

REFERENCE: U-5818

PROJECT: 44390

SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5818	1	86

ROADWAY SUBSURFACE INVESTIGATION

COUNTY McDOWELL
PROJECT DESCRIPTION SR 1001 (SUGAR HILL RD.)
FROM I-40 WB RAMPS TO 0.3 MI. WEST OF
I-40 EB RAMPS.

INVENTORY

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	10+00-20+00	4	8
-L-	20+00-34+00	5	9
-L-	34+00-41+13.22	6	10
-RPA-	10+00-14+50	7	10
-RPA-	14+50-16+52.98	5	10
-RPB-	10+00-13+88.50	5	10
-RPC-	10+00-17+67.97	4	11
-RPD-	10+00-16+84.66	4	11
-Y-	458+00-471+50	4	12
-Y-	471+50-483+50	5	11
-Y-	483+50-493+62.76	7	13
-Y2-	10+00-10+25	5	11
-Y2-	10+25-12+69.14	6	11
-Y3-	10+00-10+75	6	11

CROSS SECTIONS

LINE	STATION	SHEETS
-L-	10+00 - 12+00	14 - 16
-L-	14+00 - 16+50	17 - 21
-L-	22+50 - 26+50	22 - 29
-L-	29+00 - 31+00, 32+00	30 - 34
-RPA-	10+00 - 16+50	35 - 40
-RPC-	15+00 - 17+50	41 - 46
-RPD-	10+50 - 14+00	47 - 52
-Y-	461+00 - 469+00	53 - 66

APPENDICES

APPENDIX	DESCRIPTION	SHEETS
A	LAB RESULTS	68 - 83

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 MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE 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

<u>J. WILLIAMSON</u>	<u>J. NELSON</u>
	<u>M. STEPHENSON</u>
	<u>J. SWARTLEY</u>
	<u>B. BLIZZARD</u>
	<u>J. LITTLE</u>
	<u>M. HERD</u>
	<u>M. RAWLS</u>

INVESTIGATED BY R. KRAL

DRAWN BY J. NELSON, J. SWARTLEY

CHECKED BY R. KRAL

SUBMITTED BY S&ME, INC.

DATE JUNE 2018



9751 SOUTHERN PINE BLVD
CHARLOTTE, NC 28273
(704) 523-4726























DocuSigned by:
Stewart Laney 06/15/2018

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**DOCUMENT NOT CONSIDERED FINAL
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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 DISLODGED 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 (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.																																																																																									
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.										WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.										CRSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.																																																																																									
MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										COMPRESSIONIBILITY SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50										NON-CRSTALLINE ROCK (NCR)  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.										COASTAL PLAIN SEDIMENTARY ROCK (CP)  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.																																																																																									
PERCENTAGE OF MATERIAL										WEATHERING										WEATHERING										WEATHERING																																																																																									
ORGANIC MATERIAL TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC > 10%										GRANULAR SOILS 2 - 3% 3 - 5% 5 - 12% > 12%										SILT - CLAY SOILS 3 - 5% 5 - 12% 12 - 20% > 20%										OTHER MATERIAL TRACE 1 - 10% LITTLE 10 - 20% SOME 20 - 35% HIGHLY 35% AND ABOVE										FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.										VERY SLIGHT (IV SLI.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.										SLIGHT (SLI.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.										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.										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>										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>										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>										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.									
GROUND WATER										GROUND WATER										GROUND WATER										GROUND WATER																																																																																									
 WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING										 STATIC WATER LEVEL AFTER 24 HOURS										 PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA										 SPRING OR SEEP										MISCELLANEOUS SYMBOLS										MISCELLANEOUS SYMBOLS										MISCELLANEOUS SYMBOLS										MISCELLANEOUS SYMBOLS																																																	
 ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION										 SOIL SYMBOL										 ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT										 INFERRED SOIL BOUNDARY										 INFERRED ROCK LINE										 ALLUVIAL SOIL BOUNDARY										 ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION										 SOIL SYMBOL										 ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT										 INFERRED SOIL BOUNDARY										 INFERRED ROCK LINE										 ALLUVIAL SOIL BOUNDARY									
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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 75 2.0 0.25 0.05 0.005 IN. 12 3										RECOMMENDATION SYMBOLS										RECOMMENDATION SYMBOLS										RECOMMENDATION SYMBOLS										RECOMMENDATION SYMBOLS																																																	
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AR - AUGER REFUSAL BT - BORING TERMINATED CL. - CLAY CPT - CONE PENETRATION TEST CSE. - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY										MED. - MEDIUM MICA. - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY										VST - VANE SHEAR TEST WEA. - WEATHERED UG - UNIT WEIGHT UG - DRY UNIT WEIGHT										S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO										SOIL MOISTURE - CORRELATION OF TERMS										SOIL MOISTURE - CORRELATION OF TERMS										SOIL MOISTURE - CORRELATION OF TERMS										SOIL MOISTURE - CORRELATION OF TERMS																																																	
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NON PLASTIC 0-5 SLIGHTLY PLASTIC 6-15 MODERATELY PLASTIC 16-25 HIGHLY PLASTIC 26 OR MORE										PLASTICITY INDEX (PI)										DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH										EQUIPMENT USED ON SUBJECT PROJECT										EQUIPMENT USED ON SUBJECT PROJECT										EQUIPMENT USED ON SUBJECT PROJECT										EQUIPMENT USED ON SUBJECT PROJECT																																																											
DRILL UNITS: <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST										ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE * STEEL TEETH <input type="checkbox"/> TRICONE * TUNG-CARB. <input type="checkbox"/> CORE BIT <input checked="" type="checkbox"/> 3.5 inch auger										HAMMER TYPE: <input type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL CORE SIZE: <input type="checkbox"/> -B <input type="checkbox"/> -H <input type="checkbox"/> -N HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST										FRACURE SPACING										FRACURE SPACING										FRACURE SPACING										FRACURE SPACING																																																											
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VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FOOT VERY CLOSE LESS THAN 0.16 FEET										SPACING										VERY THICKLY BEDDED 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET										INDURATION										INDURATION										INDURATION										INDURATION																																																											
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FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.										MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.										INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.										EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.										NOTES: * ELEVATIONS DERIVED FROM GEOPAK AND THE .TIN FILE *U5818.LS.TNL.TIN* RECEIVED ON 9/27/17										NOTES: * ELEVATIONS DERIVED FROM GEOPAK AND THE .TIN FILE *U5818.LS.TNL.TIN* RECEIVED ON 9/27/17										NOTES: * ELEVATIONS DERIVED FROM GEOPAK AND THE .TIN FILE *U5818.LS.TNL.TIN* RECEIVED ON 9/27/17										NOTES: * ELEVATIONS DERIVED FROM GEOPAK AND THE .TIN FILE *U5818.LS.TNL.TIN* RECEIVED ON 9/27/17																																																	
COLOR										COLOR										COLOR										COLOR																																																																																									
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.										ELEVATION: FEET										ELEVATION: FEET										ELEVATION: FEET										ELEVATION: FEET																																																																															
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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)

<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>STRUCTURE</p>	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
<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> <p>COMPOSITION AND STRUCTURE</p>	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
<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>	<p>DECREASING INTERLOCKING OF ROCK PIECES</p>	<p>DECREASING SURFACE QUALITY →</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>	<p>DECREASING SURFACE QUALITY OF DISCONTINUITIES</p>	<p>DECREASING SURFACE QUALITY →</p>				



DATE: March 14, 2018

STATE PROJECT: 44390.1.1 (U-5818)
 FEDERAL PROJECT: N/A
 COUNTY: McDowell

DESCRIPTION: SR 1001 (Sugar Hill Rd.) from I-40 WB Ramps to 0.3mi. West of I-40 EB Ramps

SUBJECT: Geotechnical Report – Inventory

S&ME, Inc. has completed a reconnaissance and subsurface investigation for the above roadway project and presents the following inventory. Plans, profiles, and cross-sections are included in this report.

Project Description

This report presents the findings for the proposed widen of SR 1001 (Sugar Hill Road) to three lanes from the I-40 westbound ramp to the I-40 eastbound ramp in McDowell County, North Carolina. The investigation consisted of exploring SR 1001 (Sugar Hill Road) (-L-), Ramp A (-RPA-), Ramp B (-RPB-), Ramp C (-RPC-), and a section along the left side of westbound I-40 (-Y-). Three North Muddy Creek culverts will be extended and the SR 1001 (Sugar Hill Road) bridge over I-40 will be replaced with a 3-span structure to accommodate the widened section.

The geotechnical field investigation was conducted during the period of October 2017 through January 2018. One S&ME drill crew was used to drill, sample, and log the borings in this report. S&ME rigs used for the drilling include one rubber tired ATV-mounted CME-550X and one track-mounted Diedrich D-50 drill machines. All rigs were equipped with automatic hammers. Standard Penetration Tests were performed at selected locations and additional borings were advanced using continuous flight augers. Rod sounding was used at the proposed culvert extensions due to access limitations and NQ rock coring techniques were used to obtain rock core sampled from the proposed locations of the interior bent of the SR 1001 (Sugar Hill Road) (-L-) bridge over I-40 (-Y-). Representative soil samples were collected for visual classification in the field and selected soil and rock core samples were submitted for laboratory analysis.

The following alignments, totaling 0.64 miles, were investigated. Subsurface profiles and/or cross-sections of these alignments are included in this report.

<u>Line</u>	<u>Station</u>
-L-	10+00 to 38+00
-RPA-	10+00 to 16+23
-RPC-	10+00 to 17+50
-RPD-	10+00 to 16+67
-Y-	460+00 to 468+00

Areas of Special Geotechnical Interest

- 1) Highly Plastic Clays: Highly plastic clays (PI > 35) were encountered on the project at the following borehole locations:

<u>Line</u>	<u>Stations</u>	<u>Offsets (ft)</u>
-L-	12+00	LT
-L-	22+00	LT
-L-	25+72 to 34+18	LT, RT, CL
-RPA-	12+00 to 14+00	RT
-RPC-	13+50 to 15+50	LT, RT
-RPD-	14+00 to 16+00	LT
-Y-	460+11 to 468+11	LT

- 2) Alluvial Soils: The following borehole locations encountered alluvial soils:

<u>Line</u>	<u>Stations</u>	<u>Offsets (ft)</u>
-L-	12+00	LT
-L-	22+00	LT
-L-	30+00	RT
-L-	23+96 to 26+16	LT, RT
-L-	29+41	RT
-L-	36+07	LT
-RPD-	12+00 to 16+00	LT
-Y-	462+11 to 466+11	LT

- 3) Micaceous Soils: Micaceous soils were encountered at various depths and locations along the proposed / existing alignments. Below is a summary of the locations where micaceous soils were noted by our field professional(s) at the time of drilling:

<u>Line</u>	<u>Stations</u>	<u>Offset (ft)</u>
-Y1-	24+00-26+75	150 RT to 250 RT
-Y1-	26+50-29+00	90 RT to 970 RT

Physiography and Geology

The project corridor is located in western North Carolina in the Piedmont Physiographic Province of North Carolina in Marion. Commercial and residential properties and wooded areas exist adjacent to the project corridor. Topography along the project is mountainous with slopes generally falling from right to left along SR 1001 (Sugar Hill Road) (-L-). Elevations along the centerline of the existing SR 1001 (Sugar Hill Road) (-L-) roadway range from 1,403± to 1,445± feet (MSL).

Geologically the project area is located within the Inner Piedmont Belt and consists of Biotite Gneiss and Schist. These are metamorphic rock that were formed around the Cambrian to late Proterozoic periods. The Biotite Gneiss and Schist is characterized as inequigranular, locally abundant potassic feldspar and garnet; interlayered and gradational with calc-silicate rock, sillimanite-mica schist, mica schist, and amphibolite. Contains small masses of granitic rock.

The residual soils derived from these rocks can contain a high mica content in some locations. Weathered and Crystalline rock underlay these residual soils at depth. Some surface exposures of rock outcrop can be seen in some places along the project corridor.

Water Bodies

The North Muddy Creek and its tributaries generally run from west to east through the project corridor. At the western side of the project, North Muddy Creek flows under SR 1001 (Sugar Hill Road) (-L-) through a 7 feet by 6 feet concrete box culvert (Culvert No. 1) towards Ramp C (-RPC-). North Muddy Creek then flows northeast beneath Ramp C (-RPC-) and Ramp D (-RPD-) through a 6 feet by 6 feet concrete box culvert (Culvert No. 2) towards I-40 (-Y-). A tributary of North Muddy Creek intersects North Muddy Creek 200 feet left at the approximate Station 17+50 -L- from the north, crossing under I-40 (-Y-) through an 8 feet by 7 feet concrete box culvert (Culvert No. 3). Flow from North Muddy Creek continues east and makes a final crossing under SR 1001 (Sugar Hill Road) (-L-) through a 14 feet by 9 feet box culvert (Culvert No. 4) before flowing beyond the project limits.

Soil Properties

Soils encountered during this investigation are separated into three categories: Alluvial, Roadway Embankment, and Residual soils.

Alluvial soils are found in the low lying areas from the nearby North Muddy Creek. These soils consist of olive, green, brown, orange, tan, gray, and black, very soft to very stiff, sandy clay (A-6), silty clay (A-7-6), sandy silt (A-4), clayey silt (A-5) and very loose to dense, silty sand (A-2-4), clayey sand (A-2-6), silty sand (A-2-4), fine sand (A-1-a) and coarse sand (A-1-b).

Roadway Embankment soils are similar in nature to Residual soils and may be derived from nearby sources. These soils consist of gray, tan, brown, red, orange, black, and green, very soft to hard, sandy silt (A-4), clayey silt (A-5), sandy clay (A-6) and silty clay (A-7-6) and very loose to very dense fine sand (A-1-a), coarse sand (A-1-b), clayey sand (A-2-6), and silty sand (A-2-4/A-2-5). Various amounts of cobbles, boulders, and mica were encountered within the Roadway Embankment soils.

Residual soils are derived from the weathering of underlying rock in the area. These soils consist of gray, tan, brown, pink, red, black, white, orange, and yellow, very soft to hard, saprolitic, micaceous sandy silt (A-4), clayey silt (A-5), sandy clay (A-6) and loose to very dense, saprolitic, micaceous, coarse sand (A-1-b), silty sand (A-2-4/A-2-5), and sand (A-3).

Rock Properties

Weathered rock and crystalline rock occur throughout the project. The weathered rock is derived from the underlying Biotite Gneiss bedrock and was encountered between elevations 1,384.6 feet and 1,306.7 feet (MSL) and ranges from 3 feet to 38.6 feet or more in thickness. Crystalline rock occurs as surface outcrops in some locations along the left side of the -L- alignment. Crystalline rock was encountered in some borings between elevations 1,376.6 feet and 1,295.8 feet (MSL).

Ground Water

Ground water measurements were taken in October and December of 2017 during above average rainfall conditions. Ground water elevations ranged between 1,342.1 feet and 1,378.4 feet (MSL). Ground water was not encountered in many of the borings and recorded as dry, FIAD, or caved at the bottom of the boring cylinder. Ground water is not expected to cause any significant impacts.

Undisturbed Samples

Two undisturbed thin wall Shelby tube samples were collected and submitted for testing at the following locations:

<u>Sample No.</u>	<u>Line</u>	<u>Station & Offset</u>	<u>Depth</u>	<u>Test</u>
ST-1	-L-	26+91, 8 RT	6.0 - 8.0	Triaxial CU
ST-2	-L-	28+70, 2 LT	10.0 - 12.0	Consolidation, Triaxial CU

Bulk Samples

Two bulk samples were collected for CBR and Proctor testing at the following location:

<u>Sample No.</u>	<u>Line</u>	<u>Station & Offset</u>	<u>Depth</u>	<u>Test</u>
BULK-1	-L-	14+00, 20 LT	0.0 - 10.0	Proctor, CBR
BULK-2	-L-	32+00, 8 LT	1.0 - 7.0	Proctor, CBR

Respectfully Submitted,



Robert E. Kral, PE
Project Manager

8/17/99

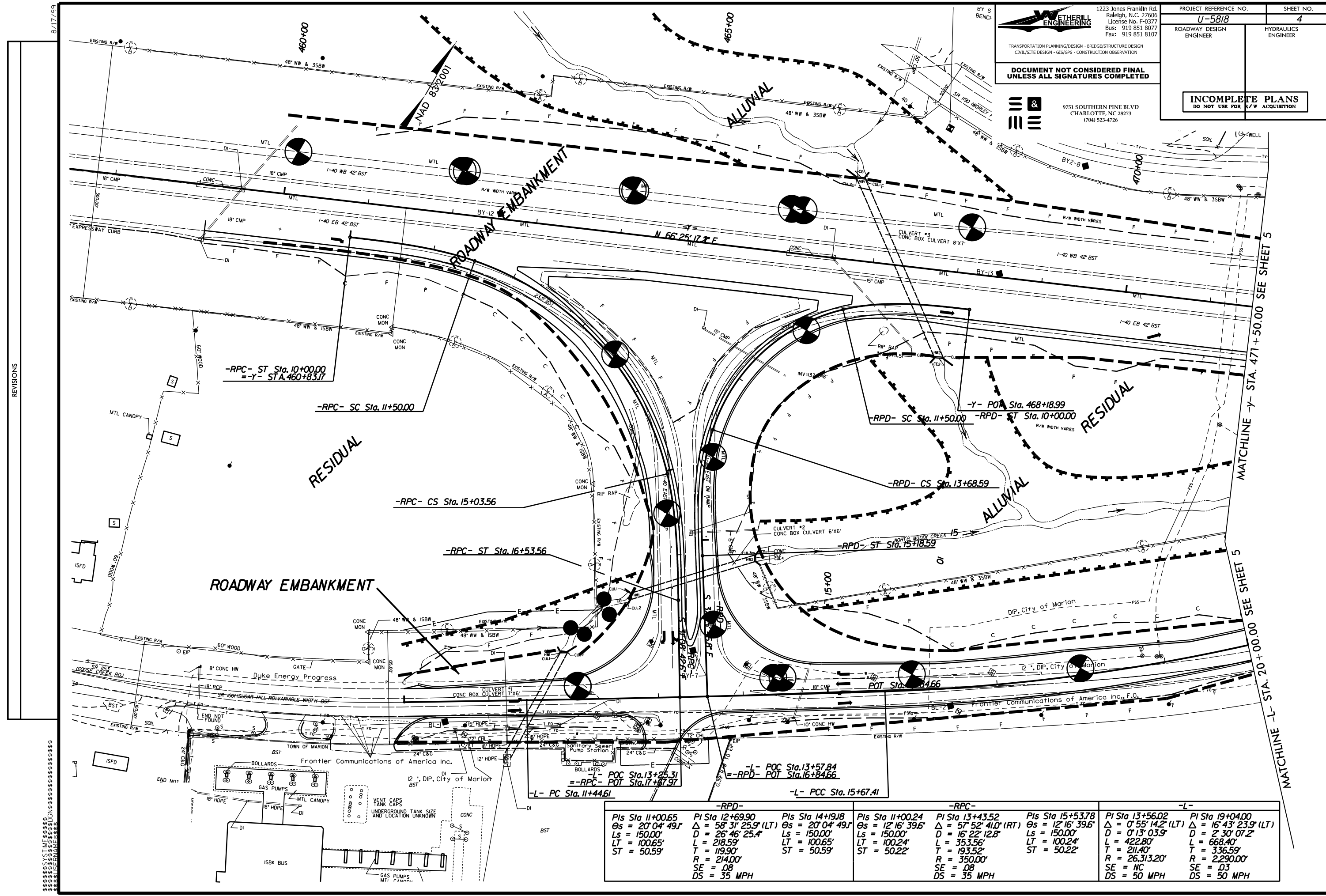
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 Raleigh, N.C. 27606
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 Fax: 919 851 8107

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PROJECT REFERENCE NO. U-5818	SHEET NO. 4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	

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 CHARLOTTE, NC 28273
 (704) 523-4726



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*****SYTIME*****
 *****CDGN*****

<p>-L- PC Sta. 11+44.61</p> <p>Pls Sta 11+00.65 $\Theta_s = 20^\circ 04' 49.1''$ $L_s = 150.00'$ $LT = 100.65'$ $ST = 50.59'$</p>	<p>-RPC-</p> <p>PI Sta 12+69.90 $\Delta = 58^\circ 31' 25.9''$ (LT) $D = 26^\circ 46' 25.4''$ $L = 218.59'$ $T = 119.90'$ $R = 214.00'$ $SE = 08$ $DS = 35$ MPH</p>	<p>Pls Sta 14+19.18 $\Theta_s = 20^\circ 04' 49.1''$ $L_s = 150.00'$ $LT = 100.65'$ $ST = 50.59'$</p>	<p>-RPC-</p> <p>PI Sta 11+00.24 $\Theta_s = 12^\circ 16' 39.6''$ $L_s = 150.00'$ $LT = 100.24'$ $ST = 50.22'$</p>	<p>-RPC-</p> <p>PI Sta 13+43.52 $\Delta = 57^\circ 52' 41.0''$ (RT) $D = 16^\circ 22' 12.8''$ $L = 353.56'$ $T = 193.52'$ $R = 350.00'$ $SE = 08$ $DS = 35$ MPH</p>	<p>Pls Sta 15+53.78 $\Theta_s = 12^\circ 16' 39.6''$ $L_s = 150.00'$ $LT = 100.24'$ $ST = 50.22'$</p>	<p>-L-</p> <p>PI Sta 13+56.02 $\Delta = 0^\circ 55' 14.2''$ (LT) $D = 0^\circ 13' 03.9''$ $L = 422.80'$ $T = 263.1320'$ $R = 263.1320'$ $SE = NC$ $DS = 50$ MPH</p>	<p>PI Sta 19+04.00 $\Delta = 16^\circ 43' 23.9''$ (LT) $D = 2^\circ 30' 07.2''$ $L = 668.40'$ $T = 336.59'$ $R = 2,290.00'$ $SE = 03$ $DS = 50$ MPH</p>
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REVISIONS

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\$\$\$\$PLANNING\$\$\$\$
\$\$\$\$DESIGN\$\$\$\$
\$\$\$\$CONSTRUCTION\$\$\$\$

-Y2-	-Y2-	-L-	-Y3-
PI Sta 10+47.11 Δ = 12' 34" 52.2' (LT) D = 13' 24" 21.2" L = 93.85' T = 47.11' R = 427.39' SE = EXIST.	PI Sta 11+79.70 Δ = 6' 15" 38.5' (RT) D = 39' 30" 51.6" L = 155.03' T = 85.86' R = 145.00' SE = .03 DS = STOP CONDT.	PI Sta 38+05.20 Δ = 22' 57" 43.5' (LT) D = 3' 40" 35.7" L = 624.55' T = 316.52' R = 1,558.40' SE = .04 DS = 50 MPH	PI Sta 10+79.23 Δ = 12' 57" 20.2' (RT) D = 11' 17" 12.6" L = 114.79' T = 57.64' R = 507.63' SE = EXIST.

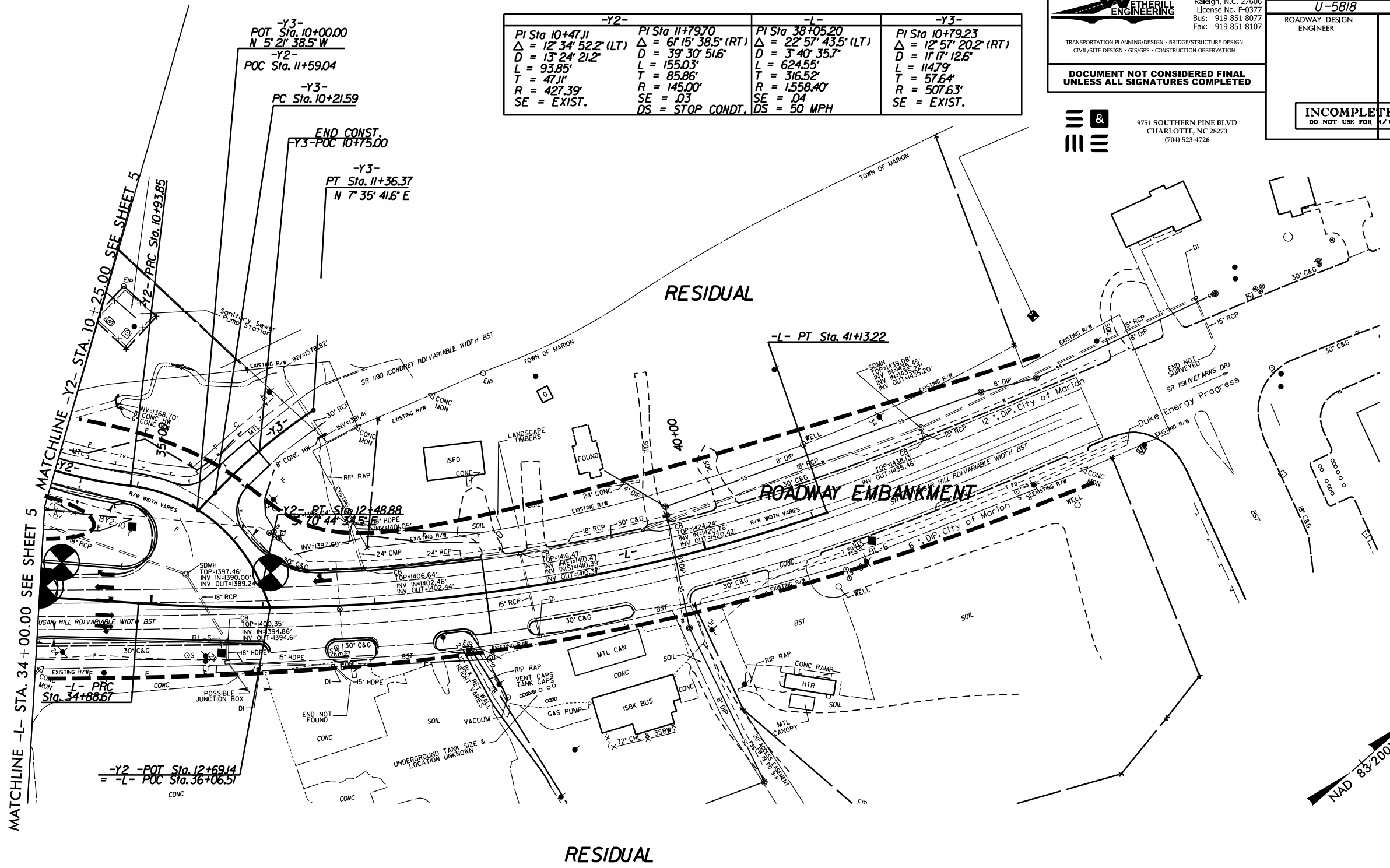
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MATCHLINE -L- STA. 34+00.00 SEE SHEET 5

MATCHLINE -Y2- STA. 10+25.00 SEE SHEET 5

RESIDUAL

RESIDUAL

ROADWAY EMBANKMENT



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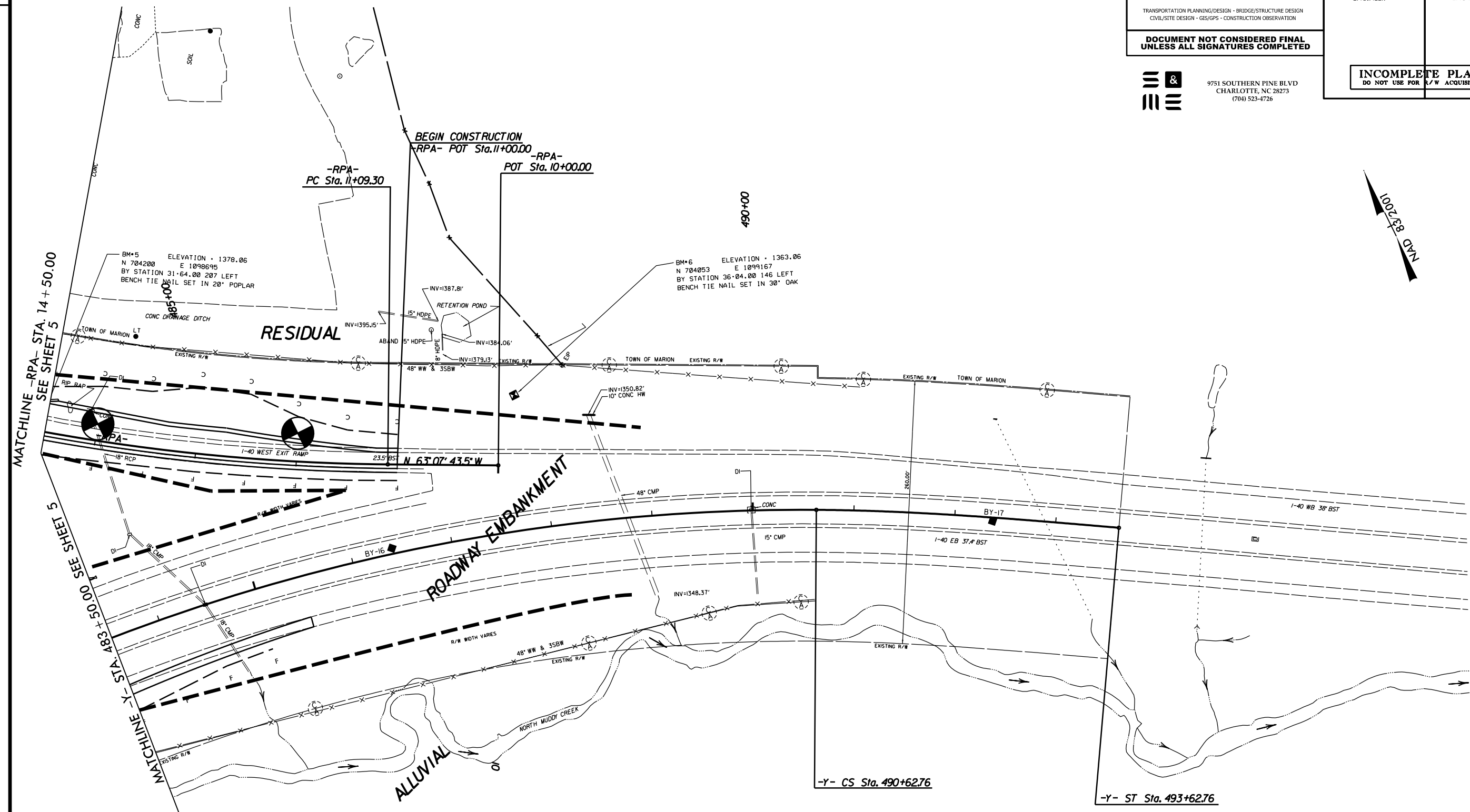
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-Y-		-RPA-
PI Sta 483+42.39	PIs Sta 491+62.82	PI Sta 13+23.24
$\Delta = 45^\circ 50' 00.0''$ (RT)	$\Theta_s = 4^\circ 30' 00.0''$	$\Delta = 12^\circ 12' 40.2''$ (RT)
$D = 3^\circ 00' 00.0''$	$L_s = 300.00'$	$D = 2^\circ 51' 53.2''$
$L = 1527.78'$	$LT = 200.06'$	$L = 426.25'$
$T = 807.41'$	$ST = 100.06'$	$T = 213.94'$
$R = 1909.86'$		$R = 2,000.00'$
$SE = EXIST.$		$SE = .04$
		$DS = STOP COND.$

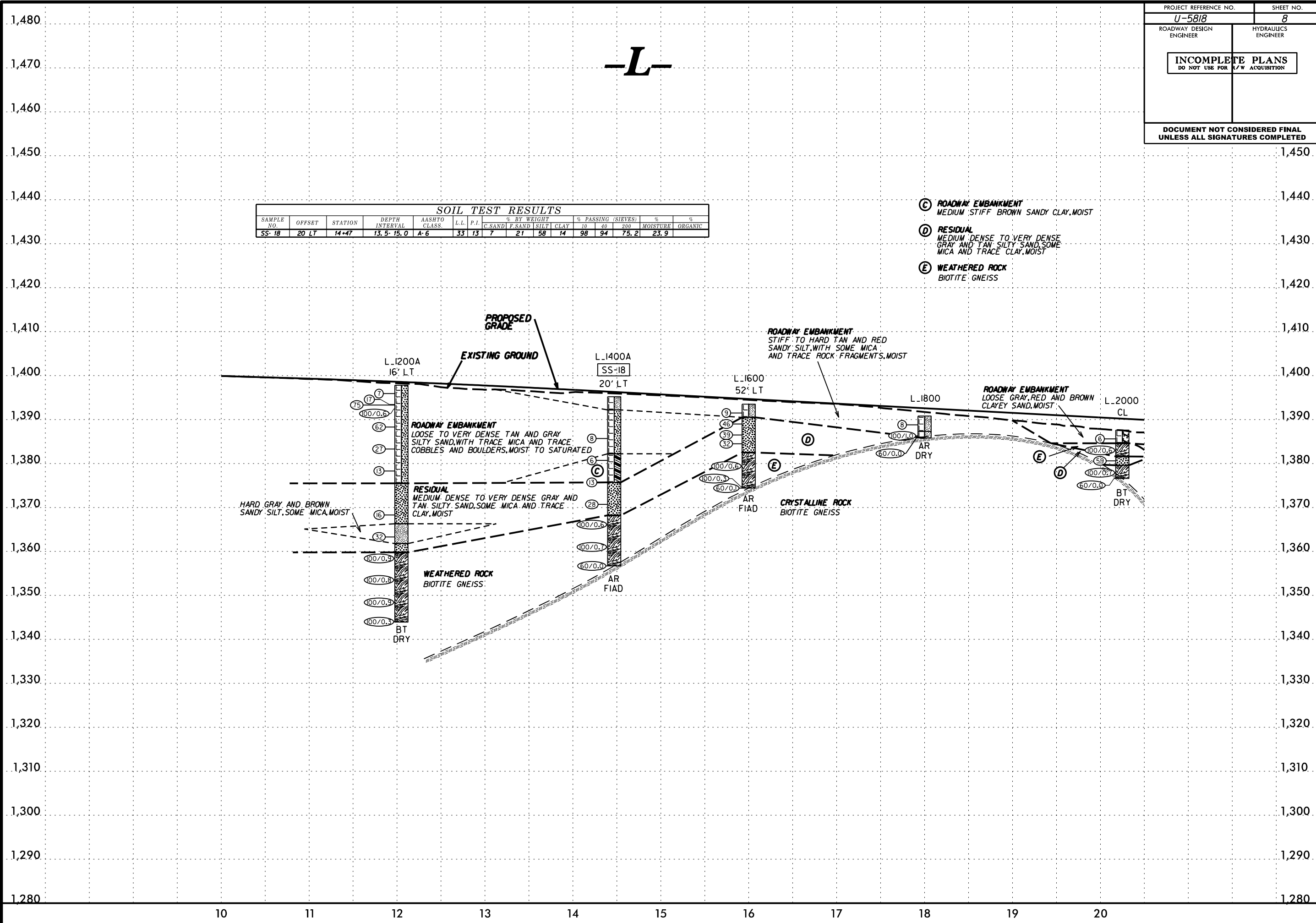


5/14/99

PROJECT REFERENCE NO. U-5818	SHEET NO. 8
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
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SOIL TEST RESULTS														
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)		% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	#10	#40		
SS-18	20 LT	14+47	13.5-15.0	A-6	33	13	7	21	58	14	98	94	75.2	23.9

- (C) ROADWAY EMBANKMENT
MEDIUM STIFF BROWN SANDY CLAY, MOIST
- (D) RESIDUAL
MEDIUM DENSE TO VERY DENSE GRAY AND TAN SILTY SAND, SOME MICA AND TRACE CLAY, MOIST
- (E) WEATHERED ROCK
BIOTITE GNEISS



\$\$\$SYTIME\$\$\$\$\$
\$\$\$\$\$DATE\$\$\$\$\$
\$\$\$\$\$TIME\$\$\$\$\$
\$\$\$\$\$USER\$\$\$\$\$
\$\$\$\$\$PROJECT\$\$\$\$\$
\$\$\$\$\$SHEET\$\$\$\$\$
\$\$\$\$\$NO\$\$\$\$\$

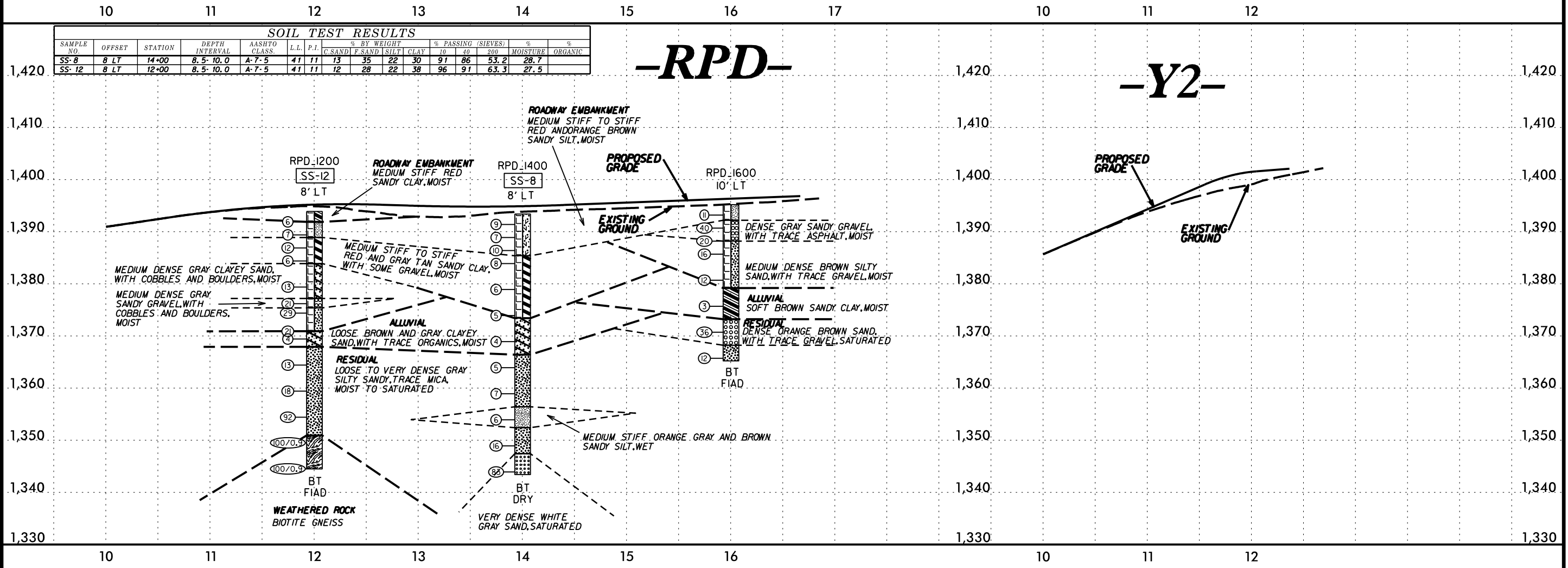
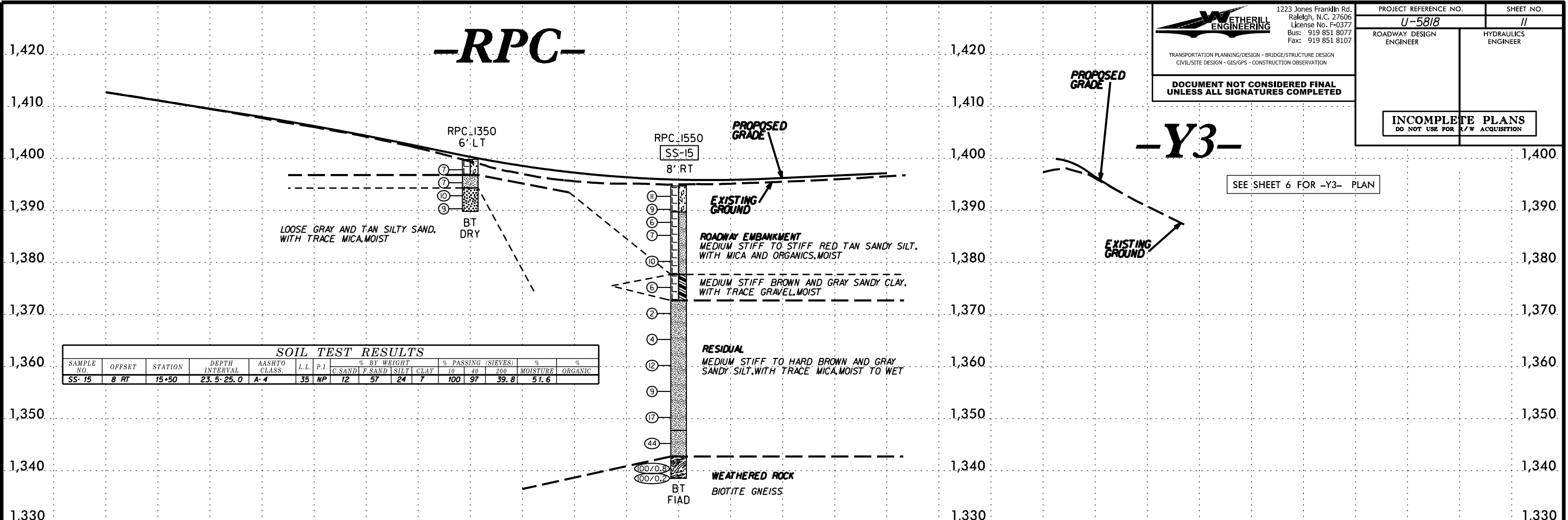
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PROJECT REFERENCE NO. U-5818	SHEET NO. 11
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5/28/99

