Dominion Blvd. Reconstruction

ASHE Greater Hampton Roads Chapter Site Visit

September 27, 2016

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City of Chesapeake

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WSP Parsons Brinkerhoff

Dominion Boulevard Reconstruction

- **Owner**: City of Chesapeake, Virginia (Locally Administered Project – largest in the state)
- **Design**: Parsons Brinckerhoff
- **Construction Engineering/Inspection**: MBP
- **Contractors**: Dominion Blvd Constructors
  - McLean Contracting
  - Bryant Contracting
  - R. R. Dawson Bridge
  - E. V. Williams

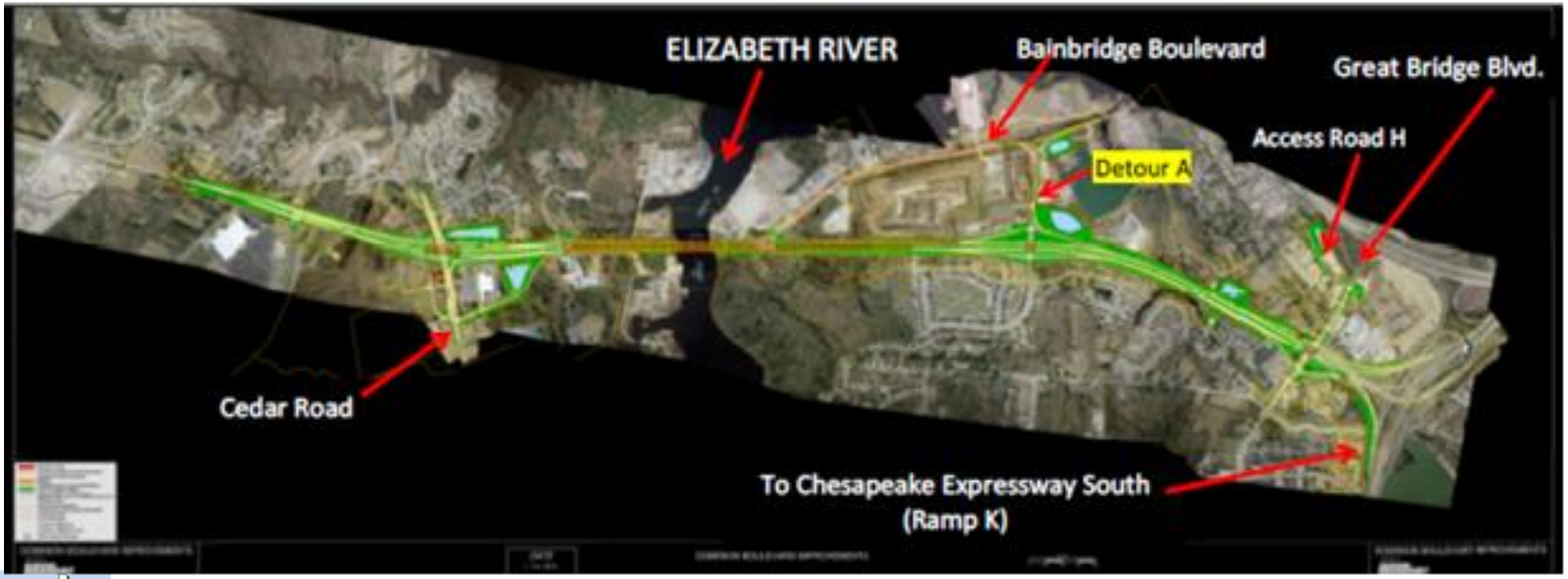
Project Timeline

- Start Design (Parsons Brinckerhoff): 2004
- Design Public Hearing: Aug 2008
- FoNSI: Mar 2009
- Advertisement: Jul 2012
- Contractor NTP: Jan 2013
- Fixed Completion Date: Apr 2017*

*Incentive for Early Completion

Dominion Boulevard Reconstruction

- **Project Overview**
  - April 1, 2017: Contract Completion
  - 4-lane limited access highway (3.8 miles)
  - 3 interchanges
  - 9 bridges



Cost Estimates by Major Element

Dominion Boulevard - Projected Project Costs			
	Estimate	**Contingency**	**Total**
Engineering	16,088,768	-	16,088,768
Right-of-Way	58,476,858	20,000,000	78,476,858
Utility Relocations	8,688,269	1,000,000	9,688,269
Wetland Mitigation	358,873	-	358,873
Construction	187,711,447	22,568,438	210,279,885
Inspection/Administration	23,378,052	1,908,006	25,286,058
Incentive Clause[1]	-	5,000,000	5,000,000
Total	**$294,702,267**	**$50,476,444**	**$345,178,711**

- The winning construction bid came in $70 million lower than Engineer's estimate, thus total costs went down from $416 million to $346 million.

1. Maximum incentive based on $26,279/day for early completion

New Wetlands Mitigation Basin

Source of Funds

RSTP	$ 86,040,980
Bonds	$ 107,244,236
VTIB Loan*	$ 151,893,495
TOTAL	$ 345,178,711

*First VTIB loan in the state

All project savings revert to VTIB for future projects

Right-of-Way Acquisition

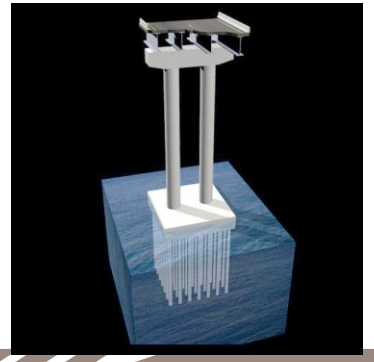
- 46 Total Takes
  - 17 Residential Relocations
  - 8 Non-Residential Relocations
  - Parcel acquired for on-site tidal wetlands mitigation
- 132 Partial Takes

