This electronic collection of documents is provided for the convenience of the user and is Not a Certified Document –

The documents contained herein were originally issued and sealed by the individuals whose names and license numbers appear on each page, on the dates appearing with their signature on that page.
This file or an individual page shall not be considered a certified document.

GEOTECHNICAL ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028893 ENGINEER MICHAEL H. STERLING

DocuSigned by: C447682092314CC...

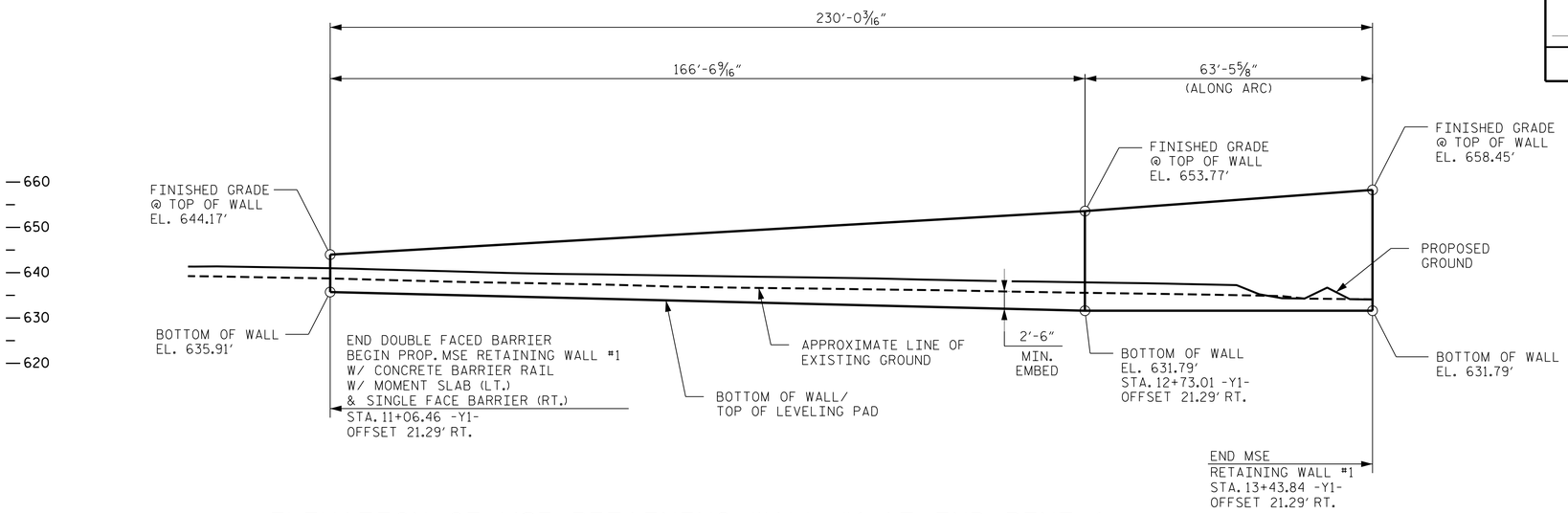
11/7/2017

SIGNATURE DATE

ENGINEER

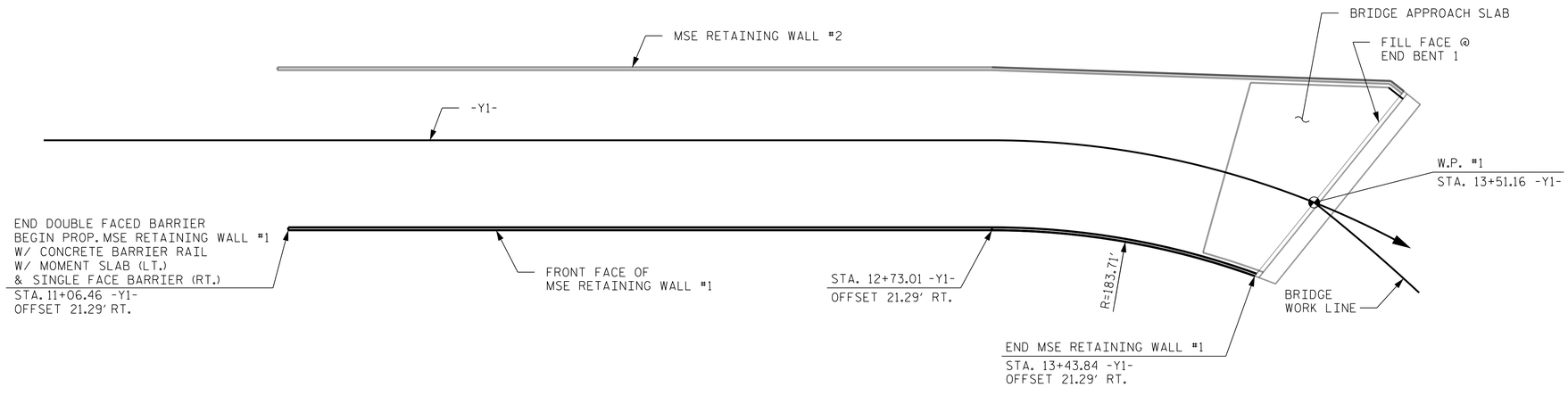
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



