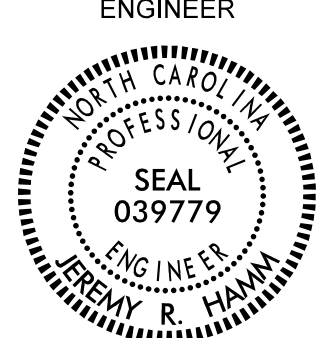


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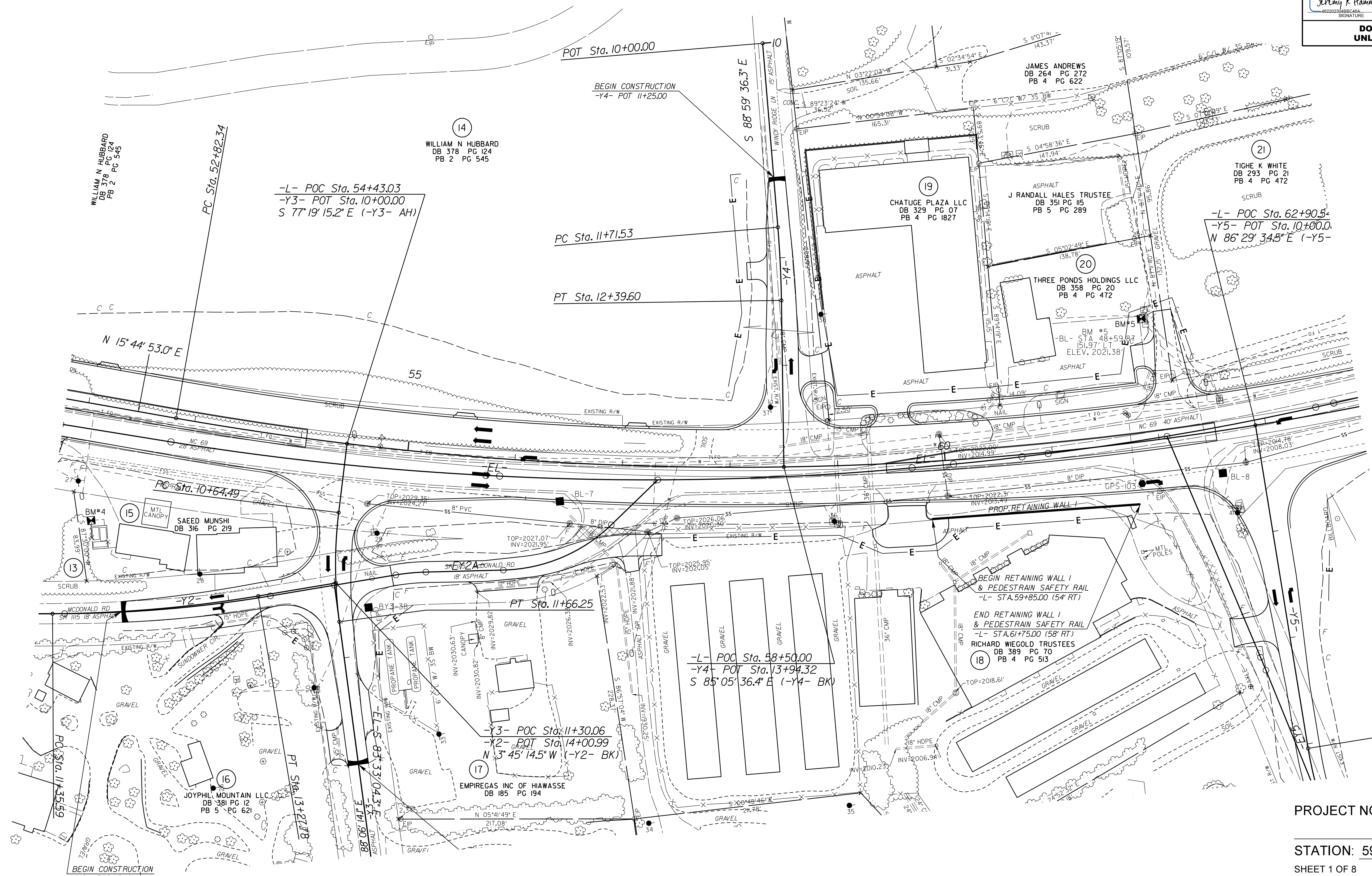
GEOTECHNICAL ENGINEER



SEAL  
039779  
ENGINEER  
JEREMY R. HAMM

DocuSigned by:  
**Jeremy R Hamm** 8/22/2019

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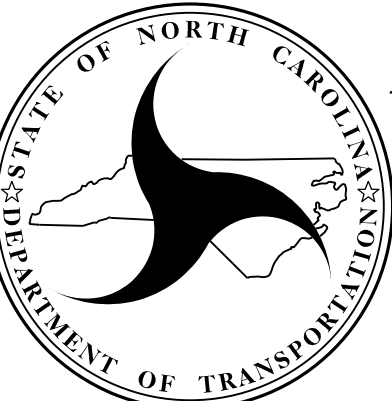


PROJECT NO.: A-0011C  
CLAY COUNTY  
STATION: 59+85, 54' RT TO 61+75, 58' RT  
SHEET 1 OF 8

PREPARED BY: J. R. HAMM	DATE: 5/15/19
REVIEWED BY: S. C. CROCKETT	DATE: 5/17/19



FALCON ENGINEERING, INC.  
1210 TRINITY ROAD, SUITE 110  
RALEIGH, NC 27607  
PHONE: 919.871.0800  
FAX: 919.871.0803



**NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS**

**GEOTECHNICAL  
ENGINEERING UNIT**

REVISIONS					
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1			3		
2			4		

