

REFERENCE: B-4484

PROJECT: 33723

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.	B-4484	1	66

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-LI-	24+00-35+00	5	8-9
-LI-	35+00-48+00	6	9-10
-LI-	48+00-54+00	7	10
-DWI-	10+00-14+37	6	10

CROSS SECTIONS

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-LI-	28+00-34+00	19-32
-LI-	38+00-39+45	33-35
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ROADWAY SUBSURFACE INVESTIGATION

COUNTY CRAVEN

PROJECT DESCRIPTION BRIDGE NOS. 138 AND 139 ON
SR 1470 (MAPLE CYPRESS RD.) OVER NEUSE RIVER
AND NEUSE RIVER OVERFLOW

INVENTORY

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:

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

PERSONNEL

MID-ATLANTIC
DRILLING, INC.

J.R. SWARTLEY

E. BLONSHINE

J. MILLWOOD

INVESTIGATED BY S&ME, Inc.

DRAWN BY J.R. SWARTLEY

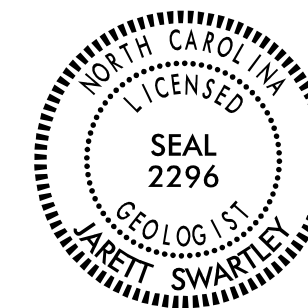
CHECKED BY S.S. LANEY

SUBMITTED BY S.S. LANEY

DATE JULY 2019



3201 SPRING FOREST ROAD
RALEIGH, NC 27616
(919) 872-2660



DocuSigned by:

Jarett Swartley

10/31/2019

919459487833723

SIGNATURE

DATE

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

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

SOIL DESCRIPTION

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 208, 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, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

Table with columns for General Class, Group Class, Symbol, % Passing #10, #40, #200, Material Passing #40 (LL, PI), Group Index, Usual Types of Major Materials, Gen. Rating as Subgrade, and Soil Legend symbols for Granular Materials, Silty-Clay Materials, and Organic Materials.

CONSISTENCY OR DENSENESS

Table mapping Primary Soil Type (e.g., Generally Granular Material, Generally Silty-Clay Material) to Compaction Consistency (e.g., Very Loose, Medium Dense) and Range of Standard Penetration Resistance (N-value).

TEXTURE OR GRAIN SIZE

Table showing U.S. Std. Sieve Size (mm) and corresponding Boulders, Cobbles, Gravel, Coarse Sand, Fine Sand, Silt, and Clay percentages.

SOIL MOISTURE - CORRELATION OF TERMS

Table correlating Soil Moisture Scale (Atterberg Limits), Field Moisture Description (e.g., Saturated, Wet, Moist, Dry), and Guide for Field Moisture Description.

PLASTICITY

Table showing Plasticity Index (PI) ranges (e.g., 0-5, 6-15, 16-25, 26 or more) and corresponding Dry Strength (Very Low, Slight, Medium, High).

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

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.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE (LL < 31)
MODERATELY COMPRESSIBLE (LL = 31 - 50)
HIGHLY COMPRESSIBLE (LL > 50)

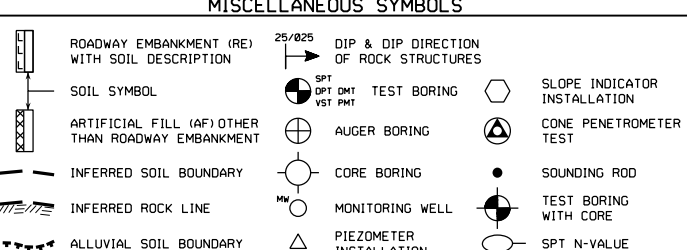
PERCENTAGE OF MATERIAL

Table showing percentages of Organic Material, Granular Soils, Silty-Clay Soils, and Other Material.

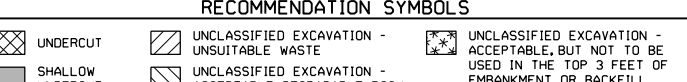
GROUND WATER

Water level symbols for bore hole immediately after drilling, static water level after 24 hours, perched water, and spring or seep.

MISCELLANEOUS SYMBOLS



RECOMMENDATION SYMBOLS



ABBREVIATIONS

Table of abbreviations for auger refusal, boring terminated, clay, cone penetration test, coarse, dilatometer test, dynamic penetration test, void ratio, fine, fossiliferous, fractured, fragments, highly, medium, mica, micaceous, moderately, non plastic, organic, pressuremeter test, saprolite, sand, sandy, silt, silty, slightly, tricone refusal, moisture content, very, van shear test, weathered, unit weight, dry unit weight, bulk, split spoon, Shelby tube, rock, re-compacted triaxial, CBR, ratio.

EQUIPMENT USED ON SUBJECT PROJECT

Checklist for equipment used on subject project, including drill units (CME-45C, CME-55, CME-550, vane shear test, portable hoist, D-25), advancing tools (clay bits, continuous flight auger, hollow augers, hard faced finger bits, tung-carbide inserts, casing, tricone, tricone, core bit), hammer type (automatic, manual), core size (-B, -H, -N), hand tools (post hole digger, hand auger, sounding rod, vane shear test, soil probe).

ROCK DESCRIPTION

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 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:

WEATHERED ROCK (WR) - NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.

CRYSTALLINE 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.

NON-CRYSTALLINE 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.

WEATHERING

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. IF TESTED, WOULD YIELD SPT REFUSAL

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. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF

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. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF

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.

ROCK HARDNESS

VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.

HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.

MODERATELY HARD - CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.

MEDIUM HARD - CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.

SOFT - CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.

VERY SOFT - CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.

FRACTURE SPACING

Table mapping fracture spacing terms (very wide, wide, moderately close, close, very close) to spacing ranges (more than 10 feet, 3 to 10 feet, 1 to 3 feet, 0.16 to 1 foot, less than 0.16 feet).

BEDDING

Table mapping bedding terms (very thickly bedded, thickly bedded, thinly bedded, very thinly bedded, thickly laminated, thinly laminated) to thickness ranges (4 feet, 1.5 - 4 feet, 0.16 - 1.5 feet, 0.03 - 0.16 feet, 0.008 - 0.03 feet, < 0.008 feet).

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

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.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

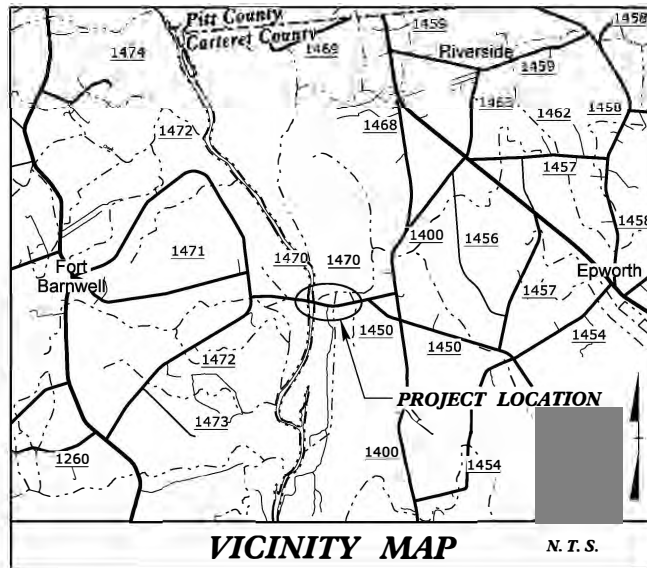
BENCH MARK: B-4484-1 N: 572680 E: 2506001

ELEVATION: 24.216 FEET

NOTES:

FIAD = FILLED IMMEDIATELY AFTER DRILLING

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CRAVEN COUNTY

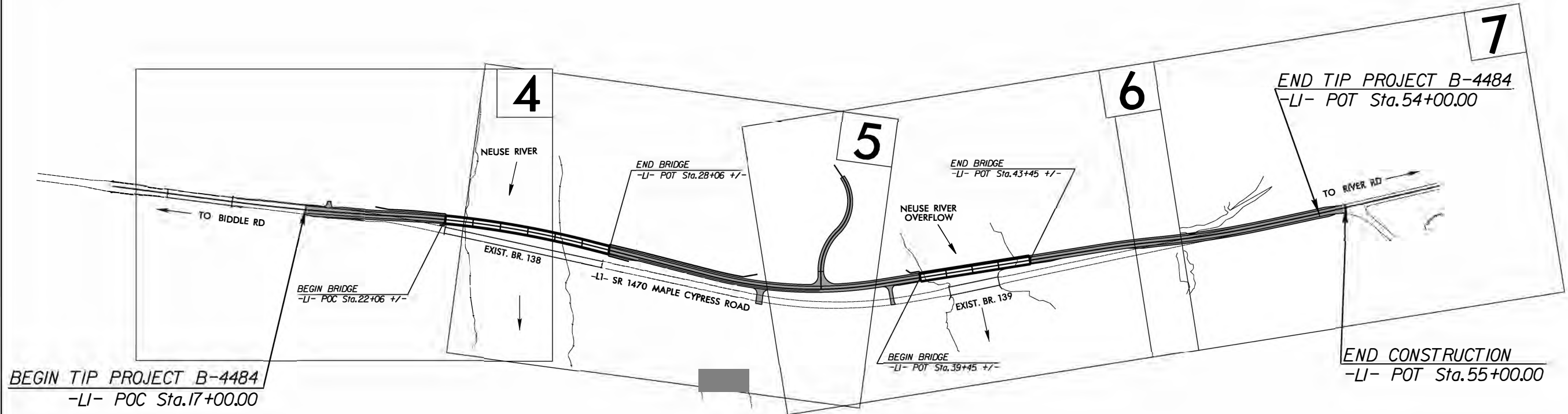
LOCATION: REPLACE BRIDGES NO. 138 & 139 OVER NEUSE RIVER AND NEUSE RIVER OVERFLOW ON SR 1470 (MAPLE CYPRESS ROAD)

TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND STRUCTURE

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4484	3	66
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
33723.1.2	NA	PE	



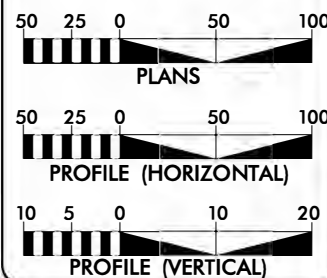
PROJECT: B-4484



THERE IS NO CONTROL OF ACCESS ON THIS PROJECT.
THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES



DESIGN DATA

ADT 2019 = 1,863
ADT 2039 = 2,279
K = 12 %
D = 60 %
T = 10 % *
V = 60 MPH
*(TTST=3% + DUAL=7%)
FUNC CLASS = MAJOR COLLECTOR
SUB-REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-4484 = 0.515 MILE +/-
LENGTH STRUCTURE TIP PROJECT B-4484 = 0.186 MILE +/-
TOTAL LENGTH TIP PROJECT B-4484 = 0.701 MILE +/-

PLANS PREPARED BY:

RS&H

8521 SIX FORKS RD, SUITE 400
RALEIGH, NC 27615
919-926-4100

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
JULY 20, 2018

LETTING DATE:
JUNE 18, 2019

FOR THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

JOHN TOWNSEND, PE
PROJECT ENGINEER

DREW MORROW, PE
PROJECT DESIGN ENGINEER

HON YEUNG, PE
NCDOT CONTACT

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.



CONTRACT:



March 1, 2019

STATE PROJECT: 33723.1.2 (B-4484)
 FEDERAL PROJECT: N/A
 COUNTY: Craven
 DESCRIPTION: Replace Bridge No. 138 and 139 on SR 1470 over Neuse River and Neuse River Overflow

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

The project corridor is located in Craven County near the town of Ft. Barnwell. The project consists of the realignment of Maple Cypress Rd. Maple Cypress Rd. (-L1-) will be realigned to the northwest of existing so the new structures over the Neuse River and Neuse River Overflow can be constructed with no off-site detour. There are four retaining walls associated with these bridges that were investigated during this Roadway Investigation. The mainline (-L1-) starts at the southern end of the project and continues northeast for approximately 0.71 miles. There is one secondary alignment (-DW1-) that intersects with Maple Cypress Rd. This is a partial new alignment that will tie into the existing boat ramp driveway. The boat ramps and gravel driveway currently belong to the NC Wildlife Resources Commission.

The geotechnical field investigation was conducted during the period of November 2018 through February 2019. One Mid-Atlantic drill crew and one S&ME drill crew were used to drill, sample, and log the borings in this report. Mid-Atlantic rigs used for the drilling include a truck-mounted CME-45C drill machine and a D-25 drill machine mounted on an amphibious carrier equipped with tracks. The S&ME rig used was a truck-mounted D-50. All rigs were equipped with automatic hammers. Standard Penetration Tests were performed at selected locations and additional borings were advanced using hand augers and sampling probes. Representative soil samples were collected for visual classification in the field and selected samples were submitted for laboratory analysis by the S&ME soils lab. Soil results are referenced back to the original alignment the boring was assigned to during layout and drilling.

The following alignments, excluding the bridges, totaling 0.59 miles, were investigated. Subsurface profiles and/or cross-sections of these alignments are included in this report.

<u>Line</u>	<u>Station</u>
-L1-	17+00 to 54+00
-DW1-	10+00 to 14+37

Areas of Special Geotechnical Interest

1) The following station ranges encountered soft, cohesive soils which have the potential to cause embankment stability and/or long term settlement problems:

<u>Line</u>	<u>Station</u>
-L1-	20+00 to 22+06
-L1-	28+06 to 33+50
-L1-	38+50 to 39+45
-L1-	43+45 to 50+00

2) Highly Plastic Clays: Highly plastic clays (PI > 25) were encountered on the project at the following station ranges:

<u>Line</u>	<u>Stations</u>	<u>Offsets (ft)</u>
-L1-	17+00 to 21+00	9' LT to 38' LT

3) High Groundwater: High groundwater within 6' of grade or less was encountered at the following station ranges:

<u>Line</u>	<u>Stations</u>	<u>Offsets (ft)</u>
-DW1-	10+11 to 14+37	LT & RT

4) Organic Soils: Soils with varying degrees of organic matter were encountered at the following locations:

<u>Line</u>	<u>Stations</u>	<u>Offsets (ft)</u>
-L1-	47+00 to 48+50	40' LT to 40' RT
-L1-	49+60 to 50+42	25' LT to 30 RT

Physiography and Geology

The project corridor is located in eastern North Carolina in the Coastal Plain Physiographic Province of North Carolina. A mixture of fields, wooded areas and swamp lie within the project corridor. The project corridor is predominately rural with few single family homes and farm fields. Topography along the project is flat to gently sloping. Elevations along the project range from -5± to 27± feet above sea level.

Geologically the surficial soils in the area are generally classified as alluvial sediments. These soils were transported by the fluvial processes in this area and are of recent depositional timelines. They were deposited and transported during fluctuating periods of river elevation rise and fall and channel migration. The soils underlying these deposits are formational Coastal Plain soils belonging to the Duplin Formation and Castle Hayne Formation. The Duplin Formation is Tertiary in age and consists of glauconitic and/or calcareous, sands, silts and clays with or without shells. Varying degrees of cementation are possible in the older stratas of the Duplin Formation. This formation can be intercalated with sedimentary rock in some locations. The Castle Hayne Formation is also Tertiary in age and are older sediments than the Duplin. These soils consist of limestone, sandy limestone, calcareous sands and phosphate conglomerates. Some sedimentary rock including limestone and sandstone were encountered minimally during this investigation.

Water Bodies

There are some rivers and streams that run through the project corridor. All the water bodies flow from left to right underneath Maple Cypress Road. Starting from the southern part of the project, the Neuse River passes underneath a 14-span bridge on Maple Cypress Rd at -L1- Sta. 25+00. Towards the northern end of the project, the Neuse River Overflow passes underneath a 4-span Bridge on Maple Cypress Rd at -L1- Sta. 41+50. These two structures are state bridge nos. 138 and 139 respectively. At -L1- Sta. 49+00 there is a stream that passes underneath Maple Cypress Rd. through an 84" corrugated pipe. All of these structures will be replaced or improved at the time of this investigation and were investigated with additional SPT borings. A separate inventory report will be submitted for each.

The Neuse River Overflow contains a substantial floodplain in the form of a cypress swamp between -L- Sta. 42+00 and 52+00. Three feet or less of water resides in this swamp during most of the year. These water bodies have had some major impacts from hurricanes in the recent past. In 1999, Hurricane Floyd inundated most of the corridor with a recorded water elevation of 21.6 feet. In 2016, Hurricane Matthew did the same with a recorded water elevation of 19.2 feet. In 2018, Hurricane Florence caused a water level of approximately ± 17 to ± 18 feet according to local interviews. There is a USGS river gauge attached to Bridge No. 138 that can be monitored throughout the year. During this investigation water elevations ranged from approximately $7\pm$ to $10\pm$ feet. Water elevation is variable at this site.

Soil Properties

Soils encountered during this investigation are separated into 3 categories: Roadway Embankment, Alluvial and Coastal Plain soils.

Roadway Embankment soils are granular in nature and may be derived from nearby sources. These soils consist of gray, tan and brown, very loose to med. dense, clayey sand (A-2-6), silty sand (A-2-4) and sand (A-3) soft to stiff, sandy silt (A-4) and sandy clay (A-6).

Alluvial soils are found near the channels and floodplains from the nearby rivers and streams in the area. These soils consist of gray, brown, tan, orange and green, very loose to dense, sand (A-3), silty sand (A-2-4) and clayey sand (A-2-6) and very soft to stiff, sandy clay (A-6), silty clay (A-7-6), sandy silt (A-4) and muck.

Coastal Plain formational soils of the Duplin Formation underlie the alluvial soils. These soils consist of gray and green, very loose to very dense, sand (A-3), silty sand (A-2-4) and clayey sand (A-2-6) and very soft to stiff, sandy silt (A-4) and sandy clay (A-6).

Coastal Plain formational soils of the Castle Hayne Formation underlie the Duplin Formation. These soils consist of med. dense to very dense, gray, dark gray and black, sand (A-1-b/A-3) and silty sand (A-2-4) and moderately weathered, sandy limestone.

Groundwater

Groundwater measurements were taken in November and December of 2018 and February and March of 2019 during average to above average rainfall conditions. Groundwater is typically between 1 foot and 7 feet below the ground surface in upland areas and at or near the surface in low lying areas. Ground water is expected to cause some impacts during construction depending on rainfall conditions at the time.

Respectfully Submitted,



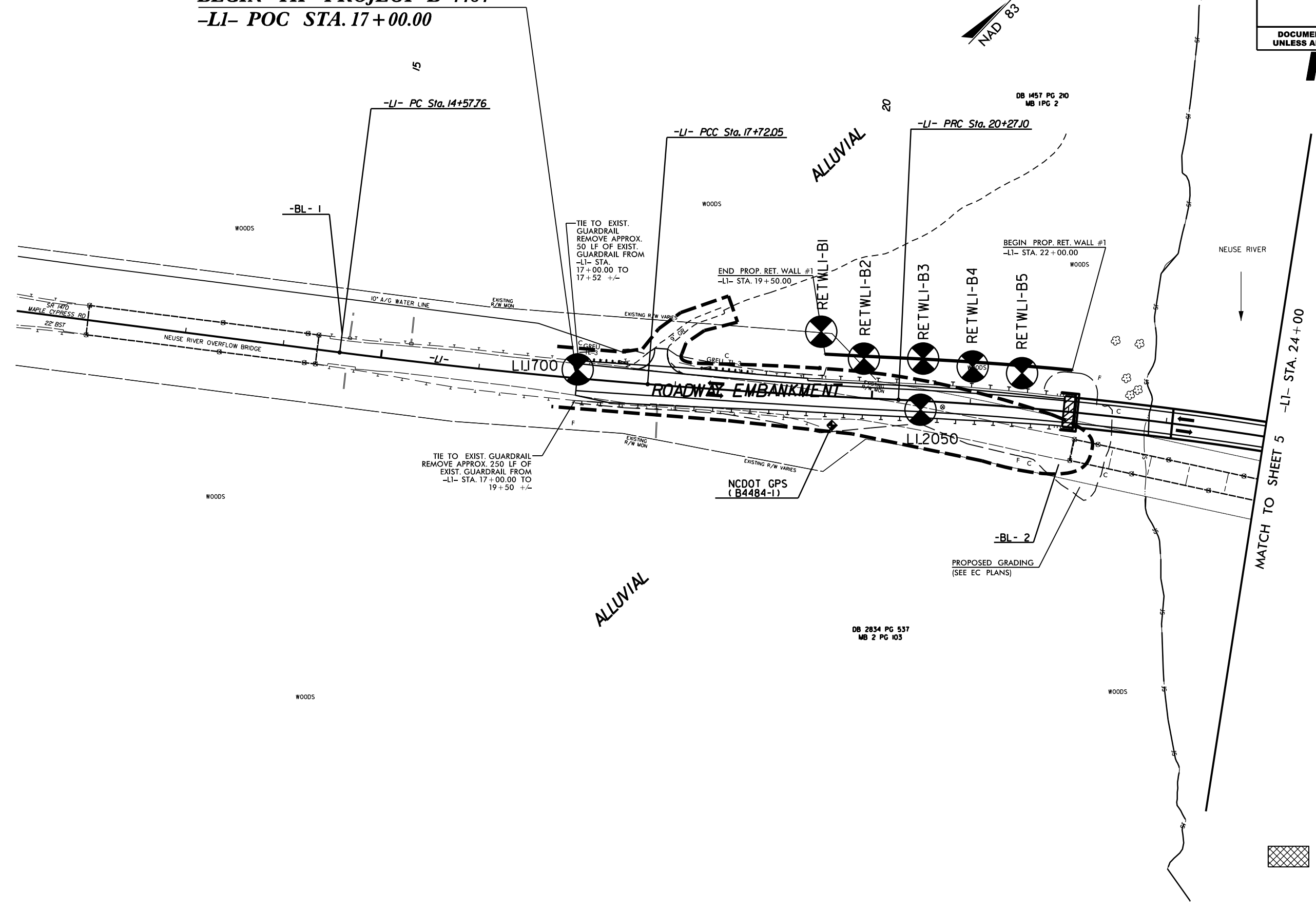
Jarett Swartley, PG
Senior Geologist

8/17/99

PROJECT REFERENCE NO. B-4484	SHEET NO. 4
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



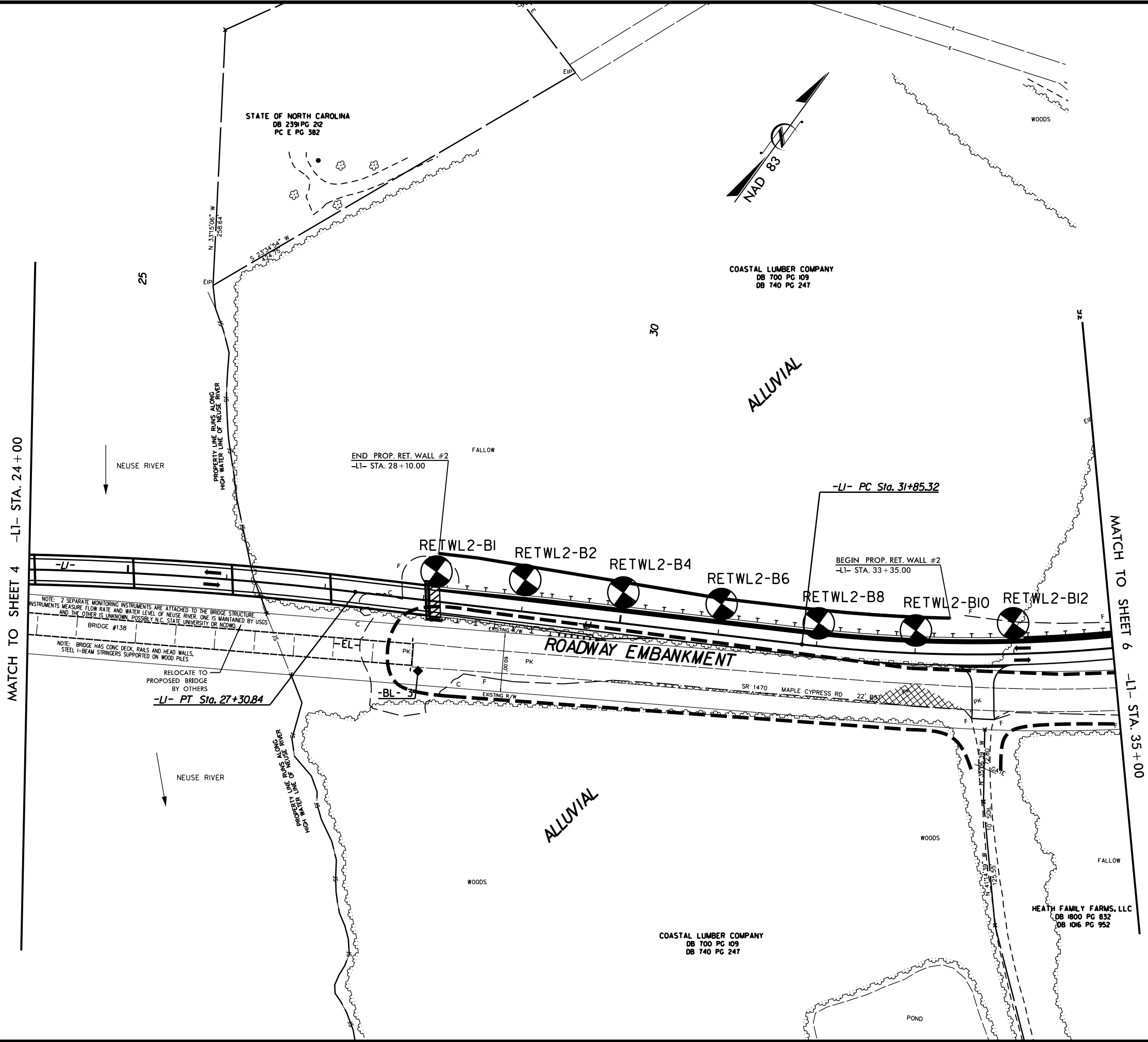
BEGIN TIP PROJECT B-4484
-LI- POC STA. 17+00.00



PAVEMENT REMOVAL

\$\$\$\$\$SYTIME\$\$\$\$\$
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\$\$\$\$\$DATE\$\$\$\$\$
\$\$\$\$\$BY\$\$\$\$\$

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INCOMPLETE PLANS <small>DO NOT USE FOR A/W ACQUISITION</small>			
DOCUMENT NOT CONSIDERED FINAL <small>UNLESS ALL SIGNATURES COMPLETED</small>			



COASTAL LUMBER COMPANY
 DB 700 PG 109
 DB 740 PG 247

HEATH FAMILY FARMS, LLC
 DB 1800 PG 832
 DB 1016 PG 952

PAVEMENT REMOVAL

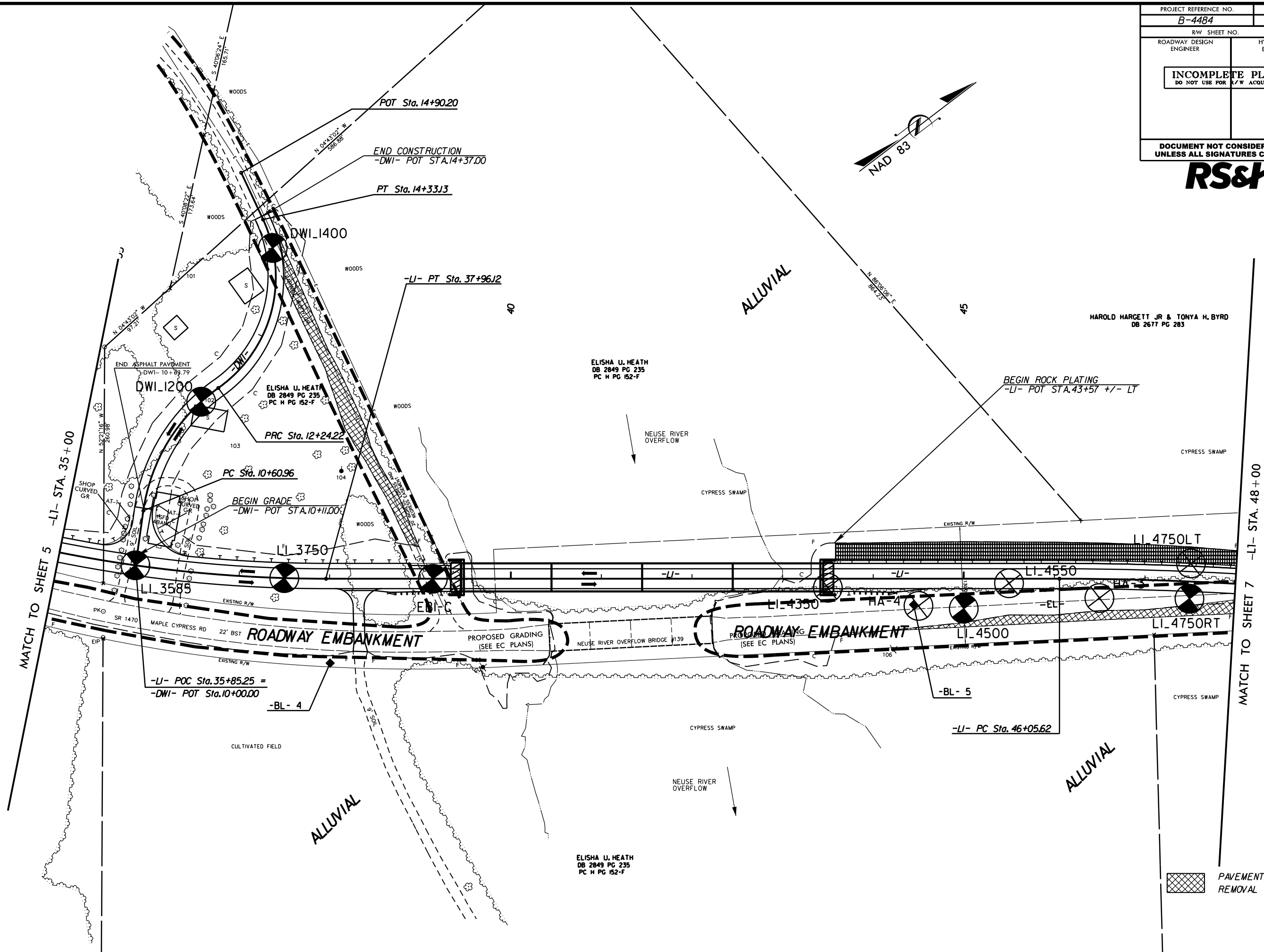
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8/17/99

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RS&H

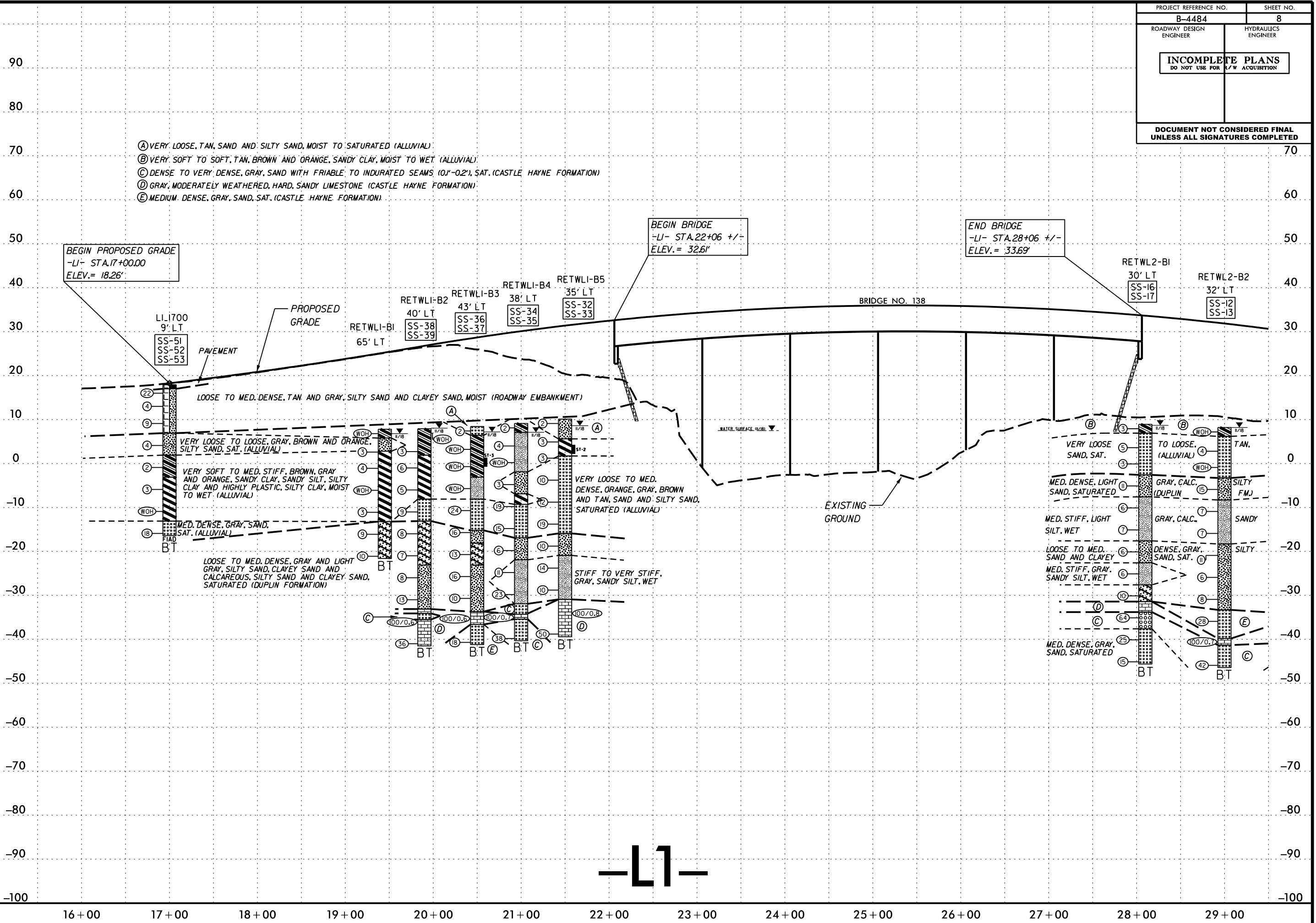
HAROLD HARGETT JR & TONYA H. BYRD
DB 2677 PG 283



PAVEMENT REMOVAL

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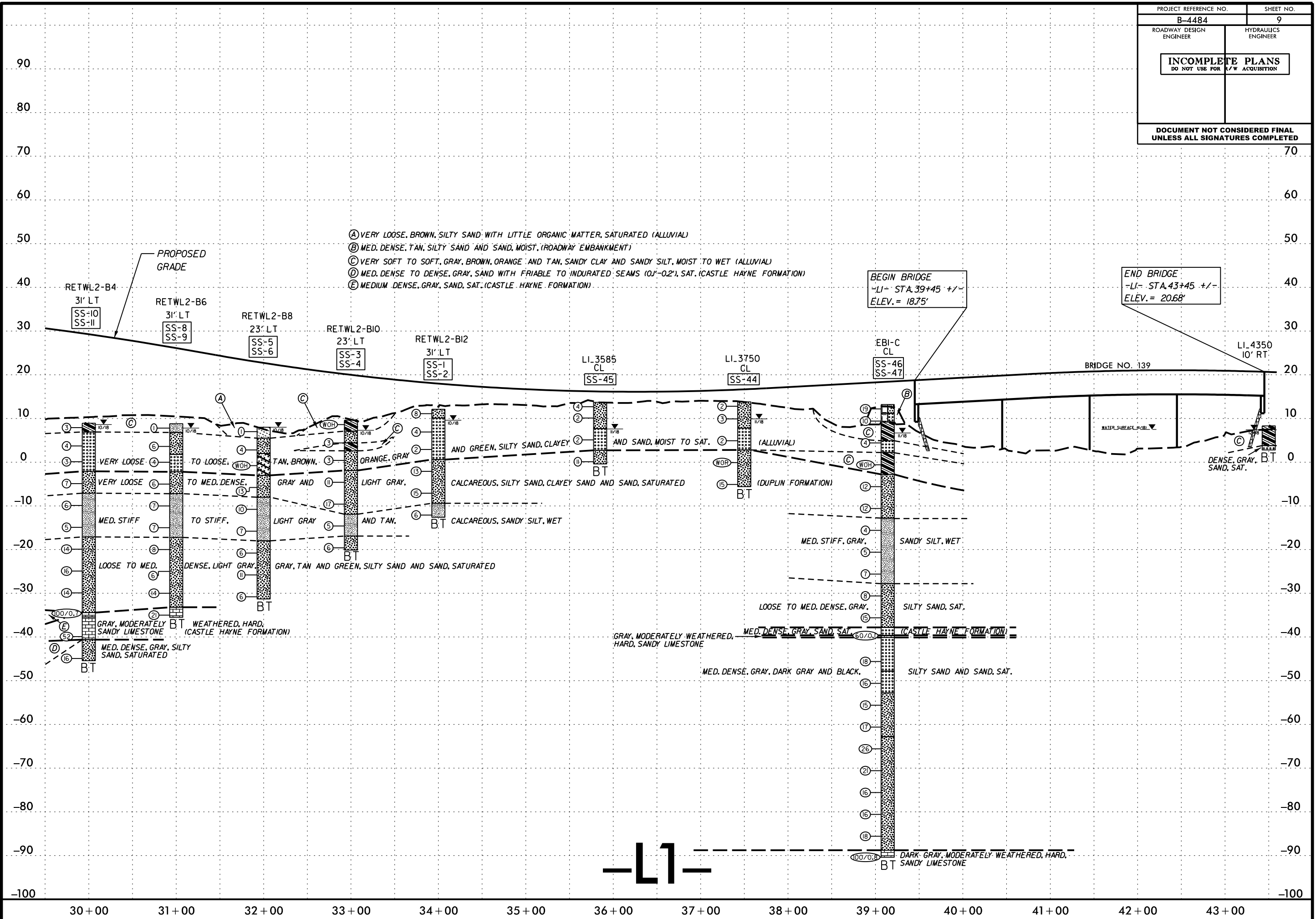
5/14/99



