TWEED SHIRE COUNCIL

Impact of Climate Change

and subsequent fallout

What Happened

A combination of high tides plus an unforeseen sea level anomaly caused Bray Park Weir to be overtopped on the nights of the 21st and 22nd August 2017. The overtopping occurred at a time of low flow in the Tweed River and the consequence was salt water ingress into the Bray Park Weir pool.

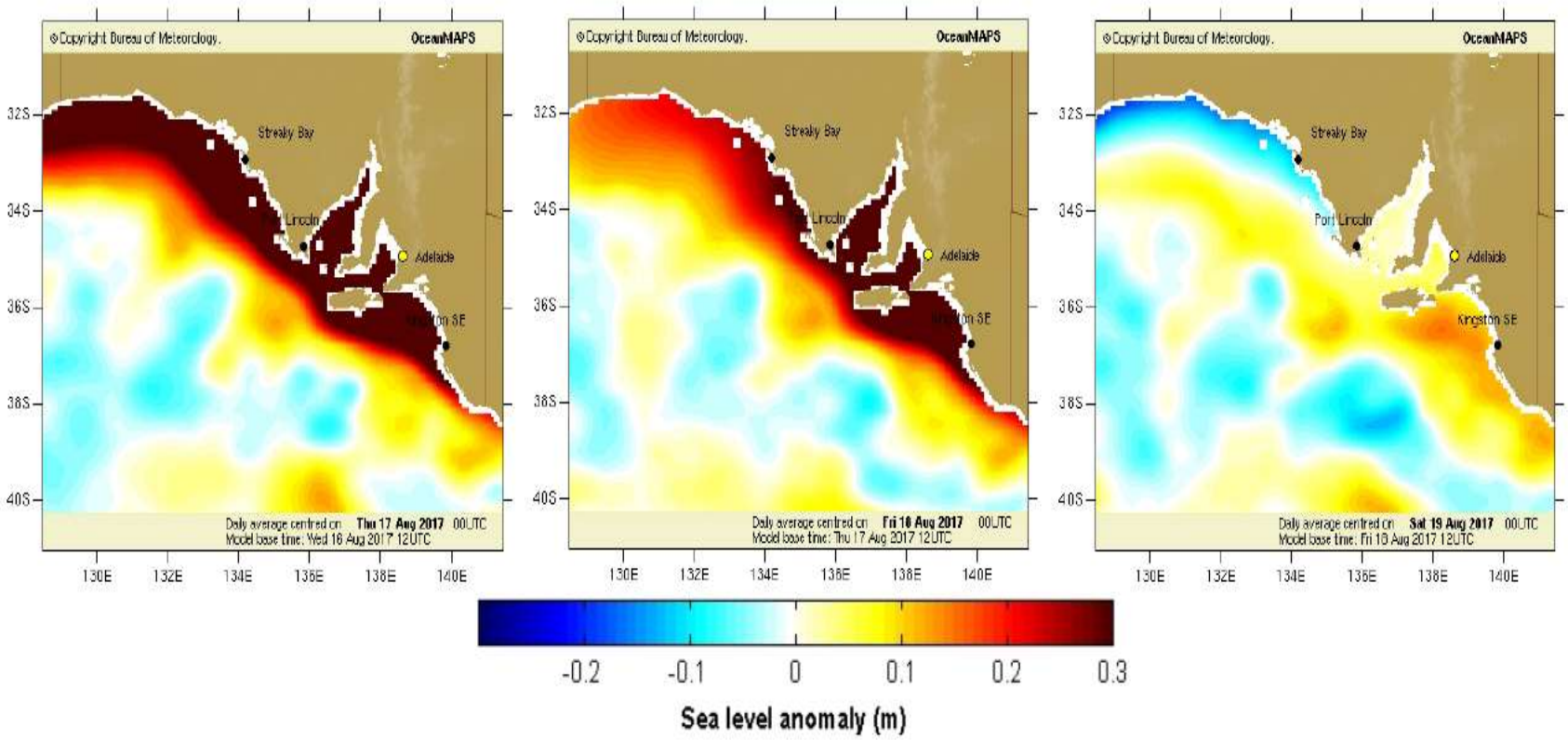
The salt water ingress caused the raw water provided to the Bray Park Water Treatment Plant to be contaminated.

The contaminated salt water went through Bray Park WTP and the water supply was contaminated.

Then level of salt contamination of the drinking water supply was not high and did not cause a health risk. It just made a cup of tea taste tangy.

