Bridge Planning

Bridge Planning Practitioners Seminar
April 2012

Overview

- Purpose of Seminar
- Why is Bridge Planning Required?
- What is Bridge Planning?
- Bridge Planning Categories
- Level of Detail Required
- Resources

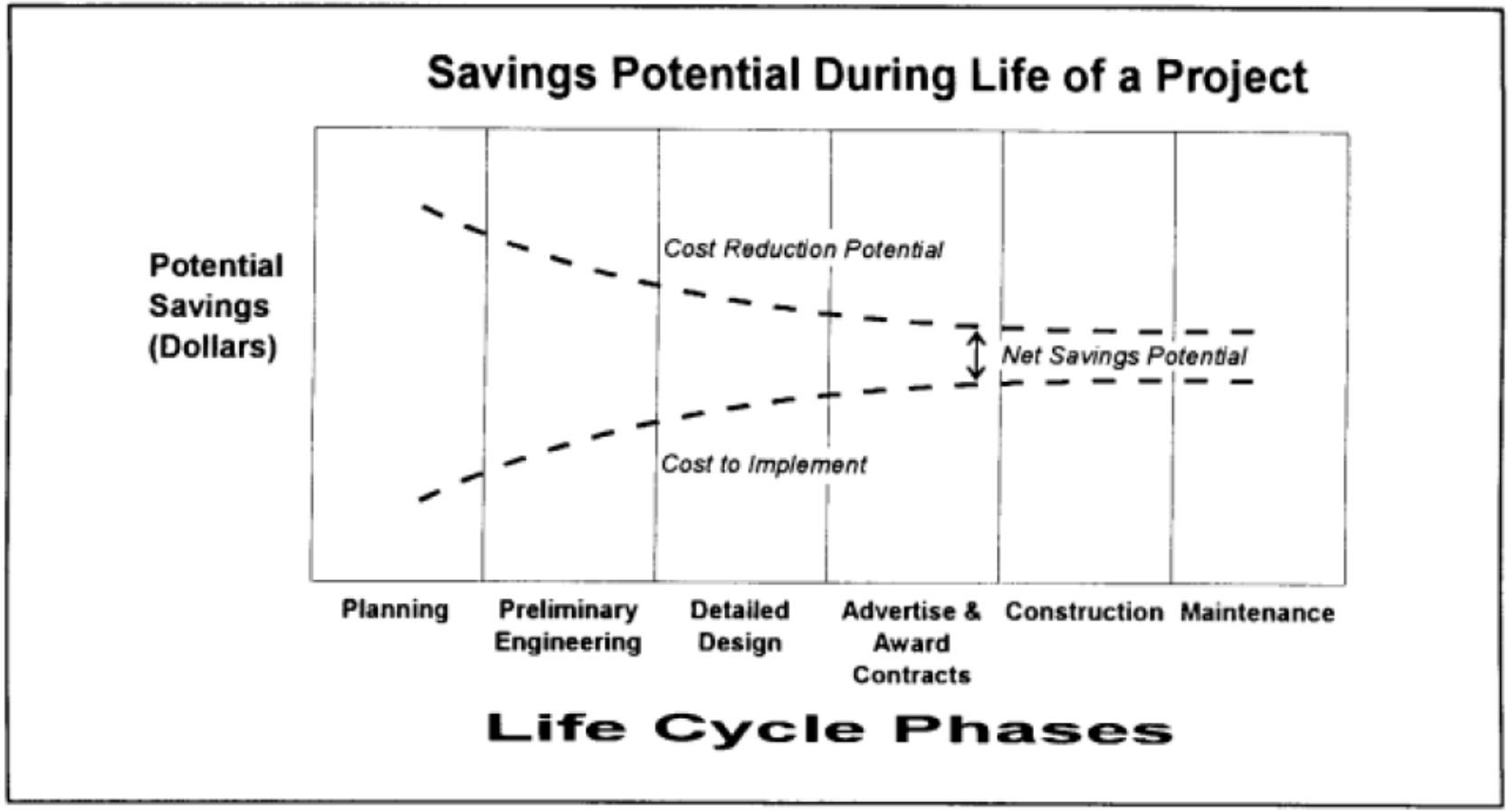
Purpose of Seminar

- The seminar is not setup to teach bridge planning fundamentals.
- Update practitioners with respect to current design bulletins, best practices etc.
- Provide information on available AT tools and show relevance to the bridge planning process
- Demonstrate process and tools through case studies
- Engage in exchange of ideas and discuss problems currently encountered in the delivery process

Why is Bridge Planning Required?

