

# Construction of US Route 460

Concrete Segmental Bridge

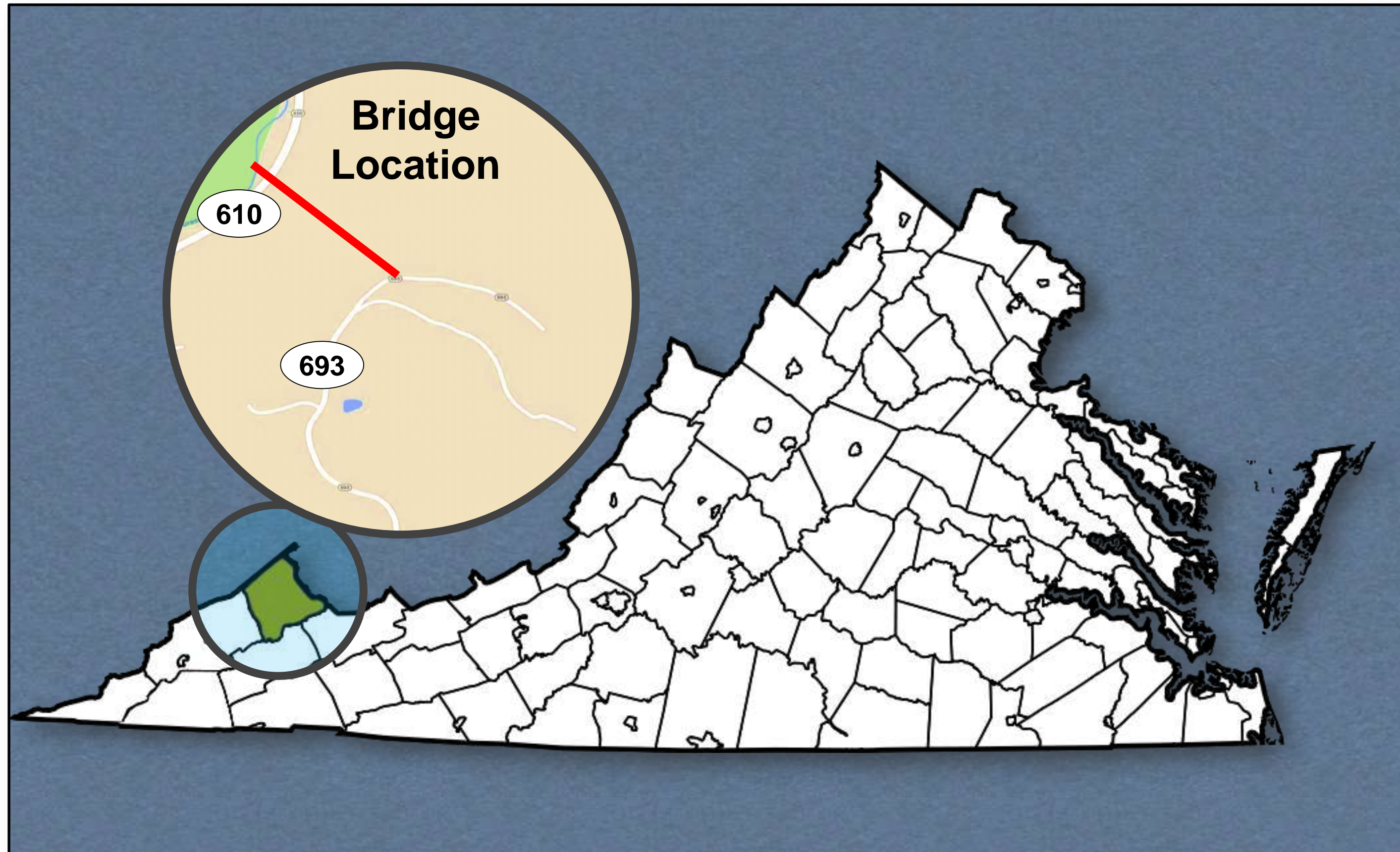
LEO SPAANS, P.E., S.E.

