

REFERENCE: U-5810

PROJECT: 35993

CONTENTS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4	PROFILE (BRIDGE)
5-6	CROSS SECTIONS (BRIDGE)
7	WALL 10 PROFILE
8	WALL 11 PROFILE
9-13	BORE LOGS & CORE REPORTS
14	CORE PHOTOGRAPHS
15	SOIL TEST RESULTS
16	SITE PHOTOGRAPH

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY WATAUGA
PROJECT DESCRIPTION WILSON RIDGE RD (SR 1523)
& BAMBOO RD (SR 1514) WIDENING
SITE DESCRIPTION CONSTRUCT BRIDGE ON SR 1514
(BAMBOO RD) & RETAINING WALLS 10 & 11

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5810	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:
- 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.
 - 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

KEBEA, B.

MARLOWE, J.

D. MORGAN

INVESTIGATED BY S&ME, Inc.

DRAWN BY J. SWARTLEY

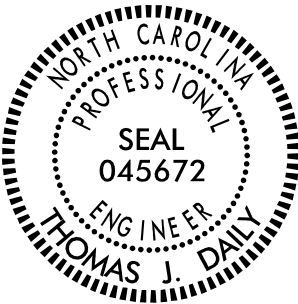
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SUBMITTED BY S&ME, Inc.

DATE FEBRUARY 2025



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RALEIGH, NC 27616
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DocuSigned by:

Thomas J. Daily

F29CA6BB83F449F...

