

REFERENCE: DF18314.1075020

PROJECT: N/A

CONTENTS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-10	CROSS SECTIONS
11-20	BORELOGS, CORE REPORTS, & CORE PHOTOGRAPHS

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GEOTECHNICAL ENGINEERING UNIT

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY POLK
 PROJECT DESCRIPTION EMERGENCY DESIGN FOR
US 176

SITE DESCRIPTION SITE 942
-L943-942- STA. 15 + 50.00 TO 23 + 62.00

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	DF18314.1075020	1	

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

R. WELCH, G.I.T.

CG2 EXPLORATION

INVESTIGATED BY CG2, PLLC

DRAWN BY P. PERRY, E.I.T.

CHECKED BY M. BREWER, P.E.

SUBMITTED BY CG2, PLLC

DATE JULY 2025

Prepared in the Office of:
 **CAROLINAS GEOTECHNICAL GROUP**
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 CHARLOTTE, NC 28270
 (980) 339-8684



DocuSigned by:
Matthew Brewer 12/2/2025
386129COA... SIGNATURE DATE

**DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED**

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																																																																									
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>										<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p>										<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>										<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																									
<p>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <th>A-1</th> <th>A-3</th> <th>A-2</th> <th>A-2-4</th> <th>A-2-5</th> <th>A-2-6</th> <th>A-2-7</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> </tr> <tr> <th>SYMBOL</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>% PASSING #10 #40 #200</th> <td>50 MX 30 MX 15 MX</td> <td>50 MX 25 MX 10 MX</td> <td>51 MN 35 MX 35 MX</td> <td>40 MX 35 MX 35 MX</td> <td>41 MN 41 MN 41 MN</td> <td>40 MX 41 MN 41 MN</td> <td>40 MX 41 MN 41 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>36 MN 36 MN 36 MN</td> <td>GRANULAR SOILS</td> <td>SILT-CLAY SOILS</td> <td>MUCK, PEAT</td> <td></td> </tr> <tr> <th>MATERIAL PASSING #40 LL PI</th> <td colspan="15"> <p>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</p> <p>HIGHLY ORGANIC SOILS</p> </td> </tr> <tr> <th>GROUP INDEX</th> <td colspan="15"> <p>EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR POOR UNSUITABLE</p> </td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="15"> <p>STONE FRAGS. 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IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.</p> <p>MODERATE (MOD.) - SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.</p> <p>MODERATELY SEVERE (MOD. SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p> <p>SEVERE (SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i></p> <p>VERY SEVERE (IV SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i></p> <p>COMPLETE - ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p>									
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<p>COMPRESSION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p>COMPRESSION</p> <p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p>										<p>PERCENTAGE OF MATERIAL</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE 1 - 10%</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE 10 - 20%</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME 20 - 35%</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>> 10%</td> <td>> 20%</td> <td>HIGHLY 35% AND ABOVE</td> </tr> </table>										ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE 1 - 10%	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE 10 - 20%	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME 20 - 35%	HIGHLY ORGANIC	> 10%	> 20%	HIGHLY 35% AND ABOVE	<p>GROUND WATER</p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p>																																																																																																																					
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<p>TEXTURE OR GRAIN SIZE</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <td>4</td> <td>10</td> <td>40</td> <td>60</td> <td>200</td> <td>270</td> </tr> <tr> <td></td> <td>4.75</td> <td>2.00</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> <tr> <th>BOULDER (BLDR.)</th> <th>COBBLE (COB.)</th> <th>GRAVEL (GR.)</th> <th>COARSE SAND (CSE. SD.)</th> <th>FINE SAND (F SD.)</th> <th>SILT (SL.)</th> <th>CLAY (CL.)</th> </tr> <tr> <td>GRAIN SIZE</td> <td>MM 305 IN. 12</td> <td>75</td> <td>2.0</td> <td>0.25</td> <td>0.05</td> <td>0.005</td> </tr> </table>										U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270		4.75	2.00	0.42	0.25	0.075	0.053	BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)	GRAIN SIZE	MM 305 IN. 12	75	2.0	0.25	0.05	0.005	<p>RECOMMENDATION SYMBOLS</p> <p> UNDERCUT</p> <p> SHALLOW UNDERCUT</p> <p> UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</p> <p> UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</p> <p> UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</p>										<p>ROCK HARDNESS</p> <p>VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>MODERATELY HARD - CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.</p> <p>MEDIUM HARD - CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT - CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.</p> <p>VERY SOFT - CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.</p>																																																																																																																							
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<p>COLOR</p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>										<p>BENCH MARK:</p> <p style="text-align: right;">ELEVATION: _____ FEET</p>										<p>NOTES:</p> <p>ROADWAY DESIGN FILES PROVIDED MARCH 2025.</p> <p>BORING COLLAR ELEVATIONS OBTAINED USING CARLSON BRX7 GPS.</p> <p>REF = REFUSAL</p> <p>CT = CORE TERMINATED</p>																																																																																																																																																			

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT**

SUBSURFACE INVESTIGATION

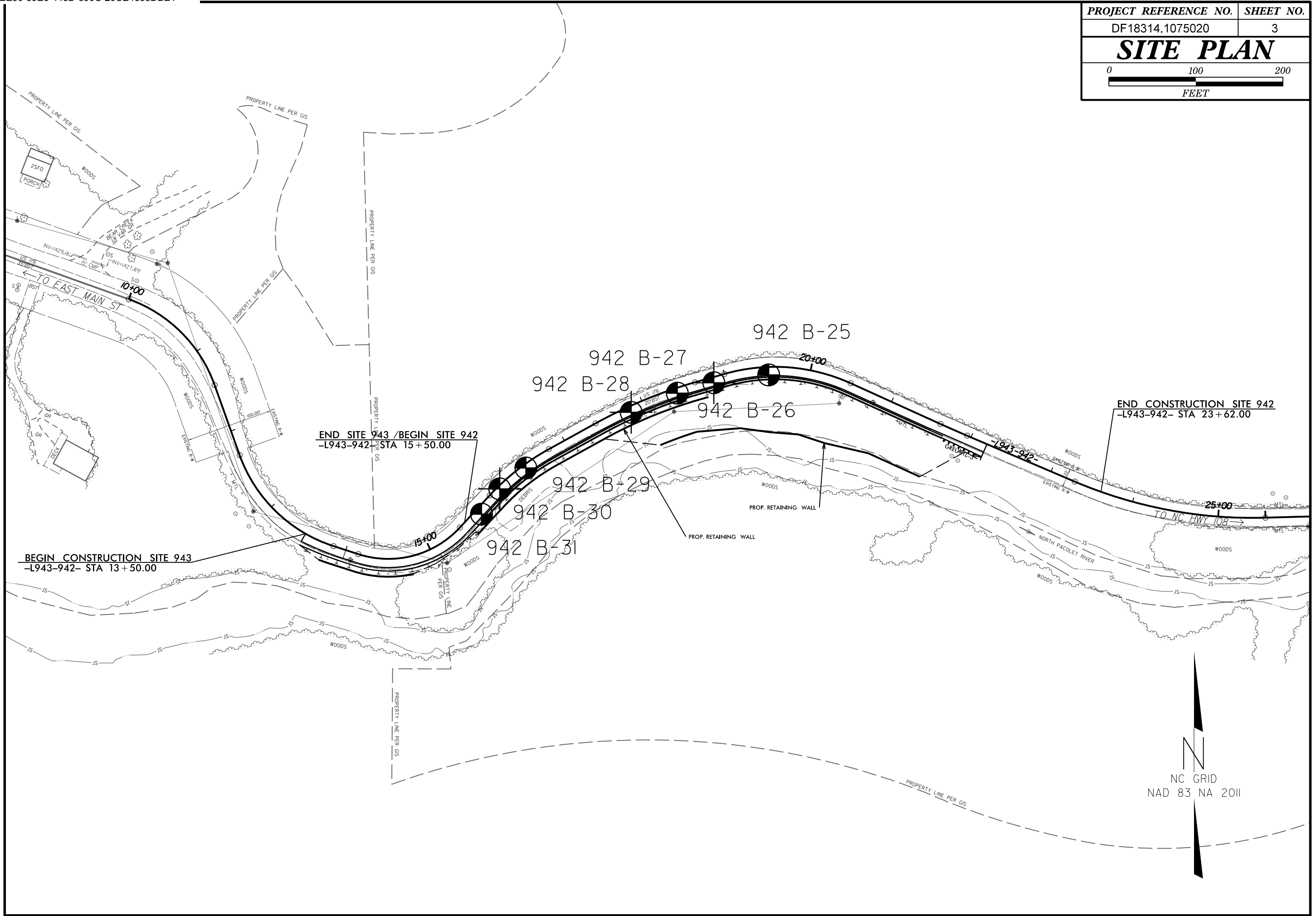
**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS**

