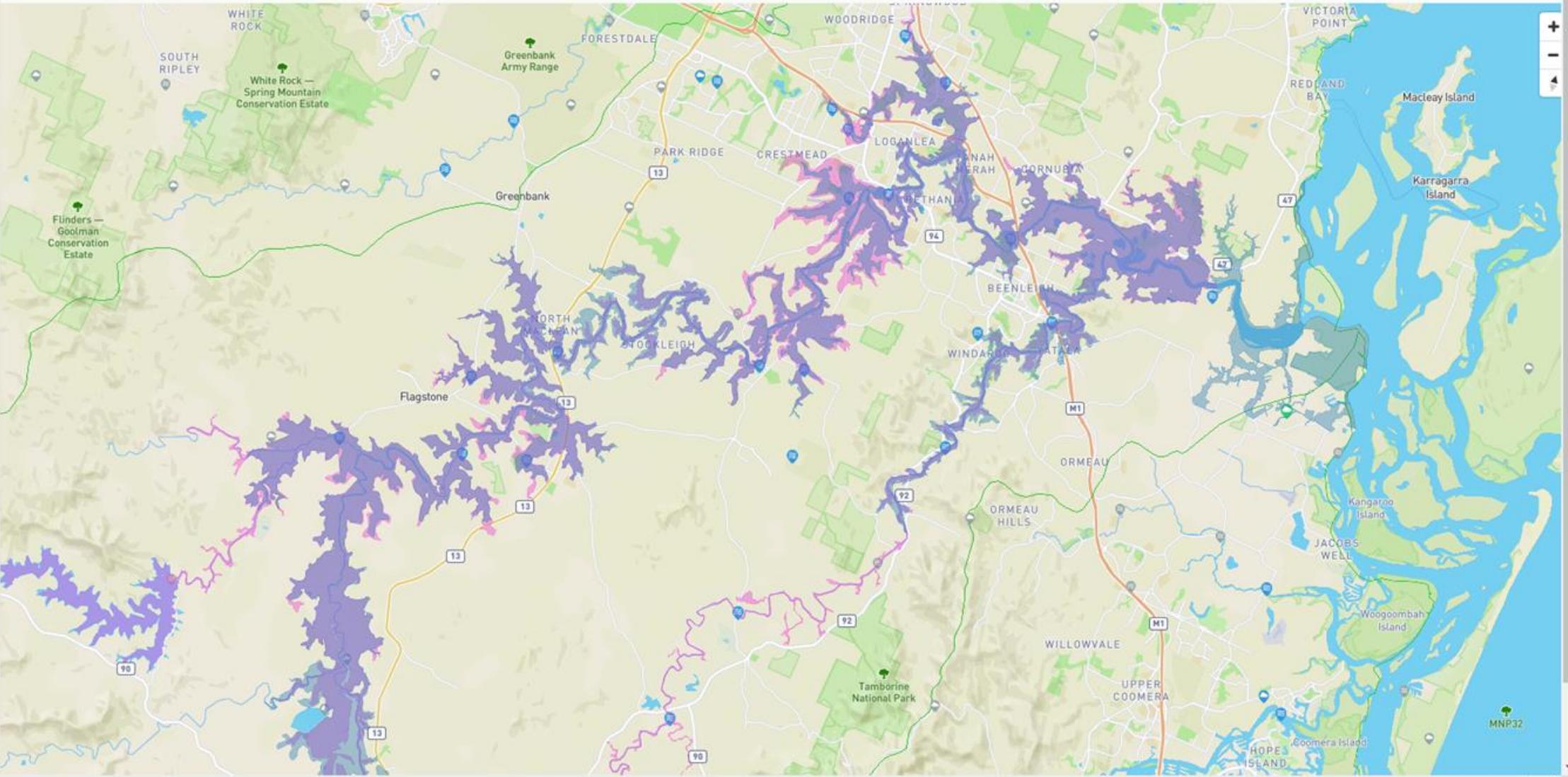
- Historical Floods
- Predicted Floods (Demo)

River Conditions

- Normal
- Minor
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Rain Stations

