



March 2017



# ***The Port Access Road Design Build Project***

**Presented By:**

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Michael Ulmer, P.E.



# I - Project Introduction

# If you don't hear anything else I say.....

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- **Who**.....is building it? Fluor-Lane SC, JMT, KCI, D&F, S&ME
- **What**.....are you building? 11 Major structures (14,000 Ft.) and *some roadway pavement*
- **Where**....is it being built? I-26 Exits 217 & 218 near Cosgrove
- **When**.....will it be done? *Done when its done.....*By 2020
- **How**.....much does it cost? \$220 Million.....so far

# Who

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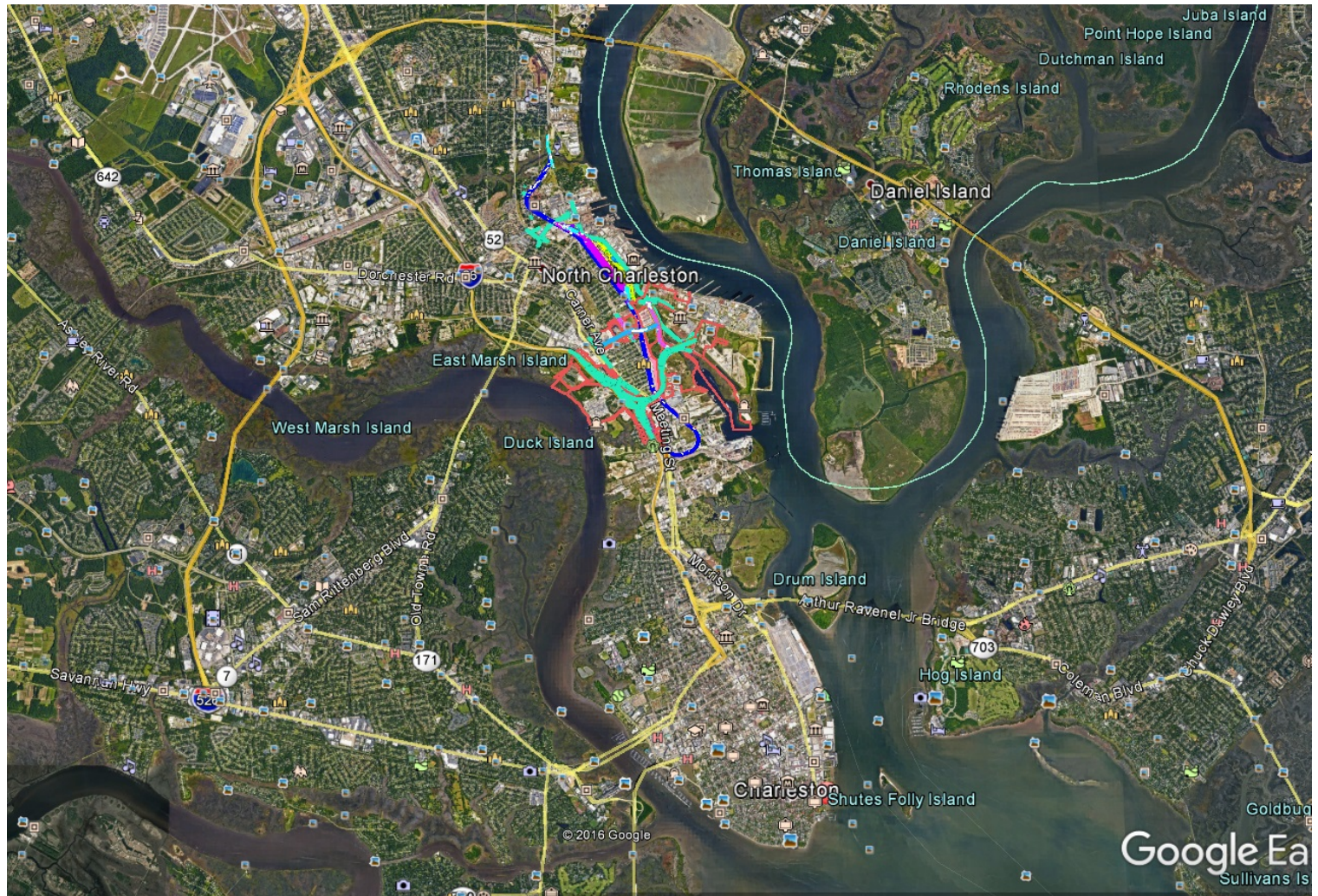
# What

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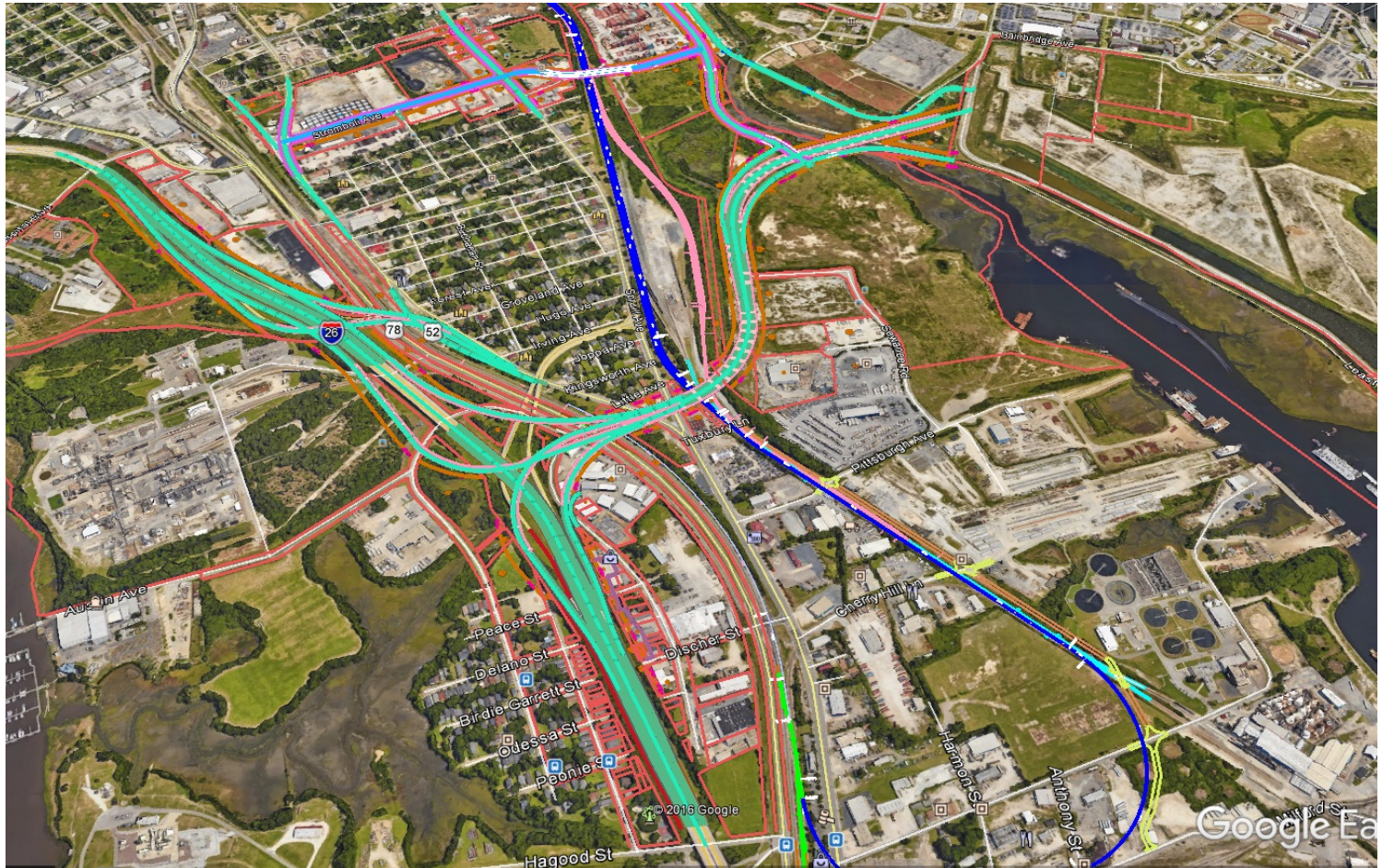
- New fully directional interchange on I-26
- Bainbridge Connector Road
- Extension of Stromboli Avenue and associated roadway improvements to surface streets to serve the Leatherman Terminal

# Where



- I-26 Exits 217 and 218

# Where



- I-26 Exits 217 and 218

# Where

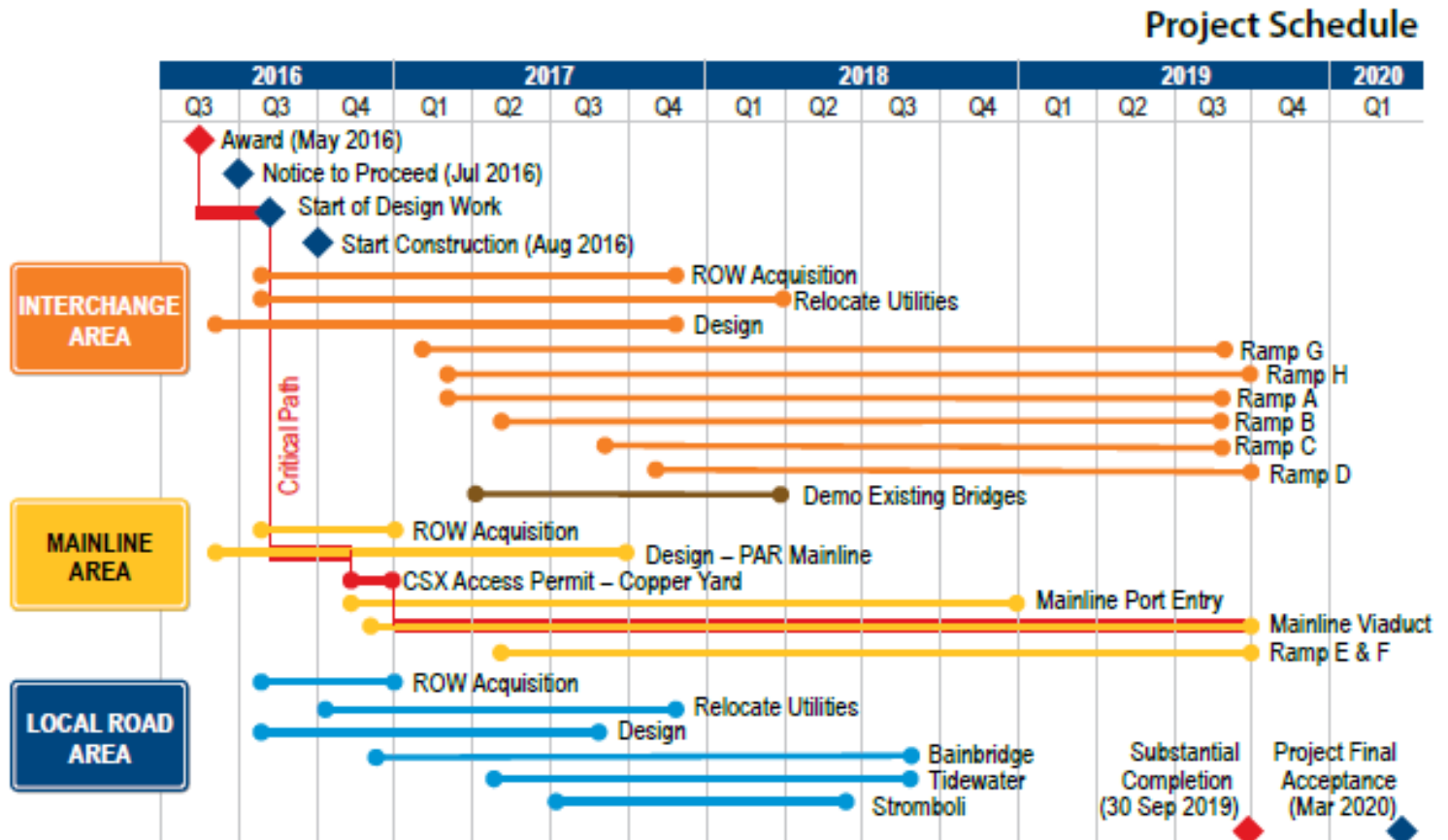
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# When