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

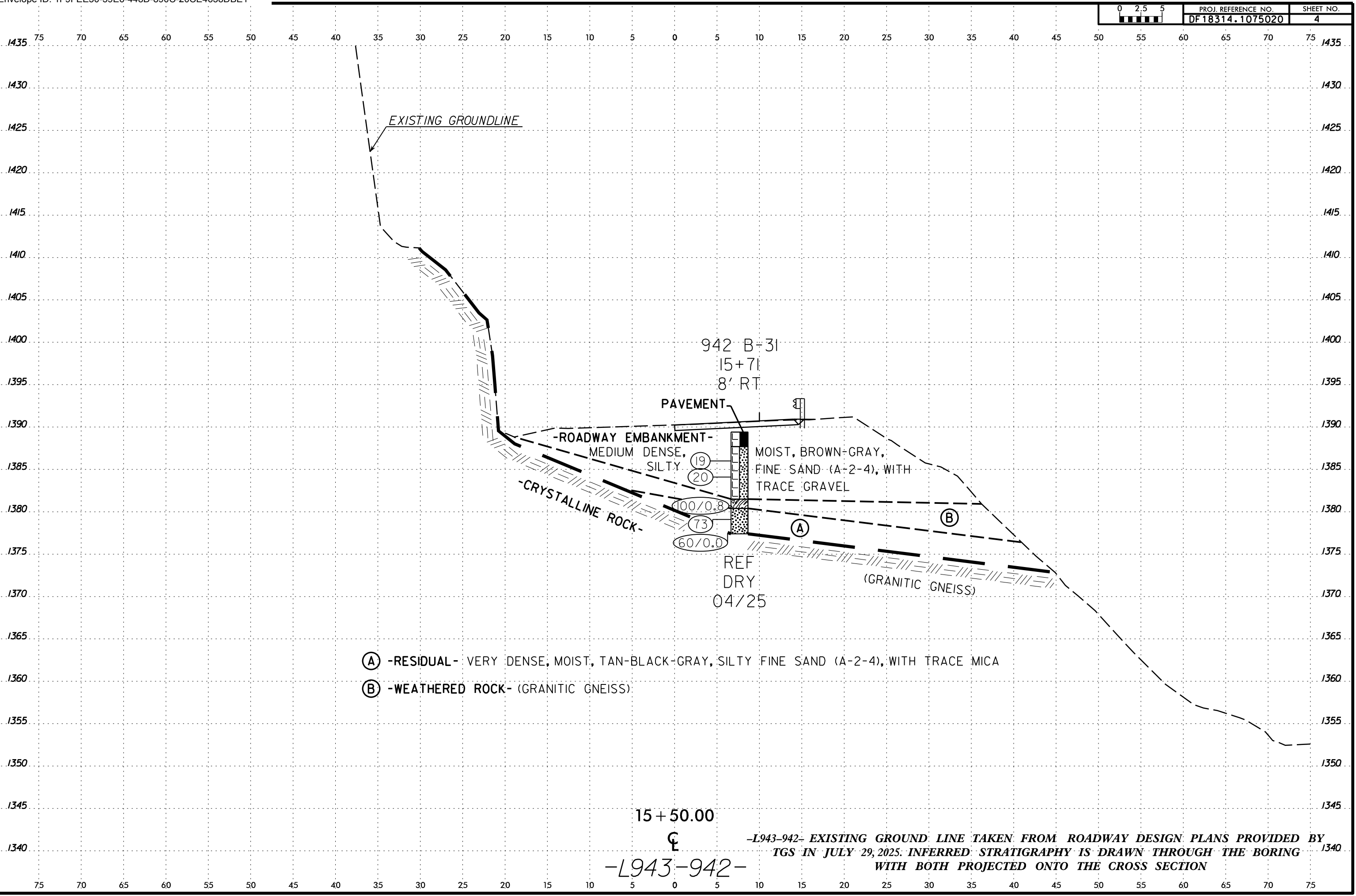
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

<p>GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)</p> <p>From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.</p>						<p>GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)</p> <p>From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.</p>							
SURFACE CONDITIONS	VERY GOOD	GOOD	FAIR	POOR	VERY POOR	SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD	GOOD	FAIR	POOR	VERY POOR		
STRUCTURE	DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE	VERY ROUGH, FRESH UNWEATHERED SURFACES	ROUGH, SLIGHTLY WEATHERED SURFACES	SMOOTH, MODERATELY WEATHERED AND ALTERED SURFACES	VERY SMOOTH, OCCASIONALLY SLICKENSIDED SURFACES WITH COMPACT COATINGS OR FILLINGS WITH ANGULAR FRAGMENTS	VERY SMOOTH, SLICKENSIDED OR HIGHLY WEATHERED SURFACES WITH SOFT CLAY COATINGS OR FILLINGS		
<p> INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities</p> <p> BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets</p> <p> VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets</p> <p> BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity</p> <p> DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces</p> <p> LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes</p>	90	80	70	60	50	40	30	20	10	N/A	N/A		
<p>→</p> <p>DECREASING INTERLOCKING OF ROCK PIECES</p> <p>↓</p>						<p> A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.</p> <p> B. Sandstone with thin inter-layers of siltstone</p> <p> C. Sandstone and siltstone in similar amounts</p> <p> D. Siltstone or silty shale with sandstone layers</p> <p> E. Weak siltstone or clayey shale with sandstone layers</p> <p> F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure</p> <p> G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers</p> <p> H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.</p> <p>→ Means deformation after tectonic disturbance</p>	70	60	50	40	30	20	10

PROJECT REFERENCE NO.	SHEET NO.
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SITE PLAN	