-L1-

5/14/99

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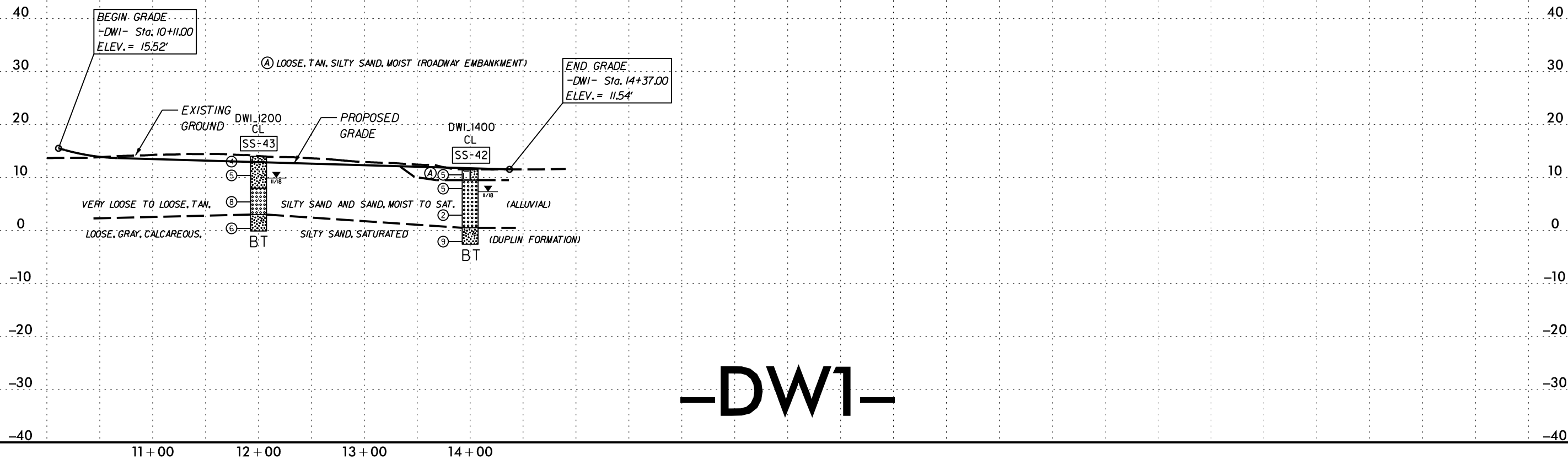
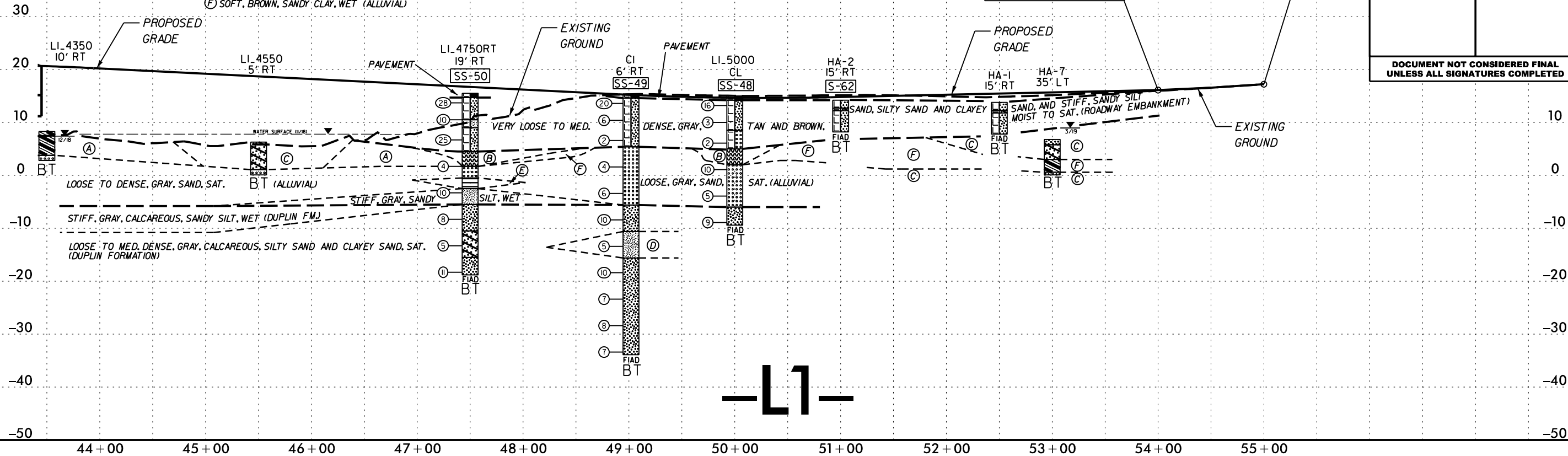
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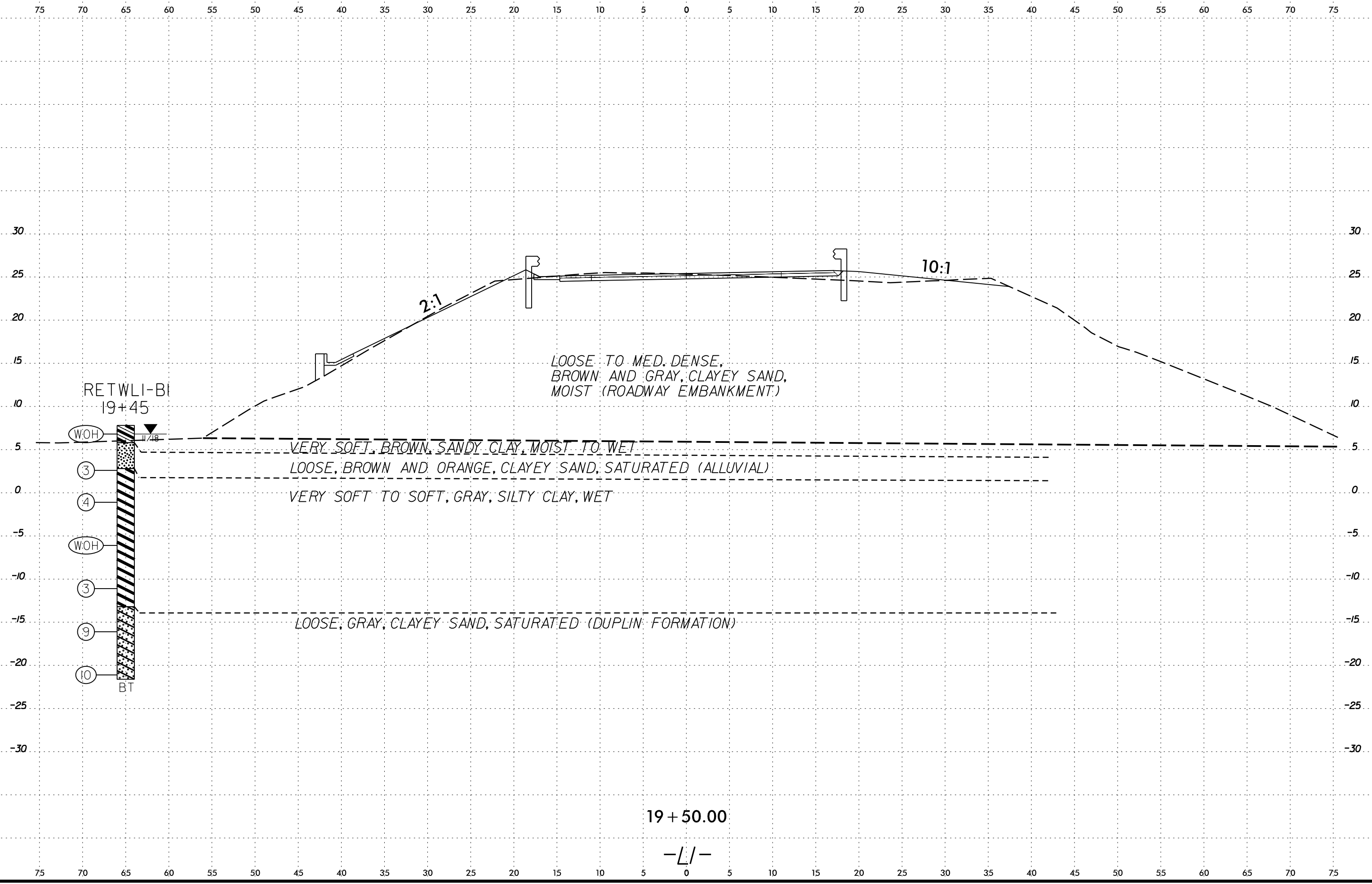
5/28/99

- (A) VERY SOFT TO SOFT, GRAY, SANDY CLAY, MOIST TO WET (ALLUVIAL)
- (B) SOFT, BROWN, MUCK, SAT. (ALLUVIAL)
- (C) VERY LOOSE TO MED. DENSE, BROWN, GRAY, GREEN AND TAN, CLAYEY SAND AND SILTY SAND, SATURATED (ALLUVIAL)
- (D) MED. STIFF, GRAY AND GREEN, SANDY SILT, WET (DUPLIN FORMATION)
- (E) VERY SOFT, BROWN, SANDY SILT WITH MODERATE ORGANIC MATTER, WET (ALLUVIAL)
- (F) SOFT, BROWN, SANDY CLAY, WET (ALLUVIAL)

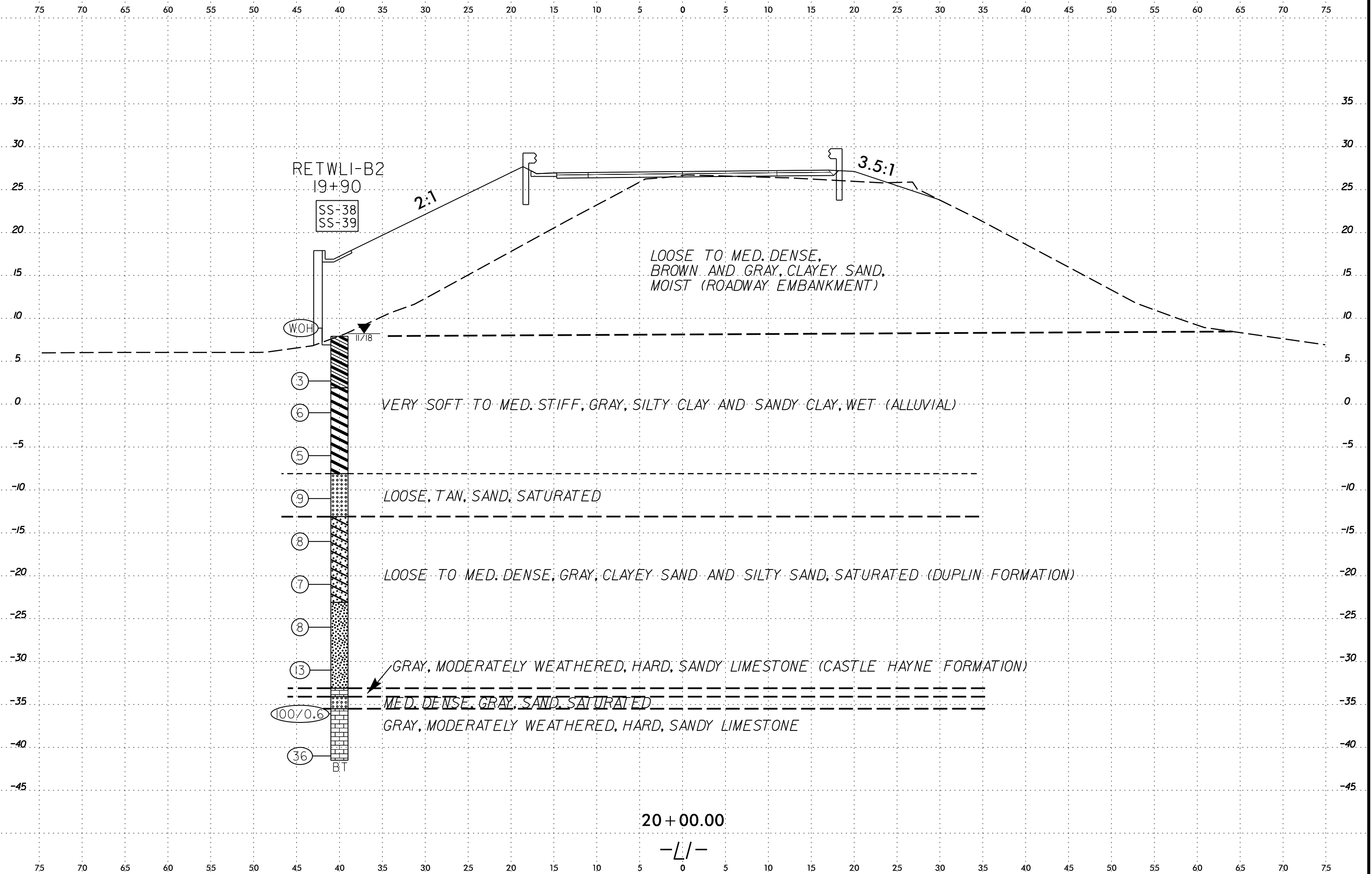
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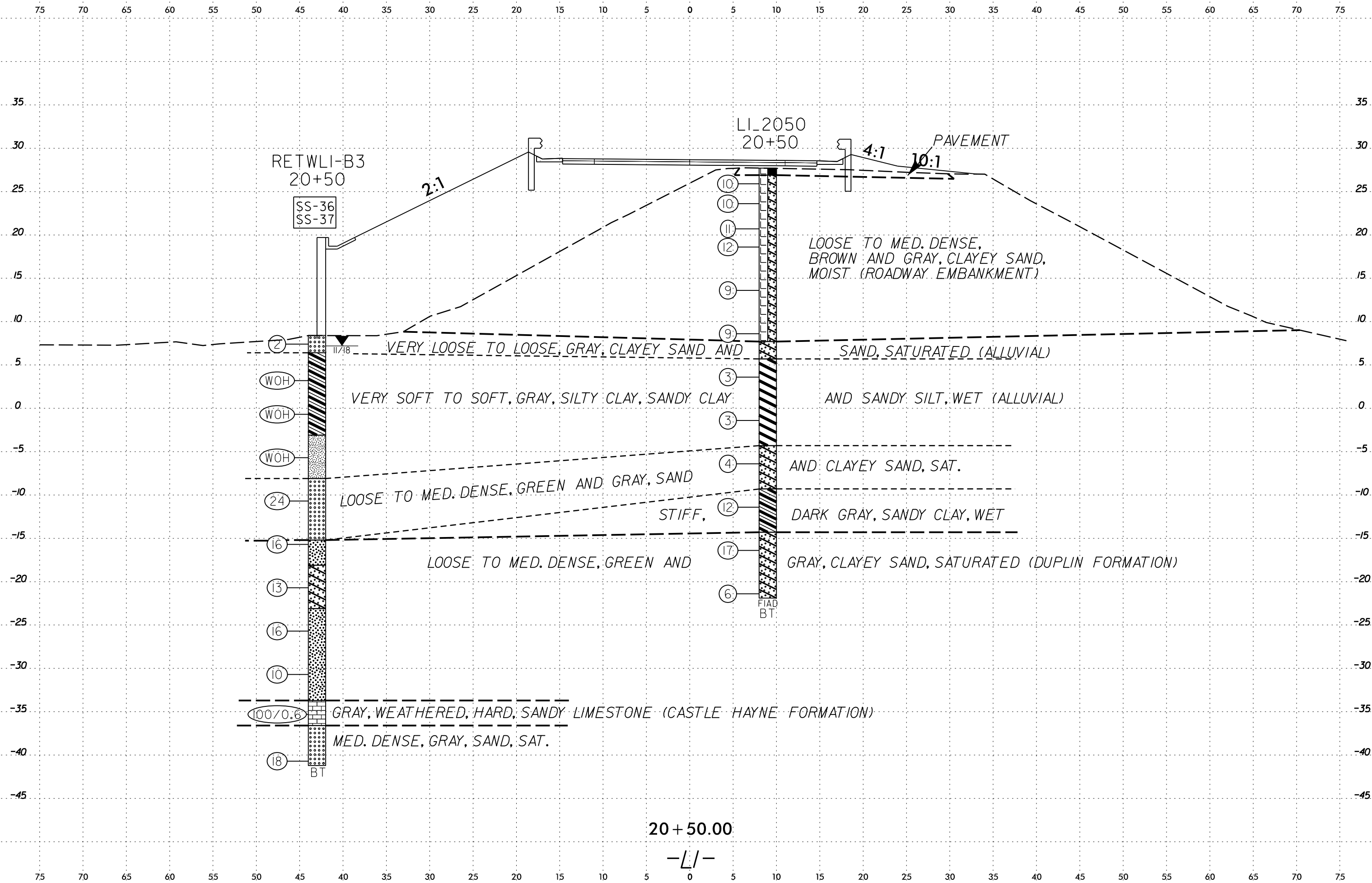
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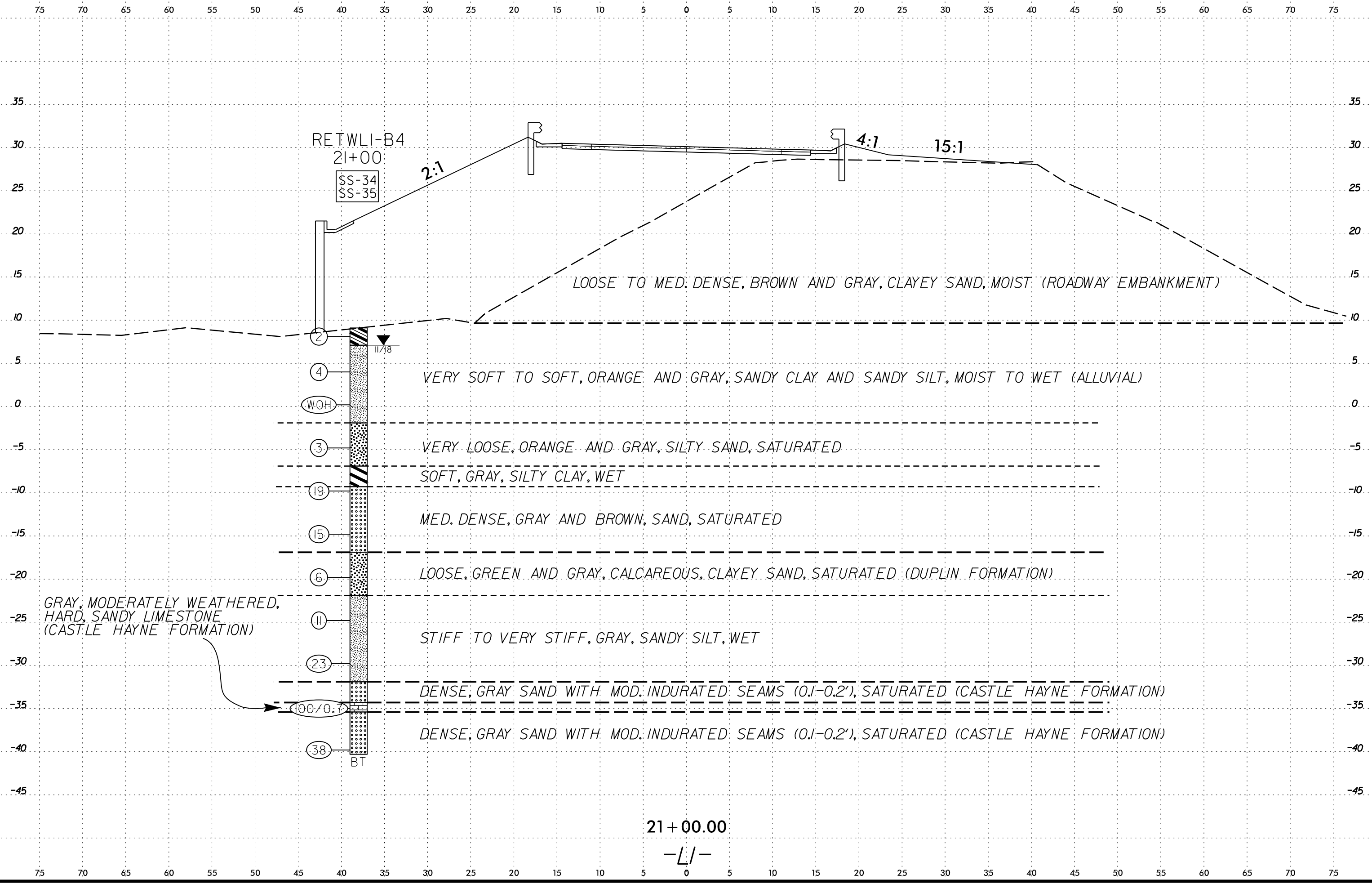
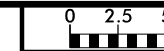
DATE: 6/23/16
 DRAWN BY: J. BRYAN
 CHECKED BY: J. BRYAN
 PROJECT: B-4484
 SHEET: 11



SCHEMATIC CROSS SECTION
DUPLIN FORMATION
CASTLE HAYNE FORMATION



SYTIME
CON
DU
RRA
NE



RETWLI-B4
21+00
SS-34
SS-35

LOOSE TO MED. DENSE, BROWN AND GRAY, CLAYEY SAND, MOIST (ROADWAY EMBANKMENT)

VERY SOFT TO SOFT, ORANGE AND GRAY, SANDY CLAY AND SANDY SILT, MOIST TO WET (ALLUVIAL)

VERY LOOSE, ORANGE AND GRAY, SILTY SAND, SATURATED

SOFT, GRAY, SILTY CLAY, WET

MED. DENSE, GRAY AND BROWN, SAND, SATURATED

LOOSE, GREEN AND GRAY, CALCAREOUS, CLAYEY SAND, SATURATED (DUPLIN FORMATION)

GRAY, MODERATELY WEATHERED,
HARD, SANDY LIMESTONE
(CASTLE HAYNE FORMATION)

STIFF TO VERY STIFF, GRAY, SANDY SILT, WET

DENSE, GRAY SAND WITH MOD. INDURATED SEAMS (0.1-0.2'), SATURATED (CASTLE HAYNE FORMATION)

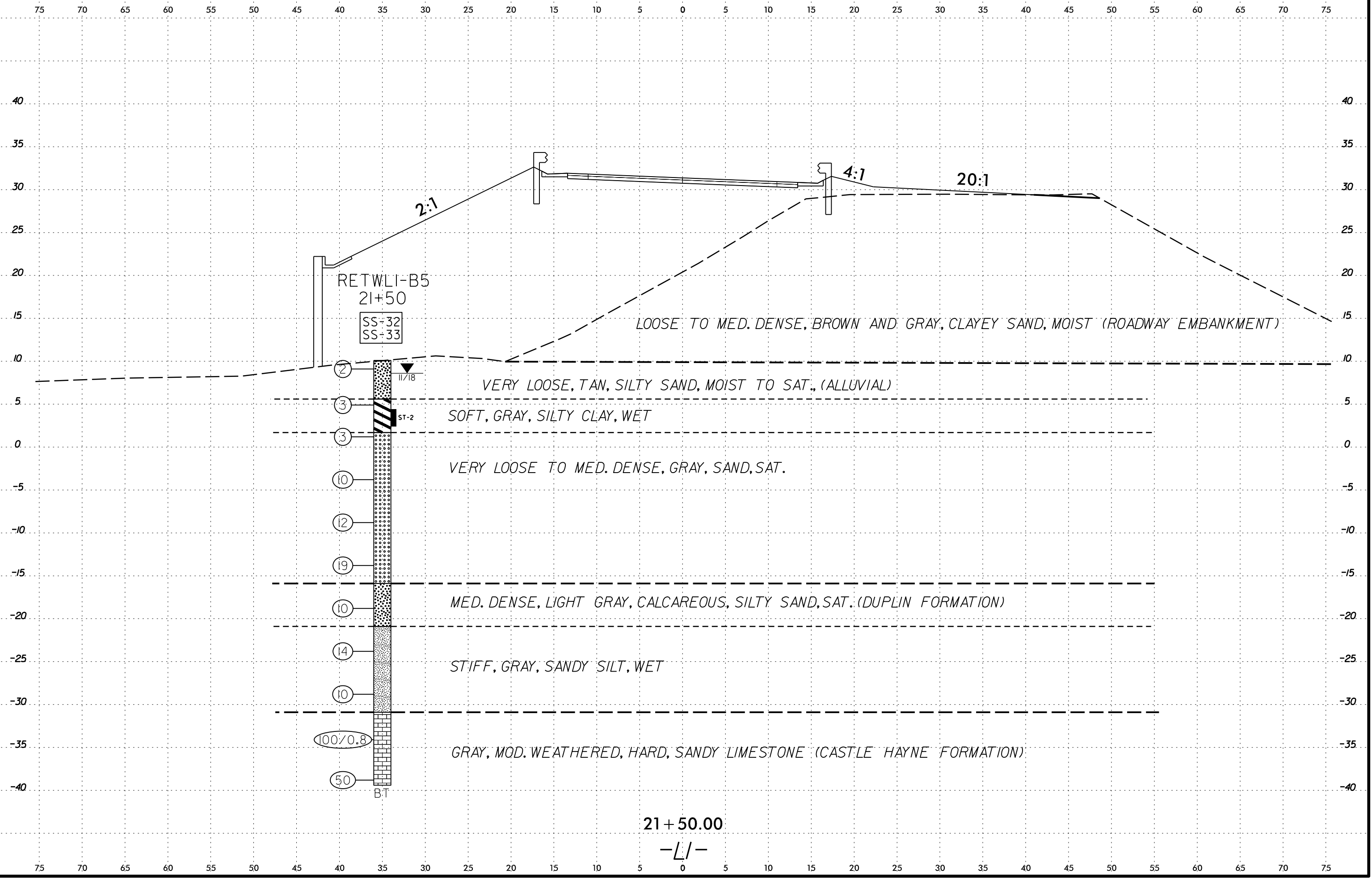
DENSE, GRAY SAND WITH MOD. INDURATED SEAMS (0.1-0.2'), SATURATED (CASTLE HAYNE FORMATION)

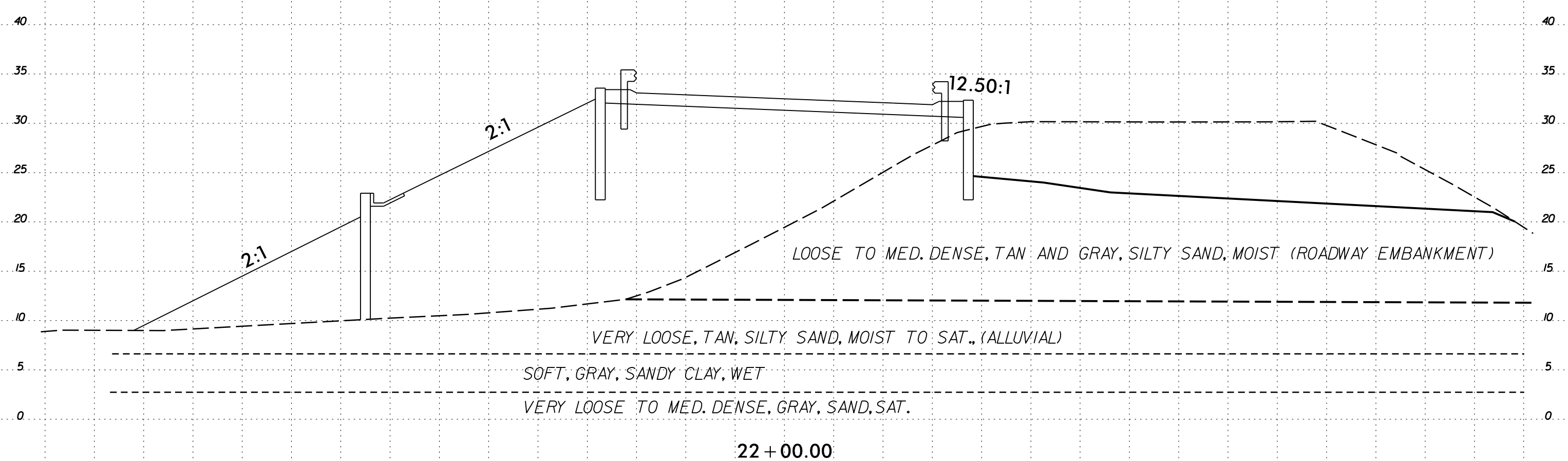
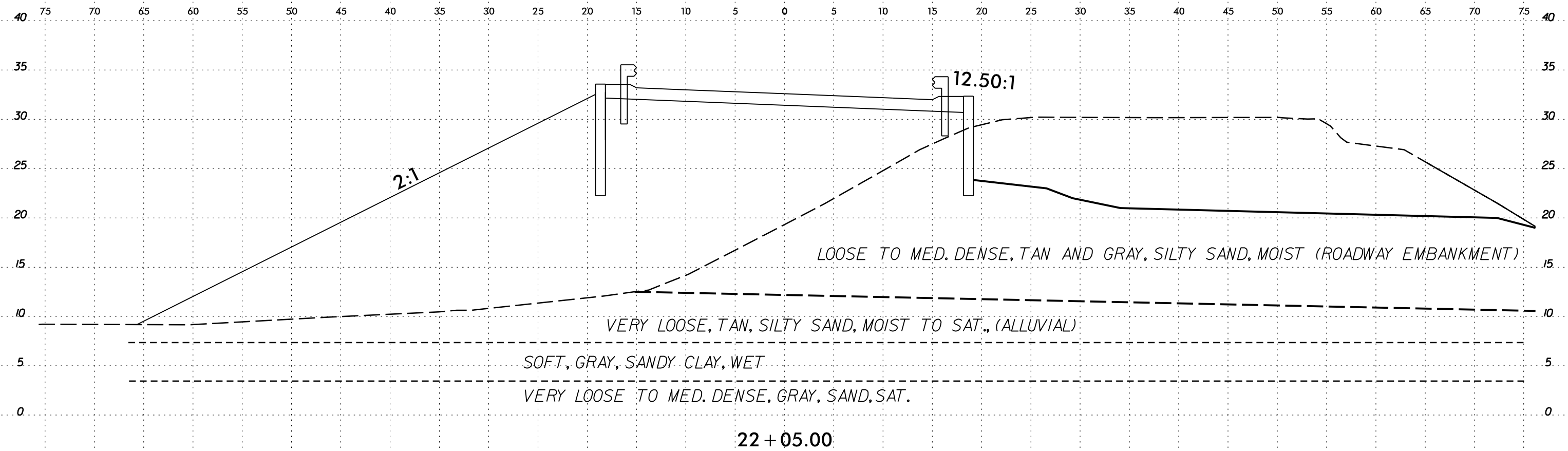
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-L1-

CASTLE HAYNE FORMATION

6/23/16
SYTIME
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REARRANG

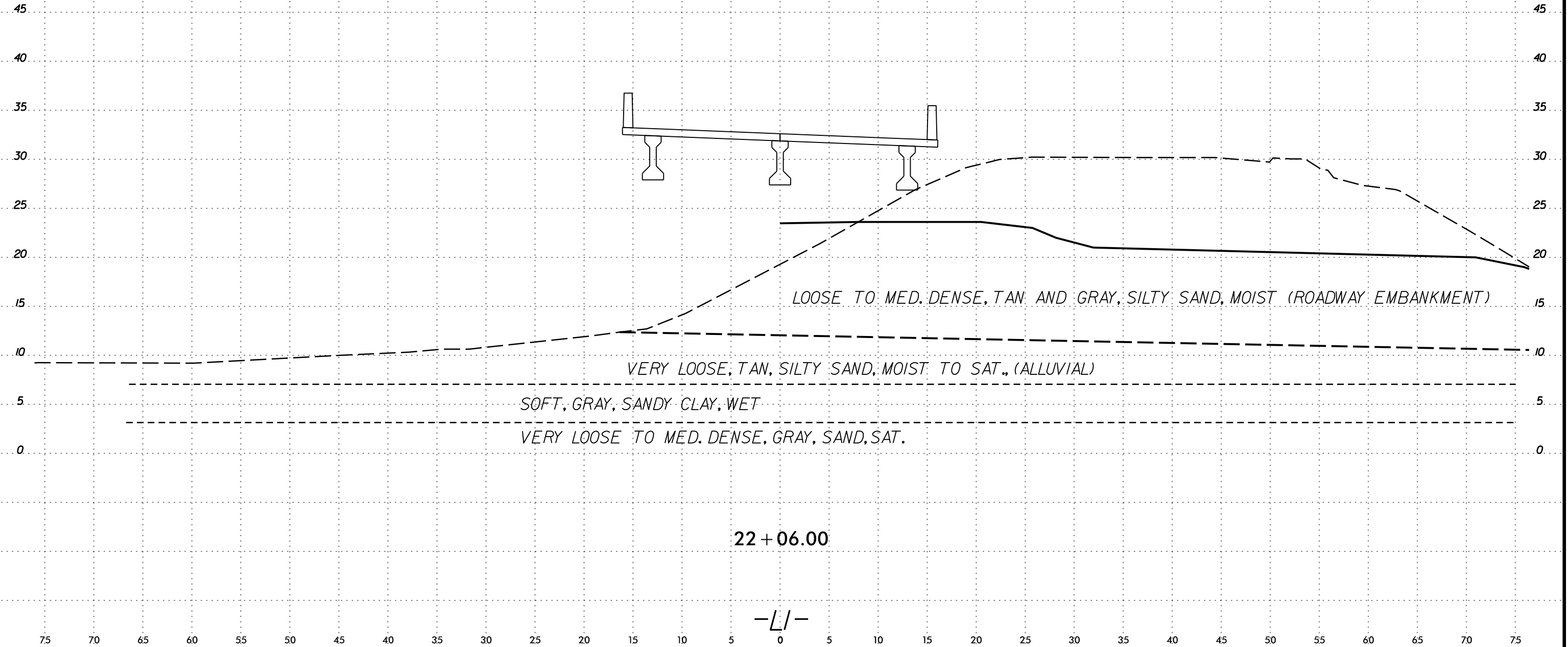


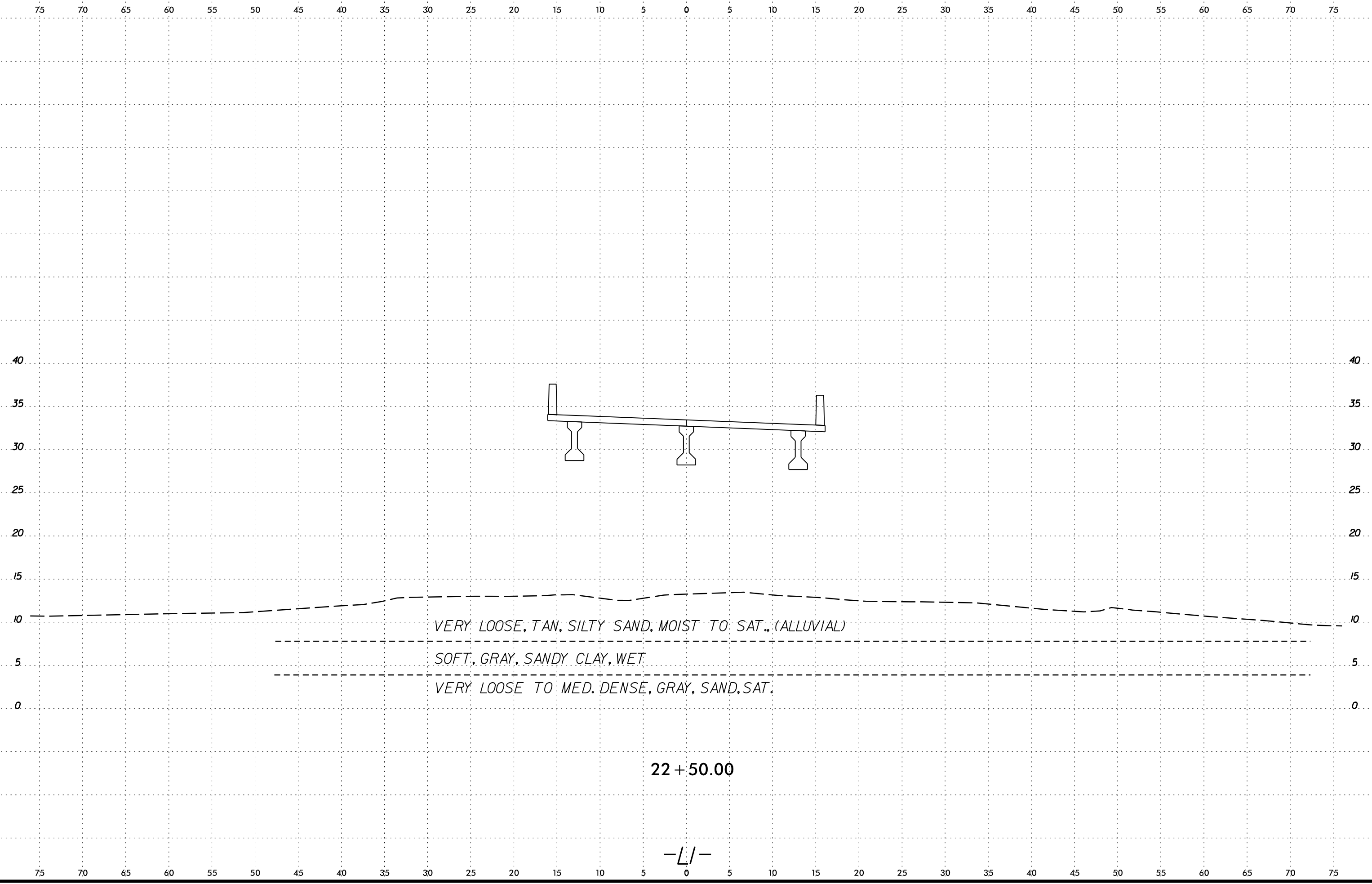


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PROJECT: B-4484
SHEET: 16

6/23/16
UNION
COUNTY
TERRITORY
ARIZONA

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75





VERY LOOSE, TAN, SILTY SAND, MOIST TO SAT., (ALLUVIAL)