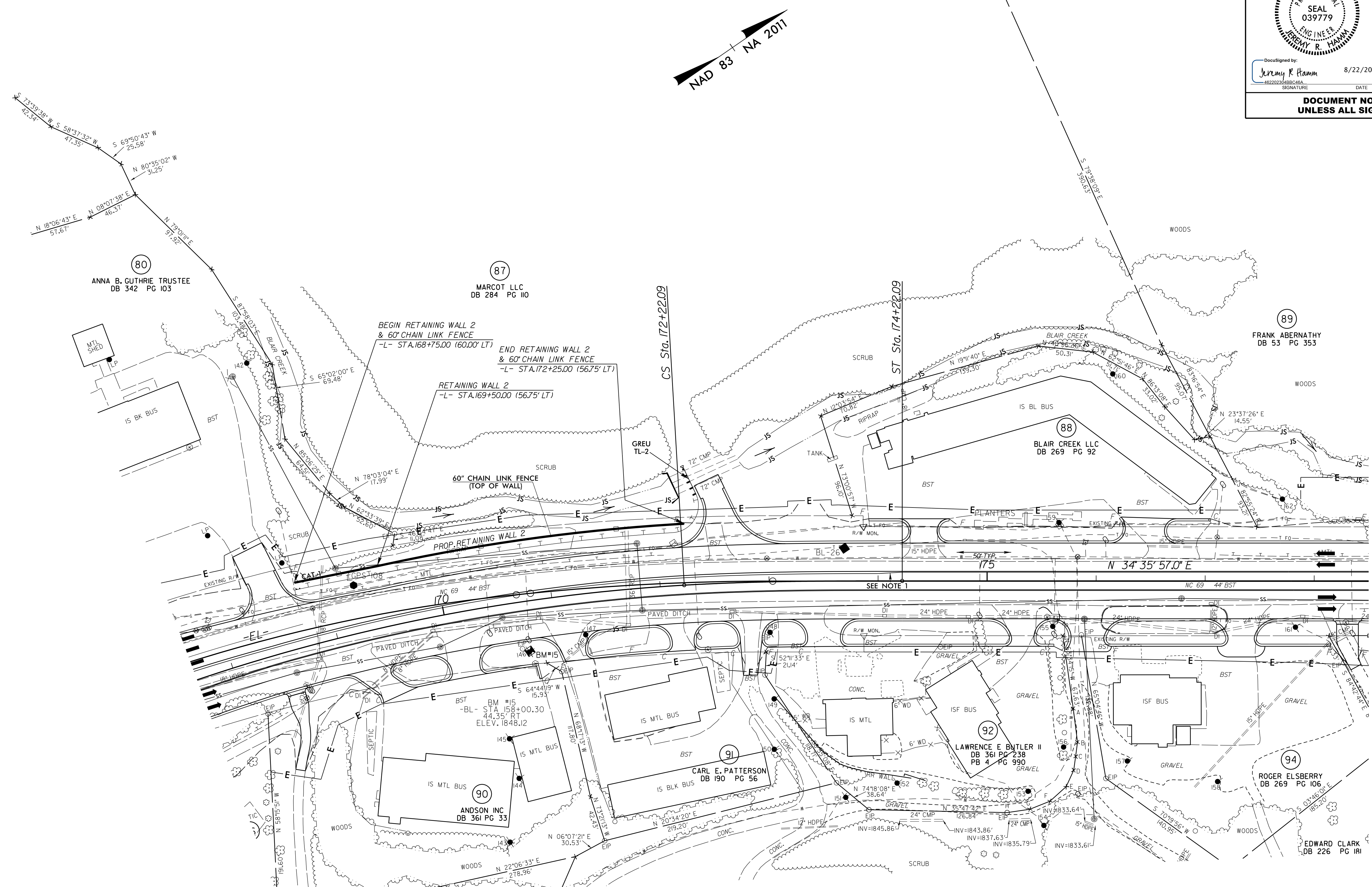
SHEET NO. W-1

GEOTECHNICAL ENGINEER

DocuSigned by:  
**Jeremy R. Hamm** 8/22/2019

DATE: 8/22/2019

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PROJECT NO.: A-0011C  
 CLAY COUNTY  
 STATION: 168+75, 60' LT TO 172+25, 56.75' LT  
 SHEET 2 OF 8

PREPARED BY: J. R. HAMM DATE: 5/15/19  
 REVIEWED BY: S. C. CROCKETT DATE: 5/17/19

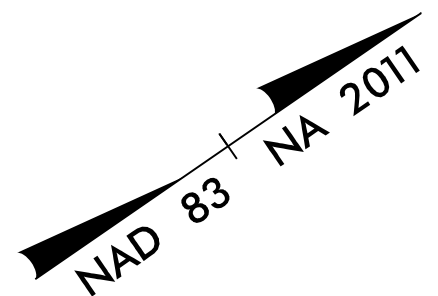
**FALCON ENGINEERING, INC.**  
 1210 TRINITY ROAD, SUITE 110  
 RALEIGH, NC 27607  
 PHONE: 919.871.0800  
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**NORTH CAROLINA  
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**GEOTECHNICAL  
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NO.	BY	DATE	NO.	BY	DATE
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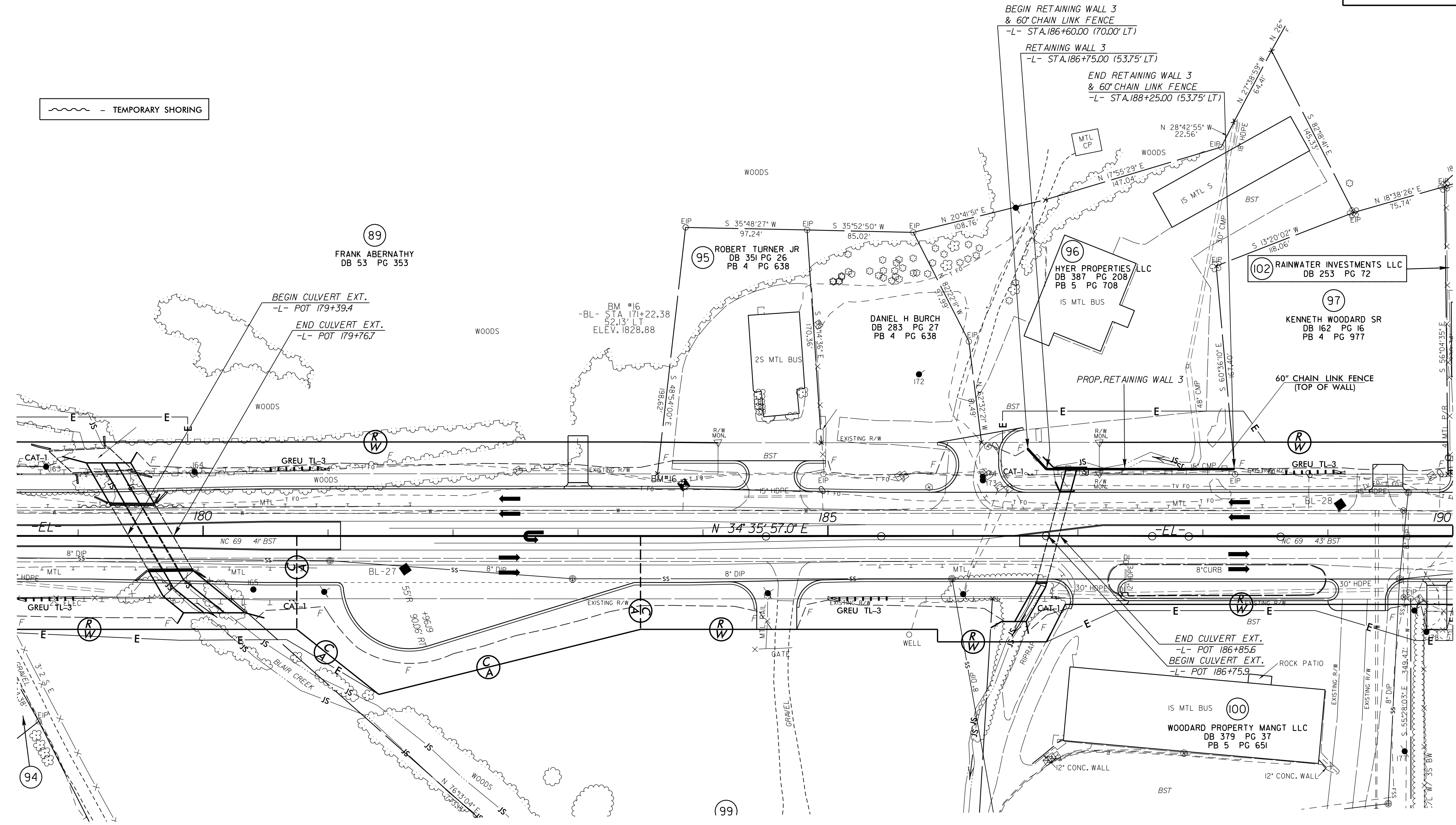
SHEET NO. W-2



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**Jeremy R Hamm** 8/22/2019  
46220234880C4E4

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--- TEMPORARY SHORING

PROJECT NO.: A-0011C  
 CLAY COUNTY  
 STATION: 186+60, 70' LT TO 188+25, 53.75' LT  
 SHEET 3 OF 8

PREPARED BY: J. R. HAMM DATE: 5/15/19  
 REVIEWED BY: S. C. CROCKETT DATE: 5/17/19

FALCON ENGINEERING, INC.  
 1210 TRINITY ROAD, SUITE 110  
 RALEIGH, NC 27607  
 PHONE: 919.871.0800  
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**NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS**

