

Cost Implications of Rapid Renewal Projects

Discussion on Total Project Cost

Michael P. Culmo
VP Transportation and Structures
CME Associates, Inc.



REALITY



- In general, bid prices for ABC are higher than conventional construction.
- This has discouraged some agencies from using ABC
- Bid prices are higher, but what about other project costs?

HOW MUCH DOES ABC COST?



It depends.....

- **How fast is fast**
 - Build a bridge in a weekend: Very expensive
 - Build a bridge in a week: Expensive
 - Build a bridge in a month: Not too bad
 - Build a bridge in 2 months: Can be the same price
- **Overtime pay**
 - Weekends, nights
- **Details**
 - Complex details tend to be more expensive
- **Site conditions**
 - Difficult sites can lead to higher costs
- **Equipment**
 - Specialized equipment is pricey

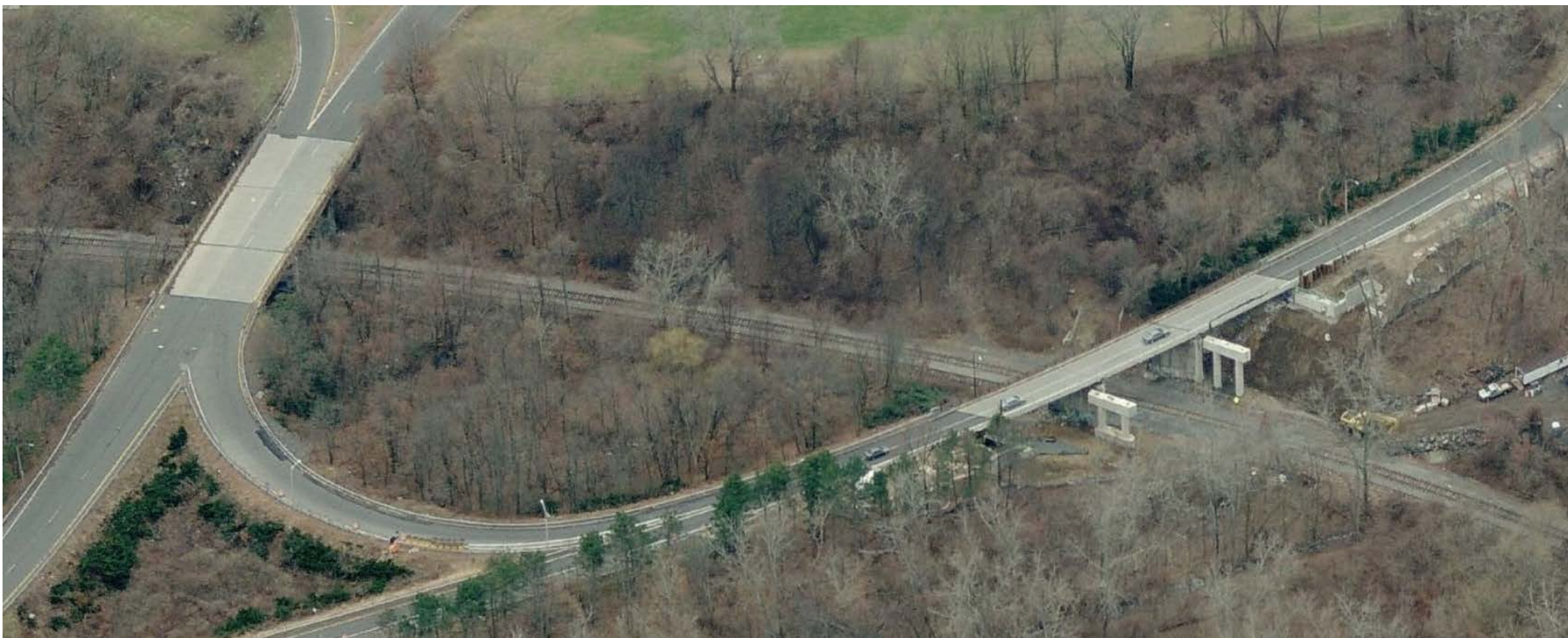
MASS DOT TEST PROJECT



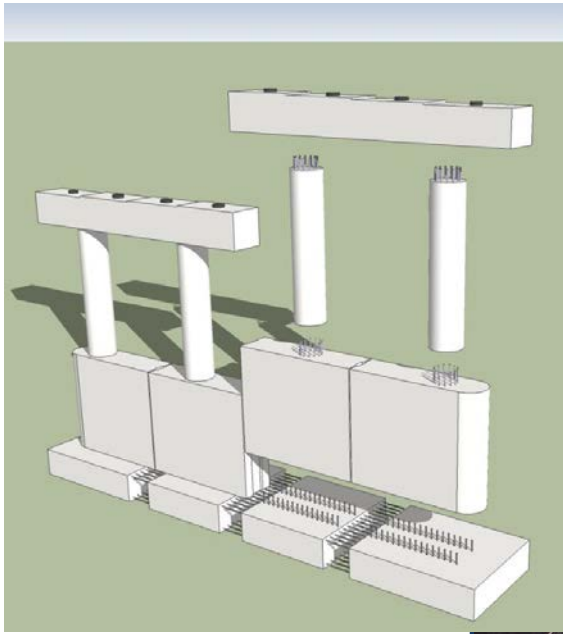
MassDOT PBES Project

- 3 Span Bridge
 - Precast: Footings, walls, columns, pier caps, deck, approach slabs
 - Project goal:
 - Use staged (or phased) construction
 - Replace the bridge in one construction season
 - Avoid snow plowing issues during winter shutdown
- Adjacent to very similar bridge
 - Built one year previously
 - Conventional construction
 - Staged Construction

MASS DOT TEST PROJECT



MASS DOT TEST PROJECT



MASS DOT TEST PROJECT



Cost Information

- Conventional Construction Bridge
 - \$224 per square foot
- PBES Bridge
 - \$284 per square foot
- Understand that these are east coast prices
 - Prices in other regions will vary significantly
- Cost differential
 - ABC was 27% more than conventional construction