JSE Inc.

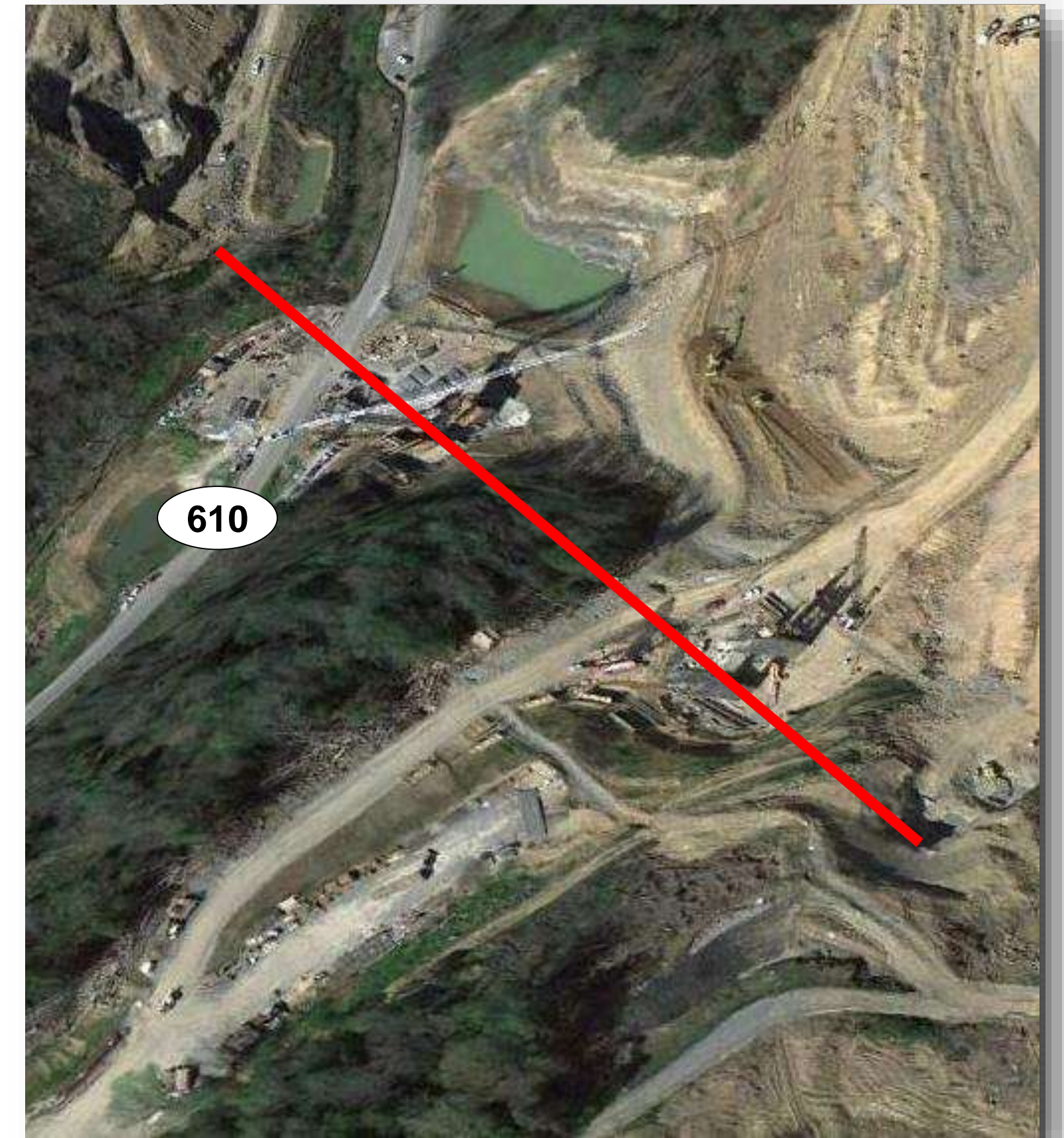
August 10, 2015



# PROJECT LOCATION



BUCHANAN COUNTY, VIRGINIA near the Breaks Interstate Park



GOOGLE IMAGE



