The 2011 Queensland Floods

Bill Syme
FMA Conference, San Diego
September 2011

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Why were Qld Floods Surprising?

Different types

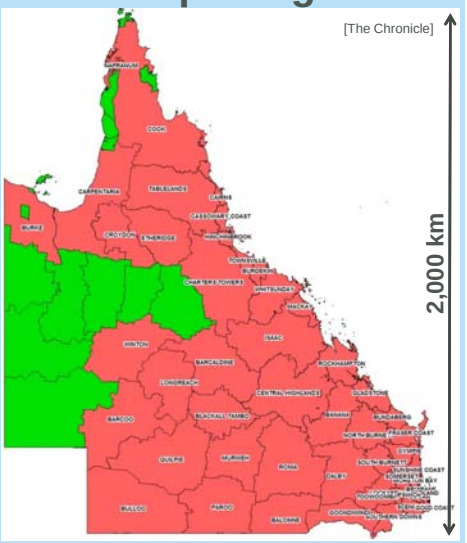
- Flash floods
- Long duration floods
- Repeat floods (Dalby 5 times!)

Severity

- Significant number of locations experienced greater than 1 in 100 year rainfall

Geographical extent

- North Queensland to NSW
- Coastal areas and inland
- Rural areas, towns and cities



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Flash Flooding – Toowoomba

Within an hour of rainfall, creeks of Toowoomba had risen several metres.

The flood wave travelled 6km through the CBD in 30 mins.

The street drainage system was designed for a 2-5 year rainfall event

Major sheet and roadway flow as well as creek flooding

Catchment increasingly urbanised – faster and less attenuated runoff

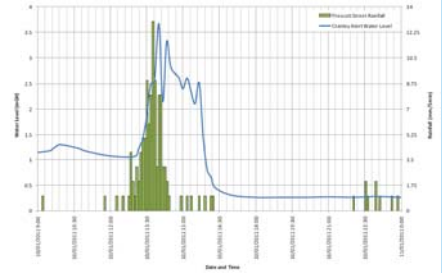

Figure 8.1 Recorded Gowrie Creek Water Levels at Cranley Streamgauge, 10 January 2011

[news.com.au]

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Flash Flooding – Helidon

[The Courier Mail]

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Long Duration River Flooding Goondiwindi

14th January 2011: Predicted 10.8

Reached 10.65m

Levee crest at 11m

[Goondiwindi Historical Society]

[Goondiwindi Historical Society]

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Questions Arising

Flood Forecasting and Warnings

Were the forecasts accurate and the warnings useful?

Community Preparedness

Did we know what to do?

Operation of Somerset and Wivenhoe Dams

Did the operation of the flood gates reduce flooding?

Emergency Management

How did we go managing the emergency?

Development Controls

Did our planning controls reduce the risk to lives and damage to property?

Design and Location of Infrastructure

Were our emergency services and key transport routes fully functional?

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Flood Forecasting and Warnings

The Bureau of Meteorology (BoM) issues forecasts predominantly as predicted levels at gauges

These forecasts are relayed to the community via the web/phone and the media who must quote verbatim

Number one criticism was that many (most?) people did not know what a flood gauge height meant

- Does 5.5m mean we get flooded? – no idea
- When do we lose access? – no idea
- Should we raise or remove our possessions? – no idea

The accuracy of the forecasts not great, but at least they tended to be conservative!

- Key recommendation from inquiry is to use a hydraulic model for forecasting (only a hydrologic model was used)

Brisbane Times

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Community Preparedness

In many areas very poor

- People in general had little idea of what to do
- Those that experienced previous floods much more astute

If we were a prepared community would we have had this...

ABC

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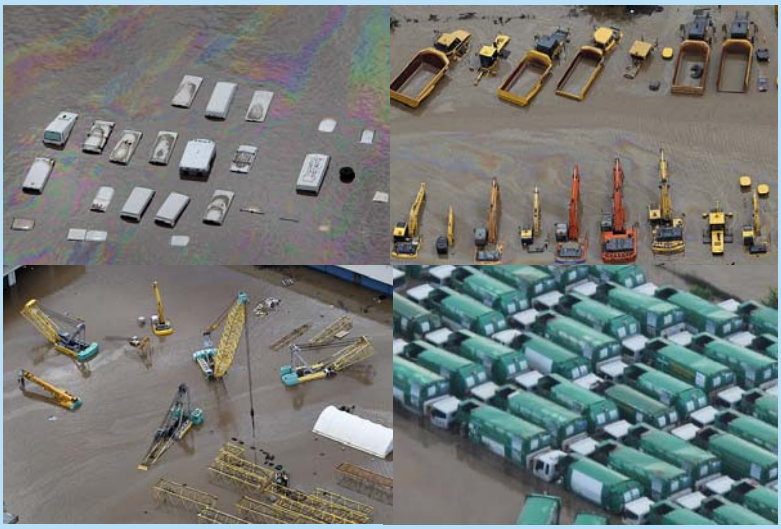
and this?