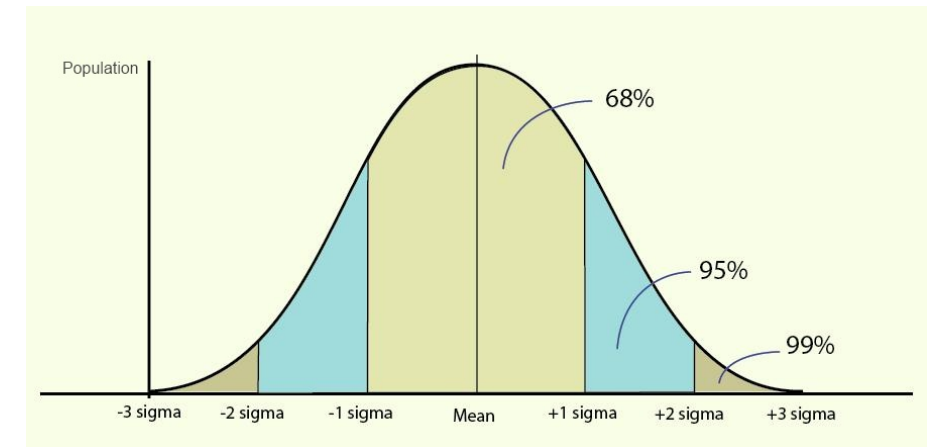
SPEED VS. RISK

- Speed of construction affects costs
- Incentives and disincentives
 - I/Ds create **RISK** for the contractor
 - Disincentives can be high (up to 10% of the bid)
 - Failure to meet milestones = loss of \$\$
 - Tight milestones or high I/D = Higher **RISK**
- **Risk = \$\$**
- Why is it difficult to put a finger on ABC costs?
 - Contractors bid **RISK**
 - Designers do not estimate **RISK**

RISK ANALYSIS

Risk cost = Cost of failure * Probability of Occurrence

- Known probabilities can be managed
- Unknown probabilities are difficult to estimate
- Probabilities will vary between different contractor
 - Size and experience of staff
 - Back-up equipment
- **Example**
 - Weekend Disincentive Clause = \$100k
 - Probability of not finishing bridge = 10%
 - Risk factor = $\$100k * 0.10 = \$10,000$



HOW DO CONTRACTORS BID RISK?

Perform a risk analysis for critical features of the construction

- Determine the probability of failure for various functions
- Apply it to the disincentives

Option 1: Investigate ways to minimize risk

- Add labor
- Add equipment
- Add specialty sub-contractors
 - More experience to the team
 - Spread the risk out to more than one entity
- This all adds cost

Option 2: Bid the risk

- Increase the bid to account for risk factors

HOW CAN OWNERS ADDRESS RISK?



Understand that I/Ds come at a price

- Pick I/Ds that are commensurate with the needs

Tight schedules come at a price

- Consider relaxing the schedule if appropriate

Risk Analysis?

- Difficult for owners to estimate probabilities
- Engage a specialty construction schedule consultant

OTHER WAYS TO REDUCE COSTS

Simplify details

- Easier construction = lower risk of problems

Bid a series of similar projects

- Builds up contractor experience = lower risk
- Get more efficient use out of specialized equipment
 - If it is a “one of a kind” project, you may pay for the equipment in one project
 - Some agencies have done this with SPMT projects – Doesn’t really work
 - Similar to precast girder forms

HOW DO YOU JUSTIFY ABC?



If it costs more, why do we do it?

- Reduced user costs
 - However, you can't spend user costs
 - Good PR for the agency 😊
- Improved Safety
 - Workers and travelers 😊
- Better Durability
 - Prefabricated Elements 😊

Still...Some agencies are naturally hesitant to use ABC in this time of tight budgets.

DO BID PRICES TELL THE WHOLE STORY?

The simple answer is NO

We need to look at **TOTAL PROJECT COSTS**

- This is the total cost to the agency to complete a project
 - Engineering costs
 - Right of Way
 - Environmental permitting
 - Traffic Management
 - Construction management
 - Safety Costs: Police details, flaggers, etc.

FACTORING NON-BID COSTS IN DECISION MAKING



Decision makers should use both bid costs and agency costs in decision making

- There is no one ABC decision making solution
 - Some agencies need a simple process
 - Some need detailed processes
- Oregon Analytical Hierarchy Process
 - Sophisticated analysis approach
 - Includes agency costs and indirect costs
- Connecticut DOT process
 - Simplified approach to total project cost

CONNECTICUT DOT APPROACH



Consider total project costs in the ABC decision process

- Look at traffic management options
 - Temporary structures and roadways
 - Temporary signals
 - Overbuilds to accommodate staged construction
- Look at agency costs
 - Primarily Construction Management
 - Other factors can also be added in

WEIGHTED SCORE APPROACH



ABC Rating

	Score	Weight Factor	Adjusted Score	Maximum Score	Adjusted Score
Average Daily Traffic	0	10	0	5	50
User Impact Reduction	0	30	0	5	150
Bridge Location	0	5	0	5	25
Use of Typical Details	0	5	0	5	25
Work Zone Geometry	0	8	0	5	40
Site Conditions	0	5	0	5	25
Railroad Impacts	0	5	0	0	0
Cost Analysis	0	30	0	5	150
Envir. /Water Handling	0	5	0	0	0
Waterway Limitations	0	5	0	0	0
Total Score			0	Max. Score	465

ABC Rating	0
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ABC Rating Scale	
60-100	Use ABC
50-60	Consider ABC
0-50	Do not use ABC

