Infrastructure Engineering Solutions

3031 W. Grand Blvd. • Suite 228 • Detroit, Michigan 48202

DRAFT GEOTECHNICAL DATA REPORT

I-75 MODERNIZATION PROJECT
OWNER'S REPRESENTATIVE CONSULTANT
TUNNEL DESIGN INVESTIGATION
NORTH OF 8 MILE ROAD (M-102) TO NORTH OF 12 MILE ROAD
OAKLAND COUNTY, MICHIGAN
MDOT JN: 122104O; CS: 63174

Owner:

Michigan Department of Transportation
18101 W. Nine Mile Road
Southfield, MI 48075

Prepared for:

WSP Michigan, Inc.
500 Griswold Street, Suite 2600
Detroit, Michigan 48226

2014195C
August 22, 2017

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Somat Engineering, INCORPORATED

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August 22, 2017
2014195C

Mrs. Barbara J. Arens, PE, PTOE
President, Central Region Operations Manager
WSP Michigan, Inc.
500 Griswold Street, Suite 2600
Detroit, Michigan 48226

RE: Draft Geotechnical Data Report
I-75 Modernization Project
ORC Tunnel Design Investigation- North of 8 Mile Rd (M-102) to North of 12 Mile Rd
Oakland County, Michigan MDOT JN: 122104O; CS: 63174

Dear Mrs. Arens:

We have completed the geotechnical investigation for the above referenced project. The following sections of this report will provide our understanding of the project, a description of our field investigation, the results of the field and laboratory tests, and the logs of test borings.

This draft report includes the borings performed during Phases 1 and 2 of the tunnel investigation. To date the field exploration program consisted of performing a total of sixty (60) soil borings throughout the project limits from north of 8 Mile Road to north of 12 Mile Road. We understand that more soil borings will be performed as part of Phase 3 geotechnical investigation for the proposed tunnel. Upon completion of the next phase of the geotechnical investigation, this draft report will be updated with the additional subsurface information when it becomes available.

WSP requested that the soil samples obtained from the tunnel borings (performed during Work Orders Numbers 3 and 4, under ORC MDOT JN: 122104O) should be retained until completion of tunnel construction. Typically, we retain the soil and rock samples for a period of 90 days from the date of the final geotechnical investigation report. After this retention period, we can relinquish the samples to MDOT for storage in their facilities. If however MDOT would not take custody of the samples, then Somat will be willing to retain them for the requested period of time in a climate controlled storage facility for a monthly storage rental fee. For budgetary purposes we assumed the need to store the samples for 12 months.

It was a pleasure working with you on this project. If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,
Somat Engineering, Inc.

Jonathan D. Zaremski, P.E.
Geotechnical Project Manager

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3031 W. Grand Blvd, Suite 228, Detroit, Michigan 48202 web: www.somateng.com phone: 313-963-2721 fax: 313-963-2736 email: info@somateng.com

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1.0 INTRODUCTION

1.1 GENERAL

Upon authorization from WSP Michigan, Inc. (WSP) in Detroit, Michigan, Somat Engineering, Inc. (Somat) has conducted a geotechnical investigation as part of the Owner's Representative Consultant (ORC) services for the proposed drainage/storage tunnel of a section of I-75 from north of 8 Mile Road to north of 12 Mile Road in Oakland County, Michigan. The geotechnical investigation was performed in general accordance with the following proposals and work plans:

- Somat Proposal No. P140068 for Work Order 2, dated December 15, 2014;
- "Proposed Scope of Work for the Tunnel Study Phase" dated September 9, 2015;
- Somat Proposal No. P150404 for Work Order 3, dated January 21, 2016;
- Somat Proposal No. P160384A for Work Order 4, dated December 6, 2016; and
- MDOT Program/Project Management System (P/PMS) Task 3325 Geotechnical Structural Site Characterization.

The following sections of this report will provide our understanding of the project, a description of our field investigation, the results of the field and laboratory tests, and the logs of test borings. The information presented in this data report is intended to be used to facilitate the design of the geotechnical aspects of the project.

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1.2 PROJECT INFORMATION

The overall I-75 Modernization project consists of the design and reconstruction of I-75 from 8 Mile Road (M-102) to north of South Boulevard, encompassing approximately 18 miles of the I-75 freeway. This stretch of freeway, which traverses through six (6) communities in Oakland County, has been divided into a total of nine main segments for reconstruction.