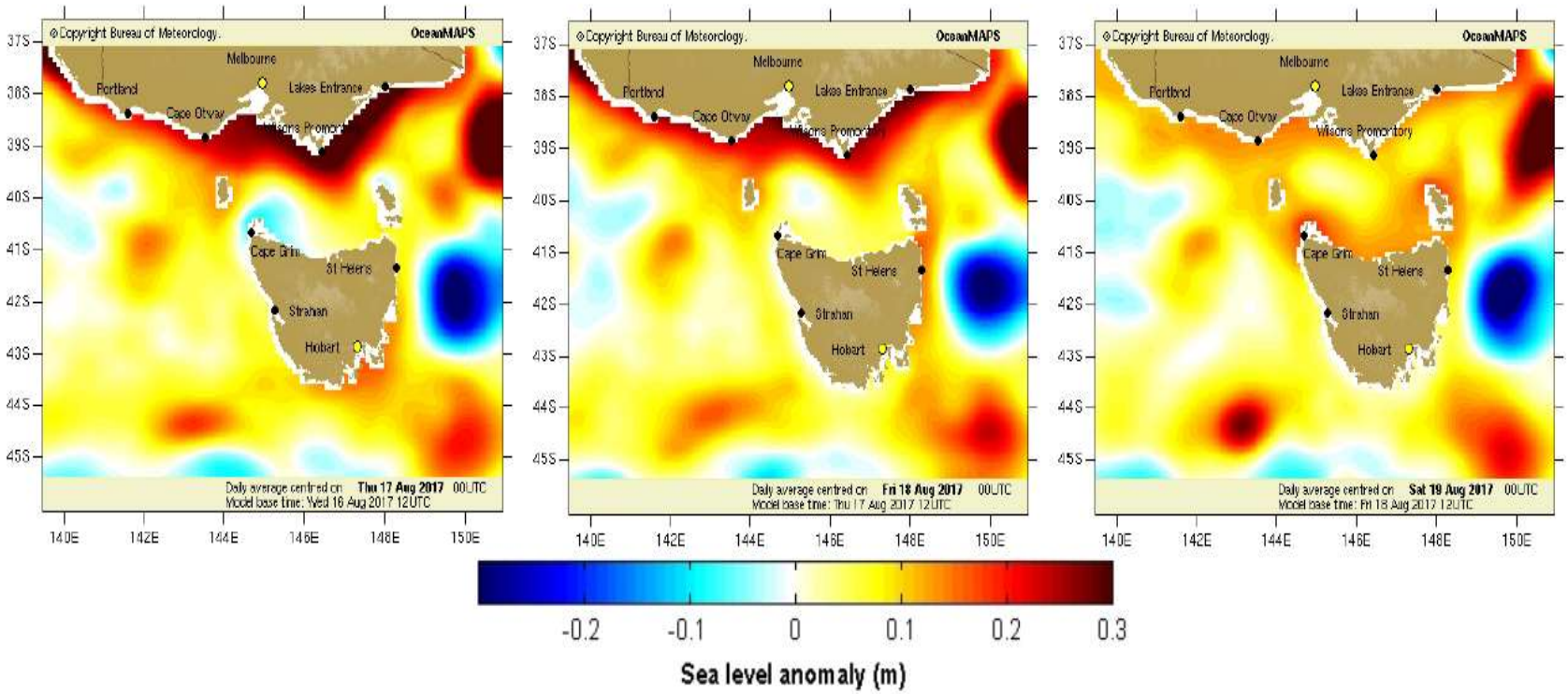
Why did it Happen

It is South Australia's fault



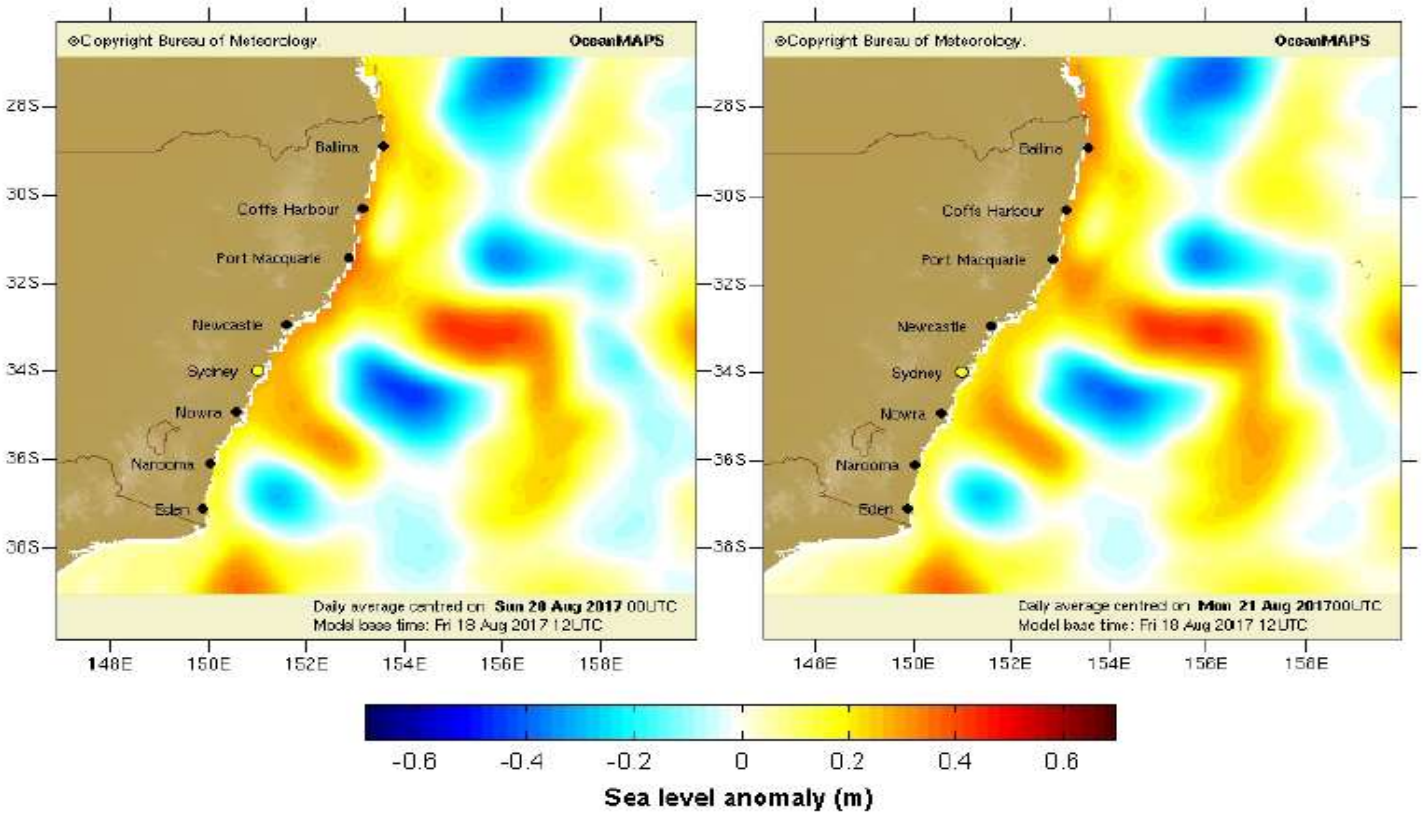
Why did it Happen

And it is Tasmania and Victoria's fault.



