

**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 SMSE WALL SYSTEM WITH PRECAST PANELS FOR THIS RETAINING WALL.  
 DO NOT USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL #16.  
 A SMOOTH ARCHITECTURAL FINISH IS REQUIRED FOR PRECAST CONCRETE PANELS FOR RETAINING WALL #16.  
 A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL #16.  
 A DRAIN IS REQUIRED FOR RETAINING WALL #16. THE DRAIN SHALL CONNECT TO EXISTING AND NEW HORIZONTAL DRAINS AND DAYLIGHT OUTSIDE OF WALL LIMITS.

BEFORE BEGINNING SMSE WALL DESIGN FOR RETAINING WALL #16, 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 #16 FOR WALL HEIGHTS EQUAL TO THE DESIGN HEIGHT (DIFFERENCE BETWEEN FINISHED GRADE/TOP OF WALL ELEVATION AND BOTTOM OF WALL ELEVATION) PLUS EMBEDMENT (DIFFERENCE BETWEEN BOTTOM OF WALL ELEVATION AND TOP OF LEVELING PAD ELEVATION).

- DESIGN RETAINING WALL #16 FOR THE FOLLOWING:
- 1) H = DESIGN HEIGHT + EMBEDMENT
  - 2) DESIGN LIFE = 75 YEARS
  - 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 6,800 PSF
  - 4) MINIMUM MSE REINFORCEMENT LENGTH (L) = VARIES, SEE TABLE ON SHEET W16-3, STRAPS AND REINFORCED ZONE SHALL EXTEND TO FACE OF SOIL NAIL WALL FOR RETAINING WALL #16 AT ALL LOCATIONS REGARDLESS OF MINIMUM STRAP LENGTHS.
  - 5) MINIMUM SOIL NAIL REINFORCEMENT LENGTHS ARE BASED ON SNAIL.
  - 6) MINIMUM EMBEDMENT DEPTH = 5 FT (MIN), SEE TABLE ON SHEET W16-3
  - 7) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (φ) DEGREES	COHESION (C) PSF
COARSE	110	38	0
FINE	115	34	0

\* SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.

9) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (φ) DEGREES	COHESION (C) PSF
BACKFILL	120	32	0
FOUNDATION	120	32	0

DESIGN RETAINING WALL #16 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.  
 EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, ANCHORS, EXISTING HORIZONTAL DRAINS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH MSE AND SOIL NAIL REINFORCEMENT FOR RETAINING WALL #16.  
 DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR MSE WALL PORTION OF RETAINING WALL #16 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.  
 FOR WILDLIFE FENCES ON THE TOP OF THE RETAINING WALL, SEE ROADWAY PLANS FOR FENCE ATTACHMENT DETAILS.  
 FOR SOIL NAIL RETAINING WALLS, SEE SMSE RETAINING WALL SPECIAL PROVISION.

THE SMSE WALL DESIGNER SHALL CONSULT WITH THE SOIL NAIL WALL DESIGNER TO VERIFY LOCATIONS WHERE "TEMPORARY SHORING" MAY BE REQUIRED FOR THE RETAINING WALL IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE TRAFFIC CONTROL PLANS. IN LOCATIONS WHERE "PERMANENT SOIL NAIL WALL" IS USED, PAYMENT WILL NOT BE MADE FOR "TEMPORARY SHORING" FOR TRAFFIC CONTROL.  
 THE PERMANENT SOIL NAIL WALL HEIGHT IS AN ESTIMATE ONLY, THAT IS BASED ON THE ANTICIPATED EXCAVATION PLUS THE MINIMUM EMBEDMENT LISTED.

WHERE APPLICABLE, DESIGN SOIL NAIL WALL REINFORCEMENT INCLINATION TO ACCOUNT FOR EXISTING OR FUTURE UTILITY CONFLICTS BEHIND THE SOIL NAIL WALL. VERIFY UTILITY LOCATION AND ELEVATION BEFORE BEGINNING SOIL NAIL WALL DESIGN OR CONSTRUCTION.