ELEVATION OF MSE RETAINING WALL #1 AT END BENT 1

ALL DIMENSIONS AND STATIONS ARE ALONG FRONT FACE OF WALL
LOOKING AT THE FRONT FACE OF WALL



PLAN OF MSE RETAINING WALL #1 AT END BENT 1

BRIDGE SUPERSTRUCTURE AND MOMENT SLAB NOT SHOWN FOR CLARITY
FOR MOMENT SLAB DETAILS, SEE "MOMENT SLAB DETAILS" SHEETS.

ESTIMATED WALL QUANTITY	
RETAINING WALL NO. 1	* 4,055 SQUARE FEET

* WALL AREA IS MEASURED USING THE DESIGN HEIGTH "H"

PREPARED BY: MHS	DATE: 9/28/17
REVIEWED BY: SCC	DATE: 9/28/17

PROJECT NO.: 44378.1.D1 (U-5806)

CABARRUS COUNTY

STATION: RWAL01 - STA. 10+55.07 -Y1- TO 13+43.84 -Y1-

SHEET 1 OF 6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

RETAINING WALL NO. 1
MSE WALL

REVISIONS

NO.	BY	DATE	NO.	BY	DATE
1	MHS	11/7/17	3		
2			4		

SHEET NO. W-1

GEOTECHNICAL ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028893 ENGINEER MICHAEL H. STEPHENS

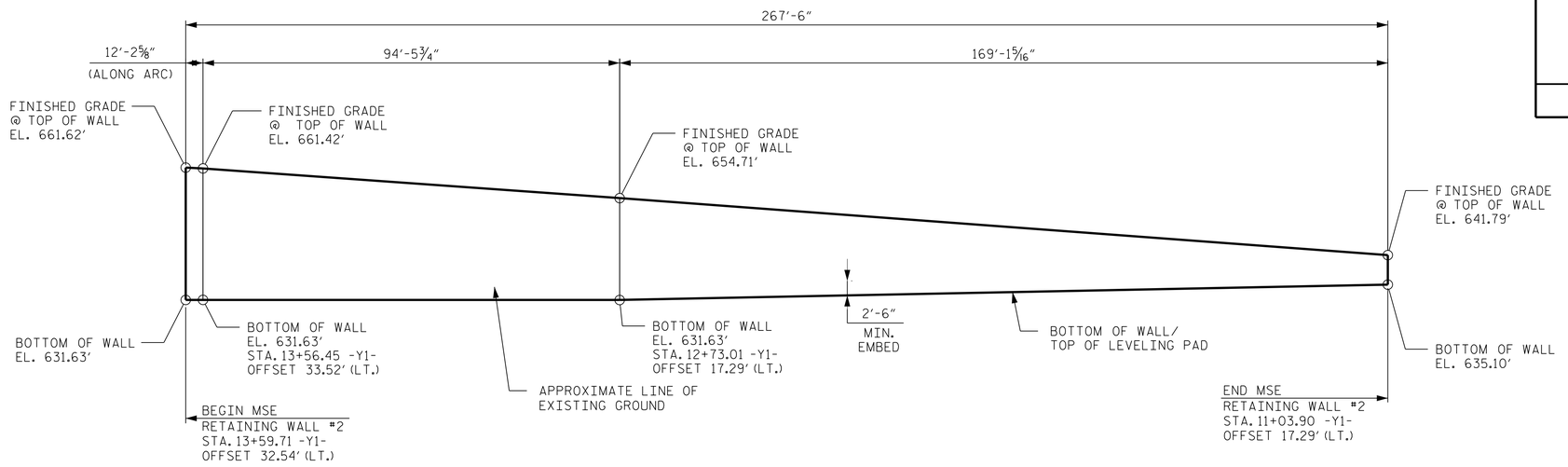
Docusigned by: C447682092314...