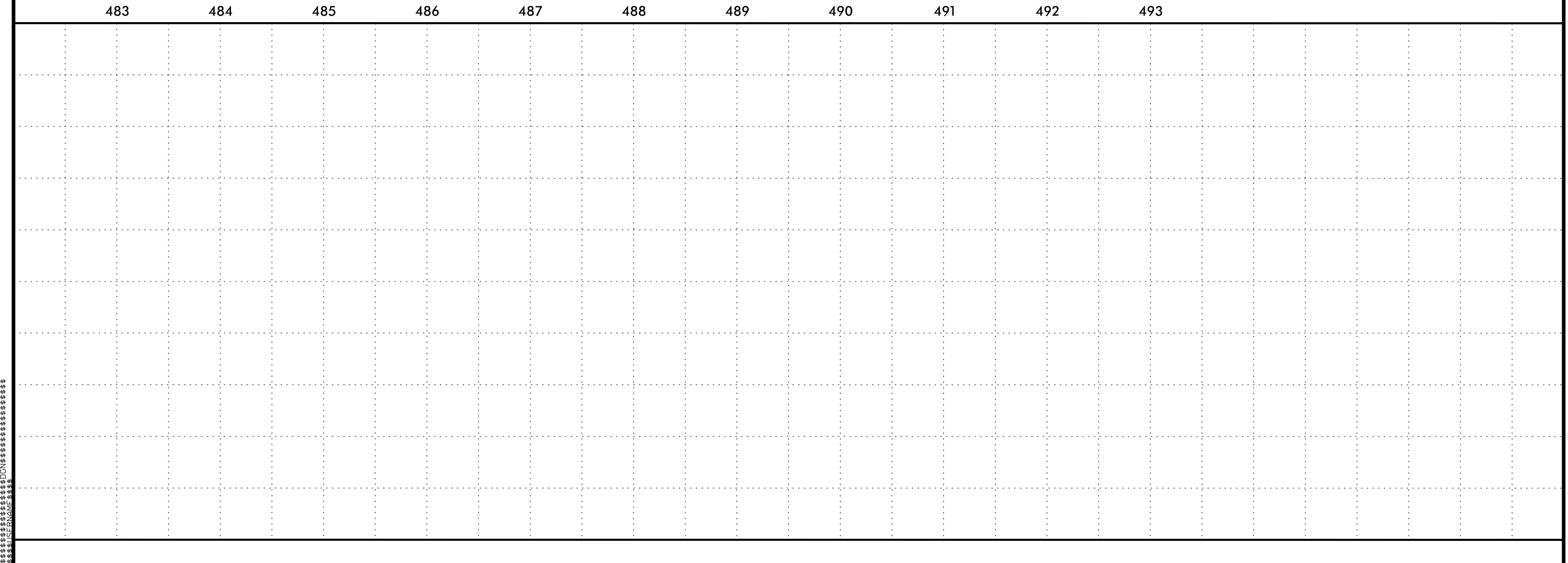
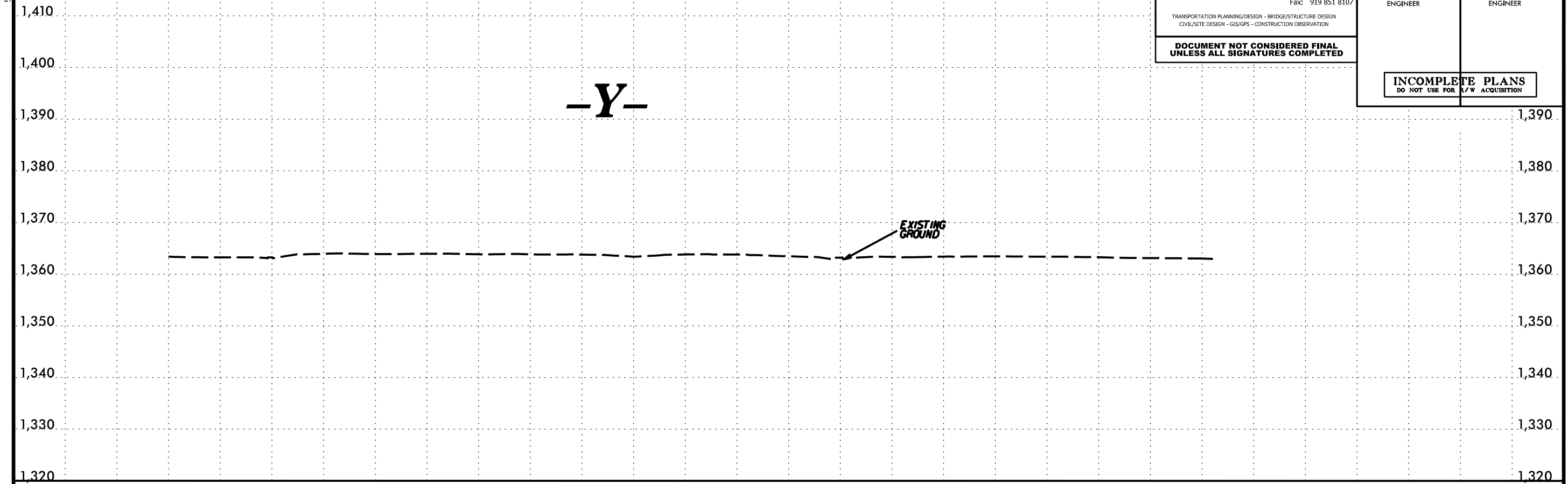


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Fax: 919 851 8107

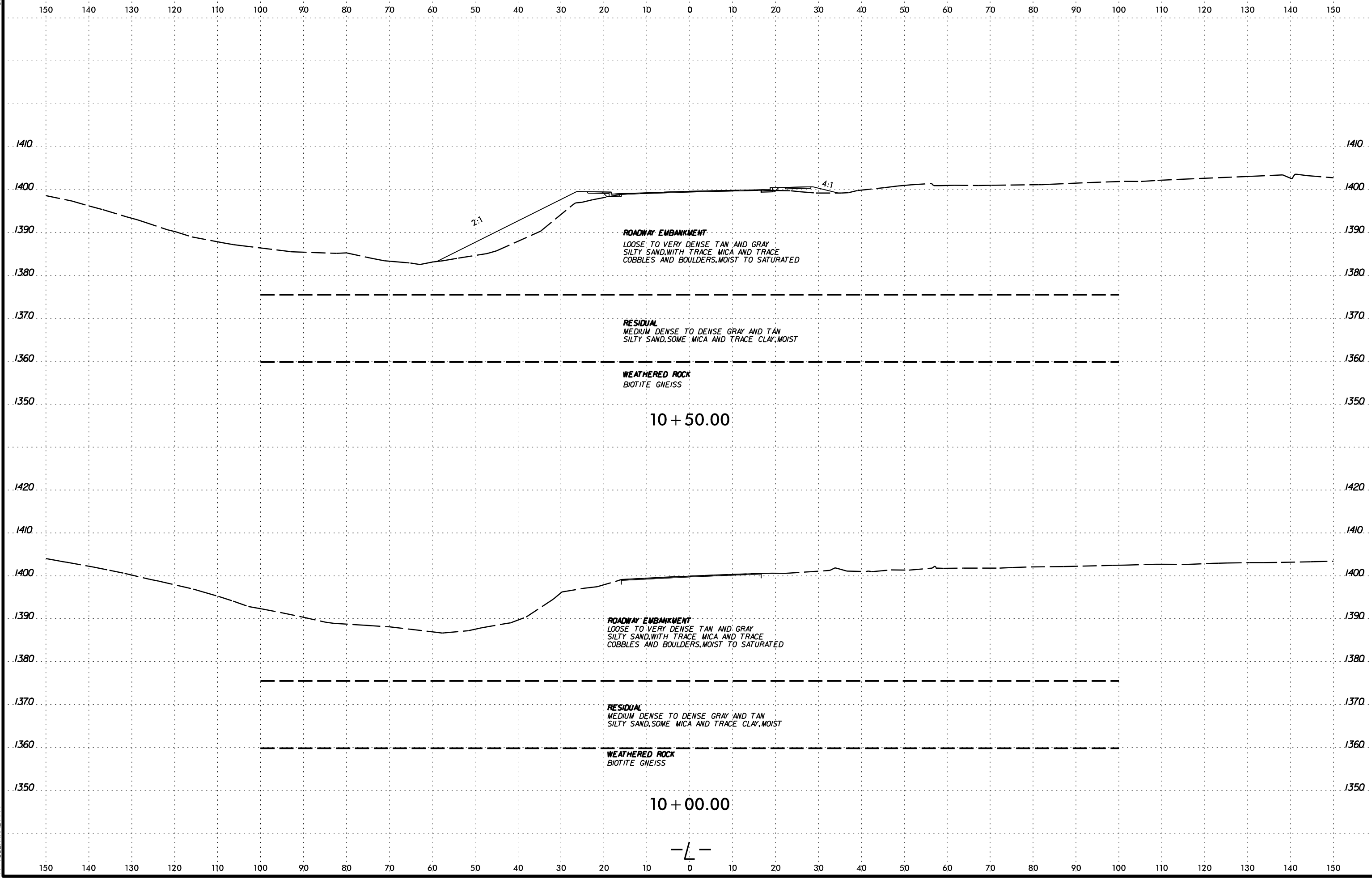
TRANSPORTATION PLANNING/DESIGN - BRIDGE/STRUCTURE DESIGN
CIVIL/SITE DESIGN - GIS/GPS - CONSTRUCTION OBSERVATION

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

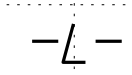
PROJECT REFERENCE NO. <i>U-5818</i>	SHEET NO. <i>13</i>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	



\$\$\$\$\$
SYSTEMS
\$\$\$\$\$

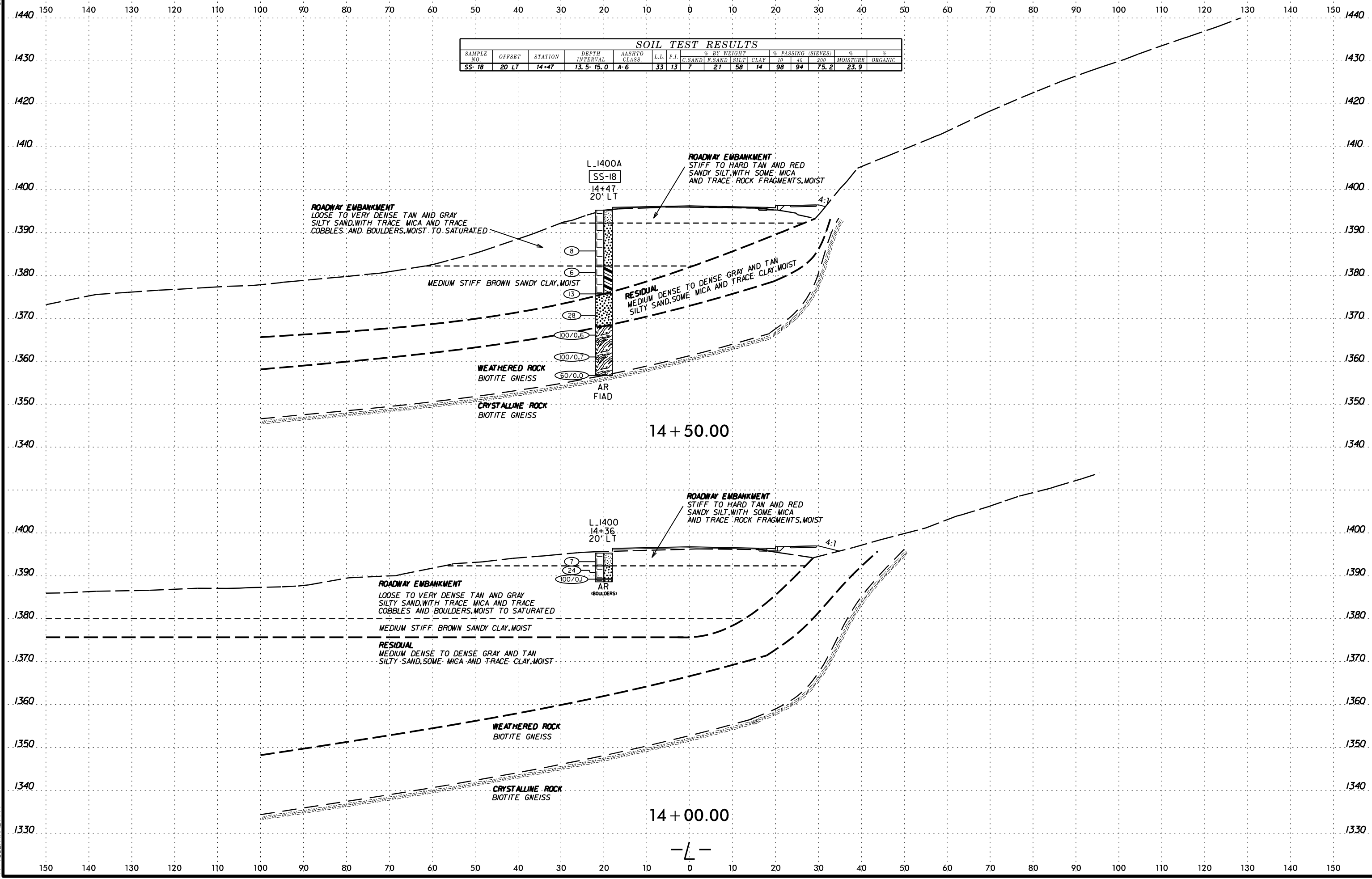


SYTIME
CON
ARRIVE



6/23/16

SOIL TEST RESULTS														
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)		% MOISTURE	% ORGANIC
							C. SAND	F SAND	SILT	CLAY	10	40		
SS-18	20 LT	14+47	13.5-15.0	A-6	33	13	7	21	58	14	98	94	75.2	23.9