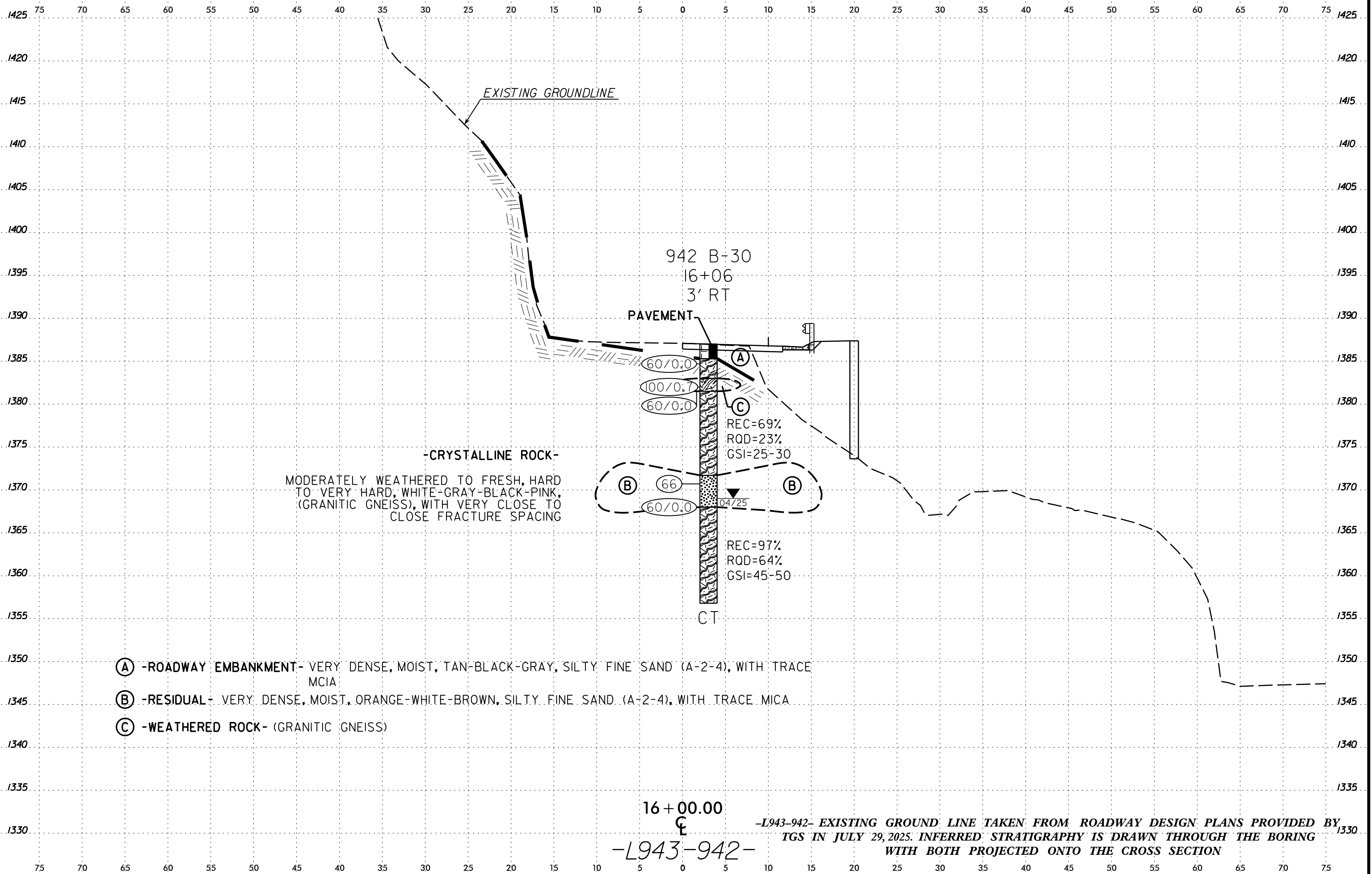


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-L943-942- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY TGS IN JULY 29, 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION



-CRYSTALLINE ROCK-
 MODERATELY WEATHERED TO FRESH, HARD TO VERY HARD, WHITE-GRAY-BLACK-PINK, (GRANITIC GNEISS), WITH VERY CLOSE TO CLOSE FRACTURE SPACING

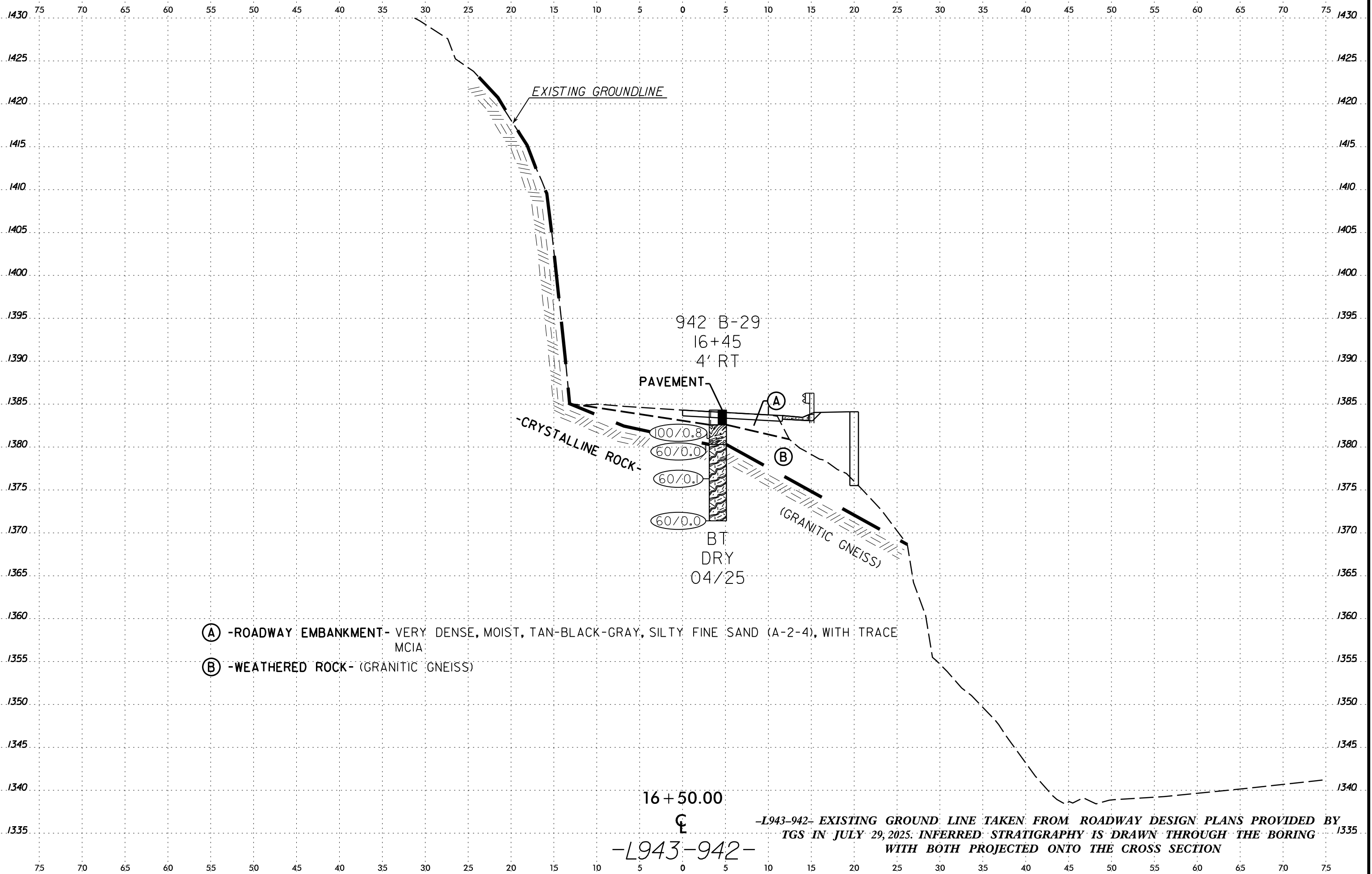
942 B-30
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PAVEMENT