"TOP OF SOIL NAIL WALL" AS SHOWN IN THE WALL ENVELOPE REPRESENTS THE APPROXIMATE GRADE ELEVATION AT A DISTANCE OF 0.5 TIMES THE PROPOSED WALL HEIGHT ("H") AT THAT STATION OR ELEVATION AT THE TOP OF THE EXISTING WALL.

THE ESTIMATED SOIL NAIL WALL QUANTITY IS BASED ON 0.5 TIMES "H" (SMSE DESIGN HEIGHT) INCLUDING THE MINIMUM EMBEDMENT LISTED IN THE DESIGN TABLE ON SHEET W16-3. THESE VALUES ARE PROVIDED AS AN ESTIMATE ONLY AND MAY VARY DUE TO SITE CONDITIONS.

THE SOIL NAIL WALL DESIGNER IS RESPONSIBLE FOR DETERMINING GLOBAL STABILITY BASED ON THE FINISHED SMSE WALL. A MINIMUM FACTOR OF SAFETY OF 1.35 IS REQUIRED FOR GLOBAL STABILITY. SUBMIT THESE RESULTS WITH THE WALL DESIGN PACKAGE. VERIFY UTILITY LOCATIONS AND ELEVATIONS BEFORE BEGINNING MSE WALL DESIGN OR CONSTRUCTION.

CONTRACTOR SHALL BE MADE AWARE THAT GRAVELLY SOILS AND BOULDER FILL WERE USED IN THE EXISTING ROADWAY EMBANKMENT AND MAY BE ENCOUNTERED DURING SOIL NAIL WALL CONSTRUCTION.

**SPECIAL NOTES:**

THE EXISTING ANCHORED STEEL H-PILE WALL WILL REMAIN IN PLACE. REMOVE THE TOP 6 FEET OF THE EXISTING WALL TO CONSTRUCT SMSE BENCH. DO NOT DISTURB EXISTING WALL BELOW THE 1ST ROW OF ANCHORS. CONSTRUCT PERMANENT SOIL NAIL WALL IN FRONT OF EXISTING ANCHORED WALL. IGNORE ALL POTENTIAL SUPPORT FROM THE EXISTING WALL IN THE DESIGN OF THE THE SMSE WALL. PAYMENT FOR EXISTING WALL DECONSTRUCTION WILL BE INCIDENTAL TO THE COST OF RETAINING WALL #16.

THE EXISTING HORIZONTAL DRAINS SHALL BE RETAINED AND CONNECTED TO THE DRAINAGE STRIPS. AT THE DISCRETION OF THE ENGINEER, ADDITIONAL DRAINAGE STRIPS OR HORIZONTAL DRAINS WILL BE INSTALLED IF EXISTING DRAINS ARE DAMAGED DURING WALL CONSTRUCTION. FOR HORIZONTAL DRAINS, SEE STANDARD PROVISION.

THE EXISTING LAGGING SHALL BE REMOVED TO THE SATISFACTION OF THE DEPARTMENT TO ALLOW INSTALLATION OF DRAINAGE BOARD AGAINST THE EARTH BEHIND THE EXISTING RETAINING WALL AND PLACEMENT OF SHOTCRETE TO FILL THE VOIDS PRESENT BEHIND THE EXISTING RETAINING WALL.