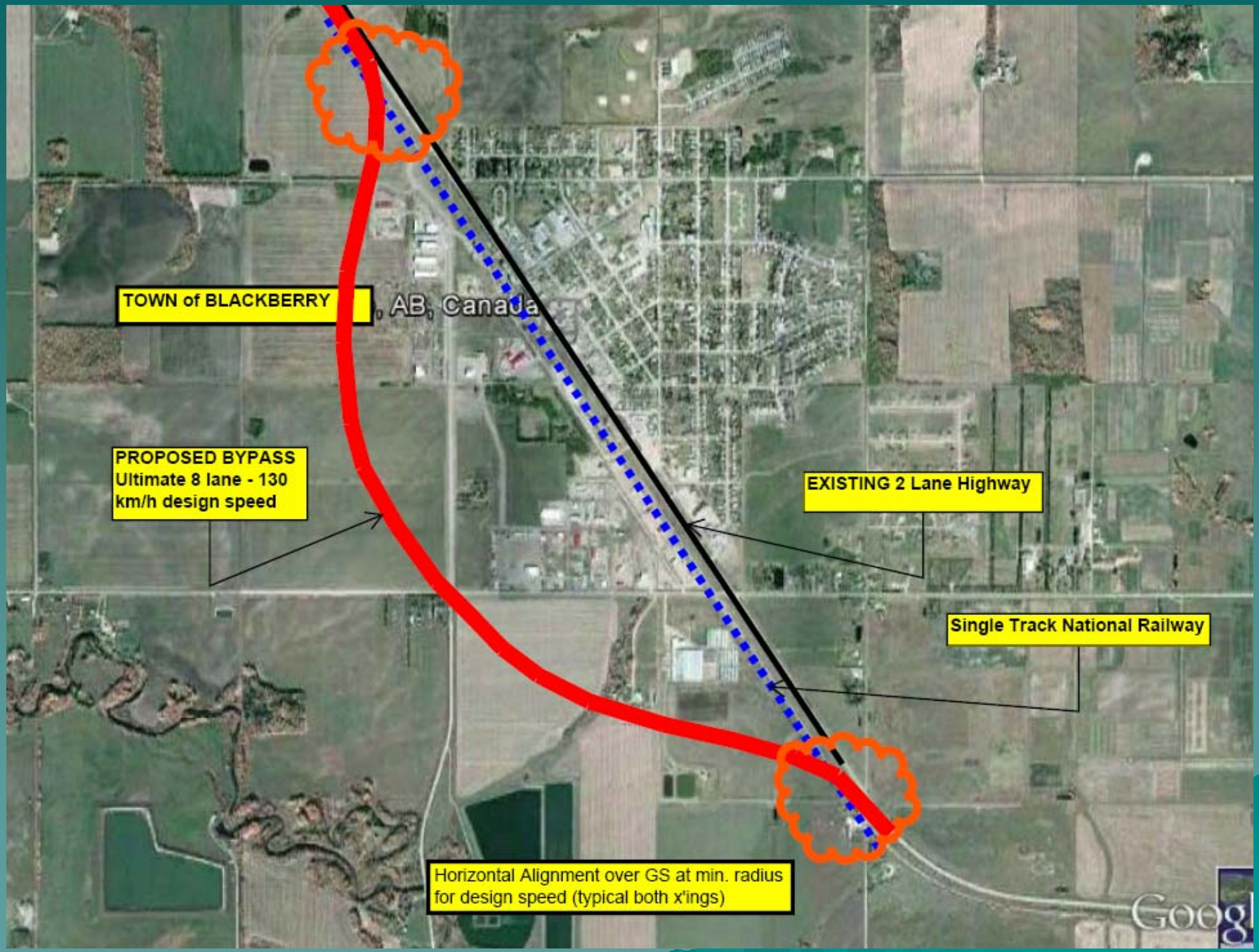
- Bridges are expected to have a design life of 75 to 100 years.
- Bridges are the most expensive component of the highway system per kilometer by an order of magnitude.
- Bridges are the least flexible infrastructure component for accommodation of future unpredictable functionality changes.
- The number of functionally obsolete or structurally deficient structures in Alberta and across North America exceeds projected funding likely to be available for replacement.