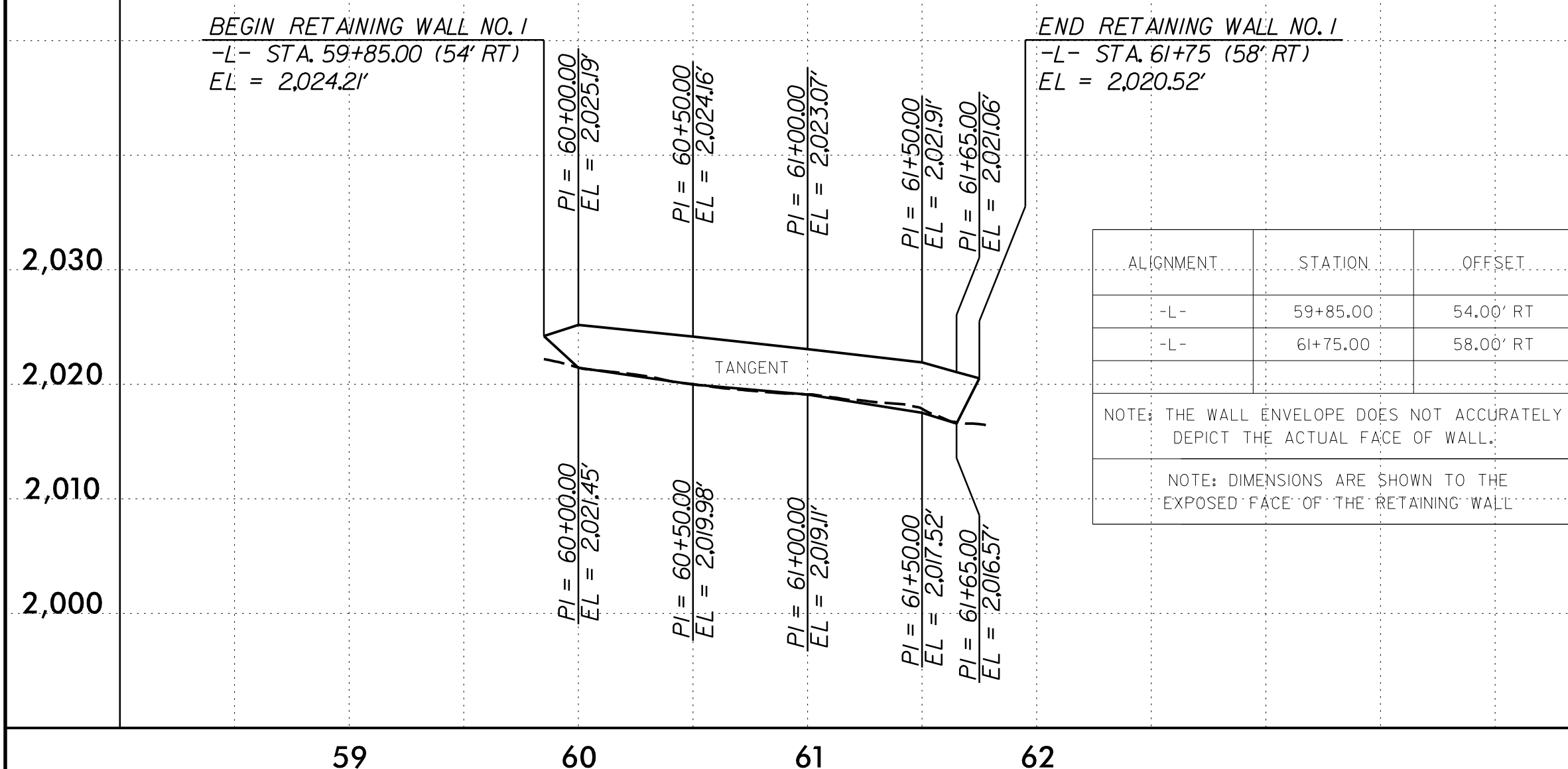
**GEOTECHNICAL  
ENGINEERING UNIT**

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
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2			4		

