| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | U-2525C | 1 | 76 |

PROJECT: 34821

REFERENCE: U-2525C

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

# STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *GUILFORD*

PROJECT DESCRIPTION *GREENSBORO EASTERN LOOP FROM US 29 NORTH OF GREENSBORO TO SR 2303 (LAWNDALE DRIVE)*

SITE DESCRIPTION *SITE #2 (STRUCTURE #2 AND #3) BRIDGE NO. 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-) CPT AND DMT TESTING*

## CONTENTS



PERSONNEL

*C. CHILDREY*

*B. RAMSEYER*

INVESTIGATED BY *T. WELLS*

DRAWN BY *T. WELLS*

CHECKED BY *X. BARRETT*

SUBMITTED BY *KLEINFELDER, INC.*

DATE *OCTOBER 2017*

## 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.

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NOTES:

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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.

*Prepared in the Office of:*


KLEINFELDER
*Bright People. Right Solutions.*
7343 WEST FRIENDLY AVE. SUITE B
GREENSBORO, NC 27410
ENGINEERING FIRM LICENSE NO. F-1143


NORTH CAROLINA PROFESSIONAL SEAL 037998 ENGINEER THOMAS R. WELLS

DocuSigned by:
Thomas R. Wells
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SIGNATURE

10/23/2017
DATE

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

| PROJECT REFERENCE NO. | SHEET NO. |
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| U-2525C | 2 |

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

# SUBSURFACE INVESTIGATION

### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
### (PAGE 1 OF 2)

## 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 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,

*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<br>A-3 | A-4, A-5<br>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,<br>A-7-6 | | | |
| SYMBOL | | | | | | | | | | | | | | |
| % PASSING<br>#10<br>#40<br>#200 | 50 MX<br>30 MX<br>15 MX | 50 MX<br>25 MX | 51 MN<br>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 |
| MATERIAL PASSING #40<br>LL<br>PI | —<br>6 MX | | —<br>NP | 40 MX<br>10 MX | 41 MN<br>10 MX | 40 MX<br>11 MN | 41 MN<br>11 MN | 40 MX<br>10 MX | 41 MN<br>10 MX | 40 MX<br>11 MN | 41 MN<br>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 SUBGRADE | EXCELLENT TO GOOD | | | | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSUITABLE |

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

## CONSISTENCY OR DENSENESS

| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$) |
|---|---|---|---|
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | < 4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>> 50 | N/A |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | < 2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>> 30 | < 0.25<br>0.25 TO 0.5<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>> 4 |

## TEXTURE OR GRAIN SIZE

| U.S. STD. SIEVE SIZE | 4 | 10 | 40 | 60 | 200 | 270 |
|---|---|---|---|---|---|---|
| OPENING (MM) | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |

| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) |
|---|---|---|---|---|---|---|

| GRAIN SIZE | MM | 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005 |
|---|---|---|---|---|---|---|---|
| | IN. | 12 | 3 | | | | |

## 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<br>PLASTIC RANGE (PI)<br>PL — PLASTIC LIMIT | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| OM — OPTIMUM MOISTURE<br>SL — SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

## PLASTICITY

| | PLASTICITY INDEX (PI) | DRY STRENGTH |
|---|---|---|
| NON PLASTIC | 0-5 | VERY LOW |
| SLIGHTLY PLASTIC | 6-15 | SLIGHT |
| MODERATELY PLASTIC | 16-25 | MEDIUM |
| HIGHLY PLASTIC | 26 OR MORE | HIGH |

## COLOR

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

## 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

| 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 SEEP

## MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

## RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

## 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, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
$w$ - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
$\gamma$ - UNIT WEIGHT
$\gamma_d$ - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

## EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CONETEC 15 TON
- [ ] _____

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
- [ ] _____

HAMMER TYPE:
- [ ] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

| PROJECT REFERENCE NO. | SHEET NO. |
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| U-2525C | 2A |

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

# SUBSURFACE INVESTIGATION

## SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
## (PAGE 2 OF 2)

## 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. 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 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 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 (V 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 PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S 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 FOOT |
| 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 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 DISLODGED FROM PARENT MATERIAL.

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

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

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

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

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

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

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

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

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

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (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 (SRQD) - 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.

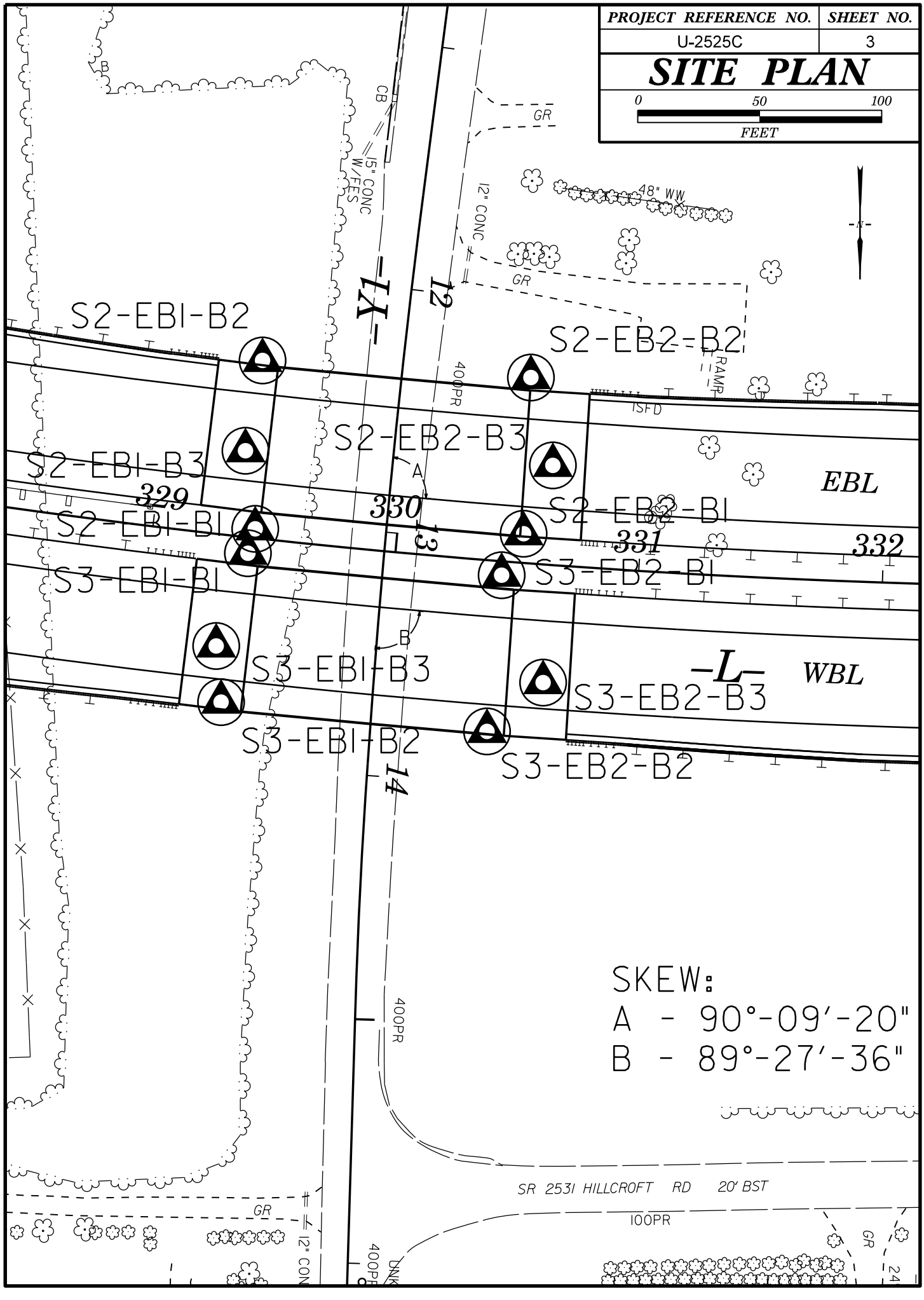
BENCH MARK: N/A

ELEVATION: N/A FEET

NOTES:

TOP OF CPT AND DMT ELEVATIONS OBTAINED FROM PROJECT TIN FILE (U2525C_LS_TIN.TIN) RECEIVED ON SEPTEMBER 14, 2016

DATE: 8-15-14


PROJECT REFERENCE NO.
U-2525C
SHEET NO.
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SITE PLAN
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100
FEET
S2-EB1-B2
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S2-EB1-B3
S2-EB2-B3
S2-EB1-B1
S2-EB2-B1
S3-EB1-B1
S3-EB2-B1
S3-EB1-B3
S3-EB2-B3
S3-EB1-B2
S3-EB2-B2
-Y1-
-L-
EBL
WBL
329
330
331
332
A
B
GR
48" WW
12" CONC
15" CONC W/FES
400PR
RAMP
ISFD
SR 2531 HILLCROFT RD 20' BST
100PR
SKEW:
A - 90°-09'-20"
B - 89°-27'-36"

# PRESENTATION OF SITE INVESTIGATION RESULTS

# SITE #2 (STRUCTURE #2 AND #3) – BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-) – Greensboro NC – Rev 04

*Prepared for*:

Kleinfelder

ConeTec Job No: 16-54112

Project Start Date: 19-DEC-2016
Project End Date: 21-DEC-2016
Report Date: 3-JAN-2017
Revision Date: 20-OCT-2017


*Prepared by:*

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Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec Inc. for Kleinfelder at SITE #2 (STRUCTURE #2 AND #3) – BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-) in Greensboro, NC. The program consisted of 12 cone penetration tests (CPTu) and 12 flat plate dilatometer tests (DMT) at locations selected and labeled under the direction of Kleinfelder personnel. The purpose of the program was to evaluate existing site conditions.

Project Information

| Project | |
|---|---|
| Client | Kleinfelder |
| Project | SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-) |
| ConeTec project number | 16-54112 |

A map from Google Earth including the CPT and DMT test locations is presented below.


| Rig Description | Deployment System | Test Type |
|---|---|---|
| 25 Ton CPT Truck Rig | Integrated CPT Ramset | CPTu, DMT |

| Coordinates | | |
|---|---|---|
| Test Type | Collection Method | EPSG Number |
| CPTu, DMT | Handheld GPS | 4326 |

| Cone Penetration Test (CPT) | |
|---|---|
| Depth reference | Depths are referenced to the existing ground surface at the time of each test |
| Tip and sleeve data offset | 0.1 meter<br>This has been accounted for in the CPT data files |

| Cone Penetrometers Used for this Project | | | | | | |
|---|---|---|---|---|---|---|
| Cone Description | Cone Number | Cross Sectional Area ($cm^2$) | Sleeve Area ($cm^2$) | Tip Capacity (bar) | Sleeve Capacity (bar) | Pore Pressure Capacity (psi) |
| 367:T1500F15U500 | AD367 | 15 | 225 | 1500 | 15 | 500 |
| Cone 367 was used for all CPT soundings | | | | | | |

| Interpretation Tables | |
|---|---|
| Additional information | The Soil Behaviour Type (SBT) classification chart (Robertson et al., 1986 presented by Lunne, Robertson and Powell, 1997) was used to classify the soil for this project. A detailed set of CPT interpretations were generated and are provided in Excel format files in the release folder. The CPT interpretations are based on values of corrected tip ($q_t$), sleeve friction ($f_s$) and pore pressure ($u_2$) averaged over a user specified interval of 20 cm.<br><br>Soils were classified as either drained or undrained based on the Soil Behaviour Type (SBT) classification chart (Robertson et al., 1986 presented by Lunne, Robertson and Powell, 1997). |

| Flat Plate Dilatometer Test (DMT) | |
|---|---|
| Depth reference | Depths are referenced to the existing ground surface at the time of each test |
| Phreatic surface determination | The phreatic surface is assumed not to be encountered within sounding exploration depth |

Limitations

This report has been prepared for the exclusive use of Kleinfelder (Client) for the project titled "SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)". The report's contents may not be relied upon by any other party without the express written permission of ConeTec Inc. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 $cm^2$ and 15 $cm^2$ tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first Appendix. The 15 $cm^2$ penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 $cm^2$ piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "$u_2$" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

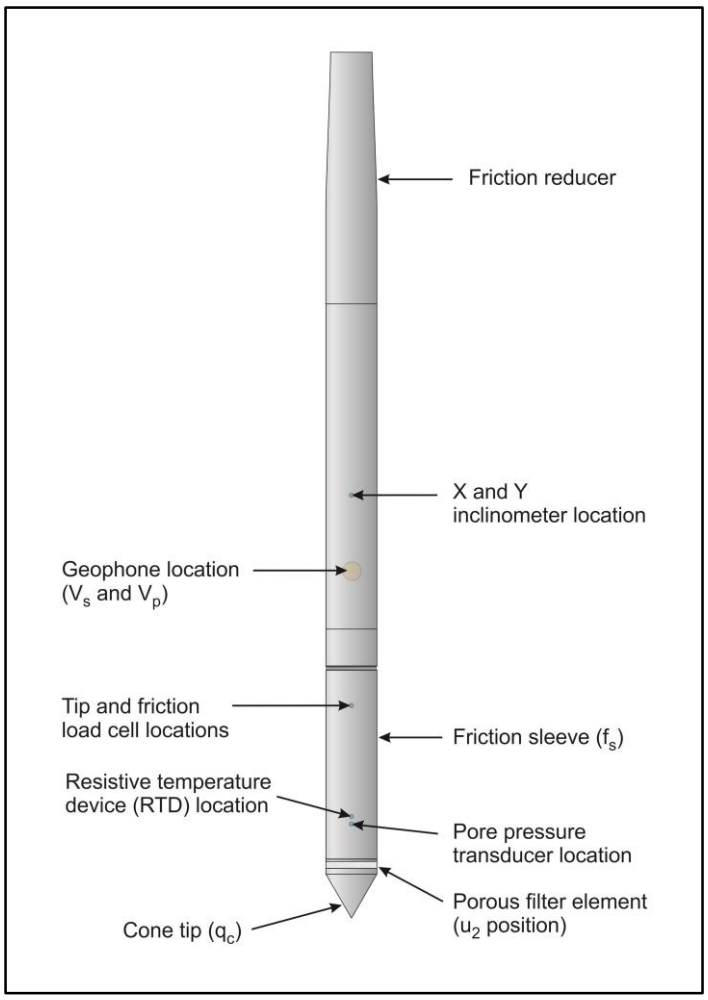


Figure CPTu. Piezocone Penetrometer (15 $cm^2$)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance ($q_c$)
- Sleeve friction ($f_s$)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance ($q_t$), sleeve friction ($f_s$) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance ($q_c$) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance ($q_t$) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1\text{-}a) \bullet u_2$$

where: $q_t$ is the corrected tip resistance
$q_c$ is the recorded tip resistance
$u_2$ is the recorded dynamic pore pressure behind the tip ($u_2$ position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction ($f_s$) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high

friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is also included in the data release folder.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

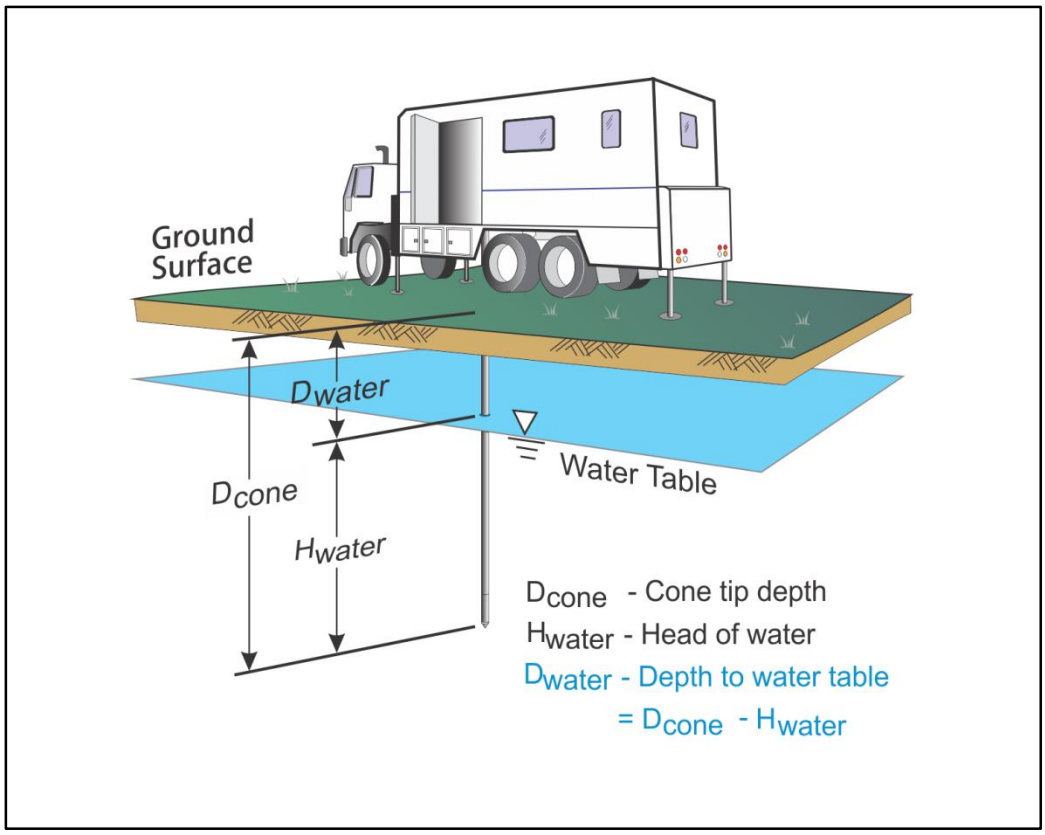


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

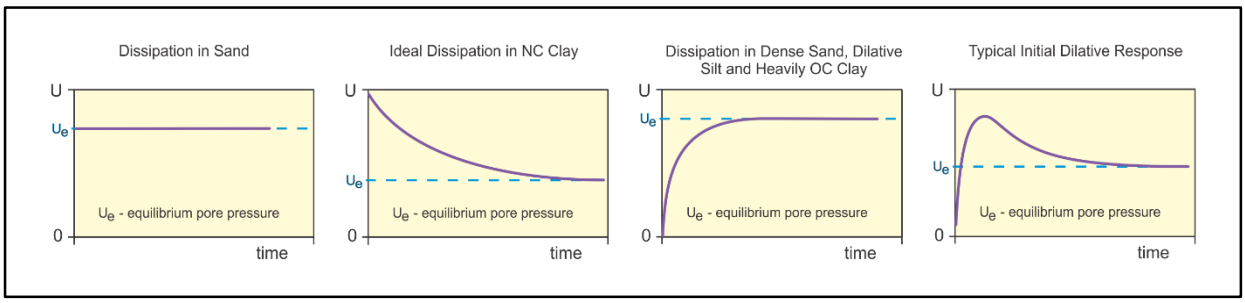


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure ($u_{eq}$) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as $t_{100}$. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to $t_{100}$. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation ($c_h$) at various degrees of dissipation resulting in the expression for $c_h$ shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
$I_r$ is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby, 1991)

| Degree of Dissipation (%) | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
|---|---|---|---|---|---|---|---|
| T* ($u_2$) | 0.038 | 0.078 | 0.142 | 0.245 | 0.439 | 0.804 | 1.60 |

The coefficient of consolidation is typically analyzed using the time ($t_{50}$) corresponding to a degree of dissipation of 50% ($u_{50}$). In order to determine $t_{50}$, dissipation tests must be taken to a pressure less than $u_{50}$. The $u_{50}$ value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as $u_{100}$. To estimate $u_{50}$, both the initial maximum pore pressure and $u_{100}$ must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at $t_{100}$) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly ($u_{100}$), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of $c_h$ (Teh and Houlsby, 1991), $t_{50}$ values are estimated from the corresponding pore pressure dissipation curve and a rigidity index ($I_r$) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining $t_{50}$. In cases where the time to peak is excessive, $t_{50}$ values are not calculated.

Due to possible inherent uncertainties in estimating $I_r$, the equilibrium pore pressure and the effect of an initial dilatory response on calculating $t_{50}$, other methods should be applied to confirm the results for $c_h$.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Burns, S.E. and Mayne, P.W., 1998, "Monotonic and dilatory pore pressure decay during piezocone tests", Canadian Geotechnical Journal 26 (4): 1063-1073.

Burns, S.E. and Mayne, P.W., 2002, "Analytical cavity expansion-critical state model cone dissipation in fine-grained soils", Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, "The piezometer probe: a useful investigation tool", Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

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Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27: 151-158.

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Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34.

Flat plate dilatometer tests (DMT) are conducted using a flat steel blade with a thin, expandable, circular membrane mounted on one surface, a control unit and a compressed gas (typically nitrogen) supply. A photo of the system is presented in Figure DMT-1.

The dilatometer blade is connected to the up-hole control box by a pneumatic tube with an inner conductor wire. The tube is threaded through a set of steel push rods. The control unit has pressure gauges, an audio-visual signal, a gas flow control and vent valve. A syringe is used to quantify the stiffness of the blade membrane.


Figure DMT-1. Flat plate dilatometer system
(Marchetti, http://www.marchetti-dmt.it/pagespictures/blade&case.htm)

Prior to conducting a DMT profile, the blade membrane stiffness is recorded according to the current ASTM D6635 specifications and the system is assembled and tested for any leaks.

The dilatometer blade is pushed into the ground to the desired depth from surface or through a cased hole using a CPT rig or a drill rig. The blade is inflated using compressed gas and up to three pressure readings are recorded, the A reading at zero deflection (lift-off) and the B reading when a deflection of 1.1 mm has been achieved. An optional C reading representing the closing pressure can be recorded by slowly deflating the membrane soon after B is reached. The blade is advanced to subsequent depths

and the test procedures are repeated at each test depth, up to the sounding termination depth. After the blade is retracted membrane stiffness values are recorded.

The dilatometer operating procedures are performed in general accordance with the current ASTM D6635 standard.

The interpretation of the dilatometer data is based on the pressure related parameters $p_o$ and $p_1$ that are derived from the recorded A and B pressure values corrected for membrane stiffness and the gauge zero offset. Figure DMT-2 shows $p_o$ and $p_1$.

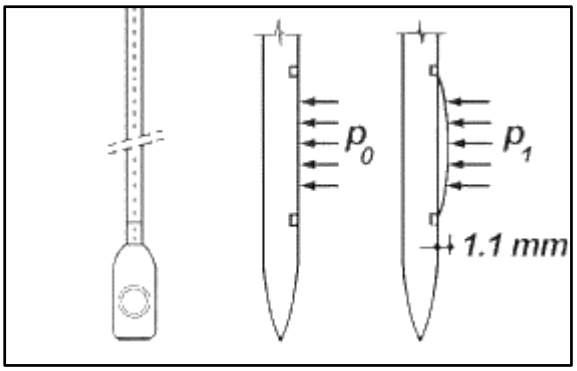


Figure DMT-2. Flat plate dilatometer $p_0$ and $p_1$
(Marchetti, http://www.marchetti-dmt.it/)

The A reading is the pressure required to lift-off the membrane while the B reading is the pressure required to move the center of the membrane by 1.1 mm. The C pressure measurement is the pressure at which the membrane returns to the A position and is used to estimate equilibrium pore pressures in sand. The A and B pressure readings are corrected by the membrane stiffness values at the respective membrane deflections that are recorded before and after each test location.

The empirical correlations use the parameters $p_0$, $p_1$ and $p_2$ derived from the A, B and C readings accounting for membrane stiffness and gauge offset. These parameters provide the basic values needed in the empirical correlations developed by Marchetti et al. (2001). The equations for these parameters are presented in the relevant appendix.

The $p_o$, $p_1$ and $p_2$ parameters are used to calculate the DMT indices, material index ($I_D$), horizontal stress index ($K_D$), and dilatometer modulus ($E_D$). Soil type is inferred from the material index. Clays generally have a material index of less than 0.6. The material index for silts is generally between 0.6 and 1.8, while sands generally exhibit a material index greater than 1.8. While $K_D$ and $E_D$ have limited direct use in geotechnical design, they are critical for determining parameters that are required for most design calculations such as earth pressure coefficient ($K_o$), undrained shear strength ($S_u$), and over consolidation ratio (OCR).

A summary of the tests including coordinates and estimated phreatic surface, along with plots and tabular results are provided in the relevant appendices. The calculated geotechnical parameters presented are based on published empirical correlations and are provided only as a first approximation. No warranty, expressed or implied, is made to the accuracy of these estimated geotechnical parameters.

References

ASTM D6635-01, Reapproved 2007, "Standard Test Method for Performing the Flat Plate Dilatometer ", ASTM, West Conshohocken, US.

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Marchetti, S., n.d, [Photographs of DMT and SDMT system], Retrieved from http://www.marchetti-dmt.it/pagespictures/blade&case.htm.

Marchetti, S., n.d, [Illustration of DMT blade, po and p1], http://www.marchetti-dmt.it/.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots
- Flat Plate Dilatometer Test Summary, Plots and Tabular Results

# Cone Penetration Test Summary and Standard Cone Penetration Test Plots

| | |
|---|---|
| Job No: | 16-54112 |
| Client: | Kleinfelder |
| Project: | SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-) |
| Start Date: | 19-Dec-2016 |
| End Date: | 21-Dec-2016 |

## *CONE PENETRATION TEST SUMMARY*

| Sounding ID | File Name | Date | Cone | Assumed Phreatic Surface[1] (ft) | Final Depth (ft) | Northing[2] (feet) | Easting (feet) | Refer to Notation Number |
|---|---|---|---|---|---|---|---|---|
| STR2_EB1_B1 | 16-54112_CP STR2_EB1_B1 | 19-Dec-2016 | 367:T1500F15U500 | | 34.0 | 874653 | 1777563 | 1 |
| STR2_EB1_B2 | 16-54112_CP STR2_EB1_B2 | 19-Dec-2016 | 367:T1500F15U500 | | 28.5 | 874584 | 1777560 | 1 |
| STR2_EB1_B3 | 16-54112_CP STR2_EB1_B3 | 19-Dec-2016 | 367:T1500F15U500 | | 30.5 | 874621 | 1777567 | 1 |
| STR2_EB2_B1 | 16-54112_CP STR2_EB2_B1 | 19-Dec-2016 | 367:T1500F15U500 | | 28.1 | 874655 | 1777453 | 1 |
| STR2_EB2_B2 | 16-54112_CP STR2_EB2_B2 | 19-Dec-2016 | 367:T1500F15U500 | | 29.0 | 874591 | 1777450 | 1 |
| STR2_EB2_B3 | 16-54112_CP STR2_EB2_B3 | 19-Dec-2016 | 367:T1500F15U500 | | 29.9 | 874627 | 1777441 | 1 |
| STR3_EB1_B1 | 16-54112_CP STR3_EB1_B1 | 19-Dec-2016 | 367:T1500F15U500 | | 32.8 | 874663 | 1777566 | 1 |
| STR3_EB1_B2 | 16-54112_CP STR3_EB1_B2 | 19-Dec-2016 | 367:T1500F15U500 | | 33.0 | 874724 | 1777577 | 1 |
| STR3_EB1_B3 | 16-54112_CP STR3_EB1_B3 | 19-Dec-2016 | 367:T1500F15U500 | | 32.8 | 874701 | 1777579 | 1 |
| STR3_EB2_B1 | 16-54112_CP STR3_EB2_B1 | 19-Dec-2016 | 367:T1500F15U500 | | 27.6 | 874672 | 1777462 | 1 |
| STR3_EB2_B2 | 16-54112_CP STR3_EB2_B2 | 19-Dec-2016 | 367:T1500F15U500 | | 27.9 | 874736 | 1777468 | 1 |
| STR3_EB2_B3 | 16-54112_CP STR3_EB2_B3 | 19-Dec-2016 | 367:T1500F15U500 | | 27.9 | 874716 | 1777445 | 1 |
| Totals | 12 soundings | | | | 361.9 | | | |

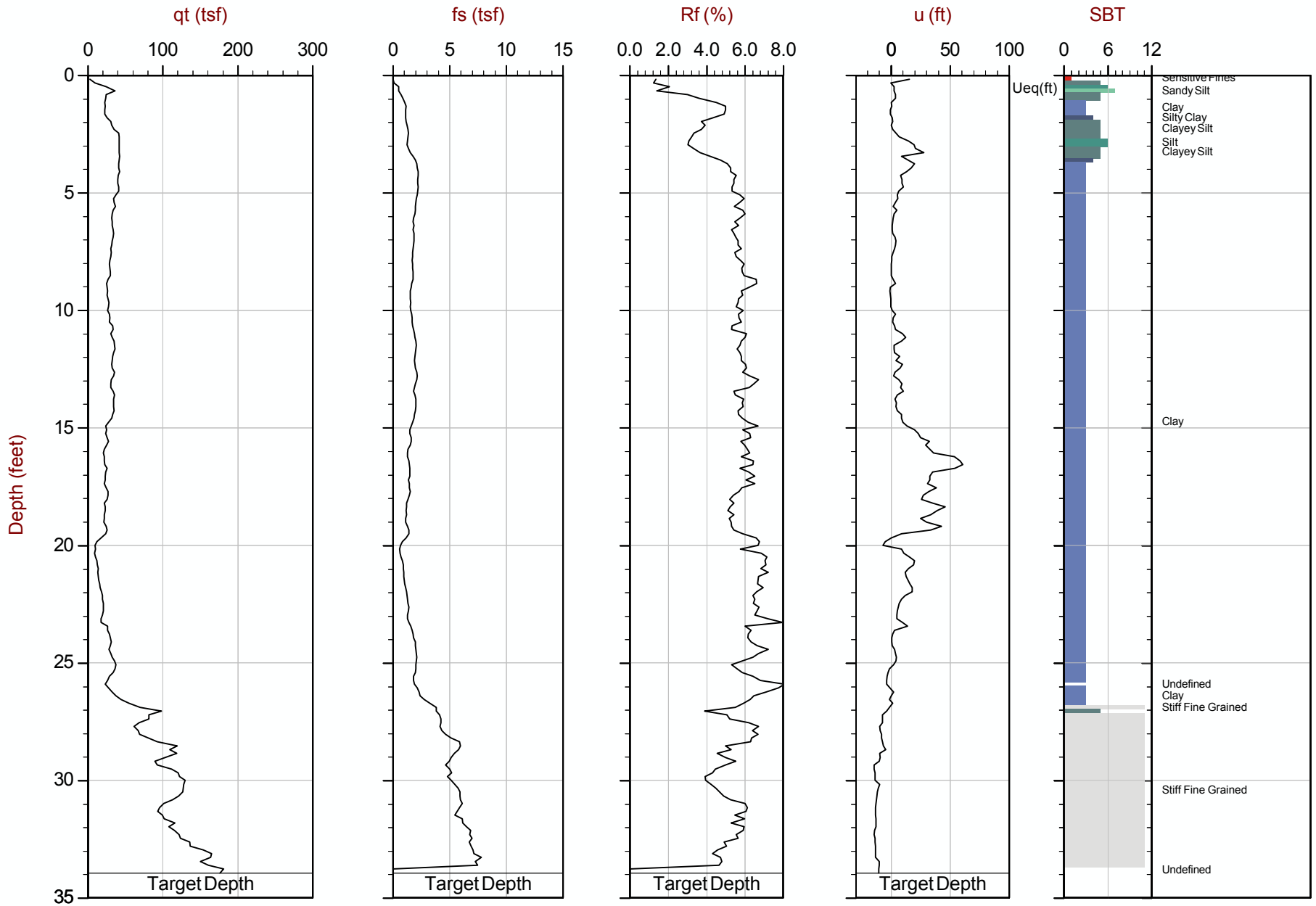
1. Phreatic surface is assumed not to be encountered within exploration depth.
2. State Plane System 3200 - North Carolina. Coordinates were provided by client.