As part of the I-75 reconstruction, a new drainage/storage tunnel from north of 8 Mile Road to north of 12 Mile Road is planned to be constructed. The proposed tunnel is approximately 20,000 feet long and crosses through the communities of Hazel Park, Madison Heights, and Royal Oak. The proposed tunnel will store and convey excess storm water during rain events, and the proposed alignment is generally located under the northbound I-75 Service Drive (Stephenson Highway/N. Chrysler Drive). The proposed tunnel finished diameter will be generally 12 to 14 feet, with the invert elevation ranging from 538 feet at the north end of the tunnel to 560 feet at the south end. In addition to the tunnel, drop shaft structures and a new pump station are proposed. This report addresses the geotechnical investigation for the design of a proposed drainage/storage tunnel and associated structures.

The tunnel borings were performed in two phases. The following table lists the borings and the groundwater monitoring wells performed/installed during each phase. The soil borings are presented in order from north to south, following the downstream direction of the proposed tunnel. This draft report includes the borings performed during Phases 1 and 2.

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Table 1.2 Summary of the Tunnel Investigation Soil Borings

Phase 1 Soil Boring ID	Phase 2 Soil Boring ID	
	Phase 2-A	Phase 2-B
TB-06*	TB-06A	TB-119
TB-05*	SB-03	TB-118
TB-04	SB-03A	TB-117
TB-03*	SB-06*	SB-09
TB-02	RW-40	SB-09A
TB-01*	RW-40A	RW-37
	TB-05A	RW-37A
	SB-12	RW-31
	RW-20	RW-31A
	RW-13	RW-25
	RW-08*	RW-25A
	RW-08A	RW-17
	SB-17	RW-17A
	SB-17A	SB-15
	SB-17B	SB-15A
	TB-04A	SB-16
	TB-116	SB-16A
	TB-114	SB-16B*
	TB-03A	SB-18
	TB-111*	SB-18A
	TB-109	TB-115
	TB-107	TB-113
	TB-02A	TB-112
	TB-105	TB-110
	TB-103	TB-108
	TB-101	TB-106
		TB-104
		TB-102
Total 6 borings	**Total 26 borings**	**Total 28 borings**
Grand total 60 borings		

*Groundwater monitoring wells.

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1.3 SITE CONDITIONS

I-75 carries three lanes of traffic in both directions, with a posted speed limit of 70 miles per hour. The existing pavement surface consists of either asphaltic cement concrete or Portland cement concrete. The service roads on the east side of I-75, including N. Chrysler Drive and Stephenson Highway, consist of two-lane, one-way traffic, running northbound and parallel to

NB I-75. Entrance and exit ramps from N. Chrysler Drive and Stephenson Highway to NB I-75 are typically one lane with paved shoulders. The proposed tunnel construction passes under the I-696/I-75 interchange. The topography of the site is relatively level, with similar grades along the service drives and the surrounding area. The mainline of I-75 within the project limits is depressed at I-696 and the overpasses except for the 12 Mile Road interchange, where the mainline has been built up over existing grades.

This area of Oakland County is generally residential in nature. The areas on either side of the freeway along this stretch of I-75 are vegetated with trees and brushes, including some areas between the ramps at the interchange of I-75 and I-696 as well as grass-covered areas between NB I-75 and the adjacent access roads of N. Chrysler Drive and Stephenson Highway.

2.0 SUBSURFACE INVESTIGATION

2.1 FIELD EXPLORATION

To date the field exploration program consisted of performing a total of sixty (60) soil borings throughout the project limits from north of 8 Mile Road to north of 12 Mile Road. This includes six (6) soil borings performed during Phase 1, twenty-six (26) soil borings performed during Phase 2-A, and twenty-eight (28) soil borings performed during Phase 2-B. We understand that more soil borings will be performed as part of Phase 3 geotechnical investigation for the proposed tunnel. The number, location and spacing of the soil borings were selected by WSP to investigate the existing soils along the proposed tunnel alignment. The final locations of the soil borings were selected and staked in the field by Somat, taking into consideration the locations of the utilities (underground and overhead) and equipment accessibility. Ground surface elevations and coordinates were obtained by Surveying Solutions, Inc. (SSI) using horizontal datum “North American Datum of 1983” (NAD 83) (NSRS 2011) and vertical datum “North American Vertical Datum of 1988” (NAVD 88). The ground surface elevations and coordinates were provided to Somat for use in this report.