# US ROUTE 460 CONNECTOR



RENDERING

BUCHANAN COUNTY, VIRGINIA



# PROJECT TEAM

## 1. Owner:

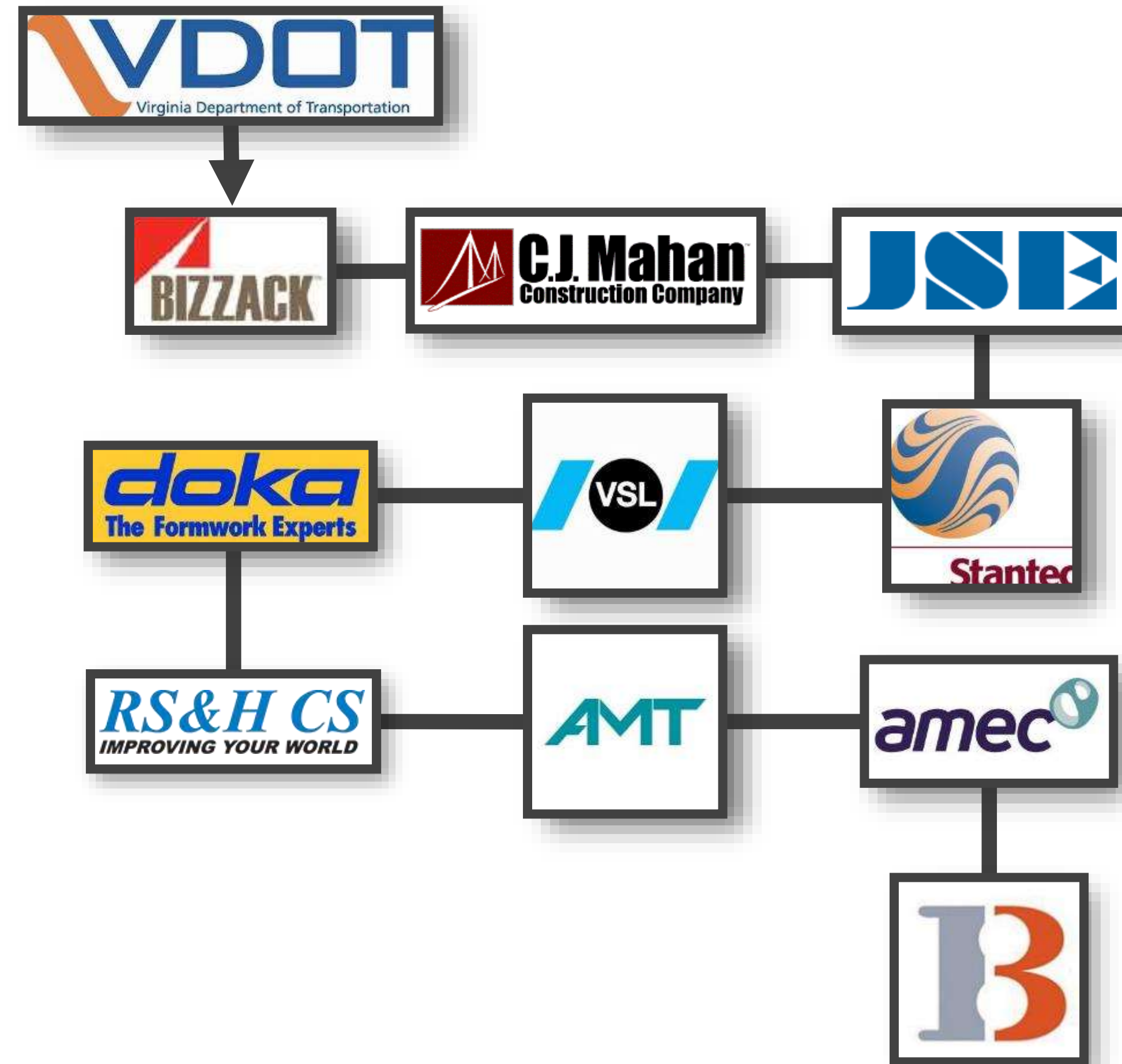
- Virginia Department of Transportation

