

# Bay of Quinte Skyway (Site No. 11-245) VE Study

**2013 CSVA Conference**  
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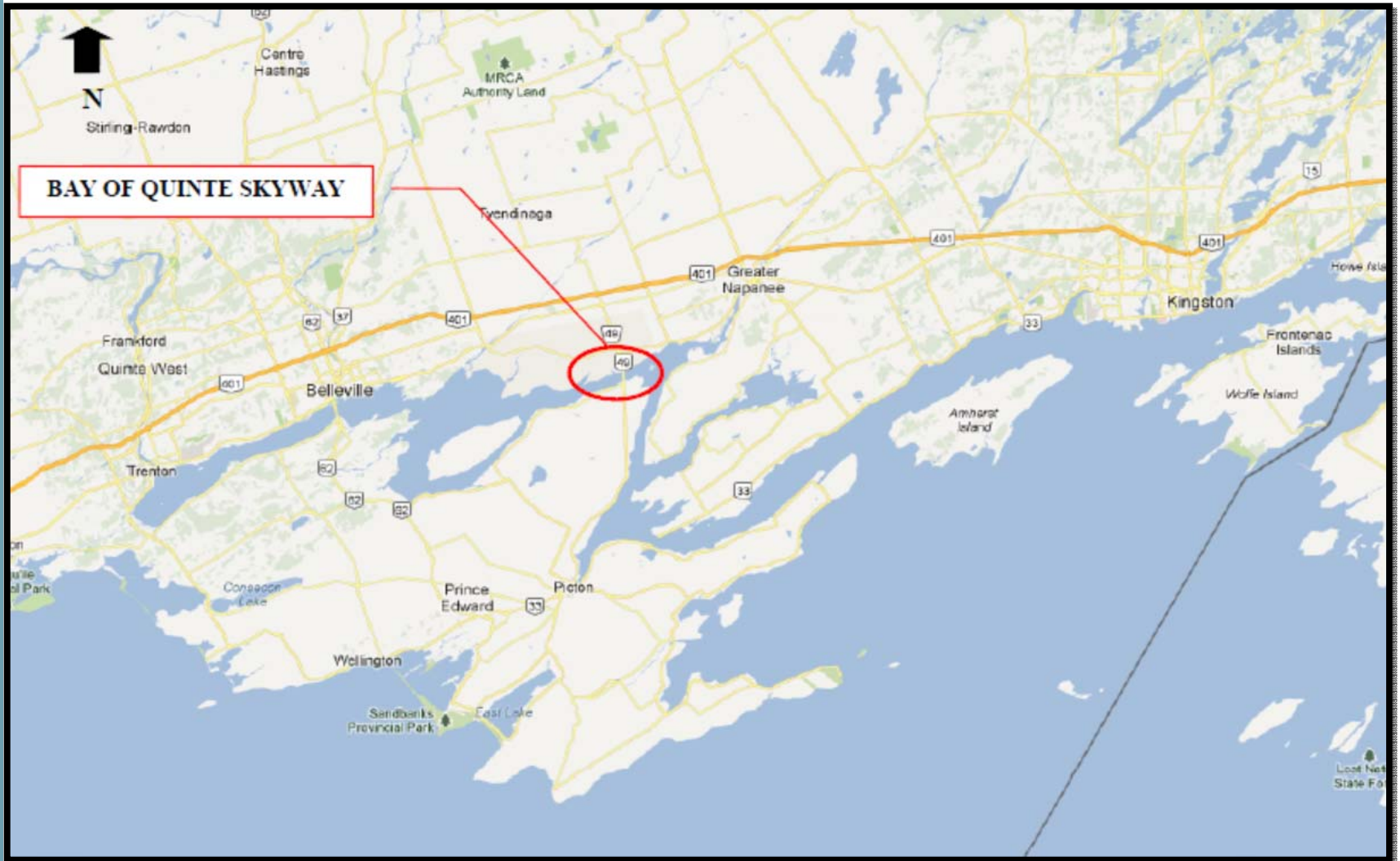
# Topic Overview

- Importance of involving key stakeholders
- VE Teams should not be afraid to challenge the base case
- VE is not just a cost-cutting tool
- Value improvement can include increase cost
- Process to ensure the right course of action is being undertaken

The image features a complex abstract layout. At the top, a thin black horizontal line spans the width. Below it, a light olive-green horizontal bar is positioned. The main area is divided into several sections: a large blue rectangle on the left containing the text 'Project Background'; a dark grey vertical bar to its right; a dark olive-green rectangle to the right of the grey bar; a large blue rectangle on the far right; and a dark grey horizontal bar at the bottom right. A wide, light olive-green horizontal bar runs across the bottom of the page.

**Project  
Background**

# Project Location



# Project Location



# Bay of Quinte Skyway



# Importance of the Bay of Quinte Skyway

- This high level 17 span bridge crosses the Tyendinaga Mohawk Territory
- It is a significant landmark to First Nations
- The Bridge serves 1,100 homes on the Tyendinaga Mohawk Territory
- The bridge connects Belleville to Prince Edward County across the Bay of Quinte
- Closure would require lengthy detours (between 29 and 47km)