**Not soon enough.....** Substantial Completion by Sept 2019



# How Much

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Flour-Lane South Carolina	\$220,700,745
Traylor-United Joint Venture	\$235,757,435
Skanska-PCL Joint venture	\$297,812,467



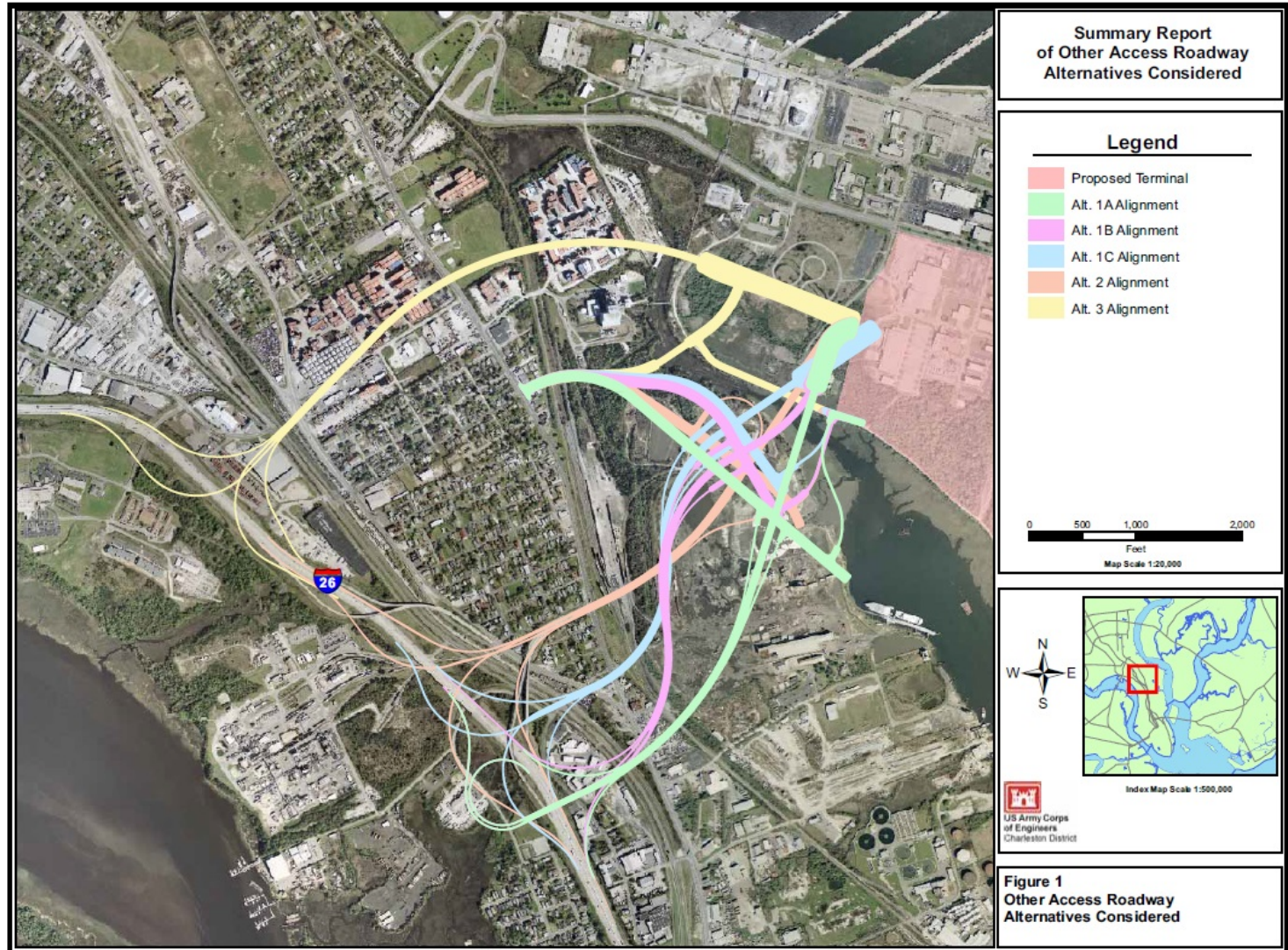
# II – Project Inception & Design Build Procurement

# Environmental Document

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- 1999 - SCSPA applied to USACE and SCDHEC for a permit to construct a marine cargo terminal on its property on Daniel Island.
- 2001 - permit withdrawn after strong public opposition.
- 2002 - South Carolina General Assembly approved a Joint Resolution requiring the SCSPA to begin environmental impact studies and other required actions to obtain a permit for a new terminal facility on the West Bank of the Cooper River on the former Navy Base site.
- EIS included Port Access Road.
- 2005-2006 - Several options considered....**how many?**

# Environmental Document

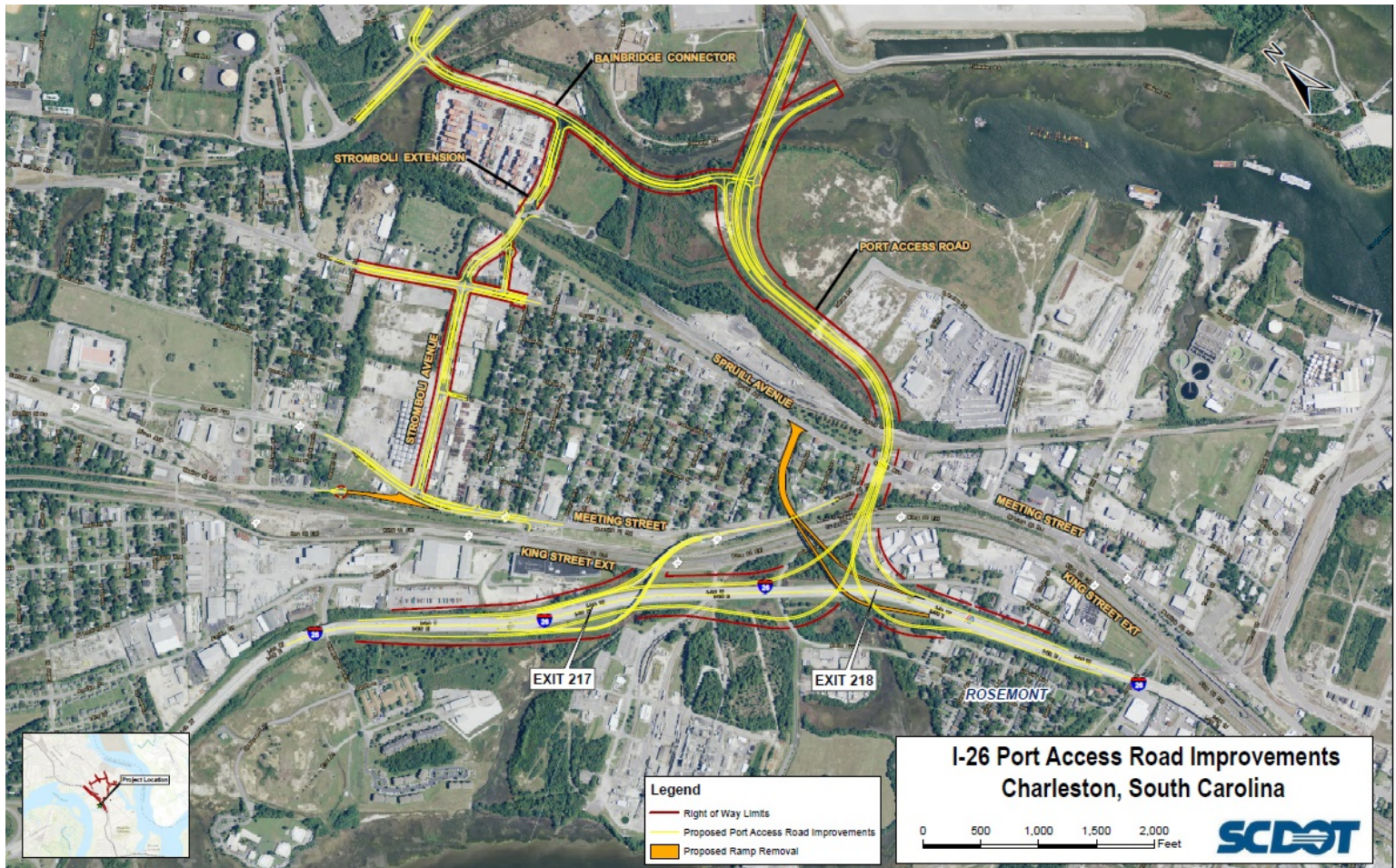


# Major Components

- Who gets Noise Walls?



# Environmental Document



- Preferred Alignment

# Environmental Document

## CNC South Access Roadway Feasibility Study Cost Estimate

### Program-Level (PE, ROW and CON)

July 2006

#### Alternative 1D

##### Alignment 1D Summary

CON	Bridge	\$134,170,803
	Roadway	\$70,065,039

PE	\$15,317,688
ROW	\$27,159,082
CON	\$204,235,842

##### Adjustments

Escalation accounted for in summary costs above (Construction complete in 2011)

PE adjustment from bid price to program level. Add contingency and SCDOT admin.

x 1.16

ROW adjustment from acquisition cost to program level. Add services and admin.

x 1.1

CON adjustment from bid price to program level. Add CEI, change orders, SCDOT admin.

x 1.16

PE	\$17,615,341
ROW	\$29,874,991
CON	\$234,871,218

##### Total Cost

TOTAL	\$282,361,550
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- Projected Construction of \$234 Million in 2010



# Environmental Document

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- 2006 November – SCDHEC OCRM Critical Area permit and CZC certification
- 2007 Final EIS for Container Terminal Approved with controlled access 4-lane road from I-26 to terminal
- 2007 September - Department of Army permit issued
- 2013 April – Port Access Road EA Approved by FHWA
- 2013 August – FHWA FONSI
- 2015 May - Changes due to Intermodal Yard Plans
- **2015 May – SCDOT Issues RFQ**

# RFQ - Schedule

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## 2.6. Milestone Schedule

Milestone	Date
Advertise Request for Qualifications (RFQ)	May 28, 2015
Deadline for Submittal of Qualifications	June 25, 2015 @ 12 pm EDT
Selection of Shortlisted Teams	August 6, 2015
Issue RFP for Industry Review	August 27, 2015
Debriefs for non-short-listed Proposers	September 1, 2015 & September 3, 2015
Issue Final RFP	Fall 2015
Submittal of Technical/Cost Proposals	Spring 2016
Bid Opening	Spring 2016

# RFQ - Project Scope

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## 2.1. Project Overview

The Port Access Road is a new roadway and structure Project to provide direct access between the proposed marine container terminal location on the former Navy Base and I-26 while maintaining adequate service for local, commuter, and commercial traffic.

Included in the Project's purpose is the intent to safely integrate container terminal traffic with existing traffic; support local and regional planning policies and strategies; and minimizing adverse impacts on communities and the environment.

The Project consists of the construction of a new fully directional interchange on I-26, a Bainbridge Connector Road, the extension of Stromboli Avenue and associated roadway improvements to surface streets to serve the proposed Naval Base Terminal (NBT) in Charleston County, South Carolina.

# RFQ - Project Scope

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2.2.2. The design work will include, but not be limited to:

- Surveys
- Geotechnical exploration and design
- Hydrologic/hydraulic analysis and design
- Roadway design
- Bridge design
- Traffic design
- Sound barrier design
- Seismic design
- Public/Media/Community Relations and Information
- Utility coordination
- Railroad coordination
- Transportation Management Plan
- As-Built Plans
- HAZMAT Studies & Compliance

# RFQ - Project Scope

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**2.2.3.** Construction will consist of all necessary roadway and bridge work, including but not limited to:

- New roadway connecting I-26 with the proposed NBT.
- Replace the partial interchange at Exit 218 (Spruill Avenue) with a fully directional interchange.
- Removal and reconstruction of the Meeting Street ramp structures (Exit 217).
- The Meeting Street (Exit 217) ramps will be connected to the Port Access Road ramps via a collector-distributor roadway system combining exiting movements along I-26 generated by the new terminal and Exit 217.
- Construction of Bainbridge Connector Road to connect Bainbridge Avenue to the Port Access Road. In addition, Bainbridge Avenue Connector Road will connect to Tidewater Road via a two-lane roadway, including a low-level bridge crossing Shipyard Creek.
- Tidewater Road will be reconstructed in this area to connect to a secondary gate at the new NBT.
- New half urban diamond interchange at the intersection of the Port Access Road and Bainbridge Connector Road to include two one-way ramps that connect Port Access Road, grade separated above, to Bainbridge Connector.
- Extension of Stromboli Avenue northeasterly from the existing intersection with Spruill Avenue and grade separated crossing of the existing CSX railroad tracks to tie into the Bainbridge Connector Road.
- A signalized tee intersection will be constructed at the intersection of Bainbridge Connector Road and the Stromboli Avenue extension.
- Extension of Stromboli Avenue southwesterly to Carner Avenue where an unsignalized T-intersection will be constructed.
- The intersection of Meeting Street and Carner Avenue will be improved with Meeting Street being vacated midway between the Meeting Street/Carner Avenue intersection and Clements Avenue to the north.
- Sound barrier for the Rosemont Community.
- Drainage, utility and railroad coordination.
- Erosion and sediment control work items.
- Maintenance of traffic.
- Construction Engineering and Management including Quality Control.
- Dynamic or Static Load Testing of Drill Shafts.
- Concrete and asphalt paving.
- Construct within Phosphogypsum stack to potentially include relocation of Phosphogypsum by a HAZWOPER certified contractor.