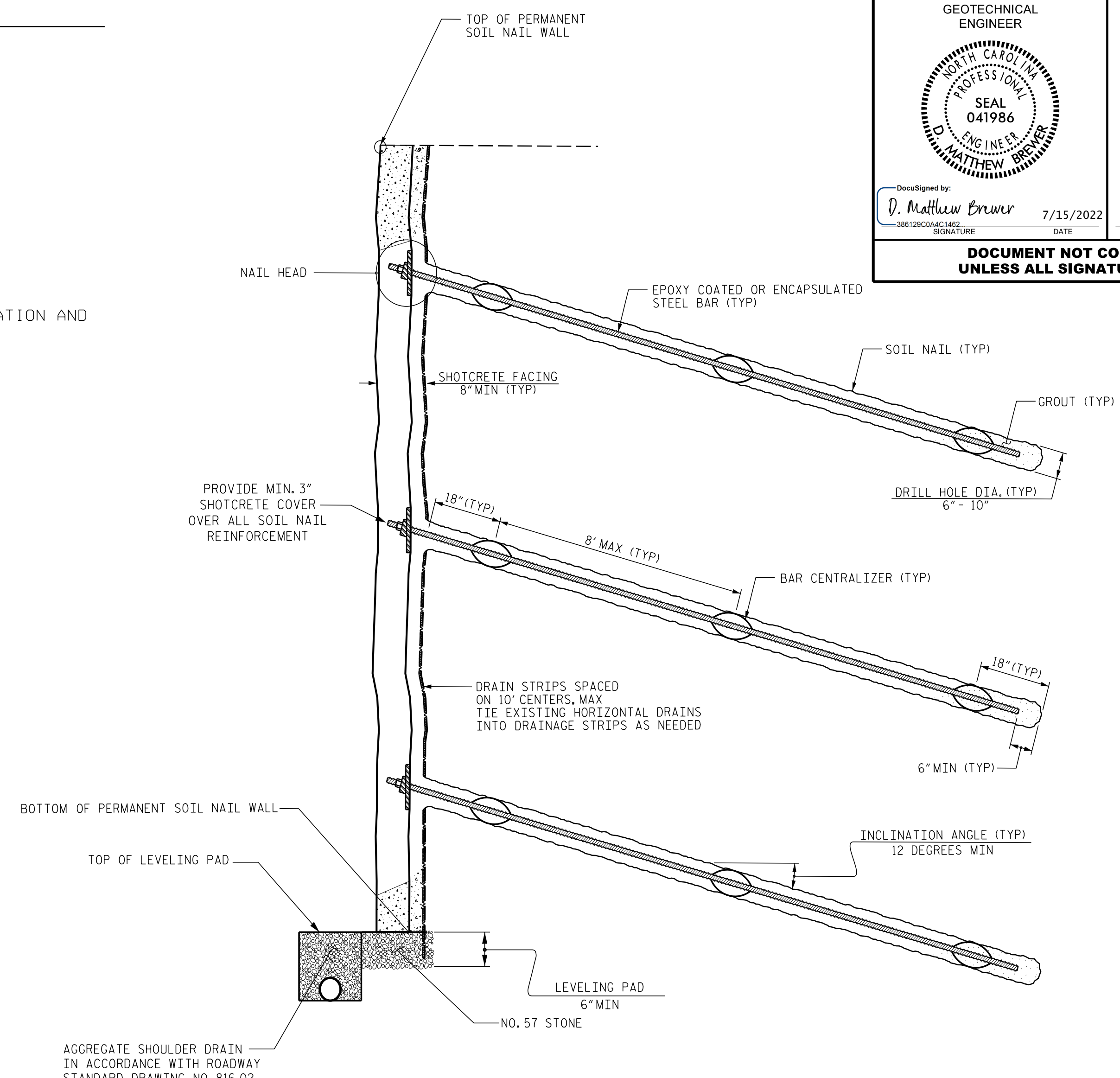
UNDERCUTTING COLLUVIAL SOILS BELOW THE SMSE WALL IS REQUIRED AS SHOWN ON SHEET W16-6. USE UNDERCUT EXCAVATION TO REMOVE SOILS AS DIRECTED BY THE ENGINEER. PLACE GEOTEXTILE FOR SOIL STABILIZATION WHEN NEEDED IN THE BOTTOM OF THE EXCAVATION AND BACKFILL WITH SUITABLE EMBANKMENT MATERIAL. FOR UNDERCUT EXCAVATION SEE STANDARD SPECIFICATIONS. UNDERCUT EXCAVATION AND GEOTEXTILE FOR SOIL STABILIZATION WILL BE PAID AS SEPARATE ADDITIONAL QUANTITIES.