**Slide 7**

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**SMH1**

Add image of Mohawk Territory

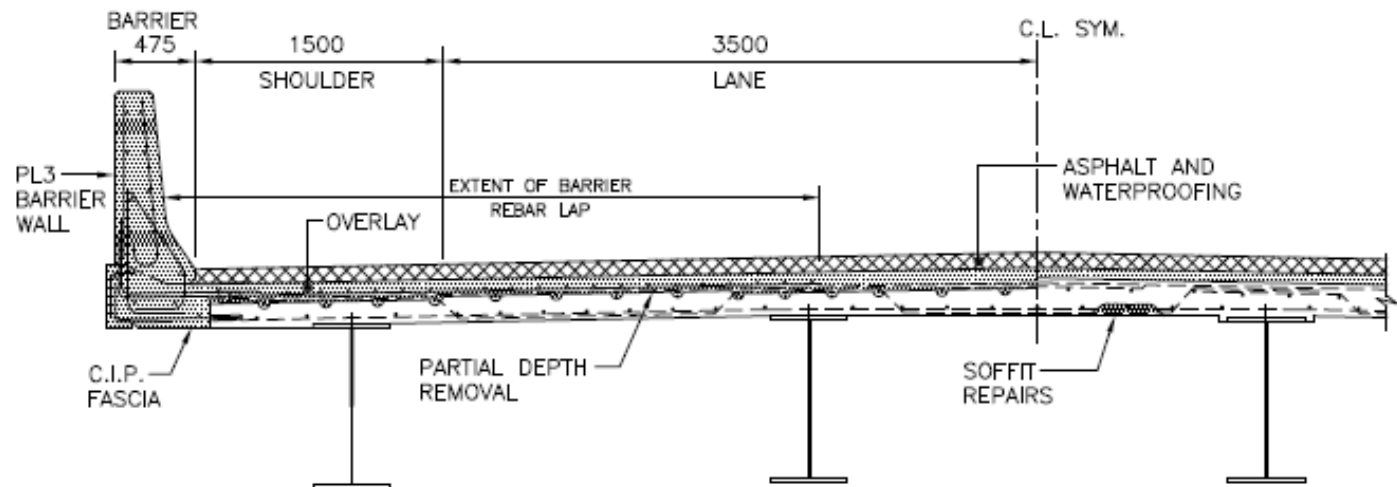
Holmesst, 11/21/2013

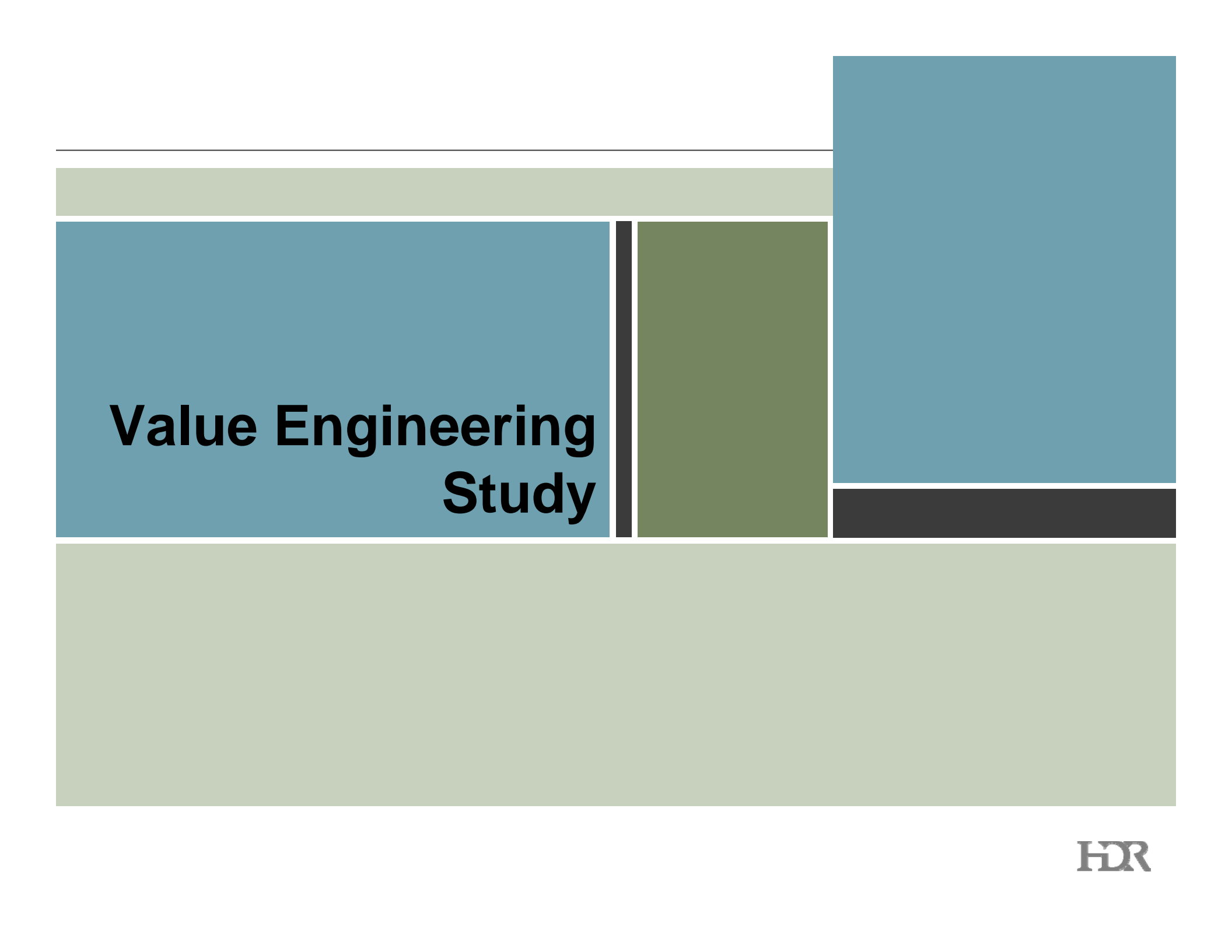
# Base Case Project Background / Objectives

- **Structural Requirements**
  - Deteriorated bridge condition
  - Additional 40 years of service life
  - Life Cycle Costing is to be used
  - Maintain traffic during construction

# Structural Evaluation and Needs

- Barriers for 100 km/h design speed on the bridge
- Replacing the deck and maintaining superstructure
- Replace bearings
- Patch / reface deteriorated substructure components
- Repair steel girder fatigue defects
- Coat structural steel



The image features a complex abstract graphic design. It consists of several overlapping rectangular blocks in muted colors: a light olive green at the top, a medium blue on the left containing the text, a dark olive green in the center, a large medium blue block on the right, and a dark charcoal grey block at the bottom right. A thin black horizontal line is positioned near the top, and a thin black vertical line separates the blue text block from the dark olive green block. The overall composition is clean and modern.

# Value Engineering Study

# VE Study Goals and Objectives

- **Technical Objectives**
  - Optimize:
    - Rehabilitation schedule
    - Staging
    - Construction methodology
    - Use of innovative construction techniques

# VE Study Goals and Objectives

- **Other Objectives**
  - Building the relationships with Tyendinaga Mohawk Nation through:
    - Participation of members of the Nation in the workshop
    - Inviting the Nation to share with the Value Team their local knowledge

# VE Study Job Plan

- First Nations was invited and accepted to attend workshop
- CVS with experience undertaking VE Studies with First Nation's representatives
- Mohawks of the Bay of Quinte Presentation
- Full-time participation by the Mohawks of the Bay of Quinte in the VE Study
- Two representatives
  - Director of Community Infrastructure
  - CAO

# Mohawks of the Bay of Quinte

## Information Phase

- CVS gave a presentation on the VE Process
- Mohawks of the Bay of Quinte presentation outlining:
  - Their history, community, facilities, territory
  - The Highway 49 corridor
  - Their Highway 49/Skyway bridge concerns
  - Political issues
  - Their collaboration with the MTO
  - Safety concerns with respect to the bridge
    - Speed and signage issues

# Mohawks of the Bay of Quinte

- The Mohawk Nation is a member of the Six Nations Confederacy
- The Mohawks are considered the easternmost Nation within the Iroquois/Six Nation Confederacy and are referred to as the “Keepers of Eastern Door”
- The ancestral homeland of the Mohawk Nation is the Mohawk River Valley of present day New York State
- "Mohawks were military allies of the British Crown during the American Revolution”

# Mohawks of the Bay of Quinte

- The Six Nations negotiated Treaty 3 ½ for a tract of land along the Bay of Quinte as compensation for services during the American Revolution
- A deed to this land known as the Simcoe Deed or Treaty 3 ½ was executed on April 1, 1793 by Lieutenant Governor John Graves Simcoe
- The Bay of Quinte area is considered sacred to the Six Nations people as the birthplace of Tekanawita, the Peacemaker who brought the original Five Nations Iroquois Confederacy under a constitution of peace in the 12<sup>th</sup> century