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The exploration depths of the soil borings were selected by WSP. The soil borings generally extended to a minimum depth of 1.5 times the proposed tunnel diameter below the proposed tunnel invert, based on a potential mined diameter of up to 16 feet. As such, the soil borings generally extended a minimum of 25 feet below the proposed finished tunnel invert. Borings RW-08, TB-102A, TB-106, TB-104 and TB-103 terminated at approximately 18 to 21 feet below the proposed finished tunnel invert.Boring TB-107 terminated 13 feet below the proposed finished tunnel invert. Some bridge structure borings extended deeper, with penetration into rock, to provide data for bridge foundation design.

All of the soil borings were performed for the geotechnical investigation of the proposed tunnel; however some of the soil borings served a dual purpose for both the proposed tunnel and proposed structures along the I-75 Modernization Project Segment 2 from I-696 to south of 12 Mile Road. The following table summarizes the field exploration program for Phase 1 and Phase 2 of the tunnel design investigation:

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Table 2.1
Field Exploration Program Summary

Boring IDs	*Phase*	*Number of Soil Borings*	*Purpose (Project Components)*
TB-06, TB-05, TB-04, TB-03, TB-02, TB-01	1	6	Tunnel Borings
RW-40, RW-40A, RW-20, RW-13, RW-08, RW-08A	2-A	6	Retaining Wall/Noise Wall Borings and Tunnel Borings
SB-03, SB-03A, SB-06, SB-12, SB-17, SB-17A, SB-17B	2-A	7	Bridge Structure Borings and Tunnel Borings
TB-06A, TB-05A, TB-04A, TB-03A, TB-02A	2-A	5	Tunnel Borings
TB-116, TB-114, TB-111, TB-109, TB-107, TB-105, TB-103, TB-101	2-A	8	Tunnel Borings
RW-37, RW-37A, RW-31, RW-31A, RW-25, RW-25A, RW-17, RW-17A	2-B	8	Retaining Wall/Noise Wall Borings and Tunnel Borings
SB-09, SB-09A, SB-15, SB-15A, SB-16, SB-16A, SB-16B, SB-18, SB-18A	2-B	9	Bridge Structure Borings and Tunnel Borings
TB-119, TB-118, TB-117, TB-115, TB-113, TB-112, TB-110, TB-108, TB-106, TB-104, TB-102	2-B	11	Tunnel Borings

Soil boring location diagrams are presented in Appendix A. The logs of soil borings and rock cores are included in Appendix B.

2.1.1 Drilling Operations

The drilling operations for Phase 1 of the tunnel design investigation were performed on various days between October 6, 2015 and October 20, 2015. The drilling operations for Phase 2 were performed on various days between August 17, 2016 and March 23, 2017. The soil borings were drilled using either a truck mounted drill rig or an all terrain vehicle (ATV) mounted drill rig, as required by the site condition.

The soil borings were drilled using 4-inch diameter solid stem augers and 2¼-inch to 4¼-inch diameter hollow stem augers. Deeper soil borings were drilled by advancing solid stem or hollow stem augers before transitioning to a wash rotary drilling technique.

In some of the bridge structure borings that were serving as dual purpose for the tunnel investigation, rock cores were obtained upon encountering bedrock. The rock cores were obtained by means of a NQ wire-line double core barrel with a 1-7/8 inch (nominal) inside diameter, advanced generally in 5 foot runs.

Upon completion, the soil borings were generally backfilled with a cement-bentonite grout mixture. Three soil borings (RW-40, RW-31, and RW-17) were backfilled with soil cuttings. Groundwater monitoring wells were installed in eight (8) of the boreholes (TB-06, SB-06, TB-05, RW-08, SB-16B, TB-111, TB-03, and TB-01). Soil borings performed through pavements were patched at the surface with asphalt cold-patch or quick-setting concrete to match the existing conditions.