SIGNATURE

2/28/2025

DATE

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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									
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>										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.										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:										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 (ROD) - 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 (N 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.									
SOIL LEGEND AND AASHTO CLASSIFICATION										MINERALOGICAL COMPOSITION										WEATHERING																			
GENERAL CLASS. SILT-CLAY MATERIALS (< 35% PASSING #200) ORGANIC MATERIALS										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.																			
GROUP CLASS. A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-9, A-10, A-11, A-12, A-13, A-14, A-15, A-16, A-17, A-18, A-19, A-20, A-21, A-22, A-23, A-24, A-25, A-26, A-27, A-28, A-29, A-30, A-31, A-32, A-33, A-34, A-35, A-36, A-37, A-38, A-39, A-40, A-41, A-42, A-43, A-44, A-45, A-46, A-47, A-48, A-49, A-50, A-51, A-52, A-53, A-54, A-55, A-56, A-57, A-58, A-59, A-60, A-61, A-62, A-63, A-64, A-65, A-66, A-67, A-68, A-69, A-70, A-71, A-72, A-73, A-74, A-75, A-76, A-77, A-78, A-79, A-80, A-81, A-82, A-83, A-84, A-85, A-86, A-87, A-88, A-89, A-90, A-91, A-92, A-93, A-94, A-95, A-96, A-97, A-98, A-99, A-100, A-101, A-102, A-103, A-104, A-105, A-106, A-107, A-108, A-109, A-110, A-111, A-112, A-113, A-114, A-115, A-116, A-117, A-118, A-119, A-120, A-121, A-122, A-123, A-124, A-125, A-126, A-127, A-128, A-129, A-130, A-131, A-132, A-133, A-134, A-135, A-136, A-137, A-138, A-139, A-140, A-141, A-142, A-143, A-144, A-145, A-146, A-147, A-148, A-149, A-150, A-151, A-152, A-153, A-154, A-155, A-156, A-157, A-158, A-159, A-160, A-161, A-162, A-163, A-164, A-165, A-166, A-167, A-168, A-169, A-170, A-171, A-172, A-173, A-174, A-175, A-176, A-177, A-178, A-179, A-180, A-181, A-182, A-183, A-184, A-185, A-186, A-187, A-188, A-189, A-190, A-191, A-192, A-193, A-194, A-195, A-196, A-197, A-198, A-199, A-200, A-201, A-202, A-203, A-204, A-205, A-206, A-207, A-208, A-209, A-210, A-211, A-212, A-213, A-214, A-215, A-216, A-217, A-218, A-219, A-220, A-221, A-222, A-223, A-224, A-225, A-226, A-227, A-228, A-229, A-230, A-231, A-232, A-233, A-234, A-235, A-236, A-237, A-238, A-239, A-240, A-241, A-242, A-243, A-244, A-245, A-246, A-247, A-248, A-249, A-250, A-251, A-252, A-253, A-254, A-255, A-256, A-257, A-258, A-259, A-260, A-261, A-262, A-263, A-264, A-265, A-266, A-267, A-268, A-269, A-270, A-271, A-272, A-273, A-274, A-275, A-276, A-277, A-278, A-279, A-280, A-281, A-282, A-283, A-284, A-285, A-286, A-287, A-288, A-289, A-290, A-291, A-292, A-293, A-294, A-295, A-296, A-297, A-298, A-299, A-300, A-301, A-302, A-303, A-304, A-305, A-306, A-307, A-308, A-309, A-310, A-311, A-312, A-313, A-314, A-315, A-316, A-317, A-318, A-319, A-320, A-321, A-322, A-323, A-324, A-325, A-326, A-327, A-328, A-329, A-330, A-331, A-332, A-333, A-334, A-335, A-336, A-337, A-338, A-339, A-340, A-341, A-342, A-343, A-344, A-345, A-346, A-347, A-348, A-349, A-350, A-351, A-352, A-353, A-354, A-355, A-356, A-357, A-358, A-359, A-360, A-361, A-362, A-363, A-364, A-365, A-366, A-367, A-368, A-369, A-370, A-371, A-372, A-373, A-374, A-375, A-376, A-377, A-378, A-379, A-380, A-381, A-382, A-383, A-384, A-385, A-386, A-387, A-388, A-389, A-390, A-391, A-392, A-393, A-394, A-395, A-396, A-397, A-398, A-399, A-400, A-401, A-402, A-403, A-404, A-405, A-406, A-407, A-408, A-409, A-410, A-411, A-412, A-413, A-414, A-415, A-416, A-417, A-418, A-419, A-420, A-421, A-422, A-423, A-424, A-425, A-426, A-427, A-428, A-429, A-430, A-431, A-432, A-433, A-434, A-435, A-436, A-437, A-438, A-439, A-440, A-441, A-442, A-443, A-444, A-445, A-446, A-447, A-448, A-449, A-450, A-451, A-452, A-453, A-454, A-455, A-456, A-457, A-458, A-459, A-460, A-461, A-462, A-463, A-464, A-465, A-466, A-467, A-468, A-469, A-470, A-471, A-472, A-473, A-474, A-475, A-476, A-477, A-478, A-479, A-480, A-481, A-482, A-483, A-484, A-485, A-486, A-487, A-488, A-489, A-490, A-491, A-492, A-493, A-494, A-495, A-496, A-497, A-498, A-499, A-500, A-501, A-502, A-503, A-504, A-505, A-506, A-507, A-508, A-509, A-510, A-511, A-512, A-513, A-514, A-515, A-516, A-517, A-518, A-519, A-520, A-521, A-522, A-523, A-524, A-525, A-526, A-527, A-528, A-529, A-530, A-531, A-532, A-533, A-534, A-535, A-536, A-537, A-538, A-539, A-540, A-541, A-542, A-543, A-544, A-545, A-546, A-547, A-548, A-549, A-550, A-551, A-552, A-553, A-554, A-555, A-556, A-557, A-558, A-559, A-560, A-561, A-562, A-563, A-564, A-565, A-566, A-567, A-568, A-569, A-570, A-571, A-572, A-573, A-574, A-575, A-576, A-577, A-578, A-579, A-580, A-581, A-582, A-583, A-584, A-585, A-586, A-587, A-588, A-589, A-590, A-591, A-592, A-593, A-594, A-595, A-596, A-597, A-598, A-599, A-600, A-601, A-602, A-603, A-604, A-605, A-606, A-607, A-608, A-609, A-610, A-611, A-612, A-613, A-614, A-615, A-616, A-617, A-618, A-619, A-620, A-621, A-622, A-623, A-624, A-625, A-626, A-627, A-628, A-629, A-630, A-631, A-632, A-633, A-634, A-635, A-636, A-637, A-638, A-639, A-640, A-641, A-642, A-643, A-644, A-645, A-646, A-647, A-648, A-649, A-650, A-651, A-652, A-653, A-654, A-655, A-656, A-657, A-658, A-659, A-660, A-661, A-662, A-663, A-664, A-665, A-666, A-667, A-668, A-669, A-670, A-671, A-672, A-673, A-674, A-675, A-676, A-677, A-678, A-679, A-680, A-681, A-682, A-683, A-684, A-685, A-686, A-687, A-688, A-689, A-690, A-691, A-692, A-693, A-694, A-695, A-696, A-697, A-698, A-699, A-700, A-701, A-702, A-703, A-704, A-705, A-706, A-707, A-708, A-709, A-710, A-711, A-712, A-713, A-714, A-715, A-716, A-717, A-718, A-719, A-720, A-721, A-722, A-723, A-724, A-725, A-726, A-727, A-728, A-729, A-730, A-731, A-732, A-733, A-734, A-735, A-736, A-737, A-738, A-739, A-740, A-741, A-742, A-743, A-744, A-745, A-746, A-747, A-748, A-749, A-750, A-751, A-752, A-753, A-754, A-755, A-756, A-757, A-758, A-759, A-760, A-761, A-762, A-763, A-764, A-765, A-766, A-767, A-768, A-769, A-770, A-771, A-772, A-773, A-774, A-775, A-776, A-777, A-778, A-779, A-780, A-781, A-782, A-783, A-784, A-785, A-786, A-787, A-788, A-789, A-790, A-791, A-792, A-793, A-794, A-795, A-796, A-797, A-798, A-799, A-800, A-801, A-802, A-803, A-804, A-805, A-806, A-807, A-808, A-809, A-810, A-811, A-812, A-813, A-814, A-815, A-816, A-817, A-818, A-819, A-820, A-821, A-822, A-823, A-824, A-825, A-826, A-827, A-828, A-829, A-830, A-831, A-832, A-833, A-834, A-835, A-836, A-837, A-838, A-839, A-840, A-841, A-842, A-843, A-844, A-845, A-846, A-847, A-848, A-849, A-850, A-851, A-852, A-853, A-854, A-855, A-856, A-857, A-858, A-859, A-860, A-861, A-862, A-863, A-864, A-865, A-866, A-867, A-868, A-869, A-870, A-871, A-872, A-873, A-874, A-875, A-876, A-877, A-878, A-879, A-880, A-881, A-882, A-883, A-884, A-885, A-886, A-887, A-888, A-889, A-890, A-891, A-892, A-893, A-894, A-895, A-896, A-897, A-898, A-899, A-900, A-901, A-902, A-903, A-904, A-905, A-906, A-907, A-908, A-909, A-910, A-911, A-912, A-913, A-914, A-915, A-916, A-917, A-918, A-919, A-920, A-921, A-922, A-923, A-924, A-925, A-926, A-927, A-928, A-929, A-930, A-931, A-932, A-933, A-934, A-935, A-936, A-937, A-938, A-939, A-940, A-941, A-942, A-943, A-944, A-945, A-946, A-947, A-948, A-949, A-950, A-951, A-952, A-953, A-954, A-955, A-956, A-957, A-958, A-959, A-960, A-961, A-962, A-963, A-964, A-965, A-966, A-967, A-968, A-969, A-970, A-971, A-972, A-973, A-974, A-975, A-976, A-977, A-978, A-979, A-980, A-981, A-982, A-983, A-984, A-985, A-986, A-987, A-988, A-989, A-990, A-991, A-992, A-993, A-994, A-995, A-996, A-997, A-998, A-999, A-1000, A-1001, A-1002, A-1003, A-1004, A-1005, A-1006, A-1007, A-1008, A-1009, A-1010, A-1011, A-1012, A-1013, 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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

