ID: U-2550B

CONTRACT: C202622

CONTENTS: -L-
RAMP A
RAMP B
RAMP C
-Y1-

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2550B	1	13

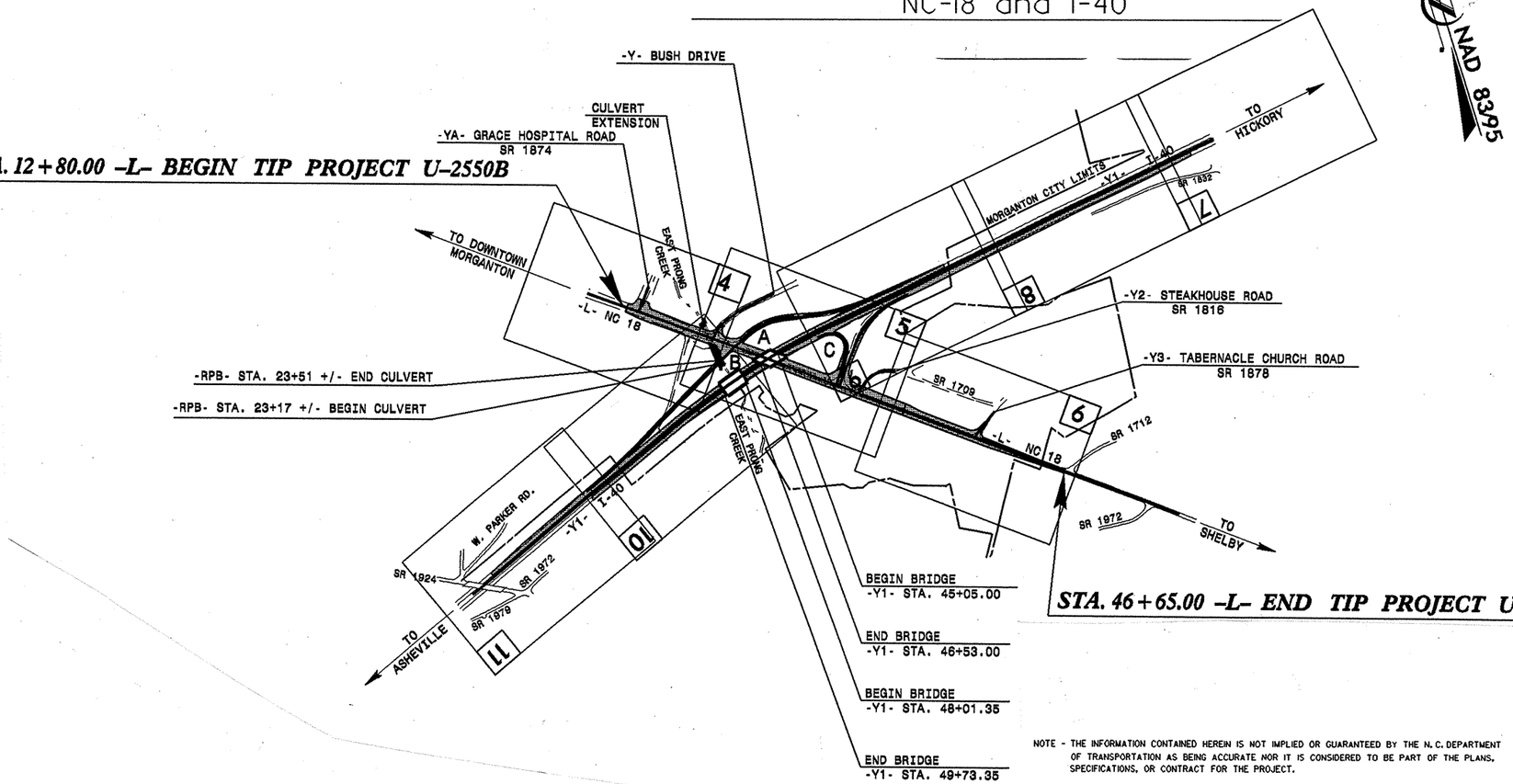
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34831.1.1	STPNHF-M-8165(1)	P.E.
34831.2.4	STPNHF-0018(13)	RW, UTIL.
34831.3.4	STPNHF-0018(11)	CONST.

STATE PROJECT 8.1851001 I.D. NO. U-2550B

F.A. PROJECT STPNHF-M-8165(1)

COUNTY BURKE

DESCRIPTION INTERCHANGE OF
NC-18 and I-40



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INVESTIGATED BY C A Dunnagan PERSONNEL T B Daniel

CHECKED BY W D Frye E A Smith

SUBMITTED BY W D Frye L E Lankford

DATE April 2003

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NOTE - 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.

NORTH CAROLINA LICENSED SEAL 1004 GEOLOGIST CHARLES ANDREWS DUNNAGAN

SEAL

SIGNATURE

DRAWN BY: C. A. Dunnagan

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
U-2550B	8.1851001	2	13

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤35% PASSING #200)							SILT-CLAY MATERIALS (>35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	6 MX		N.P.	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<0.25 0.25 TO 0.5 0.5 TO 1 1 TO 2 2 TO 4 >4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	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"				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) 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
UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT- CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	>10%	>20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING.
- STATIC WATER LEVEL AFTER 24 HOURS.
- PW — PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA
- SPRING OR SEEPAGE

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP/DIP DIRECTION OF ROCK STRUCTURES
- ● - SOUNDING ROD
- SPT, CME, VST — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS
S- BULK SAMPLE
SS- SPLIT SPOON SAMPLE
ST- SHELBY TUBE SAMPLE
RS- ROCK SAMPLE
RT- RECOMPACTED TRIAXIAL SAMPLE
CBR - CBR SAMPLE

ABBREVIATIONS

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
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- ☐ MOBILE B-___
- ☐ BK-51
- ☐ CME-45
- ☒ CME-550
- ☐ PORTABLE HOIST
- ☐ OTHER _____
- ☐ OTHER _____

ADVANCING TOOLS:
- ☐ CLAY BITS
- ☐ 6" CONTINUOUS FLIGHT AUGER
- ☒ 8" HOLLOW AUGERS
- ☐ HARD FACED FINGER BITS
- ☒ TUNG.-CARBIDE INSERTS
- ☐ CASING ☐ W/ ADVANCER
- ☐ TRICONE _____" STEEL TEETH
- ☐ TRICONE _____" TUNG.-CARB.
- ☐ CORE BIT
- ☐ OTHER _____

HAMMER TYPE:
- ☒ AUTOMATIC ☐ MANUAL

CORE SIZE:
- ☐ -B_____
- ☐ -N_____
- ☐ -H_____

HAND TOOLS:
- ☐ POST HOLE DIGGER
- ☐ HAND AUGER
- ☐ SOUNDING ROD
- ☐ VANE SHEAR TEST
- ☐ OTHER _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. 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:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.
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 YEILD 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 (V. 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 ROCKS 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 GEOLOGISTS 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 GEOLOGISTS 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 PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED 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 FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
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

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE 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 WHICH 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, AS SHALE, SLATE, ETC.