Why is Bridge Planning Required?



Bridge Planning Group Exercise

- Focus on only the railway grade separations in the following example
- Hwy. 999 is a two lane highway running through town and is to be replaced by a bypass high speed (130 kmh) ultimate 8 lane rural freeway.
- Assume initial corridor FPS concluded bypass on south of town is best option.
- Arrange yourselves into a group for each row and the exercise will take 10 minutes
- Identify potential bridge and road issues and develop at least two options.


TOWN of BLACKBERRY
, AB, Canada
PROPOSED BYPASS
Ultimate 8 lane - 130
km/h design speed
EXISTING 2 Lane Highway
Single Track National Railway
Horizontal Alignment over GS at min. radius
for design speed (typical both x'ings)

What is Bridge Planning?

- What its not is “structural engineering”, cookbook application of standards and practices, or working (reverse engineering) backwards from design.
- The process of finding the optimal solution for a roadway to cross a watercourse, another roadway, or railway. It also includes river engineering associated with highways adjacent streams. It requires integration of **roadway** and **bridge** issues from appropriate areas of expertise under the direction of a bridge planner.
- Represents the best opportunity to achieve the greatest cost savings in any highway project involving structures.
- Is the process point at which a bridge and highway project have the most flexibility for alternatives.

What is Bridge Planning?

- Considerations:
  - Site history/constraints
  - Hydrotechnical
  - Roadway Geometrics
  - Structural
  - Geotechnical
  - Environmental
  - Cost/risk/safety
  - Operations/user cost
  - Stakeholders
  - Construction
  - Staging
  - Land use
  - Etc.

Bridge Planning Categories

- Bridge planning involvement is required for:
  - Major Bridge/Complex River Crossings
  - Stream crossings/encroachments
  - Rail crossings
  - Hydrotechnical Studies
  - Stormwater Management
  - Standard Bridges/Culverts
  - Planning Studies

Level of Detail

- All projects follow the same bridge planning basic process and the methods demonstrated today are transferrable from FPS to Standard bridges and culverts projects.
- What changes is the level of detail and the deliverables for each category of project.

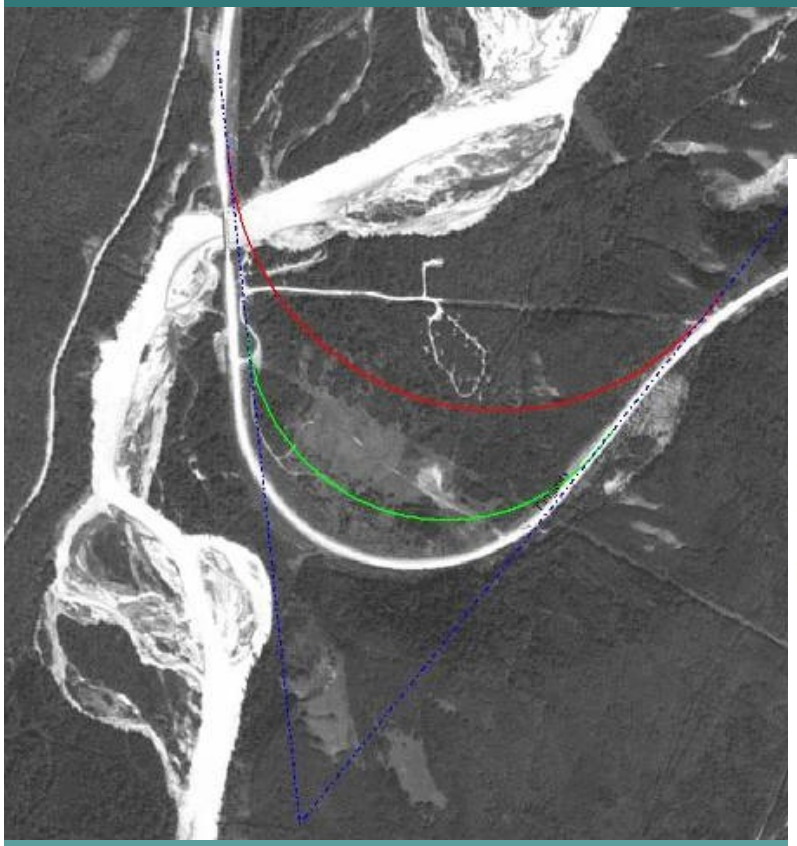
Determination of the Level of Bridge Planning Required