PROJECT EXAMPLE



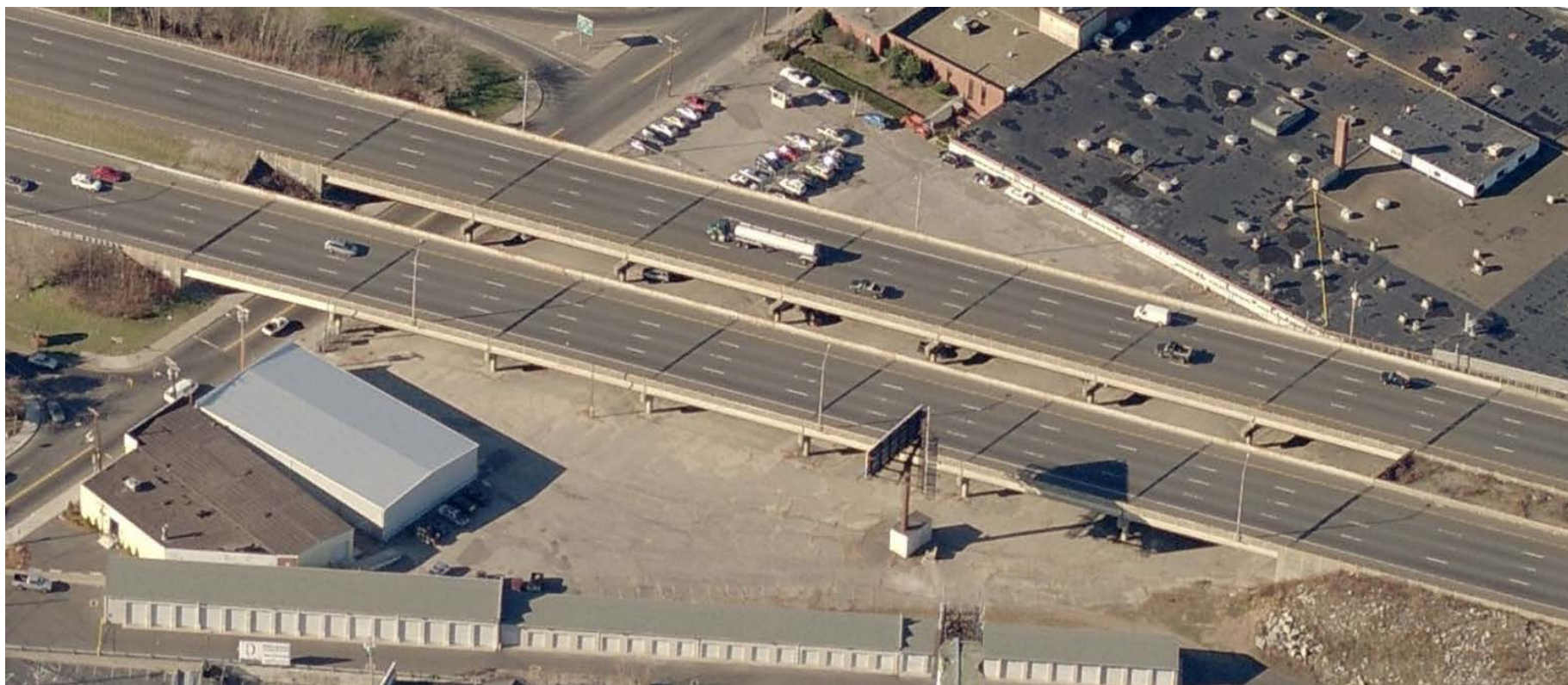
CTDOT Design/Build Project



Capitol Avenue
Bridges

Lindley Street
Bridges

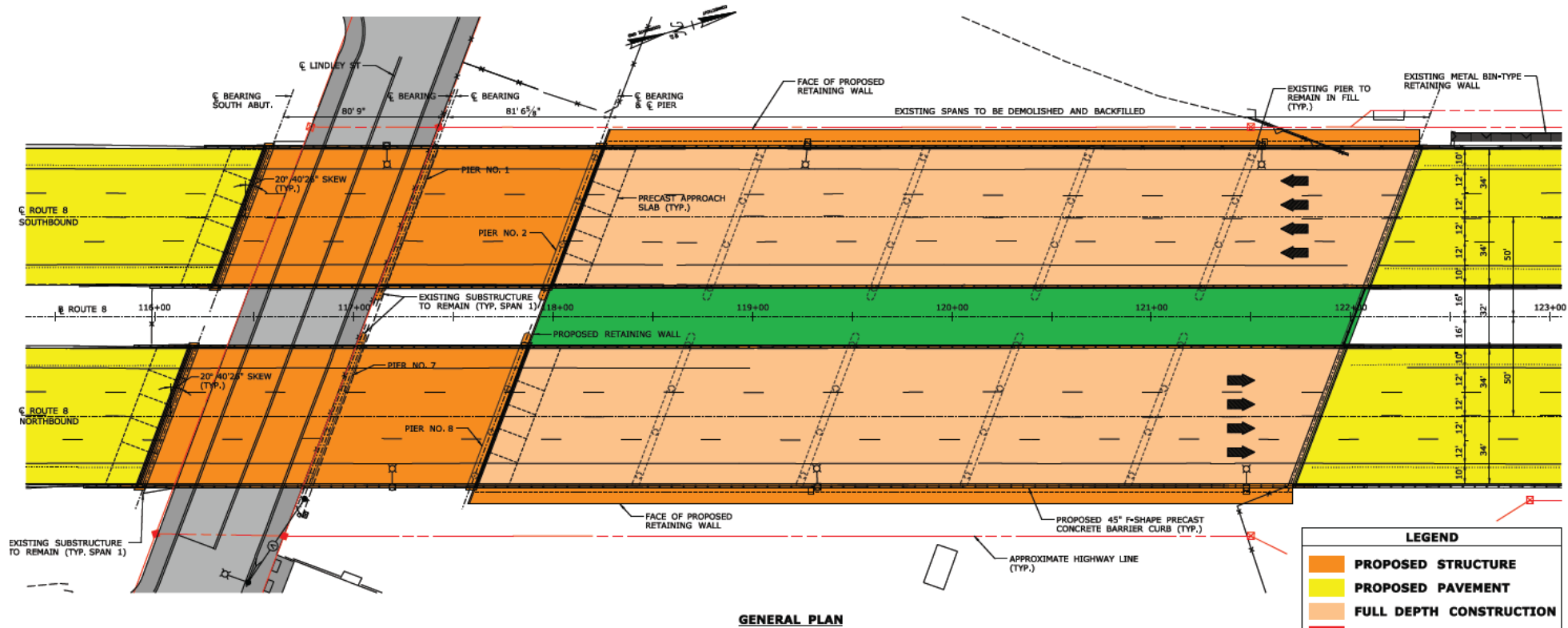
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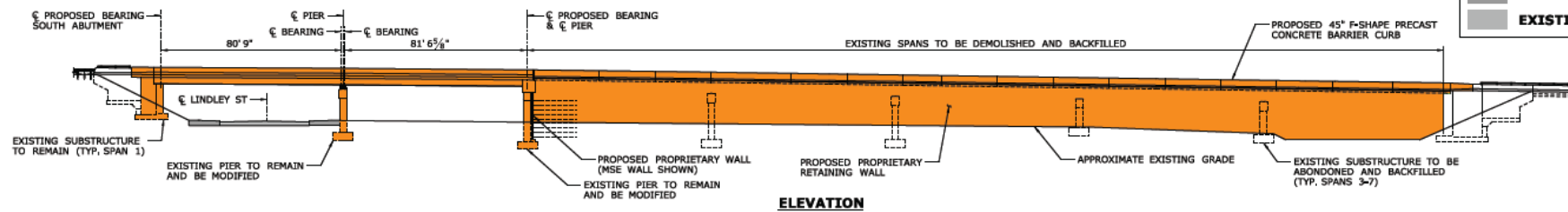
