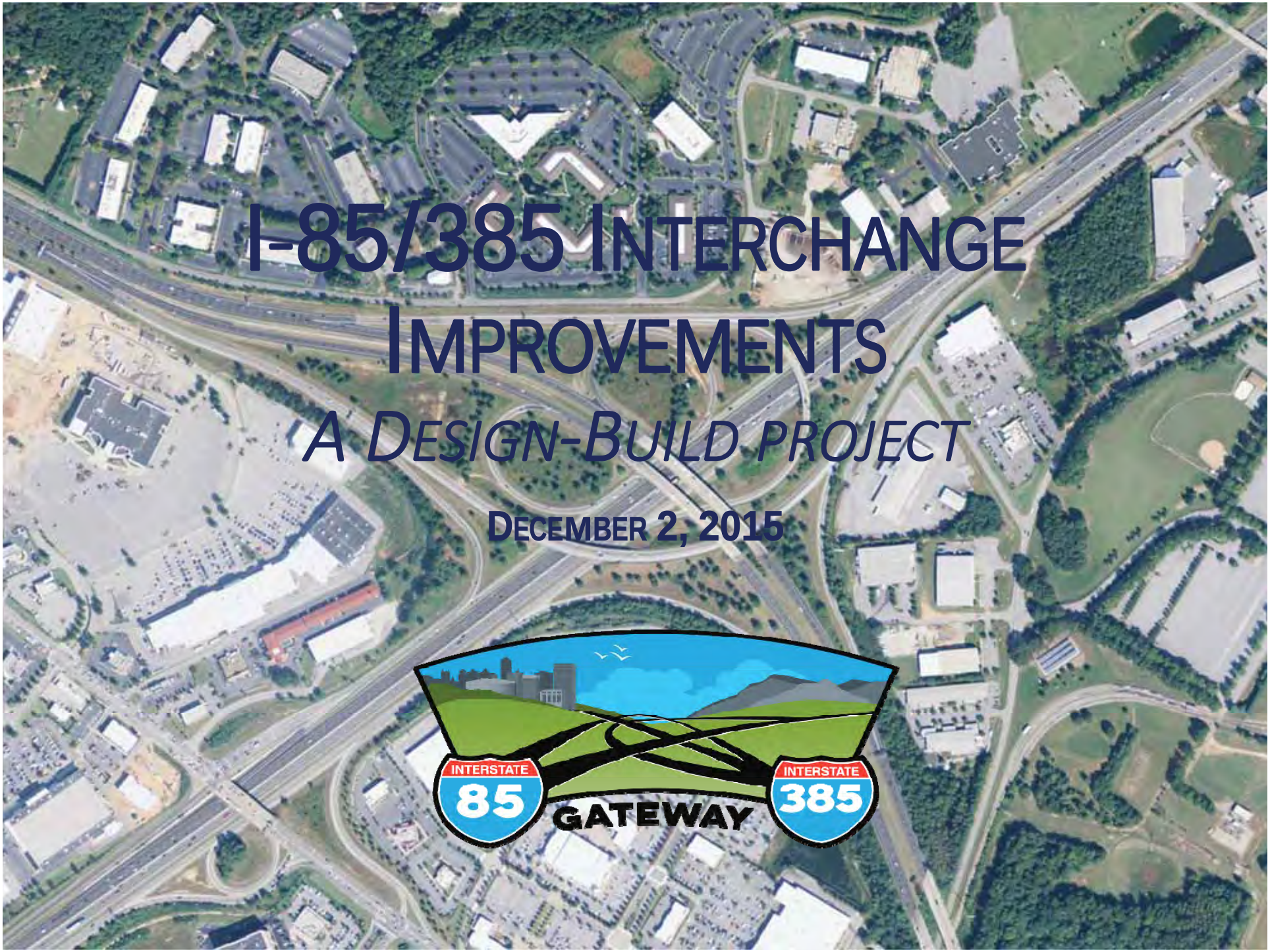


I-85/385 Interchange Improvements

A Design-Build Project

December 2, 2015

INTERSTATE 85 GATEWAY INTERSTATE 385

PROJECT TEAM

Owner

SCDOT
South Carolina Department of Transportation

Contractor

FLATIRON | ZACHRY
a joint venture

Designers

Civil Engineering Consulting Services, Inc.

T·Y·LIN

Mead & Hunt

Stantec

INDEPENDENT MAPPING CONSULTANTS

ECS

ARM ENVIRONMENTAL SERVICES, INC.

PAN PROPERTY ACQUISITIONS & NEGOTIATIONS, Inc.

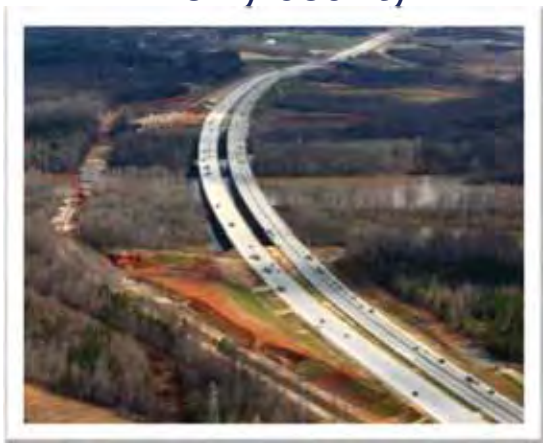
thompson ENGINEERING

Complete PUBLIC RELATIONS

FLATIRON

- Headquartered in Denver, Colorado
- Annual construction volume of $1 billion
- Ranked eleventh for Top Transportation Contractors and 14 of 50 for Top Domestic Heavy Contractors by ENR (2015)
- Constructing Carolina Bays Parkway

Carolina Bays Parkway
Horry County



I-85/Yadkin River Bridge
Salisbury, NC

Reconstruction of
I-880/SR92 interchange

SR60 Tampa Airport/Interchanges

ZACHRY

- Headquartered in San Antonio, Texas; ranked 29 on ENR 2015 Top 400 Contractors
- In the last five years has completed four DB projects with a construction value of $3.2 billion
- Recently completed widening of I-20 in Richland County

I-20 Widening
Richland County

Dallas/Fort Worth Connector

Loop 375 at I-10 Interchange

Dallas County IH 635
Interchange - High Five

PROJECT HISTORY

- Began in 2008 with F&H selected for interchange design
- RFQ published – July 1, 2013
- Final RFP released – March 27, 2014
- Proposals Accepted
  - Design-build proposal – July 21, 2014
  - Cost Proposal – August 6, 2014
  - Selection made – August 12, 2014
- Notice to Proceed #1 – October 27, 2014

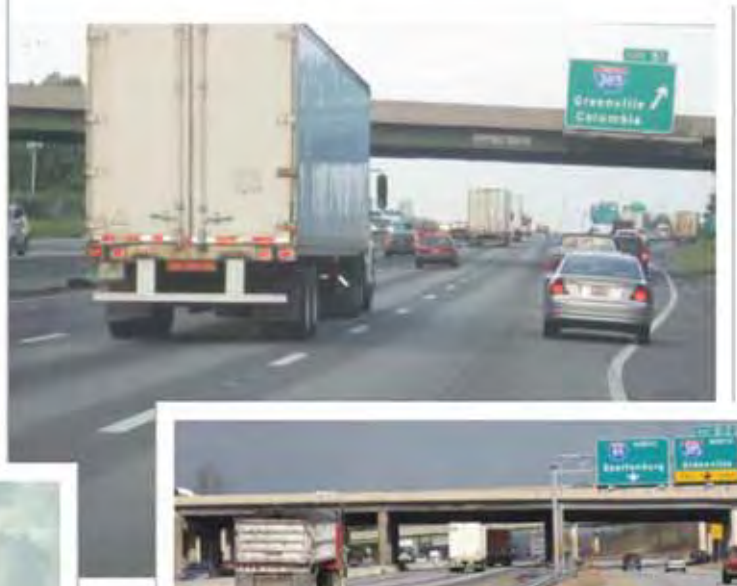
FLATIRON | ZACHRY | CJCS Civil Engineering Consulting Services, Inc.

85 GATEWAY 385

THE INTERCHANGE

FLATIRON | ZACHRY | CJCS Civil Engineering Consulting Services, Inc.

THE INTERCHANGE



GENERAL SCHEDULE

- NTP1 – October 27, 2014
- NTP2 – December 14, 2015
- Contract Completion time – 1035 days (September 2018)

Overall Project Delivery Time 2008 to 2018 = 10 Years

THE DESIGN TEAM

Civil Engineering Consulting Services, Inc.	Roadway, Drainage, Bridge Design
T.Y. Lin International	Bridge Design
Stantec Consulting Services, Inc.	Maintenance of Traffic, Bridge & Wall Design
Mead & Hunt, Inc.	Bridge Design, Survey
ECS, Ltd.	Geotechnical Design
Property Acquisitions & Negotiations, Inc.	Right of Way Acquisition Services
Thompson Engineering	Geotechnical Exploration and Testing
Complete Public Relations	Public/Community Relations
ARM Environmental Services, Inc.	Hazmat
Independent Mapping Consultants	Mapping

EXISTING INTERCHANGE

FLATIRON | ZACHRY | CFCS Civil Engineering Consulting Services, Inc.

85 GATEWAY 385

NEW INTERCHANGE

PROJECT STATISTICS

- $231 Million for Design, ROW, and Construction
- 7.1 miles of Mainline Interstate
- 10 miles of Ramps
- 2.9 miles of Collector/Distributor Roads
- 1.9 miles of Local Streets and Roads
- 4.6 miles of Interstate Rehabilitation
- 39 Retaining Walls
- 12 Bridges

FLATIRON | ZACHRY | CFCS Civil Engineering Consulting Services, Inc.

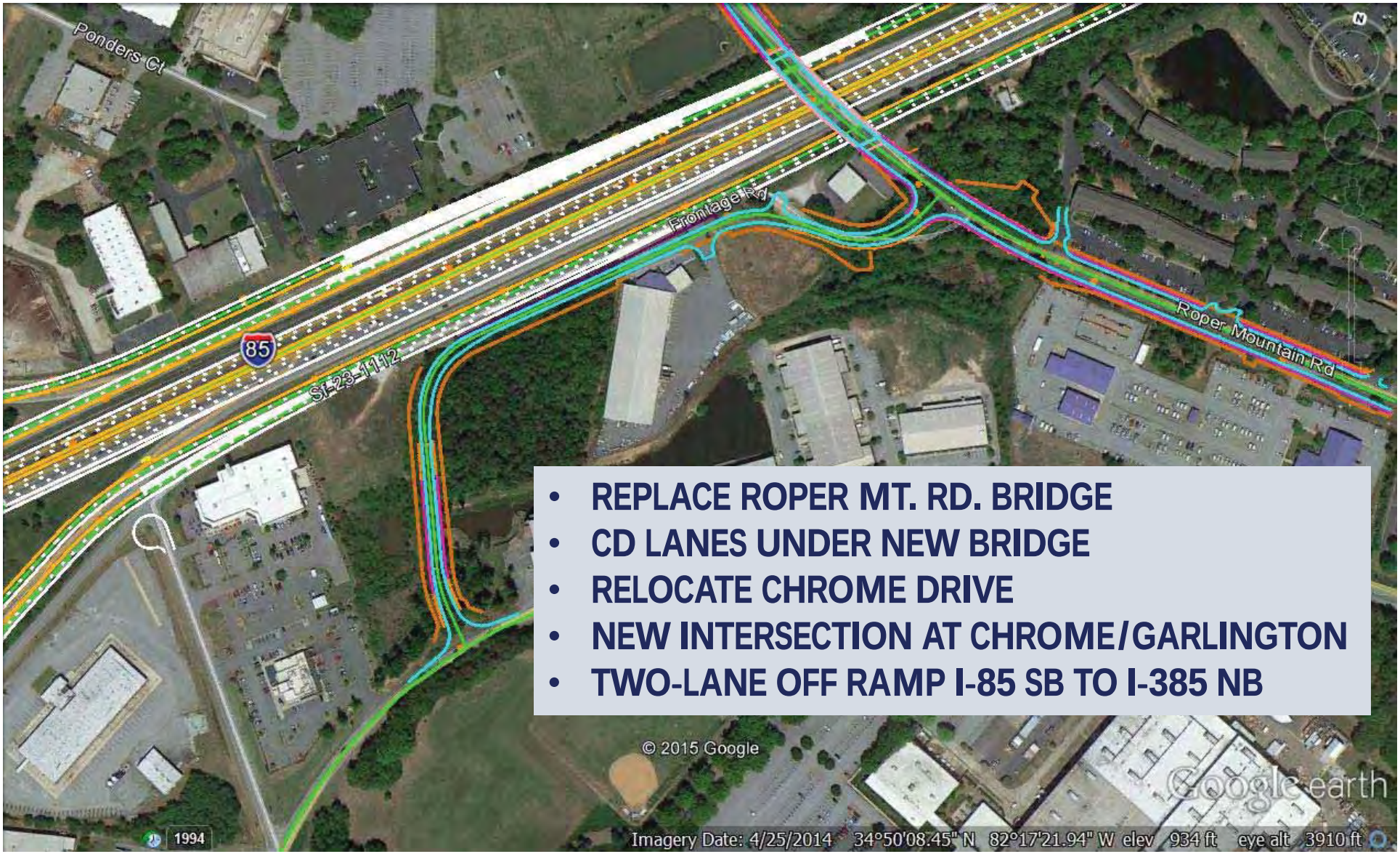
85 GATEWAY 385

INTERCHANGE

FLATIRON | ZACHRY | CJCS Civil Engineering Consulting Services, Inc.

85 GATEWAY 385

ROPER MOUNTAIN ROAD

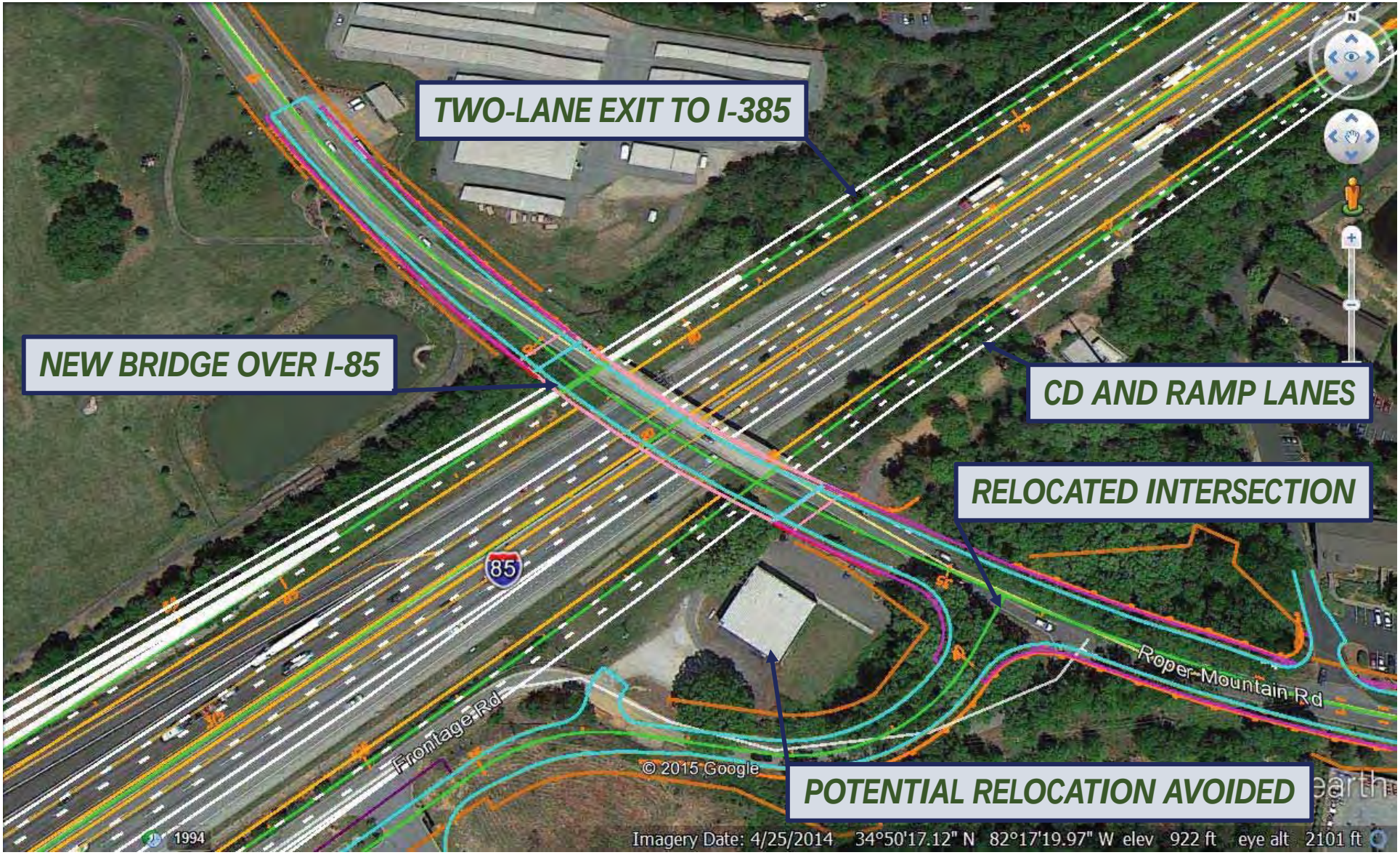


- REPLACE ROPER MT. RD. BRIDGE
- CD LANES UNDER NEW BRIDGE
- RELOCATE CHROME DRIVE
- NEW INTERSECTION AT CHROME/GARLINGTON
- TWO-LANE OFF RAMP I-85 SB TO I-385 NB

FLATIRON | ZACHRY CJCS Civil Engineering Consulting Services, Inc.