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Brisbane Flooding

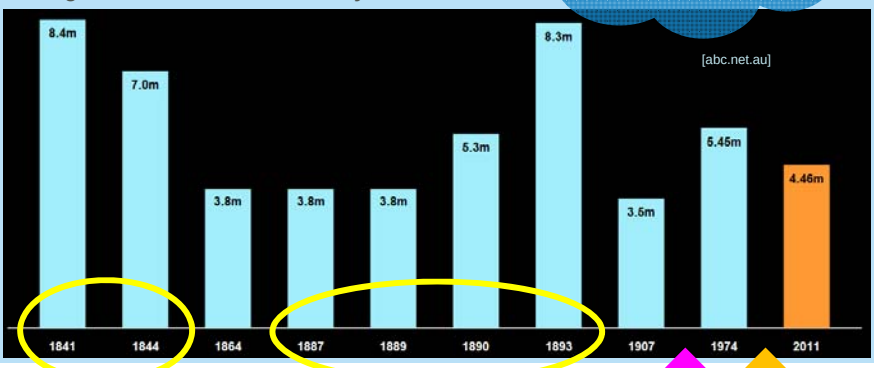
11,900 houses & 2,500 businesses with above floor flooding

2,100 roads inundated

100,000 homes without power

6th largest flood in recorded history

Without Wivenhoe?
Levels in City approx 2m higher
14,000 additional properties affected
[SEQwater]



[abc.net.au]