# RFQ – Scoring Criteria

Category	Points
<b>Team Structure and Approach</b>	
<i>Organizational Chart and Team Structure</i>	5
<i>Capacity, Resources and Project Approach</i>	25
<b>Experience of Key Individuals</b>	
<i>Project Manager</i>	10
<i>Design Engineering Team</i>	20
<i>Construction Management Team</i>	15
<b>Past Performance of Team</b>	
<i>Experience of Proposer's Team</i>	10
<i>Quality of Past Performance</i>	15
<b>Total</b>	<b>100</b>

# RFQ – Proposal Criteria

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The SOQ shall be:

- Prepared on 8.5” X 11” white paper
- Typed on one side only
- Double spaced
- Times New Roman, minimum size 12-point font
- Text contained on the Key Personnel Resume and Work History Forms, charts, exhibits, or other illustrative information shall be no smaller than 10-point Times New Roman

The SOQ must not exceed **ten pages** (not including Section Dividers or Appendices).

# Better bring your “A Game”

LEAD CONTRACTOR OR JOINT VENTURE	LEAD DESIGN FIRM
Archer Western Construction, LLC	TranSystems Corporation
Traylor Brothers, Inc. / United Infrastructure Group – Joint Venture	Infrastructure Consulting & Engineering, PLLC
Skanska USA Civil Southeast, Inc. / PCL Civil Constructors, Inc. – Joint Venture	STV Incorporated
The Conti Group	The Louis Berger Group, Inc.
China Construction America / E.V. Williams, Inc. / GLF Construction Corporation / McLean Contracting Company – Joint Venture	Figg Bridge Engineers, Inc.
Zachry Construction Corporation / American Bridge Company – Joint Venture	Civil Engineering Consulting Services, Inc.
Fluor Enterprises, Inc. / The Lane Corporation – Joint Venture	Johnson, Mirmiran & Thompson, Inc.
Flatiron Constructors, Inc. / Blythe Development Company – Joint Venture	RS&H
Granite Construction Company	Parsons Transportation Group, Inc.



# ATC's

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Alternative Technical Concepts (ATC) are suggested changes submitted by proposing teams to the contracting agency's supplied basic configurations, project scope, design or construction criteria.

These proposed changes provide a solution that is **equal or better** to the requirements in the Request for Proposal document.

*Can we build  
a better  
mousetrap?*

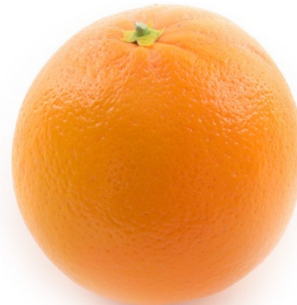


# ATC's

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Is this solution **equal or better** to the requirements in the Request for Proposal document.

Owner:  
*I want  
an  
Apple*



# ATC's

Owner: *I want an Apple*



Braeburn



Cortland



Fuji



Gala



Ginger Gold



Golden Delicious



Red Delicious



Granny Smith



Honeycrisp



Jonathan



Jonagold



McIntosh



Pacific Rose



Paula Red



Wealthy

# ATC's

# *What did we do different?*





# III – Project Start Up & Field Work

# GDM

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- South Carolina Department of Transportation's *Geotechnical Design Manual* (GDM)
  - “learn it, love it, live it...”
- GDM dictates practically everything about the project's subsurface exploration and geotechnical engineering.
- A comprehensive resource for geotechnical explorations; soil parameters (strength and compressibility); and geotechnical engineering processes, methods, and techniques.
- A strict performance specification, which is often unreasonable in “soft ground” sites.
- New version to be released later this year corrects some of the unreasonable performance specifications.

# GDM – Chapter 10 (48 pages)

Table 10-5, Embankment Deformation Notations

Notation	Description
$\delta_v$	Vertical Differential Settlement
$\Delta_v$	Vertical Displacement / Settlement
$\Delta_{VP}$	Vertical Settlement at a Profile Grade at a specific Station (cross-section).
$\Delta_{VA}$	Vertical Settlement at end of Approach Slab/Embankment
$\Delta_{VE}$	Vertical Settlement at the End Bent (Abutment).
$\Delta_{VT}$	Vertical Settlement of new embankment widening section at location of maximum settlement.
$\Delta_{VTS}$	Vertical Displacement at the Top of the Slope failure surface
$\Delta_{VBS}$	Vertical Displacement at the Bottom of the Slope failure surface
$\Delta_L$	Lateral Displacement
$\Delta_{LTS}$	Lateral Displacement at the Top of the Slope failure surface
$\Delta_{LBS}$	Lateral Displacement at the Bottom of the Slope failure surface
$\Delta L$	Deformation occurring along the critical failure surface due to slope instability.
$L_{Slab}$	Longitudinal Length of the approach slab
$L_L$	Longitudinal distance of area affected by the compressive soils producing embankment settlements.
$L_T$	Transverse distance that defines the span of maximum differential settlement from the existing embankment (no settlement or minimal settlement) to the location of maximum settlement for the portion of new embankment that has been widened.

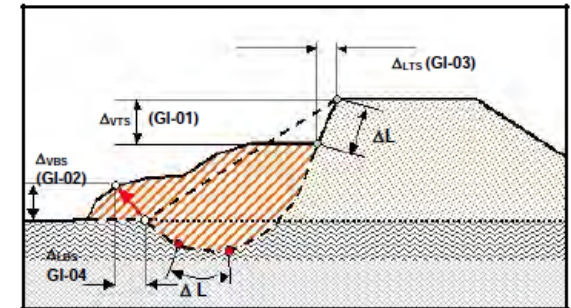


Figure 10-1, Embankment Circular Arc Instability

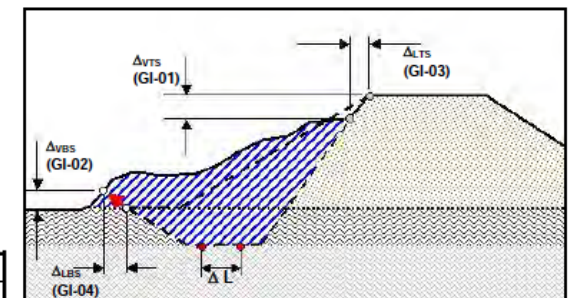


Figure 10-2, Embankment Sliding Block Instability

Table 10-28, Embankment Global Instability Performance Limits at EE I Limit State

Deformation ID No.	EE I Limit State Performance Limit Description <sup>(1)</sup>	Design EQ	ROC			
			I	II	III	
Vertical Displacement	GI-01	Maximum Vertical Displacement at top of the slope failure surface. (Inches)	FEE	1.00"	2.00"	4.00"
			SEE	2.00"	4.00"	8.00"
Vertical Displacement	GI-02	Maximum Vertical Displacement at bottom of the slope failure surface. (Inches)	FEE	1.00"	2.00"	4.00"
			SEE	2.00"	4.00"	8.00"
Lateral <sup>(2)</sup> Displacement	GI-03	Maximum Lateral Displacement at top of the slope failure surface. (Inches)	FEE	3.00"	6.00"	24.00"
			SEE	4.00"	12.00"	60.00"
	GI-04	Maximum Lateral Displacement at bottom of the slope failure surface. (Inches)	FEE	3.00"	6.00"	24.00"
			SEE	4.00"	12.00"	60.00"

<sup>(1)</sup> Project specific requirements may need to be selected for these performance limits if adjacent structures require more restrictive deformations. The geotechnical and structural engineers should evaluate these performance limits to determine applicability to the specific project.

<sup>(2)</sup> In the direction of global instability.

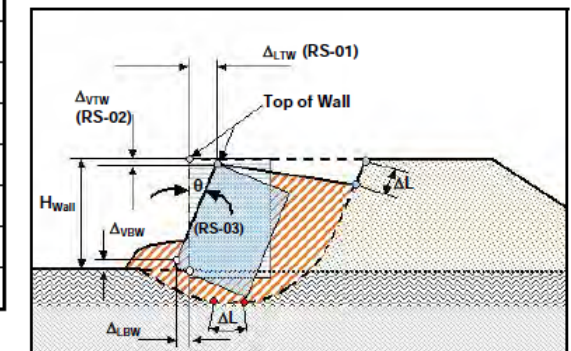


Figure 10-14, ERS Circular-Arc Instability (Section B-B)

# Geotechnical Investigation

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- 260 Test Locations (to date)
  - 58 “borings” from the Base Line Report
  - >200 “borings” during design-build phase.
  - Roughly half are CPT/DMT soundings
  - Roughly half are soil test borings
  - A “boring” at every bent, two at each abutment, and more along the roadways, walls, signs, etc.
  - In situ testing included vane shear, shear wave velocity (MASW and SCPT), and DMT
- Lots of coordination with Contractor for site access
  - Permission to access private property
  - Salt marsh areas, un-level areas
  - Wooded areas needed clearing
  - Traffic control (lots of traffic control)
- Field Exploration has been completed on time and on budget.