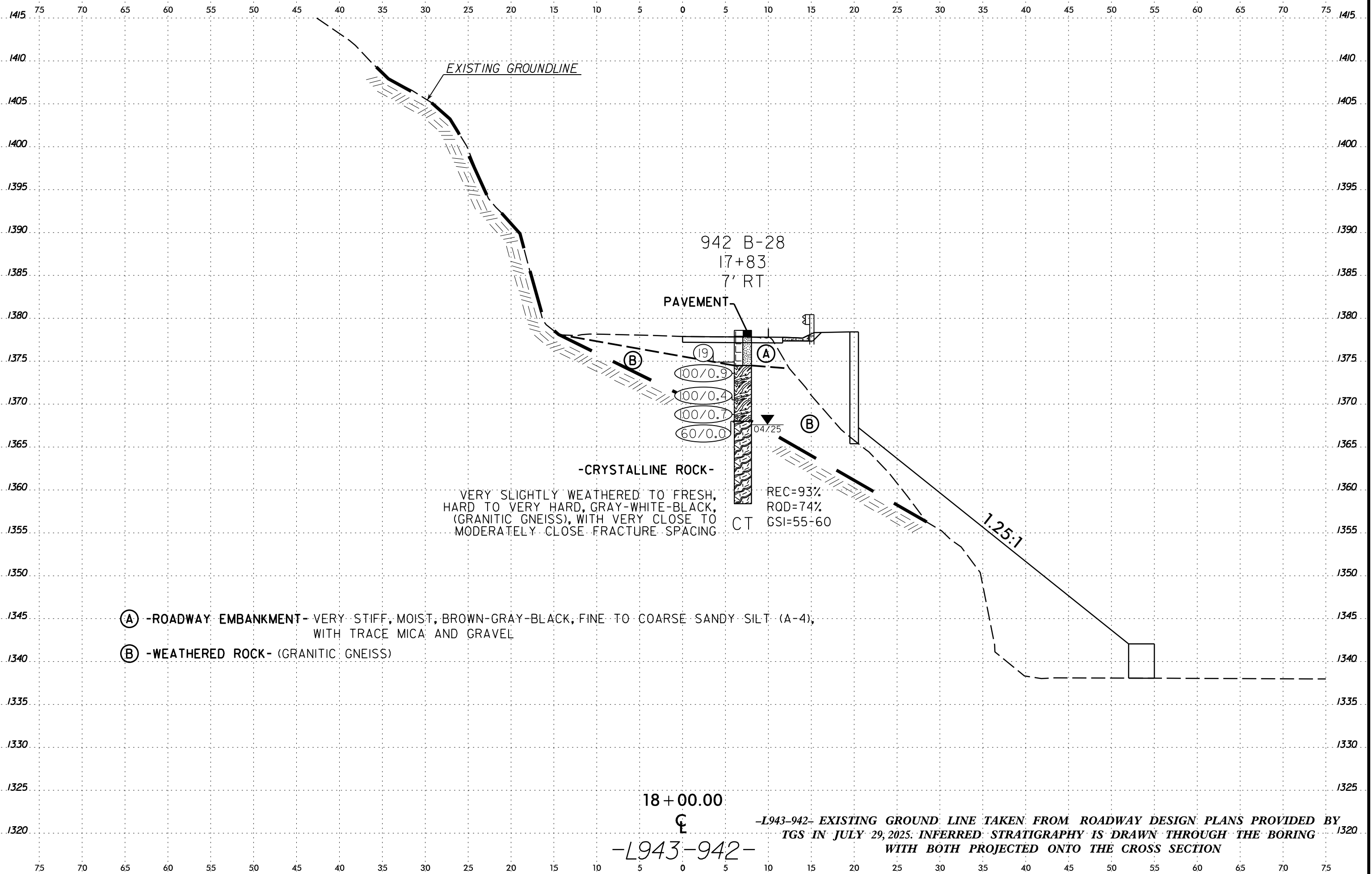
- (A) -ROADWAY EMBANKMENT- VERY DENSE, MOIST, TAN-BLACK-GRAY, SILTY FINE SAND (A-2-4), WITH TRACE MICA
- (B) -RESIDUAL- VERY DENSE, MOIST, ORANGE-WHITE-BROWN, SILTY FINE SAND (A-2-4), WITH TRACE MICA
- (C) -WEATHERED ROCK- (GRANITIC GNEISS)

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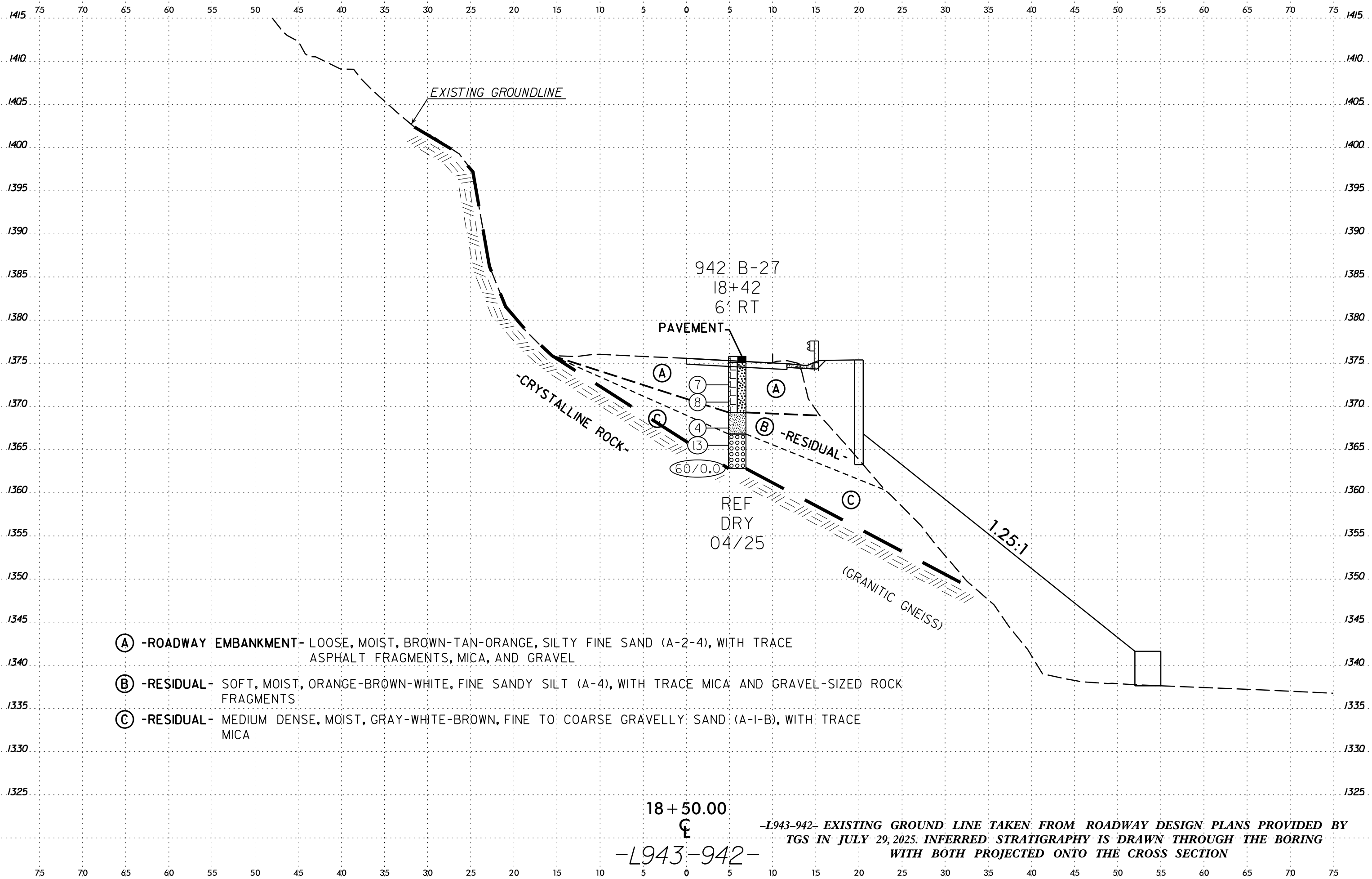