SOFT, GRAY, SANDY CLAY, WET

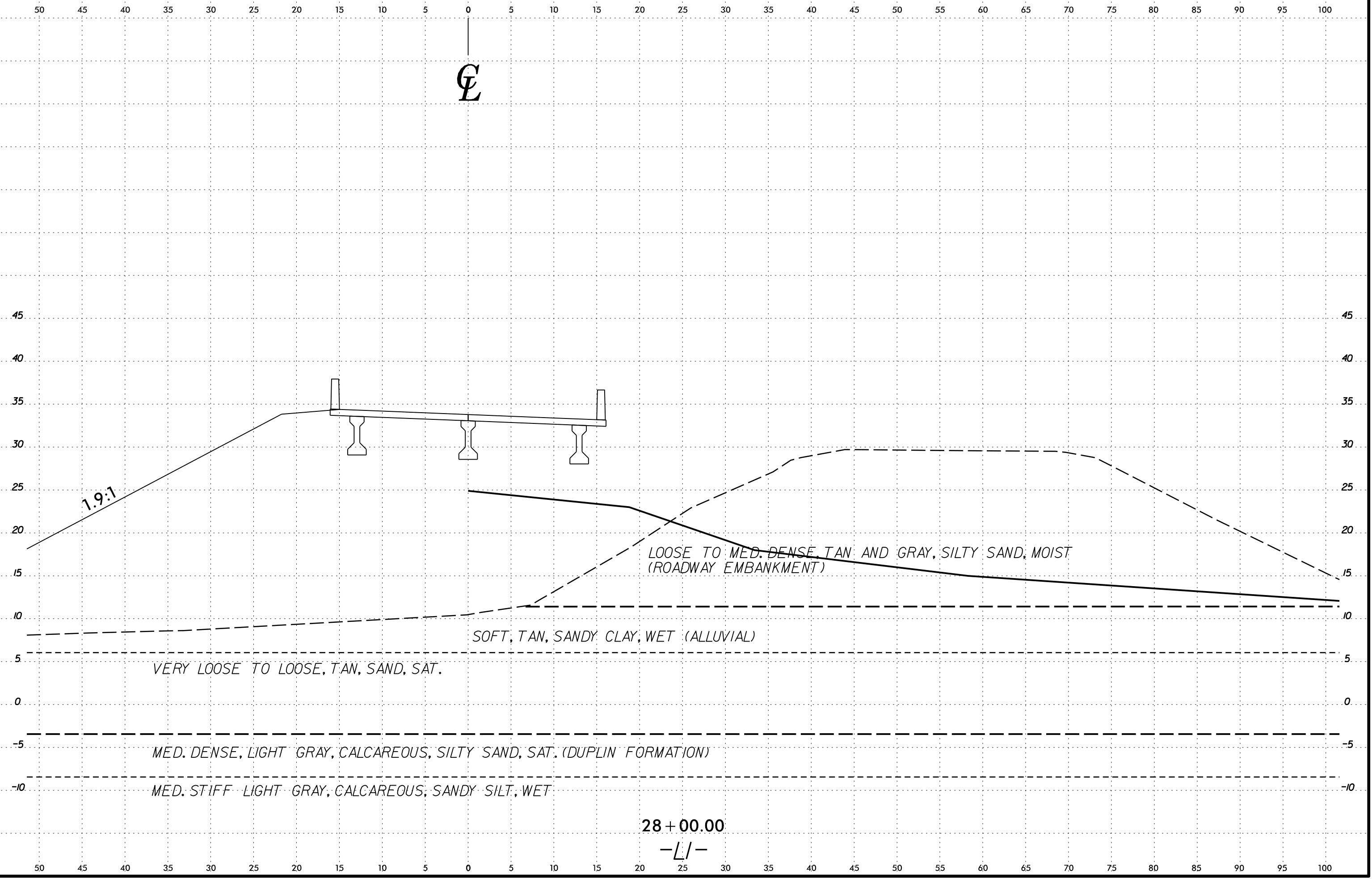
VERY LOOSE TO MED. DENSE, GRAY, SAND, SAT.

22 + 50.00

-L/-

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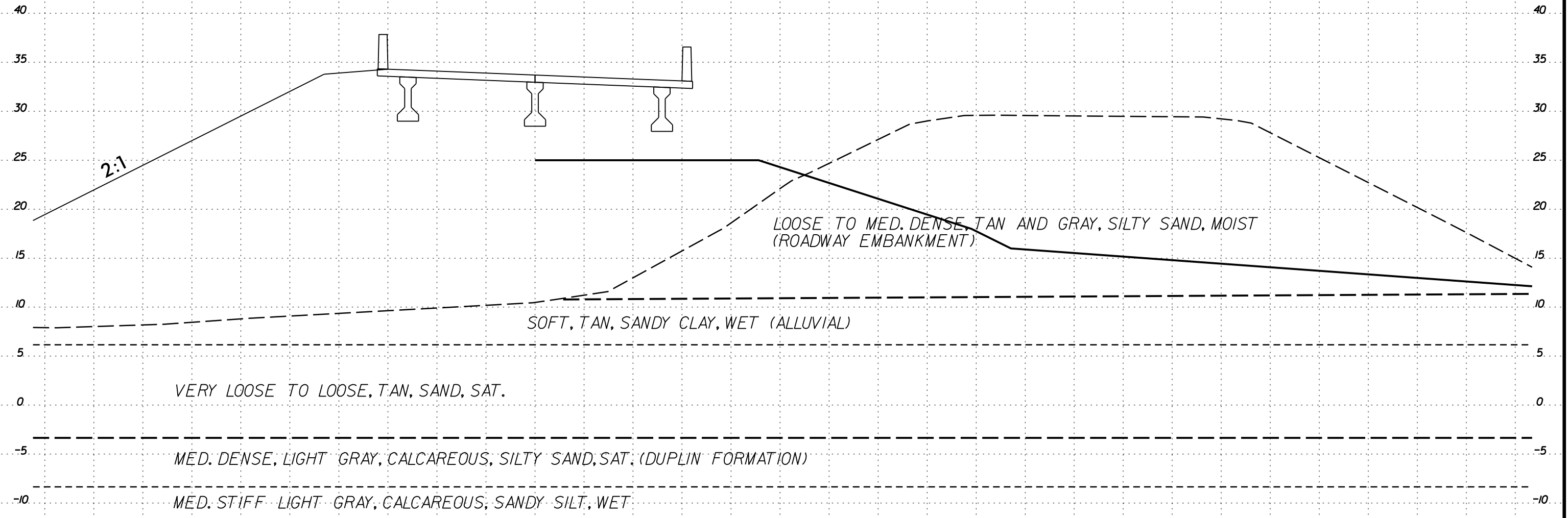
6/23/16
SECTION
DUPLIN
FORMATION



6/23/16

50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

CL



2:1

LOOSE TO MED. DENSE, TAN AND GRAY, SILTY SAND, MOIST (ROADWAY EMBANKMENT)

SOFT, TAN, SANDY CLAY, WET (ALLUVIAL)

VERY LOOSE TO LOOSE, TAN, SAND, SAT.

MED. DENSE, LIGHT GRAY, CALCAREOUS, SILTY SAND, SAT. (DUPLIN FORMATION)

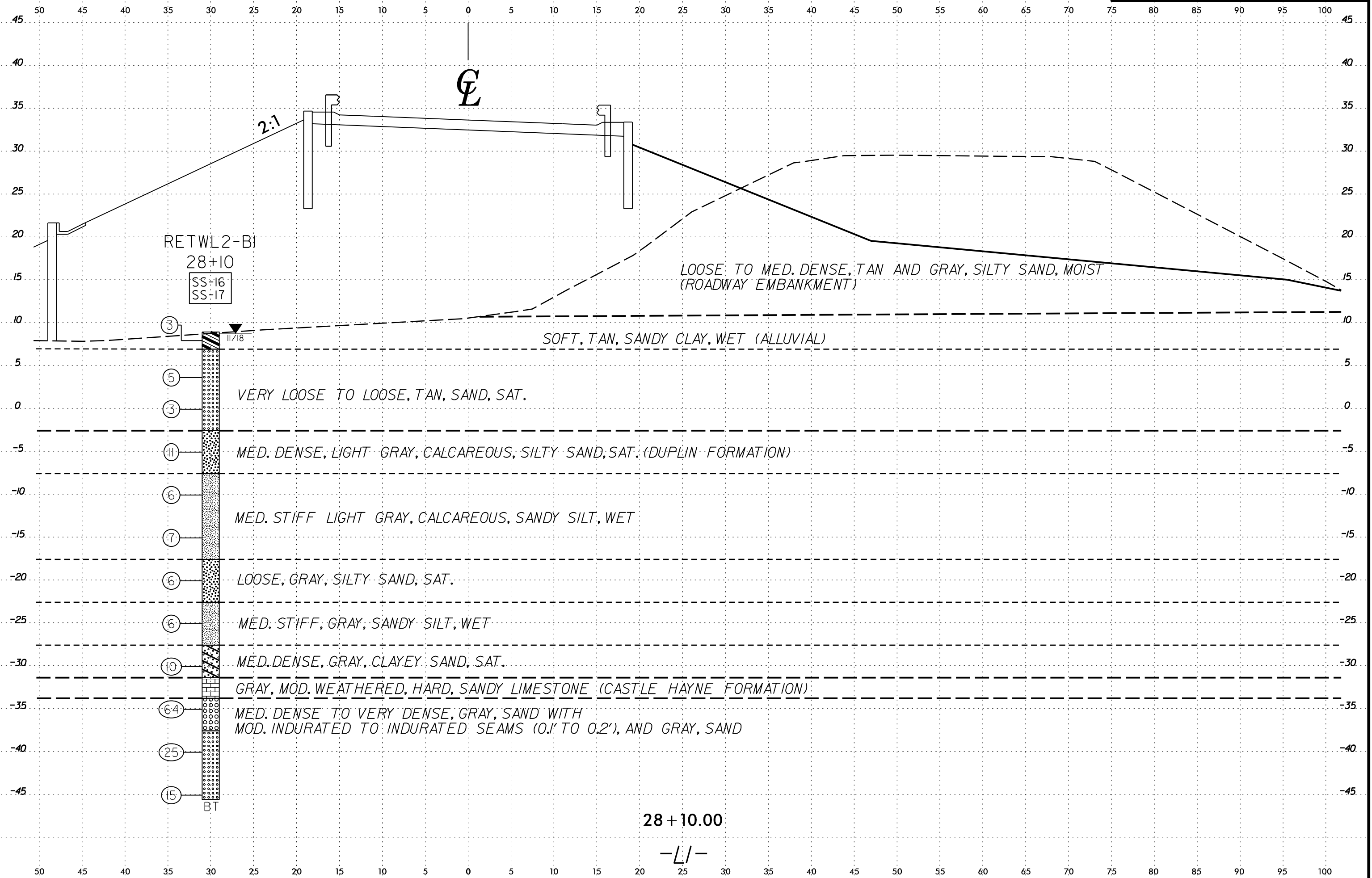
MED. STIFF LIGHT GRAY, CALCAREOUS, SANDY SILT, WET

28 + 06.00

-L/-

SECTION ON DUPLIN FORMATION

6/23/16



RETWL2-B1
28+10
SS-16
SS-17

LOOSE TO MED. DENSE, TAN AND GRAY, SILTY SAND, MOIST
(ROADWAY EMBANKMENT)

SOFT, TAN, SANDY CLAY, WET (ALLUVIAL)

VERY LOOSE TO LOOSE, TAN, SAND, SAT.

MED. DENSE, LIGHT GRAY, CALCAREOUS, SILTY SAND, SAT. (DUPLIN FORMATION)

MED. STIFF LIGHT GRAY, CALCAREOUS, SANDY SILT, WET

LOOSE, GRAY, SILTY SAND, SAT.

MED. STIFF, GRAY, SANDY SILT, WET

MED. DENSE, GRAY, CLAYEY SAND, SAT.

GRAY, MOD. WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)

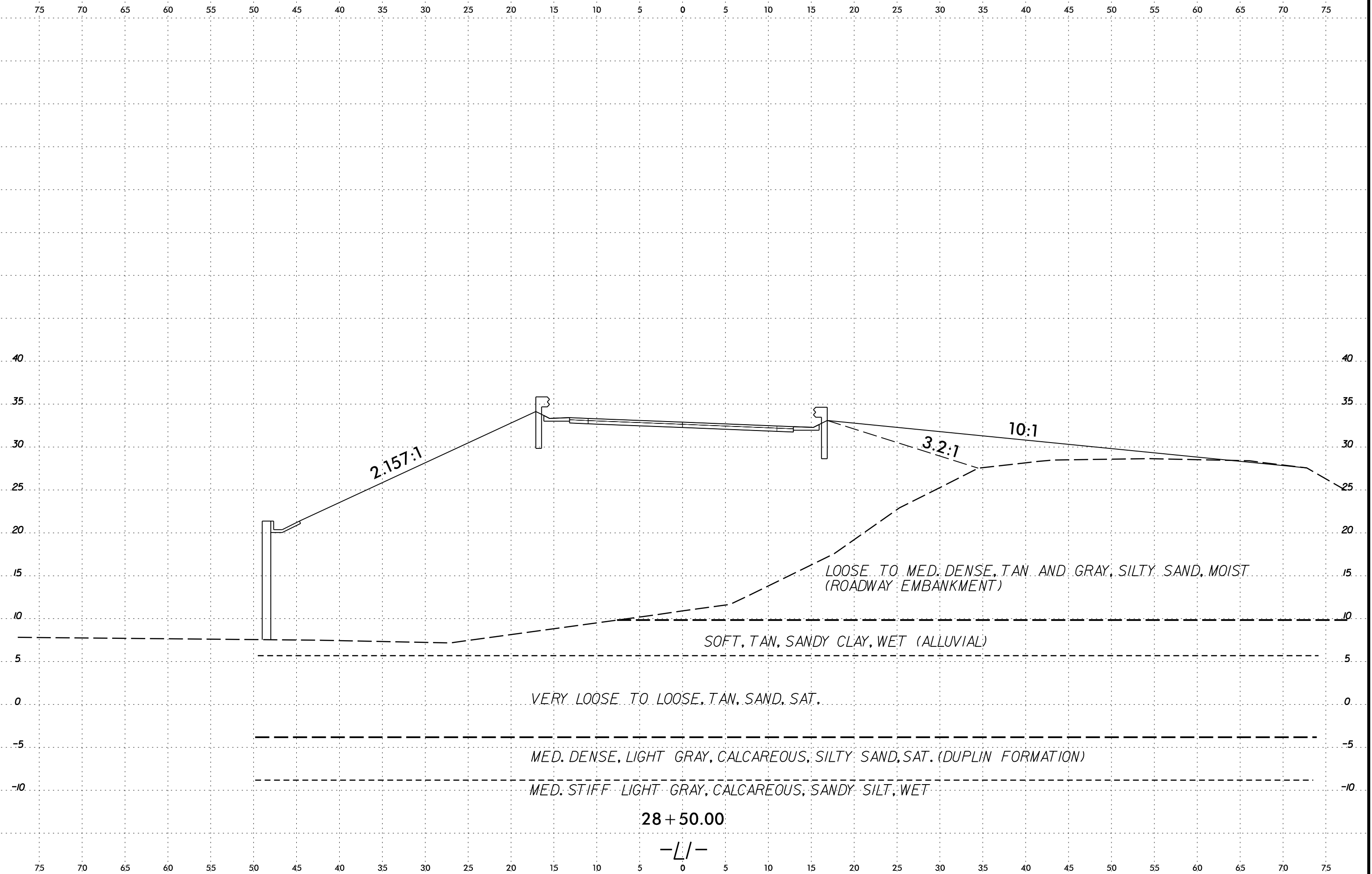
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MOD. INDURATED TO INDURATED SEAMS (0.1' TO 0.2'), AND GRAY, SAND

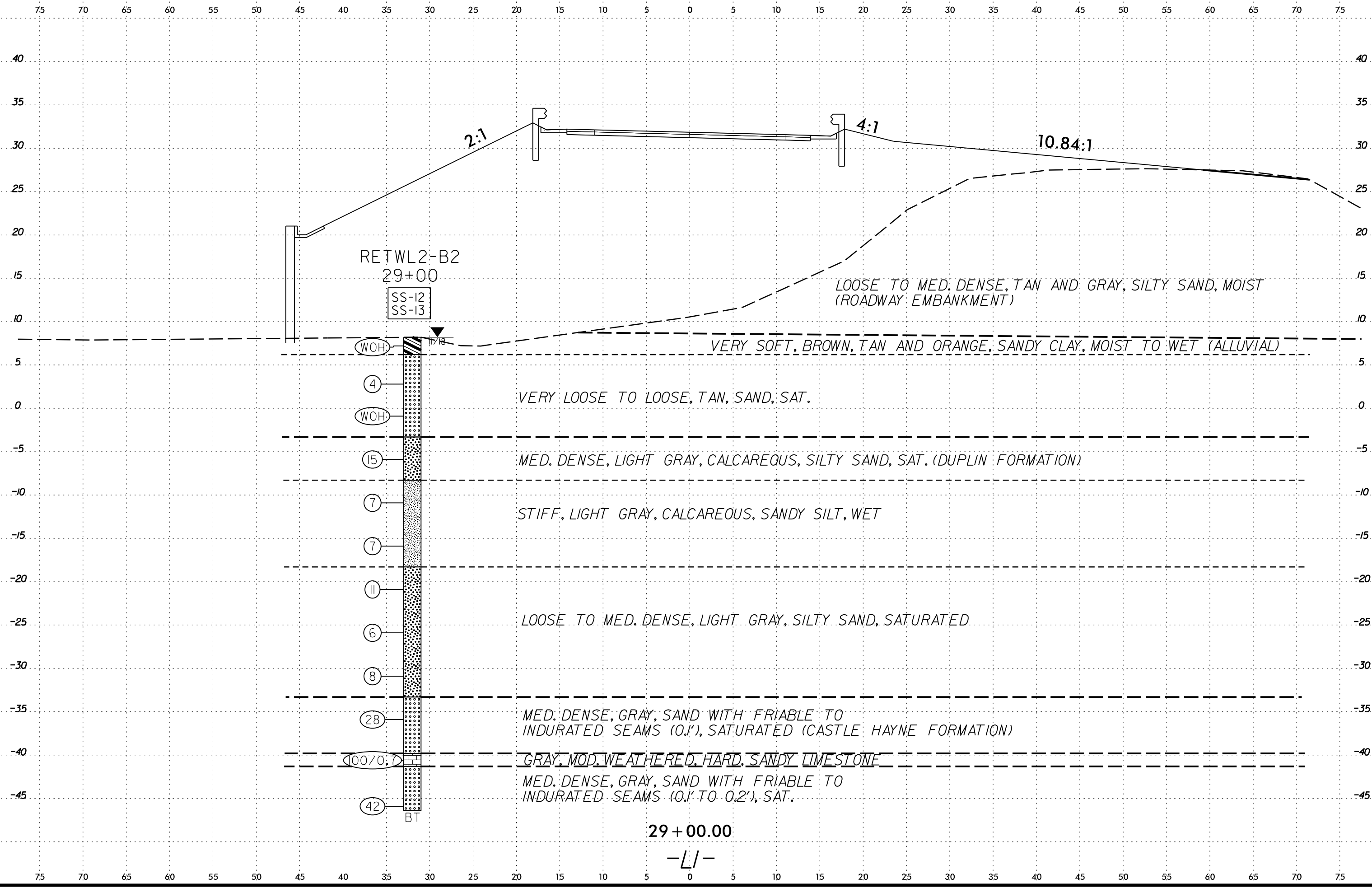
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-L/-

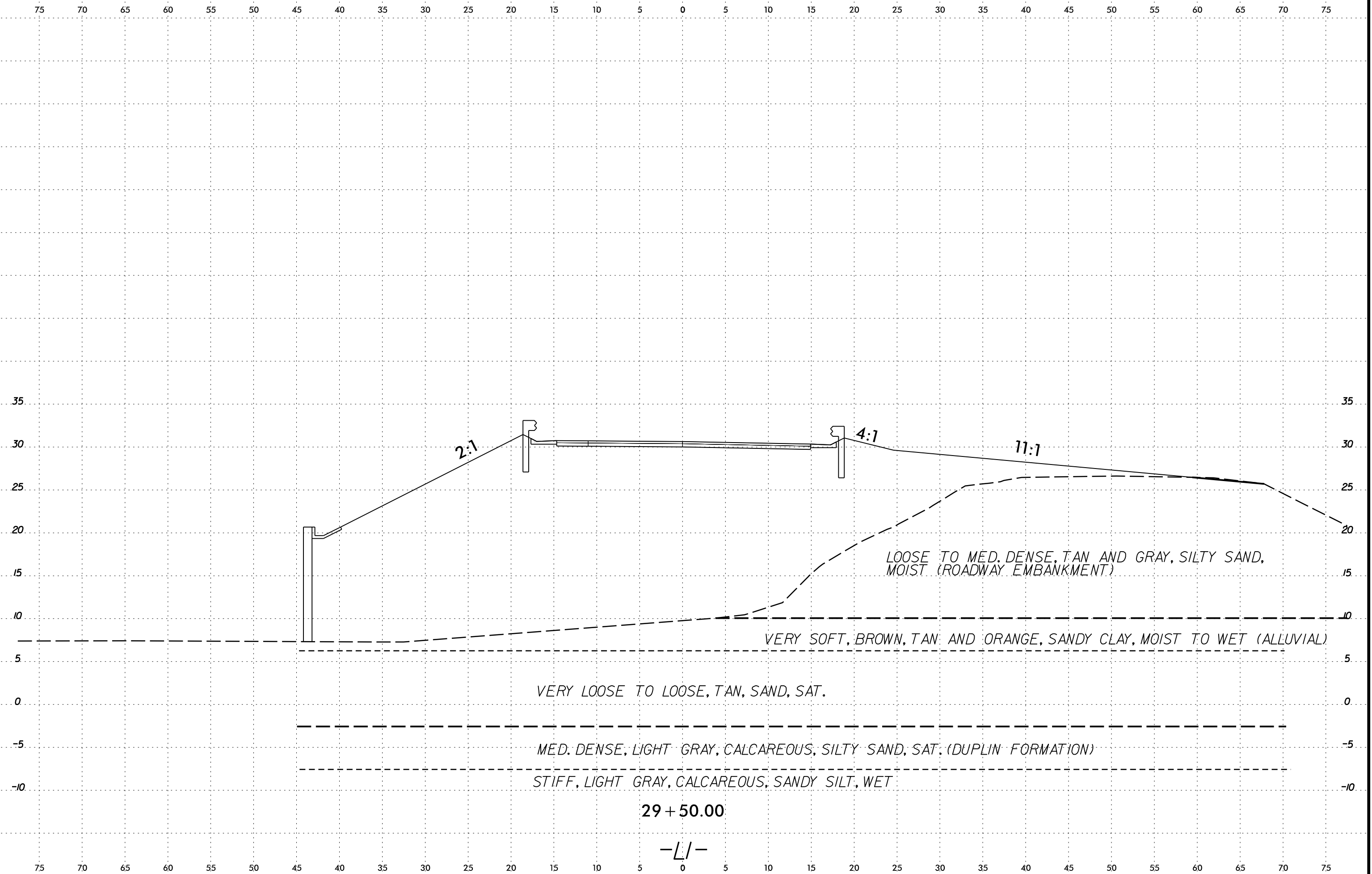
SYSTEMS CONNECTIONS
 10000 W. BIRCHMOUNT DRIVE
 SUITE 100
 GREENWOOD VILLAGE, CO 80120
 TEL: 303.733.8800
 WWW.SCMCONNECTIONS.COM

6/23/16





6/23/16
SECTION
DUPLIN
ROADWAY



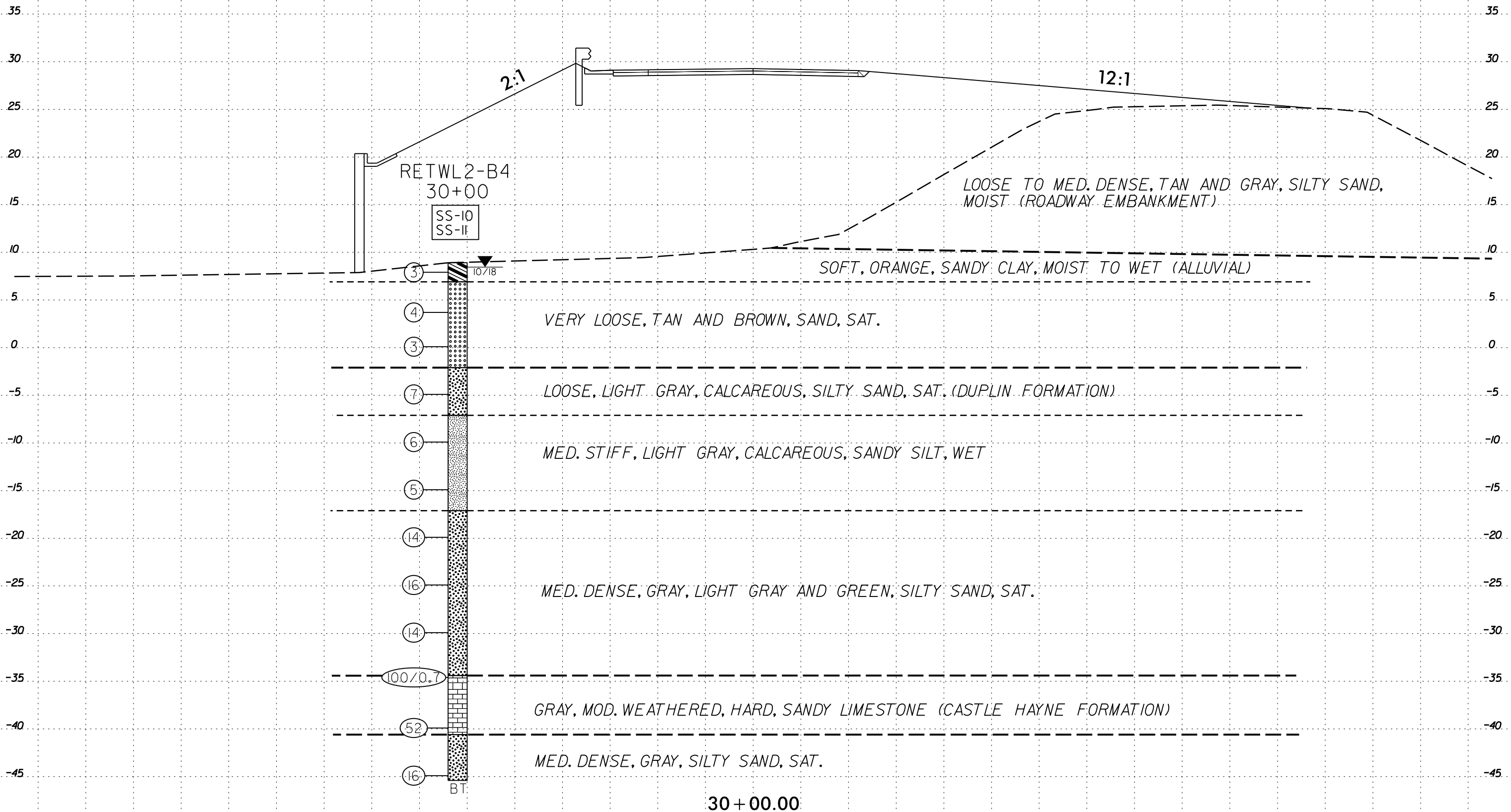
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PROJ. REFERENCE NO. B-4484

SHEET NO. 25

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RETWL 2-B4
30+00
SS-10
SS-II

10/18

LOOSE TO MED. DENSE, TAN AND GRAY, SILTY SAND, MOIST. (ROADWAY EMBANKMENT)

SOFT, ORANGE, SANDY CLAY, MOIST TO WET (ALLUVIAL)

VERY LOOSE, TAN AND BROWN, SAND, SAT.

LOOSE, LIGHT GRAY, CALCAREOUS, SILTY SAND, SAT. (DUPLIN FORMATION)

MED. STIFF, LIGHT GRAY, CALCAREOUS, SANDY SILT, WET

MED. DENSE, GRAY, LIGHT GRAY AND GREEN, SILTY SAND, SAT.

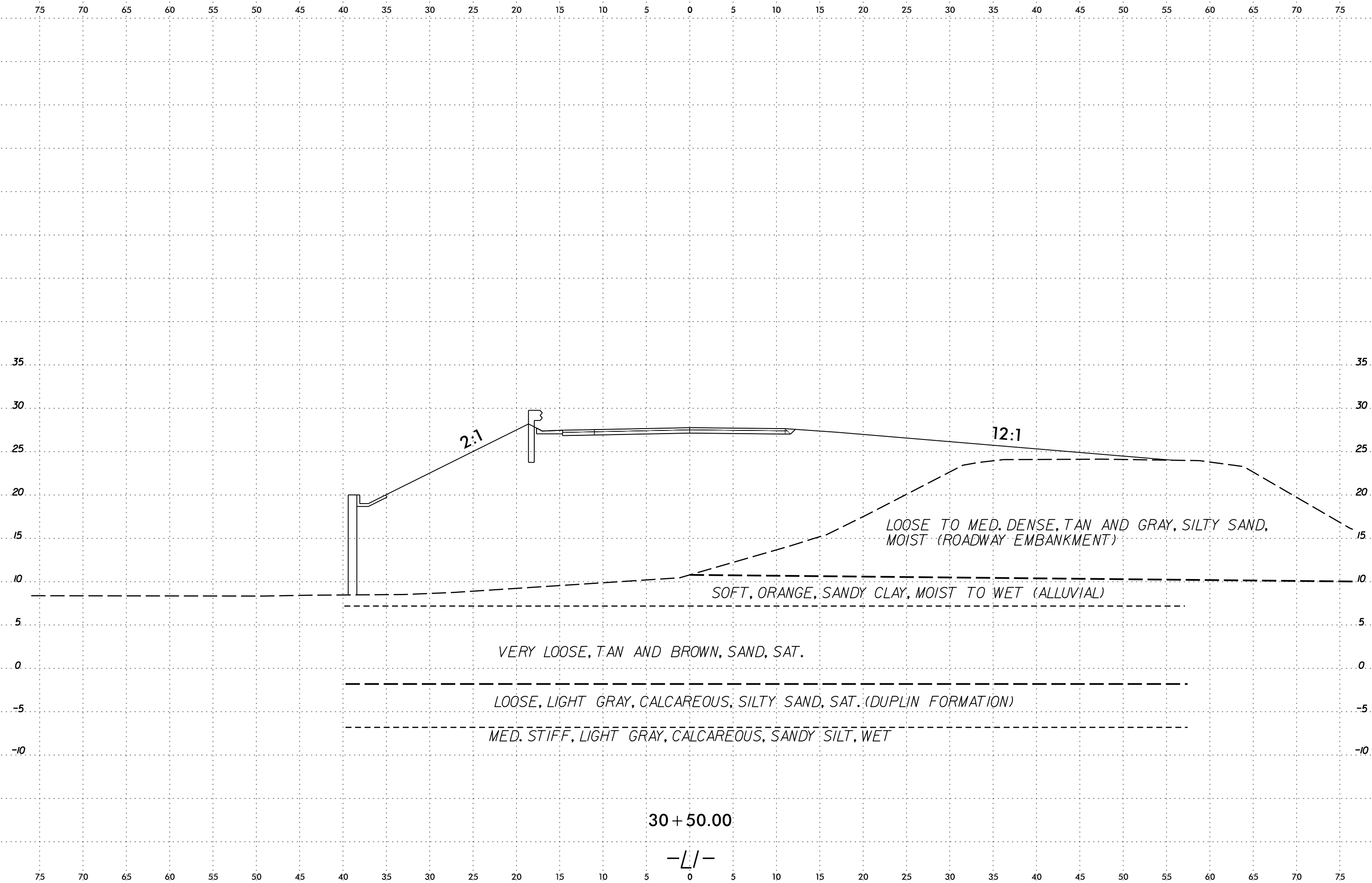
GRAY, MOD. WEATHERED, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)

MED. DENSE, GRAY, SILTY SAND, SAT.