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

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - 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 WHICH 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, WHICH 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 B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 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 (S.R.Q.D.) - 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 (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION:

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

April 2003

STATE PROJECT: 8.1851001 (U-2550B)
F. A. PROJECT: STPNHF-M-8165(1)
COUNTY: Burke
DESCRIPTION: NC-18 and I-40 Interchange

SUBJECT: Geotechnical Report – Inventory

This project is located in central Burke County, south of downtown Morganton. Proposed is the upgrade of the interchange between NC-18 and I-40. This consists primarily of widening the existing ramps and loops, as well as lowering the grade of Line -L- (NC-18). The only relocation proposed is that of Ramp -B-. This will align Ramp -B- with Ramp -A-. At a later date, the bridges carrying the Interstate (-Y1-) over NC-18 are to be widened.

The subsurface investigation was conducted with a CME-550 drill machine and 8-inch hollow-stem augers. Standard Penetration Tests (SPT) were performed at intervals of five feet, and soil samples were obtained and tested for quality.

Physiology, Land Use and Surface Drainage

The project is located in the Inner Piedmont Belt, over gently rolling terrain. The land is used for light commercial purposes; primarily restaurants and secondarily gas stations. Surface drainage is provided by the creek that flows northwest across the project corridor. This creek is approximately 10.0 feet wide with a sand floor.

Geology and Rock Characteristics

The rocks underlying this project are intrusives, Cambrian to Ordovician in age. These rocks are migmatites of granitic composition. Within the project corridor, they are exposed in the existing cut, left of Ramp -A-. The outcrops in this cut are sporadic. The rocks themselves are

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FAX: 919-250-4237

WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
CENTURY CENTER COMPLEX
BUILDING B
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

moderately hard, moderately severe to moderately weathered and extremely to moderately fractured.

Areas of Geotechnical Interest

(1) A creek crosses the project at the following locations:

-L- Station 18+50
-RPB- Station 19+70
-L1- Station 32+55

(2) Underground Storage Tanks (UST)

No UST's were noted within the project corridor. However, several stations and oil companies are located adjacent to the project. The possibility of contaminates within construction limits does exist.

(3) A spring was noted, approximately 50.0 feet right of -L- Station 22+00. This location coincides with the juncture of the embankments for NC-18 (-L-) and I-40 (-Y1-). This may be an ephemeral spring, appearing only in times of precipitation.

Geotechnical Descriptive Analysis of the Project

Fill materials were encountered in several borings throughout the project. These were probably emplaced during the original highway construction. They consist of loose silty sand with clay, and are less than 10.0 feet thick.

Colluvium is present sporadically across the site, in the more upland areas. The colluvium strongly resembles the fill material: red-brown silty sand with clay and occasional gravel. This horizon yielded -N- values of 4, and is 5.0 feet (or less) in thickness.

Alluvium was encountered in the two borings advanced for Ramp B. This layer is less than 10.0 feet thick, and contains layers of silty sands and sandy silts. The boring at Ramp B Station 18+00 encountered alluvium composed of silty clay. This material has densities ranging from very soft to medium stiff, and contains moderate amounts of mica. The boring at Ramp B Station 19+50 encountered alluvium composed of loose silty sand.

Residual soils were found at a couple of sites. These soils are made of loose, red-brown silty sand, and contain varying amounts of quartz fragments. An occasional residual silty clay soil is present across the project. These soils have -N- values of approximately 10 blows-per-foot (bpf).

Saprolite was encountered in all but one of the borings. The saprolite is composed of loose to dense silty sand with interlayers of sandy silt. A horizon of silty clay saprolite was encountered in the borings left of -L- Station 35+00 and left of Ramp C Station 13+90. At -L- Station 35+00, the clay had an -N- value of 64 bpf. At Ramp C Station 13+90, the -N- value was 10 bpf. Mica is present in moderate amounts. Weathered rock was found underlying the saprolite in several borings. The contact between the weathered rock and the saprolite is sharp.

As mentioned above, rock is exposed in a very limited area. These outcrops occur sporadically in the existing cut, left of approximate Ramp-A Station interval 17+00 to 18+00. The rock is extremely to moderately fractured, and moderately severe to moderately weathered. An SPT boring was advanced 60.0 feet left of Ramp-A Station 16+85. Material with -N- values greater than 100 were reached by 6.5 feet, but the boring was taken to 22.7 feet without encountering hard, crystalline rock.

Static groundwater was found in only one boring. At -L- Station 23+50, 35.0 feet LT, static water level was measured at 9.7 feet. At Ramp-B Station 19+50, water was measured in the hole immediately after drilling at 5.0 feet. However, after 24 hours the hole was found to be dry.

Respectfully Submitted,

C. A. Dunnagan, TEG-III

CAD:mw

EARTHWORK BALANCE SHEET

Volumes in Cubic Yards

PROJECT **TIP #** U-2550B COUNTY Burke DATE 10/25/2010 SHEET 1 OF 3 SHEETS 3/13

LINE	STATION	STATION	TOTAL EXCAV. (UNCL.)	ROCK EXCAV.	UNDERCUT EXCAV.	UNSUIT. EXCAV.	SUITABLE EXCAV.	TOTAL EMB.	ROCK EMB.	UNDERCUT EMB.	EARTH EMB.	EMBANK. 15%	BORROW	SUITABLE WASTE	UNSUIT. WASTE	TOTAL WASTE
-Y1- (I-40) DET. CONST. PHASE 1																
DETWB & DETRPA OUTSIDE																
-Y1-	31+50.00	45+27.58	568		0	0	568	15878		0	15878	18260	17692	0	0	0
MEDIAN																
-Y1-	35+14.74	40+00	480		0	0	480	4		0	4	5	0	475	0	475
DETEB																
-Y1-	40+00.00	44+21.68	120		0	0	120	48		0	48	55	0	65	0	65
DETWB																
-Y1-	39+84	45+51 DET BRG	1485		0	0	1485	418		0	418	481	0	1004	0	1004
-Y1-	47+32 DET BRG	55+13.94	324		0	0	324	18193		0	18193	20922	20598	0	0	0
DETEB & MEDIAN																
-Y1-	49+09.32	58+56.33	579		0	0	579	18		0	18	21	0	558	0	558
DETLPC LEFT																
-DETLPC-	11+49.01	13+00.00	81		0	0	81	0		0	0	0	0	81	0	81
DETLPC RIGHT																
-DETLPC-	11+49.01	13+00.00	20		0	0	20	2		0	2	2	0	18	0	18
DETRPB																
-Y1-	52+70.61	55+93.89	1737		0	0	1737	45		0	45	52	0	1685	0	1685
OUT WBL & RPB																
Y1	55+93.89	71+00.00	20194		0	0	20194	46		0	46	53	0	20141	0	20141
SUBTOTAL			25588		0	0	25588	34652	0	0	34652	39851	38290	24027	0	24027
USE WASTE IN LIEU OF BORROW													-24027	-24027		-24027
PHASE 1 TOTAL			25588		0	0	25588	34652	0	0	34652	39851	14263	0		0
-Y1- (I-40) DET. 2 CONST. PHASE 2																
DETEB2 & DETWB2 & DET2LPC																
-Y1-	37+50	45+16.20 (WALL)	818		0	0	818	1079		0	1079	1241	423	0	0	0
-Y1-	45+95.87 (WALL)	48+01.35(BRDG)	0		0	0	0	7782		0	7782	8949	8949	0	0	0
-Y1-	49+73.35(BRDG)	52+00	0		0	0	0	3819		0	3819	4392	4392	0	0	0
DETEB2 OUTSIDE																
-Y1-	52+00	60+30.23	375		0	0	375	1123		0	1123	1291	916	0	0	0
DETWB2																
-Y1-	52+00	52+17.22	0		0	0	0	5		0	5	6	6	0	0	0
DET2LPC																
-DET2LPC-	10+35.82	11+36.90	13		0	0	13	31		0	31	36	23	0	0	0
PHASE 2 TOTAL			1206		0	0	1206	13839		0	13839	15915	14709	0	0	0

† EARTHWORK QUANTITIES ARE CALCULATED BY THE ROADWAY DESIGN UNIT. THESE EARTHWORK QUANTITIES ARE BASED IN PART ON SUBSURFACE DATA PROVIDED BY THE GEOTECHNICAL ENGINEERING UNIT.