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 2016-12-19 15:17
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)

Sounding: STR2_EB1_B1
Cone: 367:T1500F15U500




Max Depth: 10.350 m / 33.96 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR2_EB1_B1.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874653 E: 1777563 Elev: 876.9

△ Dissipation with estimated Ueq value

△ Dissipation, equilibrium not achieved

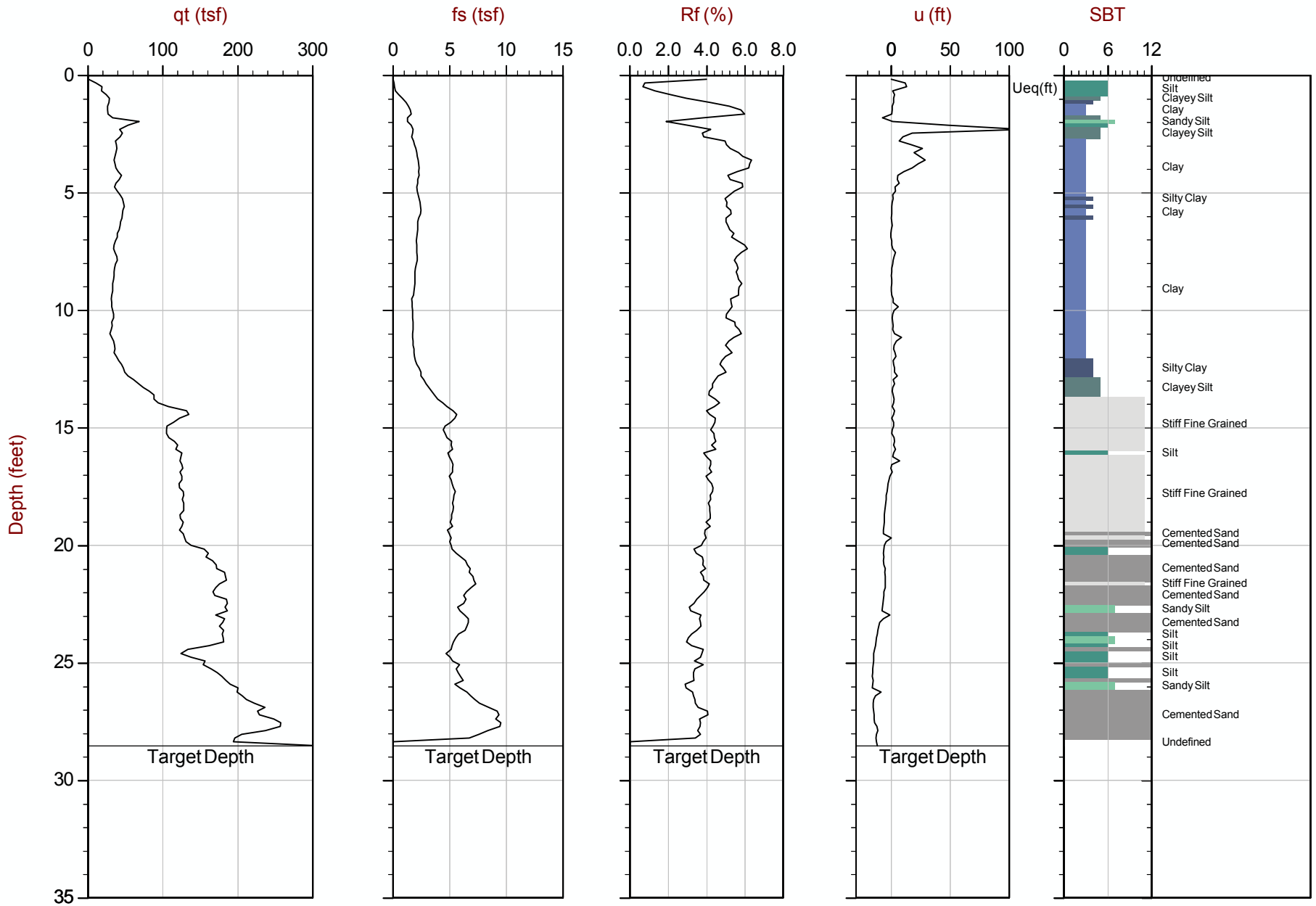
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 2016-12-19 16:27
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)

Sounding: STR2_EB1_B2
Cone: 367:T1500F15U500




Max Depth: 8.700 m / 28.54 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR2_EB1_B2.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874584 E: 1777560 Elev: 874.1

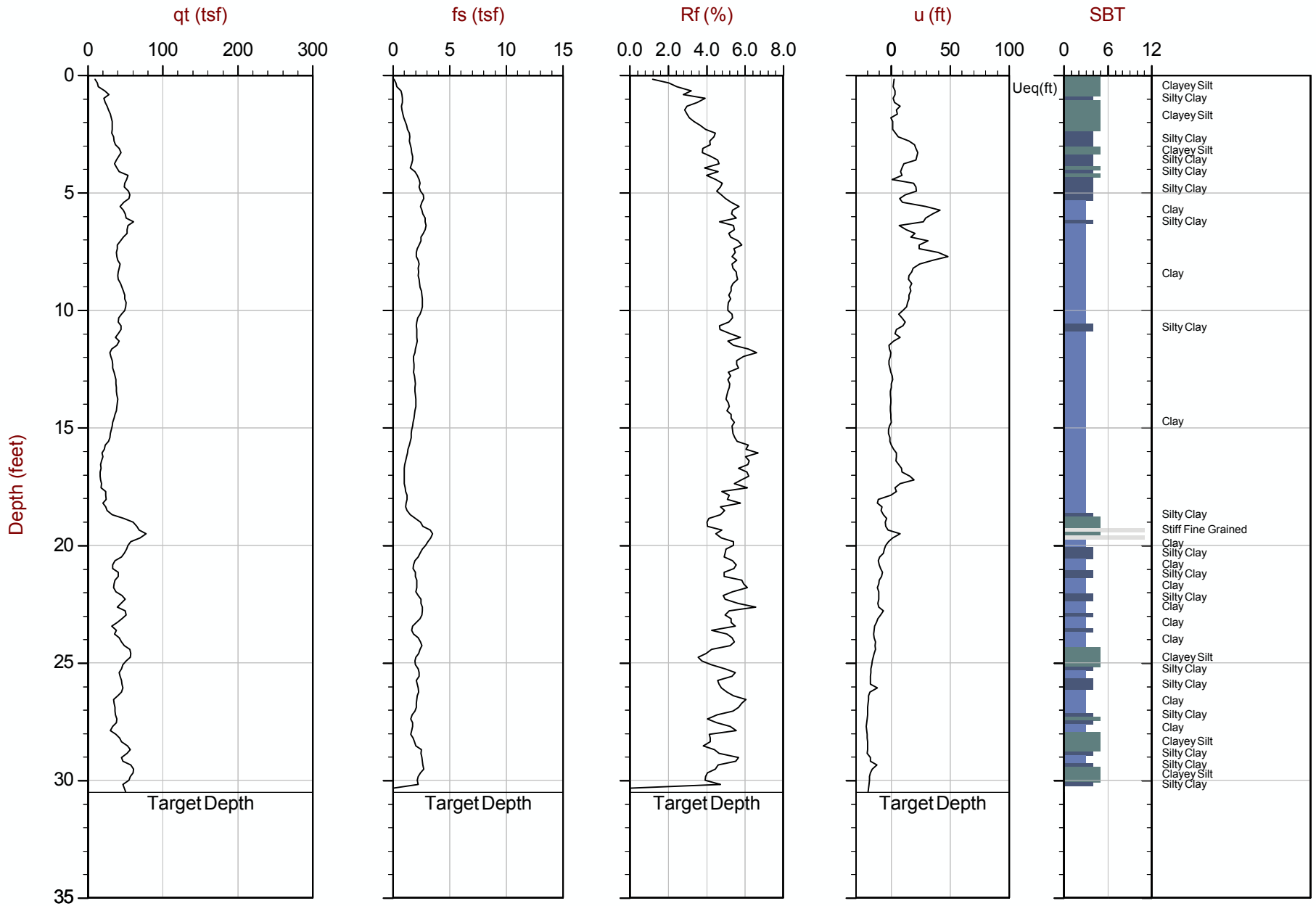
△ Dissipation with estimated Ueq value
△ Dissipation, equilibrium not achieved

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# Kleinfelder

Job No: 16-54112 | Sounding: STR2_EB1_B3
Date: 2016-12-19 15:50 | Cone: 367:T1500F15U500
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)




Max Depth: 9.300 m / 30.51 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR2_EB1_B3.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874621 E: 1777567 Elev: 875.8

△ Dissipation with estimated Ueq value

▲ Dissipation, equilibrium not achieved

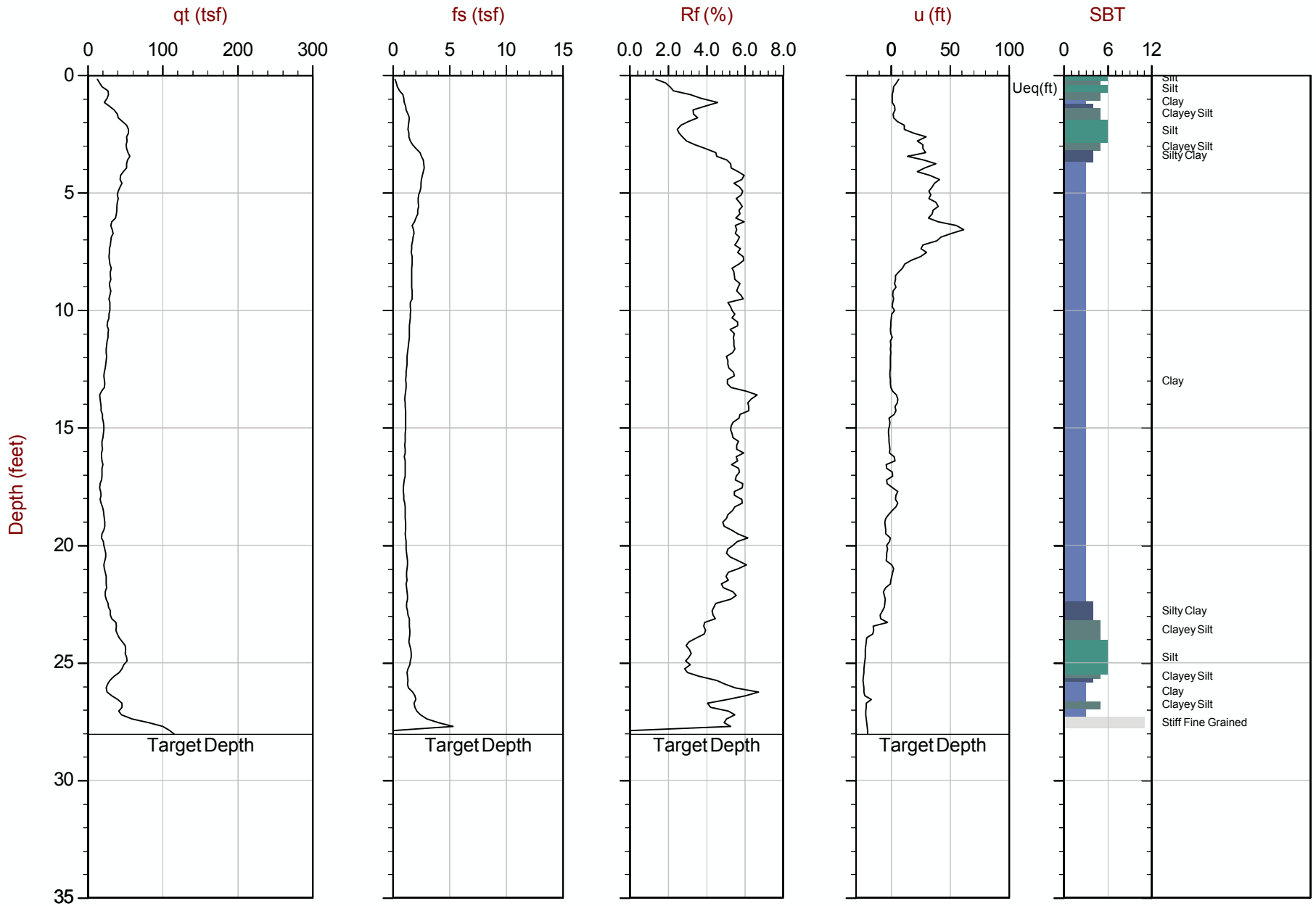
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 2016-12-19 10:36
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)

Sounding: STR2_EB2_B1
Cone: 367:T1500F15U500




Max Depth: 8.550 m / 28.05 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR2_EB2_B1.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874655 E: 1777453 Elev: 873.0

△ Dissipation with estimated Ueq value

△ Dissipation, equilibrium not achieved

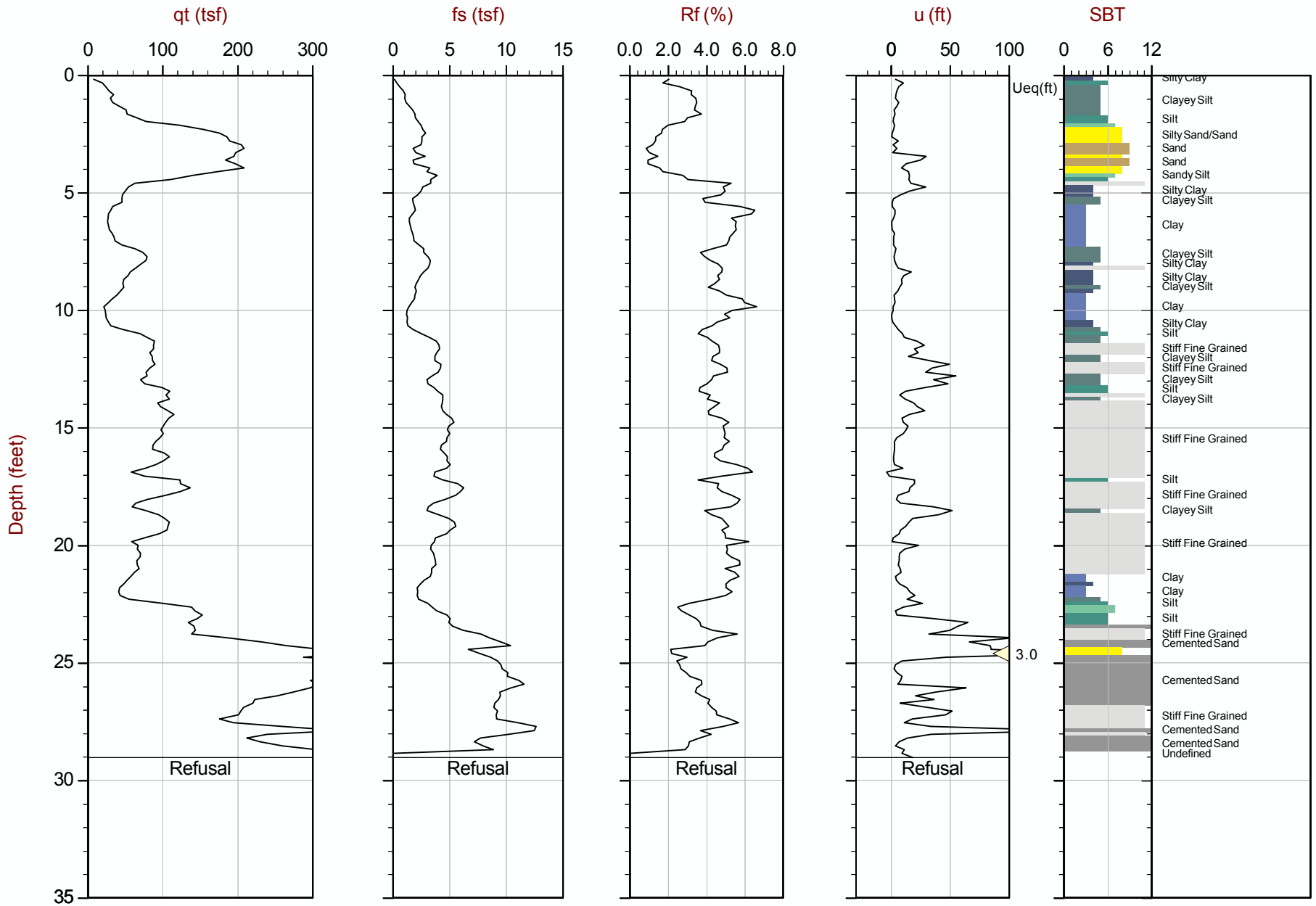
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 2016-12-19 08:50
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)

Sounding: STR2_EB2_B2
Cone: 367:T1500F15U500




Max Depth: 8.850 m / 29.04 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR2_EB2_B2.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874591 E: 1777450 Elev: 874.0

△ Dissipation with estimated Ueq value
△ Dissipation, equilibrium not achieved

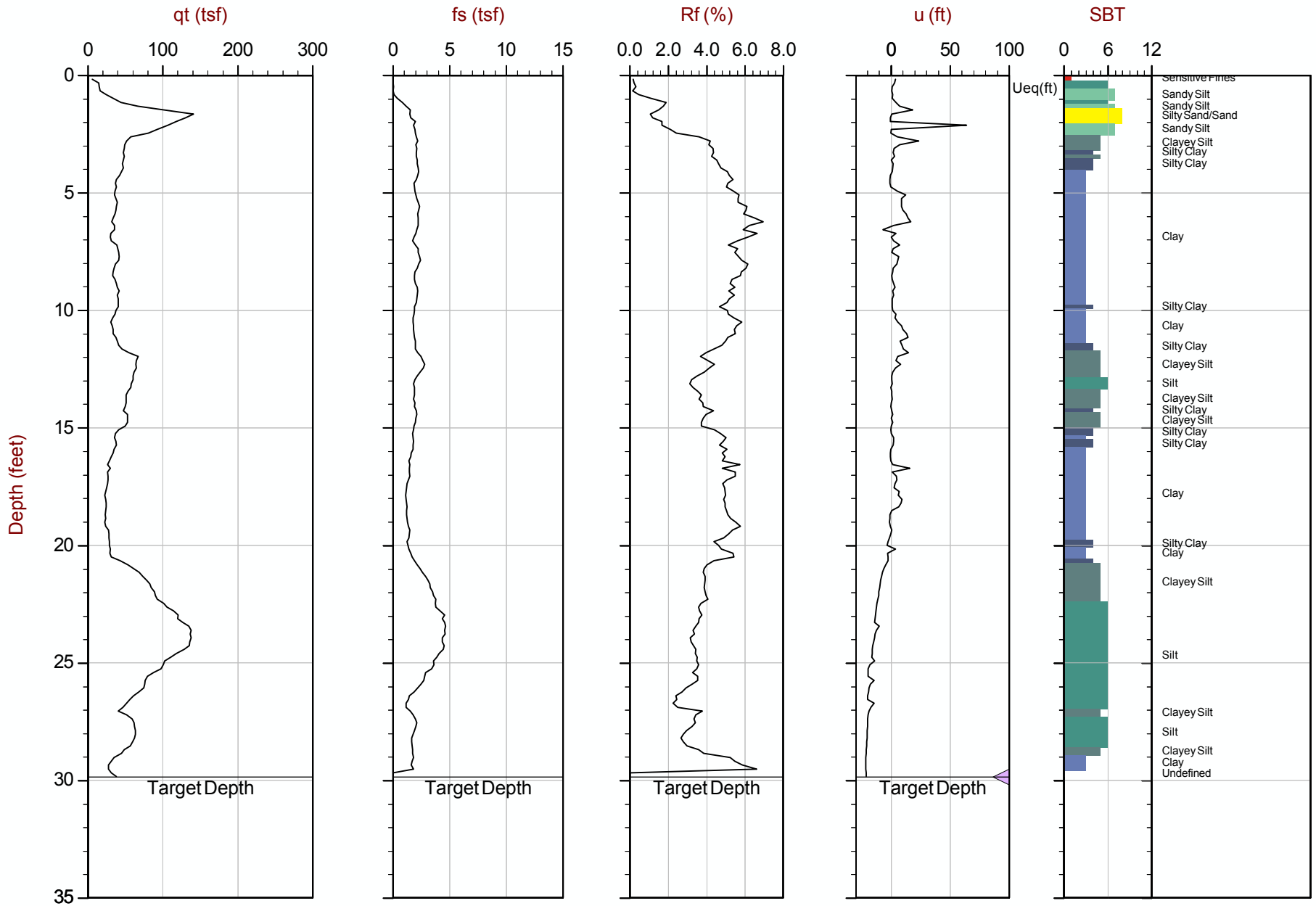
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 2016-12-19 09:49
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)

Sounding: STR2_EB2_B3
Cone: 367:T1500F15U500




Max Depth: 9.100 m / 29.86 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR2_EB2_B3.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874627 E: 1777441 Elev: 873.4

△ Dissipation with estimated Ueq value

△ Dissipation, equilibrium not achieved

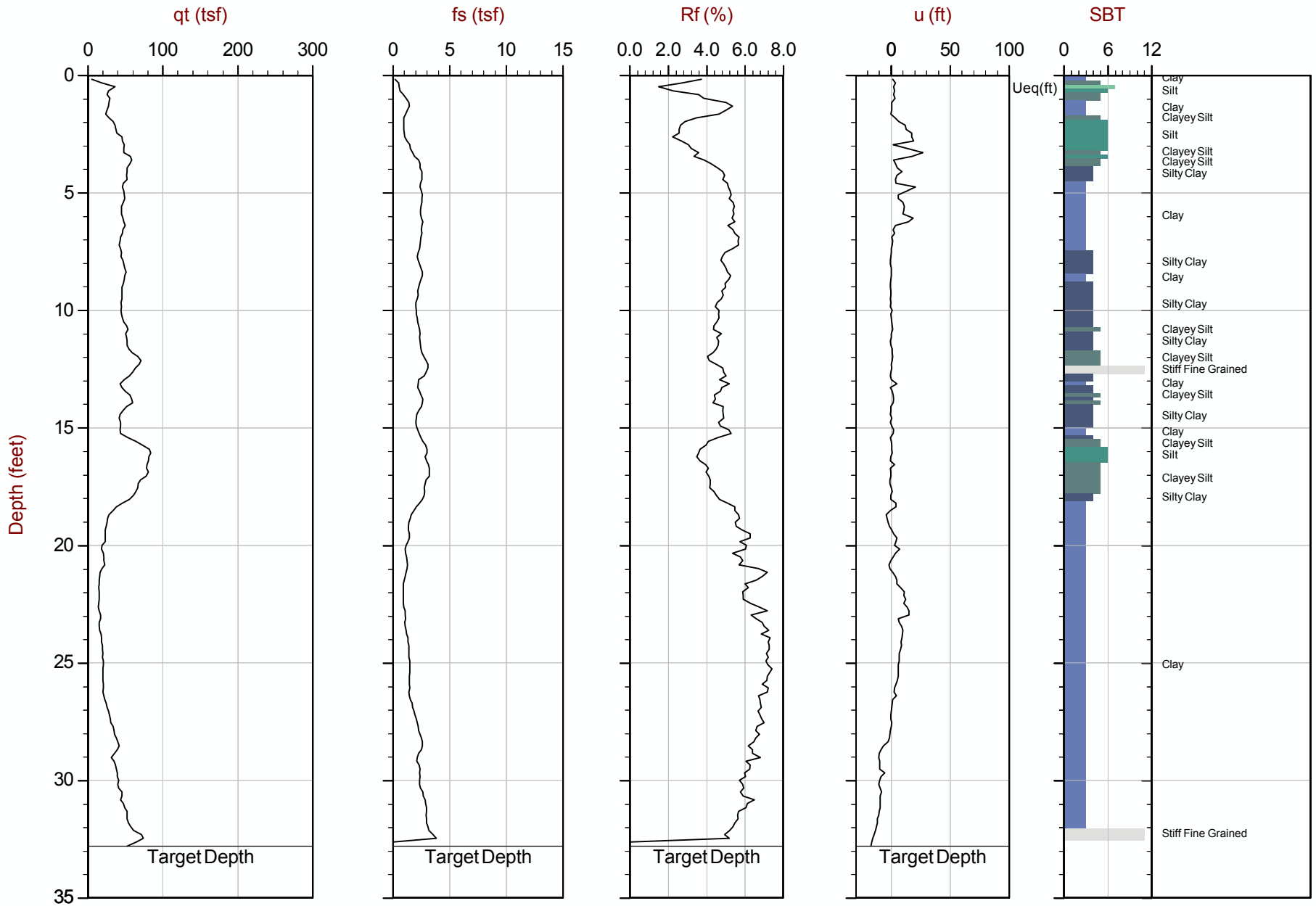
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 2016-12-19 14:47
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)

Sounding: STR3_EB1_B1
Cone: 367:T1500F15U500




Max Depth: 10.000 m / 32.81 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR3_EB1_B1.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874663 E: 1777566 Elev: 877.3

△ Dissipation with estimated Ueq value

△ Dissipation, equilibrium not achieved

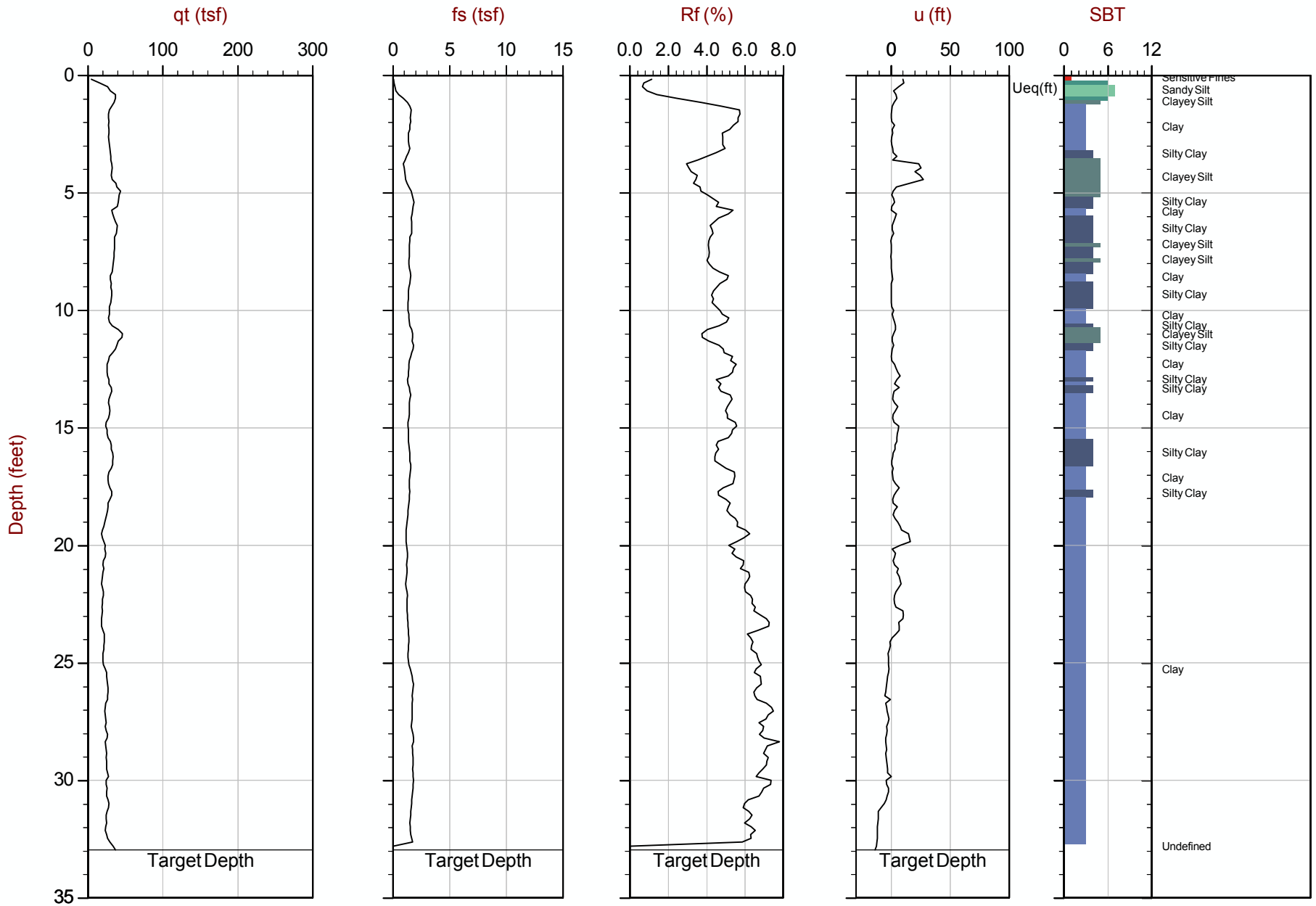
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 2016-12-19 13:26
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)

Sounding: STR3_EB1_B2
Cone: 367:T1500F15U500




Max Depth: 10.050 m / 32.97 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR3_EB1_B2.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874724 E: 1777577 Elev: 877.4

△ Dissipation with estimated Ueq value

▲ Dissipation, equilibrium not achieved

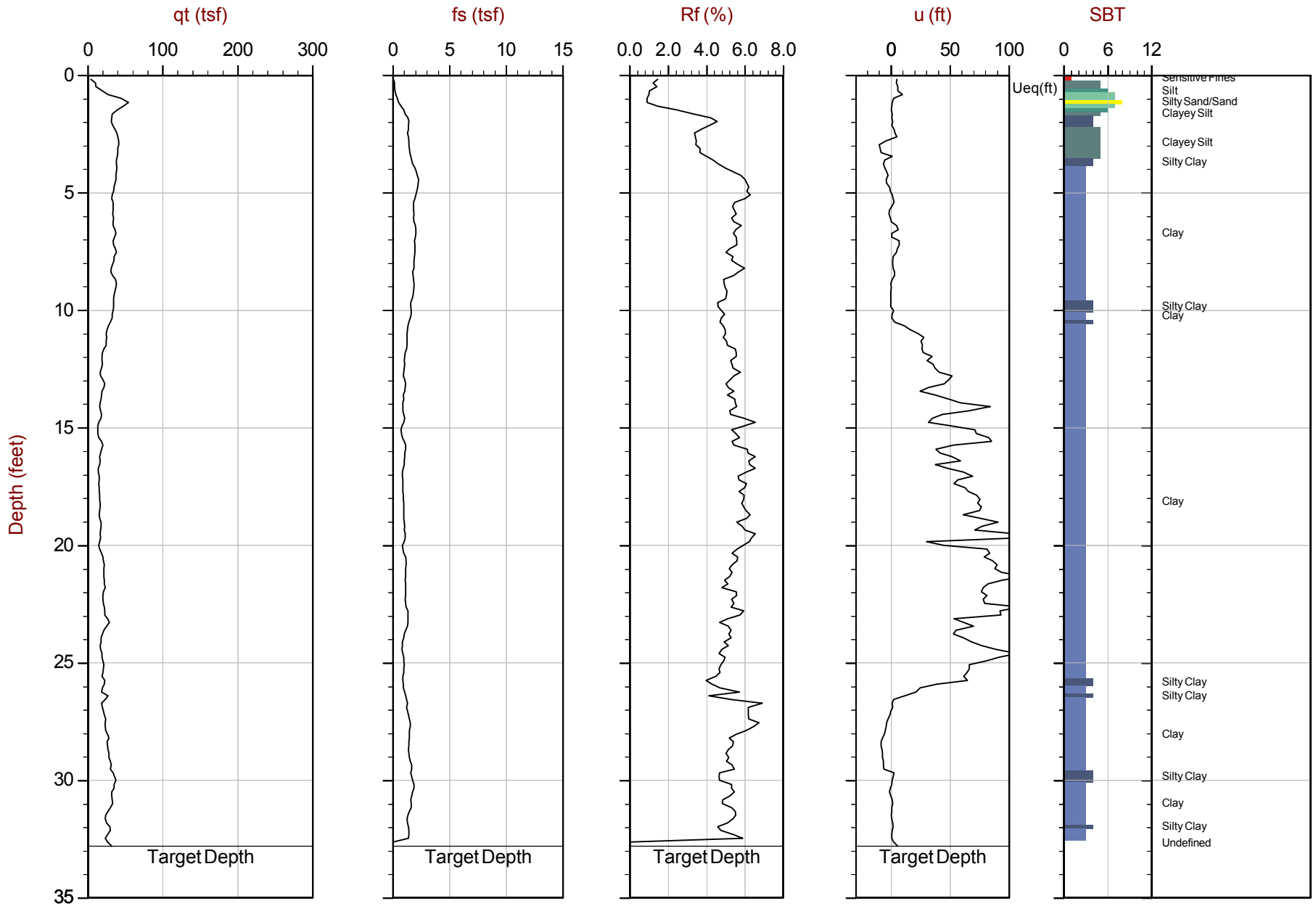
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 2016-12-19 14:07
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)

Sounding: STR3_EB1_B3
Cone: 367:T1500F15U500




Max Depth: 10.000 m / 32.81 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR3_EB1_B3.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874701 E: 1777579 Elev: 877.4

△ Dissipation with estimated Ueq value

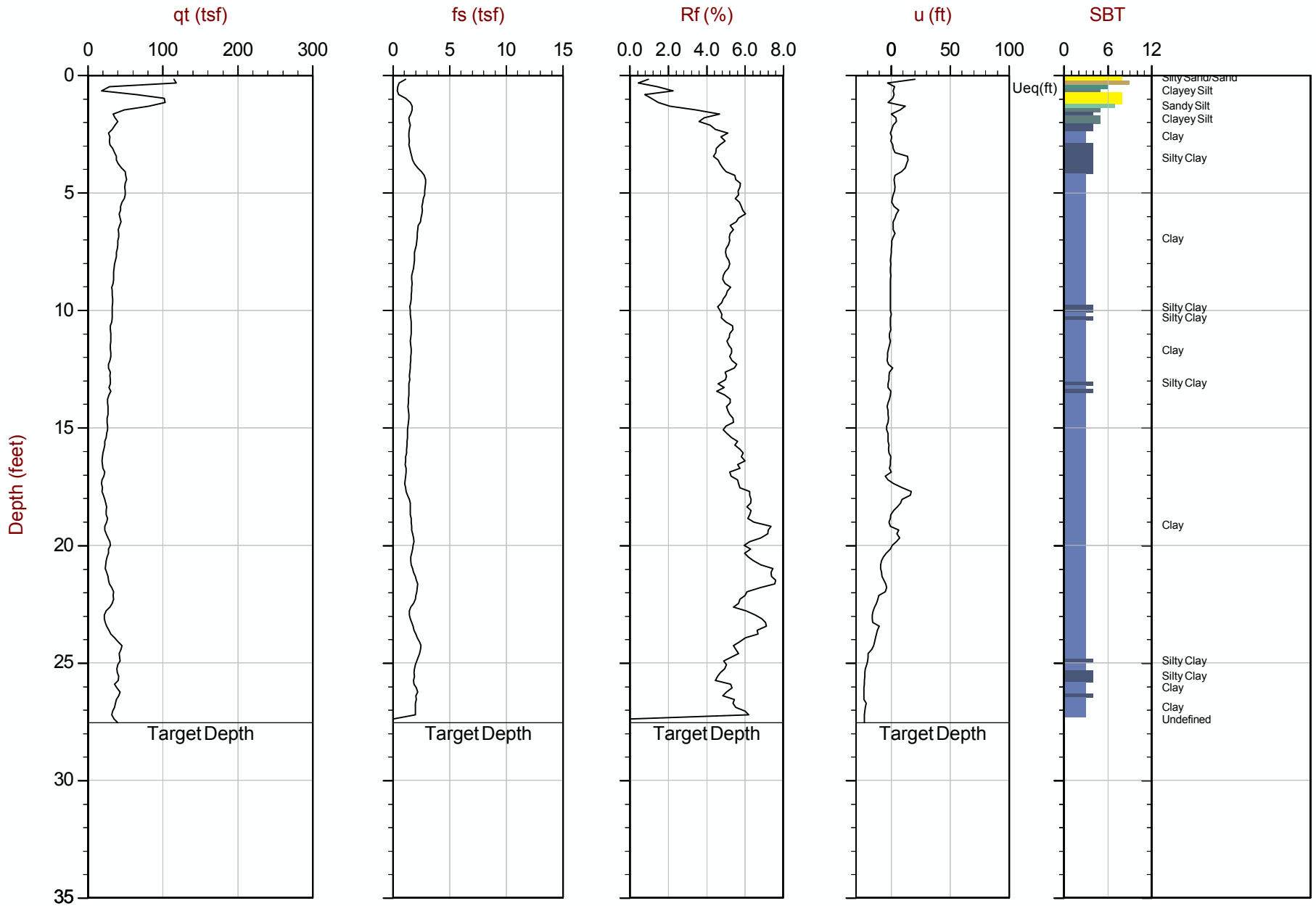
△ Dissipation, equilibrium not achieved

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# Kleinfelder

Job No: 16-54112 | Sounding: STR3_EB2_B1
Date: 2016-12-19 11:13 | Cone: 367:T1500F15U500
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)




Max Depth: 8.400 m / 27.56 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR3_EB2_B1.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874672 E: 1777462 Elev: 873.3