11/7/2017

ENGINEER

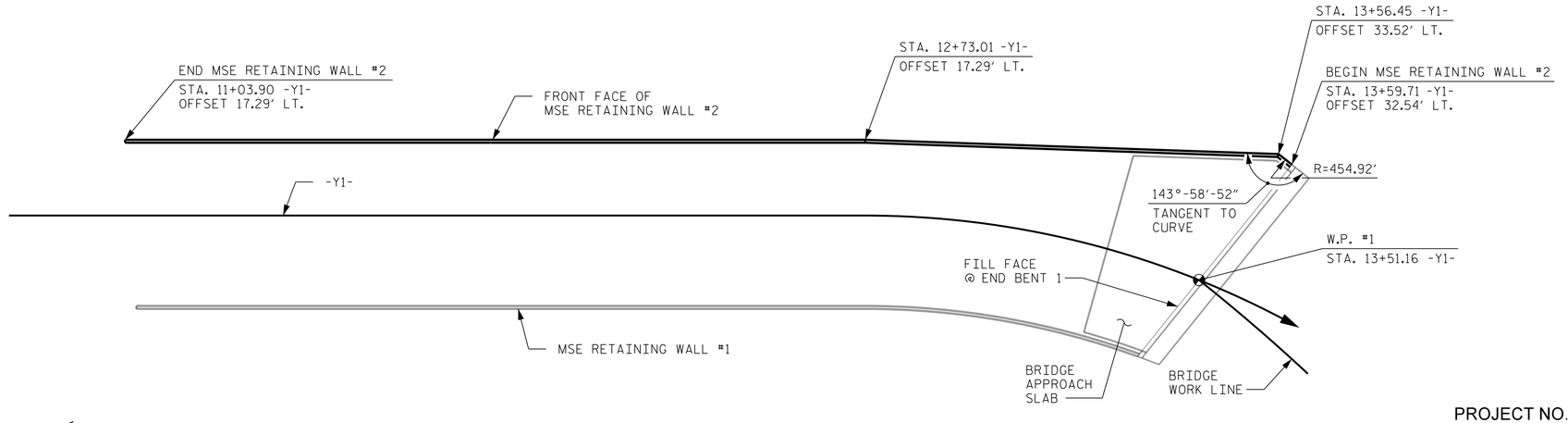
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



ELEVATION OF MSE RETAINING WALL #2 AT END BENT 1

ALL DIMENSIONS AND STATIONS ARE ALONG FRONT FACE OF WALL
LOOKING AT THE FRONT FACE OF WALL



PLAN OF MSE RETAINING WALL #2 AT END BENT 1

BRIDGE SUPERSTRUCTURE AND MOMENT SLAB NOT SHOWN FOR CLARITY
FOR MOMENT SLAB DETAILS, SEE "MOMENT SLAB DETAILS" SHEETS.

ESTIMATED WALL QUANTITY	
RETAINING WALL NO. 2	* 5,195 SQUARE FEET

* WALL AREA IS MEASURED USING THE DESIGN HEIGTH "H"

PREPARED BY: MHS	DATE: 9/28/17
REVIEWED BY: SCC	DATE: 9/28/17

PROJECT NO.: 44378.1.D1 (U-5806)