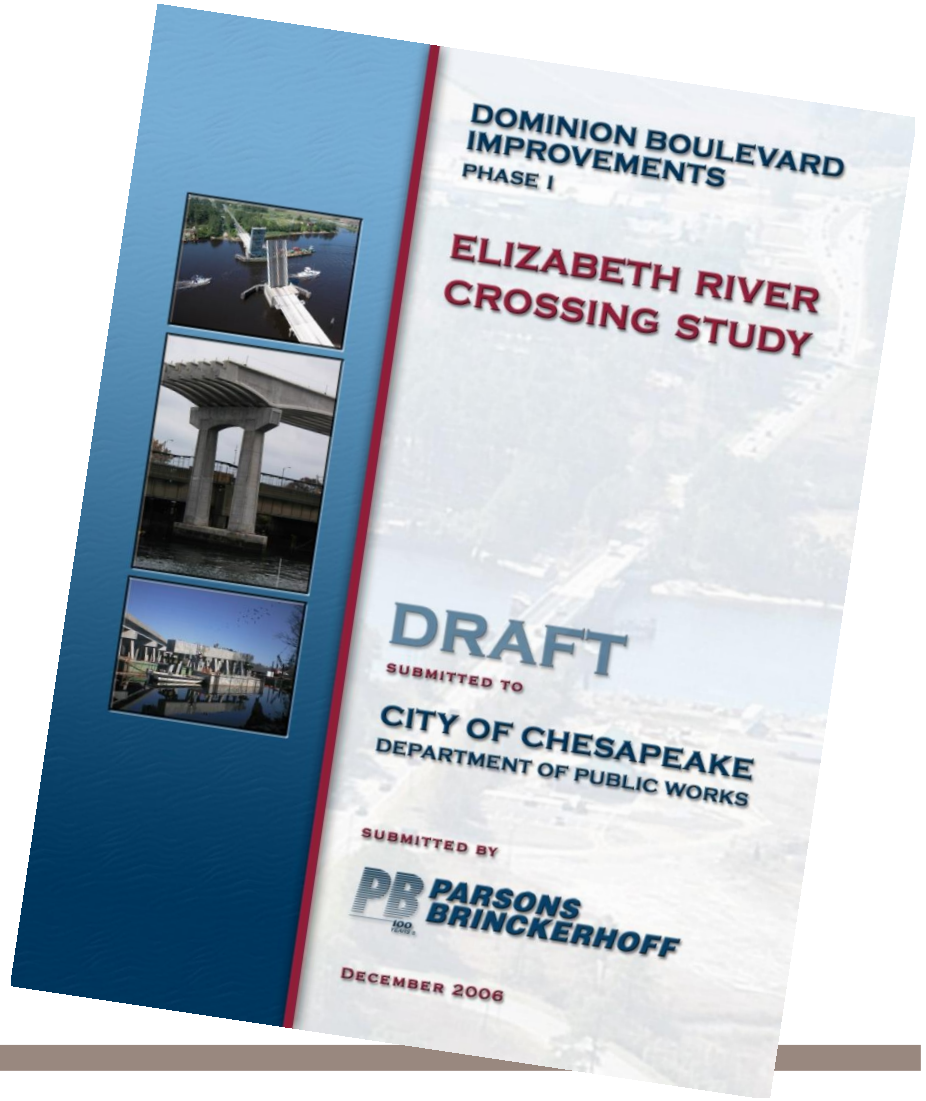
2 outstanding condemnation cases

Risk Management

- Risk Management Workshop
- Establish Risk Management Register
  - Soil conditions
  - Environmental Impacts
  - Differing Site Conditions
  - Safety
  - MOT, Materials, Access, Etc.
- Regular review of risks (biweekly / monthly)

Bridge Concept Study





Preliminary Recommendation

Elizabeth River Crossing

- Multi-span continuous structure
- Five superstructure types considered:
  - Concrete Spliced Girders (bulb-tees)
  - Steel Plate Girders (50 ksi)
  - Steel Plate Girders (70 ksi)
  - Steel Plate Girders w/Variable Depth Web (50 ksi)
  - Segmental Box Girders
- Approaches similar for each alternative

Structure Types

- Channel Crossing:
  - Fixed – longer spans; steel plate girder - $250/sf
  - Moveable – shorter span; non-standard built-up steel framing; electrical & mechanical equipment; special foundation - $1,850/sf
- Approaches:
  - Low Level – “trestle” type; short spans - $70/sf
  - Mid Level – pier columns; 105-115’ spans - $115/sf
  - High Level – pier columns; up to 140’ spans - $250/sf

Structure Type – *cont'd*

- Concrete spliced girder and box girder were considered
- Steel constant depth and variable depth girder options
- Abutment, pier, and foundation types similar for each
- Preliminary size & quantities for each alternative
- Unit costs researched from historical bid data
- Costs adjusted for project specific conditions
- Cost applied for each alternative

Summary of Findings

- Concrete Spliced Girders (bulb-tees) - $98.7 m
- Steel Plate Girders (50 ksi) - $108.5 m
- Steel Plate Girders (70 ksi) - $106.5 m
- Steel Plate Girders w/Variable Depth Web (50 ksi) - $106 m
- Segmental Box Girders - $118.3 m

Recommendation

- Spliced Concrete Bulb-Tee chosen for the channel crossing unit
  - Cheaper than steel
  - Lower life-cycle cost
- Standard PCBT beams made continuous using standard continuity diaphragms will be used for all approach superstructures
- Due to bridge width and height several pier types will be used:
  - Trestle bents
  - Multi-column piers on pre-stressed concrete piles
  - Hammerhead piers on pre-stressed concrete piles

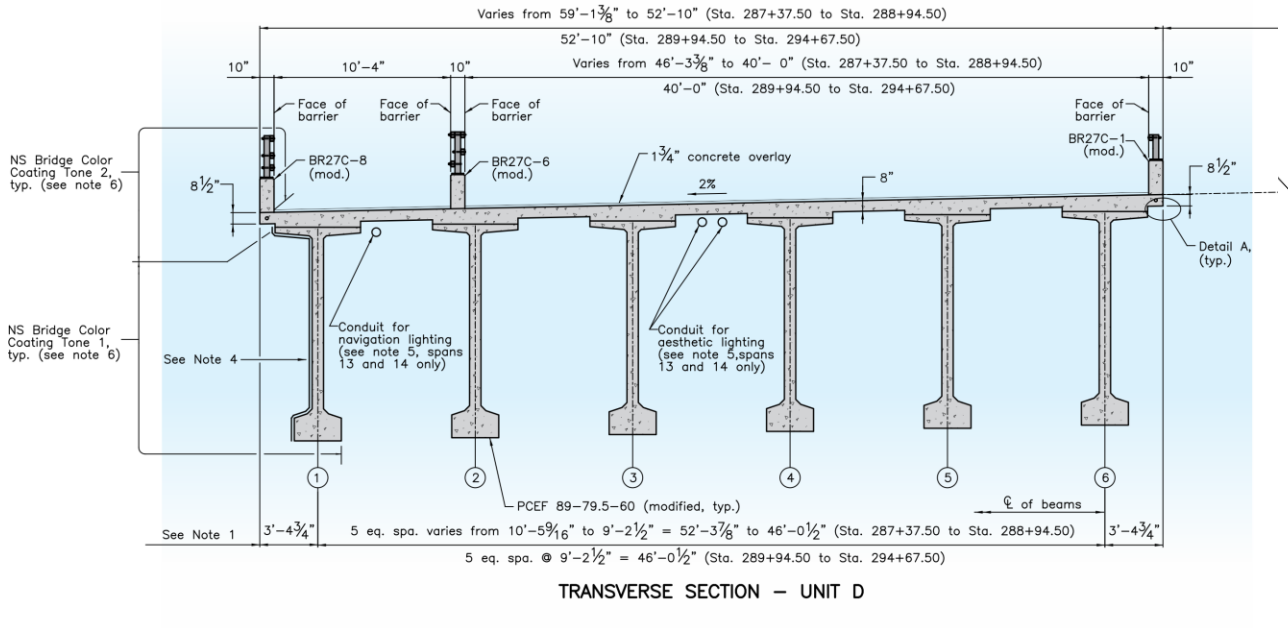
S. Branch Elizabeth River Crossing

- Bridge Length: 6000’ (SB), 5200’ (NB)
- Bridge Height: Over 110’ (95’ vertical clearance)
- Channel Crossing Unit: 222’-285’-222’
  - Spliced Girder Construction
- 91 Piers (50 SB & 41 NB)
- Over 50,000 CY CIP Concrete
- Over 90,000 LF Concrete Pile
- Over 8 Million lbs Reinforcing Steel