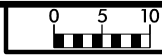


14 + 50.00

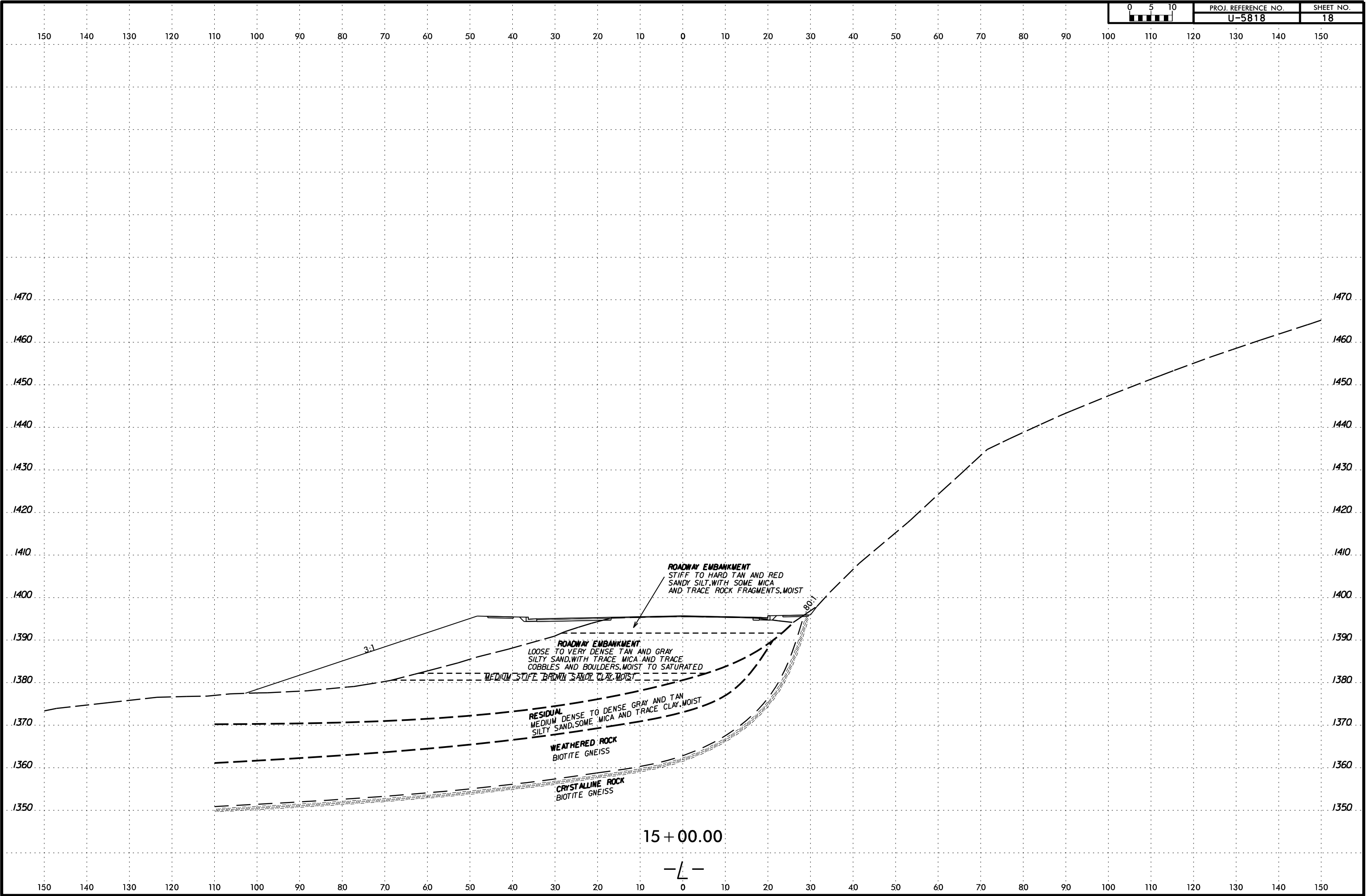
14 + 00.00

— L —

6/23/16



PROJ. REFERENCE NO.	SHEET NO.
U-5818	18

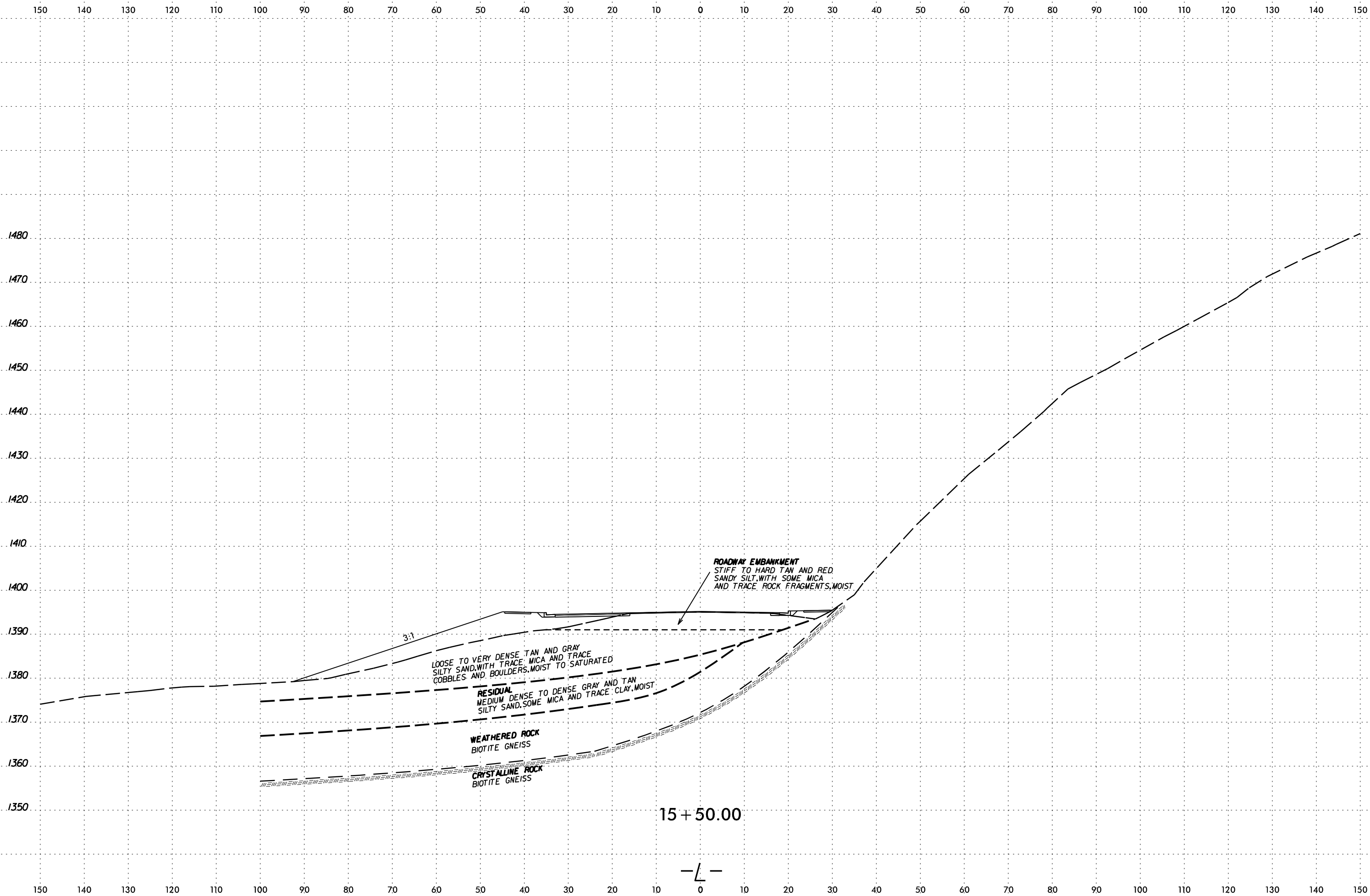


SECTION ON
LINE
ARRANGED
AS SHOWN

15 + 00.00

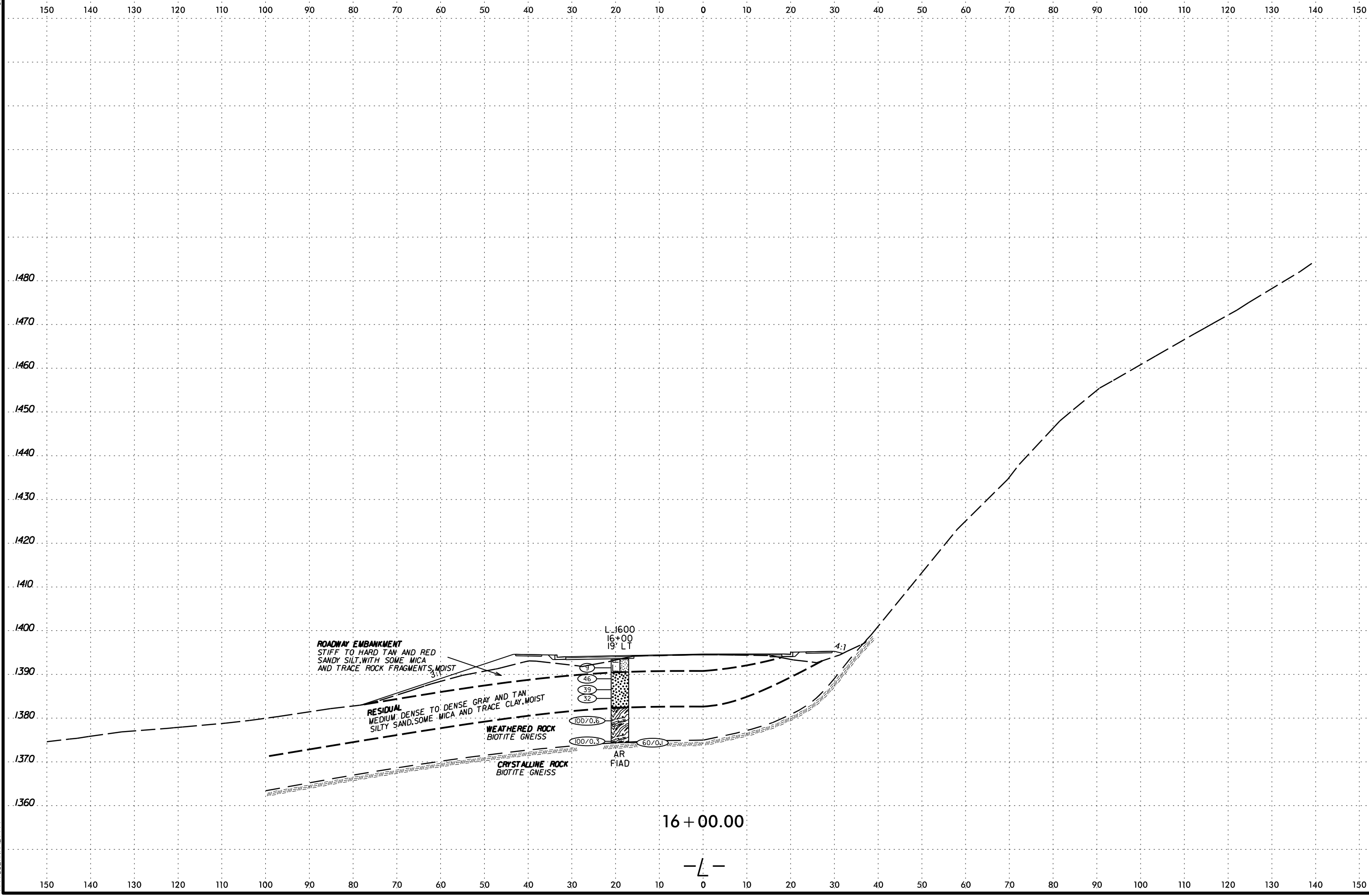


6/23/16



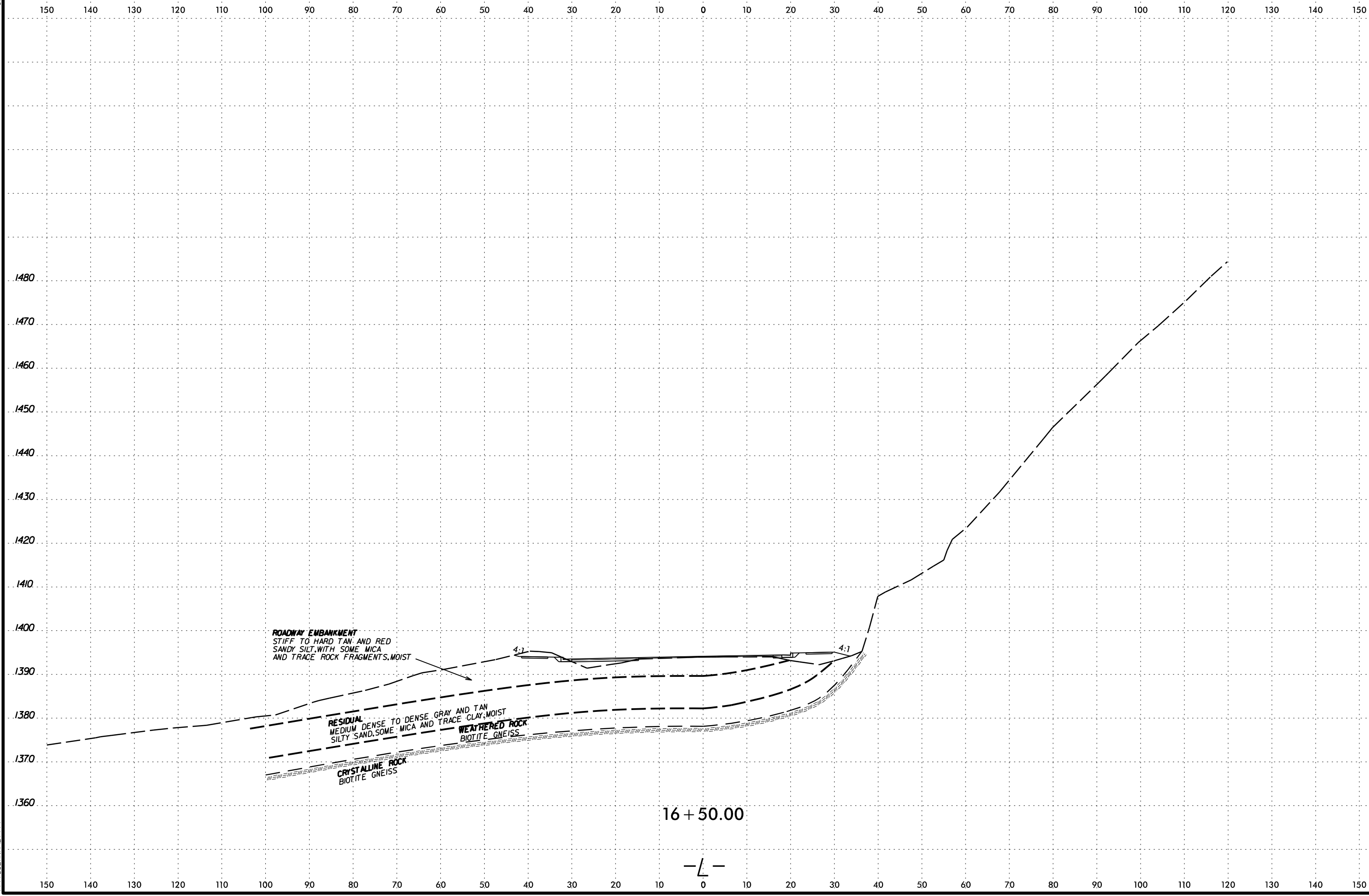
SECTION ON
LINE
FRY

6/23/16



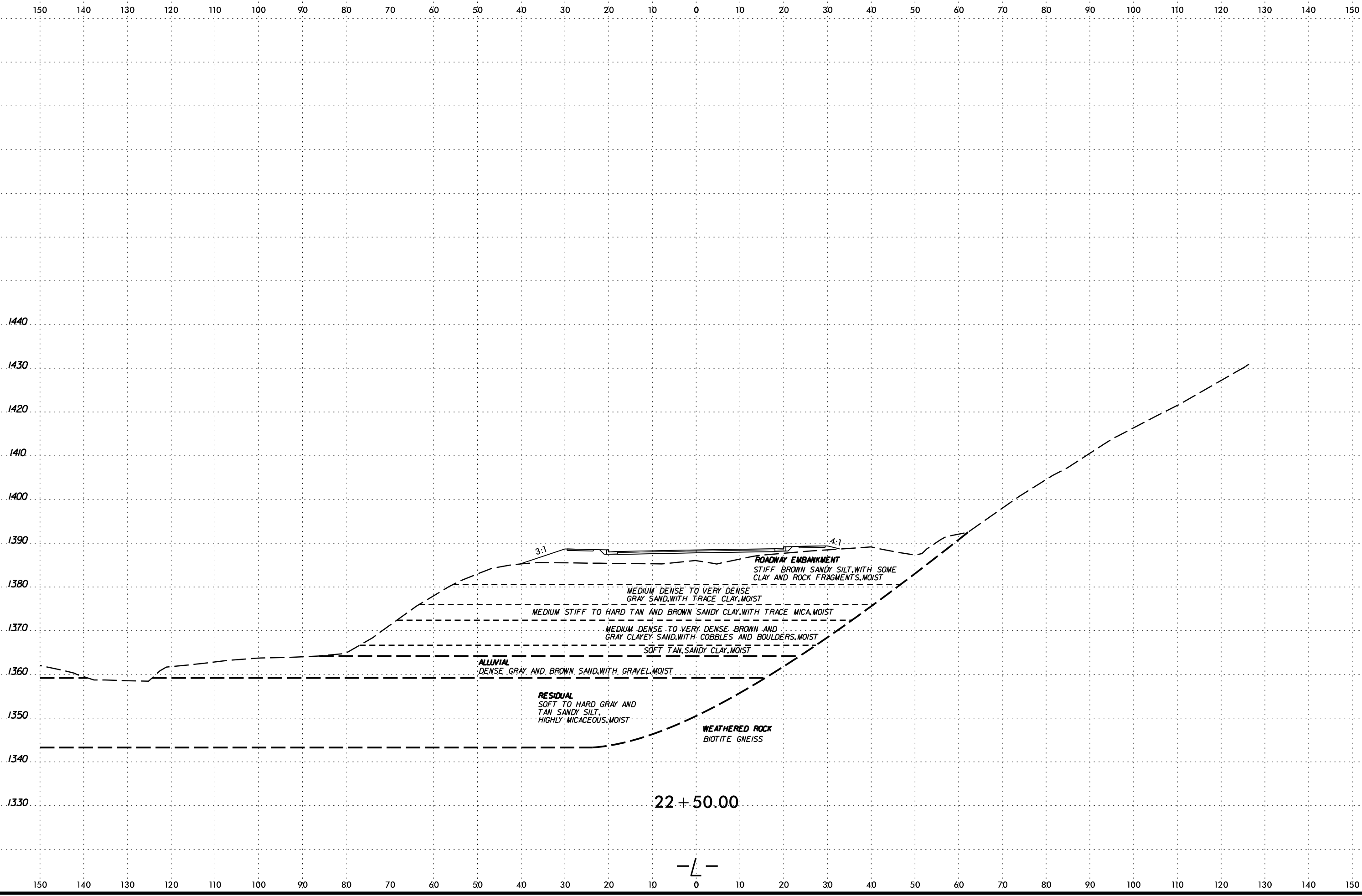
SECTION ON
LINE
ARRANGED

6/23/16



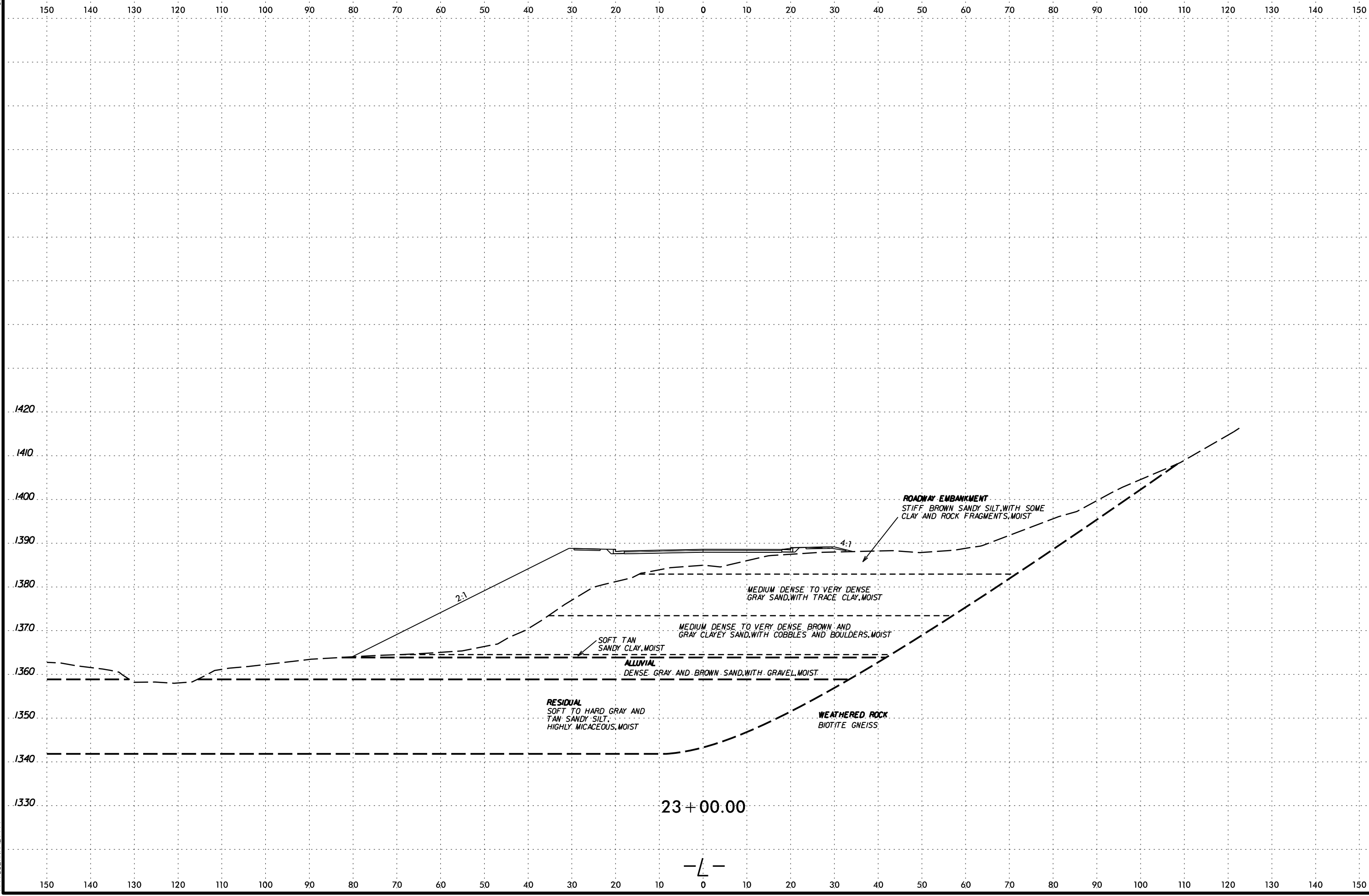
SYNTHESIS CONSULTING ENGINEERS

6/23/16



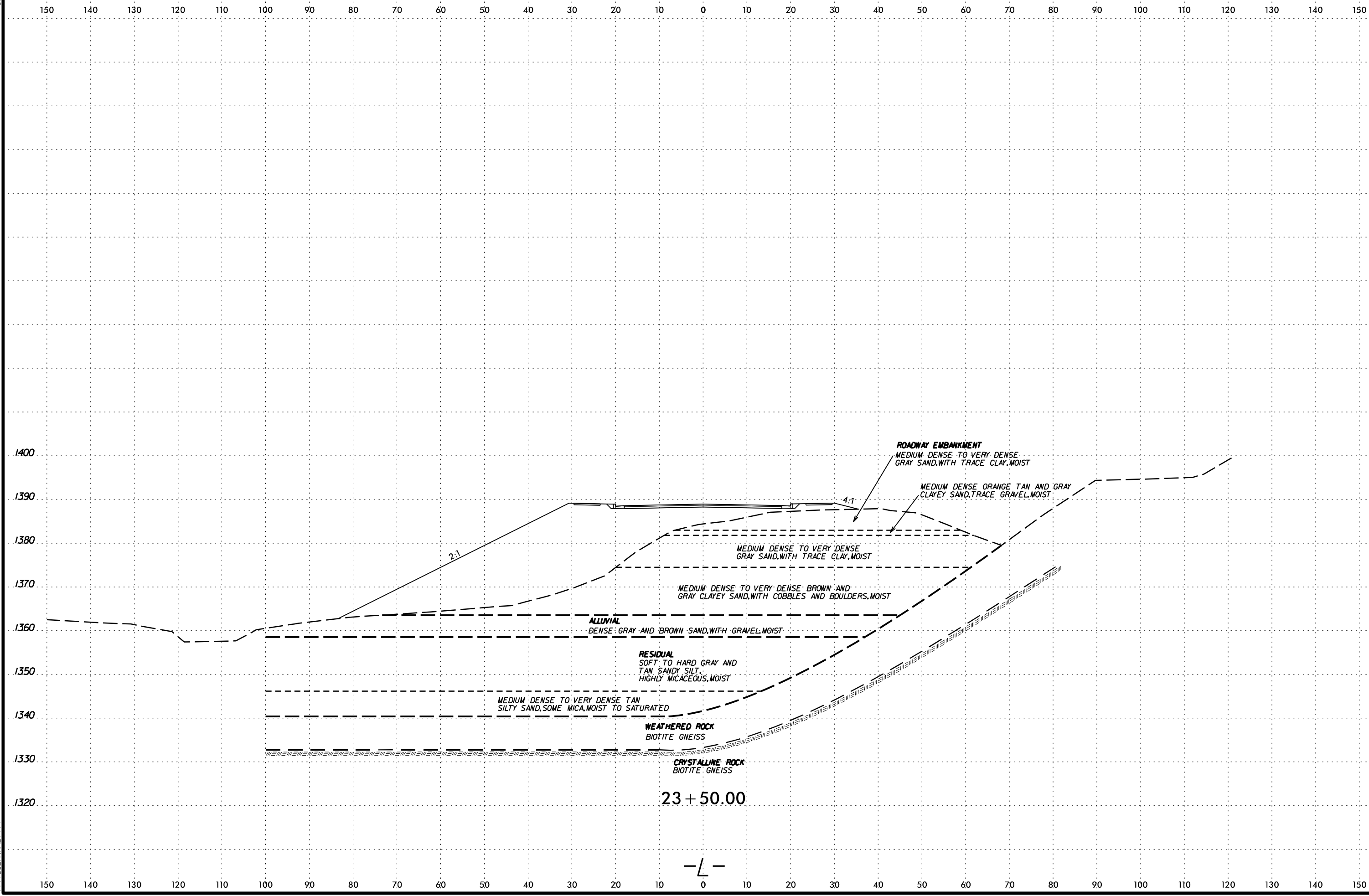
SECTION ON CENTERLINE

6/23/16



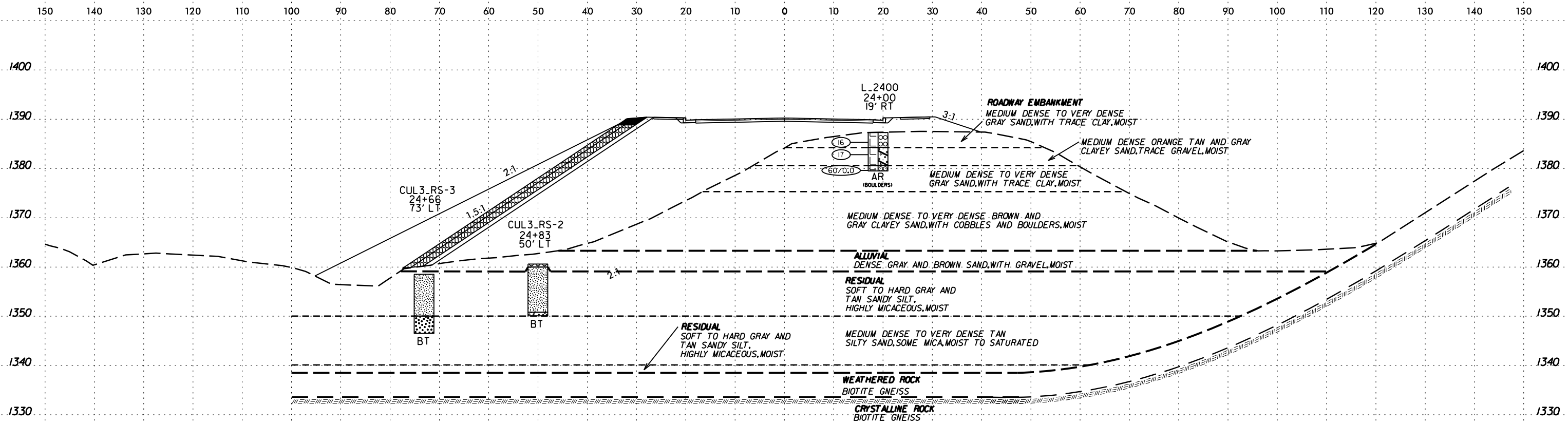
SECTION ON CENTERLINE OF ROADWAY

6/23/16

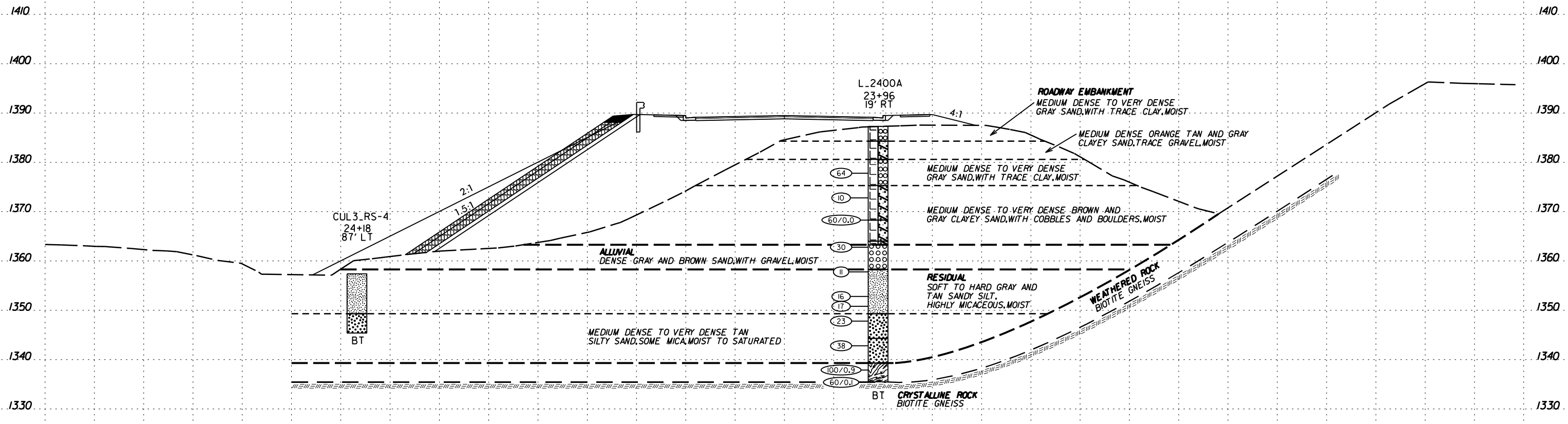


SECTION ON CENTERLINE

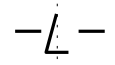




24 + 50.00

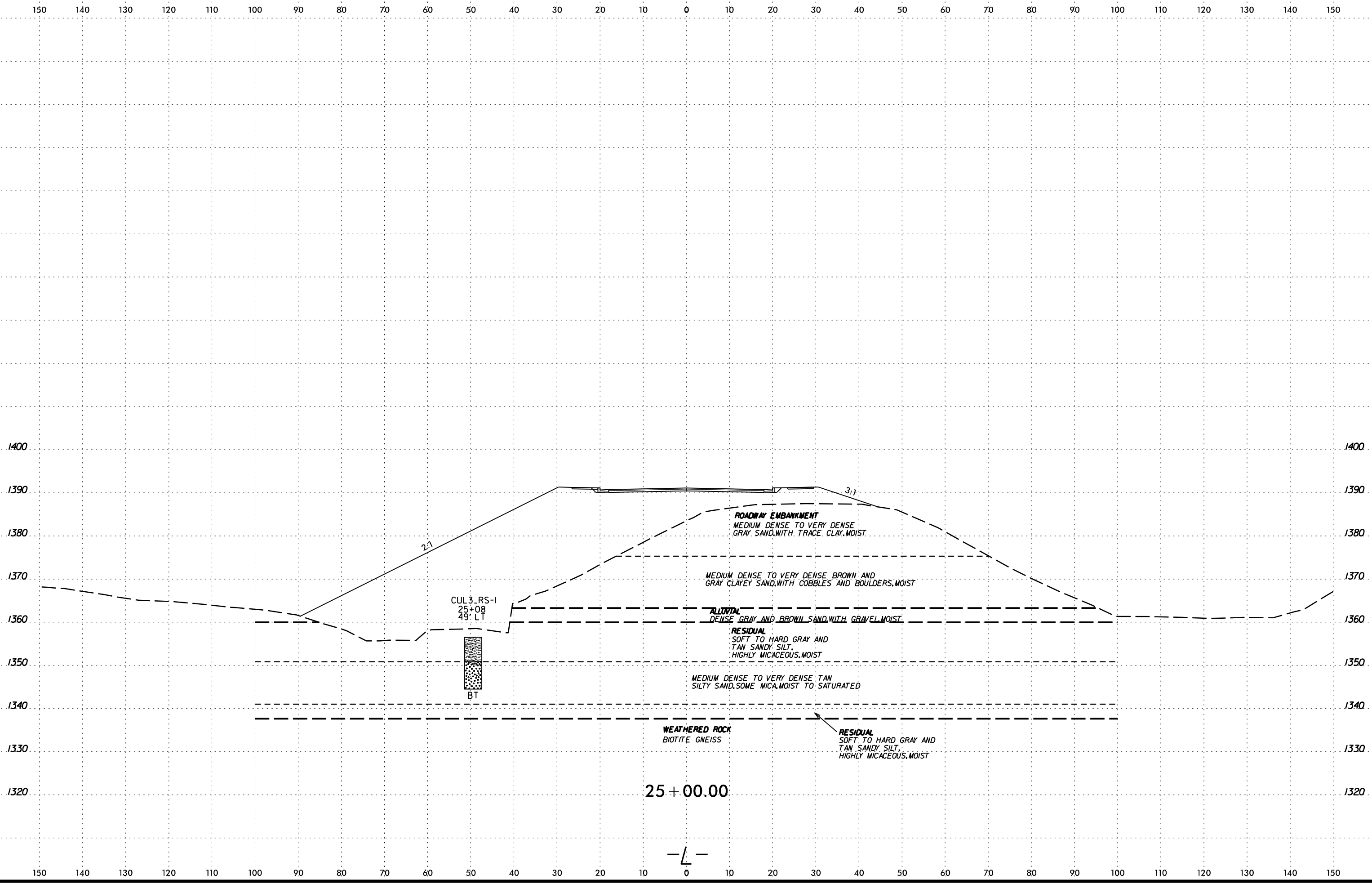


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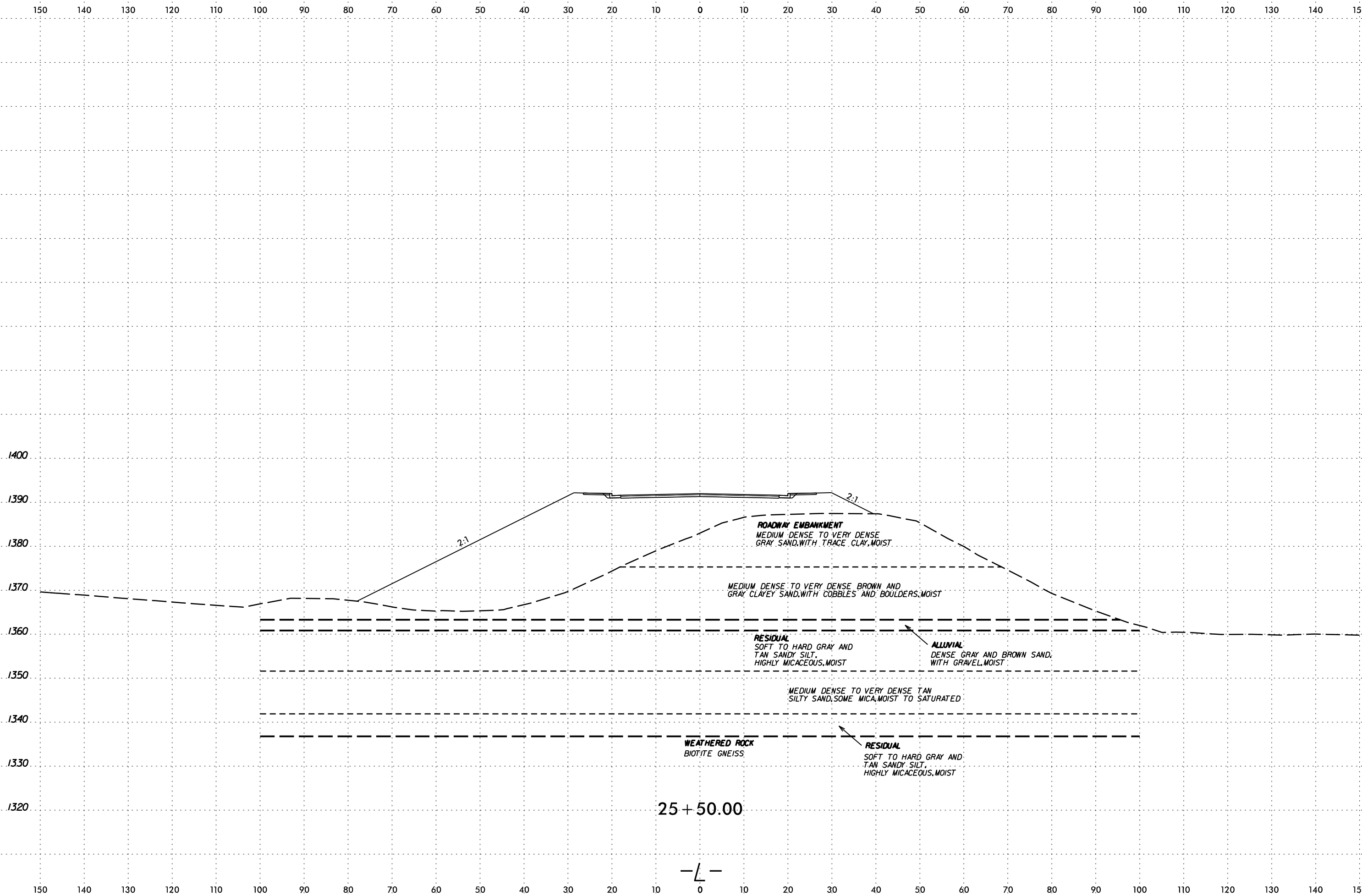


SECTION CONCERNING JULY 1994

6/23/16

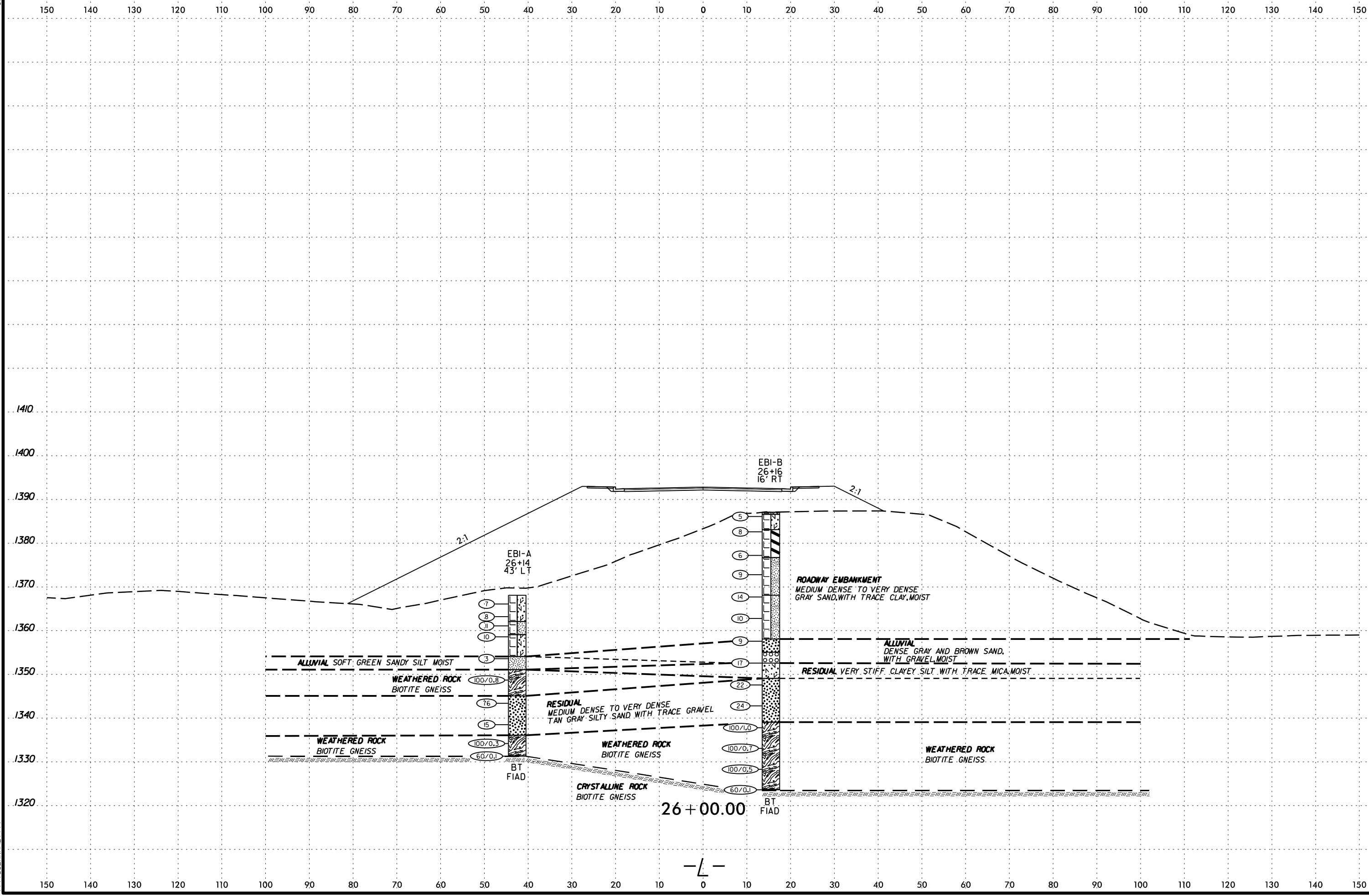


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CHECKED BY: [illegible]
SCALE: AS SHOWN



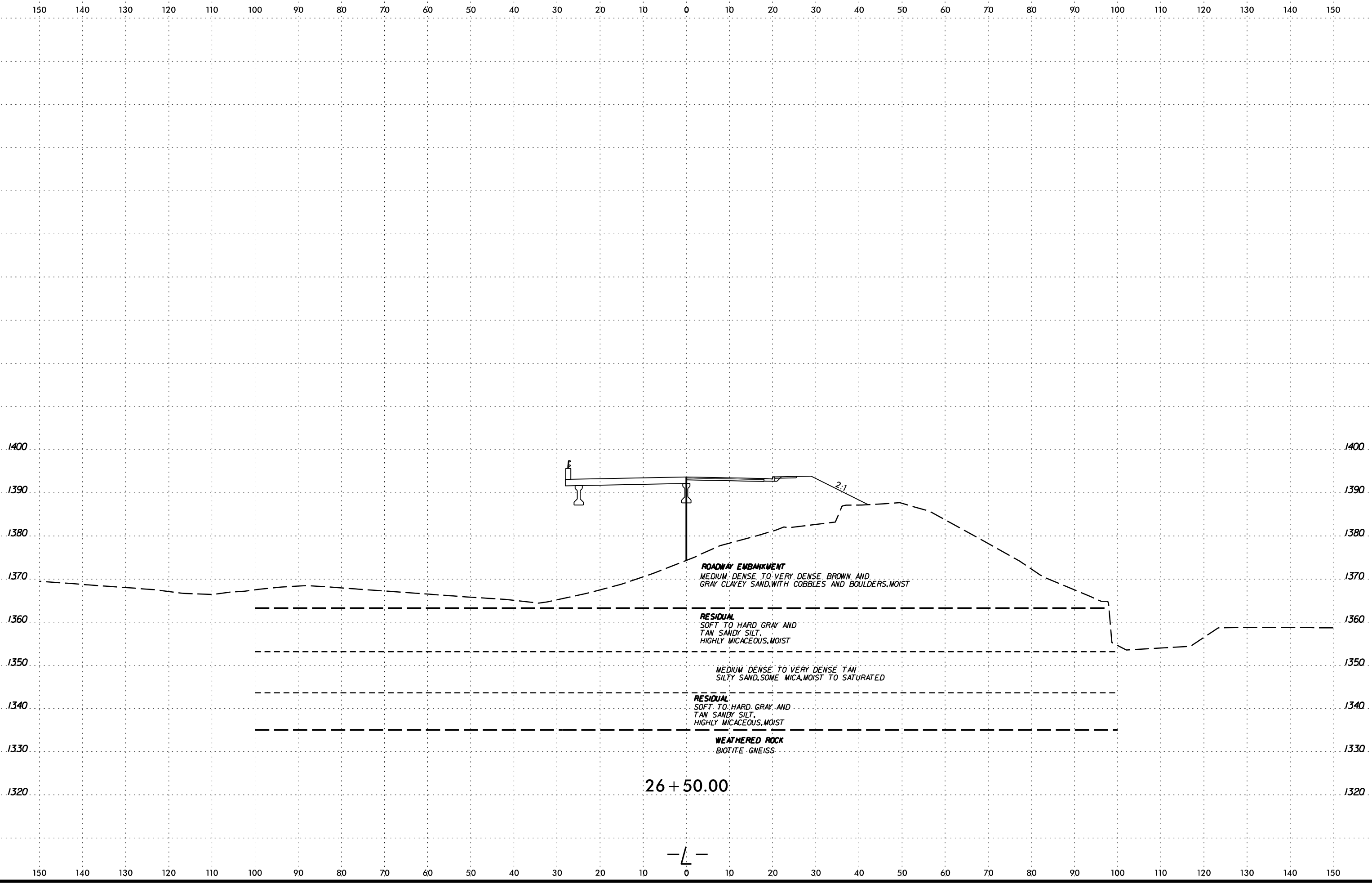
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CHECKED BY: [unreadable]
SCALE: AS SHOWN
PROJECT: U-5818
SHEET: 27

6/23/16



SECTION CONSTRUCTION

-L-



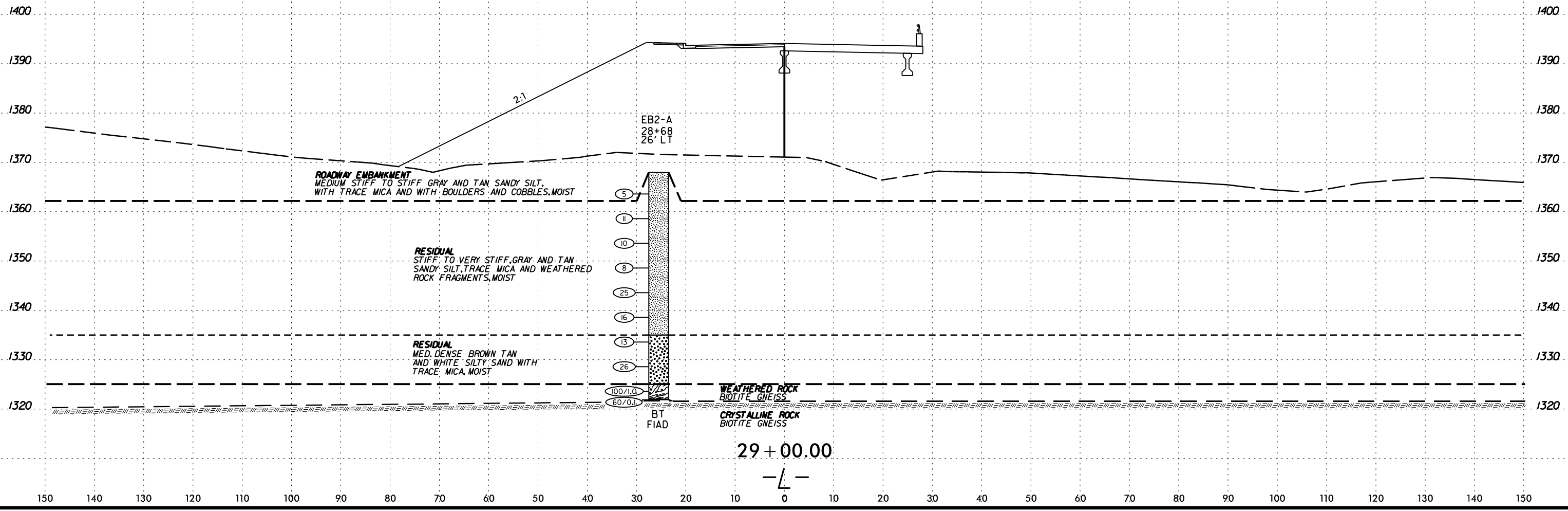
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26 + 50.00

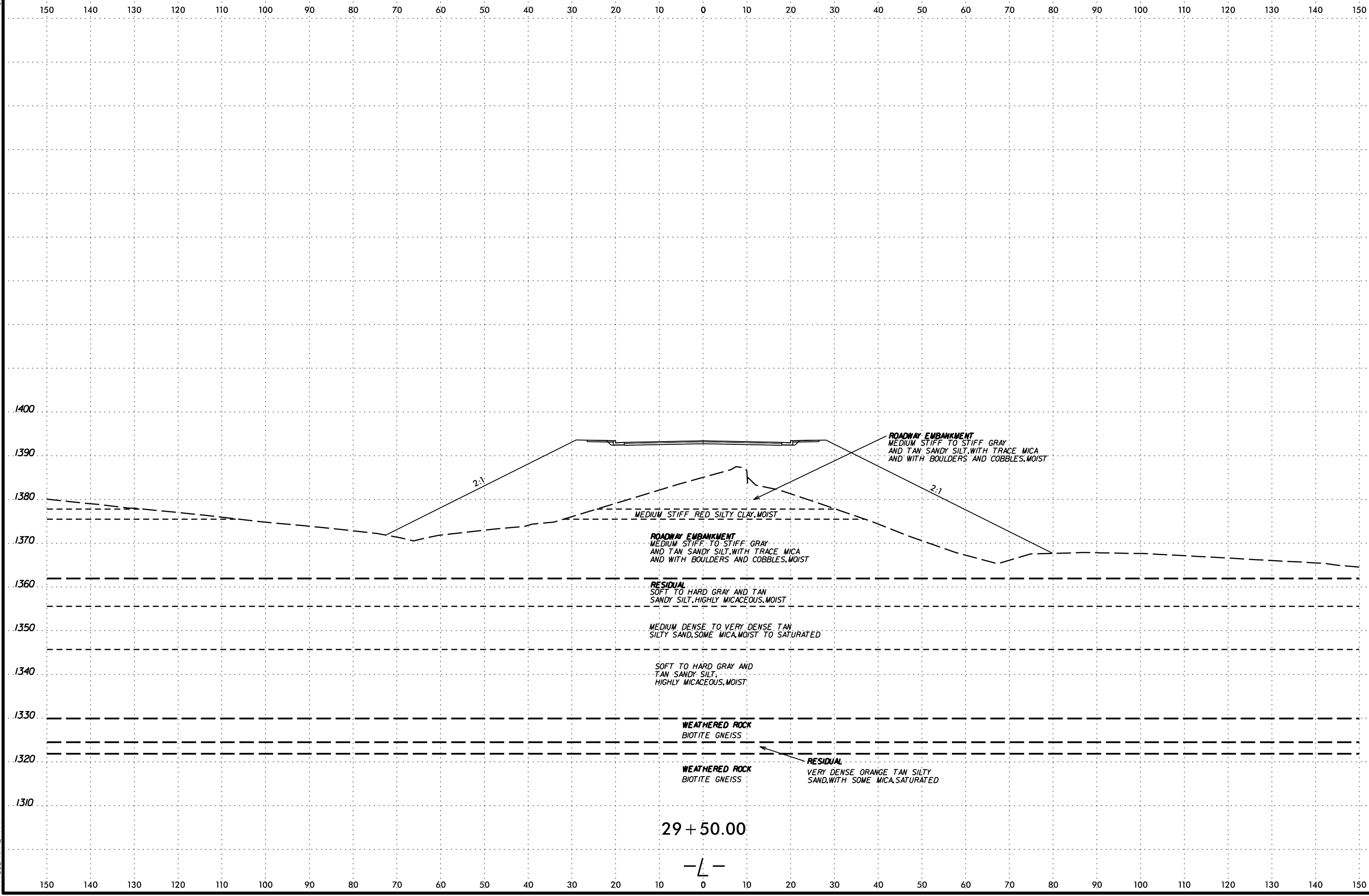
— L —

6/23/16

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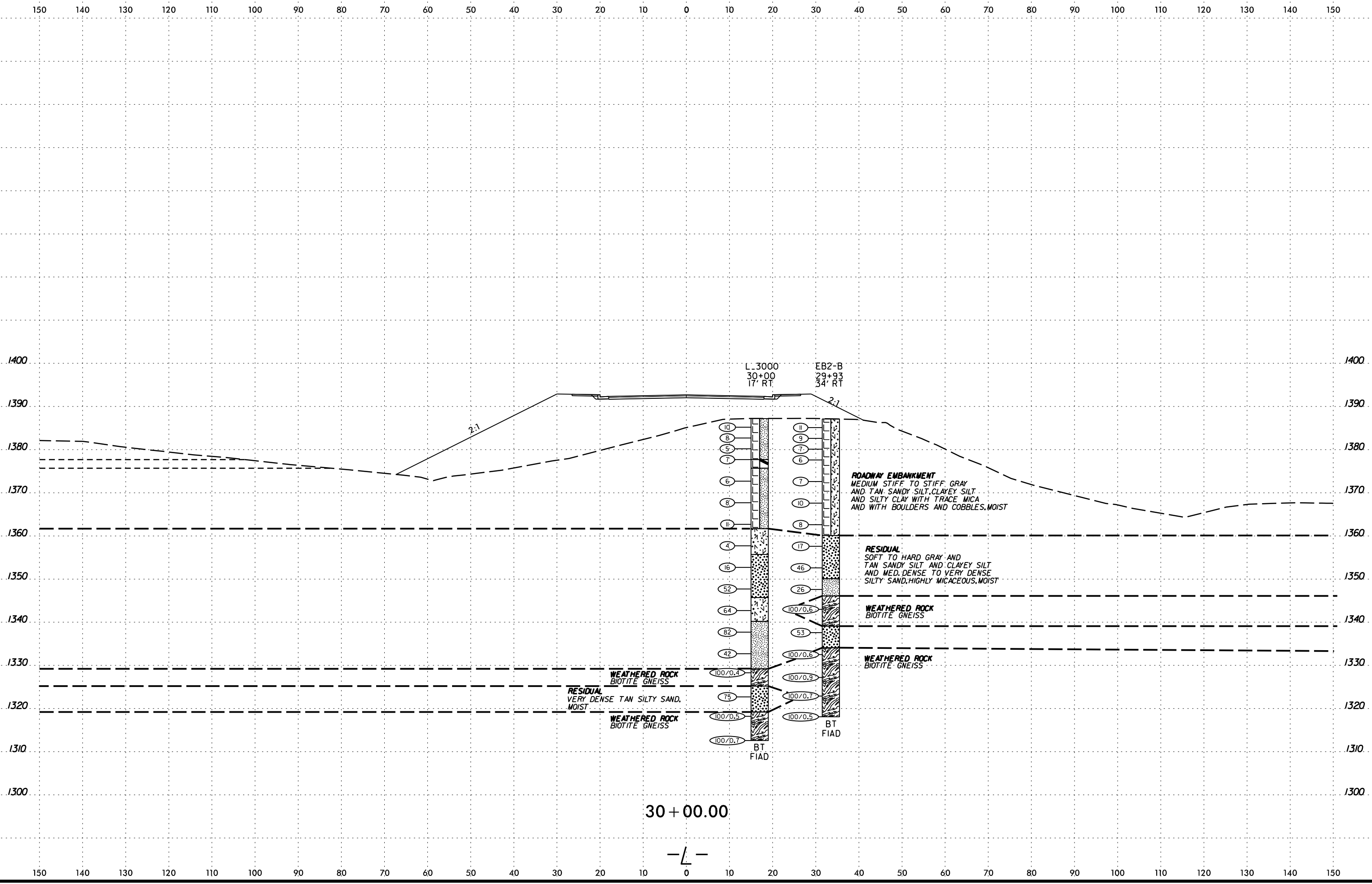


DATE: 6/23/16
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 CHECKED BY: [illegible]
 PROJECT: U-5818
 SHEET: 30



SECTION ON
LINE
DATE
BY

6/23/16

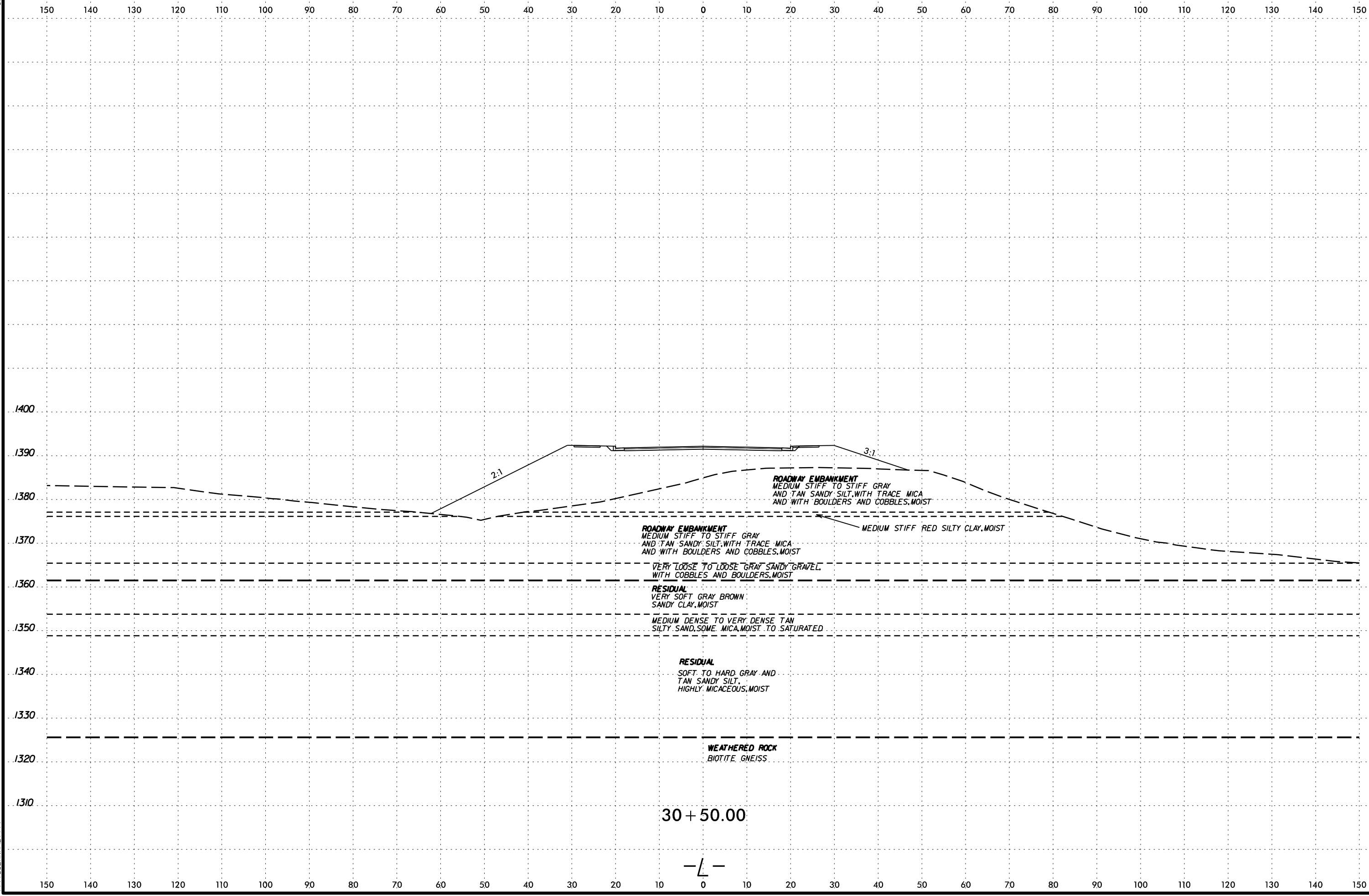


SECTION ON CENTERLINE

30 + 00.00

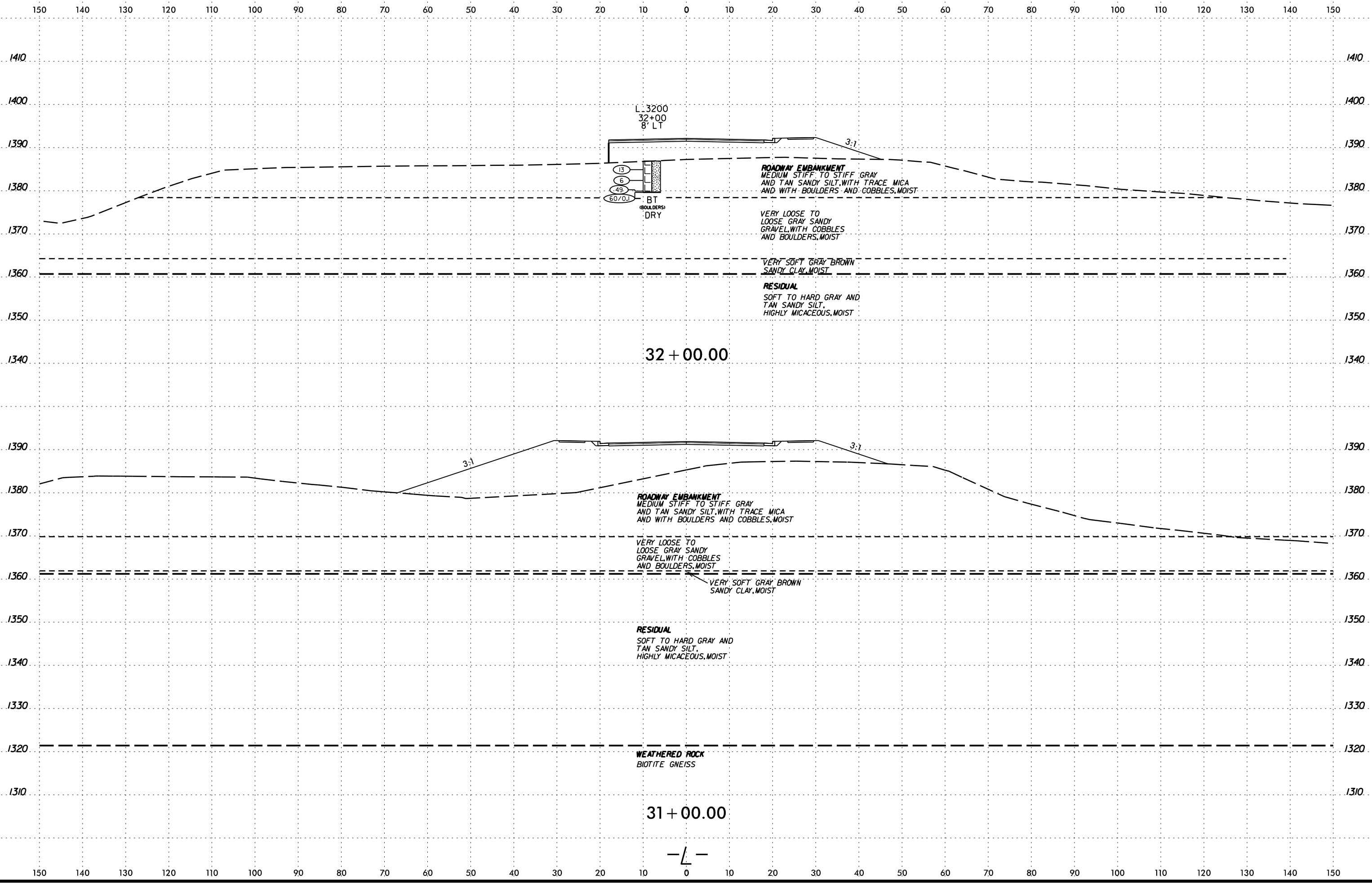
-L-

6/23/16



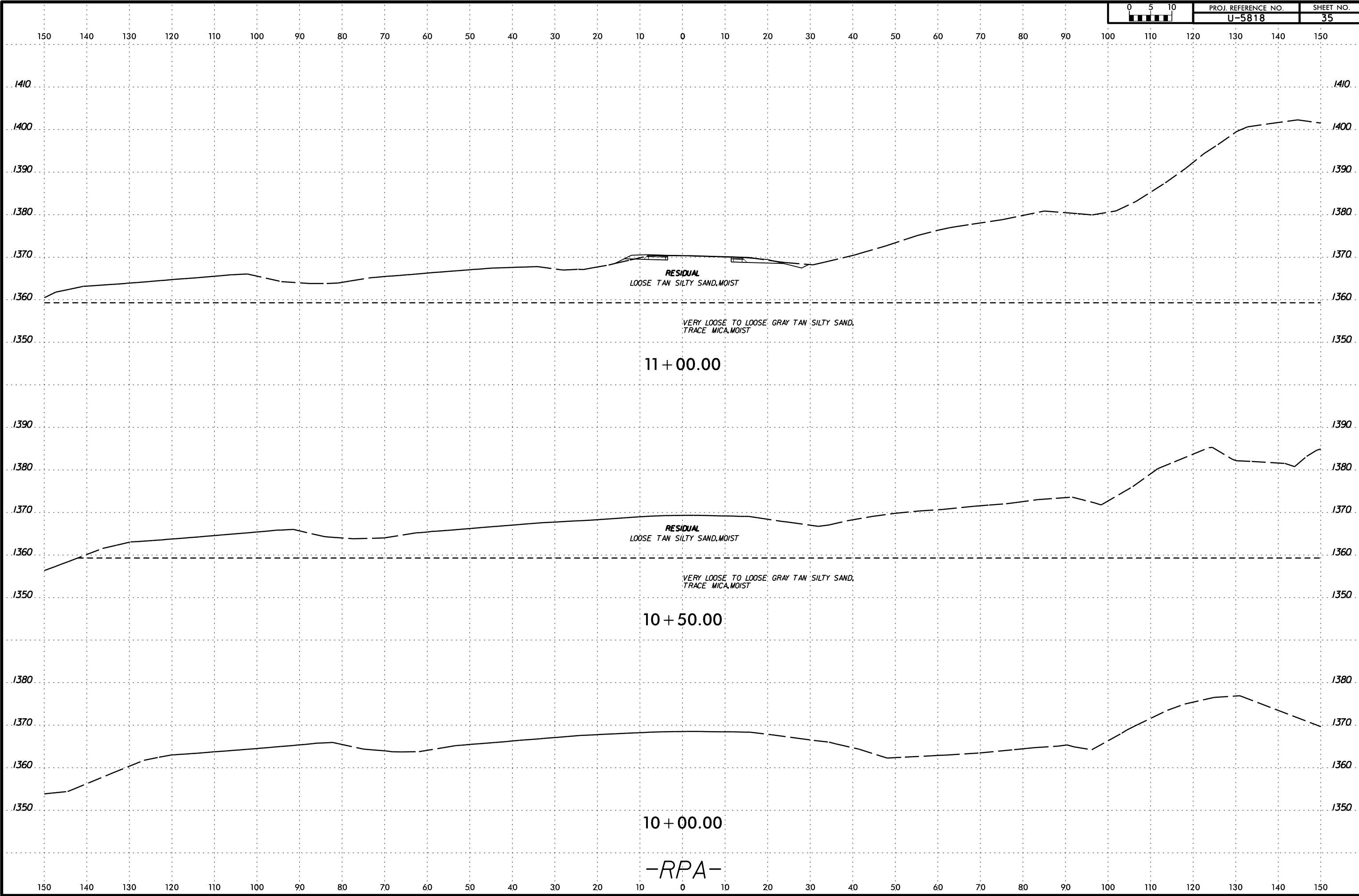
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 CHECKED BY: [unreadable]
 APPROVED BY: [unreadable]

6/23/16

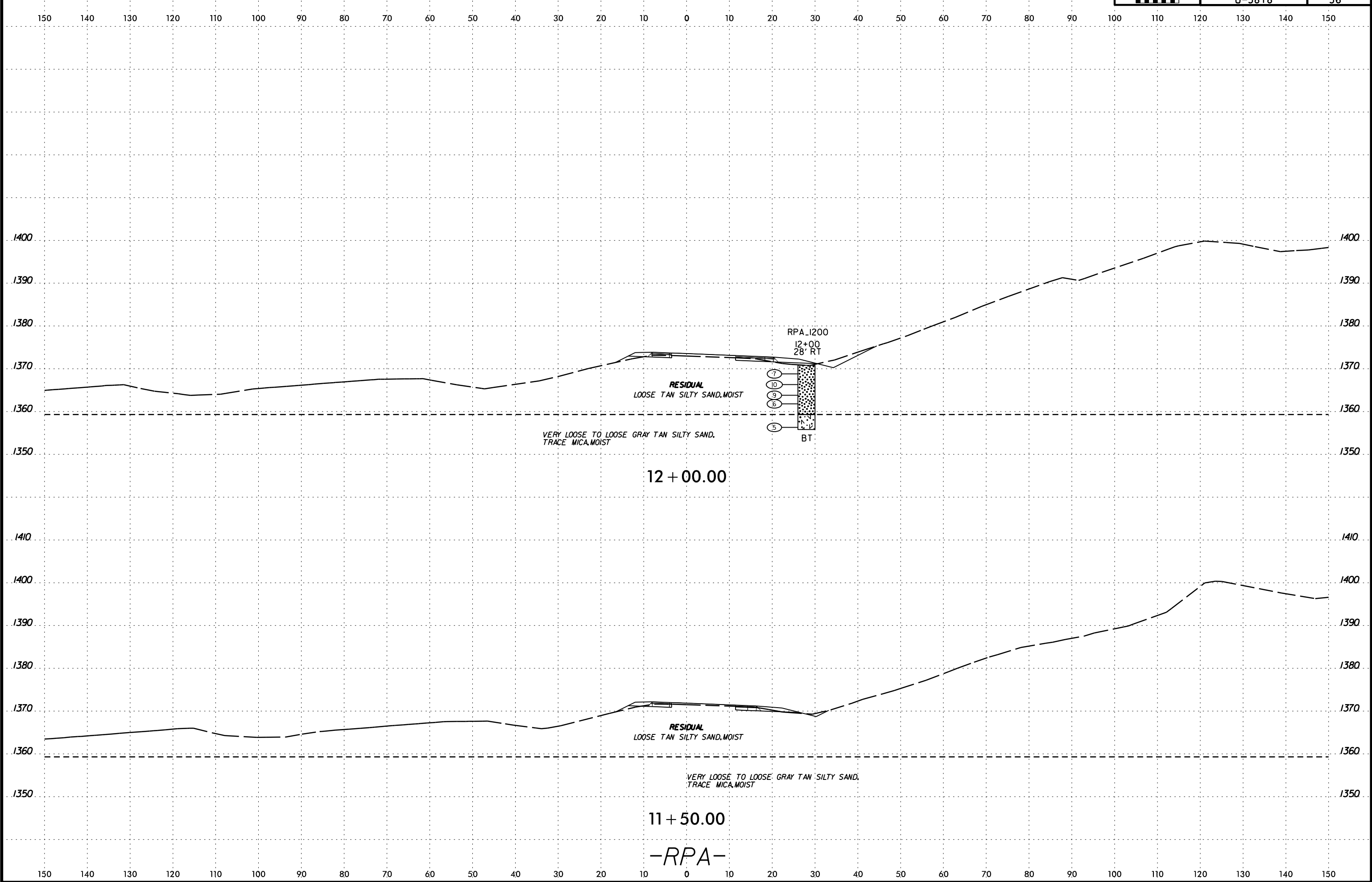


SYNOPSIS OF SOILS AND ROCKS

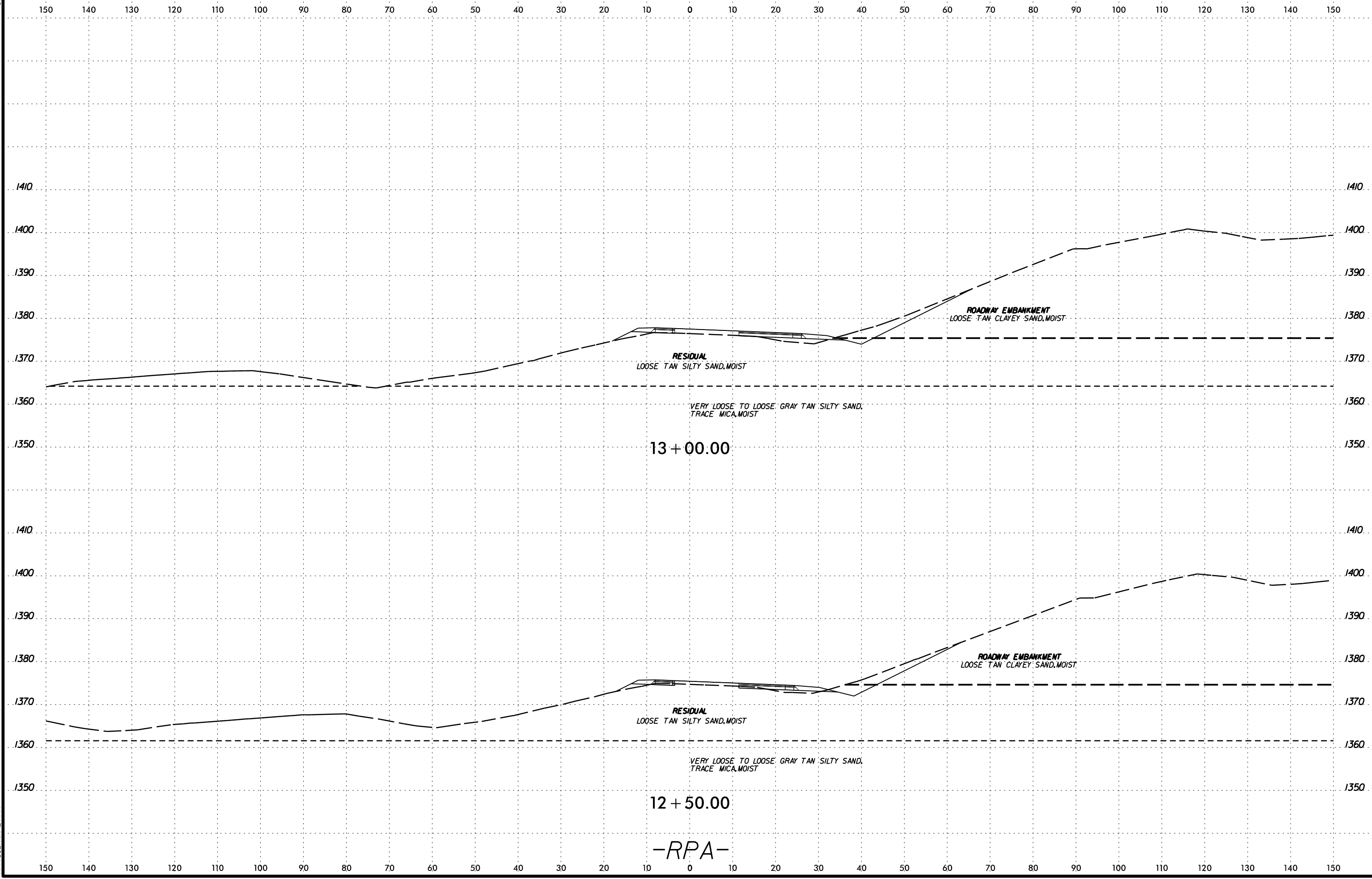
6/23/16



DATE: 6/23/16
DRAWN BY: J. J. WILSON
CHECKED BY: J. J. WILSON
SCALE: AS SHOWN
PROJECT: U-5818
SHEET: 35



6/23/16

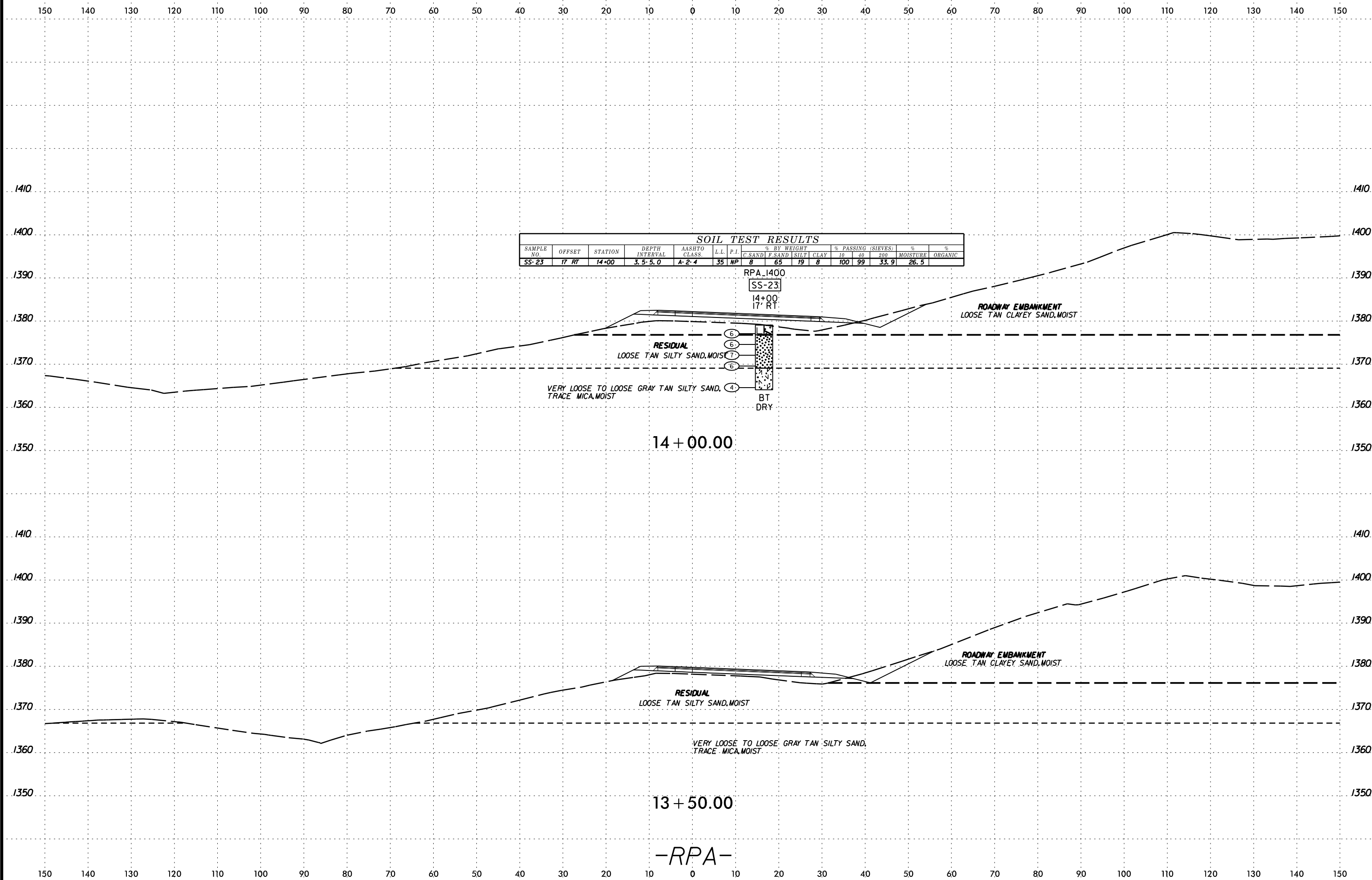


SYTIME CONSTRUCTION SERVICES

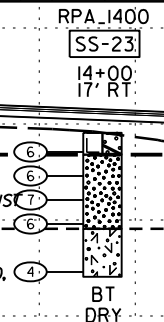
13 + 00.00

12 + 50.00

-RPA-



SOIL TEST RESULTS														
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)		% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40		
SS-23	17' RT	14+00	3.5-5.0	A-2-4	35	NP	8	65	19	8	100	99	33.9	26.5