2.1.2 Standard Penetration Test (SPT)

Soil samples collected during the drilling portion of the subsoil exploration were labeled with the soil boring designation and a unique sample number. Soil boring samples were obtained by

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Standard Penetration Tests in general accordance with ASTM D-1586 procedures, whereby a conventional 2-inch O.D. split-spoon sampler is driven into the soil with a 140 pound hammer repeatedly dropped through a free-fall distance of 30 inches. A hydraulically driven automatic SPT hammer fixed to a drill rig was used to perform the test. The sampler is generally driven three successive 6-inch increments, with the blows for each 6-inch increment being recorded. The number of blows required to advance the sampler through 12 inches after an initial penetration of 6 inches, is termed the Standard Penetration Test resistance (N-value) and is presented graphically on the individual Logs of Test Borings. As added information, the number of blows for each 6-inch increment are also presented on the boring logs.

A fourth 6-inch increment was driven on select SPT samples. In general, this method of SPT sampling was utilized during continuous sampling intervals to obtain additional soil material. The N-value is the sum of blows through the second and third 6-inch increments, regardless of the presence of a fourth increment.

2.1.3 Sampling

Soil samples from the borings were recovered using SPT sampling procedures in general accordance with ASTM Standard D-1586 ("Standard Method for Penetration Tests and Split Barrel Sampling of Soils"). The soil samples were sealed in glass jars in the field to protect the samples and maintain their natural moisture contents.

In general, the SPT samples were obtained at a regular interval of 2½ feet to a depth of 10 feet below grade and at an interval of 5 feet thereafter to the exploration depth of the borings. Additional sampling and testing was requested throughout the tunnel influence zone, an interval from 20 feet above the proposed tunnel crown to 10 feet below the proposed tunnel invert. Shelby tube sampling was generally performed within the tunnel influence zone, as well as continuous SPT sampling in select soil borings.

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In addition to the split spoons, 3-inch diameter thin-walled (Shelby) tubes were obtained at selected depth intervals where cohesive soils were anticipated. The Shelby tubes were collected by use of the direct push method, per ASTM D-1587 (Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes). The Shelby tube samples were sealed immediately at both ends with a wax plug and plastic end-caps. All tubes were identified with information on boring number, sample number, sample depth and recovery. The tubes were stored in a vertical position to minimize sample disturbance during transportation. These samples include a sample number prefix of "ST" on the Logs of Test Borings.

Rock core samples retrieved from the rock core process were placed into wooden boxes labeled, and photographed for documentation. The core boxes were transported to Somat Lab for further testing, classification and logging. Photographs of the rock cores are included in Appendix C.

All soil samples were transported to Somat's laboratory for further analysis and testing. WSP requested that the soil samples obtained from the tunnel borings (performed during Work Orders Numbers 3 and 4, under ORC MDOT JN: 122104O) should be retained until completion of tunnel construction. Typically, we retain the soil and rock samples for a period of 90 days from the date of the final geotechnical investigation report. After this retention period, we can relinquish the samples to MDOT for storage in their facilities. However, if MDOT would not take custody of the samples, then Somat will be willing to retain them for the requested period of time in a climate controlled storage facility for a monthly storage rental fee. For budgetary purposes we assumed the need to store the samples for 12 months.

2.1.4 In-Situ Field Vane Shear Tests

Field vane shear tests were generally performed using Acker vane shear test kit with a calibrated torque head, in general accordance with ASTM D-2573. The in-situ field vane tests were performed within the tunnel influence zone, where suitably soft to stiff clay layers were encountered. These tests were performed to determine the in-place shear strength of the clay soils. The test generally consists of pushing a four-bladed vane into the undisturbed soil and

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rotating it from the surface to determine the torsional force required to cause a cylindrical surface to be sheared by the vane. This torsional force is then converted to a unit shearing resistance of the cylindrical surface.

The vane was rotated at a rate of approximately 5 degrees per minute and torque readings were obtained at 5-degree intervals. Following determination of the maximum shear strength, the vane was rotated quickly to shear off the soil column and a remolded strength test was performed following a 5-minute waiting interval. The undisturbed shear strength was compared to the remolded shear strength to determine the sensitivity of the clay. The results of these field vane shear tests are presented on the Logs of Test Borings with a sample number prefix of "VS" and as detailed reports in Appendix D.