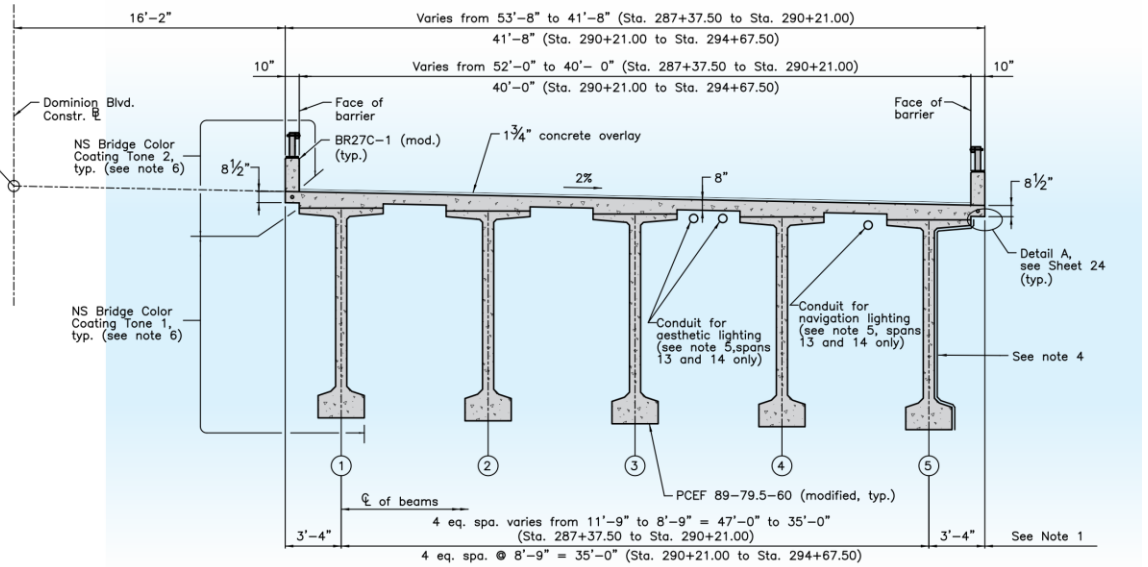
Before

After

S. Branch Elizabeth River Crossing

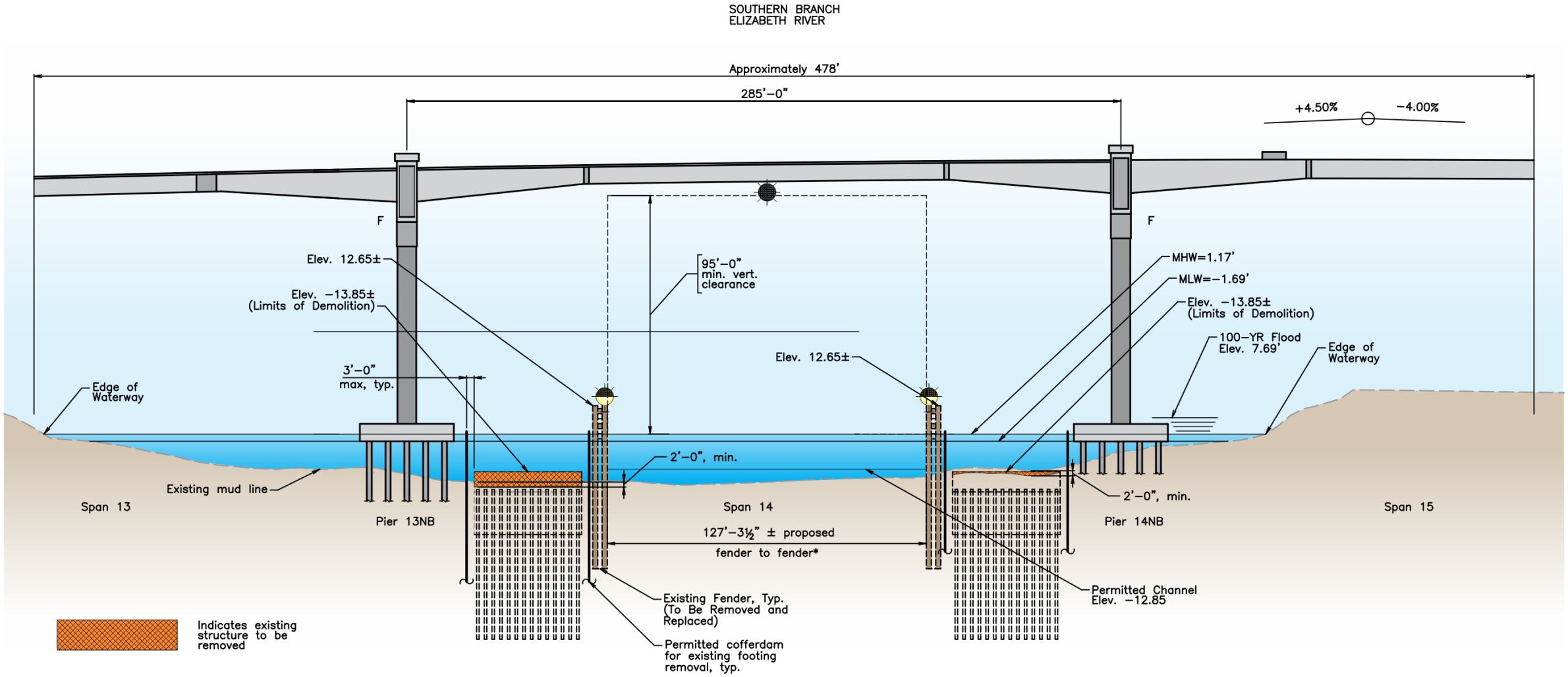


TRANSVERSE SECTION – UNIT D



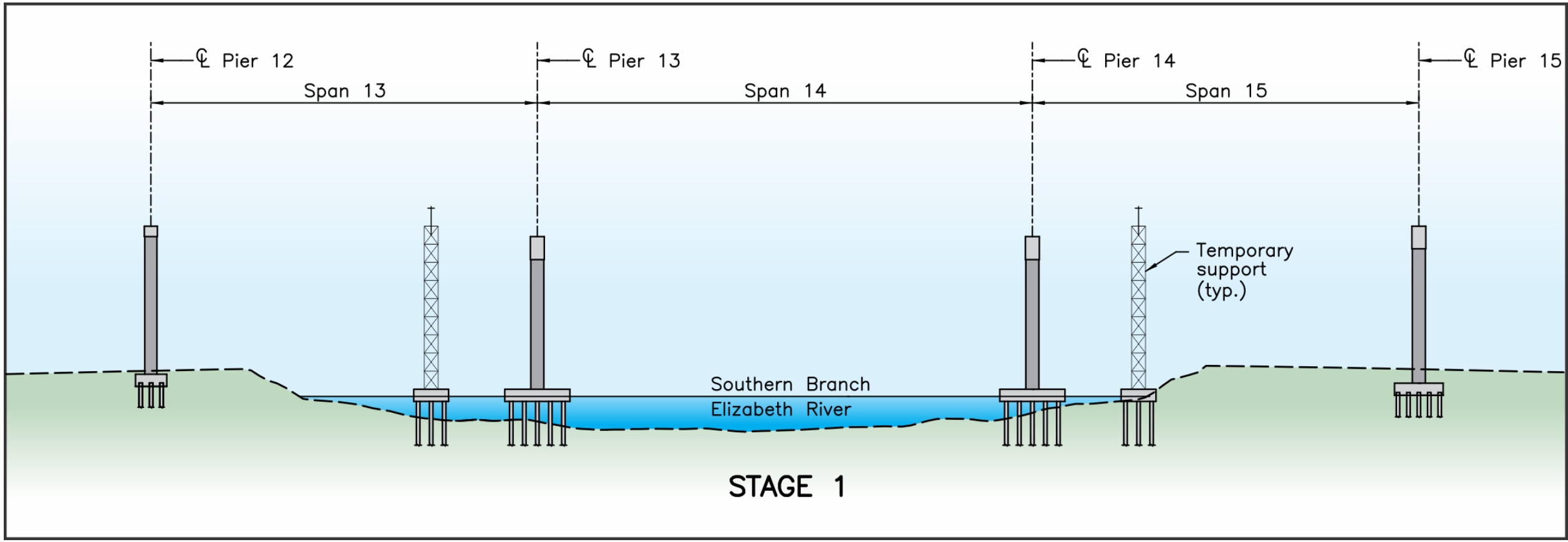
TRANSVERSE SECTION – UNIT D