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Operation of Dams

Somerset Dam

Stanley River

Flows into Wivenhoe

Wivenhoe Dam

Brisbane River

Built post-1974 flood

Both dams equipped with radial gates to be operated during a flood

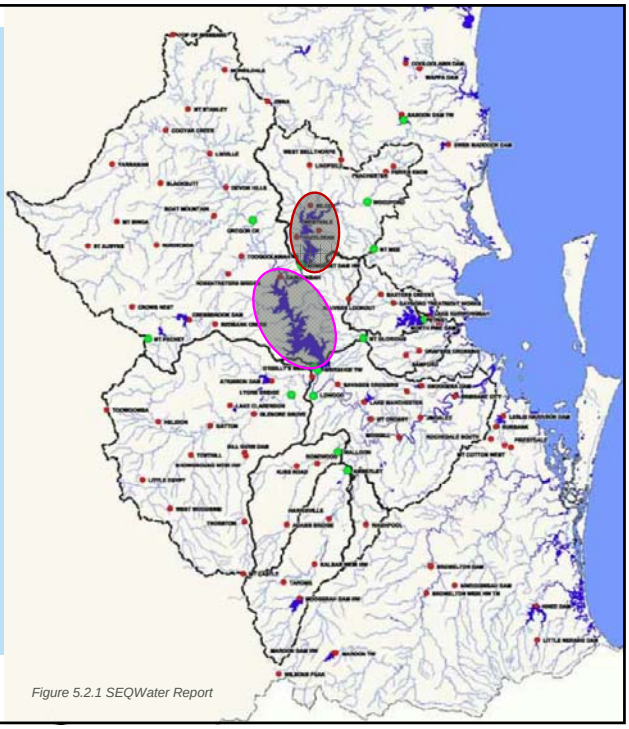


Figure 5.2.1 SEQWater Report

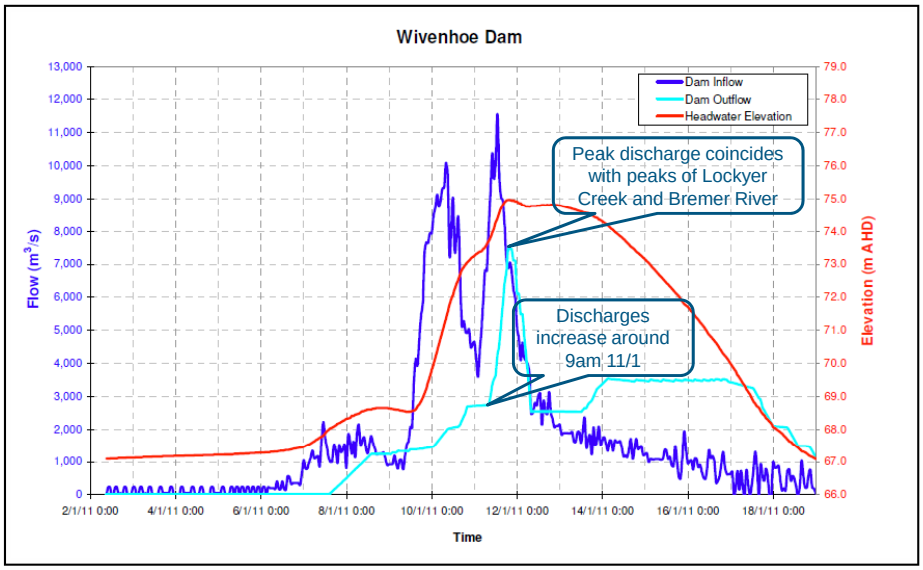
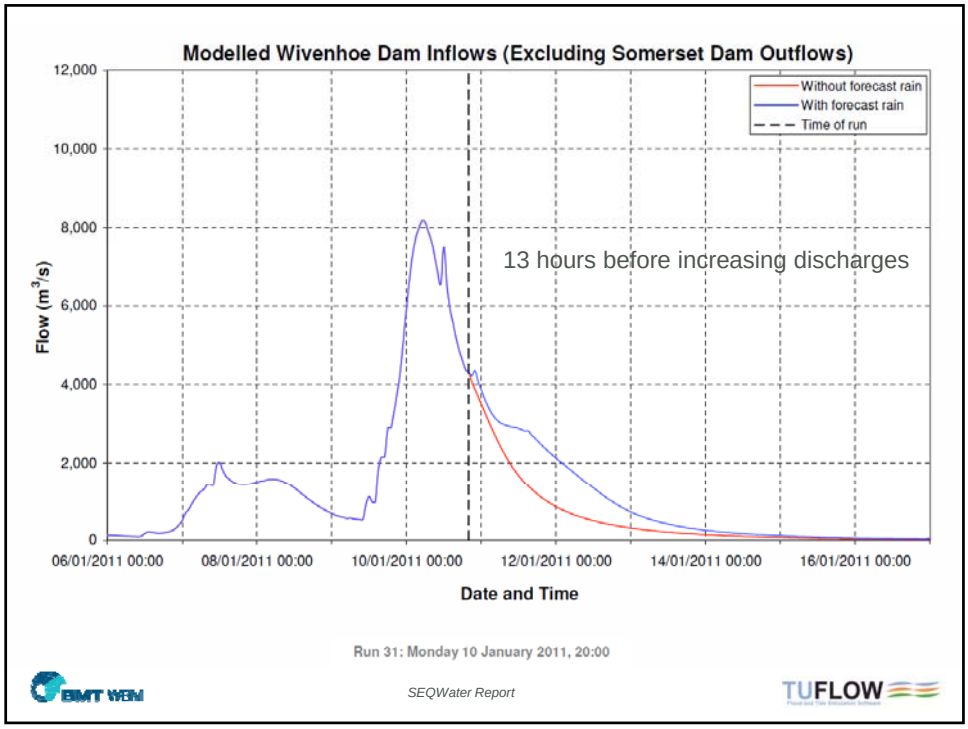
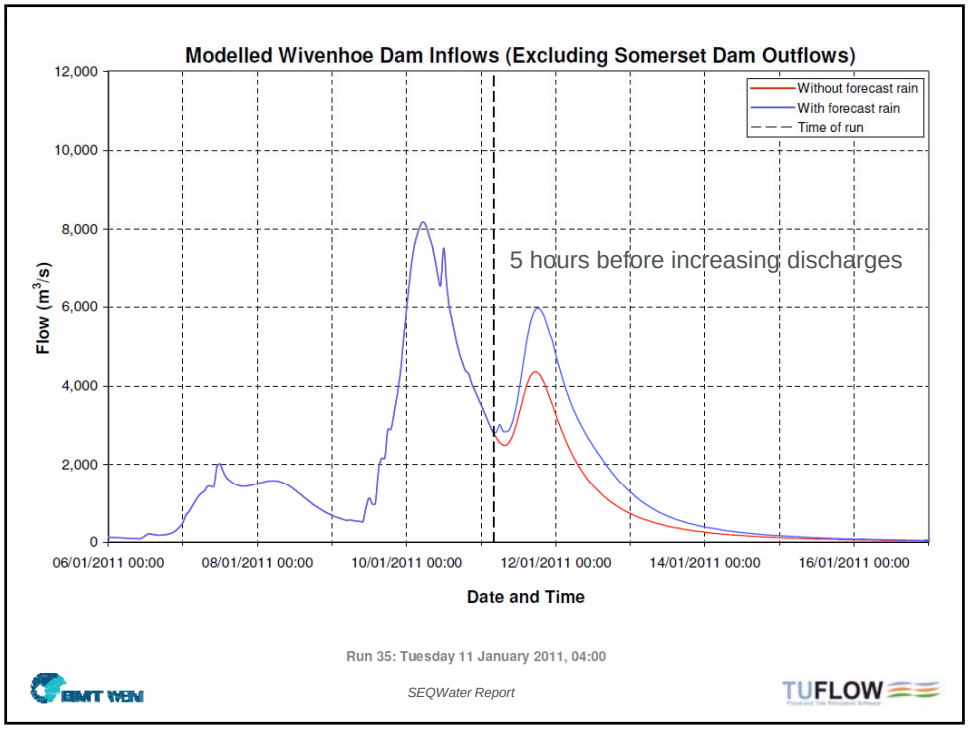
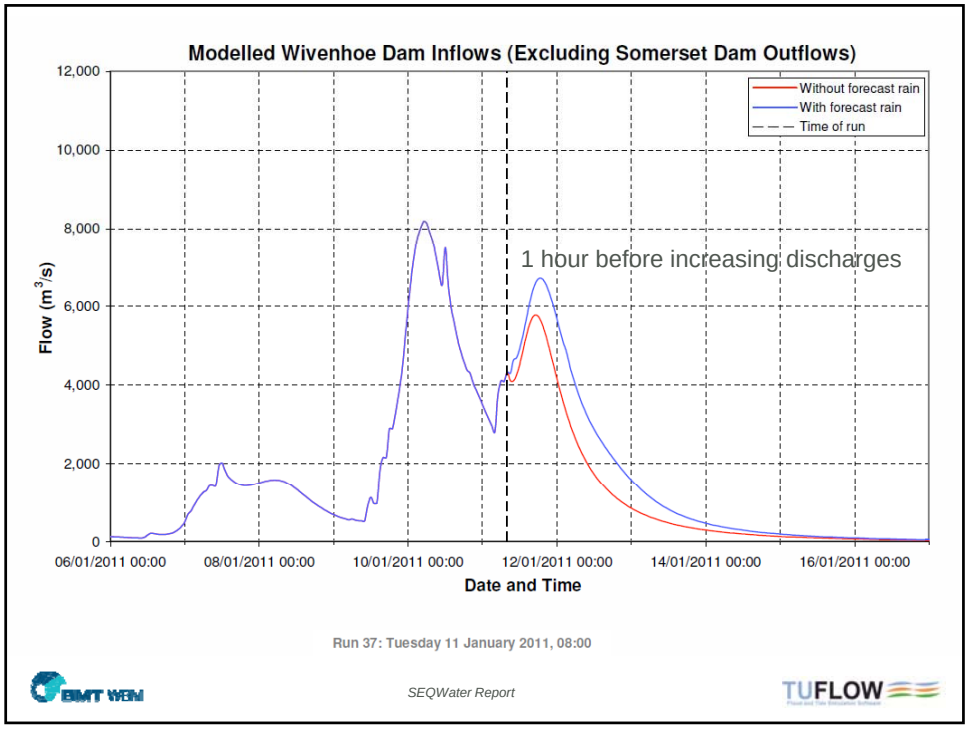