85 GATEWAY 385

ROPER MOUNTAIN ROAD



FLATIRON | ZACHRY CES Civil Engineering Consulting Services, Inc.

85 GATEWAY 385

WOODRUFF ROAD IMPROVEMENTS

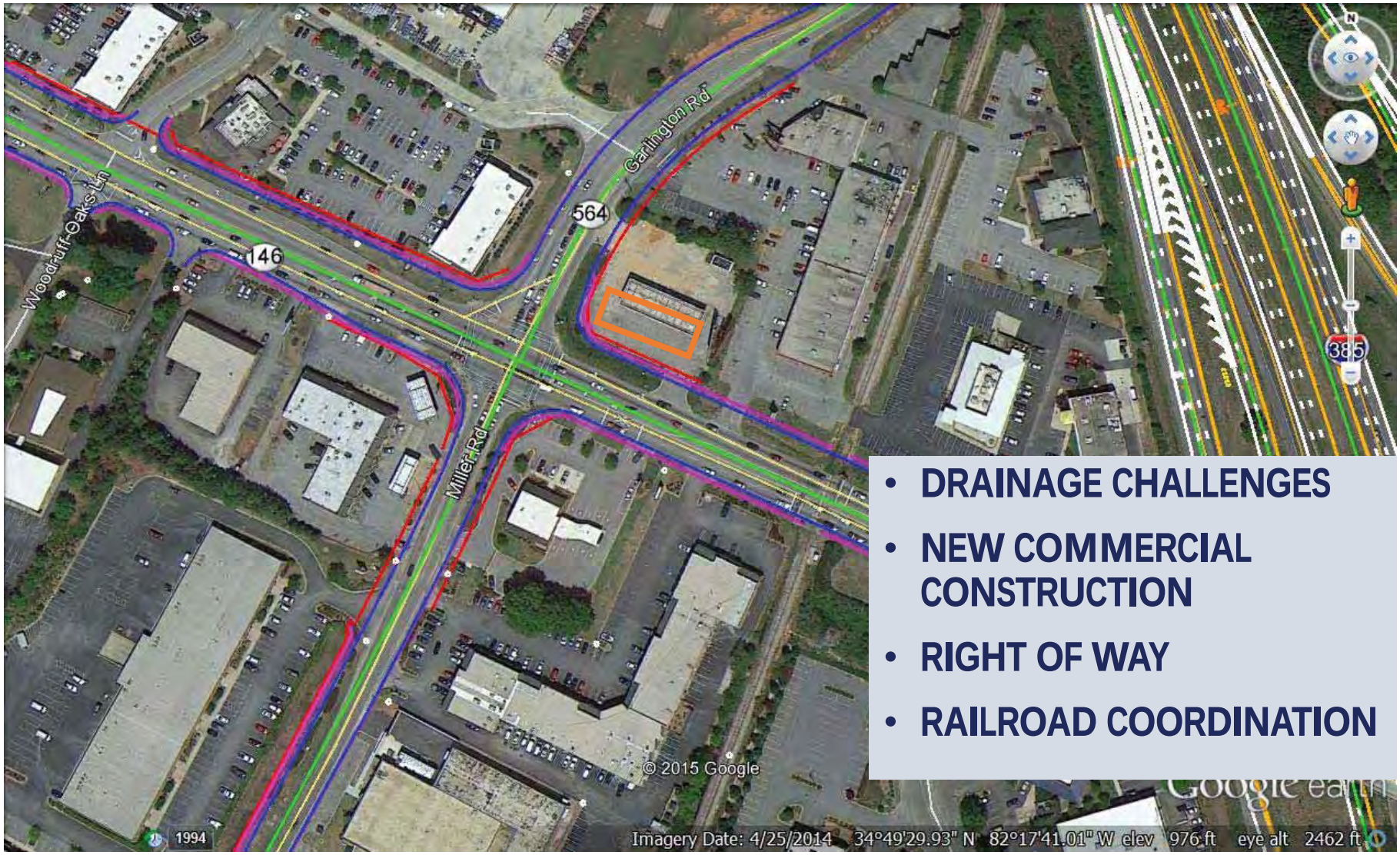
- GPATS PROJECT – CONGESTION REDUCTION
- ADD LEFT TURN LANES
- IMPROVE GARLINGTON AND MILLER ROADS
- IMPLEMENT ADAPTIVE TRAFFIC SIGNALS FOR 17 INTERSECTIONS

INTERSECTION IMPROVEMENTS

FLATIRON | ZACHRY CJ CJ Civil Engineering Consulting Services, Inc.

85 GATEWAY 385

WOODRUFF ROAD IMPROVEMENTS



- DRAINAGE CHALLENGES
- NEW COMMERCIAL CONSTRUCTION
- RIGHT OF WAY
- RAILROAD COORDINATION

REHABILITATION SECTIONS OF I-85

- Cross slope correction and resurfacing for safety
- Construction in Progress
- Two Segments
  - Pelham Road to north of Highway 14 - 2.6 miles
  - South of Salters Road to 1 mile south of Laurens Road – approximately 2.0 miles

DESIGN CONSIDERATIONS

RFP Goals

- Minimize Environmental Impacts
- Minimize ROW Impacts
- Minimize Impacts to Utilities

Challenges

- Endangered Species
- Stream Mitigation
- Variable Subsurface Strata
- Maintenance of Traffic
- Tight Roadway Geometrics
- FEMA Floodway Revisions
- Utility Coordination

ENVIRONMENTAL CONSIDERATIONS

- Numerous NEPA Documents
- Clean Water Act Permitting
- Environmental Construction Compliance

NEPA Documents

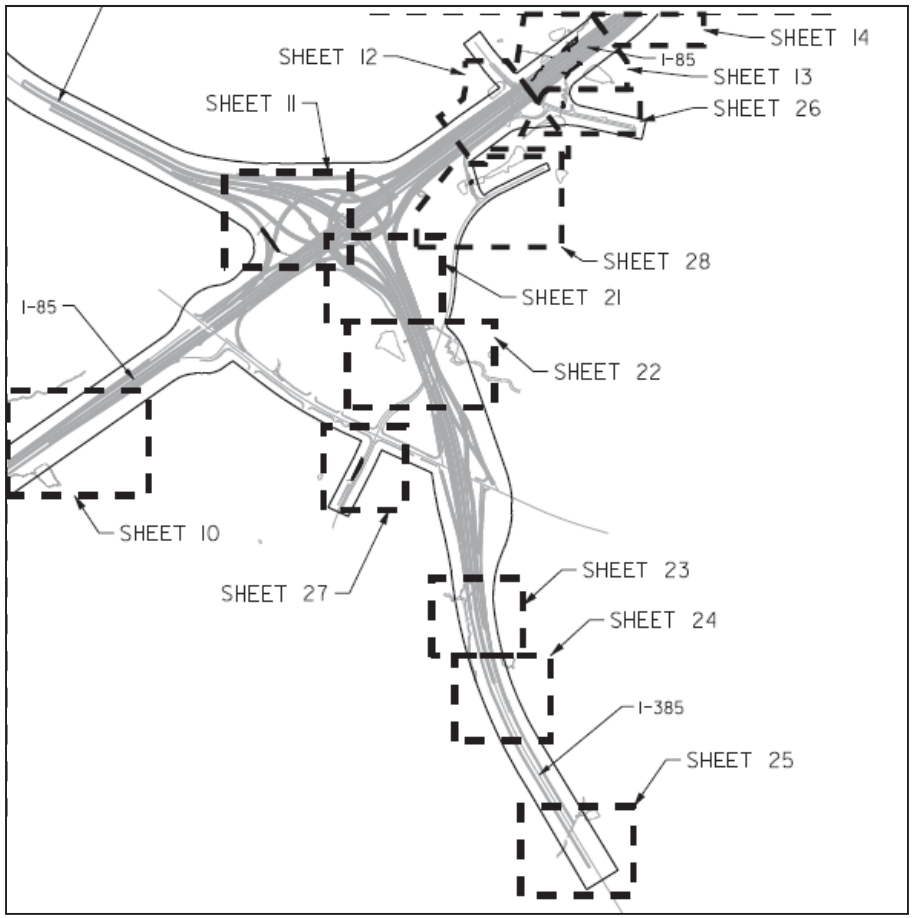
- Four Categorical Exclusions (CE) for minor improvements
  - I-85 Northbound Exit Ramp
  - I-85 Rehabilitation
  - Woodruff Road Intersection Improvement (and CE Re-Evaluation)
  - Woodruff Road Signalization
- Interchange Environmental Assessment (EA)
  - Three Interchange Re-evaluations of the EA
- Interchange Finding of No Significant Impact

ENVIRONMENTAL CHANGES & UPDATES

- The Northern Long-eared Bat is listed as a protected species during the design phase.
- A minor expansion of the project area requires a new wetland/stream delineation.
- Stream impacts are greatly reduced from original estimates. Stream impacts reduced by over 1,000 feet and wetland reduced from 0.5 to 0.415 acres.
- Building relocations identified in the EA are not needed.

ENVIRONMENTAL PERMITTING

- A complex Individual Permit application is submitted to the U.S. Army Corps of Engineers for review.
- Both stream and wetland impacts are greatly reduced from the original EA estimates.
- Permit placed on public notice
- Only 4 comments received from USACE.
- Permit Approval Dec. 2015



US Army Corps of Engineers

D H E C
PROMOTE PROTECT PROSPER

BRIDGES

	Length	Spans	Foundation
Bridge 1/2A	379’ – 11.5”	5	Driven Piles
Bridge 2B	379’ – 11.5”	5	Driven Piles
Bridge 3	319’ – 11”	4	Driven Piles
Bridge 4	148’ – 2”	1	Driven/Drilled Piles
Bridge 5	1522’ – 11.625”	8	Driven Piles/Drilled Piers
Bridge 6	1962’ – 10”	11	Driven Piles
Bridge 7	475’ – 0”	4	Driven Piles/Drilled Piers
Bridge 8	254’ – 10.125”	2	Driven Piles/Drilled Piers
Bridge 9	368’ – 3.75”	4	Driven Piles/Drilled Piers
Bridge 10	220’ – 0.625”	1	Driven Piles
Bridge 11	310’ – 2”	4	Driven Piles/Drilled Piers
Bridge 12	497’ – 2”	4	Driven Piles/Drilled Piers

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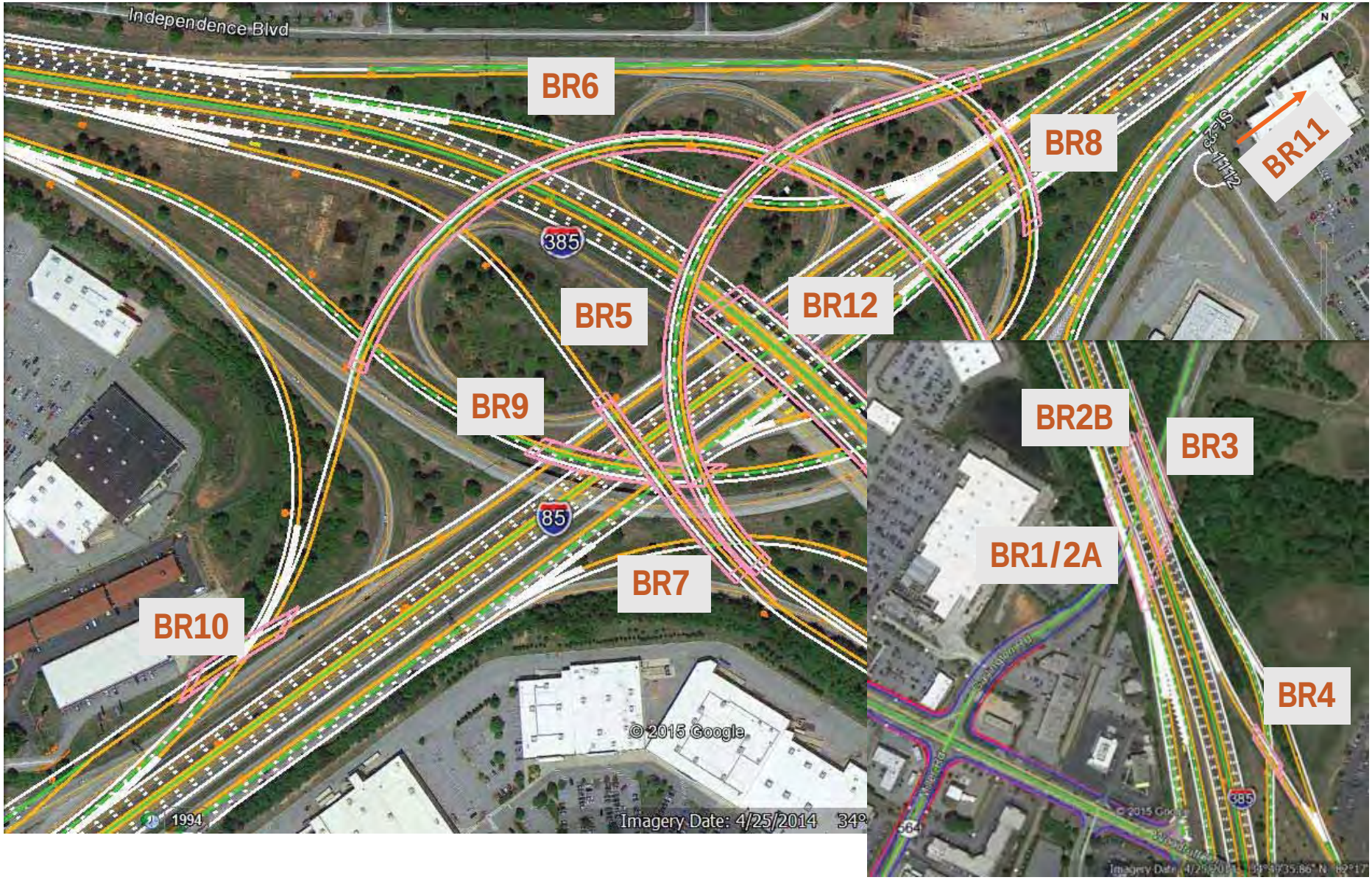
85 GATEWAY 385