△ Dissipation with estimated Ueq value
△ Dissipation, equilibrium not achieved

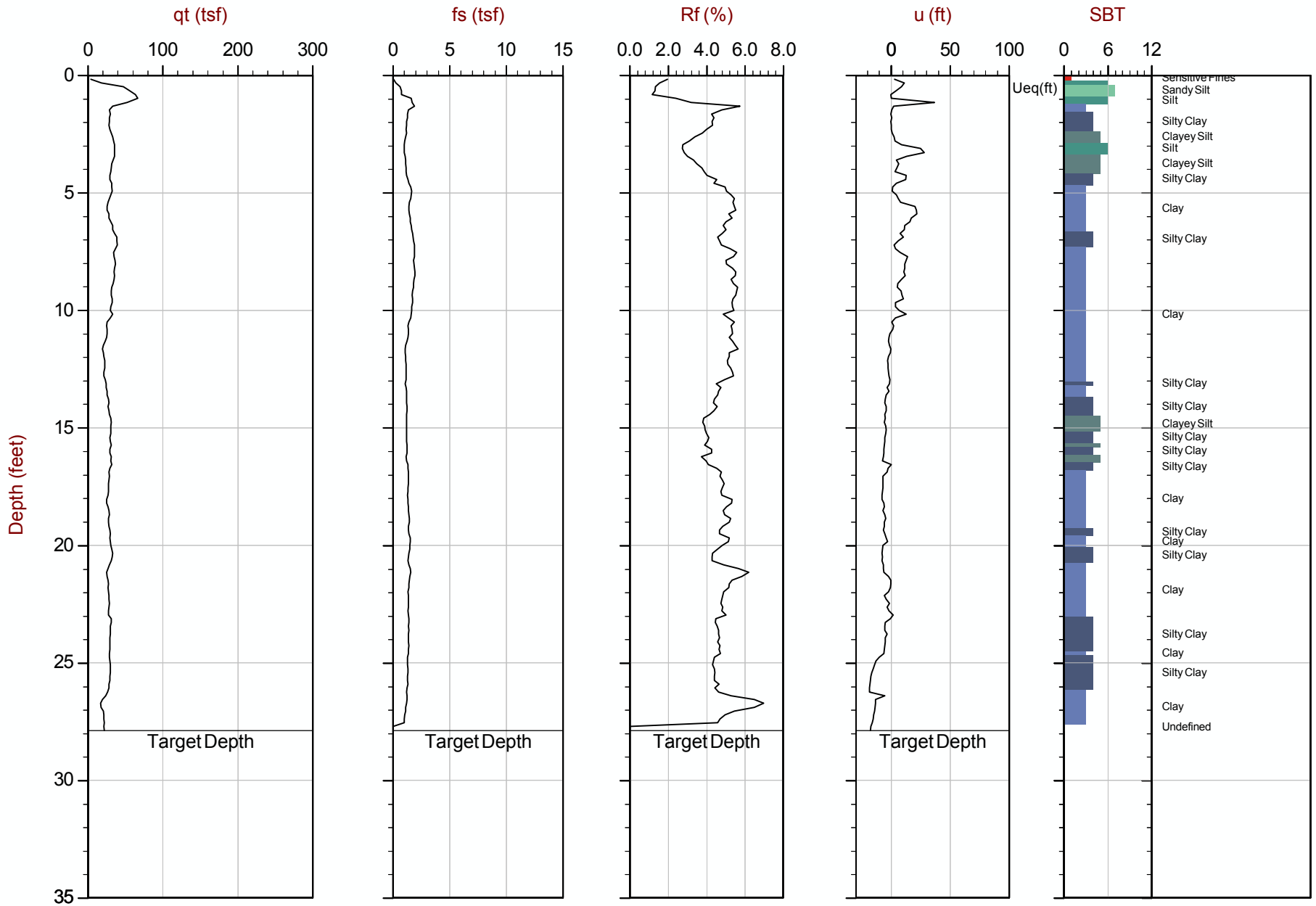
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 2016-12-19 12:52
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)

Sounding: STR3_EB2_B2
Cone: 367:T1500F15U500




Max Depth: 8.500 m / 27.89 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR3_EB2_B2.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874736 E: 1777468 Elev: 872.5

△ Dissipation with estimated Ueq value

△ Dissipation, equilibrium not achieved

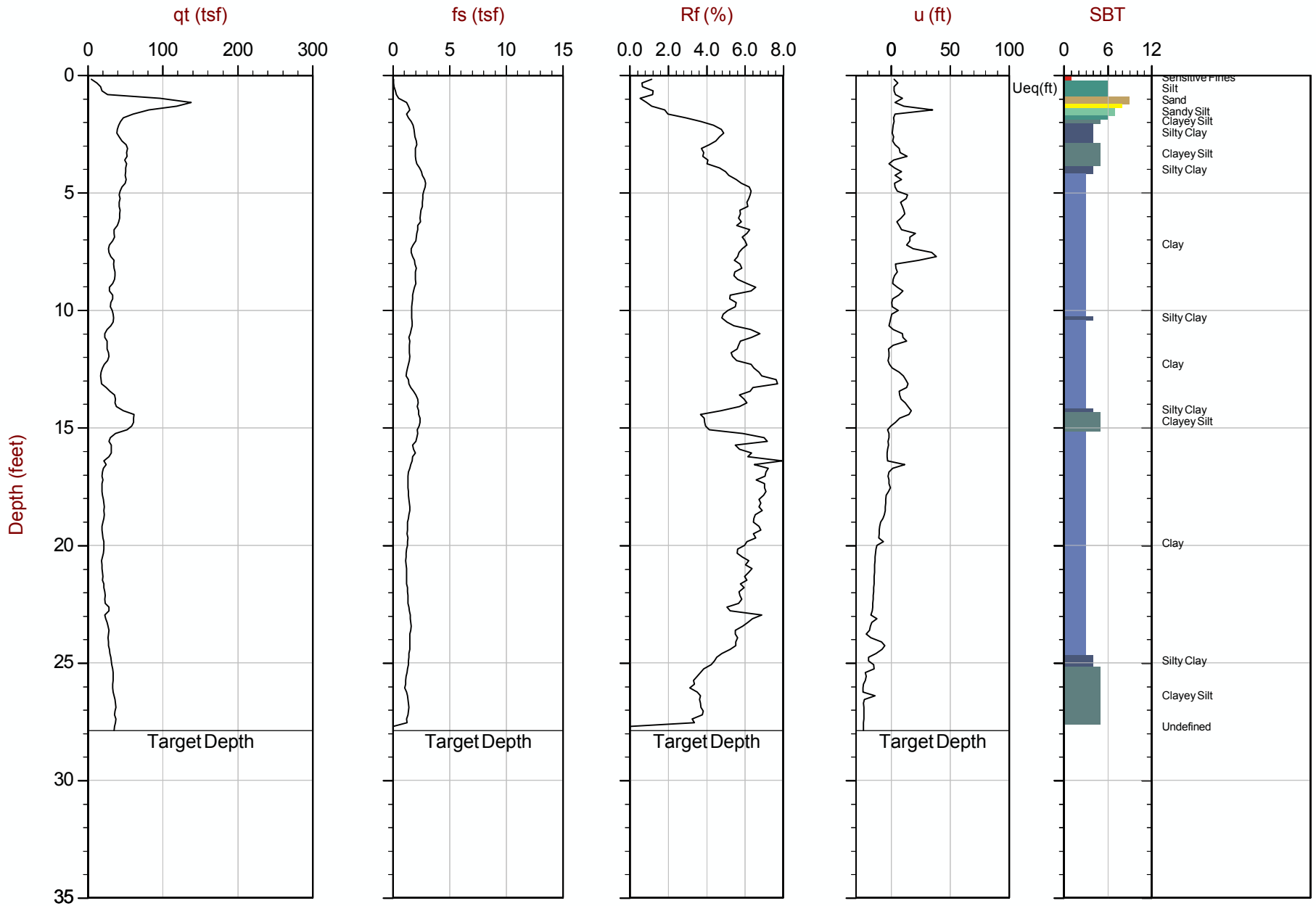
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 2016-12-19 12:09
Site: SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)

Sounding: STR3_EB2_B3
Cone: 367:T1500F15U500




Max Depth: 8.500 m / 27.89 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 16-54112_CP STR3_EB2_B3.COR
Unit Wt: SBT (R&C1986)

SBT: Robertson and Campanella, 1986
Coords: N: 874716 E: 1777445 Elev: 872.2

△ Dissipation with estimated Ueq value

△ Dissipation, equilibrium not achieved

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Pore Pressure Dissipation Summary and

Pore Pressure Dissipation Plots

CONETEC

| | |
|---|---|
| Job No: | 16-54112 |
| Client: | Kleinfelder |
| Project: | SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-) |
| Start Date: | 19-Dec-2016 |
| End Date: | 21-Dec-2016 |

## *CPTu PORE PRESSURE DISSIPATION SUMMARY*

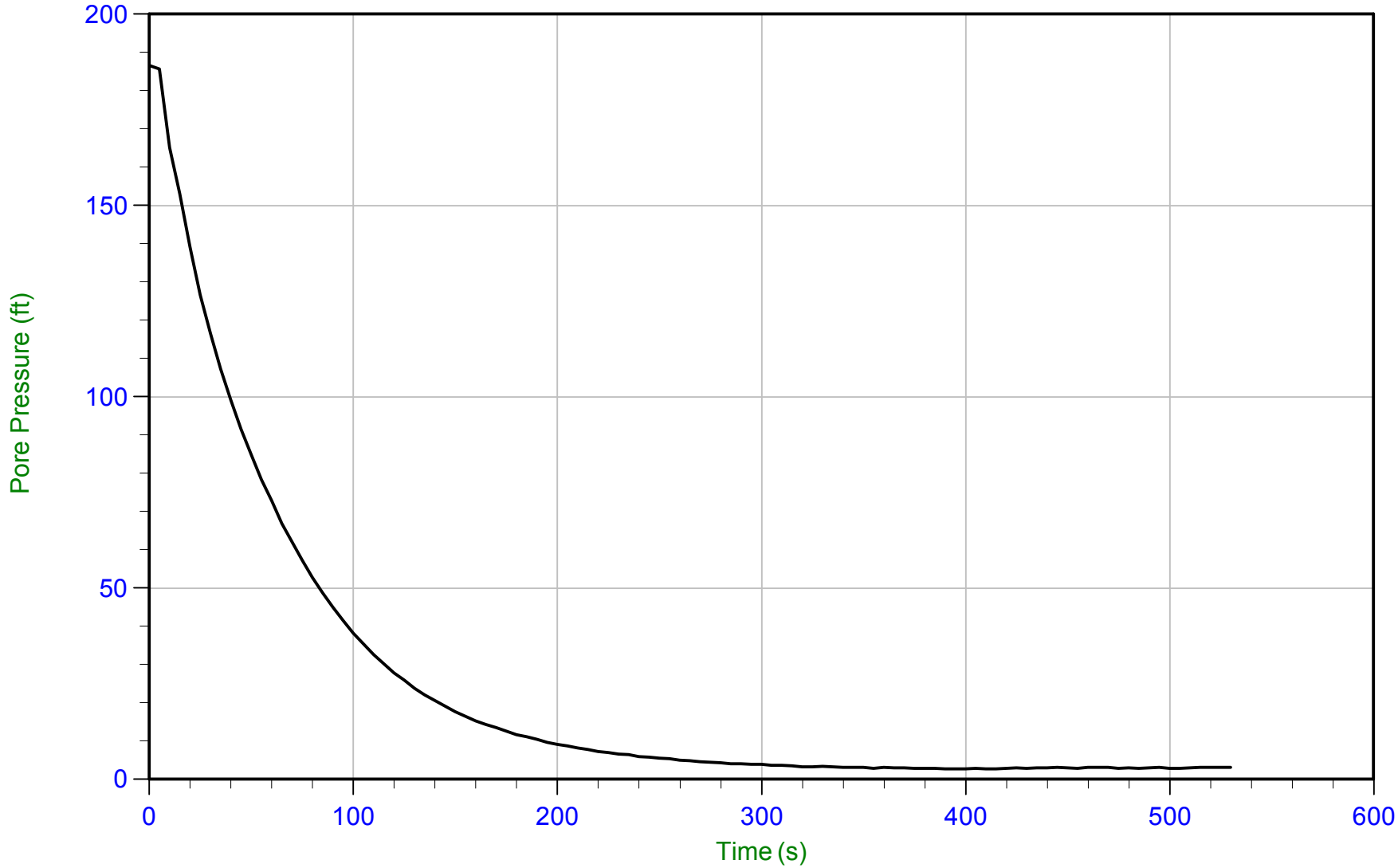
| Sounding ID | File Name | Cone Area ($cm^2$) | Duration (s) | Test Depth (ft) | Estimated Equilibrium Pore Pressure $U_{eq}$ (ft) | Calculated Phreatic Surface (ft) |
|---|---|---|---|---|---|---|
| STR2_EB2_B2 | 16-54112_CP STR2_EB2_B2.PPD | 15.0 | 530 | 24.6 | 3.0 | 21.6 |
| STR2_EB2_B3 | 16-54112_CP STR2_EB2_B3.PPD | 15.0 | 865 | 29.9 | | |
| Totals | | | 14.4 min | | | |

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 12/19/2016 08:50
Site: SITE #2 (STRUCTURE #2 AND #3)...

Sounding: STR2_EB2_B2
Cone: 367:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-54112_CP STR2_EB2_B2.PUF
Depth: 7.500 m / 24.606 ft
Duration: 530.0 s

U Min: 2.7 ft
U Max: 186.5 ft

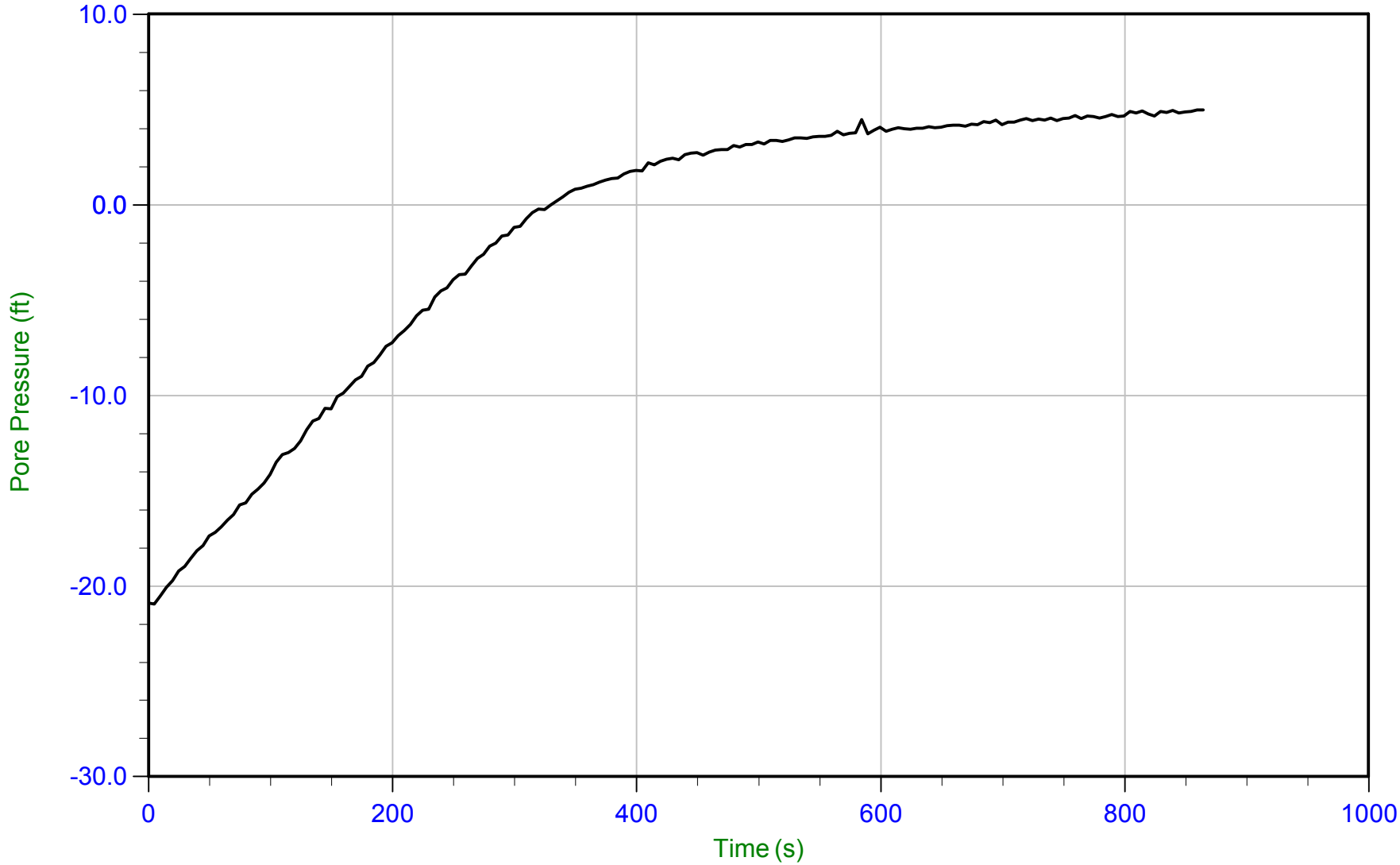
WT: 6.591 m / 21.624 ft
Ueq: 3.0 ft

CONETEC

# Kleinfelder

Job No: 16-54112
Date: 12/19/2016 09:49
Site: SITE #2 (STRUCTURE #2 AND #3)...

Sounding: STR2_EB2_B3
Cone: 367:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-54112_CP STR2_EB2_B3.PUF
Depth: 9.100 m / 29.855 ft
Duration: 865.0 s

U Min: -20.9 ft
U Max: 5.0 ft

# Flat Plate Dilatometer Test Summary, Plots and Tabular Results

CONETEC

| | |
|---|---|
| Job No: | 16-54112 |
| Client: | Kleinfelder |
| Project: | SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-) |
| Start Date: | 19-Dec-2016 |
| End Date: | 21-Dec-2016 |

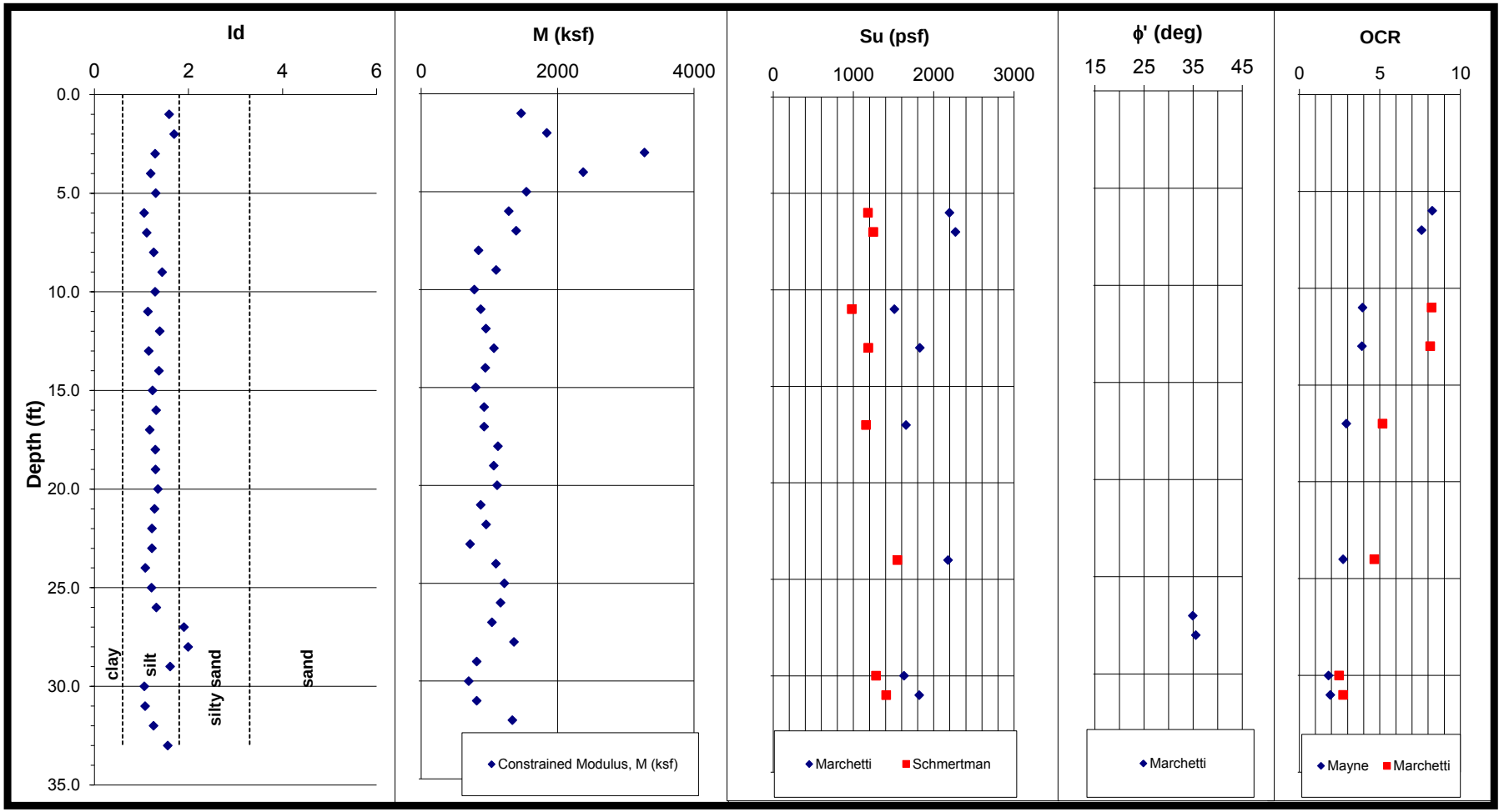
## *FLAT PLATE DILATOMETER TEST SUMMARY*

| Sounding ID | File Name | Date | Final Depth (ft) | Assumed Phreatic Surface (ft) | Northing[2] (feet) | Easting (feet) | Refer to Notation Number |
|---|---|---|---|---|---|---|---|
| STR2_EB1_B1 | 16-54112_DMT STR2_EB1_B1 | 20-Dec-2016 | 33 | | 874653 | 1777563 | 1 |
| STR2_EB1_B2 | 16-54112_DMT STR2_EB1_B2 | 20-Dec-2016 | 20 | | 874584 | 1777560 | 1 |
| STR2_EB1_B3 | 16-54112_DMT STR2_EB1_B3 | 20-Dec-2016 | 30 | | 874621 | 1777567 | 1 |
| STR2_EB2_B1 | 16-54112_DMT STR2_EB2_B1 | 21-Dec-2016 | 25 | | 874655 | 1777453 | 1 |
| STR2_EB2_B2 | 16-54112_DMT STR2_EB2_B2 | 21-Dec-2016 | 21 | | 874591 | 1777450 | 1 |
| STR2_EB2_B3 | 16-54112_DMT STR2_EB2_B3 | 21-Dec-2016 | 28 | | 874627 | 1777441 | 1 |
| STR3_EB1_B1 | 16-54112_DMT STR3_EB1_B1 | 20-Dec-2016 | 32 | | 874663 | 1777566 | 1 |
| STR3_EB1_B2 | 16-54112_DMT STR3_EB1_B2 | 20-Dec-2016 | 32 | | 874724 | 1777577 | 1 |
| STR3_EB1_B3 | 16-54112_DMT STR3_EB1_B3 | 20-Dec-2016 | 32 | | 874701 | 1777579 | 1 |
| STR3_EB2_B1 | 16-54112_DMT STR3_EB2_B1 | 21-Dec-2016 | 28 | | 874672 | 1777462 | 1 |
| STR3_EB2_B2 | 16-54112_DMT STR3_EB2_B2 | 20-Dec-2016 | 28 | | 874736 | 1777468 | 1 |
| STR3_EB2_B3 | 16-54112_DMT STR3_EB2_B3 | 21-Dec-2016 | 27 | | 874716 | 1777445 | 1 |

1. Phreatic surface is assumed not to be encountered within exploration depth.
2. State Plane System 3200 - North Carolina. Coordinates were provided by client.

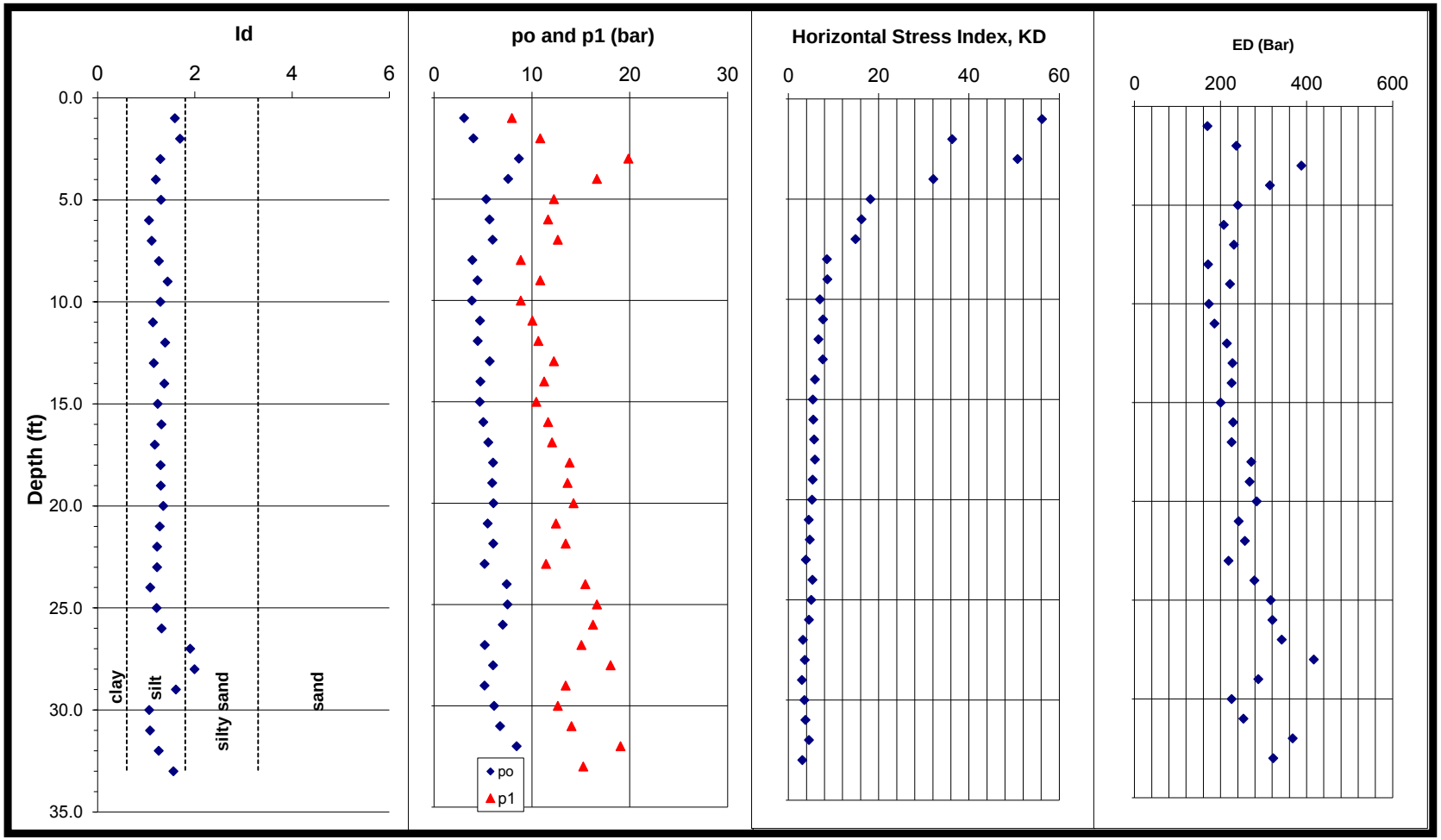
# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB1_B1
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB1_B1
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



Job No: 16-54112
Job Name: SITE #2 (STRUCTURE #2 AND
Job Location: Greensboro, NC
Date: 12-20-16
Sounding No: STR2_EB1_B1
Ground Water Depth (ft): N/A

| | Membrane 1 | Membrane 2 | Membrane 3 |
|---|---|---|---|
| ΔA = | 0.2 | 0 | 0 |
| ΔB = | 0.35 | 0 | 0 |
| Zm= | 0 | bar | |

Northing 874653
Easting 1777563

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

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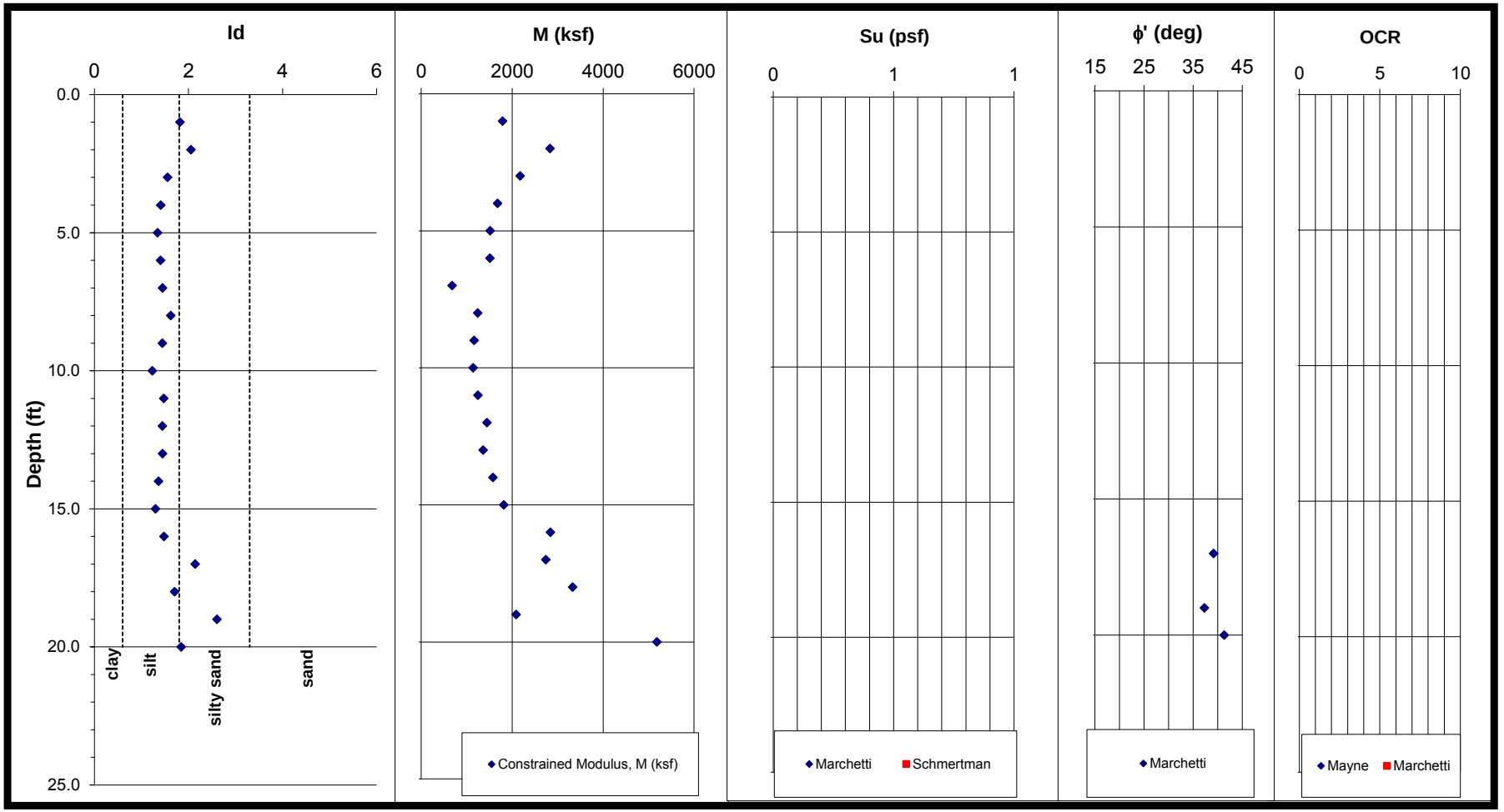
## DILATOMETER TEST RESULTS

| Depth[1] (ft) | A (bar) | B (bar) | C (bar) | po (bar) | p1 (bar) | p2 (bar) | $u_o$ (psf) | $\gamma_T$[5] (pcf) | $\sigma_{vo}$ (psf) | $\sigma_{vo}'$ (psf) | Id | $K_D$ | $E_D$ (bar) | $K_o$ | OCR[2] | OCR[3] | $\phi'$[3] (deg) | $R_M$ | $E_D$ (ksf) | $s_u$[3] (psf) | $s_u$[4] (psf) | M (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 3.1 | 8.3 | | 3.1 | 7.95 | | 0 | 114 | 114 | 114 | 1.59 | 56.2 | 169 | | | | | 4.13 | 354 | | | 1463 |
| 2.0 | 4.15 | 11.2 | | 4.0 | 10.85 | | 0 | 117 | 231 | 231 | 1.70 | 36.3 | 237 | | | | | 3.72 | 495 | | | 1841 |
| 3.0 | 9 | 20.2 | 0 | 8.7 | 19.85 | | 0 | 125 | 356 | 356 | 1.29 | 50.8 | 388 | | | | | 4.04 | 810 | | | 3273 |
| 4.0 | 7.8 | 17 | | 7.6 | 16.65 | | 0 | 123 | 492 | 492 | 1.20 | 32.1 | 315 | | | | | 3.61 | 658 | | | 2373 |
| 5.0 | 5.45 | 12.6 | | 5.3 | 12.25 | | 0 | 119 | 611 | 611 | 1.30 | 18.2 | 240 | | | | | 3.07 | 502 | | | 1540 |
| 6.0 | 5.75 | 12 | 0 | 5.7 | 11.65 | | 0 | 119 | 730 | 730 | 1.06 | 16.2 | 208 | 2.5 | 8.3 | 26.2 | | 2.96 | 434 | 2196 | 1183 | 1283 |
| 7.0 | 6.1 | 13 | | 6.0 | 12.65 | | 0 | 120 | 838 | 838 | 1.11 | 14.9 | 231 | 2.3 | 7.6 | 23.0 | | 2.88 | 483 | 2271 | 1249 | 1391 |
| 8.0 | 3.95 | 9.2 | | 3.9 | 8.85 | | 0 | 115 | 953 | 953 | 1.26 | 8.6 | 171 | | | | | 2.35 | 358 | | | 840 |
| 9.0 | 4.55 | 11.2 | 0 | 4.4 | 10.85 | | 0 | 118 | 1071 | 1071 | 1.44 | 8.7 | 222 | | | | | 2.36 | 464 | | | 1096 |
| 10.0 | 3.9 | 9.2 | | 3.9 | 8.85 | | 0 | 115 | 1154 | 1154 | 1.29 | 7.0 | 173 | | | | | 2.15 | 361 | | | 777 |
| 11.0 | 4.75 | 10.4 | | 4.7 | 10.05 | | 0 | 117 | 1271 | 1271 | 1.14 | 7.7 | 186 | 1.6 | 3.9 | 8.2 | | 2.24 | 388 | 1512 | 981 | 871 |
| 12.0 | 4.55 | 11 | 0 | 4.5 | 10.65 | | 0 | 117 | 1388 | 1388 | 1.39 | 6.7 | 215 | | | | | 2.11 | 449 | | | 948 |
| 13.0 | 5.8 | 12.6 | | 5.7 | 12.25 | | 0 | 119 | 1550 | 1550 | 1.15 | 7.7 | 228 | 1.6 | 3.9 | 8.1 | | 2.24 | 476 | 1828 | 1188 | 1064 |
| 14.0 | 4.85 | 11.6 | | 4.7 | 11.25 | | 0 | 118 | 1668 | 1668 | 1.37 | 5.9 | 226 | | | | | 1.99 | 472 | | | 939 |
| 15.0 | 4.75 | 10.8 | 0 | 4.7 | 10.45 | | 0 | 117 | 1786 | 1786 | 1.24 | 5.5 | 200 | | | | | 1.91 | 419 | | | 798 |
| 16.0 | 5.15 | 12 | | 5.0 | 11.65 | | 0 | 119 | 1897 | 1897 | 1.31 | 5.5 | 230 | | | | | 1.92 | 479 | | | 922 |
| 17.0 | 5.65 | 12.4 | | 5.5 | 12.05 | | 0 | 119 | 2016 | 2016 | 1.18 | 5.7 | 226 | 1.3 | 2.9 | 5.2 | | 1.95 | 472 | 1656 | 1157 | 921 |
| 18.0 | 6.2 | 14.2 | 0 | 6.0 | 13.85 | | 0 | 121 | 2137 | 2137 | 1.30 | 5.9 | 271 | | | | | 1.98 | 567 | | | 1123 |
| 19.0 | 6.1 | 14 | | 5.9 | 13.65 | | 0 | 120 | 2289 | 2289 | 1.30 | 5.4 | 268 | | | | | 1.90 | 559 | | | 1062 |
| 20.0 | 6.25 | 14.6 | | 6.1 | 14.25 | | 0 | 121 | 2410 | 2410 | 1.35 | 5.3 | 284 | | | | | 1.87 | 594 | | | 1111 |
| 21.0 | 5.6 | 12.8 | 0 | 5.5 | 12.45 | | 0 | 119 | 2529 | 2529 | 1.28 | 4.5 | 242 | | | | | 1.72 | 506 | | | 870 |
| 22.0 | 6.2 | 13.8 | | 6.0 | 13.45 | | 0 | 120 | 2648 | 2648 | 1.22 | 4.8 | 257 | | | | | 1.77 | 536 | | | 950 |
| 23.0 | 5.25 | 11.8 | | 5.2 | 11.45 | | 0 | 118 | 2766 | 2766 | 1.22 | 3.9 | 219 | | | | | 1.57 | 457 | | | 717 |
| 24.0 | 7.6 | 15.8 | 0.1 | 7.4 | 15.45 | 0.30 | 0 | 122 | 2888 | 2888 | 1.08 | 5.4 | 279 | 1.2 | 2.7 | 4.7 | | 1.88 | 582 | 2181 | 1549 | 1095 |
| 25.0 | 7.75 | 17 | | 7.5 | 16.65 | | 0 | 123 | 3074 | 3074 | 1.22 | 5.1 | 317 | | | | | 1.84 | 662 | | | 1217 |
| 26.0 | 7.25 | 16.6 | | 7.0 | 16.25 | | 0 | 123 | 3196 | 3196 | 1.32 | 4.6 | 321 | | | | | 1.74 | 670 | | | 1163 |
| 27.0 | 5.45 | 15.4 | 0.05 | 5.2 | 15.05 | 0.25 | 0 | 121 | 3317 | 3317 | 1.91 | 3.3 | 342 | | | | 34.9 | 1.45 | 715 | | | 1035 |
| 28.0 | 6.4 | 18.4 | | 6.0 | 18.05 | | 0 | 123 | 3452 | 3452 | 1.99 | 3.6 | 417 | | | | 35.5 | 1.56 | 871 | | | 1357 |
| 29.0 | 5.35 | 13.8 | | 5.2 | 13.45 | | 0 | 120 | 3572 | 3572 | 1.61 | 3.0 | 288 | | | | | 1.35 | 601 | | | 811 |
| 30.0 | 6.25 | 13 | 1.25 | 6.1 | 12.65 | 1.45 | 0 | 120 | 3590 | 3590 | 1.06 | 3.6 | 226 | 0.9 | 1.8 | 2.5 | | 1.48 | 472 | 1631 | 1282 | 696 |
| 31.0 | 6.9 | 14.4 | | 6.8 | 14.05 | | 0 | 121 | 3711 | 3711 | 1.08 | 3.8 | 253 | 0.9 | 1.9 | 2.7 | | 1.54 | 529 | 1821 | 1410 | 814 |
| 32.0 | 8.75 | 19.4 | | 8.4 | 19.05 | | 0 | 125 | 3835 | 3835 | 1.26 | 4.6 | 368 | | | | | 1.74 | 769 | | | 1335 |
| 33.0 | 6.2 | 15.6 | 0 | 6.0 | 15.25 | | 0 | 122 | 4014 | 4014 | 1.56 | 3.1 | 322 | | | | | 1.37 | 673 | | | 925 |