CABARRUS COUNTY

STATION: RWAL02 - STA. 10+69.01 -Y1- TO 13+59.71 -Y1-

SHEET 2 OF 6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

RETAINING WALL NO. 2
MSE WALL

REVISIONS

NO.	BY	DATE	NO.	BY	DATE
1	MHS	11/7/17	3	-	-
2	-	-	4	-	-

SHEET NO. W-2

GEOTECHNICAL ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028893 ENGINEER MICHAEL H. STEPHENS

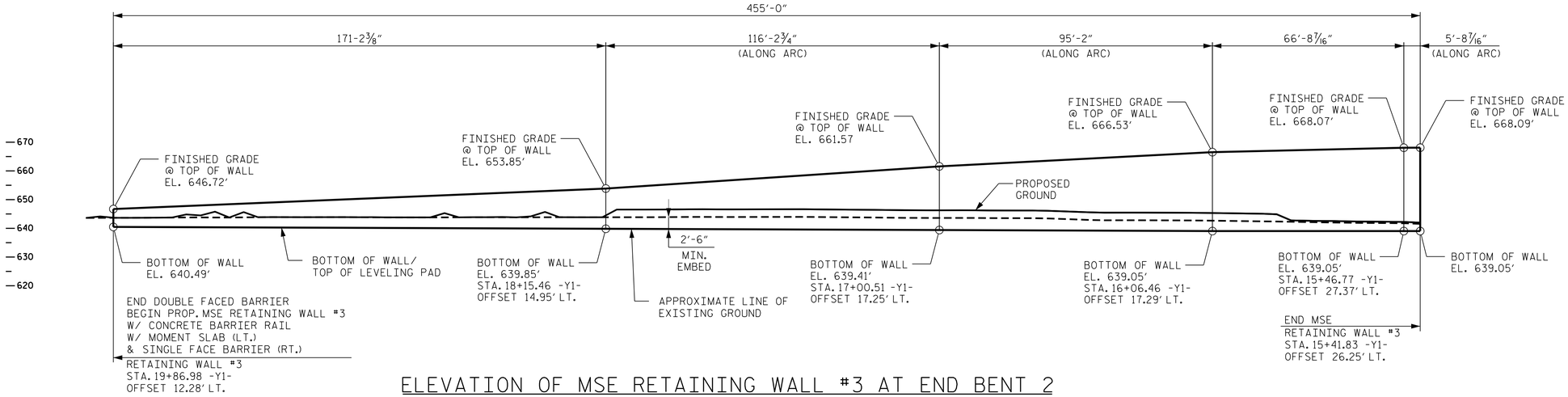
C447082092314 11/7/2017

SIGNATURE DATE

ENGINEER

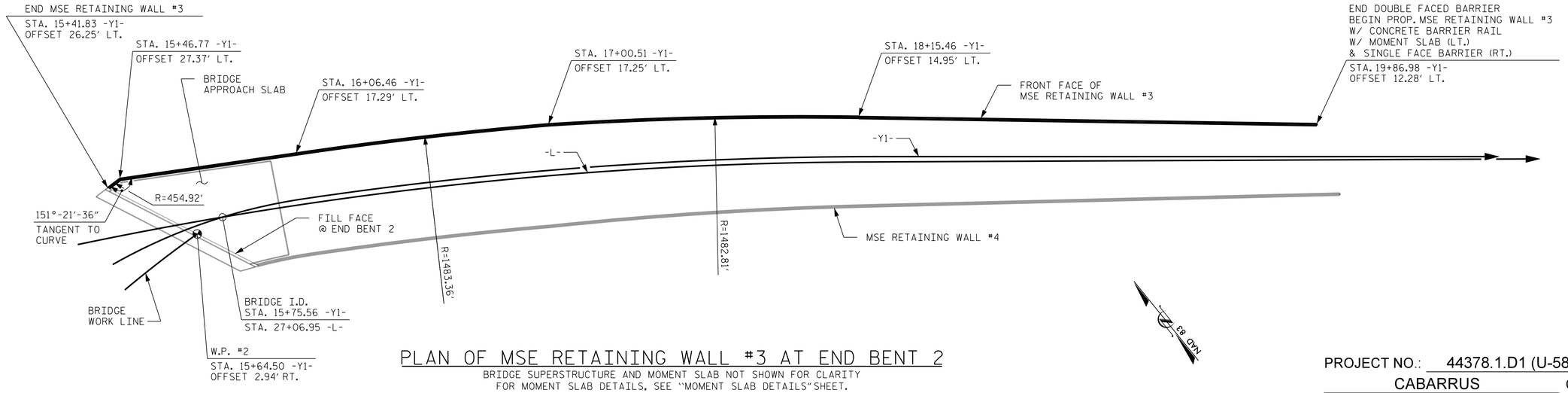
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



ELEVATION OF MSE RETAINING WALL #3 AT END BENT 2

ALL DIMENSIONS AND STATIONS ARE ALONG FRONT FACE OF WALL
LOOKING AT THE FRONT FACE OF WALL



PLAN OF MSE RETAINING WALL #3 AT END BENT 2

BRIDGE SUPERSTRUCTURE AND MOMENT SLAB NOT SHOWN FOR CLARITY
FOR MOMENT SLAB DETAILS, SEE "MOMENT SLAB DETAILS" SHEET.