Figure 9.1.2 – Wivenhoe Dam inflow and release summary for the January 2011 Flood Event

SEQWater Report


Modelled Wivenhoe Dam Inflows (Excluding Somerset Dam Outflows)
Without forecast rain
With forecast rain
Time of run
13 hours before increasing discharges
Flow (m3/s)
12,000
10,000
8,000
6,000
4,000
2,000
0
06/01/2011 00:00
08/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date and Time
Run 31: Monday 10 January 2011, 20:00
SEQWater Report
TUFLOW


Modelled Wivenhoe Dam Inflows (Excluding Somerset Dam Outflows)
Without forecast rain
With forecast rain
Time of run
5 hours before increasing discharges
Flow (m3/s)
12,000
10,000
8,000
6,000
4,000
2,000
0
06/01/2011 00:00
08/01/2011 00:00
10/01/2011 00:00
12/01/2011 00:00
14/01/2011 00:00
16/01/2011 00:00
Date and Time
Run 35: Tuesday 11 January 2011, 04:00
SEQWater Report
TUFLOW



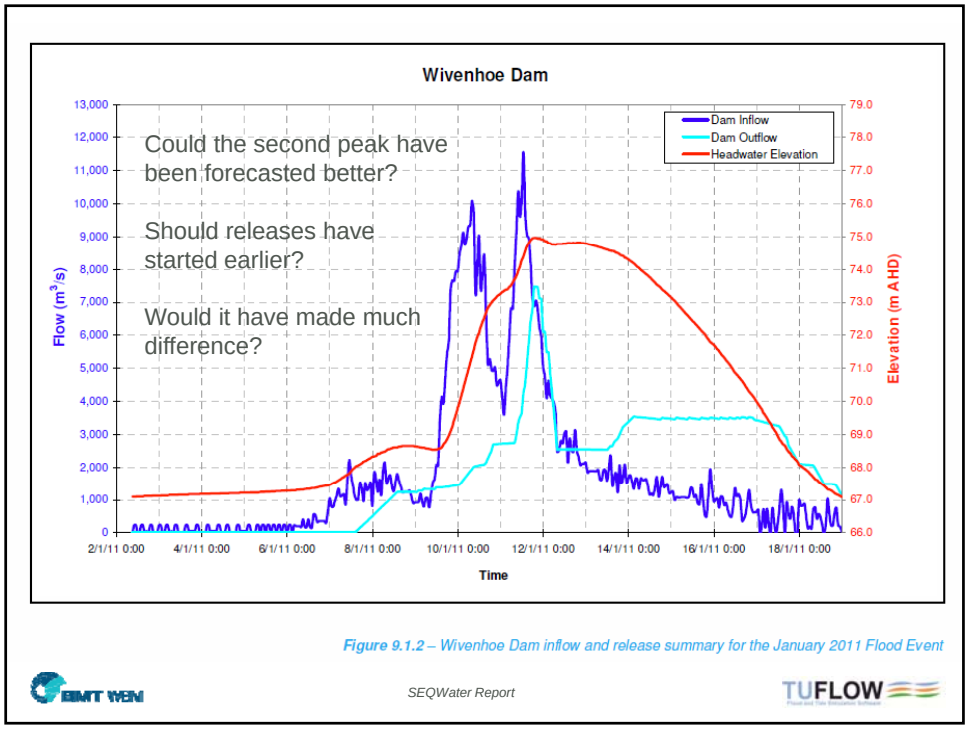


Figure 9.1.2 – Wivenhoe Dam inflow and release summary for the January 2011 Flood Event

Wivenhoe Dam

Provided substantial flood mitigation

Questions over timing of releases prior to and during the second flood peak

Highly effective at reducing flood peaks but did the presence of the dam give residents and decision makers a false sense of security...

The larger the flood the more ineffective the dam...

Questions over effect of dam on design flood levels for development controls

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Wivenhoe Dam

Provided substantial flood mitigation

Questions over timing of releases prior to and during the second flood peak

Highly effective at reducing flood peaks but did the presence of the dam give residents and decision makers a false sense of security...

Also, the larger the flood the more ineffective the dam...

Questions over effect of dam on design flood levels for development controls

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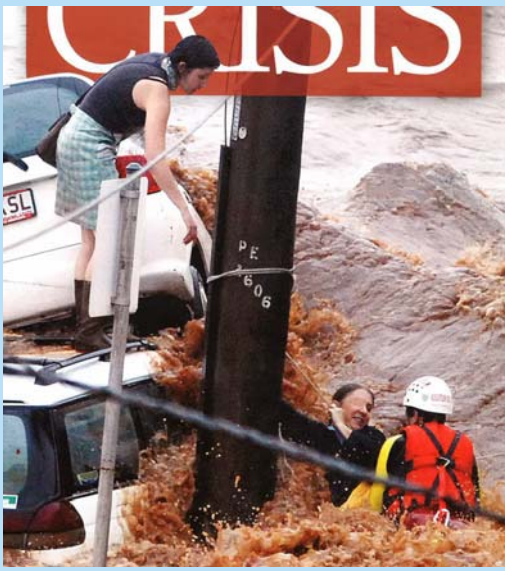
Emergency Management

- General opinion is the floods were handled well (given the extent)
- Strong and compassionate leadership by key politicians
- Outstanding effort by rescue personnel
- However, 35 people died with some still missing presumed dead
  - Government acting on recommendations from Inquiry