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-L943-942- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY TGS IN JULY 29, 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

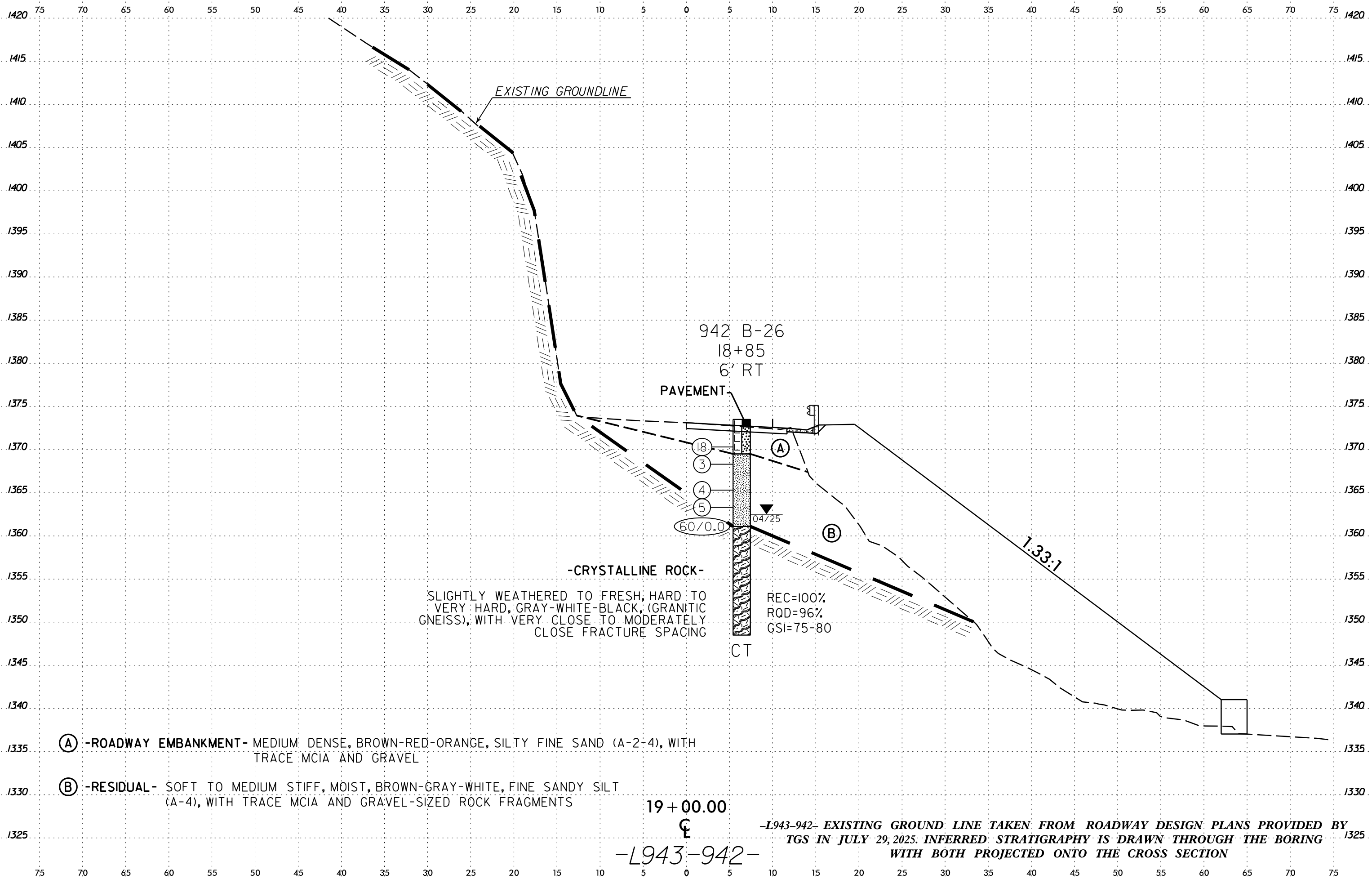
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- (A) -ROADWAY EMBANKMENT- LOOSE, MOIST, BROWN-TAN-ORANGE, SILTY FINE SAND (A-2-4), WITH TRACE ASPHALT FRAGMENTS, MICA, AND GRAVEL
- (B) -RESIDUAL- SOFT, MOIST, ORANGE-BROWN-WHITE, FINE SANDY SILT (A-4), WITH TRACE MICA AND GRAVEL-SIZED ROCK FRAGMENTS
- (C) -RESIDUAL- MEDIUM DENSE, MOIST, GRAY-WHITE-BROWN, FINE TO COARSE GRAVELLY SAND (A-I-B), WITH TRACE MICA

18 + 50.00
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 -L943-942-
 -L943-942- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY TGS IN JULY 29, 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

04-AUG-2025 07:35
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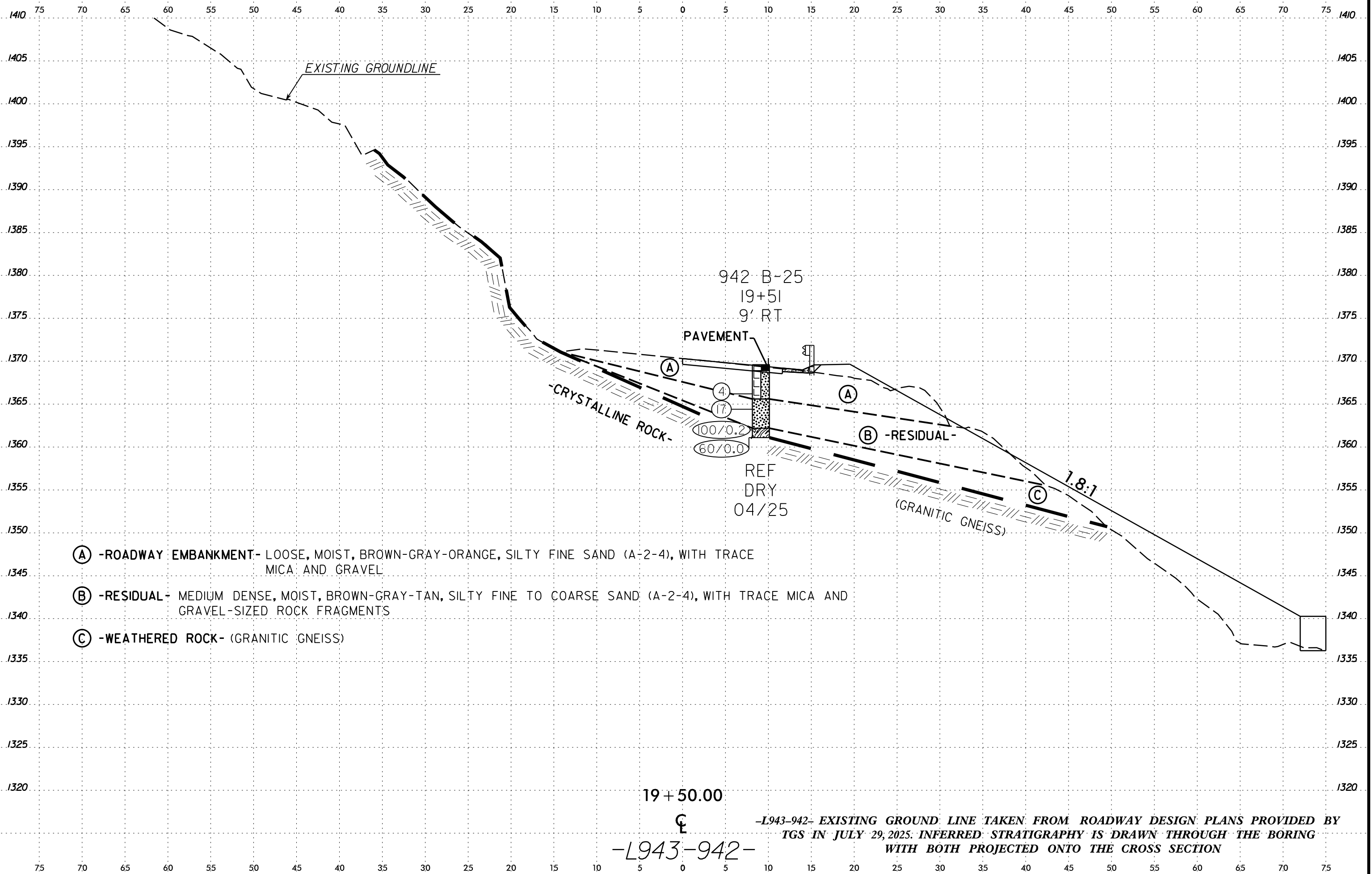