Why did it Happen

And they sent it to NSW – Note the change of scale



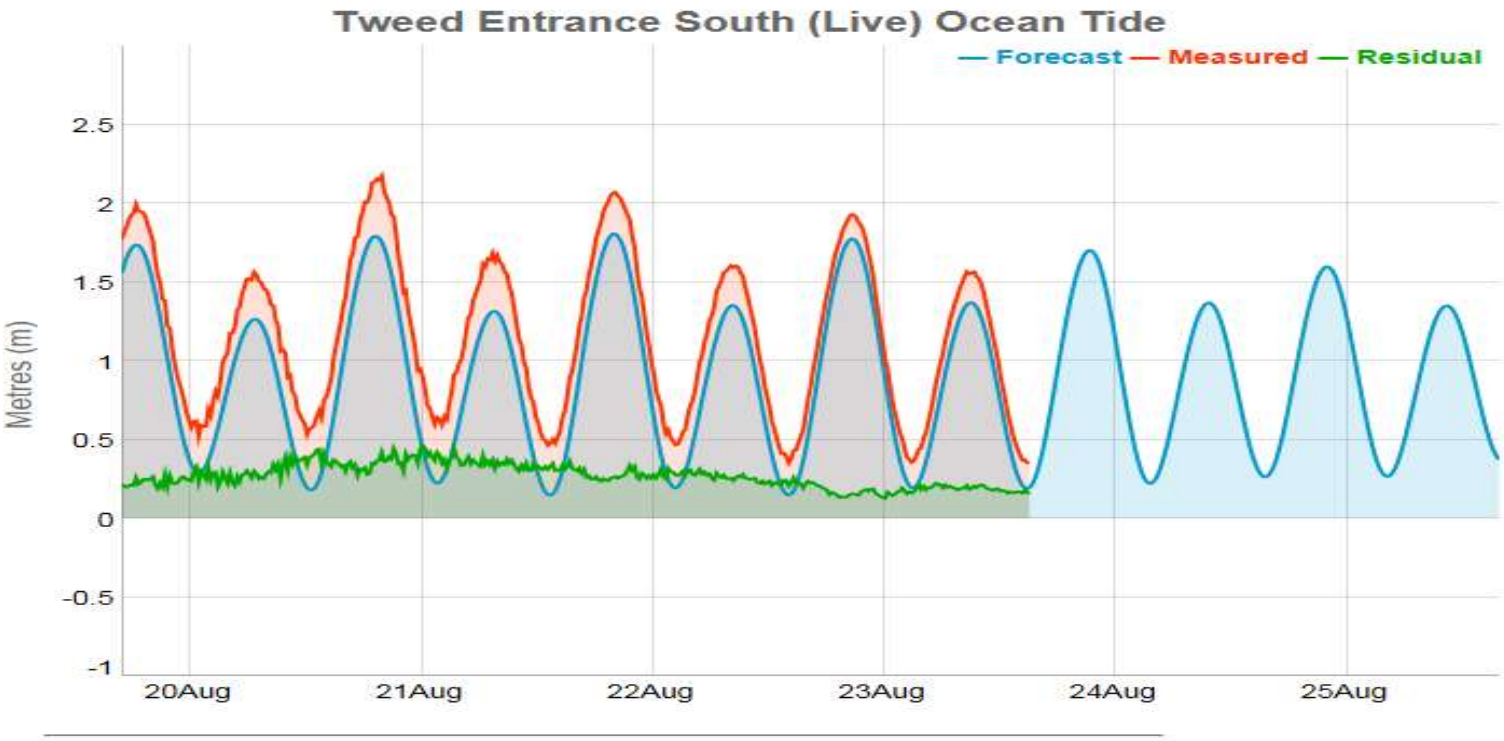
Why did it Happen

And it arrived at the Tweed River Entrance

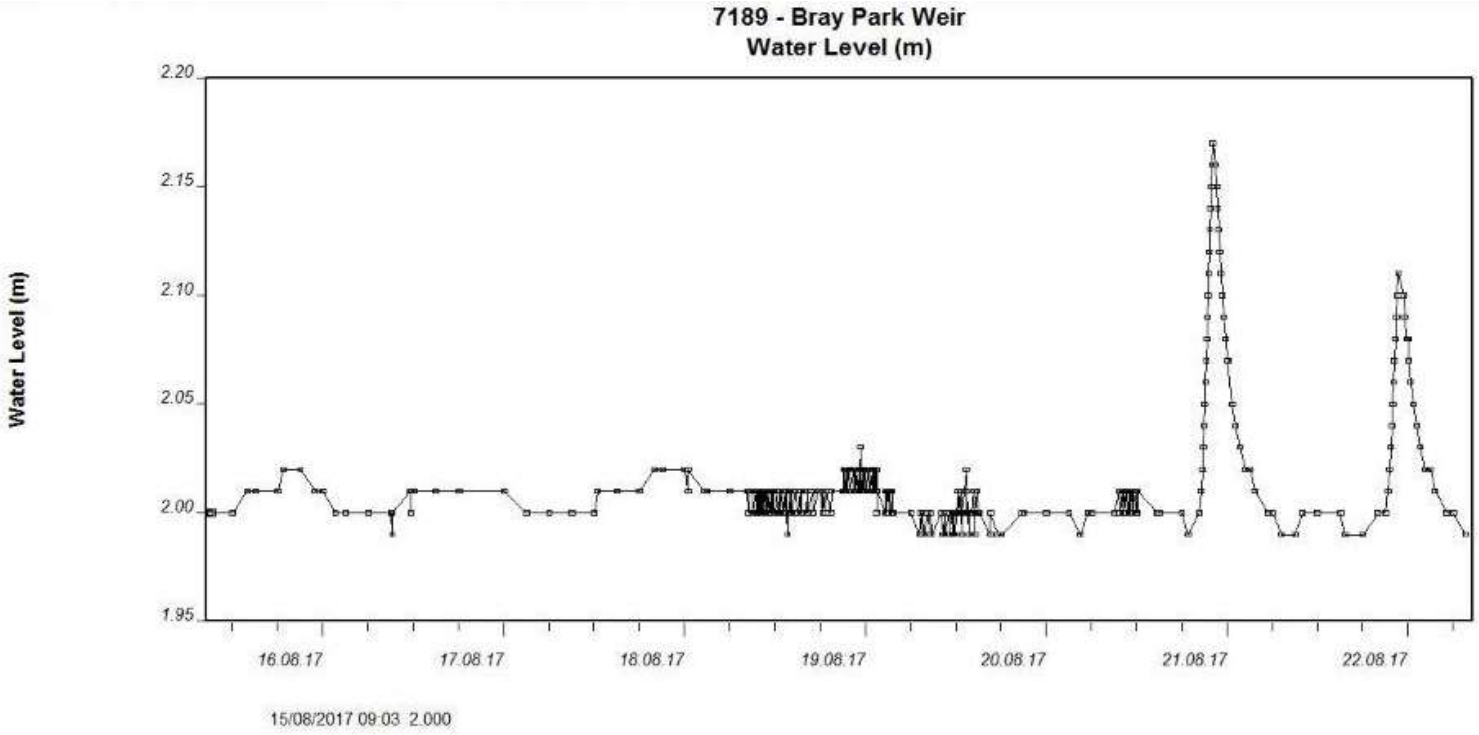
Tweed River at Tweed Entrance South (201472)

Latest : 0.373 (Metres (m)) @ 2017-08-25 16:00:00 Aus Eastern Standard Time.
Maximum : 1.805, 2.071, 0.266 (Metres (m)) @ 2017-08-21 20:15:00 Aus Eastern Standard Time.