SHEET NO. W-3

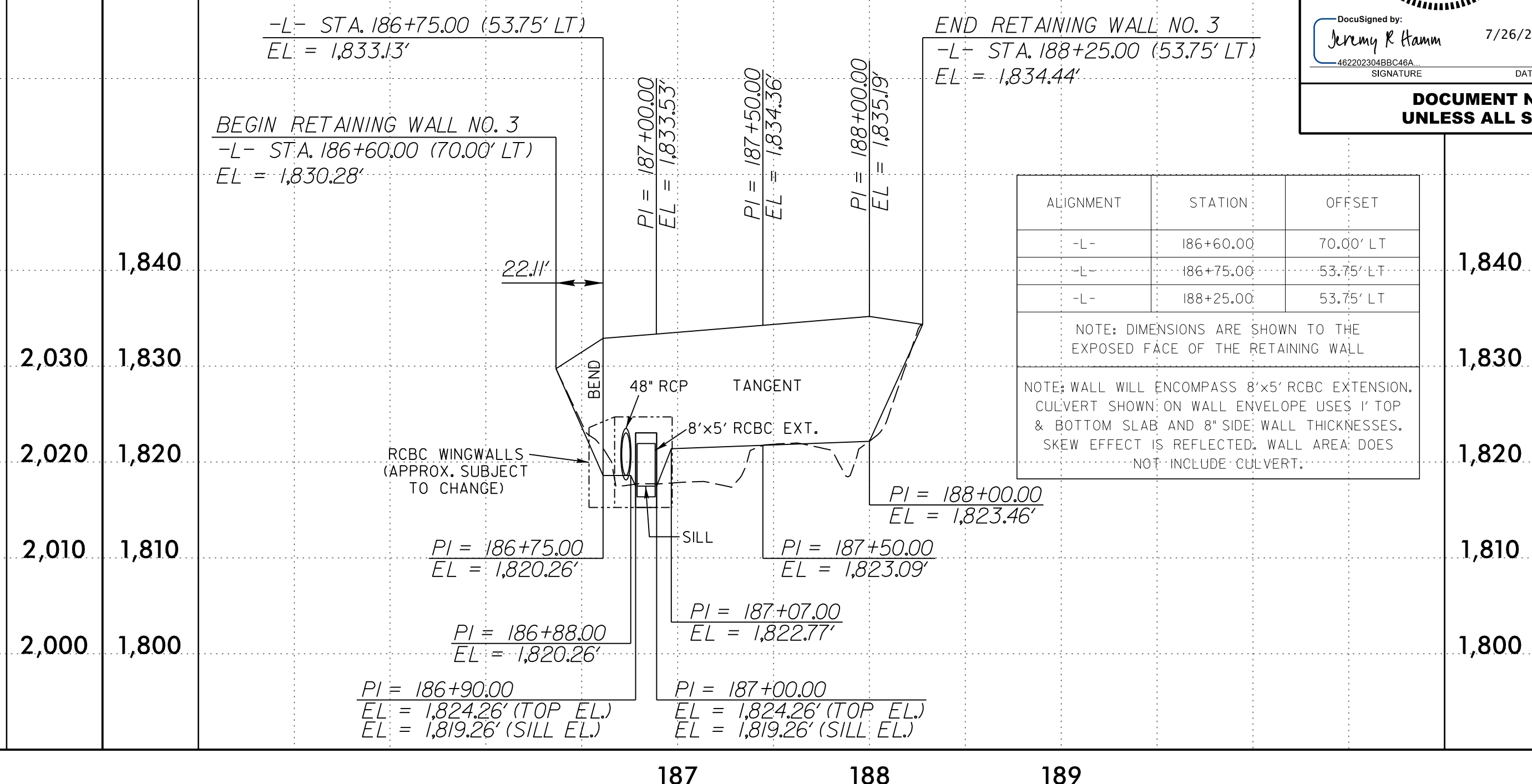
# WALL 1

## WALL ADJACENT -L-



# WALL 3

## WALL ADJACENT -L-



GEOTECHNICAL ENGINEER

DocuSigned by:  
Jeremy R Hamm  
7/26/2019

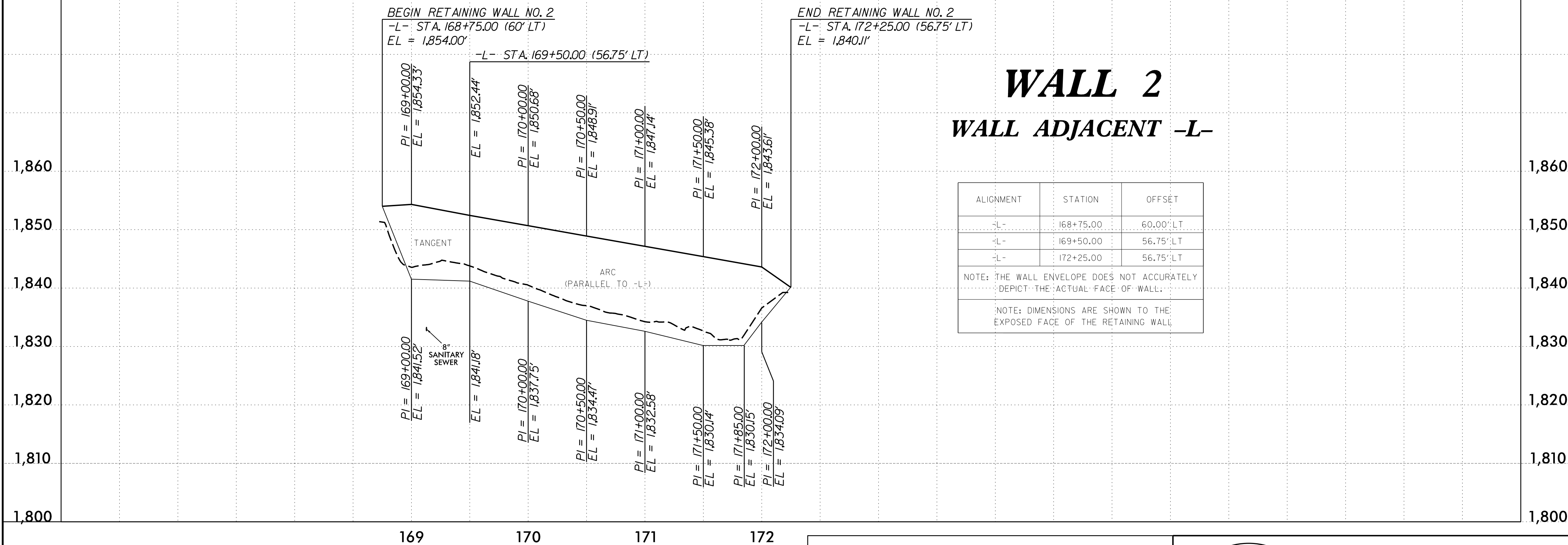
DATE: 7/26/2019

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59 60 61 62 187 188 189

# WALL 2

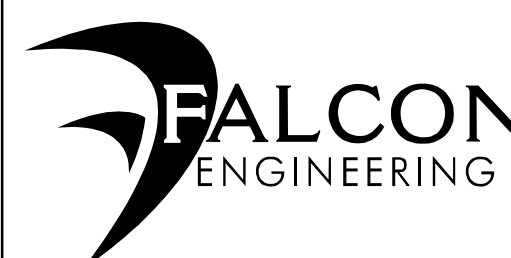
## WALL ADJACENT -L-



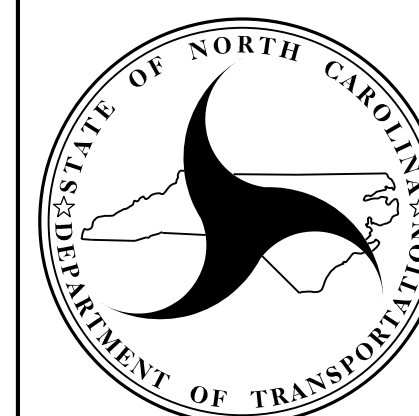
ESTIMATED WALL QUANTITIES (SQUARE FEET)	
MSE RETAINING WALL NO. 1	1060 SF
MSE RETAINING WALL NO. 2	5740 SF
ANCHORED RETAINING WALL	2690 SF

169 170 171 172

PREPARED BY: J. R. HAMM DATE: 5/15/19  
REVIEWED BY: S. C. CROCKETT DATE: 5/17/19



FALCON ENGINEERING, INC.  
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NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
**GEOTECHNICAL  
ENGINEERING UNIT**

PROJECT NO.: A-0011C  
CLAY COUNTY  
STATION: \_\_\_\_\_  
SHEET 4 OF 8

### RETAINING WALLS NO. 1, 2, & 3 ENVELOPES

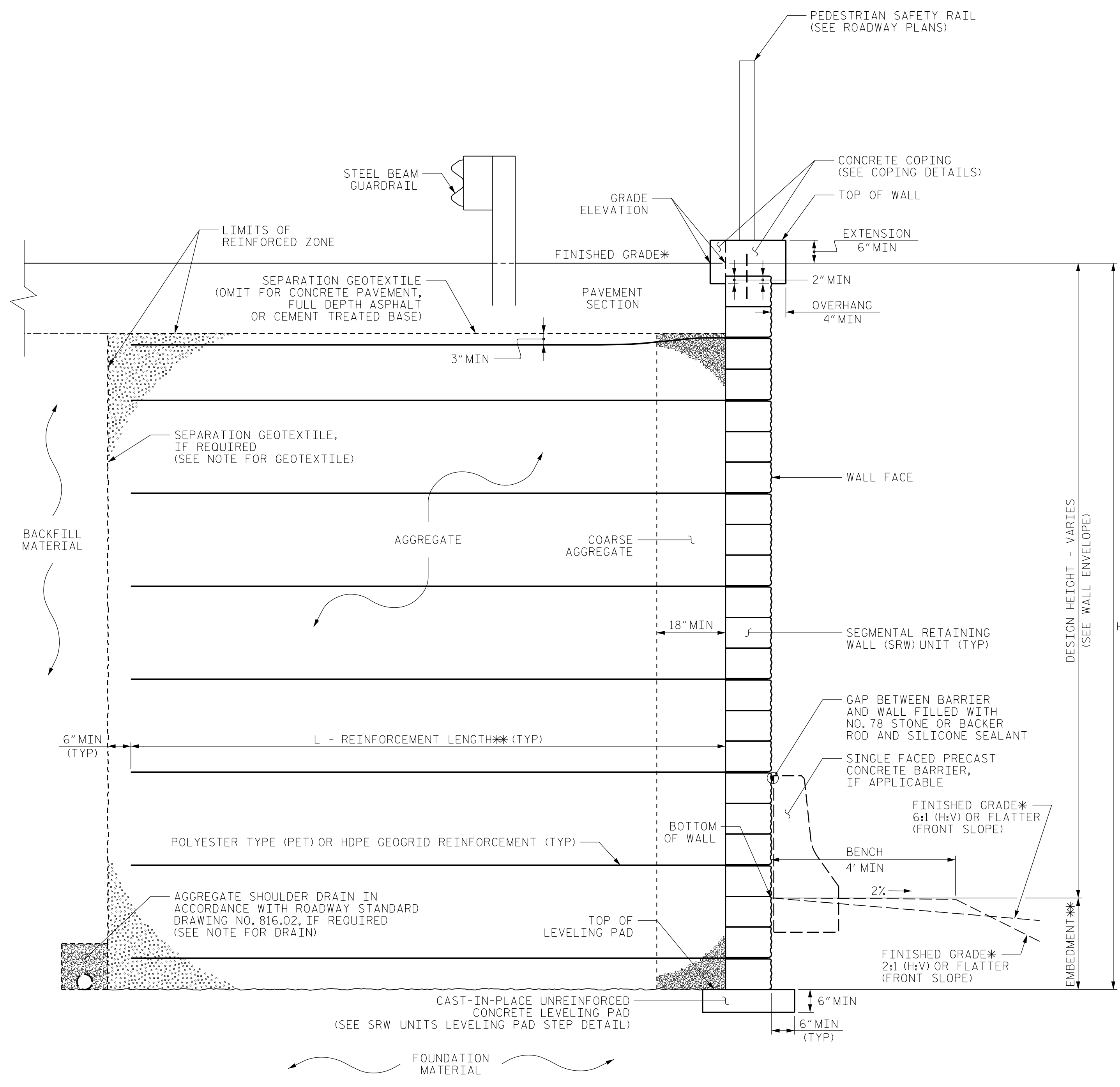
REVISIONS					
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1			3		
2			4		