S. Branch Elizabeth River Channel Crossing Unit



Elizabeth River Piers

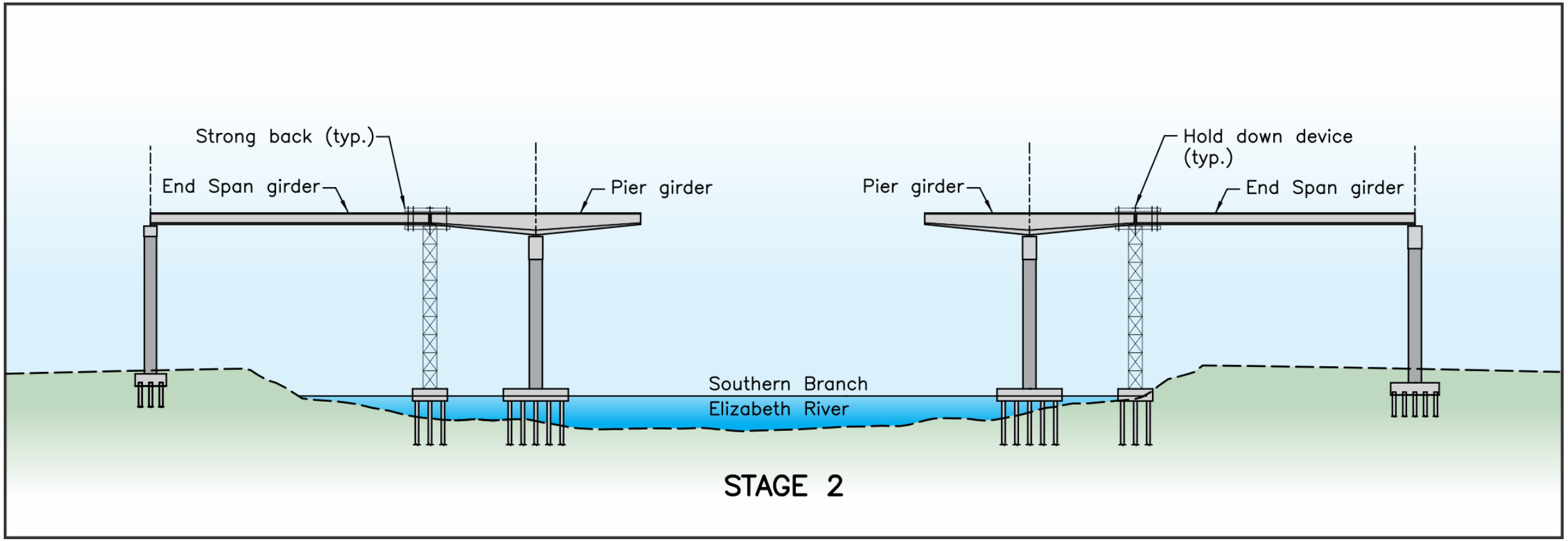
Spliced Girder Sequence



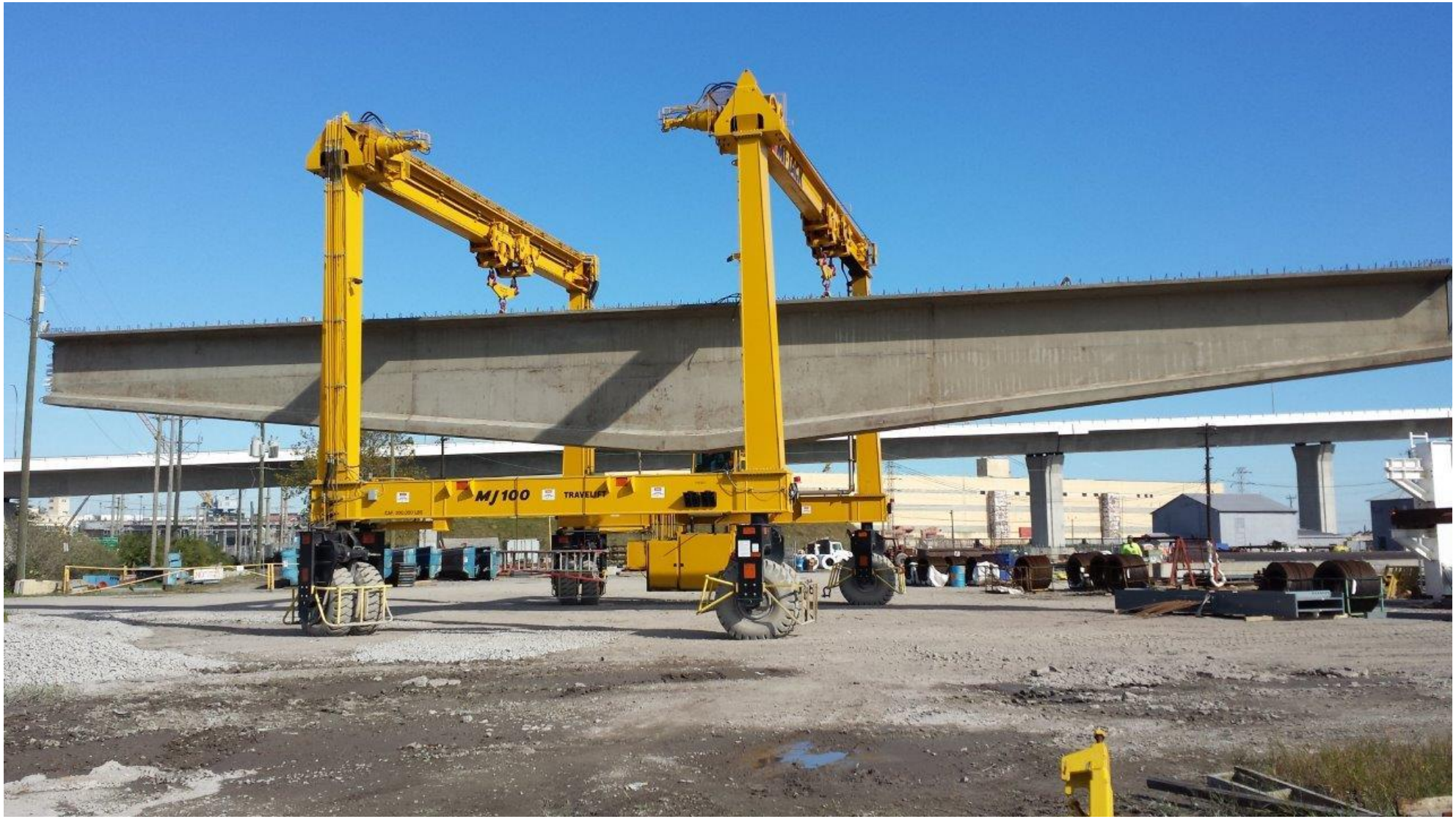
Stage 1: Construct Piers and Temporary Supports