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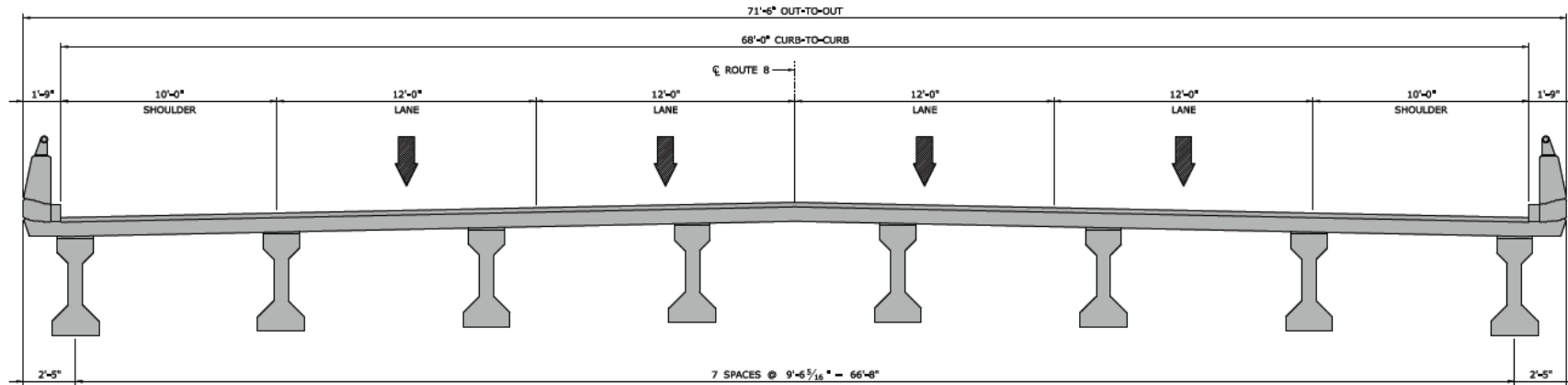
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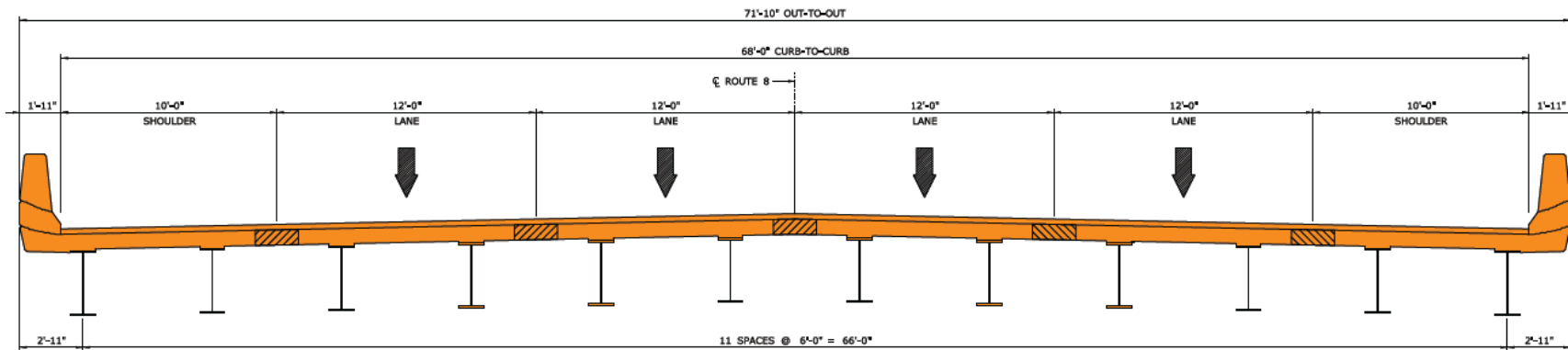
LEGEND	
	PROPOSED STRUCTURE
	PROPOSED PAVEMENT
	FULL DEPTH CONSTRUCTION
	PROPERTY LINES
	FILL
	EXISTING SIDEWALK
	EXISTING ROADWAY