BRIDGES



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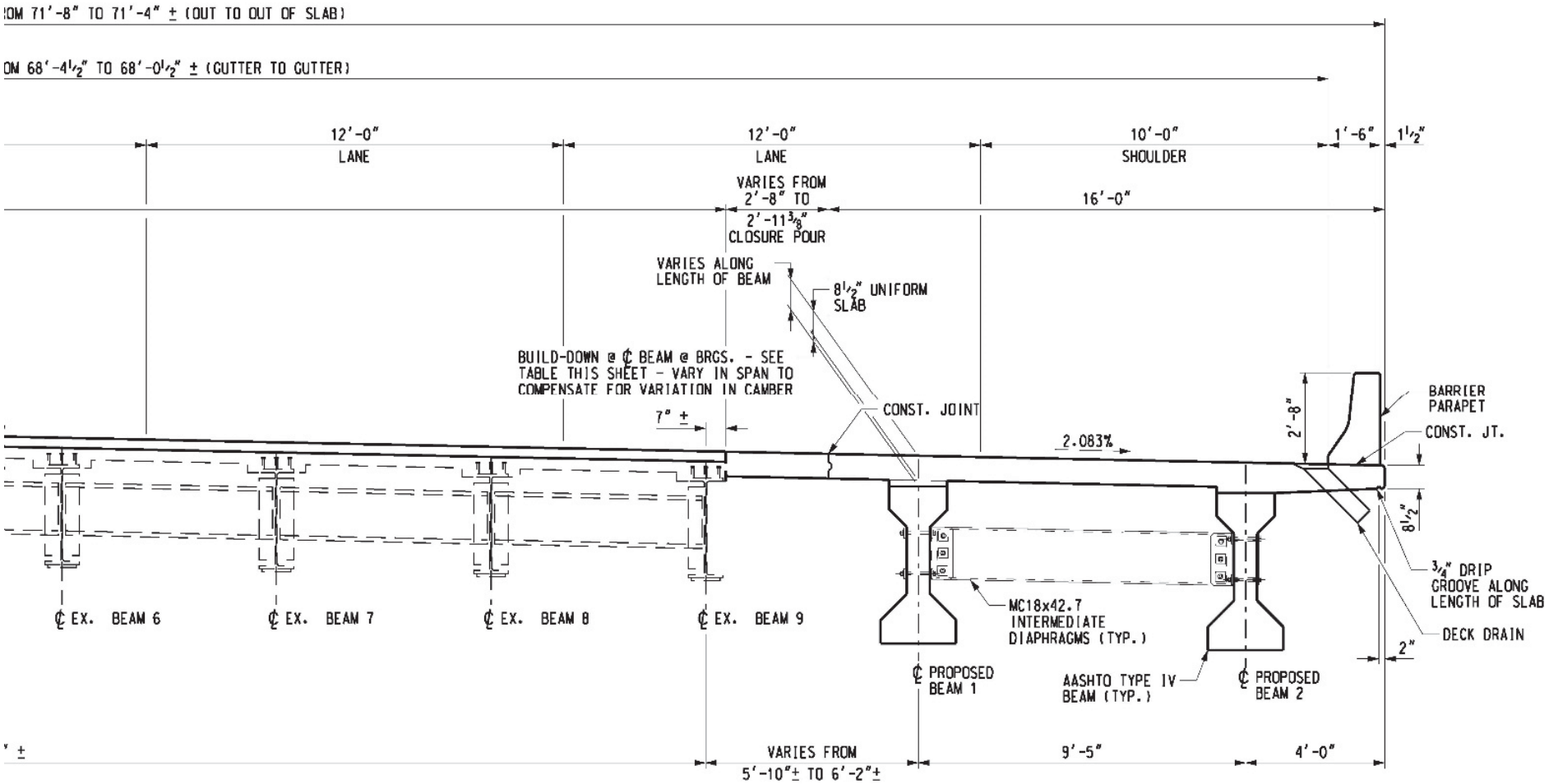
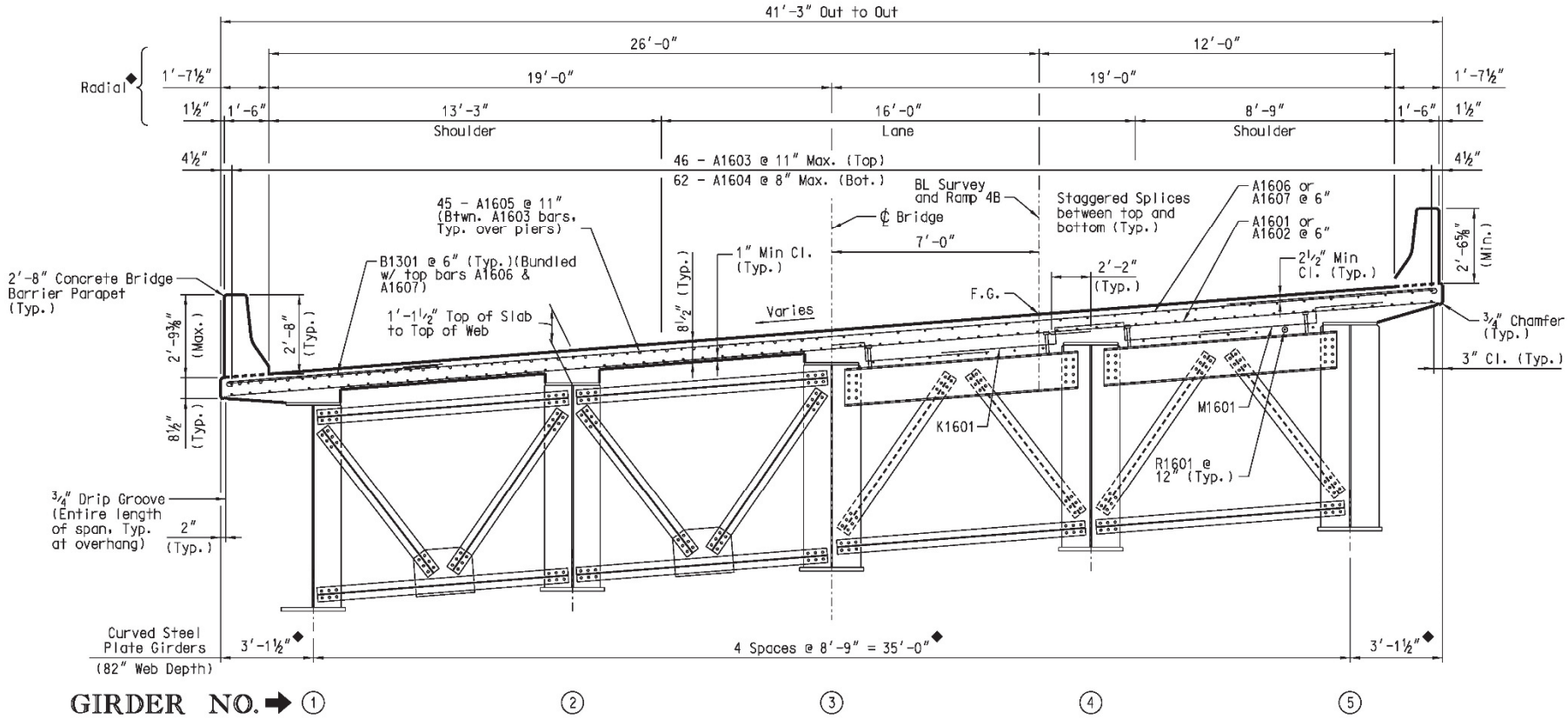
85 GATEWAY 385

BRIDGE 2B



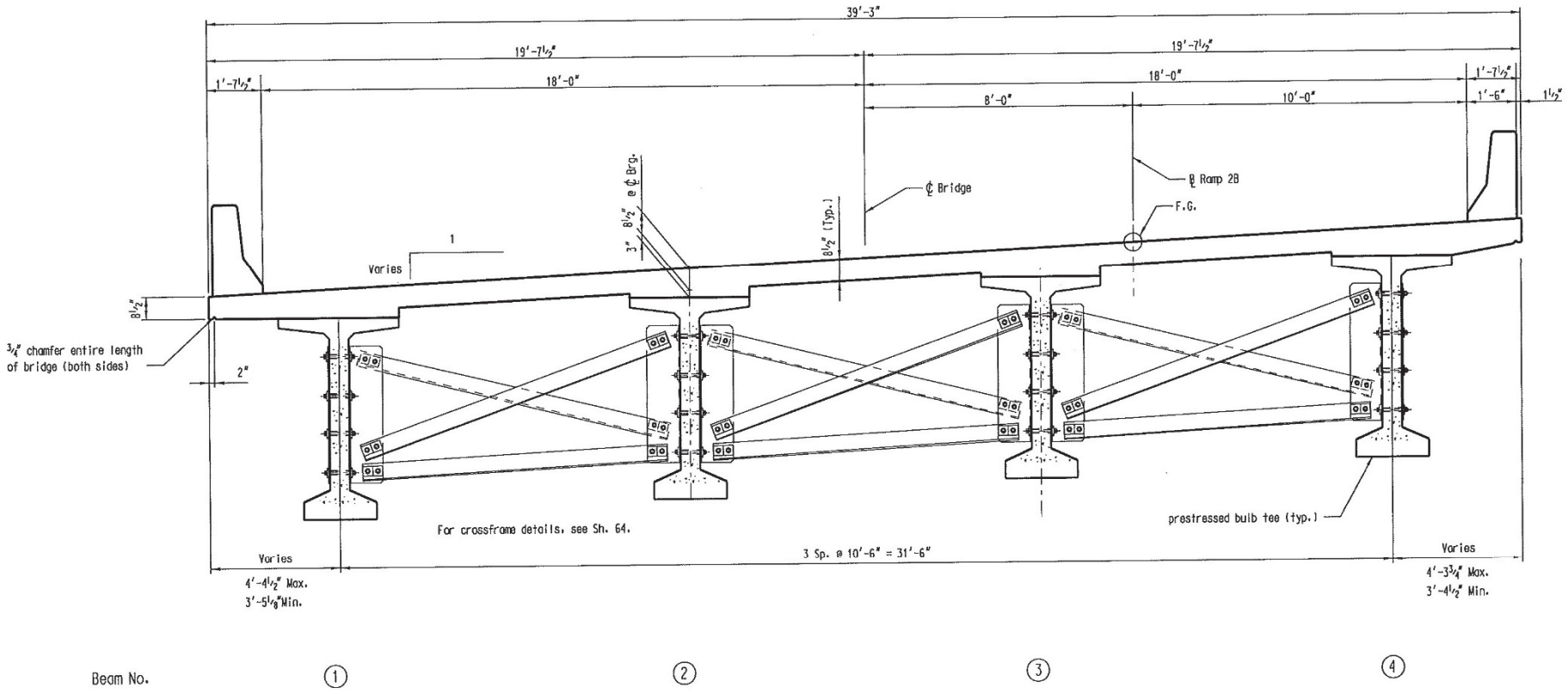
APPROVED ATC FOR GIRDER TYPE

BRIDGE 6



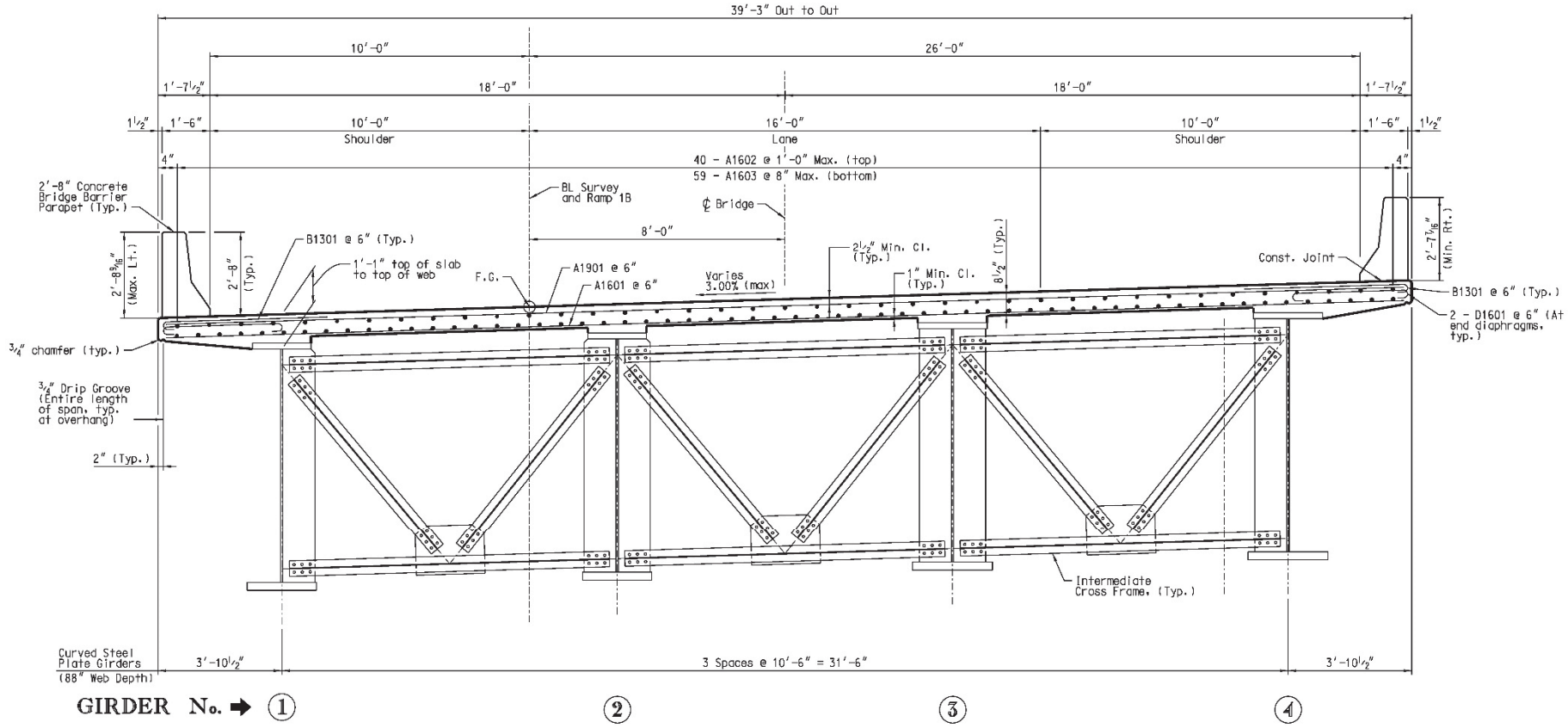
- **CURVED STEEL GIRDERS**
- **MAXIMUM SPAN LENGTH OF 246'**

BRIDGE 7



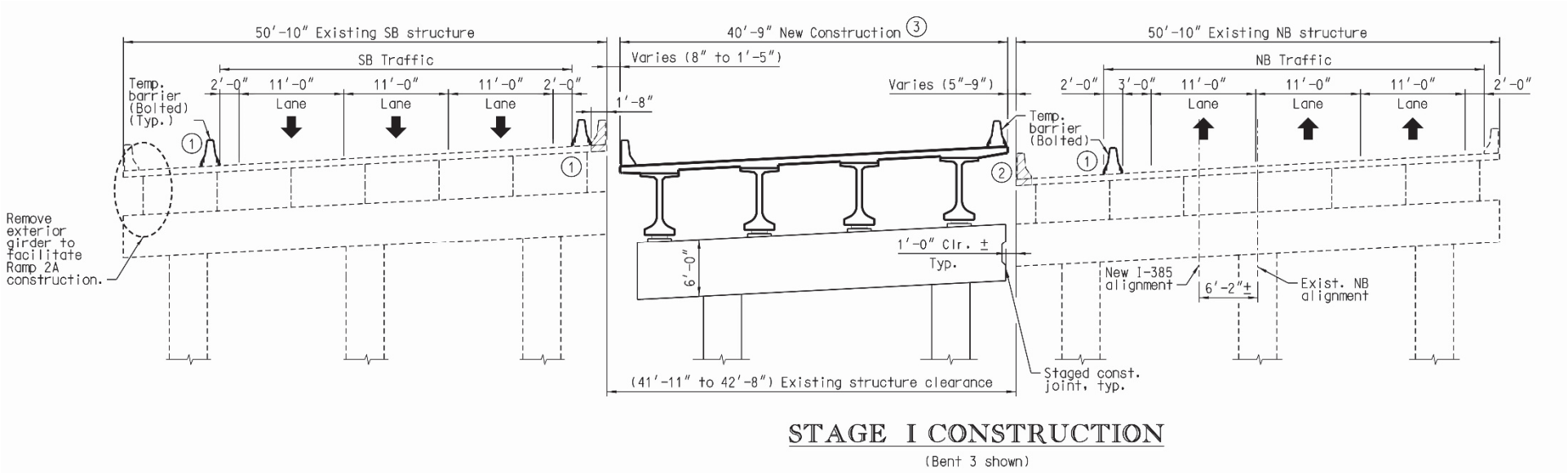
- **CURVED BRIDGE DECK**
- **STRAIGHT PS CONCRETE GIRDERS**

BRIDGE 10



- **STRAIGHT ALIGNMENT**
- **STEEL GIRDERS IN SINGLE 220’ SPAN**

BRIDGE 12 – PHASE I

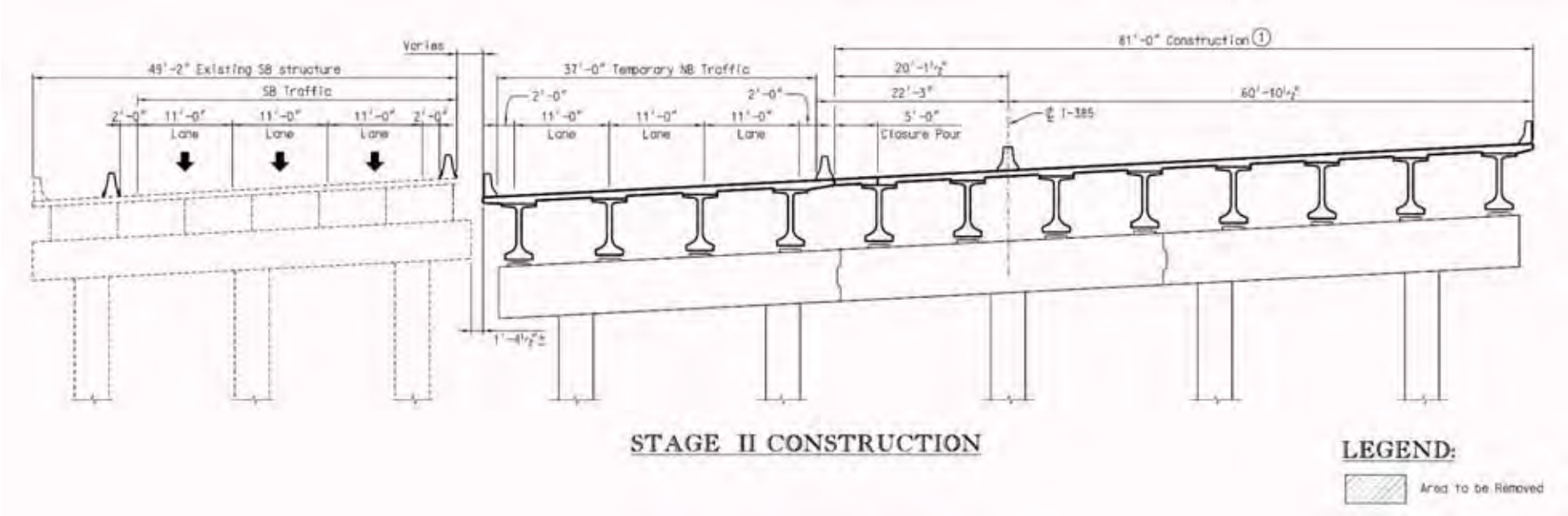


STAGE I CONSTRUCTION

(Bent 3 shown)

