Golden Ears Bridge Project

April 17, 2008
Bill Kendrick
A new high-level bridge across the Fraser River.

An interchange at 113B Avenue.

A new roadway heading north, crossing both the Lougheed Highway and the CPR tracks.

The Abernethy Connector will head north and east from the new interchange at Lougheed Highway to 128th Avenue in Maple Ridge.

An off-ramp to 199A Street and on-ramp from 201st Street connecting to 200th Street and Highway #1.

A connection to 192nd Street, providing Port Kells access.

A new east/west road connecting to Highway #15, after crossing under Highway #1.

A new intersection at Highway #15, south of 96th Avenue.

Widening of 200th Street from 201st Street to 86th Avenue.
Project Scope

- 13.3 km (8.25 miles) of 2, 4 & 6 lane mainline
- 11.5 km (7.1 miles) of local street reconstruction
- 17 bridges
- Total 4.656 km (2.9 miles) of bridges
- Total 112,000 sq m (1.2 million sq ft) of bridge deck
Many stakeholders other than TransLink:

- Four municipalities
- Katzie First Nation with 3 separate reserves
- Five different Utility Owners plus the Municipalities
- Two national railways
- Ministry of Transportation
GEB Project

- DBFO project; $800 M DB Price
- Owner: GVTA (“TransLink”)
- GVTA has rights of taxation
- Revenue stream from direct tolls (not at risk)
TransLink
Revenue Stream

Projected Annual Toll Revenues, based on car toll of $2.50 ($2003)
The Deal

- Financing cost driven
- “license fee”; constrained capital payments
- 32 year operating period
- Operating payments constrained to a small range
- Capital costs don’t get paid down until year 9
Selection Process

- Technical Submittal Pass/Fail
- Aesthetics Submissions Pass/Fail
- Financial Submission Lowest NPV
the story of golden ears
Our Team: The Golden Crossing Group

**DB Phase**
- DB Contractor: Golden Crossing Constructors JV
  - Billfinger Berger Civil - Prime
  - CH2M HILL - Prime
- Engineering Design & Other Consultants
  - Buckland & Taylor - Prime
  - AMEC
  - McElhanney
  - Trow
  - Leonhardt Andrä
  - Hoton Bakker Boniface Haden
  - Phillips Farvaag Smallenberg
  - Hamilton
  - PBA Engineering
  - Kario Communications

**Construction Subcontractors**
- Bel Contracting
- Columbia Bitulithic
- Imperial Paving
- Jack Cewe
- FRPD

**DBFO Contractor**
- Golden Crossing Group SPC
  - Billfinger Berger BOT (Financial Prime)

**Tolling Operator**

**OMR Phase**

**OMR Phase**
- O&M Contractor
  - Capilano - Prime
  - Subcontractors
- Rehabilitation
  - Golden Crossing Group SPC
  - Subcontractors

**Legal Advisor**
- CMS Cameron McKenna

**Financial Advisors**
- Pricewaterhouse Coopers Ernst & Young
Bid Phase Schedule

- RFQ
- Shortlist of 3 teams
- RFP issued
- Technical Submission
- Notification of Technical Compliance
- Financial Submission
- Preferred Proponent Announcement

Nov, 2004
Dec 8, 2004
Jan 14, 2005
Sept 13, 2005
Oct 21, 2005
Nov 4, 2005
Dec 7, 2005
Delivery Phase Schedule

• Commercial Close
  Feb 24, 2006

• Financial Close
  Mar 3, 2006

• Traffic Availability
  Jun, 2009
Bid Phase

• 25,000 labour hours of design
• Bridge strategy
  – focus on foundations
  – maximize modularization
  – precast deck planks key
• Road Strategy
  – few alignment alternatives
  – focus on embankment heights/fill material
Site Conditions

Vertical scale 10 time exaggerated

No Hard Bottom
Geotechnical Issues

• Soft silt and clays
• Settlements drive decisions
  – Embankment heights limited
  – Use of lightweight fills (pumice, EPS)
• Seismic design requirements are key
Approach Structures

- 8m “Economic height” of approach fills
- 2.4m NU, 45m span modules
- Prestressed deck planks
- Two level seismic (post-disaster)
  - 475 Yr event – limited inelasticity
  - 1000 Yr event – prevent collapse
Main River Bridge

- 968 m (3175 ft) shore pier to shore pier
- 6 lanes plus 2 sidewalks
- Four river piers
- 240 m spans
- Composite steel extradosed superstructure
- Foundation: 2.4 m diameter, 92 m deep, partly cased bored piles (drilled shafts)
Comparison of Golden Ears Bridge to the Alex Fraser Bridge
**Design Considerations**

- Three level seismic (lifeline structures)
  - 475 Yr elastic response
  - 1000 Yr limited inelasticity
  - 2475 Yr prevent collapse
- Vessel collisions
- Settlement tolerance
Piling

South Approach
Dia=2.5m
L ~60m
Total pile L= 4.5 km

Main Crossing
Dia=2.5m
L ~80m
Total pile L= 4 km

North Approach
0.35x0.35m
L ~15-36m
Total pile L= 19 km

SILT
SAND
River
GRAVEL & SAND
CLAY

~2 km ~1 km ~0.6 km
Pile Load Test using Osterberg Cell

- For High capacity piles
- No need for external loading
- Can test selected portions of pile
Back Calculation

Back-analysis of Ocell test for calibration of Beta and LCPC methods

Shaft Resistance (MN)

Upper shaft 25 MN
Middle shaft 25 MN
Bottom shaft 5 MN

Cased pile in sand, \( \beta = 0.25 \)
Uncased pile in sand, \( \beta = 0.4 \)

\( q_f \) (bars)

Clay, depth < 74 m, \( \beta = 0.25 \)
Clay, depth > 74 m, \( \beta = 0.20 \)

Clay, \( \gamma = 17.5 \text{ kN/m}^3 \)
Sand, \( \gamma = 18.0 \text{ kN/m}^3 \)
STAGE 3
- Install stays to stage 1A force. The cast-and-weld stay cables shall be stressed concurrently.

STAGE 4
- Prior to installing precast panels confirm by survey that the plan alignment of the steel segment is acceptable. If not adjust using the wire rope controls present.
- Check that precast panel supports are in place on floorbeam, string beam and girder top flanges respectively.
- Seat beam and girder precast panels.

50% REDUCED

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REVISIONS

THE GOLDEN EARS BRIDGE
Main River Bridge - Superstructure
Typical Segment Erection Sequence - Sheet 2 of 4

DESIGN CONSULTANT:
BUCKLAND & TAYLOR Bridge Engineering

[Company Logos]
Questions