Beames Brook Bridge temporary replacement

William Reed (North West District) | Department of Transport and Main Roads
Location

Wills Developmental Road

- 25 km south of Burketown, in the Gulf of Carpentaria
- 426 km north of Mount Isa
- 420 km from North West District office, Cloncurry
- 900 km west of Cairns.
Beames Brook

An oasis in a unforgiving land
The Beames Brook project

- Construct an emergency/temporary bridge at Beames Brook before Christmas 2015 and the wet season

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<th>Week No.</th>
<th>Wk 1</th>
<th>Wk 2</th>
<th>Wk 3</th>
<th>Wk 4</th>
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<tr>
<td>Starting</td>
<td>23-Nov</td>
<td>30-Nov</td>
<td>7-Dec</td>
<td>14-Dec</td>
<td>21-Dec</td>
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Contract Awarded
Nov 15
Christmas
Dec 25
Constraints

- Remote – limited local resources
- No reliable local concrete supply or rock for rip rap
- Small traffic volumes: Annual Average Daily Traffic of 90, 38% commercial vehicles
- Higher Mass Limit (HML) to south side of bridge
- Limited local skilled labour
- Community and stakeholder relations
  - Only wet weather access to Burketown
  - Highly sensitive cultural heritage
  - Politicised.
Tender design

- SM1600 Unibridge temporary bridge – single lane
- On existing alignment
- Single span – length = 34.2m
- Deck 1.5m higher than old bridge
- Precast concrete abutments.
Unibridge technical specifications

- Modular steel bridges
  - 6m or
  - 11.4m
- Simply supported
- Temporary bridges
  - Steel infill panel deck
- Permanent bridges
  - Concrete cast-in-situ deck.
Geotechnical

- Limited time – insitu subgrade testing only
- 1950s – steel probes to ~6 m below deck level
- Timber piles in existing bridge
- Stable alluvial banks
- Local area – silty clays with gravel layers.
Flooding considerations

- Expect overtopping one to two times a year
- Raising deck by even one metre would significantly increase flood immunity
- Stream heavily wooded
- Local scour under existing bridge
- Flood immunity of the new bridge compatible with rest of link.
Superstructure

Ratio Design Load to Maximum Permissible Load

- Unibridge Technical Specifications

### 1.25M High Girder

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<th>T44</th>
<th>SM1600</th>
<th>HLP320</th>
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<td>Single lane</td>
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<td>without sidewalk</td>
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* Deflection limits exceeded
Substructure design considerations

• Low bearing pressure spread footing ~ 100kPa
  - Heritage
  - On existing road

• Precast concrete slabs
  - No reliable concrete
  - Speedy construction

• Braking
  - Platypus anchors
  - Passive pressure.
Flood forces: superstructure

- Uplift forces > dead load
  - Joint capacity
- Moment @ longitudinal axis
  - Lift on upstream girder > downstream girder
  - Joints
  - Diaphragms
- Drag
  - Bending/bracing
  - Joint capacity
  - Diaphragms
- Impact.
Flood forces: drag
Flood forces: crushing

- Box girders sealed
- Buoyant
- Could be like submarine- too deep
- Critical depth > 9m?
- Risk management
  - Inspection after floods
  - Annual inspection.
Removing the old bridge
Foundations

- Bobcat-mounted concrete mixer
- Bagged concrete
Assembling precast slabs
Northern abutment

250 universal column piles
Three slabs
Gap under girders
Erosion protection.
Flood Forces: top flanges welded

26mm partial penetration butt weld
Bridge complete, 21 December 2015
Conclusions

• Temporary SM1600 unibridge
• A higher flood will induce larger forces
• High velocities even in flat terrain
• Long, narrow, buoyant bridges without deck diaphragm/bracing may be sensitive to flood loads
• Embankments and large spans
  - Restrict waterway area
  - High velocities even in flat terrain
• Plans for the future.
Acknowledgements

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  – Eloise Kippers, Environmental Officer
  – Ruth Chaplain / Lucy Richardson, Communications Officers

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