- **CONSTRUCT BETWEEN EXISTING BRIDGES**
- **DEMOLISH EXISTING NB BRIDGE**

BRIDGE 12 – PHASE II



- **CONSTRUCT ADDITIONAL NEW BRIDGE ON THE NORTH SIDE**
- **DEMOLISH EXISTING SB BRIDGE**

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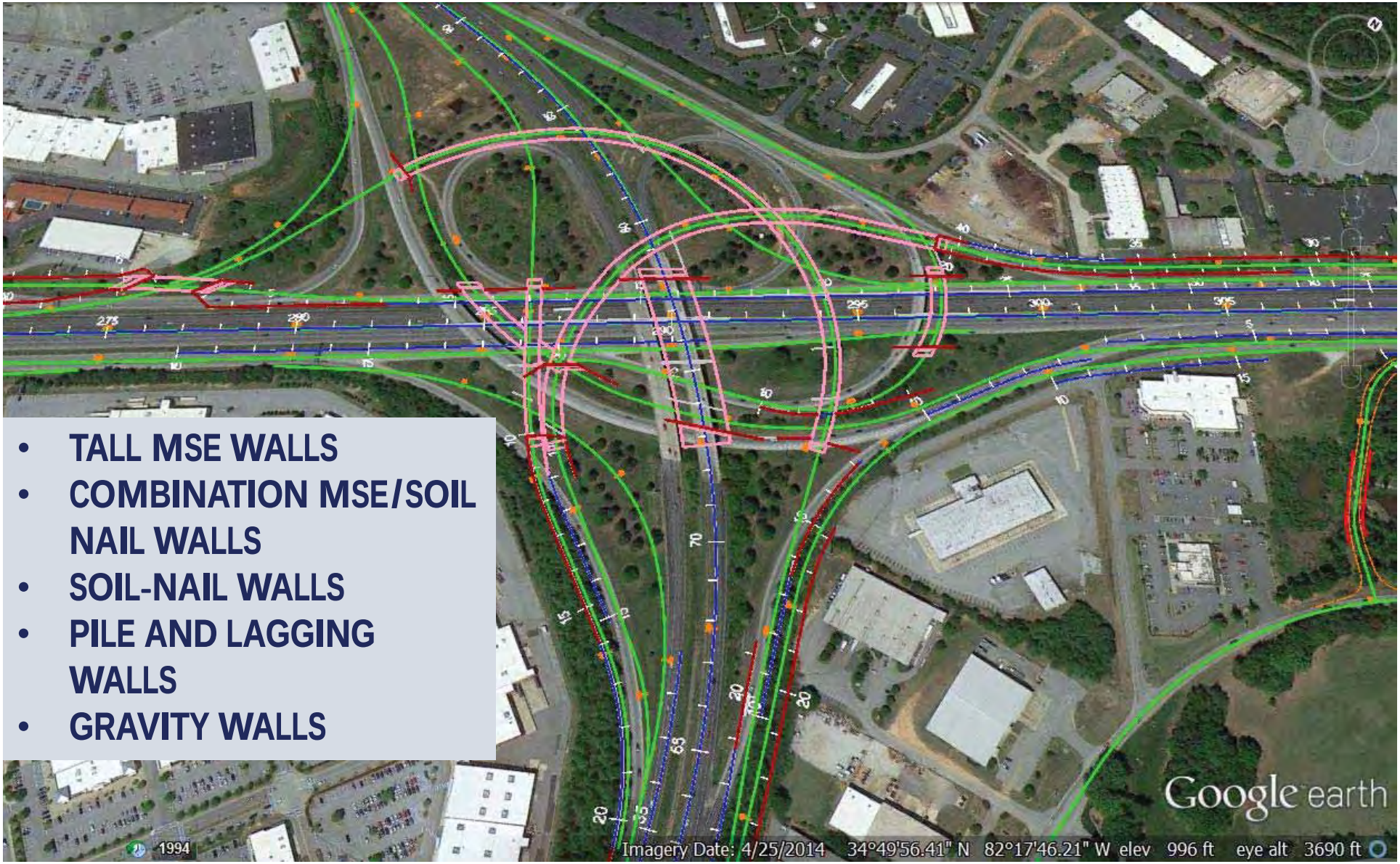
85 GATEWAY 385

WALL OVERVIEW



- TALL MSE WALLS
- COMBINATION MSE/SOIL NAIL WALLS
- SOIL-NAIL WALLS
- PILE AND LAGGING WALLS
- GRAVITY WALLS

MSE Walls

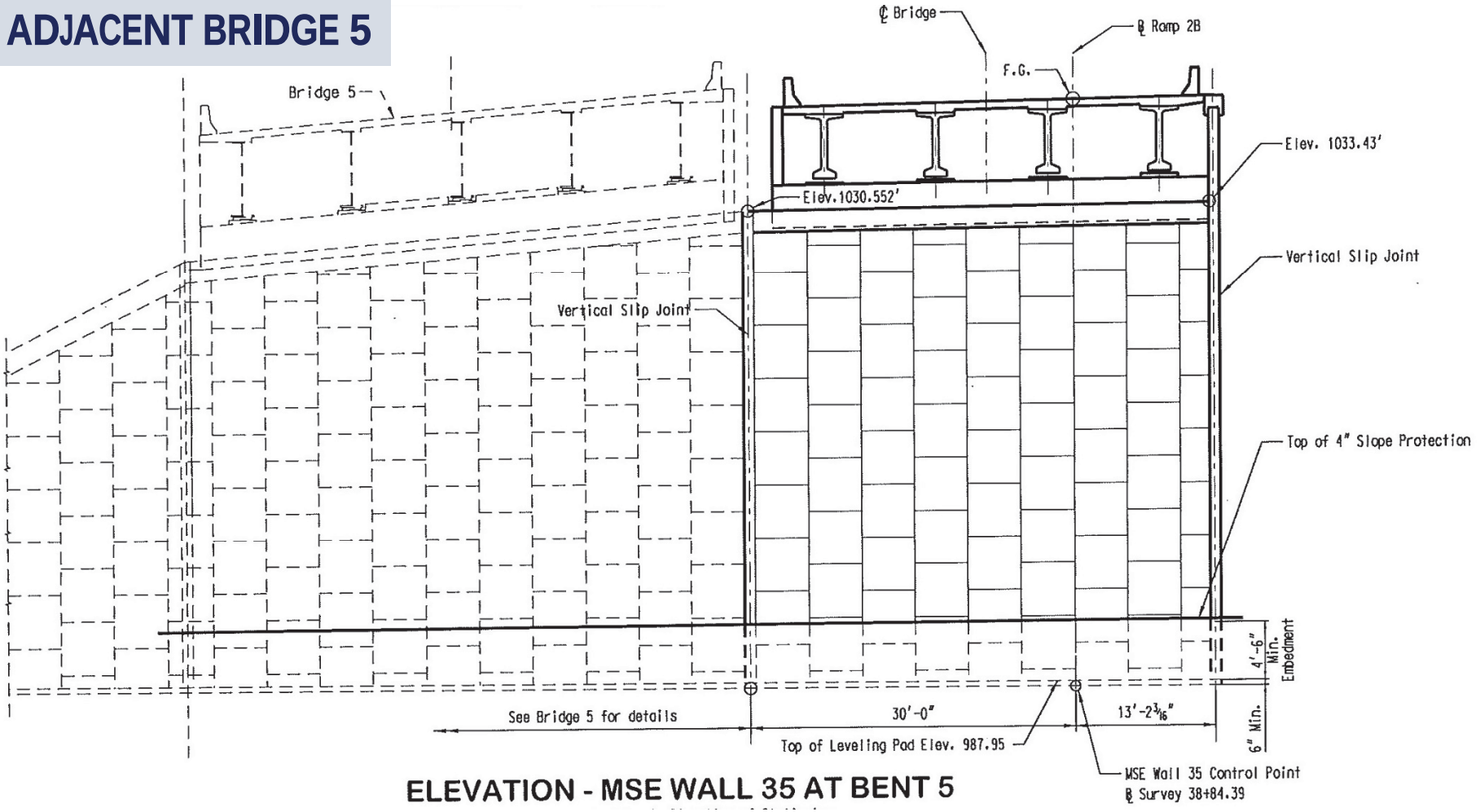
Wall #	Maximum Height (ft)	Associated Roadway
3	20	Bridge 9
4	28	Bridge 9
5	27	Bridge 12
6	34	Bridge 12
7	36	Bridge 6
8	25	Bridge 8
9	26.5	Bridge 8
10	20.5	Ramp 3A
11	17	Ramp 4
13	42	Bridge 5/Ramp 1A
14	44.5	Ramp 4

MSE Walls

Wall #	Maximum Height (ft)	Associated Roadway
16A	23.5	Chrome Rd.
16B	22	Bridge 11
28	28.5	Bridge 4
29	30.5	Bridge 4
32	56	I-385 NBCD
33	58	Bridge 7/Ramp 2B
35	46	Bridge 5
36A	15	Ramp 4B
36B	15	Ramp 4B
37	22.5	Bridge 6
38	10	I-385