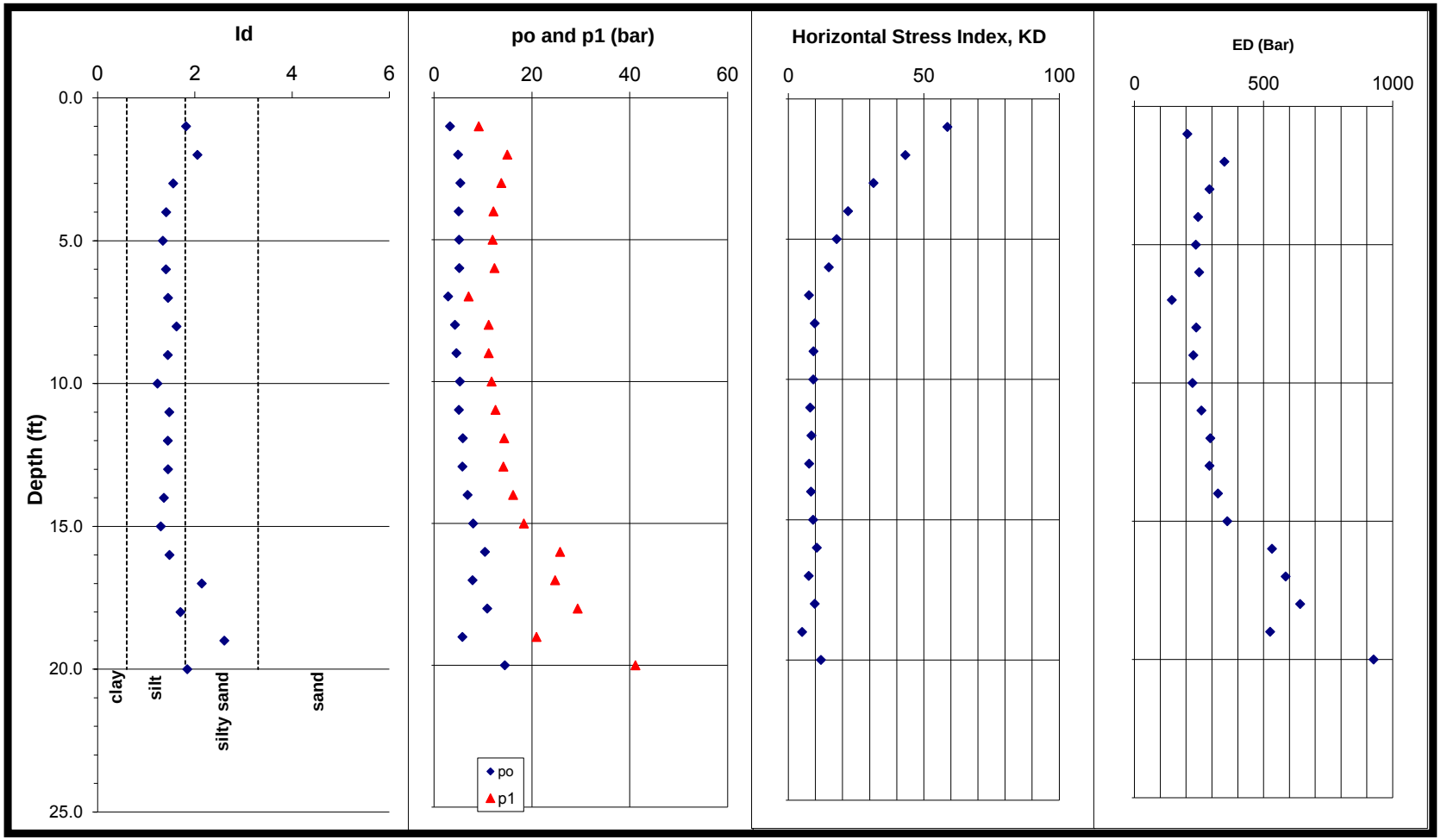
# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB1_B2
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB1_B2
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



| | | | Membrane 1 | Membrane 2 | Membrane 3 | | | |
|---|---|---|---|---|---|---|---|---|
| Job No: | 16-54112 | | | | | | | |
| Job Name: | SITE #2 (STRUCTURE #2 ANI | ΔA = | 0.125 | 0 | 0 | | | |
| Job Location: | Greensboro, NC | ΔB = | 0.65 | 0 | 0 | | | |
| Date: | 12-20-16 | Zm= | 0 | bar | | Northing | 874584 | |
| Sounding No: | STR2_EB1_B2 | | | | | Easting | 1777560 | |
| Ground Water Depth (ft): | N/A | | | | | | | |

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

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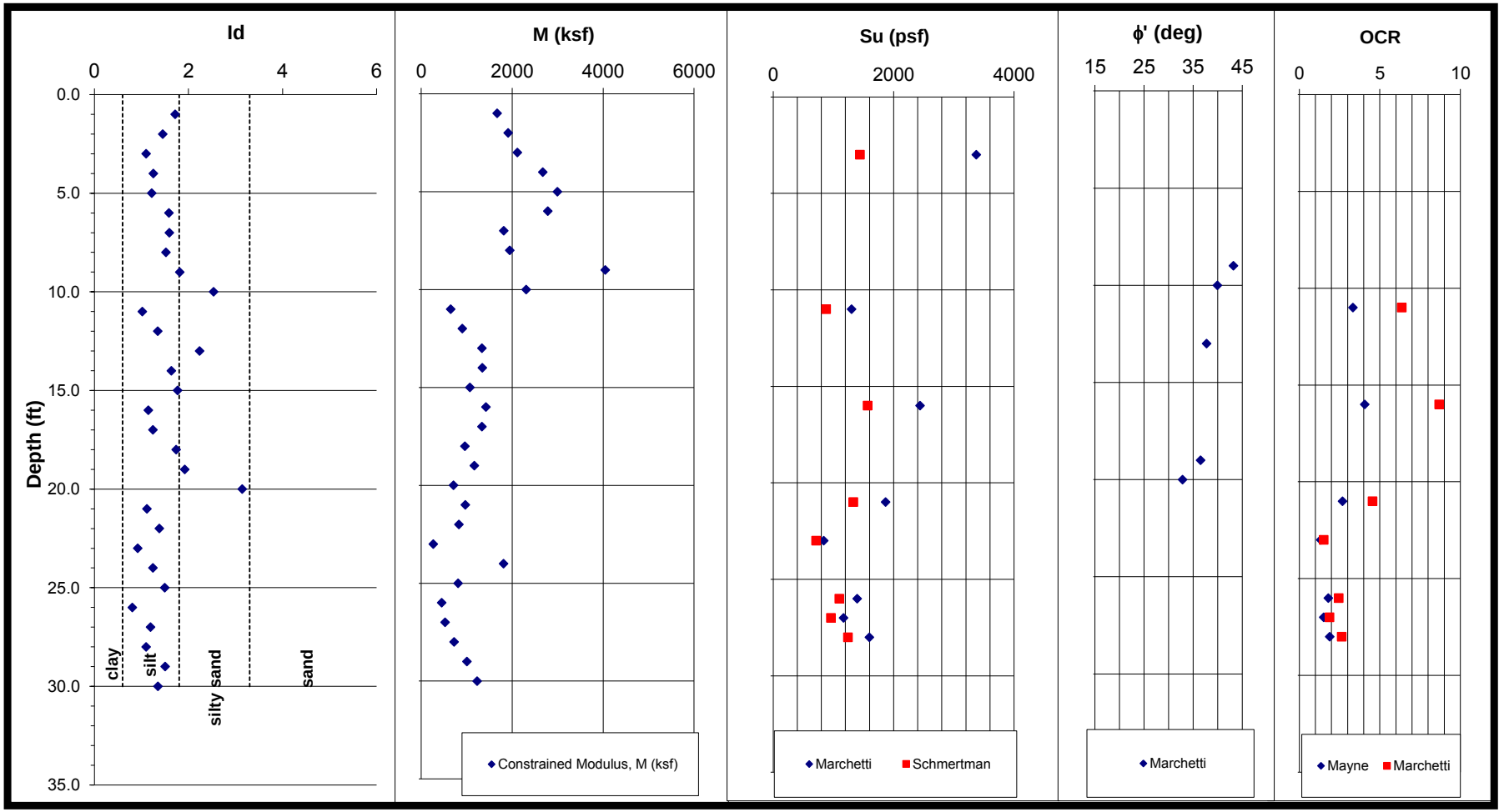
## *DILATOMETER TEST RESULTS*

| Depth[1] (ft) | A (bar) | B (bar) | C (bar) | po (bar) | p1 (bar) | p2 (bar) | $u_o$ (psf) | $\gamma_T$[5] (pcf) | $\sigma_{vo}$ (psf) | $\sigma_{vo}'$ (psf) | Id | $K_D$ | $E_D$ (bar) | $K_o$ | OCR[2] | OCR[3] | $\phi'$[3] (deg) | $R_M$ | $E_D$ (ksf) | $s_u$[3] (psf) | $s_u$[4] (psf) | M (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 3.4 | 9.8 | | 3.2 | 9.15 | | 0 | 115 | 115 | 115 | 1.82 | 58.7 | 205 | | | | 47.3 | 4.18 | 428 | | | 1788 |
| 2.0 | 5.25 | 15.6 | | 4.9 | 14.95 | | 0 | 121 | 236 | 236 | 2.05 | 43.3 | 349 | | | | 46.3 | 3.89 | 729 | | | 2832 |
| 3.0 | 5.65 | 14.4 | 0 | 5.4 | 13.75 | | 0 | 120 | 357 | 357 | 1.56 | 31.5 | 291 | | | | | 3.59 | 607 | | | 2176 |
| 4.0 | 5.25 | 12.8 | | 5.0 | 12.15 | | 0 | 119 | 476 | 476 | 1.41 | 22.1 | 247 | | | | | 3.25 | 516 | | | 1676 |
| 5.0 | 5.3 | 12.6 | | 5.1 | 11.95 | | 0 | 119 | 595 | 595 | 1.34 | 17.9 | 238 | | | | | 3.05 | 497 | | | 1515 |
| 6.0 | 5.35 | 13 | 0 | 5.1 | 12.35 | | 0 | 119 | 714 | 714 | 1.41 | 15.0 | 250 | | | | | 2.88 | 523 | | | 1509 |
| 7.0 | 2.95 | 7.7 | | 2.9 | 7.05 | | 0 | 113 | 789 | 789 | 1.45 | 7.6 | 145 | | | | | 2.24 | 302 | | | 676 |
| 8.0 | 4.45 | 11.8 | | 4.2 | 11.15 | | 0 | 118 | 907 | 907 | 1.63 | 9.8 | 240 | | | | | 2.48 | 500 | | | 1240 |
| 9.0 | 4.75 | 11.8 | 0 | 4.6 | 11.15 | | 0 | 118 | 1025 | 1025 | 1.44 | 9.3 | 229 | | | | | 2.43 | 478 | | | 1160 |
| 10.0 | 5.45 | 12.4 | | 5.3 | 11.75 | | 0 | 119 | 1187 | 1187 | 1.23 | 9.3 | 225 | | | | | 2.42 | 470 | | | 1139 |
| 11.0 | 5.3 | 13.2 | | 5.1 | 12.55 | | 0 | 119 | 1307 | 1307 | 1.48 | 8.1 | 260 | | | | | 2.30 | 542 | | | 1245 |
| 12.0 | 6.15 | 15 | 0 | 5.9 | 14.35 | | 0 | 121 | 1428 | 1428 | 1.44 | 8.6 | 294 | | | | | 2.35 | 614 | | | 1446 |
| 13.0 | 6.05 | 14.8 | | 5.8 | 14.15 | | 0 | 121 | 1571 | 1571 | 1.45 | 7.7 | 291 | | | | | 2.24 | 607 | | | 1362 |
| 14.0 | 7.15 | 16.8 | | 6.8 | 16.15 | | 0 | 122 | 1693 | 1693 | 1.36 | 8.4 | 323 | | | | | 2.33 | 675 | | | 1576 |
| 15.0 | 8.35 | 19 | 0 | 8.0 | 18.35 | | 0 | 124 | 1817 | 1817 | 1.30 | 9.2 | 360 | | | | | 2.42 | 751 | | | 1815 |
| 16.0 | 11 | 26.4 | | 10.4 | 25.75 | | 0 | 128 | 2052 | 2052 | 1.48 | 10.6 | 533 | | | | | 2.55 | 1113 | | | 2842 |
| 17.0 | 8.55 | 25.4 | | 7.9 | 24.75 | | 0 | 127 | 2179 | 2179 | 2.14 | 7.5 | 586 | | | | 39.2 | 2.24 | 1223 | | | 2740 |
| 18.0 | 11.6 | 30 | 0 | 10.8 | 29.35 | | 0 | 130 | 2309 | 2309 | 1.71 | 9.8 | 642 | | | | | 2.48 | 1341 | | | 3328 |
| 19.0 | 6.4 | 21.6 | | 5.8 | 20.95 | | 0 | 124 | 2365 | 2365 | 2.61 | 5.1 | 526 | | | | 37.3 | 1.90 | 1098 | | | 2088 |
| 20.0 | 15.6 | 41.8 | | 14.5 | 41.15 | | 0 | 134 | 2499 | 2499 | 1.85 | 12.1 | 926 | | | | 41.3 | 2.68 | 1935 | | | 5183 |

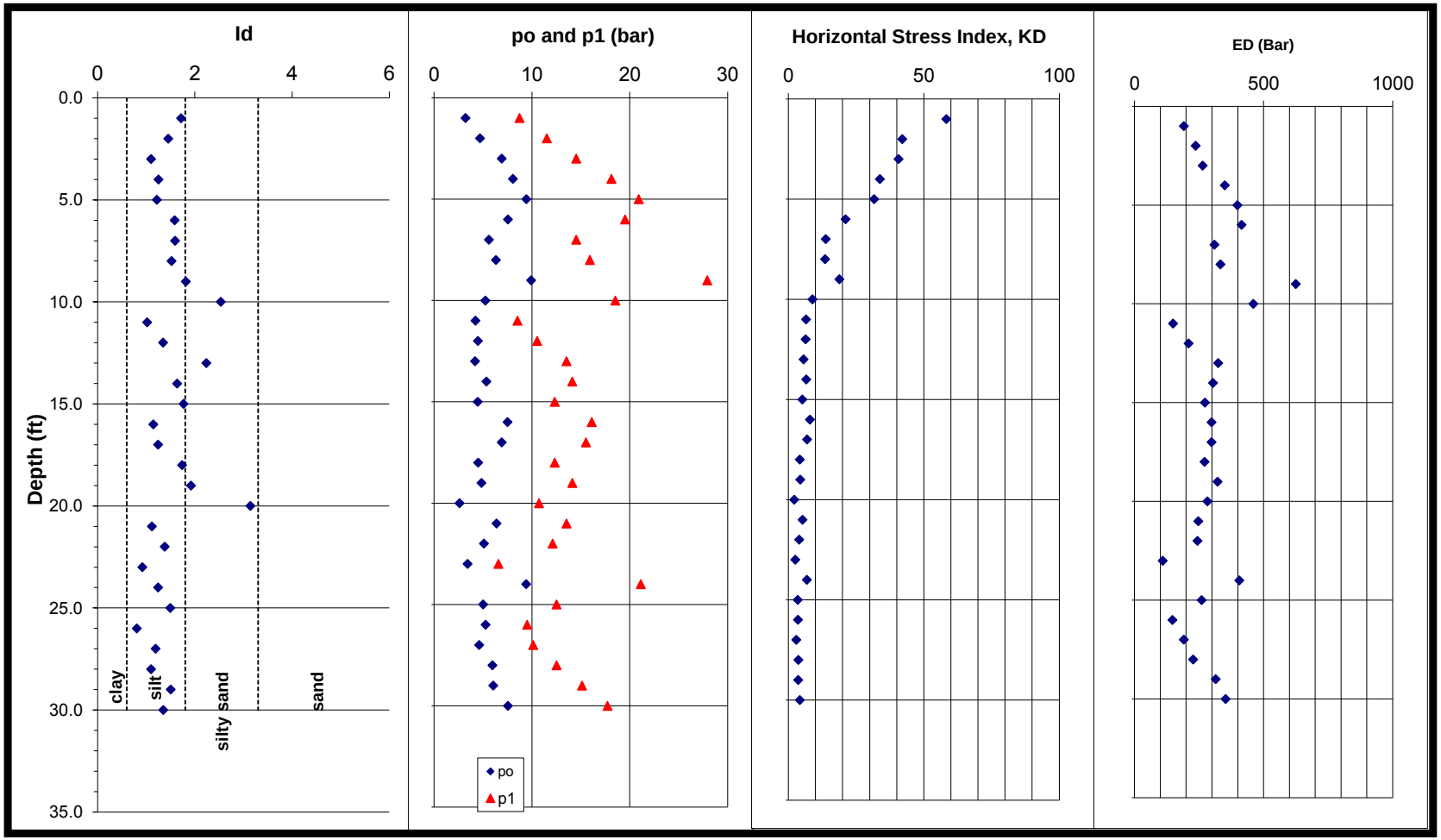
# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB1_B3
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB1_B3
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



Job No: 16-54112
Job Name: SITE #2 (STRUCTURE #2 AND
Job Location: Greensboro, NC
Date: 12-20-16
Sounding No: STR2_EB1_B3
Ground Water Depth (ft): N/A

| | Membrane 1 | Membrane 2 | Membrane 3 |
|---|---|---|---|
| ΔA = | 0.175 | 0 | 0 |
| ΔB = | 0.475 | 0 | 0 |
| Zm= | 0 | bar | |

Latitude: 36.15071
Longitude: -79.75336

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

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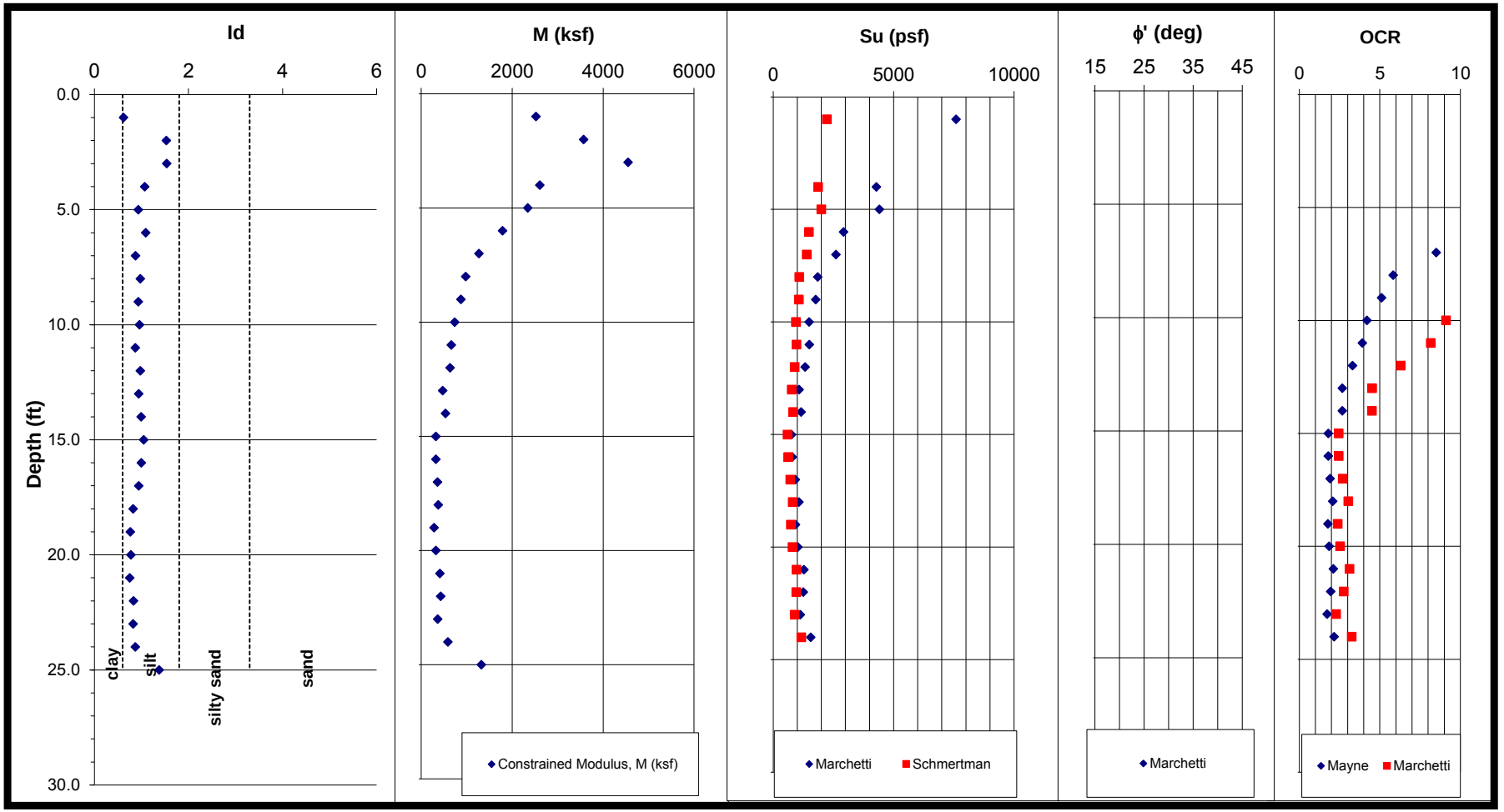
## DILATOMETER TEST RESULTS

| Depth[1] (ft) | A (bar) | B (bar) | C (bar) | po (bar) | p1 (bar) | p2 (bar) | $u_o$ (psf) | $\gamma_T$[5] (pcf) | $\sigma_{vo}$ (psf) | $\sigma_{vo}'$ (psf) | Id | $K_D$ | $E_D$ (bar) | $K_o$ | OCR[2] | OCR[3] | $\phi$[3] (deg) | $R_M$ | $E_D$ (ksf) | $s_u$[3] (psf) | $s_u$[4] (psf) | M (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 3.3 | 9.2 | | 3.2 | 8.725 | | 0 | 115 | 115 | 115 | 1.72 | 58.4 | 191 | | | | | 4.17 | 400 | | | 1666 |
| 2.0 | 4.85 | 12 | | 4.7 | 11.525 | | 0 | 118 | 233 | 233 | 1.45 | 42.1 | 237 | | | | | 3.86 | 495 | | | 1910 |
| 3.0 | 7.1 | 15 | 0 | 6.9 | 14.525 | | 0 | 121 | 355 | 355 | 1.10 | 40.7 | 264 | 4.1 | 20.7 | 110.1 | | 3.83 | 552 | 3373 | 1444 | 2113 |
| 4.0 | 8.35 | 18.6 | | 8.0 | 18.125 | | 0 | 124 | 496 | 496 | 1.25 | 33.9 | 350 | | | | | 3.66 | 731 | | | 2670 |
| 5.0 | 9.8 | 21.4 | | 9.4 | 20.925 | | 0 | 126 | 622 | 622 | 1.22 | 31.7 | 399 | | | | | 3.59 | 833 | | | 2993 |
| 6.0 | 7.95 | 20 | 0.6 | 7.6 | 19.525 | 0.78 | 0 | 125 | 746 | 746 | 1.58 | 21.1 | 415 | | | | | 3.21 | 867 | | | 2784 |
| 7.0 | 5.85 | 15 | | 5.6 | 14.525 | | 0 | 121 | 847 | 847 | 1.59 | 13.8 | 310 | | | | | 2.81 | 647 | | | 1815 |
| 8.0 | 6.6 | 16.4 | | 6.3 | 15.925 | | 0 | 122 | 969 | 969 | 1.52 | 13.6 | 333 | | | | | 2.79 | 696 | | | 1944 |
| 9.0 | 10.6 | 28.4 | 1.1 | 9.9 | 27.925 | 1.28 | 0 | 129 | 1098 | 1098 | 1.82 | 18.9 | 625 | | | | 43.2 | 3.10 | 1305 | | | 4047 |
| 10.0 | 5.7 | 19 | | 5.2 | 18.525 | | 0 | 123 | 1230 | 1230 | 2.53 | 8.9 | 461 | | | | 40.0 | 2.40 | 963 | | | 2306 |
| 11.0 | 4.25 | 9 | | 4.2 | 8.525 | | 0 | 115 | 1345 | 1345 | 1.02 | 6.6 | 149 | 1.4 | 3.3 | 6.4 | | 2.08 | 312 | 1304 | 881 | 648 |
| 12.0 | 4.6 | 11 | 0 | 4.5 | 10.525 | | 0 | 117 | 1463 | 1463 | 1.35 | 6.4 | 210 | | | | | 2.07 | 438 | | | 904 |
| 13.0 | 4.45 | 14 | | 4.2 | 13.525 | | 0 | 120 | 1554 | 1554 | 2.24 | 5.6 | 324 | | | | 37.8 | 1.97 | 677 | | | 1335 |
| 14.0 | 5.6 | 14.6 | | 5.4 | 14.125 | | 0 | 121 | 1674 | 1674 | 1.64 | 6.7 | 304 | | | | | 2.11 | 635 | | | 1343 |
| 15.0 | 4.65 | 12.8 | 0 | 4.5 | 12.325 | | 0 | 119 | 1793 | 1793 | 1.77 | 5.2 | 273 | | | | | 1.88 | 571 | | | 1071 |
| 16.0 | 7.75 | 16.6 | | 7.5 | 16.125 | | 0 | 123 | 1961 | 1961 | 1.15 | 8.0 | 299 | 1.6 | 4.1 | 8.7 | | 2.28 | 624 | 2442 | 1570 | 1422 |
| 17.0 | 7.15 | 16 | | 6.9 | 15.525 | | 0 | 122 | 2083 | 2083 | 1.25 | 6.9 | 299 | | | | | 2.14 | 624 | | | 1335 |
| 18.0 | 4.7 | 12.8 | 0 | 4.5 | 12.325 | | 0 | 119 | 2202 | 2202 | 1.74 | 4.3 | 271 | | | | | 1.69 | 567 | | | 959 |
| 19.0 | 5.1 | 14.6 | | 4.8 | 14.125 | | 0 | 120 | 2287 | 2287 | 1.92 | 4.4 | 322 | | | | 36.5 | 1.73 | 673 | | | 1167 |
| 20.0 | 2.8 | 11.2 | | 2.6 | 10.725 | | 0 | 116 | 2403 | 2403 | 3.14 | 2.2 | 282 | | | | 32.9 | 1.20 | 590 | | | 710 |
| 21.0 | 6.55 | 14 | 0 | 6.4 | 13.525 | | 0 | 120 | 2523 | 2523 | 1.12 | 5.3 | 248 | 1.2 | 2.7 | 4.6 | | 1.87 | 517 | 1870 | 1334 | 967 |
| 22.0 | 5.25 | 12.6 | | 5.1 | 12.125 | | 0 | 119 | 2618 | 2618 | 1.38 | 4.1 | 244 | | | | | 1.62 | 510 | | | 827 |
| 23.0 | 3.4 | 7.05 | | 3.4 | 6.575 | | 0 | 112 | 2730 | 2730 | 0.92 | 2.6 | 109 | 0.7 | 1.3 | 1.5 | | 1.16 | 228 | 842 | 715 | 264 |
| 24.0 | 9.8 | 21.6 | 0 | 9.4 | 21.125 | | 0 | 126 | 2856 | 2856 | 1.24 | 6.9 | 406 | | | | | 2.13 | 848 | | | 1810 |
| 25.0 | 5.2 | 13 | | 5.0 | 12.525 | | 0 | 119 | 2983 | 2983 | 1.50 | 3.5 | 261 | | | | | 1.49 | 544 | | | 810 |
| 26.0 | 5.3 | 10 | | 5.3 | 9.525 | | 0 | 116 | 3099 | 3099 | 0.81 | 3.6 | 148 | 0.9 | 1.8 | 2.5 | | 1.45 | 308 | 1398 | 1101 | 448 |
| 27.0 | 4.7 | 10.6 | 0 | 4.6 | 10.125 | | 0 | 117 | 3216 | 3216 | 1.20 | 3.0 | 191 | 0.8 | 1.5 | 1.9 | | 1.31 | 400 | 1172 | 963 | 524 |
| 28.0 | 6.1 | 13 | | 6.0 | 12.525 | | 0 | 120 | 3347 | 3347 | 1.10 | 3.7 | 228 | 0.9 | 1.9 | 2.6 | | 1.52 | 476 | 1600 | 1245 | 722 |
| 29.0 | 6.3 | 15.6 | | 6.0 | 15.125 | | 0 | 122 | 3469 | 3469 | 1.50 | 3.6 | 315 | | | | | 1.52 | 658 | | | 1003 |
| 30.0 | 7.85 | 18.2 | 0 | 7.5 | 17.725 | | 0 | 124 | 3709 | 3709 | 1.35 | 4.2 | 353 | | | | | 1.66 | 738 | | | 1228 |