RESIDUAL
LOOSE TAN SILTY SAND, MOIST

VERY LOOSE TO LOOSE GRAY TAN SILTY SAND,
TRACE MICA, MOIST

BT
DRY

ROADWAY EMBANKMENT
LOOSE TAN CLAYEY SAND, MOIST

14 + 00.00

RESIDUAL
LOOSE TAN SILTY SAND, MOIST

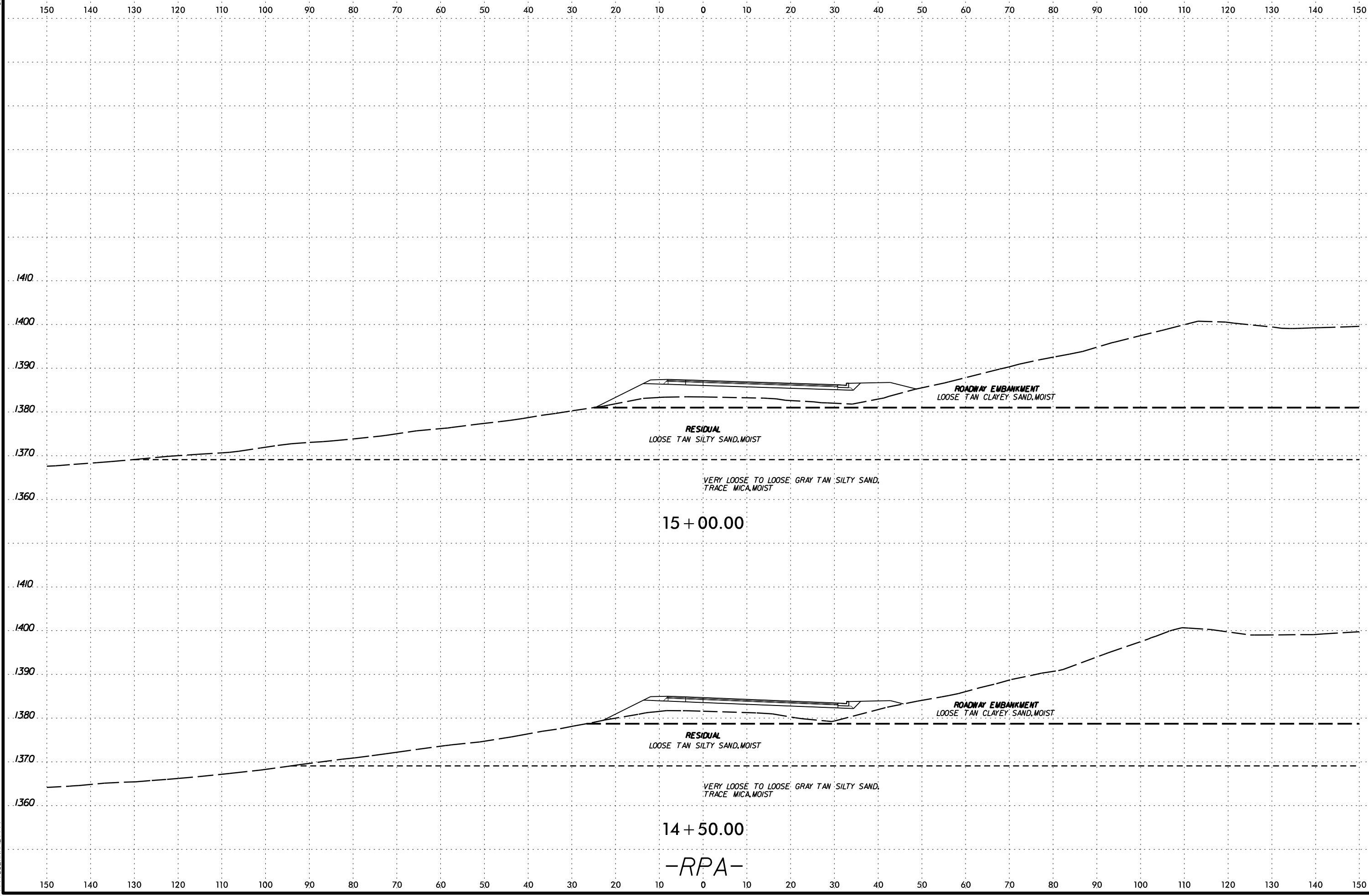
ROADWAY EMBANKMENT
LOOSE TAN CLAYEY SAND, MOIST

VERY LOOSE TO LOOSE GRAY TAN SILTY SAND,
TRACE MICA, MOIST

13 + 50.00

-RPA-

6/23/16



15 + 00.00

14 + 50.00

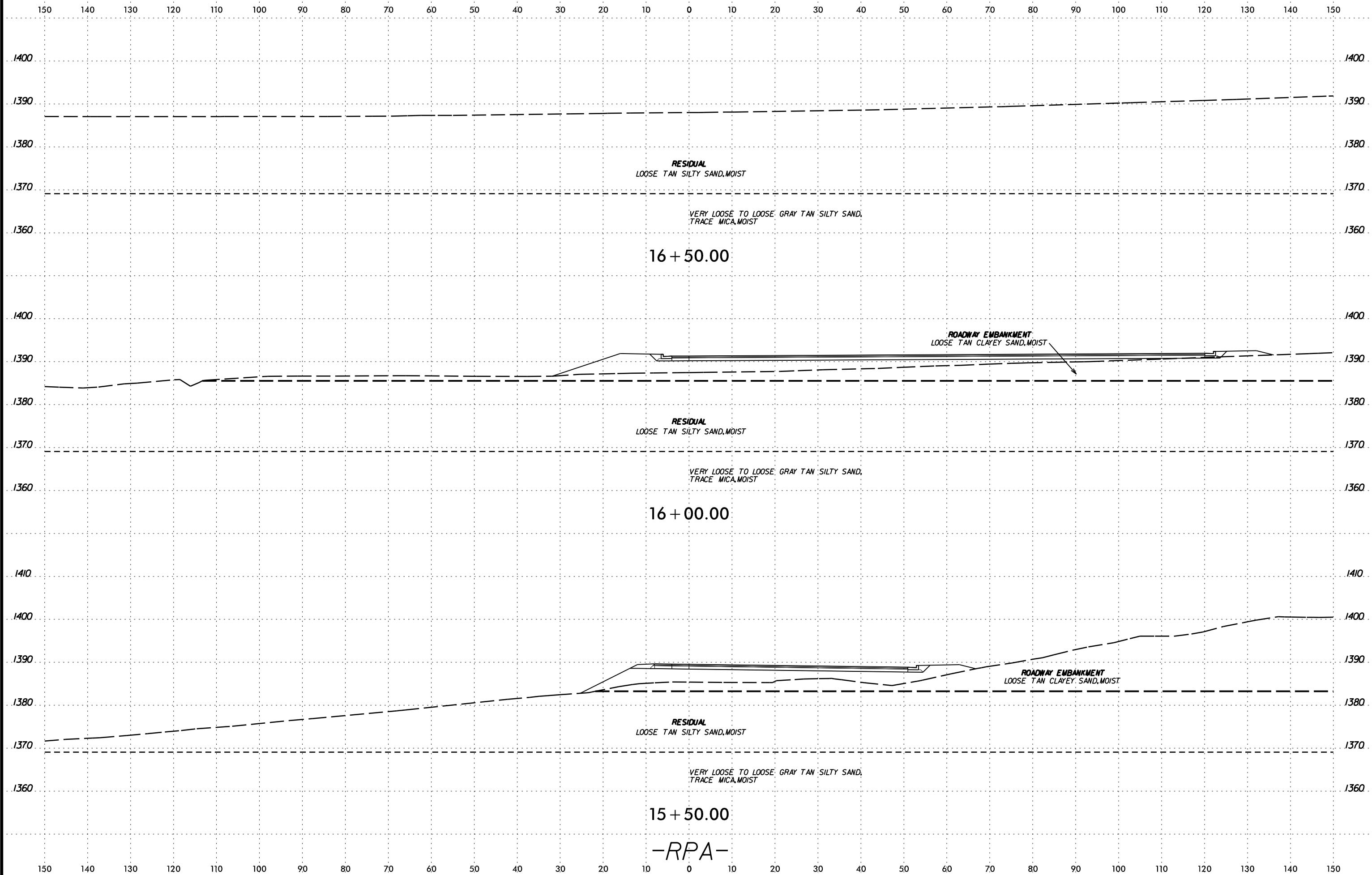
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SYNTHETIC
SECTION
AVAILABLE
FOR
REVIEW
ONLY

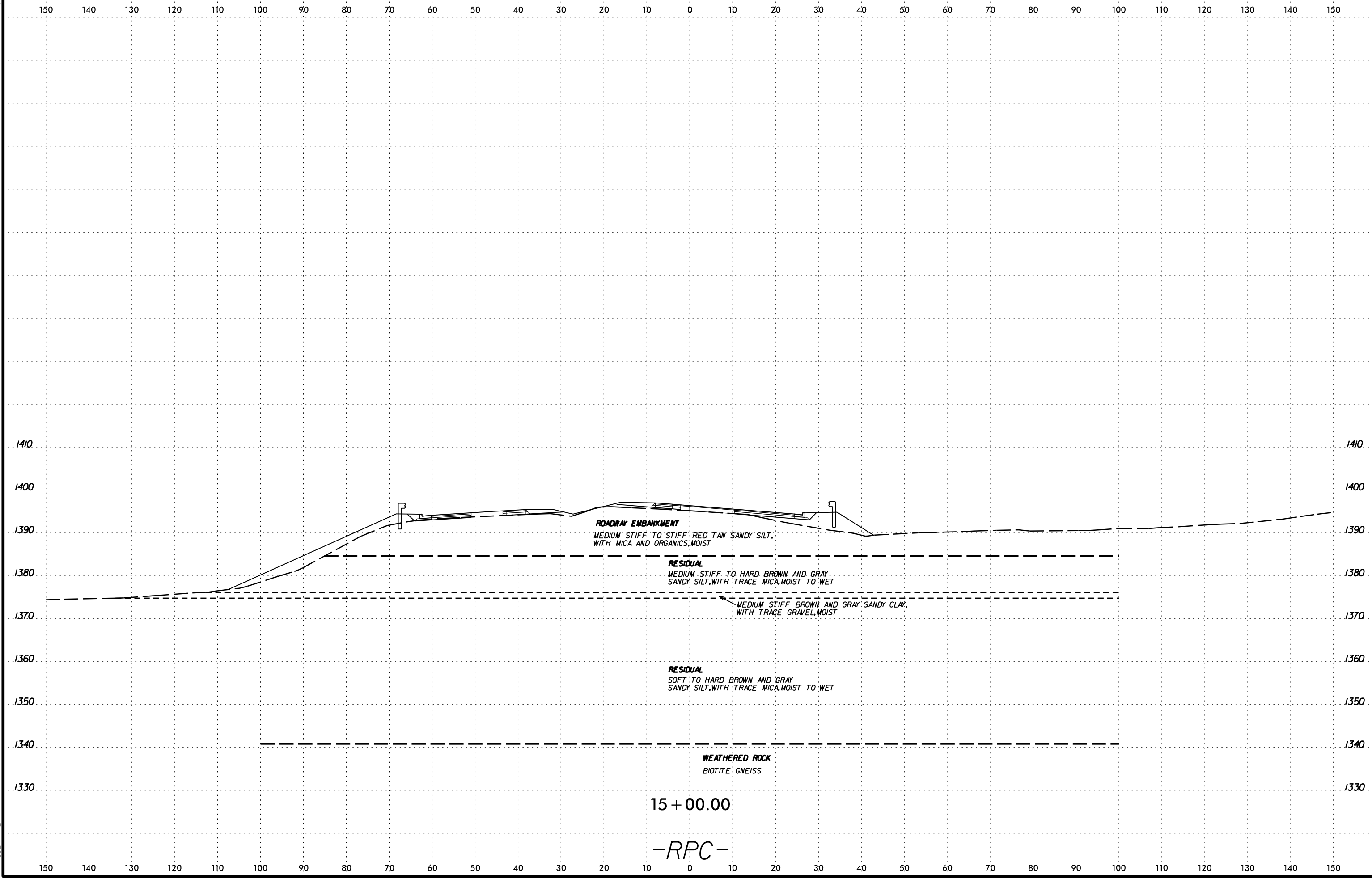
6/23/16



PROJ. REFERENCE NO.	SHEET NO.
U-5818	40



SYTIME
CON
JULY
ARRIVE



ROADWAY EMBANKMENT
 MEDIUM STIFF TO STIFF RED TAN SANDY SILT,
 WITH MICA AND ORGANICS, MOIST

RESIDUAL
 MEDIUM STIFF TO HARD BROWN AND GRAY
 SANDY SILT, WITH TRACE MICA, MOIST TO WET

MEDIUM STIFF BROWN AND GRAY SANDY CLAY,
 WITH TRACE GRAVEL, MOIST

RESIDUAL
 SOFT TO HARD BROWN AND GRAY
 SANDY SILT, WITH TRACE MICA, MOIST TO WET

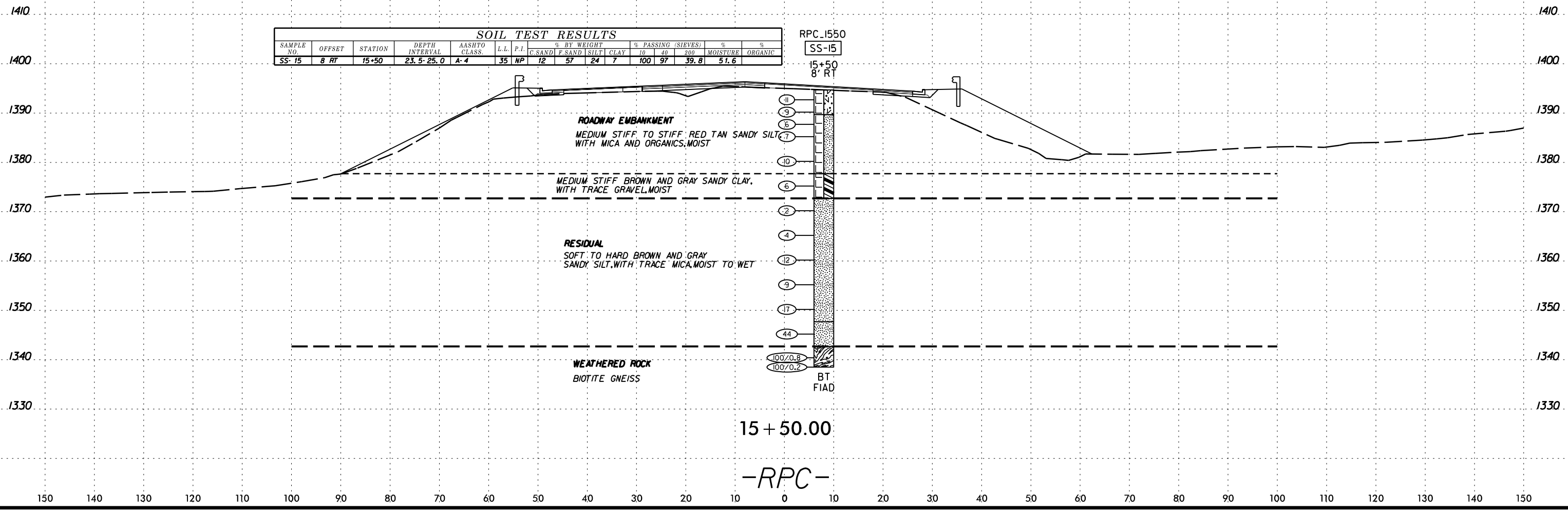
WEATHERED ROCK
 BIOTITE GNEISS

15 + 00.00

-RPC-

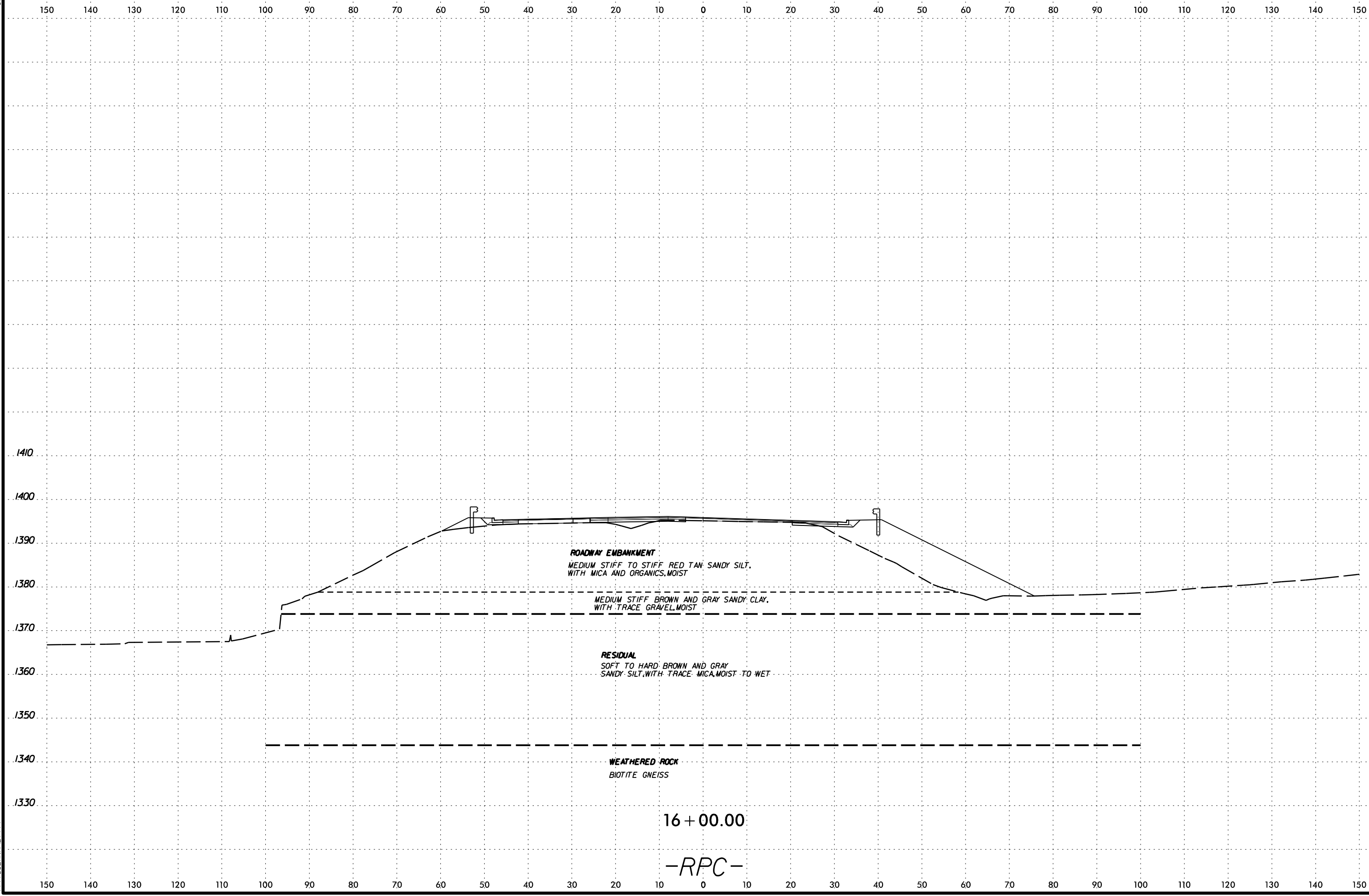
6/23/16
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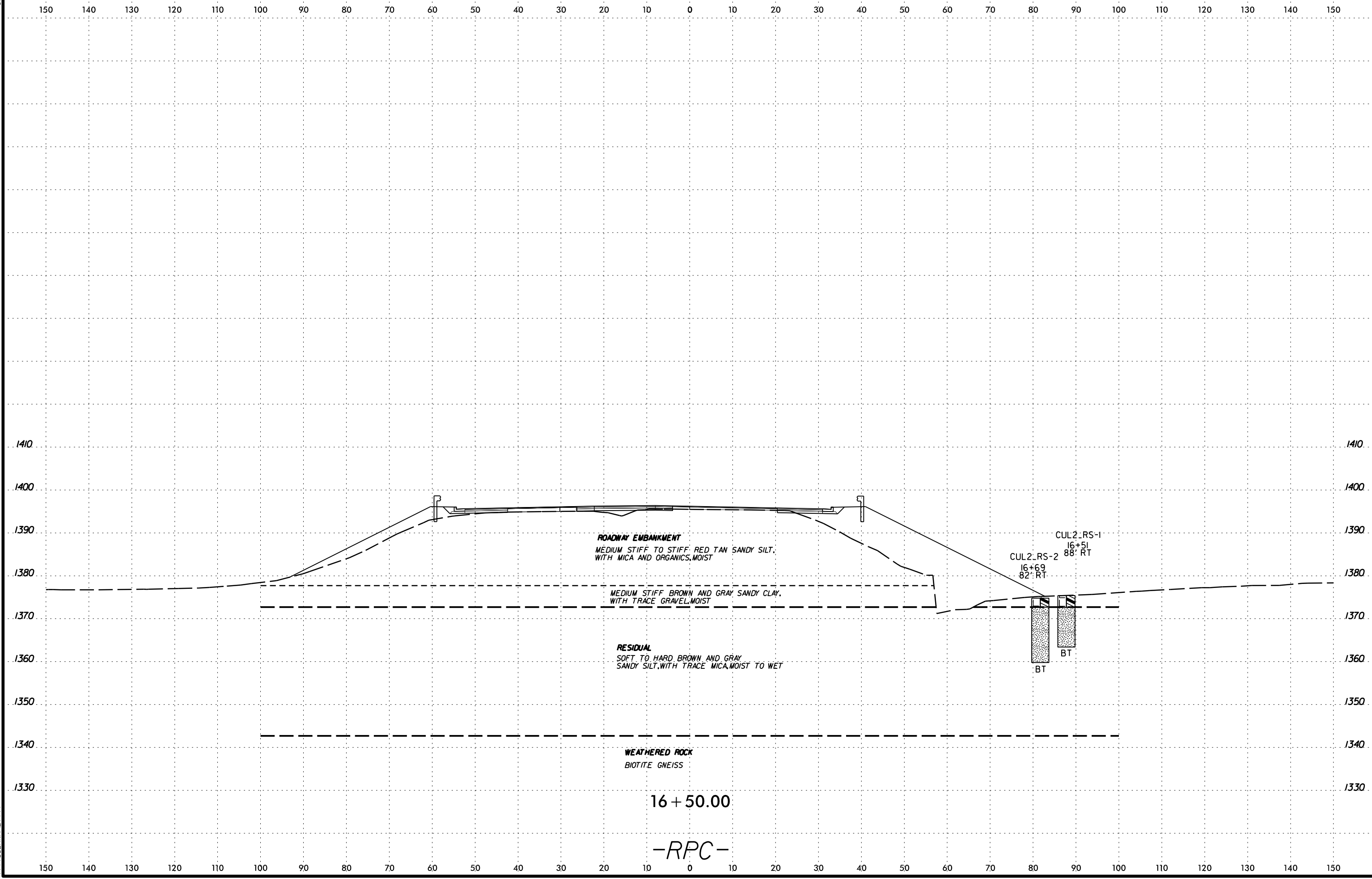
6/23/16
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6/23/16



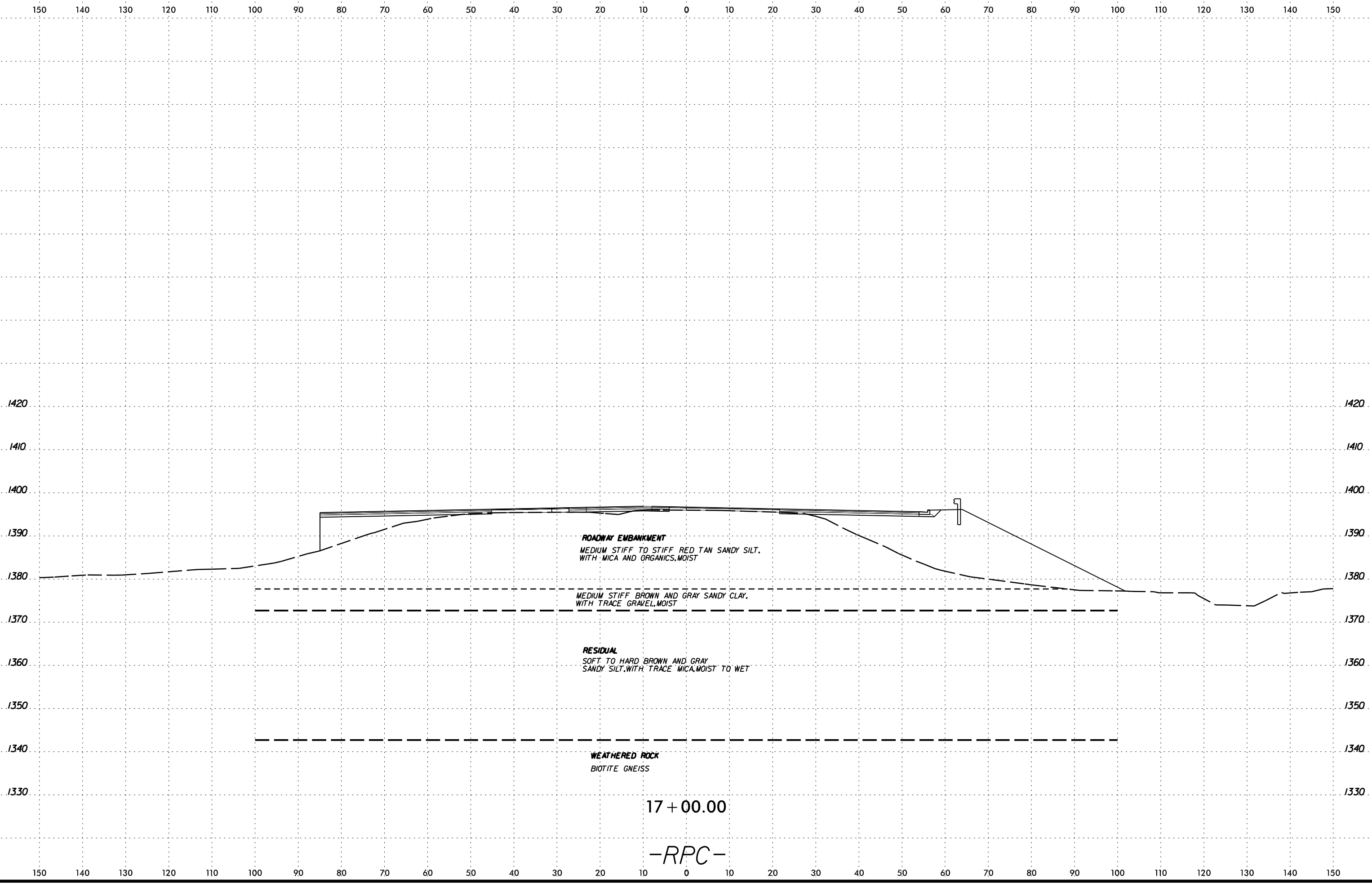
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CHECKED BY: [illegible]
SCALE: [illegible]

6/23/16



DATE: 6/23/16
DRAWN BY: [illegible]
CHECKED BY: [illegible]
SCALE: AS SHOWN

6/23/16



ROADWAY EMBANKMENT
 MEDIUM STIFF TO STIFF RED TAN SANDY SILT,
 WITH MICA AND ORGANICS, MOIST

MEDIUM STIFF BROWN AND GRAY SANDY CLAY,
 WITH TRACE GRAVEL, MOIST

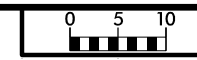
RESIDUAL
 SOFT TO HARD BROWN AND GRAY
 SANDY SILT, WITH TRACE MICA, MOIST TO WET

WEATHERED ROCK
 BIOTITE GNEISS

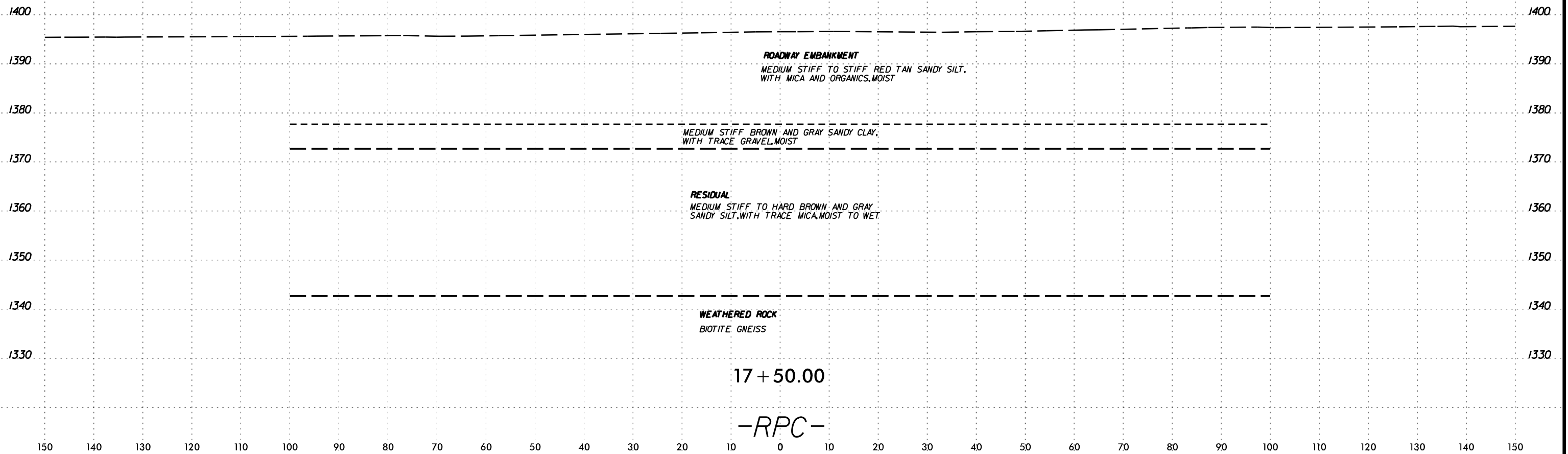
17 + 00.00

-RPC-

6/23/16
 17 + 00.00
 -RPC-
 17 + 00.00
 6/23/16

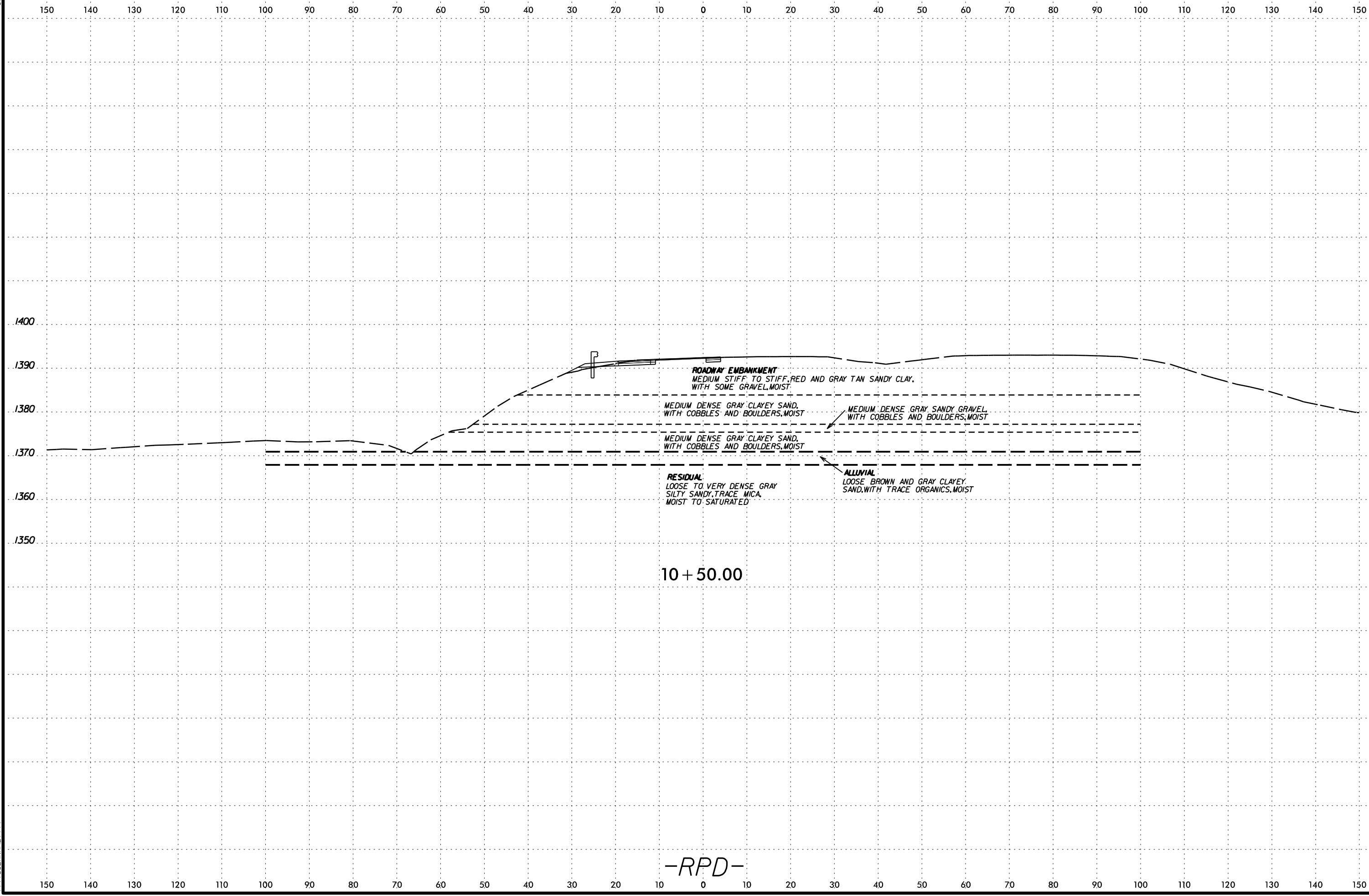


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 CHECKED BY: [unreadable]
 PROJECT: U-5818
 SHEET: 46

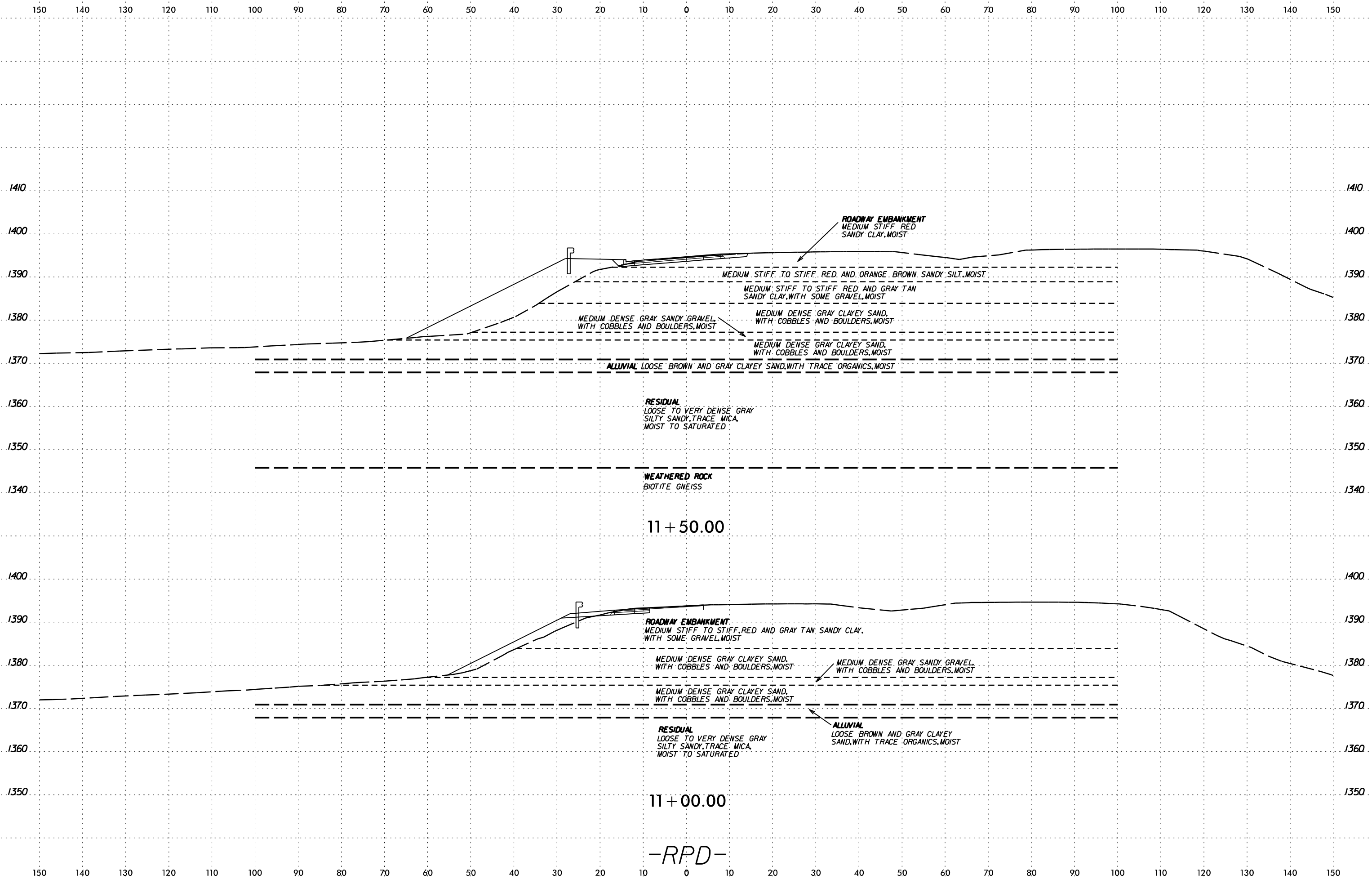
6/23/16



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DATE: 6/23/16
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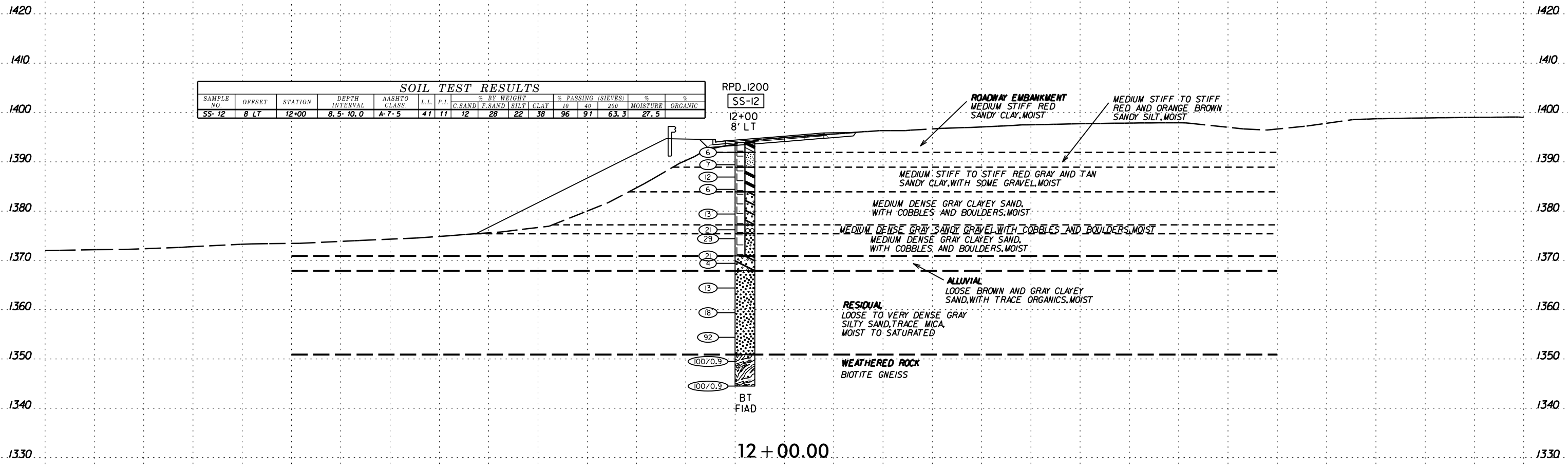
6/23/16