PROJECT EXAMPLE



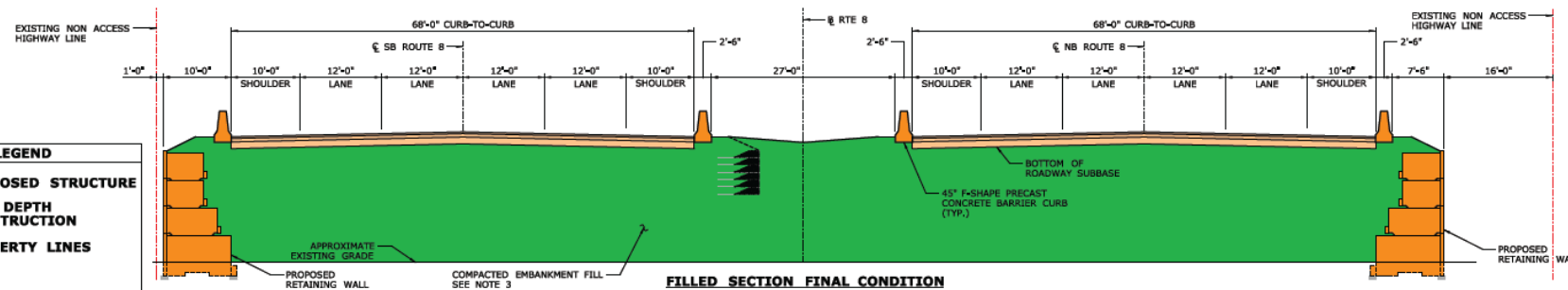
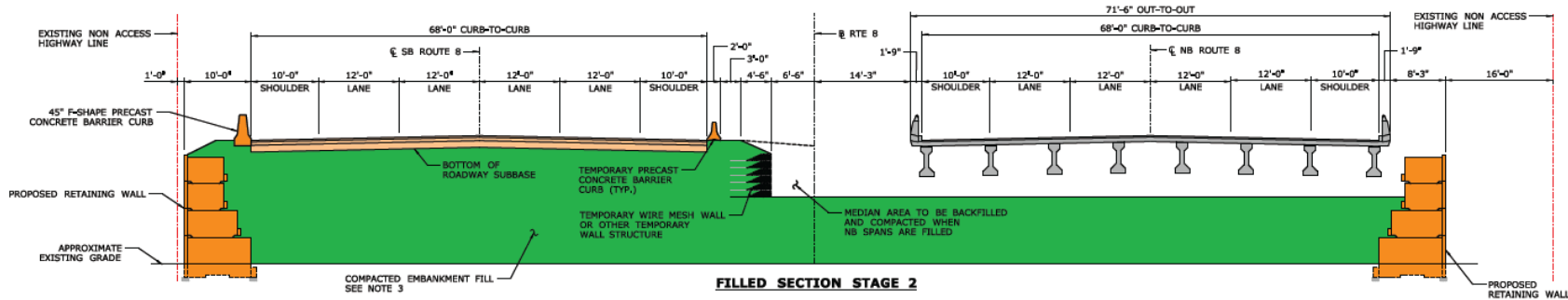
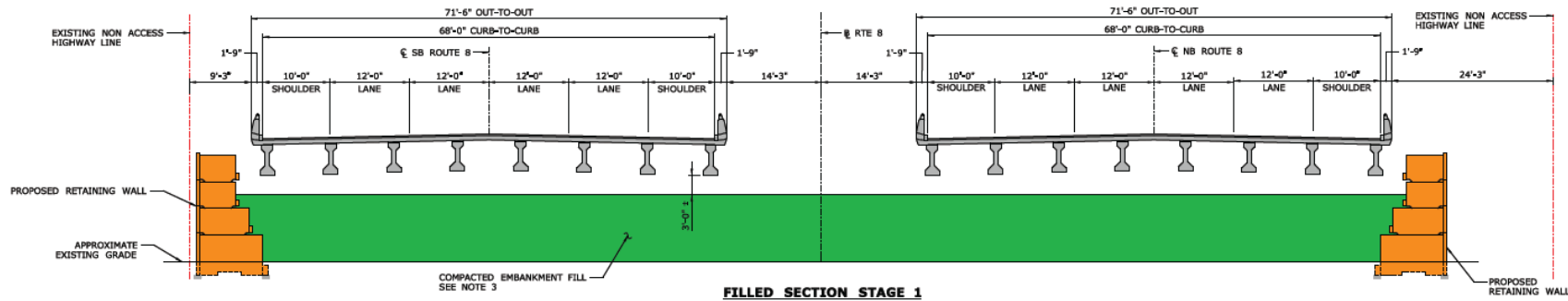
EXISTING CROSS SECTION