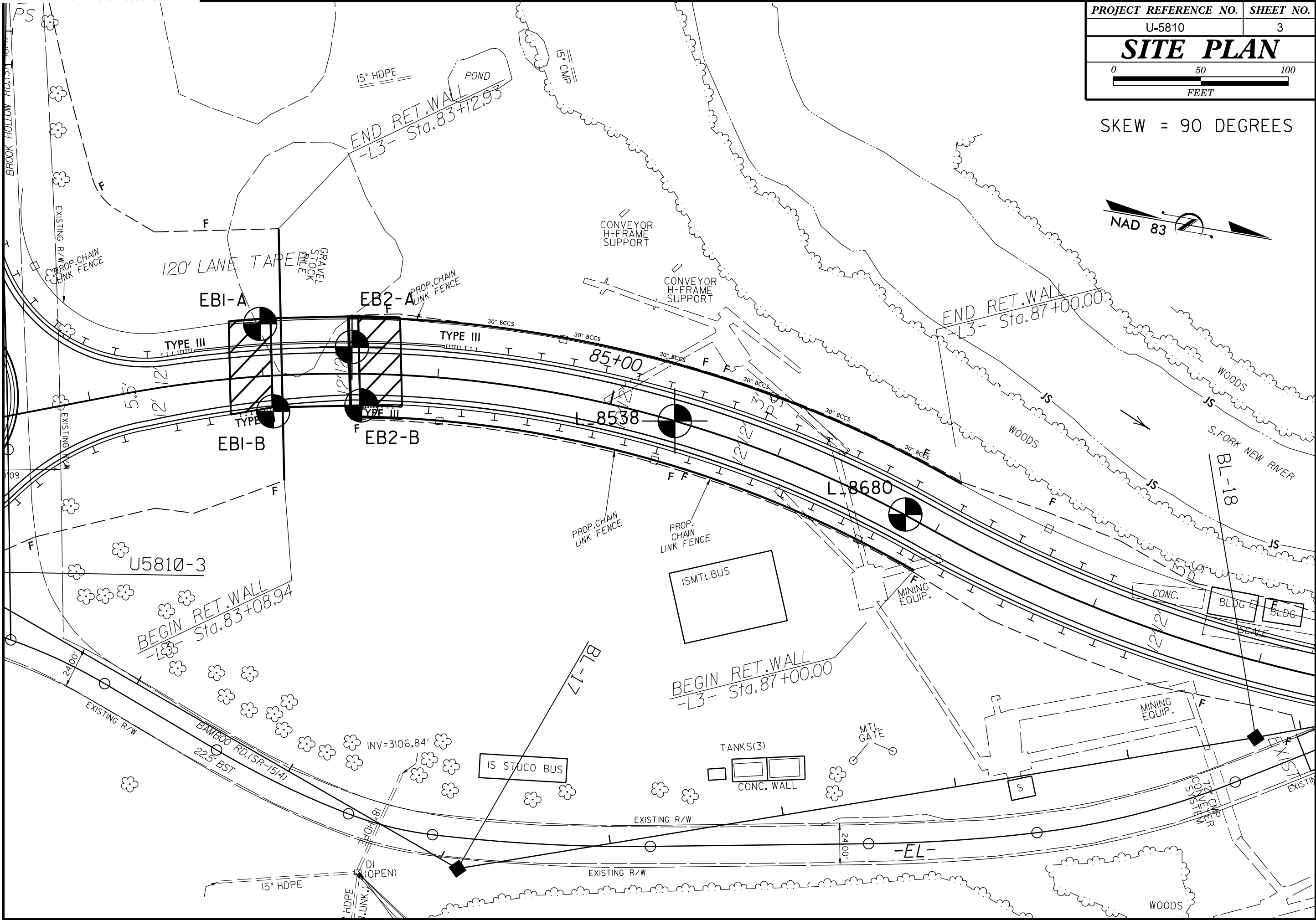
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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

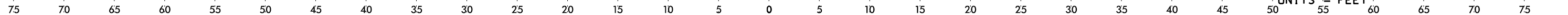
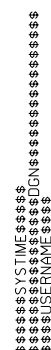
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that 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.	SURFACE CONDITIONS VERY GOOD Very rough, fresh unweathered surfaces GOOD Rough, slightly weathered, iron stained surfaces FAIR Smooth, moderately weathered and altered surfaces POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	STRUCTURE INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	DECREASING SURFACE QUALITY ➡ DECREASING INTERLOCKING OF ROCK PIECES ⬇	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000) 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.	SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes) VERY GOOD - Very Rough, fresh unweathered surfaces GOOD - Rough, slightly weathered surfaces FAIR - Smooth, moderately weathered and altered surfaces POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings	COMPOSITION AND STRUCTURE 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. B. Sandstone with thin inter-layers of siltstone C. Sandstone and siltstone in similar amounts D. Siltstone or silty shale with sandstone layers E. Weak siltstone or clayey shale with sandstone layers F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers 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. ➡ Means deformation after tectonic disturbance	70 60 50 40 30 20 10
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PROJECT REFERENCE NO.	SHEET NO.
U-5810	3
SITE PLAN	
050100 FEET	

SKEW = 90 DEGREES





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— $\angle$ —

CROSS-SECTION GROUND LINE CONSTRUCTED
ALONG BENT LINE WITH SKEW OF 90 DEGREES
USING TIN FILE 'U5810 Is tin.tin' DATED 10/22/2018.
SUBSURFACE STRATIGRAPHY IS PROJECTED ALONG IT.

6/23/16

CROSS-SECTION ALONG END BENT 2

(A) **RESIDUAL,**
MEDIUM DENSE, GRAY AND WHITE, SILTY FINE TO COARSE SAND, MOIST, A-2-4

EB2-A
83+51
15' LT
-L-

EB2-B
83+57
18' RT
-L-

EXISTING GROUND

SS-13

SS-20
SS-23

ARTIFICIAL FILL.