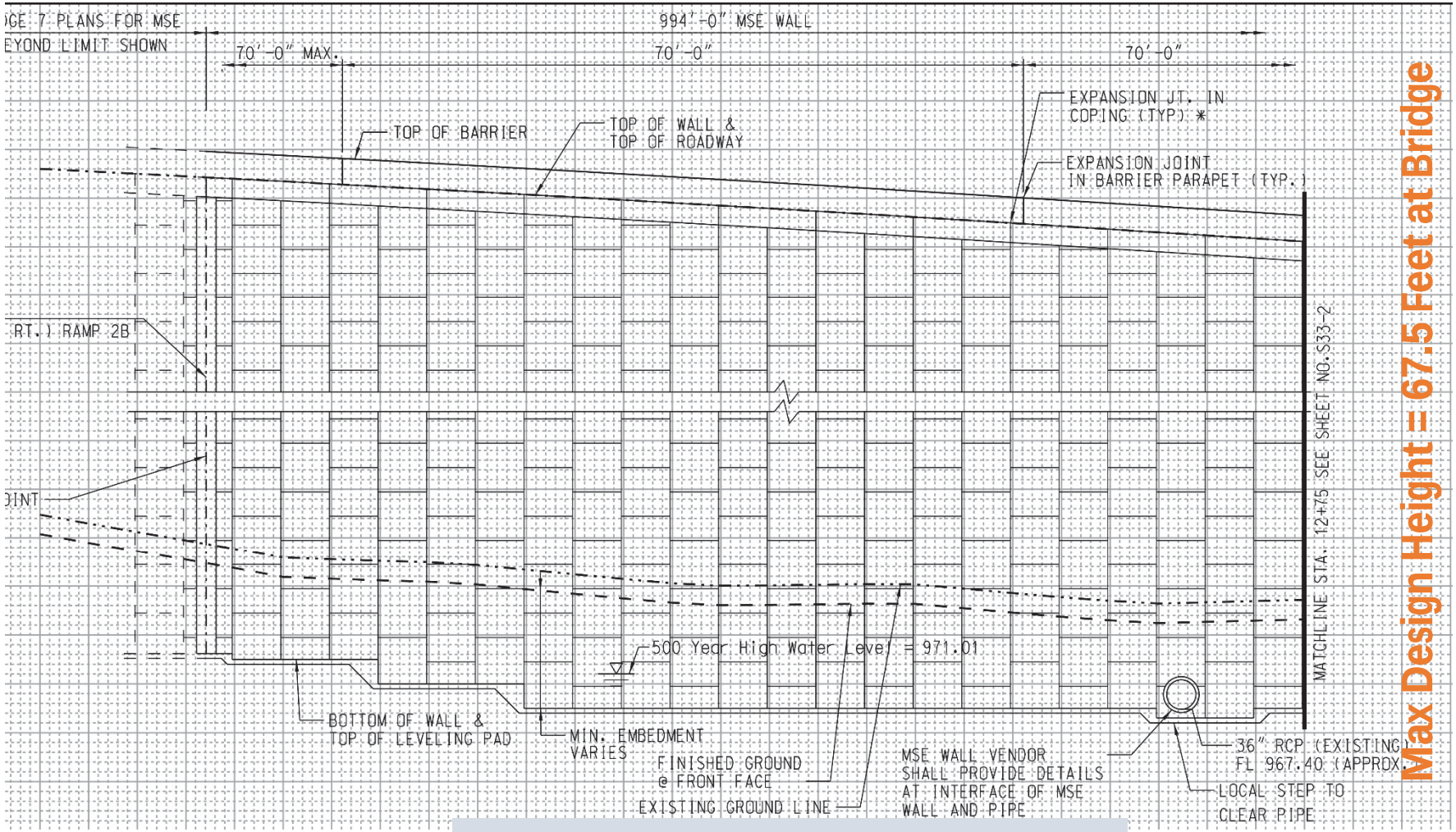
BRIDGE 7

- TALL WALLS
- ADJACENT BRIDGE 5



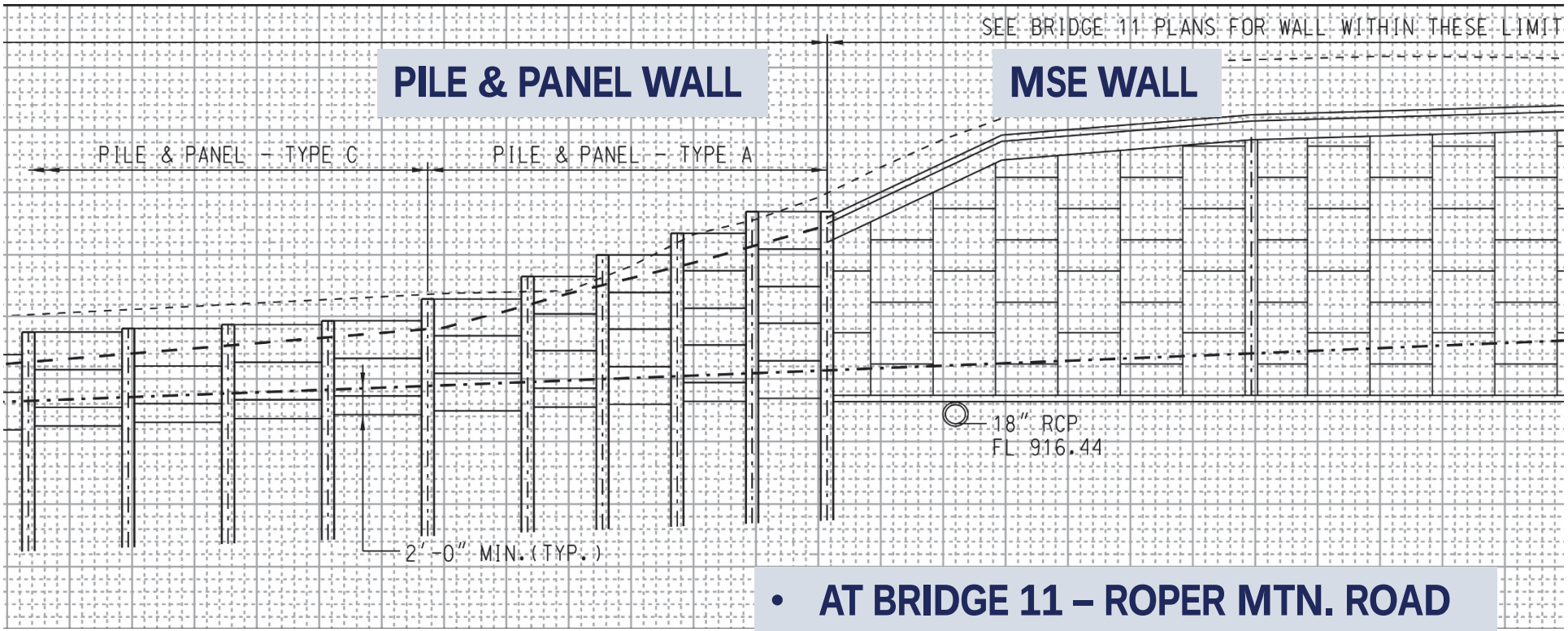
ELEVATION - MSE WALL 35 AT BENT 5

ELEVATION – WALL 33



FOUNDATION CONSIDERATIONS

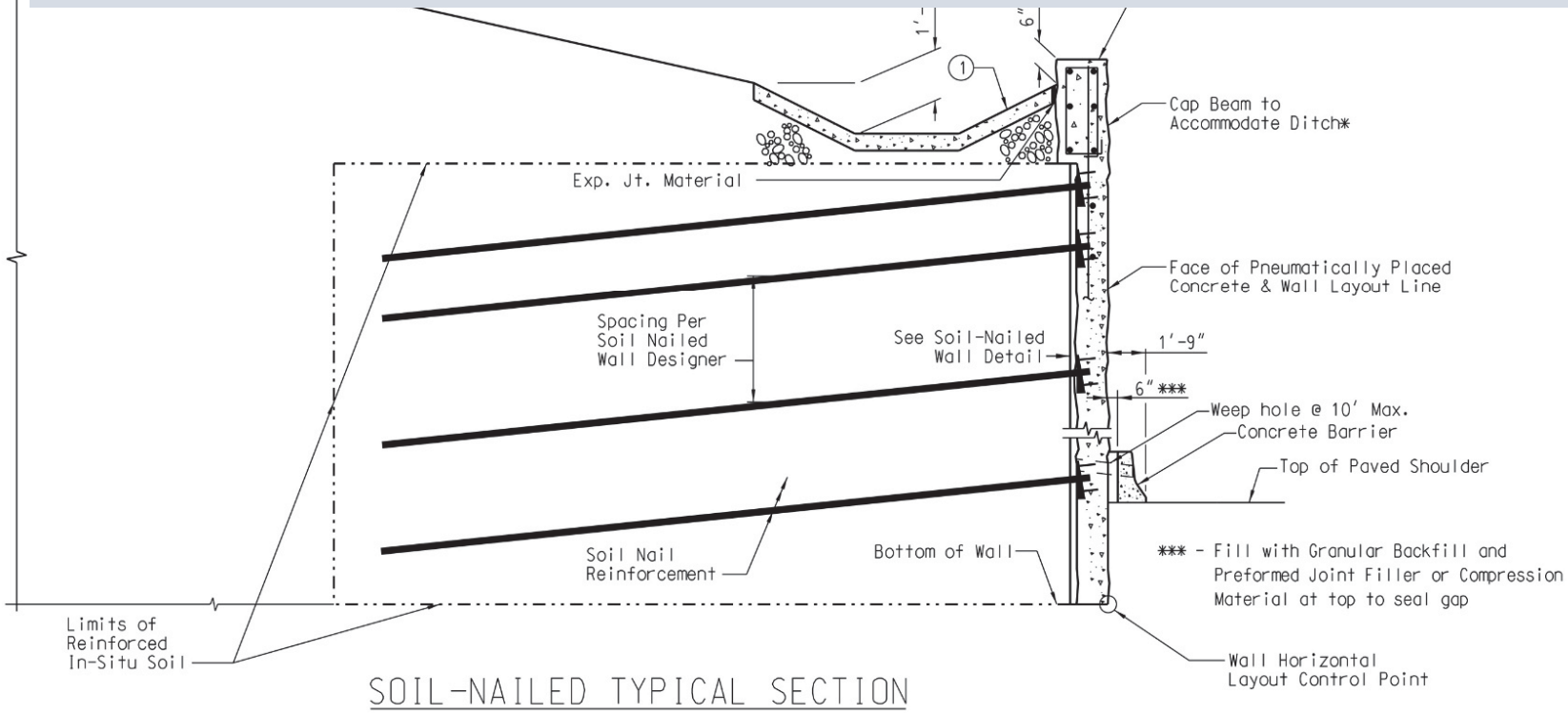
ELEVATION – WALL 12



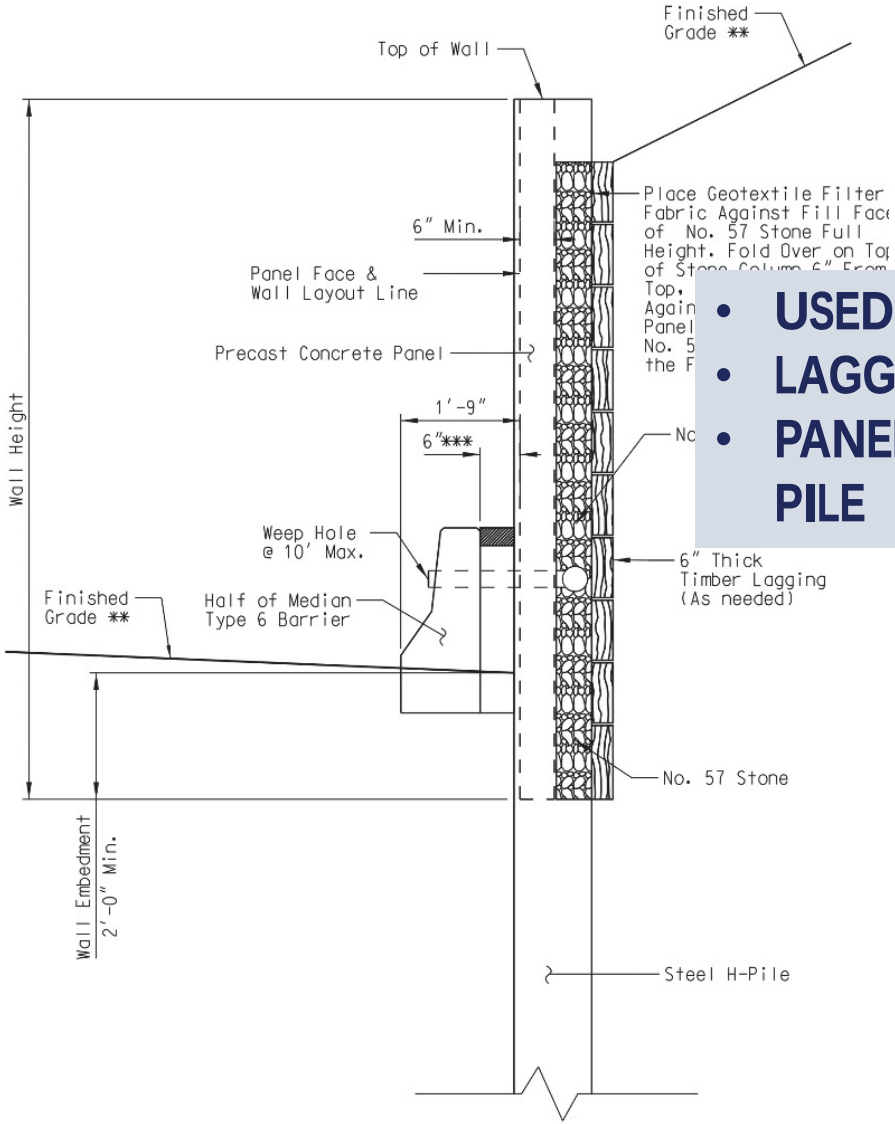
- AT BRIDGE 11 – ROPER MTN. ROAD
- COMBINATION OF WALL TYPES

SOIL-NAILED TYPICAL SECTION

- **USED AT ROPER MOUNTAIN ROAD BRIDGE AND WOODRUFF ROAD**
- **DESIGNED BY SPECIALTY WALL DESIGNER**
- **USED IN "CUT" SITUATIONS**



PILE & PANEL – TYPE C



- USED IN "CUT" SITUATION
- LAGGING PLACED FROM TOP DOWN
- PANEL AND STONE PLACE IN WEB OF PILE

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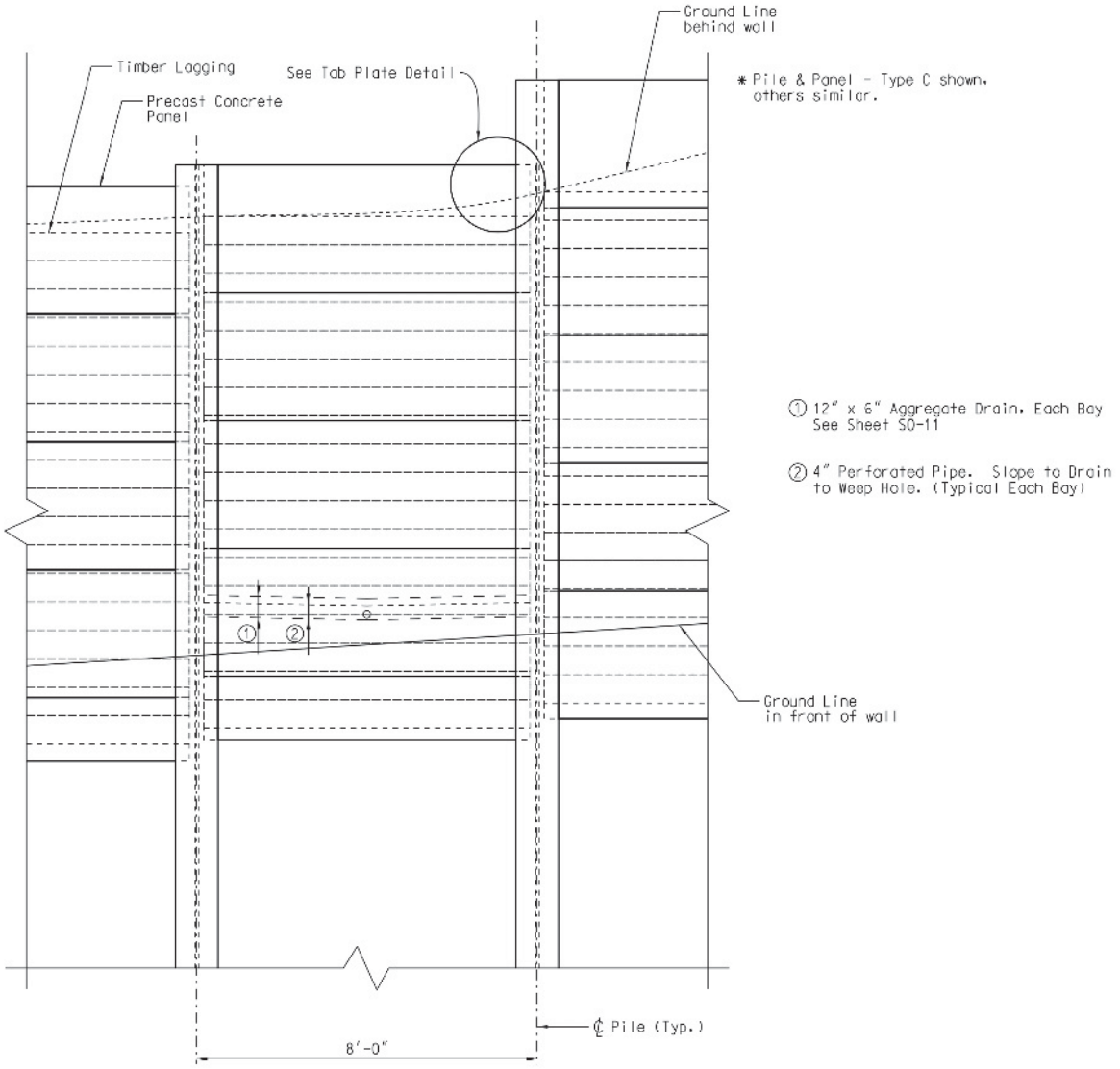
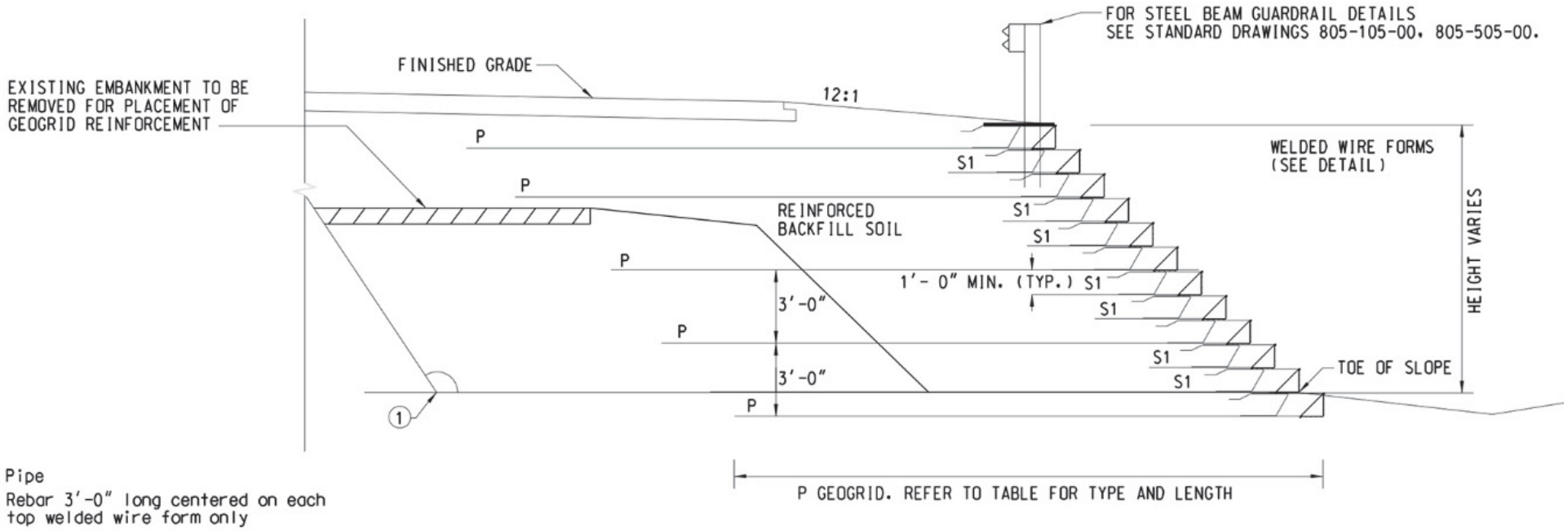
85 GATEWAY 385

PILE & PANEL



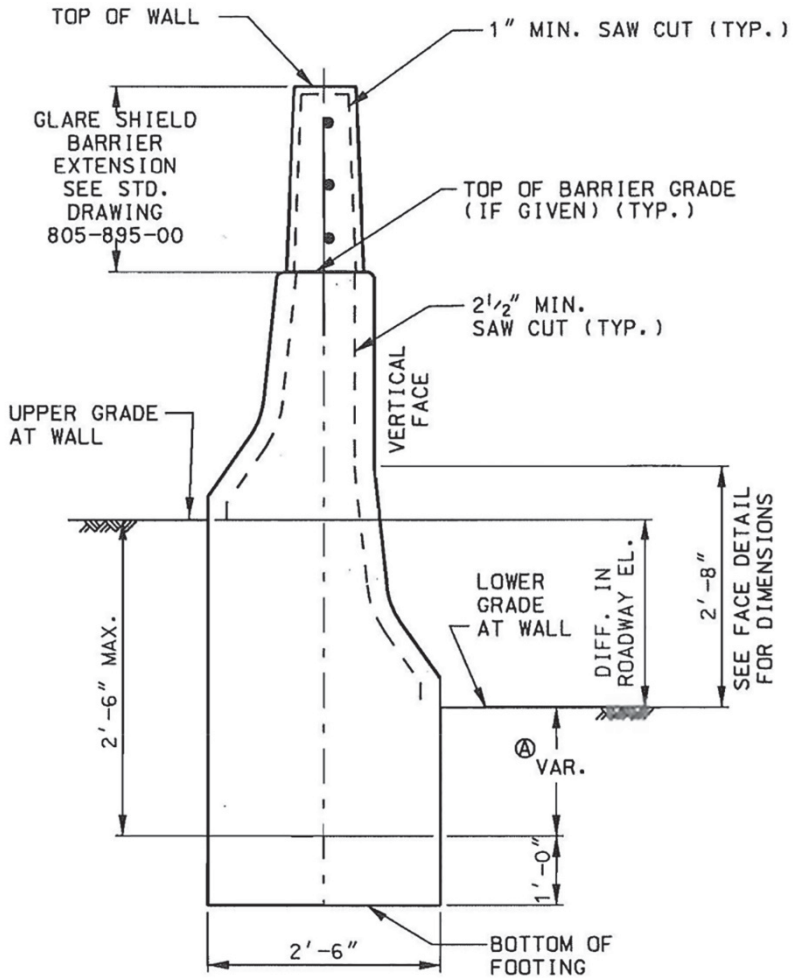
TYPICAL REINFORCED SOIL SLOPE

Avoid: Culvert/Stream, Floodway, Cemetery, Restricted Right of Way



TYPICAL REINFORCED SOIL SECTION

BARRIER WALL



TYPE 11A

2'-6" MAX. RETAIN HEIGHT

GEOTECHNICAL CHALLENGES

- Diverse Soil Profile
- Shallow Rock
- Tall Embankments resulting in significant downdrag
- Liquefaction/Soil Shear Strength Loss Triggering
- Stability of Tall Embankments and Walls