Drag mouse across plot to zoom-in. Double-click to reset.



And then it Happened



And then it Happened (but at night)

And we got a dredge (actually 2)

What we had also done

Water Supply Augmentation

- Concerns about sea level rise at Bray Park Weir
- Concerns about lower flows and inability to “hold back the tide”

Engagement of WRL to determine the impacts.

Climate Change

Impact of Climate Change

- Higher Sea Levels

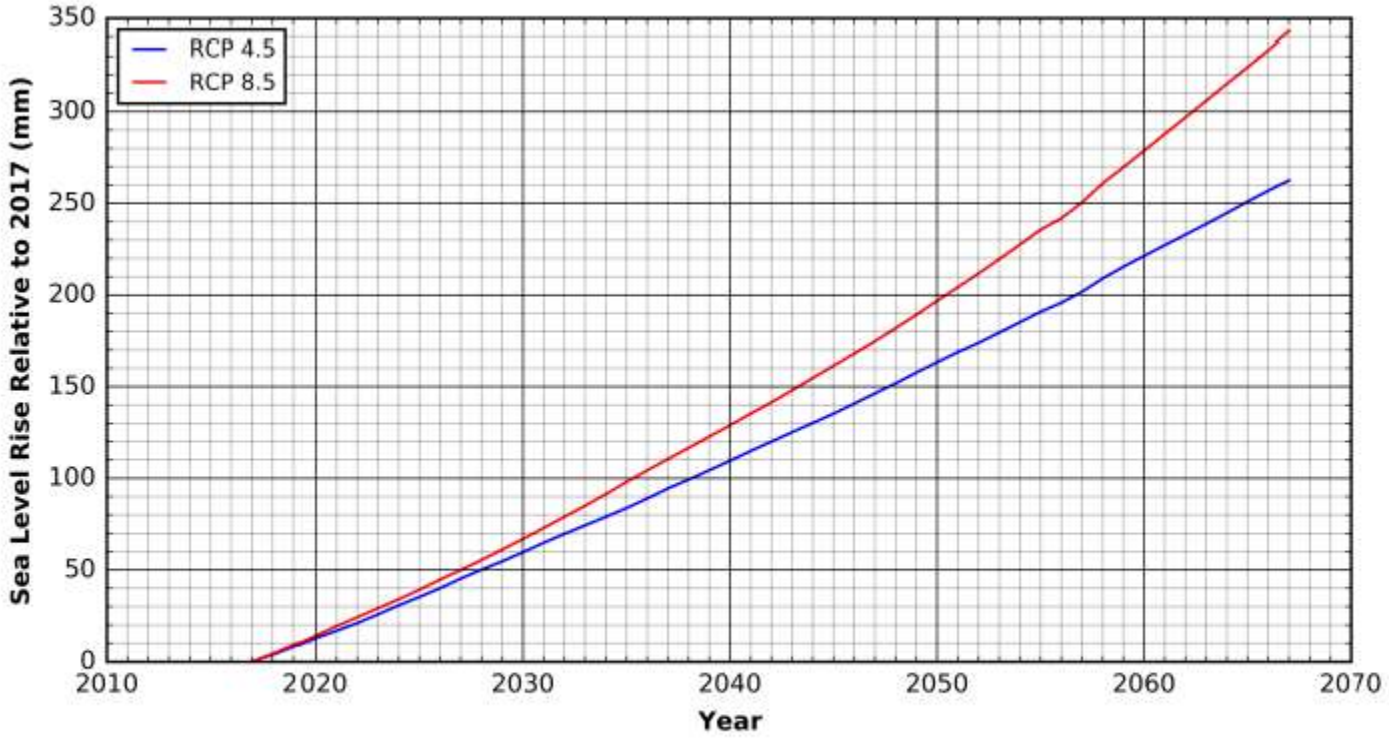
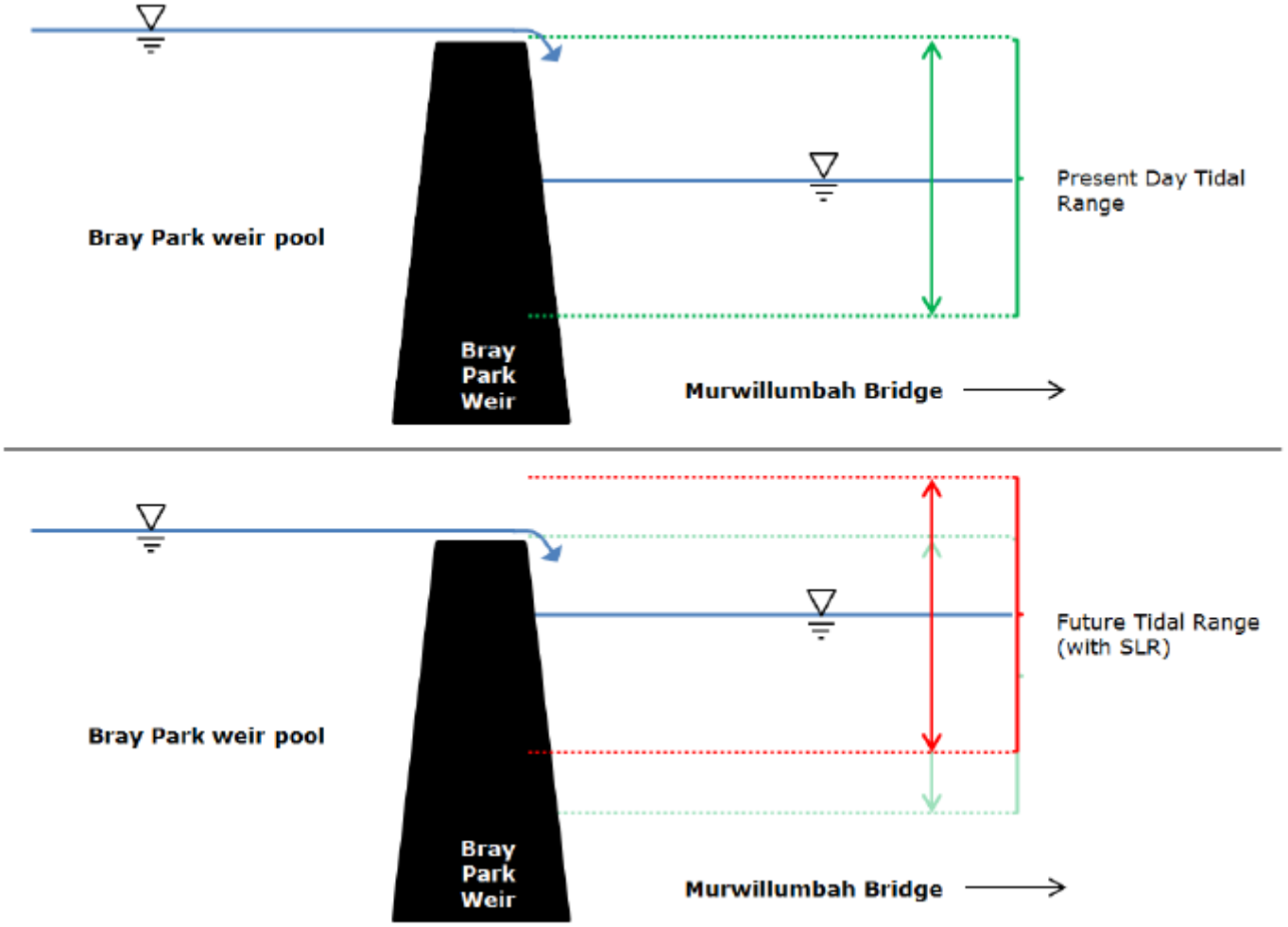