# Mohawks of the Bay of Quinte

- Land area includes approximately 12km of shoreline
- Total Membership – 8,542 status members
- Road Network – 84.77km



# Mohawks of the Bay of Quinte Hwy 49 / Skyway Bridge Concerns

- Speed limit
- Contingency plans
  - Emergencies
  - High Level Rescue
  - Detours if required
- Communication Protocols
  - MTO on site contact
  - Critical MBQ contacts – police/fire
- Proposed Detours
  - Impacts to local roads
  - Volumes increasing on York Road
- Intersection at Bayshore Road/Airport Road/Hwy 49
  - Queued traffic
  - Impacts to local bus routes

# Mohawks of the Bay of Quinte

- One of the Mohawk representatives was employed as an iron worker on the original construction
  - His experiences during its construction and a rare opportunity of learning the methods used during the original construction
- Participate fully during all Phase of the VE Job Plan
  - Many of their ideas were carried forward and recommended by the VE Team

# Mohawks of the Bay of Quinte

- Their involvement lead to:
  - A full understanding of their issues
  - Better understanding of final solution
  - Builds better communication and understanding between them and MTO

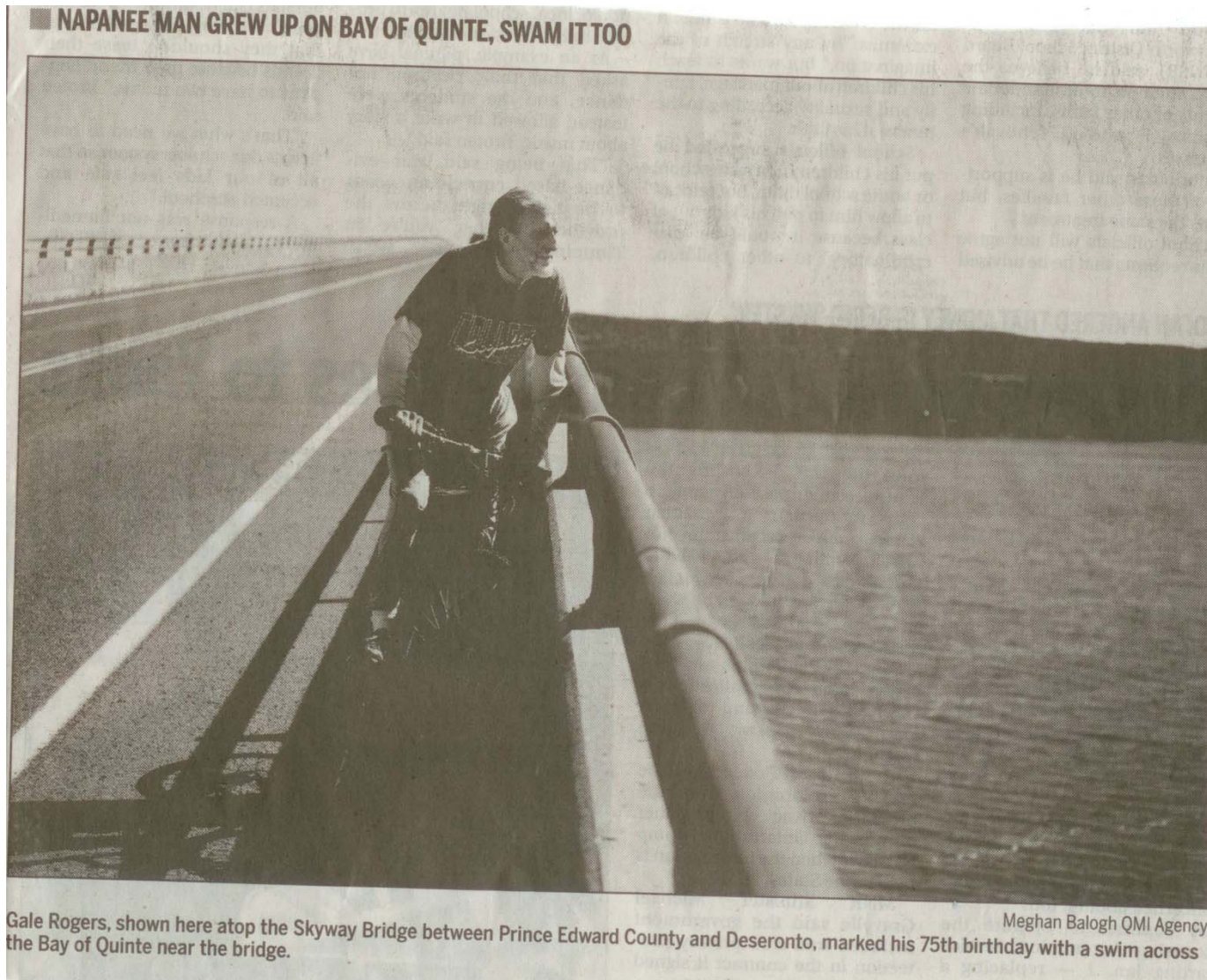
# Constraints/Opportunities

- No in water work required
- No foundations work
- Focus is on superstructure, girders and deck
- Maintain deck platform width if possible
- Review how the connecting road network interacts with the bridge
- Base Case is a Group “C” environmental undertaking

# Top Risks

- Schedule (3 to 4 years)
- Traffic Disruption to the Hwy 49 corridor (queues)
- Gas pipe being on the bridge

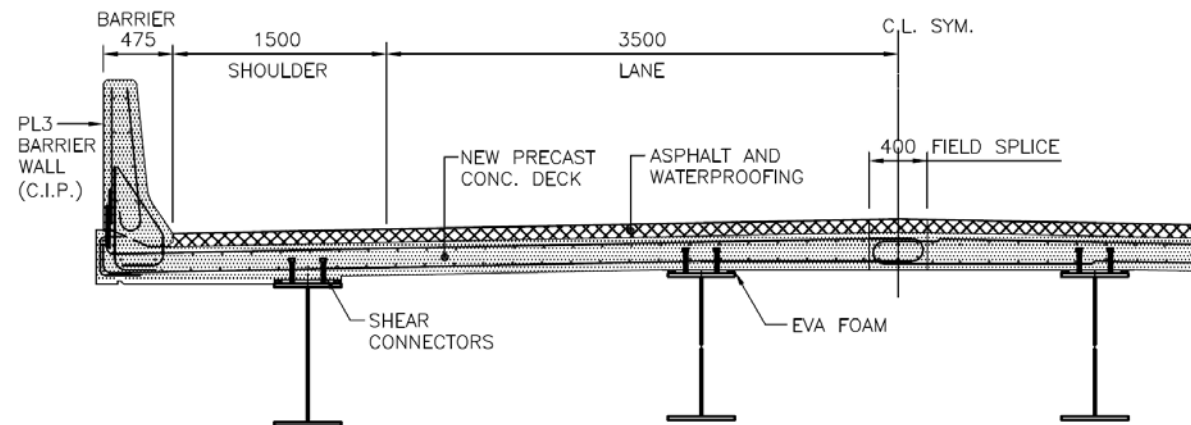
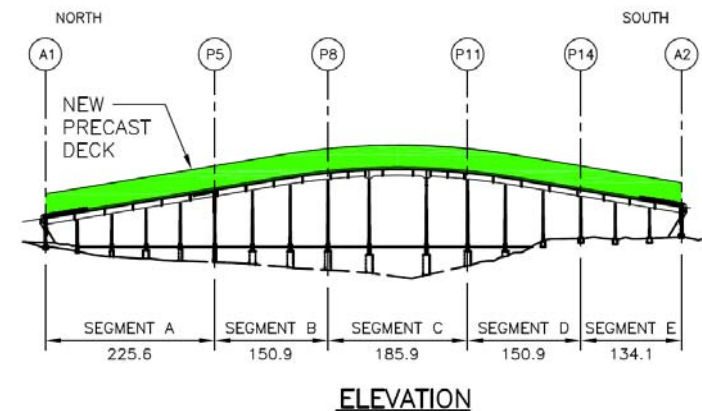
# The Intelligencer – Sept. 11, 2012