MEDIUM DENSE TO VERY DENSE, BROWN AND GRAY,
SILTY FINE TO COARSE SAND, LITTLE GRAVEL, MOIST, A-2-4

MEDIUM STIFF TO VERY STIFF, RED AND BROWN,
SANDY SILT, MOIST, A-4

MEDIUM STIFF, GRAY AND BROWN, CLAY, MOIST, A-7-5

ALLUVIAL,
LOOSE, GRAY, SILTY FINE TO COARSE SAND, MOIST, A-2-4

ALLUVIAL,
MEDIUM STIFF, GRAY AND BROWN,
SANDY CLAY AND CLAYEY SILT,
MOIST, A-6 & A-5

RESIDUAL,
VERY STIFF TO HARD, BROWN, GRAY
AND WHITE SANDY SILT, DRY TO MOIST, A-4

WEATHERED ROCK,
BIOTITE GRANITIC GNEISS

CRYSTALLINE ROCK,
BIOTITE GRANITIC GNEISS

WEATHERED ROCK,
BIOTITE GRANITIC GNEISS

REC = 86%
RQD = 86%
GSI = 80-90

REC = 93%
RQD = 93%
GSI = 80-90

CRYSTALLINE ROCK,
BIOTITE GRANITIC GNEISS

83+55

-L-

CROSS-SECTION GROUND LINE CONSTRUCTED
ALONG BENT LINE WITH SKEW OF 90 DEGREES
USING .TIN FILE 'U5810.ls.tin.tin' DATED 10/22/2018.
SUBSURFACE STRATIGRAPHY IS PROJECTED ALONG IT.

(A) **ARTIFICIAL FILL**, WOOD

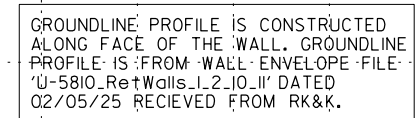
(B) **ARTIFICIAL FILL**, MEDIUM STIFF TO VERY STIFF, BROWN, GRAY, AND RED, SANDY SILT, AND VERY LOOSE TO VERY DENSE, SILTY SAND, MOIST TO WET, A-4 & A-2-4

(C) **ARTIFICIAL FILL**, MEDIUM STIFF, GRAY AND BROWN, CLAY, MOIST, A-7-5

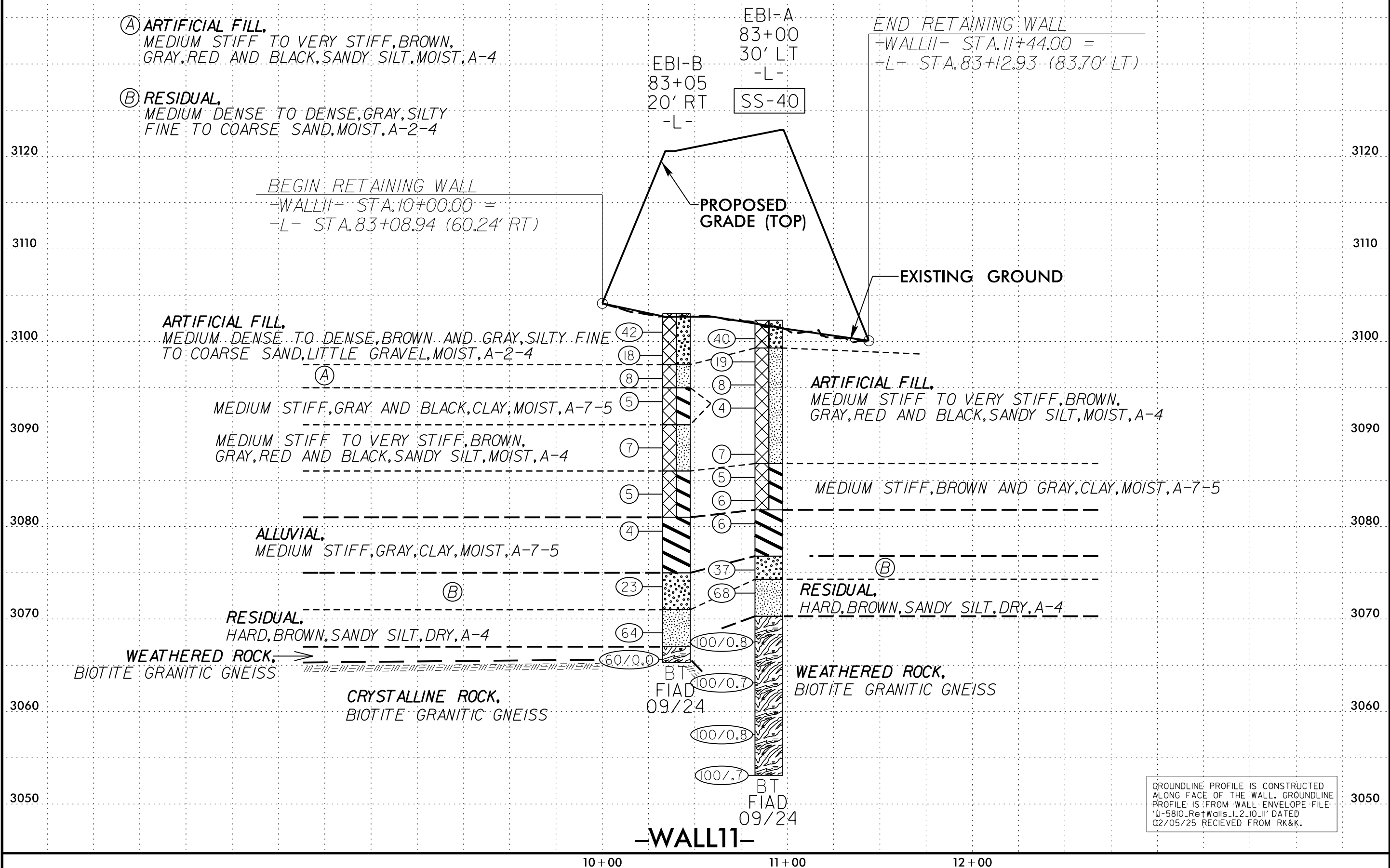
(D) **ALLUVIAL**, SOFT TO MEDIUM STIFF, GRAY, SANDY SILT, MOIST, A-4