SUBSURFACE EXPLORATION

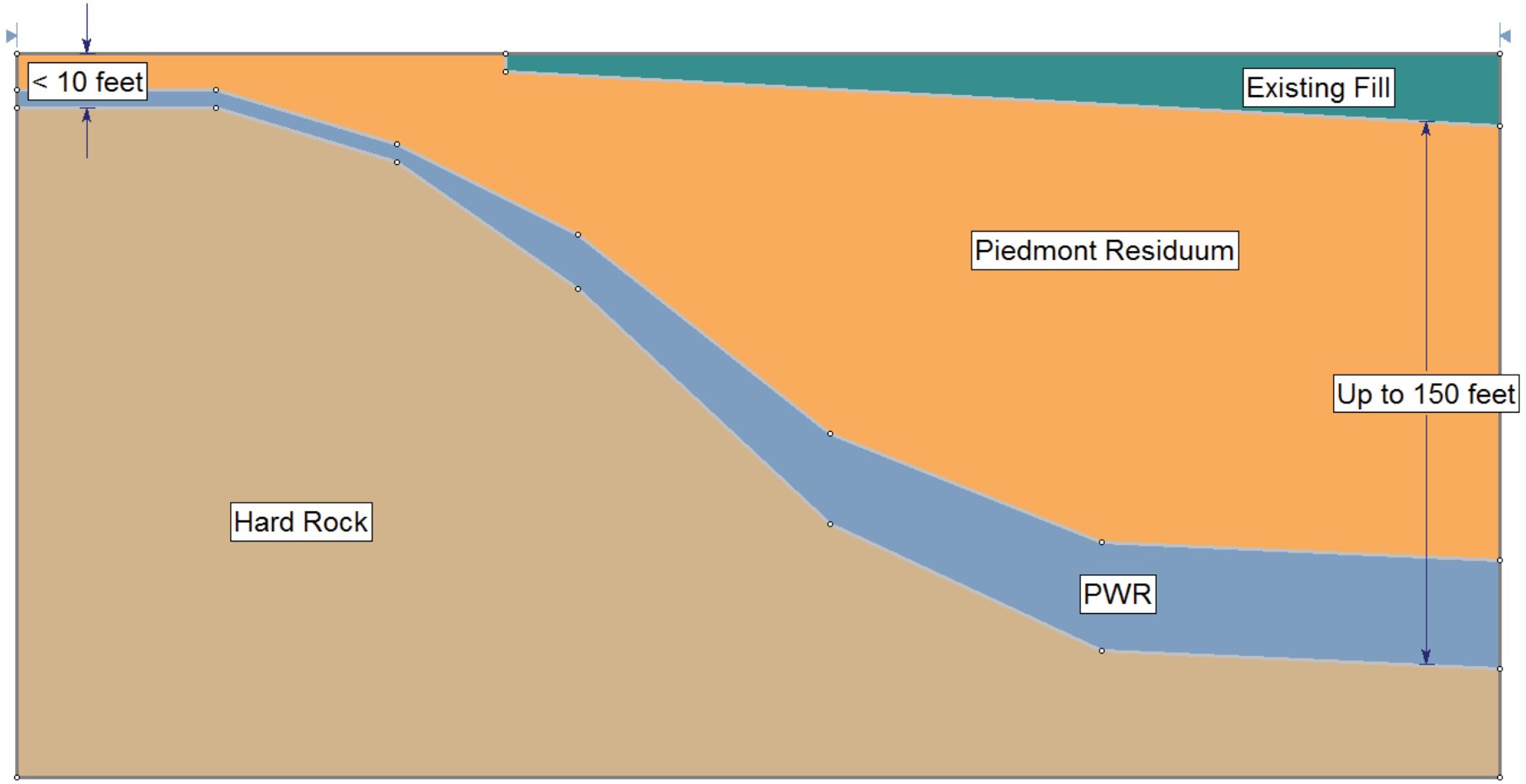
Number of borings totals 324

- Total linear feet = 13,570
- Number of Pursuit Borings = 72
- Number of Bridge Borings = 69
- Number of Wall borings = 99
- Number of Roadway/Drainage Borings = 84

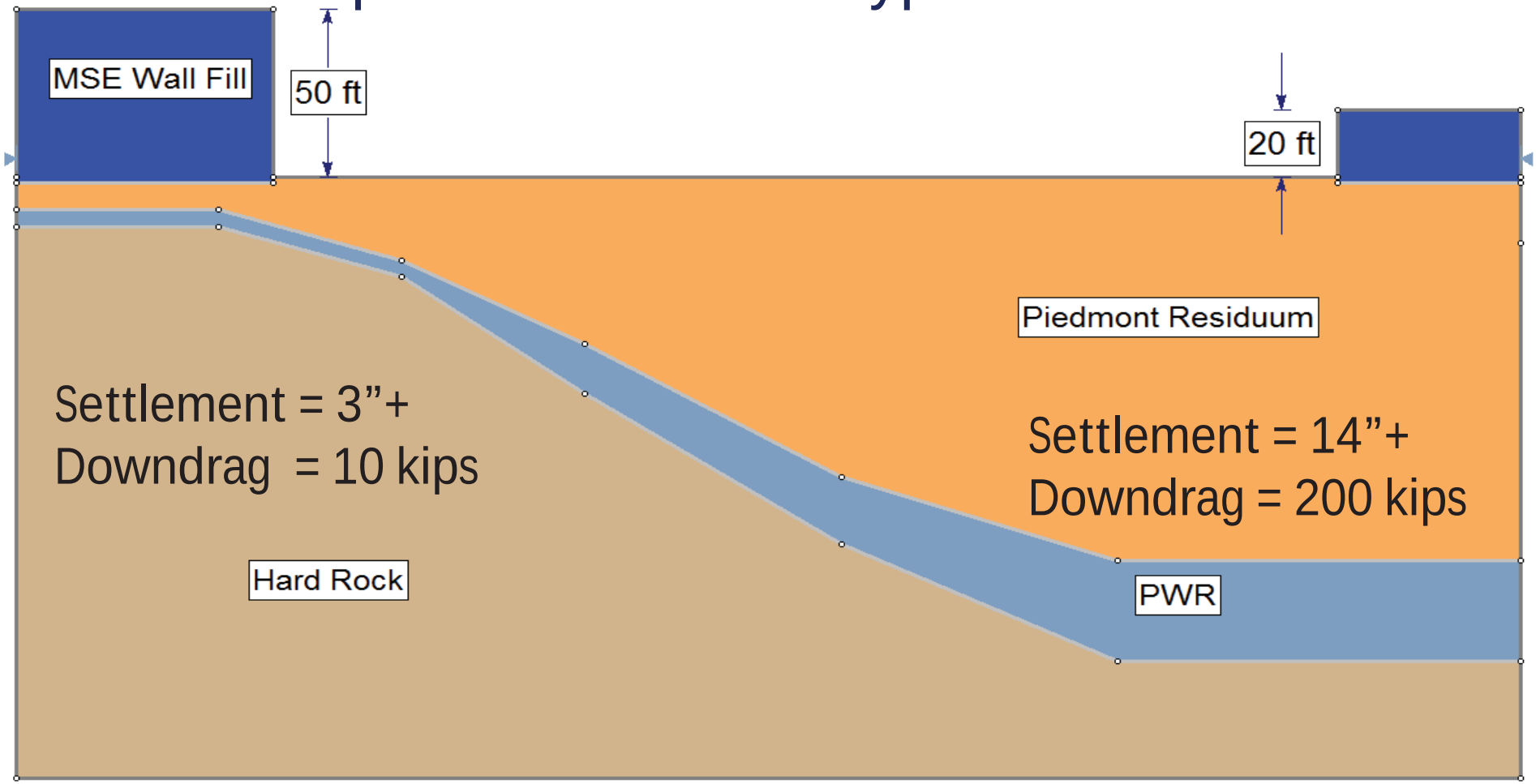
Number of other tests

- Atterberg Limits = 1413
- Moisture Content = 1415
- Sieve Analysis = 1384
- Triaxial Compression = 20

GENERALIZED SUBSURFACE PROFILE



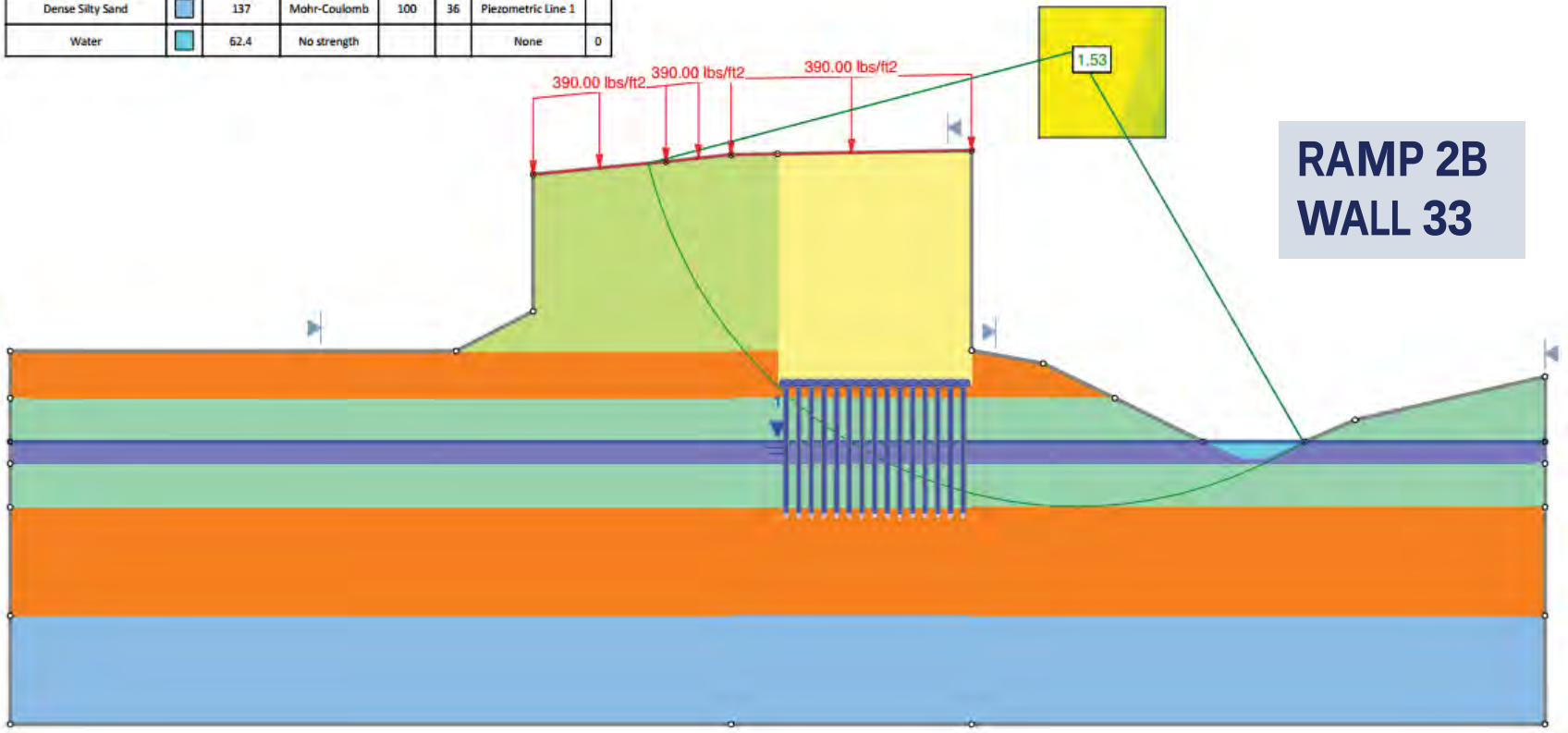
Drastic variation in subsurface profile results in atypical results



CONSIDER GROUND IMPROVEMENT

Minimum Embedment,
0.79H Reinforcement, and
Piles on 3'x3' Spacing
Resistance Factor = 0.65

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
MSE Wall Fill		105	Mohr-Coulomb	5000	0	Piezometric Line 1	
Embankment Fill		117	Mohr-Coulomb	50	32	Piezometric Line 1	
Medium Dense Silty Sand		120	Mohr-Coulomb	50	32	Piezometric Line 1	
Loose Silty Sand		112	Mohr-Coulomb	50	30	Piezometric Line 1	
Clayey Sand		112	Mohr-Coulomb	50	30	Piezometric Line 1	
Dense Silty Sand		137	Mohr-Coulomb	100	36	Piezometric Line 1	
Water		62.4	No strength			None	0



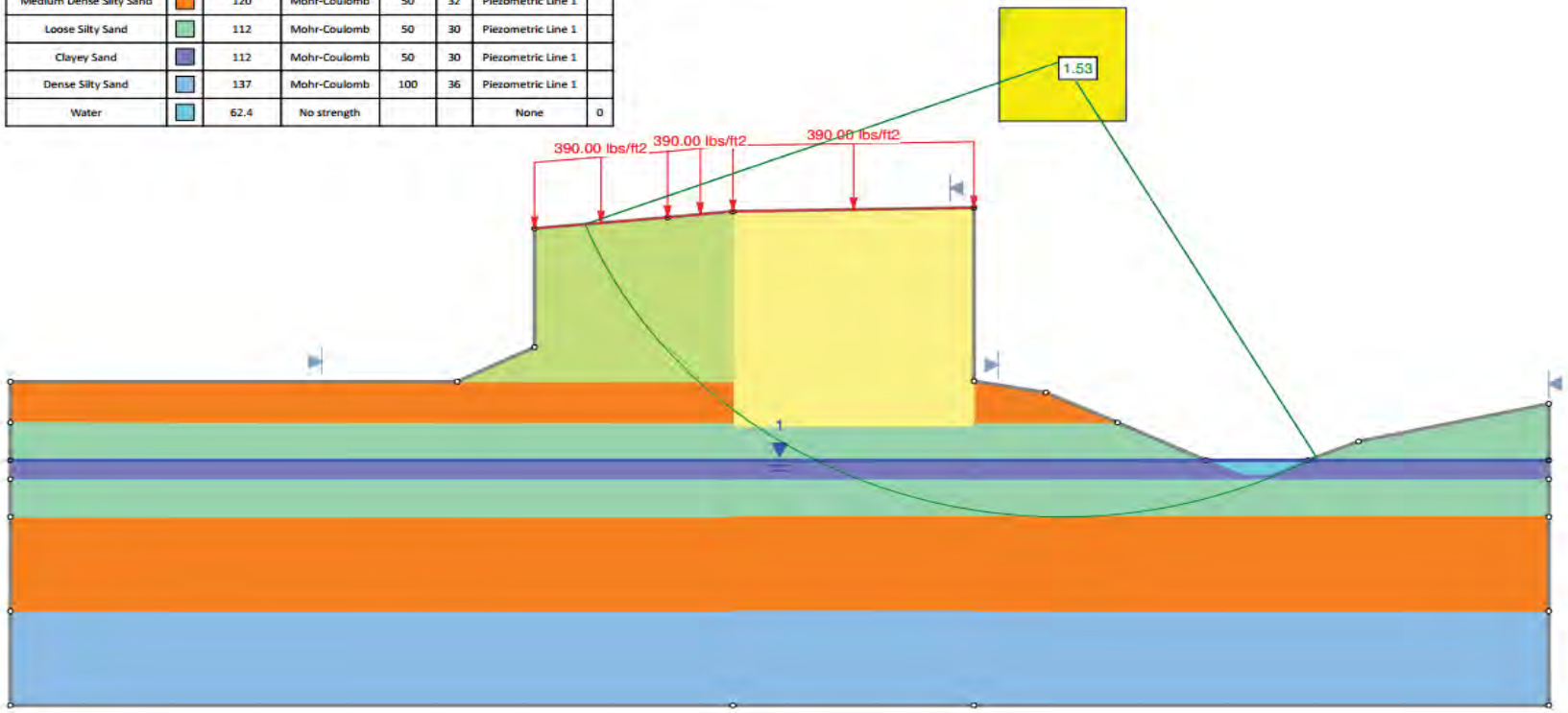
RAMP 2B
WALL 33

CONSIDER INCREASED EMBEDMENT AND LONGER STRAPS

12 foot Embedment and
1.0H Reinforcement
Resistance Factor = 0.65

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
MSE Wall Fill		105	Mohr-Coulomb	5000	0	Piezometric Line 1	
Embankment Fill		117	Mohr-Coulomb	50	32	Piezometric Line 1	
Medium Dense Silty Sand		120	Mohr-Coulomb	50	32	Piezometric Line 1	
Loose Silty Sand		112	Mohr-Coulomb	50	30	Piezometric Line 1	
Clayey Sand		112	Mohr-Coulomb	50	30	Piezometric Line 1	
Dense Silty Sand		137	Mohr-Coulomb	100	36	Piezometric Line 1	
Water		62.4	No strength			None	0

Method: bishop simplified
FS: 1.54 (PHI=0.65)
Method: spencer
FS: 1.53 (PHI=0.65)
Method: gle/morgenstern-price
FS: 1.54 (PHI=0.65)