**Base Case**

# Base Case

- **Option E – ‘Half & Half’ Precast Deck**
  - Remove Half the Deck
  - Install Half-Width Precast Concrete Deck Panels
  - Construct PL3 Barrier Wall



OPTION E – 1/2 WIDTH PRECAST DECK REPLACEMENT WITH PL3 BARRIER WALL

Slide 25

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SMH2

PL3 too detailed  
replace barrier walls  
Holmesst, 11/21/2013

# Vertical Crest Curve Issue

## Proposed Treatment:

### I. W.P. 280-59 (Struct.) Cronk's Ferry High Level

V. C. = 600' v. c. This is based on the structure providing 350' stopping sight distance. The original D. C. called for 900' v. c.



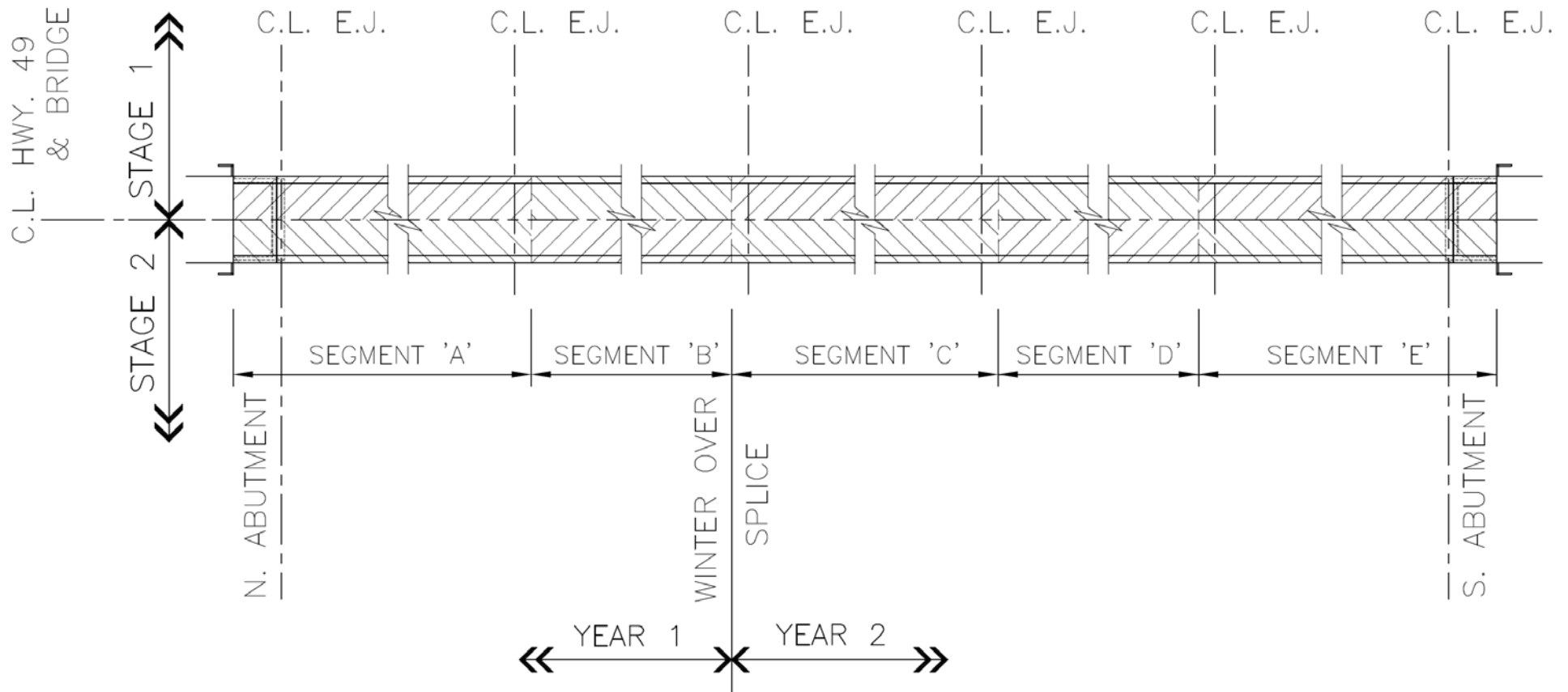
# Base Case

Schedule	Costs	Risks & Limitations
<b>TOTAL: 3 Construction Seasons (Based on working days estimate)</b>	<b>Estimated Capital Cost (2012) = \$25M</b>  Major Cost Assumptions: <ul style="list-style-type: none"><li>•Coat all structural steel</li><li>•Patch, W/P membrane &amp; pave at Year 30</li></ul>	<ul style="list-style-type: none"><li>• New deck condition following installation</li><li>• Upgrades barrier wall safety to 100 km/h design standards</li><li>• 100 km/h design standard calls for 3.75 m wide lanes</li><li>• Potential precast unit alignment challenges</li></ul>