-RPD-

SECTION 11+00.00 TO 11+50.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-12	8' LT	12+00	8.5-10.0	A-7.5	41	11	12	28	22	38	96	91	63.3	27.5	

RPD-1200
SS-12
12+00
8' LT

ROADWAY EMBANKMENT
MEDIUM STIFF RED SANDY CLAY, MOIST

MEDIUM STIFF TO STIFF RED AND ORANGE BROWN SANDY SILT, MOIST

MEDIUM STIFF TO STIFF RED, GRAY AND TAN SANDY CLAY, WITH SOME GRAVEL, MOIST

MEDIUM DENSE GRAY CLAYEY SAND, WITH COBBLES AND BOULDERS, MOIST

MEDIUM DENSE GRAY SANDY GRAVEL WITH COBBLES AND BOULDERS, MOIST
MEDIUM DENSE GRAY CLAYEY SAND, WITH COBBLES AND BOULDERS, MOIST

ALLUVIAL
LOOSE BROWN AND GRAY CLAYEY SAND, WITH TRACE ORGANICS, MOIST

RESIDUAL
LOOSE TO VERY DENSE GRAY SILTY SAND, TRACE MICA, MOIST TO SATURATED

WEATHERED ROCK
BIOTITE GNEISS

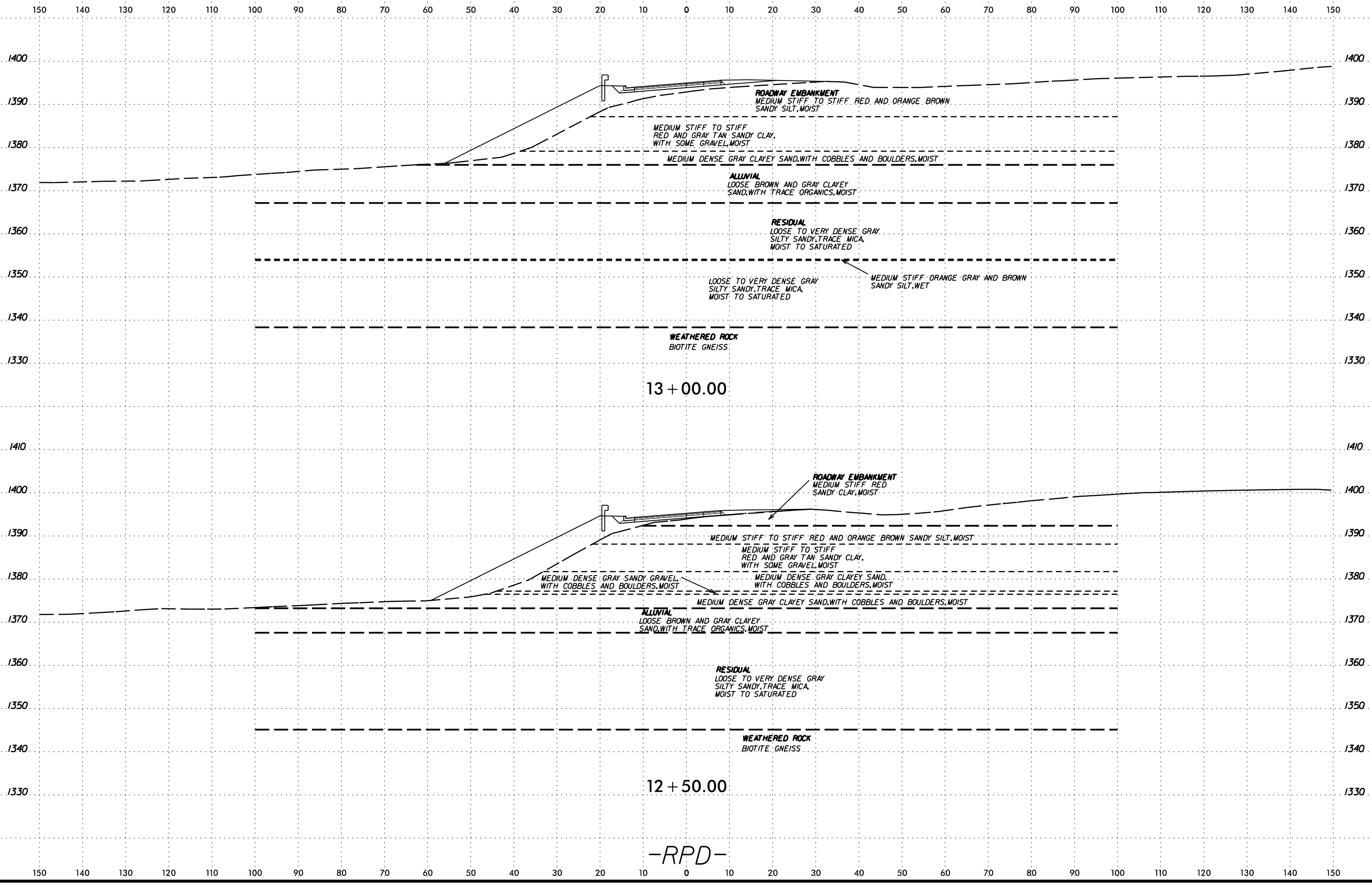
BT FIAD

12 + 00.00

-RPD-

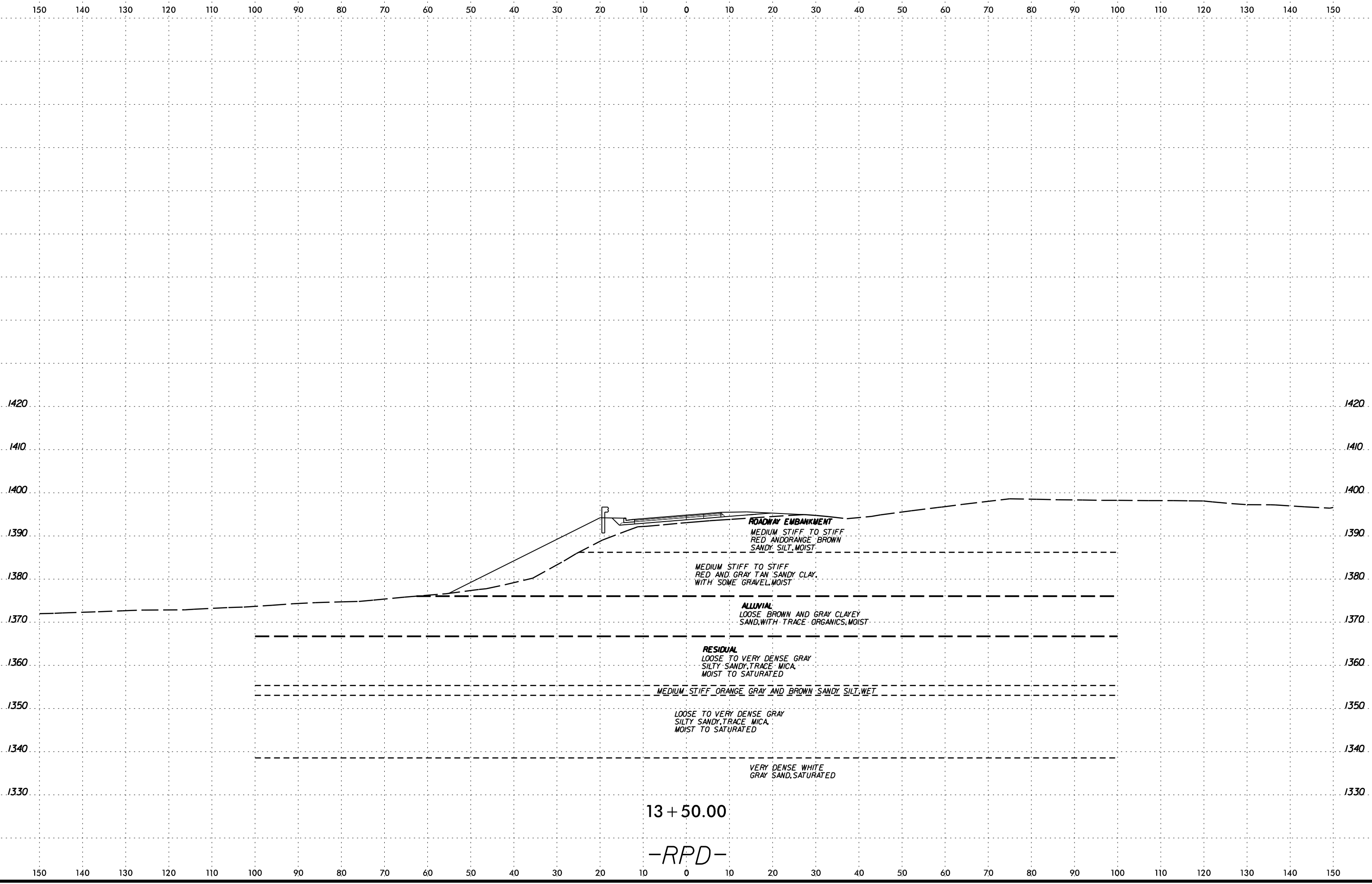
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6/23/16
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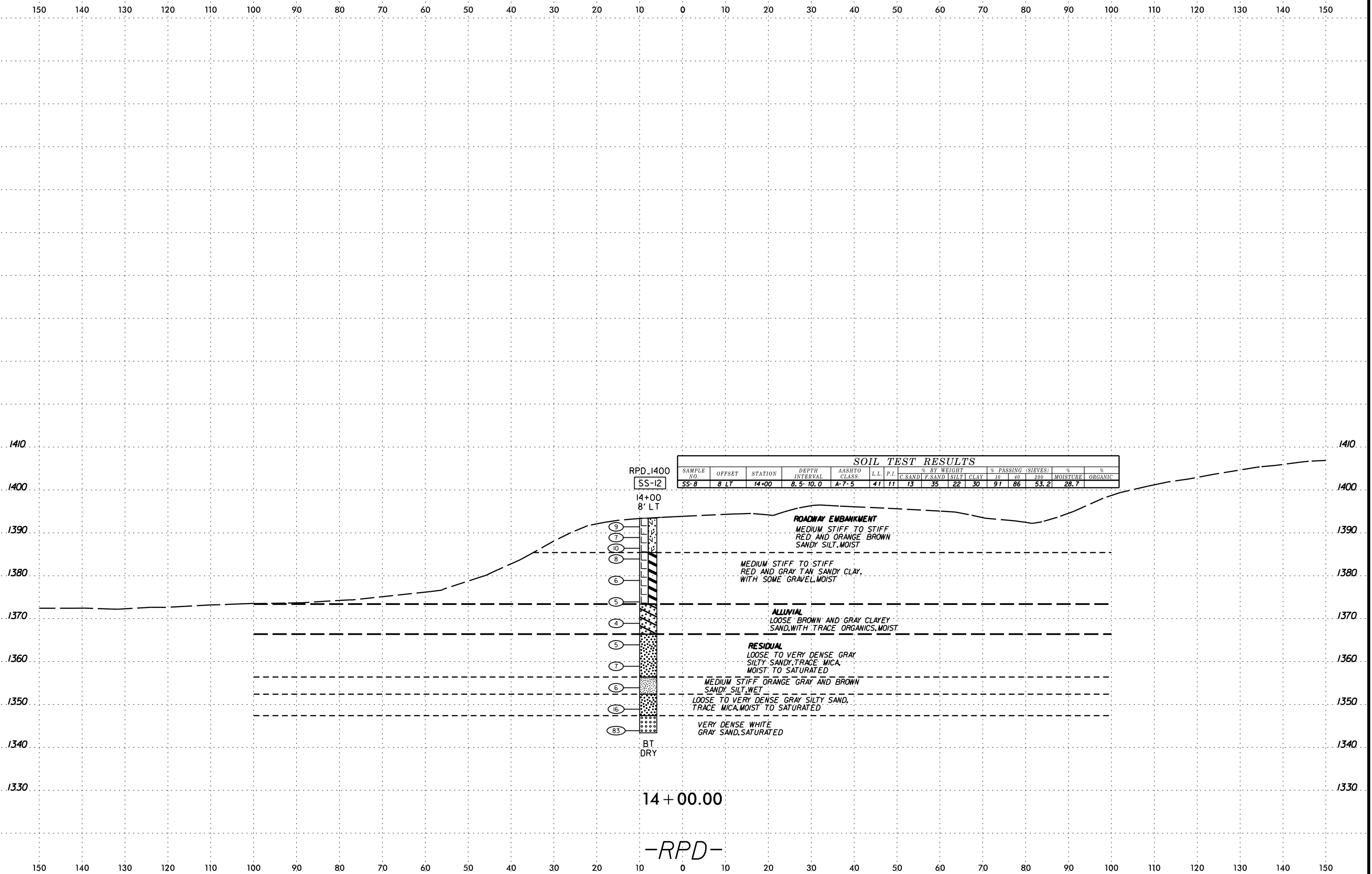
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CUSTOMER: CONSTRUCTION SERVICES



DATE: 6/23/16
 DRAWN BY: [illegible]
 CHECKED BY: [illegible]
 PROJECT: U-5818

6/23/16



SOIL TEST RESULTS														
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)		% MOISTURE	% ORGANIC
							C SAND	F SAND	SILT	CLAY	10	40		
SS-8	8 LT	14+00	8.5'-10.0'	A-7-5	41	11	13	35	22	30	91	86	53.2	28.7

RPD_1400
SS-12

14+00
8' LT

ROADWAY EMBANKMENT
MEDIUM STIFF TO STIFF
RED AND ORANGE BROWN
SANDY SILT, MOIST

MEDIUM STIFF TO STIFF
RED AND GRAY TAN SANDY CLAY,
WITH SOME GRAVEL, MOIST

ALLUVIAL
LOOSE, BROWN AND GRAY CLAYEY
SAND, WITH TRACE ORGANICS, MOIST

RESIDUAL
LOOSE TO VERY DENSE GRAY
SILTY SANDY, TRACE MICA,
MOIST TO SATURATED

MEDIUM STIFF ORANGE GRAY AND BROWN
SANDY SILT, WET

LOOSE TO VERY DENSE GRAY SILTY SAND,
TRACE MICA, MOIST TO SATURATED

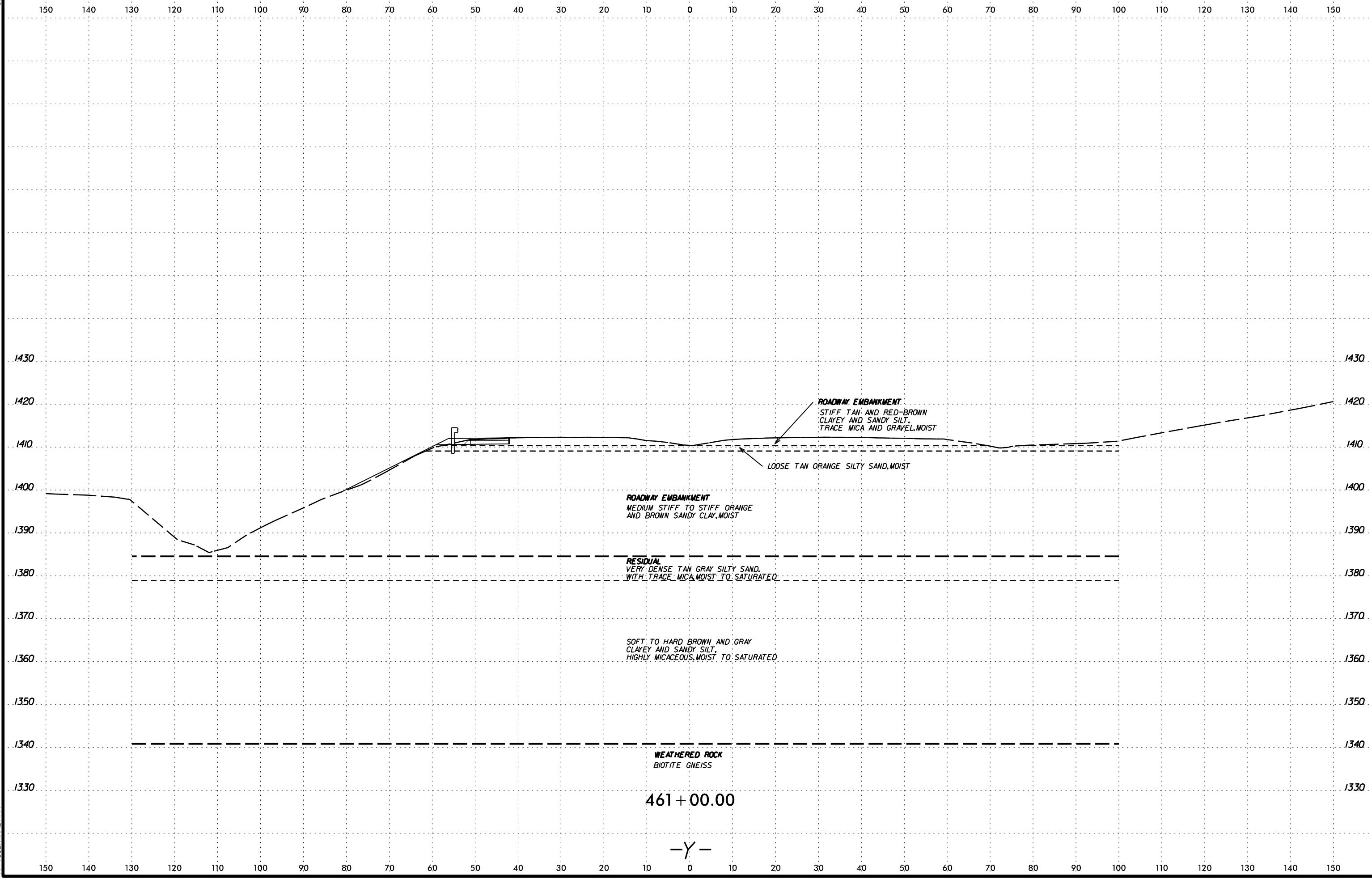
VERY DENSE WHITE
GRAY SAND, SATURATED

BT
DRY

14 + 00.00

-RPD-

6/23/16



ROADWAY EMBANKMENT
 STIFF TAN AND RED-BROWN
 CLAYEY AND SANDY SILT,
 TRACE MICA AND GRAVEL, MOIST

LOOSE TAN ORANGE SILTY SAND, MOIST

ROADWAY EMBANKMENT
 MEDIUM STIFF TO STIFF ORANGE
 AND BROWN SANDY CLAY, MOIST

RESIDUAL
 VERY DENSE TAN GRAY SILTY SAND,
 WITH TRACE MICA, MOIST TO SATURATED

SOFT TO HARD BROWN AND GRAY
 CLAYEY AND SANDY SILT,
 HIGHLY MICACEOUS, MOIST TO SATURATED

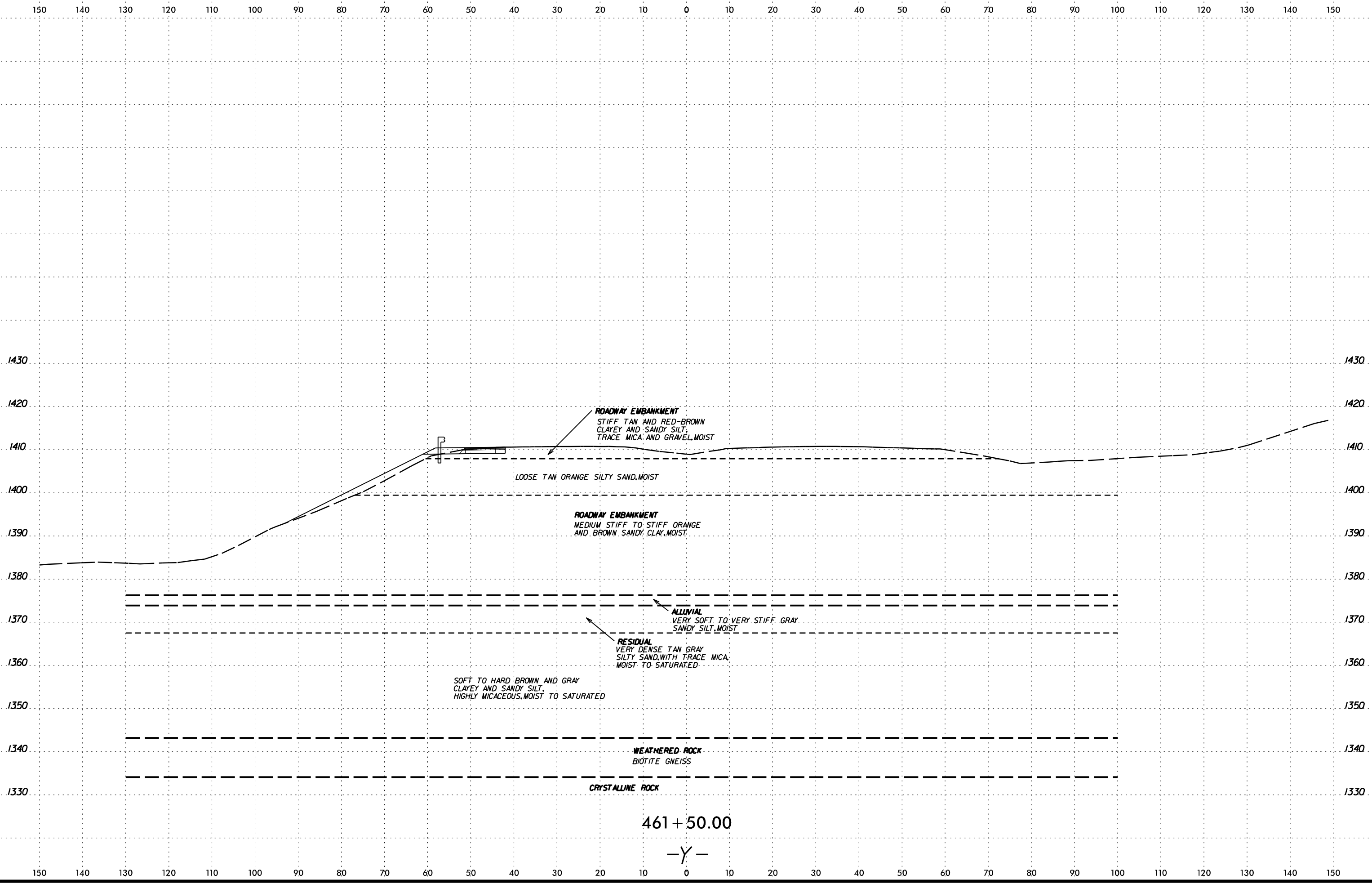
WEATHERED ROCK
 BIOTITE GNEISS

461+00.00

-Y-

DATE: 6/23/16
 DRAWN BY: [illegible]
 CHECKED BY: [illegible]
 PROJECT: U-5818

6/23/16



SYNTHESIS CONSULTING ENGINEERS



150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

1440 1430 1420 1410 1400 1390 1380 1370 1360 1350 1340 1330 1320

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)		% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	200		
SS-183	51 LT	462+06	28.5-29.5	A-7-5	54	24	7	20	20	53	96	93	74.0	35.0
SS-184	51 LT	462+06	33.5-35.0	A-4	40	10	5	16	59	20	100	98	82.1	36.7

Y_46211A
462+06
51' LT
SS-183
SS-184

ROADWAY EMBANKMENT
STIFF TAN AND RED-BROWN
CLAYEY AND SANDY SILT.
TRACE MICA AND GRAVEL, MOIST

LOOSE TAN ORANGE SILTY SAND, MOIST

SOFT TO STIFF ORANGE AND
BROWN SANDY AND SILTY CLAY, MOIST

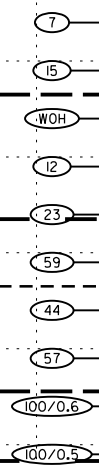
ALLUVIAL
VERY SOFT TO VERY STIFF GRAY
SANDY SILT, MOIST

RESIDUAL
VERY DENSE TAN GRAY
SILTY SAND, WITH TRACE MICA,
MOIST TO SATURATED

SOFT TO HARD BROWN AND GRAY
CLAYEY AND SANDY SILT,
HIGHLY MICACEOUS,
MOIST TO SATURATED

WEATHERED ROCK
BIOTITE GNEISS

CRYSTALLINE ROCK
BIOTITE GNEISS



BT
DRY

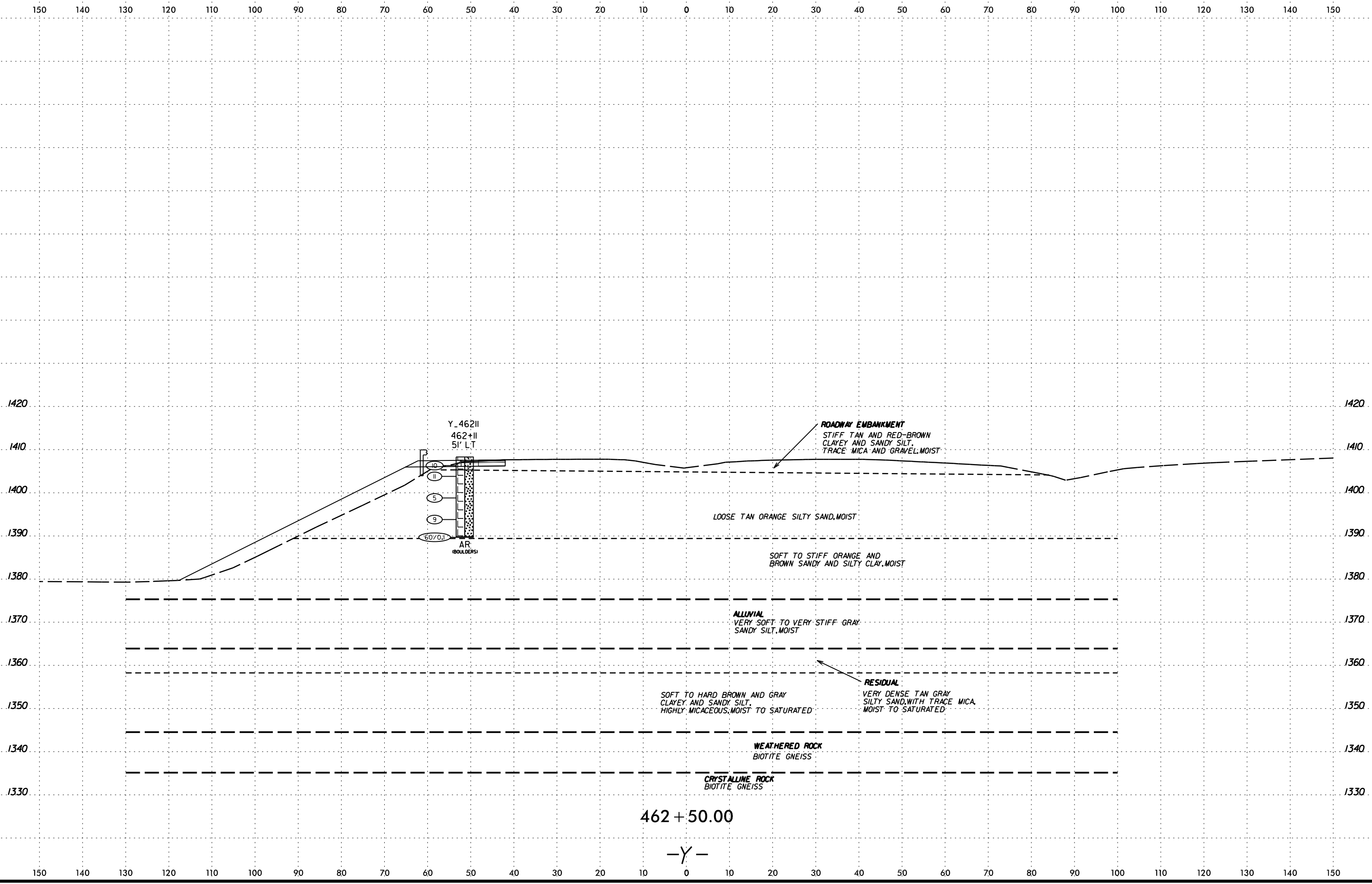
462 + 00.00

-Y-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

SYNTHETIC
CONCRETE
REINFORCEMENT
STAIN
RESISTANT
PAINT
FOR
CONCRETE
SURFACES
AND
STRUCTURAL
STEEL

6/23/16



SCHEMATIC CROSS SECTION
DATE: 6/23/16
DRAWN BY: J. BRYAN

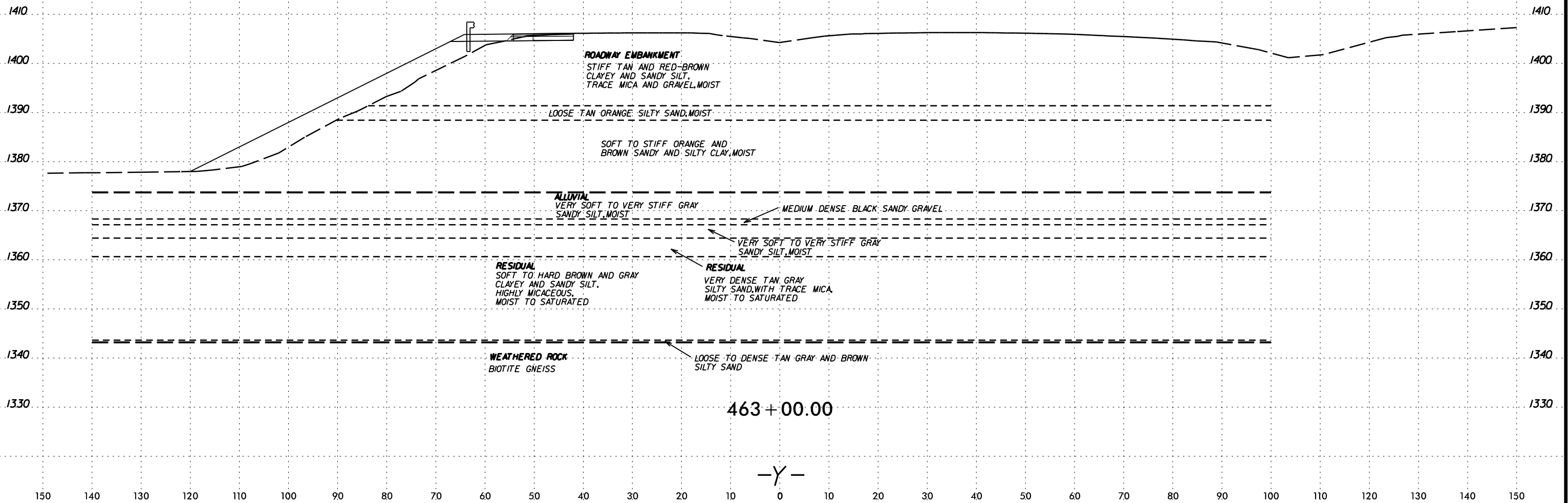
6/23/16



PROJ. REFERENCE NO.
U-5818

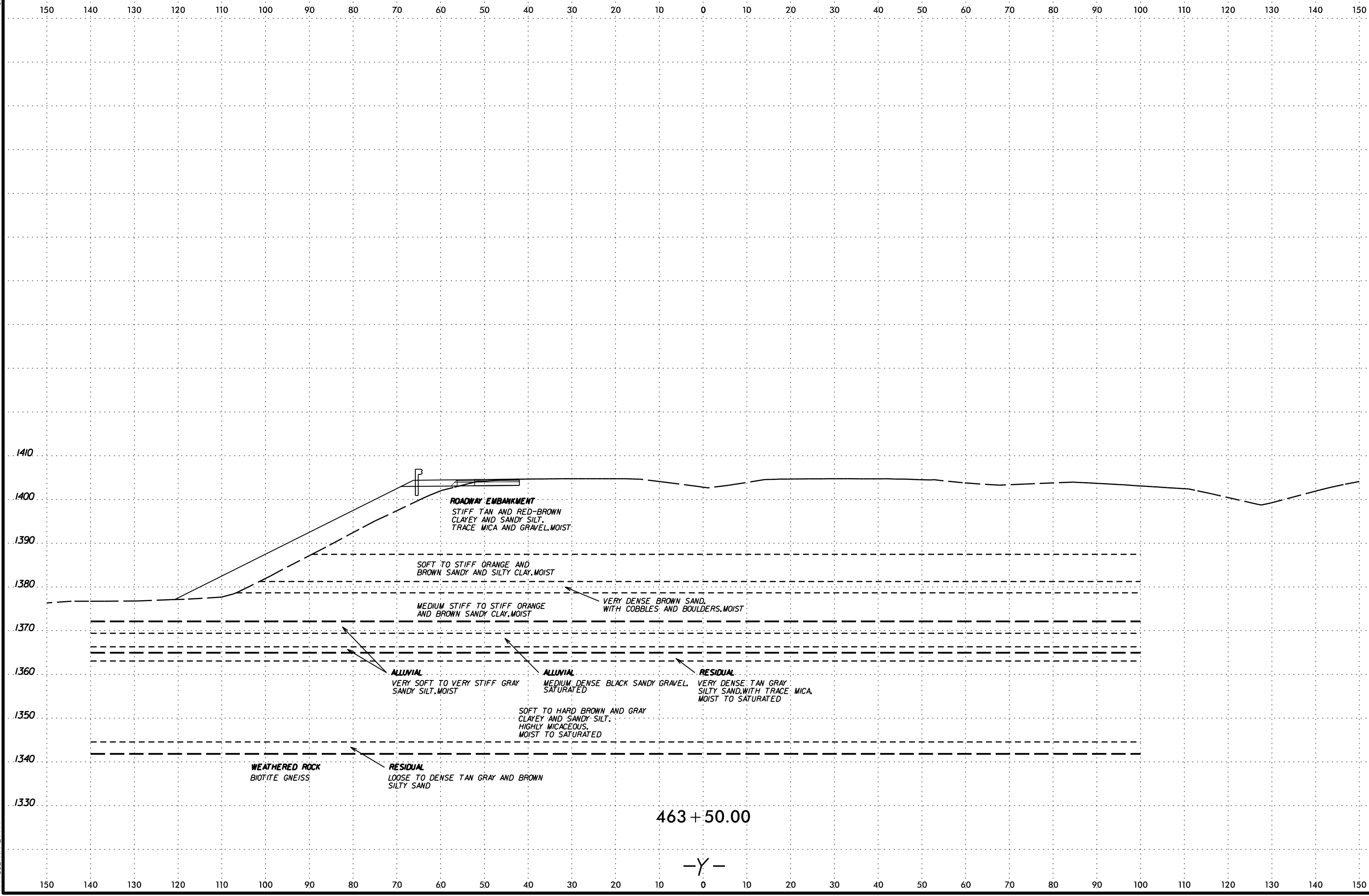
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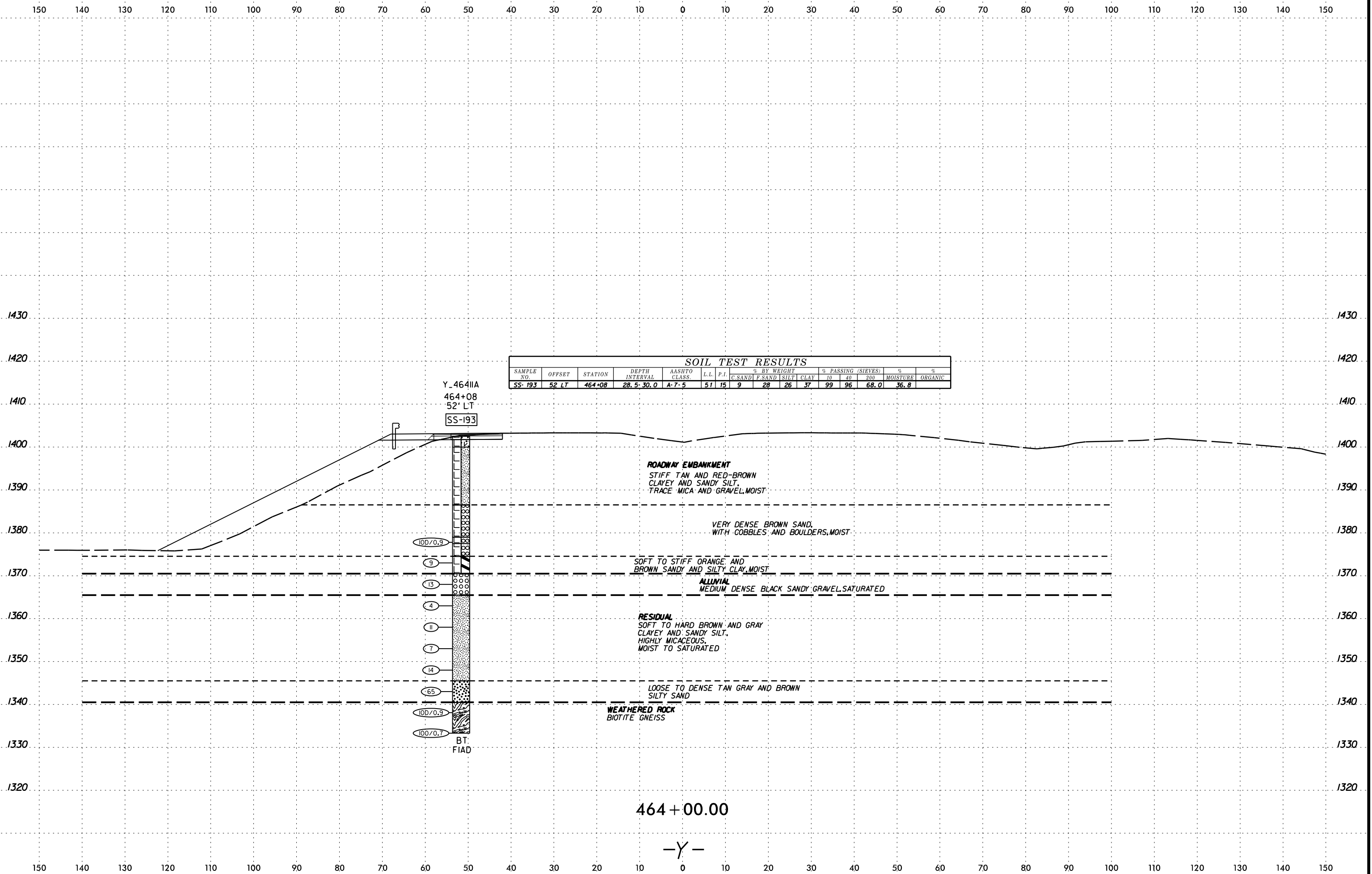
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SCALE: AS SHOWN
PROJECT: U-5818
SHEET: 57

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



DATE: 6/23/16
DRAWN BY: [illegible]
CHECKED BY: [illegible]
SCALE: AS SHOWN

6/23/16



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)		% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40		
SS-193	52 LT	464+08	28.5-30.0	A-7-5	51	15	9	28	26	37	99	96	68.0	36.8

Y_46411A
464+08
52' LT
SS-193

ROADWAY EMBANKMENT
STIFF TAN AND RED-BROWN
CLAYEY AND SANDY SILT,
TRACE MICA AND GRAVEL, MOIST

VERY DENSE BROWN SAND,
WITH COBBLES AND BOULDERS, MOIST

SOFT TO STIFF ORANGE AND
BROWN SANDY AND SILTY CLAY, MOIST

ALLUVIAL
MEDIUM DENSE BLACK SANDY GRAVEL, SATURATED

RESIDUAL
SOFT TO HARD BROWN AND GRAY
CLAYEY AND SANDY SILT,
HIGHLY MICACEOUS,
MOIST TO SATURATED

LOOSE TO DENSE TAN GRAY AND BROWN
SILTY SAND

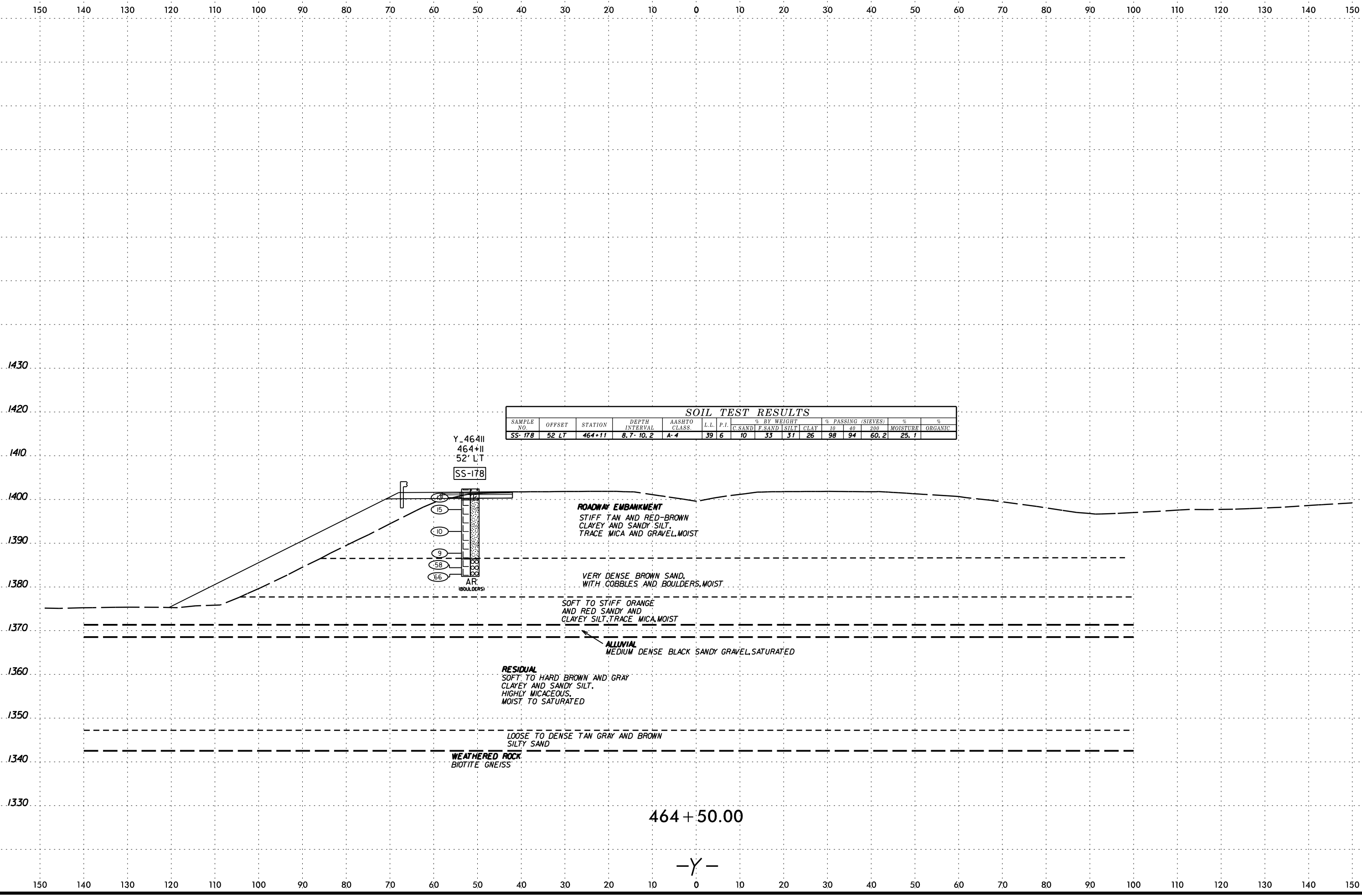
WEATHERED ROCK
BIOTITE GNEISS

- 100/0.9
- 9
- 13
- 4
- 11
- 7
- 14
- 65
- 100/0.9
- 100/0.7

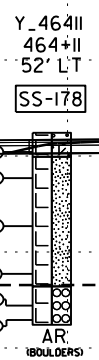
BT.
FIAD

464 + 00.00

-Y-



SOIL TEST RESULTS														
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)		% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40		
SS-178	52 LT	464+11	8.7-10.2	A-4	39	6	10	33	31	26	98	94	60.2	25.1