## 2. Design Build Firm:

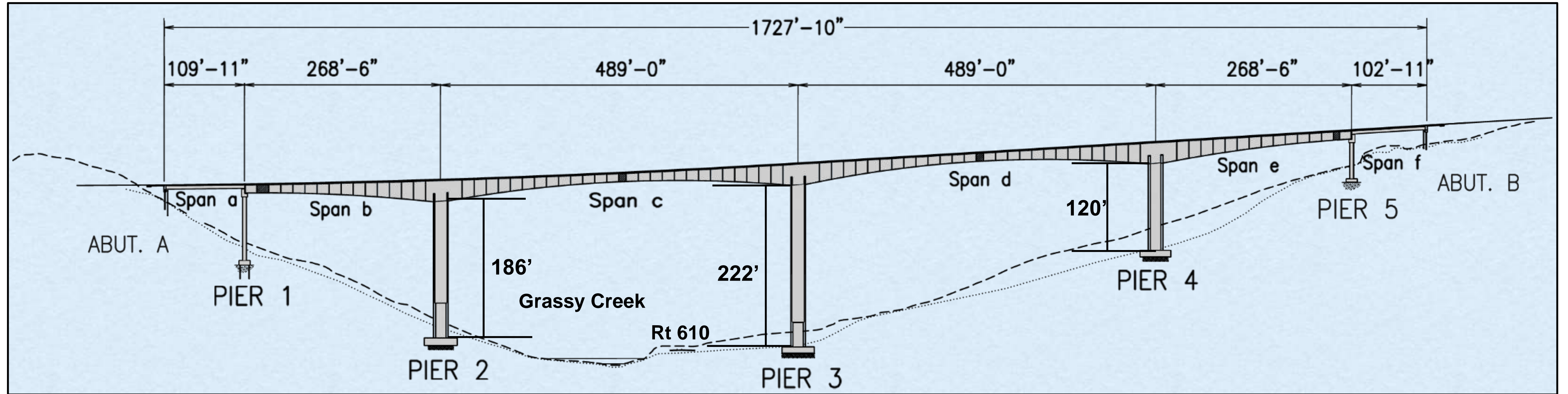
- Bizzack Construction, LLC
- CJ Mahan Construction Company
- Janssen & Spaans Engineering, Inc.
- Stantec
- VSL, Inc.
- Doka USA Ltd.