(E) **ALLUVIAL**, SOFT TO MEDIUM STIFF, GRAY, CLAY, SANDY CLAY AND CLAYEY SILT, MOIST, A-7-5, A-6 & A-5

(F) **RESIDUAL**, VERY STIFF TO HARD, BROWN, GRAY, AND WHITE, SANDY SILT AND DENSE, SILTY SAND, MOIST, A-4 & A-2-4



PROJECT REFERENCE NO.	SHEET NO.
U-5810	8
PROFILE ALONG FACE OF RET. WALL II OFFSETS ARE FROM -L-	



WBS		35993.1.1		TIP	U-5810		COUNTY	WATAUGA		GEOLOGIST	Kebea, B.						
SITE DESCRIPTION										CONSTRUCT BRIDGE ON SR 1514 (BAMBOO RD)		GROUND WTR (ft)					
BORING NO.		EB1-A		STATION		83+00		OFFSET		30 ft LT		ALIGNMENT -L-		0 HR.	26.0		
COLLAR ELEV.		3,102.3 ft		TOTAL DEPTH		49.2 ft		NORTHING		907,548		EASTING 1,222,081		24 HR.	FIAD		
DRILL RIG/HAMMER EFF./DATE								SME0593 CME-550X 92%11/17/2023				DRILL METHOD		H.S. Augers		HAMMER TYPE	Automatic
DRILLER				Marlowe, J.		START DATE		09/20/24		COMP. DATE		09/20/24		SURFACE WATER DEPTH N/A			
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
3105																	
3100	3,101.3	1.0	13	20	20									3,102.3	GROUND SURFACE	0.0	
	3,098.8	3.5	4	10	9							D		ARTIFICIAL FILL			
3095	3,096.3	6.0	4	4	4							M		3,099.3	DENSE, BROWN GRAY, SILTY FINE TO COARSE SAND A-2-4, LITTLE GRAVEL	3.0	
	3,093.8	8.5	1	1	3							M			MEDIUM STIFF TO VERY STIFF, BROWN GRAY BLACK, SANDY SILT A-4		
3090	3,088.8	13.5	2	3	4							M					
	3,086.3	16.0	1	2	3							M		3,086.8	MEDIUM STIFF, BROWN GRAY, CLAY A-7-5	15.5	
3085	3,083.8	18.5	2	2	4							SS-40	43%				
	3,081.3	21.0	1	2	4							M		3,081.8		20.5	
3080	3,076.3	26.0	11	13	24							W			ALLUVIAL		
	3,073.8	28.5	28	33	35							W		3,076.8	MEDIUM STIFF, GRAY, CLAY A-7-5		
3075	3,073.8	28.5	28	33	35							M		3,074.3	DENSE, BROWN GRAY, SILTY FINE TO COARSE SAND A-2-4	28.0	
	3,068.8	33.5	14	61	39/0.3							D			HARD, BROWN, SANDY SILT A-4		
3065	3,063.8	38.5	67	33/0.2										3,070.3		32.0	
	3,058.8	43.5	14	54	56/0.3										WEATHERED ROCK		
3055	3,053.8	48.5	77	33/0.2											(BIOTITE GRANITIC GNEISS)		
															Boring Terminated at Elevation 3,053.1 ft IN WEATHERED ROCK (BIOTITE GRANITIC GNEISS)		

WBS		35993.1.1		TIP		U-5810		COUNTY		WATAUGA		GEOLOGIST		Kebea, B.						
SITE DESCRIPTION													CONSTRUCT BRIDGE ON SR 1514 (BAMBOO RD)			GROUND WTR (ft)				
BORING NO.		EB1-B		STATION		83+05		OFFSET		20 ft RT		ALIGNMENT		-L-		0 HR.	25.0			
COLLAR ELEV.		3,103.0 ft		TOTAL DEPTH		37.7 ft		NORTHING		907,564		EASTING		1,222,129		24 HR.	FIAD			
DRILL RIG/HAMMER EFF./DATE								SME0593 CME-550X 92% 11/17/2023				DRILL METHOD			H.S. Augers		HAMMER TYPE		Automatic	
DRILLER				Marlowe, J.		START DATE		09/20/24		COMP. DATE		09/20/24		SURFACE WATER DEPTH					N/A	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	L O G	SOIL AND ROCK DESCRIPTION						
			0.5ft	0.5ft	0.5ft	0	25	50	75	100										
3105																				
	3,102.0	1.0																		
3100	3,099.5	3.5	20	18	24							M		3,103.0	GROUND SURFACE		0.0			
	3,097.0	6.0										M								
3095	3,094.5	8.5	3	10	8							M		3,097.5	ARTIFICIAL FILL MEDIUM DENSE TO DENSE, BROWN GRAY, SILTY FINE TO COARSE SAND (A-2-4), LITTLE GRAVEL					
	3,091.0		4	3	5							M		3,097.0	MEDIUM STIFF, RED BROWN, SANDY SILT A-4		5.5			
	3,089.5		2	2	3							M		3,095.0	MEDIUM STIFF, GRAY BLACK, CLAY A-7-5		8.0			
3090	3,088.5	13.5										M		3,091.0	MEDIUM STIFF, BROWN, SANDY SILT A-4		12.0			
	3,084.5	18.5										M		3,086.0	MEDIUM STIFF, BROWN, CLAY A-7-5		17.0			
3085	3,080.5	22.5	1	2	3							M		3,081.0			22.0			
3080	3,074.5	28.5	1	2	2							W			ALLUVIAL MEDIUM STIFF, GRAY, CLAY A-7-5					
3075	3,074.5	28.5												3,075.0			28.0			
	3,069.5	33.5	24	13	10							D			RESIDUAL MEDIUM DENSE, GRAY, SILTY FINE TO COARSE SAND A-2-4					
3070	3,069.5	33.5												3,071.0	HARD, BROWN, SANDY SILT A-4		32.0			
	3,065.6	37.4	9	23	41							D		3,067.0			36.0			
			60/0.0											3,065.3	WEATHERED ROCK (BIOTITE GRANITIC GNEISS)		37.7			
														Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 3,065.3 ft ON CRYSTALLINE ROCK (BIOTITE GRANITIC GNEISS)						