SHEET NO. W-4

GEOTECHNICAL ENGINEER

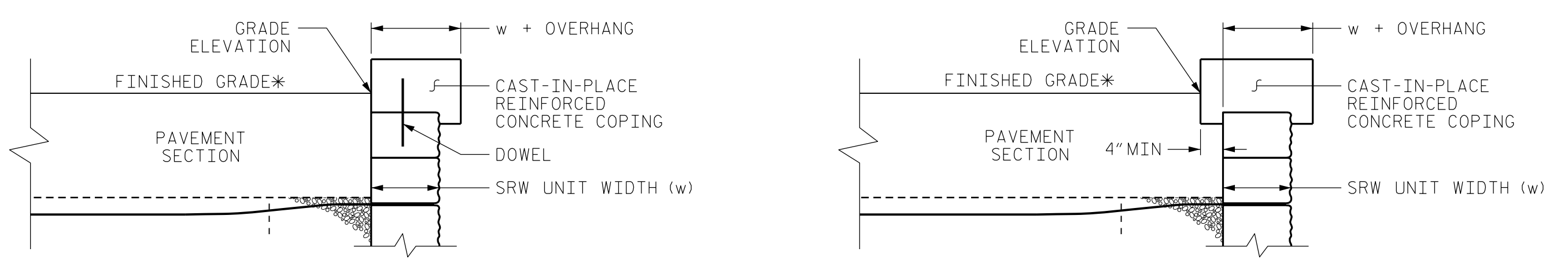
DocuSigned by:  
**Jeremy R Hamm** 8/22/2019  
462202348BC48A  
 SIGNATURE DATE SIGNATURE DATE

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**MSE WALL WITH SRW UNITS - TYPICAL SECTION**

\*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.  
 \*\*SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.



**COPING DETAILS**

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO SRW UNITS WITH DOWELS OR EXTEND COPING DOWN BACK OF SRW UNITS.  
 \*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.

PROJECT NO.: A-0011C  
 CLAY COUNTY  
 STATION: 59+85, 54' RT TO 61+75, 58' RT  
 SHEET 5 OF 8

PREPARED BY: J. R. HAMM	DATE: 5/15/19
REVIEWED BY: S. C. CROCKETT	DATE: 5/17/19

**FALCON ENGINEERING, INC.**  
 1210 TRINITY ROAD, SUITE 110  
 RALEIGH, NC 27607  
 PHONE: 919.871.0800  
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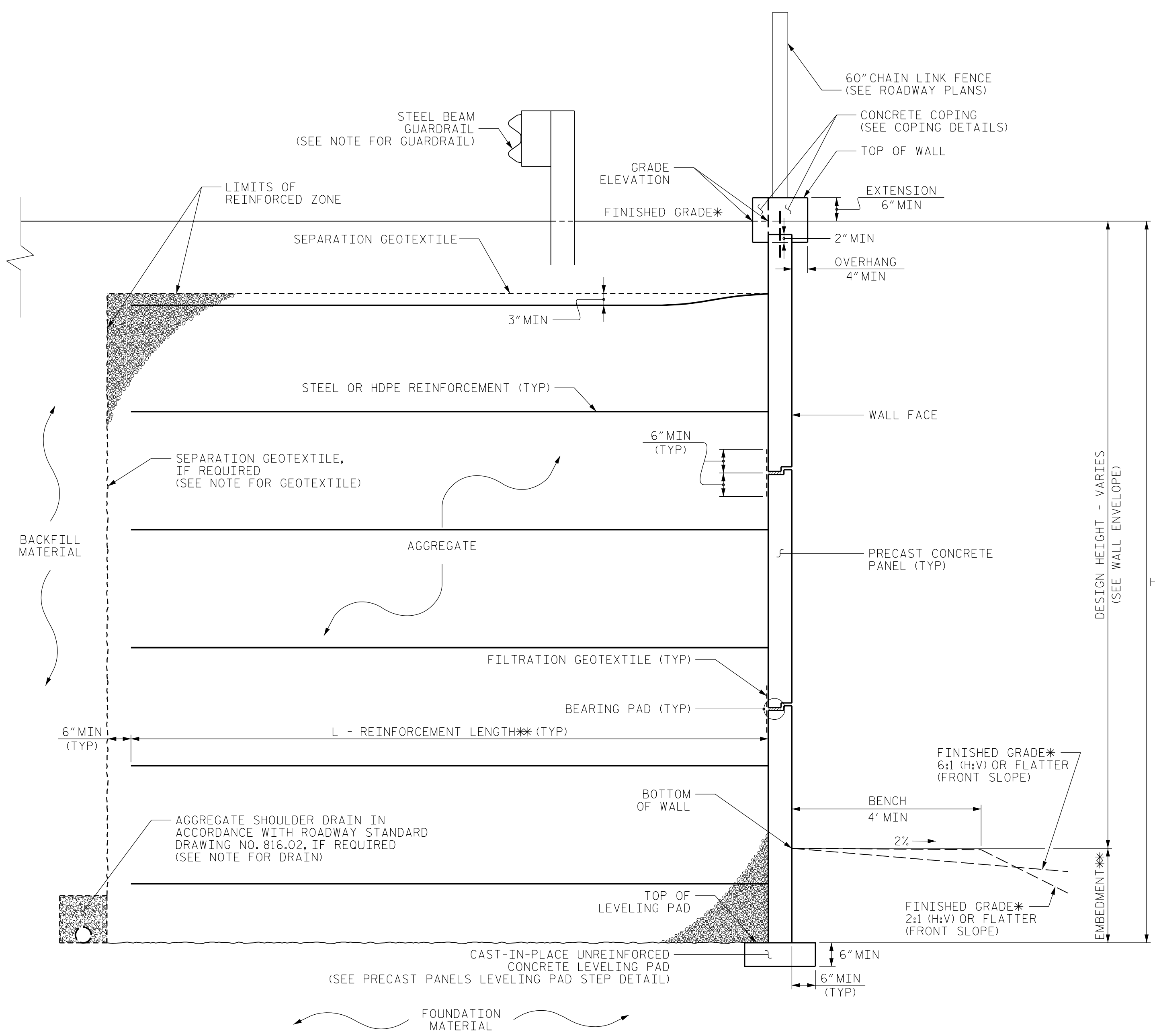
**NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS**  
  
**GEOTECHNICAL  
 ENGINEERING UNIT**

REVISIONS						SHEET NO. W-5
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			