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85 GATEWAY 385

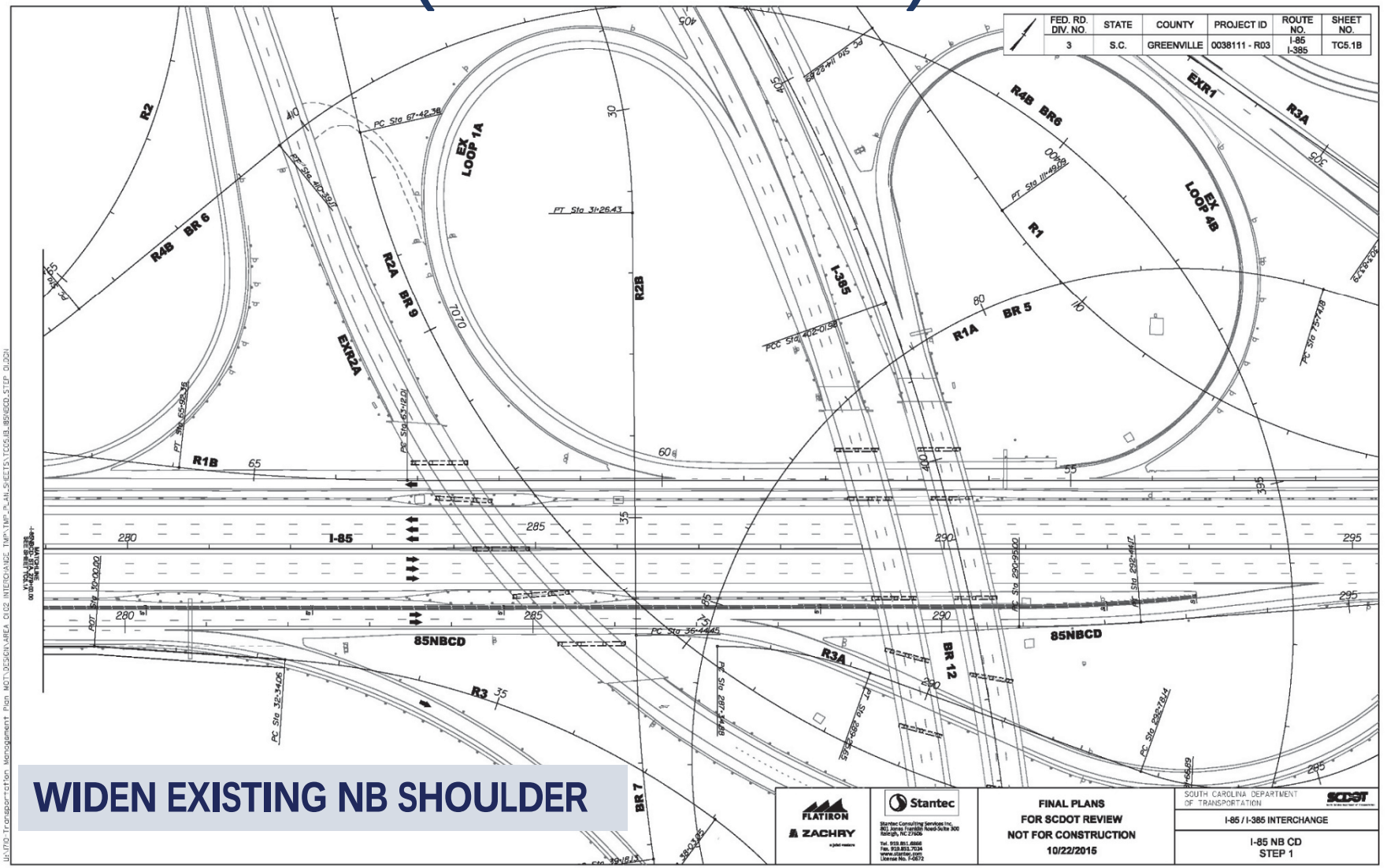
MAINTENANCE OF TRAFFIC

MAINTENANCE OF TRAFFIC

CHALLENGES

- **AVOID EXISTING BRIDGES**
- **AVOID NEW BRIDGES**
- **STAY ON EXISTING PAVEMENT, IF POSSIBLE**
- **MEET DESIGN SPEEDS**

MOT Example – I-85 NB CD (459 Plan Sheets)

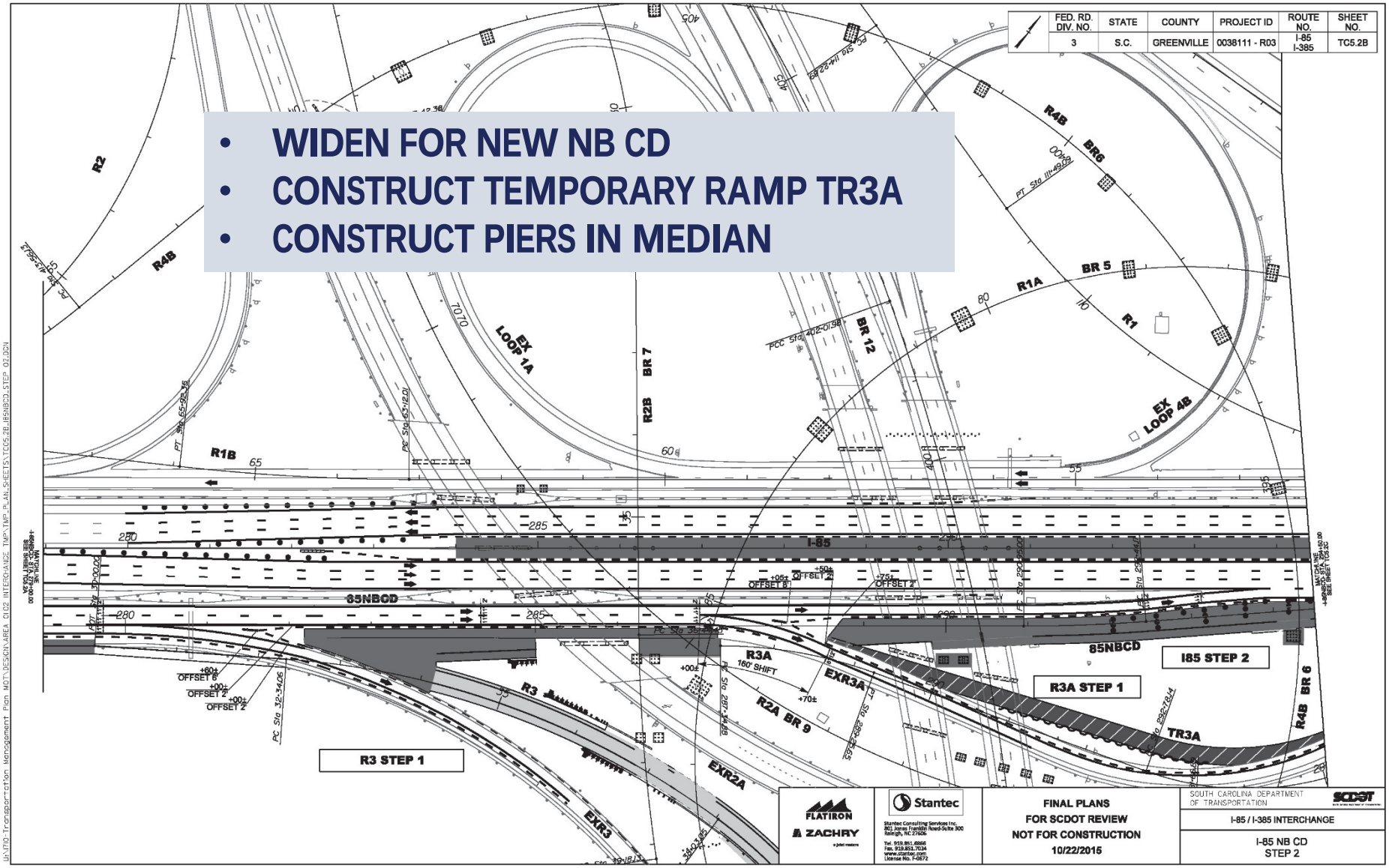


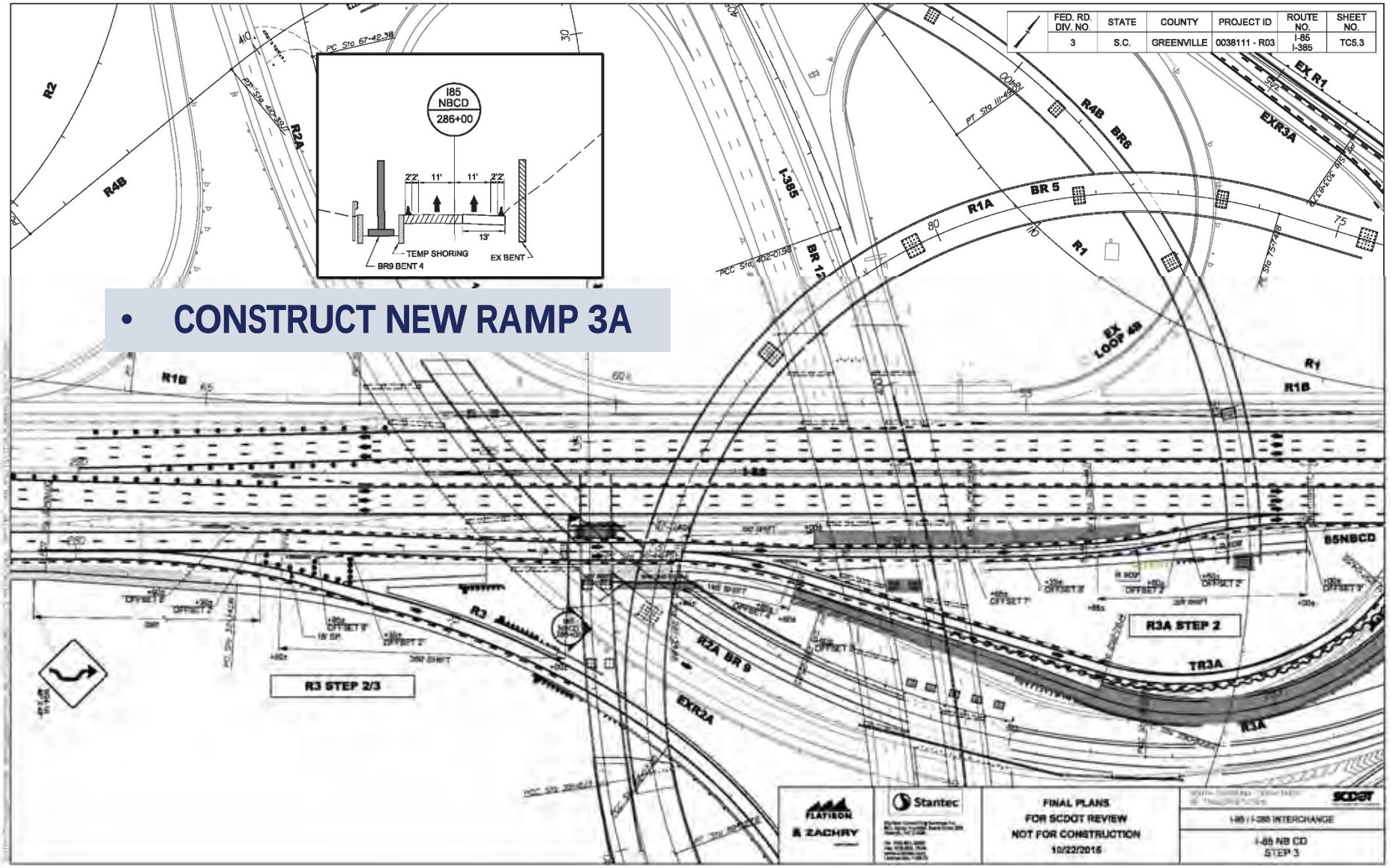
WIDEN EXISTING NB SHOULDER

FLATIRON | ZACHRY | CJCS Civil Engineering Consulting Services, Inc.

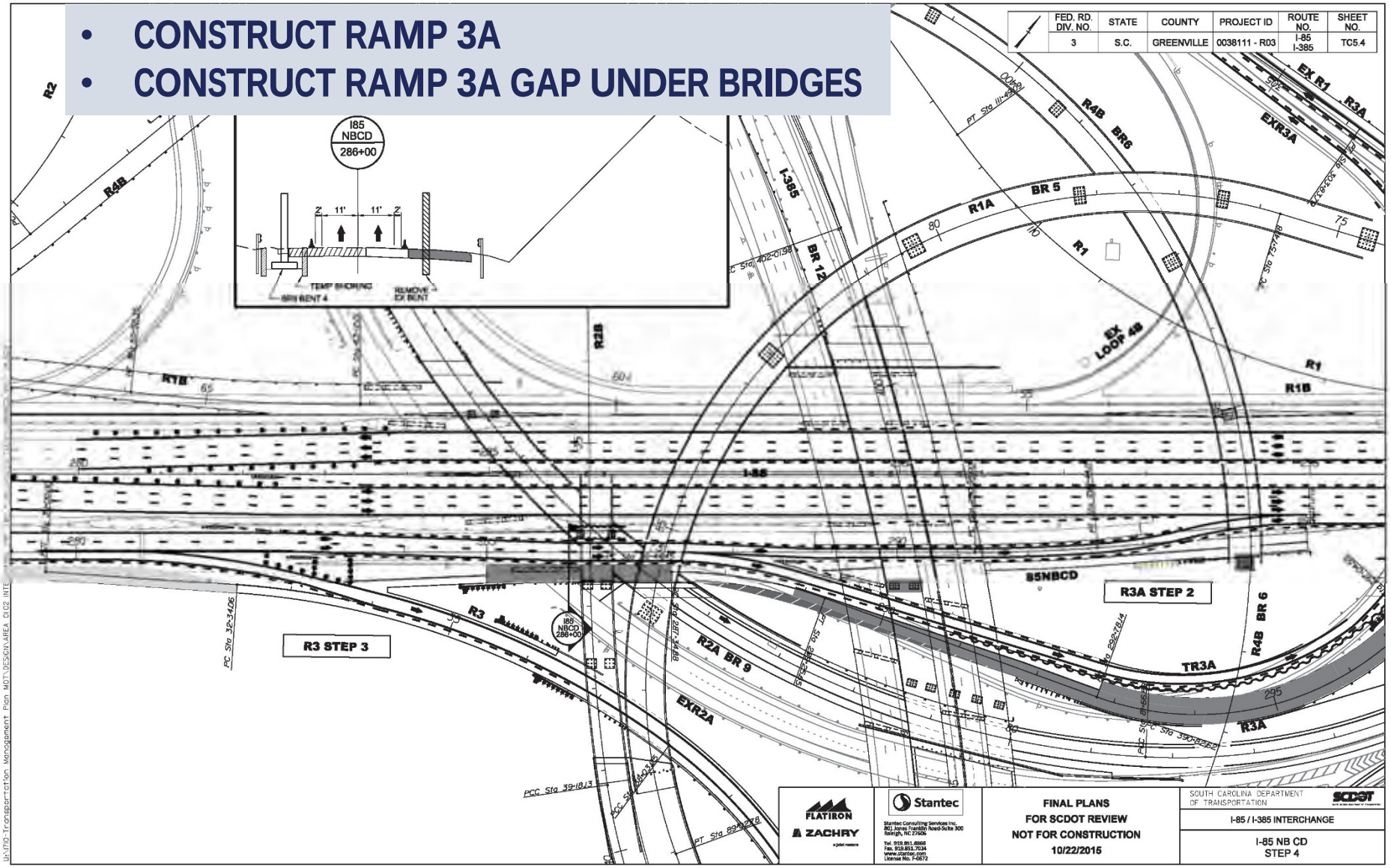
85 GATEWAY 385

- **WIDEN FOR NEW NB CD**
- **CONSTRUCT TEMPORARY RAMP TR3A**
- **CONSTRUCT PIERS IN MEDIAN**




I85 NBCD 286+00
2'2' 11' 11' 2'2'
13'
TEMP SHORING
BR9 BENT 4
EX BENT
FED. RD. DIV. NO. 3
STATE S.C.
COUNTY GREENVILLE
PROJECT ID 0038111 - R03
ROUTE NO. I-85 I-385
SHEET NO. TC5.3
• CONSTRUCT NEW RAMP 3A
R3 STEP 2/3
R3A STEP 2
FINAL PLANS
FOR SCDOT REVIEW
NOT FOR CONSTRUCTION
10/22/2015
I-85 / I-385 INTERCHANGE
I-85 NB CD
STEP 3

- **CONSTRUCT RAMP 3A**
- **CONSTRUCT RAMP 3A GAP UNDER BRIDGES**



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R03	I-85 I-385	TC5.4

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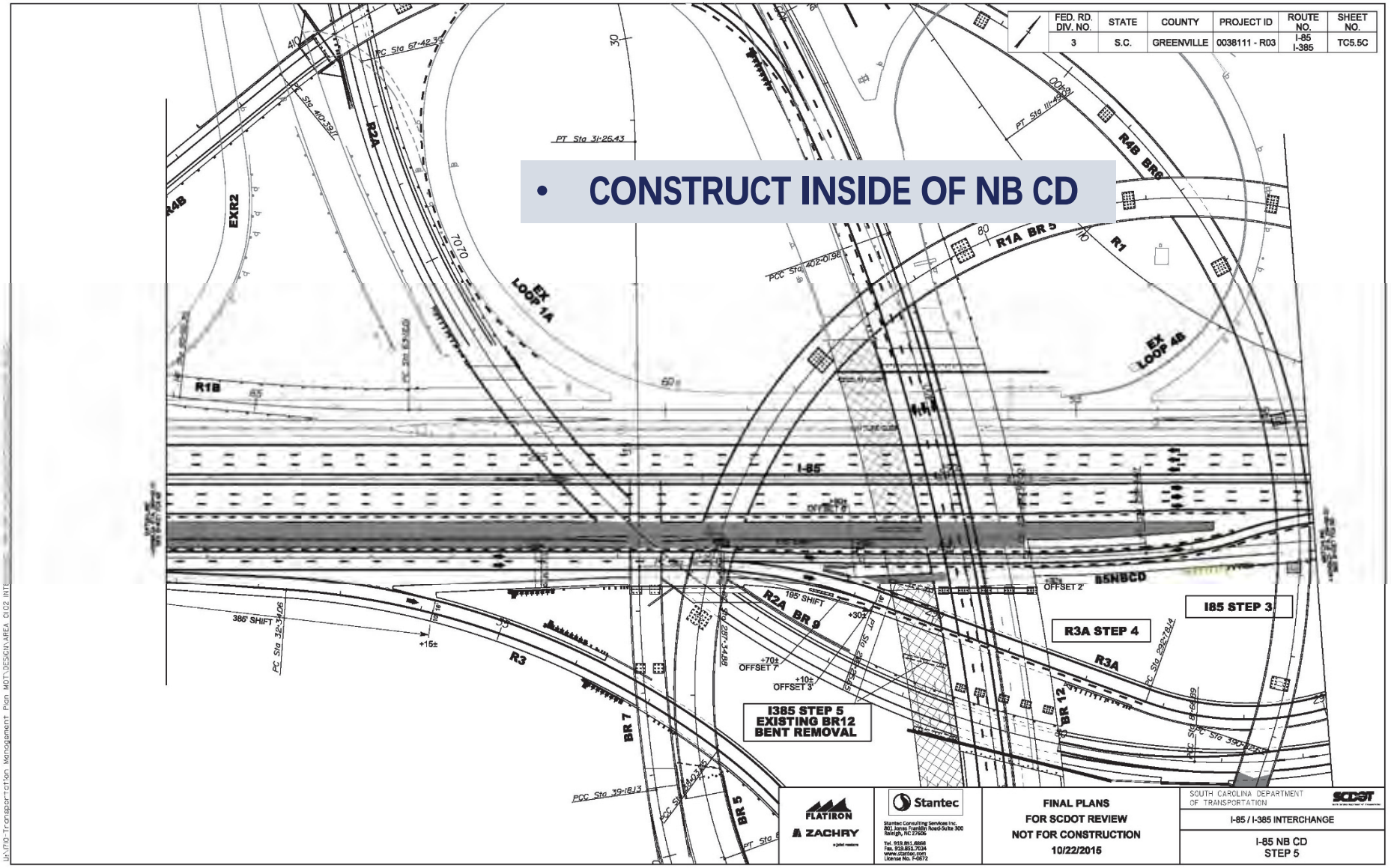
85 GATEWAY 385