2.1.5 Photoionization Detector (PID) Screening

Soil samples from soil borings located at the primary drop shaft locations (TB-06A, TB-116, and TB-101) were screened for general volatile organic compound vapor presence using a PID screening meter. The PID is a portable vapor and gas instrument that detects a variety of organic compounds with a detection range of approximately 0.1 to 10,000 parts per million (ppm). The PID indicates if volatile organic compounds (VOCs) or semi volatile organic contents (SVOCs) are present, but does not identify which type or the specific concentration. The PID was calibrated prior to screening using 100-ppm isobutylene. Each soil sample was placed in a re-sealable, plastic sample collection bag. This allowed for headspace expansion as the sample was allowed to warm. Once expansion occurred, the bag was opened, the tip of the PID was inserted in the bag and the result was recorded. A summary of the PID soil screening results is presented in Appendix E.

2.1.6 Gas Monitoring

During drilling of the soil borings, the atmosphere within the breathing zone was being monitored continuously throughout the drilling and rock coring of the borings. Gas monitoring was performed using a four-gas detection meter. The meter simultaneously measures the Lower

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Explosive Limit (LEL) of combustible gases, oxygen, carbon monoxide, and hydrogen sulfide. These gases are virtually undetectable by visual and olfactory methods (hydrogen sulfide has a distinct odor, but the gas can paralyze the sense of smell). The four-gas meter was also utilized every time water level readings were obtained from the groundwater monitoring wells. Detectable levels of gas readings are recorded in Appendix G "Monitoring Wells Groundwater Level Readings and Gas Readings".

2.1.7 Groundwater Level Observation Procedures

Whenever possible, groundwater level observations were made during the drilling operations and immediately after completion of drilling, and are shown on the individual Logs of Test Borings. During drilling, the depth at which free water was observed, where drill cuttings became saturated or where saturated samples were collected, was indicated as the groundwater level during drilling. In granular, pervious soils, the indicated water levels are considered relatively reliable when solid or hollow-stem augers are used for drilling. However, in cohesive soils, groundwater observations are not necessarily indicative of the static water table due to the low permeability rates of the soils, and due to the sealing off of natural paths of groundwater flow during drilling operations. Further, the use of wash water in the drilling process makes detecting groundwater seepage difficult.

It should be noted that seasonal variations and recent rainfall conditions may influence the level of the groundwater table significantly.

2.1.8 Groundwater Monitoring Well Installation Procedures

As part of the scope of work for Phase 1 and Phase 2, open-standpipe monitoring wells were installed at eight (8) of the soil boring locations. The standpipe wells were constructed out of 2-inch diameter PVC pipe and each well consisted of a 10-foot to 15-foot long schedule 10 PVC screen and several 10-foot pipe risers. A sand pack was placed in the annulus around the screen and sealed at the top with bentonite. A flush mounted roadway box was placed over each well

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location for protection and security. A summary of the groundwater monitoring wells constructed at the site is presented in Table 2.1.8.

Table 2.1.8
Summary of Monitoring Well Installations

Boring Number	Well Description	Screen Length (ft)	Approximate Screen Depth (ft)	Approximate Screen Elevation (ft)
TB-06	Standpipe PVC Monitoring Well, Flush Mount	10	78 to 88	579.6 to 569.6
SB-06	Standpipe PVC Monitoring Well, Flush Mount	15	87 to 102	551.1 to 536.1
TB-05	Standpipe PVC Monitoring Well, Flush Mount	10	53 to 63	584.0 to 574.0
RW-08	Standpipe PVC Monitoring Well, Flush Mount	15	66 to 81	568.1 to 553.1
SB-16B	Standpipe PVC Monitoring Well, Flush Mount	15	70.5 to 85.5	562.1 to 547.1
TB-111	Standpipe PVC Monitoring Well, Flush Mount	15	69 to 84	562.8 to 547.8
TB-03	Standpipe PVC Monitoring Well, Flush Mount	10	43 to 53	591.6 to 581.6
TB-01	Standpipe PVC Monitoring Well, Flush Mount	10	34 to 44	598.5 to 588.5

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All of the monitoring wells were flushed out by the drilling contractor immediately after they were installed and then they were developed by Somat within a week from the installation date. The wells were developed utilizing manual bailing techniques or a submersible pump until the water levels in the wells were lowered to the bottom of the well.

Per our scope of services, groundwater level readings will be subsequently obtained until the end of 2017. In general, the readings will be obtained once per month at intervals of approximately 30 days. The monitoring well installation records and groundwater level readings are included in Appendix F and G, respectively. An addendum to this report will be issued upon the completion of the groundwater well monitoring program, which will include all of the well readings obtained until the end of 2017.