The Toowoomba Chronicle

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- Post flood clean-up carried out with great community spirit

Piles of household goods damaged in the Brisbane flood littered suburban streets after an army of volunteers turned out to clean up Australia's third-largest city. *PHOTO: Eddie Safarik AFP*

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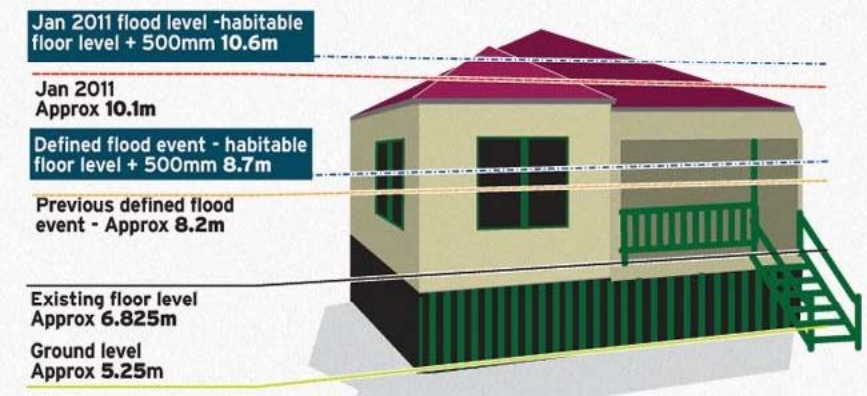
Development Controls

Example house in Rocklea, Brisbane



[The Courier Mail]

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Development Controls

After the 2011 flood, Brisbane City Council relaxed height restrictions in flood-prone areas and have raised minimum floor level to above 2011 levels...

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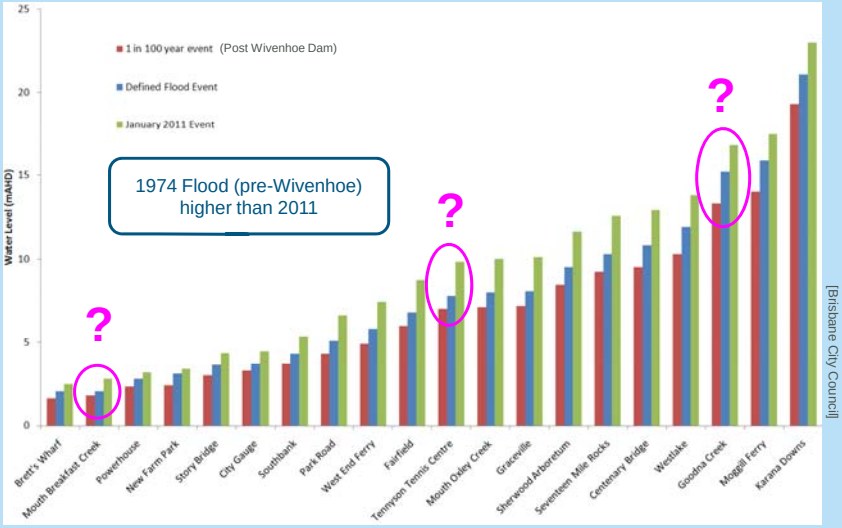
Brisbane: Comparison to Planning Levels



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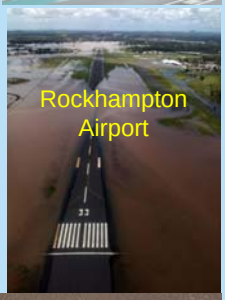
Review of Infrastructure Emergency Services

Main Transport Corridors



Location of Hospitals, Police, Fire, Ambulance

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Scorecard

If I had given 4/5 stars to everything I don't think I'd be giving this presentation!

Flood Forecasting and Warnings

Were the forecasts accurate and the warnings useful? ★★☆☆☆

Community Preparedness

Did we know what to do? ★☆☆☆☆

Operation of Somerset and Wivenhoe Dams

Did the operation of flood gates reduce flooding in Ipswich & Brisbane? ★★★★☆

Emergency Management

How did we go managing the emergency? ★★★★⋆

Development Controls

Did our planning controls reduce the risk to lives and damage to property? ★★☆☆☆

Design and Location of Infrastructure

Were our emergency services and key transport routes fully functional? ★★★☆☆

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Where to From Here?

Queensland needs to adopt national best-practice guidelines for flood planning and management

NSW Flood Risk Management approach an excellent example
(NSW has pursued a very active flood management program for over 30 years)

Queensland's guidelines ~15 pages (including bushfires!)

NSW's guidelines ~200 hundred pages!