PROPOSED CROSS SECTION

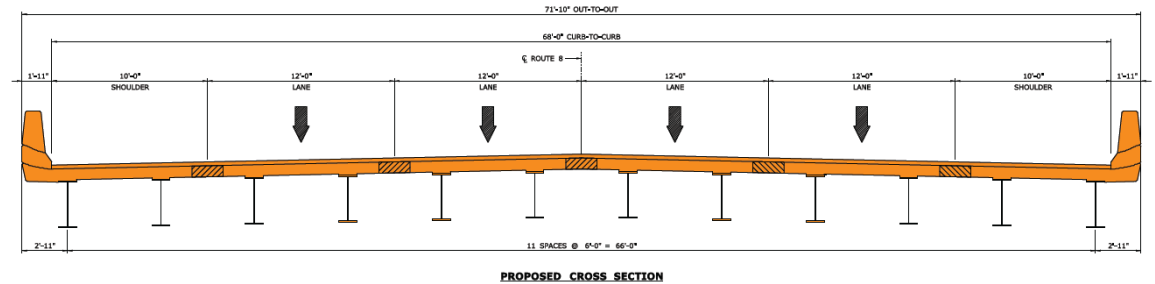
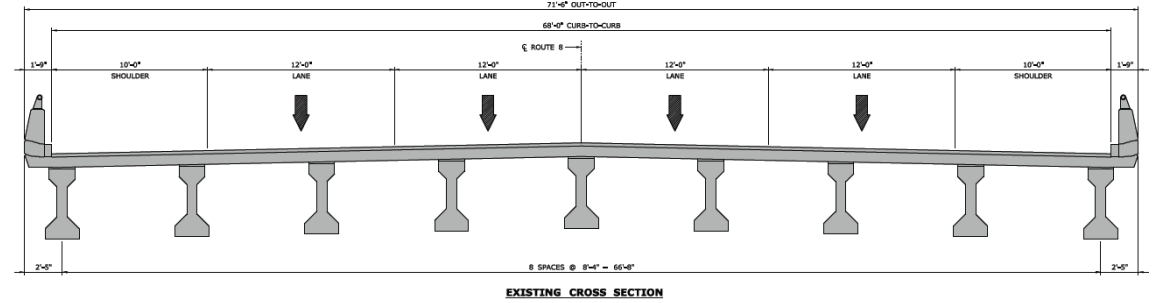
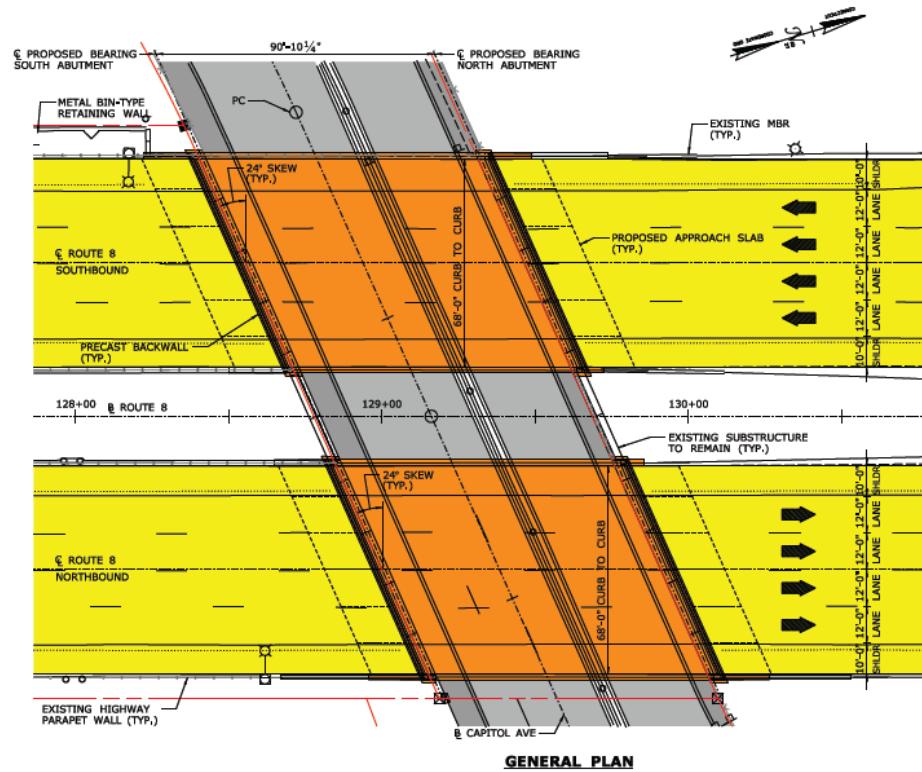
LEGEND	
	EXISTING STRUCTURE
	PROPOSED STRUCTURE

PROJECT EXAMPLE



LEGEND	
	PROPOSED STRUCTURE
	FULL DEPTH CONSTRUCTION
	PROPERTY LINES
	FILL
	EXISTING STRUCTURE

PROJECT EXAMPLE

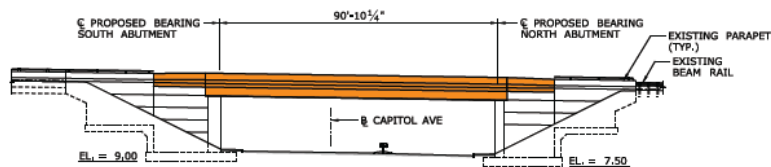


LEGEND

Grey box	EXISTING STRUCTURE
Orange box	PROPOSED STRUCTURE

LEGEND

Orange box	PROPOSED STRUCTURE
Yellow box	PROPOSED OVERLAY
Red box	PROPERTY LINES
Grey box	EXISTING SIDEWALK
Light grey box	EXISTING ROADWAY