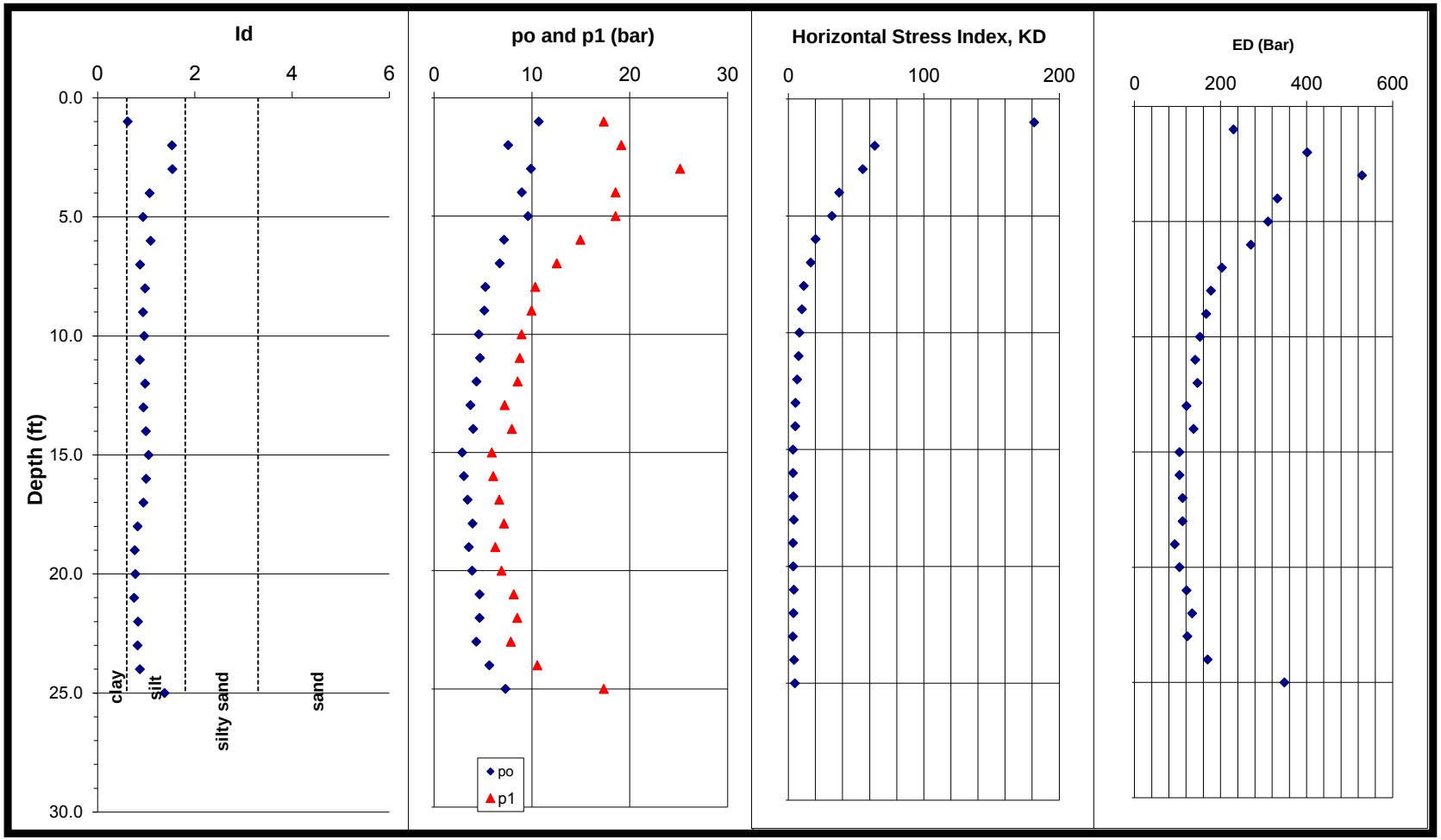
# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB2_B1
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB2_B1
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



| | | Membrane 1 | Membrane 2 | Membrane 3 | | |
|---|---|---|---|---|---|---|
| Job No: | 16-54112 | | | | | |
| Job Name: | SITE #2 (STRUCTURE #2 ANI | ΔA = | 0.225 | 0 | 0 | |
| Job Location: | Greensboro, NC | ΔB = | 0.25 | 0 | 0 | |
| Date: | 12-21-16 | Zm= | 0 | bar | Northing | 874655 |
| Sounding No: | STR2_EB2_B1 | | | | Easting | 1777453 |
| Ground Water Depth (ft): | N/A | | | | | |

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

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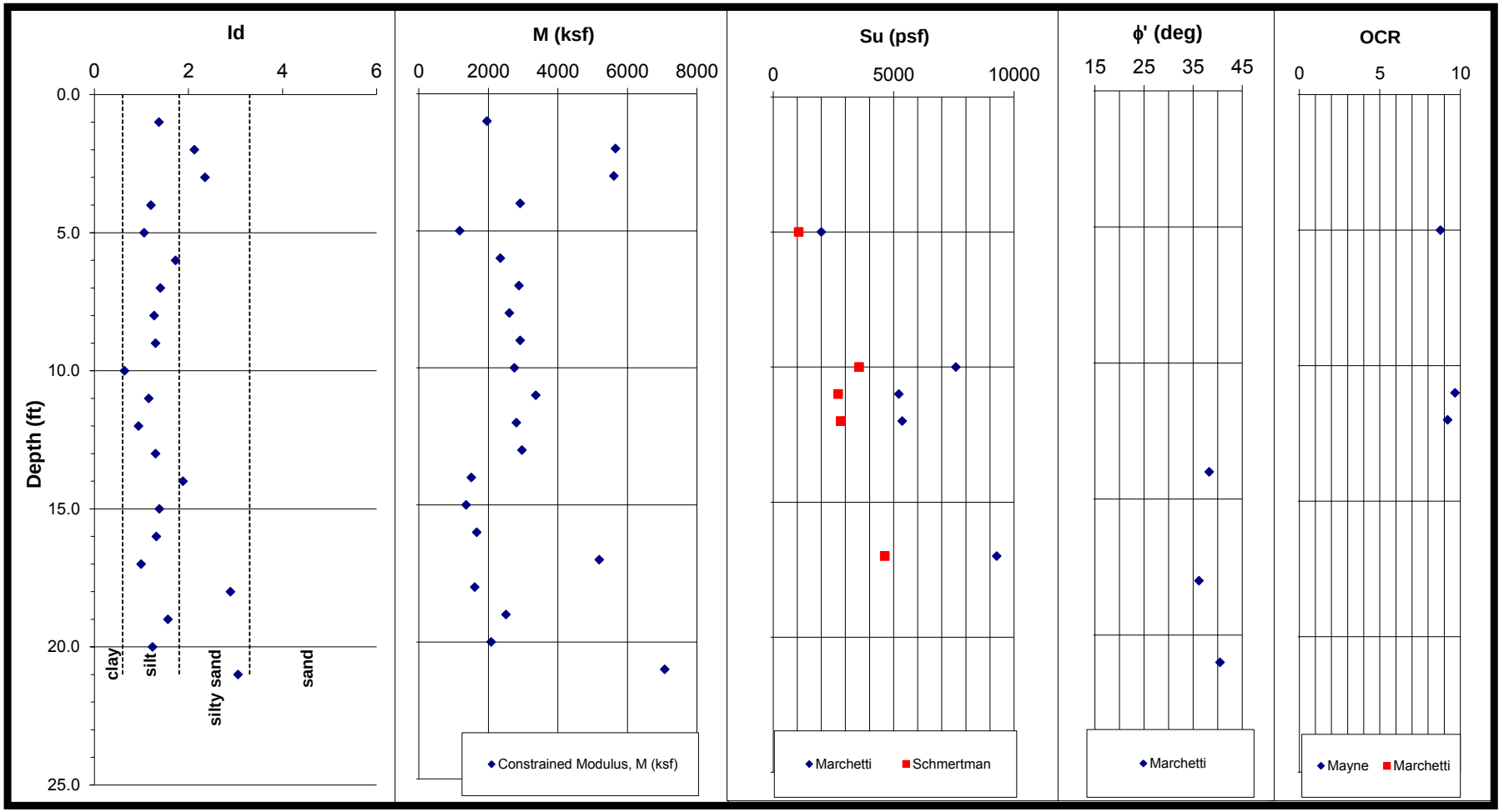
## DILATOMETER TEST RESULTS

| Depth[1] (ft) | A (bar) | B (bar) | C (bar) | po (bar) | p1 (bar) | p2 (bar) | $u_o$ (psf) | $\gamma_T$[5] (pcf) | $\sigma_{vo}$ (psf) | $\sigma_{vo}'$ (psf) | Id | $K_D$ | $E_D$ (bar) | $K_o$ | OCR[2] | OCR[3] | $\phi$'[3] (deg) | $R_M$ | $E_D$ (ksf) | $s_u$[3] (psf) | $s_u$[4] (psf) | M (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 10.8 | 17.6 | | 10.7 | 17.35 | | 0 | 123 | 123 | 123 | 0.62 | 181.6 | 230 | 8.9 | 92.4 | 1134.0 | | 5.24 | 481 | 7594 | 2237 | 2524 |
| 2.0 | 7.9 | 19.4 | | 7.6 | 19.15 | | 0 | 124 | 248 | 248 | 1.53 | 63.9 | 402 | | | | | 4.26 | 839 | | | 3570 |
| 3.0 | 10.4 | 25.4 | 0.15 | 9.9 | 25.15 | 0.38 | 0 | 128 | 376 | 376 | 1.54 | 55.1 | 529 | | | | | 4.11 | 1105 | | | 4548 |
| 4.0 | 9.2 | 18.8 | | 9.0 | 18.55 | | 0 | 124 | 497 | 497 | 1.07 | 37.7 | 332 | 3.9 | 19.2 | 97.5 | | 3.76 | 694 | 4292 | 1873 | 2608 |
| 5.0 | 9.8 | 18.8 | | 9.6 | 18.55 | | 0 | 124 | 622 | 622 | 0.93 | 32.2 | 311 | 3.6 | 16.4 | 76.5 | | 3.61 | 649 | 4419 | 2005 | 2341 |
| 6.0 | 7.3 | 15.2 | 0 | 7.2 | 14.95 | | 0 | 122 | 743 | 743 | 1.09 | 20.1 | 271 | 2.8 | 10.2 | 36.6 | | 3.16 | 565 | 2926 | 1494 | 1786 |
| 7.0 | 6.75 | 12.8 | | 6.7 | 12.55 | | 0 | 120 | 837 | 837 | 0.87 | 16.7 | 203 | 2.5 | 8.5 | 27.4 | | 2.99 | 424 | 2616 | 1399 | 1267 |
| 8.0 | 5.25 | 10.6 | | 5.2 | 10.35 | | 0 | 117 | 954 | 954 | 0.98 | 11.5 | 178 | 2.0 | 5.8 | 15.2 | | 2.63 | 371 | 1859 | 1093 | 975 |
| 9.0 | 5.15 | 10.2 | 0 | 5.1 | 9.95 | | 0 | 117 | 1071 | 1071 | 0.93 | 10.0 | 167 | 1.8 | 5.1 | 12.4 | | 2.50 | 348 | 1770 | 1075 | 872 |
| 10.0 | 4.55 | 9.2 | | 4.6 | 8.95 | | 0 | 116 | 1156 | 1156 | 0.96 | 8.3 | 152 | 1.6 | 4.2 | 9.1 | | 2.31 | 318 | 1495 | 954 | 733 |
| 11.0 | 4.65 | 9 | | 4.7 | 8.75 | | 0 | 115 | 1271 | 1271 | 0.87 | 7.7 | 141 | 1.6 | 3.9 | 8.2 | | 2.24 | 295 | 1506 | 978 | 659 |
| 12.0 | 4.3 | 8.8 | 0 | 4.3 | 8.55 | | 0 | 115 | 1386 | 1386 | 0.98 | 6.5 | 147 | 1.4 | 3.3 | 6.3 | | 2.07 | 306 | 1334 | 903 | 634 |
| 13.0 | 3.65 | 7.45 | | 3.7 | 7.2 | | 0 | 113 | 1470 | 1470 | 0.94 | 5.3 | 121 | 1.2 | 2.7 | 4.5 | | 1.86 | 253 | 1085 | 775 | 470 |
| 14.0 | 3.95 | 8.2 | | 4.0 | 7.95 | | 0 | 114 | 1585 | 1585 | 0.99 | 5.3 | 138 | 1.2 | 2.7 | 4.5 | | 1.86 | 287 | 1166 | 833 | 533 |
| 15.0 | 2.8 | 6.15 | 0 | 2.9 | 5.9 | | 0 | 111 | 1695 | 1695 | 1.05 | 3.5 | 105 | 0.9 | 1.8 | 2.4 | | 1.47 | 219 | 764 | 602 | 321 |
| 16.0 | 2.95 | 6.3 | | 3.0 | 6.05 | | 0 | 111 | 1779 | 1779 | 1.00 | 3.6 | 105 | 0.9 | 1.8 | 2.5 | | 1.47 | 219 | 804 | 633 | 321 |
| 17.0 | 3.35 | 6.9 | | 3.4 | 6.65 | | 0 | 112 | 1891 | 1891 | 0.94 | 3.8 | 112 | 0.9 | 1.9 | 2.7 | | 1.52 | 234 | 922 | 715 | 357 |
| 18.0 | 3.85 | 7.4 | 0 | 3.9 | 7.15 | | 0 | 113 | 2004 | 2004 | 0.82 | 4.1 | 112 | 1.0 | 2.1 | 3.0 | | 1.60 | 234 | 1077 | 819 | 373 |
| 19.0 | 3.45 | 6.5 | | 3.5 | 6.25 | | 0 | 111 | 2117 | 2117 | 0.76 | 3.5 | 94 | 0.9 | 1.8 | 2.4 | | 1.43 | 196 | 937 | 741 | 281 |
| 20.0 | 3.8 | 7.15 | | 3.9 | 6.9 | | 0 | 113 | 2230 | 2230 | 0.78 | 3.6 | 105 | 0.9 | 1.9 | 2.5 | | 1.47 | 219 | 1035 | 811 | 323 |
| 21.0 | 4.6 | 8.4 | 0 | 4.7 | 8.15 | | 0 | 114 | 2344 | 2344 | 0.75 | 4.2 | 121 | 1.0 | 2.1 | 3.1 | | 1.61 | 253 | 1285 | 973 | 407 |
| 22.0 | 4.6 | 8.75 | | 4.6 | 8.5 | | 0 | 115 | 2529 | 2529 | 0.83 | 3.8 | 134 | 1.0 | 2.0 | 2.8 | | 1.53 | 280 | 1255 | 969 | 428 |
| 23.0 | 4.25 | 8.1 | | 4.3 | 7.85 | | 0 | 114 | 2643 | 2643 | 0.82 | 3.4 | 123 | 0.9 | 1.7 | 2.3 | | 1.41 | 257 | 1130 | 899 | 362 |
| 24.0 | 5.65 | 10.8 | 0 | 5.6 | 10.55 | | 0 | 117 | 2761 | 2761 | 0.87 | 4.3 | 170 | 1.0 | 2.2 | 3.3 | | 1.64 | 356 | 1566 | 1178 | 584 |
| 25.0 | 7.55 | 17.6 | | 7.3 | 17.35 | | 0 | 123 | 3084 | 3084 | 1.38 | 4.9 | 349 | | | | | 1.81 | 729 | | | 1321 |

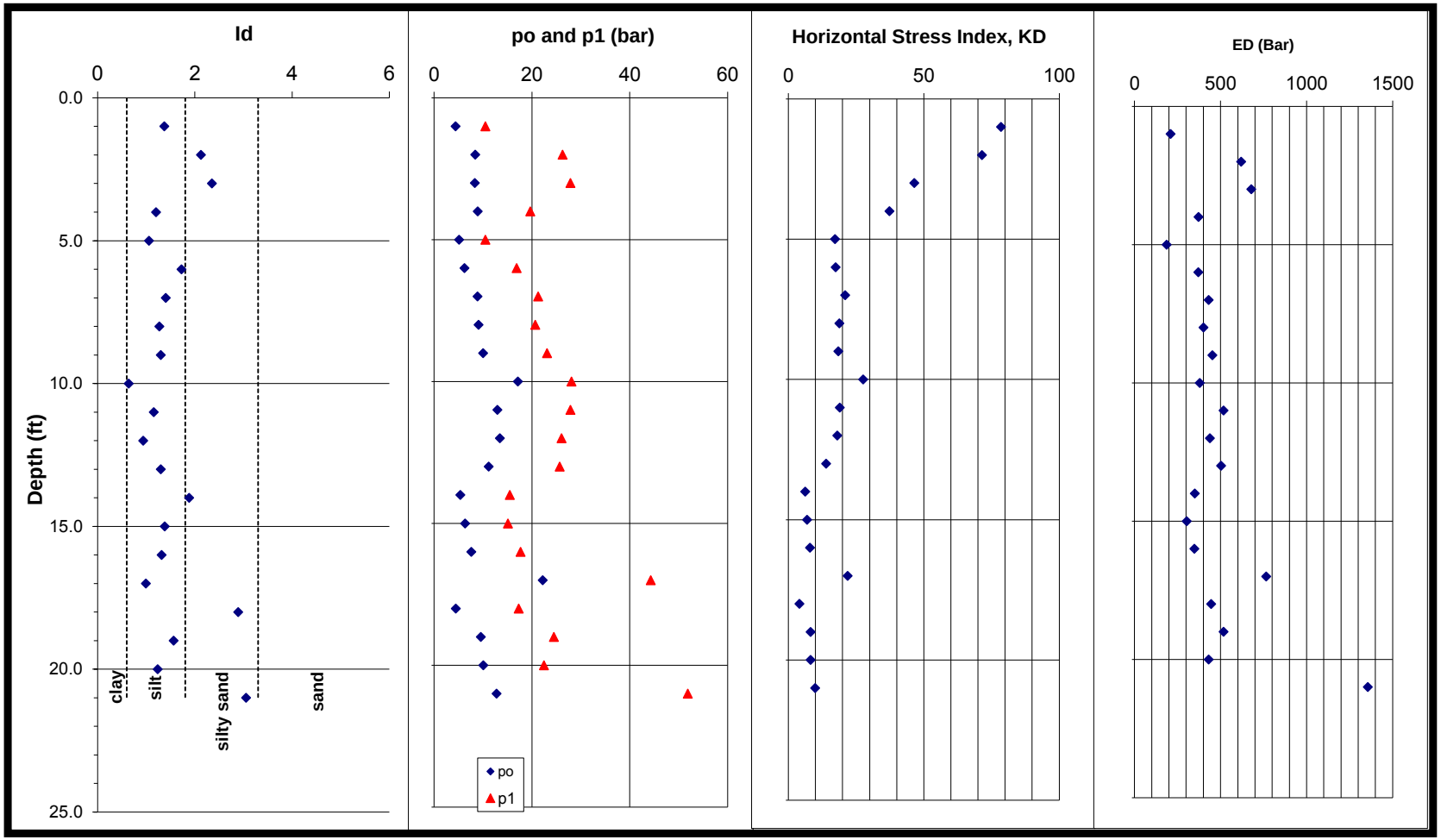
# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB2_B2
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB2_B2
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



Job No: 16-54112
Job Name: SITE #2 (STRUCTURE #2 ANI
Job Location: Greensboro, NC
Date: 12-21-16
Sounding No: STR2_EB2_B2
Ground Water Depth (ft): N/A

| | Membrane 1 | Membrane 2 | Membrane 3 |
|---|---|---|---|
| ΔA = | 0.25 | 0 | 0 |
| ΔB = | 0.125 | 0 | 0 |
| Zm= | 0 | bar | |

Northing 874591
Easting 1777450

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

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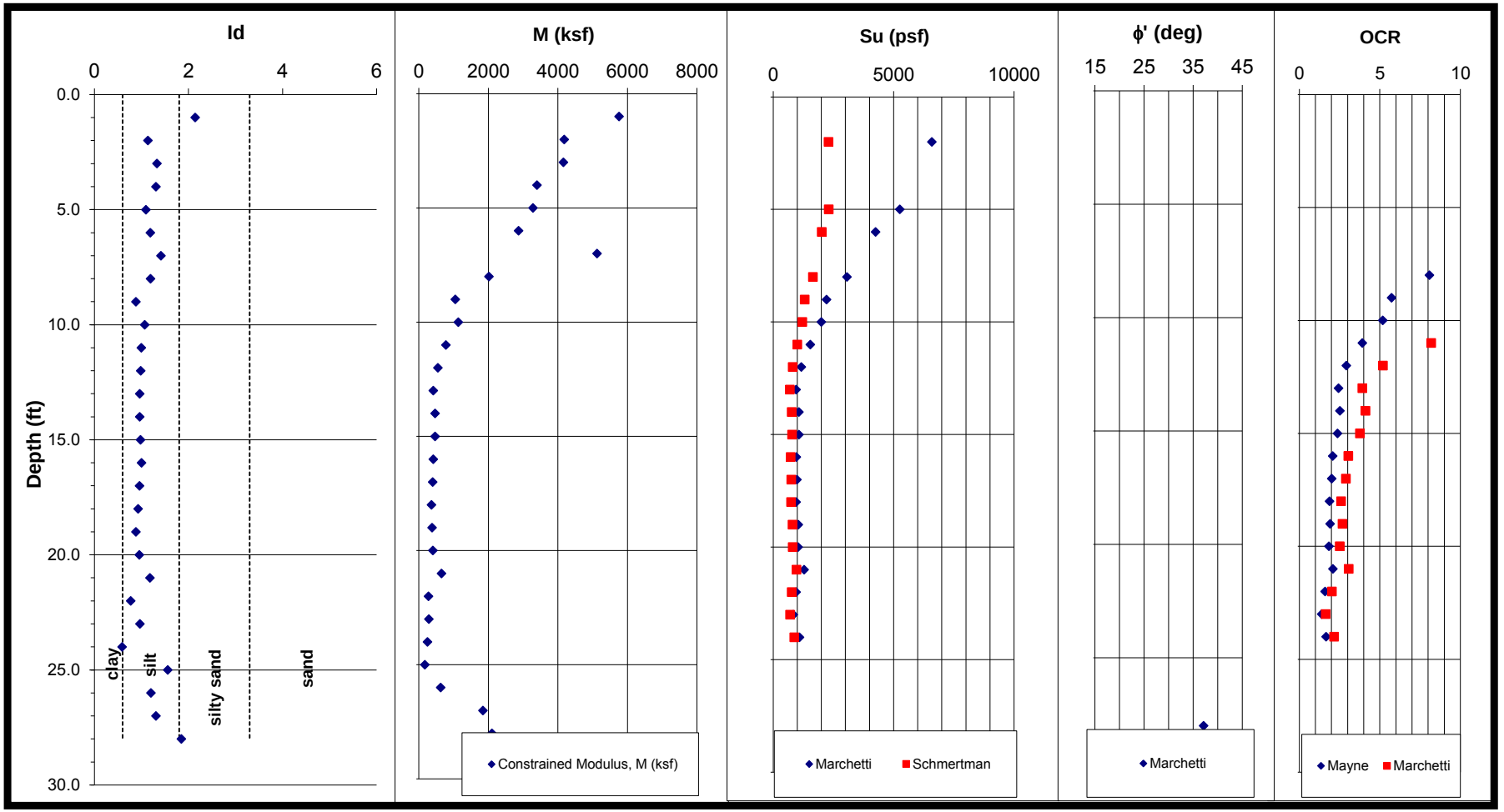
## DILATOMETER TEST RESULTS

| Depth[1] (ft) | A (bar) | B (bar) | C (bar) | po (bar) | p1 (bar) | p2 (bar) | $u_o$ (psf) | $\gamma_T$[5] (pcf) | $\sigma_{vo}$ (psf) | $\sigma_{vo}'$ (psf) | Id | $K_D$ | $E_D$ (bar) | $K_o$ | OCR[2] | OCR[3] | $\phi$'[3] (deg) | $R_M$ | $E_D$ (ksf) | $s_u$[3] (psf) | $s_u$[4] (psf) | M (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 4.45 | 10.6 | | 4.4 | 10.475 | | 0 | 117 | 117 | 117 | 1.37 | 78.6 | 210 | | | | | 4.45 | 439 | | | 1956 |
| 2.0 | 9 | 26.4 | | 8.4 | 26.275 | | 0 | 128 | 245 | 245 | 2.13 | 71.6 | 620 | | | | 47.9 | 4.36 | 1296 | | | 5653 |
| 3.0 | 9 | 28 | 0 | 8.3 | 27.875 | | 0 | 128 | 373 | 373 | 2.35 | 46.5 | 679 | | | | 46.5 | 3.96 | 1417 | | | 5606 |
| 4.0 | 9.2 | 19.8 | | 8.9 | 19.675 | | 0 | 125 | 500 | 500 | 1.20 | 37.3 | 373 | | | | | 3.75 | 778 | | | 2916 |
| 5.0 | 5.1 | 10.6 | | 5.1 | 10.475 | | 0 | 117 | 618 | 618 | 1.06 | 17.2 | 187 | 2.5 | 8.8 | 28.8 | | 3.01 | 390 | 2005 | 1064 | 1176 |
| 6.0 | 6.45 | 17 | 0 | 6.2 | 16.875 | | 0 | 123 | 740 | 740 | 1.73 | 17.5 | 371 | | | | | 3.03 | 774 | | | 2345 |
| 7.0 | 9.2 | 21.4 | | 8.9 | 21.275 | | 0 | 126 | 881 | 881 | 1.40 | 21.0 | 431 | | | | | 3.20 | 900 | | | 2882 |
| 8.0 | 9.4 | 20.8 | | 9.1 | 20.675 | | 0 | 126 | 1007 | 1007 | 1.27 | 18.9 | 402 | | | | | 3.10 | 839 | | | 2602 |
| 9.0 | 10.4 | 23.2 | 0.15 | 10.0 | 23.075 | 0.40 | 0 | 127 | 1134 | 1134 | 1.30 | 18.5 | 453 | | | | | 3.08 | 945 | | | 2913 |
| 10.0 | 17.4 | 28.2 | | 17.1 | 28.075 | | 0 | 129 | 1293 | 1293 | 0.64 | 27.7 | 380 | 3.3 | 14.1 | 60.3 | | 3.46 | 793 | 7590 | 3577 | 2748 |
| 11.0 | 13.4 | 28 | | 12.9 | 27.875 | | 0 | 129 | 1422 | 1422 | 1.15 | 19.0 | 518 | 2.7 | 9.7 | 33.5 | | 3.11 | 1082 | 5219 | 2702 | 3364 |
| 12.0 | 13.8 | 26.2 | 0.95 | 13.4 | 26.075 | 1.20 | 0 | 129 | 1551 | 1551 | 0.94 | 18.1 | 438 | 2.6 | 9.2 | 31.1 | | 3.06 | 915 | 5360 | 2809 | 2802 |
| 13.0 | 11.6 | 25.8 | | 11.2 | 25.675 | | 0 | 128 | 1668 | 1668 | 1.30 | 14.0 | 504 | | | | | 2.82 | 1052 | | | 2963 |
| 14.0 | 5.6 | 15.6 | | 5.4 | 15.475 | | 0 | 122 | 1790 | 1790 | 1.88 | 6.3 | 351 | | | | 38.3 | 2.06 | 732 | | | 1509 |
| 15.0 | 6.5 | 15.2 | 0.25 | 6.3 | 15.075 | 0.50 | 0 | 122 | 1912 | 1912 | 1.38 | 6.9 | 303 | | | | | 2.14 | 633 | | | 1357 |
| 16.0 | 7.85 | 17.8 | | 7.6 | 17.675 | | 0 | 124 | 1978 | 1978 | 1.32 | 8.0 | 349 | | | | | 2.29 | 729 | | | 1667 |
| 17.0 | 23 | 44.4 | | 22.2 | 44.275 | | 0 | 136 | 2114 | 2114 | 0.99 | 21.9 | 766 | 2.9 | 11.2 | 41.9 | | 3.24 | 1600 | 9281 | 4636 | 5190 |
| 18.0 | 4.8 | 17.4 | 0 | 4.4 | 17.275 | | 0 | 122 | 2235 | 2235 | 2.89 | 4.1 | 445 | | | | 36.2 | 1.73 | 930 | | | 1609 |
| 19.0 | 10 | 24.6 | | 9.5 | 24.475 | | 0 | 128 | 2423 | 2423 | 1.57 | 8.2 | 518 | | | | | 2.31 | 1082 | | | 2502 |
| 20.0 | 10.4 | 22.6 | | 10.1 | 22.475 | | 0 | 127 | 2549 | 2549 | 1.23 | 8.2 | 431 | | | | | 2.31 | 900 | | | 2078 |
| 21.0 | 14.4 | 52 | 0 | 12.8 | 51.875 | | 0 | 136 | 2685 | 2685 | 3.06 | 9.9 | 1356 | | | | 40.5 | 2.50 | 2833 | | | 7069 |

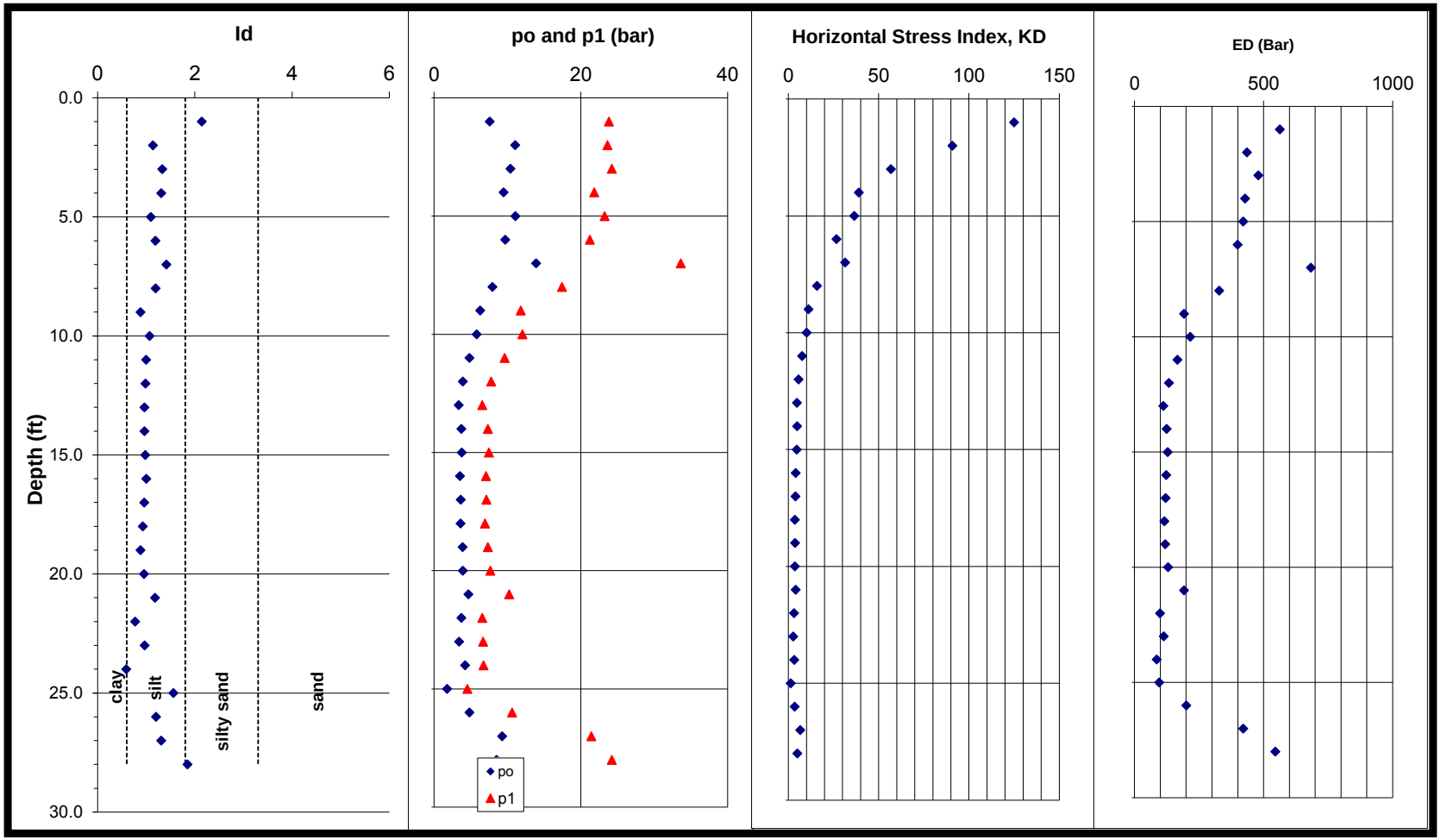
# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB2_B3
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR2_EB2_B3
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



| | | Membrane 1 | Membrane 2 | Membrane 3 | | |
|---|---|---|---|---|---|---|
| Job No: | 16-54112 | | | | | |
| Job Name: | SITE #2 (STRUCTURE #2 ANI | ΔA = | 0.25 | 0 | 0 | |
| Job Location: | Greensboro, NC | ΔB = | 0.175 | 0 | 0 | |
| Date: | 12-21-16 | Zm= | 0 | bar | Northing | 874627 |
| Sounding No: | STR2_EB2_B3 | | | | Easting | 1777441 |
| Ground Water Depth (ft): | N/A | | | | | |