NCDOT BORE DOUBLE U-5810 GEO BRIDGE.GPJ NC_DOT.GDT 2/21/25

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 35993.1.1		TIP U-5810		COUNTY WATAUGA		GEOLOGIST Kebea, B.							
SITE DESCRIPTION CONSTRUCT BRIDGE ON SR 1514 (BAMBOO RD)								GROUND WTR (ft)					
BORING NO. EB2-A		STATION 83+51		OFFSET 15 ft LT		ALIGNMENT -L-		0 HR.	N/A				
COLLAR ELEV. 3,103.4 ft		TOTAL DEPTH 50.8 ft		NORTHING 907,602		EASTING 1,222,085		24 HR.	9.0				
DRILL RIG/HAMMER EFF./DATE SME0593 CME-550X 92%11/17/2023				DRILL METHOD NW/Casing WSPT & Core		HAMMER TYPE Automatic							
DRILLER Marlowe, J.		START DATE 09/19/24		COMP. DATE 09/19/24		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)
3105													
	3,102.4	1.0	16	28	30								3,103.4 GROUND SURFACE 0.0
3100	3,099.9	3.5	12	15	18								
	3,097.4	6.0	20	10	9								3,097.9 ARTIFICIAL FILL 5.5
3095	3,094.9	8.5	5	7	6								STIFF TO VERY STIFF, RED BROWN, SANDY SILT A-4
3090	3,089.9	13.5	4	5	6								
3085	3,084.9	18.5	2	2	3					SS-13	33%		3,086.4 ALLUVIAL 17.0
													MEDIUM STIFF, GRAY, SANDY CLAY A-6
3080	3,079.9	23.5	3	3	4								
3075	3,074.9	28.5	4	8	13								3,075.4 RESIDUAL 28.0
													VERY STIFF, GRAY WHITE BROWN, SANDY SILT A-4
3070	3,069.9	33.5	11	17	13								
3065	3,064.9	38.5	42	58/0.3									3,066.7 WEATHERED ROCK 36.7
	3,062.9	40.5	60/0.0										(BIOTITE GRANITIC GNEISS)
3060													3,062.9 CRYSTALLINE ROCK 40.5
													BLUE, VERY HARD TO HARD, FRESH WEATHERING, CLOSE TO MODERATELY CLOSE FRACTURE SPACING, BIOTITE GRANITIC GNEISS
3055													REC = 93% RQD = 93%
													3,055.3 48.1
													3,054.7 48.7
													3,052.6 WEATHERED ROCK 50.8
													(BIOTITE GRANITIC GNEISS)
													CRYSTALLINE ROCK
													BLUE, VERY HARD TO HARD, FRESH WEATHERING, CLOSE TO MODERATELY CLOSE FRACTURE SPACING, BIOTITE GRANITIC GNEISS
													REC = 86% RQD = 86%
													Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 3,052.6 ft IN CRYSTALLINE ROCK (BIOTITE GRANITIC GNEISS)

GEOTECHNICAL BORING REPORT

CORE LOG

WBS 35993.1.1				TIP U-5810				COUNTY WATAUGA				GEOLOGIST Kebea, B.											
SITE DESCRIPTION CONSTRUCT BRIDGE ON SR 1514 (BAMBOO RD)												GROUND WTR (ft)											
BORING NO. EB2-A				STATION 83+51				OFFSET 15 ft LT				ALIGNMENT -L-				0 HR. N/A							
COLLAR ELEV. 3,103.4 ft				TOTAL DEPTH 50.8 ft				NORTHING 907,602				EASTING 1,222,085				24 HR. 9.0							
DRILL RIGHAMMER EFF./DATE SIME0593 CME-550X 92% 11/17/2023								DRILL METHOD NW Casing W/SPT & Core				HAMMER TYPE Automatic											
DRILLER Marlowe, J.				START DATE 09/19/24				COMP. DATE 09/19/24				SURFACE WATER DEPTH N/A											
CORE SIZE NQ				TOTAL RUN 10.3 ft																			
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) % ROD (ft) %		SAMP. NO.	STRATA REC. (ft) % ROD (ft) %		L O G	DESCRIPTION AND REMARKS												DEPTH (ft)
3062.87	3,062.9	40.5	5.3	1:30/1.3	(4.8)	(4.8)		(7.1)	(7.1)		3,062.9	Begin Coring @ 40.5 ft											
3060				1:00/1.0	91%	91%		93%	93%		3,062.9	CRYSTALLINE ROCK											40.5
				1:00/1.0								BLUE, VERY HARD TO HARD, FRESH WEATHERING, CLOSE TO MODERATELY CLOSE FRACTURE SPACING, BIOTITE GRANITIC GNEISS											
	3,057.6	45.8		1:30/1.0								GSI = 80 - 90											
3055			5.0	0:45/1.0	(4.8)	(4.1)					3,055.3												48.1
				1:30/1.0	96%	82%					3,054.7	WEATHERED ROCK											48.7
				0:45/1.0				(1.8)	(1.8)			CRYSTALLINE ROCK											
	3,052.6	50.8		1:45/1.0				86%	86%		3,052.6	BLUE, VERY HARD TO HARD, FRESH WEATHERING, CLOSE TO MODERATELY CLOSE FRACTURE SPACING, BIOTITE GRANITIC GNEISS											50.8
												GSI = 80 - 90											
												Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 3,052.6 ft IN CRYSTALLINE ROCK (BIOTITE GRANITIC GNEISS)											