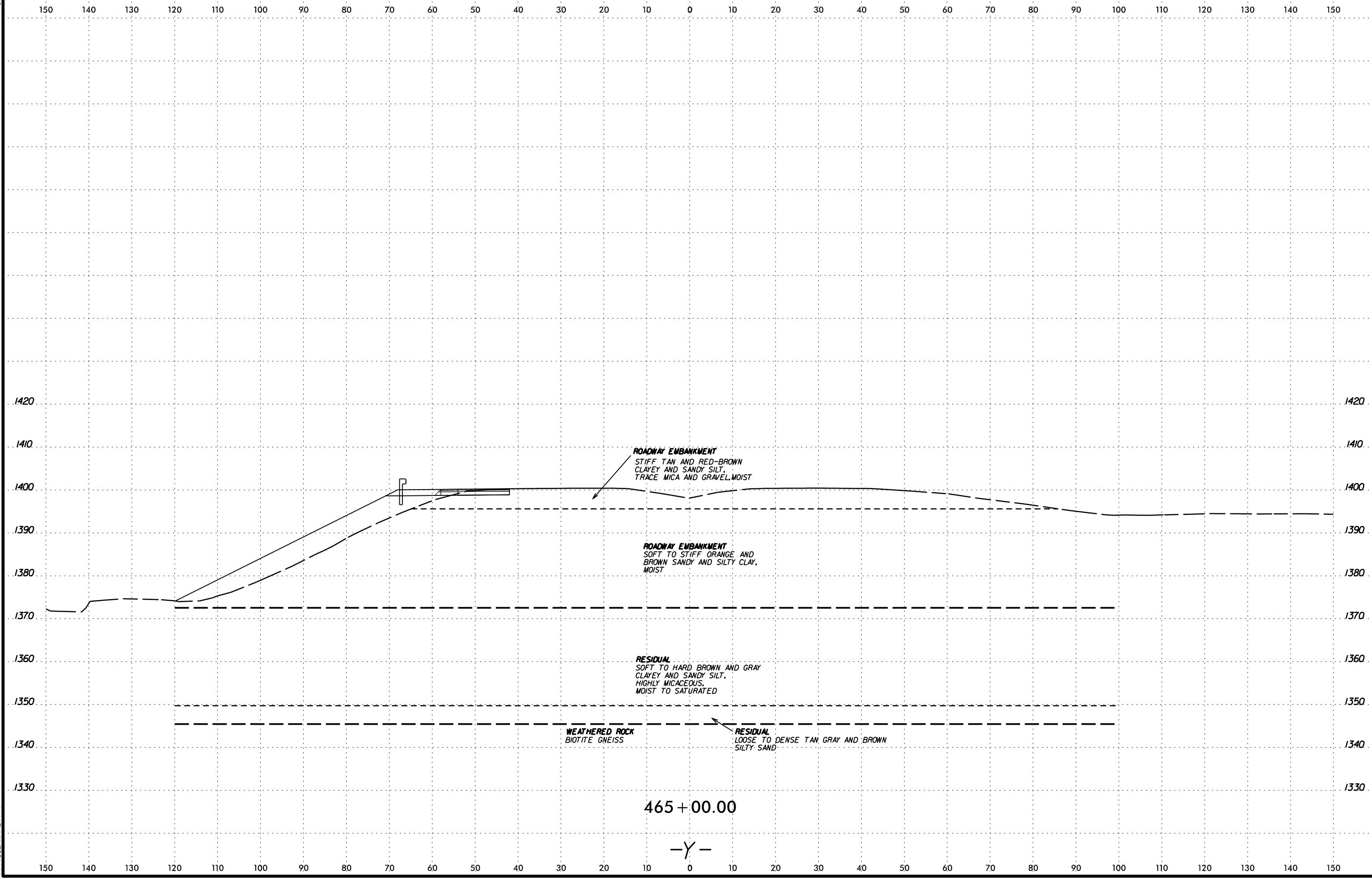


464 + 50.00

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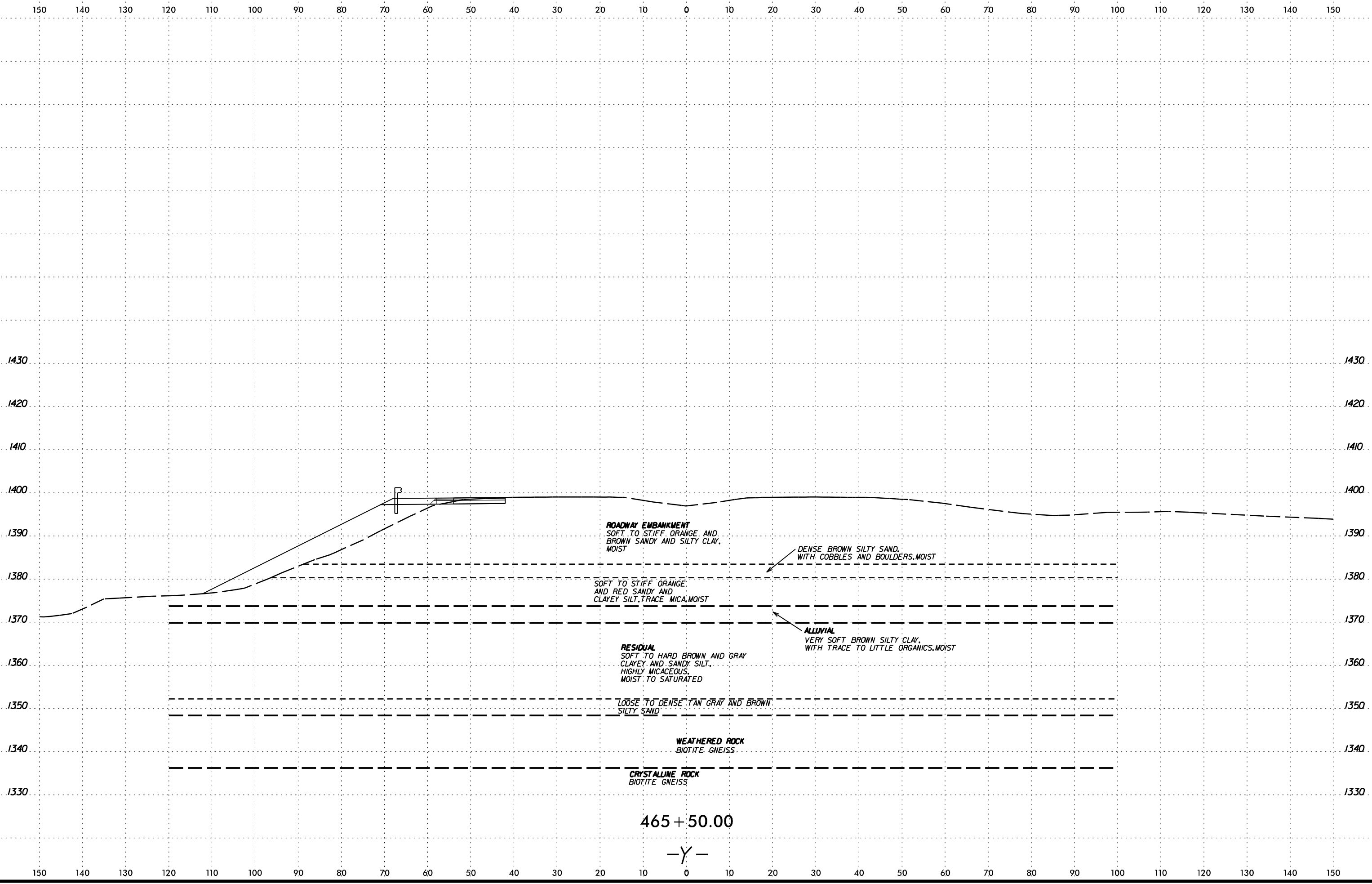
DATE PLOTTED: 6/23/16

6/23/16

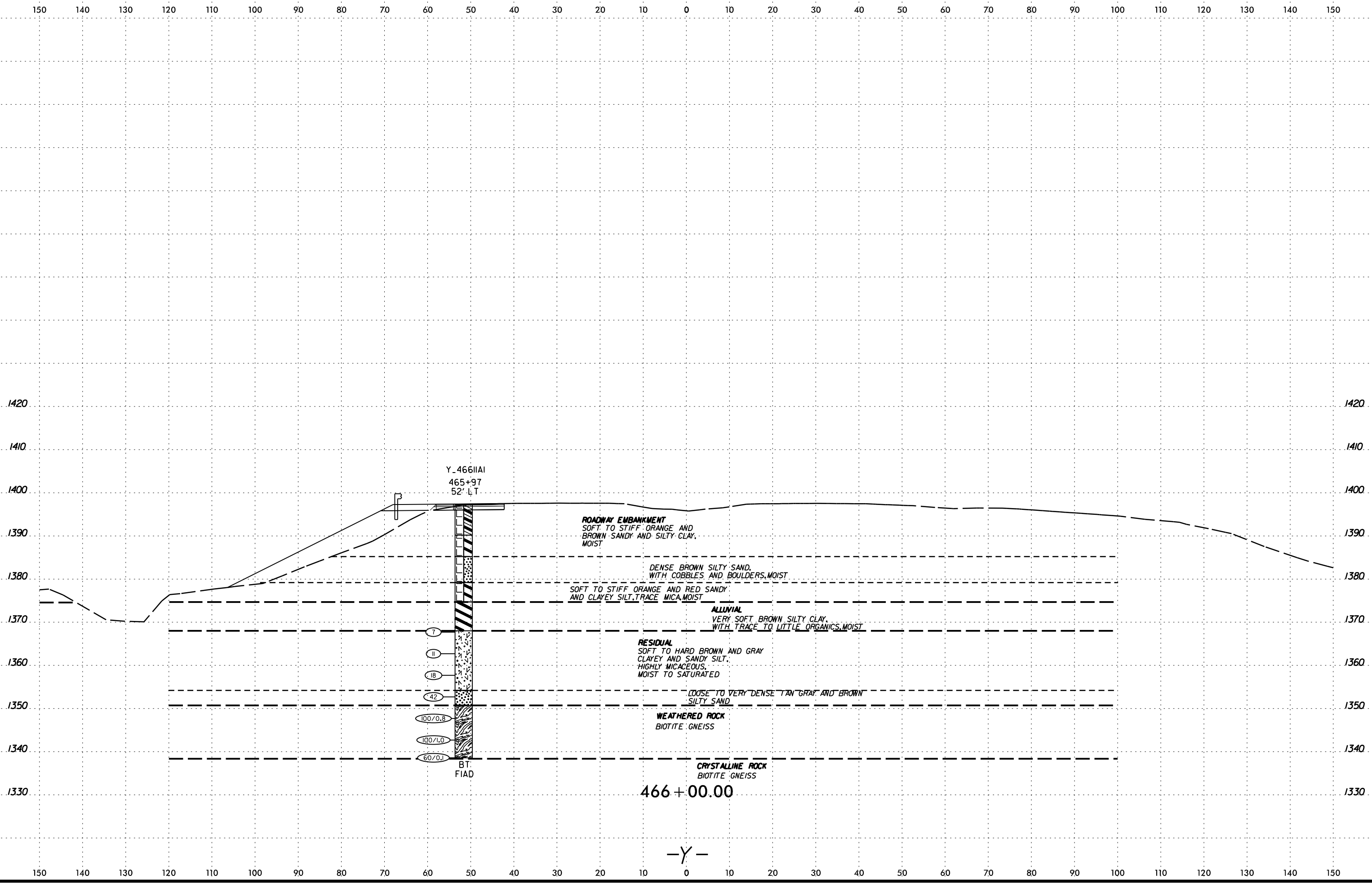


SECTION ON
LINE
OF
ROADWAY

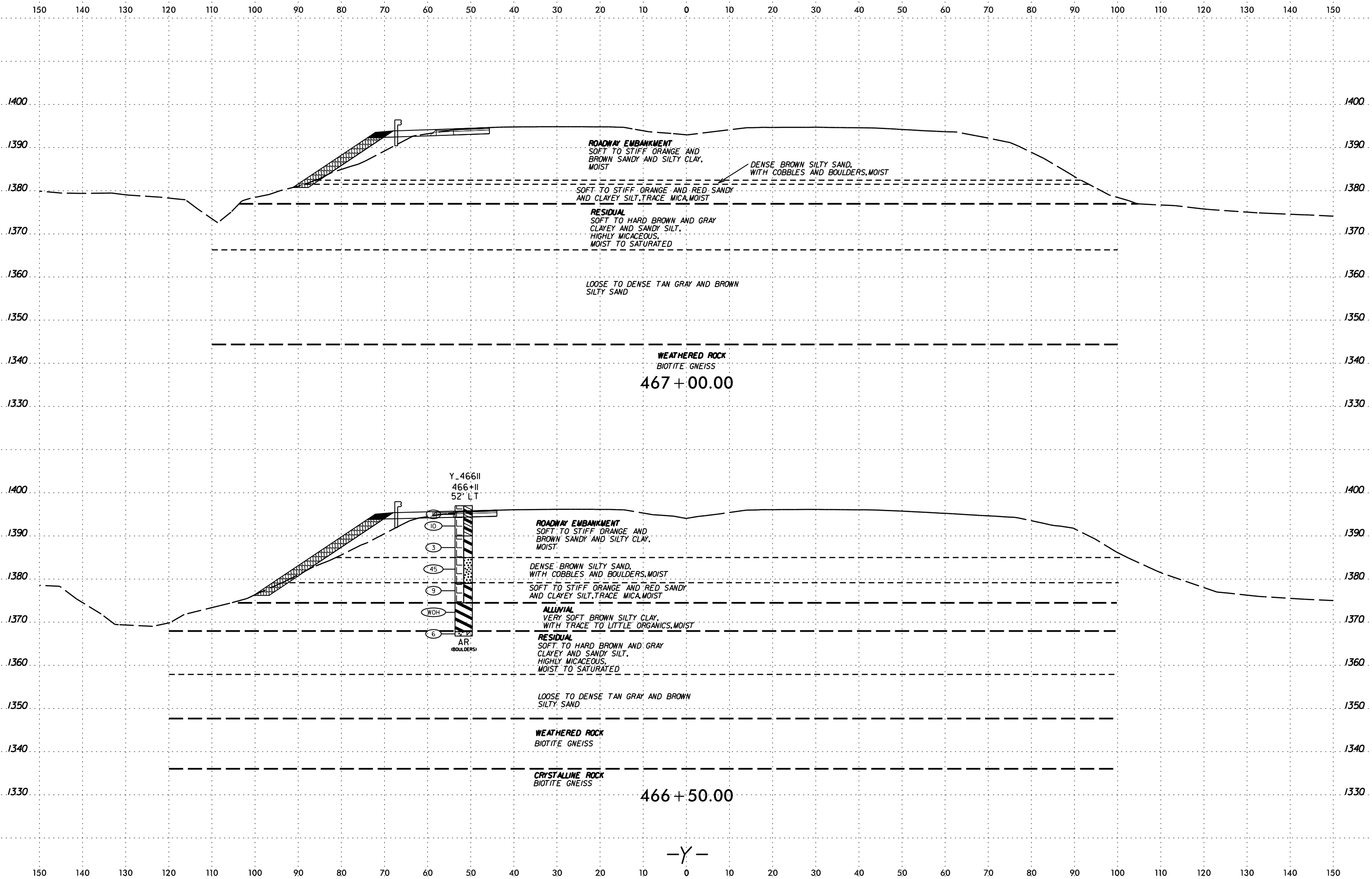
6/23/16



SECTION ON CENTERLINE

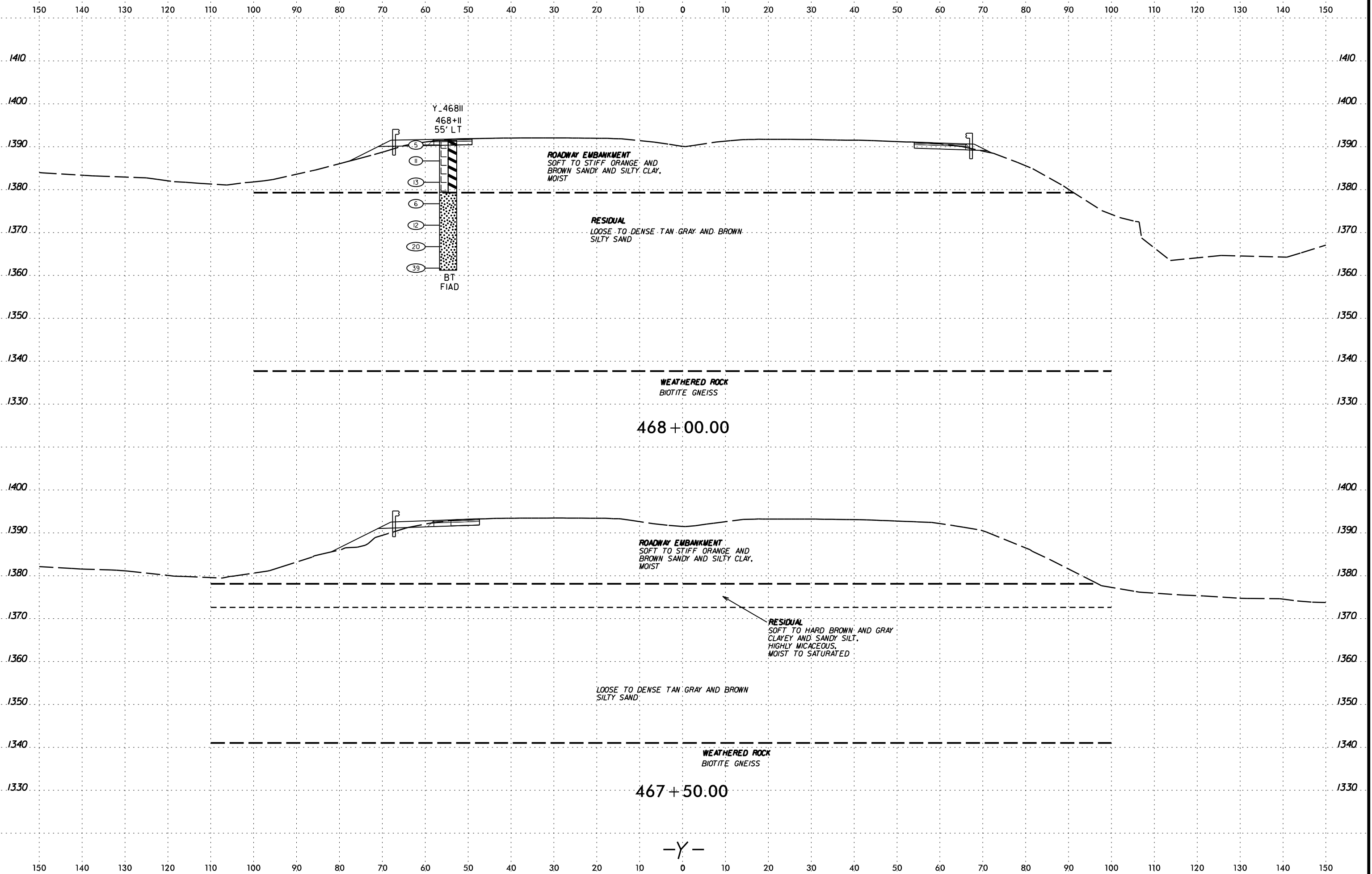


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DRAWN BY: [illegible]
CHECKED BY: [illegible]
SCALE: AS SHOWN



DATE: 6/23/16
DRAWN BY: [illegible]
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SCALE: AS SHOWN

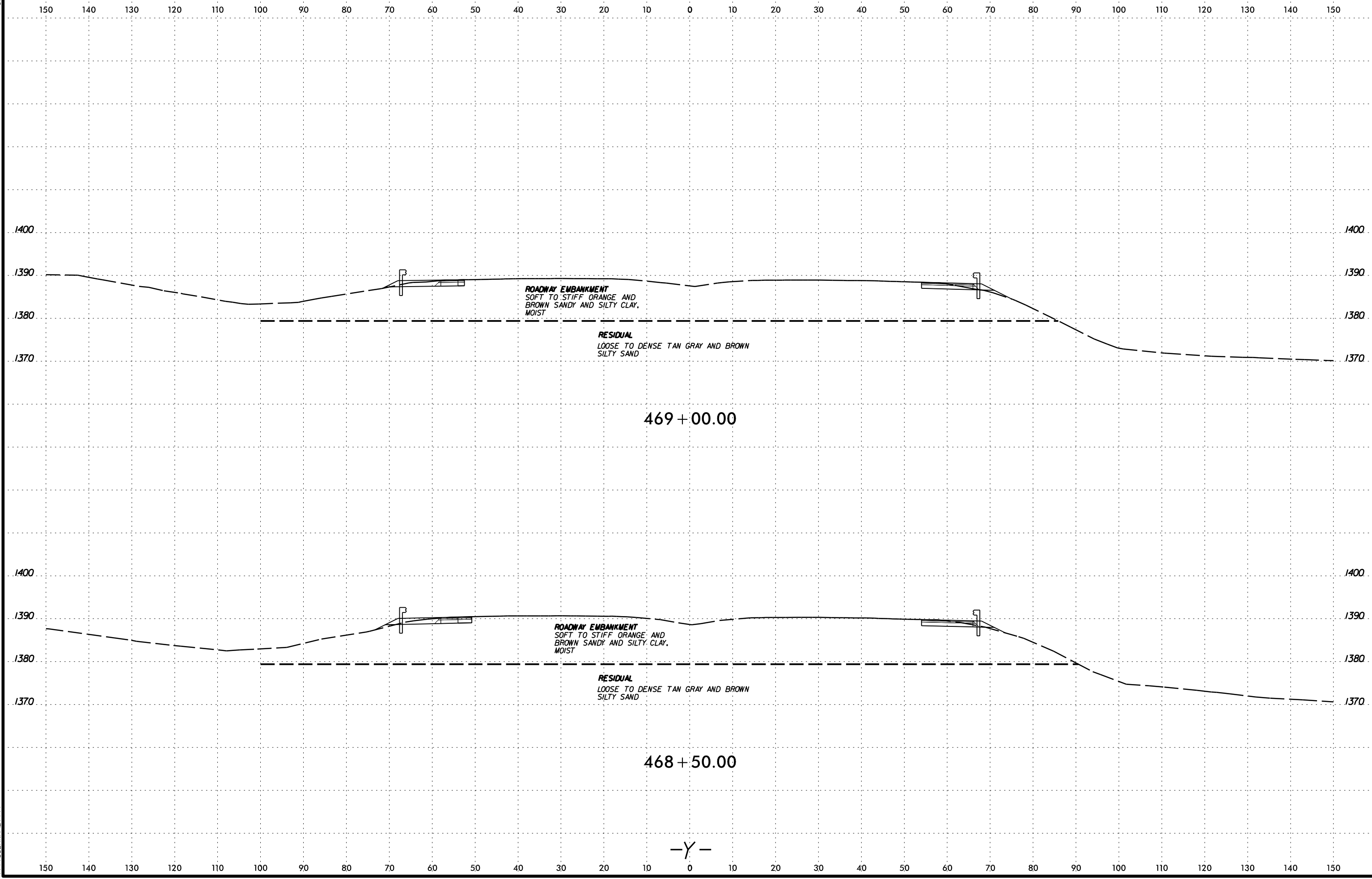
-Y-



SECTION CONSTRUCTION
BY J. J. BRYAN

-Y-

6/23/16



DATE: 6/23/16
DRAWN BY: J. W. BRYAN
CHECKED BY: J. W. BRYAN
SCALE: AS SHOWN
SHEET NO.: 66
PROJECT: U-5818

-Y-

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

SUBSURFACE INVESTIGATION

*APPENDIX A
LABORATORY RESULTS*

REFERENCE: U-5818

PROJECT: 44390.1.1

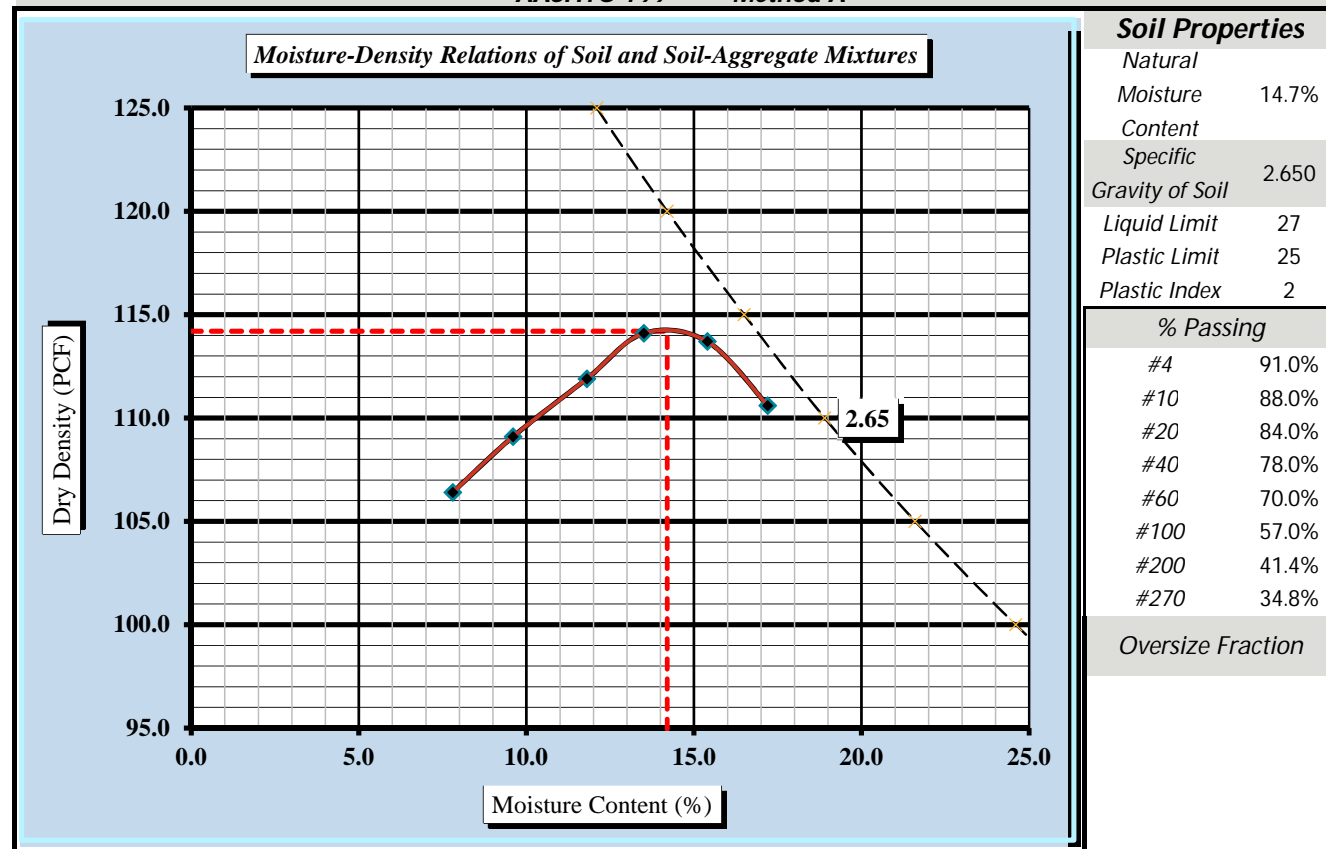
MOISTURE - DENSITY REPORT



Quality Assurance

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273			
S&ME Project #:	6235-17-016	Report Date:	1/28/18
Project Name:	Sugar Hill Road & Bridge Marion, NC	Test Date(s):	1/3-10/18
Client Name:	WEI		
Client Address:	Raleigh, NC		
Boring #:	L-1400	Sample #:	Bulk
		Sample Date:	10/26/2017
Location:	14+36	Offset:	20 LT
		Depth:	0-10'
Sample Description:	Gray-Red-Tan Sandy Silt A-4		

Maximum Dry Density 114.2 PCF. Optimum Moisture Content 14.2%
 AASHTO T99 - - Method A



Moisture-Density Curve Displayed: Fine Fraction Corrected for Oversize Fraction (ASTM D 4718)
 Sieve Size used to separate the Oversize Fraction: #4 Sieve 3/8 inch Sieve 3/4 inch Sieve
 Mechanical Rammer Manual Rammer Moist Preparation Dry Preparation
 References / Comments / Deviations: ND: Not Determined

AASHTO T 99: Moisture-Density Relations of Soil Using a 5.5 Lb. Rammer and a 12" Drop

<u>Rob Kral</u> Technical Responsibility	 Signature	<u>Project Manager</u> Position	<u>1/28/2018</u> Date
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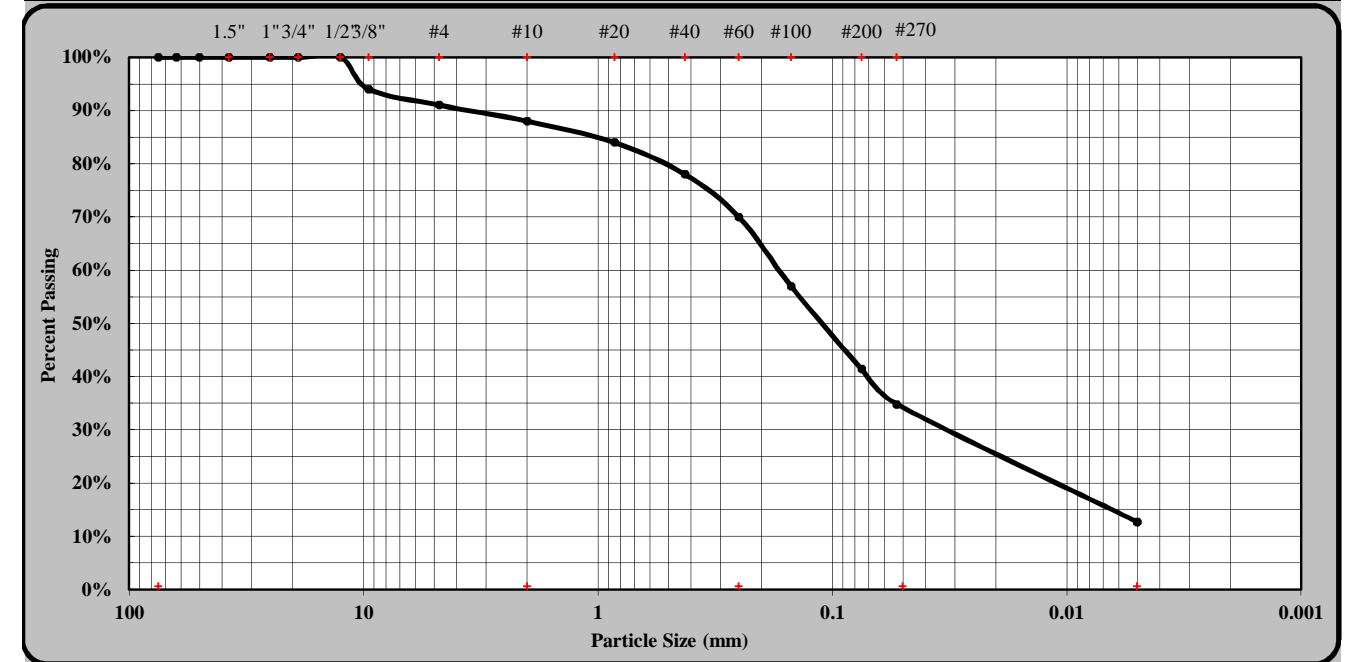
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Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT



S&ME, Inc. 9751 Southern Pine Blvd., Charlotte, NC 28273			
Project #:	6235-17-016	Report Date:	1/28/18
Project Name:	Sugar Hill Road, Marion, NC	Test Date(s):	1/4-8/18
State Project #:	4390.1.1	F.A. Project No: NA	TIP NO: U-5818
Client Name:	WEI		
Address:	Raleigh, NC		
Alignment	L-1400	Sample #:	Bulk
		Sample Date:	10/26/17
Station #:	14+36	Offset:	20 LT
		Depth (ft):	0-10'
Sample Description:	Gray-Red-Tan Sandy Silt A-4 (0)		



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm	
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm	
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm	

Maximum Particle Size	3/8"	Coarse Sand	18%	Silt	22%
Gravel	12%	Fine Sand	35%	Clay	13%
Apparent Relative Density	ND	Moisture Content	14.7%	% Passing #200	41.4%
Liquid Limit	27	Plastic Limit	25	Plastic Index	2

Coarse Sand	20%	Fine Sand	41%	Silt	25%	Clay	14%
-------------	-----	-----------	-----	------	-----	------	-----

Description of Sand & Gravel Particles: Rounded Angular
 Hard & Durable Soft Weathered & Friable

References / Comments / Deviations: ND=Not Determined.

<u>Karen Warner</u> Technician Name	<u>118-06-0305</u> Certification No.	<u>Laboratory Technician</u> Position	<u>1/28/2018</u> Date
<u>Rob Kral, P.E.</u> Technical Responsibility	 Signature	<u>Project Manager</u> Position	<u>1/28/2018</u> Date

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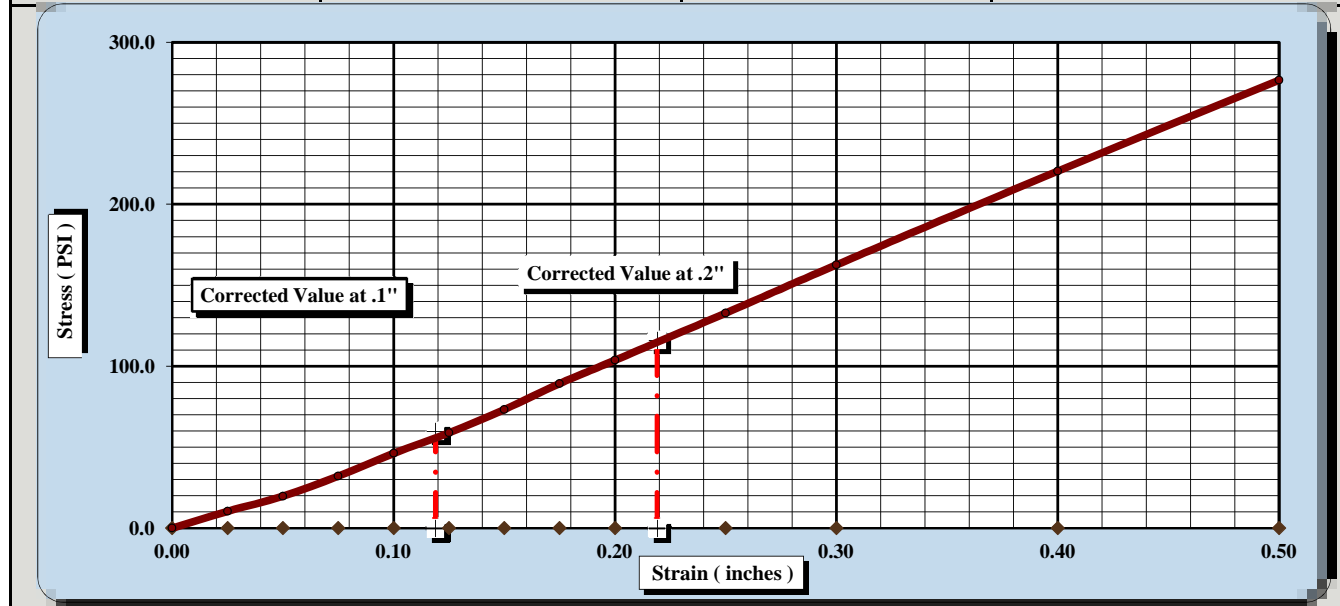
**CBR (CALIFORNIA BEARING RATIO)
 OF LABORATORY COMPACTED SOIL**



AASHTO T 193

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273			
Project #:	6235-17-016	Report Date:	1/28/18
Project Name:	Sugar Hill Road (U-5818), Marion, NC	Test Date(s)	1/3-10/18
Client Name:	WEI		
Client Address:	Raleigh, NC		
Boring #:	L-1400	Sample #:	Bulk B
		Sample Date:	10/26/17
Location:	14+36	Offset:	20 LT
		Elevation:	0-10'
Sample Description:	Gray-Red-Tan Sandy Silt		A-4
AASHTO T99 Method A	Maximum Dry Density: 114.2 PCF	Optimum Moisture Content:	14.2%
Line 20: Use an alternate description here if applicable		% Retained on the 3/4" sieve:	0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	4.6	CBR at 0.1 in.	6.0
CBR at 0.2 in.	6.9	CBR at 0.2 in.	7.7



CBR Sample Preparation: Performed on the fine fraction
 Grading was in accordance with the above method and compacted using the 6" diameter CBR mold.

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	56	Final Dry Density (PCF)	116.2
Initial Dry Density (PCF)	116.3	Moisture Content (top 1" after soaking)	16.0%
Moisture Content of the Compacted Specimen	14.0%	Percent Swell	0.3%
Percent Compaction	101.8%		

Soak Time: 96 Hours Surcharge Weight: 10.0 Surcharge Wt. per sq. Ft.: 50.9
 Liquid Limit: 27 Plastic Index: 2 Assumed Apparent Relative Density: 2.650

Notes/Deviations/References:

Rob Kral Project Manager 1/28/2018
 Technical Responsibility Signature Position Date

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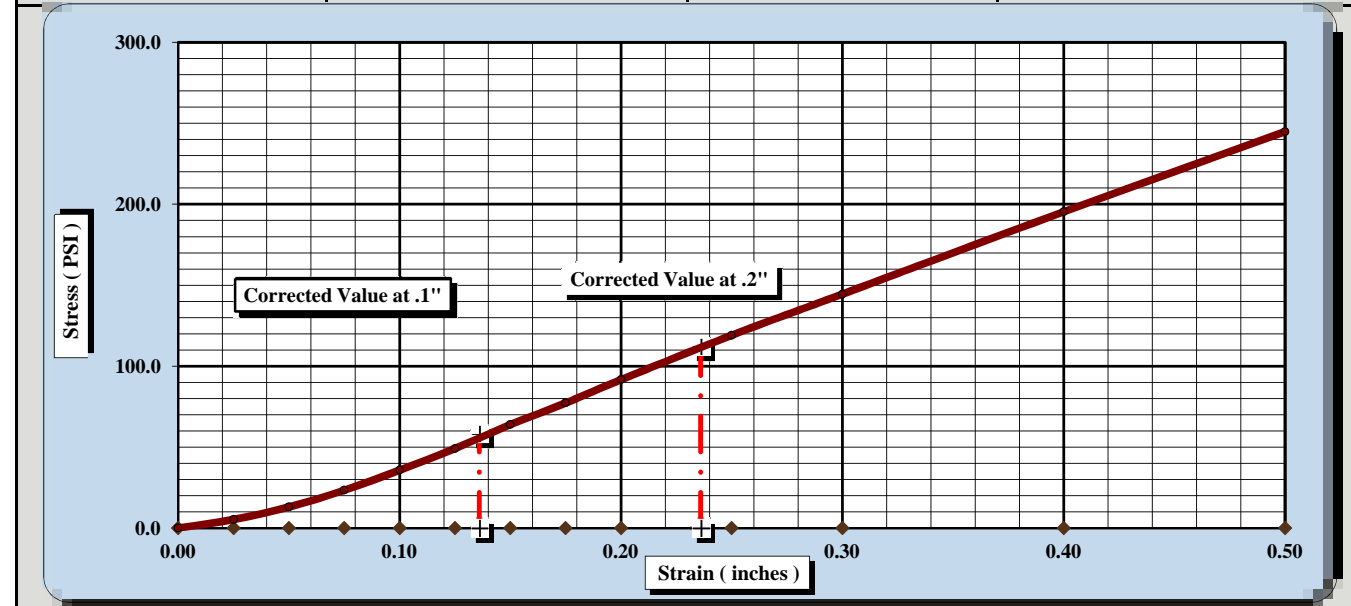
**CBR (CALIFORNIA BEARING RATIO)
 OF LABORATORY COMPACTED SOIL**



AASHTO T 193

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273			
Project #:	6235-17-016	Report Date:	1/18/18
Project Name:	Sugar Hill Road (U-5818), Marion, NC	Test Date(s)	1/3-10/18
Client Name:	WEI		
Client Address:	Raleigh, NC		
Boring #:	L-1400	Sample #:	Bulk A
		Sample Date:	10/26/17
Location:	14+36	Offset:	20 LT
		Elevation:	0-10'
Sample Description:	Gray-Red-Tan Sandy Silt		A-4
AASHTO T99 Method A	Maximum Dry Density: 114.2 PCF	Optimum Moisture Content:	14.2%
Line 20: Use an alternate description here if applicable		% Retained on the 3/4" sieve:	0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	3.6	CBR at 0.1 in.	5.8
CBR at 0.2 in.	6.1	CBR at 0.2 in.	7.5



CBR Sample Preparation: Performed on the fine fraction
 Grading was in accordance with the above method and compacted using the 6" diameter CBR mold.