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

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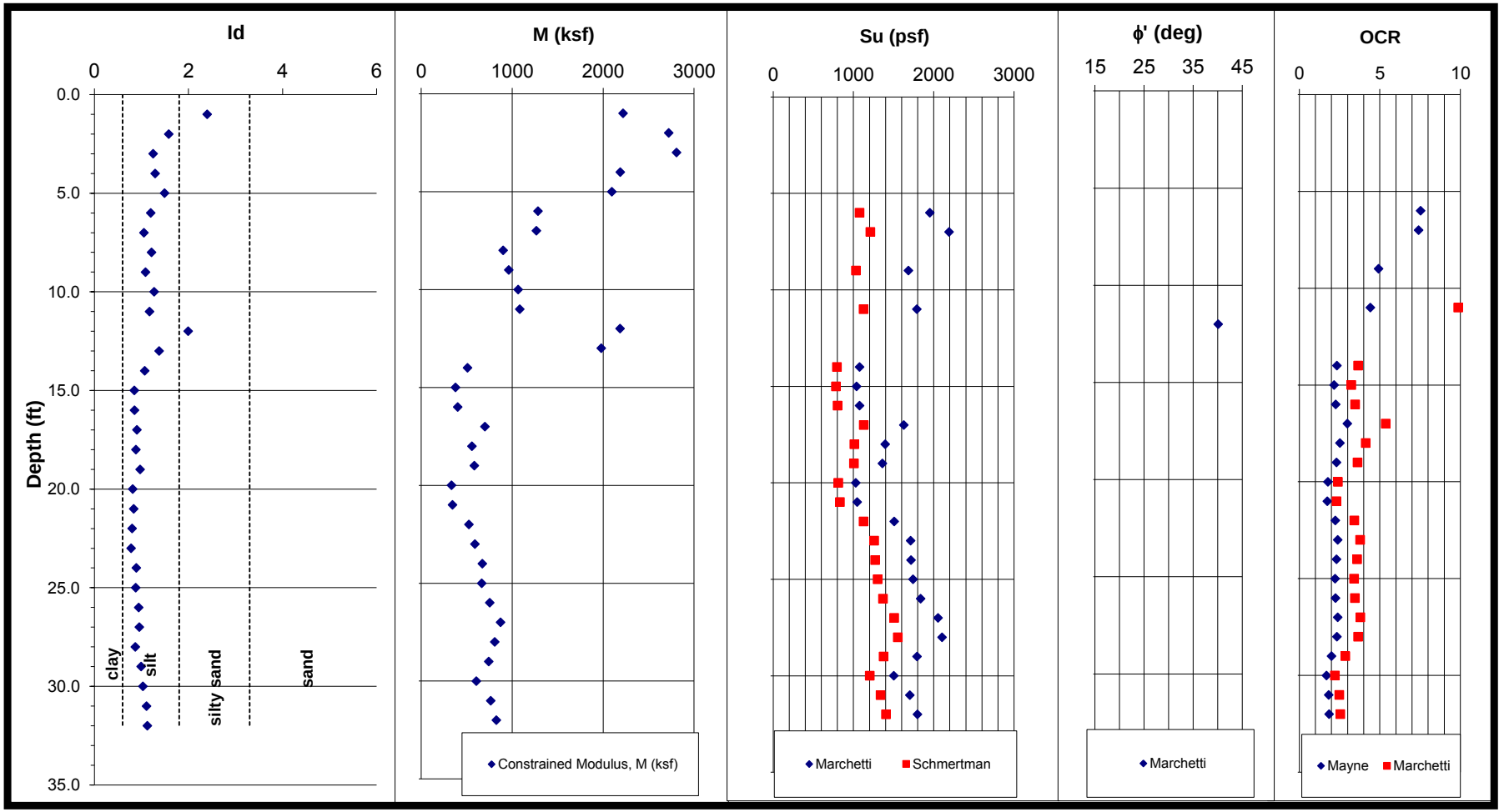
## DILATOMETER TEST RESULTS

| Depth[1] (ft) | A (bar) | B (bar) | C (bar) | po (bar) | p1 (bar) | p2 (bar) | $u_o$ (psf) | $\gamma_T$[5] (pcf) | $\sigma_{vo}$ (psf) | $\sigma_{vo}'$ (psf) | Id | $K_D$ | $E_D$ (bar) | $K_o$ | $OCR^2$ | $OCR^3$ | $\phi'^3$ (deg) | $R_M$ | $E_D$ (ksf) | $s_u$[3] (psf) | $s_u$[4] (psf) | M (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 8.1 | 24 | | 7.6 | 23.825 | | 0 | 127 | 127 | 127 | 2.14 | 125.0 | 564 | | | | 49.4 | 4.89 | 1178 | | | 5760 |
| 2.0 | 11.4 | 23.8 | | 11.1 | 23.625 | | 0 | 127 | 254 | 254 | 1.14 | 90.9 | 436 | 6.3 | 46.3 | 385.2 | | 4.59 | 911 | 6592 | 2308 | 4182 |
| 3.0 | 10.8 | 24.4 | 0 | 10.4 | 24.225 | | 0 | 128 | 382 | 382 | 1.33 | 56.9 | 480 | | | | | 4.15 | 1003 | | | 4157 |
| 4.0 | 9.8 | 22 | | 9.5 | 21.825 | | 0 | 126 | 505 | 505 | 1.31 | 39.1 | 429 | | | | | 3.79 | 896 | | | 3397 |
| 5.0 | 11.4 | 23.4 | | 11.1 | 23.225 | | 0 | 127 | 632 | 632 | 1.10 | 36.6 | 422 | 3.9 | 18.6 | 93.1 | | 3.73 | 881 | 5260 | 2312 | 3283 |
| 6.0 | 10 | 21.4 | 0 | 9.7 | 21.225 | | 0 | 126 | 758 | 758 | 1.19 | 26.7 | 400 | 3.3 | 13.6 | 57.1 | | 3.43 | 835 | 4261 | 2026 | 2865 |
| 7.0 | 14.6 | 33.8 | | 13.9 | 33.625 | | 0 | 132 | 922 | 922 | 1.42 | 31.5 | 684 | | | | | 3.59 | 1429 | | | 5124 |
| 8.0 | 8.15 | 17.6 | | 7.9 | 17.425 | | 0 | 124 | 1046 | 1046 | 1.19 | 15.9 | 329 | 2.4 | 8.1 | 25.3 | | 2.94 | 687 | 3065 | 1660 | 2017 |
| 9.0 | 6.3 | 12 | 0.5 | 6.3 | 11.825 | 0.75 | 0 | 119 | 1165 | 1165 | 0.88 | 11.3 | 192 | 2.0 | 5.7 | 14.8 | | 2.61 | 401 | 2225 | 1313 | 1049 |
| 10.0 | 5.85 | 12.2 | | 5.8 | 12.025 | | 0 | 119 | 1191 | 1191 | 1.07 | 10.2 | 216 | 1.9 | 5.2 | 12.7 | | 2.52 | 451 | 2003 | 1212 | 1135 |
| 11.0 | 4.8 | 9.8 | | 4.8 | 9.625 | | 0 | 116 | 1307 | 1307 | 1.00 | 7.7 | 167 | 1.6 | 3.9 | 8.2 | | 2.24 | 348 | 1552 | 1007 | 780 |
| 12.0 | 3.85 | 7.95 | 0 | 3.9 | 7.775 | | 0 | 114 | 1421 | 1421 | 0.99 | 5.8 | 134 | 1.3 | 2.9 | 5.2 | | 1.95 | 280 | 1172 | 818 | 545 |
| 13.0 | 3.25 | 6.75 | | 3.3 | 6.575 | | 0 | 112 | 1457 | 1457 | 0.96 | 4.8 | 112 | 1.1 | 2.4 | 3.9 | | 1.76 | 234 | 957 | 699 | 413 |
| 14.0 | 3.65 | 7.5 | | 3.7 | 7.325 | | 0 | 113 | 1570 | 1570 | 0.96 | 5.0 | 125 | 1.2 | 2.5 | 4.1 | | 1.80 | 261 | 1075 | 779 | 469 |
| 15.0 | 3.7 | 7.65 | 0 | 3.8 | 7.475 | | 0 | 114 | 1684 | 1684 | 0.98 | 4.7 | 128 | 1.1 | 2.4 | 3.8 | | 1.74 | 268 | 1072 | 788 | 467 |
| 16.0 | 3.45 | 7.25 | | 3.5 | 7.075 | | 0 | 113 | 1807 | 1807 | 1.00 | 4.1 | 123 | 1.0 | 2.1 | 3.0 | | 1.61 | 257 | 970 | 738 | 412 |
| 17.0 | 3.55 | 7.3 | | 3.6 | 7.125 | | 0 | 113 | 1920 | 1920 | 0.96 | 4.0 | 121 | 1.0 | 2.0 | 2.9 | | 1.57 | 253 | 990 | 759 | 397 |
| 18.0 | 3.5 | 7.1 | 0 | 3.6 | 6.925 | | 0 | 113 | 2032 | 2032 | 0.93 | 3.7 | 116 | 0.9 | 1.9 | 2.6 | | 1.50 | 242 | 962 | 750 | 362 |
| 19.0 | 3.8 | 7.5 | | 3.9 | 7.325 | | 0 | 113 | 2152 | 2152 | 0.88 | 3.8 | 119 | 0.9 | 1.9 | 2.7 | | 1.52 | 249 | 1046 | 812 | 378 |
| 20.0 | 3.85 | 7.85 | | 3.9 | 7.675 | | 0 | 114 | 2266 | 2266 | 0.96 | 3.6 | 130 | 0.9 | 1.8 | 2.5 | | 1.48 | 272 | 1044 | 819 | 403 |
| 21.0 | 4.7 | 10.4 | 0 | 4.7 | 10.225 | | 0 | 117 | 2383 | 2383 | 1.18 | 4.1 | 192 | 1.0 | 2.1 | 3.1 | | 1.62 | 401 | 1289 | 979 | 651 |
| 22.0 | 3.6 | 6.75 | | 3.7 | 6.575 | | 0 | 112 | 2464 | 2464 | 0.77 | 3.1 | 99 | 0.8 | 1.6 | 2.0 | | 1.33 | 207 | 956 | 776 | 275 |
| 23.0 | 3.3 | 6.85 | | 3.4 | 6.675 | | 0 | 112 | 2576 | 2576 | 0.97 | 2.8 | 114 | 0.7 | 1.4 | 1.6 | | 1.21 | 238 | 844 | 709 | 287 |
| 24.0 | 4.1 | 6.9 | 0 | 4.2 | 6.725 | | 0 | 112 | 2688 | 2688 | 0.59 | 3.3 | 87 | 0.8 | 1.7 | 2.2 | | 1.36 | 181 | 1101 | 884 | 246 |
| 25.0 | 1.65 | 4.7 | | 1.8 | 4.525 | | 0 | 108 | 2693 | 2693 | 1.56 | 1.4 | 96 | | | | | 0.85 | 200 | | | 170 |
| 26.0 | 4.85 | 10.8 | | 4.8 | 10.625 | | 0 | 118 | 2810 | 2810 | 1.20 | 3.6 | 201 | | | | | 1.49 | 420 | | | 626 |
| 27.0 | 9.6 | 21.6 | 0 | 9.3 | 21.425 | | 0 | 126 | 2936 | 2936 | 1.31 | 6.6 | 422 | | | | | 2.09 | 881 | | | 1843 |
| 28.0 | 9 | 24.4 | | 8.5 | 24.225 | | 0 | 127 | 3559 | 3559 | 1.85 | 5.0 | 546 | | | | 37.2 | 1.84 | 1140 | | | 2101 |

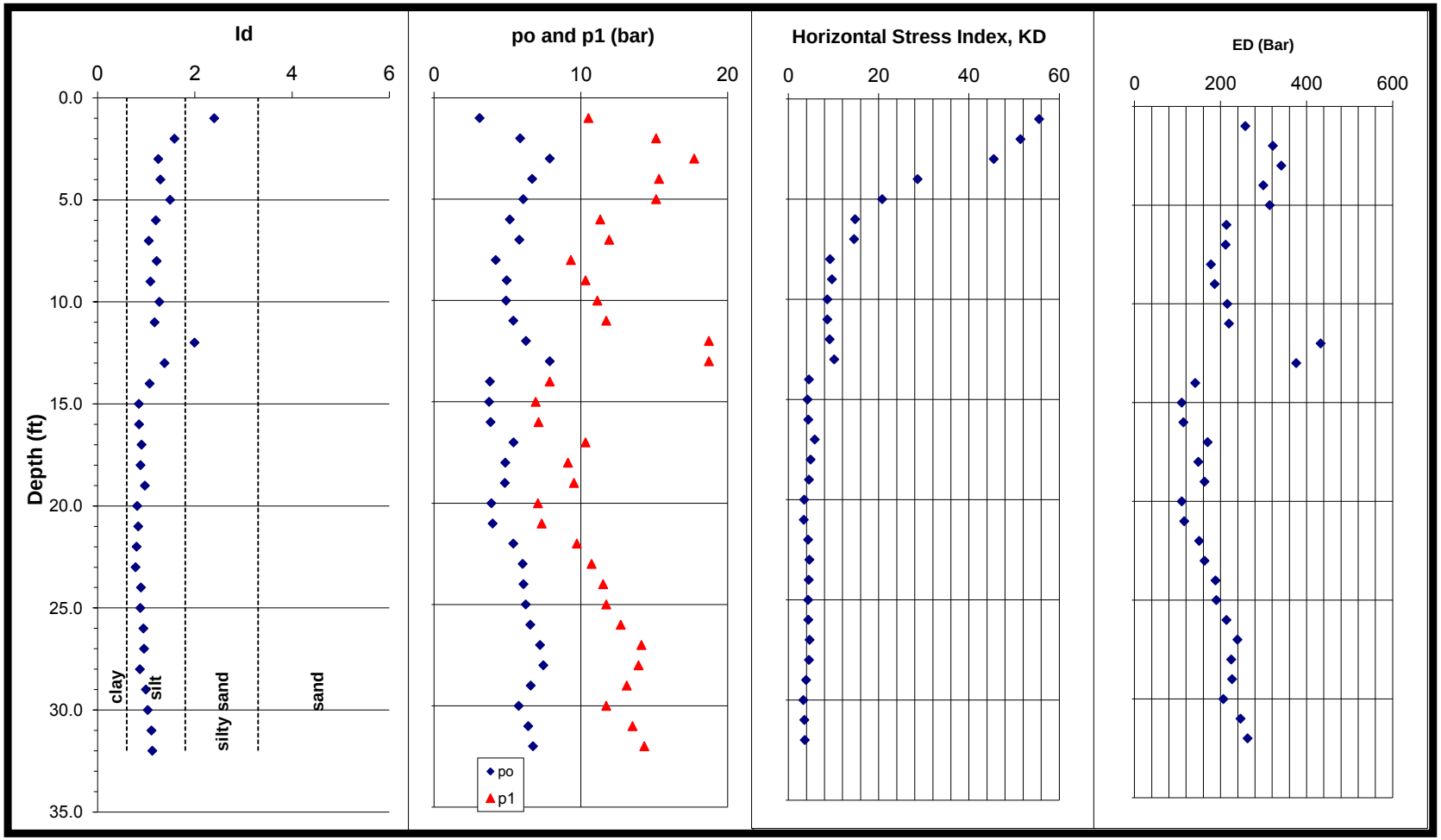
# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB1_B1
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB1_B1
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



Job No: 16-54112
Job Name: SITE #2 (STRUCTURE #2 ANI
Job Location: Greensboro, NC
Date: 12-20-16
Sounding No: STR3_EB1_B1
Ground Water Depth (ft): N/A

| | Membrane 1 | Membrane 2 | Membrane 3 |
|---|---|---|---|
| ΔA = | 0.2 | 0 | 0 |
| ΔB = | 0.275 | 0 | 0 |
| Zm= | 0 | bar | |

Northing 874663
Easting 1777566

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

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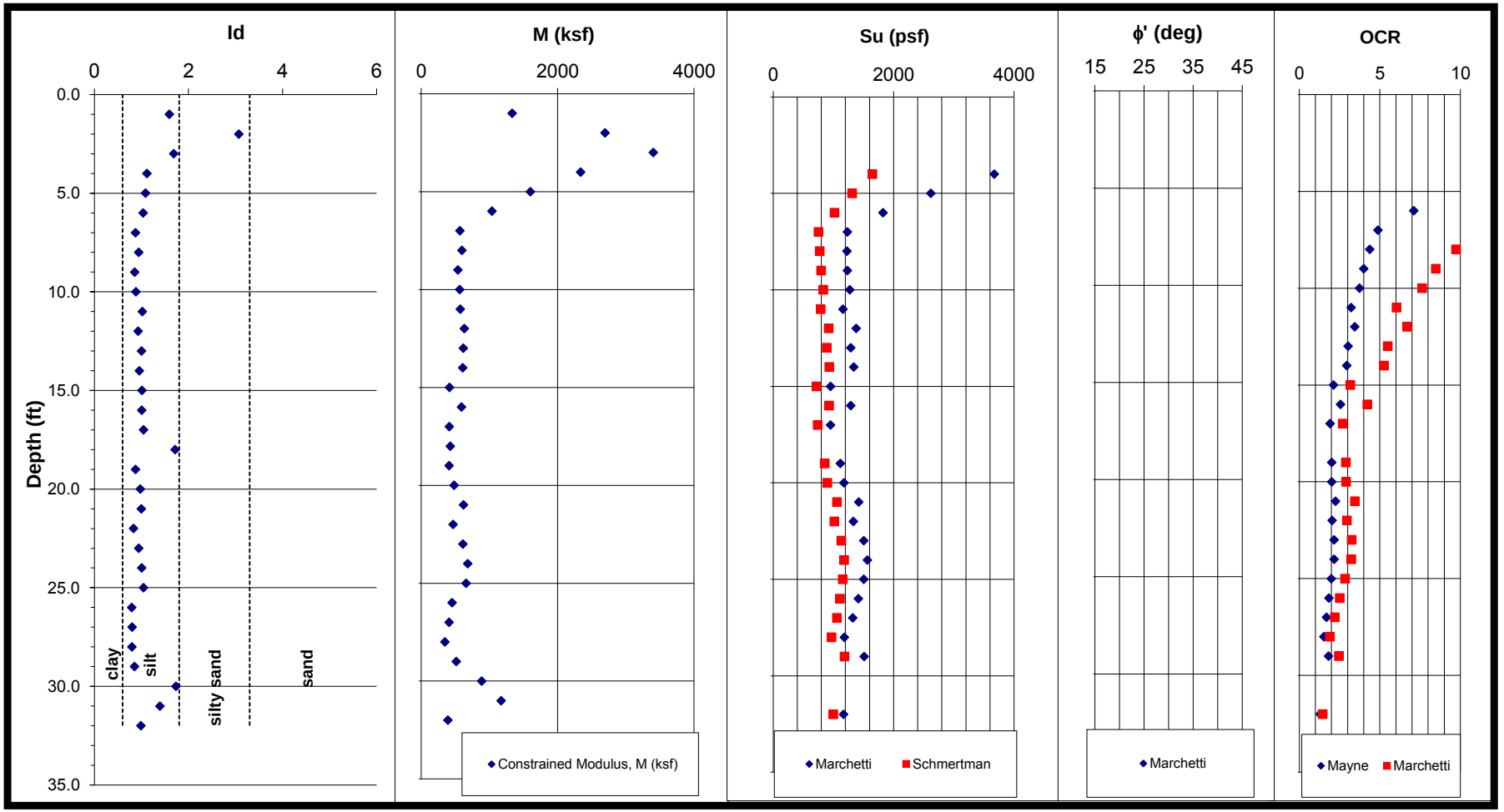
## DILATOMETER TEST RESULTS

| Depth[1] | A | B | C | po | p1 | p2 | $u_o$ | $\gamma_T$[5] | $\sigma_{vo}$ | $\sigma_{vo}'$ | | | $E_D$ | | | | $\phi$[3] | | $E_D$ | $s_u$[3] | $s_u$[4] | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (ft) | (bar) | (bar) | (bar) | (bar) | (bar) | (bar) | (psf) | (pcf) | (psf) | (psf) | Id | $K_D$ | (bar) | $K_o$ | OCR[2] | OCR[3] | (deg) | $R_M$ | (ksf) | (psf) | (psf) | (ksf) |
| 1.0 | 3.25 | 10.8 | | 3.1 | 10.525 | | 0 | 116 | 116 | 116 | 2.40 | 55.6 | 258 | | | | 47.1 | 4.12 | 538 | | | 2220 |
| 2.0 | 6.1 | 15.4 | | 5.9 | 15.125 | | 0 | 122 | 238 | 238 | 1.58 | 51.4 | 322 | | | | | 4.05 | 672 | | | 2720 |
| 3.0 | 8.15 | 18 | 0 | 7.9 | 17.725 | | 0 | 124 | 362 | 362 | 1.25 | 45.5 | 342 | | | | | 3.93 | 713 | | | 2807 |
| 4.0 | 6.9 | 15.6 | | 6.7 | 15.325 | | 0 | 122 | 488 | 488 | 1.29 | 28.7 | 300 | | | | | 3.50 | 626 | | | 2189 |
| 5.0 | 6.3 | 15.4 | | 6.1 | 15.125 | | 0 | 122 | 609 | 609 | 1.49 | 20.8 | 314 | | | | | 3.19 | 656 | | | 2096 |
| 6.0 | 5.25 | 11.6 | 0 | 5.2 | 11.325 | | 0 | 118 | 727 | 727 | 1.20 | 14.8 | 214 | 2.3 | 7.5 | 22.7 | | 2.87 | 447 | 1954 | 1077 | 1284 |
| 7.0 | 5.9 | 12.2 | | 5.8 | 11.925 | | 0 | 119 | 833 | 833 | 1.05 | 14.6 | 212 | 2.3 | 7.4 | 22.1 | | 2.86 | 443 | 2192 | 1213 | 1266 |
| 8.0 | 4.25 | 9.6 | | 4.2 | 9.325 | | 0 | 116 | 949 | 949 | 1.22 | 9.3 | 178 | | | | | 2.42 | 371 | | | 899 |
| 9.0 | 5 | 10.6 | 0 | 4.9 | 10.325 | | 0 | 117 | 1066 | 1066 | 1.09 | 9.7 | 187 | 1.8 | 4.9 | 11.7 | | 2.47 | 390 | 1685 | 1033 | 963 |
| 10.0 | 5 | 11.4 | | 4.9 | 11.125 | | 0 | 118 | 1181 | 1181 | 1.27 | 8.7 | 216 | | | | | 2.36 | 451 | | | 1064 |
| 11.0 | 5.5 | 12 | | 5.4 | 11.725 | | 0 | 119 | 1299 | 1299 | 1.17 | 8.7 | 220 | 1.7 | 4.4 | 9.9 | | 2.36 | 458 | 1790 | 1128 | 1082 |
| 12.0 | 6.65 | 19 | 0 | 6.3 | 18.725 | | 0 | 124 | 1423 | 1423 | 1.99 | 9.2 | 433 | | | | 40.1 | 2.42 | 904 | | | 2187 |
| 13.0 | 8.2 | 19 | | 7.9 | 18.725 | | 0 | 124 | 1616 | 1616 | 1.38 | 10.2 | 376 | | | | | 2.52 | 786 | | | 1978 |
| 14.0 | 3.8 | 8.15 | | 3.8 | 7.875 | | 0 | 114 | 1730 | 1730 | 1.07 | 4.6 | 141 | 1.1 | 2.3 | 3.7 | | 1.73 | 295 | 1077 | 795 | 509 |
| 15.0 | 3.7 | 7.2 | 0 | 3.7 | 6.925 | | 0 | 113 | 1843 | 1843 | 0.85 | 4.2 | 110 | 1.0 | 2.2 | 3.2 | | 1.64 | 230 | 1040 | 783 | 377 |
| 16.0 | 3.8 | 7.4 | | 3.8 | 7.125 | | 0 | 113 | 1807 | 1807 | 0.85 | 4.4 | 114 | 1.1 | 2.3 | 3.5 | | 1.68 | 238 | 1078 | 803 | 400 |
| 17.0 | 5.45 | 10.6 | | 5.4 | 10.325 | | 0 | 117 | 1925 | 1925 | 0.91 | 5.9 | 170 | 1.3 | 3.0 | 5.4 | | 1.97 | 356 | 1629 | 1131 | 699 |
| 18.0 | 4.85 | 9.4 | 0 | 4.8 | 9.125 | | 0 | 116 | 2040 | 2040 | 0.88 | 5.0 | 148 | 1.2 | 2.5 | 4.1 | | 1.79 | 310 | 1397 | 1012 | 556 |
| 19.0 | 4.85 | 9.8 | | 4.8 | 9.525 | | 0 | 116 | 2210 | 2210 | 0.97 | 4.6 | 163 | 1.1 | 2.3 | 3.6 | | 1.71 | 341 | 1363 | 1008 | 584 |
| 20.0 | 3.85 | 7.35 | | 3.9 | 7.075 | | 0 | 113 | 2323 | 2323 | 0.81 | 3.5 | 110 | 0.9 | 1.8 | 2.4 | | 1.44 | 230 | 1031 | 814 | 332 |
| 21.0 | 3.95 | 7.6 | 0 | 4.0 | 7.325 | | 0 | 113 | 2436 | 2436 | 0.84 | 3.4 | 116 | 0.9 | 1.7 | 2.3 | | 1.42 | 242 | 1049 | 834 | 342 |
| 22.0 | 5.4 | 10 | | 5.4 | 9.725 | | 0 | 116 | 2563 | 2563 | 0.80 | 4.4 | 150 | 1.1 | 2.2 | 3.4 | | 1.67 | 314 | 1509 | 1127 | 524 |
| 23.0 | 6.05 | 11 | | 6.0 | 10.725 | | 0 | 118 | 2680 | 2680 | 0.78 | 4.7 | 163 | 1.1 | 2.4 | 3.8 | | 1.73 | 341 | 1714 | 1259 | 590 |
| 24.0 | 6.15 | 11.8 | 0 | 6.1 | 11.525 | | 0 | 119 | 2799 | 2799 | 0.89 | 4.5 | 189 | 1.1 | 2.3 | 3.6 | | 1.71 | 394 | 1718 | 1272 | 672 |
| 25.0 | 6.3 | 12 | | 6.2 | 11.725 | | 0 | 119 | 2968 | 2968 | 0.88 | 4.4 | 190 | 1.1 | 2.2 | 3.4 | | 1.67 | 398 | 1745 | 1303 | 664 |
| 26.0 | 6.65 | 13 | | 6.6 | 12.725 | | 0 | 120 | 3088 | 3088 | 0.94 | 4.4 | 214 | 1.1 | 2.3 | 3.5 | | 1.68 | 447 | 1838 | 1369 | 753 |
| 27.0 | 7.35 | 14.4 | 0 | 7.2 | 14.125 | | 0 | 121 | 3209 | 3209 | 0.96 | 4.7 | 240 | 1.1 | 2.4 | 3.8 | | 1.74 | 500 | 2054 | 1508 | 872 |
| 28.0 | 7.55 | 14.2 | | 7.4 | 13.925 | | 0 | 121 | 3382 | 3382 | 0.87 | 4.6 | 225 | 1.1 | 2.3 | 3.7 | | 1.72 | 470 | 2105 | 1554 | 807 |
| 29.0 | 6.7 | 13.4 | | 6.6 | 13.125 | | 0 | 120 | 3502 | 3502 | 0.99 | 3.9 | 227 | 1.0 | 2.0 | 2.9 | | 1.57 | 474 | 1792 | 1376 | 742 |
| 30.0 | 5.85 | 12 | 0 | 5.8 | 11.725 | | 0 | 119 | 3621 | 3621 | 1.03 | 3.3 | 207 | 0.9 | 1.7 | 2.2 | | 1.40 | 432 | 1504 | 1204 | 606 |
| 31.0 | 6.55 | 13.8 | | 6.4 | 13.525 | | 0 | 120 | 3734 | 3734 | 1.11 | 3.6 | 247 | 0.9 | 1.8 | 2.5 | | 1.48 | 516 | 1704 | 1339 | 765 |
| 32.0 | 6.9 | 14.6 | | 6.7 | 14.325 | | 0 | 121 | 3855 | 3855 | 1.13 | 3.7 | 263 | 0.9 | 1.9 | 2.6 | | 1.50 | 550 | 1799 | 1407 | 826 |

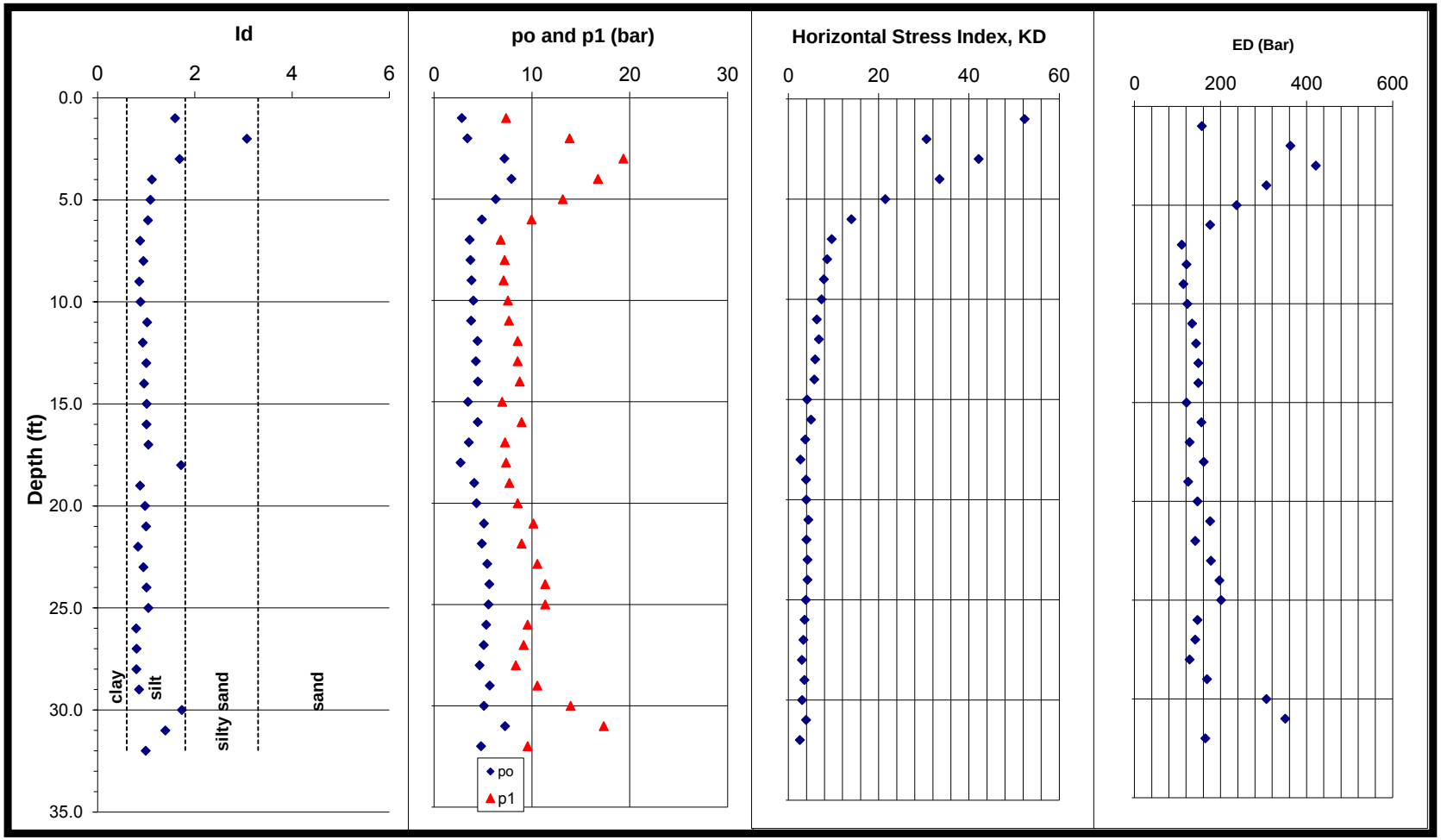
# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB1_B2
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB1_B2
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



Job No: 16-54112
Job Name: SITE #2 (STRUCTURE #2 ANI
Job Location: Greensboro, NC
Date: 12-20-16
Sounding No: STR3_EB1_B2
Ground Water Depth (ft): N/A

| | Membrane 1 | Membrane 2 | Membrane 3 |
|---|---|---|---|
| ΔA = | 0.25 | 0.175 | 0 |
| ΔB = | 0.15 | 0.45 | 0 |
| Zm= | 0 | bar | |