(A) -ROADWAY EMBANKMENT- MEDIUM DENSE, BROWN-RED-ORANGE, SILTY FINE SAND (A-2-4), WITH TRACE MCIA AND GRAVEL

(B) -RESIDUAL- SOFT TO MEDIUM STIFF, MOIST, BROWN-GRAY-WHITE, FINE SANDY SILT (A-4), WITH TRACE MCIA AND GRAVEL-SIZED ROCK FRAGMENTS

-L943-942- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY TGS IN JULY 29, 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

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- (A) -ROADWAY EMBANKMENT- LOOSE, MOIST, BROWN-GRAY-ORANGE, SILTY FINE SAND (A-2-4), WITH TRACE MICA AND GRAVEL
- (B) -RESIDUAL- MEDIUM DENSE, MOIST, BROWN-GRAY-TAN, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE MICA AND GRAVEL-SIZED ROCK FRAGMENTS
- (C) -WEATHERED ROCK- (GRANITIC GNEISS)

-L943-942- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY TGS IN JULY 29, 2025. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

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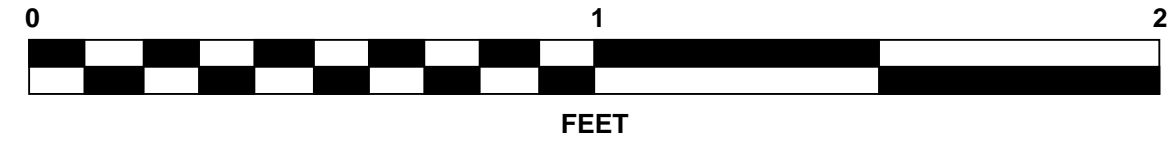
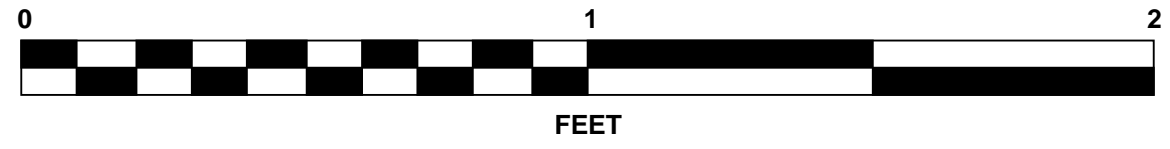
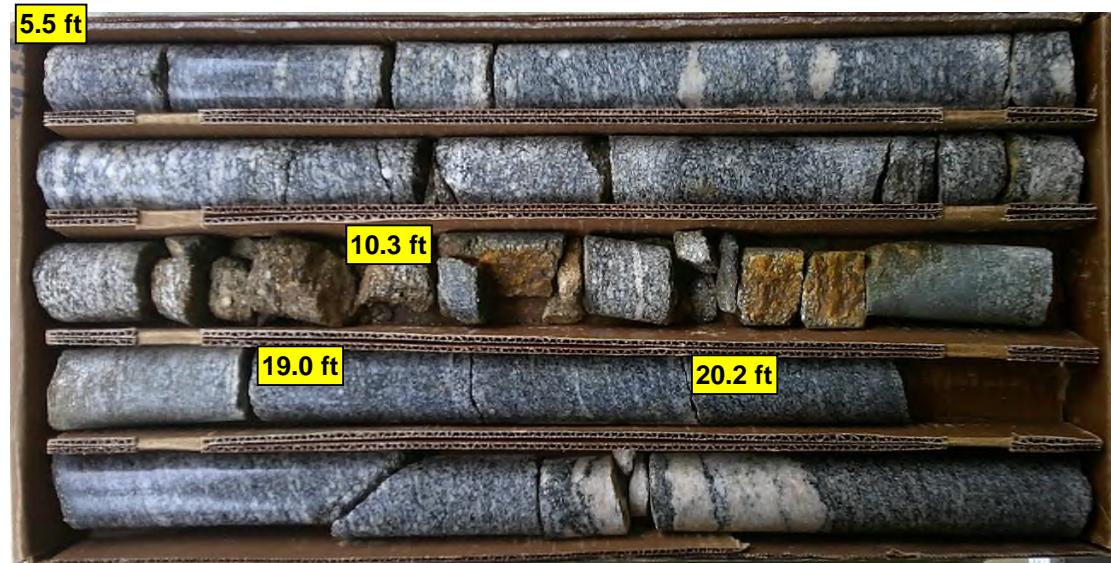
GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF18314.1075020		TIP N/A		COUNTY POLK		GEOLOGIST R. Welch										
SITE DESCRIPTION Road Repairs along US 176 Highway							GROUND WTR (ft)									
BORING NO. 942 B-31		STATION 15+71		OFFSET 8 ft RT		ALIGNMENT -L943-942-										
COLLAR ELEV. 1,389.4 ft		TOTAL DEPTH 12.0 ft		NORTHING 552,092		EASTING 1,011,020										
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D-50 97% 04/30/2024				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER C. Odom		START DATE 04/16/25		COMP. DATE 04/16/25		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
1390														1,389.4	0.0	GROUND SURFACE
	1,387.0	2.4												1,387.7	1.7	ROADWAY EMBANKMENT Asphalt (1.0'), ABC (0.7')
1385	1,385.1	4.3	10	10	9											Medium Dense, Brown-Gray, Silty Fine SAND (A-2-4), with trace gravel
	1,382.0	7.4												1,381.5	7.9	
1380	1,380.1	9.3	8	12	8									1,380.4	9.0	WEATHERED ROCK White-Tan-Orange, (Granitic Gneiss)
	1,377.4	12.0	46	45	28									1,377.4	12.0	RESIDUAL Very Dense, Tan-Black-Gray, Silty Fine SAND (A-2-4), with trace mica Boring Terminated with Standard Penetration Test Refusal at Elevation 1,377.4 ft On Crystalline Rock (Granitic Gneiss)