Figure C8: Adopted Sea Level Rise Scenarios

Climate Change



Climate Change

Impact of Climate Change

- Lower flows to hold back the tide

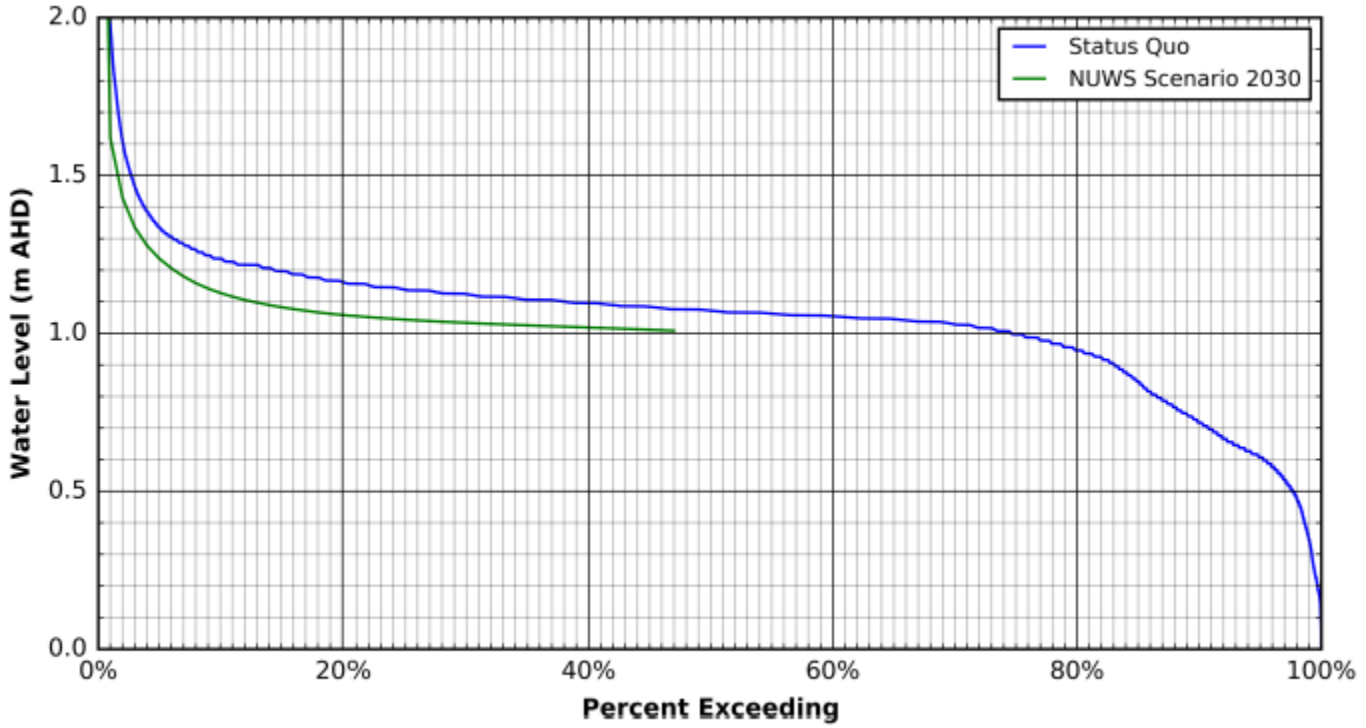
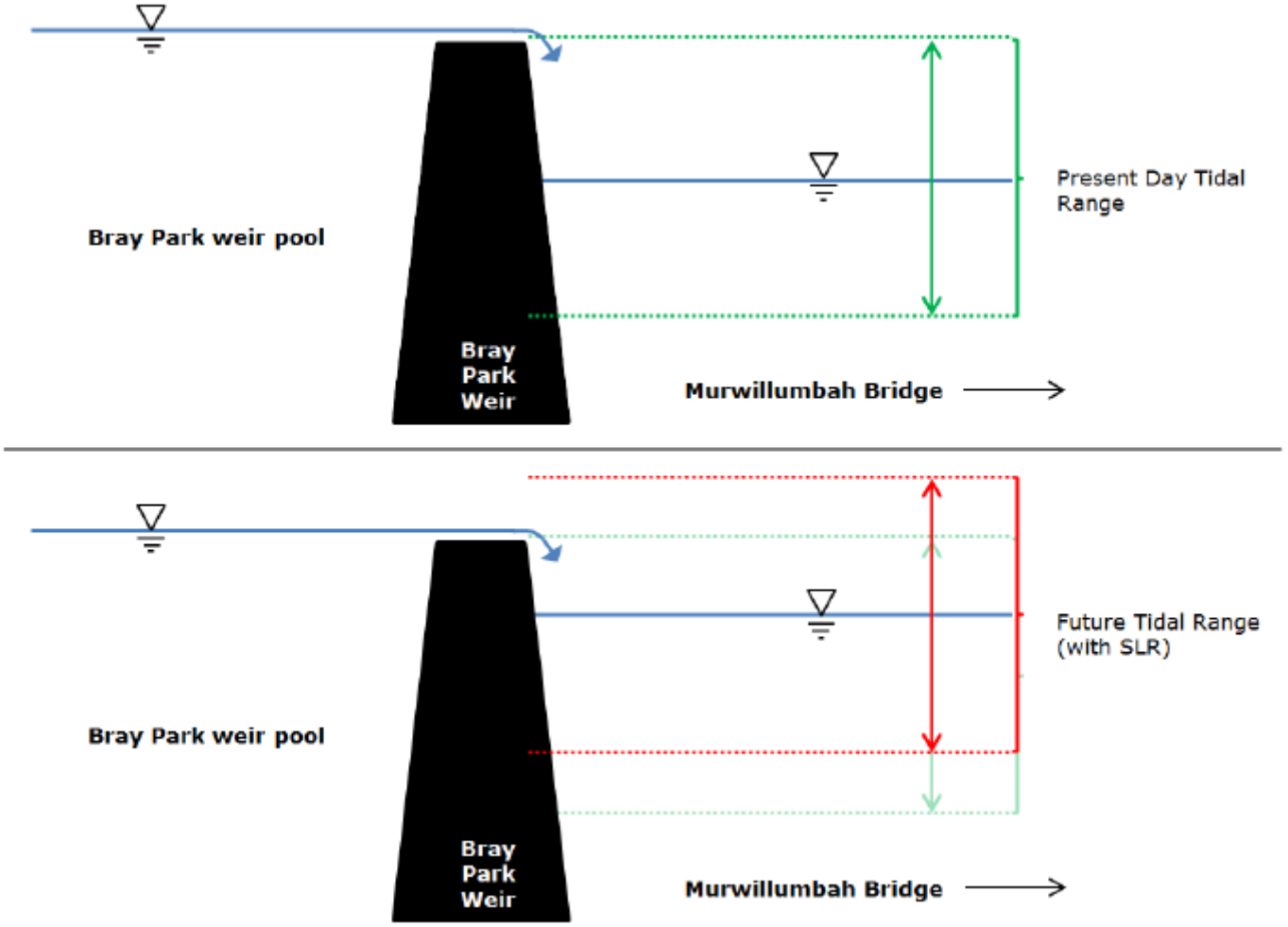