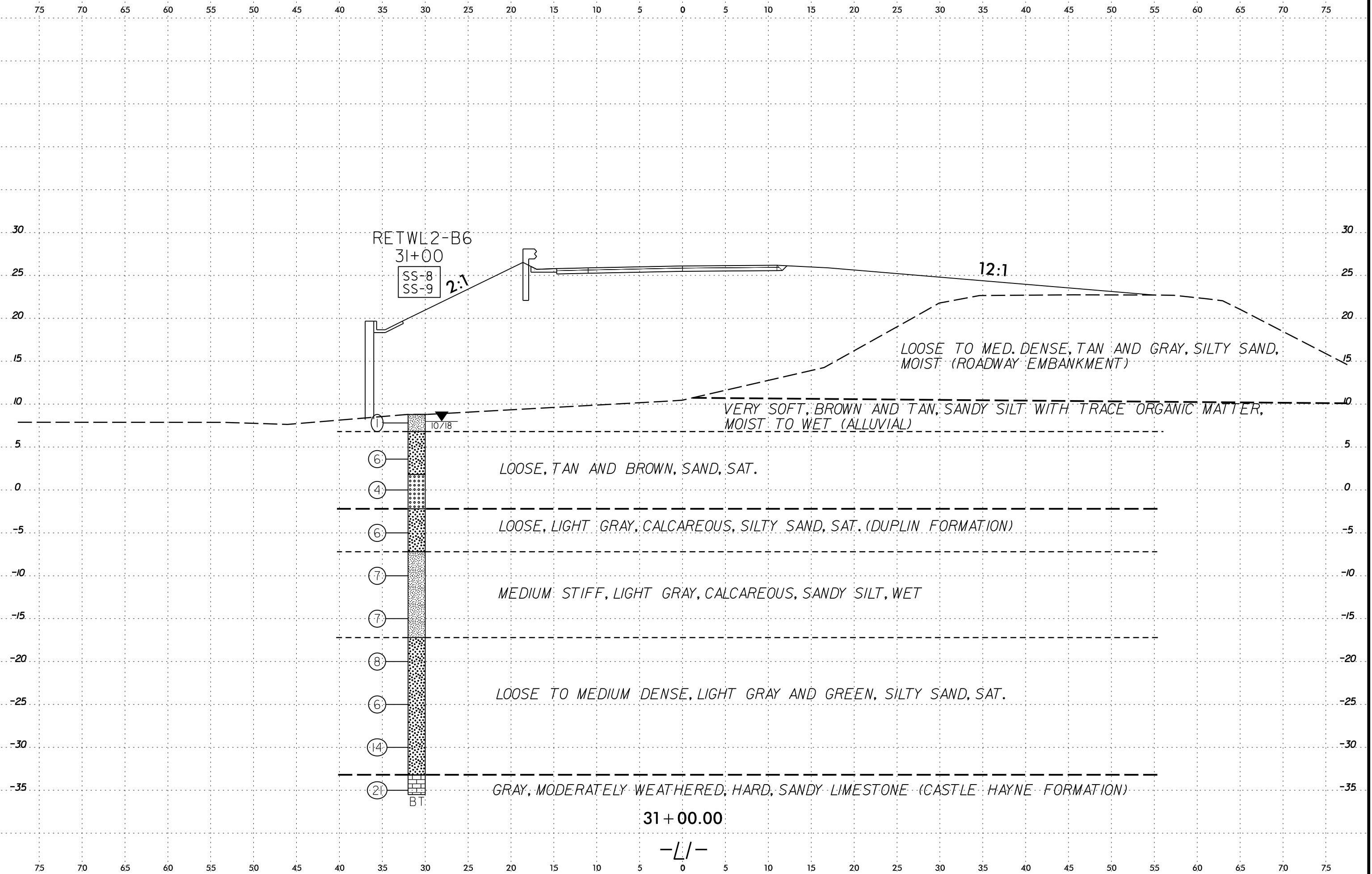
30 + 00.00

LI

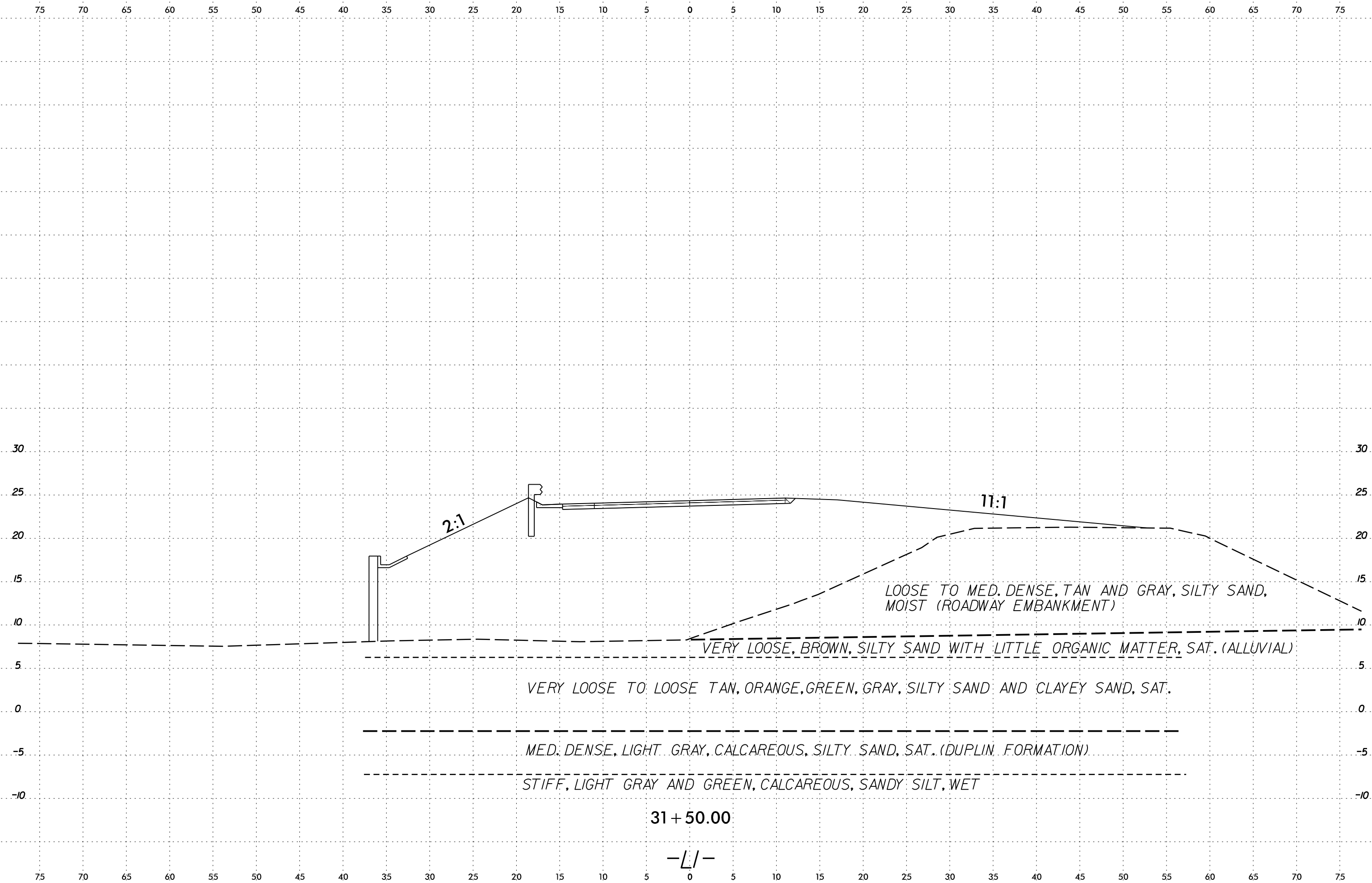
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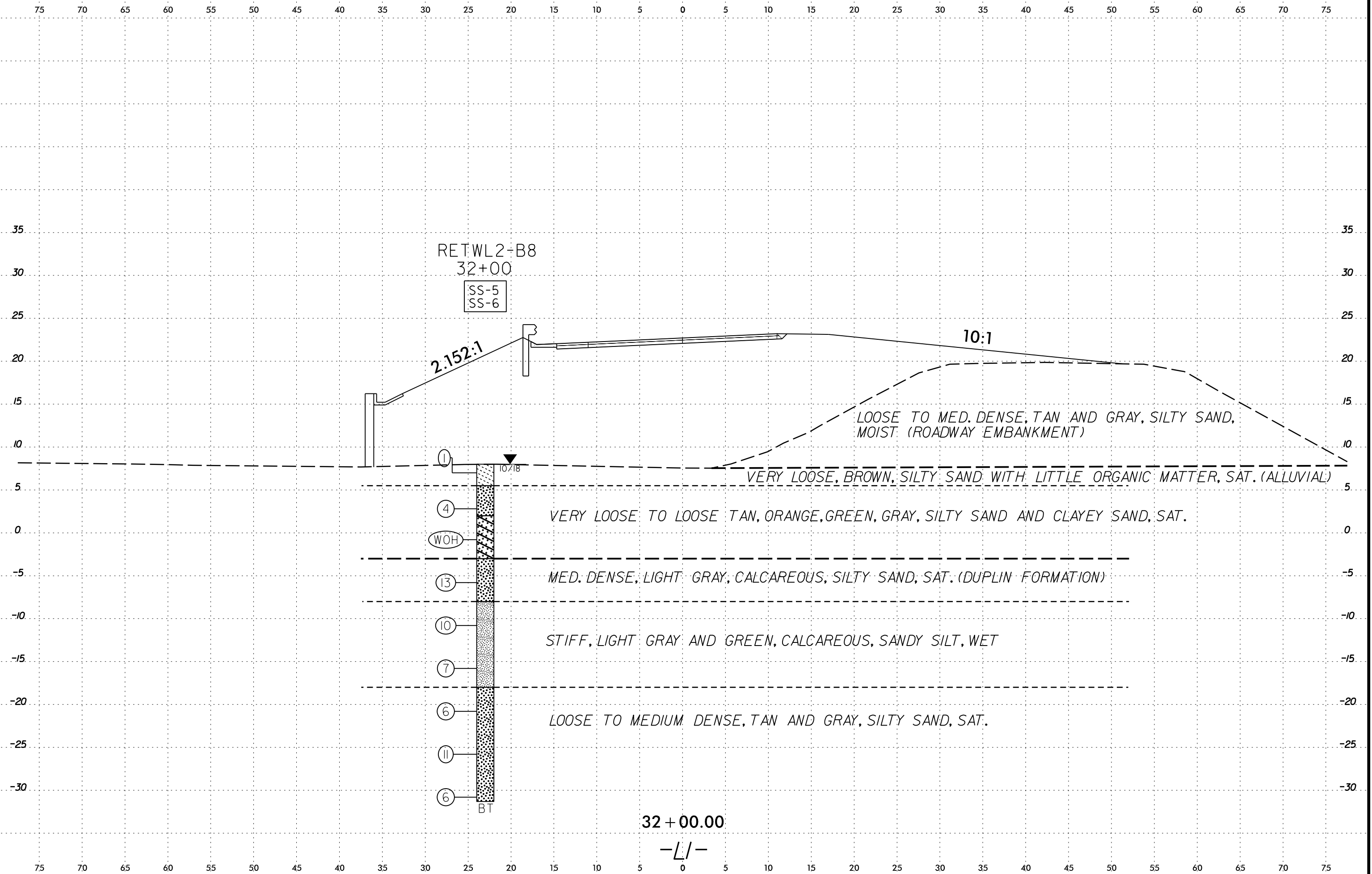


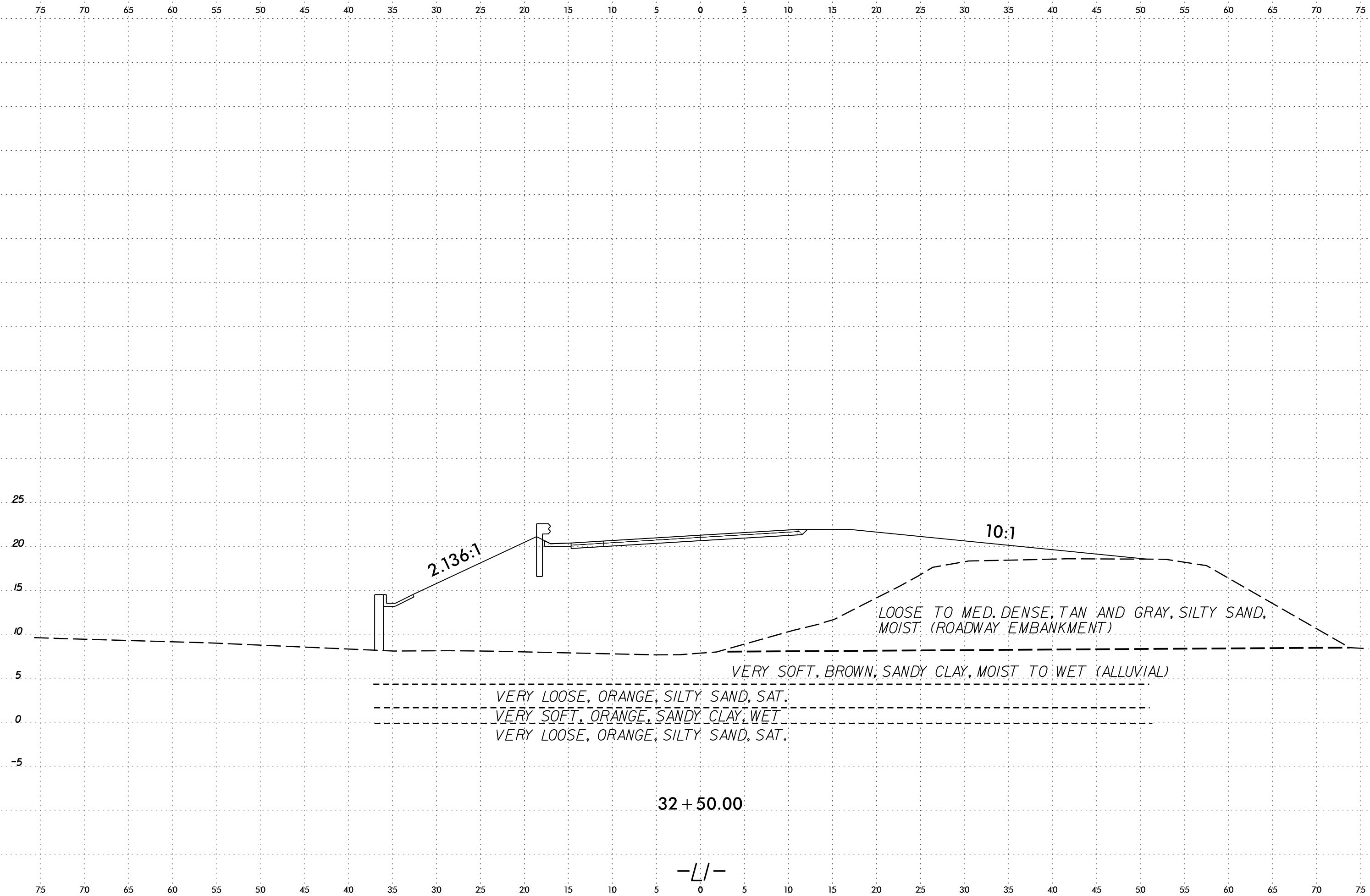
SYNOPSIS OF SOILS FOUND AT THIS LOCATION



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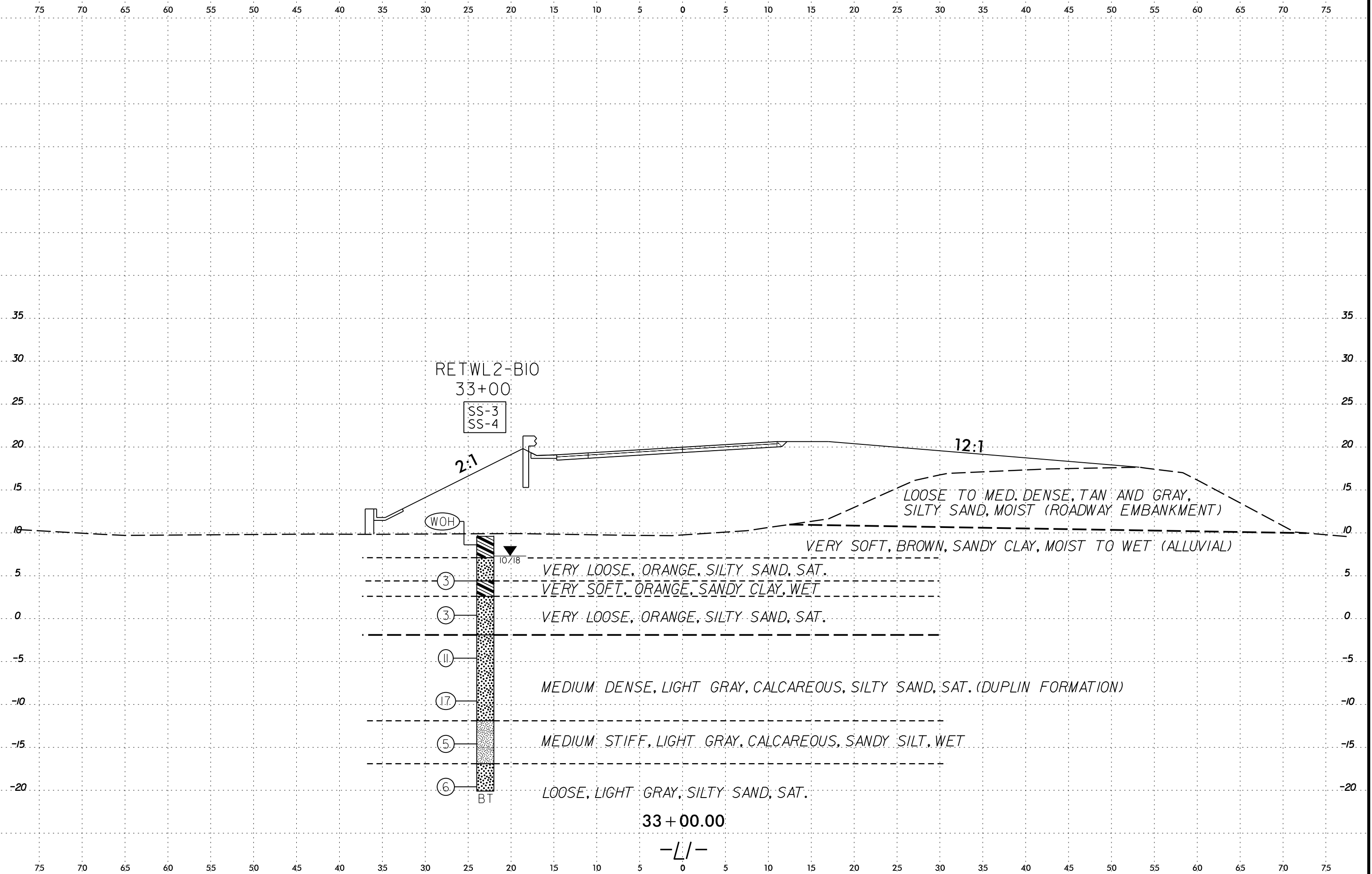
6/23/16
SOUTH PLANTATION ROAD
DUPLIN COUNTY, GEORGIA

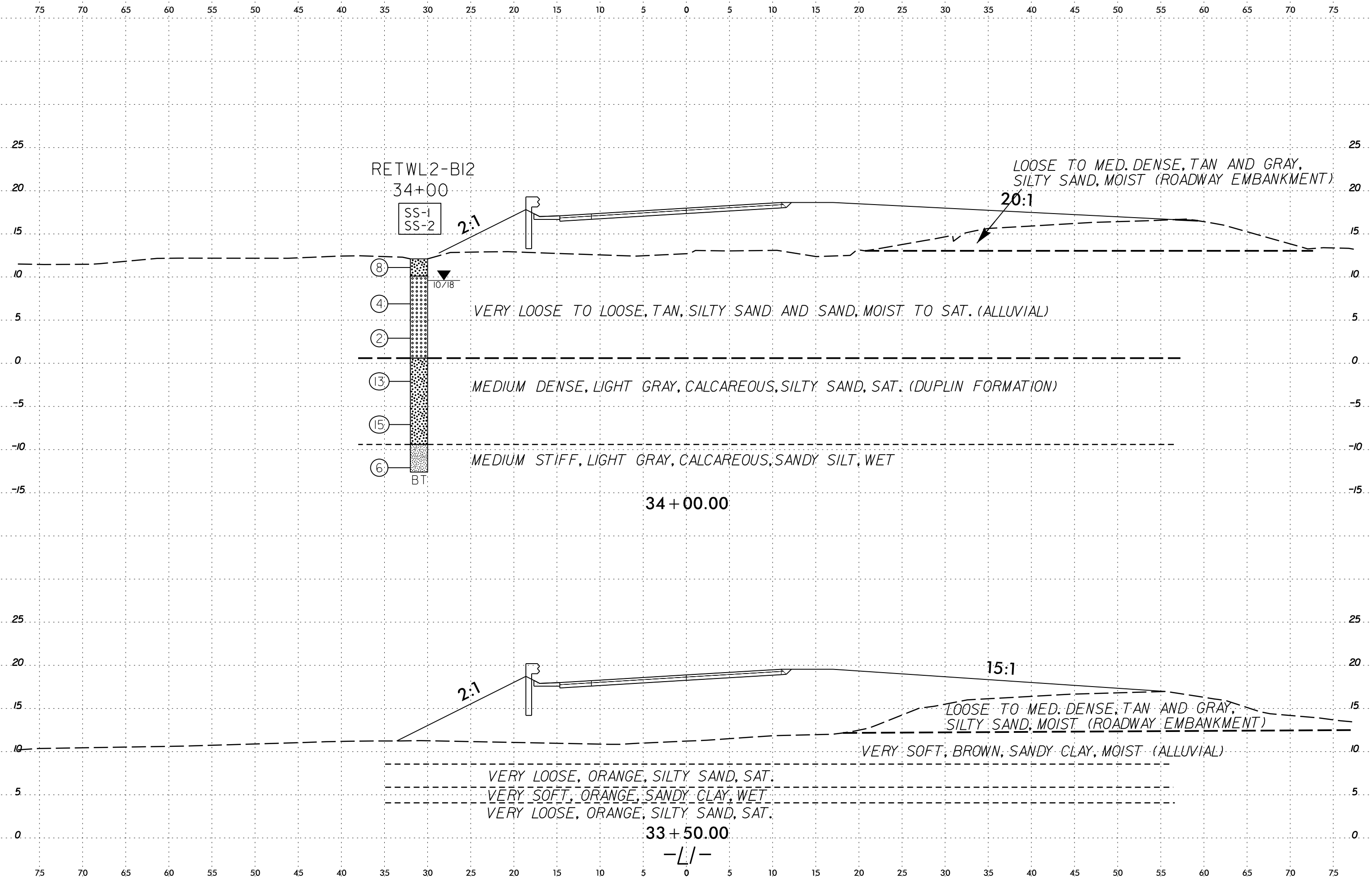




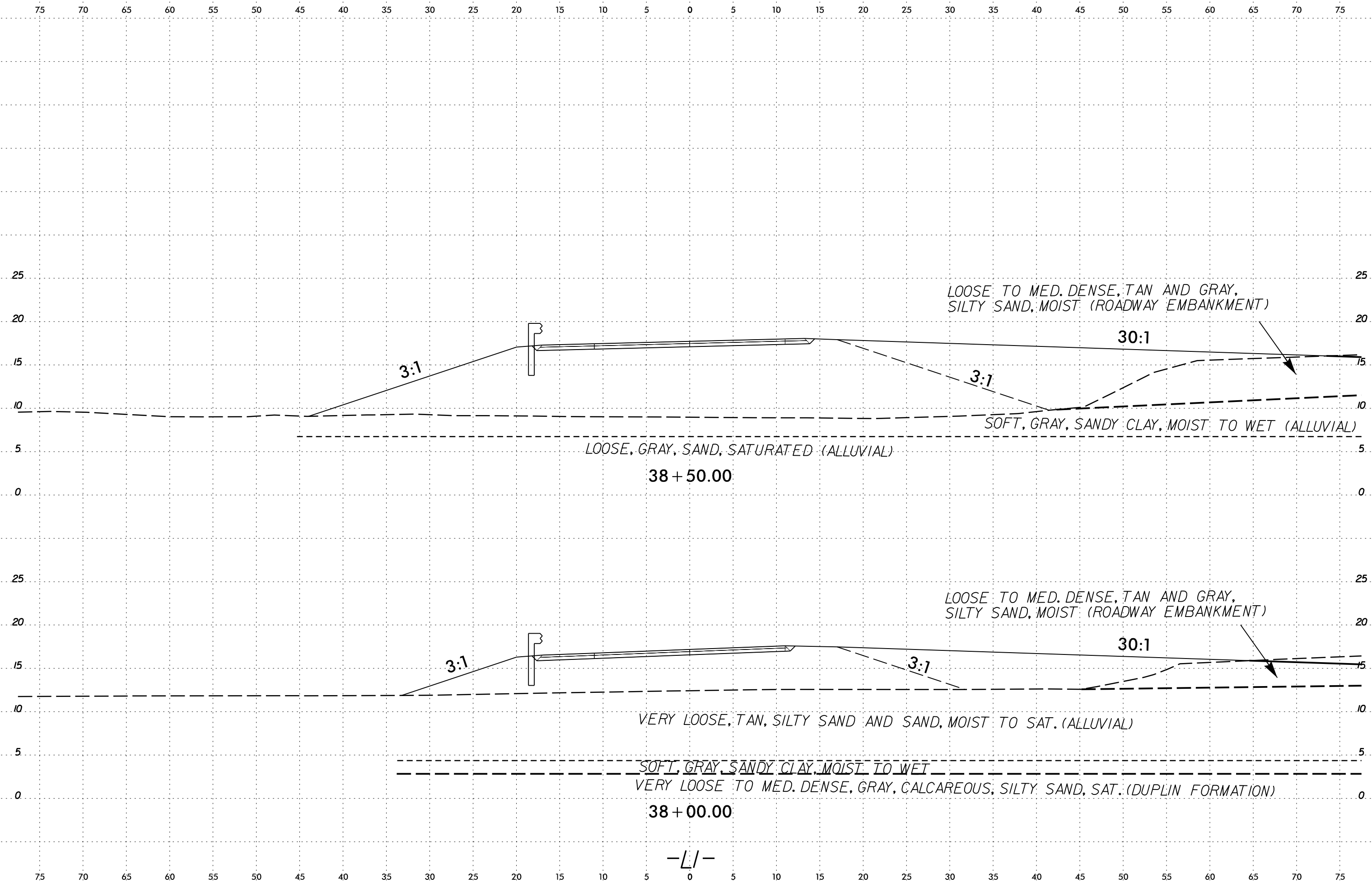
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6/23/16
SOUTH
CUMMINGS
CONSTRUCTION
CORPORATION
SHERMAN
ALABAMA



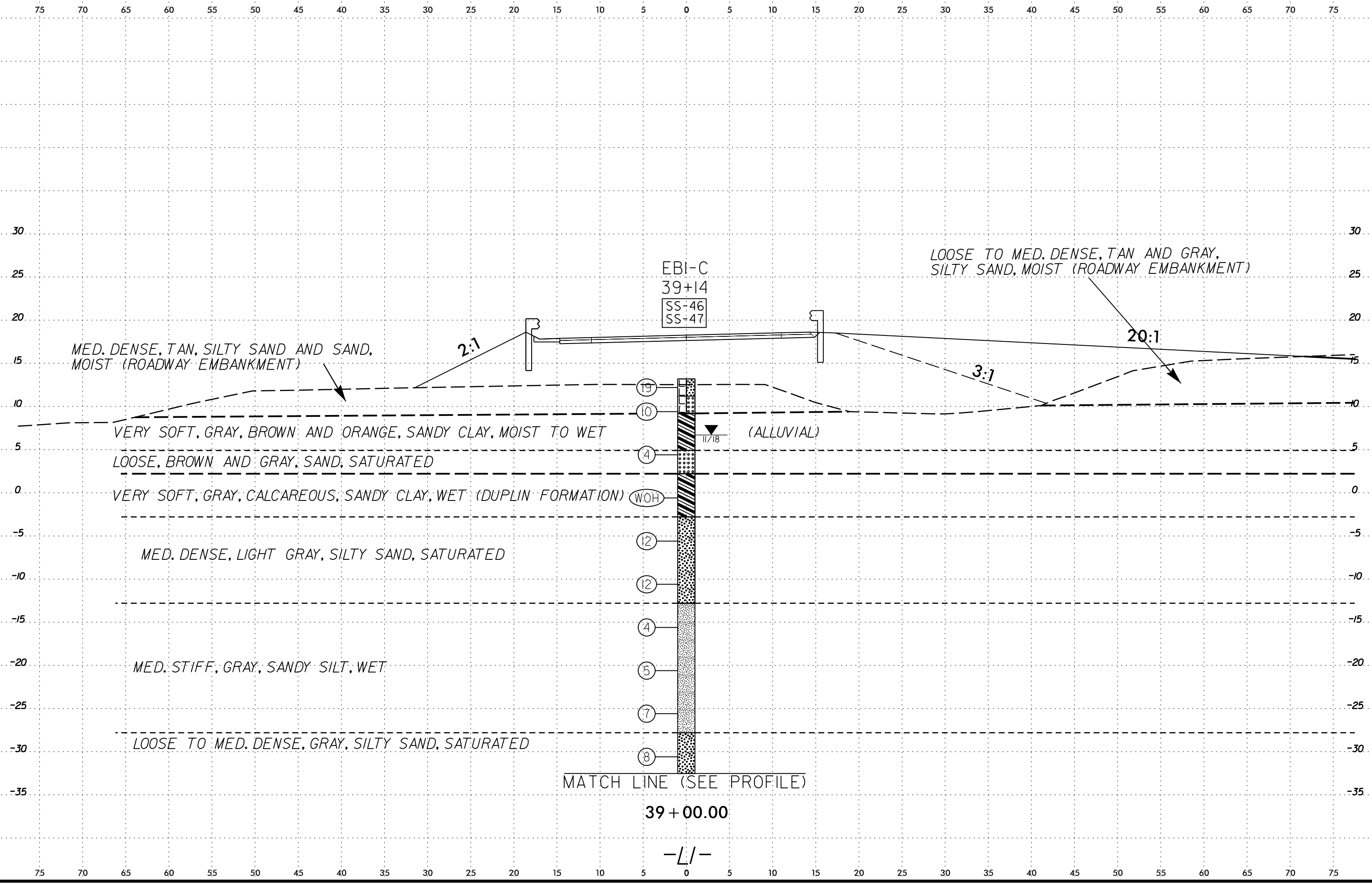


SYTIME
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ARRANGE

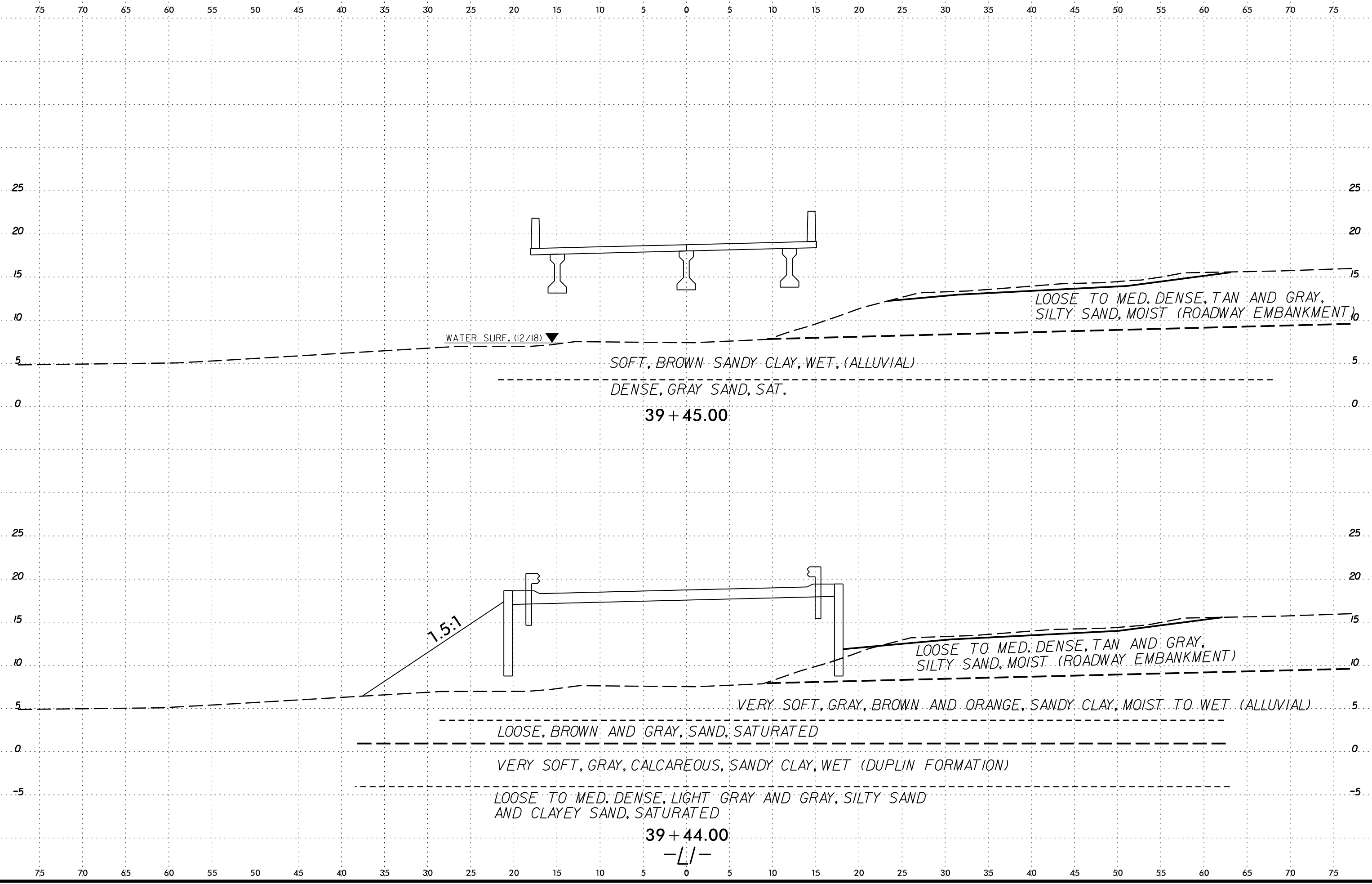


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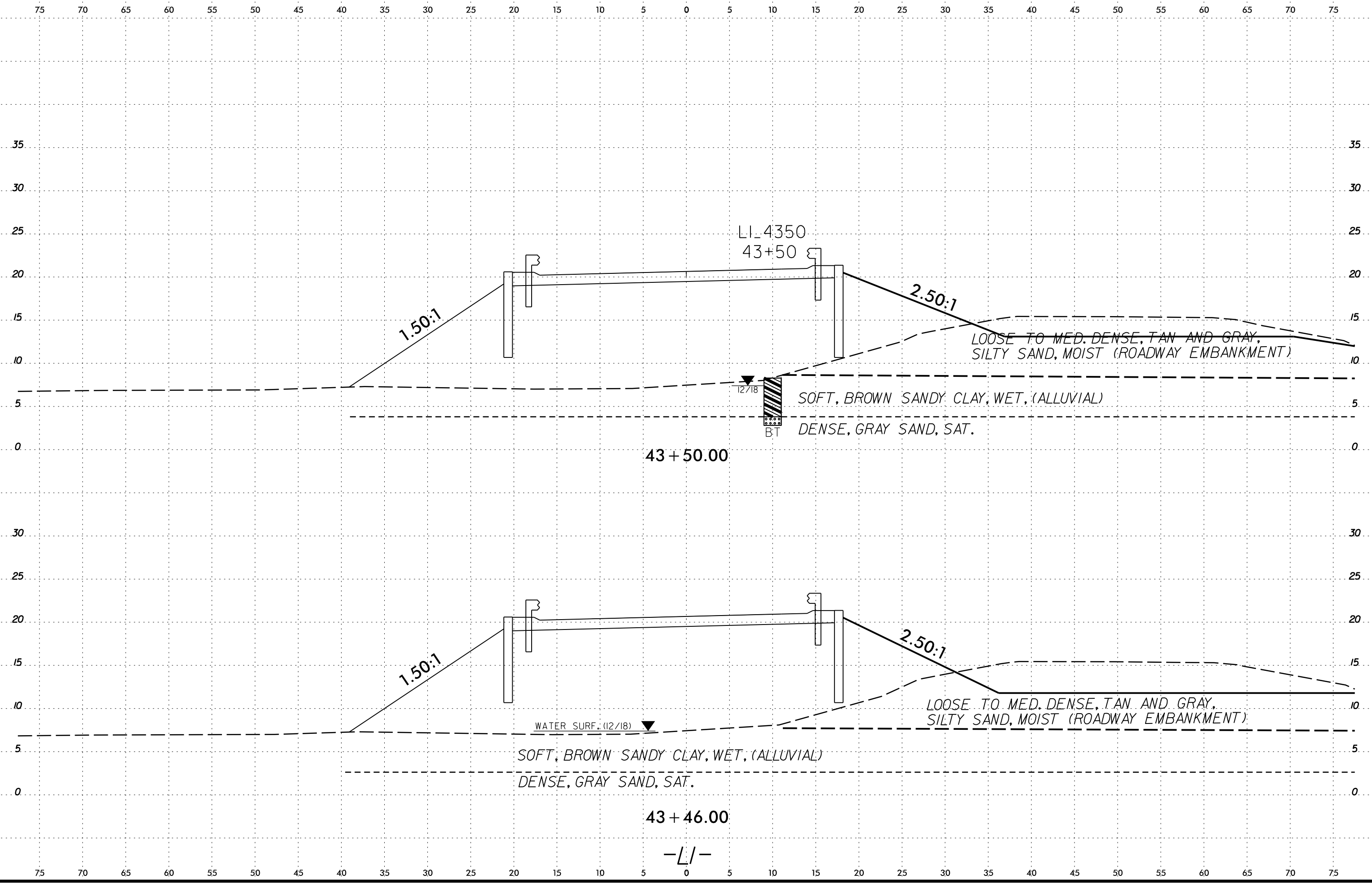
-L/-