# Geotechnical Investigation



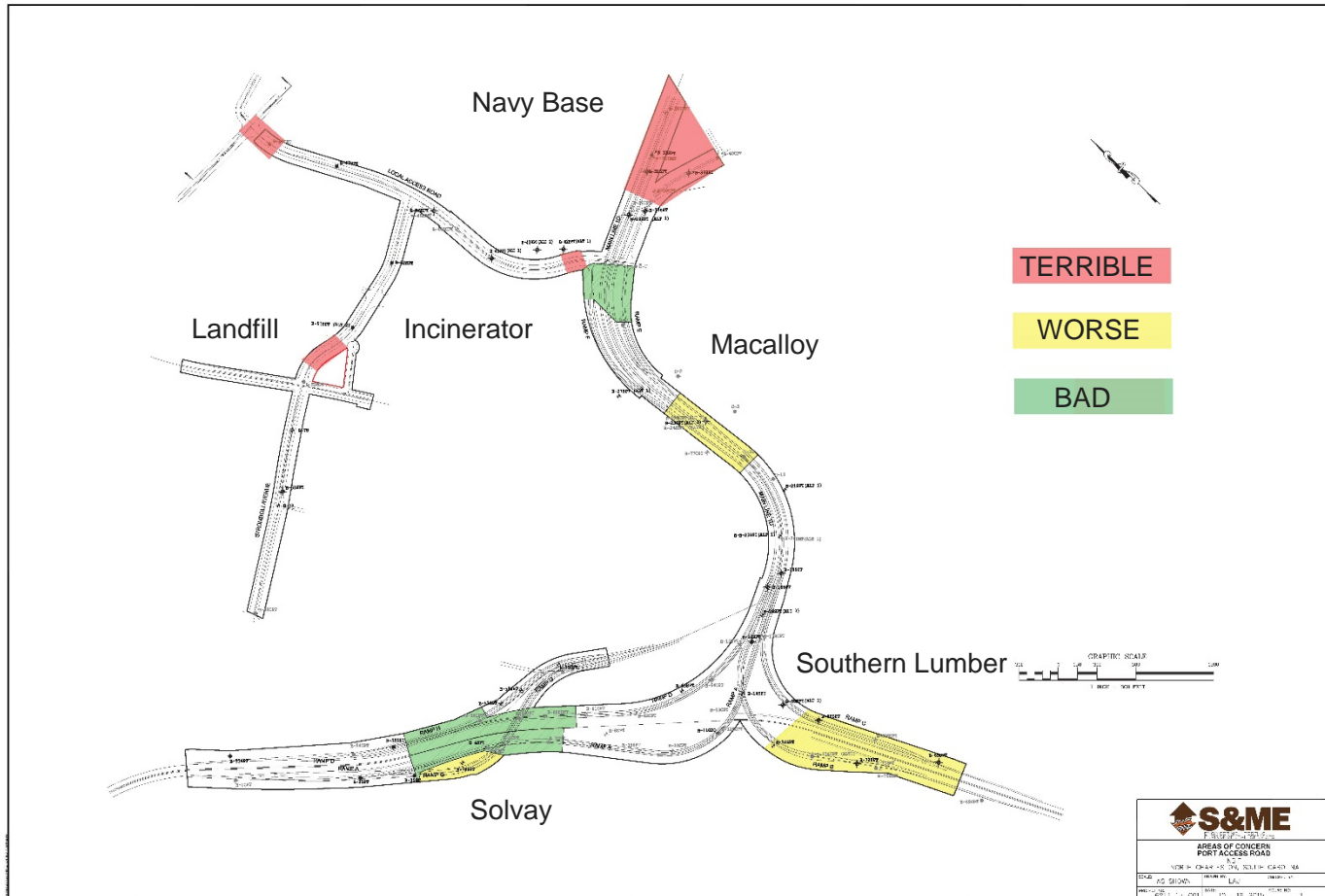
# HazMat Investigation

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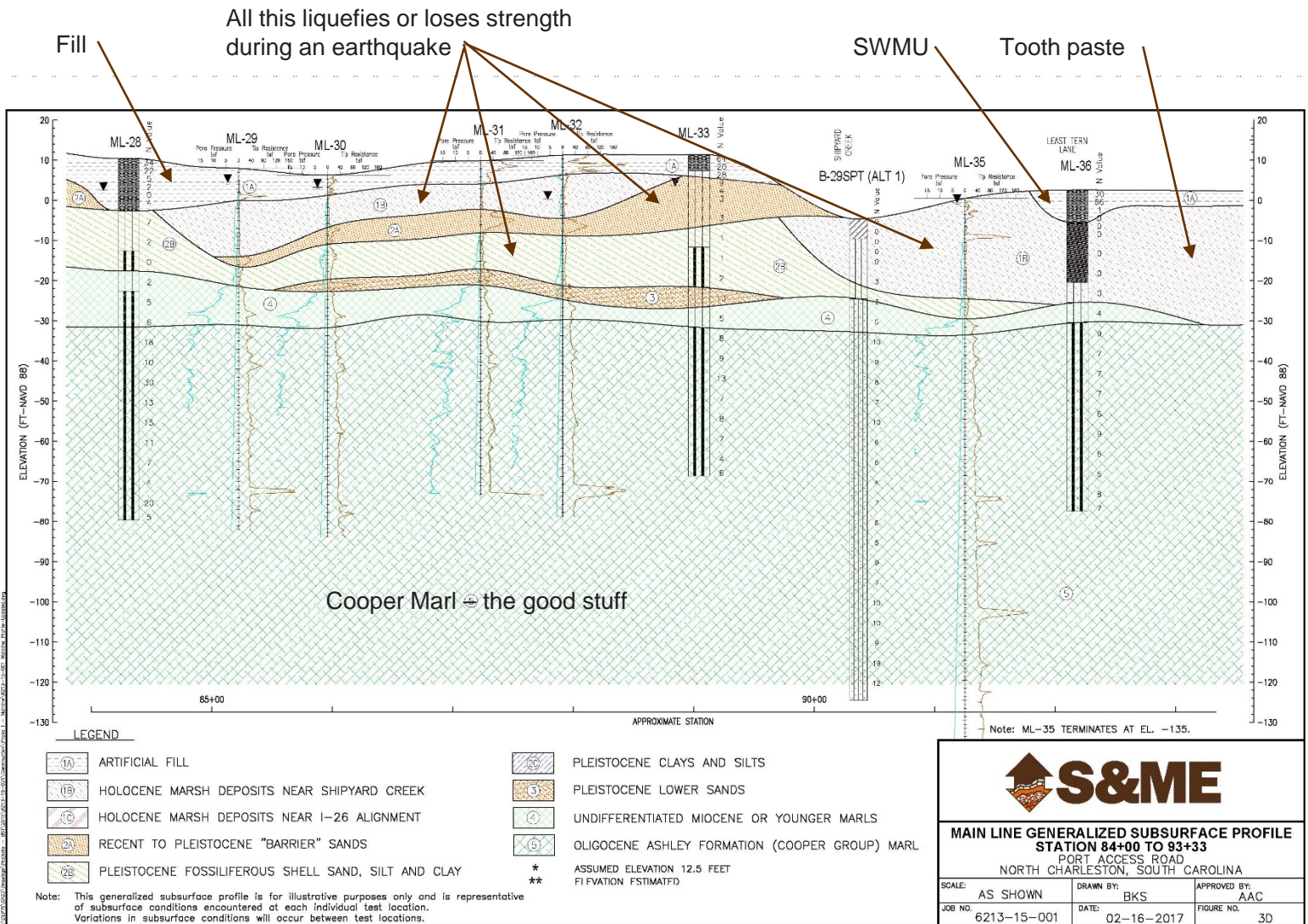
- Project is in the historic industrial “Neck Area” of Charleston
- Numerous parcels are contaminated
- SCDOT spent significant resources to study the project corridor and identify the parcels of concern and how those concerns would affect design and construction.
- Lots of scientists, engineers, and lawyers involved
- The Big ones:
  - Solvay, Navy Base, and Macalloy
  - Five other parcels with Voluntary Cleanup Contracts
  - Numerous other parcels with concerns, some to be found
- All drilled shaft and shallow excavations located on contaminated parcels require HAZMAT sampling and testing
  - Data collected is used to characterize the spoils for disposal
- This has been a significant effort, and has been completed on time and on budget.

# Findings

- Dear Flour-Lane, your subsurface conditions are bad, worse, and terrible. And, by the way...are contaminated.



# Findings



# Geotechnical Solutions

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- Bridge Foundations
  - Drilled Shafts
  - Driven Piles (HP, OEP (30” to 42”), and PSC)
- All shafts have permanent casing to the marl.
  - RFP and GDM do not allow axial resistance on casing
- Must consider downdrag and seismic soil strength loss in axial and lateral response analyses of shafts and piles
  
- Embankments and MSE Walls
  - Fill heights over 20 ft in many areas
  - EQ drains and surcharging in many areas
  - Column supported embankments in the “terrible” areas
    - Soils are just too bad
    - Accelerated project schedule does not allow time for surcharge program.
  
- Seismic design case controls everything.



# IV - Design

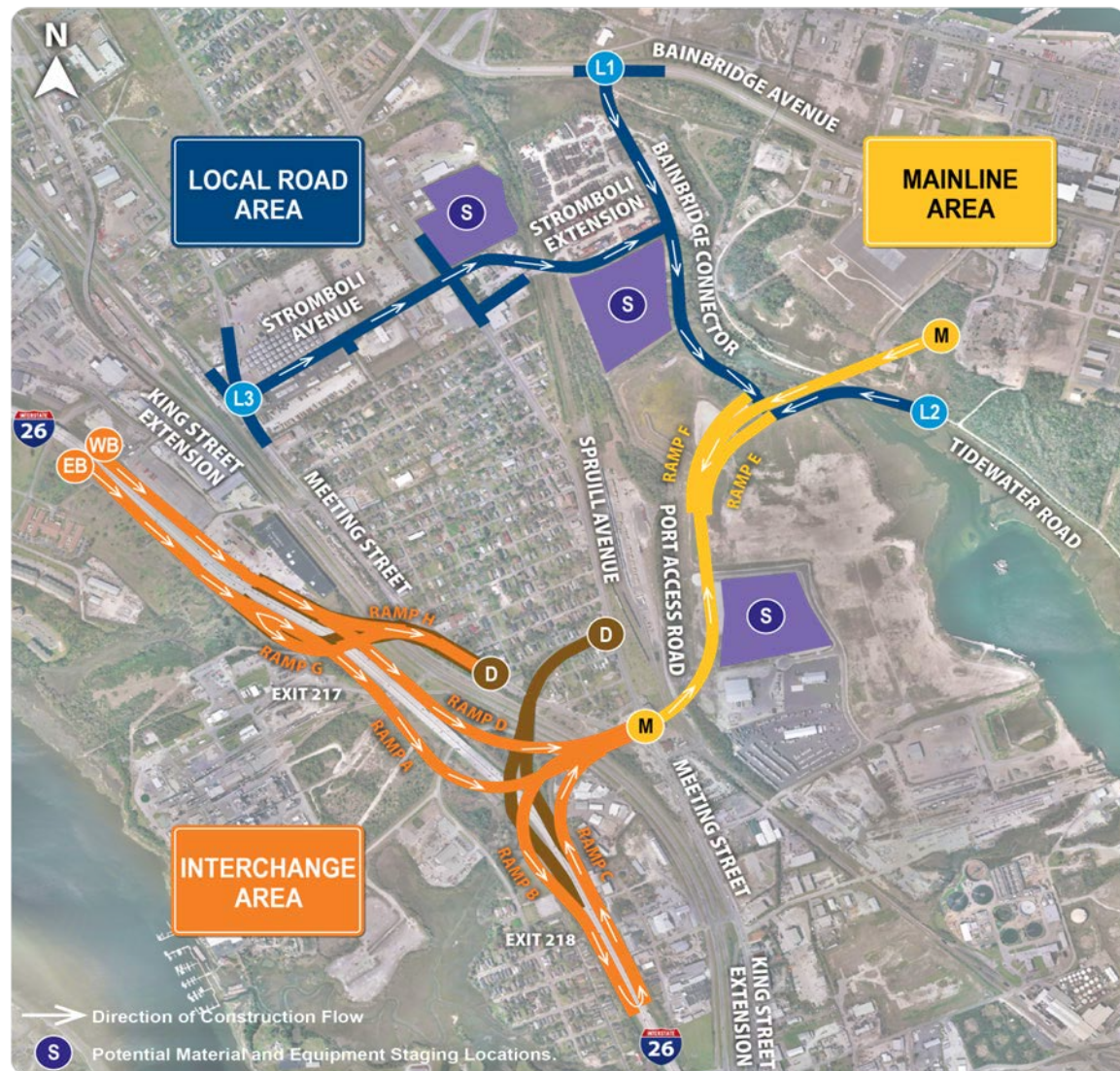
# Major Components

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- Meeting Street Interchange – I-26 Exit 217
  - Demolition and Reconstruction of existing interchange
- Fully Directional Interchange – I-26 Exit 218
  - Removal of existing Spruill Ave Ramps
  - 3-Level Interchange from I-26 to Port Access Roadway
- Port Access Road – 4-Lane Elevated Roadway
- Bainbridge Connector – 4-Lane Roadway and Structure
- Stromboli Avenue Improvements
- Bridge to Tidewater Road – Access to Marina and Port

# Division of Work

- **Mainline Area**
  - Elevated structure
  - Pipe pile foundations
  - Work from both ends
- **Interchange Area**
  - Demolition of existing ramps
  - 6 Ramp structures
  - Drilled shaft foundations
  - Work concurrently on EB and WB sides of I-26
- **Local Road Area**
  - Right-of-Way acquisition, utility and railroad coordination
  - Flat-slab bridge structures
  - Grading, drainage, paving