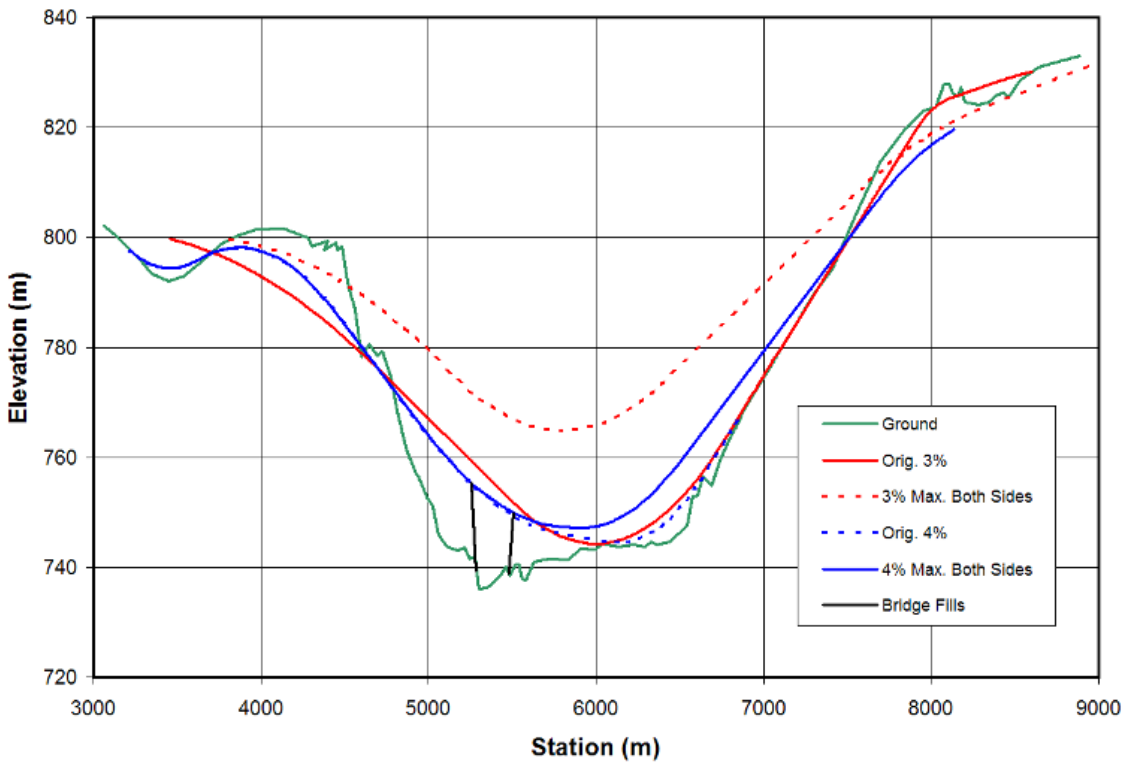
- Assess planning horizon context (long term vs immediate)
- Projects not constrained by pending construction/design schedules/horizons or site constraints generally should have higher level big picture (less detail) bridge planning.
- The amount of detailed information currently available for the study will provide a guide as to the level of detail to be provided with respect to bridge planning (assessments, etc.)
- The recommended bridge planning outcomes must be supported by sufficient technical effort and confirmatory investigations to validate their viability where critical to the ultimate plan and staging options.