GEOTECHNICAL ENGINEER

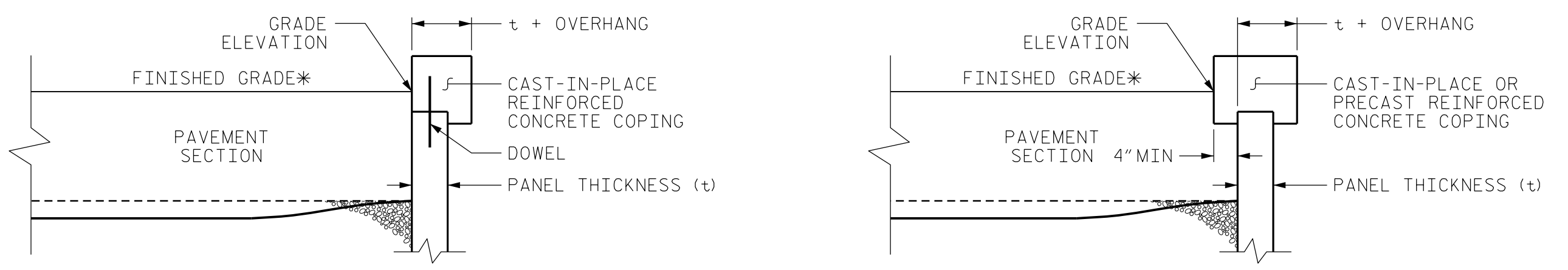
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**Jeremy R. Hamm** 8/22/2019  
4622023483C46A SIGNATURE DATE

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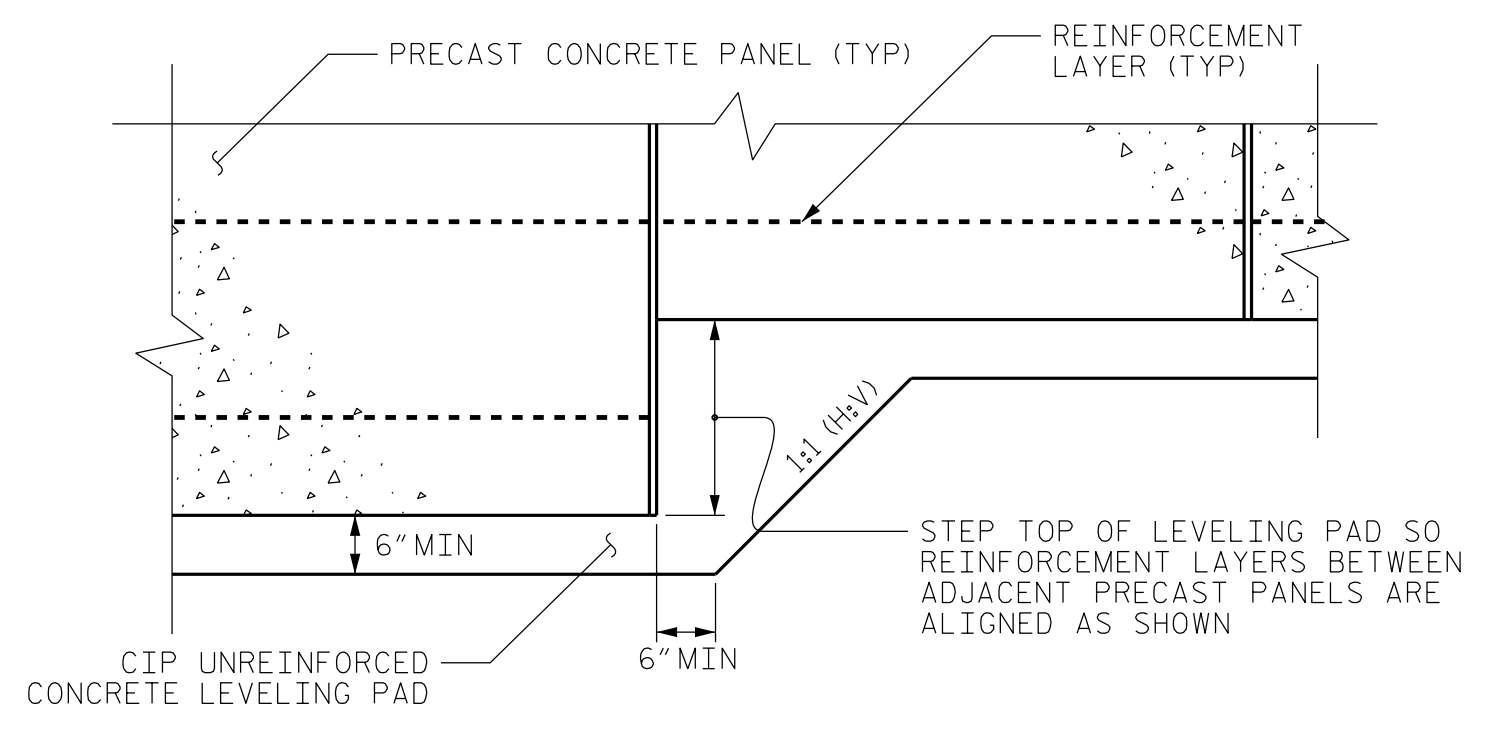
**MSE WALL WITH PRECAST PANELS - TYPICAL SECTION**

\*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.  
 \*\*SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.



**COPING DETAILS**

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.  
 \*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.



**PRECAST PANELS  
LEVELING PAD STEP DETAIL**

PROJECT NO.: A-0011C  
 CLAY COUNTY  
 STATION: 168+75, 60' LT TO 172+25, 56.75' LT  
 SHEET 5 OF 8

PREPARED BY: J. R. HAMM	DATE: 5/15/19
REVIEWED BY: S. C. CROCKETT	DATE: 5/17/19

FALCON ENGINEERING, INC.  
 1210 TRINITY ROAD, SUITE 110  
 RALEIGH, NC 27607  
 PHONE: 919.871.0800  
 FAX: 919.871.0803

**NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS**

**GEOTECHNICAL  
ENGINEERING UNIT**

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

SHEET NO. W-6

**NOTES:**

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.

FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.

USE AN MSE WALL SYSTEM WITH SEGMENTAL RETAINING WALL (SRW) UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARD SPECIFICATIONS FOR RETAINING WALL NO. 1.

WHEN USING AN MSE WALL SYSTEM WITH SRW UNITS FOR RETAINING WALLS NO. 1 AND 2, FREEZE-THAW DURABLE SRW UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARD SPECIFICATIONS ARE REQUIRED.

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALLS NO. 1 OF 2.

CIP REINFORCED CONCRETE COPING IS REQUIRED FOR RETAINING WALL NO. 1.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALLS NO. 1 AND 2.

A DRAIN IS REQUIRED FOR RETAINING WALLS NO. 1 AND 2.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALLS NO. 1 AND 2, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL NO. 1 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 2,050 PSF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.85 H OR 6 FT, WHICHEVER IS LONGER
- 5) MINIMUM EMBEDMENT DEPTH = 2 FT
- 6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT ( $\gamma$ ) PCF	FRICTION ANGLE ( $\phi$ ) DEGREES	COHESION (c) PSF
COARSE	110	38	0
FINE	115	34	0
*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.			

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT ( $\gamma$ ) PCF	FRICTION ANGLE ( $\phi$ ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	110	28	0

DESIGN RETAINING WALL NO. 2 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 4,500 PSF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.8 H OR 6 FT, WHICHEVER IS LONGER
- 5) MINIMUM EMBEDMENT DEPTH = 4 FT
- 6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT ( $\gamma$ ) PCF	FRICTION ANGLE ( $\phi$ ) DEGREES	COHESION (c) PSF
COARSE	110	38	0
FINE	115	34	0
*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.			