EARTHWORK BALANCE SHEET

Volumes in Cubic Yards

PROJECT **TIP #** U-2550B COUNTY Burke DATE 10/25/2010 SHEET 2 OF 3 SHEETS 34/13

LINE	STATION	STATION	TOTAL EXCAV. (UNCL.)	ROCK EXCAV.	UNDERCUT EXCAV.	UNSUIT. EXCAV.	SUITABLE EXCAV.	TOTAL EMB.	ROCK EMB.	UNDERCUT EMB.	EARTH EMB.	EMBANK. 15%	BORROW	SUITABLE WASTE	UNSUIT. WASTE	TOTAL WASTE
-L- (NC 18) CONST.																
-L- LEFT																
-L-	14+42	20+00	416		0		416	798		0	798	918	502	0	0	0
-L-	27+50	42+95	10460		0		10460	2125		0	2125	2444	0	8016	0	8016
-L- RIGHT																
-L-	13+00	20+00	2193		0		2193	2966		0	2966	3411	1218	0	0	0
-L-	27+50	46+65	1094		0		1094	7457		0	7457	8576	7482	0	0	0
-L- FOR TURF ISLAND																
-L-	17+65	19+00	21		0		21	4		0	4	5	0	16	0	16
-L-	29+71	34+50	76		0		76	58		0	58	67	0	9	0	9
-L- FULL WIDTH																
-L-	20+00	27+50	9171		0		9171	6021		0	6021	6924	0	2247	0	2247
-L- CONST. SUBTOTAL			23431		0		23431	19429		0	19429	22345	9202	10288	0	10288
USE WASTE IN LIEU OF BORROW													-9202	-9202		-9202
-L- CONST. TOTAL			23431		0		23431	19429		0	19429	22345	0	1086	0	1086
-Y1- (I-40) FINAL PHASE																
-Y1- OUTSIDE EBL																
-Y1-	12+00	44+31.32 BRG	10731		0		10731	2769		0	2769	3184	0	7547	0	7547
-Y1	56+24 END SBG	62+00	2551		0		2551	4		0	4	5	0	2546	0	2546
MED & WBL & RPB																
-Y1-	31+50	45+22.47 BRG	1511		0		1511	2206		0	2206	2537	1026	0	0	0
-Y1-	46+91.81 BRG	48+01.35 BRG	984		0		984	1714		0	1714	1971	987	0	0	0
-Y1-	49+73.35 BRG	56+00	5505		0		5505	7967		0	7967	9162	3657	0	0	0
MED ONLY																
-Y1-	56+00	62+00	468		0		468	0		0	0	0	0	468	0	468
RPB																
-Y1-	48+50	50+00	1309		0		1309	4414		0	4414	5076	3767	0	0	0
RPA RIGHT																
-RPA-	18+58.89 SBG RT	21+14	31		0		31	4037		0	4037	4643	4612	0	0	0
RPA LEFT																
-RPA-	15+74.06	21+14	534		0		534	195		0	195	224	0	310	0	310
RPA FULL WIDTH																
-RPA-	21+14	22+38	289		0		289	3009		0	3009	3460	3171	0	0	0
-Y1 (I-40) FINAL PHASE SHEET SUBTOTAL			23913		0		23913	26315		0	26315	30262	17220	10871	0	10871