NC DOT BORE DOUBLE U-5810 GEO BRIDGE.GPJ NC_DOT.GDT 1/16/25

NCDOT CORE DOUBLE U-5810 GEO BRIDGE.GPJ NC DOT.GDT 1/16/25

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 35993.1.1			TIP U-5810			COUNTY WATAUGA			GEOLOGIST Kebea, B.						
SITE DESCRIPTION CONSTRUCT BRIDGE ON SR 1514 (BAMBOO RD)										GROUND WTR (ft)					
BORING NO. EB2-B			STATION 83+57			OFFSET 18 ft RT			ALIGNMENT -L-		0 HR. 23.5				
COLLAR ELEV. 3,103.1 ft			TOTAL DEPTH 36.0 ft			NORTHING 907,613			EASTING 1,222,117		24 HR. FIAD				
DRILL RIG/HAMMER EFF./DATE SVE0593 CME-550X 92%/11/17/2023						DRILL METHOD H.S. Augers				HAMMER TYPE Automatic					
DRILLER Marlowe, J.			START DATE 09/20/24			COMP. DATE 09/20/24			SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
3105															
	3,102.1	1.0												3,103.1	GROUND SURFACE 0.0
3100	3,099.6	3.5	8	20	40										
	3,099.6		5	8	17										
	3,097.1	6.0	2	2	3									3,097.6	ARTIFICIAL FILL 5.5
3095	3,094.6	8.5													
	3,094.6		4	2	2										
3090	3,089.6	13.5													
	3,089.6		3	2	4										
3085	3,084.6	18.5												3,086.1	MEDIUM DENSE TO VERY DENSE, BROWN GRAY, SILTY FINE TO COARSE SAND A-2-4, LITTLE GRAVEL 17.0
	3,084.6		2	2	3										
3080	3,079.6	23.5												3,081.1	MEDIUM STIFF, RED BROWN, SANDY SILT A-4 22.0
	3,079.6		2	2	2										
3075	3,074.6	28.5													
	3,074.6		1	9	13									3,076.6	ALLUVIAL 26.5
														3,074.1	MEDIUM STIFF, GRAY BROWN, CLAY A-7-5 29.0
3070	3,069.6	33.5													
	3,069.6		8	32	40									3,071.1	MEDIUM STIFF, GRAY BROWN, CLAYEY SILT A-5 32.0
	3,067.1	36.0													
														3,067.1	RESIDUAL 36.0

NCDOT BORE DOUBLE U-5810_GEO_BRIDGE.GPJ NC_DOT.GDT 1/16/25

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 35993.1.1				TIP U-5810				COUNTY WATAUGA				GEOLOGIST Kebea, B.					
SITE DESCRIPTION CONSTRUCT BRIDGE ON SR 1514 (BAMBOO RD)												GROUND WTR (ft)					
BORING NO. L_8538				STATION 85+38				OFFSET CL				ALIGNMENT -L-				0 HR. N/A	
COLLAR ELEV. 3,102.6 ft				TOTAL DEPTH 38.4 ft				NORTHING 907,791				EASTING 1,222,095				24 HR. FIAD	
DRILL RIGHAMMER EFF./DATE SME0593 CME-550X 92%11/17/2023								DRILL METHOD NW Casing WSPT & Core				HAMMER TYPE Automatic					
DRILLER Marlowe, J.				START DATE 09/18/24				COMP. DATE 09/18/24				SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
3105																	
3100	3,101.6	1.0	100	0.4						100/0.4			D		3,102.6	GROUND SURFACE	0.0
	3,099.1	3.5											D			ARTIFICIAL FILL	
	3,096.6	6.0	35	28	30								D		3,097.1	VERY DENSE, BROWN GRAY, SILTY FINE TO COARSE SAND A-2-4, SOME GRAVEL	
3095													M			(WOOD)	5.5
	3,092.4	10.2	7	17	23								M		3,094.3	MEDIUM STIFF, GRAY, SANDY SILT A-4, TRACE WOOD FRAGMENTS	8.3
3090	3,089.1	13.5	3	2	2								M		3,090.6		12.0
																ALLUVIAL	
3085	3,084.1	18.5	3	1	1										3,087.6	VERY SOFT, GRAY, SILT A-4, TRACE WOOD FRAGMENTS	15.0
																VERY SOFT TO MEDIUM STIFF, GRAY, CLAY A-7-5, TRACE WOOD FRAGMENTS	
3080	3,079.1	23.5	2	2	3								M		3,080.6		22.0
																SOFT, GRAY, SANDY SILT A-4	
3075	3,074.3	28.3	1	2	1										3,075.0		27.6
			60	0.0						60/0.0					3,074.3	WEATHERED ROCK (BIOTITE GRANITIC GNEISS)	28.3
3070																CRYSTALLINE ROCK	
																BLUE, VERY HARD TO HARD, FRESH WEATHERING, WIDE TO CLOSE FRACTURE SPACING, BIOTITE GRANITIC GNEISS	
3065																REC = 96% RQD = 91%	38.4
																Boring Terminated at Elevation 3,064.2 ft IN CRYSTALLINE ROCK (BIOTITE GRANITIC GNEISS)	

NCDOT BORE DOUBLE U-5810_GEO_BRIDGE.GPJ NC_DOT.GDT 1/16/25

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 35993.1.1					TIP U-5810			COUNTY WATAUGA			GEOLOGIST Kebea, B.		
SITE DESCRIPTION CONSTRUCT BRIDGE ON SR 1514 (BAMBOO RD)											GROUND WTR (ft)		
BORING NO. L_8538					STATION 85+38			OFFSET CL			ALIGNMENT -L-		0 HR. N/A
COLLAR ELEV. 3,102.6 ft					TOTAL DEPTH 38.4 ft			NORTHING 907,791			EASTING 1,222,095		24 HR. FIAD
DRILL RIGHAMMER EFF./DATE SME0593 CME-550X 92%11/17/2023								DRILL METHOD NW Casing W/SPT & Core			HAMMER TYPE Automatic		
DRILLER Marlowe, J.					START DATE 09/18/24			COMP. DATE 09/18/24			SURFACE WATER DEPTH N/A		
CORE SIZE NQ					TOTAL RUN 10.1 ft								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %RQD (ft) %		SAMP. NO.	STRATA REC. (ft) %RQD (ft) %		L O G	DESCRIPTION AND REMARKS ELEV. (ft) DEPTH (ft)		
3074.29											Begin Coring @ 28.3 ft		
3070	3,074.3	28.3	2.1	1:15/1.0	(1.8)	(1.7)		(9.7)	(9.2)		3,074.3	28.3	
	3,072.2	30.4		1:30/1.1	86%	81%					CRYSTALLINE ROCK		
			5.0	1:15/1.0	(5.0)	(5.0)					BLUE, VERY HARD TO HARD, FRESH WEATHERING, WIDE TO CLOSE FRACTURE SPACING, BIOTITE GRANITIC GNEISS		
			1:30/1.0	100%	100%	GSI = 80 - 90							
3065	3,067.2	35.4		1:30/1.0									
			3.0	1:15/1.0	(2.9)	(2.5)							
	3,064.2	38.4		1:15/1.0	97%	83%					3,064.2	38.4	
											Boring Terminated at Elevation 3,064.2 ft IN CRYSTALLINE ROCK (BIOTITE GRANITIC GNEISS)		