ESTIMATED WALL QUANTITY	
RETAINING WALL NO. 3	* 8,220 SQUARE FEET

* WALL AREA IS MEASURED USING THE DESIGN HEIGTH "H"

PREPARED BY: MHS	DATE: 9/28/17
REVIEWED BY: SCC	DATE: 9/28/17

PROJECT NO.: 44378.1.D1 (U-5806)

CABARRUS COUNTY

STATION: RWAL03 - STA. 15+41.83 -Y1- TO 21+00.51 -Y1-

SHEET 3 OF 6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

RETAINING WALL NO. 3
MSE WALL

REVISIONS

NO.	BY	DATE	NO.	BY	DATE
1	MHS	11/7/17	3	-	-
2	-	-	4	-	-

SHEET NO. W-3

GEOTECHNICAL ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028893 ENGINEER MICHAEL H. STEPHENS

DocuSigned by: C447682092314C0...

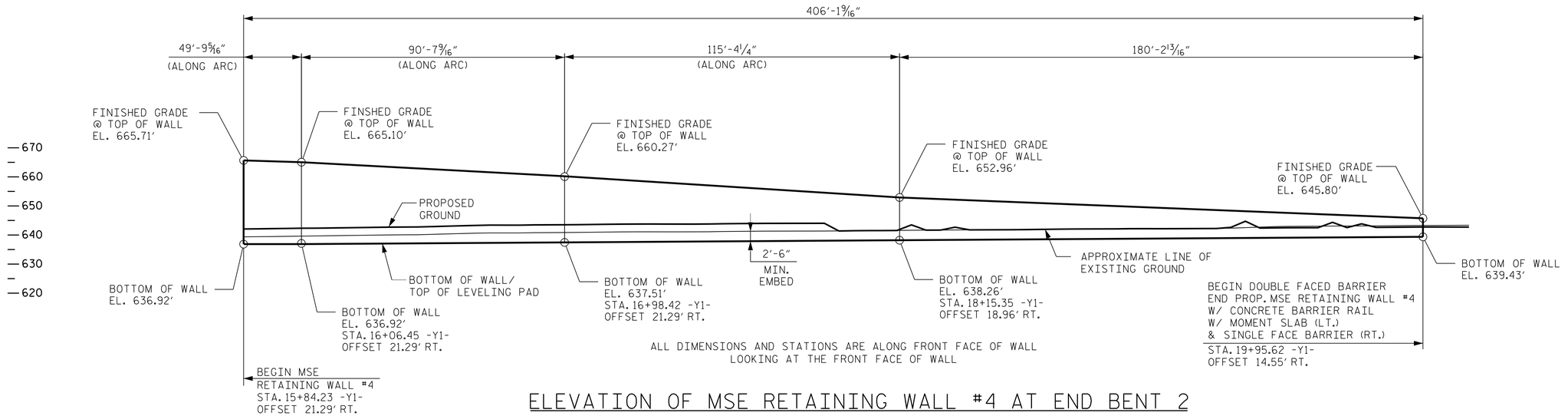
11/7/2017

SIGNATURE DATE

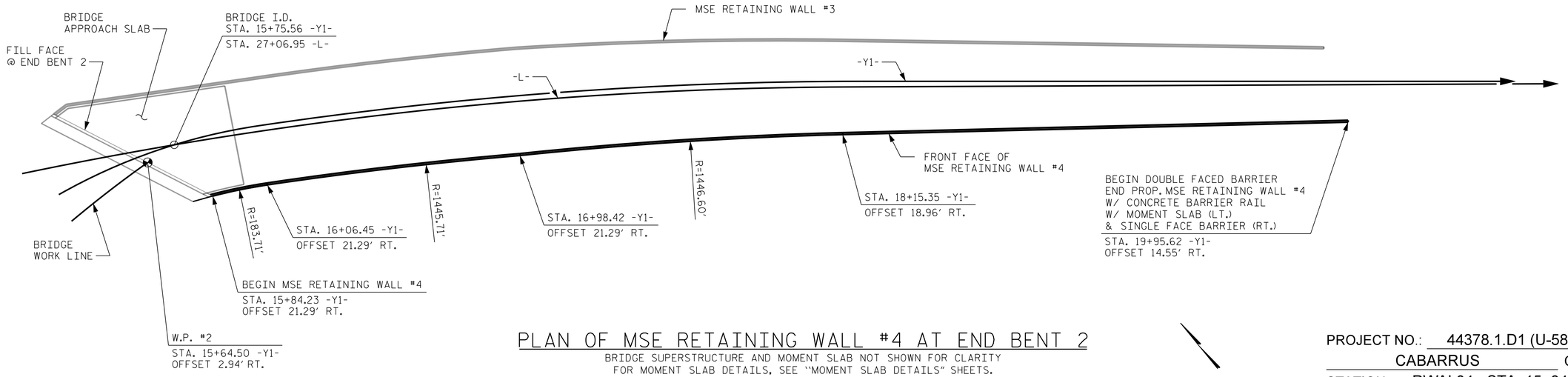
ENGINEER

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



ELEVATION OF MSE RETAINING WALL #4 AT END BENT 2



PLAN OF MSE RETAINING WALL #4 AT END BENT 2

BRIDGE SUPERSTRUCTURE AND MOMENT SLAB NOT SHOWN FOR CLARITY
FOR MOMENT SLAB DETAILS, SEE "MOMENT SLAB DETAILS" SHEETS.

ESTIMATED WALL QUANTITY	
RETAINING WALL NO. 4	* 4,425 SQUARE FEET

* WALL AREA IS MEASURED USING THE DESIGN HEIGTH "H"

PREPARED BY: MHS	DATE: 9/28/17
REVIEWED BY: SCC	DATE: 9/28/17

PROJECT NO.: 44378.1.D1 (U-5806)

CABARRUS COUNTY

STATION: RWAL04 - STA. 15+84.23 -Y1- TO 20+25.98 -Y1-

SHEET 4 OF 6

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

RETAINING WALL NO. 4 MSE WALL

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	W-4
1	MHS	11/7/17	3	-	-	
2	-	-	4	-	-	