Invest in the Future – Invest in Flood Management

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NSW Flood Risk Management Process

www.environment.nsw.gov.au/floodplains

Flood Modification Measures

Property Modification Measures

Response Modification Measures

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Risk Based Approach

Take into account

- ALL events (not just the 100 year event)
- Warning times
- Hazard level
- Uncertainties
- Climate Change

Flash flood areas should have different controls than areas of long-duration river flooding

Use extreme events for evacuation planning and emergency management

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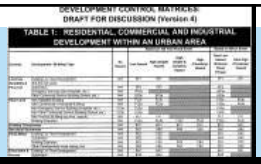
Development Control Matrix



DEVELOPMENT WITHIN A RESIDENTIAL AREA						
		100 Year Hazard			500 Year Hazard	
Controls	**Development Type**	**Low Hazard**	**High (Depth) Hazard**	**High (Floodway) Hazard**	**Rare Low Hazard (Extreme Flood Fringe)**	**Rare High (Floodway) Hazard**
Fill Level	New Development	No Min	No Min		No Min	No Min
	Emergency Services	PMF Flood Level			PMF Flood Level	
Floor Level	Habitable Building	100y level +0.5m	100y level +0.5m		100y level +0.5m	100y level +0.5m
	Ancillary Building (eg shed)	10y level +0.3m	10y level +0.3m		10y level +0.3m	10y level +0.3m
	Emergency Services	PMF Level			PMF Level	

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Property Modification Measures

Development Control Matrix Example

Example – Mechanics Garage

- High Hazard Depth
- Rare Extreme Hazard
- Floor Level F2 Required
- Floor Level = 59.3mAHD

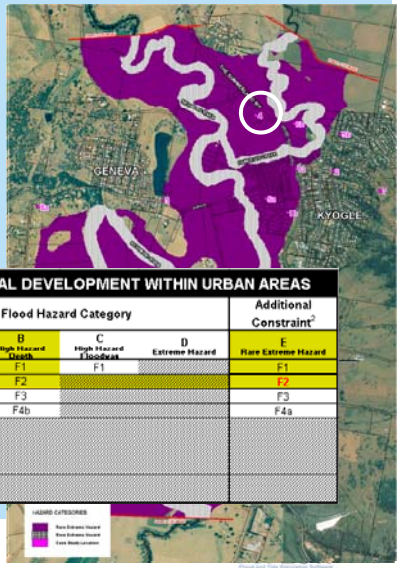

TABLE 2-3: RESIDENTIAL, COMMERCIAL AND INDUSTRIAL DEVELOPMENT WITHIN URBAN AREAS

Controls	Development / Building Type	No Hazard	Flood Hazard Category A Flood Fringe	B High Hazard Depth	C High Hazard Floodway	D Extreme Hazard	Additional Constraint[2] E Rare Extreme Hazard
Floor Level	New Ancillary Building (eg shed, carport)	N/A	F1	F1	F1		F1
	New Commercial or Industrial Building	N/A	F2	F2			F2
	New Habitable Building	N/A	F3	F3			F3
	Building Extension	N/A	F4a	F4b			F4a
	New Emergency Services (eg hospitals, etc) /Critical Infrastructure (eg major telephone exchange, etc)	N/A	F5				
	New Other Community Service (School, etc) /Special Evacuation Needs (eg aged care)	N/A	F5a				

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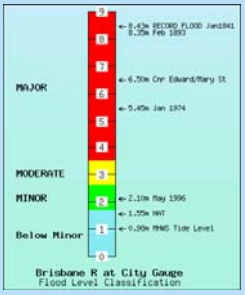
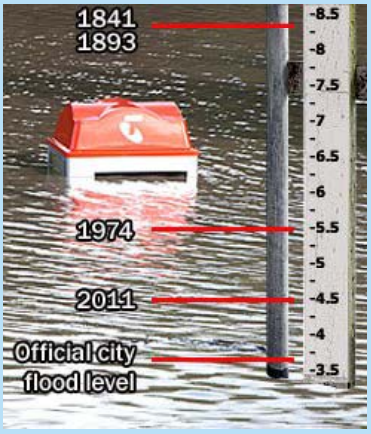
Flood Warnings

Gauge heights
– let's make them mean something!