# Base Case Preferred Staging Option Summary

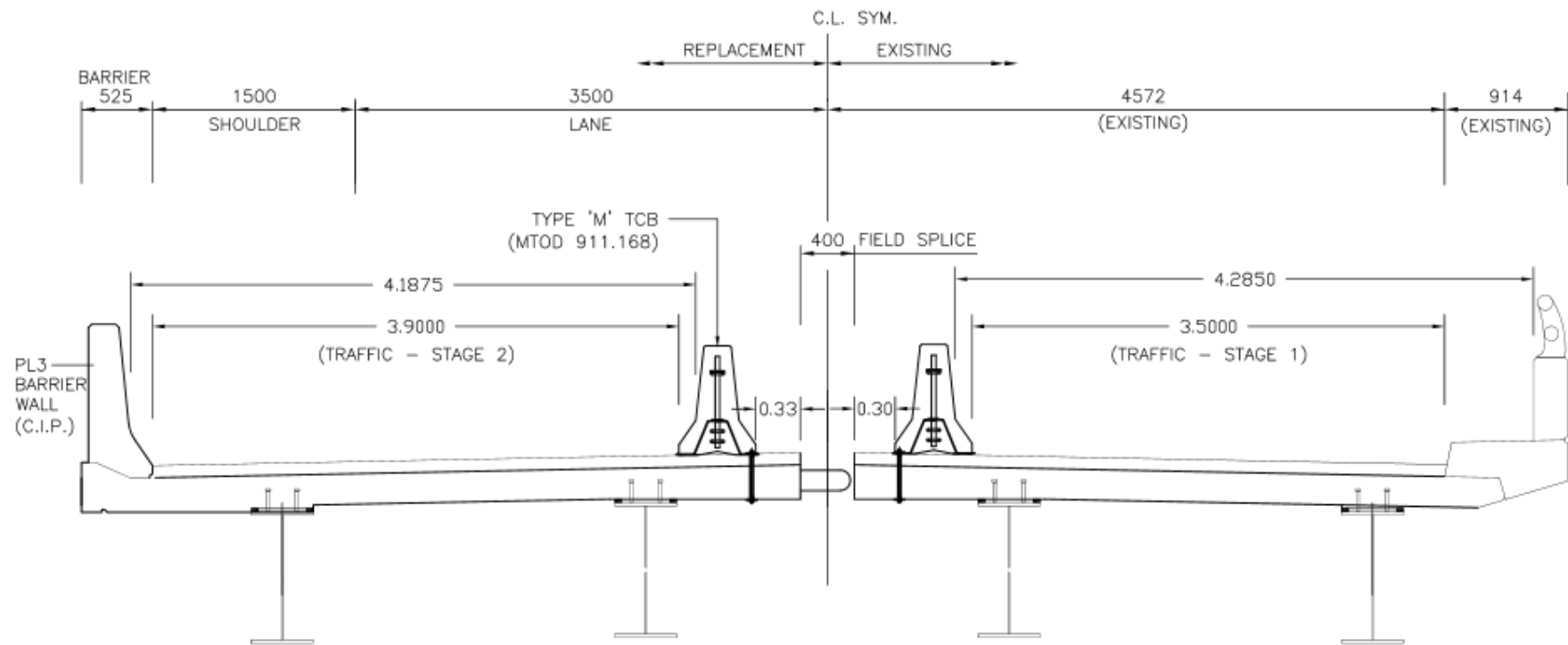
- Single-lane closures with bi-directional traffic managed by temporary traffic signals
- 15-minute full closures
  - restricted to off-peak hours
- Full closures can be accommodated for 11 hours per day
  - During peak hours, alternate methods of delivering precast deck panels must be utilized

# Proposed Staging of Construction – Bridge Segments



CONSTRUCTION STAGING: SCHEMATIC PLAN VIEW

# Proposed Staging of Construction – Cross-Section



OPTION E - 1/2 WIDTH PRECAST DECK REPLACEMENT WITH PL3 BARRIER WALL

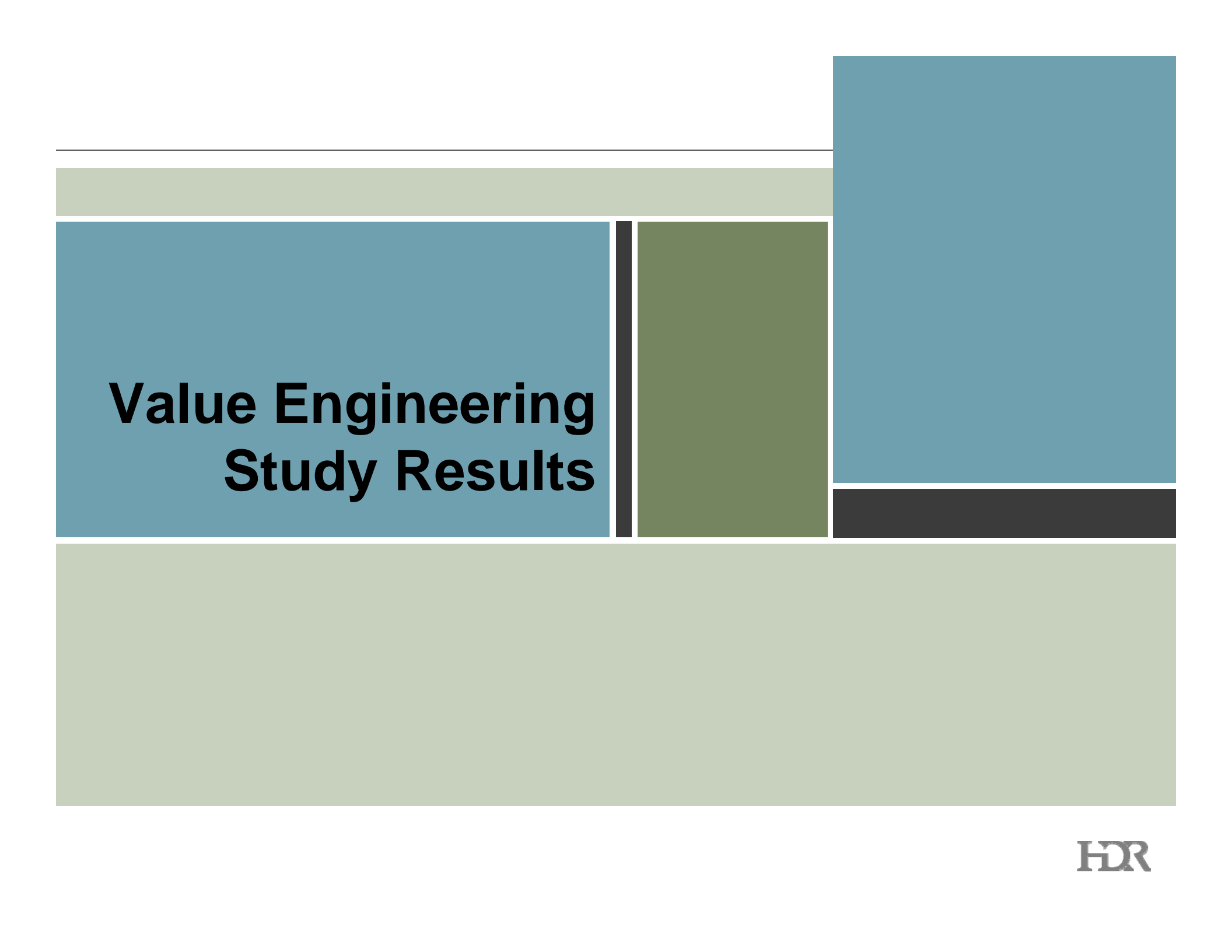
**Slide 30**

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**SMH3**

Too much detail on the base case, can you drop a few slides?

Holmesst, 11/21/2013

The image features a complex abstract graphic design. It consists of several overlapping rectangular blocks. A large blue block on the left contains the text 'Value Engineering Study Results'. To its right is a vertical dark grey bar, followed by a green block. Further right is a tall blue block, and below its base is a dark grey block. The bottom of the page is dominated by a large, light green block. The overall aesthetic is modern and professional.