NCDOT BORE DOUBLE GEO_US_176_SITE_942_GTM.GPJ NC_DOT.GDT 7/2/25

**Road Repairs along US 176 Highway
Polk County, North Carolina
Rock Core Photographs
Boring: 942 B-30
5.5 to 15.3 and 19.0 to 30.2 Feet**



GEOTECHNICAL BORING REPORT

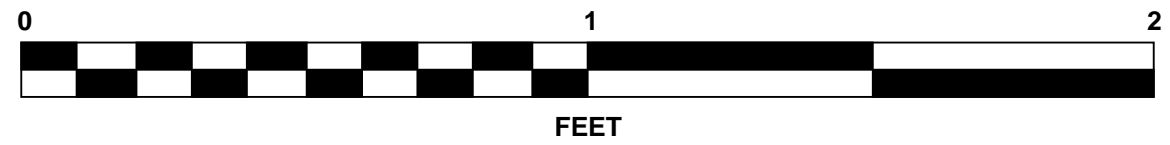
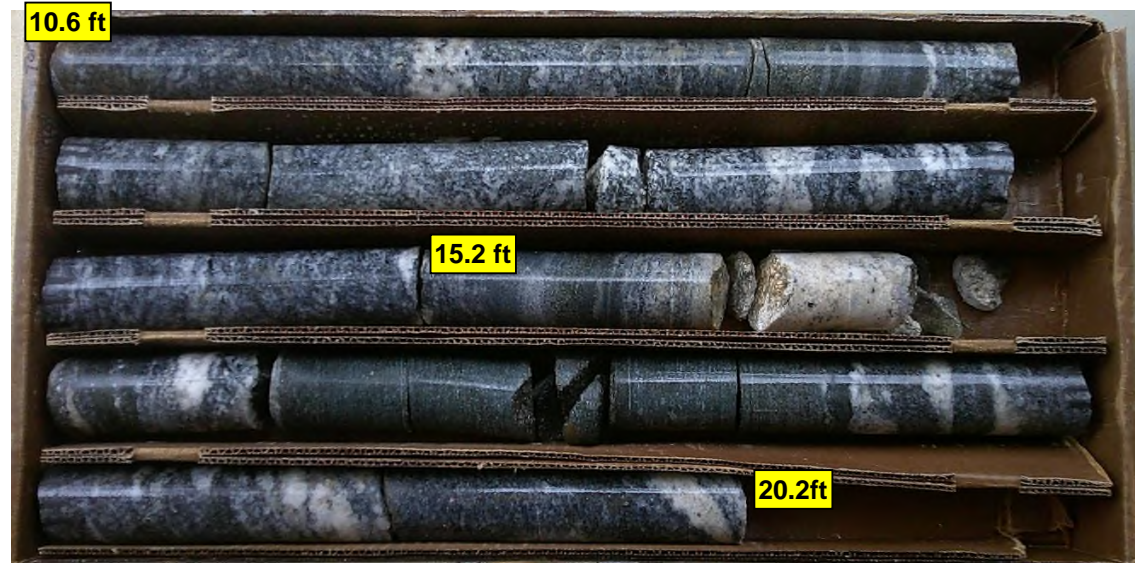
BORE LOG

WBS DF18314.1075020		TIP N/A		COUNTY POLK		GEOLOGIST R. Welch										
SITE DESCRIPTION Road Repairs along US 176 Highway							GROUND WTR (ft)									
BORING NO. 942 B-29		STATION 16+45		OFFSET 4 ft RT		ALIGNMENT -L943-942-										
COLLAR ELEV. 1,384.3 ft		TOTAL DEPTH 12.9 ft		NORTHING 552,145		EASTING 1,011,071										
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D-50 97% 04/30/2024				DRILL METHOD Wash Boring		HAMMER TYPE Automatic										
DRILLER C. Odom		START DATE 04/16/25		COMP. DATE 04/17/25		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
1385														1,384.3	GROUND SURFACE	0.0
	1,382.3	2.0												1,382.6	ROADWAY EMBANKMENT Asphalt (1.0'), ABC (0.7')	1.7
1380	1,380.3	4.0	20	55	45/0.3									1,380.3	WEATHERED ROCK Gray-White, (Granitic Gneiss)	4.0
			60/0.0												CRYSTALLINE ROCK (Granitic Gneiss)	
1375	1,376.4	7.9														
			60/0.1													
	1,371.4	12.9												1,371.4	Boring Terminated with Standard Penetration Test Refusal at Elevation 1,371.4 ft In Crystalline Rock (Granitic Gneiss)	12.9
			60/0.0													

NCDOT BORE DOUBLE GEO_US_176_SITE_942_GTM.GPJ NC_DOT.GDT 7/2/25



Road Repairs along US 176 Highway
Polk County, North Carolina
Rock Core Photographs
Boring: 942 B-28
10.6 to 20.2 Feet

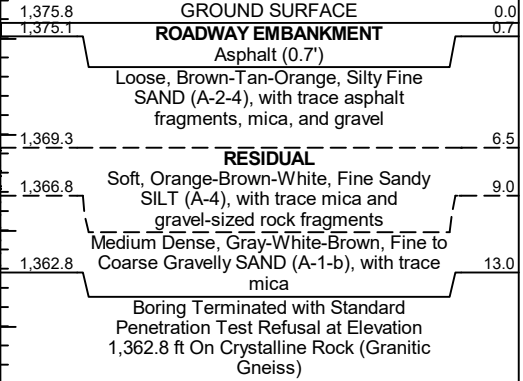


GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF18314.1075020		TIP N/A		COUNTY POLK		GEOLOGIST R. Welch									
SITE DESCRIPTION Road Repairs along US 176 Highway							GROUND WTR (ft)								
BORING NO. 942 B-27		STATION 18+42		OFFSET 6 ft RT		ALIGNMENT -L943-942-									
COLLAR ELEV. 1,375.8 ft		TOTAL DEPTH 13.0 ft		NORTHING 552,231		EASTING 1,011,245									
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D-50 97% 04/30/2024				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER C. Odom		START DATE 04/17/25		COMP. DATE 04/17/25		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					ELEV. (ft)
1380															
1375														1,375.8	0.0
														1,375.1	0.7
	1,373.5	2.3	6	4	3							M			
	1,371.5	4.3	5	3	5							M			
1370														1,369.3	6.5
	1,368.5	7.3	6	1	3							M			
	1,366.5	9.3	5	10	3							M			
1365														1,366.8	9.0
	1,362.8	13.0	60/0.0											1,362.8	13.0