TRAFFIC MANAGEMENT

Northern
Crossover

Work Zones

Southern
Crossover

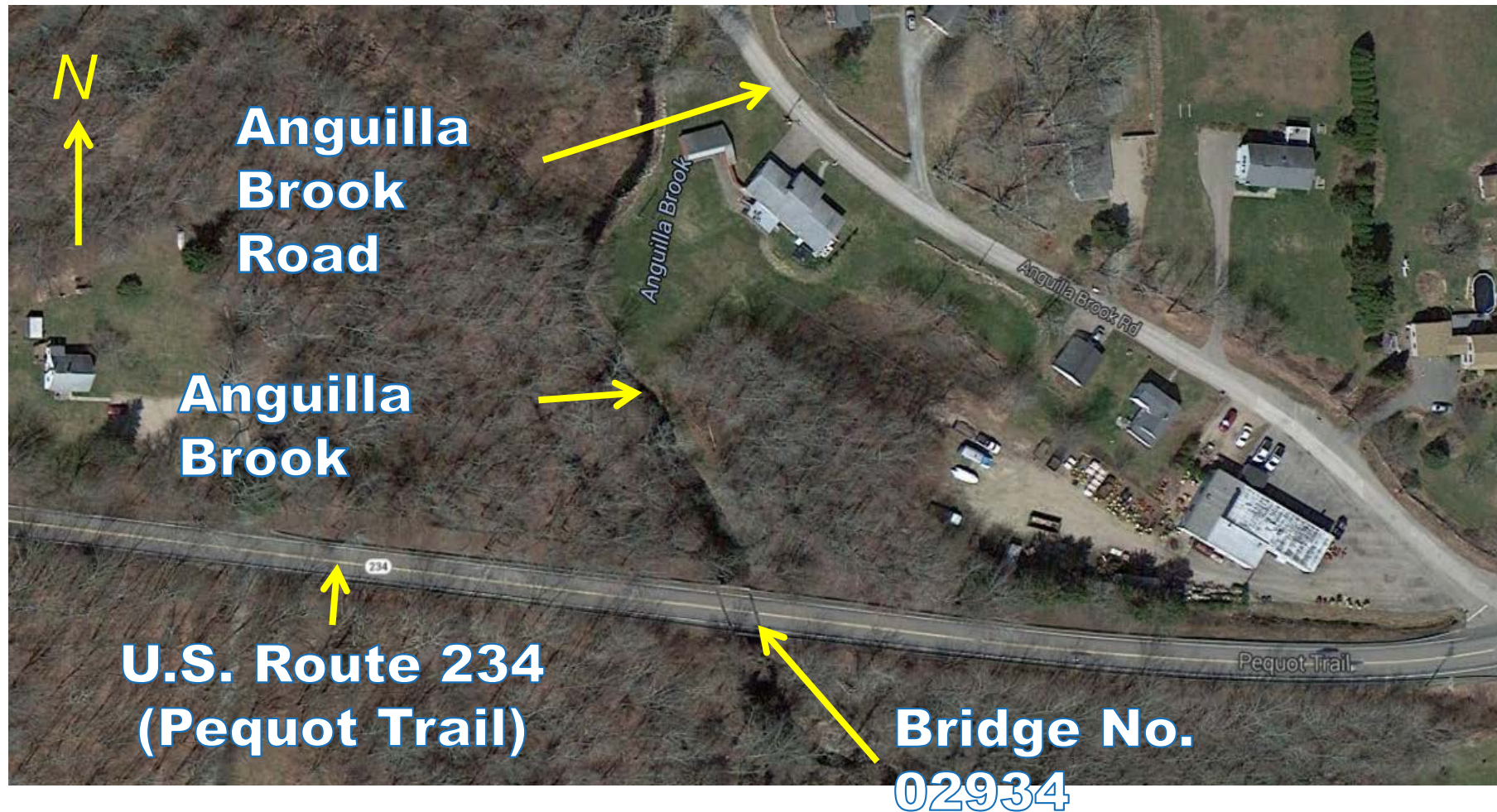


DECISION PROCESS



CTDOT Decision Spreadsheet

PROJECT EXAMPLE



**Anguilla
Brook
Road**

**Anguilla
Brook**

**U.S. Route 234
(Pequot Trail)**

**Bridge No.
02934**

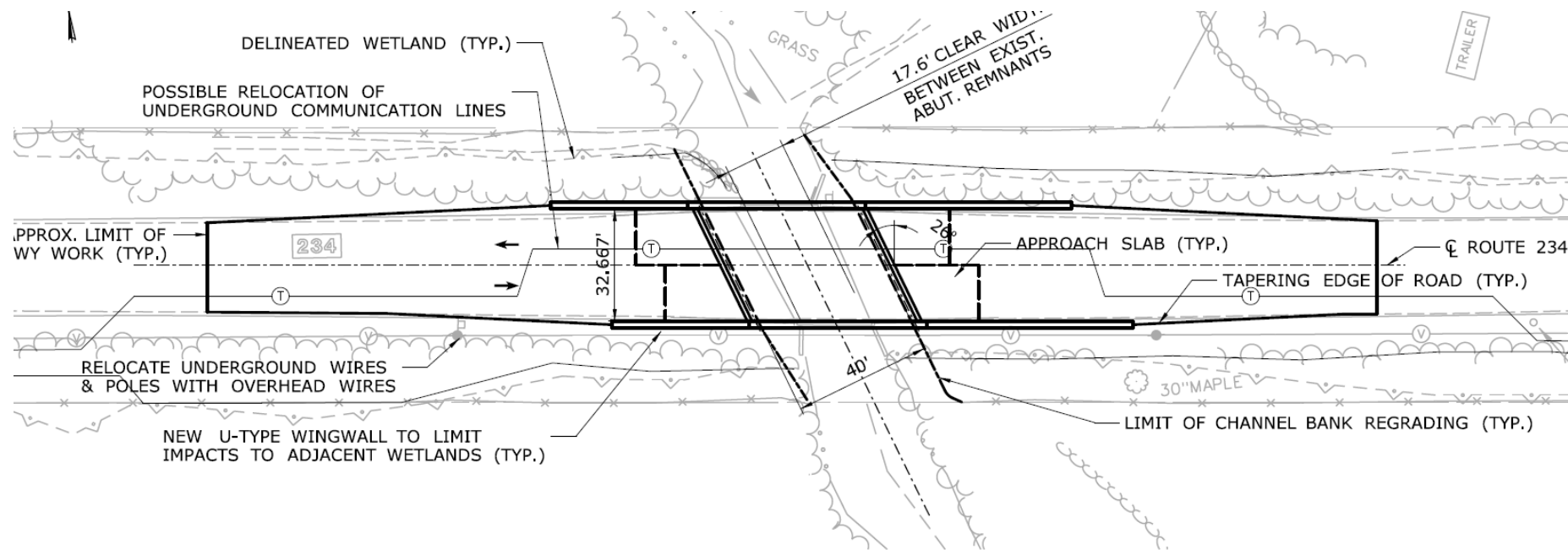
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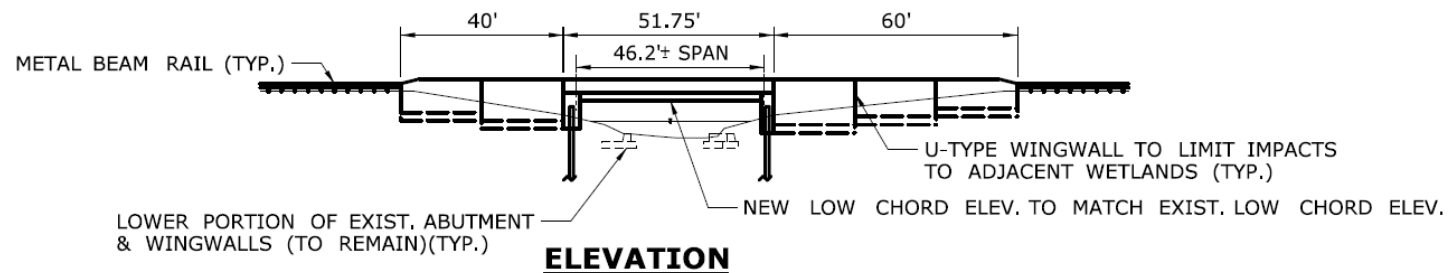