Erect Span 15NB End Girders

Spliced Girder Sequence

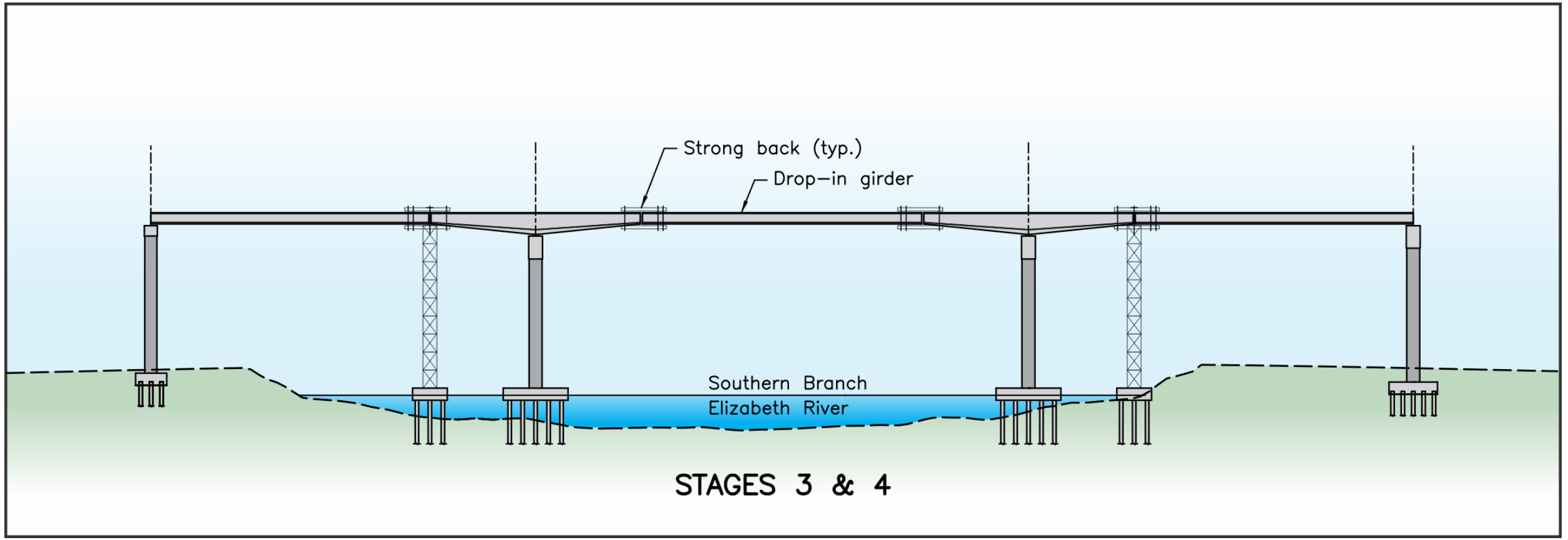


Stage 2: Erect Pier Segments & End Span Girders


MJ100
TRAVELIFT

Erect Pier 13NB Pier Girder – Balanced Condition

Spliced Girder Sequence



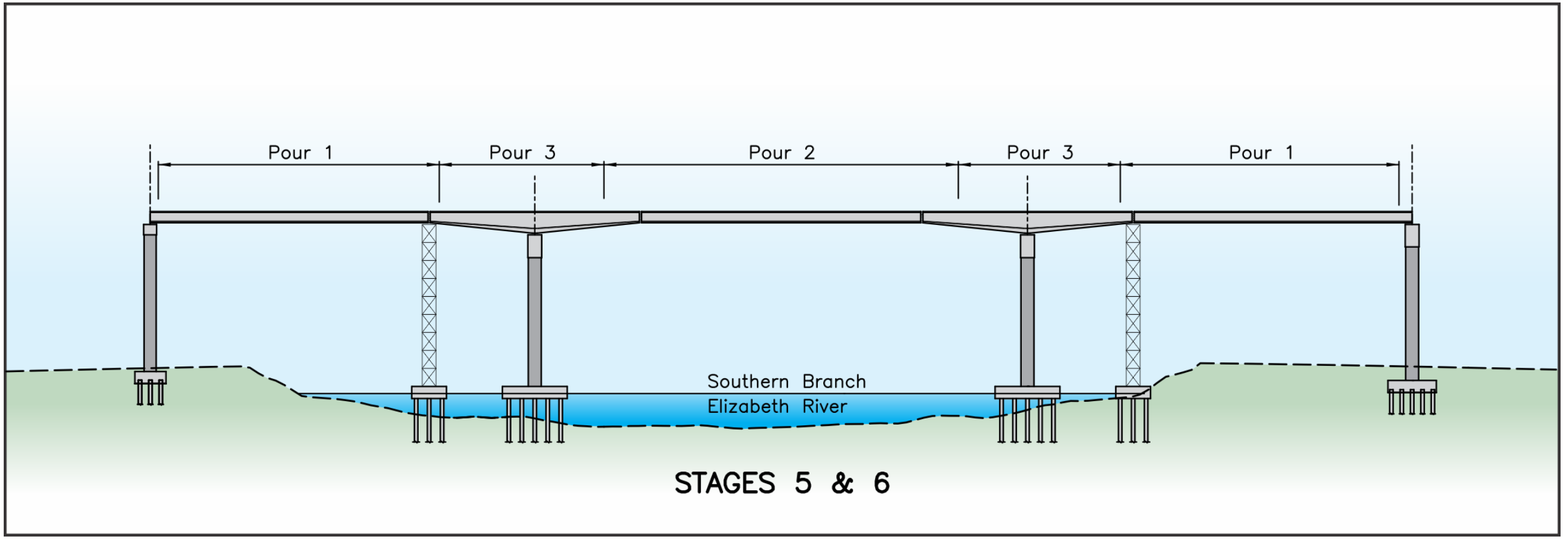
Stage 3: Install Drop-In Segment using Strong Backs, Cast Closures