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT ( $\gamma$ ) PCF	FRICTION ANGLE ( $\phi$ ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	110	28	0


DESIGN RETAINING WALL NO. 1 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 1.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 1 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

AT THE CONTRACTOR'S OPTION, "TEMPORARY SHORING FOR WALL CONSTRUCTION" MAY BE USED TO CONSTRUCT RETAINING WALL NO. 1. SEE MSE RETAINING WALLS PROVISION FOR TEMPORARY SHORING FOR WALL CONSTRUCTION.

GEOTECHNICAL ENGINEER



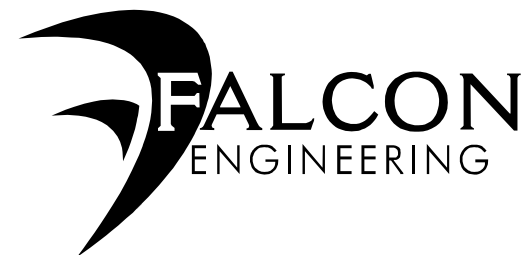
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*Jeremy R Hamm* 6/26/2019

452202104583C46A  
SIGNATURE DATE SIGNATURE DATE

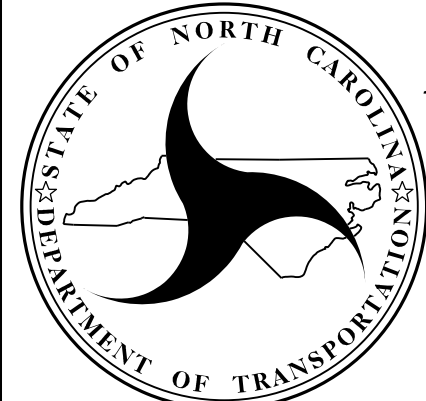
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UNLESS ALL SIGNATURES COMPLETED**

PROJECT NO.: A-0011C  
 CLAY COUNTY  
 STATION: 59+85, 54' RT TO 61+75, 58' RT  
 168+75, 60' LT TO 172+25, 56.75' LT  
 SHEET 6 OF 8

PREPARED BY: J. R. HAMM	DATE: 5/15/19
REVIEWED BY: S. C. CROCKETT	DATE: 5/17/19



FALCON ENGINEERING, INC.  
 1210 TRINITY ROAD, SUITE 110  
 RALEIGH, NC 27607  
 PHONE: 919.871.0800  
 FAX: 919.871.0803



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 DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS**

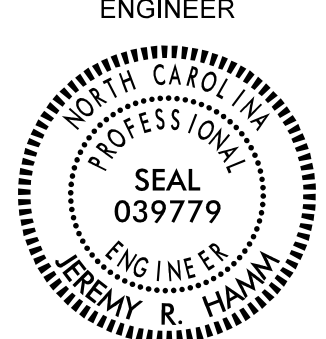
**GEOTECHNICAL  
 ENGINEERING UNIT**

**RETAINING WALLS NO. 1 AND 2  
 MSE WALL NOTES**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-7
2			4			

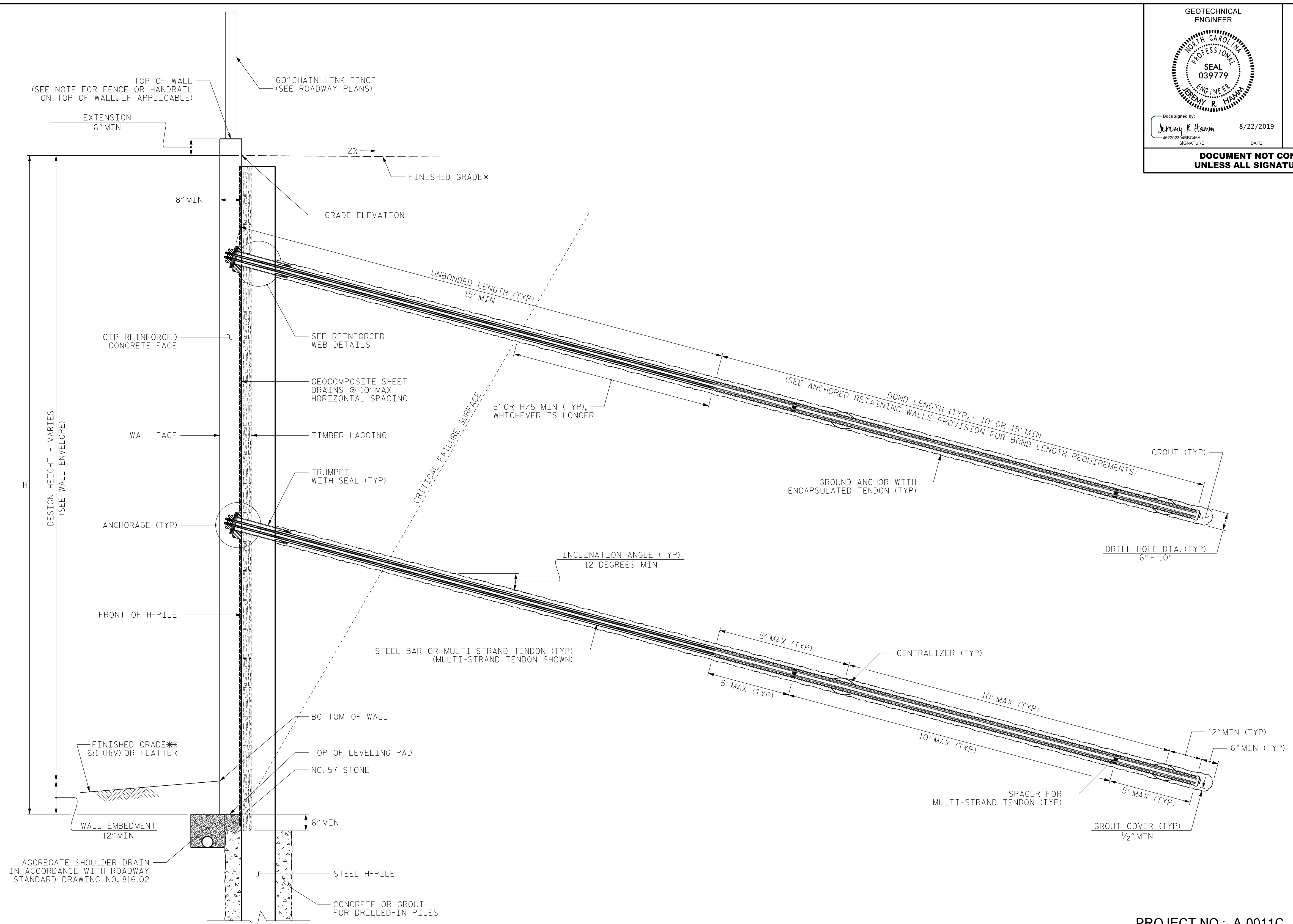


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DocuSigned by:  
**Jeremy R Hamm** 8/22/2019  
6522023485BC4EA  
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**ANCHORED WALL - TYPICAL SECTION**

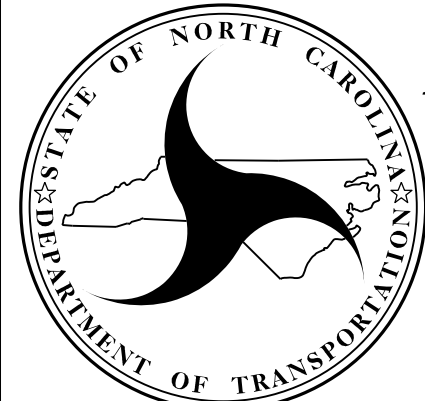
(GROUND ANCHORS SHOWN, AS NEEDED BASED ON VARYING WALL HEIGHT AND PILE SPACING)  
 \*SEE PLANS FOR FINISHED GRADE DETAILS.