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EARTHWORK BALANCE SHEET

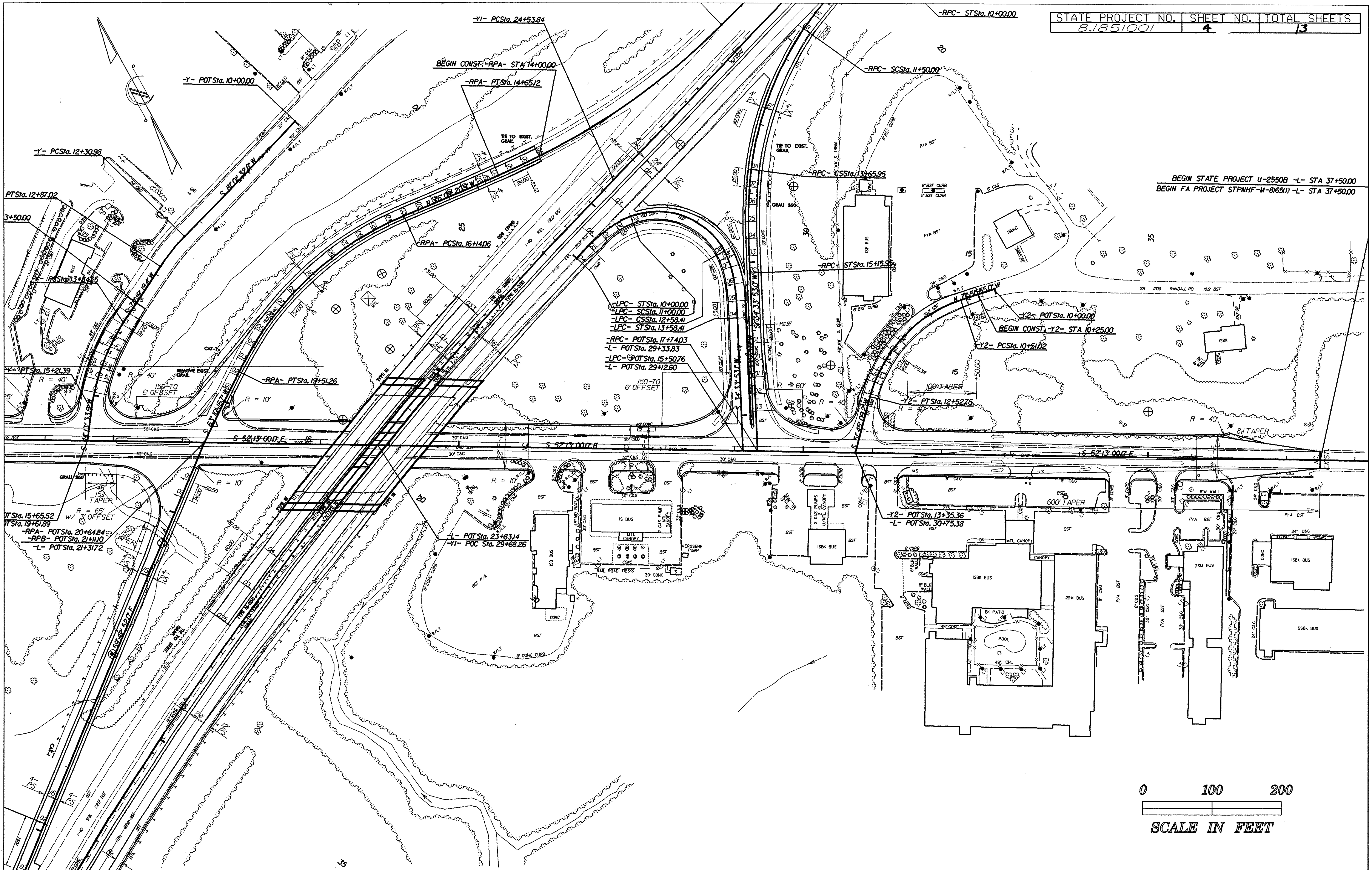
Volumes in Cubic Yards

PROJECT **TIP #** U-2550B COUNTY Burke DATE 10/25/2010 SHEET 3 OF 3 SHEETS 3B/13

LINE	STATION	STATION	TOTAL EXCAV. (UNCL.)	ROCK EXCAV.	UNDERCUT EXCAV.	UNSUIT. EXCAV.	SUITABLE EXCAV.	TOTAL EMB.	ROCK EMB.	UNDERCUT EMB.	EARTH EMB.	EMBANK. 15%	BORROW	SUITABLE WASTE	UNSUIT. WASTE	TOTAL WASTE
-Y1- (I-40) FINAL PHASE contd.																
RPC																
-RPC-	12+84.20	18+00	2427		0		2427	3009		0	3009	3460	1033	0	0	0
BETWEEN RPC & LPC																
-RPC-	16+00.00	18+00.00	34		0		34	0		0	0	0	0	34	0	34
LPC RIGHT																
-RPC-	15+71.69	18+00	287		0		287	102		0	102	117	0	170	0	170
LPC																
-LPC-	11+46.12	12+50	262		0		262	3		0	3	3	0	259	0	259
-Y1-(I-40) FINAL PHASE SHEET SUBTOTAL			3010		0		3010	3114		0	3114	3580	1033	463	0	463
-Y1- (I-40) FINAL PHASE SUBTOTAL			26923		0		26923	29429		0	29429	33842	18253	11334	0	11334
USE WASTE IN LIEU OF BORROW													-11334	-11334		-11334
-Y1- (I-40) FINAL PHASE TOTAL			26923		0		26923	29429		0	29429	33842	6919	0	0	0
PROJECT SUBTOTAL			77148		0		77148	97349		0	97349	111953	35891	1086	0	1086
SHOULDER CONSTRUCTION								7600			7600	8740	8740			
LOSS DUE TO CLEARING & GRUBBING			-10				-10						10			
PROJECT TOTAL			77138		0		77138	104949		0	104949	120693	44641	1086	0	1086
EST 5% TO REPLACE TOP SOIL ON BORROW PIT													2232			
GRAND TOTAL			77138										46873			1086
SAY			**77200**										**47000**			
SHALLOW UNDERCUT : 825 CY																
UNDERCUT : 250 CY																

*** EARTHWORK QUANTITIES ARE CALCULATED BY THE ROADWAY DESIGN UNIT. THESE EARTHWORK QUANTITIES ARE BASED IN PART ON SUBSURFACE DATA PROVIDED BY THE GEOTECHNICAL ENGINEERING UNIT.**

STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
8.1851001	4	13



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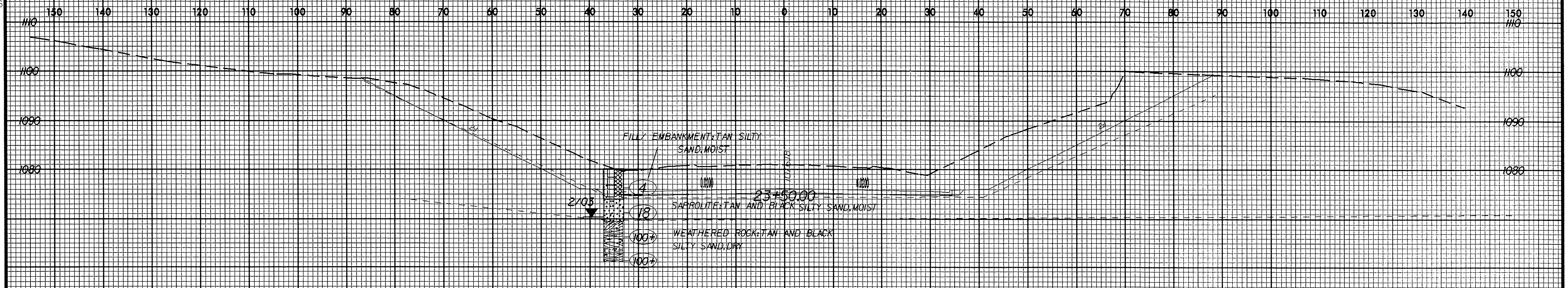
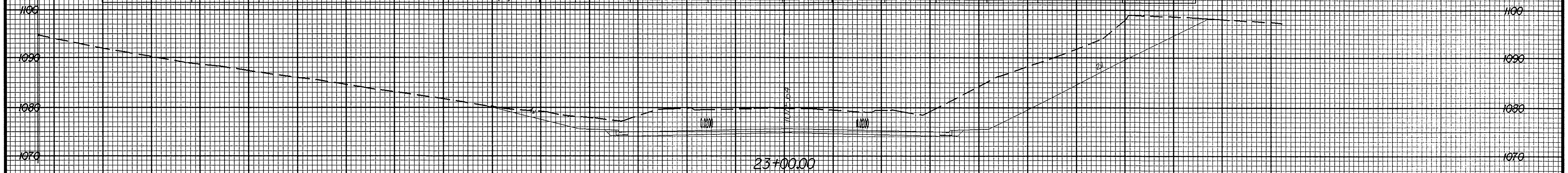
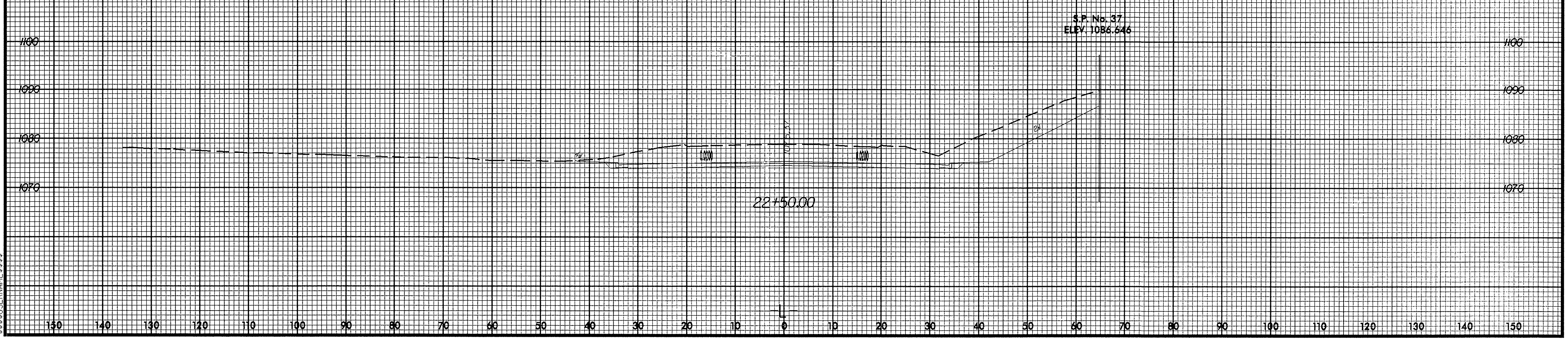


SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	PL. I.	% BY WEIGHT C. SAND	% BY WEIGHT F. SAND	% BY WEIGHT SILT	% BY WEIGHT CLAY	% PASSING SIEVES 10	% PASSING SIEVES 40	% PASSING SIEVES 200	% MOISTURE	% ORGANIC
SS-8	35' LT	23+50	4.2' - 5.2'	A-2-4(0)	34	NP	36	35	13	16	99	79	35		
SS-9	35'LT	23+50	9.2' - 10.2'	A-2-4(0)	28	NP	44	40	10	6	100	76	22		





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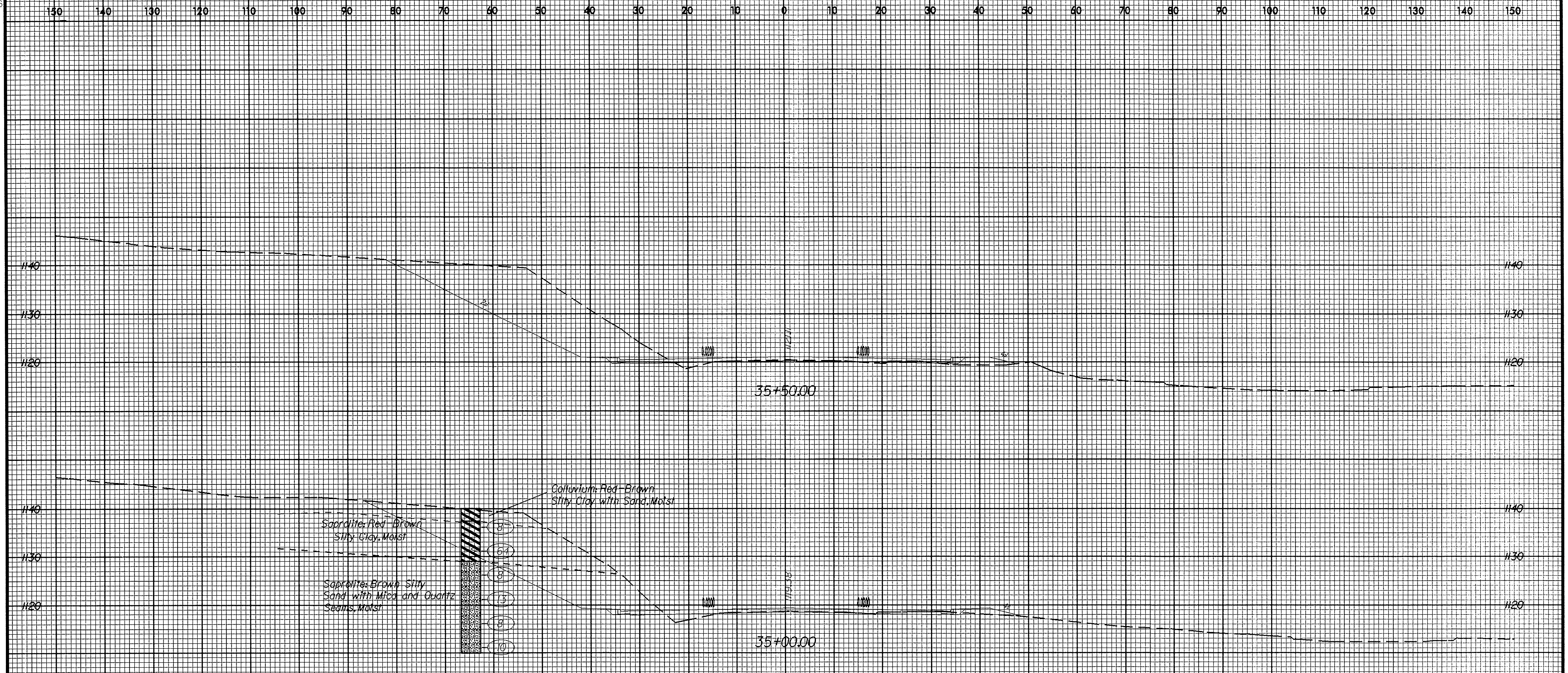
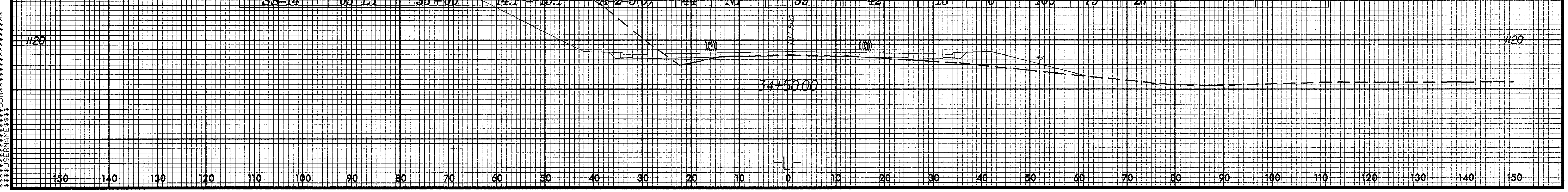
PROJ. REFERENCE NO.	SHEET NO.
U-2550B	6 OF 13



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	PL. I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING SIEVES 10	40	200	% MOISTURE	% ORGANIC
SS-12	65' LT	35+00	4.1' - 5.1'	A-7-6(14)	53	25	15	22	11	52	100	86	66		
SS-13	65' LT	35+00	9.1' - 10.1'	A-7-5(4)	47	13	24	36	18	22	100	87	48		
SS-14	65' LT	35+00	14.1' - 15.1'	A-2-5(0)	44	NP	39	42	13	6	100	79	27		