Stage 4: Stage 1 Post-Tensioning

Elizabeth River Crossing – Construction Sequence

Drop In Beams

Spliced Girder Sequence



Stage 5: Remove Strongbacks, Cast Deck
Stage 6: Stage 2 Post-Tensioning

Elizabeth River Crossing

NB Bridge over the Elizabeth River

(Post Tensioning)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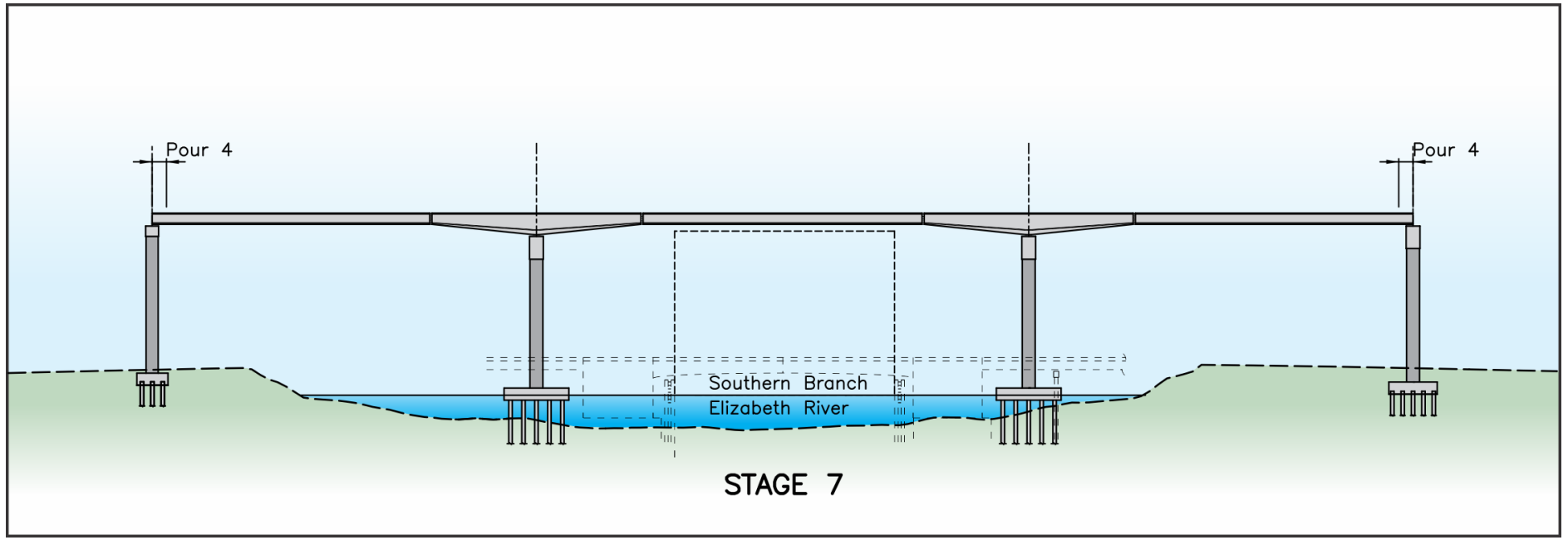
Spliced Girder Sequence



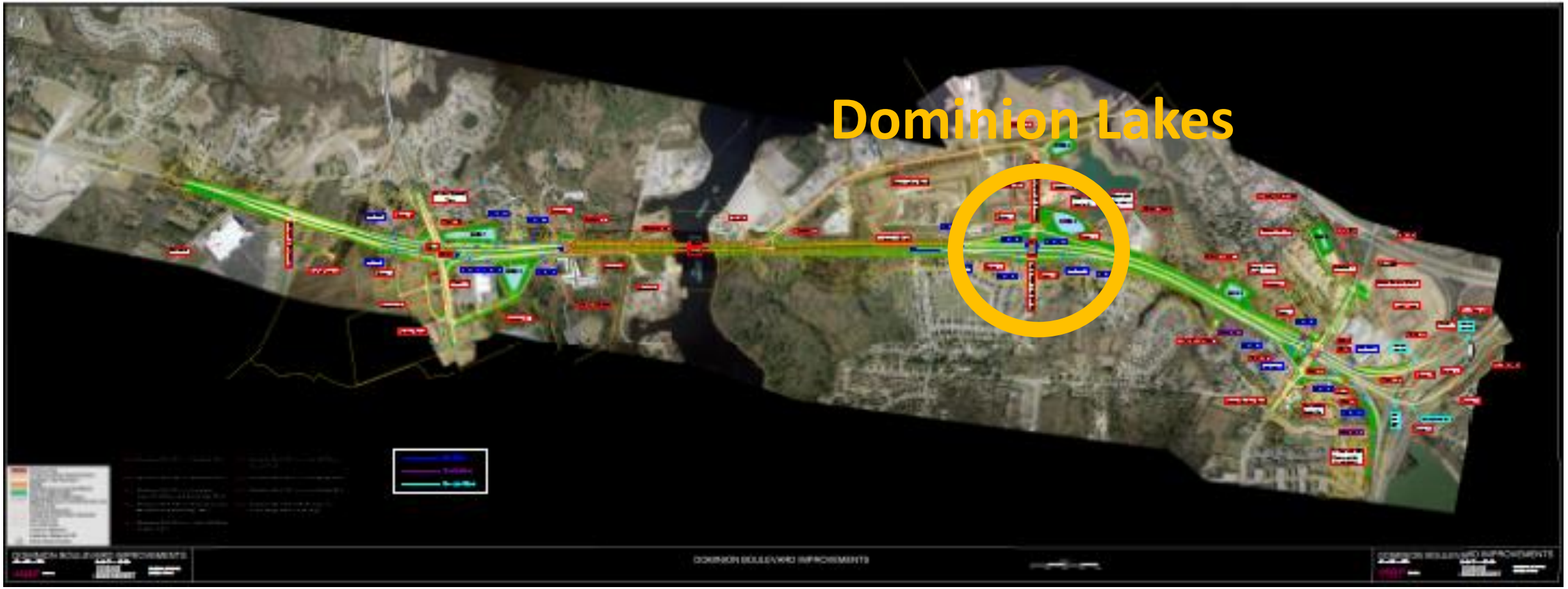
Stage 7: End Diaphragms, Barriers and Overlay