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	56	Final Dry Density (PCF)	116.6
Initial Dry Density (PCF)	116.9	Moisture Content (top 1" after soaking)	15.1%
Moisture Content of the Compacted Specimen	13.8%	Percent Swell	0.4%
Percent Compaction	102.4%		

Soak Time: 96 Hours Surcharge Weight: 10.0 Surcharge Wt. per sq. Ft.: 50.9
 Liquid Limit: 27 Plastic Index: 2 Assumed Apparent Relative Density: 2.650

Notes/Deviations/References:

Rob Kral Project Manager 1/18/2018
 Technical Responsibility Signature Position Date

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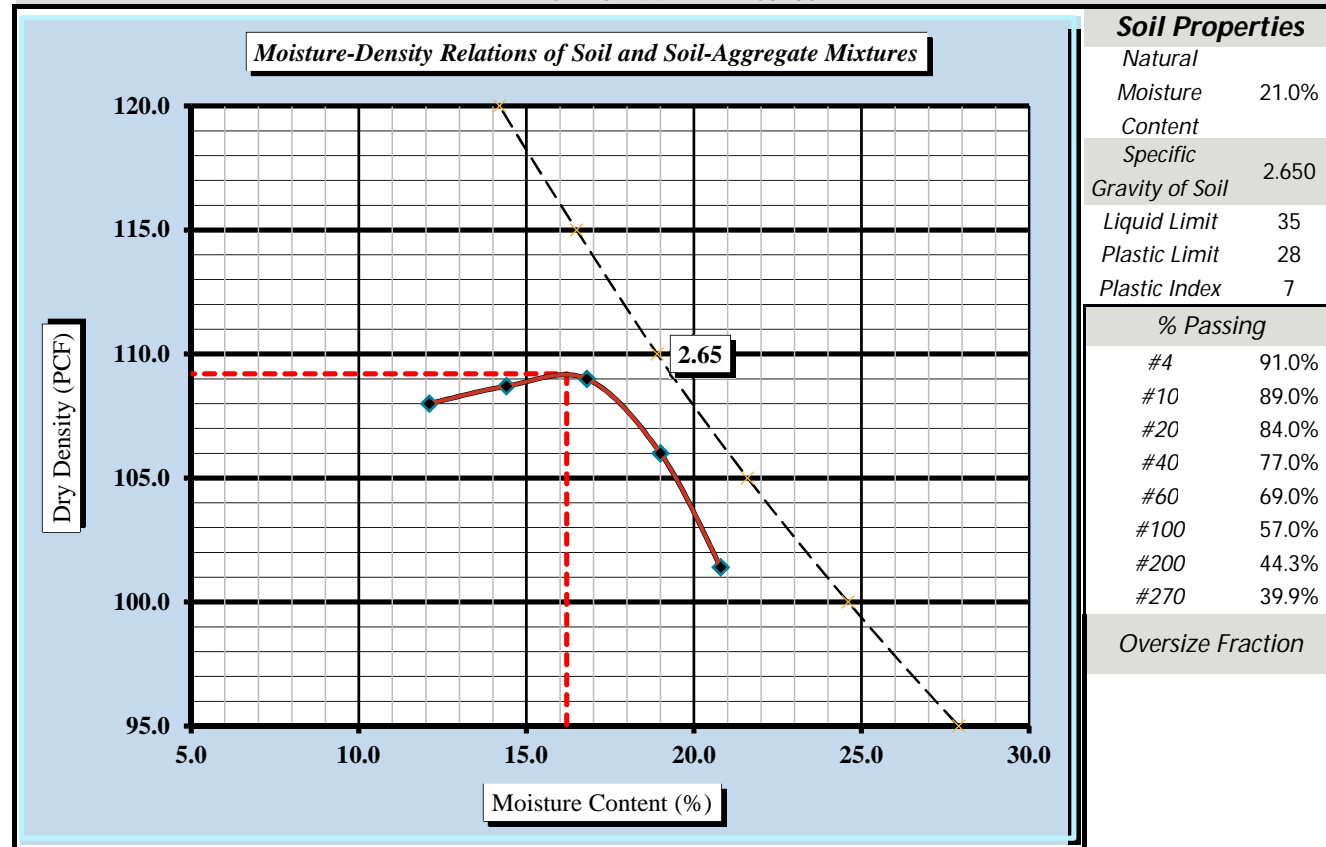
MOISTURE - DENSITY REPORT



Quality Assurance

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273			
S&ME Project #:	6235-17-016	Report Date:	1/28/18
Project Name:	Sugar Hill Road (U-5818), Marion, NC	Test Date(s):	1/3-5/18
Client Name:	WEI		
Client Address:	Raleigh, NC		
Boring #:	L-3200	Sample #:	Bulk
		Sample Date:	11/8/2017
Location:	32+00	Offset:	8 LT
		Depth:	1-7'
Sample Description:	Gray-Tan Sandy Silt A-4		

Maximum Dry Density 109.2 PCF. Optimum Moisture Content 16.2%
 AASHTO T99 - - Method A



Moisture-Density Curve Displayed: Fine Fraction Corrected for Oversize Fraction (ASTM D 4718)
 Sieve Size used to separate the Oversize Fraction: #4 Sieve 3/8 inch Sieve 3/4 inch Sieve
 Mechanical Rammer Manual Rammer Moist Preparation Dry Preparation
 References / Comments / Deviations: ND: Not Determined

AASHTO T 99: Moisture-Density Relations of Soil Using a 5.5 Lb. Rammer and a 12" Drop

Rob Kral Technical Responsibility	 Signature	Project Manager Position	1/28/2018 Date
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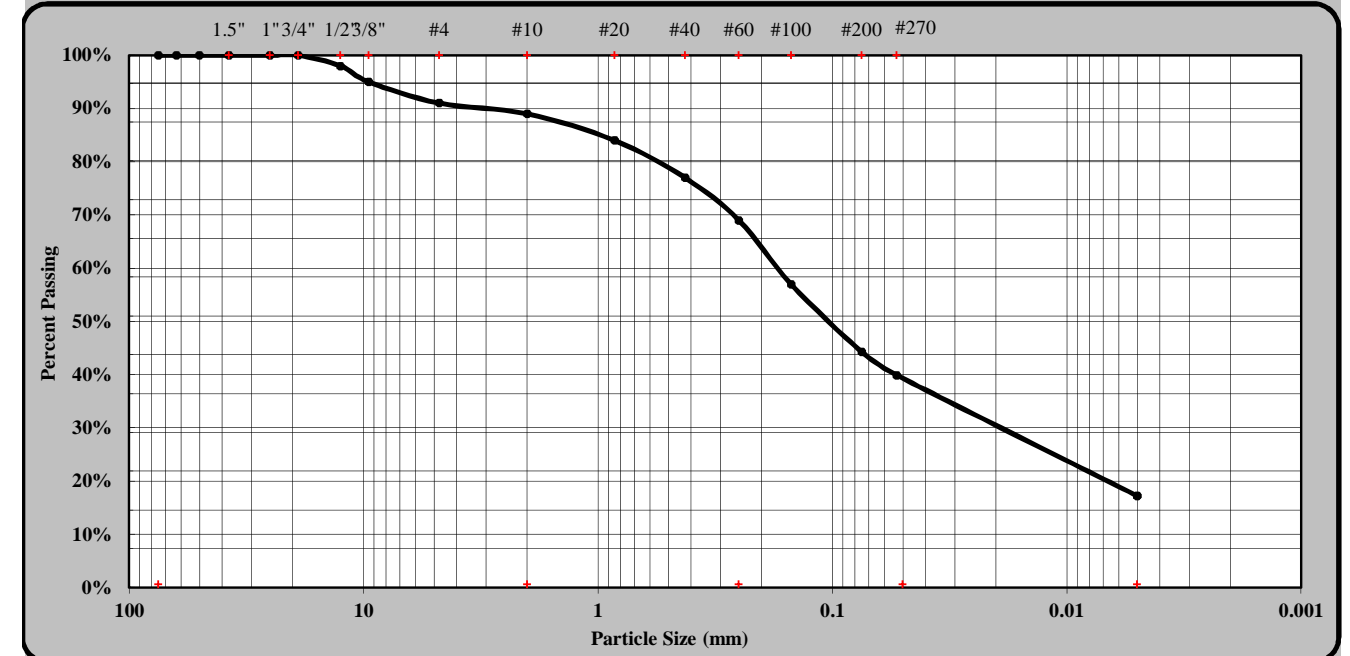
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Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT



S&ME, Inc. 9751 Southern Pine Blvd., Charlotte, NC 28273			
Project #:	6235-17-016	Report Date:	1/28/18
Project Name:	Sugar Hill Road, Marion, NC	Test Date(s):	1/4-8/18
State Project #:	44390.1.1	F.A. Project No: NA	TIP NO: U-5818
Client Name:	WEI		
Address:	Raleigh, NC		
Alignment	L	Sample #:	3200 Bulk
		Sample Date:	11/8/17
Station #:	32+00	Offset:	8 LT
		Depth (ft):	1-7'
Sample Description:	Gray-Tan, Sandy Silt A-4 (1)		



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm	
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm	
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm	

Maximum Particle Size	1/2"	Coarse Sand	20%	Silt	23%
Gravel	11%	Fine Sand	29%	Clay	17%
Apparent Relative Density	ND	Moisture Content	21.0%	% Passing #200	44.3%
Liquid Limit	35	Plastic Limit	28	Plastic Index	7

Soil Mortar (-#10 Sieve)					
Coarse Sand	23%	Fine Sand	32%	Silt	26%
				Clay	19%

Description of Sand & Gravel Particles:	Rounded	<input type="checkbox"/>	Angular	<input checked="" type="checkbox"/>	
Hard & Durable	<input checked="" type="checkbox"/>	Soft	<input type="checkbox"/>	Weathered & Friable	<input type="checkbox"/>

References / Comments / Deviations: ND=Not Determined.

Karen Warner Technician Name	118-06-0305 Certification No.	Laboratory Technician Position	1/28/2018 Date
Rob Kral, P.E. Technical Responsibility	 Signature	Project Manager Position	1/28/2018 Date

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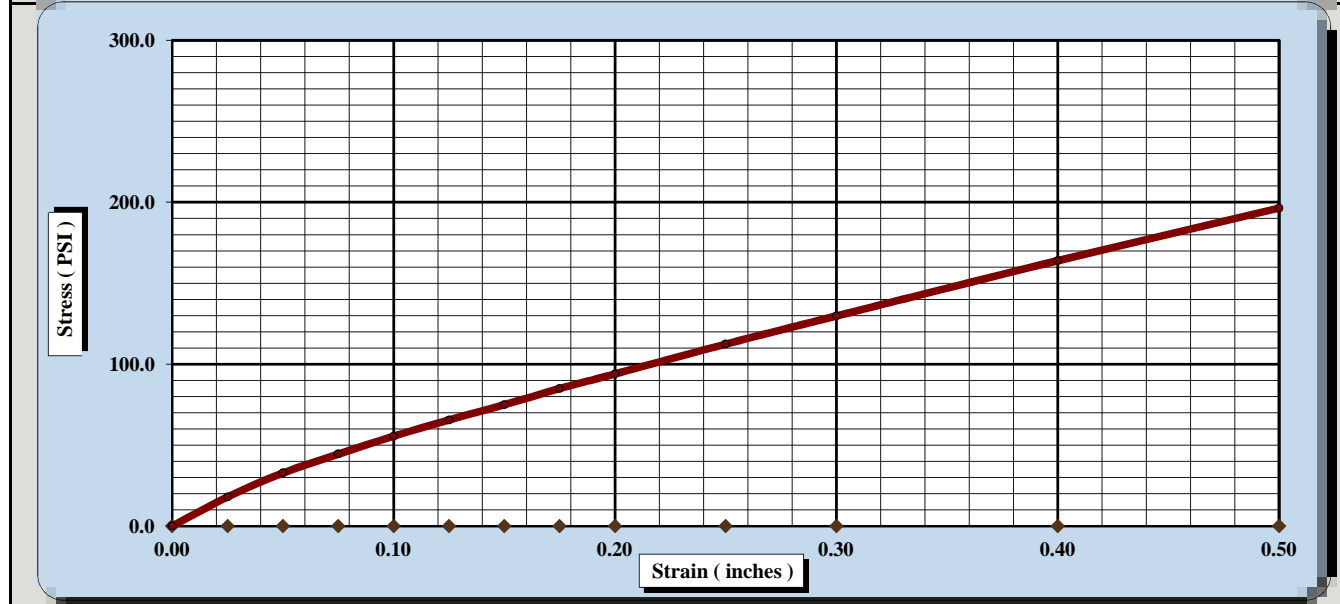
**CBR (CALIFORNIA BEARING RATIO)
 OF LABORATORY COMPACTED SOIL**



AASHTO T 193

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273			
Project #:	6235-17-016	Report Date:	1/28/18
Project Name:	Sugar Hill Road (U-5818), Marion, NC	Test Date(s)	1/12-16/18
Client Name:	WEI		
Client Address:	Raleigh, NC		
Boring #:	L-3200	Sample #:	Bulk B
Location:	32+00	Offset:	8 LT
		Elevation:	1-7'
Sample Description:	Gray-Tan Sandy Silt		A-4
AASHTO T99 Method A	Maximum Dry Density: 109.2 PCF	Optimum Moisture Content:	16.2%
	Compaction Test performed on the Fine Fraction only	% Retained on the 3/4" sieve:	0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	5.6	CBR at 0.1 in.	5.6
CBR at 0.2 in.	6.3	CBR at 0.2 in.	6.3



CBR Sample Preparation: Performed on the fine fraction
 The entire gradation was used and compacted in a 6" CBR mold in accordance with

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	56	Final Dry Density (PCF)	110.1
Initial Dry Density (PCF)	111.5	Moisture Content (top 1" after soaking)	36.9%
Moisture Content of the Compacted Specimen	16.3%	Percent Swell	1.6%
Percent Compaction	102.1%		

Soak Time: 96 Hours Surcharge Weight: 10.0 Surcharge Wt. per sq. Ft.: 50.9
 Liquid Limit: 35 Plastic Index: 7 Assumed Apparent Relative Density: 2.650

Notes/Deviations/References:

Rob Kral Project Manager 1/16/2018
 Technical Responsibility Signature Position Date

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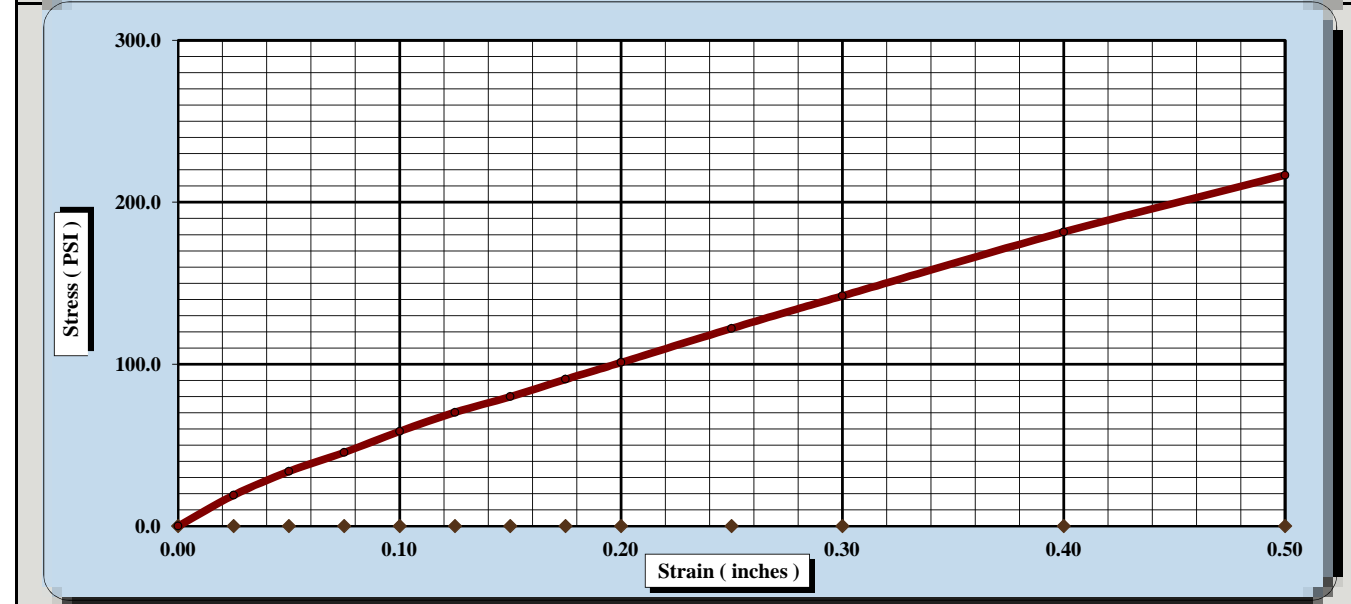
**CBR (CALIFORNIA BEARING RATIO)
 OF LABORATORY COMPACTED SOIL**



AASHTO T 193

S&ME, Inc. Charlotte: 9751 Southern Pine Boulevard, Charlotte, NC 28273			
Project #:	6235-17-016	Report Date:	1/16/18
Project Name:	Sugar Hill Road (U-5818), Marion, NC	Test Date(s)	1/12-16/18
Client Name:	WEI		
Client Address:	Raleigh, NC		
Boring #:	L-3200	Sample #:	Bulk A
Location:	32+00	Offset:	8 LT
		Elevation:	1-7'
Sample Description:	Gray-Tan Sandy Silt		A-4
AASHTO T99 Method A	Maximum Dry Density: 109.2 PCF	Optimum Moisture Content:	16.2%
	Compaction Test performed on the Fine Fraction only	% Retained on the 3/4" sieve:	0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	5.9	CBR at 0.1 in.	5.9
CBR at 0.2 in.	6.7	CBR at 0.2 in.	6.7



CBR Sample Preparation: Performed on the fine fraction
 The entire gradation was used and compacted in a 6" CBR mold in accordance with

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	56	Final Dry Density (PCF)	110.3
Initial Dry Density (PCF)	111.8	Moisture Content (top 1" after soaking)	18.8%
Moisture Content of the Compacted Specimen	16.0%	Percent Swell	1.5%
Percent Compaction	102.4%		

Soak Time: 96 Hours Surcharge Weight: 10.0 Surcharge Wt. per sq. Ft.: 51.0
 Liquid Limit: 35 Plastic Index: 7 Assumed Apparent Relative Density: 2.650

Notes/Deviations/References:

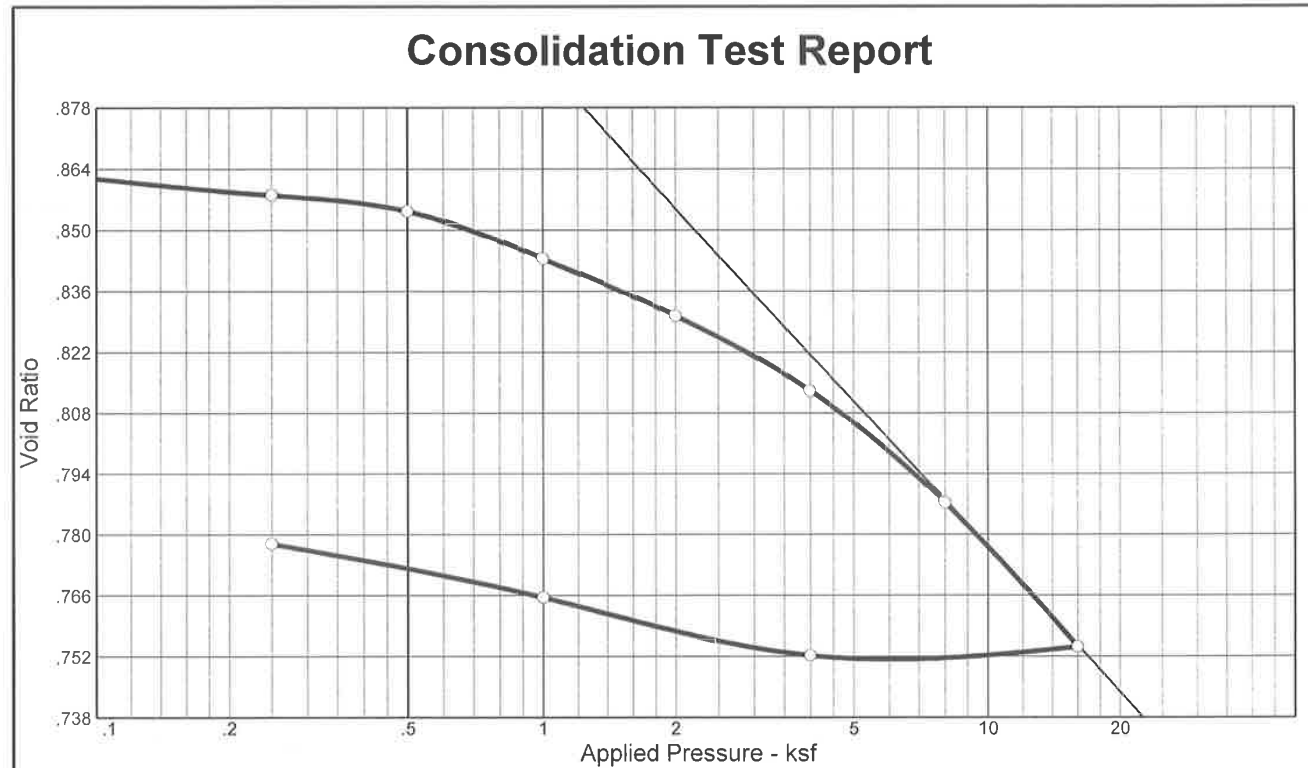
Rob Kral Project Manager 1/16/2018
 Technical Responsibility Signature Position Date

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SUMMIT Engineering Laboratory & Testing, Inc.

COMPANY NAME AND CERTIFICATION NO. SUMMIT (119-0705)
 NCDOT Project 623517016 Phase 01 Tested By: F. Gonzalez
 Project Name Sugar Hill Road (U-5818) Checked By: Mimi Hourani
Marion, NC
 Client S&ME, Inc. - Charlotte Date: 2/12/2018



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.323									
2	0.50	0.636									
3	1.00	0.009									
4	2.00	0.021									
5	4.00	0.246									
6	8.00	0.073									
7	16.00	0.072									
8	4.00	0.568									
9	1.00	0.528									
10	0.25	0.547									

MATERIAL DESCRIPTION								USCS	AASHTO				
Grey-Brown Silty Sand								SM	A-5(0)				
LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
41	3	2.70		90.5		27.0 %	28.1 %	84.6 %	97.6 %	0.862	0.778	2.40	0.11

Preparation Process: D2435 Method C_r Swell Press. (ksf) Heave %

Condition of Test: 0.02

Project No. 623517016.01 **Client:** S&ME, Inc. - Charlotte

Project: Sugar Hill Road
Marion, NC

Location: W 2-3 UD @ 10'-12'

Summit Engineering
Ft. Mill, South Carolina

Remarks:

Checked By:

Title: Figure

TEST RESULTS

Boring No.	W1-4	W2-3				
Sample No.	EB	EB				
Depth (ft)	6-8	10-12				
Retained #4 Sieve %	0	0				
Passing #10 Sieve %	98	100				
Passing #40 Sieve %	94	98				
Passing #200 Sieve %	41	49				

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	12.3	8.2				
Fine Sand Ret - #270 %	59.2	58.4				
Silt 0.05 - 0.005 mm %	22.2	27.0				
Clay < 0.005 mm %	6.2	6.3				
Passing #40 Sieve %	95.5	98.2				
Passing #200 Sieve %	41.8	49.1				

Liquid Limit	NP	41				
Plasticity Index	NP	3				
AASHTO Classification	A-4(0)	A-5(0)				

Mimi Hourani
Lab Manager

CONSOLIDATION TEST DATA

Client: S&ME, Inc. - Charlotte
 Project: Sugar Hill Road
 Marion, NC
 Project Number: 623517016.01

Sample Data

Source:
 Sample No.:
 Elev. or Depth: Sample Length(in./cm.):
 Location: W 2-3 UD @ 10'-12'
 Description: Grey-Brown Silty Sand
 Liquid Limit: 41 Plasticity Index: 3
 USCS: SM AASHTO: A-5(0) Figure No.:
 Testing Remarks:

Test Specimen Data

TOTAL SAMPLE		BEFORE TEST	AFTER TEST
Wet w+t =	148.14 g.	Consolidometer # =	1
Dry w+t =	116.65 g.	Wet w+t =	149.46 g.
Tare Wt. =	.00 g.	Dry w+t =	116.65 g.
Height =	1.00 in.	Spec. Gravity =	2.70
Diameter =	2.50 in.	Height =	1.00 in.
Weight =	148.14 g.	Diameter =	2.50 in.
		Defl. Table =	1
Moisture =	27.0 %	Ht. Solids =	0.5371 in.
Wet Den. =	115.0 pcf	Dry Wt. =	116.65 g.
Dry Den. =	90.5 pcf	Moisture =	28.1 %
		Dry Wt. =	116.65 g.*
		Void Ratio =	0.862
		Saturation =	84.6 %
		Void Ratio =	0.778

* Final dry weight used in calculations

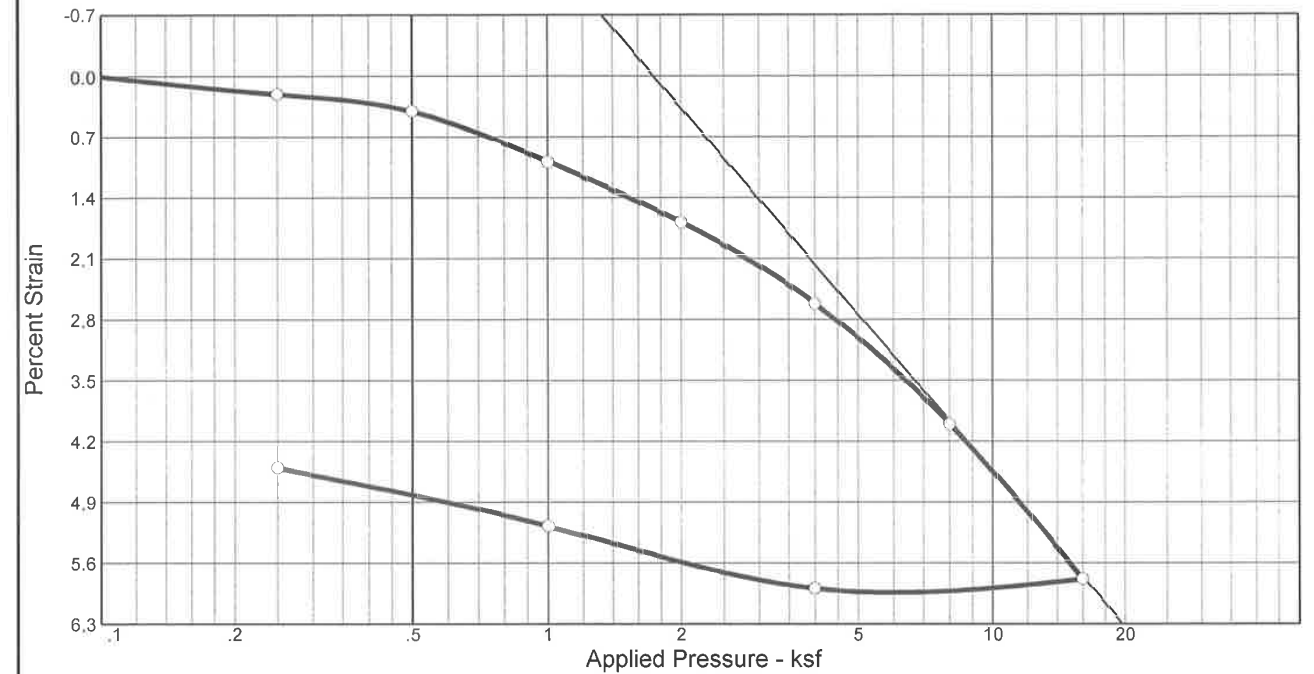
End-of-Load Summary

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C _v (in.2/min.)	C _α	Void Ratio	% Compression / Swell
start	0.00000				0.862	
0.25	0.00230	0.00030	0.323		0.858*	0.2 Comprs.*
0.50	0.00490	0.00060	0.636		0.854*	0.4 Comprs.*
1.00	0.01110	0.00100	0.009		0.843*	1.0 Comprs.*
2.00	0.01910	0.00140	0.021		0.830*	1.7 Comprs.*
4.00	0.02970	0.00170	0.246		0.813*	2.6 Comprs.*
8.00	0.04520	0.00230	0.073		0.787*	4.0 Comprs.*
16.00	0.06530	0.00310	0.072		0.754*	5.8 Comprs.*
4.00	0.06140	0.00250	0.568		0.752*	5.9 Comprs.*
1.00	0.05320	0.00200	0.528		0.766*	5.2 Comprs.*
0.25	0.04560	0.00160	0.547		0.778*	4.5 Comprs.*

*CALCULATED USING D₁₀₀ INSTEAD OF FINAL READING

C_c = 0.11 P_c = 2.40 ksf C_r = 0.02

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.323									
2	0.50	0.636									
3	1.00	0.009									
4	2.00	0.021									
5	4.00	0.246									
6	8.00	0.073									
7	16.00	0.072									
8	4.00	0.568									
9	1.00	0.528									
10	0.25	0.547									

MATERIAL DESCRIPTION

Grey-Brown Silty Sand

USCS: SM
 AASHTO: A-5(0)

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
41	3	2.70		90.5		27.0 %	28.1 %	84.6 %	97.6 %	0.862	0.778	2.40	0.11

Preparation Process:	D2435 Method	C _r	Swell Press. (ksf)	Heave %
Condition of Test:		0.02		

Project No. 623517016.01 Client: S&ME, Inc. - Charlotte
 Project: Sugar Hill Road Marion, NC
 Location: W 2-3 UD @ 10'-12'
 Summit Engineering
 Ft. Mill, South Carolina
 Remarks:
 Checked By:
 Title:
 Figure

Pressure: 2.00 ksf TEST READINGS Load No. 4

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.01110	11	60.00	0.01840
2	0.10	0.01730	12	120.00	0.01880
3	0.25	0.01740	13	240.00	0.01900
4	0.50	0.01750	14	480.00	0.01910
5	1.00	0.01760	15	720.00	0.01910
6	2.00	0.01770			
7	4.00	0.01800			
8	8.00	0.01820			
9	15.00	0.01820			
10	30.00	0.01830			

Void Ratio = 0.830 Compression = 1.7 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.01582 D₉₀ = 0.01680 D₁₀₀ = 0.01691
 C_v at 9.8 min. = 0.021 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 5

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.01910	11	60.00	0.02920
2	0.10	0.02710	12	120.00	0.02940
3	0.25	0.02720	13	240.00	0.02970
4	0.50	0.02770			
5	1.00	0.02780			
6	2.00	0.02790			
7	4.00	0.02810			
8	8.00	0.02850			
9	15.00	0.02860			
10	30.00	0.02880			

Void Ratio = 0.813 Compression = 2.6 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.02484 D₉₀ = 0.02607 D₁₀₀ = 0.02620
 C_v at 0.8 min. = 0.246 in.²/min.

Pressure: 8.00 ksf TEST READINGS Load No. 6

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.02970	11	60.00	0.04380
2	0.10	0.04030	12	120.00	0.04400
3	0.25	0.04070	13	240.00	0.04450
4	0.50	0.04130	14	480.00	0.04470
5	1.00	0.04150	15	720.00	0.04480
6	2.00	0.04200	16	960.00	0.04520
7	4.00	0.04230			
8	8.00	0.04260			
9	15.00	0.04300			
10	30.00	0.04320			

Void Ratio = 0.787 Compression = 4.0 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.03768 D₉₀ = 0.03981 D₁₀₀ = 0.04005
 C_v at 2.7 min. = 0.073 in.²/min.

Pressure: 0.25 ksf TEST READINGS Load No. 1

No.	Elapsed Time	Dial Reading
1	0.00	0.00000
2	0.10	0.00210
3	0.25	0.00220
4	0.50	0.00230
5	1.00	0.00230
6	2.00	0.00230
7	4.00	0.00230
8	8.00	0.00230
9	15.00	0.00230

Void Ratio = 0.858 Compression = 0.2 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.00164 D₉₀ = 0.00200 D₁₀₀ = 0.00204
 C_v at 0.7 min. = 0.323 in.²/min.

Pressure: 0.50 ksf TEST READINGS Load No. 2

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00230	11	60.00	0.00490
2	0.10	0.00450	12	120.00	0.00490
3	0.25	0.00460			
4	0.50	0.00460			
5	1.00	0.00460			
6	2.00	0.00460			
7	4.00	0.00470			
8	8.00	0.00470			
9	15.00	0.00480			
10	30.00	0.00490			

Void Ratio = 0.854 Compression = 0.4 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.00373 D₉₀ = 0.00400 D₁₀₀ = 0.00403
 C_v at 0.3 min. = 0.636 in.²/min.

Pressure: 1.00 ksf TEST READINGS Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00490	11	60.00	0.01090
2	0.10	0.01020	12	120.00	0.01100
3	0.25	0.01030	13	240.00	0.01110
4	0.50	0.01030			
5	1.00	0.01040			
6	2.00	0.01040			
7	4.00	0.01050			
8	8.00	0.01050			
9	15.00	0.01080			
10	30.00	0.01080			

Void Ratio = 0.843 Compression = 1.0 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.00912 D₉₀ = 0.00980 D₁₀₀ = 0.00988
 C_v at 22.3 min. = 0.009 in.²/min.

Pressure: 0.25 ksf TEST READINGS Load No. 10

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.05320	11	60.00	0.04610
2	0.10	0.04740	12	120.00	0.04600
3	0.25	0.04690	13	240.00	0.04590
4	0.50	0.04680	14	480.00	0.04580
5	1.00	0.04670	15	720.00	0.04580
6	2.00	0.04670	16	960.00	0.04570
7	4.00	0.04660	17	1440.00	0.04560
8	8.00	0.04650			
9	15.00	0.04650			
10	30.00	0.04640			

Void Ratio = 0.778 Compression = 4.5 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.04666 D₉₀ = 0.04525 D₁₀₀ = 0.04510
 C_v at 0.4 min. = 0.547 in.²/min.

Pressure: 16.00 ksf TEST READINGS Load No. 7

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.04520	11	60.00	0.06300
2	0.10	0.05820	12	120.00	0.06330
3	0.25	0.05900	13	240.00	0.06390
4	0.50	0.05930	14	480.00	0.06460
5	1.00	0.05990	15	720.00	0.06480
6	2.00	0.06050	16	960.00	0.06520
7	4.00	0.06080	17	1200.00	0.06530
8	8.00	0.06150	18	1440.00	0.06530
9	15.00	0.06200			
10	30.00	0.06230			

Void Ratio = 0.754 Compression = 5.8 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.05472 D₉₀ = 0.05750 D₁₀₀ = 0.05781
 C_v at 2.6 min. = 0.072 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 8

No.	Elapsed Time	Dial Reading
1	0.00	0.06530
2	0.10	0.06150
3	0.25	0.06140
4	0.50	0.06140
5	1.00	0.06140
6	2.00	0.06140
7	4.00	0.06140
8	8.00	0.06140
9	15.00	0.06140

Void Ratio = 0.752 Compression = 5.9 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.05917 D₉₀ = 0.05890 D₁₀₀ = 0.05887
 C_v at 0.3 min. = 0.568 in.²/min.

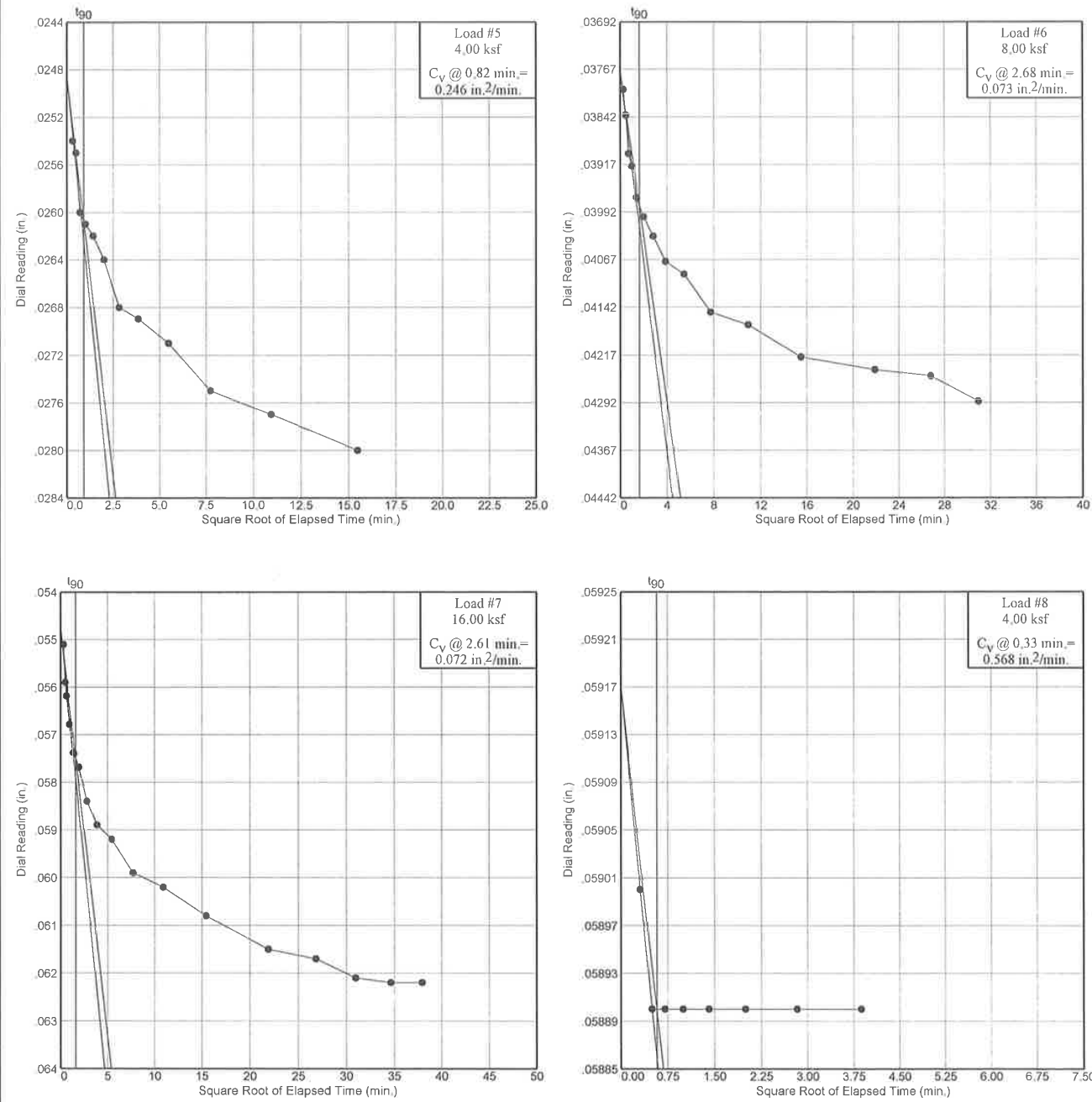
Pressure: 1.00 ksf TEST READINGS Load No. 9

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.06140	11	60.00	0.05320
2	0.10	0.05430	12	120.00	0.05320
3	0.25	0.05390			
4	0.50	0.05380			
5	1.00	0.05380			
6	2.00	0.05370			
7	4.00	0.05370			
8	8.00	0.05360			
9	15.00	0.05330			
10	30.00	0.05320			

Void Ratio = 0.766 Compression = 5.2 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.05299 D₉₀ = 0.05185 D₁₀₀ = 0.05173
 C_v at 0.4 min. = 0.528 in.²/min.