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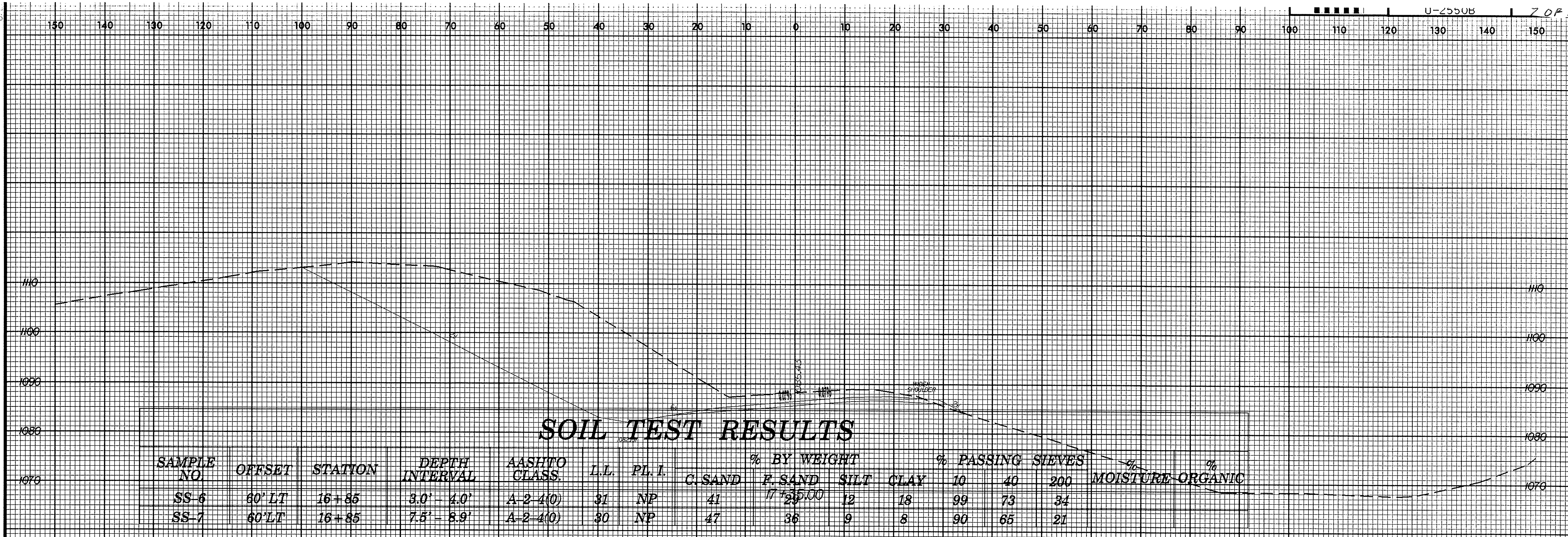
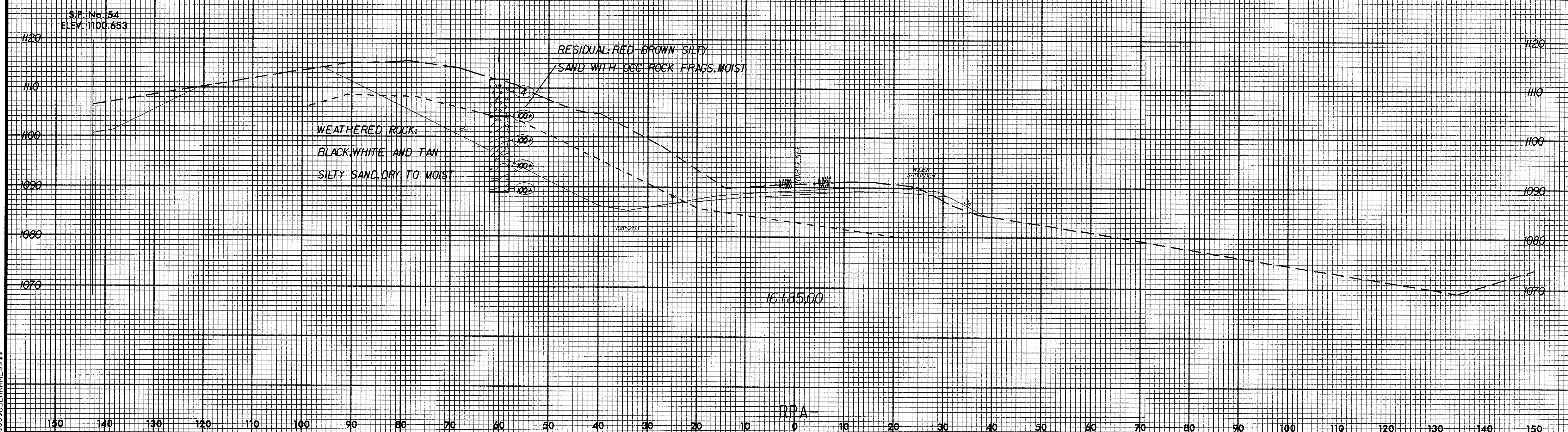


SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	PL. I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING SIEVES 10	40	200	% MOISTURE	% ORGANIC
SS-6	60' LT	16+85	3.0' - 4.0'	A-2-4(0)	31	NP	41	29	12	18	99	73	34		
SS-7	60'LT	16+85	7.5' - 8.9'	A-2-4(0)	30	NP	47	36	9	8	90	65	21		



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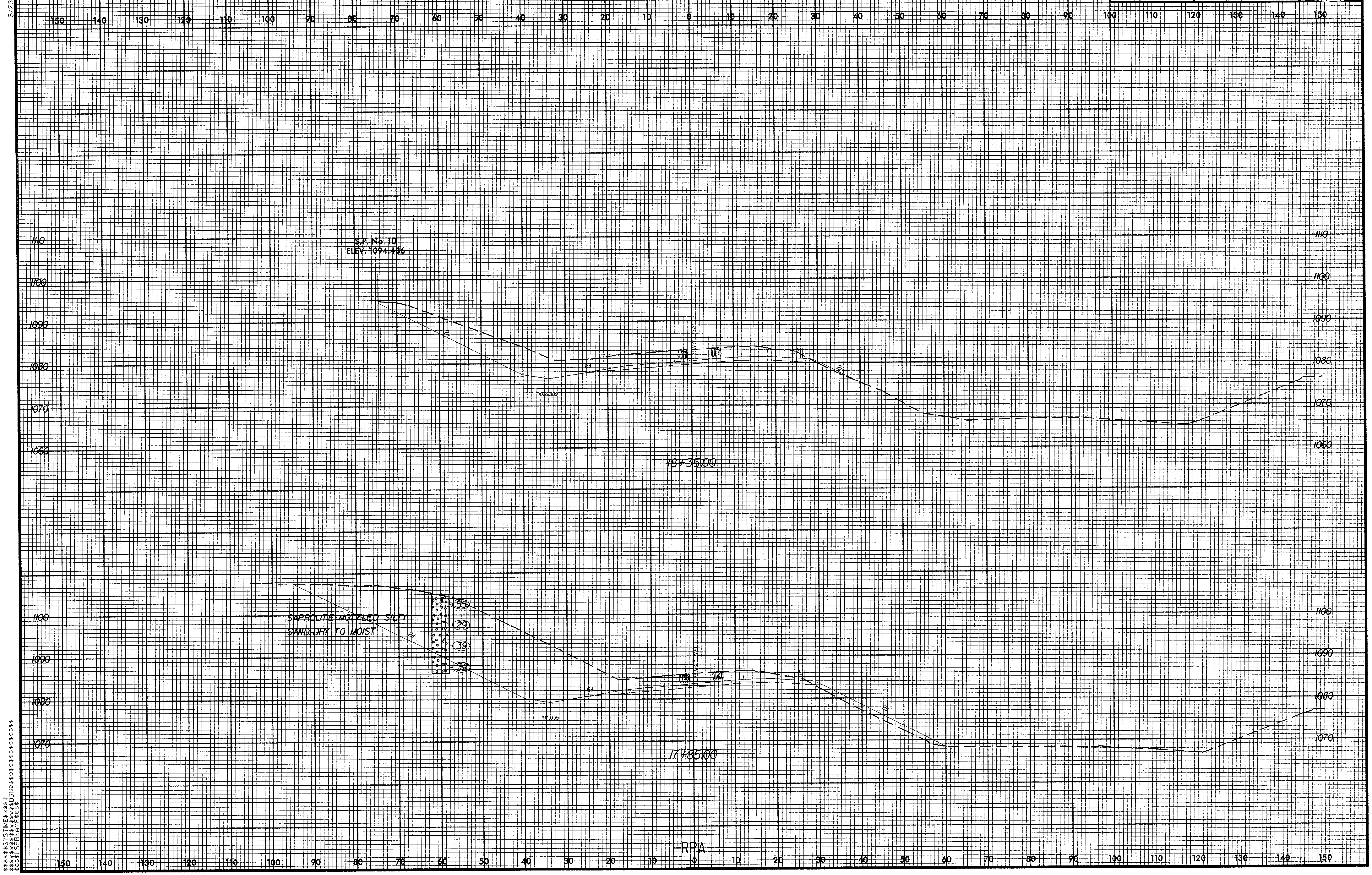
PROJ. REFERENCE NO.	SHEET NO.
U-2550B	8 OF 13