GEOTECHNICAL ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028893 ENGINEER MICHAEL H. STEPHENS

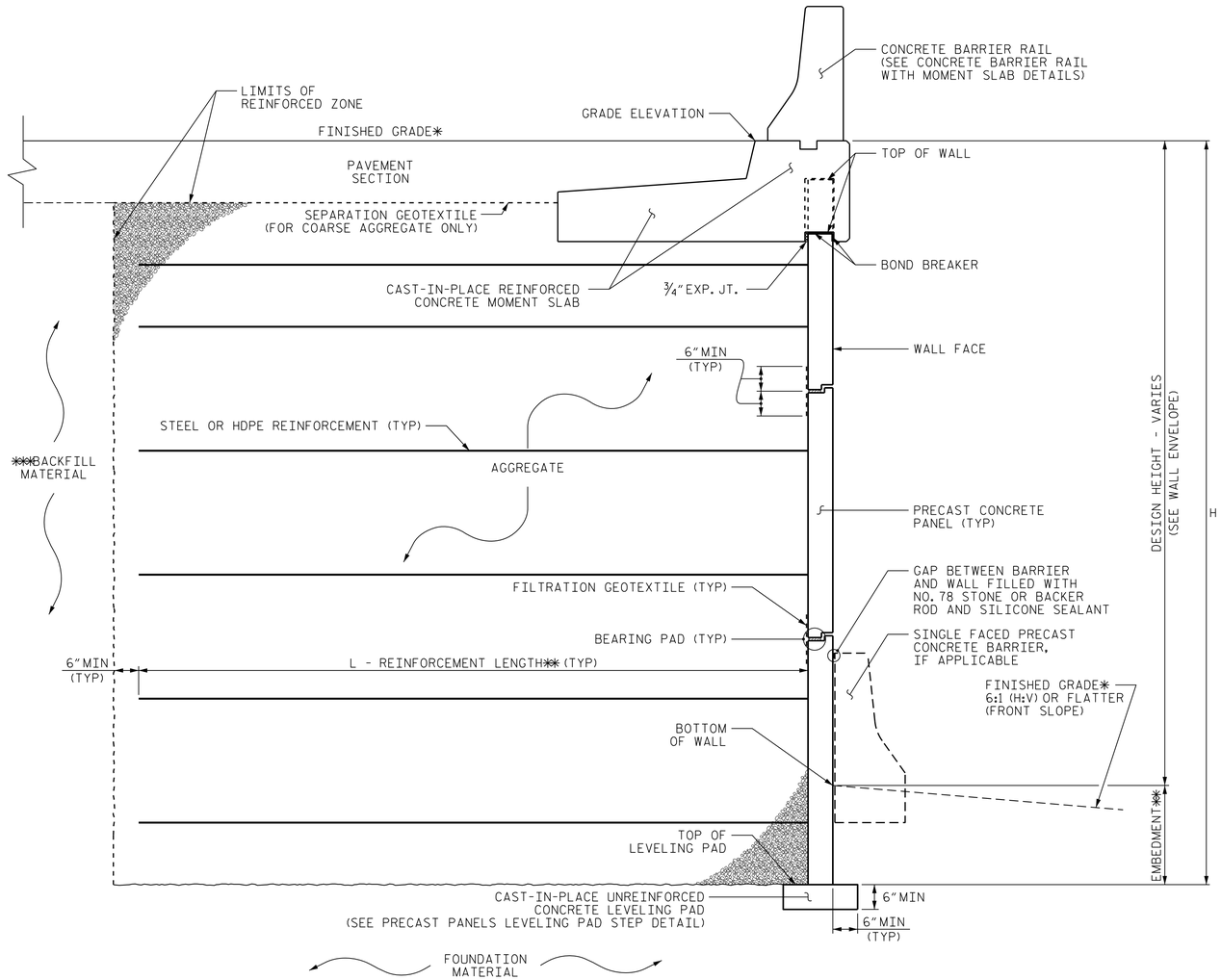
C44768209314C 11/7/2017

SIGNATURE DATE

ENGINEER

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



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.
***BACKFILL MATIAL IS THE SAME AS COARSE OR FINE AGGREGATE USED IN REINFORCED ZONE.

PROJECT NO.: 44378.1.D1 (U-5806)

CABARRUS COUNTY

STATION: RWAL01 - RWAL04

PREPARED BY: MHS	DATE: 9/28/17
REVIEWED BY: SCC	DATE: 9/28/17

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

TYPICAL SECTION MSE WALL

REVISIONS

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

SHEET NO. W-5

GEOTECHNICAL ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028893 ENGINEER MICHAEL H. STEPHENS

C44768209231402 SIGNATURE 11/7/2017 DATE

ENGINEER

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NOTES:

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

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

A CONCRETE BARRIER RAIL WITH MOMENT SLAB IS REQUIRED FOR RETAINING WALLS 1, 2, 3, AND 4. SEE PLANS FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB DETAILS.

A SIMULATED BRICK FORM LINER FINISH IS REQUIRED FOR PRECAST CONCRETE PANELS FOR RETAINING WALLS 1, 2, 3, AND 4, SEE SPECIAL PROVISION.

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALLS 1, 2, 3, AND 4.

A SEPARATION GEOTEXTILE IS NOT REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALLS 1, 2, 3, AND 4.

A DRAIN IS NOT REQUIRED FOR RETAINING WALLS 1, 2, 3, AND 4.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALLS 1, 2, 3, AND 4, 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 NOS. 1, 2, 3, AND 4 FOR THE FOLLOWING:
1) H = DESIGN HEIGHT + EMBEDMENT
2) DESIGN LIFE = 100 YEARS
3) MINIMUM REINFORCEMENT LENGTH (L) = 0.7H OR 6 FT, WHICHEVER IS LONGER
4) MINIMUM EMBEDMENT ELEVATION = 2.5 FT OR H/20, WHICHEVER IS GREATER.
5) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (g) LB/CF	FRICTION ANGLE (f) DEGREES	COHESION (c) LB/SF
COARSE	110	38	0
FINE	115	34	0
*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.			

6) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (g) LB/CF	FRICTION ANGLE (f) DEGREES	COHESION (c) LB/SF
BACKFILL (COARSE)	110	38	0
BACKFILL (FINE)	115	34	0
FOUNDATION	120	30	0

7) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL

RETAINING WALL	MAXIMUM FACTORED VERTICAL PRESSURE, LB/SF		
	WALL HEIGHT <10 FT	WALL HEIGHT 10 FT - 20 FT	WALL HEIGHT >20 FT
RETAINING WALL NOS. 1, 2, 3, AND 4	4,500	9,500	11,600

DESIGN RETAINING WALL NOS. 1, 2, 3, AND 4 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

FOUNDATIONS FOR SIGNS, LIGHTING, OR SIGNAL MAY BE LOCATED BEHIND RETAINING WALL NOS. 1, 2, 3, AND 4 AND MAY INTERFERE WITH REINFORCEMENT. BEFORE BEGINNING MSE WALL CONSTRUCTION, SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS FOR APPROVAL.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NOS. 1, 2, 3, AND 4.

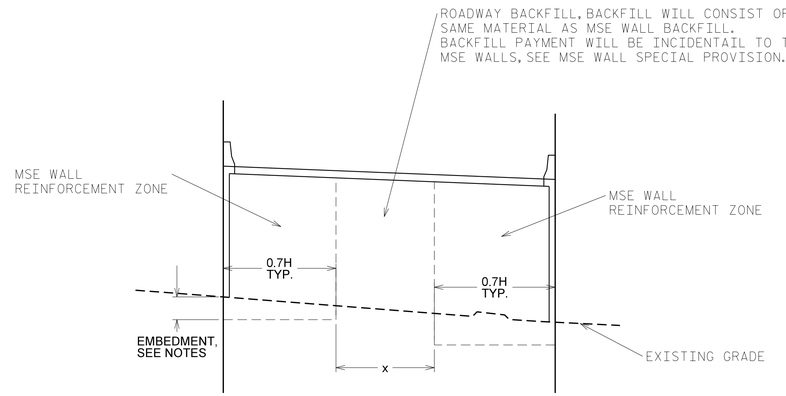
DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NOS. 1, 2, 3, AND 4 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

FOR RETAINING WALL NOS. 1, 2, 3, AND 4 PROVIDE DETAILS ON THE MSE WALL AND CONCRETE ABUTMENT WALL INTERFACE.

SHOP DRAWINGS FOR RETAINING WALL NOS. 1 AND 2 (END BENT NO. 1) WILL BE SUBMITTED CONCURRENLTY FOR REVIEW PURPOSES.

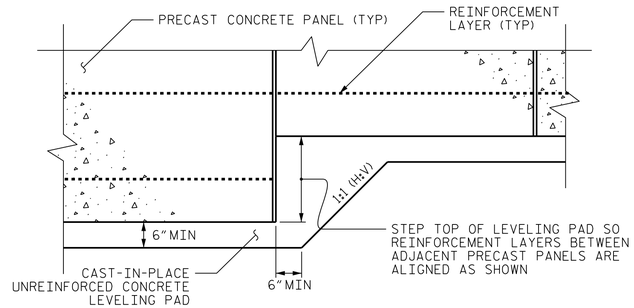
SHOP DRAWINGS FOR RETAINING WALL NOS. 3 AND 4 (END BENT NO. 2) WILL BE SUBMITTED CONCURRENLTY FOR REVIEW PURPOSES.

BACKFILL AREA BETWEEN PARALLEL MSE WALLS WITH COARSE OR FINE AGGREGATE TO THE TOP OF THE REINFORCED ZONE SEE BACKFILL DETAIL. BACKFILL PAYMENT WILL BE INCIDENTAL TO WALL, SEE MSE WALL SPECIAL PROVISION.



TYPICAL BACKFILL DETAILS AT STA 17+50 -Y1-

X - VARIES DEPENDING ON REINFORCEMENT LENGTH AND WALL HEIGHT



PRECAST PANELS LEVELING PAD STEP DETAIL

PROJECT NO.: 44378.1.D1 (U-5806)

CABARRUS COUNTY

STATION: RWAL01 - RWAL04

SHEET 6 OF 6

PREPARED BY: MHS	DATE: 9/28/17
REVIEWED BY: SCC	DATE: 9/28/17

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

NOTES AND DETAILS MSE WALL

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	W-6
2	-	-	4	-	-	