Demo. of Old Steel Bridge

Dominion Boulevard Reconstruction

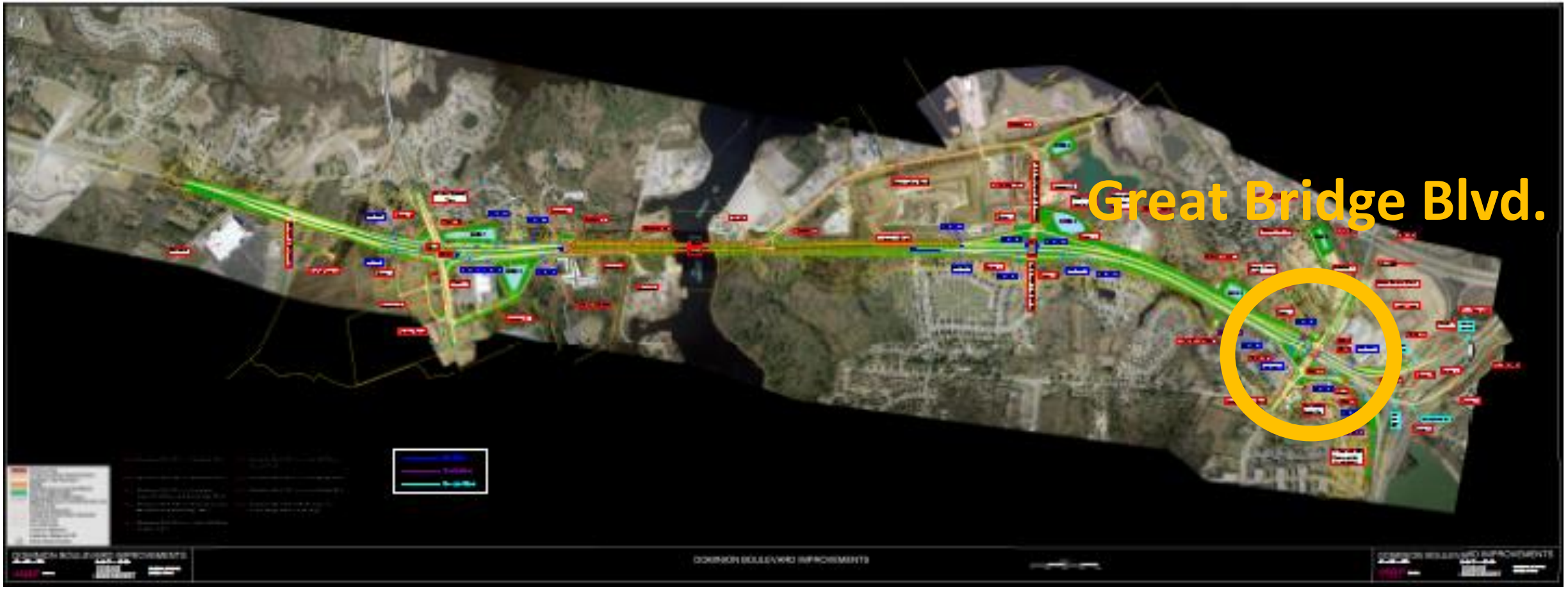
Cedar Road Interchange - SPUI

Dominion Boulevard Reconstruction

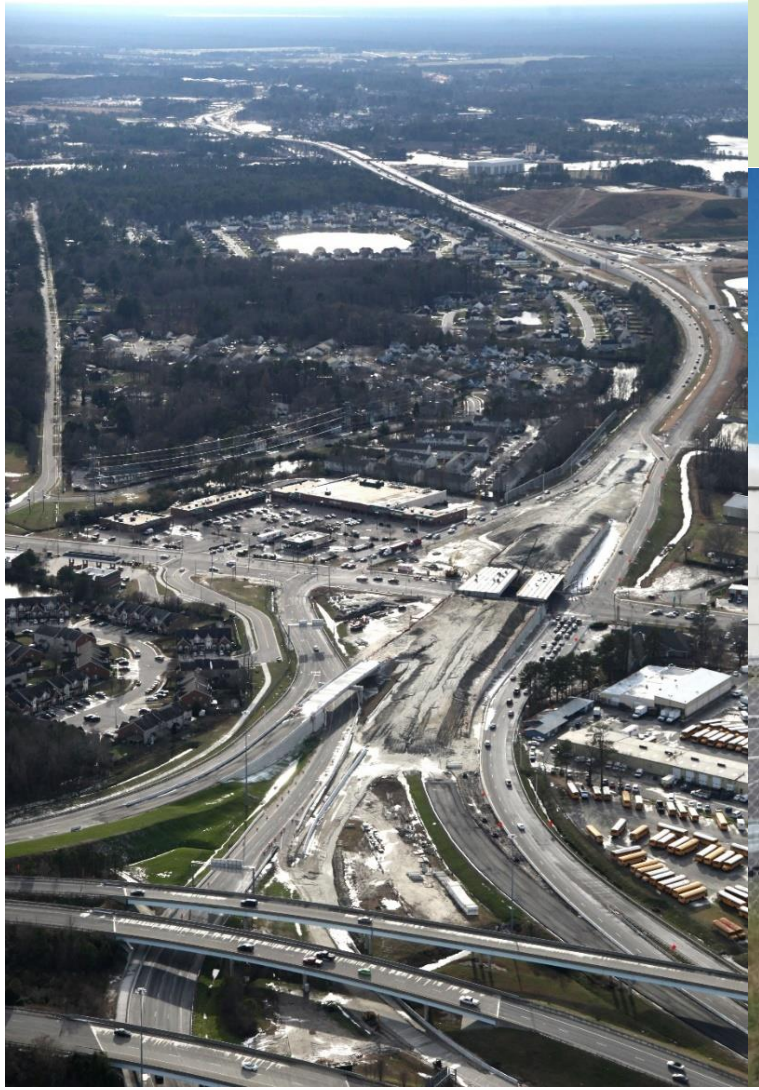


Dominion Lakes Interchange

Dominion Boulevard Reconstruction

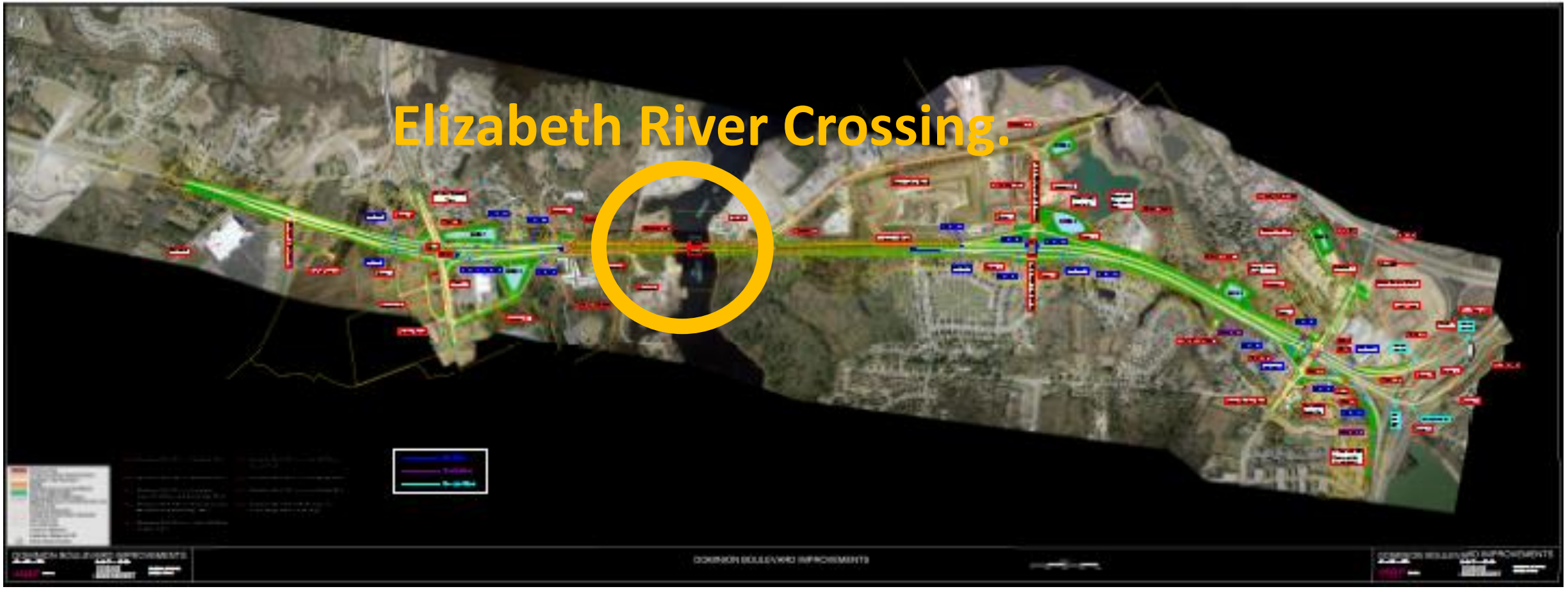


Great Bridge Boulevard Interchange (north end)



"Access to I-64/I-464 and the Chesapeake Expressway"