EXTEND SOIL NAIL SHORING TO BOTTOM OF UNDERCUT EXCAVATION. DESIGN SOIL NAIL SHORING FOR THE HEIGHT EQUAL TO THE DIFFERENCE BETWEEN THE EXISTING ROADWAY GRADE AND THE BOTTOM OF THE UNDERCUT EXCAVATION. SOIL NAIL SHORING FOR UNDERCUT EXCAVATION WILL BE PAID IN ACCORDANCE WITH THE TEMPORARY SOIL NAIL SHORING FOR COLLUVIAL UNDERCUT SPECIAL PROVISION.

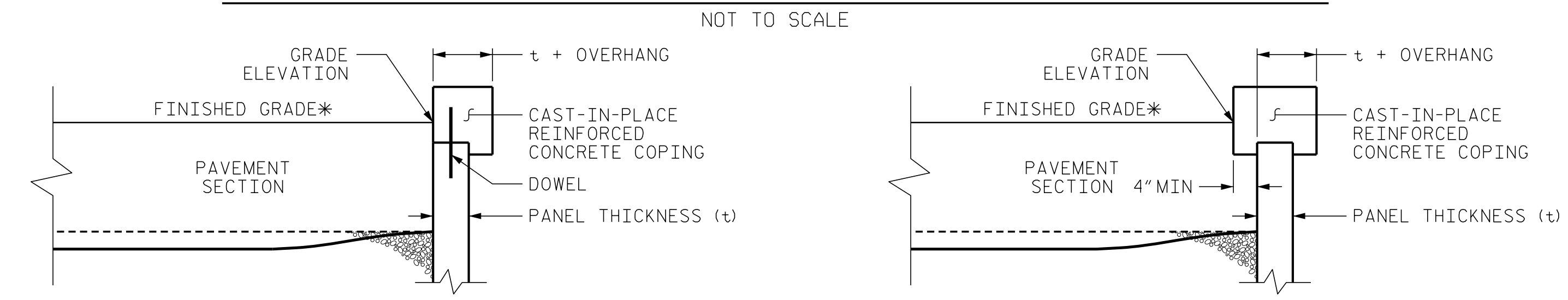
THE COLLUVIAL SOILS ARE SUITABLE FOR USE AS EMBANKMENT BUT WILL REQUIRE SIGNIFICANT DRYING TO ACHIEVE THE REQUIRED DENSITY. DO NOT USE COLLUVIAL SOILS IN THE UPPER 3 FEET OF EMBANKMENT DUE TO THE PRESENCE OF BOULDERS AND COBBLES. NO ADDITIONAL COMPENSATION WILL BE PROVIDED TO DRY COLLUVIAL SOILS OR FOR DOUBLE-HANDLING SOILS.

CONTROL GROUNDWATER DURING AND AT THE BOTTOM OF UNDERCUT EXCAVATION USING DITCHING, SUMPS, AND PERMANENT SHOULDER DRAINS AS DIRECTED BY THE ENGINEER. OUTLET SHOULDER DRAINS EVERY 50 TO 100 FEET AS DIRECTED BY THE ENGINEER.

PREPARED BY: DMB	DATE: 7/14/2022
REVIEWED BY: REK	DATE: 7/14/2022



**PERMANENT SOIL NAIL WALL - TYPICAL SECTION**



**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.

GEOTECHNICAL ENGINEER  D. Matthew Brewer 388120004001489 SIGNATURE	ENGINEER DATE: 7/15/2022 DATE
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	

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

**GEOTECHNICAL  
ENGINEERING UNIT**

PROJECT NO.: A-0009CB  
 GRAHAM COUNTY  
 STATION: -L-366+70, 50' RT TO 369+72, 50' RT  
 SHEET 5 OF 8

**RETAINING WALL #16  
SHORED MECHANICALLY  
STABILIZED EARTH (SMSE) WALL**

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

SHEET NO. W16-5