Example for Railway Grade Separations

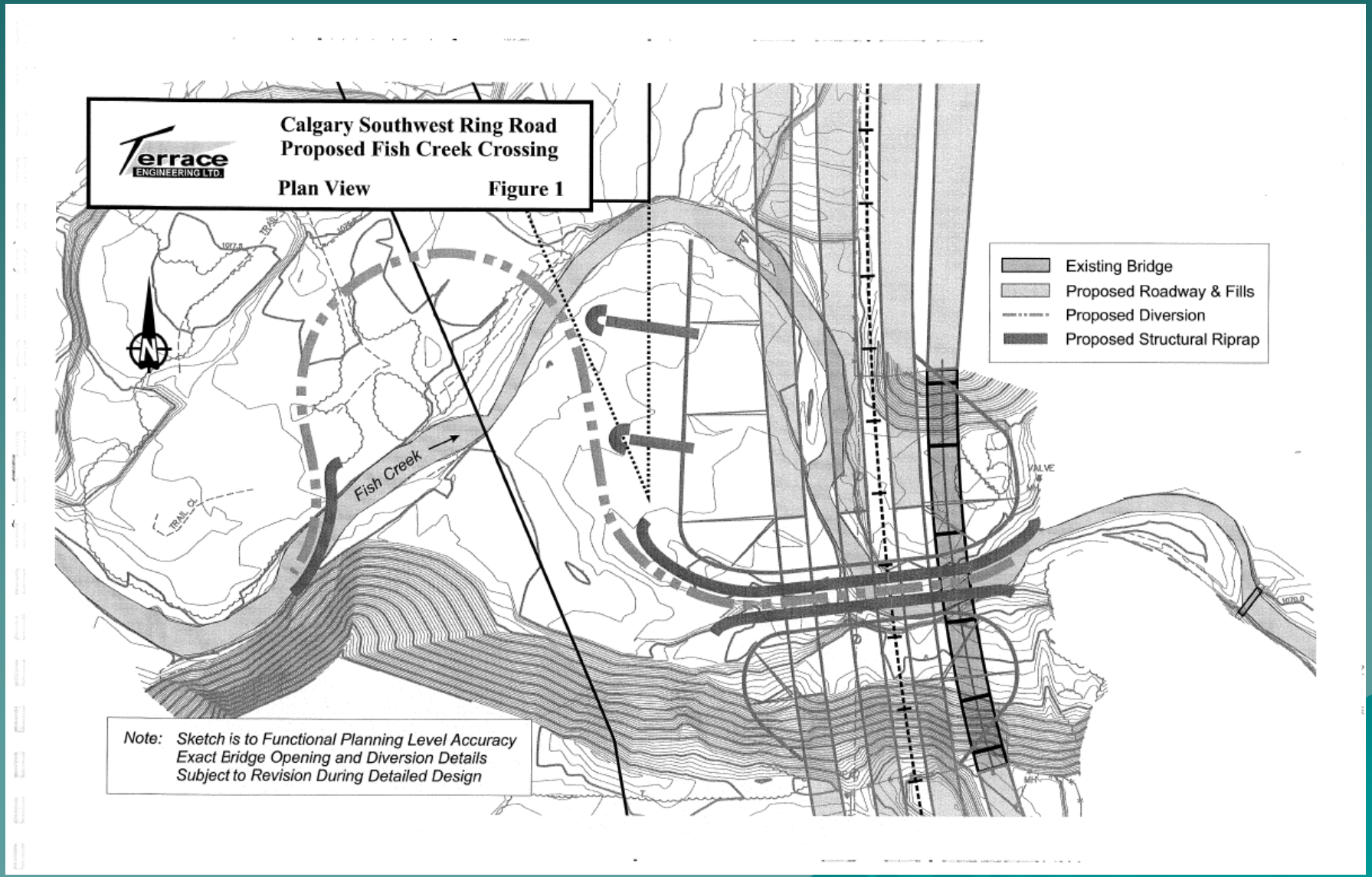
- Railways
  - Inventory of existing crossings.
  - Existing agreements (seniority).
  - Determine railway requirements and clearance boxes.
  - Identify difference between existing and future railway facilities.
  - Communicate plan to railway.
  - Look at opportunities for mutual benefit such as railway relocation.