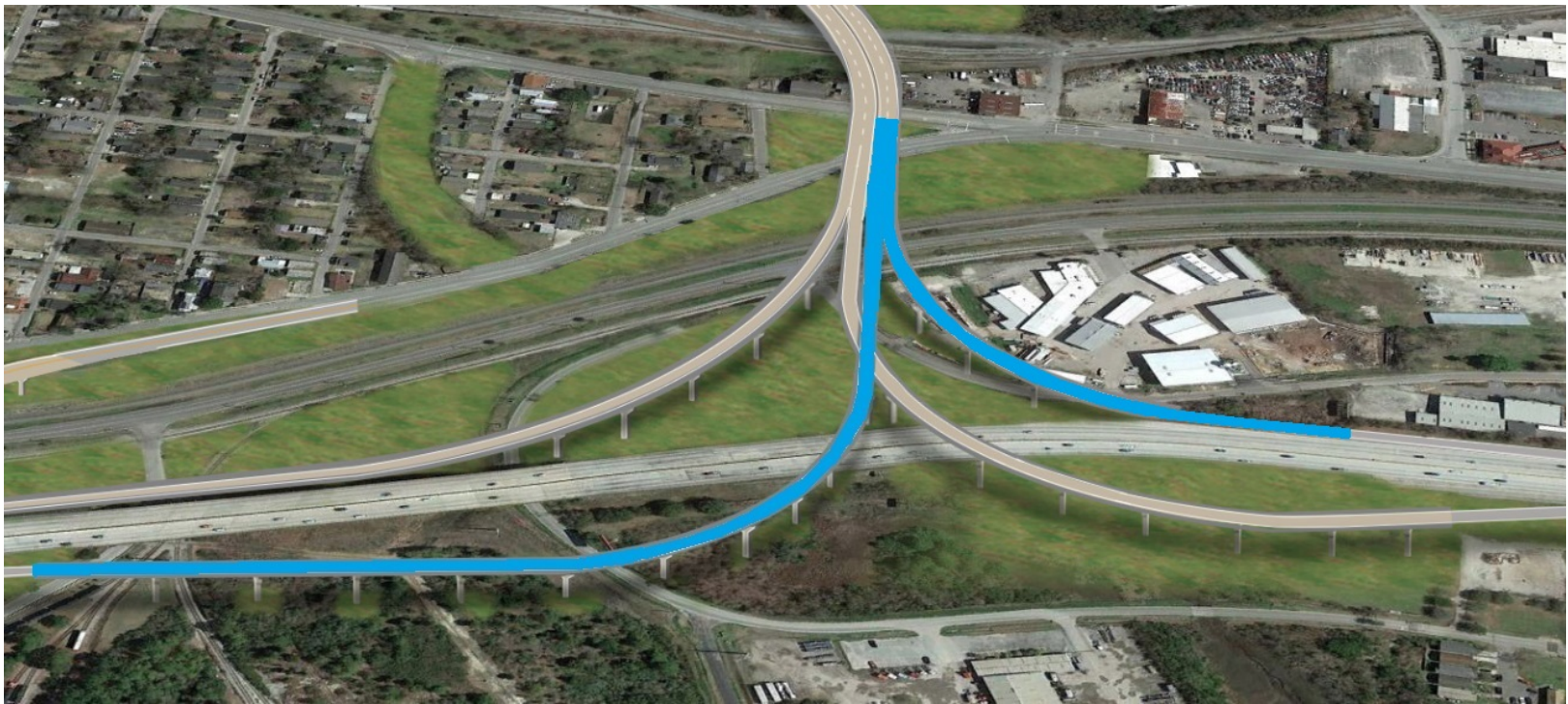


# I-26 Interchange Structures

## Exit 218

- 4 Structures – All have one 16 ft. lane with 10' and 6' shoulders

Interchange Ramps A & C (Movements to the Port)



# I-26 Interchange Structures

## Ramp A Bridge (I-26E to Port):

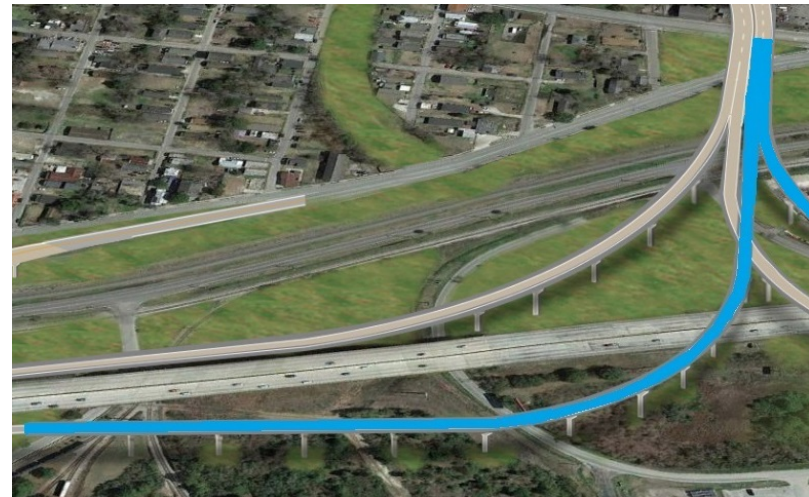
- Bridge Length = 2,629 ft.
- Bridge Width = 35'-3". (10' Shldr -16' Lane - 6' Shldr)
- 13 spans of BT-72 & 5 spans of 90" curved steel girders
- Foundations are mostly hammerhead piers on drilled shafts (6' to 11' Dia.) with some 3-column bents at merge of ramps

**HAZMAT  
CROSSING:  
Solvay Gypsum  
Stack**

**EXIT 218  
Ramps:  
Close During  
Construction**

## Crossings:

- Solvay Access Drive & Rail Spur (with screening wall on bridge)
- Austin Ave. twice
- I-26
- Ramp B
- Summerville Ave. (Closed)
- US 78 (King St. Extension)
- Two rail lines
- Meeting Street
- Spruill Ave



# I-26 Interchange Structures

## Ramp C Bridge (I-26W to Port):

- Bridge Length = 577 ft.
- Bridge Width = 35'-3". (10' Shldr -16' Lane - 6' Shldr)
- 7 spans of chorded BT-54's
- Foundations are hammerhead piers on drilled shafts (8.5' Dia.)

## Crossings:

- Summerville Ave. (Closed)
- Various commercial properties
- US 78 (King St. Extension)
- Two rail lines
- Merges into Ramp A



Summerville Ave:  
Close & Rework

# I-26 Interchange Structures

Interchange Ramps B & D (Movements from the Port)



# I-26 Interchange Structures

## Ramp B Bridge (Port to I-26E):

EXIT 218 Ramps:  
Close During Construction

- Bridge Length = 1,307 ft.
- Bridge Width = 35'-3". (10' Shldr -16' Lane - 6' Shldr)
- 7 spans of 90" curved steel girders and 1 span straight steel girders
- Foundations are hammerhead piers on drilled shafts (9.5' Dia.)

## Crossings:

- US 78 (King St. Extension)
- Two rail lines
- Austin Ave. (to remain)
- Under Ramp A
- I-26 (Solvay screen wall)



# I-26 Interchange Structures

## Ramp D Bridge (Port to I-26W):

- Bridge Length = 2,038 ft.
- Bridge Width = 35'-3". (10' Shldr -16' Lane - 6' Shldr)
- 13 spans of BT-72's and 2 spans of 102" curved steel
- Foundations are hammerhead piers and multi-column bents on drilled shafts (6.5' Dia. To 9' Dia.)

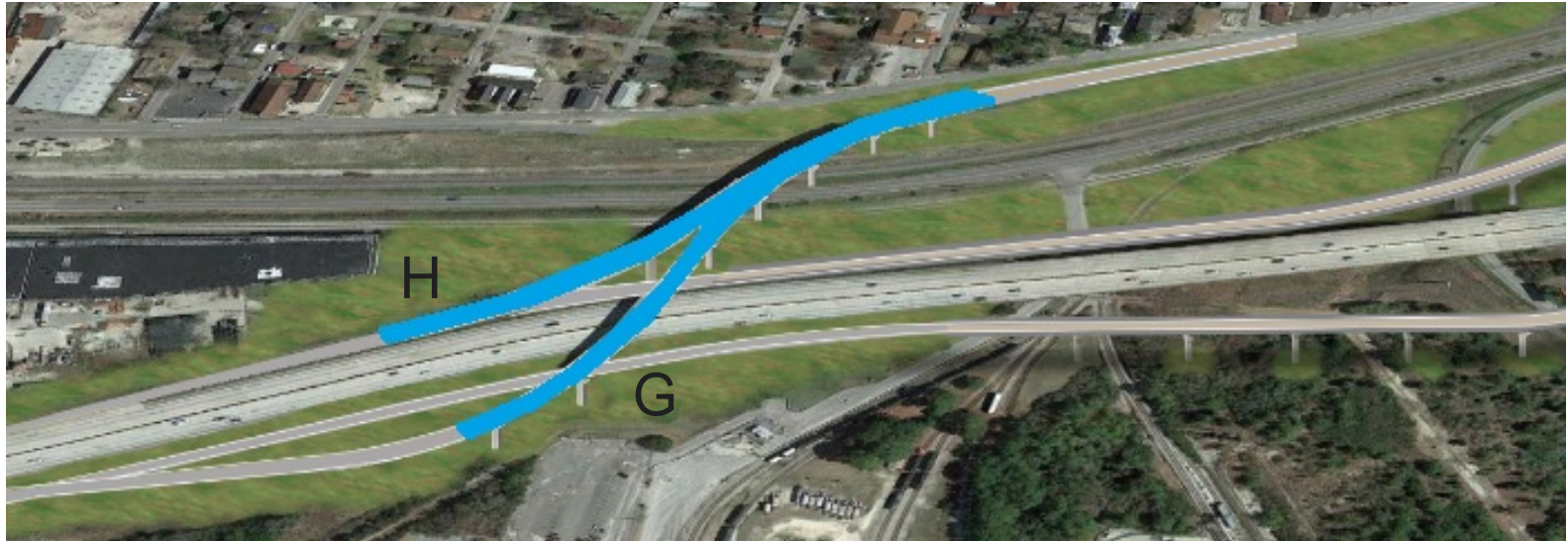
## Crossings:

- US 78 (King St. Extension)
- Two rail lines
- Austin Ave. Twice (to remain open)
- Exit 218 (Spruill Ave Ramps)
- Rail Spur and Solvay Access Drive

EXIT 218 Ramps:  
Close During Construction



# I-26 Interchange Structures



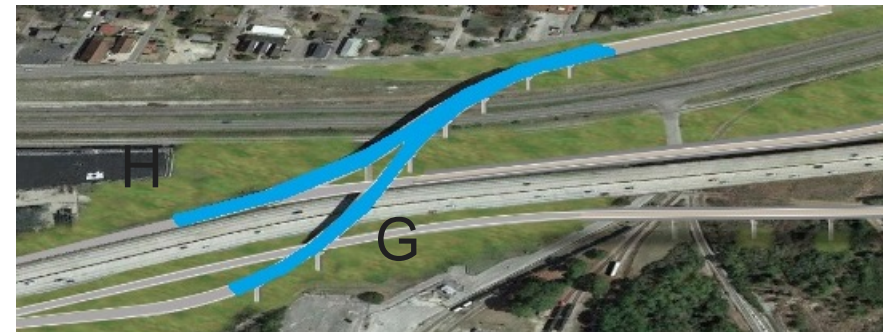
## Exit 217

- 2 Structures & collector-distributor roads to Exit 218
- Generally built in same location as existing ramps

# I-26 Interchange Structures

## Ramps G & H (Exit 217):

- Bridge Lengths = 1146 ft. (Ramp G) & 987 ft. (Ramp H)
- Bridge Width = Ramp G: 38'-9" (10' Shldr -16' Lane – 9'-6" Shldr)
- Bridge Width = Ramp H: 35'-3" (10' Shldr -16' Lane – 6'-0" Shldr)
- Ramp G: 8 spans 69" & 72" steel plate girders. Hammerhead and Multi-column bents on 6' -9' Dia. shafts
- Ramp H: 10 spans chorded BT-54's and Bt-72's. Hammerhead and Multi-column bents on 6' -10' Dia. shafts
- Ramp G Crossings (I-26E to Meeting St):
  - *Ramp A, I-26, Ramp D, US-78 (Kings St.), Two rail lines, Meeting St.*
- Ramp H Crossings (Meeting Street to I-26 W):
  - *US-78 (Kings St.), Two rail lines, Meeting St., Merges with Ramp D*