PROJECT NO.: A-0011C  
 CLAY COUNTY  
 STATION: 186+60, 70' LT TO 188+25, 53.75' LT  
 SHEET 7 OF 8

PREPARED BY: J. R. HAMM	DATE: 5/15/19
REVIEWED BY: S. C. CROCKETT	DATE: 5/17/19



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 1210 TRINITY ROAD, SUITE 110  
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 PHONE: 919.871.0800  
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**NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS**

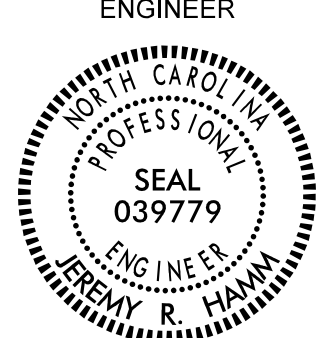
**GEOTECHNICAL  
 ENGINEERING UNIT**

**RETAINING WALL NO. 3  
 ANCHORED SOLDIER PILE WALL  
 TYPICAL DETAIL**

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

SHEET NO. W-8

GEOTECHNICAL ENGINEER



DocuSigned by:  
**Jeremy R. Hamm** 7/25/2019  
462202304881C46A

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**NOTES:**

FOR ANCHORED RETAINING WALLS, SEE ANCHORED RETAINING WALLS PROVISION.

FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.

AT THE CONTRACTOR'S OPTION, USE DRIVEN H-PILES FOR RETAINING WALL NO. 3.

BEFORE BEGINNING ANCHORED WALL DESIGN FOR RETAINING WALL NO. 3, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL NO. 3 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + WALL EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MINIMUM WALL EMBEDMENT ELEVATION = 1,818.3 FT
- 4) MINIMUM PILE PENETRATION INTO ROCK = N/A
- 5) IN-SITU ASSUMED MATERIAL PARAMETERS ABOVE ELEVATION 1,805 FT:  
 UNIT WEIGHT,  $\gamma = 115$  PCF  
 FRICTION ANGLE,  $\phi = 28$  DEGREES  
 COHESION,  $c = 0$  PSF
- 6) IN-SITU ASSUMED MATERIAL PARAMETERS BELOW ELEVATION 1,805 FT:  
 UNIT WEIGHT,  $\gamma = 125$  PCF  
 FRICTION ANGLE,  $f = 32$  DEGREES  
 COHESION,  $c = 0$  PSF

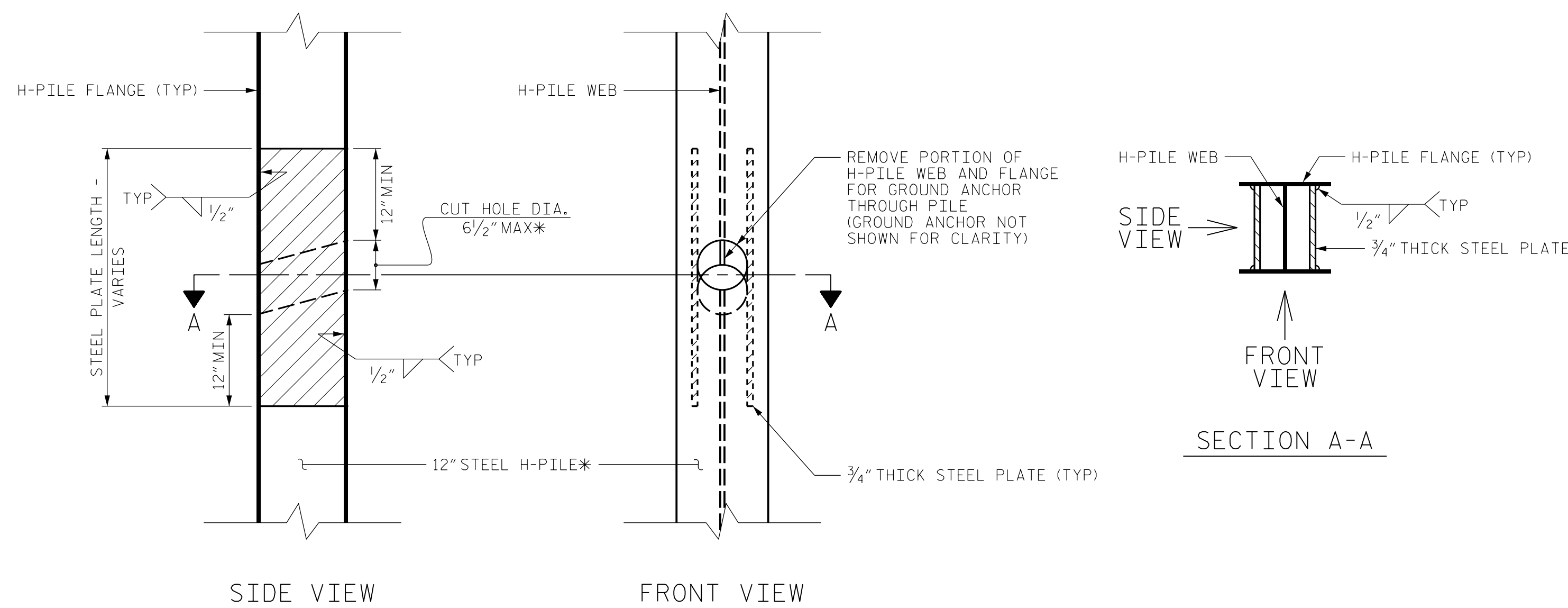
THE MINIMUM WALL EMBEDMENT ELEVATION FOR RETAINING WALL NO. 3 INCLUDES EMBEDMENT FOR SCOUR.

DESIGN WALL FOR FULL EMBEDMENT EXPOSURE (BOTTOM OF WALL EQUAL TO EMBEDMENT ELEVATION) DUE TO SCOUR POTENTIAL.

DESIGN RETAINING WALL NO. 3 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

DESIGN RETAINING WALL NO. 3 FOR A PIPE AND CULVERT EXTENDING UNDER OR THROUGH THE WALL AS SHOWN. VERIFY PIPE AND CULVERT LOCATION AND ELEVATION BEFORE BEGINNING ANCHORED WALL DESIGN OR CONSTRUCTION.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH GROUND ANCHORS FOR RETAINING WALL NO. 3.

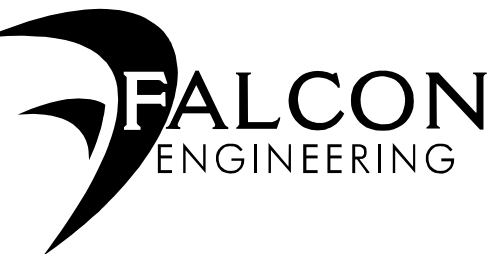


**REINFORCED WEB DETAILS**


\*DETAILS SHOWN ARE FOR 12" H-PILES WITH 6" DIA. GROUND ANCHORS. FOR DIFFERENT DIAMETER ANCHORS, SUBMIT ALTERNATE REINFORCED WEB DETAILS FOR ACCEPTANCE.

PROJECT NO.: A-0011C  
 CLAY COUNTY  
 STATION: 186+60, 70' LT TO 188+25, 53.75' LT  
 SHEET 8 OF 8

PREPARED BY: J. R. HAMM	DATE: 5/15/19
REVIEWED BY: S. C. CROCKETT	DATE: 5/17/19



FALCON ENGINEERING, INC.  
 1210 TRINITY ROAD, SUITE 110  
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 PHONE: 919.871.0800  
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**NORTH CAROLINA  
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 DIVISION OF HIGHWAYS**

**GEOTECHNICAL  
 ENGINEERING UNIT**

**RETAINING WALL NO. 3  
 ANCHORED SOLDIER PILE WALL  
 NOTES AND DETAILS**

REVISIONS					
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1			3		
2			4		

SHEET NO. W-9