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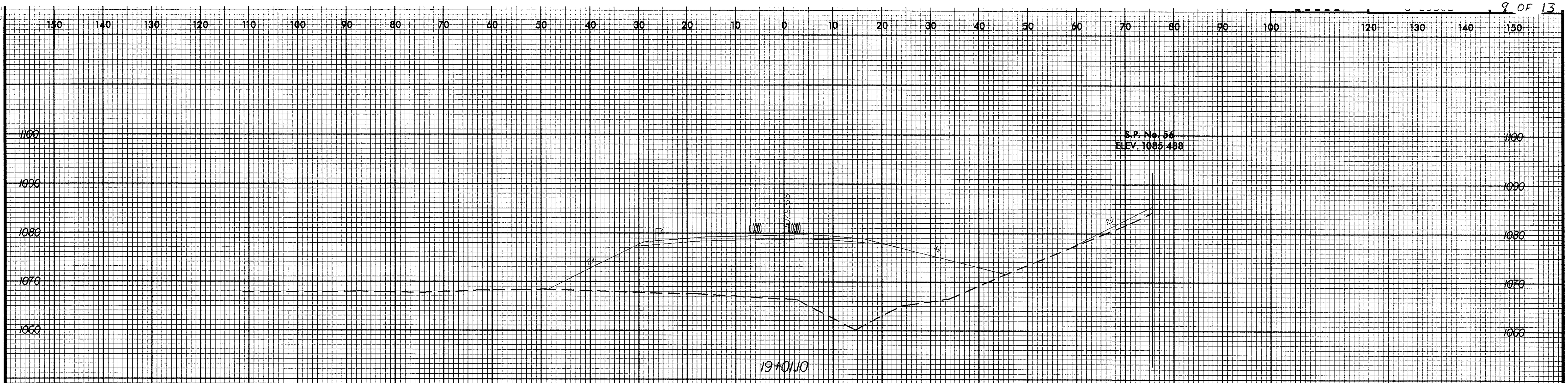
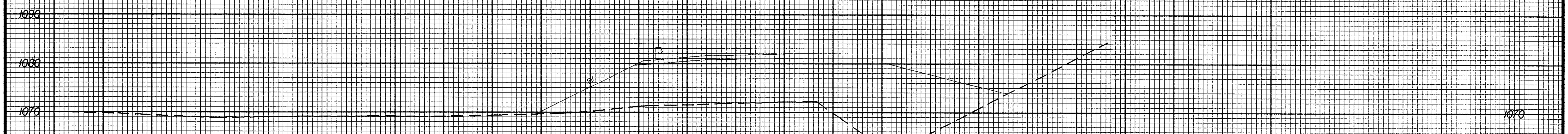
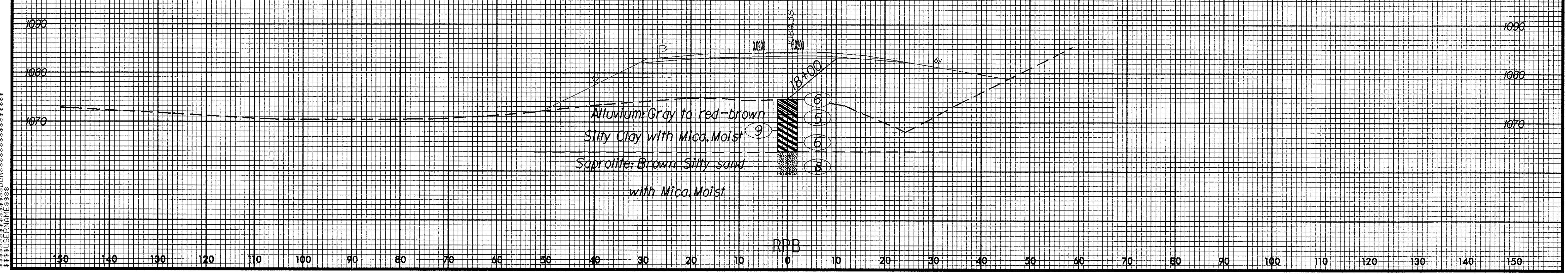




SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	PL. I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING SIEVES 10	40	200	% MOISTURE	% ORGANIC
SS-1	CL	18+00	0.5' - 1.5'	A-6(8)	39	19	21	23	26	30	99	87	59		
SS-2	CL	18+00	4.2' - 5.2'	A-7-5(15)	57	26	22	21	11	46	98	86	59		
SS-3	CL	18+00	6.7' - 7.7'	A-7-5(4)	54	15	27	33	12	28	100	80	44		
SS-4	CL	18+00	9.2' - 10.2'	A-7-5(3)	51	15	37	26	11	26	99	79	41		
SS-5	CL	18+00	14.2' - 15.2'	A-2-4(0)	37	NP	56	33	7	4	99	63	16		



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0 10	PROJ. REFERENCE NO.	SHEET NO.
	U-2550B	10 OF 13

S.P. No. 32
ELEV. 1073.281

S.P. No. 35
ELEV. 1067.484

S.P. No. 55
ELEV. 1084.876

20+09.20

INNER SHOULDER

Embankment

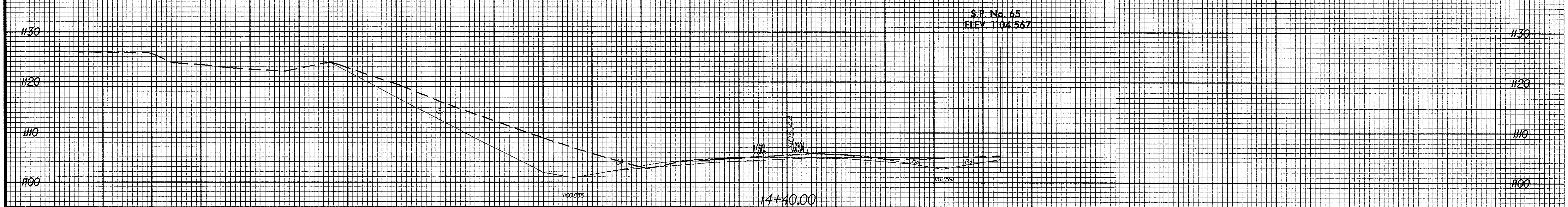
Alluvium: Gray to Brown Silty Sand with Gravel, Saturated