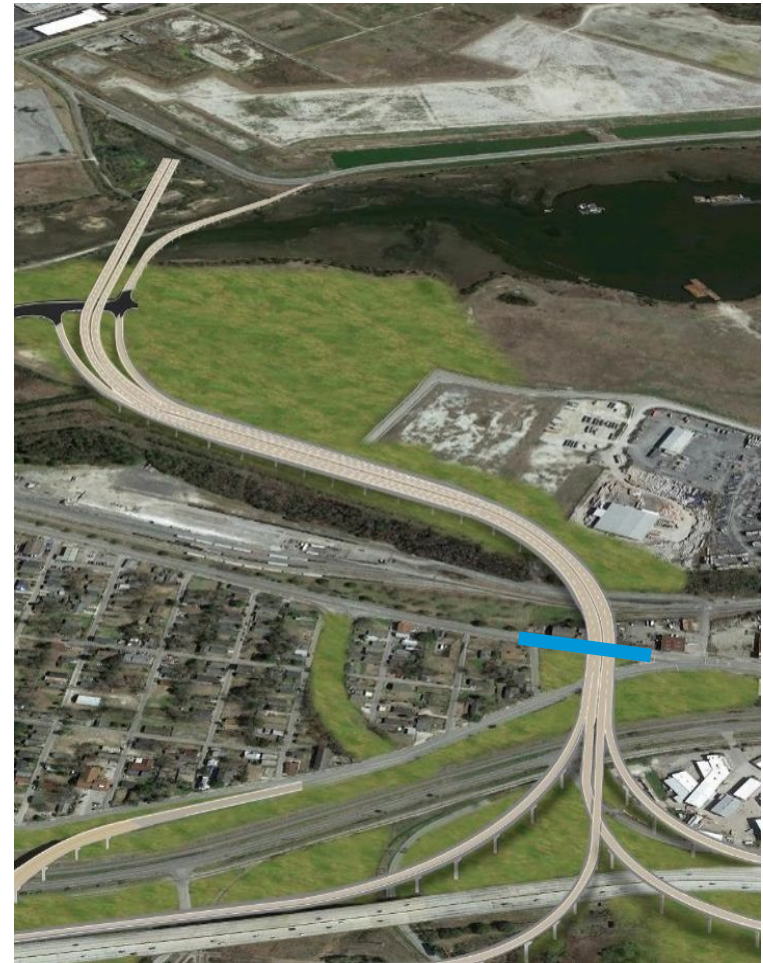


# Mainline Structures

## Port Access Road Mainline:

- Two parallel bifurcated structures ending at El. 14.0
- Bridge Length = 4,285 SB from Port & 4,282 NB to Port
- Bridge Width = 49'-3" each structure and varies
- Crossings:
  - Starts after ramps cross Spruill Ave.
  - Two CSX Rail Lines
  - Macalloy Property
  - Bainbridge Connector
  - Shipyard Creek, Associated Wetlands

**HAZMAT CROSSING:  
Macalloy Property**



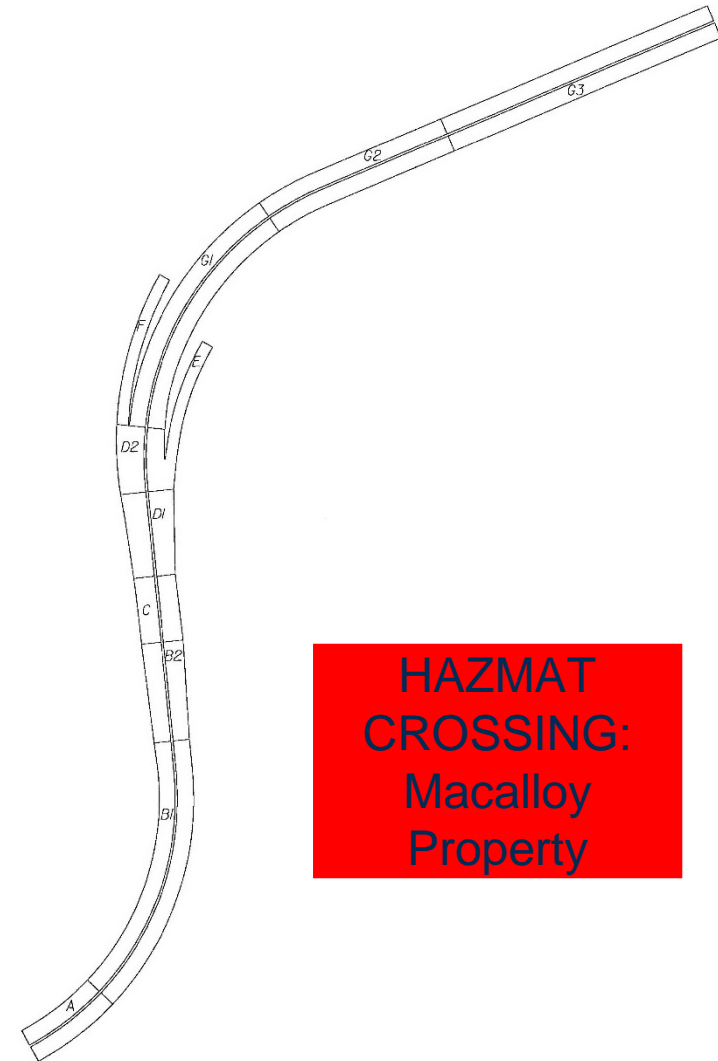
# Mainline Structures

## Port Access Road Mainline Superstructure:

- 2 spans of 66" curved steel girders
- 1 span of 82" steel girders
- 40 spans of chorded AASHTO Type IV's

## Port Access Road Mainline Substructure:

- Multi-column bents on ground level footings
- Each footing supported by 30 or 36" Dia. Pipe pile group

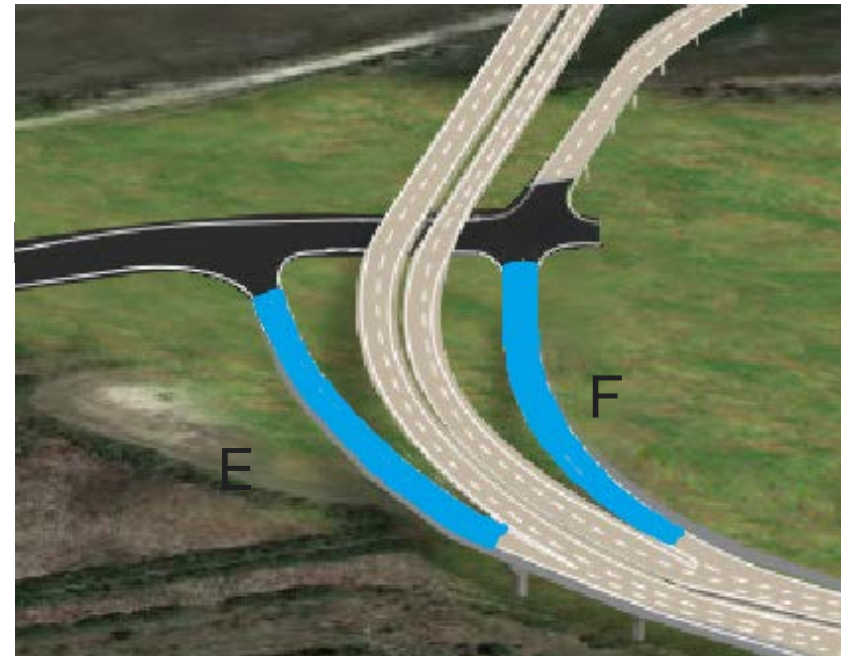


**HAZMAT  
CROSSING:  
Macalloy  
Property**

# Mainline Structures

## Port Access Road Ramps E & F:

- Bridge Lengths = 340 ft. (Ramp E) \ 450 ft. (Ramp F)
- Bridge Width = 35'-3" (10' Shldr -16' Lane - 6' Shldr)
- Ramp E: 4 spans of AASHTO Type IV's
- Ramp F: 5 spans of AASHTO Type IV's
- Multi-column bents on Pile Footings
- Transition to Embankment
  - *MSE walls and reinforced slopes*
  - *About 10-15 ft. high*



# Local Access Structures

## Bainbridge Connector & Tidewater Road:

Bridge Lengths = 1,041 ft. Bainbridge & 866 ft. Tidewater

Bridge Width = Bainbridge: 85'-10" varies to 74'-10" &  
Tidewater 39'-3"

Crossing wetlands and creeks

Cast-In-Place Flat slabs on PSC Pile Bents (30-40 ft. spans)



# Local Access Structures

## Stromboli Extension:

Bridge Length = 645 ft.

Bridge Width 89'-4"

Crossing existing and proposed RR

7 Cast-In-Place Flat slabs on PSC Pile Bents (30-40 ft. spans)

3 spans AASHTO Type IV's

Multi-column bents on 7' Dia. shafts and 24" concrete pile bents used



# Local Access Roads



## Bainbridge Connector

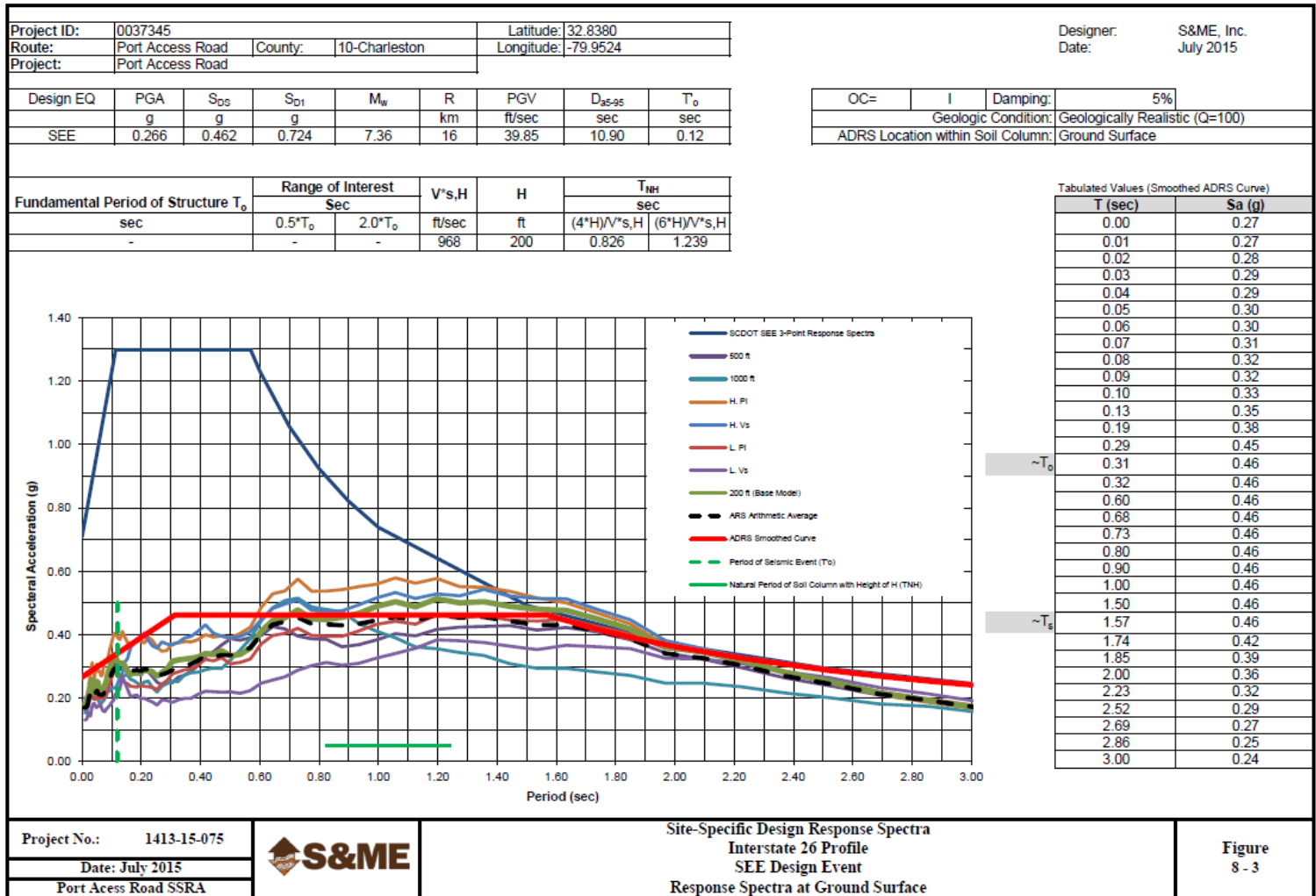
- Two 12-foot travel lanes in each direction
- 15-foot flush median, curb and gutter, 5-foot sidewalk on right outside shoulder, 10-foot shared use path on left outside shoulder
- Contractor shall separate the 10-foot path from back of curb with a 3-foot wide earth strip
- Contractor shall separate the 5-foot sidewalk from back of curb with a 2-foot wide earth strip.