SYNOPSIS
CONSTRUCTION
GENERAL
REVISIONS



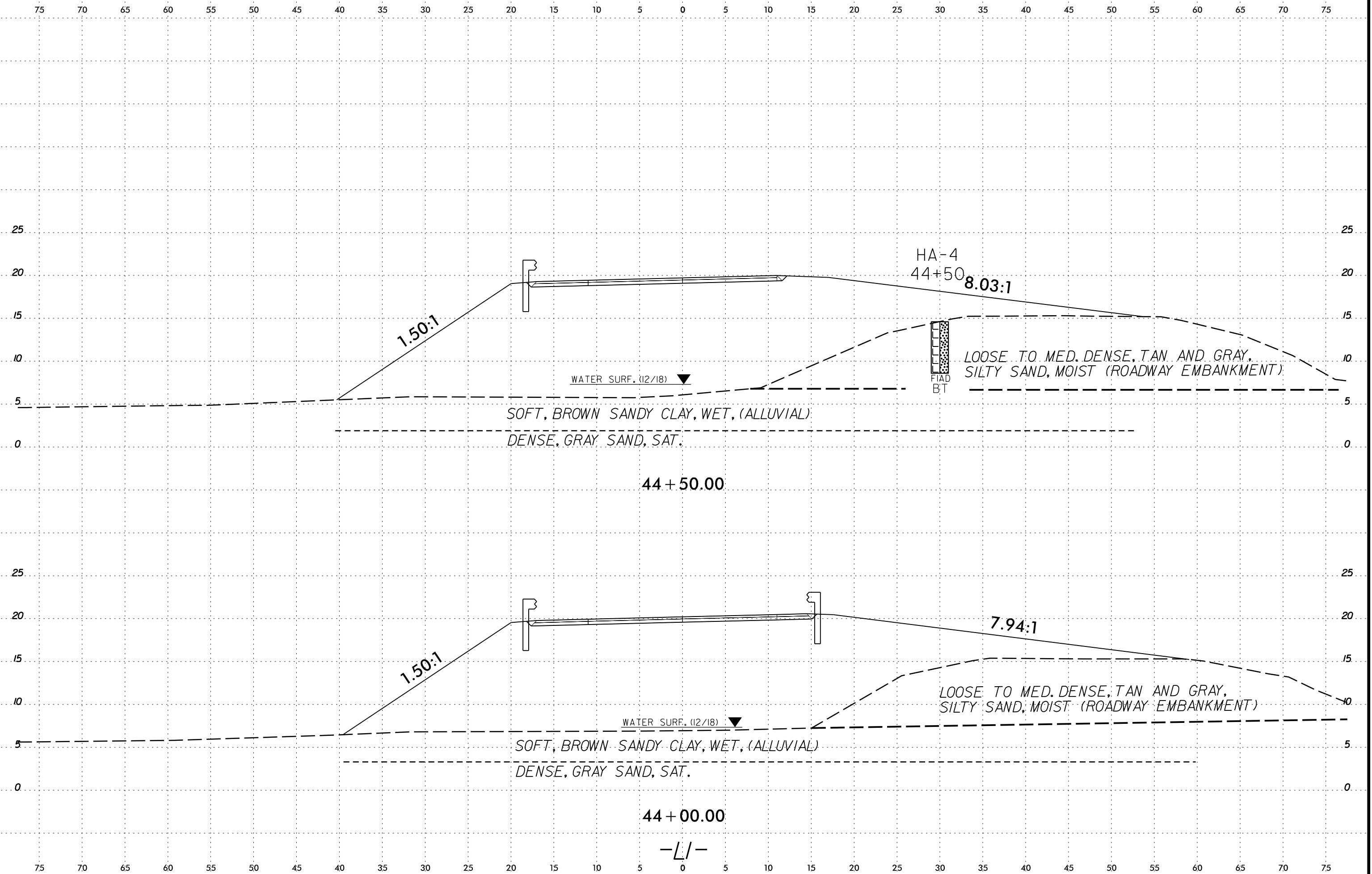
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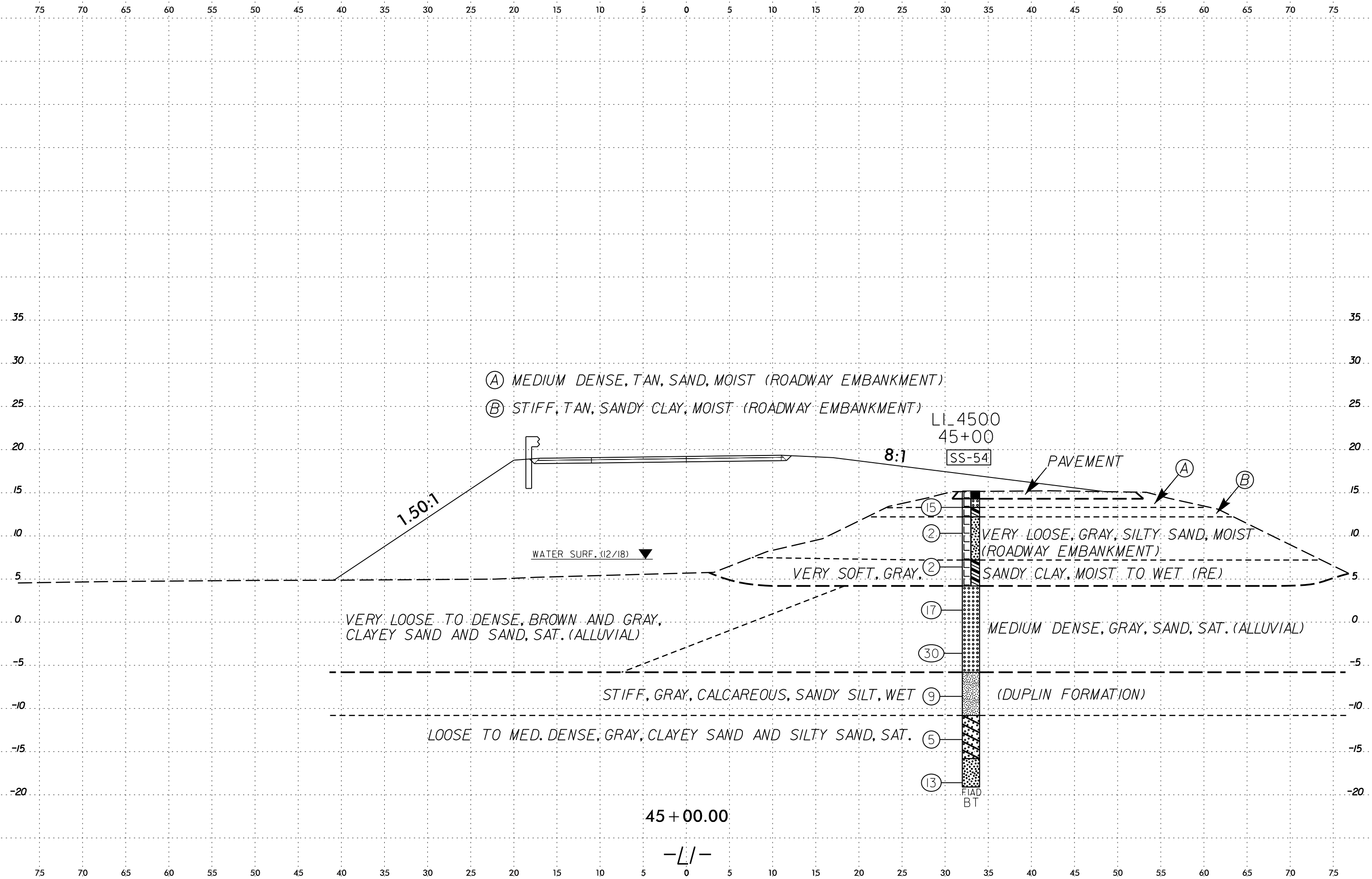


SECTION
CON
DATE
BY
SCALE

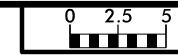
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6/23/16
SCHEMATIC CROSS SECTION
ARRANGEMENT

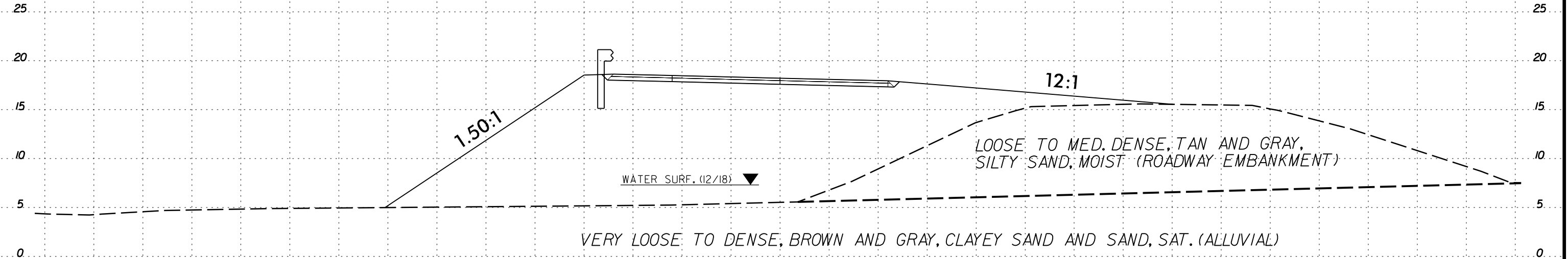




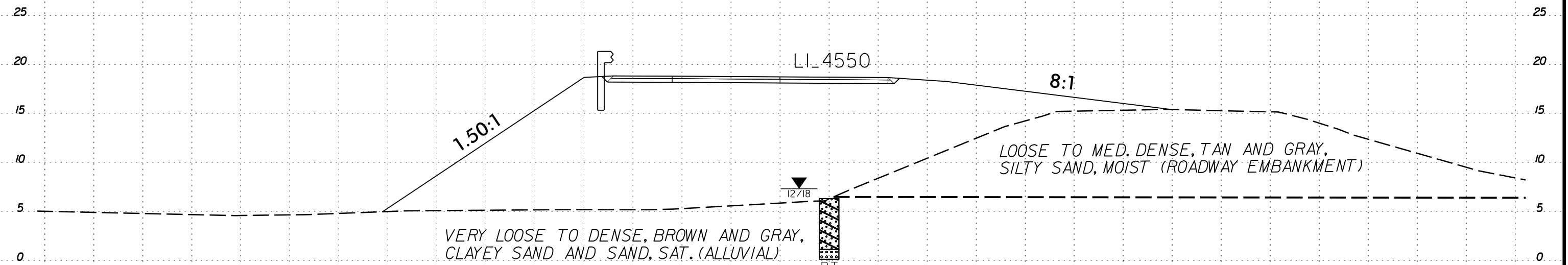
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46 + 00.00

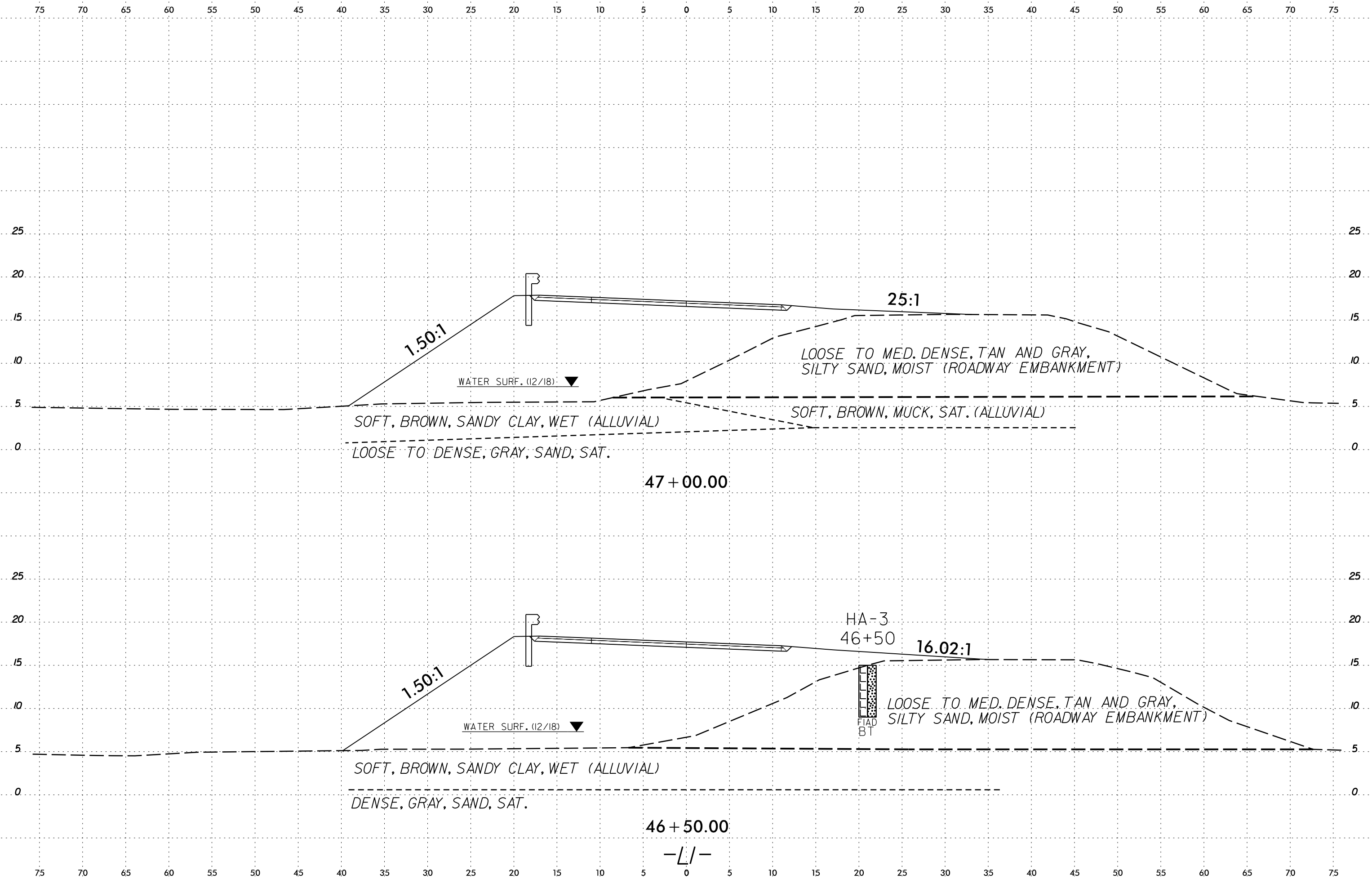


45 + 50.00

-L/-

SCHEMATIC CROSS SECTION
FOR
ROADWAY EMBANKMENT

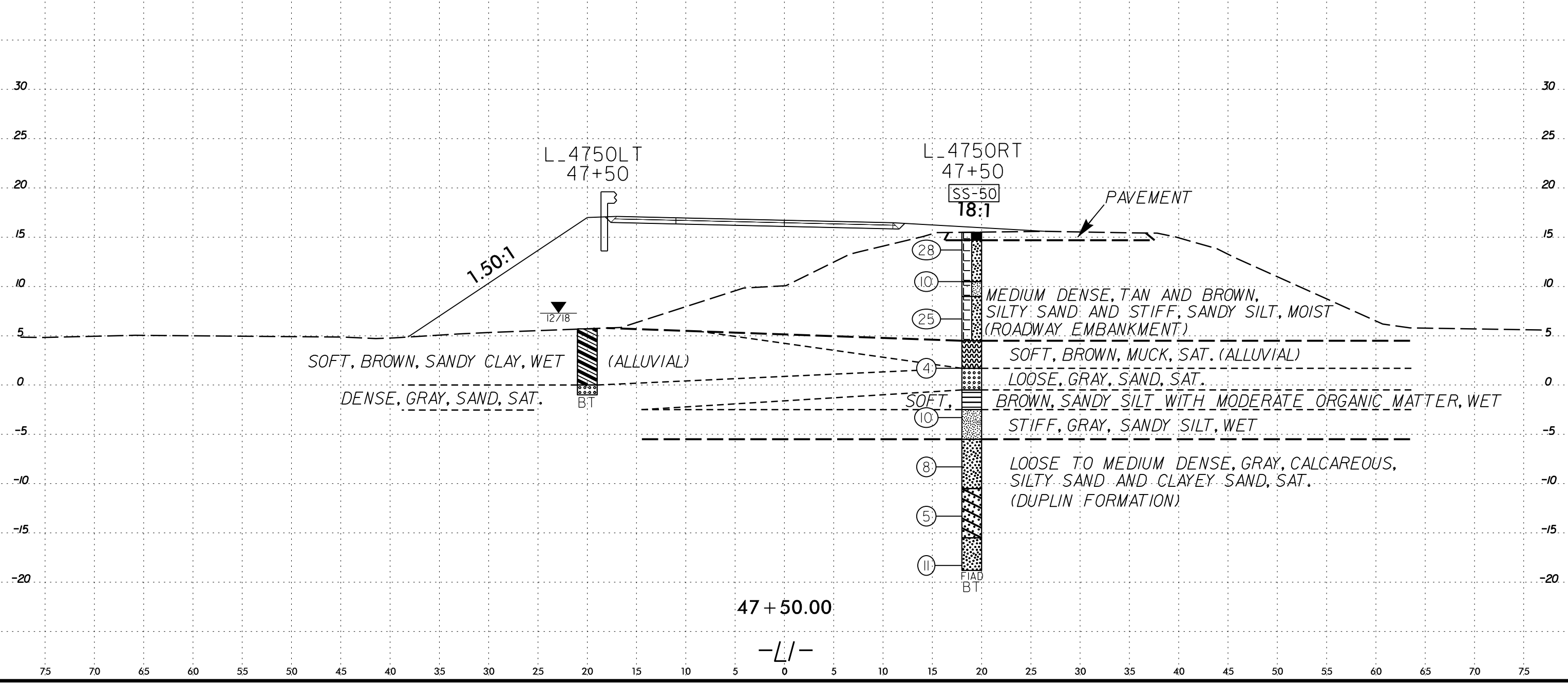
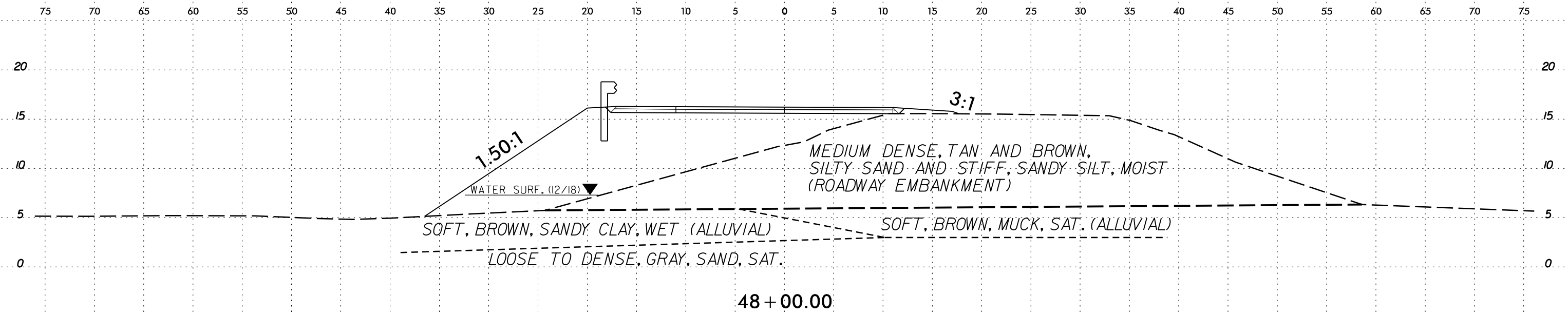
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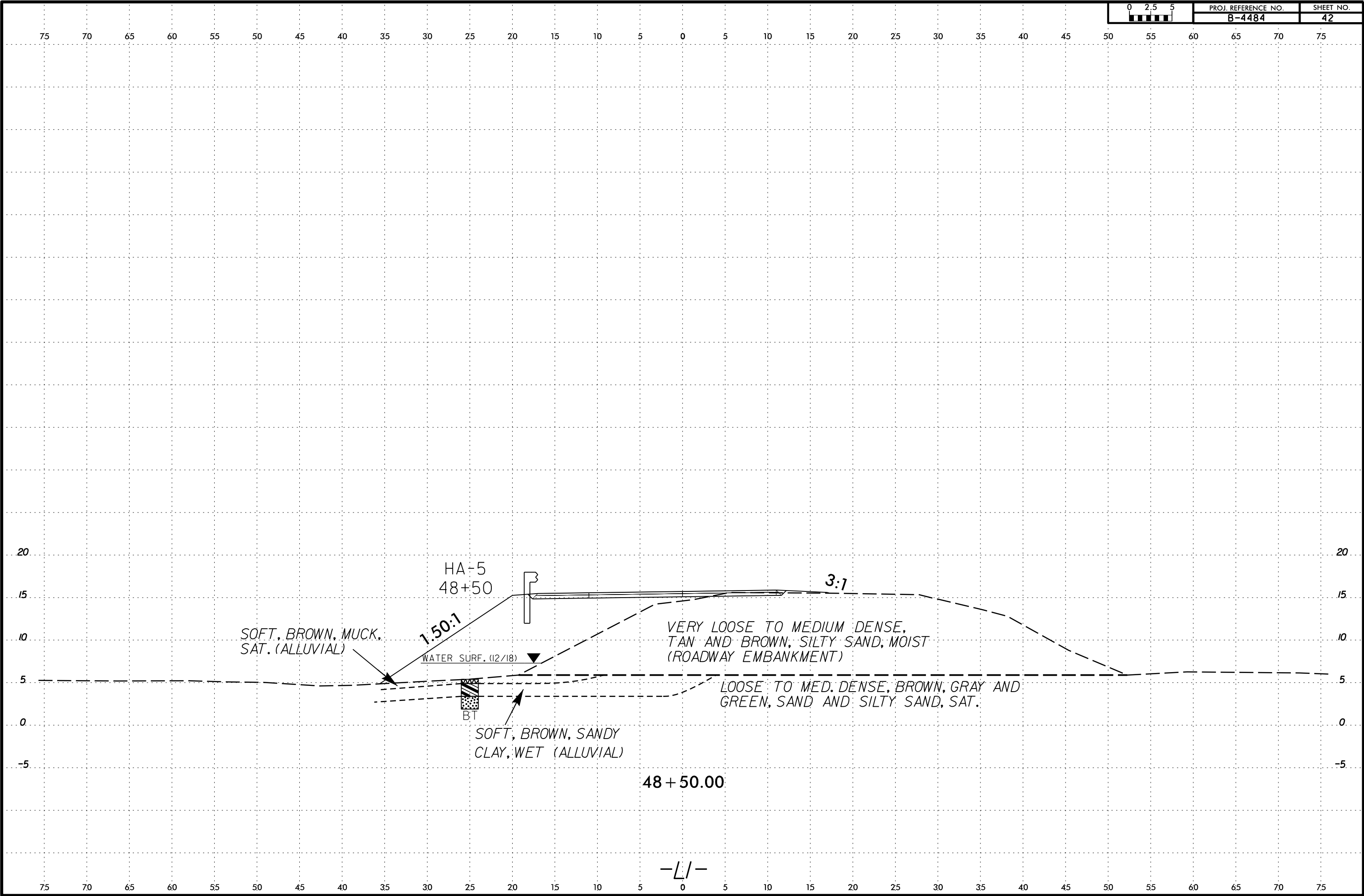
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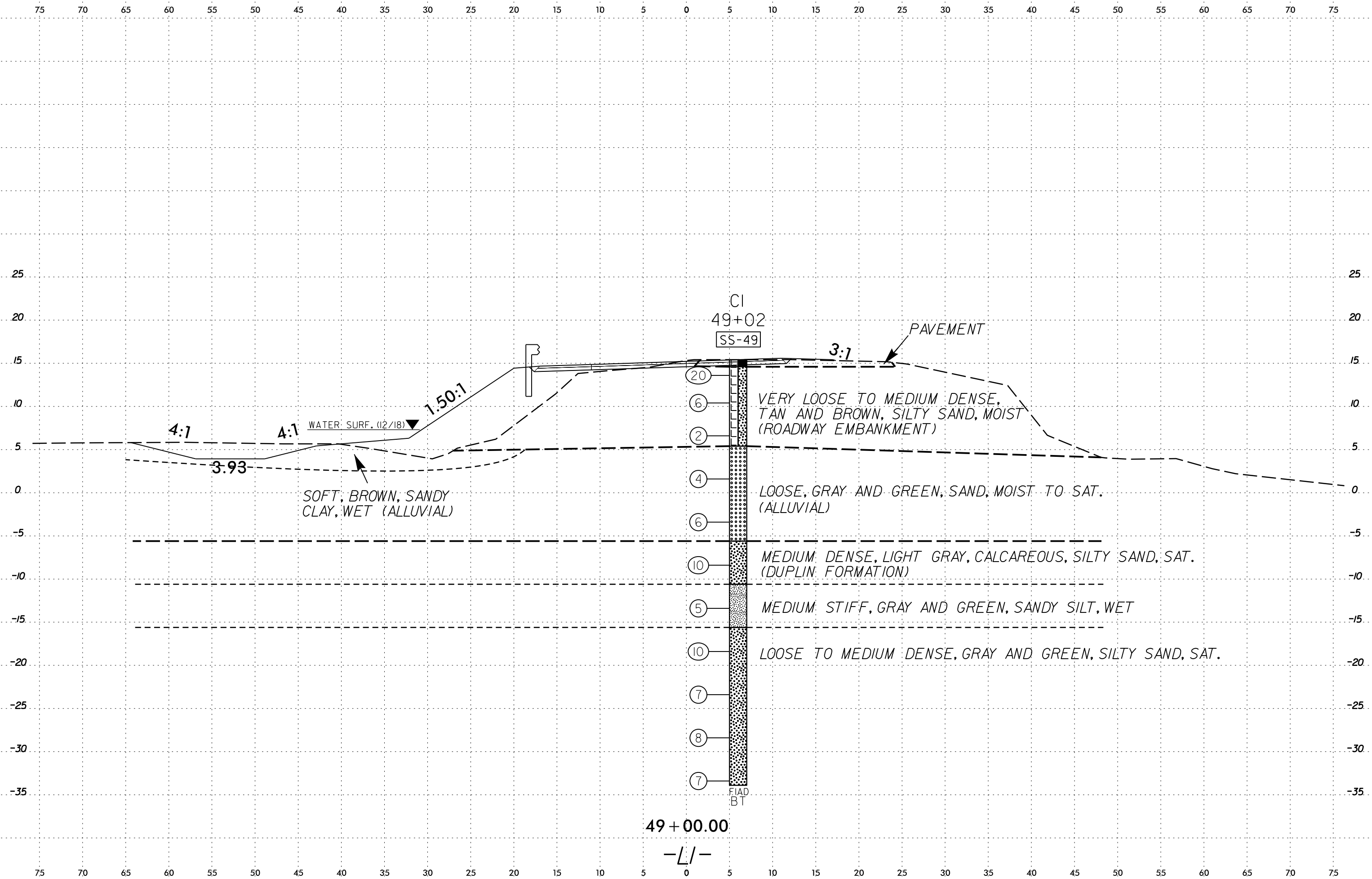
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SCHEMATIC CROSS SECTION OF ROADWAY EMBANKMENT

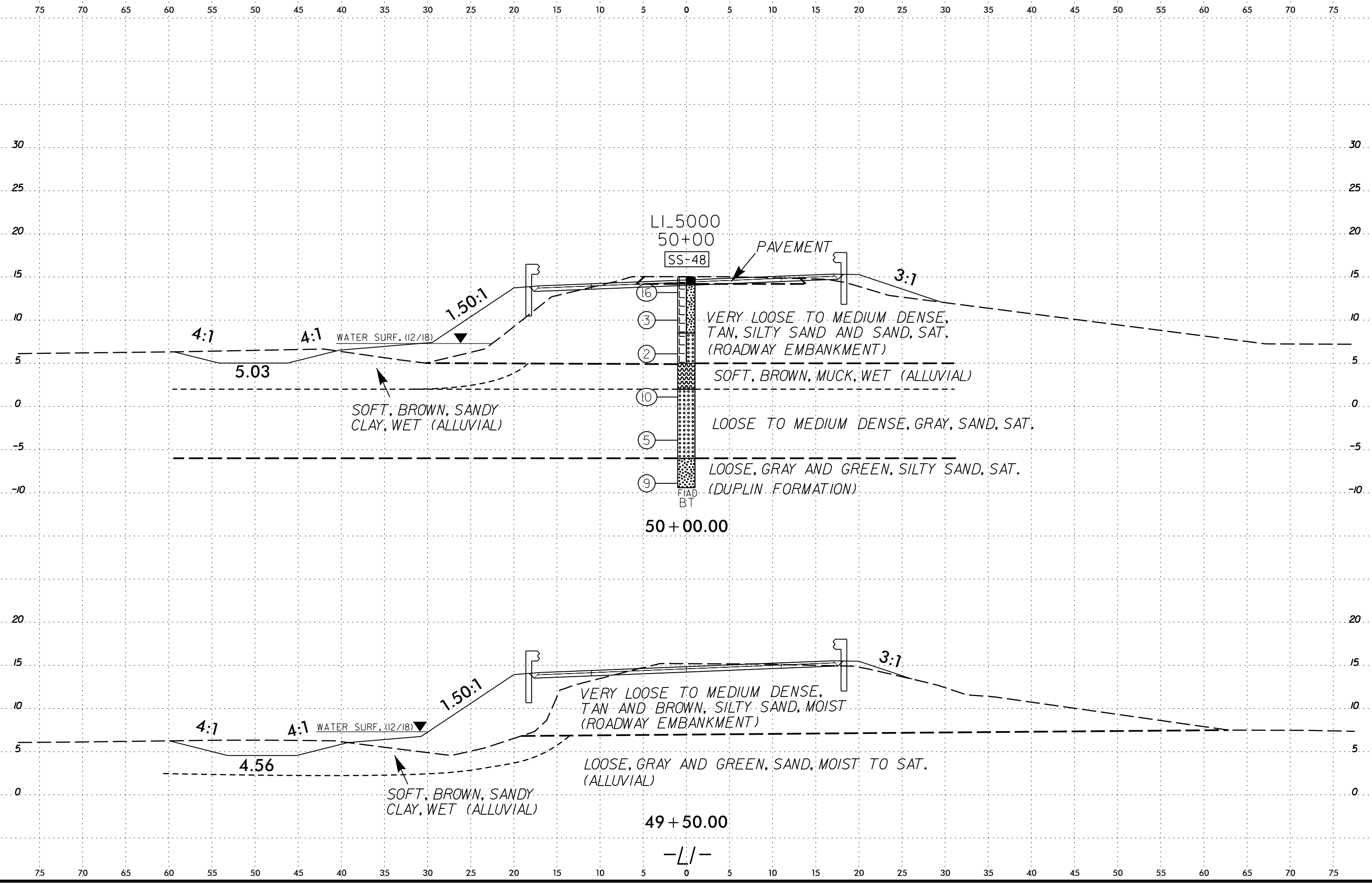


DATE: 6/23/16
DRAWN BY: J. J. BRYAN
CHECKED BY: J. J. BRYAN
SCALE: AS SHOWN



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

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-L/-



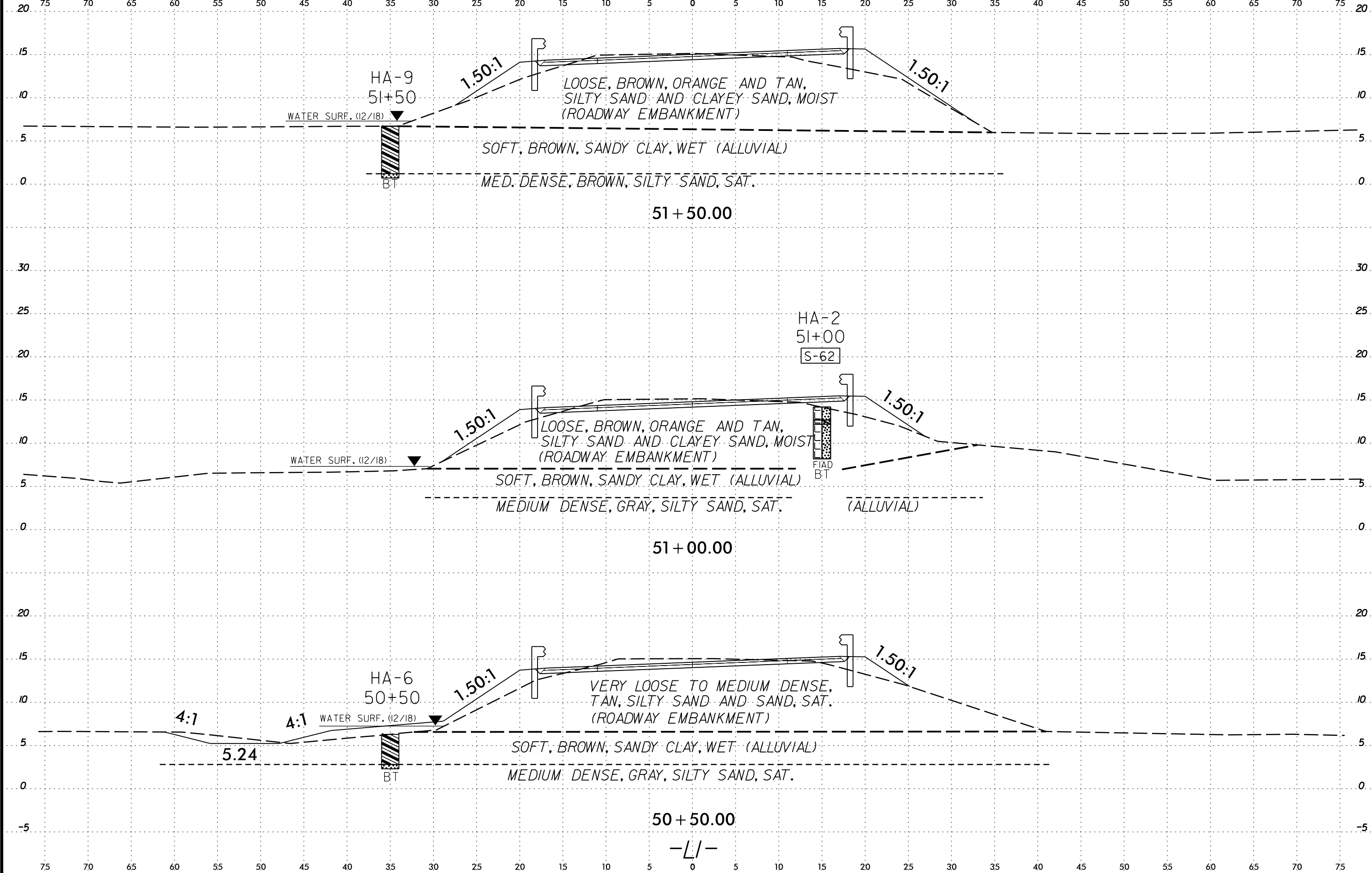
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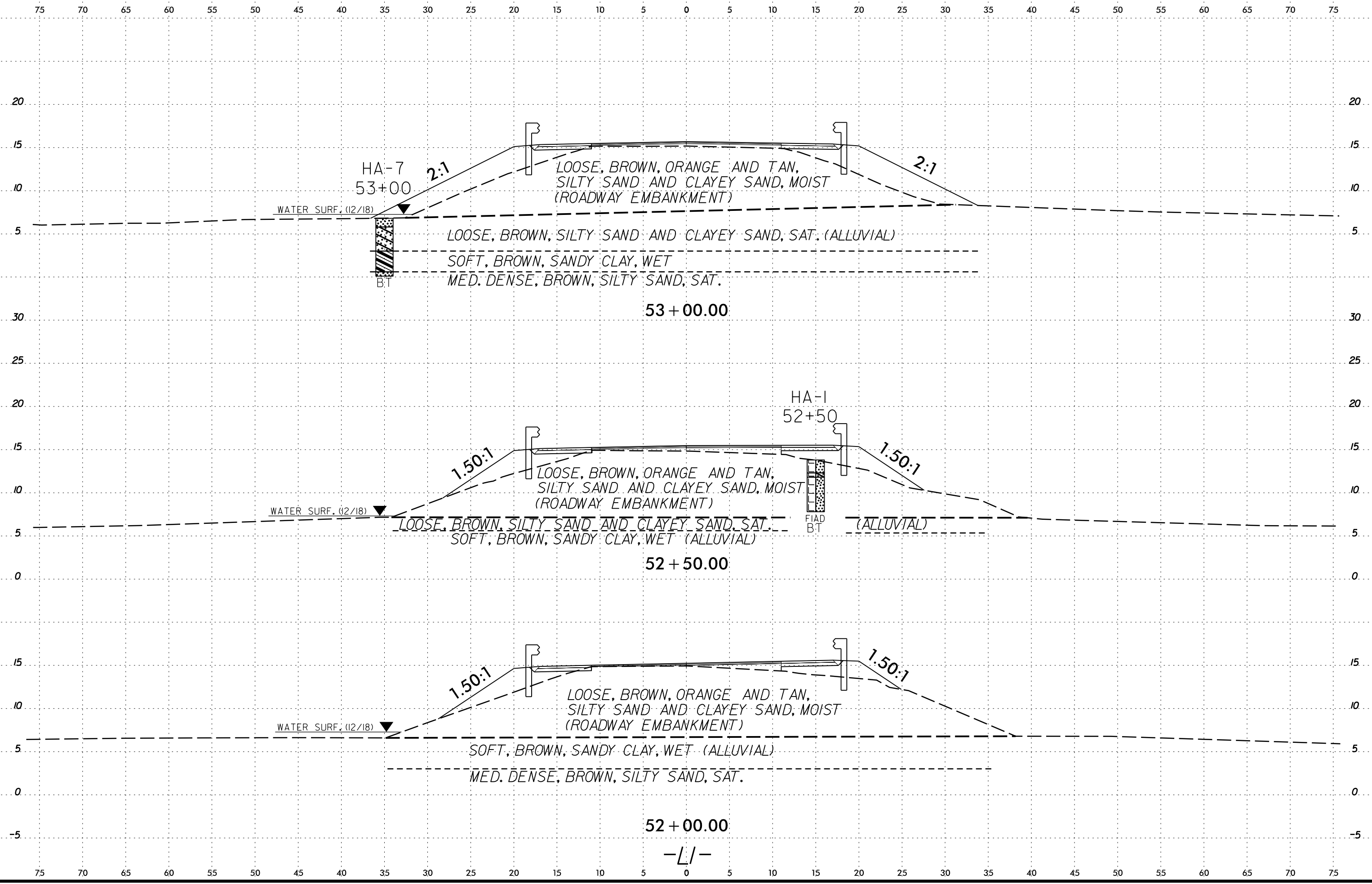
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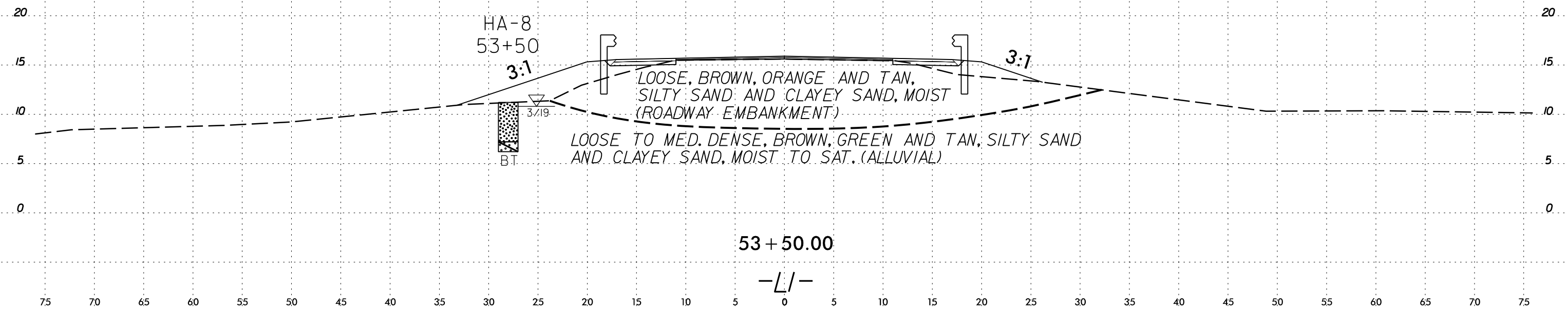
SCHEMATIC SECTION