Dial Reading vs. Time

Project No.: 623517016.01
 Project: Sugar Hill Road
 Marion, NC
 Location: W 2-3 UD @ 10'-12'

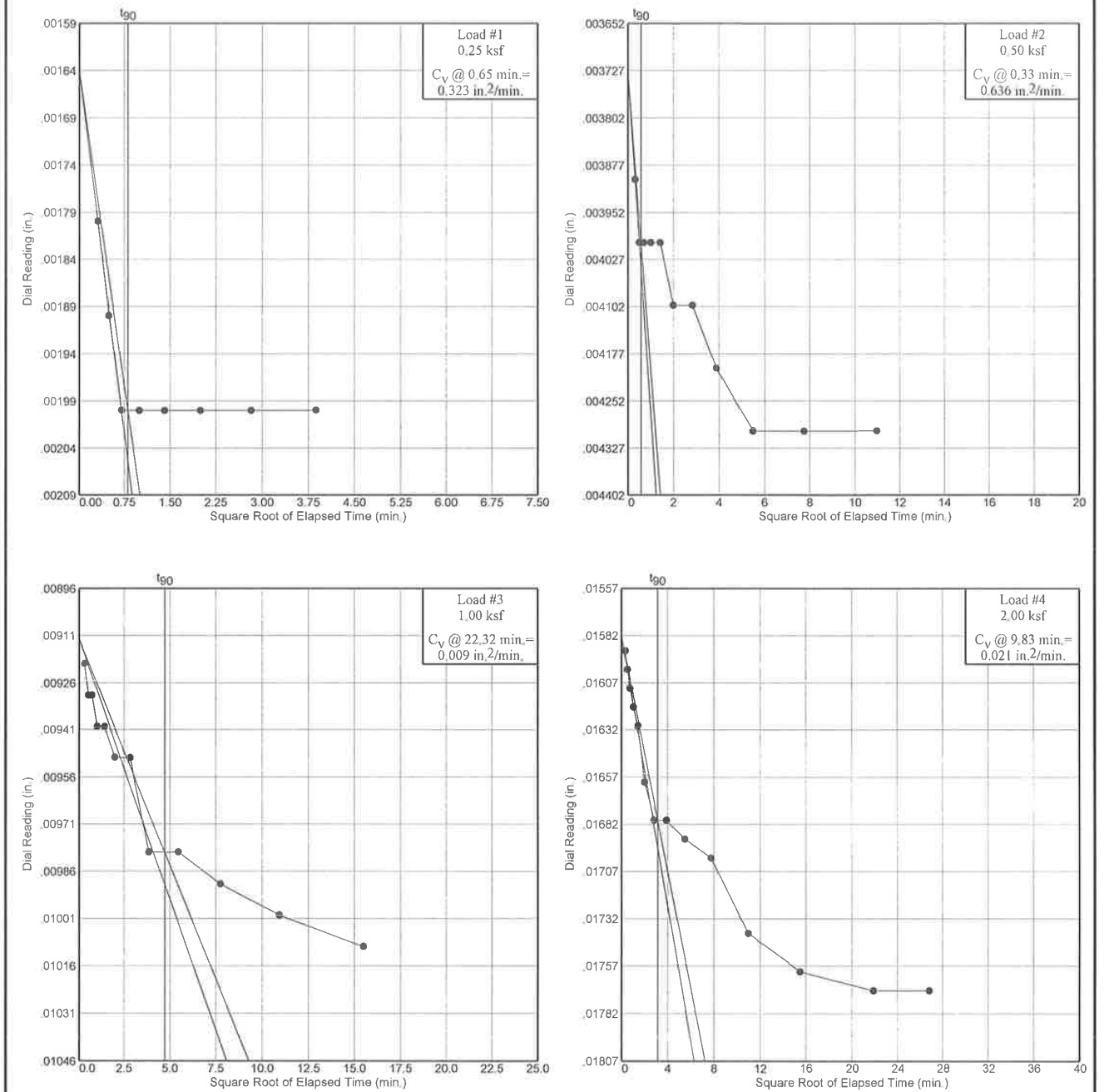


Summit Engineering
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Figure

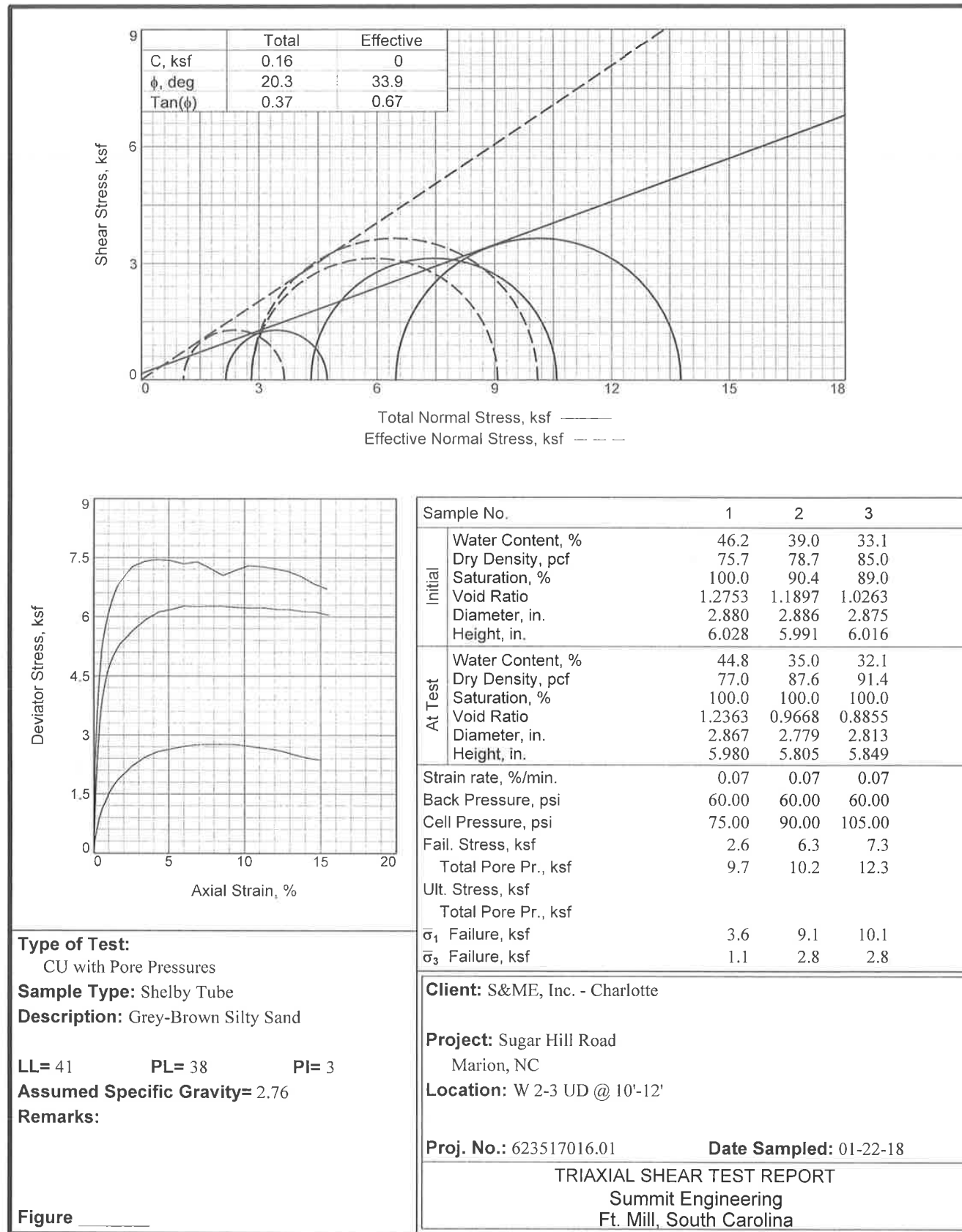
Dial Reading vs. Time

Project No.: 623517016.01
 Project: Sugar Hill Road
 Marion, NC
 Location: W 2-3 UD @ 10'-12'



Summit Engineering
 Ft. Mill, South Carolina

Figure

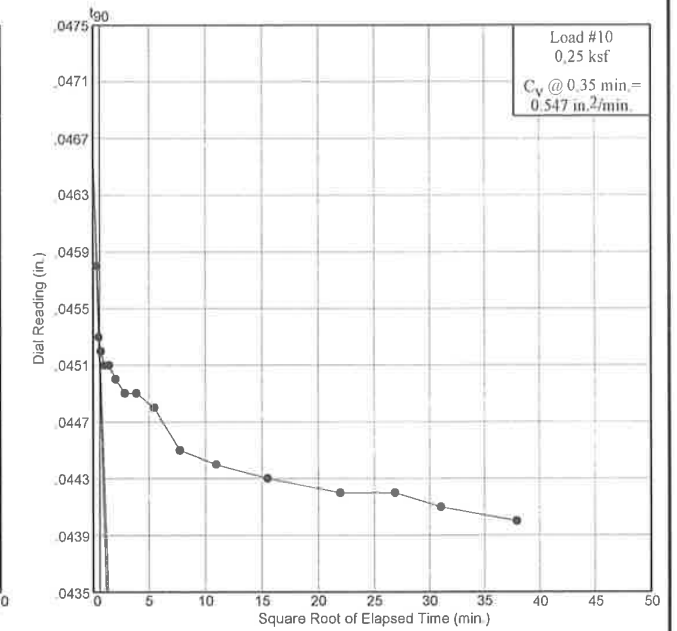
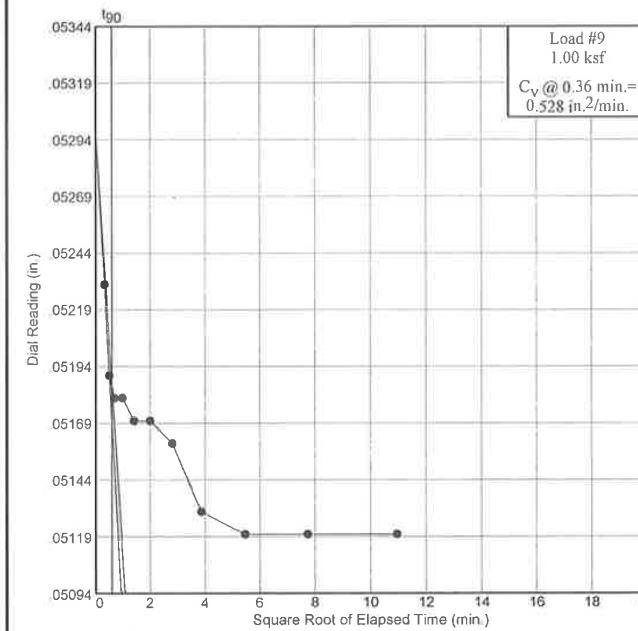


Tested By: FG

Checked By: MH

Dial Reading vs. Time

Project No.: 623517016.01
 Project: Sugar Hill Road
 Marion, NC
 Location: W 2-3 UD @ 10'-12'



Summit Engineering
 Ft. Mill, South Carolina

Figure

TRIAXIAL COMPRESSION TEST
CU with Pore Pressures

2/13/2018
2:09 PM

Date: 01-22-18
 Client: S&ME, Inc. - Charlotte
 Project: Sugar Hill Road
 Marion, NC
 Project No.: 623517016.01
 Location: W 2-3 UD @ 10'-12'
 Description: Grey-Brown Silty Sand
 Remarks:
 Type of Sample: Shelby Tube
 Assumed Specific Gravity=2.76 LL=41 PL=38 PI=3
 Test Method: ASTM D 4767 Method B

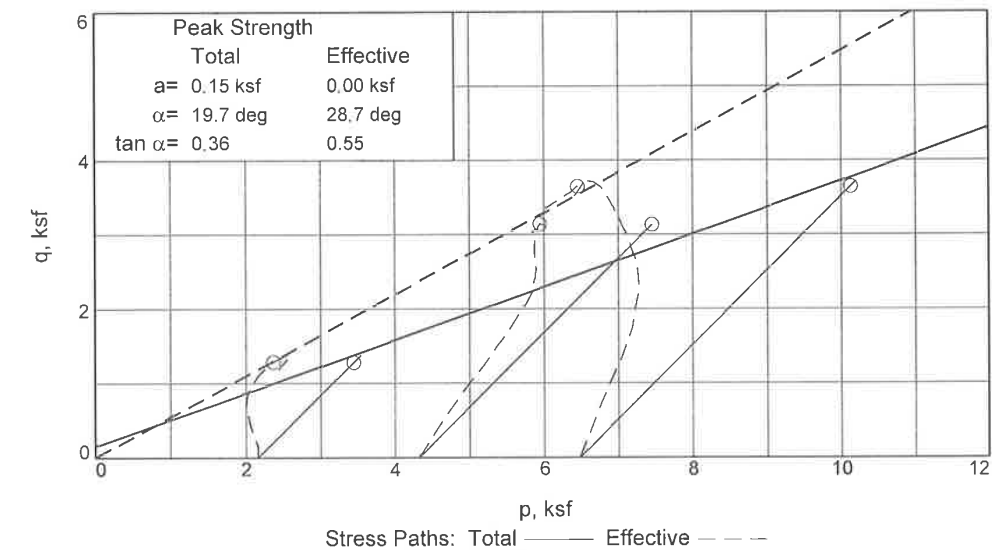
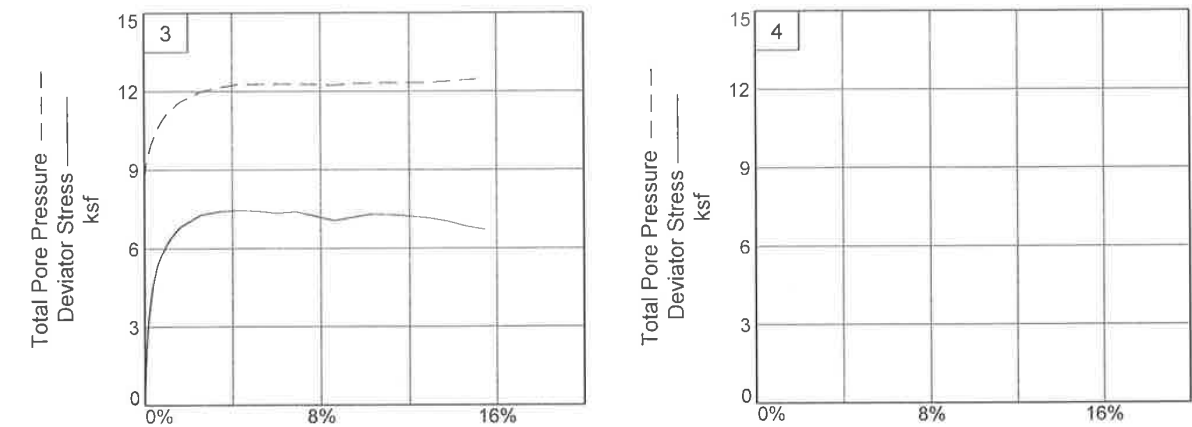
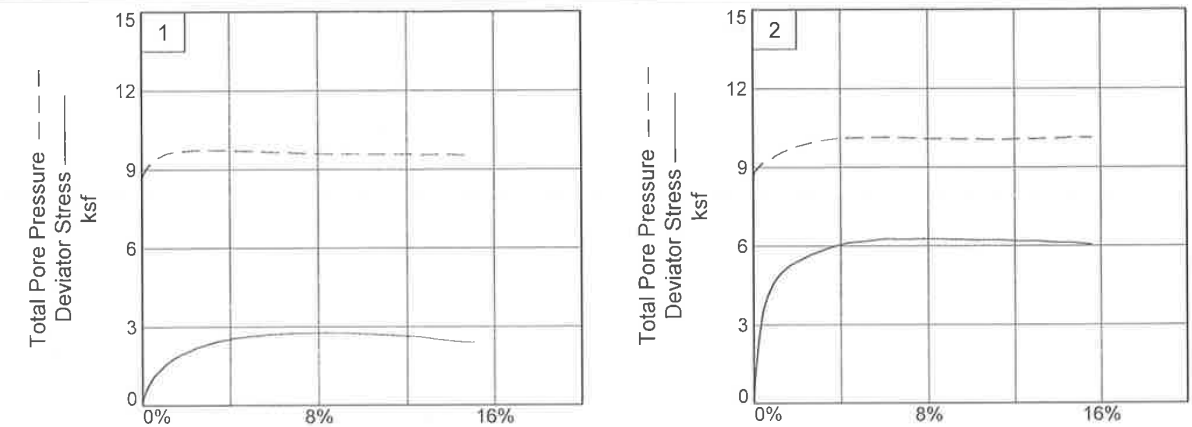
Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1141.220			1130.220
Moisture content: Dry soil+tare, gms.	780.570			780.570
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	46.2	47.4	44.8	44.8
Moist specimen weight, gms.	1141.22			
Diameter, in.	2.880	2.899	2.867	
Area, in. ²	6.514	6.600	6.454	
Height, in.	6.028	6.033	5.980	
Net decrease in height, in.		-0.005	0.053	
Net decrease in water volume, cc.			20.000	
Wet density, pcf	110.7	110.1	111.6	
Dry density, pcf	75.7	74.7	77.0	
Void ratio	1.2753	1.3070	1.2363	
Saturation, %	100.0	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Consolidation cell pressure = 75.00 psi (10.80 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 2.16 ksf
 Strain rate, %/min. = 0.07
 Fail. Stress = 2.57 ksf at reading no. 23

Summit Engineering



Client: S&ME, Inc. - Charlotte
 Project: Sugar Hill Road
 Location: W 2-3 UD @ 10'-12'
 Project No.: 623517016.01

Figure _____

Summit Engineering

Tested By: FG

Checked By: MH

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1124.920			1093.070
Moisture content: Dry soil+tare, gms.	809.500			809.500
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	39.0	38.5	35.0	35.0
Moist specimen weight, gms.	1124.92			
Diameter, in.	2.886	2.796	2.779	
Area, in. ²	6.542	6.140	6.064	
Height, in.	5.991	6.016	5.805	
Net decrease in height, in.		-0.025	0.211	
Net decrease in water volume, cc.			28.400	
Wet density, pcf	109.3	115.7	118.3	
Dry density, pcf	78.7	83.5	87.6	
Void ratio	1.1897	1.0637	0.9668	
Saturation, %	90.4	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²

Membrane thickness = 0.02 cm

Consolidation cell pressure = 90.00 psi (12.96 ksf)

Consolidation back pressure = 60.00 psi (8.64 ksf)

Consolidation effective confining stress = 4.32 ksf

Strain rate, %/min. = 0.07

Fail. Stress = 6.27 ksf at reading no. 26

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	4.32	4.32	1.00	60.00	4.32	0.00
1	0.0050	44.6	45	0.1	1.06	4.13	5.19	1.26	61.30	4.66	0.53
2	0.0100	78.7	79	0.2	1.87	4.02	5.88	1.46	62.10	4.95	0.93
3	0.0150	105.1	105	0.3	2.49	3.95	6.43	1.63	62.60	5.19	1.24
4	0.0200	126.0	126	0.3	2.98	3.87	6.86	1.77	63.10	5.36	1.49
5	0.0240	142.3	142	0.4	3.37	3.83	7.20	1.88	63.40	5.51	1.68
6	0.0290	155.3	155	0.5	3.67	3.77	7.44	1.97	63.80	5.61	1.83
7	0.0340	165.7	166	0.6	3.91	3.73	7.64	2.05	64.10	5.69	1.96
8	0.0390	174.3	174	0.7	4.11	3.70	7.81	2.11	64.30	5.76	2.06
9	0.0440	181.7	182	0.8	4.28	3.66	7.94	2.17	64.60	5.80	2.14
10	0.0490	188.0	188	0.8	4.43	3.63	8.06	2.22	64.80	5.84	2.21
11	0.0530	193.6	194	0.9	4.56	3.57	8.13	2.28	65.20	5.85	2.28
12	0.0580	198.6	199	1.0	4.67	3.53	8.20	2.32	65.50	5.86	2.33
13	0.0630	202.8	203	1.1	4.76	3.48	8.25	2.37	65.80	5.87	2.38
14	0.0680	207.1	207	1.2	4.86	3.46	8.32	2.41	66.00	5.89	2.43
15	0.0730	210.9	211	1.3	4.95	3.41	8.36	2.45	66.30	5.89	2.47
16	0.0780	214.3	214	1.3	5.02	3.38	8.40	2.48	66.50	5.89	2.51
17	0.0830	217.4	217	1.4	5.09	3.36	8.44	2.52	66.70	5.90	2.54
18	0.0880	220.2	220	1.5	5.15	3.31	8.46	2.55	67.00	5.89	2.57
19	0.0930	222.8	223	1.6	5.21	3.28	8.49	2.59	67.20	5.89	2.60
20	0.0980	225.3	225	1.7	5.26	3.25	8.51	2.62	67.40	5.88	2.63
21	0.1030	227.5	228	1.8	5.31	3.23	8.53	2.65	67.60	5.88	2.65
22	0.1530	245.0	245	2.6	5.66	3.04	8.70	2.86	68.90	5.87	2.83
23	0.2030	258.6	259	3.5	5.93	2.92	8.85	3.03	69.70	5.89	2.96

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	2.16	2.16	1.00	60.00	2.16	0.00
1	0.0040	13.8	14	0.1	0.31	2.00	2.31	1.15	61.10	2.16	0.15
2	0.0100	23.9	24	0.2	0.53	1.84	2.38	1.29	62.20	2.11	0.27
3	0.0150	30.9	31	0.3	0.69	1.74	2.43	1.39	62.90	2.09	0.34
4	0.0200	36.9	37	0.3	0.82	1.66	2.48	1.50	63.50	2.07	0.41
5	0.0250	42.0	42	0.4	0.93	1.58	2.52	1.59	64.00	2.05	0.47
6	0.0290	46.4	46	0.5	1.03	1.53	2.56	1.67	64.40	2.04	0.52
7	0.0340	50.7	51	0.6	1.12	1.47	2.59	1.77	64.80	2.03	0.56
8	0.0390	54.5	55	0.7	1.21	1.41	2.62	1.86	65.20	2.02	0.60
9	0.0450	57.7	58	0.8	1.28	1.37	2.65	1.93	65.50	2.01	0.64
10	0.0500	60.9	61	0.8	1.35	1.32	2.67	2.02	65.80	2.00	0.67
11	0.0550	64.1	64	0.9	1.42	1.30	2.71	2.09	66.00	2.00	0.71
12	0.0590	67.3	67	1.0	1.49	1.27	2.75	2.17	66.20	2.01	0.74
13	0.0640	69.9	70	1.1	1.54	1.24	2.78	2.25	66.40	2.01	0.77
14	0.0690	72.6	73	1.2	1.60	1.21	2.81	2.32	66.60	2.01	0.80
15	0.0740	74.9	75	1.2	1.65	1.20	2.85	2.38	66.70	2.02	0.83
16	0.0790	77.3	77	1.3	1.70	1.18	2.88	2.44	66.80	2.03	0.85
17	0.0840	79.5	80	1.4	1.75	1.17	2.92	2.50	66.90	2.04	0.87
18	0.0890	81.6	82	1.5	1.79	1.15	2.95	2.56	67.00	2.05	0.90
19	0.0940	83.7	84	1.6	1.84	1.14	2.98	2.62	67.10	2.06	0.92
20	0.1000	85.7	86	1.7	1.88	1.12	3.00	2.67	67.20	2.06	0.94
21	0.1500	101.0	101	2.5	2.20	1.07	3.26	3.06	67.60	2.16	1.10
22	0.2040	112.6	113	3.4	2.43	1.07	3.49	3.28	67.60	2.28	1.21
23	0.2540	120.2	120	4.2	2.57	1.08	3.65	3.38	67.50	2.36	1.28
24	0.3050	124.7	125	5.1	2.64	1.11	3.75	3.38	67.30	2.43	1.32
25	0.3500	128.5	129	5.9	2.70	1.14	3.84	3.37	67.10	2.49	1.35
26	0.4050	132.0	132	6.8	2.75	1.17	3.91	3.35	66.90	2.54	1.37
27	0.4500	134.0	134	7.5	2.76	1.20	3.96	3.31	66.70	2.58	1.38
28	0.5000	135.1	135	8.4	2.76	1.21	3.97	3.28	66.60	2.59	1.38
29	0.5550	136.2	136	9.3	2.76	1.21	3.97	3.28	66.60	2.59	1.38
30	0.6050	135.8	136	10.1	2.72	1.22	3.95	3.22	66.50	2.59	1.36
31	0.6500	135.0	135	10.9	2.68	1.22	3.91	3.19	66.50	2.57	1.34
32	0.7050	134.0	134	11.8	2.64	1.22	3.86	3.15	66.50	2.54	1.32
33	0.7510	132.3	132	12.6	2.58	1.24	3.82	3.08	66.40	2.53	1.29
34	0.8010	128.5	129	13.4	2.48	1.24	3.72	3.01	66.40	2.48	1.24
35	0.8500	125.8	126	14.2	2.41	1.25	3.66	2.92	66.30	2.46	1.20
36	0.9000	124.4	124	15.1	2.36	1.25	3.61	2.88	66.30	2.43	1.18

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
6	0.0280	210.9	211	0.5	4.86	4.84	9.70	2.01	71.40	7.27	2.43
7	0.0320	223.4	223	0.5	5.15	4.68	9.83	2.10	72.50	7.25	2.57
8	0.0370	233.8	234	0.6	5.38	4.54	9.92	2.19	73.50	7.23	2.69
9	0.0420	242.6	243	0.7	5.58	4.39	9.97	2.27	74.50	7.18	2.79
10	0.0470	250.4	250	0.8	5.76	4.28	10.03	2.35	75.30	7.16	2.88
11	0.0520	257.2	257	0.9	5.91	4.16	10.07	2.42	76.10	7.12	2.95
12	0.0570	263.8	264	1.0	6.05	4.08	10.13	2.49	76.70	7.10	3.03
13	0.0620	269.6	270	1.1	6.18	3.97	10.16	2.56	77.40	7.07	3.09
14	0.0670	275.0	275	1.1	6.30	3.89	10.19	2.62	78.00	7.04	3.15
15	0.0720	279.9	280	1.2	6.41	3.82	10.22	2.68	78.50	7.02	3.20
16	0.0770	284.1	284	1.3	6.50	3.76	10.26	2.73	78.90	7.01	3.25
17	0.0820	288.3	288	1.4	6.59	3.69	10.27	2.79	79.40	6.98	3.29
18	0.0870	291.8	292	1.5	6.66	3.61	10.28	2.84	79.90	6.95	3.33
19	0.0910	295.3	295	1.6	6.74	3.57	10.31	2.89	80.20	6.94	3.37
20	0.0960	298.2	298	1.6	6.80	3.51	10.31	2.93	80.60	6.91	3.40
21	0.1020	301.3	301	1.7	6.86	3.47	10.33	2.98	80.90	6.90	3.43
22	0.1510	321.9	322	2.6	7.27	3.14	10.41	3.32	83.20	6.77	3.63
23	0.2020	331.2	331	3.5	7.41	2.97	10.38	3.50	84.40	6.67	3.71
24	0.2510	335.7	336	4.3	7.45	2.87	10.31	3.60	85.10	6.59	3.72
25	0.3010	337.4	337	5.1	7.42	2.85	10.27	3.60	85.20	6.56	3.71
26	0.3520	336.9	337	6.0	7.34	2.84	10.18	3.59	85.30	6.51	3.67
27	0.4020	342.4	342	6.9	7.39	2.84	10.23	3.61	85.30	6.53	3.70
28	0.4520	338.2	338	7.7	7.23	2.87	10.10	3.52	85.10	6.48	3.62
29	0.5030	332.6	333	8.6	7.05	2.89	9.94	3.43	84.90	6.42	3.52
30	0.5520	342.0	342	9.4	7.18	2.82	10.00	3.54	85.40	6.41	3.59
31	0.6020	350.9	351	10.3	7.30	2.81	10.10	3.60	85.50	6.46	3.65
32	0.6530	353.0	353	11.2	7.27	2.79	10.06	3.60	85.60	6.43	3.63
33	0.7030	353.9	354	12.0	7.22	2.79	10.01	3.58	85.60	6.40	3.61
34	0.7530	354.0	354	12.9	7.15	2.79	9.94	3.56	85.60	6.37	3.57
35	0.8030	351.2	351	13.7	7.02	2.75	9.77	3.55	85.90	6.26	3.51
36	0.8530	345.2	345	14.6	6.83	2.71	9.54	3.52	86.20	6.12	3.42
37	0.9030	342.0	342	15.4	6.70	2.66	9.37	3.52	86.50	6.02	3.35

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
24	0.2520	269.2	269	4.3	6.11	2.85	8.97	3.14	70.20	5.91	3.06
25	0.3030	274.8	275	5.2	6.18	2.82	9.01	3.19	70.40	5.91	3.09
26	0.3520	281.1	281	6.1	6.27	2.81	9.08	3.23	70.50	5.94	3.14
27	0.4020	282.9	283	6.9	6.25	2.84	9.09	3.20	70.30	5.96	3.13
28	0.4520	286.2	286	7.8	6.27	2.87	9.13	3.19	70.10	6.00	3.13
29	0.5030	288.7	289	8.7	6.26	2.88	9.14	3.17	70.00	6.01	3.13
30	0.5520	290.1	290	9.5	6.23	2.88	9.11	3.16	70.00	6.00	3.12
31	0.6040	292.3	292	10.4	6.22	2.89	9.11	3.15	69.90	6.00	3.11
32	0.6530	295.5	296	11.2	6.23	2.91	9.14	3.14	69.80	6.02	3.11
33	0.7020	296.4	296	12.1	6.19	2.89	9.08	3.14	69.90	5.99	3.09
34	0.7540	299.2	299	13.0	6.18	2.88	9.06	3.15	70.00	5.97	3.09
35	0.8030	299.6	300	13.8	6.13	2.87	9.00	3.14	70.10	5.93	3.07
36	0.8530	301.9	302	14.7	6.12	2.82	8.94	3.17	70.40	5.88	3.06
37	0.9040	301.2	301	15.6	6.04	2.82	8.86	3.14	70.40	5.84	3.02

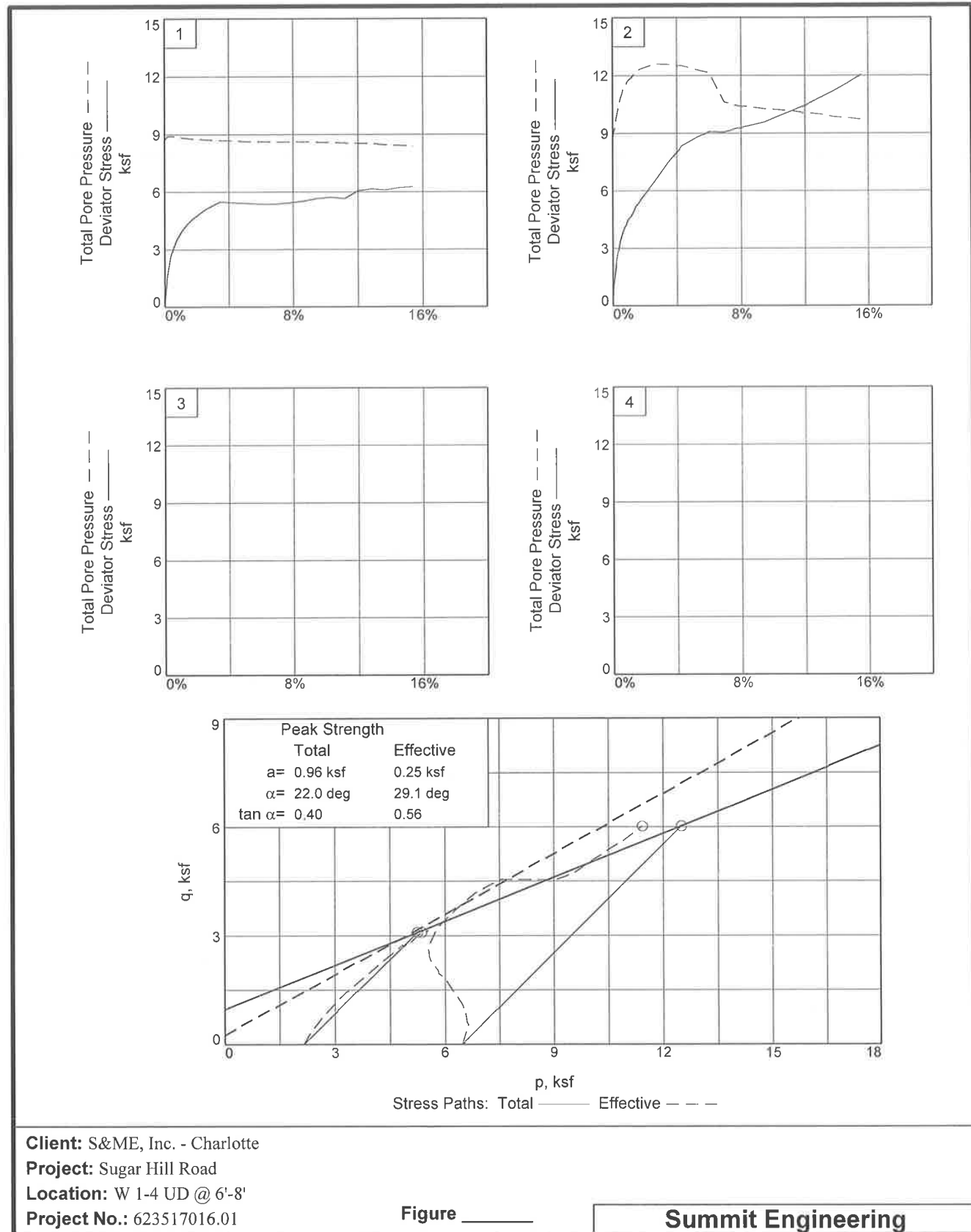
Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1160.080			1151.370
Moisture content: Dry soil+tare, gms.	871.710			871.710
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	33.1	36.1	32.1	32.1
Moist specimen weight, gms.	1160.08			
Diameter, in.	2.875	2.846	2.813	
Area, in. ²	6.492	6.360	6.213	
Height, in.	6.016	6.051	5.849	
Net decrease in height, in.		-0.035	0.202	
Net decrease in water volume, cc.			35.100	
Wet density, pcf	113.2	117.5	120.7	
Dry density, pcf	85.0	86.3	91.4	
Void ratio	1.0263	0.9966	0.8855	
Saturation, %	89.0	100.0	100.0	

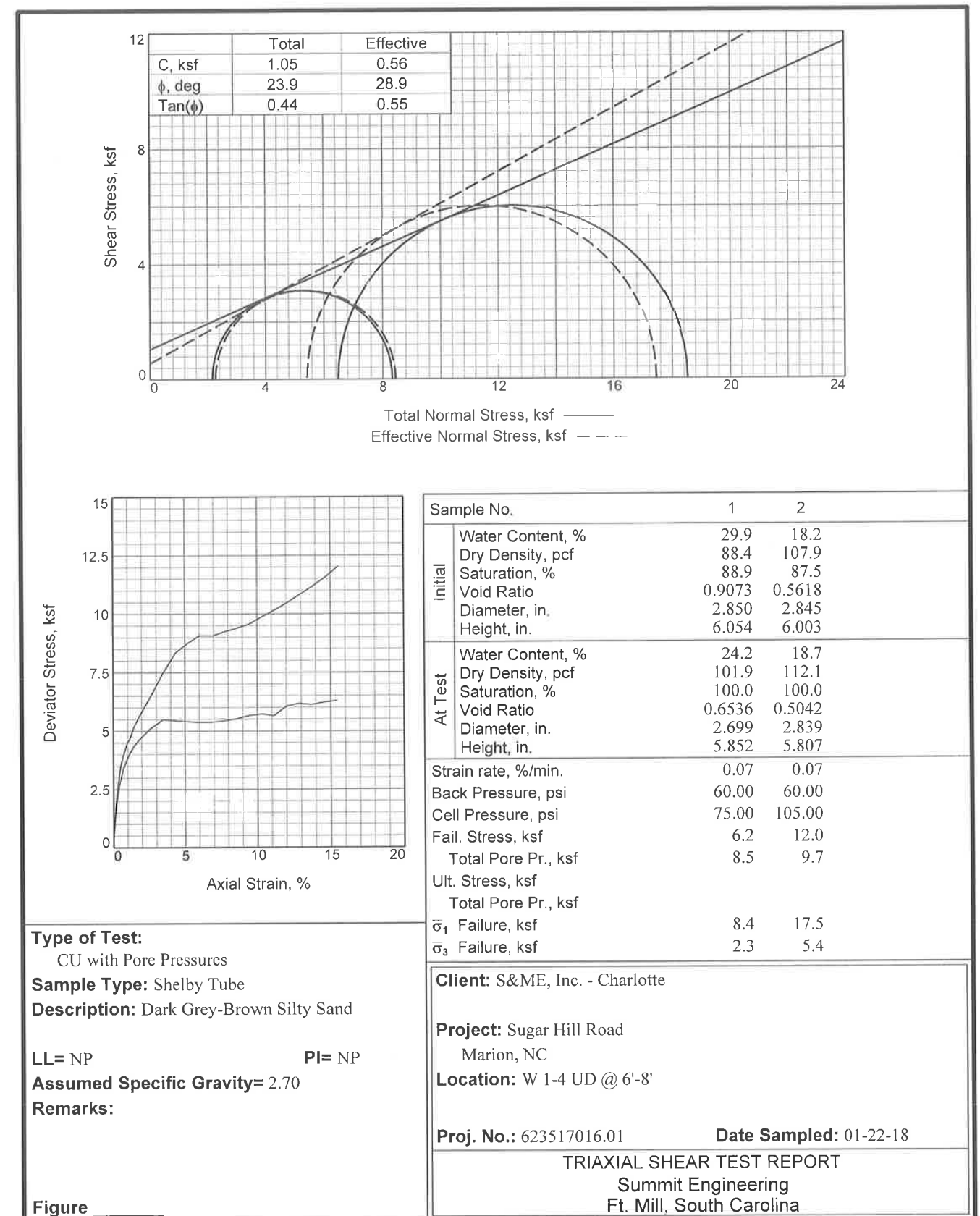
Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Consolidation cell pressure = 105.00 psi (15.12 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 6.48 ksf
 Strain rate, %/min. = 0.07
 Fail. Stress = 7.30 ksf at reading no. 31

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	6.48	6.48	1.00	60.00	6.48	0.00
1	0.0040	63.5	64	0.1	1.47	6.03	7.50	1.24	63.10	6.77	0.74
2	0.0080	115.8	116	0.1	2.68	5.70	8.38	1.47	65.40	7.04	1.34
3	0.0130	151.0	151	0.2	3.49	5.44	8.94	1.64	67.20	7.19	1.75
4	0.0180	176.4	176	0.3	4.08	5.20	9.27	1.78	68.90	7.24	2.04
5	0.0230	195.6	196	0.4	4.52	5.03	9.54	1.90	70.10	7.28	2.26



Tested By: FG _____ Checked By: MH _____



Tested By: FG _____ Checked By: MH _____

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	2.16	2.16	1.00	60.00	2.16	0.00
1	0.0030	24.0	24	0.1	0.60	2.03	2.63	1.30	60.90	2.33	0.30
2	0.0050	32.9	33	0.1	0.83	2.00	2.83	1.41	61.10	2.42	0.41
3	0.0090	55.7	56	0.2	1.40	1.93	3.33	1.73	61.60	2.63	0.70
4	0.0140	74.6	75	0.2	1.87	1.90	3.77	1.99	61.80	2.84	0.94
5	0.0190	90.1	90	0.3	2.26	1.89	4.15	2.20	61.90	3.02	1.13
6	0.0230	102.9	103	0.4	2.58	1.89	4.47	2.37	61.90	3.18	1.29
7	0.0280	113.7	114	0.5	2.85	1.89	4.73	2.51	61.90	3.31	1.42
8	0.0330	122.8	123	0.6	3.07	1.90	4.97	2.62	61.80	3.44	1.54
9	0.0380	130.7	131	0.6	3.27	1.92	5.18	2.71	61.70	3.55	1.63
10	0.0430	137.6	138	0.7	3.44	1.93	5.37	2.78	61.60	3.65	1.72
11	0.0480	143.6	144	0.8	3.58	1.94	5.53	2.84	61.50	3.74	1.79
12	0.0530	148.8	149	0.9	3.71	1.96	5.67	2.89	61.40	3.81	1.86
13	0.0580	154.0	154	1.0	3.84	1.96	5.80	2.96	61.40	3.88	1.92
14	0.0630	158.5	159	1.1	3.95	1.97	5.92	3.00	61.30	3.95	1.97
15	0.0680	163.0	163	1.2	4.05	1.97	6.03	3.06	61.30	4.00	2.03
16	0.0730	166.5	167	1.2	4.14	1.99	6.13	3.08	61.20	4.06	2.07
17	0.0780	170.2	170	1.3	4.23	1.99	6.21	3.13	61.20	4.10	2.11
18	0.0830	173.8	174	1.4	4.31	2.00	6.31	3.15	61.10	4.16	2.16
19	0.0880	176.9	177	1.5	4.39	2.00	6.39	3.19	61.10	4.19	2.19
20	0.0930	179.9	180	1.6	4.46	2.02	6.47	3.21	61.00	4.24	2.23
21	0.0980	183.0	183	1.7	4.53	2.02	6.54	3.25	61.00	4.28	2.26
22	0.1030	185.7	186	1.8	4.59	2.02	6.61	3.28	61.00	4.31	2.30
23	0.1520	208.4	208	2.6	5.11	2.07	7.18	3.46	60.60	4.63	2.55
24	0.2030	225.7	226	3.5	5.48	2.10	7.59	3.61	60.40	4.84	2.74
25	0.2530	225.8	226	4.3	5.44	2.13	7.57	3.55	60.20	4.85	2.72
26	0.3020	226.3	226	5.2	5.40	2.17	7.58	3.48	59.90	4.88	2.70
27	0.3530	227.1	227	6.0	5.37	2.17	7.55	3.47	59.90	4.86	2.69
28	0.4020	229.3	229	6.9	5.37	2.19	7.56	3.46	59.80	4.88	2.69
29	0.4520	233.7	234	7.7	5.43	2.19	7.62	3.48	59.80	4.90	2.71
30	0.5040	240.0	240	8.6	5.52	2.19	7.71	3.52	59.80	4.95	2.76
31	0.5530	248.0	248	9.4	5.65	2.20	7.85	3.57	59.70	5.03	2.83
32	0.6030	253.2	253	10.3	5.72	2.22	7.93	3.58	59.60	5.08	2.86
33	0.6530	252.7	253	11.2	5.65	2.25	7.90	3.52	59.40	5.07	2.83
34	0.7030	273.3	273	12.0	6.05	2.26	8.31	3.68	59.30	5.29	3.03
35	0.7530	281.3	281	12.9	6.17	2.28	8.44	3.71	59.20	5.36	3.08
36	0.8030	281.4	281	13.7	6.11	2.35	8.46	3.60	58.70	5.40	3.06
37	0.8530	289.5	290	14.6	6.22	2.38	8.60	3.62	58.50	5.49	3.11
38	0.9030	295.3	295	15.4	6.29	2.40	8.69	3.61	58.30	5.55	3.14

TRIAxIAL COMPRESSION TEST
CU with Pore Pressures

2/13/2018
2:34 PM

Date: 01-22-18
Client: S&ME, Inc. - Charlotte
Project: Sugar Hill Road
 Marion, NC
Project No.: 623517016.01
Location: W 1-4 UD @ 6'-8'
Description: Dark Grey-Brown Silty Sand
Remarks:
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.70 **LL=**NP **PL=** **PI=**NP
Test Method: ASTM D 4767 Method B

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1163.540			1112.790
Moisture content: Dry soil+tare, gms.	895.920			895.920
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	29.9	25.6	24.2	24.2
Moist specimen weight, gms.	1163.54			
Diameter, in.	2.850	2.695	2.699	
Area, in. ²	6.379	5.706	5.722	
Height, in.	6.054	6.000	5.852	
Net decrease in height, in.		0.054	0.148	
Net decrease in water volume, cc.			12.300	
Wet density, pcf	114.8	125.2	126.6	
Dry density, pcf	88.4	99.7	101.9	
Void ratio	0.9073	0.6906	0.6536	
Saturation, %	88.9	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.02 cm
Consolidation cell pressure = 75.00 psi (10.80 ksf)
Consolidation back pressure = 60.00 psi (8.64 ksf)
Consolidation effective confining stress = 2.16 ksf
Strain rate, %/min. = 0.07
Fail. Stress = 6.17 ksf at reading no. 35

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
24	0.1500	290.6	291	2.6	6.44	2.58	9.02	3.50	87.10	5.80	3.22
25	0.2000	338.7	339	3.4	7.44	2.59	10.03	3.87	87.00	6.31	3.72
26	0.2520	382.8	383	4.3	8.33	2.66	11.00	4.13	86.50	6.83	4.17
27	0.3040	406.2	406	5.2	8.76	2.84	11.60	4.09	85.30	7.22	4.38
28	0.3500	424.8	425	6.0	9.08	3.01	12.09	4.02	84.10	7.55	4.54
29	0.4030	427.9	428	6.9	9.06	4.52	13.58	3.00	73.60	9.05	4.53
30	0.4530	441.1	441	7.8	9.25	4.69	13.95	2.97	72.40	9.32	4.63
31	0.5020	451.9	452	8.6	9.39	4.78	14.17	2.96	71.80	9.48	4.70
32	0.5500	464.2	464	9.5	9.56	4.87	14.43	2.96	71.20	9.65	4.78
33	0.6030	484.8	485	10.4	9.89	4.92	14.81	3.01	70.80	9.87	4.94
34	0.6540	503.9	504	11.3	10.17	5.00	15.17	3.04	70.30	10.08	5.09
35	0.7000	522.7	523	12.1	10.46	5.08	15.54	3.06	69.70	10.31	5.23
36	0.7530	547.0	547	13.0	10.83	5.16	15.99	3.10	69.20	10.57	5.42
37	0.8040	570.8	571	13.8	11.19	5.28	16.47	3.12	68.30	10.88	5.59
38	0.8530	596.5	597	14.7	11.58	5.34	16.92	3.17	67.90	11.13	5.79
39	0.9040	626.7	627	15.6	12.04	5.41	17.45	3.22	67.40	11.43	6.02

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1277.950			1282.930
Moisture content: Dry soil+tare, gms.	1081.060			1081.060
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	18.2	21.4	18.7	18.7
Moist specimen weight, gms.	1277.95			
Diameter, in.	2.845	2.862	2.839	
Area, in. ²	6.357	6.432	6.329	
Height, in.	6.003	5.991	5.807	
Net decrease in height, in.		0.012	0.184	
Net decrease in water volume, cc.			29.200	
Wet density, pcf	127.6	129.7	133.0	
Dry density, pcf	107.9	106.9	112.1	
Void ratio	0.5618	0.5771	0.5042	
Saturation, %	87.5	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²

Membrane thickness = 0.02 cm

Consolidation cell pressure = 105.00 psi (15.12 ksf)

Consolidation back pressure = 60.00 psi (8.64 ksf)

Consolidation effective confining stress = 6.48 ksf

Strain rate, %/min. = 0.07

Fail. Stress = 12.04 ksf at reading no. 39

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	6.48	6.48	1.00	60.00	6.48	0.00
1	0.0030	47.5	48	0.1	1.08	6.11	7.19	1.18	62.60	6.65	0.54
2	0.0050	50.8	51	0.1	1.15	6.03	7.19	1.19	63.10	6.61	0.58
3	0.0090	77.2	77	0.2	1.75	5.69	7.44	1.31	65.50	6.56	0.88
4	0.0140	99.5	100	0.2	2.26	5.33	7.59	1.42	68.00	6.46	1.13
5	0.0190	117.3	117	0.3	2.66	5.00	7.66	1.53	70.30	6.33	1.33
6	0.0230	132.1	132	0.4	2.99	4.71	7.70	1.64	72.30	6.21	1.50
7	0.0260	144.3	144	0.4	3.27	4.48	7.75	1.73	73.90	6.11	1.63
8	0.0300	155.3	155	0.5	3.52	4.28	7.79	1.82	75.30	6.03	1.76
9	0.0350	164.7	165	0.6	3.72	4.09	7.81	1.91	76.60	5.95	1.86
10	0.0390	172.6	173	0.7	3.90	3.87	7.77	2.01	78.10	5.82	1.95
11	0.0440	180.7	181	0.8	4.08	3.77	7.85	2.08	78.80	5.81	2.04
12	0.0500	188.0	188	0.9	4.24	3.63	7.87	2.17	79.80	5.75	2.12
13	0.0530	194.7	195	0.9	4.39	3.50	7.89	2.25	80.70	5.69	2.19
14	0.0580	201.0	201	1.0	4.53	3.38	7.91	2.34	81.50	5.65	2.26
15	0.0660	206.0	206	1.1	4.63	3.28	7.92	2.41	82.20	5.60	2.32
16	0.0710	212.5	213	1.2	4.78	3.20	7.97	2.49	82.80	5.58	2.39
17	0.0750	218.0	218	1.3	4.90	3.11	8.01	2.57	83.40	5.56	2.45
18	0.0800	223.4	223	1.4	5.01	3.05	8.07	2.64	83.80	5.56	2.51
19	0.0820	228.6	229	1.4	5.13	3.00	8.12	2.71	84.20	5.56	2.56
20	0.0870	233.5	234	1.5	5.23	2.92	8.16	2.79	84.70	5.54	2.62
21	0.0920	238.1	238	1.6	5.33	2.88	8.21	2.85	85.00	5.55	2.67
22	0.0980	243.1	243	1.7	5.44	2.84	8.27	2.92	85.30	5.56	2.72
23	0.1020	247.6	248	1.8	5.53	2.81	8.34	2.97	85.50	5.58	2.77