# Value Engineering Study Results

# Performance Criteria and Measures

<b><u>Criteria</u></b>	<b><u>Weight</u></b>
Constructability	16
Long-Term Maintenance	22
Safety	27
Traffic Impact during Construction	19
Community/Social Impact	16

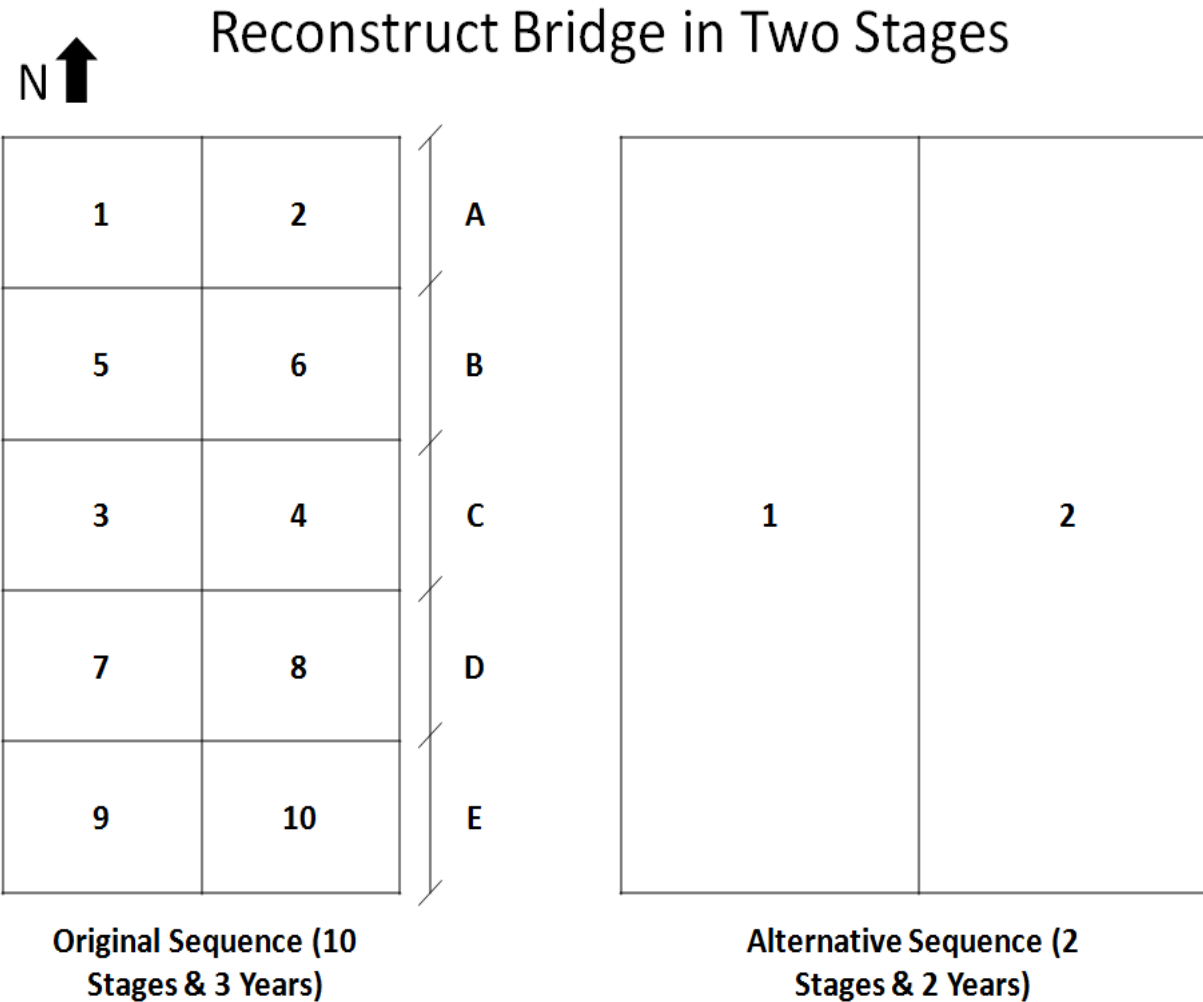
# Value Engineering Ideas Summary Table

Value Target Areas	No. of Ideas Generated	No. of Ideas Developed	No. of Design Suggestions
Constructability	38	9	10
Coating	11	3	1
Rehabilitate Skyway	27	3	9
Long-Term Traffic Management	25	2	7
Community / Social Impact	18	0	12
<b>Total</b>	<b>119</b>	<b>17</b>	<b>39</b>

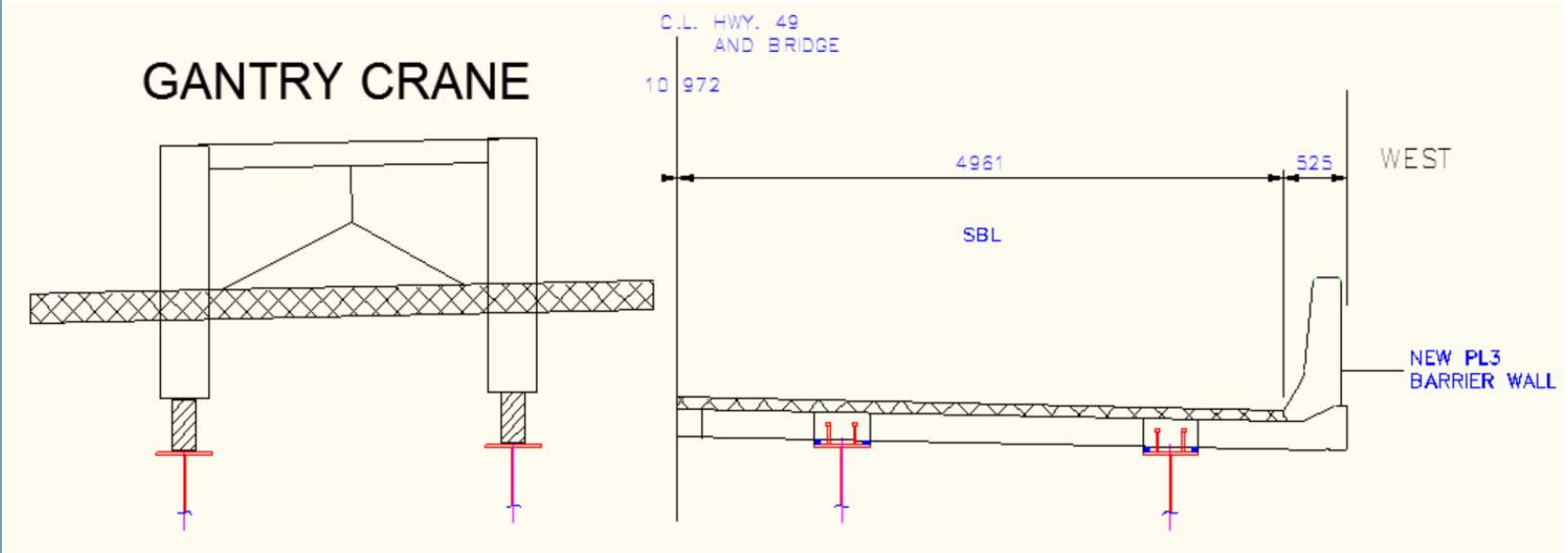
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**Key Accepted VE  
Ideas Carried  
Forward in  
Scenarios**