Figure D11: Adopted Water Level Exceedances at Bray Park Weir Pool

Climate Change



Climate Change

Year	Period of Salt Water Ingress/year	Max Depth
2017	6.9 hours	< 0.1m
2030	34 hours	0.2m
2060	256 to 441 hours	0.5m
2090	960 to 2161 hours	0.7m
2100	1284 to 3208 hours	0.8m

Plus Sea Level Anomalies

Table 2: Tidal Anomalies Offshore of Tweed Heads (Shand *et al.*, 2012)

Annual Encounter Probability (AEP)	Tidal Anomaly (m)
63%	0.29
10%	0.41
1%	0.56

Climate Change plus Anomalies

If we combine the impact of sea level rise and a sea level anomaly the depth to which the current Bray Park Weir would be over topped is

Year		Max Depth 1 in 10	Max Depth 1 in 100
2017		< 0.5 m	0.5m
2030		0.7 m	0.7 m
2060		0.9 m	1.1 m
2090		1.1 m	1.3 m
2100		1.2 m	1.4 m

And just when we thought that was it

Department of Science, Information Technology and Innovation

Meteotsunami in Queensland

February 2017

Coastal Impacts Unit

A unique and uncommon wave that is very similar to a Tsunami wave hit Queensland coastal regions on 3 and 4 December 2016. The wave occurred during a storm event and passed without being noticed in the stealth of darkness. A Tsunami-like wave train was recorded in many of the Queensland Storm Tide gauges over a 10 hour period.

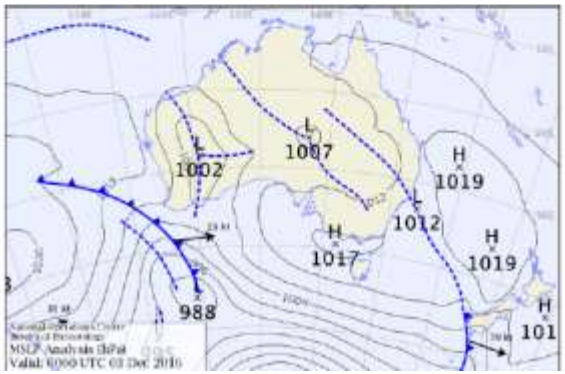
What is a Meteotsunami?

The wave is called a Meteotsunami, which are atmospheric gravity waves that occur when air parcels are lifted by buoyancy and pulled back down by gravity in oscillatory fashion. These energy and pressure fluctuations translate to the water surface and the response of the surface generates the Meteotsunami. The gravity waves generally have periods of 10 to 50 minutes and particularly affect bays and inlets.

The development of a Meteotsunami is dependent on several factors such as the intensity, direction, and speed of the atmospheric disturbance as it travels over a water body with an appropriate depth that enhances wave magnification.

Atmospheric Pressure fluctuations

The driving force responsible for the Meteotsunami was a series of sudden falls followed by a consequent rise in atmospheric pressure during the passage of a low pressure trough across the south east coast. The pressure changes were recorded by two pressure sensors at Southport beach (6.1 hPa) and within the Gold Coast Seaway (6.4 hPa).



We have a problem

Classically defined as a wicked problem

We have a Problem

Constraints to raising the Weir

- Inundation of property
- Existing fordes flooded and impassable
- Existing bridges may be flooded or have sub structure inundated
- Increased flooding upstream
- Higher flood levels and possible requirement to raise houses
- Land owner agreement
- Bank erosion
- Higher ground water

Not raising the weir

- Impact on irrigators
- Alternate water supply

What do we do? How long should the solution last?

Lots of questions

Steps Forward

- Establishment of a Project Reference Group
- Identification of assessment criteria
- Identification of options
- Engagement of a consultant to inform PRG of impact of options
- Analysis by PRG
- Recommendation to Council

Questions

Any ideas for solutions