SYTIME
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ARRANGE

6/23/16

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DATE: 6/23/16
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 CHECKED BY: [illegible]
 APPROVED BY: [illegible]



SUMMARY OF LABORATORY TEST DATA
Soil Classification and Gradation

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616			
S&ME Project #: 6235-18-037	Date Report: 11/26/2018		
State Project No.: 33723.1.2	County: Craven		
Federal ID No.: N/A	TIP No.: B-4484		
Project Name: Replace Bridge No. 138 and 139 on SR 1470 (Maple Cypress Rd) over Neuse River and Neuse River Overflow			
Client Name: NCDOT GEU	Client Address: Raleigh, NC		

Sample No.	Station	Offset	Alignment	Sample Depth (ft)	AASHTO Classification	Total % Passing					Total Mortar Fraction (%)				LL	PL	PI	Moist. %
						Sieve #					Coarse Sand	Fine Sand	Silt	Clay				
						10	40	60	200	270								
SS-1	34+00	31 LT	-L1-	13.2-14.7	A-2-4(0)	91	52	41	24	22	50	19	13	9	NP	NP	NP	28.2
SS-2	34+00	31 LT	-L1-	23.2-24.7	A-4(0)	100	97	93	47	40	7	54	19	21	25	22	3	34.0
SS-3	33+00	23 LT	-L1-	8.2-9.7	A-2-4(0)	98	78	61	22	17	37	44	8	9	NP	NP	NP	19.0
SS-4	33+00	23 LT	-L1-	28.2-29.7	A-2-4(0)	91	84	75	35	31	16	15	44	16	NP	NP	NP	28.3
SS-5	32+00	23 LT	-L1-	0.0-1.5	A-2-4(0)	100	95	87	35	30	13	57	14	6	28	26	2	80.1
SS-6	32+00	23 LT	-L1-	7.8-9.3	A-2-6(0)	91	80	66	33	30	27	40	15	18	30	18	12	38.6
SS-8	31+00	31 LT	-L1-	4.2-5.7	A-2-4(0)	100	86	57	17	13	43	44	5	8	NP	NP	NP	19.6
SS-9	31+00	31 LT	-L1-	22.8-24.3	A-4(0)	94	83	70	37	34	26	38	18	18	NP	NP	NP	26.8
SS-10	30+00	31 LT	-L1-	47.8-49.3	A-2-4(0)	86	60	40	17	14	54	29	10	7	NP	NP	NP	19.9
SS-11	30+00	31 LT	-L1-	52.8-54.3	A-2-4(0)	98	76	49	17	15	50	35	7	8	NP	NP	NP	31.9
SS-12	29+00	32 LT	-L1-	13.1-14.6	A-2-4(0)	90	65	52	29	27	43	28	15	14	NP	NP	NP	26.9
SS-13	29+00	32 LT	-L1-	18.1-19.6	A-4(1)	98	84	76	46	42	23	35	20	22	24	16	8	31.0
SS-16	28+10	30 LT	-L1-	33.0-34.5	A-4(0)	95	79	68	41	39	28	31	20	21	27	25	2	25.2
SS-17	28+10	30 LT	-L1-	43.0-44.5	A-1-b(0)	63	33	23	12	11	63	20	8	9	NP	NP	NP	20.0
SS-32	21+50	35 LT	-L1-	17.9-19.4	A-3(1)	100	80	33	4	3	67	30	1	2	NP	NP	NP	23.5
SS-33	21+50	35 LT	-L1-	32.9-34.4	A-4(0)	95	91	86	40	36	10	53	15	22	23	20	3	30.8
SS-34	21+00	38 LT	-L1-	4.1-5.6	A-4(0)	100	100	97	39	30	3	67	10	20	25	18	7	23.2
SS-35	21+00	38 LT	-L1-	32.9-34.4	A-4(0)	99	96	92	45	40	7	52	18	23	24	21	3	30.9
SS-36	20+50	43 LT	-L1-	4.2-5.7	A-6(12)	100	100	99	73	66	1	33	23	43	37	19	18	27.2
SS-37	20+50	43 LT	-L1-	13.1-14.6	A-4(0)	100	100	99	43	34	1	65	13	21	23	21	2	28.5
SS-38	19+90	40 LT	-L1-	4.2-5.7	A-6(6)	100	99	95	62	54	5	41	20	34	31	18	13	27.0
SS-39	19+90	40 LT	-L1-	7.9-9.4	A-7-6(31)	100	99	98	91	87	2	11	28	59	56	26	30	37.3
SS-42	14+00	CL	-DW1-	2.6-4.1	A-3(1)	100	84	39	6	5	61	35	1	3	NP	NP	NP	21.4
SS-43	12+00	CL	-DW1-	12.6-14.1	A-2-4(0)	89	54	44	27	25	50	22	14	14	24	21	3	22.8
SS-44	37+50	CL	-L1-	2.9-4.4	A-2-4(0)	99	83	57	12	9	42	49	4	5	NP	NP	NP	15.2
SS-45	35+85	CL	-L1-	2.6-4.1	A-2-4(0)	100	97	90	24	19	10	71	5	14	NP	NP	NP	19.5
SS-46	39+14	CL	-L1-	27.8-29.3	A-4(1)	99	91	86	56	51	13	35	22	30	26	20	6	30.4
SS-47	39+14	CL	-L1-	87.8-89.3	A-2-4(0)	95	90	81	24	22	15	62	12	11	NP	NP	NP	34.5
SS-48	50+00	CL	-L1-	17.9-19.4	A-3(1)	100	97	62	8	7	38	56	2	4	NP	NP	NP	26.7
SS-49	49+02	6 RT	-L1-	27.8-29.3	A-4(0)	98	86	78	50	46	20	34	19	27	25	20	5	29.4
SS-50	47+50	19 RT	-L1-	22.8-24.3	A-2-4(0)	89	63	53	32	30	40	27	19	14	NP	NP	NP	30.9
SS-51	17+00	9 LT	-L1-	17.8-19.3	A-6(2)	99	98	94	46	39	5	56	13	26	29	18	11	26.5
SS-52	17+00	9 LT	-L1-	22.8-24.3	A-7-5(40)	100	100	99	99	98	1	2	25	72	64	30	34	58.3
SS-53	17+00	9 LT	-L1-	27.8-29.3	A-7-6(14)	100	99	97	72	63	3	35	24	38	41	19	22	35.4



SUMMARY OF LABORATORY TEST DATA
Soil Classification and Gradation

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #: 6235-18-037	Date Report: 11/26/2018
State Project No.: 33723.1.2	County: Craven
Federal ID No.: N/A	TIP No.: B-4484
Project Name: Replace Bridge No. 138 and 139 on SR 1470 (Maple Cypress Rd) over Neuse River and Neuse River Overflow	
Client Name: NCDOT GEU	
Client Address: Raleigh, NC	

Sample No.	Station	Offset	Alignment	Sample Depth (ft)	AASHTO Classification	Total % Passing					Total Mortar Fraction (%)				LL	PL	PI	Moist. %
						Sieve #					Coarse Sand	Fine Sand	Silt	Clay				
						10	40	60	200	270								
SS-54	45+00	33 RT	-L1-	22.8-24.3	A-4 (0)	95	75	66	41	37	31	30	21	18	22	20	2	29.6
S-62	51+00	15 RT	-L1-	0.0-1.5	A-2-4 (0)	99	84	66	34	28	33	38	16	13	18	17	1	16.9
ST-2	21+50	35 LT	-L1-	5.9-7.9	A-7-6 (13)	100	96	89	67	61	12	27	22	39	42	20	22	ND
ST-3	20+45	43 LT	-L1-	7.1-9.1	A-6 (4)	100	94	83	49	44	17	39	14	30	32	16	16	ND


References / Comments / Deviations: ND=Not Determined. NP=Non-Plastic.

AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO M145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Mal Krajan, ET
Technician Name:


Signature

104-01-0703
Certification #

Thomas J. Daily, PE
Technical Responsibility:

Project Manager
Position

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Effective Stress Triaxial Compression

Consolidated Undrained

Sample details

Sketch showing specimen location in original Sample



Depth: 5.9 - 7.9 ft.
Description: Gray Coarse to Fine Sandy Silty CLAY (A-7-6) (13)

	Specimen 1	Specimen 2
Type	Undisturbed	Undisturbed
Height H_0 (in)	5.769	5.756
Diameter D_0 (in)	2.859	2.857
Weight W_0 (gr)	1165.6	1160.1
Bulk Density ρ (PCF)	119.90	119.77
Particle Density ρ_s	2.677	2.677
	(measured)	(measured)

Initial Conditions

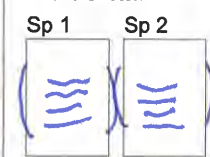
	Specimen 1	Specimen 2
Cell Pressure σ_3 (lb/in ²)	1.5	6.0
Pore Pressure u (lb/in ²)	0.0	0.0
Machine Speed d_r (in/min)	0.011	0.013
No. of Membranes	1	1
Total Thickness (in)	0.012	0.012
Strain Channel	1798	1798
Load Channel	1776	1776
Pore P. Channel	1779	1779
Volume Channel	Volume Chang	Volume Chang
Moisture Content w_0 %	28.4	27.5
Dry Density ρ_{d0} (PCF)	93.37	93.95
Voids Ratio e_0	0.79	0.78
Deg of Saturation S_0 %	96.39	94.55
Final B Value	0.96	0.96

Final Conditions

	Specimen 1	Specimen 2
Moisture Content w_f %	28.2	26.9
Dry Density ρ_d (PCF)	94.41	95.28
Voids Ratio e_f	0.77	0.75
Deg of Saturation S_f %	98.02	95.65
Failure Criteria	Mx Stress Ratio	Mx Stress Ratio
Axial Strain ϵ_f %	6.0	5.0
Corr Dev Stress $(\sigma_1 - \sigma_3)_f$ (lb/in ²)	4.0	6.1
Minor Stress σ_{3f} (lb/in ²)	0.7	2.8
Major Stress σ_{1f} (lb/in ²)	4.7	8.9
Stress Ratio $(\sigma_1/\sigma_3)_f$	6.7	3.2

Notes:

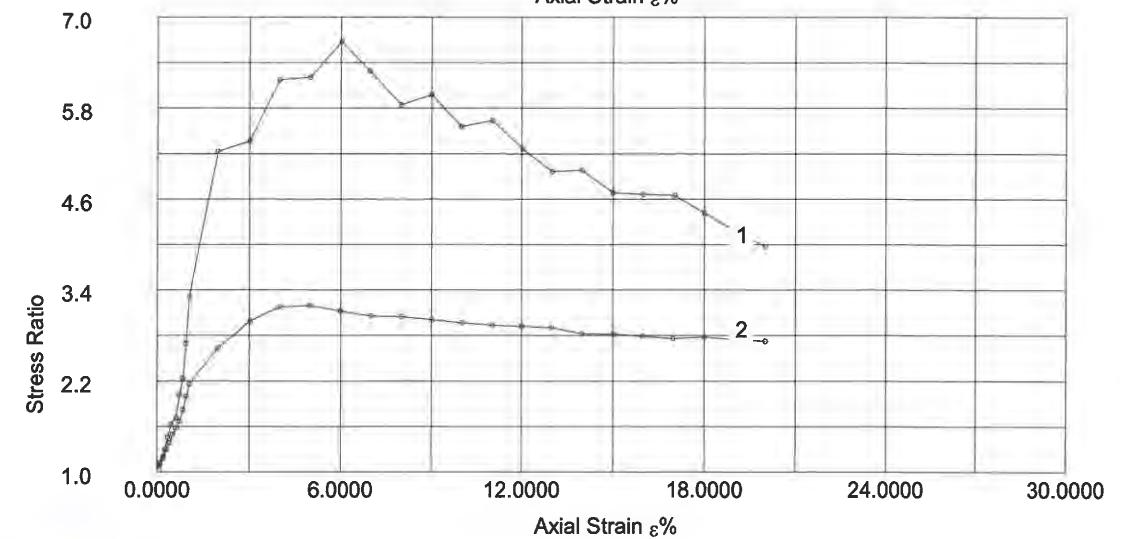
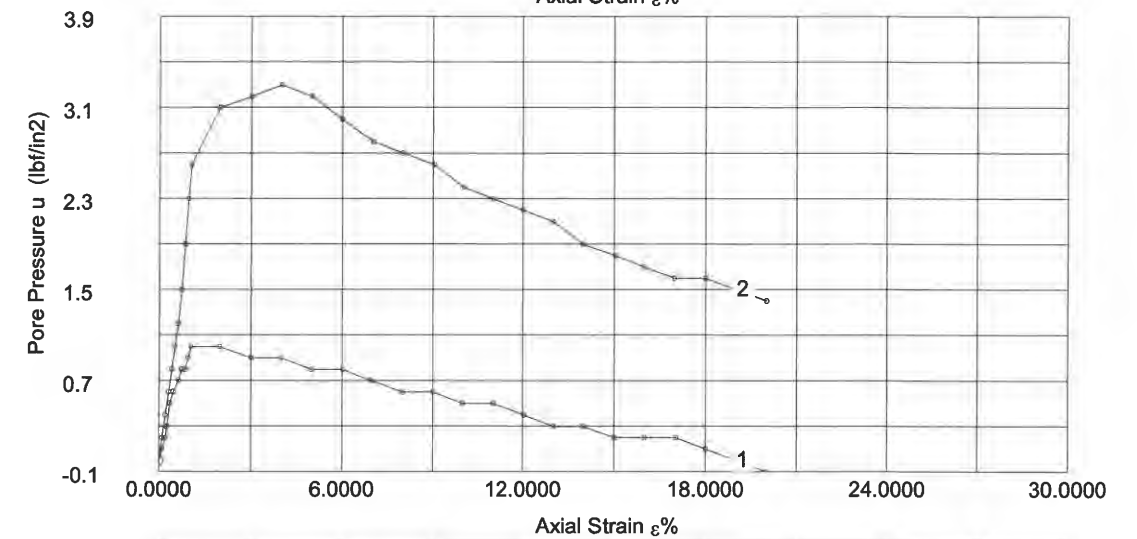
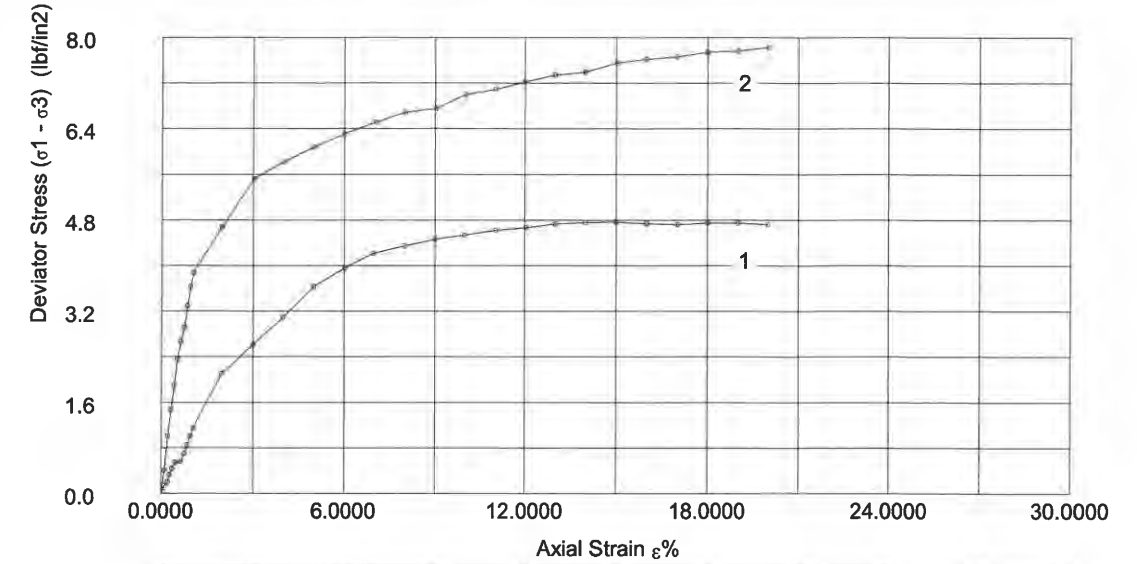
Failure Sketch



Surface Inclination

Effective Stress Triaxial Compression

Consolidated Undrained

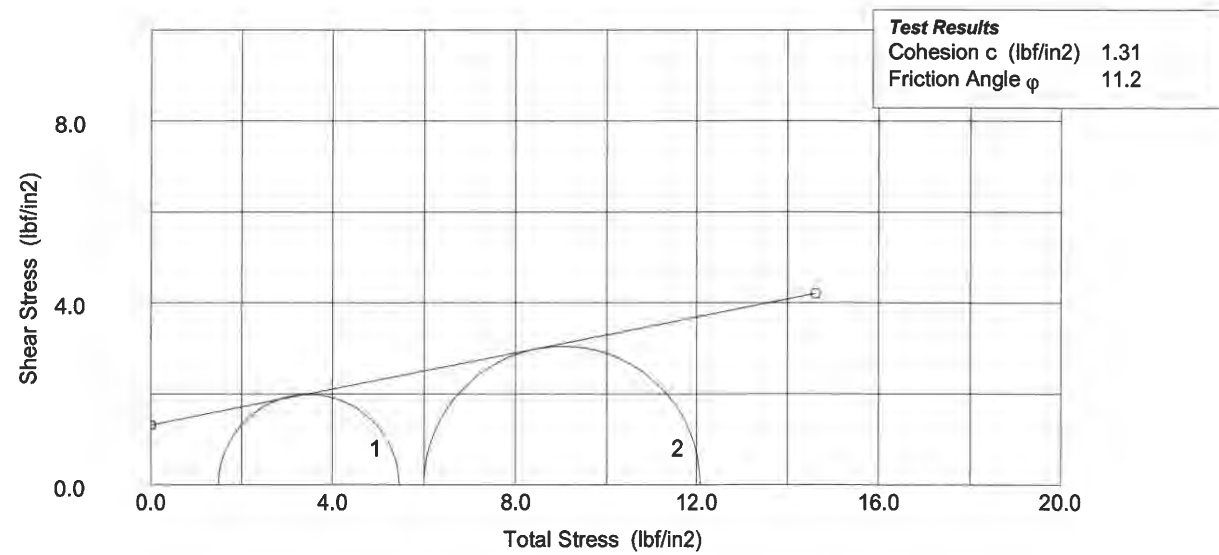
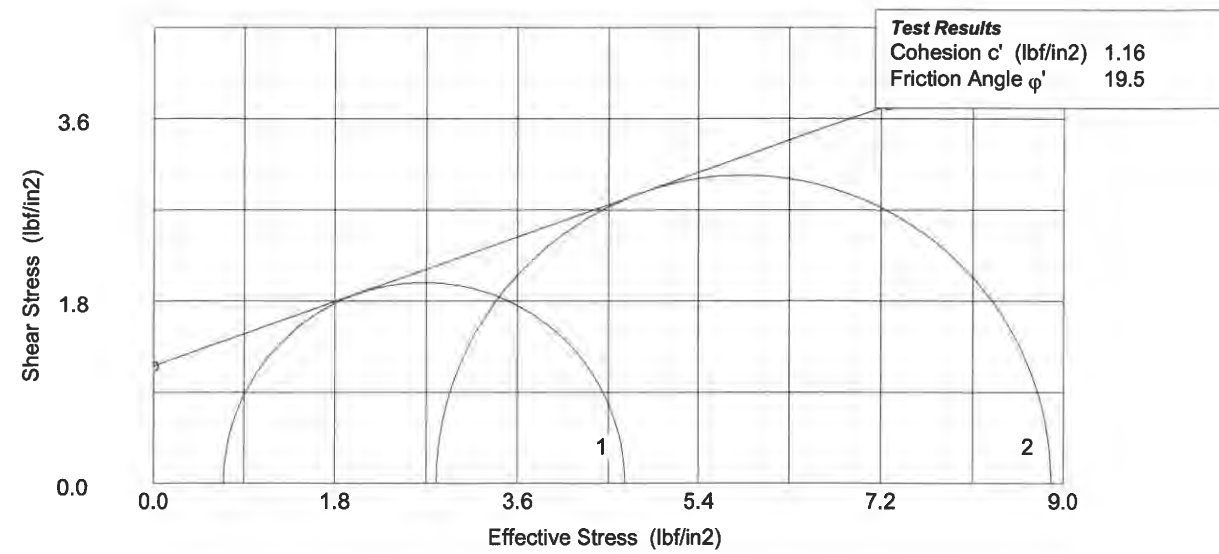


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	Site Reference: Br. Nos. 138 & 139	Date of Test: 12-26-18
	Jobfile: E:\18-036.JOB	Sample: ST-2
	Operator: <i>ML</i>	Checked: <i>ML</i>
		Approved:

	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)
	Site Reference: Br. Nos. 138 & 139	Date of Test: 12-26-18
	Jobfile: E:\18-036.JOB	Sample: ST-2
	Operator: <i>ML</i>	Checked: <i>ML</i>
		Approved:

Effective Stress Triaxial Compression

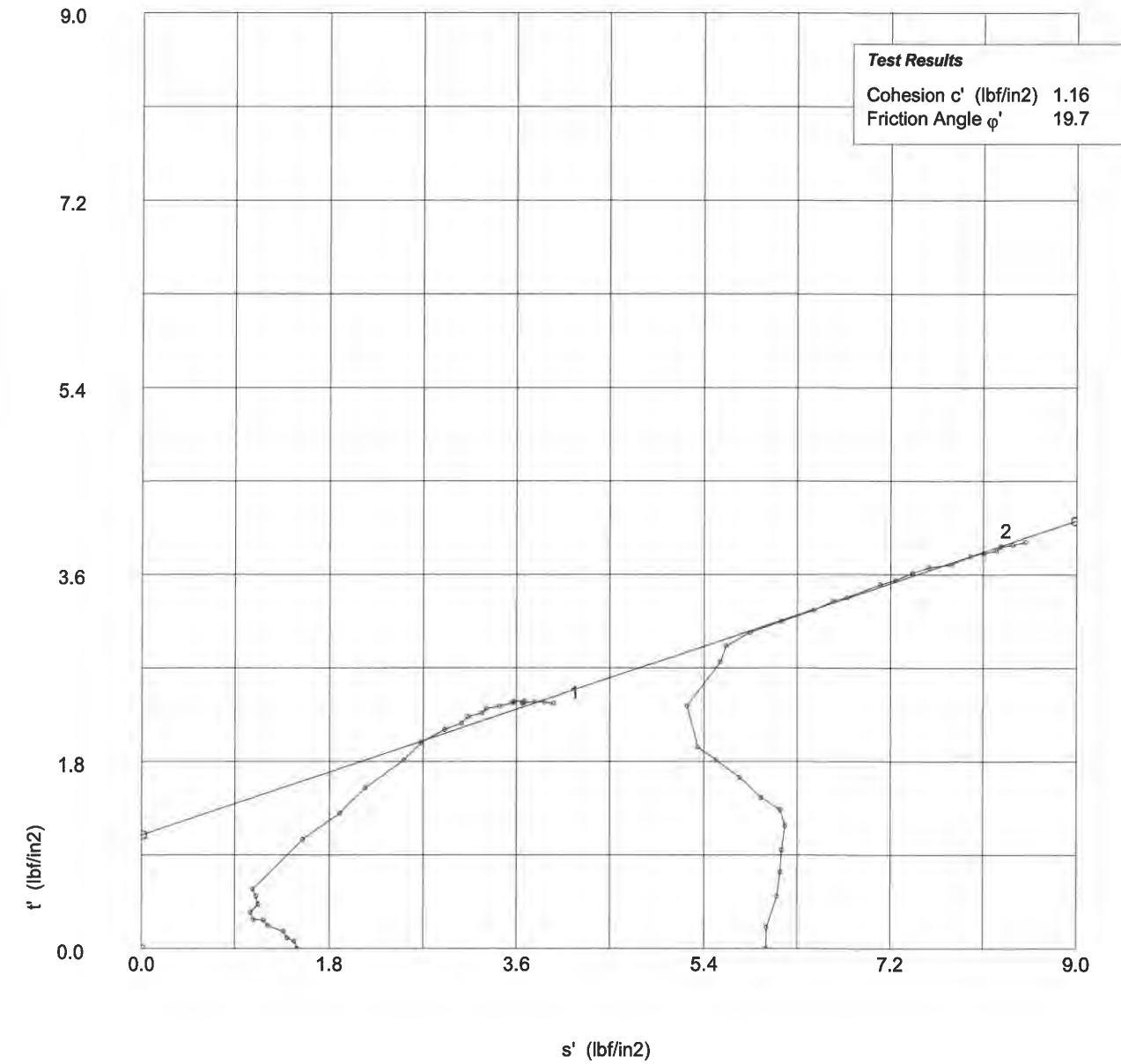
Consolidated Undrained



	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS) Date of Test: 12-26-18
	Site Reference: Br. Nos. 138 & 139 Jobfile: E:\18-036.JOB	Sample: ST-2 Borehole: ST-2
	Operator: <i>mk</i>	Checked: <i>mk</i>

Effective Stress Triaxial Compression

Consolidated Undrained



	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS) Date of Test: 12-26-18
	Site Reference: Br. Nos. 138 & 139 Jobfile: E:\18-036.JOB	Sample: ST-2 Borehole: ST-2
	Operator: <i>mk</i>	Checked: <i>mk</i>

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 1)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress (σ ₁ - σ ₃) _m (lbf/in2)	D. Stress (σ ₁ - σ ₃) _c (lbf/in2)	Minor Str σ ₃ ' (lbf/in2)	Major Str σ ₁ (lbf/in2)	Ratio σ ₁ '/σ ₃ '
1	0	0.00	510	0.0	0	0.0	0.0	0.0	1.50	1.50	1.00
2	60	0.10	519	0.9	1	0.1	0.1	0.1	1.40	1.54	1.10
3	120	0.21	523	1.3	2	0.2	0.2	0.2	1.30	1.50	1.16
4	151	0.26	531	2.1	3	0.3	0.3	0.3	1.20	1.53	1.27
5	209	0.36	538	2.8	5	0.5	0.4	0.4	1.00	1.44	1.44
6	270	0.47	545	3.5	6	0.6	0.5	0.5	0.90	1.45	1.61
7	358	0.62	556	4.6	7	0.7	0.7	0.6	0.80	1.36	1.70
8	417	0.73	565	5.5	8	0.8	0.9	0.7	0.70	1.40	2.00
9	477	0.83	575	6.5	8	0.8	1.0	0.9	0.70	1.55	2.22
10	537	0.93	585	7.5	9	0.9	1.2	1.0	0.60	1.61	2.68
11	596	1.04	594	8.4	10	1.0	1.3	1.1	0.50	1.64	3.29
12	1136	1.98	665	15.5	10	1.0	2.4	2.1	0.50	2.60	5.21
13	1731	3.01	705	19.5	9	0.9	3.0	2.6	0.60	3.21	5.35
14	2295	3.99	747	23.7	9	0.9	3.6	3.1	0.60	3.69	6.15
15	2869	4.99	791	28.1	8	0.8	4.2	3.6	0.70	4.33	6.19
16	3465	6.03	822	31.2	8	0.8	4.6	4.0	0.70	4.66	6.66
17	4003	6.96	848	33.8	7	0.7	4.9	4.2	0.80	5.02	6.27
18	4604	8.01	866	35.6	6	0.6	5.1	4.3	0.90	5.24	5.82
19	5176	9.00	884	37.4	6	0.6	5.3	4.5	0.90	5.36	5.96
20	5740	9.99	899	38.9	5	0.5	5.5	4.5	1.00	5.54	5.54
21	6337	11.02	915	40.5	5	0.5	5.7	4.6	1.00	5.62	5.62
22	6917	12.03	929	41.9	4	0.4	5.8	4.7	1.10	5.77	5.24
23	7484	13.02	943	43.3	3	0.3	5.9	4.7	1.20	5.93	4.94
24	8052	14.01	956	44.6	3	0.3	6.0	4.8	1.20	5.96	4.96
25	8623	15.00	966	45.6	2	0.2	6.1	4.8	1.30	6.07	4.67
26	9198	16.00	974	46.4	2	0.2	6.1	4.7	1.30	6.04	4.64
27	9790	17.03	984	47.4	2	0.2	6.2	4.7	1.30	6.02	4.63
28	10358	18.02	997	48.7	1	0.1	6.3	4.7	1.40	6.15	4.39
29	10933	19.02	1006	49.6	0	0.0	6.3	4.7	1.50	6.25	4.16
30	11500	20.01	1013	50.3	-1	-0.1	6.3	4.7	1.60	6.32	3.95

	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS) Shear (Specimen 1)
	Site Reference: Br. Nos. 138 & 139	Date of Test: 12-26-18
	Jobfile: E:\18-036.JOB	Sample: ST-2
	Operator: <i>MK</i>	Checked: <i>MK</i>
		Approved:

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 2)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress (σ ₁ - σ ₃) _m (lbf/in2)	D. Stress (σ ₁ - σ ₃) _c (lbf/in2)	Minor Str σ ₃ ' (lbf/in2)	Major Str σ ₁ (lbf/in2)	Ratio σ ₁ '/σ ₃ '
1	137	0.00	619	0.0	0	0.0	0.0	0.0	6.00	6.00	1.00
2	197	0.10	645	2.6	2	0.2	0.4	0.4	5.80	6.21	1.07
3	256	0.21	683	6.4	4	0.4	1.0	1.0	5.60	6.61	1.18
4	317	0.31	713	9.4	6	0.6	1.5	1.5	5.40	6.88	1.27
5	376	0.42	740	12.1	8	0.8	1.9	1.9	5.20	7.10	1.36
6	435	0.52	780	16.1	10	1.0	2.5	2.4	5.00	7.36	1.47
7	496	0.63	800	18.1	12	1.2	2.8	2.7	4.80	7.47	1.56
8	554	0.73	815	19.6	15	1.5	3.1	2.9	4.50	7.40	1.65
9	613	0.83	840	22.1	19	1.9	3.5	3.3	4.10	7.39	1.80
10	674	0.94	862	24.3	23	2.3	3.8	3.6	3.70	7.33	1.98
11	734	1.04	878	25.9	26	2.6	4.0	3.9	3.40	7.28	2.14
12	1277	1.99	940	32.1	31	3.1	5.0	4.7	2.90	7.58	2.61
13	1874	3.03	1004	38.5	32	3.2	5.9	5.5	2.80	8.32	2.97
14	2438	4.02	1036	41.7	33	3.3	6.3	5.8	2.70	8.52	3.16
15	3003	5.00	1063	44.4	32	3.2	6.6	6.1	2.80	8.88	3.17
16	3573	6.00	1088	46.9	30	3.0	6.9	6.3	3.00	9.30	3.10
17	4166	7.03	1113	49.4	28	2.8	7.2	6.5	3.20	9.71	3.04
18	4731	8.02	1136	51.7	27	2.7	7.5	6.7	3.30	9.99	3.03
19	5311	9.03	1152	53.3	26	2.6	7.6	6.8	3.40	10.16	2.99
20	5881	10.03	1181	56.2	24	2.4	8.0	7.0	3.60	10.61	2.95
21	6446	11.01	1199	58.0	23	2.3	8.1	7.1	3.70	10.79	2.92
22	7017	12.01	1221	60.2	22	2.2	8.3	7.2	3.80	11.02	2.90
23	7592	13.01	1241	62.2	21	2.1	8.5	7.3	3.90	11.24	2.88
24	8159	14.00	1258	63.9	19	1.9	8.7	7.4	4.10	11.49	2.80
25	8750	15.03	1282	66.3	18	1.8	8.9	7.6	4.20	11.75	2.80
26	9297	15.99	1299	68.0	17	1.7	9.0	7.6	4.30	11.92	2.77
27	9866	16.98	1316	69.7	16	1.6	9.1	7.7	4.40	12.06	2.74
28	10458	18.02	1336	71.7	16	1.6	9.3	7.7	4.40	12.14	2.76
29	11031	19.02	1350	73.1	15	1.5	9.3	7.8	4.50	12.27	2.73
30	11608	20.02	1367	74.8	14	1.4	9.4	7.8	4.60	12.42	2.70

	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS) Shear (Specimen 2)
	Site Reference: Br. Nos. 138 & 139	Date of Test: 12-26-18
	Jobfile: E:\18-036.JOB	Sample: ST-2
	Operator: <i>MK</i>	Checked: <i>MK</i>
		Approved:

Oedometer Settlement Tests

Sample details

Sketch showing specimen location in original Sample



Depth: 7.1 - 9.1 ft.
Description: Gray Coarse to Fine Sandy Silty CLAY (A-6) (4)

Type: Undisturbed
Height H_0 (in): 0.999
Diameter D_0 (in): 2.501
Weight W_0 (gr): 158.56
Bulk Density ρ (PCF): 123.08
Particle Density ρ_s : 2.688 (measured)

Initial Conditions

Settlement Channel: 1001
Moisture Content w_0 %: 27.1
Dry Density ρ_d (PCF): 96.83
Voids Ratio e_0 : 0.7321
Deg of Saturation S_0 %: 99.5
Swelling Pressure S_s (TSF): 0.000

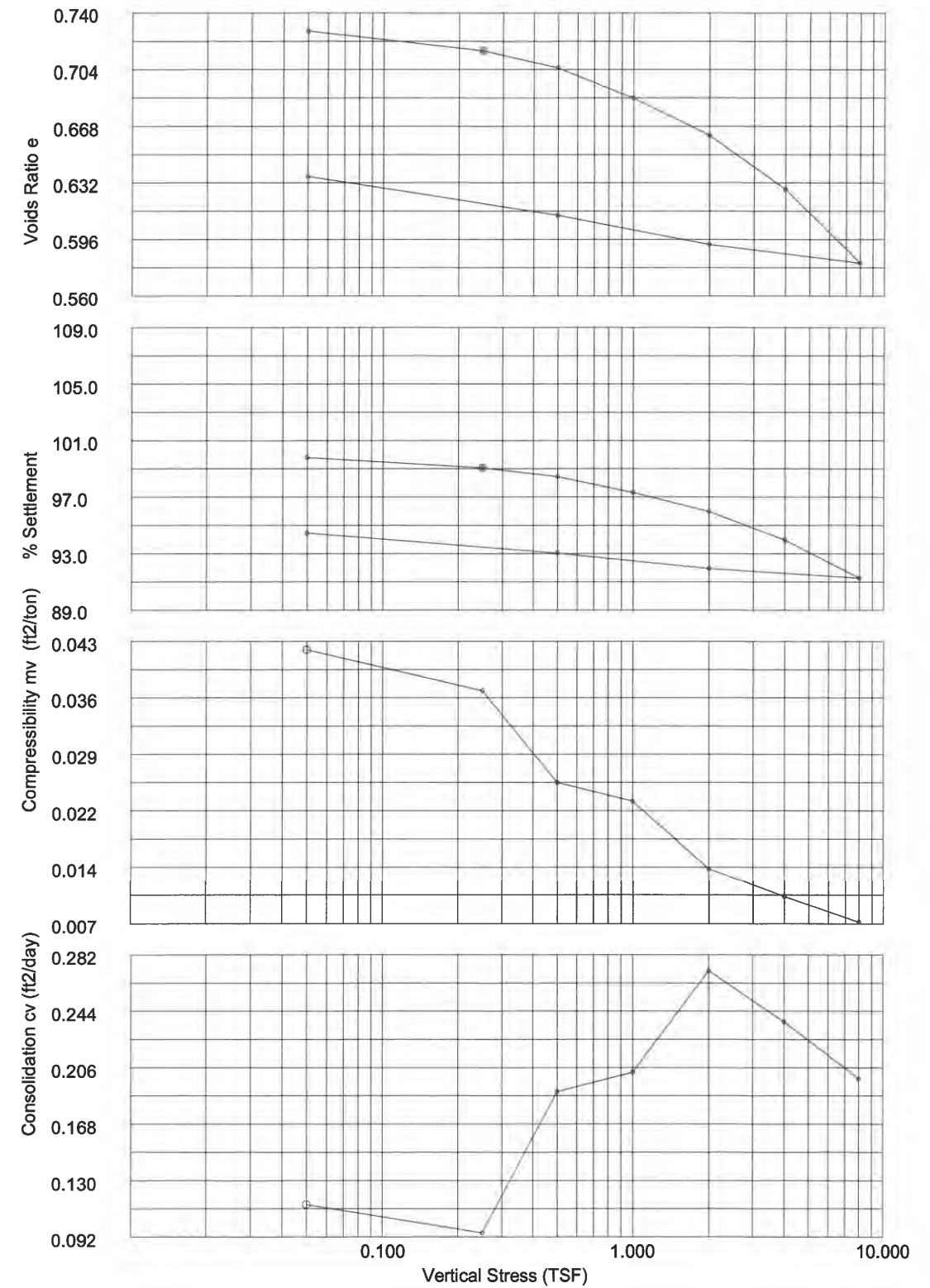
Final Conditions

Moisture Content w_f %: 24.5
Dry Density ρ_d (PCF): 102.52
Voids Ratio e_f : 0.6361
Deg of Saturation S_f %: 100.00
Settlement: (in): 0.055
Compression Index C_c : 0.158

Notes: Test specimen taken from the middle portion of UD tube.