Dominion Boulevard Reconstruction



Elizabeth River Crossing

Elizabeth River Crossing - Substructure

Elizabeth River Crossing - Substructure

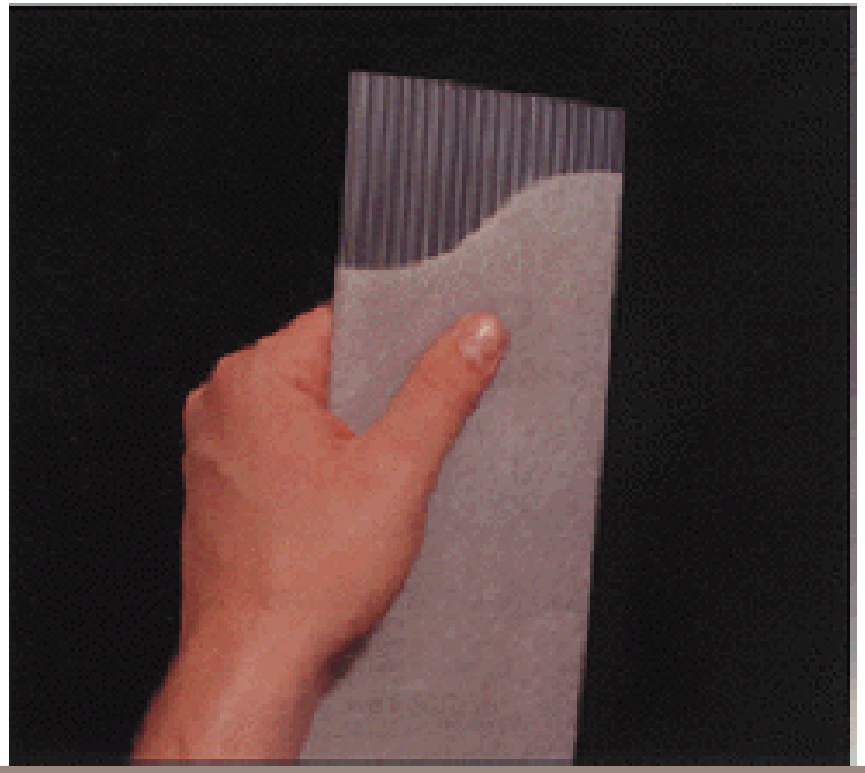
Ground Improvements

Ground Improvements – Wick Drains

Wick Drains

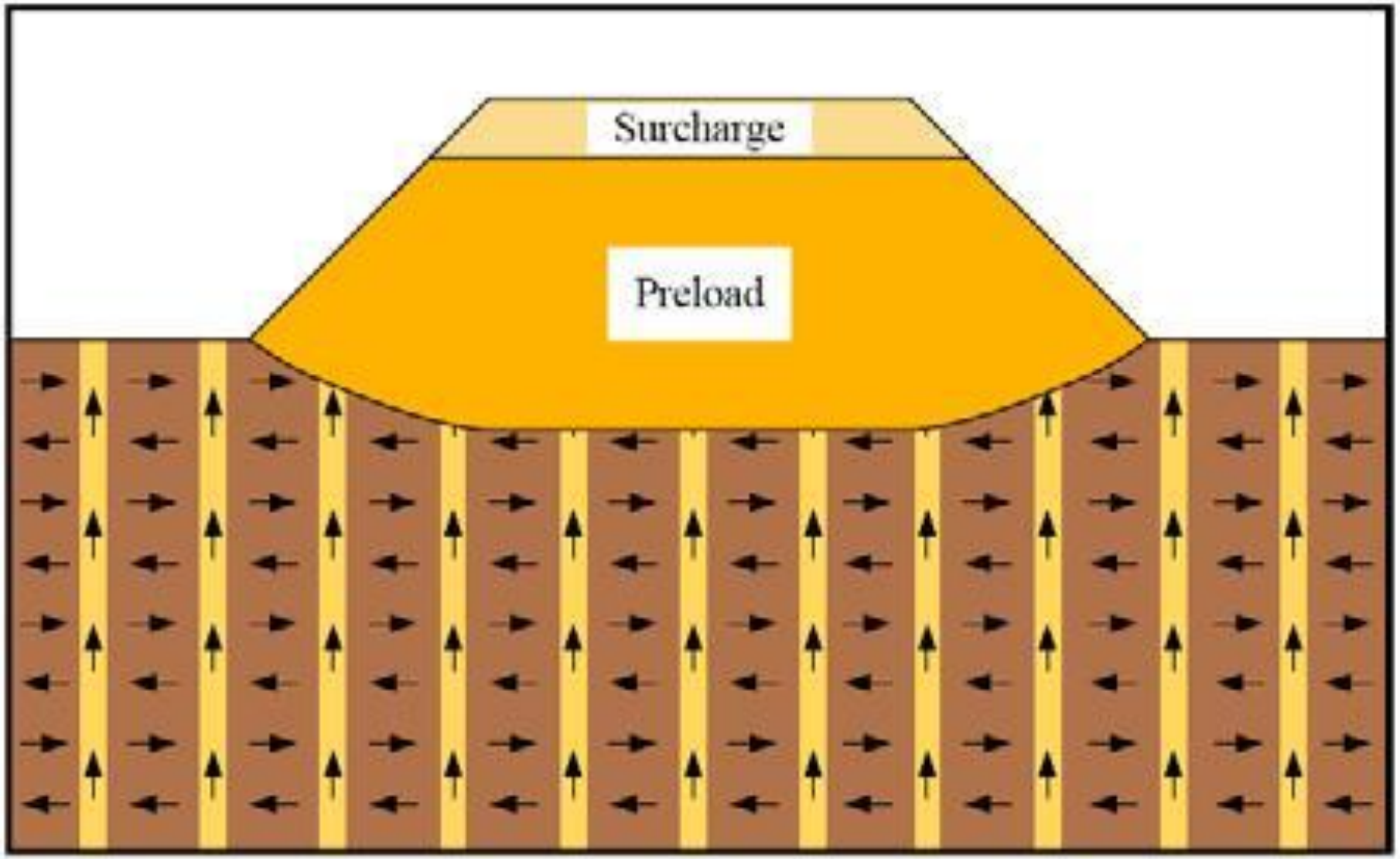
Wick Drains

- 5,813,829 Vertical Linear Feet (VLF)
- 30 to 60 feet deep



Wick Drains

Vertical Wick Drains



Mechanically Stabilized Earth (MSE) Walls

Open Road Tolling System

Toll Gantries and Hub Building

Dominion Blvd. - Overview

- **New Roadway:** *18 new lane miles (current 7.6 lane miles)*
- **Earthwork:** 1.6 Million CY
  - *400,000 CY Excavation*
  - *1.2 Million CY Embankment Fill*
- **Ground improvements:**
  - Vertical Wick Drains: *4.5 Million LF*
  - Embankment Surcharge: *23 Locations*
  - *Ground Improvement Piles: 600 each*

- 2500+ piles (157,500 lf – over 30miles)
- 66,400 lf beams (over 13 miles)
- 245,000 sf MSE walls (4,160 cy)
- 26,000 sf sound barrier (1,200 cy)
- 1,000 lf box culvert (650 cy)
- 36,000 lf RCP
- 160 pipe end sections
- 90 end walls
- 380 drop inlets

- ***Over 75,000 cy of precast concrete!***
- ***Cast-in-Place Concrete:*** *65,000 CY*

Dominion Blvd. Animated Video

(See Project Website)

Dominion Blvd. – Public Relations

www.cityofchesapeake.net/Dominion

[Dominion Boulevard Improvement Project]