Latitude: 36.15101
Longitude: -79.75339

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

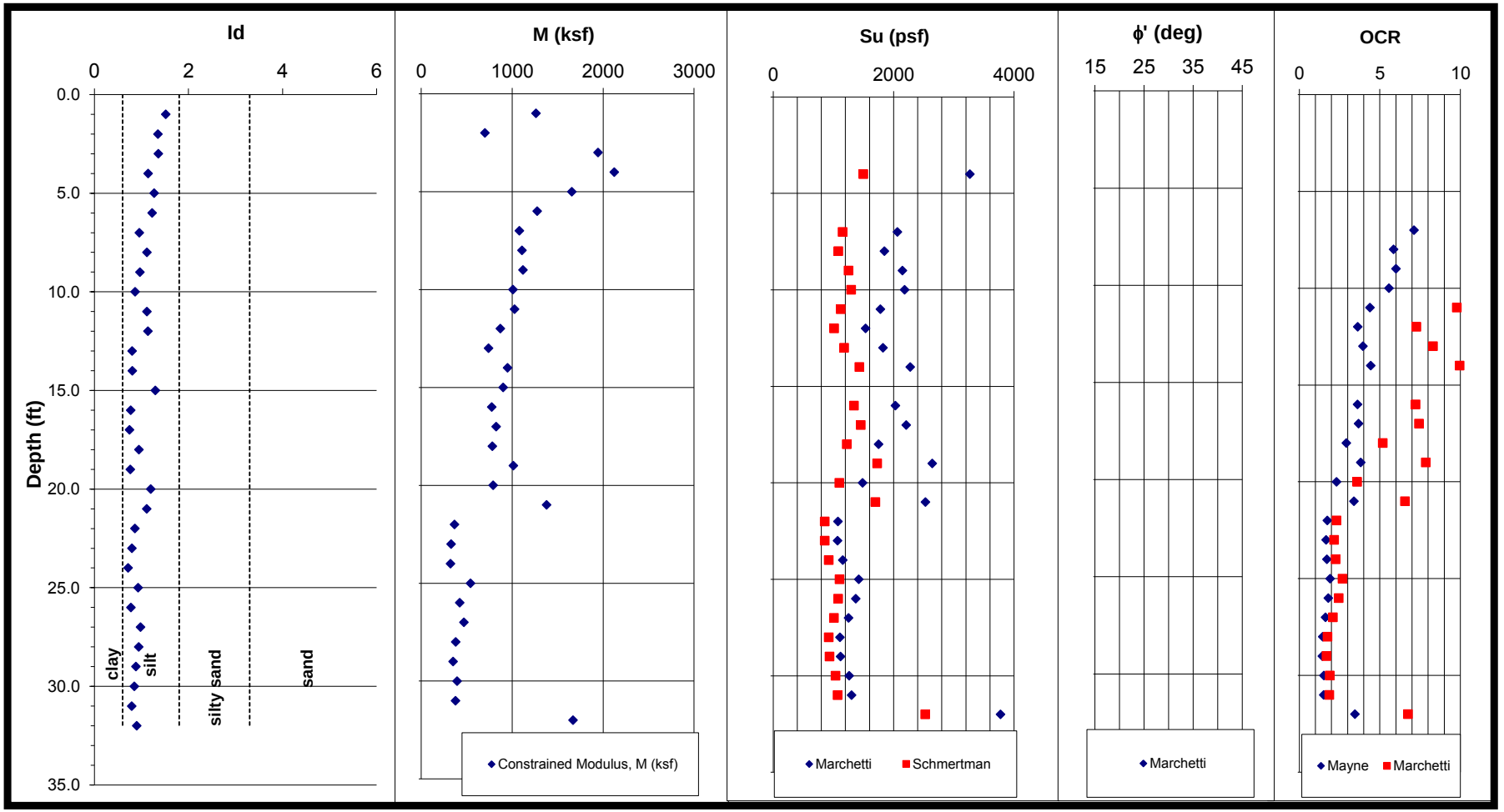
CONETEC

## DILATOMETER TEST RESULTS

| Depth[1] (ft) | A (bar) | B (bar) | C (bar) | po (bar) | p1 (bar) | p2 (bar) | $u_o$ (psf) | $\gamma_T$[5] (pcf) | $\sigma_{vo}$ (psf) | $\sigma_{vo}'$ (psf) | Id | $K_D$ | $E_D$ (bar) | $K_o$ | OCR[2] | OCR[3] | $\phi$'[3] (deg) | $R_M$ | $E_D$ (ksf) | $s_u$[3] (psf) | $s_u$[4] (psf) | M (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 2.8 | 7.5 | | 2.8 | 7.35 | | 0 | 113 | 113 | 113 | 1.59 | 52.4 | 157 | | | | | 4.07 | 327 | | | 1331 |
| 2.0 | 3.65 | 14 | | 3.4 | 13.85 | | 0 | 119 | 232 | 232 | 3.07 | 30.6 | 363 | | | | 45.1 | 3.56 | 757 | | | 2695 |
| 3.0 | 7.6 | 19.8 | 0 | 7.2 | 19.35 | | 0 | 124 | 356 | 356 | 1.69 | 42.2 | 422 | | | | | 3.86 | 881 | | | 3402 |
| 4.0 | 8.15 | 17.2 | | 7.9 | 16.75 | | 0 | 123 | 492 | 492 | 1.12 | 33.5 | 307 | 3.7 | 17.1 | 81.3 | | 3.65 | 641 | 3674 | 1651 | 2337 |
| 5.0 | 6.45 | 13.6 | | 6.3 | 13.15 | | 0 | 120 | 612 | 612 | 1.09 | 21.5 | 238 | 2.9 | 10.9 | 40.6 | | 3.22 | 497 | 2620 | 1316 | 1601 |
| 6.0 | 4.95 | 10.4 | 0 | 4.9 | 9.95 | | 0 | 117 | 729 | 729 | 1.04 | 14.0 | 176 | 2.3 | 7.1 | 20.8 | | 2.82 | 367 | 1825 | 1020 | 1035 |
| 7.0 | 3.6 | 7.25 | | 3.6 | 6.8 | | 0 | 112 | 787 | 787 | 0.88 | 9.6 | 110 | 1.8 | 4.9 | 11.6 | | 2.46 | 230 | 1233 | 757 | 566 |
| 8.0 | 3.7 | 7.65 | | 3.7 | 7.2 | | 0 | 113 | 900 | 900 | 0.94 | 8.6 | 121 | 1.7 | 4.4 | 9.7 | | 2.35 | 253 | 1227 | 775 | 594 |
| 9.0 | 3.8 | 7.55 | | 3.8 | 7.1 | | 0 | 113 | 1013 | 1013 | 0.86 | 7.9 | 114 | 1.6 | 4.0 | 8.5 | | 2.26 | 238 | 1236 | 798 | 537 |
| 10.0 | 4 | 8 | | 4.0 | 7.55 | | 0 | 114 | 1136 | 1136 | 0.88 | 7.4 | 123 | 1.5 | 3.7 | 7.6 | | 2.19 | 257 | 1275 | 837 | 563 |
| 11.0 | 3.8 | 8.1 | | 3.8 | 7.65 | | 0 | 114 | 1250 | 1250 | 1.02 | 6.3 | 134 | 1.4 | 3.2 | 6.0 | | 2.04 | 280 | 1162 | 792 | 572 |
| 12.0 | 4.45 | 9 | 0 | 4.4 | 8.55 | | 0 | 115 | 1365 | 1365 | 0.93 | 6.8 | 143 | 1.4 | 3.4 | 6.7 | | 2.11 | 299 | 1380 | 925 | 630 |
| 13.0 | 4.3 | 9 | | 4.3 | 8.55 | | 0 | 115 | 1496 | 1496 | 1.00 | 6.0 | 148 | 1.3 | 3.0 | 5.5 | | 1.98 | 310 | 1289 | 892 | 615 |
| 14.0 | 4.5 | 9.2 | | 4.5 | 8.75 | | 0 | 115 | 1611 | 1611 | 0.96 | 5.8 | 148 | 1.3 | 3.0 | 5.3 | | 1.95 | 310 | 1340 | 934 | 606 |
| 15.0 | 3.45 | 7.4 | 0 | 3.5 | 6.95 | | 0 | 113 | 1724 | 1724 | 1.01 | 4.2 | 121 | 1.0 | 2.1 | 3.2 | | 1.63 | 253 | 956 | 722 | 413 |
| 16.0 | 4.5 | 9.4 | | 4.5 | 8.95 | | 0 | 116 | 1850 | 1850 | 1.01 | 5.0 | 156 | 1.2 | 2.6 | 4.2 | | 1.82 | 325 | 1291 | 932 | 591 |
| 17.0 | 3.55 | 7.7 | | 3.5 | 7.25 | | 0 | 113 | 1963 | 1963 | 1.04 | 3.8 | 128 | 0.9 | 1.9 | 2.7 | | 1.53 | 268 | 956 | 741 | 410 |
| 18.0 | 2.75 | 7.8 | 0 | 2.7 | 7.35 | | 0 | 113 | 2076 | 2076 | 1.72 | 2.7 | 161 | | | | | 1.26 | 337 | | | 424 |
| 19.0 | 4.1 | 8.15 | | 4.1 | 7.7 | | 0 | 114 | 2163 | 2163 | 0.88 | 4.0 | 125 | 1.0 | 2.0 | 2.9 | | 1.57 | 261 | 1119 | 857 | 409 |
| 20.0 | 4.35 | 9 | | 4.3 | 8.55 | | 0 | 115 | 2278 | 2278 | 0.98 | 4.0 | 147 | 1.0 | 2.0 | 2.9 | | 1.57 | 306 | 1179 | 903 | 482 |
| 21.0 | 5.15 | 10.6 | 0.1 | 5.1 | 10.15 | 0.35 | 0 | 117 | 2395 | 2395 | 1.00 | 4.4 | 176 | 1.1 | 2.3 | 3.5 | | 1.69 | 367 | 1425 | 1062 | 619 |
| 22.0 | 4.9 | 9.4 | | 4.9 | 8.95 | | 0 | 116 | 2542 | 2542 | 0.83 | 4.0 | 141 | 1.0 | 2.0 | 3.0 | | 1.58 | 295 | 1334 | 1019 | 465 |
| 23.0 | 5.5 | 11 | | 5.4 | 10.55 | | 0 | 118 | 2660 | 2660 | 0.94 | 4.3 | 178 | 1.0 | 2.2 | 3.3 | | 1.65 | 371 | 1508 | 1134 | 610 |
| 24.0 | 5.75 | 11.8 | 0 | 5.7 | 11.35 | | 0 | 118 | 2778 | 2778 | 1.01 | 4.3 | 198 | 1.0 | 2.2 | 3.2 | | 1.65 | 413 | 1568 | 1181 | 679 |
| 25.0 | 5.65 | 11.8 | | 5.5 | 11.35 | | 0 | 118 | 2959 | 2959 | 1.05 | 3.9 | 201 | 1.0 | 2.0 | 2.9 | | 1.57 | 420 | 1508 | 1159 | 659 |
| 26.0 | 5.35 | 10 | | 5.3 | 9.55 | | 0 | 116 | 3076 | 3076 | 0.79 | 3.6 | 147 | 0.9 | 1.8 | 2.5 | | 1.47 | 306 | 1418 | 1112 | 450 |
| 27.0 | 5.1 | 9.6 | 0.15 | 5.1 | 9.15 | 0.40 | 0 | 116 | 3191 | 3191 | 0.80 | 3.3 | 141 | 0.9 | 1.7 | 2.2 | | 1.39 | 295 | 1326 | 1061 | 409 |
| 28.0 | 4.65 | 8.8 | | 4.6 | 8.35 | | 0 | 115 | 3212 | 3212 | 0.80 | 3.0 | 128 | 0.8 | 1.5 | 1.9 | | 1.29 | 268 | 1184 | 971 | 346 |
| 29.0 | 5.75 | 11 | | 5.7 | 10.55 | | 0 | 117 | 3330 | 3330 | 0.85 | 3.6 | 169 | 0.9 | 1.8 | 2.5 | | 1.46 | 352 | 1512 | 1189 | 514 |
| 30.0 | 5.35 | 14.4 | 1.35 | 5.1 | 13.95 | 1.60 | 0 | 120 | 3450 | 3450 | 1.73 | 3.1 | 307 | | | | | 1.38 | 641 | | | 887 |
| 31.0 | 7.55 | 17.8 | | 7.2 | 17.35 | | 0 | 123 | 3824 | 3824 | 1.40 | 4.0 | 351 | | | | | 1.60 | 732 | | | 1170 |
| 32.0 | 4.85 | 10 | | 4.8 | 9.55 | | 0 | 116 | 3940 | 3940 | 0.99 | 2.5 | 165 | 0.7 | 1.3 | 1.5 | | 1.13 | 344 | 1171 | 1002 | 390 |

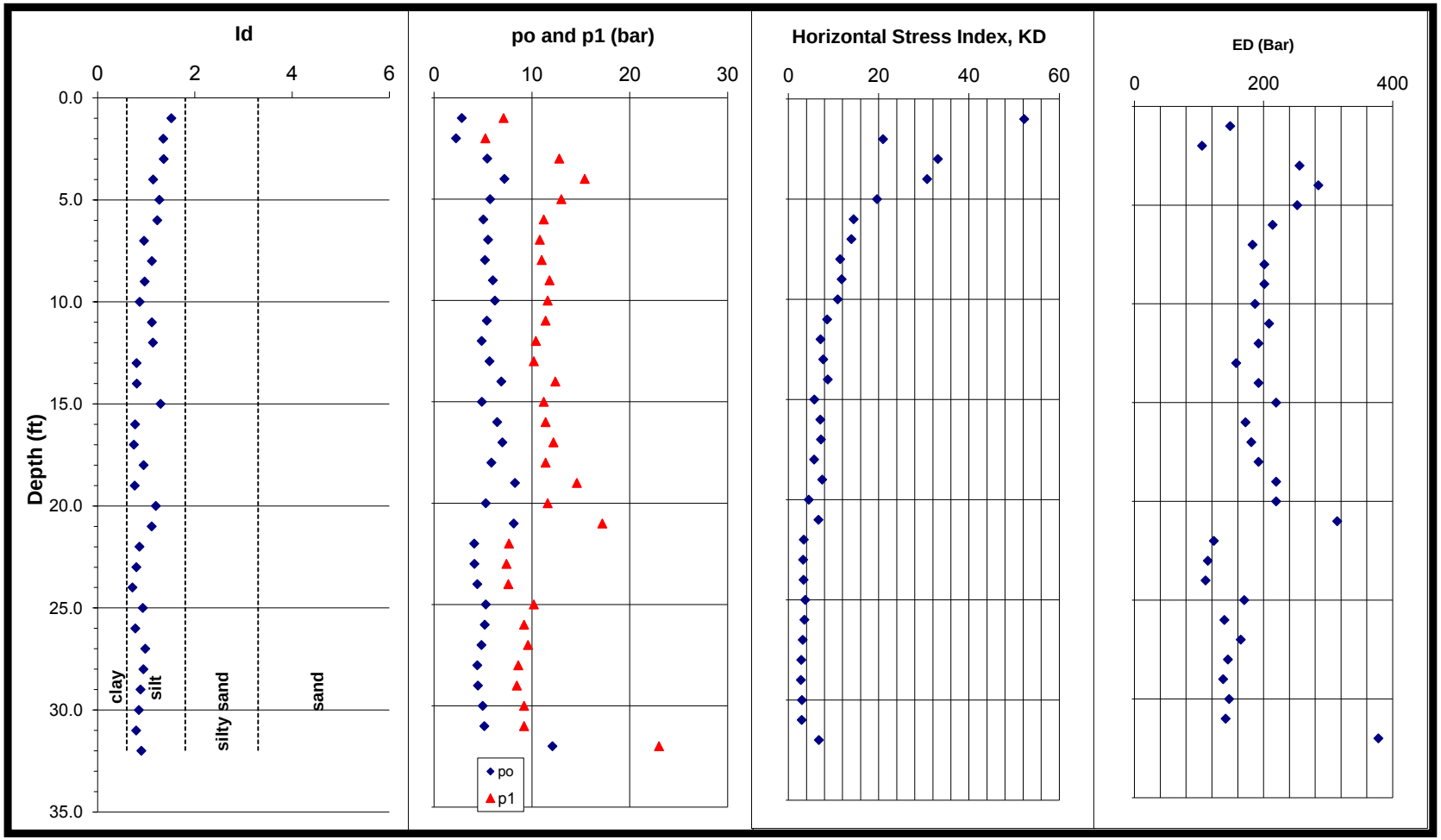
# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB1_B3
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB1_B3
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



Job No: 16-54112
Job Name: SITE #2 (STRUCTURE #2 ANI
Job Location: Greensboro, NC
Date: 12-20-16
Sounding No: STR3_EB1_B3
Ground Water Depth (ft): N/A

| | Membrane 1 | Membrane 2 | Membrane 3 |
|---|---|---|---|
| ΔA = | 0.225 | 0 | 0 |
| ΔB = | 0.2 | 0 | 0 |
| Zm= | 0 | bar | |

Northing 874701
Easting 1777579

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

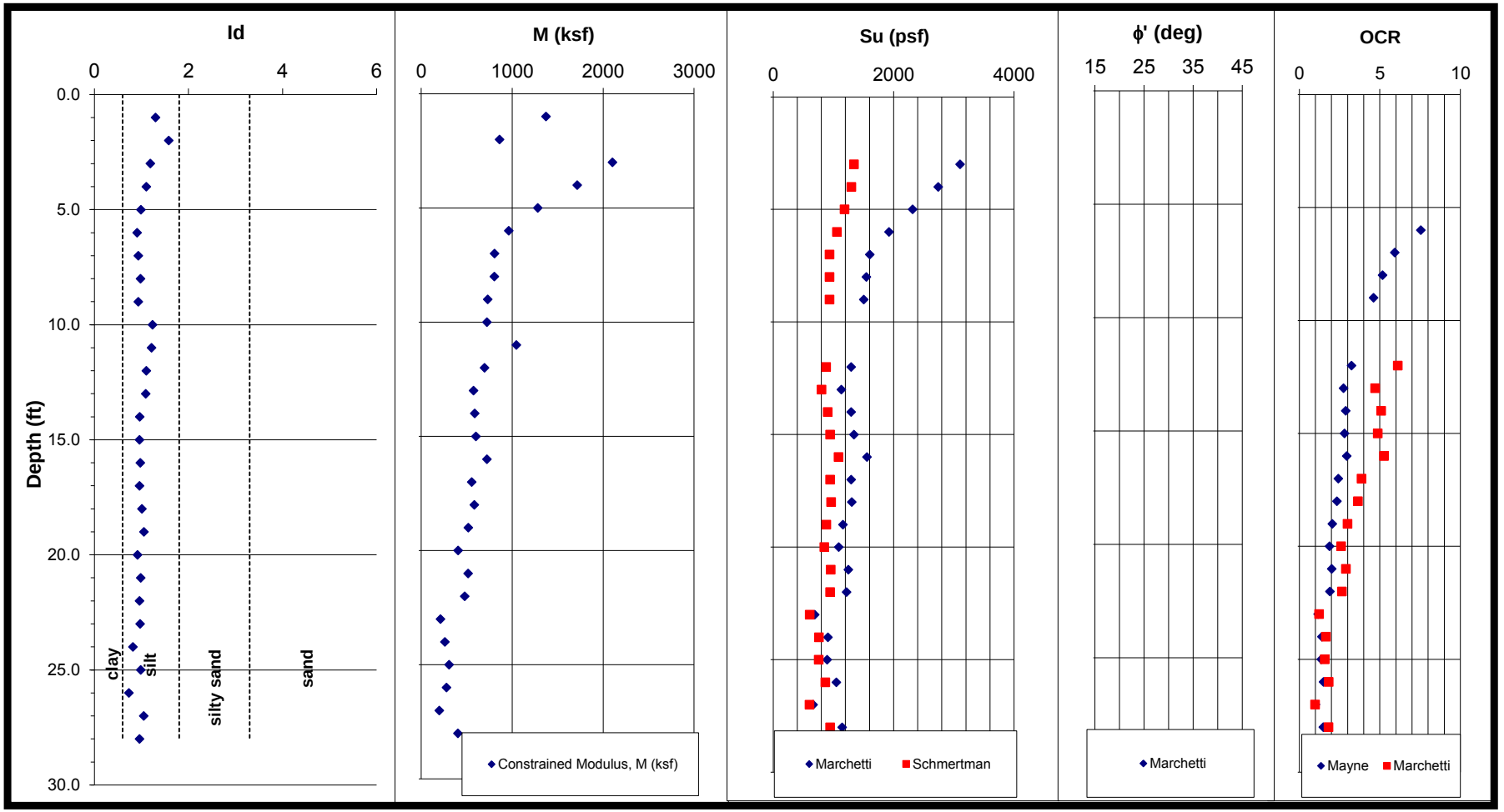
CONETEC

## DILATOMETER TEST RESULTS

| Depth[1] (ft) | A (bar) | B (bar) | C (bar) | po (bar) | p1 (bar) | p2 (bar) | $u_o$ (psf) | $\gamma_T$[5] (pcf) | $\sigma_{vo}$ (psf) | $\sigma_{vo}'$ (psf) | Id | $K_D$ | $E_D$ (bar) | $K_o$ | OCR[2] | OCR[3] | $\phi$'[3] (deg) | $R_M$ | $E_D$ (ksf) | $s_u$[3] (psf) | $s_u$[4] (psf) | M (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 2.8 | 7.3 | | 2.8 | 7.1 | | 0 | 113 | 113 | 113 | 1.52 | 52.3 | 148 | | | | | 4.07 | 310 | | | 1261 |
| 2.0 | 2.15 | 5.45 | | 2.2 | 5.25 | | 0 | 109 | 222 | 222 | 1.35 | 21.0 | 105 | | | | | 3.20 | 219 | | | 700 |
| 3.0 | 5.55 | 13 | 0 | 5.4 | 12.8 | | 0 | 120 | 342 | 342 | 1.36 | 33.1 | 256 | | | | | 3.63 | 535 | | | 1943 |
| 4.0 | 7.35 | 15.6 | | 7.2 | 15.4 | | 0 | 122 | 488 | 488 | 1.14 | 30.7 | 285 | 3.5 | 15.6 | 71.0 | | 3.56 | 595 | 3268 | 1500 | 2122 |
| 5.0 | 5.85 | 13.2 | | 5.7 | 13 | | 0 | 120 | 608 | 608 | 1.27 | 19.7 | 252 | | | | | 3.14 | 527 | | | 1655 |
| 6.0 | 5.1 | 11.4 | 0 | 5.0 | 11.2 | | 0 | 118 | 726 | 726 | 1.23 | 14.5 | 214 | | | | | 2.85 | 447 | | | 1274 |
| 7.0 | 5.55 | 11 | | 5.5 | 10.8 | | 0 | 118 | 825 | 825 | 0.96 | 14.0 | 183 | 2.3 | 7.1 | 20.8 | | 2.82 | 382 | 2064 | 1154 | 1078 |
| 8.0 | 5.25 | 11.2 | | 5.2 | 11 | | 0 | 118 | 943 | 943 | 1.12 | 11.5 | 201 | 2.0 | 5.9 | 15.4 | | 2.63 | 420 | 1850 | 1086 | 1107 |
| 9.0 | 6.05 | 12 | 0 | 6.0 | 11.8 | | 0 | 119 | 1061 | 1061 | 0.97 | 11.8 | 201 | 2.0 | 6.0 | 16.0 | | 2.66 | 420 | 2148 | 1253 | 1117 |
| 10.0 | 6.25 | 11.8 | | 6.2 | 11.6 | | 0 | 119 | 1186 | 1186 | 0.87 | 11.0 | 187 | 1.9 | 5.6 | 14.2 | | 2.59 | 390 | 2185 | 1299 | 1009 |
| 11.0 | 5.45 | 11.6 | | 5.4 | 11.4 | | 0 | 118 | 1304 | 1304 | 1.12 | 8.6 | 209 | 1.7 | 4.4 | 9.8 | | 2.35 | 436 | 1784 | 1125 | 1025 |
| 12.0 | 4.9 | 10.6 | 0 | 4.9 | 10.4 | | 0 | 117 | 1422 | 1422 | 1.14 | 7.1 | 192 | 1.5 | 3.6 | 7.3 | | 2.17 | 401 | 1535 | 1015 | 870 |
| 13.0 | 5.65 | 10.4 | | 5.7 | 10.2 | | 0 | 117 | 1522 | 1522 | 0.80 | 7.8 | 158 | 1.6 | 4.0 | 8.3 | | 2.24 | 329 | 1825 | 1182 | 739 |
| 14.0 | 6.9 | 12.6 | | 6.9 | 12.4 | | 0 | 119 | 1641 | 1641 | 0.81 | 8.7 | 192 | 1.7 | 4.4 | 10.0 | | 2.36 | 401 | 2279 | 1433 | 948 |
| 15.0 | 4.95 | 11.4 | 0 | 4.9 | 11.2 | | 0 | 118 | 1759 | 1759 | 1.30 | 5.8 | 220 | | | | | 1.96 | 458 | | | 901 |
| 16.0 | 6.45 | 11.6 | | 6.4 | 11.4 | | 0 | 118 | 1893 | 1893 | 0.77 | 7.1 | 172 | 1.5 | 3.6 | 7.2 | | 2.15 | 360 | 2031 | 1345 | 774 |
| 17.0 | 7 | 12.4 | | 7.0 | 12.2 | | 0 | 119 | 2012 | 2012 | 0.75 | 7.2 | 181 | 1.5 | 3.7 | 7.4 | | 2.17 | 379 | 2211 | 1457 | 822 |
| 18.0 | 5.9 | 11.6 | 0.15 | 5.9 | 11.4 | 0.38 | 0 | 118 | 2131 | 2131 | 0.94 | 5.7 | 192 | 1.3 | 2.9 | 5.2 | | 1.94 | 401 | 1753 | 1224 | 780 |
| 19.0 | 8.35 | 14.8 | | 8.3 | 14.6 | | 0 | 121 | 2304 | 2304 | 0.76 | 7.5 | 220 | 1.5 | 3.8 | 7.9 | | 2.21 | 458 | 2645 | 1728 | 1012 |
| 20.0 | 5.35 | 11.8 | | 5.3 | 11.6 | | 0 | 119 | 2423 | 2423 | 1.20 | 4.5 | 220 | 1.1 | 2.3 | 3.6 | | 1.72 | 458 | 1488 | 1101 | 790 |
| 21.0 | 8.35 | 17.4 | 0.2 | 8.1 | 17.2 | 0.43 | 0 | 123 | 2546 | 2546 | 1.11 | 6.7 | 314 | 1.4 | 3.4 | 6.6 | | 2.10 | 656 | 2529 | 1701 | 1378 |
| 22.0 | 4.05 | 7.85 | | 4.1 | 7.65 | | 0 | 114 | 2503 | 2503 | 0.86 | 3.4 | 123 | 0.9 | 1.7 | 2.3 | | 1.42 | 257 | 1079 | 858 | 365 |
| 23.0 | 4.05 | 7.6 | | 4.1 | 7.4 | | 0 | 113 | 2616 | 2616 | 0.80 | 3.3 | 114 | 0.8 | 1.7 | 2.2 | | 1.37 | 238 | 1071 | 860 | 327 |
| 24.0 | 4.35 | 7.8 | 0.05 | 4.4 | 7.6 | 0.28 | 0 | 114 | 2730 | 2730 | 0.72 | 3.4 | 110 | 0.9 | 1.7 | 2.3 | | 1.40 | 230 | 1159 | 924 | 322 |
| 25.0 | 5.3 | 10.4 | | 5.3 | 10.2 | | 0 | 117 | 2928 | 2928 | 0.93 | 3.8 | 170 | 0.9 | 1.9 | 2.7 | | 1.52 | 356 | 1425 | 1105 | 542 |
| 26.0 | 5.15 | 9.4 | | 5.2 | 9.2 | | 0 | 116 | 3044 | 3044 | 0.77 | 3.6 | 139 | 0.9 | 1.8 | 2.5 | | 1.45 | 291 | 1375 | 1083 | 423 |
| 27.0 | 4.85 | 9.8 | 0 | 4.8 | 9.6 | | 0 | 116 | 3160 | 3160 | 0.98 | 3.2 | 165 | 0.8 | 1.6 | 2.1 | | 1.36 | 344 | 1253 | 1013 | 469 |
| 28.0 | 4.4 | 8.8 | | 4.4 | 8.6 | | 0 | 115 | 3224 | 3224 | 0.94 | 2.9 | 145 | 0.8 | 1.5 | 1.8 | | 1.25 | 302 | 1113 | 924 | 377 |
| 29.0 | 4.45 | 8.65 | | 4.5 | 8.45 | | 0 | 115 | 3339 | 3339 | 0.88 | 2.8 | 138 | 0.7 | 1.4 | 1.7 | | 1.22 | 287 | 1122 | 937 | 351 |
| 30.0 | 4.95 | 9.4 | 0.55 | 5.0 | 9.2 | 0.78 | 0 | 116 | 3455 | 3455 | 0.85 | 3.0 | 147 | 0.8 | 1.5 | 1.9 | | 1.29 | 306 | 1265 | 1039 | 394 |
| 31.0 | 5.1 | 9.4 | | 5.1 | 9.2 | | 0 | 116 | 3591 | 3591 | 0.79 | 3.0 | 141 | 0.8 | 1.5 | 1.9 | | 1.28 | 295 | 1303 | 1072 | 376 |
| 32.0 | 12.4 | 23.2 | | 12.1 | 23 | | 0 | 127 | 3718 | 3718 | 0.90 | 6.8 | 378 | 1.4 | 3.5 | 6.7 | | 2.11 | 789 | 3777 | 2528 | 1668 |

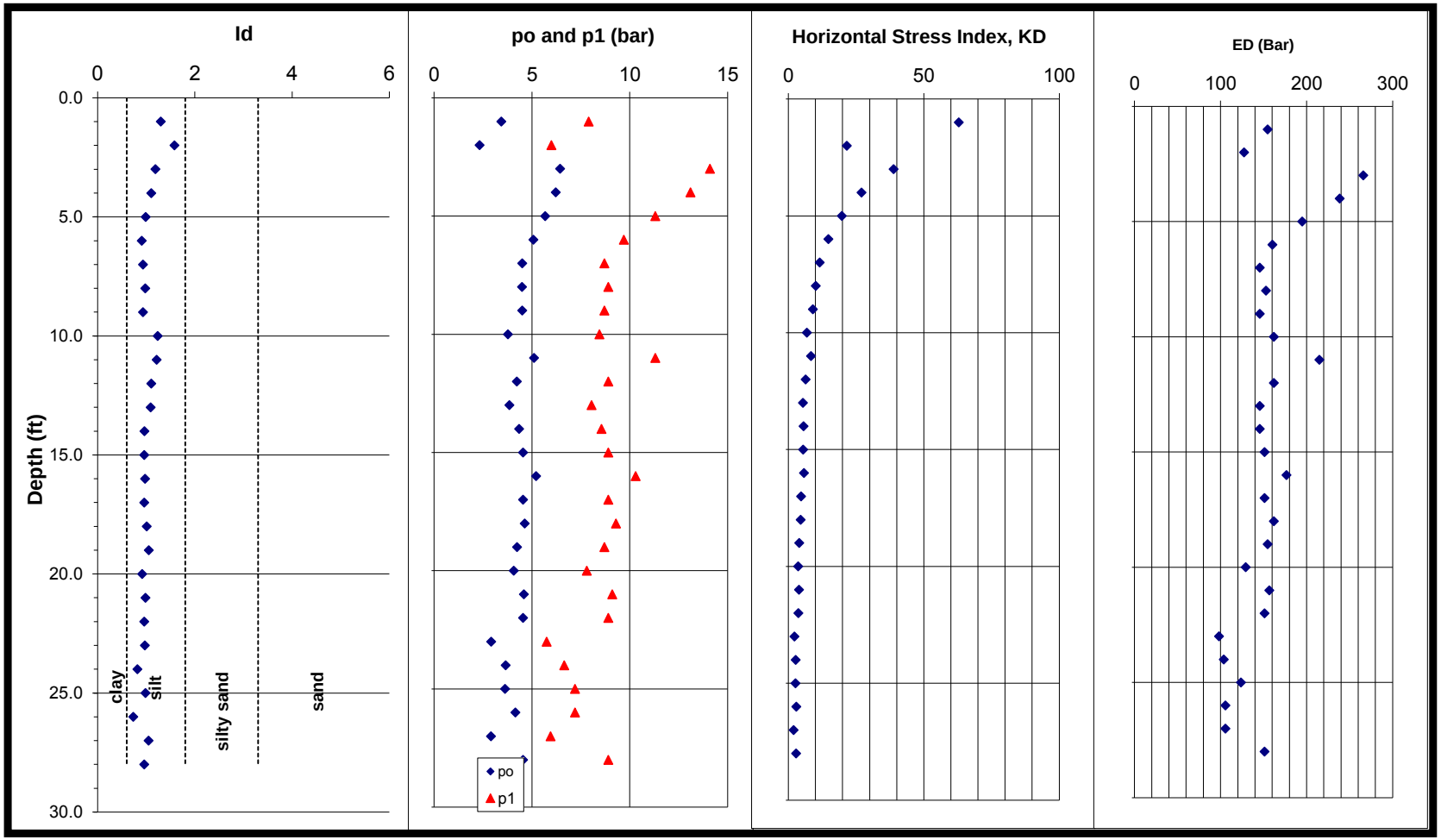
# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB2_B1
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB2_B1
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



Job No: 16-54112
Job Name: SITE #2 (STRUCTURE #2 AND
Job Location: Greensboro, NC
Date: 12-21-16
Sounding No: STR3_EB2_B1
Ground Water Depth (ft): N/A

| | Membrane 1 | Membrane 2 | Membrane 3 |
|---|---|---|---|
| ΔA = | 0.2 | 0 | 0 |
| ΔB = | 0.3 | 0 | 0 |
| Zm= | 0 | bar | |