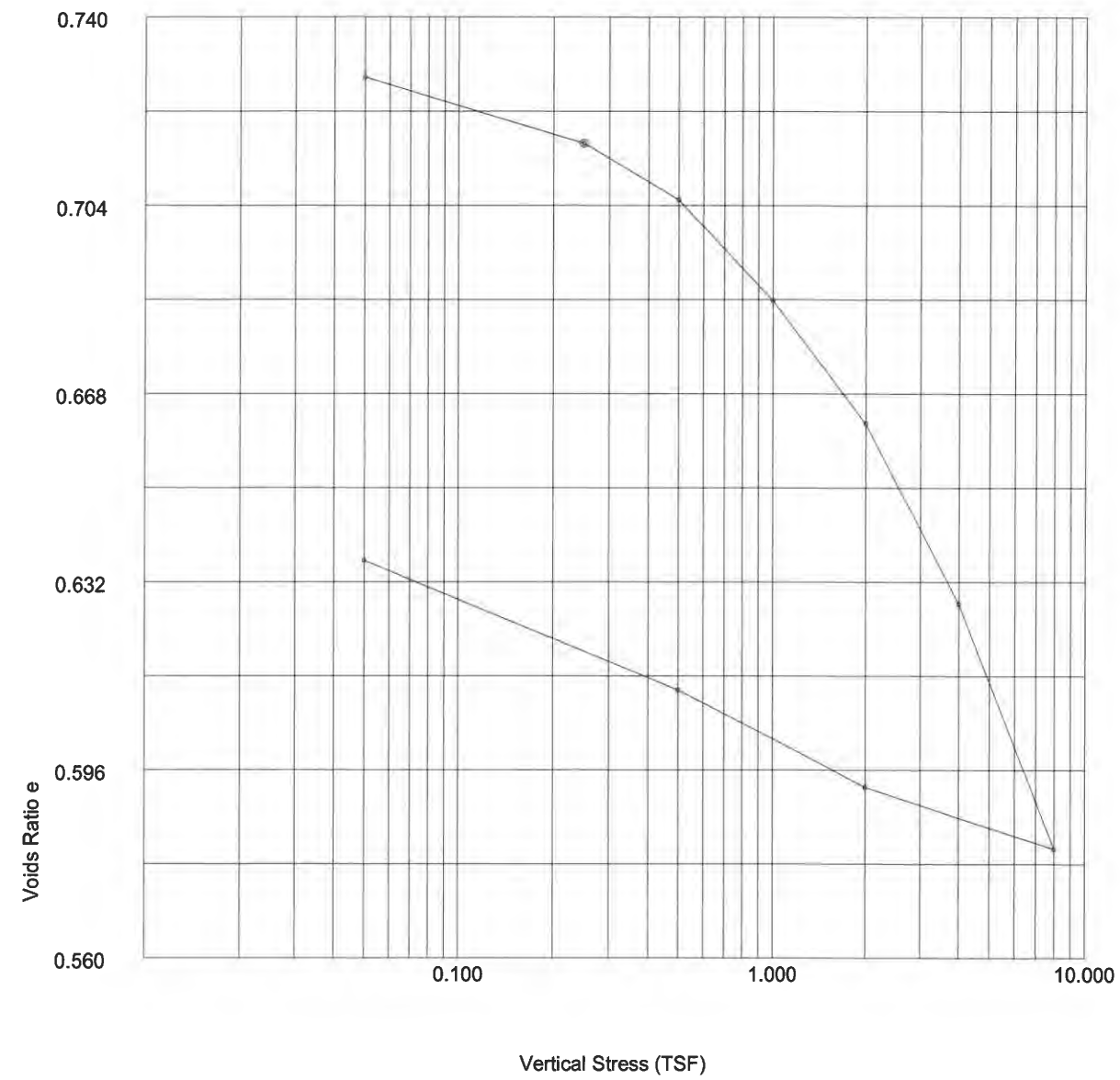
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	Site Reference: Br. Nos. 138 & 139 Jobfile: E:\18-036.JOB	Date of Test: 12-26-18
	Operator: <i>MK</i>	Checked: <i>MK</i>
		Sample: ST-3 Borehole: ST-3
		Approved:

Oedometer Settlement Tests



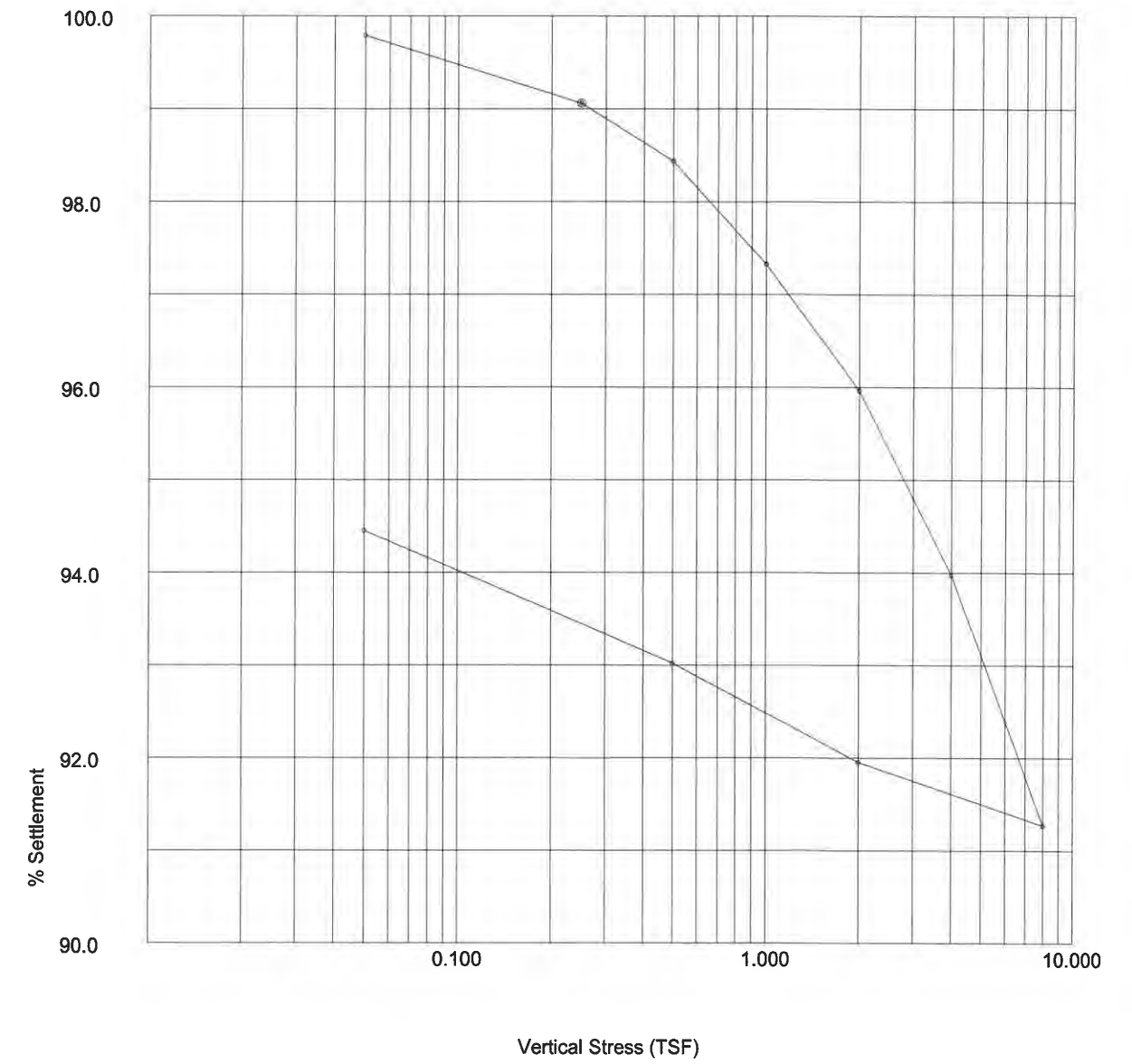
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		Sample: ST-3 Borehole: ST-3
		Approved:

Oedometer Settlement Tests



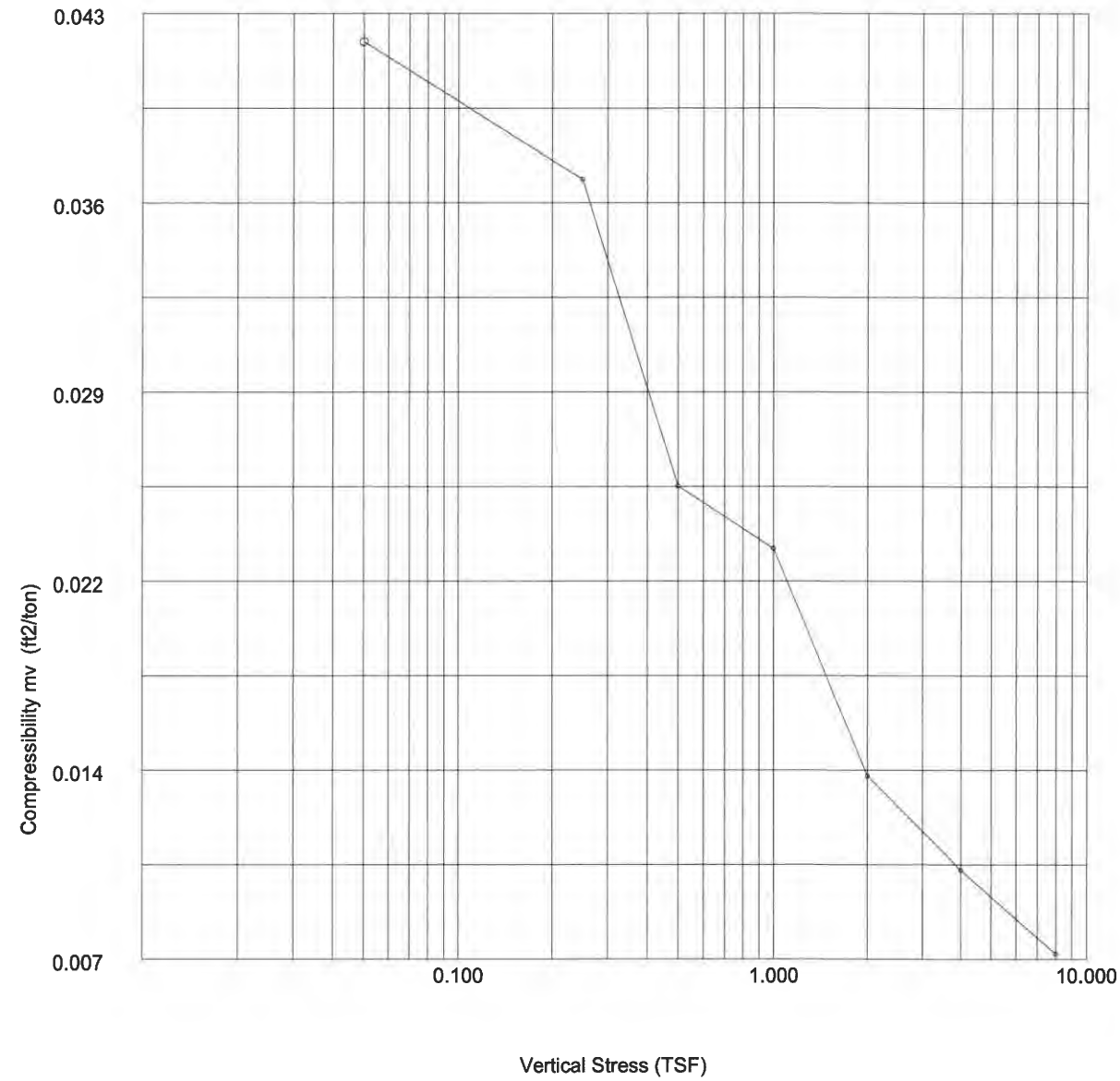
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		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile: E:\18-036.JOB	Borehole:	ST-3
Operator: MK	Checked: MK	Approved:	

Oedometer Settlement Tests



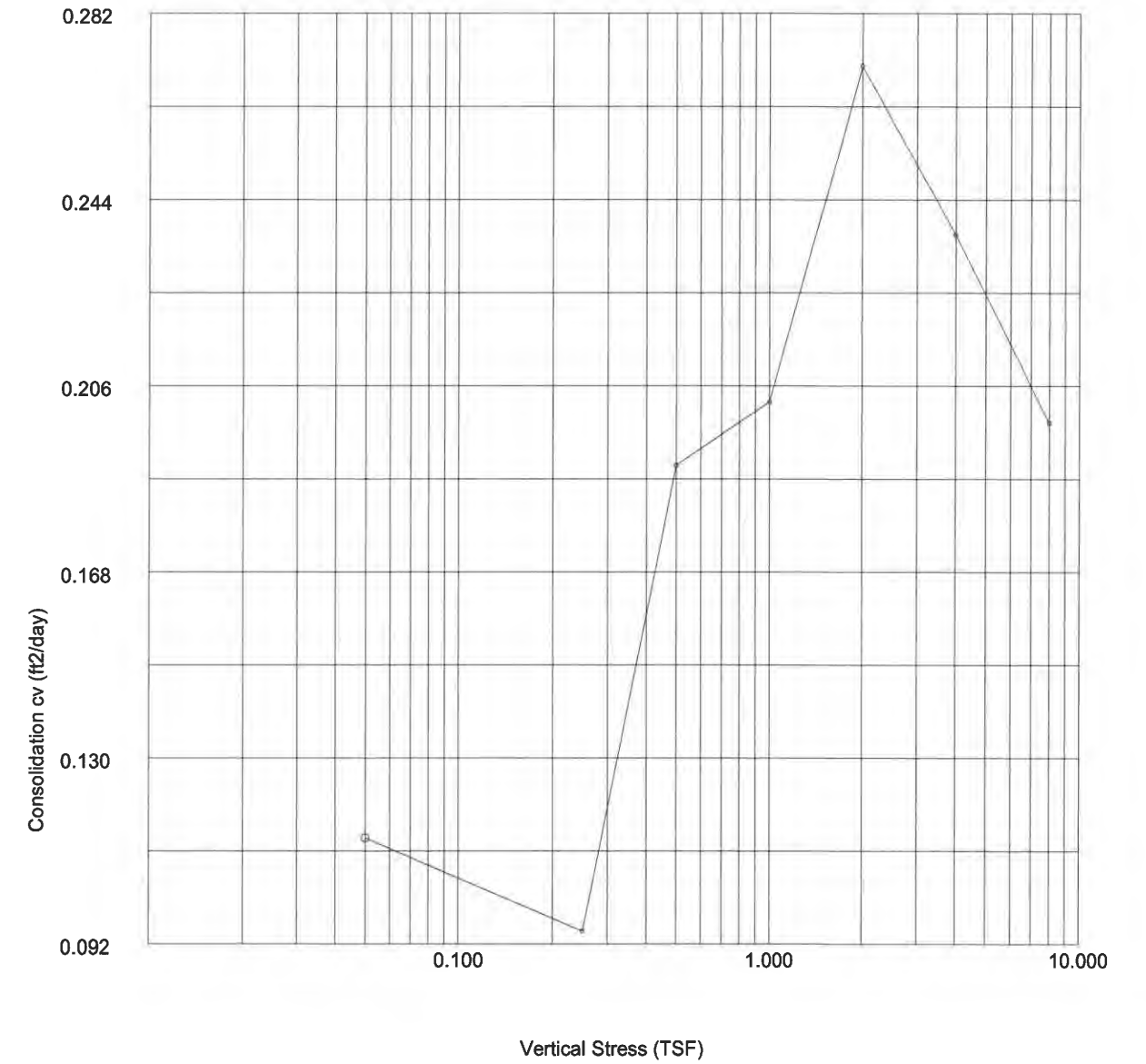
	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile: E:\18-036.JOB	Borehole:	ST-3
Operator: MK	Checked: MK	Approved:	

Oedometer Settlement Tests



	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139 Jobfile: E:\18-036.JOB	Sample:	ST-3
		Borehole:	ST-3
Operator: <i>MK</i>	Checked: <i>MK</i>	Approved:	

Oedometer Settlement Tests




	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139 Jobfile: E:\18-036.JOB	Sample:	ST-3
		Borehole:	ST-3
Operator: <i>MK</i>	Checked: <i>MK</i>	Approved:	


Oedometer Settlement Tests

Stress (TSF)	Initial Temp. oC	Settlement Total (in)	Cal Corr. (in)	Final Temp. oC	Voids Ratio e_f	t_{50} (mins)	Secondary Compr C_{sec}	c_v (ft ² /day)	m_v (ft ² /ton)
0.050	20.0	0.0021	0.0	21.7	0.7285	4.315	0.0003	0.115	0.042
0.250	20.0	0.0094	0.0	21.7	0.7158	5.213	0.0005	0.095	0.037
0.500	20.0	0.0156	0.0	21.7	0.7051	2.564	0.001	0.190	0.025
1.000	20.0	0.0267	0.0	21.7	0.6858	2.358	0.0006	0.203	0.023
2.000	20.0	0.0403	0.0	21.7	0.6623	1.718	0.0009	0.271	0.014
4.000	20.0	0.0602	0.0	21.7	0.6278	1.900	0.0012	0.237	0.011
8.000	20.0	0.0872	0.0	21.7	0.5809	2.157	0.0126	0.198	0.007
2.000	20.0	0.0804	0.0	21.7	0.5927				0.001
0.500	20.0	0.0697	0.0	21.7	0.6113				0.008
0.050	20.0	0.0554	0.0	21.7	0.6361				0.034

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	0	0.0000	0.0000
2	0.017	2	0.0002	0.0002
3	0.033	2	0.0002	0.0002
4	0.050	3	0.0003	0.0003
5	0.067	3	0.0003	0.0003
6	0.083	3	0.0003	0.0003
7	0.100	3	0.0003	0.0003
8	0.200	4	0.0004	0.0004
9	0.400	5	0.0005	0.0005
10	0.800	6	0.0006	0.0006
11	1.000	6	0.0006	0.0006
12	2.000	8	0.0008	0.0008
13	4.000	11	0.0011	0.0011
14	8.000	14	0.0014	0.0014
15	10.000	15	0.0015	0.0015
16	20.000	18	0.0018	0.0018
17	40.000	20	0.0020	0.0020
18	80.000	21	0.0021	0.0021
19	86.183	21	0.0021	0.0021

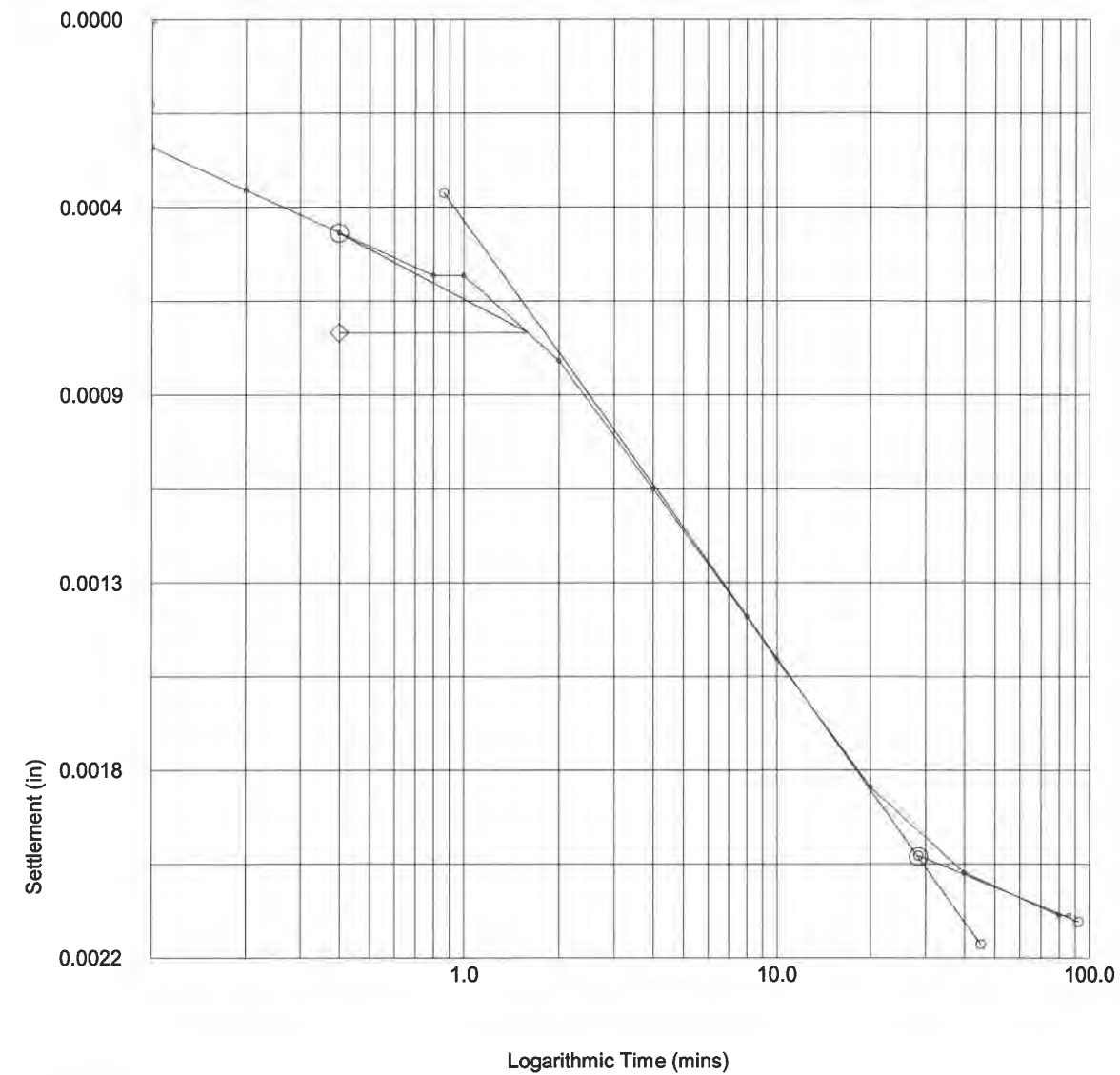
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			Date of Test:	12-26-18
	Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator:	MK	Checked:	MK	Approved:

	ASTM D2435-96		Test name	Consolidation Load: 0.050 (TSF)
			Date of Test:	12-26-18
	Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator:	MK	Checked:	MK	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0021
Voids Ratio e	0.7285
Final Temp oC	0.0
t ₅₀ (mins)	4.32
c _v (ft ² /day)	0.115
m _v (ft ² /ton)	0.042
Sec Compression C _{sec}	0.0003



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	21	0.0021	0.0021
2	0.017	26	0.0026	0.0026
3	0.033	30	0.0030	0.0030
4	0.050	31	0.0031	0.0031
5	0.067	32	0.0032	0.0032
6	0.083	33	0.0033	0.0033
7	0.100	33	0.0033	0.0033
8	0.200	36	0.0036	0.0036
9	0.400	38	0.0038	0.0038
10	0.800	41	0.0041	0.0041
11	1.000	42	0.0042	0.0042
12	2.000	47	0.0047	0.0047
13	4.000	55	0.0055	0.0055
14	8.000	65	0.0065	0.0065
15	10.000	68	0.0068	0.0068
16	20.000	78	0.0078	0.0078
17	40.000	84	0.0084	0.0084
18	80.000	87	0.0087	0.0087
19	100.000	88	0.0088	0.0088
20	200.000	90	0.0090	0.0090
21	400.000	91	0.0091	0.0091
22	800.000	93	0.0093	0.0093
23	1200.000	94	0.0094	0.0094
24	1393.500	94	0.0094	0.0094

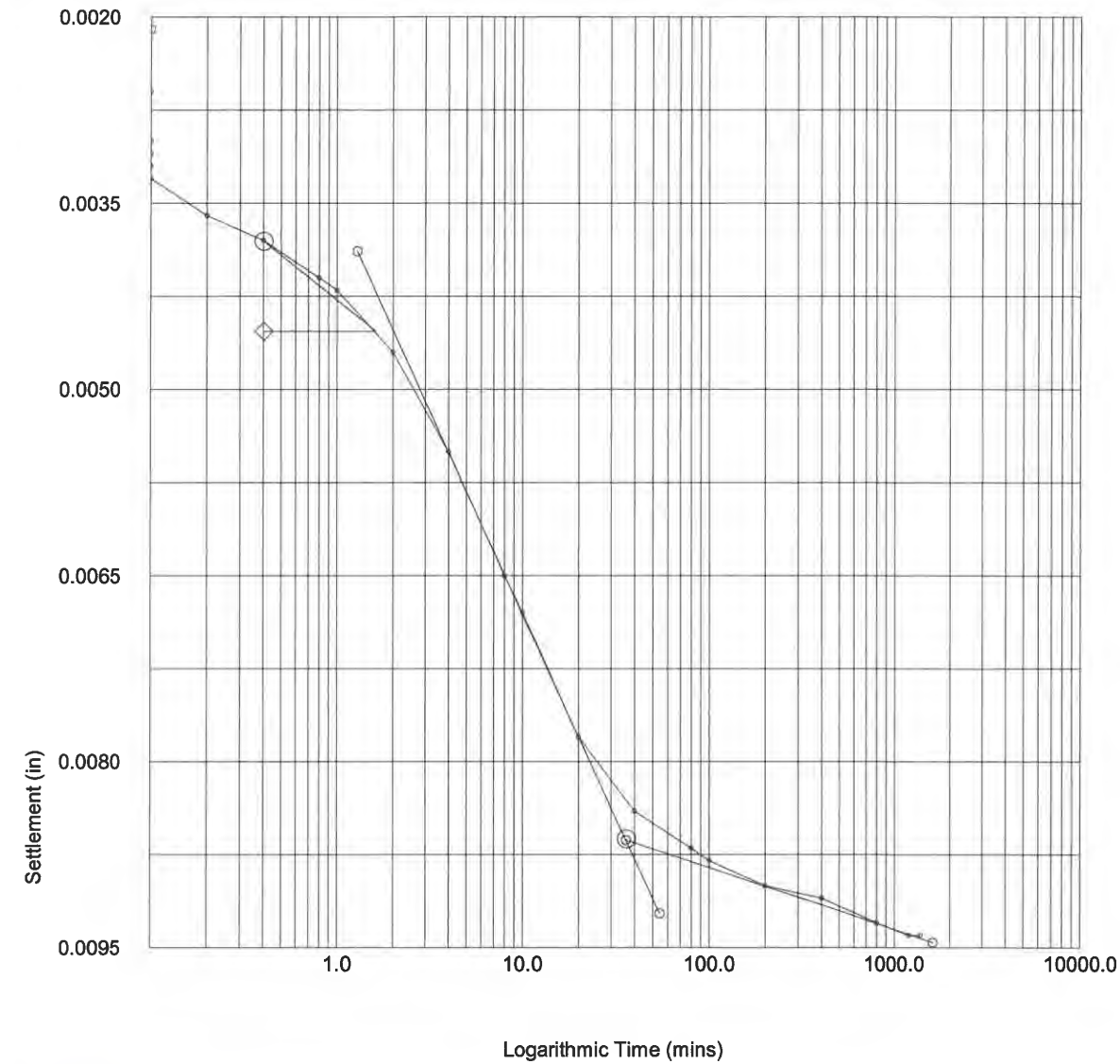
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	Site Reference: Br. Nos. 138 & 139 Jobfile: E:\18-036.JOB	Date of Test: 12-26-18
	Operator: MKC	Checked: MKC
		Sample: ST-3 Borehole: ST-3
		Approved:

	ASTM D2435-96	Test name: Consolidation Load: 0.250 (TSF)
	Site Reference: Br. Nos. 138 & 139 Jobfile: E:\18-036.JOB	Date of Test: 12-26-18
	Operator: MKC	Checked: MKC
		Sample: ST-3 Borehole: ST-3
		Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.250
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0073
Voids Ratio e	0.7158
Final Temp oC	0.0
t ₅₀ (mins)	5.21
c _v (ft ² /day)	0.095
m _v (ft ² /ton)	0.037
Sec Compression C _{sec}	0.0005



	ASTM D2435-96	Test name	Consolidation
	Site Reference: Br. Nos. 138 & 139 Jobfile: E:\18-036.JOB	Date of Test:	12-26-18
	Operator: <i>ME</i>	Sample:	ST-3
	Checked: <i>ME</i>	Borehole:	ST-3
		Approved:	

Oedometer Settlement Tests

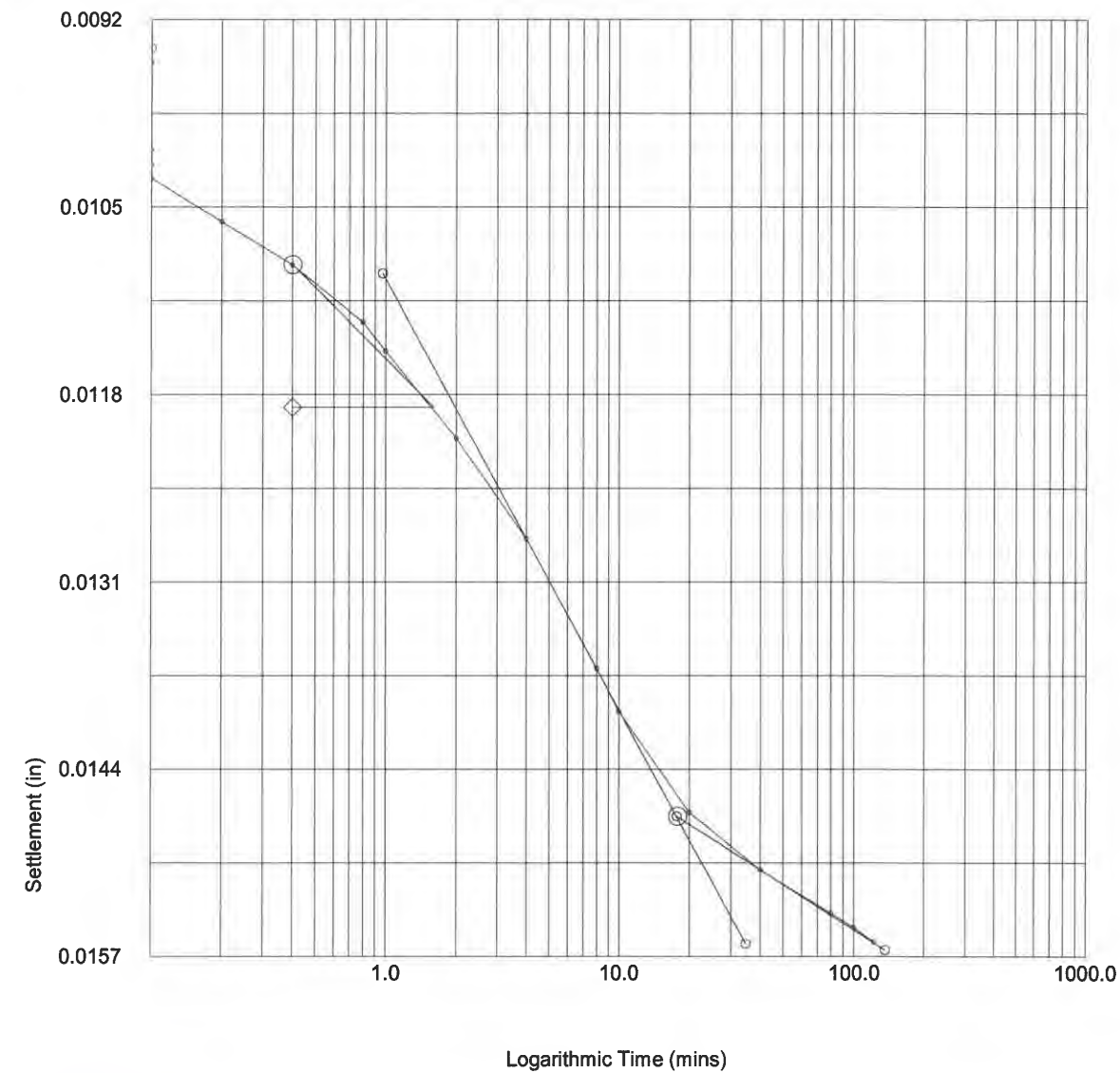
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	94	0.0094	0.0094
2	0.017	95	0.0095	0.0095
3	0.033	101	0.0101	0.0101
4	0.050	102	0.0102	0.0102
5	0.067	102	0.0102	0.0102
6	0.083	103	0.0103	0.0103
7	0.100	103	0.0103	0.0103
8	0.200	106	0.0106	0.0106
9	0.400	109	0.0109	0.0109
10	0.800	113	0.0113	0.0113
11	1.000	115	0.0115	0.0115
12	2.000	121	0.0121	0.0121
13	4.000	128	0.0128	0.0128
14	8.000	137	0.0137	0.0137
15	10.000	140	0.0140	0.0140
16	20.000	147	0.0147	0.0147
17	40.000	151	0.0151	0.0151
18	80.000	154	0.0154	0.0154
19	100.000	155	0.0155	0.0155
20	122.450	156	0.0156	0.0156

	ASTM D2435-96	Test name	Consolidation Load: 0.500 (TSF)
	Site Reference: Br. Nos. 138 & 139 Jobfile: E:\18-036.JOB	Date of Test:	12-26-18
	Operator: <i>ME</i>	Sample:	ST-3
	Checked: <i>ME</i>	Borehole:	ST-3
		Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0062
Voids Ratio e	0.7051
Final Temp oC	0.0
t ₅₀ (mins)	2.56
c _v (ft ² /day)	0.19
m _v (ft ² /ton)	0.025
Sec Compression C _{sec}	0.001



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	156	0.0156	0.0156
2	0.017	157	0.0157	0.0157
3	0.033	172	0.0172	0.0172
4	0.050	176	0.0176	0.0176
5	0.067	178	0.0178	0.0178
6	0.083	179	0.0179	0.0179
7	0.100	180	0.0180	0.0180
8	0.200	185	0.0185	0.0185
9	0.400	190	0.0190	0.0190
10	0.800	198	0.0198	0.0198
11	1.000	201	0.0201	0.0201
12	2.000	212	0.0212	0.0212
13	4.000	225	0.0225	0.0225
14	8.000	239	0.0239	0.0239
15	10.000	243	0.0243	0.0243
16	20.000	252	0.0252	0.0252
17	40.000	257	0.0257	0.0257
18	80.000	260	0.0260	0.0260
19	100.000	261	0.0261	0.0261
20	200.000	263	0.0263	0.0263
21	400.000	264	0.0264	0.0264
22	800.000	266	0.0266	0.0266
23	970.000	267	0.0267	0.0267