- **CONSTRUCT INSIDE OF NB CD**



FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.	SHEET NO.
3	S.C.	GREENVILLE	0038111 - R03	I-85 I-385	TC5.5C

FLATIRON ZACHRY joint venture

Stantec

Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com
License No. F-0672

FINAL PLANS
FOR SCDOT REVIEW
NOT FOR CONSTRUCTION
10/22/2015

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

I-85 / I-385 INTERCHANGE

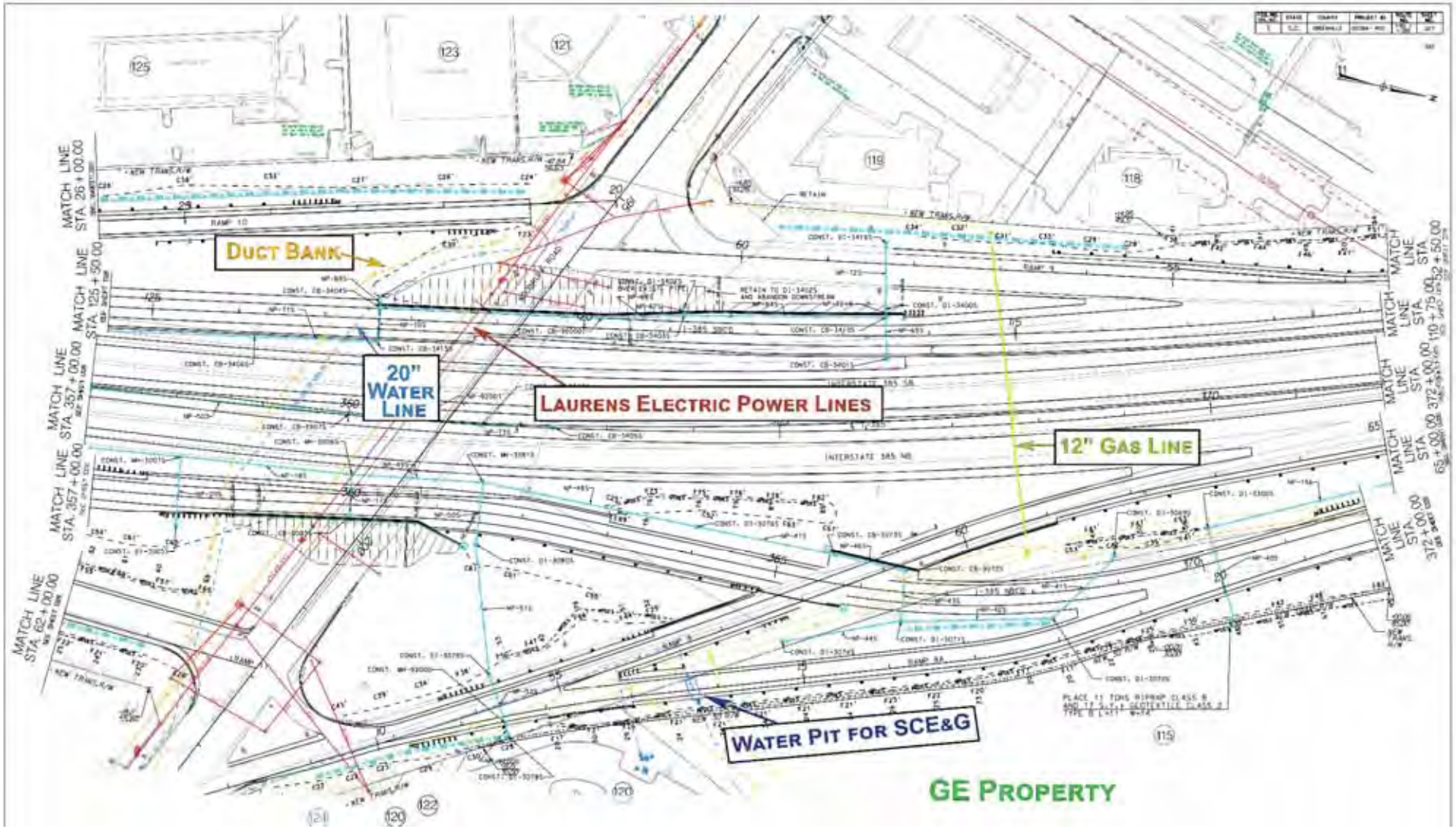
I-85 NB CD
STEP 5

10/22/2015
9:30:58 AM
U:\710_Transportation_Management Plan_MOT\05SHN\AREA 01\02 INT

FLATIRON | ZACHRY | CJ CS Civil Engineering Consulting Services, Inc.

85 GATEWAY 385

UTILITIES



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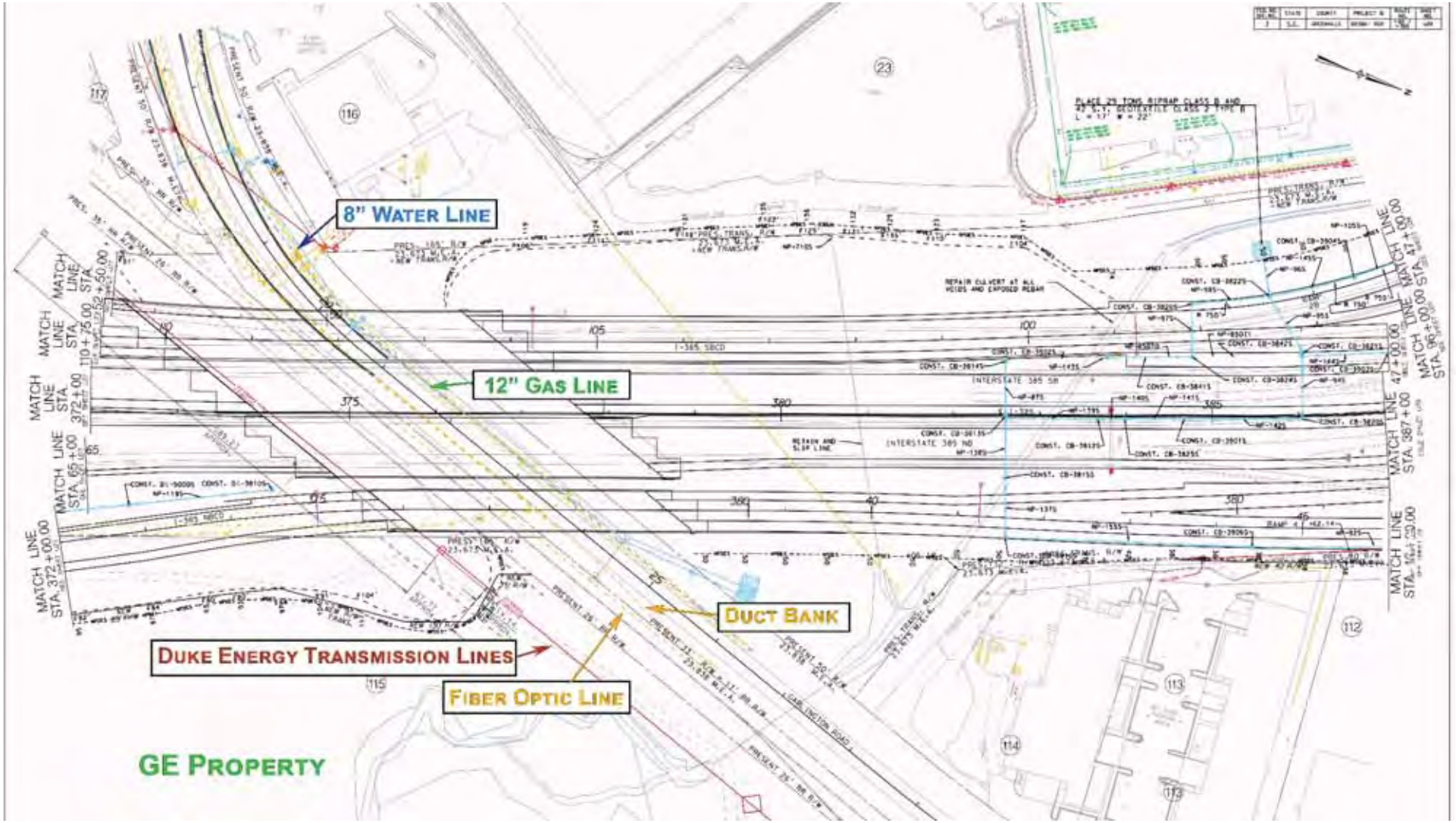
85 GATEWAY 385

UTILITIES



DRAINAGE - CHALLENGES

- Gilders Creek
  - Ordinance does not allow increase in discharge
- Rocky Creek Crossing under I-85 (south of Pelham Road)
  - Floodplain and FIRM revised after D-B proposals were received
  - 2004 Flood Elevation below roadway surface
  - 2014 Flood Elevation increased by 6' (overtops I-85)
  - History of flooding
  - Drainage Structures

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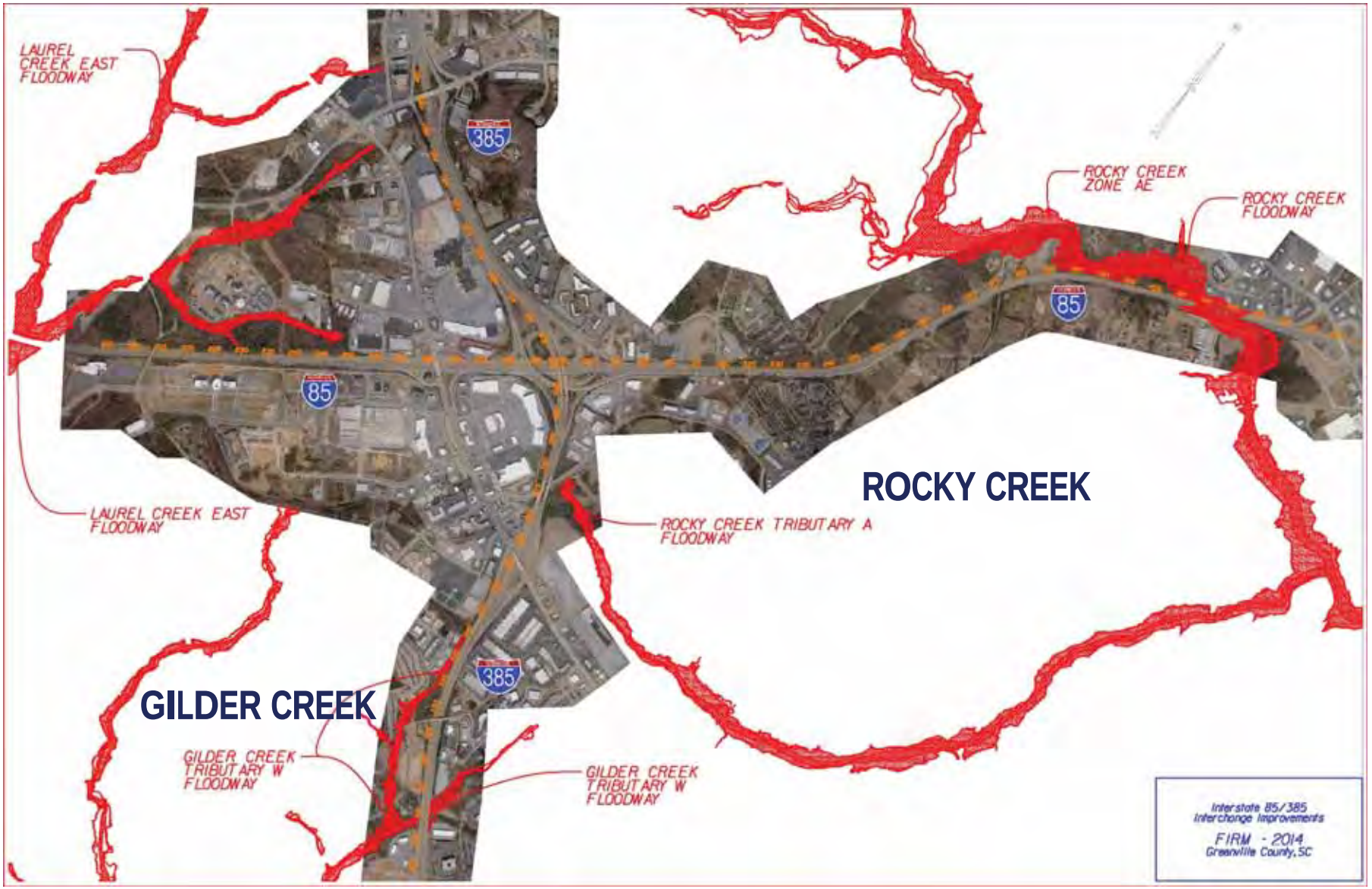
STREAM/FLOODWAY MAP



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ROCKY CREEK – NO RISE ANALYSIS

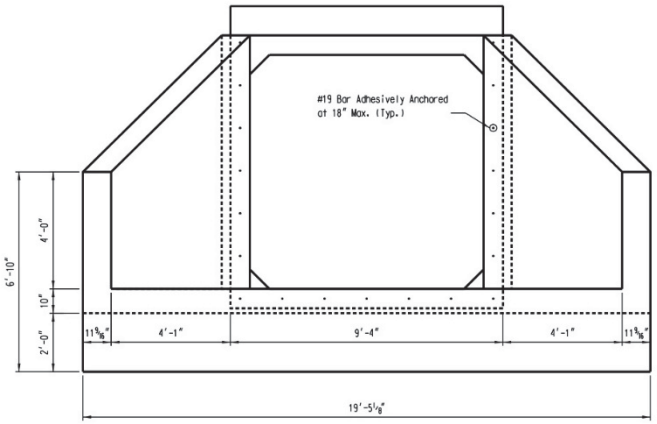
PREPARED BY:
Stantec Consulting Services Inc.
4969 Centre Pointe Drive, Suite 200
North Charleston, SC 29418
Tel. 843.740.7700
www.stantec.com

Stantec

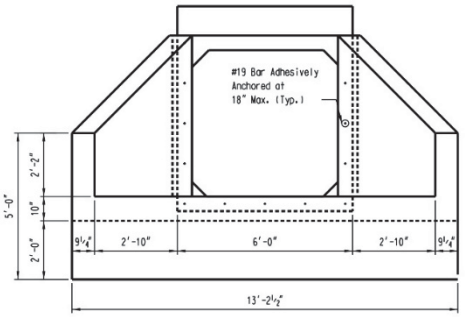
ROCKY CREEK
NO-RISE STUDY
GREENVILLE, SOUTH CAROLINA

DATE:
3/5/2015
PAGE:
1 of 1
PROJECT NO:
SCALE:
1 inch = 300 feet

CULVERT EXTENSION



8x8 Cast-in-Place Culvert Elevation



5x5 Cast-in-Place Culvert Elevation

CONSTRUCTION

- Receive NTP2 - December 2015
- Receive USACE 404 Permit – December 2015
- Receive SCDHEC NPDES (NOI) Approval - December 2015
- Construction – December 2015 thru September 2018

MAJOR QUANTITIES	
Borrow Material = 350,000 CY	Structural Steel = 4,748 Tons or 9,496,000 lbs
Excavation = 373,000 CY	Reinforcing Steel = 2,907 Tons or 5,813,930 lbs
Concrete = 21,444 CY	Prestressed Girders = 17,500 LF
Asphalt = 234,000 Tons	Drilled Shafts = 1,600 LF
PCCP = 156,400 SY	Steel H Piles = 95,000 LF
MSE Wall = 250,400 SF	

THANK YOU!

QUESTIONS OR COMMENTS