# Local Access Roads



- **Stromboli Ave & Spruill Improvements**
  - **Grade Separation**
  - **New Signal**
  - **Widening and New Roadway**

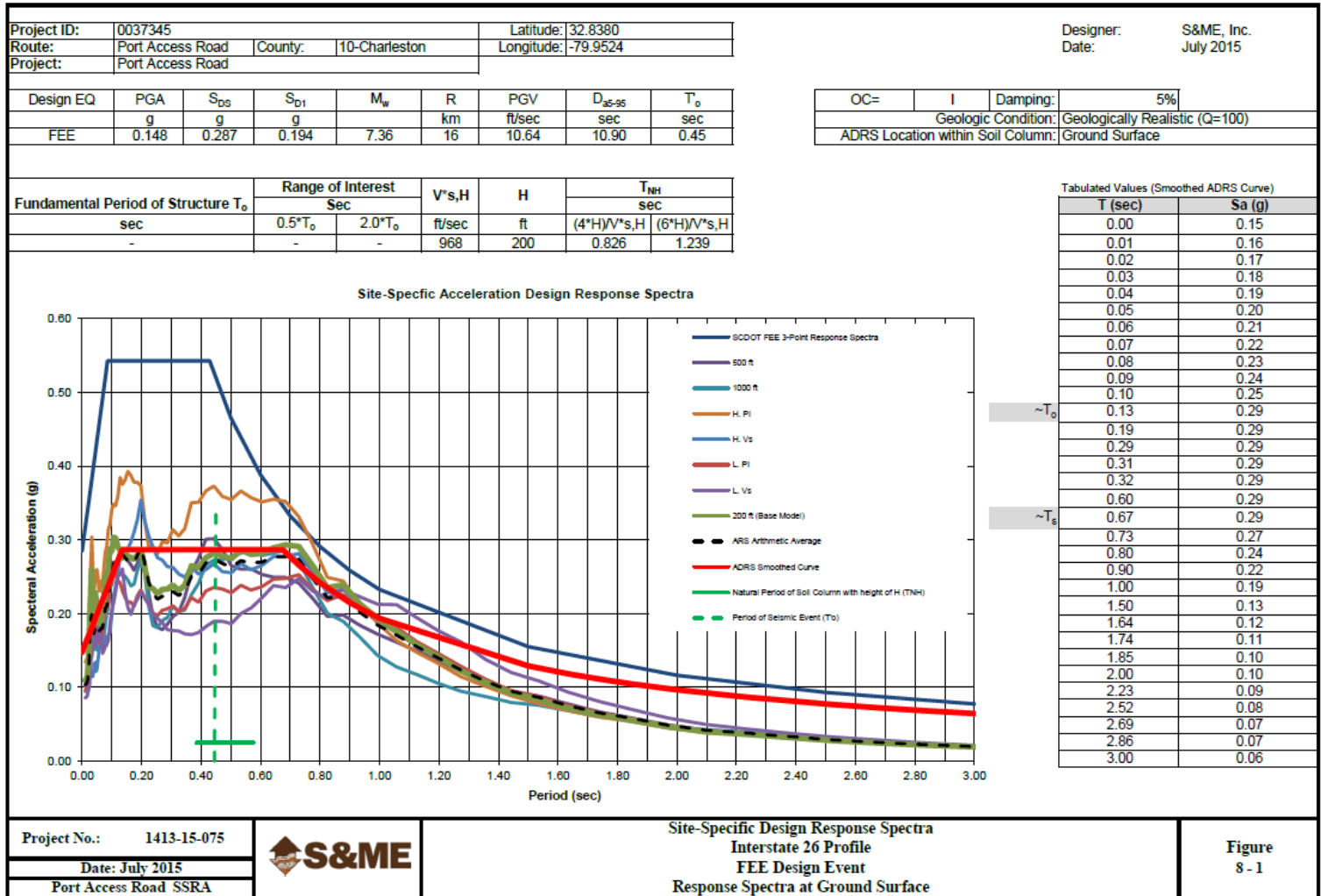
# Seismic



- Safety - 3% possibility of exceedance in 75 years

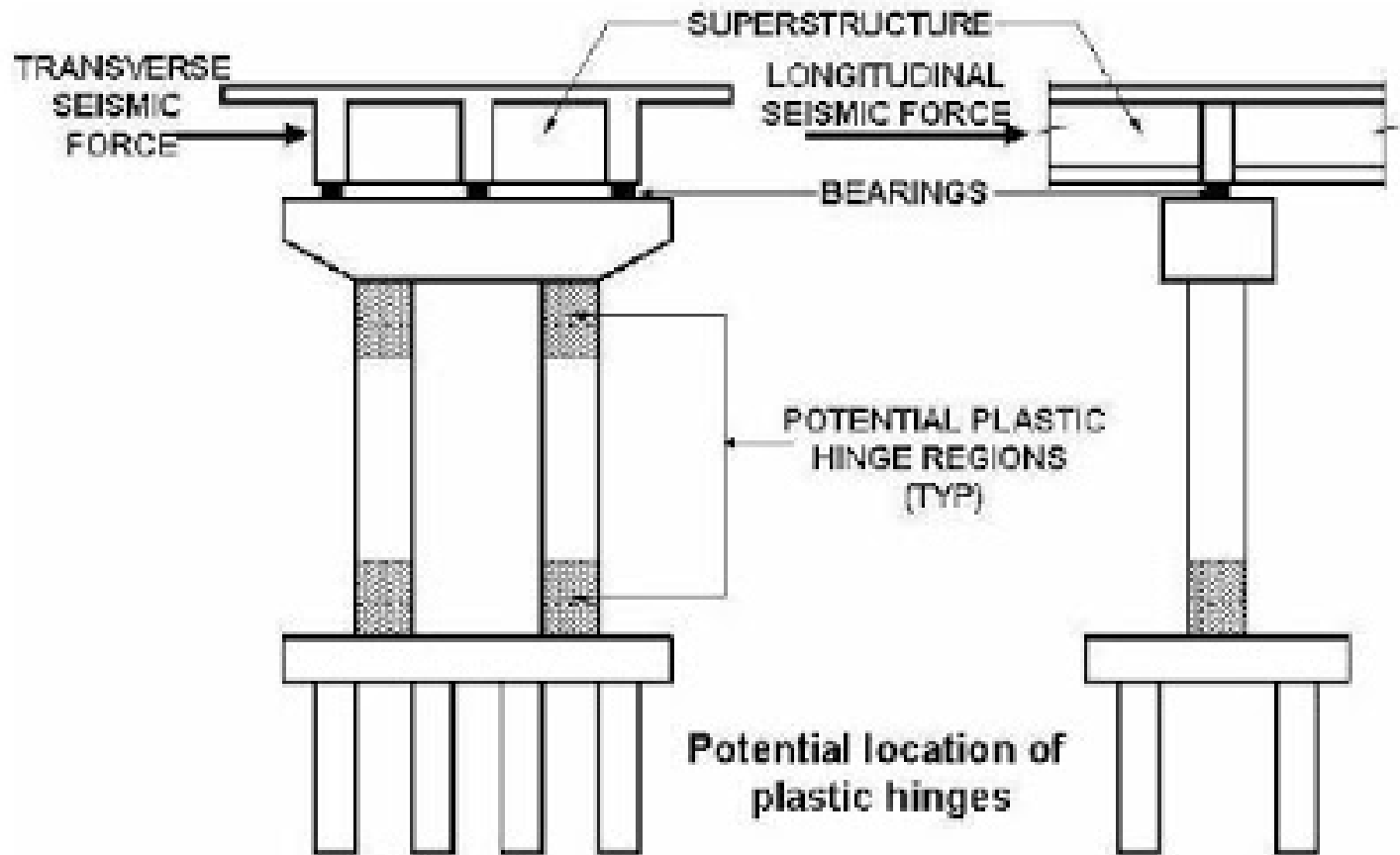


# Seismic

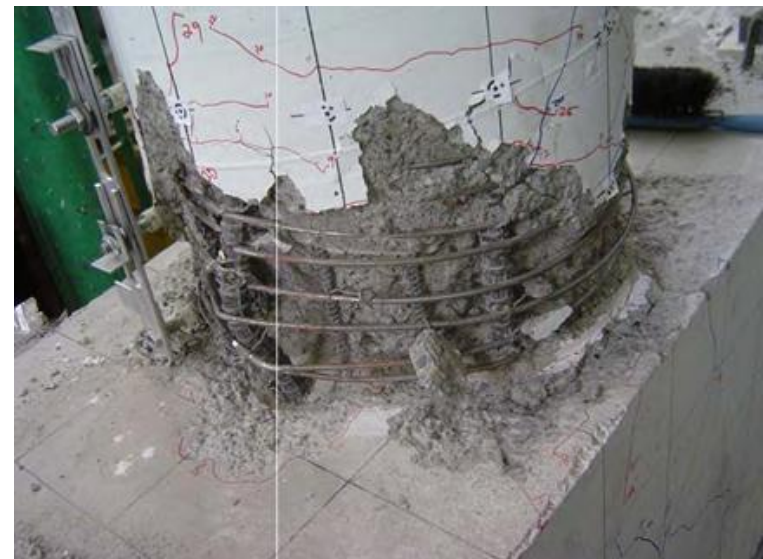


- Functional - 15% possibility of exceedance in 75 years

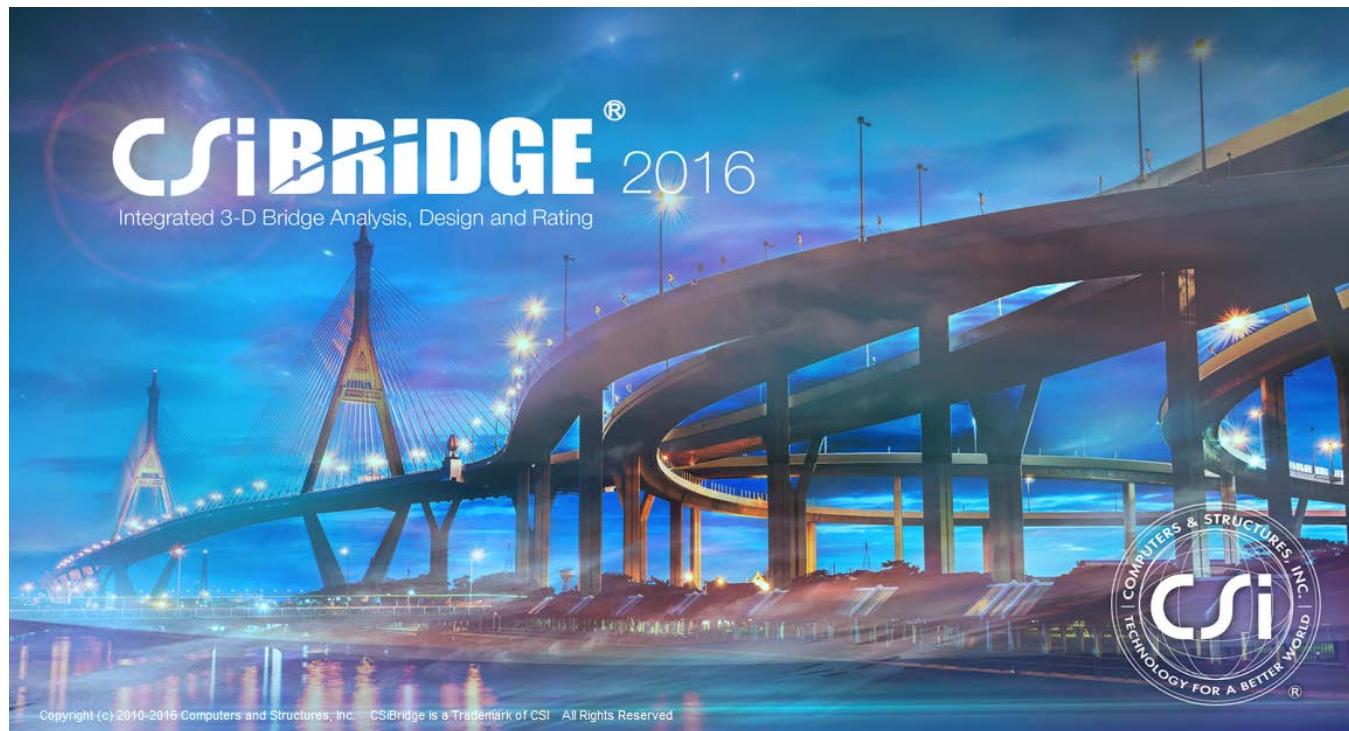
# Seismic



# Seismic



# Seismic



Seismic Design is in accordance with the 2008 SCDOT "Seismic Design Specifications for Highway Bridges", Version 2.0, with the following parameters:

Seismic Design Category: C

Analysis Method: Multimode Spectral with Pushover

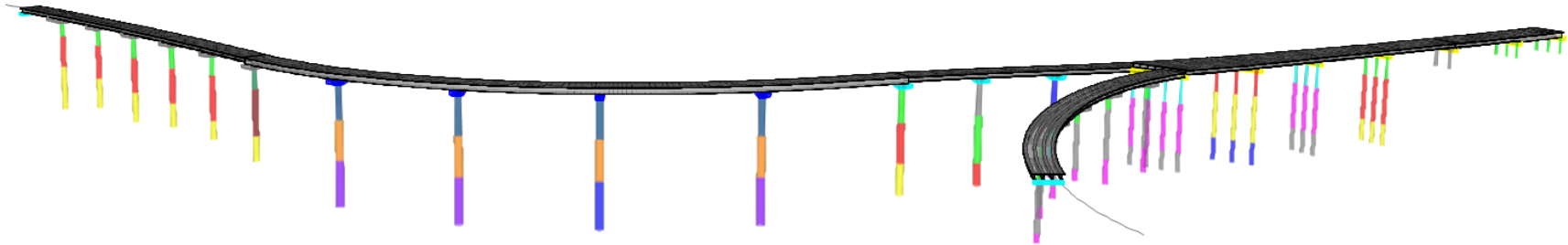
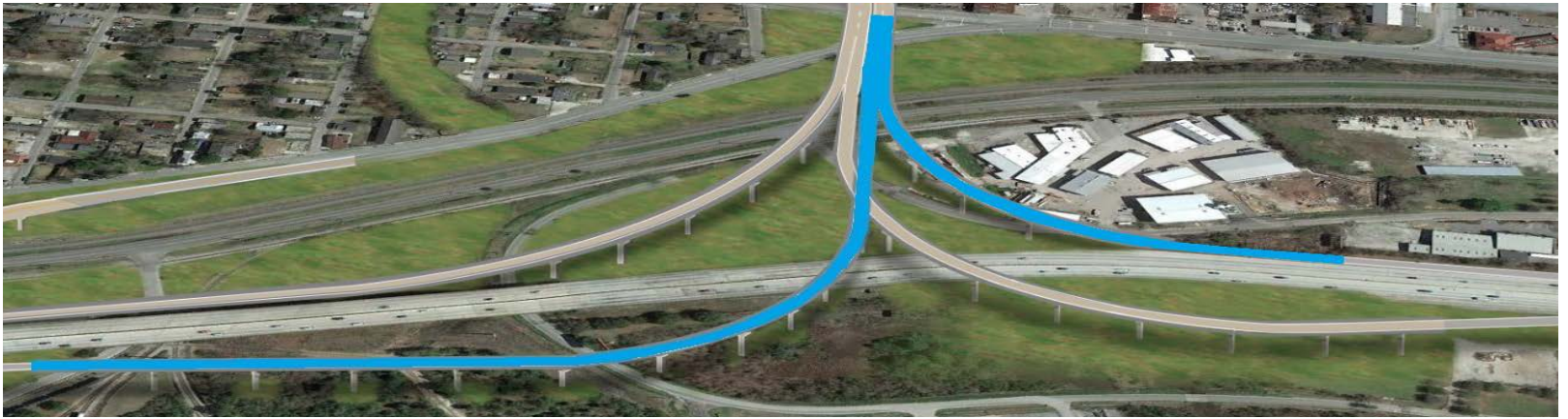
Operational Classification: II

Site Class: D

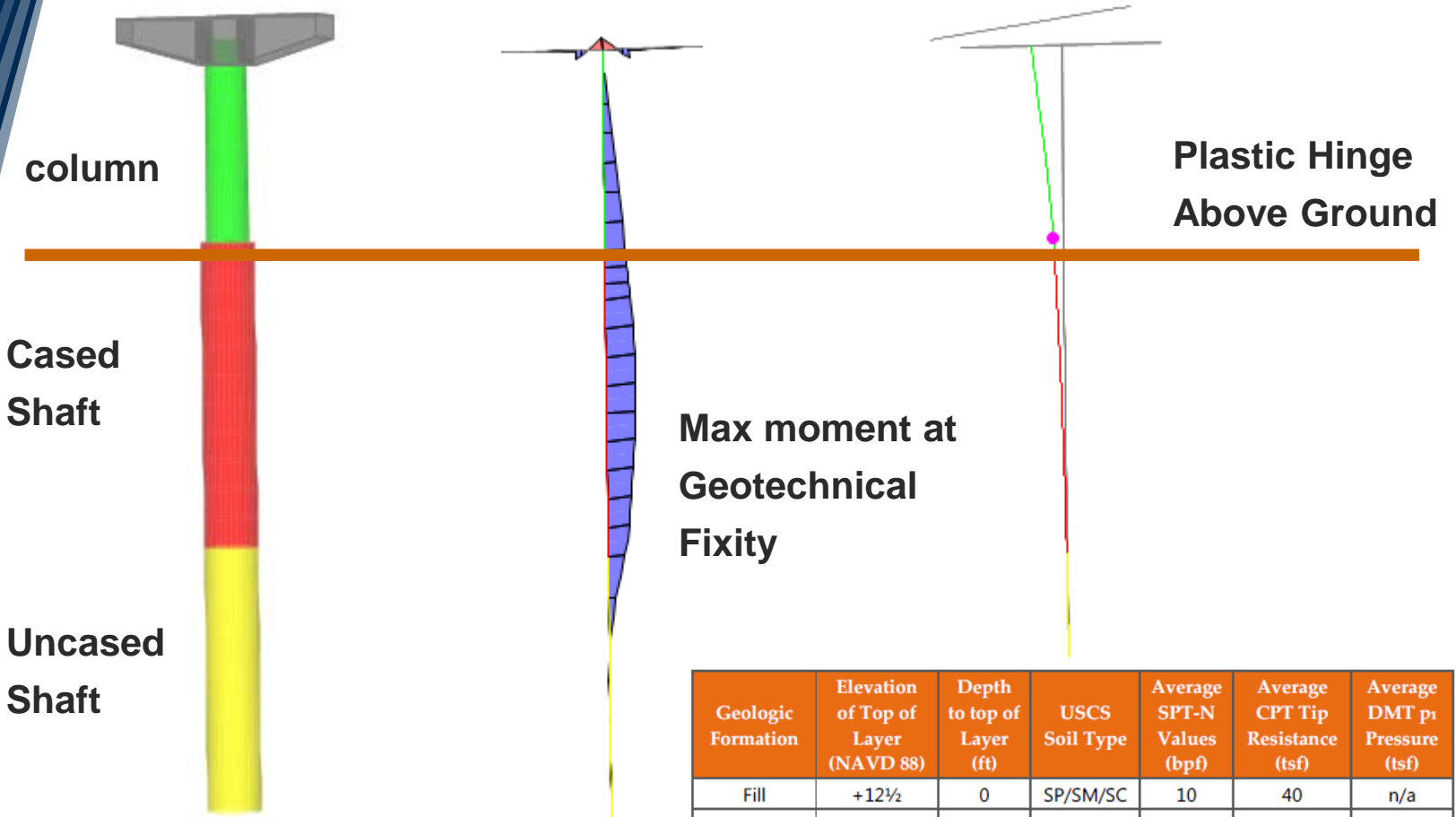
Design Acceleration Coefficients:

# Seismic

## Seismic Model for Ramps A and C



# Seismic



Geologic Formation	Elevation of Top of Layer (NAVD 88)	Depth to top of Layer (ft)	USCS Soil Type	Average SPT-N Values (bpf)	Average CPT Tip Resistance (tsf)	Average DMT $p_1$ Pressure (tsf)
Fill	+12½	0	SP/SM/SC	10	40	n/a
Holocene	0	5	CH/ML	2	5	n/a
Pleistocene	+5	2	SP/SM/SC ML/CH	10	30	n/a
Marl	-35	43	ML	12	35	n/a



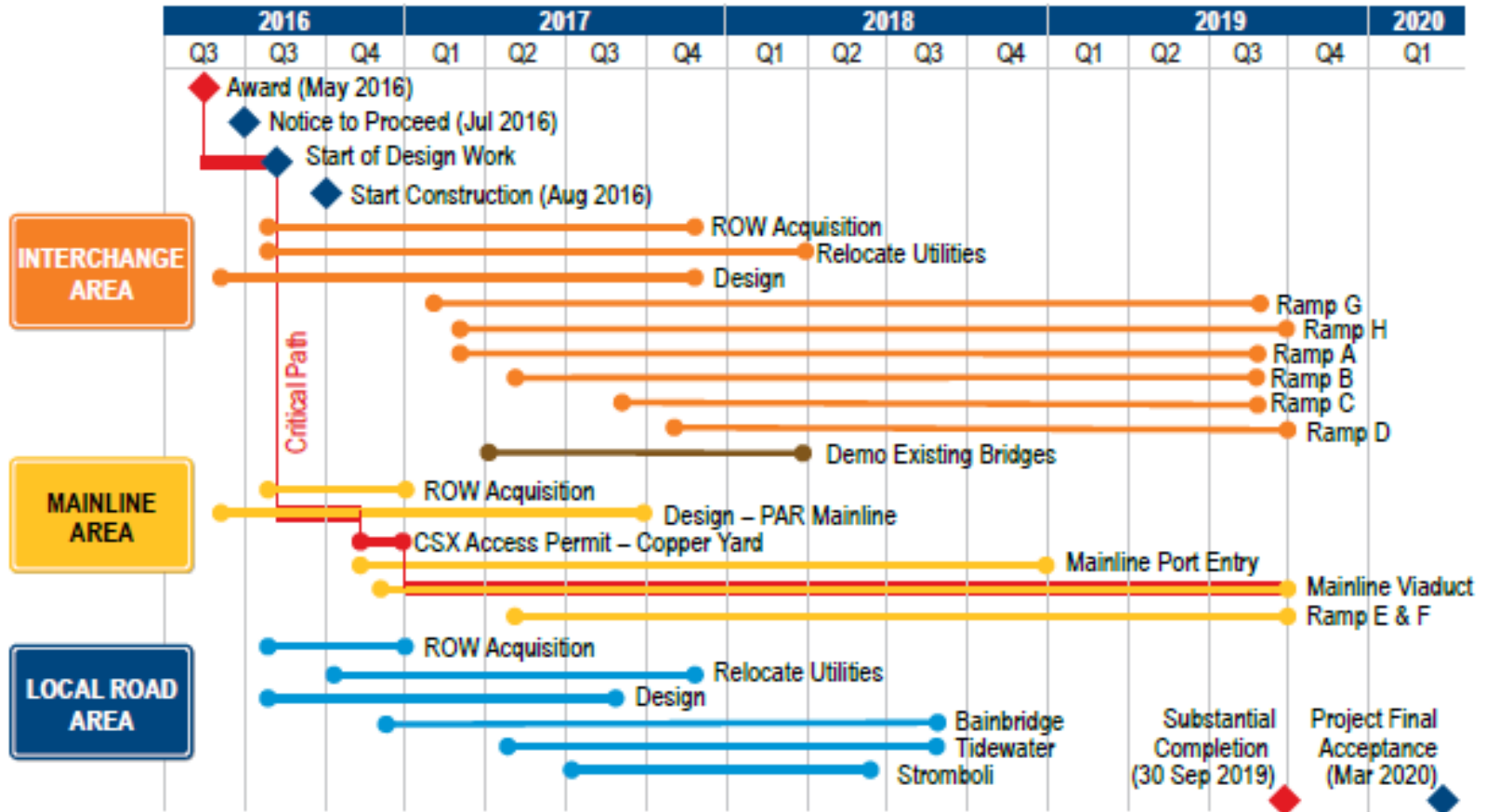


# V - Construction



# Schedule

## Project Schedule



# Demolition



# Demolition



# Demolition



# Demolition



# Demolition



# Demolition



# Construction