## 3. Inspection & Contract Management:

- RS&H CS, Inc.
- AMT Engineering
- AMEC
- 3B Consulting



# US ROUTE 460 CONNECTOR



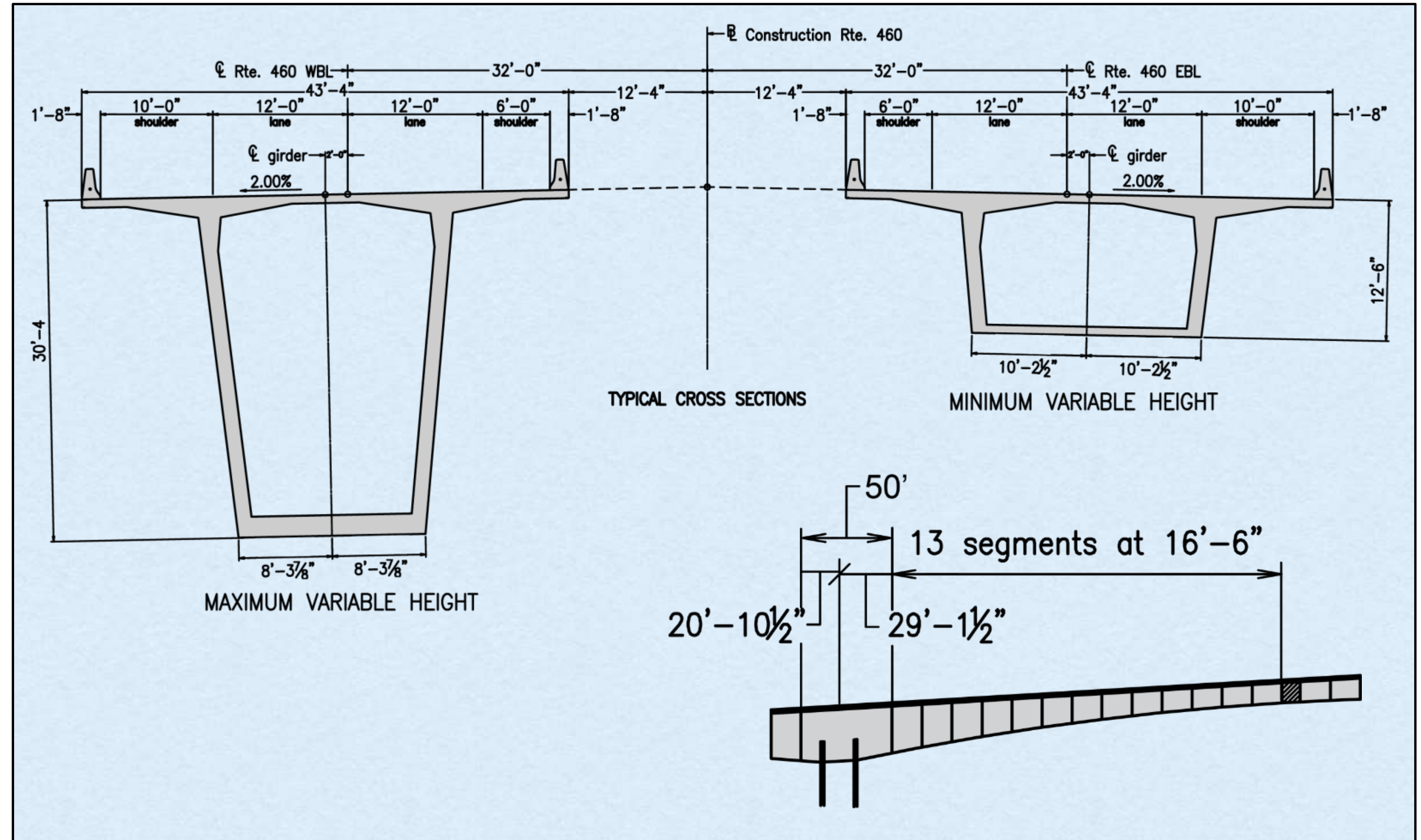
- **4 Spans b to e** - Balanced Segmental Cantilever Construction using Form Travelers
- **End Spans a & f** - 4 x 78" Prestress Bulb-T Girders
- **Longest Span** - 489'
- **Concrete Strength** - 8,000 psi / 5000 psi
- **Cantilever Post-Tensioning** -
  - 20 ea. -18x0.6" Tendons/Web
- **Continuity Post-Tensioning** -
  - Spans b & e – 5 ea. - 11x0.6" Tendons/Web
  - Spans c & d – 12 ea. - 16x0.6" Tendons/Web



# US ROUTE 460 CONNECTOR

## Typical Cross Sections:

- 43'-4" Width
- 30' – 4" Height at Piers
- 12' – 6" Height at Closures
- 16' – 6" Segment Length





# US ROUTE 460 CONNECTOR

## Construction of EB & WB Lanes

- **Pier 4** - Cantilevers were complete July of 2013
- **Pier 3** - Pier Table and 2 Segments on each side erected
- **Pier 2** - Pier Table falsework erected



PIER 4

PIER 3

PIER 2



# US ROUTE 460 CONNECTOR

## Pier 4

- Double Flange Column
- Temporary Cross-Bracing during construction



PIER 4



# US ROUTE 460 CONNECTOR

## Pier 4

- Balanced Cantilever Construction
- EBL shows concrete placed in both up and down station ends
- WBL shows travelers advanced ready for installation of post-tensioning ducts and rebar





# US ROUTE 460 CONNECTOR

- Piers at the ends of a bridge are shorter when crossing a valley. The design of the double flange column can be achieved without the need for the web.
- The “H” – Shape Column allows a cost savings by omitting the center web when not needed.