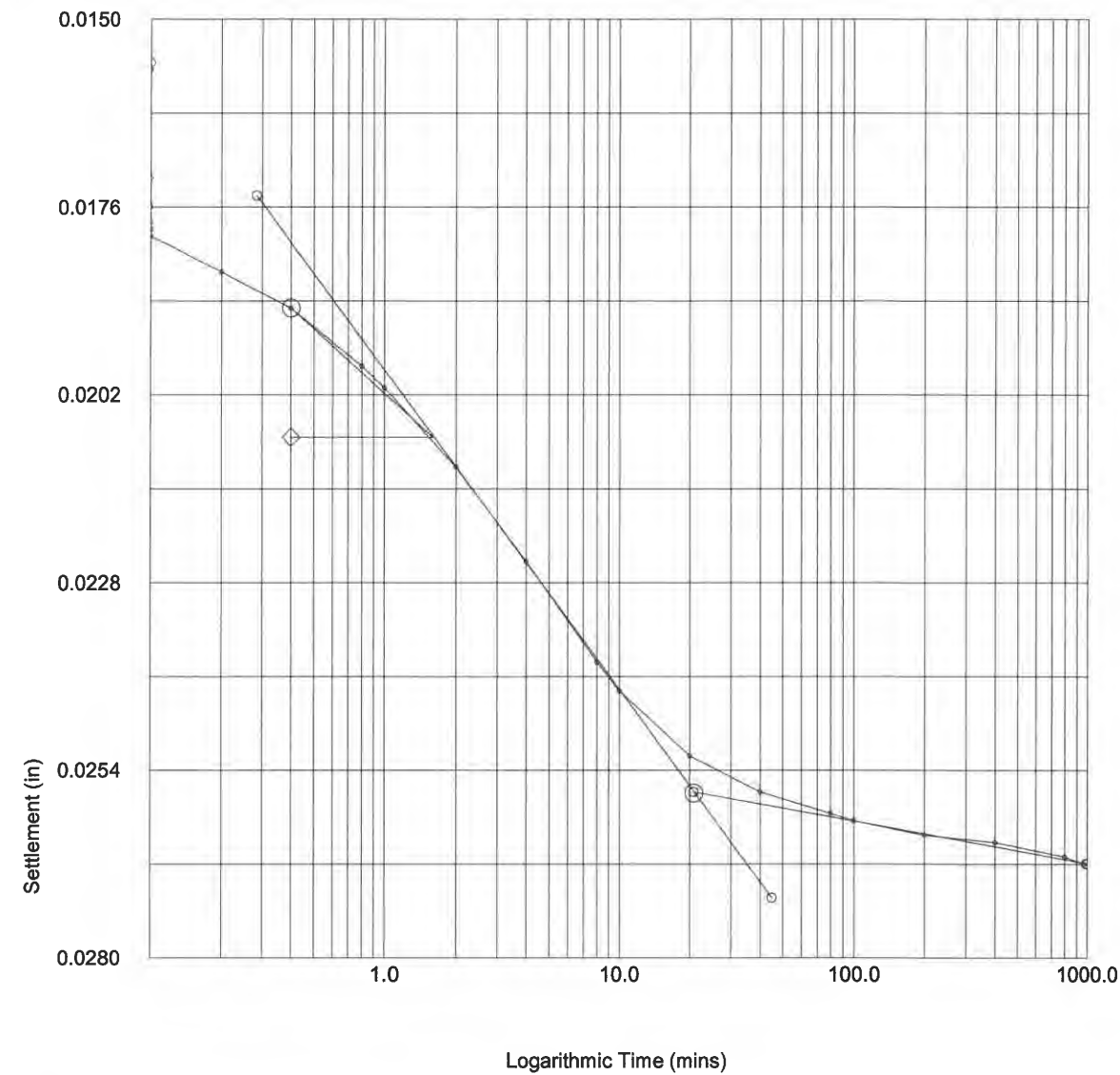
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	Site Reference: Br. Nos. 138 & 139	Date of Test:	12-26-18
	Jobfile: E:\18-036.JOB	Sample:	ST-3
Operator:	Checked:	Approved:	

	ASTM D2435-96	Test name	Consolidation Load: 1.000 (TSF)
	Site Reference: Br. Nos. 138 & 139	Date of Test:	12-26-18
	Jobfile: E:\18-036.JOB	Sample:	ST-3
Operator:	Checked:	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	1.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0111
Voids Ratio e	0.6858
Final Temp oC	0.0
t ₅₀ (mins)	2.36
c _v (ft ² /day)	0.203
m _v (ft ² /ton)	0.023
Sec Compression C _{sec}	0.0006



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	267	0.0267	0.0267
2	0.017	276	0.0276	0.0276
3	0.033	289	0.0289	0.0289
4	0.050	295	0.0295	0.0295
5	0.067	296	0.0296	0.0296
6	0.083	298	0.0298	0.0298
7	0.100	300	0.0300	0.0300
8	0.200	306	0.0306	0.0306
9	0.400	315	0.0315	0.0315
10	0.800	326	0.0326	0.0326
11	1.000	330	0.0330	0.0330
12	2.000	345	0.0345	0.0345
13	4.000	362	0.0362	0.0362
14	8.000	379	0.0379	0.0379
15	10.000	383	0.0383	0.0383
16	20.000	392	0.0392	0.0392
17	40.000	397	0.0397	0.0397
18	80.000	400	0.0400	0.0400
19	100.000	401	0.0401	0.0401
20	168.817	403	0.0403	0.0403

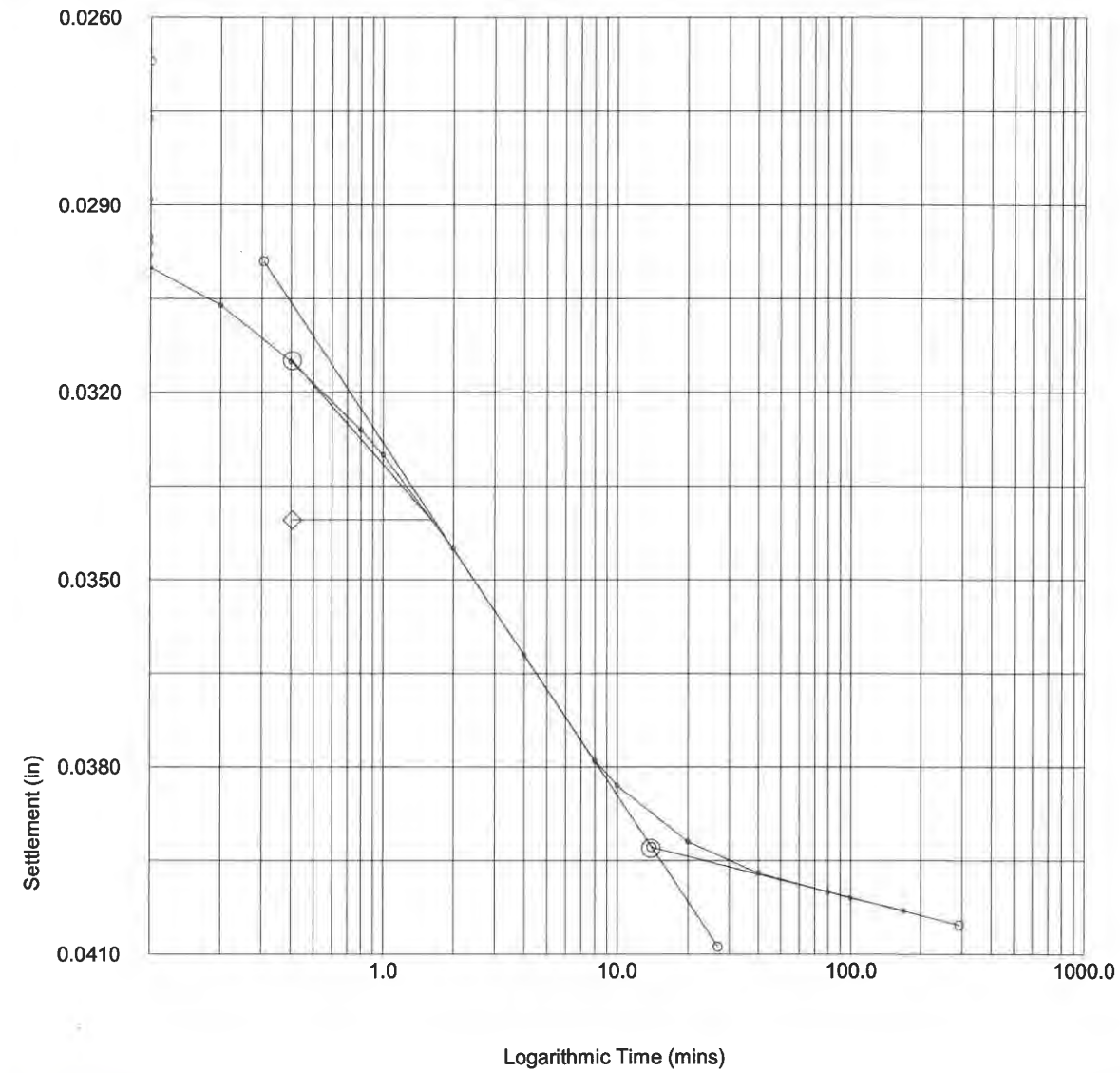
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		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile: E:\18-036.JOB	Borehole:	ST-3
	Operator: <i>MK</i>	Checked: <i>MK</i>	Approved:

	ASTM D2435-96	Test name	Consolidation Load: 2.000 (TSF)
		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile: E:\18-036.JOB	Borehole:	ST-3
	Operator: <i>MK</i>	Checked: <i>MK</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0136
Voids Ratio e	0.6623
Final Temp oC	0.0
t ₅₀ (mins)	1.72
c _v (ft ² /day)	0.271
m _v (ft ² /ton)	0.014
Sec Compression C _{sec}	0.0009



	ASTM D2435-96		Test name	Consolidation
			Date of Test:	12-26-18
	Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator:	<i>MK</i>	Checked:	<i>MK</i>	Approved:

Oedometer Settlement Tests

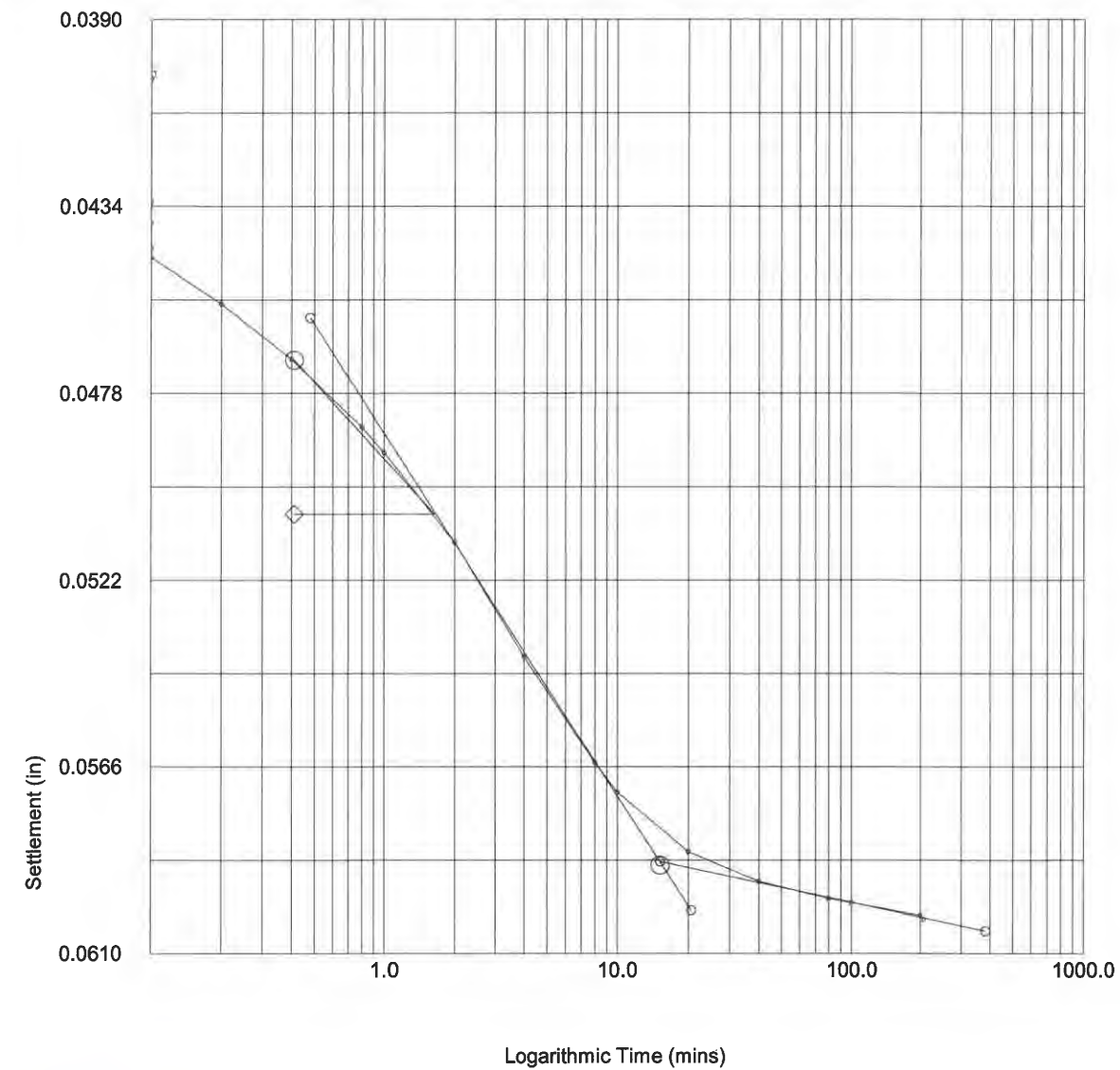
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	403	0.0403	0.0403
2	0.017	404	0.0404	0.0404
3	0.033	404	0.0404	0.0404
4	0.050	433	0.0433	0.0433
5	0.067	438	0.0438	0.0438
6	0.083	444	0.0444	0.0444
7	0.100	446	0.0446	0.0446
8	0.200	457	0.0457	0.0457
9	0.400	470	0.0470	0.0470
10	0.800	486	0.0486	0.0486
11	1.000	492	0.0492	0.0492
12	2.000	513	0.0513	0.0513
13	4.000	540	0.0540	0.0540
14	8.000	565	0.0565	0.0565
15	10.000	572	0.0572	0.0572
16	20.000	586	0.0586	0.0586
17	40.000	593	0.0593	0.0593
18	80.000	597	0.0597	0.0597
19	100.000	598	0.0598	0.0598
20	200.000	601	0.0601	0.0601
21	207.150	602	0.0602	0.0602

	ASTM D2435-96		Test name	Consolidation Load: 4.000 (TSF)
			Date of Test:	12-26-18
	Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator:	<i>MK</i>	Checked:	<i>MK</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	4.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0199
Voids Ratio e	0.6278
Final Temp oC	0.0
t ₅₀ (mins)	1.90
c _v (ft ² /day)	0.237
m _v (ft ² /ton)	0.011
Sec Compression C _{sec}	0.0012



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	602	0.0602	0.0602
2	0.017	605	0.0605	0.0605
3	0.033	605	0.0605	0.0605
4	0.050	635	0.0635	0.0635
5	0.067	639	0.0639	0.0639
6	0.083	645	0.0645	0.0645
7	0.100	647	0.0647	0.0647
8	0.200	660	0.0660	0.0660
9	0.400	677	0.0677	0.0677
10	0.800	698	0.0698	0.0698
11	1.000	706	0.0706	0.0706
12	2.000	736	0.0736	0.0736
13	4.000	774	0.0774	0.0774
14	8.000	812	0.0812	0.0812
15	10.000	822	0.0822	0.0822
16	20.000	843	0.0843	0.0843
17	40.000	853	0.0853	0.0853
18	80.000	858	0.0858	0.0858
19	100.000	860	0.0860	0.0860
20	200.000	863	0.0863	0.0863
21	400.000	866	0.0866	0.0866
22	800.000	870	0.0870	0.0870
23	1200.000	871	0.0871	0.0871
24	1348.933	872	0.0872	0.0872

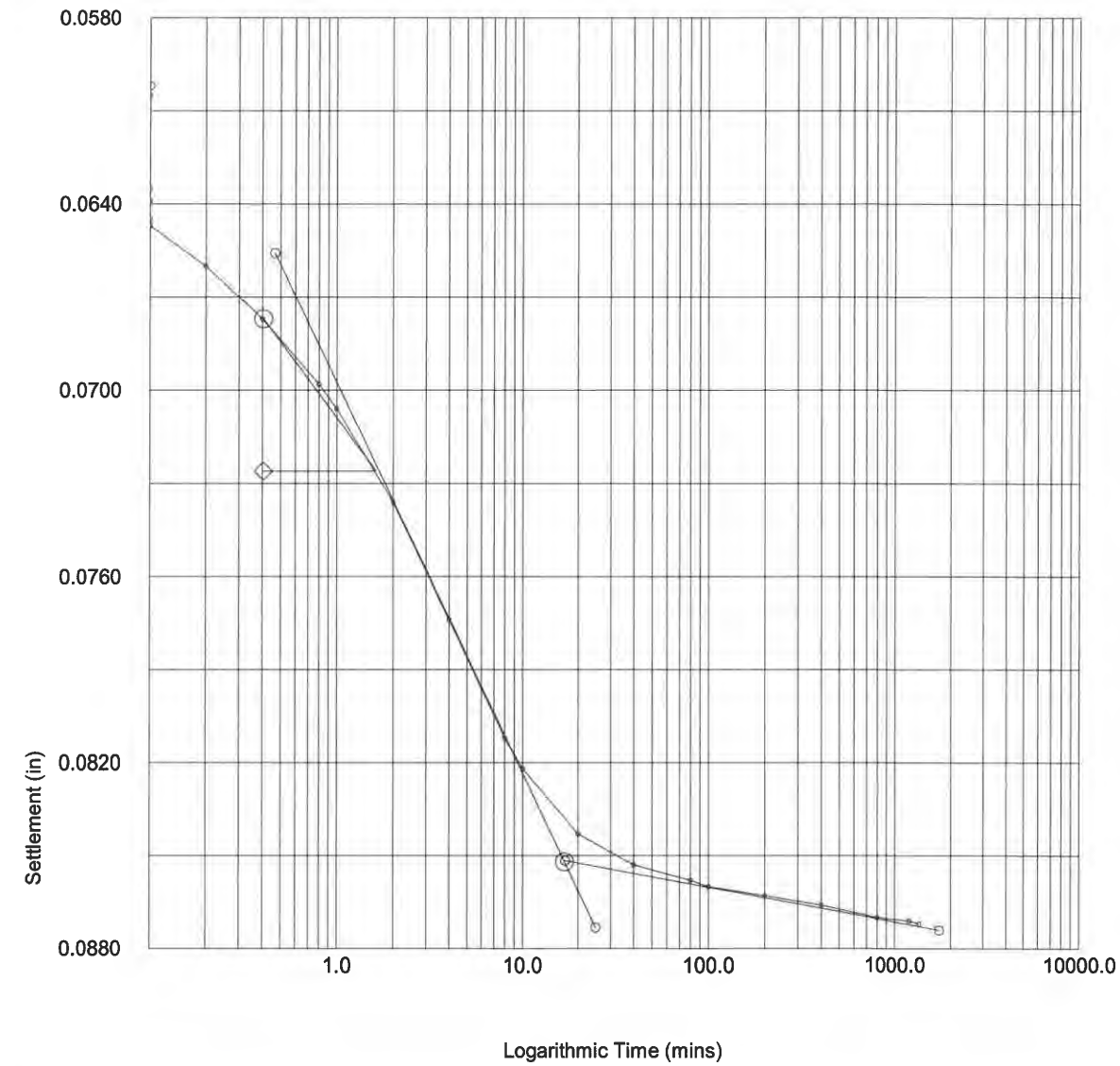
	ASTM D2435-96		Test name	Consolidation
			Date of Test:	12-26-18
	Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator:	<i>MJC</i>	Checked:	<i>MJC</i>	Approved:

	ASTM D2435-96		Test name	Consolidation Load: 8.000 (TSF)
			Date of Test:	12-26-18
	Site Reference:	Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile:	E:\18-036.JOB	Borehole:	ST-3
Operator:	<i>MJC</i>	Checked:	<i>MJC</i>	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	8.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.027
Voids Ratio e	0.5809
Final Temp oC	0.0
t ₅₀ (mins)	2.16
c _v (ft ² /day)	0.198
m _v (ft ² /ton)	0.007
Sec Compression C _{sec}	0.0126



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	872	0.0872	0.0872
2	0.017	867	0.0867	0.0867
3	0.033	861	0.0861	0.0861
4	0.050	860	0.0860	0.0860
5	0.067	859	0.0859	0.0859
6	0.083	847	0.0847	0.0847
7	0.100	846	0.0846	0.0846
8	0.200	841	0.0841	0.0841
9	0.400	837	0.0837	0.0837
10	0.800	832	0.0832	0.0832
11	1.000	830	0.0830	0.0830
12	2.000	825	0.0825	0.0825
13	4.000	820	0.0820	0.0820
14	8.000	814	0.0814	0.0814
15	10.000	813	0.0813	0.0813
16	20.000	811	0.0811	0.0811
17	40.000	809	0.0809	0.0809
18	80.000	807	0.0807	0.0807
19	100.000	807	0.0807	0.0807
20	200.000	806	0.0806	0.0806
21	400.000	805	0.0805	0.0805
22	800.000	804	0.0804	0.0804
23	1153.783	804	0.0804	0.0804

	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile: E:\18-036.JOB	Borehole:	ST-3
Operator: <i>MUC</i>	Checked: <i>MUC</i>	Approved:	

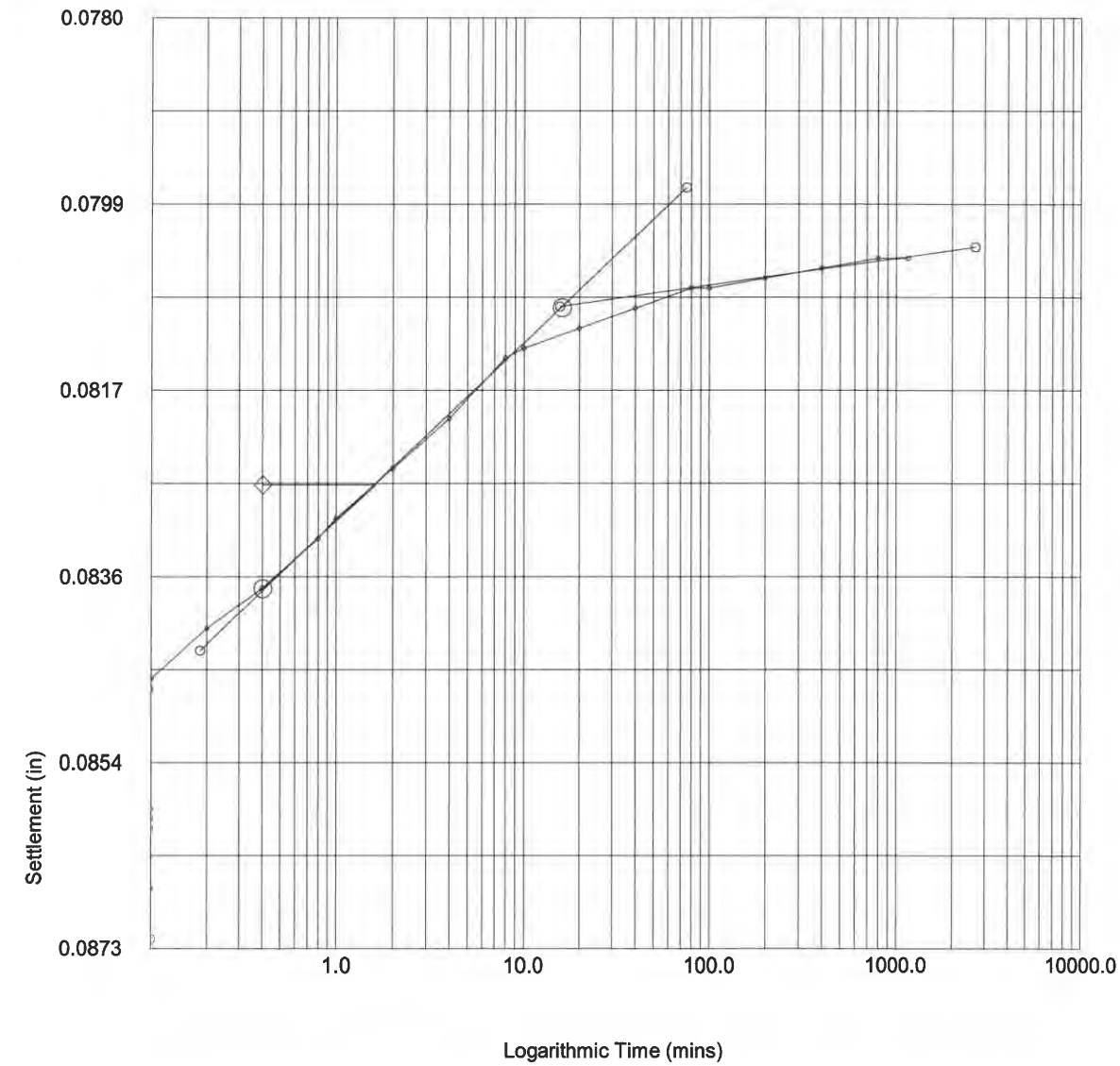
	ASTM D2435-96	Test name	Consolidation Load: 2.000 (TSF)
		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile: E:\18-036.JOB	Borehole:	ST-3
Operator: <i>MUC</i>	Checked: <i>MUC</i>	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF) 2.000
 Initial Temp oC 20.0
 Correction (in) 0.0
 Settlement (in) 0.0068
 Voids Ratio e 0.5927

Final Temp oC
 t_{50} (mins)
 c_v (ft²/day)
 m_v (ft²/ton)
 Sec Compression C_{sec}



Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	804	0.0804	0.0804
2	0.017	802	0.0802	0.0802
3	0.033	802	0.0802	0.0802
4	0.050	802	0.0802	0.0802
5	0.067	795	0.0795	0.0795
6	0.083	790	0.0790	0.0790
7	0.100	790	0.0790	0.0790
8	0.200	786	0.0786	0.0786
9	0.400	782	0.0782	0.0782
10	0.800	777	0.0777	0.0777
11	1.000	775	0.0775	0.0775
12	2.000	767	0.0767	0.0767
13	4.000	757	0.0757	0.0757
14	8.000	744	0.0744	0.0744
15	10.000	740	0.0740	0.0740
16	20.000	726	0.0726	0.0726
17	40.000	715	0.0715	0.0715
18	80.000	708	0.0708	0.0708
19	100.000	707	0.0707	0.0707
20	200.000	702	0.0702	0.0702
21	400.000	699	0.0699	0.0699
22	498.117	697	0.0697	0.0697

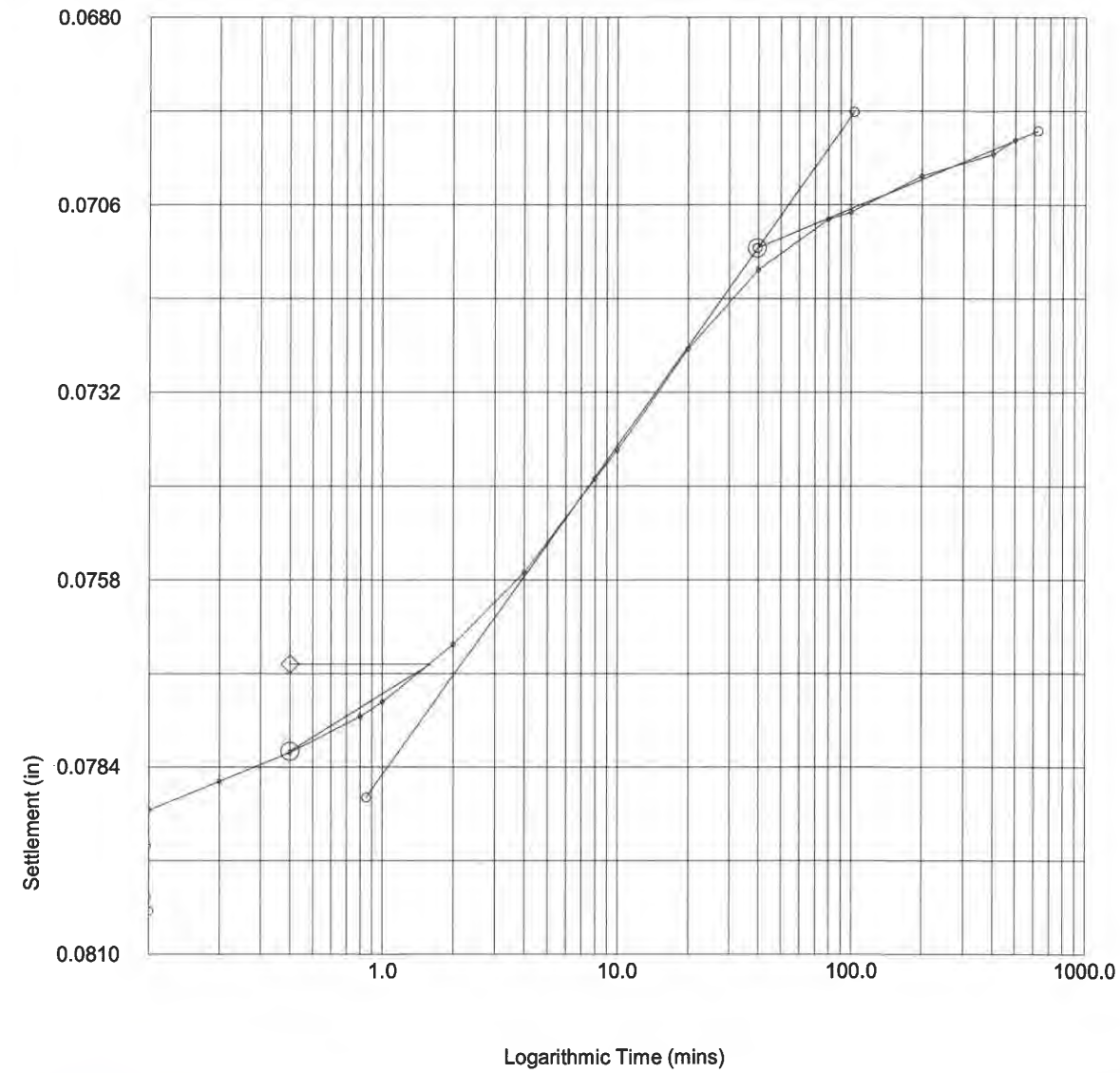
	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139 Jobfile: E:\18-036.JOB	Sample:	ST-3
		Borehole:	ST-3
Operator: <i>MJC</i>	Checked: <i>MJC</i>	Approved:	

	ASTM D2435-96	Test name	Consolidation Load: 0.500 (TSF)
		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139 Jobfile: E:\18-036.JOB	Sample:	ST-3
		Borehole:	ST-3
Operator: <i>MJC</i>	Checked: <i>MJC</i>	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF) 0.500
 Initial Temp oC 20.0
 Correction (in) 0.0
 Settlement (in) 0.0107
 Voids Ratio e 0.6113
 Final Temp oC
 t₅₀ (mins)
 c_v (ft²/day)
 m_v (ft²/ton)
 Sec Compression C_{sec}



	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile: E:\18-036.JOB	Borehole:	ST-3
Operator: <i>MJC</i>	Checked: <i>MJC</i>	Approved:	

Oedometer Settlement Tests

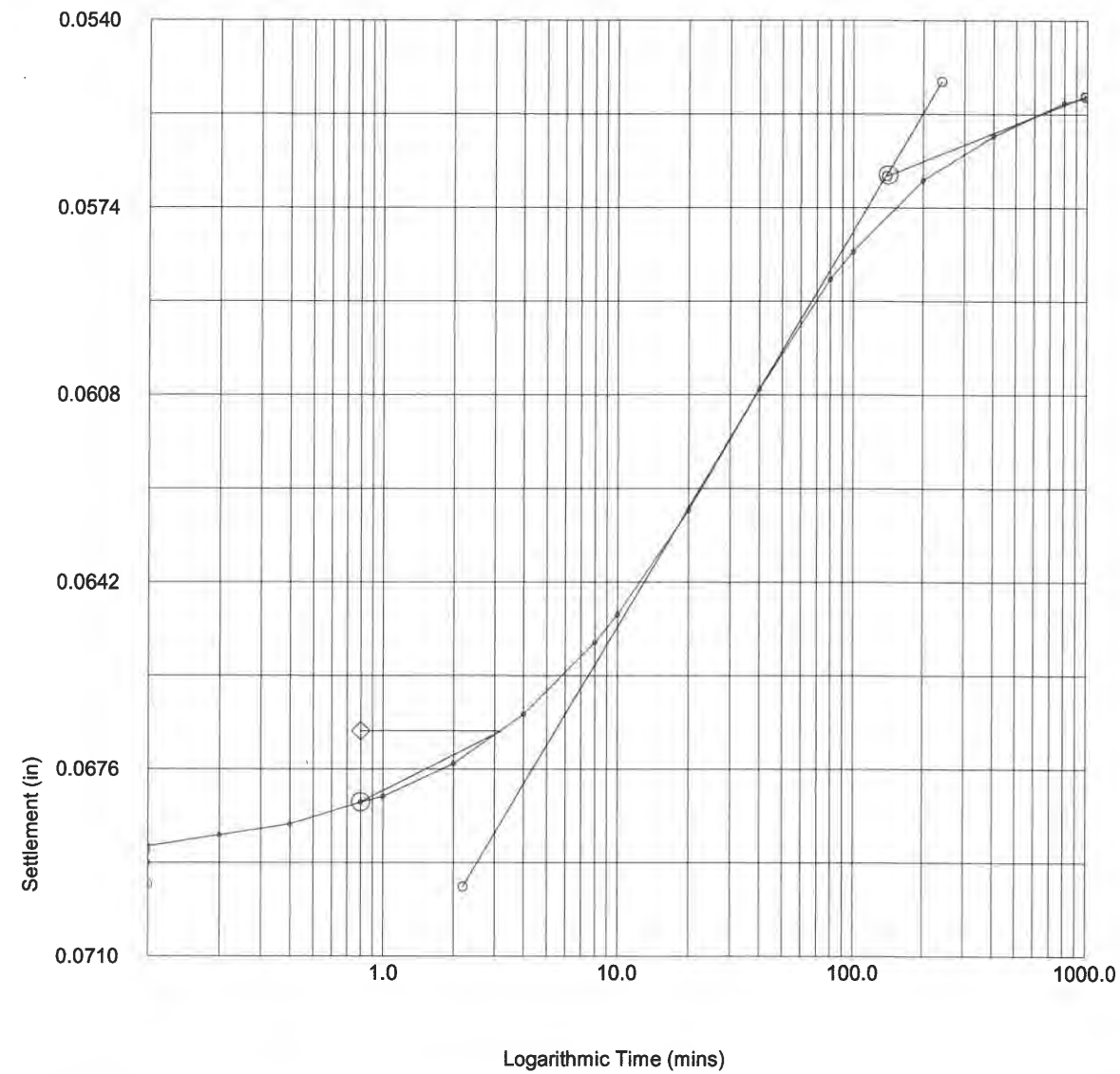
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	697	0.0697	0.0697
2	0.017	693	0.0693	0.0693
3	0.033	693	0.0693	0.0693
4	0.050	691	0.0691	0.0691
5	0.067	691	0.0691	0.0691
6	0.083	690	0.0690	0.0690
7	0.100	690	0.0690	0.0690
8	0.200	688	0.0688	0.0688
9	0.400	686	0.0686	0.0686
10	0.800	682	0.0682	0.0682
11	1.000	681	0.0681	0.0681
12	2.000	675	0.0675	0.0675
13	4.000	666	0.0666	0.0666
14	8.000	653	0.0653	0.0653
15	10.000	648	0.0648	0.0648
16	20.000	629	0.0629	0.0629
17	40.000	607	0.0607	0.0607
18	80.000	587	0.0587	0.0587
19	100.000	582	0.0582	0.0582
20	200.000	569	0.0569	0.0569
21	400.000	561	0.0561	0.0561
22	800.000	555	0.0555	0.0555
23	990.533	554	0.0554	0.0554

	ASTM D2435-96	Test name	Consolidation Load: 0.050 (TSF)
		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139	Sample:	ST-3
	Jobfile: E:\18-036.JOB	Borehole:	ST-3
Operator: <i>MJC</i>	Checked: <i>MJC</i>	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF) 0.050
 Initial Temp oC 20.0
 Correction (in) 0.0
 Settlement (in) 0.0143
 Voids Ratio e 0.6361
 Final Temp oC
 t₅₀ (mins)
 c_v (ft²/day)
 m_v (ft²/ton)
 Sec Compression C_{sec}



	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-26-18
	Site Reference: Br. Nos. 138 & 139	Sample:	ST-3
Jobfile: E:\18-036.JOB	Borehole:	ST-3	
Operator: <i>MJC</i>	Checked: <i>MJC</i>	Approved:	