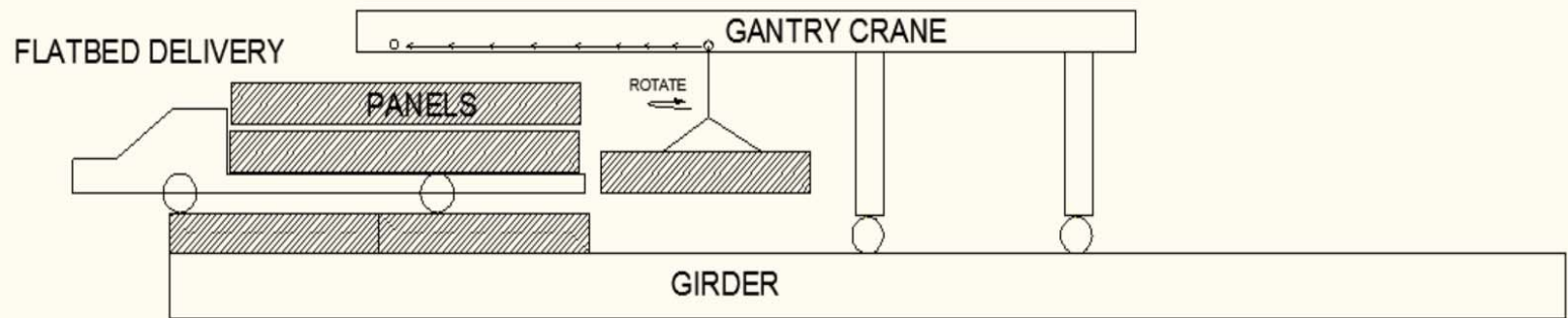
# C-1: Reconstruct the project in two phases longitudinally from end to end



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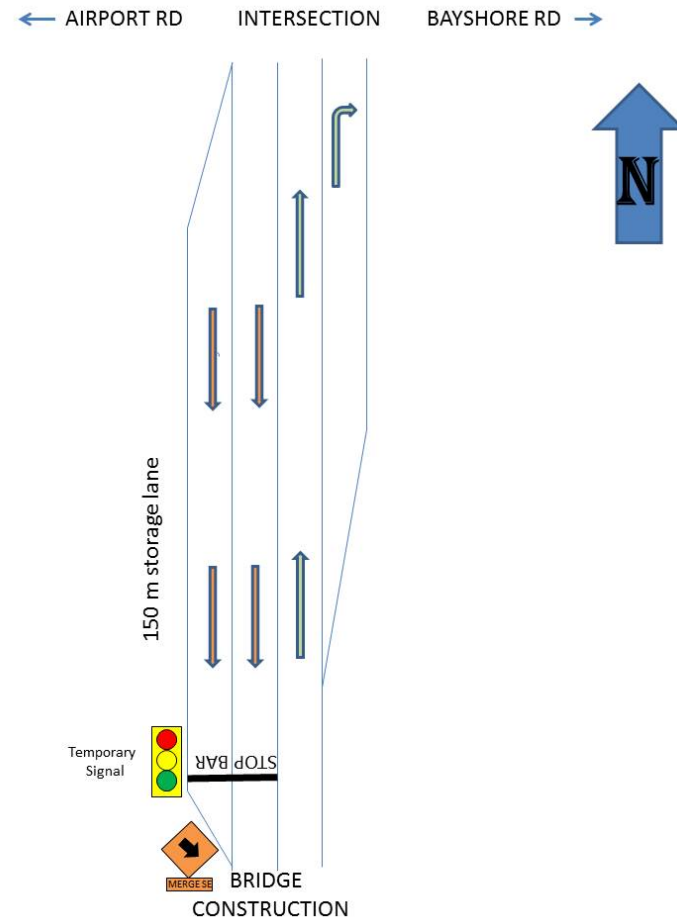


