Delivering Innovation and Value for Money Through Interactive Procurement and Innovation in Delivery
- By Peter Josey and Troy Burton
The Redcliffe Rail Link – a long time coming……
Project Objectives

- More reliable, economic and faster link to CBD
- Reduce congestion on Bruce Highway
- More sustainable transport outcome – every train removed 600 cars
- Better access to employment centres in and around Moreton Bay
- Help attract investment to area
- Act as a catalyst for growth, particularly around stations
Project Details

- **Two separate aspects**
  - Brownfield upgrade between Lawnton and Petrie Stations
  - Greenfield 12.6km dual track rail spur from Petrie to Kippa-Ring
Project Details – Key features:

1. **Complex brownfield upgrade between Lawnton and Petrie Station**
   - New four track bridge across North Pine River
   - Strengthening of existing road bridge
   - Upgrade of Petrie Station
   - Grade separation of Kippa-Ring line with existing North Coast line
2. **12.6km greenfield spur from Petrie Station to Kippa-Ring**
   - 6 new stations including 2,850 carparks
   - 22 bridges
   - Train stabling facilities at Kippa-Ring (10 x 6 – car sets expandable to 15 x 7)
   - Extensive local road upgrades
   - 12 km of shared user path
   - Rail systems including OHLE, power systems, telecoms and signalling
Procurement Process

- Client TMR with Qld Rail as key stakeholder
- Modified double early contractor (dECI)
- EOI – five candidates submitted, shortlisted to four
- Unique two stage process
- Primary Requirements (developed) in SWTC
- Process launched in August 2012
- Award in August 2013
Procurement Process – Stage 1A

Key elements
- No mandated workshops or interactive sessions
- Each proponent provided 1.5 hours with TMR each week
- Focus on innovation. Proponents encouraged to demonstrate why they will bring “best value”

Assessment Criteria
- Cost Plan 0% (within budget only)
- Team Capability 20%
- Design Report 50%
- Schedule 0%
- Risk Register 10%
- Innovation, Opportunities, Cost, Savings, Report 20%

Objectives
- Establish which options were worth pursuing
- Mandated framework
- Mandatory requirements explained
Procurement Process – Stage 1B

Unsuccessful proponent’s innovations / designs shared with two short-listed proponents
TMR representatives embedded in each of the two teams

Key focus for winning Leighton team:
• Improved alignment
• Optimised crossings
• Efficiency gains
• Capital construction savings
• Better integrated solutions
• Future – proofed design
Procurement Process Outcome

Pro’s
• Robust project requirements
• Certainty of project outcome
• Stakeholder buy in and acceptance
• Innovation from all bidders
• Demanded full commitment
• Value for money – certainty brings fierce price competition

Con’s
• Drawn out procurement – 12 months
• Significant investment from bidders (limited reimbursement from TMR)
• Odds for bidders low (1 in 4 initially)
• Level playing field – can stifle innovation, some may have held back

Innovations During Tender
Grade Separation Innovative Outcome

- Challenged & tested
- Collaboration
- High value on interaction
- Persisted achieved great outcome
Operational Modelling

- RailSys modelling used extensively
- Concept design equivalent to SWTC Ref Design for OTR
- OTR expressed as % of trains (in peak) with arrival lateness less than 4 minutes
Grade Separation Innovative Outcome

‘Trackstar’

- 100% on time running
- New island platform, reuse existing
- Intuitive wayfinding
- Easier to build, more greenfield
- Improved track geometry
- Future 4th track accommodated

‘SWTC Ref Design’

- 100% on time running
- Two new platforms (3 faces)
- Varied platform heights
- More complex construction
- More derogations on geometry needed, turnouts on VC’s
- Future 4th track requires infra upgrade
Grade Separation Innovative Outcome

- Achieves operational requirements
- Provides flexibility
- Provides an improved station layout for customers
- Reduced impact to existing infrastructure
- Refined track geometry with WOL benefits
- Provide upgradable solution
- Construction staging, design and safety benefits
- Cost effective & VfM ($30M saving)
Delivery Phase

Key feature of contract – cost-plus construction contract model

- Collaborative D&C contract model – under runs / over runs to be shared
- Ensured innovation remained a focus during detailed design and delivery
- Risk based approach adopted to draw out further innovation