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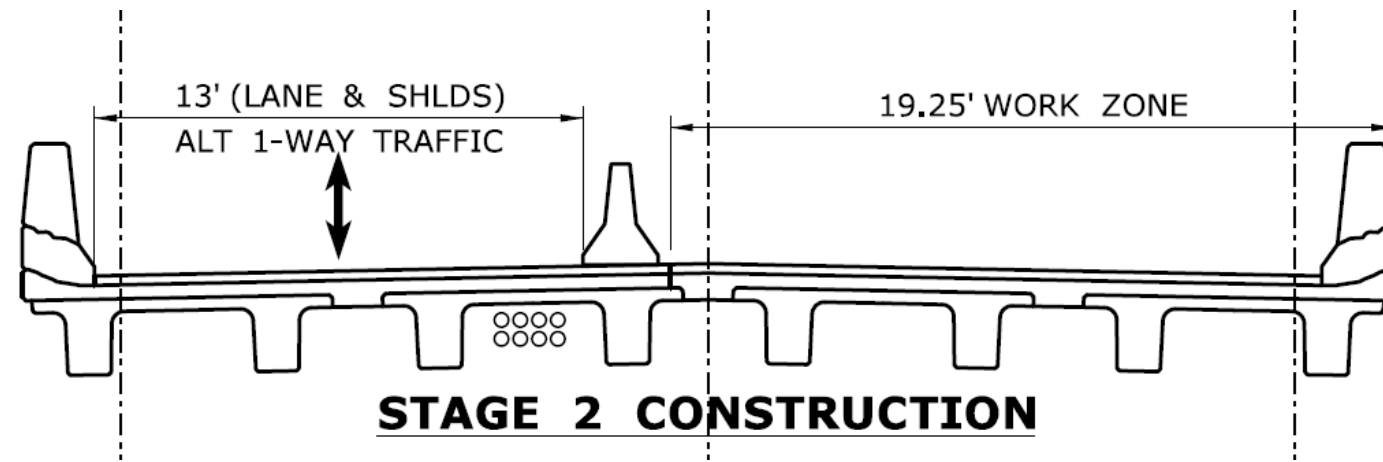
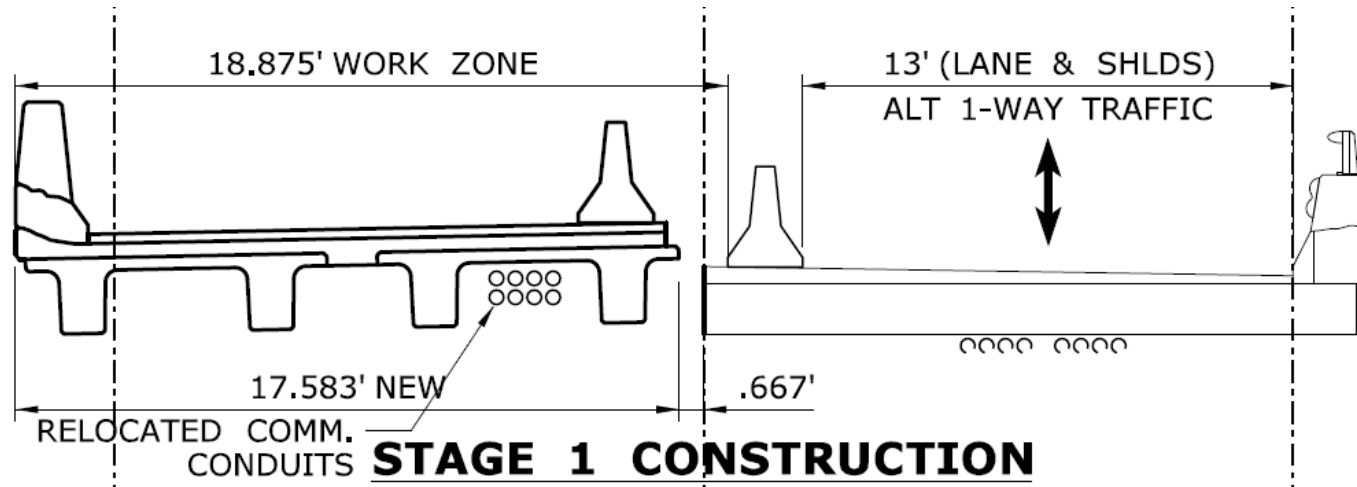
PROJECT EXAMPLE



PLAN



PROJECT EXAMPLE



DECISION PROCESS



CTDOT Decision Spreadsheet

CONCLUSIONS

- ABC Costs depend on many factors
- Significant factors
 - Speed of construction
 - Incentive/Disincentive Clauses
 - Risk
- Bid prices do not tell the whole story
 - Consider non-bid costs in ABC decision making