2.1.9 Falling Head In-Situ Permeability Test

The falling head in-situ permeability test was performed after the water level in the well was stabilized after development. Falling head permeability tests were performed in general accordance with ASTM D-4044 and the Naval Facility Engineering Command (NAVFAC) DM 7.01 (Table 15-C) for cased holes. In this test, the well is filled with water to ground surface, which is then allowed to seep into the soil. The change in head is measured and compared to the long-term groundwater level determined by the groundwater well readings. The rate of infiltration is calculated over a period of time required for the head of water to stabilize and reach equilibrium at or near the long-term groundwater level. Graphical results of the falling head in-situ tests are included in Appendix H.

2.2 GEOTECHNICAL LABORATORY TESTING

All samples were classified in general accordance with the Unified Soil Classification System. Representative soil samples were subjected to laboratory tests consisting of moisture content determinations, unit weight determinations, hand penetrometer tests, Torvane tests, unconfined compressive strength tests, Atterberg Limits tests, and grain size/hydrometer analyses. Select Shelby tube samples were subjected to other geotechnical lab tests, including three-point direct shear tests, one-dimensional consolidation tests, and consolidated undrained triaxial tests. WSP assigned the lab tests, testing depths and the required test parameters for each soil sample (SPT and Shelby tubes) and provided the lab assignment sheets to Somat for testing.

A summary table of the laboratory tests is presented in Appendix I. The results of the laboratory tests are included in Appendix B on the respective logs of test borings. All laboratory tests were performed in general accordance with applicable ASTM procedures.

Upon approval from WSP and in order to meet the lab testing schedule for this tunnel investigation, some of the tests were performed by outside geotechnical labs that are AMRL Certified. Those labs are GeoTesting Express Inc. in Acton, MA and DLZ Laboratory in Columbus, OH.

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2.2.1 Moisture Content Determination Tests

All samples were sealed in the field to retain the natural moisture content of the soil specimen. Moisture content determination tests were performed on cohesive samples in general accordance with ASTM D-2216. Results of the moisture content determination tests are included in Appendix B on the respective logs of test borings.

2.2.2 Unconfined Compressive Strength Tests

Standard test methods for unconfined compressive strength of cohesive soil were performed in general accordance with ASTM D-2166 on selected cohesive samples from the soil borings. The unconfined compression test consists of axially loading a small cylindrical soil sample at a slow rate of strain, until failure occurs. Failure is defined as the maximum stress level in the soil sample or the stress level at 15 percent strain, whichever is less. The results of these tests are shown on the respective logs of test borings in Appendix B.

Estimation of unconfined compressive strength on remaining cohesive samples was obtained by performing either a hand penetrometer test or a Torvane test. In the hand penetrometer test, the shear strength of a cohesive soil sample is estimated by measuring the resistance of the sample to the penetration of a small, calibrated spring-loaded cylinder. The maximum capacity of the penetrometer is 4.5 tons per square foot. In the Torvane test, the shear strength of a cohesive soil sample is estimated by measuring the resistance of the sample in shear when twisting a small, calibrated spring-loaded vane pressed into the sample. The results of these tests are shown on the respective logs of test borings in Appendix B.

2.2.3 Unit Weight Determination Tests

Unit weight determination tests were performed in general accordance with ASTM D-2166 on selected cohesive samples from the soil borings. The results of these tests are shown on the respective logs of test borings in Appendix B.

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2.2.4 Grain Size Analyses

Grain size/hydrometer analyses were performed in general accordance with ASTM D-422 and D-136 on selected soil samples to evaluate the gradation of the soil represented by the sample. The distribution of particle sizes larger than 75 micrometers (retained on the No. 200 sieve) is determined by sieving, while the distribution of particle sizes smaller than 75 micrometers is determined by a sedimentation process using a hydrometer. Graphical results of Grain Size Analyses are included in Appendix J.

2.2.5 Atterberg Limits Tests

Standard test methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils known as Atterberg Limits were performed in general accordance with ASTM D-4318 on selected cohesive samples from the soil borings. Fine-grained soils are tested to determine the Liquid Limit (LL) and Plastic Limits (PL), which are moisture contents that define boundaries between material consistency states. The LL and PL values define the water content boundaries between non-plastic, plastic and viscous fluid states. The plasticity index (PI) defines the complete range of plastic state. Test results of the Atterberg Limits are included in Appendix K.