Typical Bridge Planning Deliverables

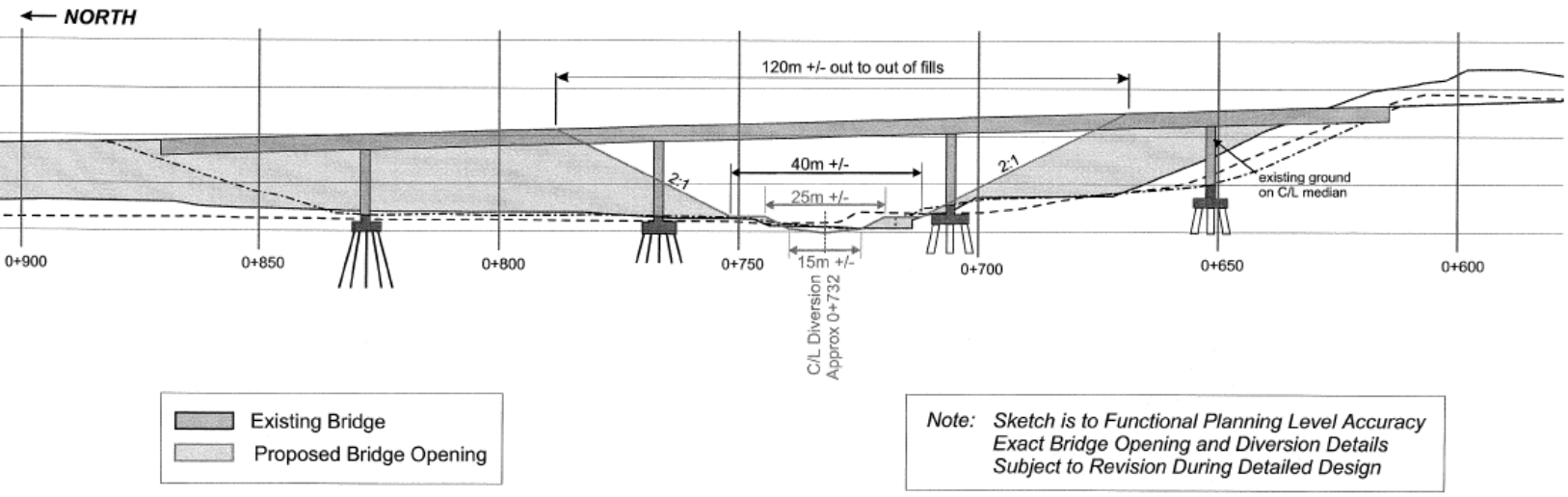




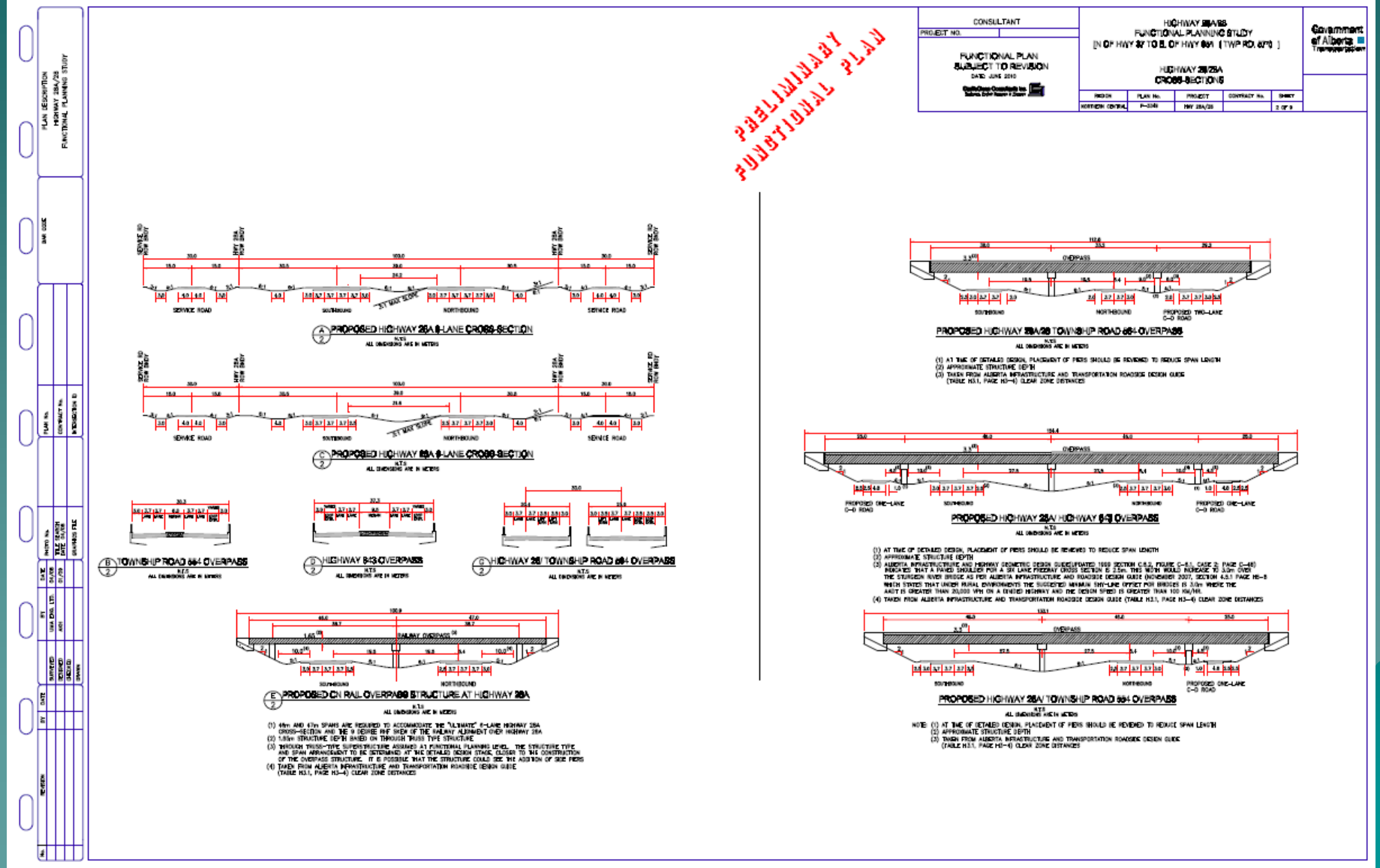
Example – Stream Crossing



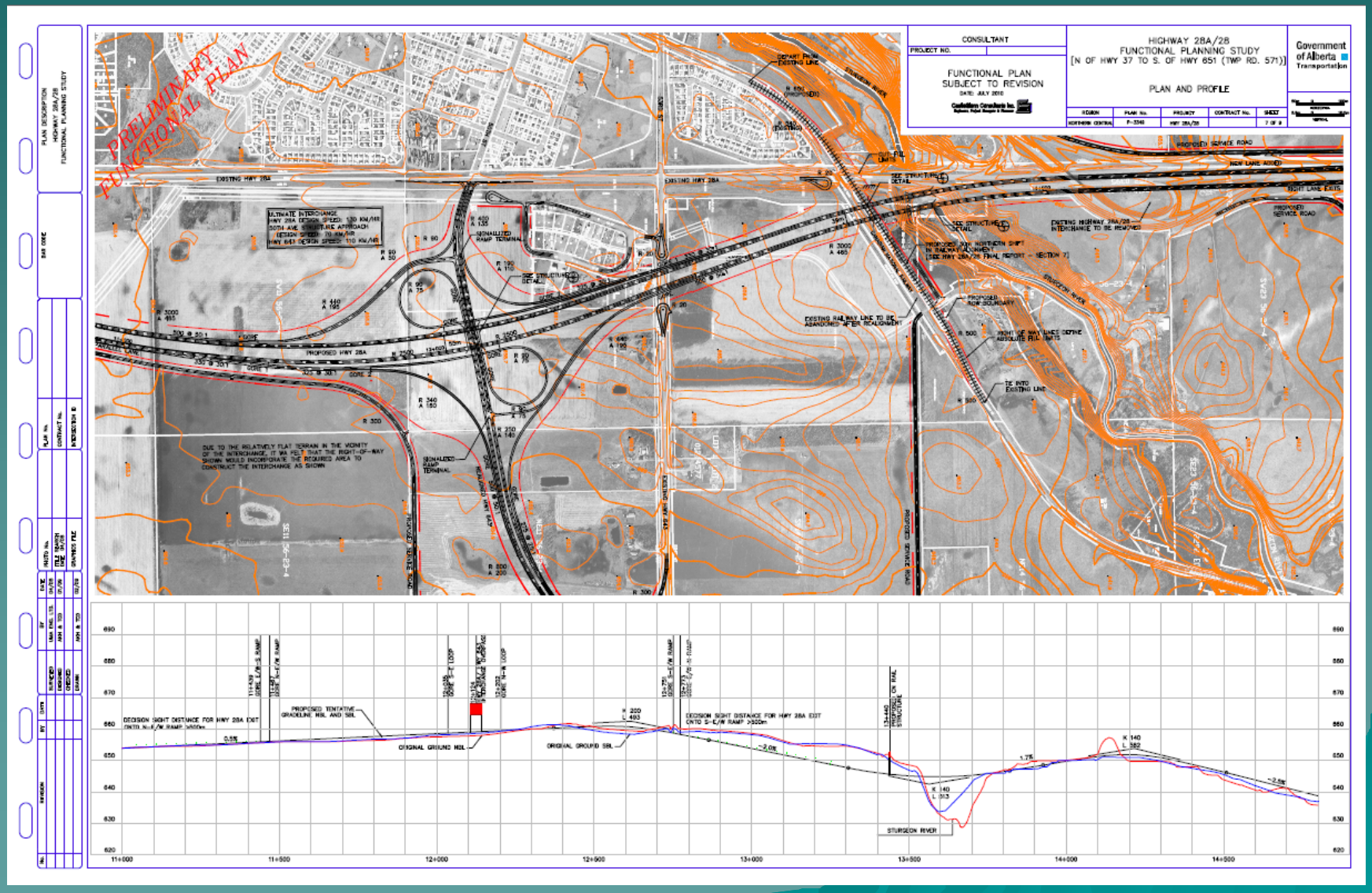
Example – Stream Crossing



Example – Grade Separation



Example – Grade Separation



Some Current General Bridge Planning Issues

- The amount of bridge planning effort in many FPS studies exceeds what is required to adequately address bridge issues.
- Most FPS studies should not require an intensive bridge structural engineering effort.
- The most important step in bridge planning involving DD deliverables is the concept choice including preliminary bridge planning summary report.