- 0-1 mm
- 1-10 mm
- 10-25 mm
- 25-50 mm
- 50+ mm

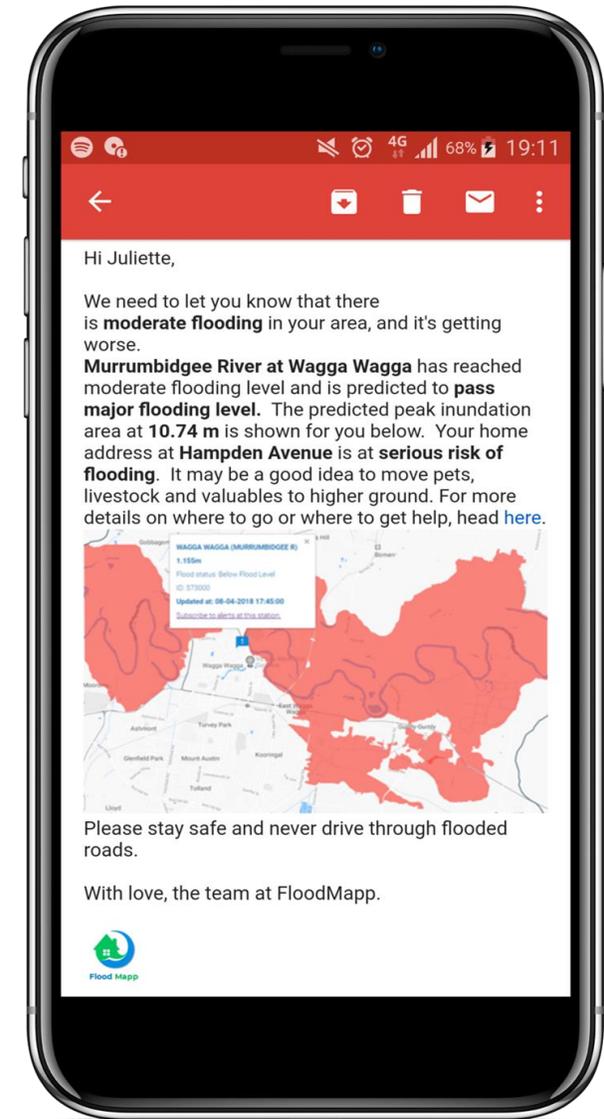


Prediction vs actual flood extent ~ 90% accuracy

Have we answered the right question?

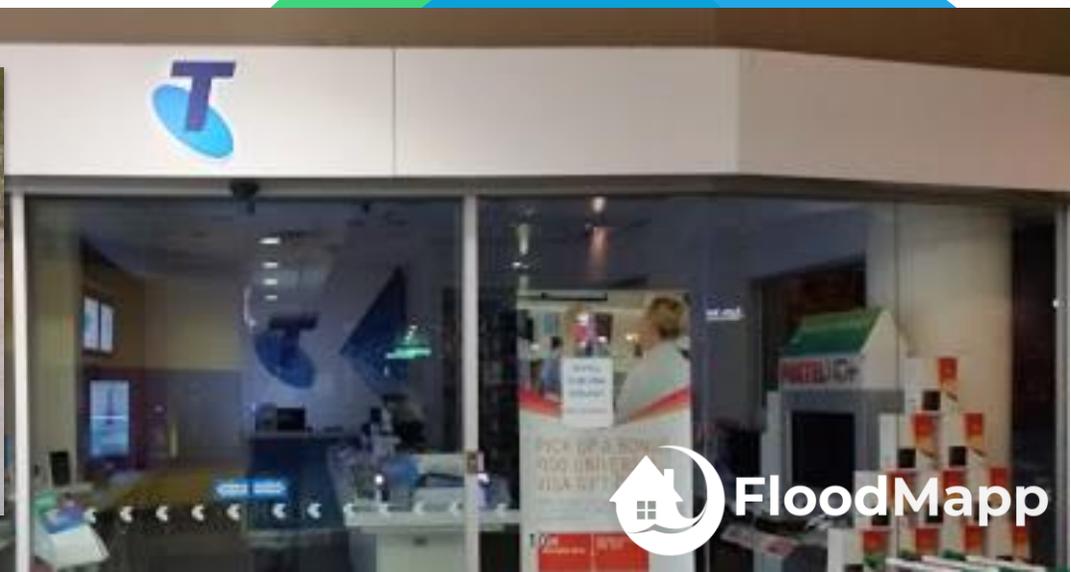


Data. Communication.





Action.



TURNING CHANGE INTO OPPORTUNITY

Q&A