NCDOT BORE DOUBLE GEO_US_176_SITE_942_GTM.GPJ NC_DOT.GDT 7/2/25



GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

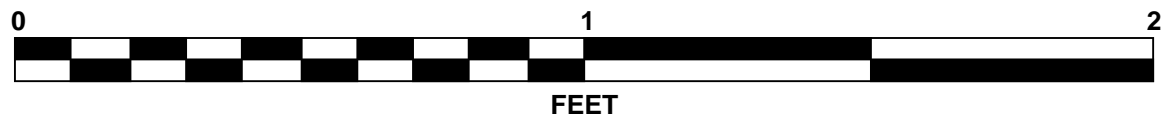
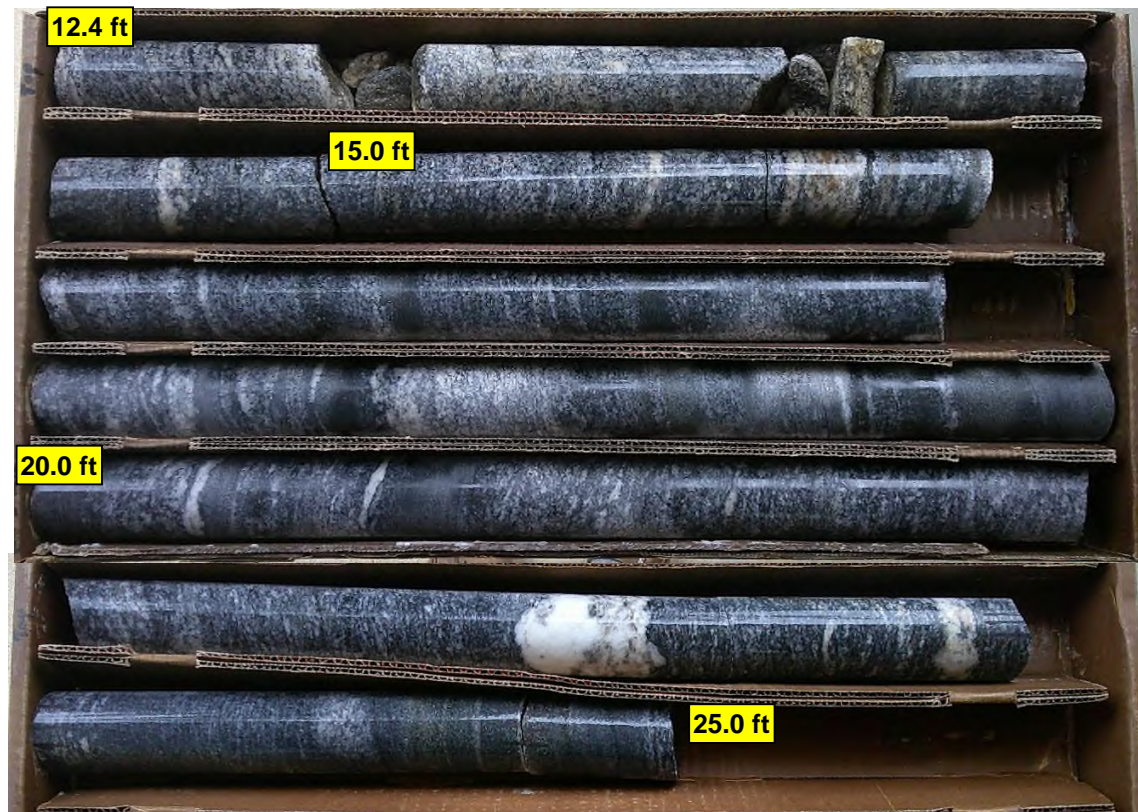
WBS DF18314.1075020		TIP N/A		COUNTY POLK		GEOLOGIST R. Welch									
SITE DESCRIPTION Road Repairs along US 176 Highway							GROUND WTR (ft)								
BORING NO. 942 B-26		STATION 18+85		OFFSET 6 ft RT		ALIGNMENT -L943-942-									
COLLAR ELEV. 1,373.5 ft		TOTAL DEPTH 25.0 ft		NORTHING 552,243		EASTING 1,011,287									
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D-50 97% 04/30/2024		DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic											
DRILLER C. Odom		START DATE 04/17/25		COMP. DATE 04/17/25		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
1375															
1370	1,371.3	2.2	10	10	8										
	1,369.3	4.2													
	1,366.3	7.2	3	2	1										
1365	1,364.3	9.2	1	1	3										
	1,361.1	12.4	5	2	3										
1360															
1355															
1350															

WBS DF18314.1075020		TIP N/A		COUNTY POLK		GEOLOGIST R. Welch						
SITE DESCRIPTION Road Repairs along US 176 Highway							GROUND WTR (ft)					
BORING NO. 942 B-26		STATION 18+85		OFFSET 6 ft RT		ALIGNMENT -L943-942-						
COLLAR ELEV. 1,373.5 ft		TOTAL DEPTH 25.0 ft		NORTHING 552,243		EASTING 1,011,287						
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D-50 97% 04/30/2024		DRILL METHOD SPT Core Boring		HAMMER TYPE Automatic								
DRILLER C. Odom		START DATE 04/17/25		COMP. DATE 04/17/25		SURFACE WATER DEPTH N/A						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	TOTAL RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	RQD (%)		REC. (%)	RQD (%)			
1361.07												
1360	1,361.1	12.4	2.6	N=60/0.0 2:49/1.0 3:04/1.0 2:01/0.6	(2.6) 100%	(2.1) 81%		(12.6) 100%	(12.1) 96%		Begin Coring @ 12.4 ft	
	1,358.5	15.0	5.0	3:58/1.0 2:31/1.0 2:37/1.0 3:08/1.0 3:09/1.0	(5.0) 100%	(5.0) 100%					CRystalline Rock Slightly Weathered to Fresh, Hard to Very Hard, Gray-White-Black, (Granitic Gneiss), with Very Close to Moderately Close Fracture Spacing	12.4
1355											GSI = 75-80	
	1,353.5	20.0	5.0	3:42/1.0 5:19/1.0 2:24/1.0 4:29/1.0 5:20/1.0	(5.0) 100%	(5.0) 100%						
1350												
	1,348.5	25.0									Boring Terminated at Elevation 1,348.5 ft In Crystalline Rock (Granitic Gneiss)	25.0

NCDOT BORE DOUBLE GEO_US 176_SITE 942_GTM.GPJ NC_DOT.GDT 7/2/25

NCDOT BORE DOUBLE GEO_US 176_SITE 942_GTM.GPJ NC_DOT.GDT 7/2/25

**Road Repairs along US 176 Highway
Polk County, North Carolina
Rock Core Photographs
Boring: 942 B-26
12.4 to 25.0 Feet**



GEOTECHNICAL BORING REPORT

BORE LOG

WBS DF18314.1075020		TIP N/A		COUNTY POLK		GEOLOGIST R. Welch										
SITE DESCRIPTION Road Repairs along US 176 Highway							GROUND WTR (ft)									
BORING NO. 942 B-25		STATION 19+51		OFFSET 9 ft RT		ALIGNMENT -L943-942-										
COLLAR ELEV. 1,369.6 ft		TOTAL DEPTH 8.5 ft		NORTHING 552,252		EASTING 1,011,350										
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D-50 97% 04/30/2024				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER C. Odom		START DATE 04/17/25		COMP. DATE 04/17/25		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
1370														1,369.6	0.0	GROUND SURFACE
														1,368.9	0.7	ROADWAY EMBANKMENT Asphalt (0.7')
	1,367.2	2.4														
1365	1,365.4	4.2	5	2	2									1,365.6	4.0	Loose, Brown-Gray-Orange, Silty Fine SAND (A-2-4), with trace mica and gravel
			4	6	11											RESIDUAL
	1,362.2	7.4												1,362.2	7.4	Medium Dense, Brown-Gray-Tan, Silty Fine to Coarse SAND (A-2-4), with trace mica and gravel sized rock-fragments
	1,361.1	8.5	100/0.2											1,361.1	8.5	WEATHERED ROCK White-Black-Gray, (Granitic Gneiss)
			60/0.0													Boring Terminated with Standard Penetration Test Refusal at Elevation 1,361.1 ft On Crystalline Rock (Granitic Gneiss)

NCDOT BORE DOUBLE GEO_US_176_SITE_942_GTM.GPJ NC_DOT.GDT 7/2/25