Saprolite: Brown Silty Sand With Mica, Saturated

19+51.03

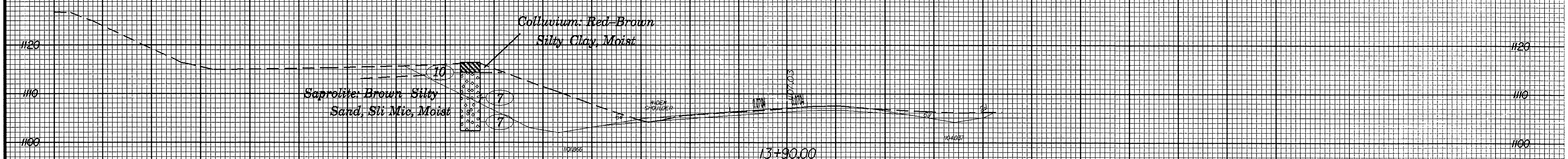
RPB

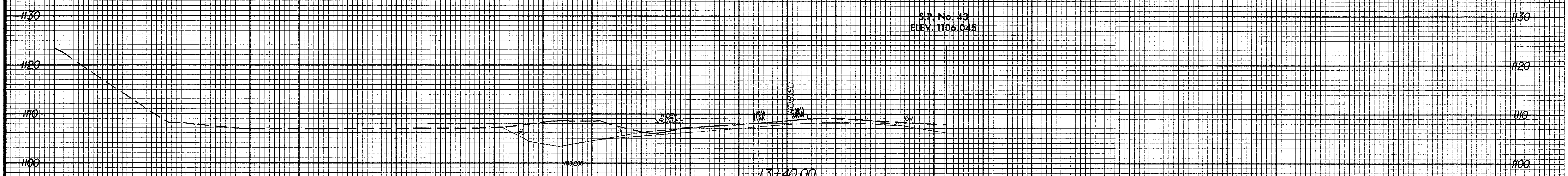
$$$$$$SYSTIME$$$$$$
$$$$$$USERNAME$$$$$$



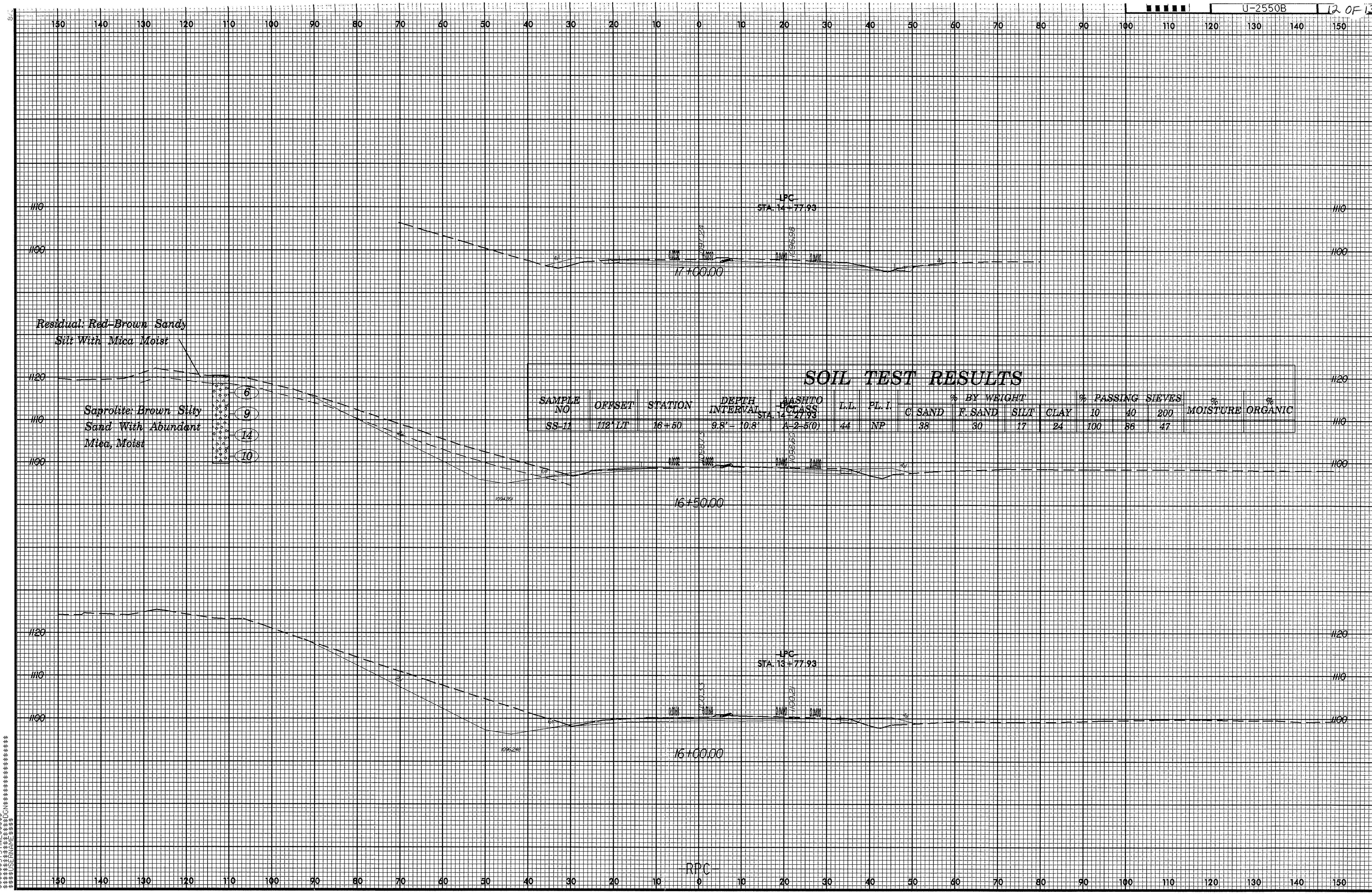
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	PL. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-10	65' LT	13+90	3.1' - 4.1'	A-7-6(6)	48	19	29	30	17	24	100	86	47		





-RPC-



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	L.L.	PL. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-11	112' LT	16+50	9.8' – 10.8'	A-2-5(0)	44	NP	38	30	17	24	100	86	47		

S.P. No. 16
ELEV. 1100.126

BEGIN BRIDGE -Y1= 28+10 A\= LEFT

28+00.00

S.P. No. 54
ELEV. 1100.653

27+50.00

Residual: Tan, Silty Sand, Dry

Weathered Rock; Mottled, Silty Coarse Sand, Dry

27+00.00

26+50.00

S.P. No. 50
ELEV. 1102.743

26+00.00

-Y1-

$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
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