Selected design features:

- Gympie Road Bridge strengthening
- Signal sighting
- Culvert base slabs
Lawnton to Petrie

- Re-configuration and expansion of Petrie Station
- Operating grade restrictions to achieve grade separation at tie in
- Sub-standard Gympie Road bridges, restricted corridor, constraints from existing commercial properties and local roads
- Sub-standard existing track geometry
- Heritage listed park

Lawnton Station
Gympie Road Bridge Strengthening

Northbound bridge – originally proposed to be demolished and replaced.
Gympie Road Bridge Strengthening

View of existing bridges.
Current configuration:
- Substandard clearance – vertical and horizontal
- Piers not designed for current collision load structure
Proposed configuration:

- Full reconstruction of bridge meant traffic disruptions to local road users
- Significant capital cost of works – better investment elsewhere on Queensland Rail network
Gympie Road Bridge Strengthening
Pier Collision Load Requirements

ANZRC Railway Bridge Design Code/NAASRA Bridge Code
Pier collision loads not specifically addressed.

Austroads Bridge Code 1992
Horizontal load  1000 kN transverse / 2000 kN longitudinal

AS5100
Horizontal load
• 1500 kN transverse  
• 3000 kN longitudinal

Queensland Rail MCE-SR-012
Horizontal load
• 2000 kN transverse  
• 2000 kN longitudinal  
(not simultaneous)
Focus on looking at retention of existing structures.

Key considerations:

- Due to network constraints, similar numbers of trains passing through spans (extra trains spread across more tracks)
- Pavement, drainage and rail conditions being upgraded on both sides of the structure - reduced derailment risk
- MCE-SR-012 only introduced in 2007 so many existing structures not designed for these requirements
- Minimum electrification clearances could still be achieved
- Road traffic barrier on “old” bridge was upgraded in 2003 to “regular” standard

Maintain structure, but strengthen capacity to AS5100
Gympie Road Bridge Strengthening

Adopted Configuration
Gympie Road Bridge Strengthening
Pier Strengthening – Plan and Section
Gympie Road Bridge Strengthening
Elevation on Pier

(Typical Section)

Existing Northbound Bridge
(Substructure to be strengthened)

Existing Southbound Bridge
(No modification required)

Shored use path
SH Lane Lane SH

750 dia QP piles

Formation level

Pier 2
(S/B)

To CABOOLTURE

(Note: Span 4 N/B and Span 2 S/B shown.)
(Section shown square to road centreline)
Signal Sighting

Physical impediments impacting on signal sighting:

- 4 closely spaced tracks (two previously), sub standard radii, no long lengths of straight track
- Existing track geometry, infrastructure, headway requirements
- Presence of catenary and contact wires
- Sub standard clearance at Old Gympie Road meant mast heights in vicinity had to be lower

Gantries with cantilever components on curved track caused significant congestion and sight line blockage
Signal Sighting

Signal 45

Culvert Base Slab Designs

Issues

- Post consolidation settlement limits:
  - 150mm generally
  - 40mm at culverts
  - 0.5% differential over 5m

- Partial removal / replacement proposed:
  - Extensive removal in soft ground
  - Removal below water level
  - Acid sulphate soil treatment

Very soft or alluvial material
Stiff alluvial material
Culvert Base Slabs – Original Design

Issues:

- QR standard designs don’t perform well under significant differential ground movement - max differential movement well less than will occur.
- Extensive remove and replacement to limit these impacts – over 1m below base of culvert.
Design features:

- “Floating”, continuous slab able to accommodate allowable settlement limits
- Significant reduction in ground improvement works
- Increase in pre-cast unit spacing and joint detail to better accommodate curvature of base slab
Project Status

- Civil, structural engineering works near complete
- Testing and commissioning underway
- Opening – mid 2016
North Pine River Bridge
Stabling Yard
Mango Hill Station
Petrie Station
Acknowledgements

- Client, project sponsors
  - Department of Transport and Main Roads
  - Queensland Rail
  - Moreton Bay Regional Council
- Project Contractor: Leighton
- Design Partner: AECOM
- Architect: Hassell
- Geotechnical Consultant: Golder Associates