NCDOT CORE DOUBLE U-5810_GEO_BRIDGE.GPJ NC_DOT.GDT 1/16/25

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 35993.1.1			TIP U-5810			COUNTY WATAUGA			GEOLOGIST Payne, C.							
SITE DESCRIPTION CONSTRUCT BRIDGE ON SR 1514 (BAMBOO RD)										GROUND WTR (ft)						
BORING NO. L_8680			STATION 86+80			OFFSET CL			ALIGNMENT -L-		0 HR. 23.5					
COLLAR ELEV. 3,102.5 ft			TOTAL DEPTH 30.0 ft			NORTHING 907,930			EASTING 1,222,125		24 HR. FIAD					
DRILL RIG/HAMMER EFF./DATE SME0593 CME-550X 92%/11/17/2023						DRILL METHOD H.S. Augers				HAMMER TYPE Automatic						
DRILLER Marlowe, J.			START DATE 09/23/24			COMP. DATE 09/23/24			SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
3105																
3100	3,101.5	1.0	14	16	11									3,102.5	GROUND SURFACE 0.0	
	3,099.0	3.5	4	3	3							M		ARTIFICIAL FILL VERY LOOSE TO MEDIUM DENSE, GRAY, SILTY FINE TO COARSE SAND A-2-4		
	3,096.5	6.0	1	1	1							M				
3095	3,094.0	8.5	WOH	1	3						SS-47	14%		3,094.5	8.0	
												W		SOFT TO MEDIUM STIFF, GRAY, SANDY SILT A-4, TRACE MICA		
3090	3,089.0	13.5	3	1	1							Sat.		3,090.5	12.0	
														ALLUVIAL SOFT, GRAY, SANDY SILT A-4		
3085	3,084.0	18.5	4	4	8							M		3,085.5	17.0	
														STIFF, BROWN GRAY, SANDY CLAY A-6, TRACE MICA		
3080	3,079.0	23.5	1	3	5							W		3,080.5	22.0	
														MEDIUM STIFF, GRAY, SANDY SILT A-4		
3075	3,074.0	28.5	19	12	14							M		3,075.5	27.0	
														RESIDUAL VERY STIFF, BROWN GRAY, SANDY SILT A-4, TRACE MICA		
														3,072.5	30.0	
														Boring Terminated at Elevation 3,072.5 ft IN VERY STIFF SANDY SILT (RESIDUAL)		

NCDOT BORE DOUBLE U-5810_GEO_BRIDGE.GPJ NC_DOT.GDT 2/28/25



CORE PHOTOGRAPHS

EB2-A

BOX 1: 40.5 - 50.8 FEET



L_8538

BOXES 1 & 2: 28.3 - 38.4 FEET





SUMMARY OF LABORATORY TEST DATA
Soil Classification and Gradation

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616											
S&ME Project #: 6235-18-038										Date Report: 1/15/2025	
State Project No.: 35993.1.1					County: Watauga			Date Tested: 1/10/2025 - 1/14/2025			
Federal ID No.: N/A					TIP No.: U-5810						
Project Name: Wilson Ridge Rd (SR 1523) & Bamboo Rd (SR 1514) Widening - Bridge and Retaining Walls 10 & 11											
Client Name: Rummel, Klepper & Kahn, LLP						Client Address: Raleigh, NC					

Sample No.	Boring#:	Station	Offset	Alignment	Sample Depth (ft)	AASHTO Classification		Total % Passing					Total Mortar Fraction (%)				LL	PL	PI	Organic Content %	Moist. %
								Sieve #					Coarse Sand	Fine Sand	Silt	Clay					
SS-5	L_8538	85+38	CL	-L-	13.5-15.0	A-4	(0)	95	90	86	66	59	10	29	33	28	40	34	6	-	38.0
SS-13	EB2-A	83+51	15' LT	-L-	18.5-20.0	A-6	(8)	100	96	93	72	63	7	30	33	30	40	29	11	-	33.0
SS-20	EB2-B	83+57	18' RT	-L-	8.5-10.0	A-4	(0)	85	72	65	42	35	23	36	25	16	38	34	4	-	26.2
SS-23	EB2-B	83+57	18' RT	-L-	23.5-25.0	A-5	(2)	90	83	78	62	55	14	25	39	22	49	48	1	-	54.1
SS-40	EB1-A	83+00	30' LT	-L-	16.0-17.5	A-7-5	(10)	100	97	93	71	62	7	31	36	26	48	36	12	-	43.2
SS-47	L_8680	86+80	CL	-L-	6.0-7.5	A-2-4	(0)	62	50	47	33	27	24	33	31	12	27	25	2	-	13.5

ND=Not Detemined. NP=Non-Plastic.

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils										AASHTO T89: Determining the Liquid Limit of Soils									
AASHTO M145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes										AASHTO T265: Laboratory Determination of Moisture Content of Soils									

<u>Mal Krajan, ET</u>		<u>104-01-0703</u>	<u>Joey Daily, PE</u>	<u>Project Manager</u>
Technician Name:	Signature	Certification #	Technical Responsibility:	Position
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SITE PHOTOGRAPH

Bridge on -L- (SR 1514 / Bamboo Rd)



Looking North