Brisbane Times



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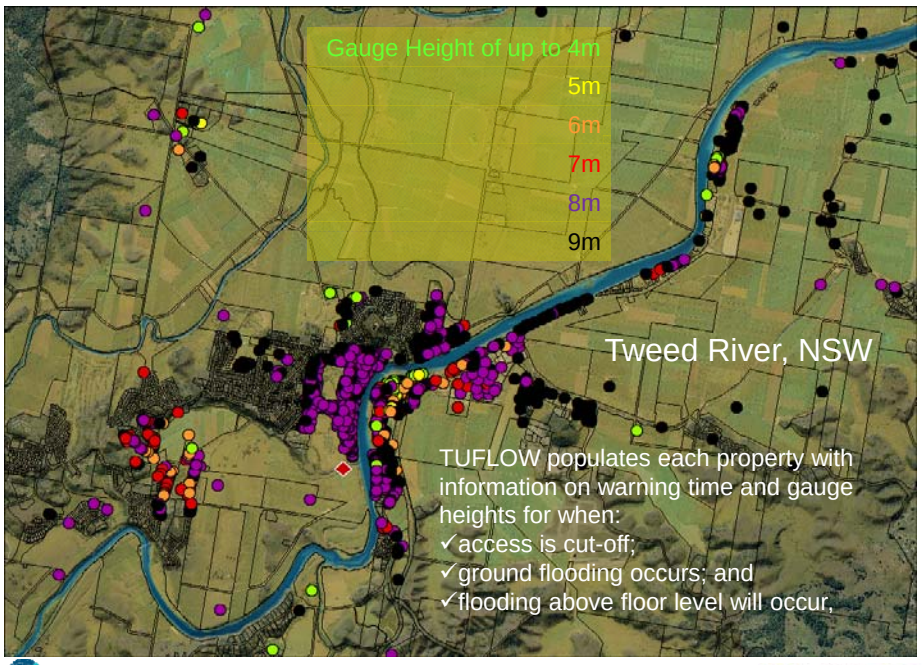

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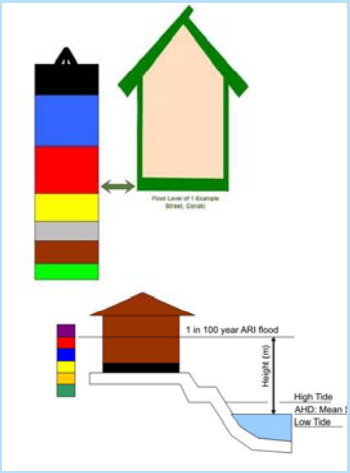
Once you have identified at risk buildings...

- **Send messages to residents and businesses**
- **Critical gauge heights for each building placed somewhere permanent (eg. inside the electricity box)**
- **Occupants / Owners can make an informed decision on the action to take**
- **Very difficult in areas with flash flooding and little warning time**
  – need greater focus on development controls to not have people in the firing line



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Flood Totems

The Next Step on from Gauge Heights

- **Links Response Modification Measures**
- **Help solves communication problems**
- **Being trialled in Innisfail, North Queensland**

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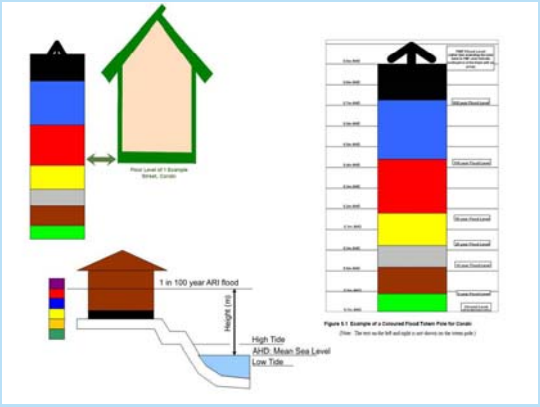
Flood Totems

The Next Step on from Gauge Heights

- More palatable to real estate agents and landowners
- Cornerstone for flood warnings
- Link to gauge height forecasts
- Indicates likelihood of inundation
- Easier to communicate to the community
- Household/Business Diagrams (eg. place in electricity box)
- Many others...



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Community Preparedness

- Raise awareness
  (probably not necessary in Queensland right now!)
- Flood evacuation plans
  - Businesses
  - Coordination by councils
  - Educate residents
- Continuous community consultation and reminders essential

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In Conclusion

- Our Qld communities and businesses could have been much better prepared
- Forecasted gauge heights were of little meaning to most
- Qld's approach to flood risk management and planning tends to be reactive rather than proactive (some councils excepted)
- Qld needs to proactively pursue a flood risk management process
- Qld can learn a lot from the NSW Flood Risk Management process and elsewhere

Toowoomba Chronicle

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Thank You

Toowoomba Chronicle

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