- Content delivered in support of bridge planning effort for standard bridges and culvert is not well understood.
- Railway grade separation process especially cost apportionment is not well understood and considered in bridge planning process.

General Bridge Planning Concerns

- Stream encroachments
  - Laterally mobile streams, RPWs (BIM), geotech instabilities
- Early railway consultation
  - Which party is senior, cost apportionment
- Early environmental consultation
  - CEAA, DFO, nav waters
- Sidewalk/MUT
  - Provide connectivity, favor separate structure (safety, costs)

General Bridge Planning Concerns

- AT standards within ROW
  - Outside can transition to municipal
- Avoid curves on bridges
  - icing, sight distance, design complexity, constructability
- Minimize skews
  - land, cost
- Minimum grade = 1% on bridges
- Preferential icing considerations > 4%
- Rural vs Urban stormwater management
  - Rural: ditches; urban: ponds

Resources

AT Website – Technical Resources – Bridges – General / Planning and Preliminary Engineering

- Engineering Consultant Guidelines
- Highway Design Bulletins
- Bridge Design Guidelines:
  - BPG 11: Stormwater Management at Rural Bridges
  - BPG 12: Bridge Deck Drainage
  - BPG 13: Freeboard at Bridges
  - BPG 14: Wildlife Passage at Stream Crossings
  - DB 5: Use of Retaining Wall Structures for Bridges and Roadways in Active Watercourse Environments
- Ernie Waschuk, Yvonne Carignan, Caroline Watt, Des Williamson

Questions??