Double Flange Column  
("H" shape without the web)

"H" – Shaped Column



# US ROUTE 460 CONNECTOR

- Temporary Cross Bracing during construction
- Column width extended to provide support for the web which removed the need for transverse post-tensioning in the diaphragm



PIER 4



# US ROUTE 460 CONNECTOR

## “H” – Shaped Columns

- Constant shape, without tapers associated with hollow sections, allows easy transition of slip forms using 20' lifts
- All surfaces are exposed for inspection
- No need for interior inspection systems that require stairways, platforms, lighting and ventilation. These needs are common for hollow pier columns

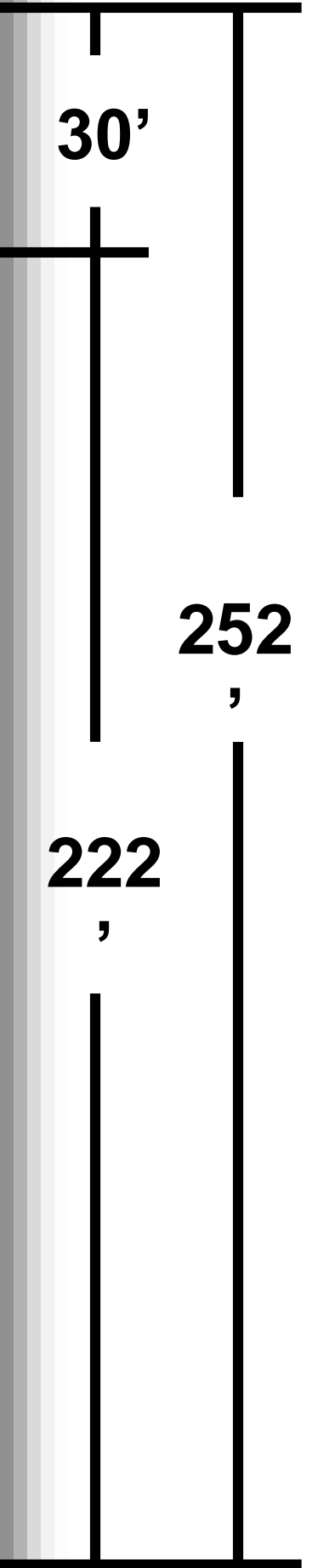


PIER 1



# US ROUTE 460 CONNECTOR

- Tallest Bridge in Virginia
- Pier 3 height is 252'
- Columns were constructed using 20' lifts. The surveyed offsets from theoretical were less than 5/16" from bottom to top.



PIER 3



# US ROUTE 460 CONNECTOR

- Construction complete through October of 2013



LOOKING UP  
STATION

PIER 4

PIER 3



# US ROUTE 460 CONNECTOR

## Traveler Consideration

- Check clearance of front Truss to accommodate 6% bridge slope. (see circles)
- If possible keep bottom slab traveler ties at a constant dimension from outside corner of web.



PIER 3





# US ROUTE 460 CONNECTOR

- View of Form Travelers with Outer/Inner Core Forms
- Horizontal struts placed between piers to share wind load to both piers



PIER 3



# US ROUTE 460 CONNECTOR

- Construction completed through October of 2013



LOOKING DOWN  
STATION

PIER 3

PIER 2

PIER 1



# US ROUTE 460 CONNECTOR

- **Pier 2** – Pier Table Falsework for lift 1 – bottom slab
- **Pier 1** – Cap Forms installed



PIER 2

PIER 1