## C-1: Reconstruct the project in two phases longitudinally from end to end



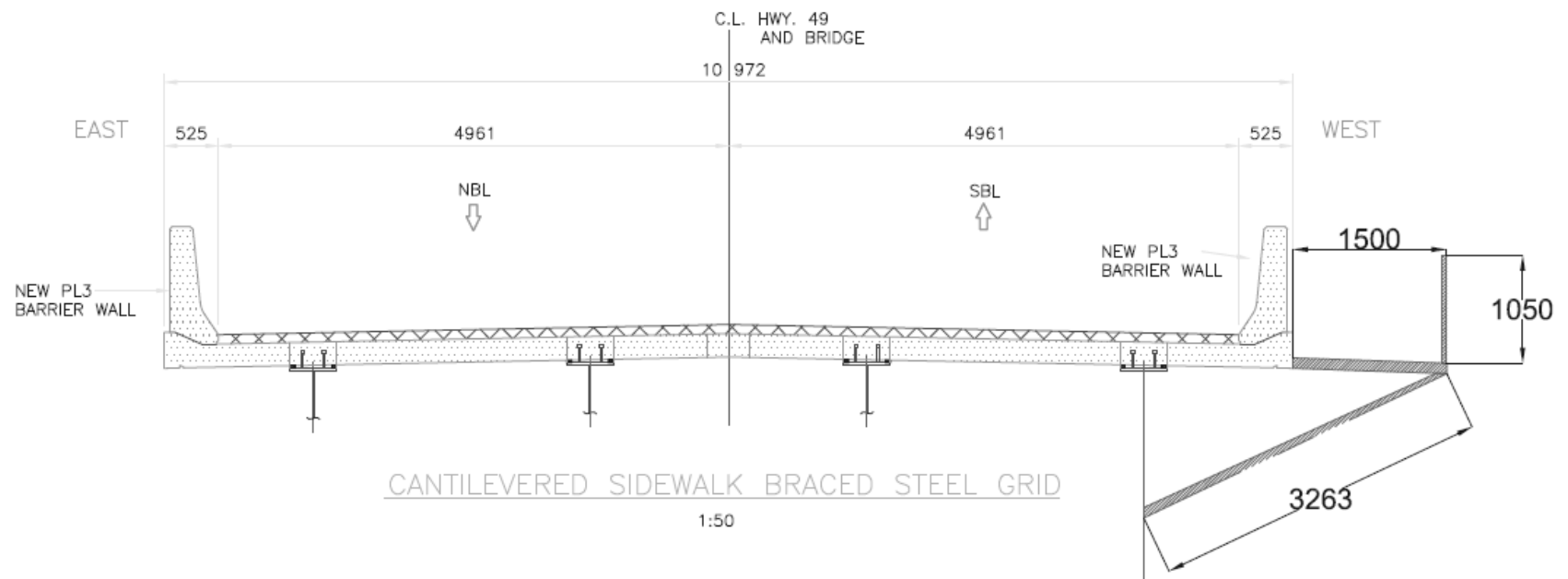
**Cost Reduction of \$1.75M**

# C-18: Additional lanes between Airport Rd and the bridge to store vehicles



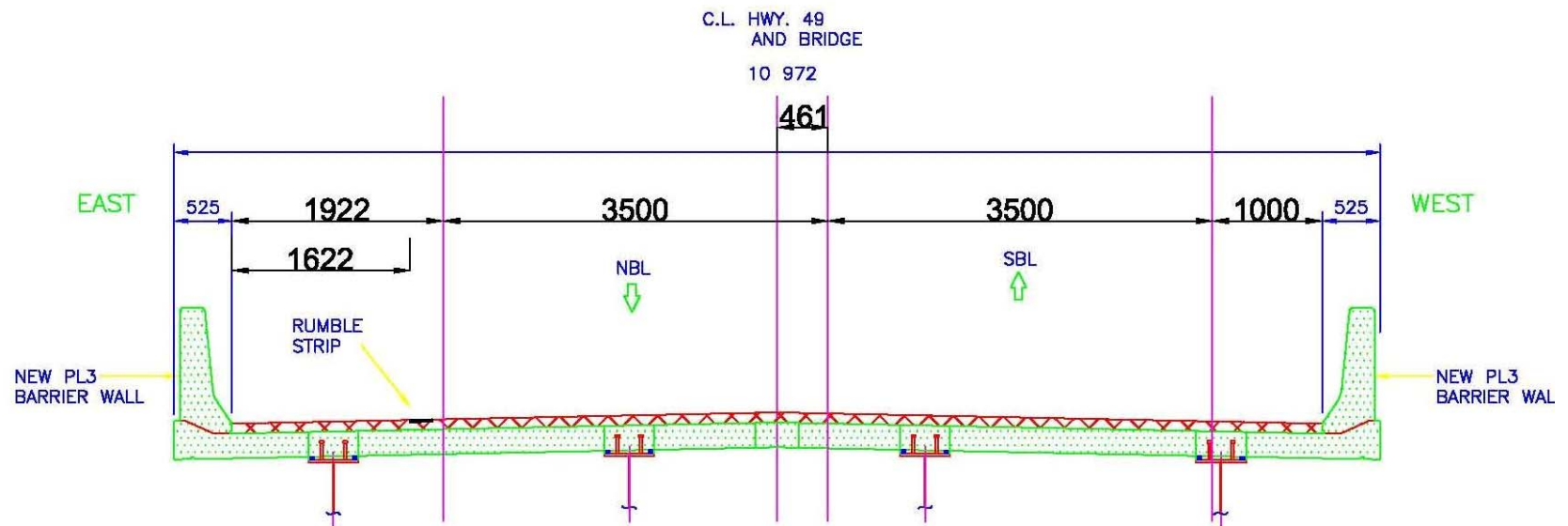
**Added Cost of \$50,000**

# LT-20, 21, 24: Cantilever sidewalk, Light weight sidewalk, Cast the precast slab to incorporate the cantilever slab past the barrier



**Added Cost of \$700,000**

# LT-22: Offset traffic lanes to accommodate peds and cyclists



**Added Cost of \$171,000**

The image features a complex abstract layout. At the top, a thin black horizontal line spans the width. Below it, a light olive-green horizontal bar is positioned. The main area is divided into several sections: a large blue rectangle on the left containing the word 'Scenarios' in bold black text; a narrow vertical black bar to its right; a dark olive-green rectangle to the right of the black bar; a large blue rectangle on the far right; and a dark grey horizontal bar at the bottom right. The bottom half of the image is a large, solid light olive-green rectangle.

# Scenarios

# Scenarios

- Scenario 1: Base Case with Modifications
- Scenario 2: Hydro Demolition with Overlay
- Scenario 3: Two Stage Construction
- Scenario 4: Deferred Deck Replacement
- Scenario 5: ACR Steel



**Evaluation Results**

# SCENARIO EVALUATION MATRIX

1. HOW WELL DOES THE SCENARIO SATISFY THE PERFORMANCE CRITERIA (ENTER RATING FROM 1-10, 10=BEST)  2. ENTER ASSIGNED WEIGHT TIMES RATING IN SUB TOTAL  3. SUM ACROSS AND RANK	Performance Criteria	Constructability	Long Term Maintenance	Safety	Traffic Impacts during Construction	Socioeconomic Environment	Total Performance (P)	Net Present Value - \$ M (C)	P/C	Total Initial Capital Cost - \$M
	- Performance Measure									
<b>SCENARIOS</b>	Weight →	16	22	27	19	16				
<b>BASE CASE:</b>	Rating 1-10	5.80	7.90	4.20	6.40	6.10				
	Sub Total	92.80	173.80	113.40	121.60	97.60	599	35.7	16.8	25.0
<b>SCENARIO 1: Base Case with Modifications</b>	Rating 1-10	6.50	6.60	7.40	6.40	6.80				
	Sub Total	104.00	145.20	199.80	121.60	108.80	679	34.3	19.8	22.7
<b>SCENARIO 2: Hydro Demolition with Overlay</b>	Rating 1-10	7.50	5.90	5.90	6.20	7.70				
	Sub Total	120.00	129.80	159.30	117.80	123.20	650	21.2	30.7	8.4
<b>SCENARIO 3: Two Stage Construction</b>	Rating 1-10	8.30	6.60	7.40	5.00	8.20				
	Sub Total	132.80	145.20	199.80	95.00	131.20	704	32.7	21.5	21.1
<b>SCENARIO 4: Deferred Deck Replacement</b>	Rating 1-10	6.50	6.10	5.20	6.20	6.10				
	Sub Total	104.00	134.20	140.40	117.80	97.60	594	22.6	26.3	10.6
<b>SCENARIO 5: ACR Steel</b>	Rating 1-10	8.30	8.40	7.90	4.20	8.20				
	Sub Total	132.80	184.80	213.30	79.80	131.20	742	28.0	26.5	28.0

**SEEK THE BEST - NOT PERFECTION**



# VE Recommendations

- All VE Scenarios have higher P/C than Base Case
- Rehabilitation options (Scenarios 2 and 4)
  - Offer lower initial capital costs using different rehabilitation approaches
- VE challenged the Base Case deck replacement and recommended that Scenario 5 be considered
- Scenario 5
  - Has higher initial Capital Cost (\$28M vs. BC of \$25M)
  - New superstructure with a 75 year design life
  - Should be considered if capital funding becomes available
- **Scenario 5 ACCEPTED**

# Value Engineering

- VE is not just a cost-cutting tool
- Process to ensure the right course of action is being undertaken
- Organizations are willing to Add Cost in order to improved VALUE
  - Reduced impacts to community
  - No deferring issue for future generation
- Importance of Construction Staging
  - Approach,
  - Schedule
  - Workers safety
  - Traffic congestion