Northing 874672
Easting 1777462

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

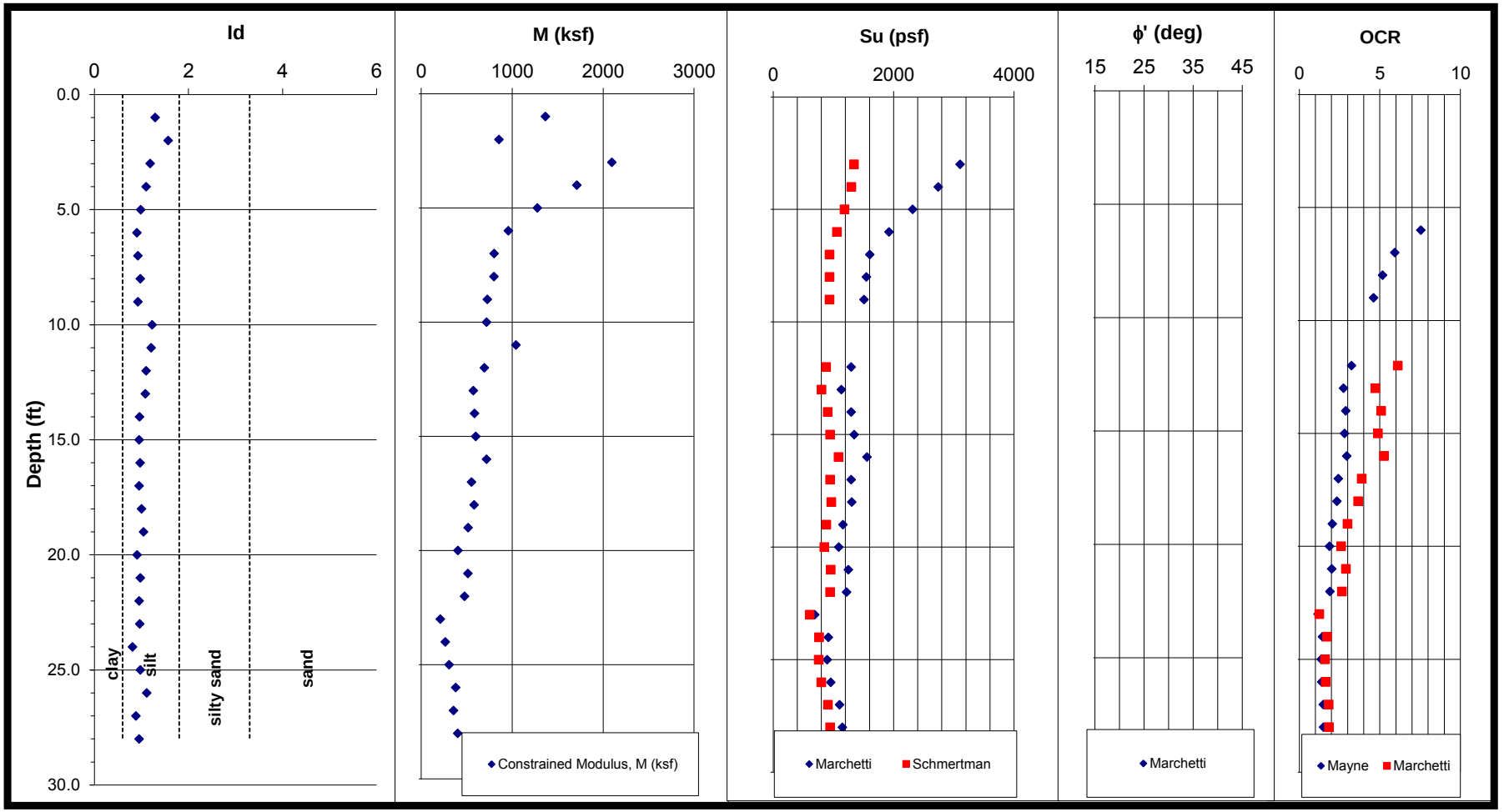
CONETEC

## DILATOMETER TEST RESULTS

| Depth[1] (ft) | A (bar) | B (bar) | C (bar) | po (bar) | p1 (bar) | p2 (bar) | $u_o$ (psf) | $\gamma_T$[5] (pcf) | $\sigma_{vo}$ (psf) | $\sigma_{vo}'$ (psf) | Id | $K_D$ | $E_D$ (bar) | $K_o$ | $OCR^2$ | $OCR^3$ | $\phi^3$ (deg) | $R_M$ | $E_D$ (ksf) | $s_u$[3] (psf) | $s_u$[4] (psf) | M (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 3.45 | 8.2 | | 3.4 | 7.9 | | 0 | 114 | 114 | 114 | 1.30 | 62.9 | 155 | | | | | 4.24 | 323 | | | 1372 |
| 2.0 | 2.3 | 6.3 | | 2.3 | 6 | | 0 | 111 | 225 | 225 | 1.58 | 21.6 | 128 | | | | | 3.23 | 266 | | | 860 |
| 3.0 | 6.6 | 14.4 | | 6.4 | 14.1 | | 0 | 121 | 346 | 346 | 1.19 | 38.9 | 266 | 4.0 | 19.8 | 102.4 | | 3.79 | 556 | 3104 | 1344 | 2103 |
| 4.0 | 6.35 | 13.4 | | 6.2 | 13.1 | | 0 | 120 | 480 | 480 | 1.11 | 27.1 | 239 | 3.3 | 13.8 | 58.2 | | 3.44 | 498 | 2742 | 1300 | 1716 |
| 5.0 | 5.75 | 11.6 | | 5.7 | 11.3 | | 0 | 118 | 599 | 599 | 0.99 | 19.8 | 195 | 2.8 | 10.1 | 35.8 | | 3.15 | 407 | 2316 | 1187 | 1282 |
| 6.0 | 5.1 | 10 | 0 | 5.1 | 9.7 | | 0 | 117 | 715 | 715 | 0.91 | 14.8 | 160 | 2.3 | 7.6 | 22.8 | | 2.87 | 335 | 1926 | 1061 | 962 |
| 7.0 | 4.5 | 9 | | 4.5 | 8.7 | | 0 | 115 | 807 | 807 | 0.93 | 11.6 | 146 | 2.0 | 5.9 | 15.6 | | 2.64 | 304 | 1606 | 940 | 805 |
| 8.0 | 4.5 | 9.2 | | 4.5 | 8.9 | | 0 | 116 | 922 | 922 | 0.98 | 10.2 | 153 | 1.9 | 5.2 | 12.6 | | 2.52 | 320 | 1549 | 938 | 804 |
| 9.0 | 4.5 | 9 | 0 | 4.5 | 8.7 | | 0 | 115 | 1038 | 1038 | 0.93 | 9.1 | 146 | 1.7 | 4.6 | 10.6 | | 2.40 | 304 | 1508 | 940 | 731 |
| 10.0 | 3.8 | 8.75 | | 3.8 | 8.45 | | 0 | 115 | 1149 | 1149 | 1.24 | 6.9 | 162 | | | | | 2.13 | 339 | | | 721 |
| 11.0 | 5.2 | 11.6 | | 5.1 | 11.3 | | 0 | 118 | 1267 | 1267 | 1.21 | 8.4 | 215 | | | | | 2.33 | 449 | | | 1046 |
| 12.0 | 4.25 | 9.2 | 0 | 4.2 | 8.9 | | 0 | 116 | 1383 | 1383 | 1.11 | 6.4 | 162 | 1.4 | 3.3 | 6.1 | | 2.06 | 339 | 1298 | 883 | 696 |
| 13.0 | 3.85 | 8.35 | | 3.9 | 8.05 | | 0 | 114 | 1487 | 1487 | 1.09 | 5.4 | 146 | 1.2 | 2.8 | 4.7 | | 1.89 | 304 | 1134 | 804 | 575 |
| 14.0 | 4.35 | 8.85 | | 4.4 | 8.55 | | 0 | 115 | 1602 | 1602 | 0.97 | 5.7 | 146 | 1.3 | 2.9 | 5.1 | | 1.93 | 304 | 1297 | 909 | 588 |
| 15.0 | 4.55 | 9.2 | 0 | 4.5 | 8.9 | | 0 | 116 | 1717 | 1717 | 0.96 | 5.5 | 151 | 1.2 | 2.8 | 4.9 | | 1.91 | 316 | 1345 | 949 | 602 |
| 16.0 | 5.25 | 10.6 | | 5.2 | 10.3 | | 0 | 117 | 1876 | 1876 | 0.98 | 5.8 | 177 | 1.3 | 3.0 | 5.3 | | 1.95 | 369 | 1561 | 1088 | 721 |
| 17.0 | 4.55 | 9.2 | | 4.5 | 8.9 | | 0 | 116 | 1991 | 1991 | 0.96 | 4.8 | 151 | 1.1 | 2.4 | 3.9 | | 1.76 | 316 | 1297 | 949 | 555 |
| 18.0 | 4.65 | 9.6 | 0 | 4.6 | 9.3 | | 0 | 116 | 2107 | 2107 | 1.01 | 4.6 | 162 | 1.1 | 2.3 | 3.6 | | 1.72 | 339 | 1308 | 966 | 583 |
| 19.0 | 4.25 | 9 | | 4.2 | 8.7 | | 0 | 115 | 2190 | 2190 | 1.05 | 4.0 | 155 | 1.0 | 2.1 | 3.0 | | 1.60 | 323 | 1161 | 885 | 517 |
| 20.0 | 4.05 | 8.1 | | 4.1 | 7.8 | | 0 | 114 | 2304 | 2304 | 0.92 | 3.7 | 129 | 0.9 | 1.9 | 2.6 | | 1.50 | 270 | 1091 | 851 | 405 |
| 21.0 | 4.6 | 9.4 | 0 | 4.6 | 9.1 | | 0 | 116 | 2420 | 2420 | 0.98 | 4.0 | 157 | 1.0 | 2.0 | 2.9 | | 1.57 | 327 | 1249 | 958 | 515 |
| 22.0 | 4.55 | 9.2 | | 4.5 | 8.9 | | 0 | 116 | 2542 | 2542 | 0.96 | 3.7 | 151 | 0.9 | 1.9 | 2.6 | | 1.51 | 316 | 1220 | 949 | 478 |
| 23.0 | 2.85 | 6.05 | | 2.9 | 5.75 | | 0 | 111 | 2652 | 2652 | 0.97 | 2.3 | 98 | 0.6 | 1.2 | 1.2 | | 1.03 | 205 | 693 | 609 | 211 |
| 24.0 | 3.6 | 6.95 | 0 | 3.7 | 6.65 | | 0 | 112 | 2764 | 2764 | 0.82 | 2.8 | 104 | 0.7 | 1.4 | 1.7 | | 1.20 | 217 | 911 | 764 | 260 |
| 25.0 | 3.6 | 7.5 | | 3.6 | 7.2 | | 0 | 113 | 2828 | 2828 | 0.98 | 2.7 | 124 | 0.7 | 1.4 | 1.6 | | 1.18 | 259 | 897 | 758 | 306 |
| 26.0 | 4.1 | 7.5 | | 4.2 | 7.2 | | 0 | 113 | 2941 | 2941 | 0.73 | 3.0 | 106 | 0.8 | 1.5 | 1.8 | | 1.26 | 221 | 1052 | 868 | 278 |
| 27.0 | 2.85 | 6.25 | 0 | 2.9 | 5.95 | | 0 | 111 | 3052 | 3052 | 1.05 | 2.0 | 106 | 0.5 | 1.0 | 1.0 | | 0.89 | 221 | 666 | 607 | 197 |
| 28.0 | 4.55 | 9.2 | | 4.5 | 8.9 | | 0 | 116 | 3235 | 3235 | 0.96 | 2.9 | 151 | 0.8 | 1.5 | 1.8 | | 1.27 | 316 | 1148 | 949 | 402 |

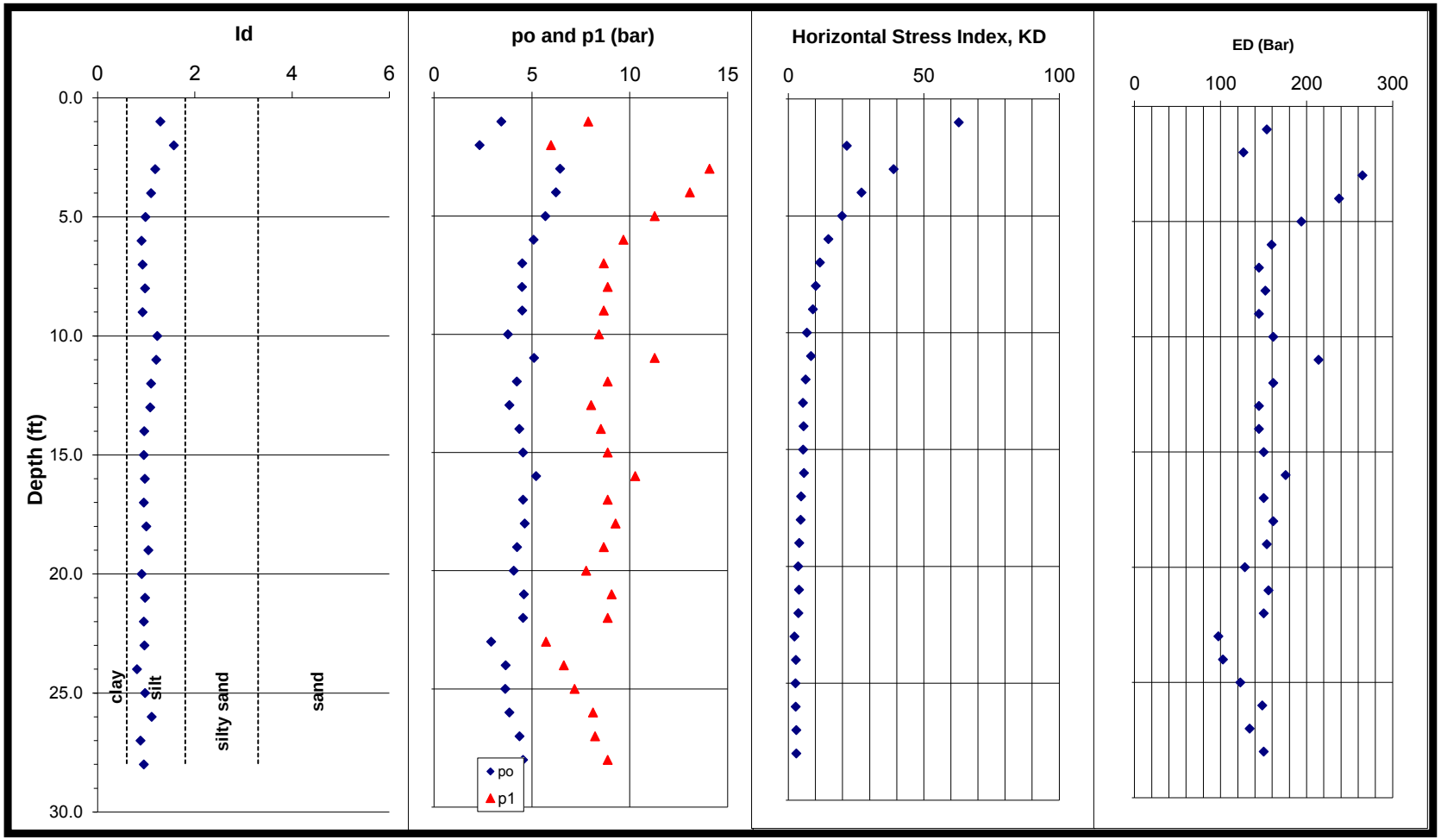
# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB2_B2
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB2_B2
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



Job No: 16-54112
Job Name: SITE #2 (STRUCTURE #2 AND
Job Location: Greensboro, NC
Date: 12-20-16
Sounding No: STR3_EB2_B2
Ground Water Depth (ft): N/A

| | Membrane 1 | Membrane 2 | Membrane 3 |
|---|---|---|---|
| ΔA = | 0.2 | 0 | 0 |
| ΔB = | 0.325 | 0 | 0 |
| Zm= | 0 | bar | |

Northing 874736
Easting 1777468

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

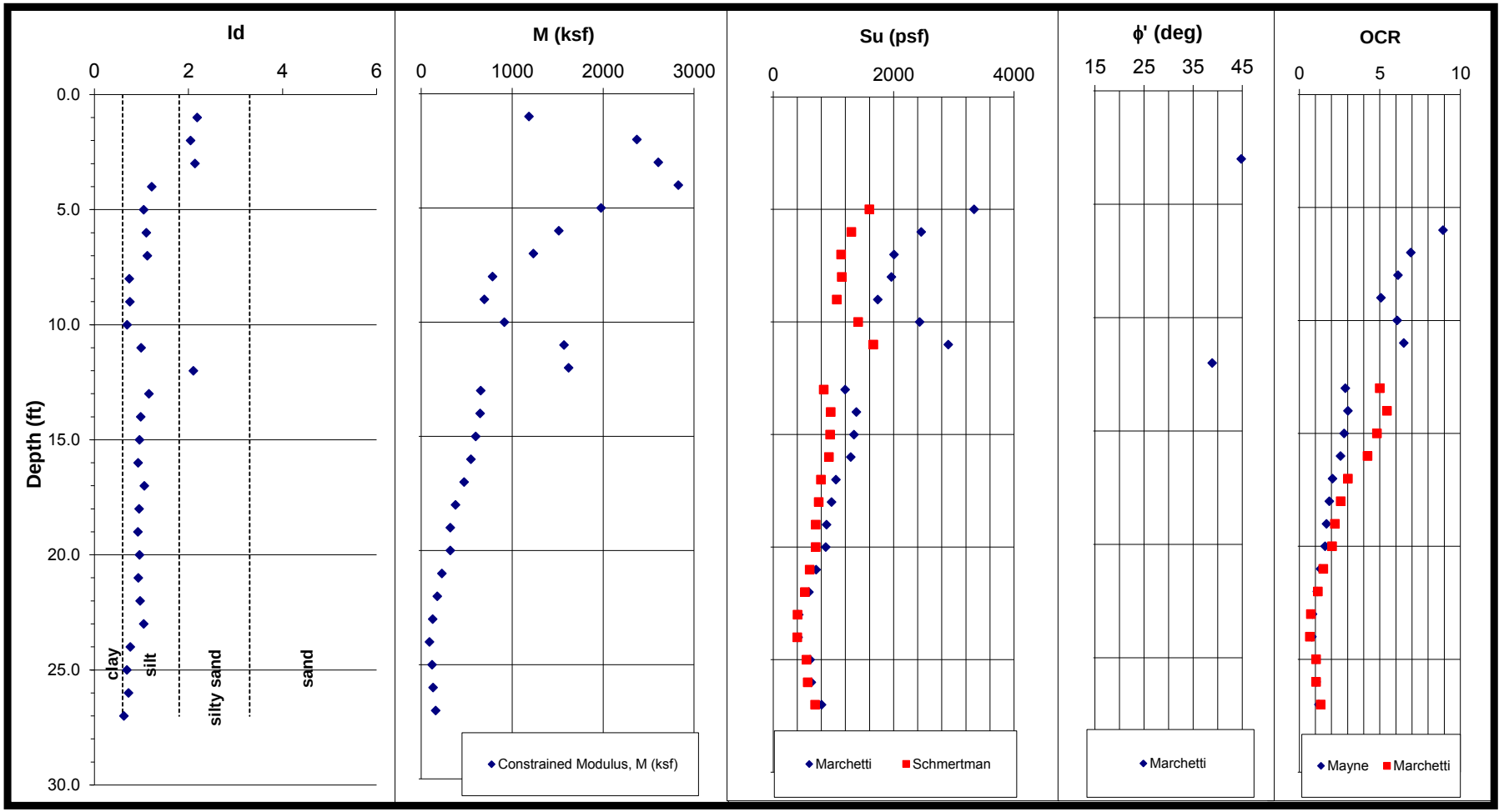
CONETEC

## DILATOMETER TEST RESULTS

| Depth[1] (ft) | A (bar) | B (bar) | C (bar) | po (bar) | p1 (bar) | p2 (bar) | $u_o$ (psf) | $\gamma_T$[5] (pcf) | $\sigma_{vo}$ (psf) | $\sigma_{vo}'$ (psf) | Id | $K_D$ | $E_D$ (bar) | $K_o$ | OCR[2] | OCR[3] | $\phi'$[3] (deg) | $R_M$ | $E_D$ (ksf) | $s_u$[3] (psf) | $s_u$[4] (psf) | M (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 3.45 | 8.2 | | 3.4 | 7.875 | | 0 | 114 | 114 | 114 | 1.29 | 63.0 | 154 | | | | | 4.24 | 322 | | | 1364 |
| 2.0 | 2.3 | 6.3 | | 2.3 | 5.975 | | 0 | 111 | 225 | 225 | 1.57 | 21.6 | 127 | | | | | 3.23 | 264 | | | 854 |
| 3.0 | 6.6 | 14.4 | | 6.4 | 14.075 | | 0 | 121 | 346 | 346 | 1.19 | 38.9 | 265 | 4.0 | 19.8 | 102.4 | | 3.79 | 554 | 3105 | 1344 | 2096 |
| 4.0 | 6.35 | 13.4 | | 6.2 | 13.075 | | 0 | 120 | 480 | 480 | 1.10 | 27.1 | 238 | 3.3 | 13.8 | 58.2 | | 3.44 | 497 | 2743 | 1300 | 1709 |
| 5.0 | 5.75 | 11.6 | | 5.7 | 11.275 | | 0 | 118 | 599 | 599 | 0.98 | 19.8 | 194 | 2.8 | 10.1 | 35.8 | | 3.15 | 405 | 2317 | 1187 | 1276 |
| 6.0 | 5.1 | 10 | 0 | 5.1 | 9.675 | | 0 | 116 | 715 | 715 | 0.90 | 14.8 | 159 | 2.3 | 7.6 | 22.8 | | 2.87 | 333 | 1927 | 1061 | 957 |
| 7.0 | 4.5 | 9 | | 4.5 | 8.675 | | 0 | 115 | 807 | 807 | 0.93 | 11.7 | 145 | 2.0 | 5.9 | 15.6 | | 2.64 | 302 | 1607 | 940 | 800 |
| 8.0 | 4.5 | 9.2 | | 4.5 | 8.875 | | 0 | 116 | 922 | 922 | 0.98 | 10.2 | 152 | 1.9 | 5.2 | 12.6 | | 2.52 | 318 | 1550 | 938 | 799 |
| 9.0 | 4.5 | 9 | 0 | 4.5 | 8.675 | | 0 | 115 | 1037 | 1037 | 0.93 | 9.1 | 145 | 1.7 | 4.6 | 10.6 | | 2.40 | 302 | 1509 | 940 | 726 |
| 10.0 | 3.8 | 8.75 | | 3.8 | 8.425 | | 0 | 115 | 1148 | 1148 | 1.23 | 6.9 | 161 | | | | | 2.13 | 337 | | | 718 |
| 11.0 | 5.2 | 11.6 | | 5.1 | 11.275 | | 0 | 118 | 1267 | 1267 | 1.21 | 8.4 | 214 | | | | | 2.33 | 447 | | | 1042 |
| 12.0 | 4.25 | 9.2 | 0 | 4.2 | 8.875 | | 0 | 115 | 1382 | 1382 | 1.10 | 6.4 | 161 | 1.4 | 3.3 | 6.1 | | 2.06 | 337 | 1299 | 883 | 692 |
| 13.0 | 3.85 | 8.35 | | 3.9 | 8.025 | | 0 | 114 | 1486 | 1486 | 1.08 | 5.4 | 145 | 1.2 | 2.8 | 4.7 | | 1.89 | 302 | 1135 | 804 | 572 |
| 14.0 | 4.35 | 8.85 | | 4.4 | 8.525 | | 0 | 115 | 1601 | 1601 | 0.96 | 5.7 | 145 | 1.3 | 2.9 | 5.1 | | 1.93 | 302 | 1297 | 909 | 585 |
| 15.0 | 4.55 | 9.2 | 0 | 4.5 | 8.875 | | 0 | 115 | 1717 | 1717 | 0.95 | 5.5 | 150 | 1.2 | 2.8 | 4.9 | | 1.91 | 314 | 1346 | 949 | 598 |
| 16.0 | 5.25 | 10.6 | | 5.2 | 10.275 | | 0 | 117 | 1875 | 1875 | 0.97 | 5.8 | 176 | 1.3 | 3.0 | 5.3 | | 1.96 | 367 | 1562 | 1088 | 718 |
| 17.0 | 4.55 | 9.2 | | 4.5 | 8.875 | | 0 | 115 | 1991 | 1991 | 0.95 | 4.8 | 150 | 1.1 | 2.4 | 3.9 | | 1.76 | 314 | 1297 | 949 | 552 |
| 18.0 | 4.65 | 9.6 | 0 | 4.6 | 9.275 | | 0 | 116 | 2107 | 2107 | 1.00 | 4.6 | 161 | 1.1 | 2.3 | 3.7 | | 1.72 | 337 | 1309 | 967 | 580 |
| 19.0 | 4.25 | 9 | | 4.2 | 8.675 | | 0 | 115 | 2189 | 2189 | 1.05 | 4.0 | 154 | 1.0 | 2.1 | 3.0 | | 1.60 | 322 | 1161 | 885 | 514 |
| 20.0 | 4.05 | 8.1 | | 4.1 | 7.775 | | 0 | 114 | 2303 | 2303 | 0.91 | 3.7 | 128 | 0.9 | 1.9 | 2.6 | | 1.50 | 268 | 1091 | 851 | 402 |
| 21.0 | 4.6 | 9.4 | 0 | 4.6 | 9.075 | | 0 | 116 | 2419 | 2419 | 0.98 | 4.0 | 156 | 1.0 | 2.0 | 2.9 | | 1.57 | 325 | 1250 | 958 | 512 |
| 22.0 | 4.55 | 9.2 | | 4.5 | 8.875 | | 0 | 115 | 2541 | 2541 | 0.95 | 3.7 | 150 | 0.9 | 1.9 | 2.6 | | 1.51 | 314 | 1220 | 949 | 475 |
| 23.0 | 2.85 | 6.05 | | 2.9 | 5.725 | | 0 | 111 | 2652 | 2652 | 0.96 | 2.3 | 97 | 0.6 | 1.2 | 1.2 | | 1.03 | 204 | 694 | 609 | 209 |
| 24.0 | 3.6 | 6.95 | 0 | 3.7 | 6.625 | | 0 | 112 | 2691 | 2691 | 0.81 | 2.8 | 103 | 0.7 | 1.4 | 1.7 | | 1.23 | 215 | 918 | 764 | 264 |
| 25.0 | 3.6 | 7.5 | | 3.6 | 7.175 | | 0 | 113 | 2804 | 2804 | 0.98 | 2.7 | 123 | 0.7 | 1.4 | 1.6 | | 1.19 | 257 | 900 | 758 | 306 |
| 26.0 | 3.85 | 8.45 | | 3.8 | 8.125 | | 0 | 114 | 2918 | 2918 | 1.11 | 2.8 | 148 | 0.7 | 1.4 | 1.6 | | 1.22 | 310 | 957 | 803 | 379 |
| 27.0 | 4.35 | 8.55 | 0.05 | 4.4 | 8.225 | 0.25 | 0 | 115 | 3094 | 3094 | 0.88 | 2.9 | 134 | 0.8 | 1.5 | 1.8 | | 1.27 | 280 | 1105 | 912 | 355 |
| 28.0 | 4.55 | 9.2 | | 4.5 | 8.875 | | 0 | 115 | 3210 | 3210 | 0.95 | 3.0 | 150 | 0.8 | 1.5 | 1.8 | | 1.28 | 314 | 1151 | 949 | 401 |

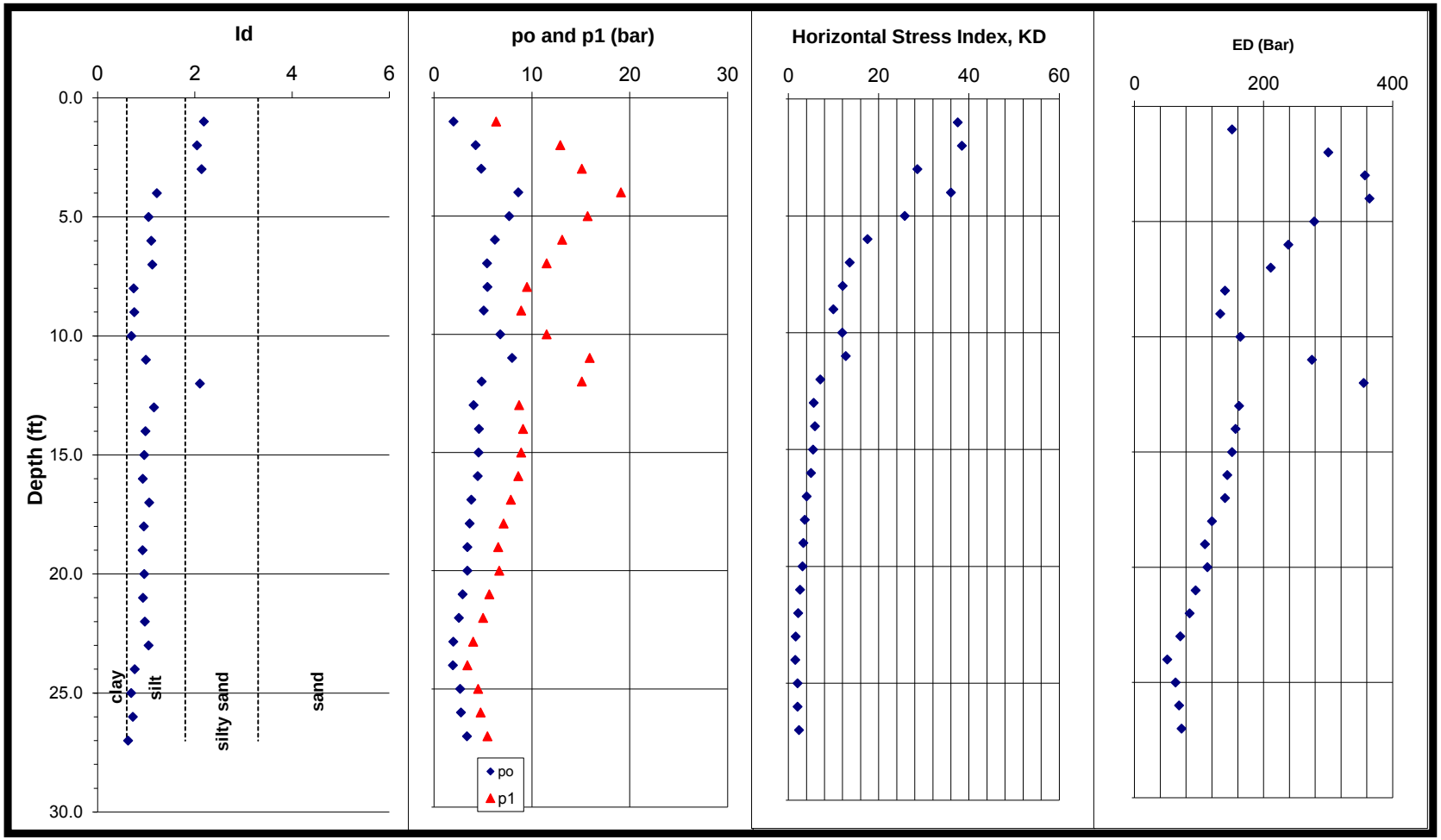
# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB2_B3
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



# DILATOMETER TEST RESULTS

**Test ID:** STR3_EB2_B3
**Site:** SITE #2 (STRUCTURE #2 AND #3) - BRIDGE NO 1241 AND 1242 ON I-85 BYPASS (-L-) OVER LEES CHAPEL ROAD (-Y1-)
**Location:** Greensboro, NC
**Project No.:** 16-54112



Job No: 16-54112
Job Name: SITE #2 (STRUCTURE #2 ANI
Job Location: Greensboro, NC
Date: 12-21-16
Sounding No: STR3_EB2_B3
Ground Water Depth (ft): N/A

| | Membrane 1 | Membrane 2 | Membrane 3 |
|---|---|---|---|
| ΔA = | 0.2 | 0 | 0 |
| ΔB = | 0.3 | 0 | 0 |
| Zm= | 0 | bar | |

Northing 874716
Easting 1777445

[1] Depth Below Existing Ground Surface
[2] Mayne, 1995
[3] Marchetti,2001
[4] Schmertman, 1991
[5] Mayne, 2002

CONETEC

## DILATOMETER TEST RESULTS

| Depth[1] | A | B | C | po | p1 | p2 | $u_o$ | $\gamma_T$[5] | $\sigma_{vo}$ | $\sigma_{vo}'$ | | | $E_D$ | | | | $\phi$'[3] | | $E_D$ | $s_u$[3] | $s_u$[4] | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (ft) | (bar) | (bar) | (bar) | (bar) | (bar) | (bar) | (psf) | (pcf) | (psf) | (psf) | Id | $K_D$ | (bar) | $K_o$ | OCR[2] | OCR[3] | (deg) | $R_M$ | (ksf) | (psf) | (psf) | (ksf) |
| 1.0 | 2 | 6.65 | | 2.0 | 6.35 | | 0 | 111 | 111 | 111 | 2.19 | 37.5 | 151 | | | | 45.8 | 3.75 | 316 | | | 1185 |
| 2.0 | 4.45 | 13.2 | | 4.2 | 12.9 | | 0 | 119 | 230 | 230 | 2.04 | 38.5 | 301 | | | | 45.9 | 3.78 | 628 | | | 2370 |
| 3.0 | 5.1 | 15.4 | 0 | 4.8 | 15.1 | | 0 | 121 | 351 | 351 | 2.14 | 28.6 | 357 | | | | 44.8 | 3.50 | 746 | | | 2607 |
| 4.0 | 8.9 | 19.4 | | 8.6 | 19.1 | | 0 | 125 | 499 | 499 | 1.22 | 36.0 | 364 | | | | | 3.71 | 761 | | | 2826 |
| 5.0 | 7.85 | 16 | | 7.7 | 15.7 | | 0 | 122 | 621 | 621 | 1.05 | 25.8 | 279 | 3.2 | 13.1 | 54.0 | | 3.40 | 582 | 3338 | 1601 | 1978 |
| 6.0 | 6.35 | 13.4 | 0 | 6.2 | 13.1 | | 0 | 120 | 741 | 741 | 1.11 | 17.5 | 239 | 2.6 | 8.9 | 29.6 | | 3.03 | 498 | 2460 | 1300 | 1511 |
| 7.0 | 5.5 | 11.8 | | 5.4 | 11.5 | | 0 | 119 | 830 | 830 | 1.13 | 13.6 | 211 | 2.2 | 6.9 | 19.9 | | 2.79 | 441 | 2008 | 1130 | 1232 |
| 8.0 | 5.45 | 9.8 | | 5.5 | 9.5 | | 0 | 116 | 946 | 946 | 0.74 | 12.1 | 140 | 2.1 | 6.1 | 16.5 | | 2.68 | 293 | 1964 | 1140 | 784 |
| 9.0 | 5.05 | 9.2 | 0 | 5.1 | 8.9 | | 0 | 115 | 1061 | 1061 | 0.76 | 10.0 | 133 | 1.8 | 5.1 | 12.3 | | 2.50 | 278 | 1740 | 1058 | 694 |
| 10.0 | 6.8 | 11.8 | | 6.8 | 11.5 | | 0 | 118 | 1183 | 1183 | 0.70 | 12.0 | 164 | 2.1 | 6.1 | 16.3 | | 2.67 | 342 | 2434 | 1415 | 914 |
| 11.0 | 8.15 | 16.2 | | 8.0 | 15.9 | | 0 | 122 | 1306 | 1306 | 0.99 | 12.8 | 275 | 2.1 | 6.5 | 18.0 | | 2.73 | 575 | 2910 | 1665 | 1568 |
| 12.0 | 5.15 | 15.4 | 0 | 4.9 | 15.1 | | 0 | 121 | 1427 | 1427 | 2.11 | 7.1 | 355 | | | | 38.9 | 2.18 | 742 | | | 1621 |
| 13.0 | 4.05 | 9 | | 4.0 | 8.7 | | 0 | 115 | 1498 | 1498 | 1.16 | 5.6 | 162 | 1.3 | 2.9 | 5.0 | | 1.93 | 339 | 1198 | 841 | 653 |
| 14.0 | 4.6 | 9.4 | | 4.6 | 9.1 | | 0 | 116 | 1614 | 1614 | 0.98 | 5.9 | 157 | 1.3 | 3.0 | 5.5 | | 1.98 | 327 | 1382 | 958 | 647 |
| 15.0 | 4.55 | 9.2 | 0 | 4.5 | 8.9 | | 0 | 116 | 1729 | 1729 | 0.96 | 5.5 | 151 | 1.2 | 2.8 | 4.8 | | 1.90 | 316 | 1343 | 949 | 600 |
| 16.0 | 4.45 | 8.9 | | 4.5 | 8.6 | | 0 | 115 | 1842 | 1842 | 0.93 | 5.0 | 144 | 1.2 | 2.6 | 4.2 | | 1.81 | 301 | 1289 | 930 | 545 |
| 17.0 | 3.8 | 8.15 | | 3.8 | 7.85 | | 0 | 114 | 1956 | 1956 | 1.06 | 4.1 | 140 | 1.0 | 2.1 | 3.0 | | 1.60 | 293 | 1044 | 795 | 470 |
| 18.0 | 3.6 | 7.4 | 0 | 3.6 | 7.1 | | 0 | 113 | 2069 | 2069 | 0.95 | 3.7 | 120 | 0.9 | 1.9 | 2.6 | | 1.50 | 251 | 972 | 759 | 376 |
| 19.0 | 3.35 | 6.85 | | 3.4 | 6.55 | | 0 | 112 | 2129 | 2129 | 0.93 | 3.3 | 109 | 0.9 | 1.7 | 2.2 | | 1.40 | 228 | 888 | 710 | 319 |
| 20.0 | 3.35 | 6.95 | | 3.4 | 6.65 | | 0 | 112 | 2241 | 2241 | 0.96 | 3.2 | 113 | 0.8 | 1.6 | 2.0 | | 1.35 | 236 | 875 | 709 | 318 |
| 21.0 | 2.85 | 5.95 | 0 | 2.9 | 5.65 | | 0 | 110 | 2351 | 2351 | 0.93 | 2.6 | 95 | 0.7 | 1.3 | 1.5 | | 1.15 | 198 | 716 | 610 | 227 |
| 22.0 | 2.45 | 5.3 | | 2.5 | 5 | | 0 | 109 | 2399 | 2399 | 0.97 | 2.2 | 86 | 0.6 | 1.1 | 1.2 | | 0.99 | 179 | 596 | 529 | 177 |
| 23.0 | 1.85 | 4.3 | | 2.0 | 4 | | 0 | 107 | 2506 | 2506 | 1.05 | 1.6 | 71 | 0.4 | 0.8 | 0.7 | | 0.85 | 148 | 426 | 408 | 126 |
| 24.0 | 1.8 | 3.7 | 0 | 1.9 | 3.4 | | 0 | 105 | 2611 | 2611 | 0.76 | 1.5 | 51 | 0.4 | 0.8 | 0.7 | | 0.85 | 107 | 416 | 403 | 91 |
| 25.0 | 2.55 | 4.8 | | 2.7 | 4.5 | | 0 | 108 | 2693 | 2693 | 0.69 | 2.1 | 64 | 0.6 | 1.1 | 1.1 | | 0.89 | 133 | 617 | 556 | 119 |
| 26.0 | 2.65 | 5.05 | | 2.8 | 4.75 | | 0 | 108 | 2802 | 2802 | 0.72 | 2.1 | 69 | 0.6 | 1.0 | 1.0 | | 0.89 | 145 | 637 | 575 | 129 |
| 27.0 | 3.25 | 5.75 | 0 | 3.4 | 5.45 | | 0 | 110 | 2911 | 2911 | 0.63 | 2.4 | 73 | 0.6 | 1.2 | 1.3 | | 1.04 | 152 | 806 | 700 | 158 |