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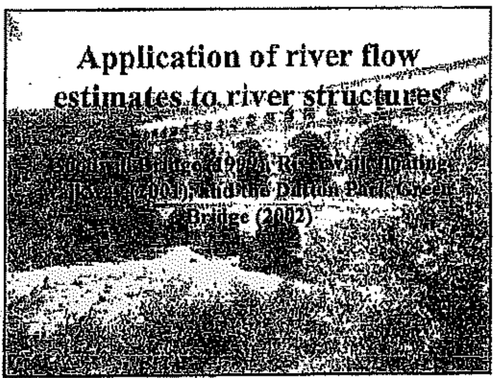
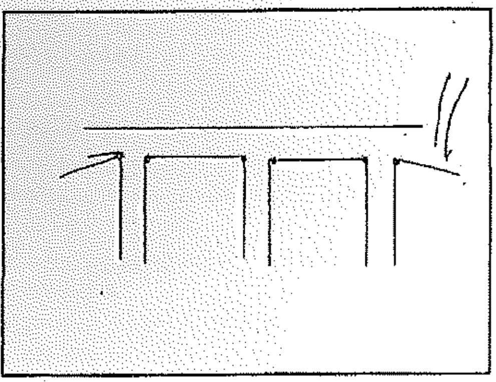


Key concepts

- Flow = volume of water passing a point in the river *in cubic metres per second = speed of the water × cross section area (height × width)*
- Q100 is an event with probability 1 in 100 years
- Q100 flow = 'high' flow (1% chance in any year)
- Q2000 flow = 'extreme' flow (0.05% chance any yr)
- Flow load = horizontal force of a flow on a bridge
- Flow height = height of a given flow
- Afflux = tendency of bridge piers to back up water, raise the flow height



Key points

- **<u>River flow load</u> has little or no effect on design of bridges / walkways in Brisbane River**
- **The most critical design factors are vertical load, ship clearance height, ship impact resistance of piers.** *Note, ship impact is much greater than even an extreme flow load*
- however, the **Australian Bridge Design Code** requires <u>river flow load</u> estimates to check:
  1. **<u>bridge pier strength</u>**, and
  2. **<u>afflux</u>** (water backup)

Bridge pier strength is checked for the 'extreme' load of a Q2000 flow

- <u>Water speed</u> is the most important factor
- However, water speed is fairly constant for flows of this order, so Q2000 flow estimate can be approximate
- more accurate estimate of Q2000 flow requires estimation of <u>maximum possible rainfall</u> event, called '**Qmax**'
- Met Bureau provided Qmax in 2001

6: new

8: a.

<u>What flow load was used to check the Goodwill Bridge pier strength in Nov 1998 and why?</u>

- **Water speed at Q2000 flow is the critical issue**
- Q2000 flow load was derived from the best available Q100 flow estimate which was 6,800 m^3/s (Met Bureau had not provided Qmax)
- SKM 1998 model was being refined, and latest draft Q100 flow estimate was 8,600 m^3/s
- ***BCC requested a further check against the more conservative June '98 estimate (8,600 m^3/s), pending final estimation of Q100 using expert advice and final State DNRM data***

Goodwill Bridge Oct 1999 afflux check

Why was June 1999 Q100 estimate used?

- In Nov 99, best available Q100 flow estimate was 6,800 m³/s at the Port Office, however...
- SKM 1998 model was being refined. In June 99, latest draft estimate was 8,600 m³/s
- Virtually no difference in afflux between 6,800 and 8,600 m³/s, *however...*
- ***...BCC requested a further check against the more conservative June '99 estimate (8,600 m³/s), pending final estimation of Q100 using expert advice and final State DNRM data***

Riverwalk floating walkway - March 2001 - why was 6,800 m³/s used for Q100 check?

- In Oct 2000, a **stakeholder workshop** advised that Q100 estimation process should continue, using expert advice and pending final State DNRM data but...
- **...Q100 flow likely to be closer to 6,800 m³/s than previous estimates**

Green Bridge Dutton Park May 2002 afflux check

Why was 2001 SKM Ipswich Q100 flow estimate used?

- In May 2002, best available Q100 flow estimate was 6,800 m³/s at the Port Office
- Virtually no difference in afflux at this order of flow, however...
- ...**water speed**, not flow, was the critical factor for afflux
- **2001 SKM Ipswich model had the most refined estimate of water speeds available**

Green Bridge May 2002 strength check

Why was 2001 SKM Ipswich Q2000 flow estimate used?

- **Water speed** (not flow) was the critical factor for strength check
- 2001 SKM Ipswich model had the most refined estimates for **water speeds**

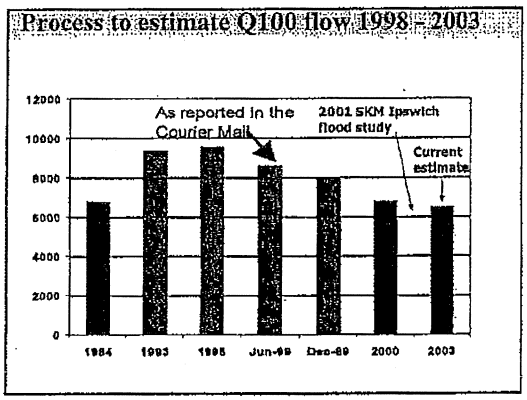
In summary...

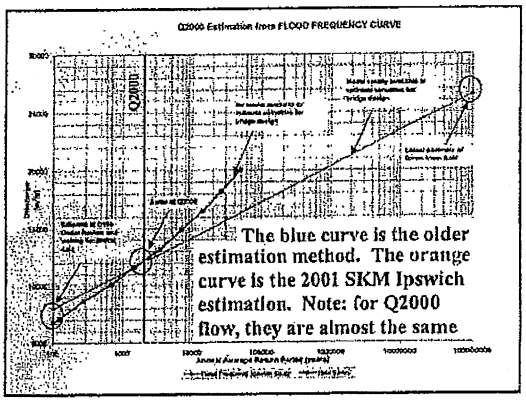
- **Estimates of water flow, flow loads, water speed and afflux had no influence on the final designs of the Goodwill Bridge, Riverwalk and the Green Bridge**
- **However, the designs were checked against best available estimates and models, and more conservative estimates as a further check**

move to front

Process to estimate Q100 flow 1998 - 2003

- 1984 - estimate Q100 flow at Port Office = 6,800 m³/s
- 1993 - State DNR estimate 9,380 m³/s, with caveats
- 1998 - SKM model, draft estimate = 9,560 m³/s (without national runoff rules, over-conservative assumptions)
- end 1998 - Professor Mein's peer review recommendations
- June 1999 - BCC City Design's draft estimate = 8,600 m³/s (Prof Mein's recommendations not fully incorporated)
- Dec 99 - City Design 2nd draft estimate 8,000 m³/s (Prof Mein's recommendations still not fully incorporated)
- Oct 2000 - workshop with Prof Mein agree Q100 closer to 6,800 m³/s (DNRM continues to support ~6,800 m³/s)
- July 2003 - DNRM estimates 6,000 to 7,000 m³/s


Process to estimate Q100 flow 1998 - 2003
12000
10000
8000
6000
4000
2000
0
As reported in the Courier Mail
2001 SKM Ipswich flood study
Current estimate
1984
1993
1995
Jun-99
Dec-99
2000
2003


Q2000 Estimation from FLOOD FREQUENCY CURVE
Q2000
The blue curve is the older estimation method. The orange curve is the 2001 SKM Ipswich estimation. Note: for Q2000 flow, they are almost the same