2.2.6 Direct Shear Test Results

Direct Shear tests were performed on Shelby tube sample ST-21 from soil boring SB-06, ST-18 from soil boring TB-111, and ST-9 from soil boring TB-02A. These tests were performed in general accordance with ASTM D-3080. These results are included in Appendix L.

2.2.7 One-Dimensional Consolidation Test Results

One-dimensional consolidation tests were performed on Shelby tube sample ST-03 from soil boring TB-06A, ST-17 from soil boring SB-06, ST-13 from soil boring TB-116, and ST-14 from soil boring TB-103. The tests were performed in general accordance with ASTM D-2435. These results are included in Appendix M.

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2.2.8 Consolidated Undrained Triaxial Test Results

Consolidated Undrained Triaxial testing was performed on Shelby tube sample ST-19 from soil boring RW-20, ST-17 from soil boring TB-116, and ST-19 from soil boring TB-101. The tests were performed in general accordance with ASTM D-4767. These results are included in Appendix N.

2.3 LIMITATIONS

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater or air, on, below or around this site. This investigation was strictly geotechnical and did not include any environmental investigation other than photoionization detector screening and gas monitoring.

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3.0 RESULTS OF SUBSURFACE INVESTIGATIONS

3.1 SOIL STRATIFICATION AND GROUNDWATER CONDITIONS

Soil conditions encountered at the test boring locations have been evaluated and are presented in the form of Logs of Test Borings. The Logs of Test Borings presented in Appendix B include approximate soil stratification with detailed soil descriptions and selected physical properties for each stratum encountered in the test borings. In addition to the observed subsoil stratigraphy, the boring logs present information relating to sample data, Standard Penetration Test results, groundwater level conditions observed in the boring, personnel involved, and other pertinent data. For information, and to aid in understanding the data as presented on the boring logs, General Notes defining nomenclature used in soil descriptions are in Appendix O. It should be noted that the Logs of Test Borings included with this report have been prepared on the basis of laboratory classifications as well as field observations and logs of the soils encountered. It is emphasized that the stratification lines shown on the Logs of Test Borings are approximate

indications of change from one soil type to another at the locations of the boreholes. The actual transition from one stratum to the next may be gradual, and may vary within the area represented by the test boring.

Please refer to the boring logs for the soil conditions at the specific boring locations. It is emphasized that the stratification lines shown on the Logs of Test Borings are approximate indications of change from one soil type to another at the locations of the boreholes. The actual transition from one stratum to the next may be gradual, and may vary within the area represented by the test boring.

3.2 GROUNDWATER LEVEL OBSERVATIONS

During the drilling process, groundwater was encountered in four of the soil borings (RW-37, SB-16, TB-107, and TB-103) prior to the introduction of any drilling fluids. Groundwater was not encountered during drilling and/or upon completion of drilling in any of the remaining soil borings. Due to the use of drilling fluids in the boreholes, no groundwater level measurements were obtained upon completion of drilling since these readings would not be reliable, and hence were recorded as “Not Applicable” (N/A) in the soil boring logs.

A lack of groundwater in the boreholes does not necessarily indicate that there is no groundwater, due to the sealing off of natural flow paths due to the drilling process. In our experience, the depth at which clayey soils change from brown to gray in color (an indication of oxidation) is frequently indicative of the long term groundwater level. However, the groundwater elevation can be better defined by groundwater observation wells. A total of eight groundwater monitoring wells were installed within various boreholes at the site. It is important to note that the clay soils may delay the recharge rate of the wells due to the low permeability of the existing soil. The monitoring well groundwater level readings obtained to date are included in Appendix G.

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It should be noted that the elevation of the perched or natural groundwater table is likely to vary throughout the year depending on the amount of precipitation, runoff, evaporation and percolation in the area, as well as on the water level of surface water bodies in the vicinity affecting the groundwater flow pattern. The possibility of perched water trapped in coarse grained layers above the clay soils (above the long term level) should also be expected.

3.3 GAS MONITORING READING OBSERVATIONS

The gas meter readings taken from the four-gas meter (LEL, H_2S, CO, O_2) were documented only where detected and observed. If the oxygen level was normal (20.9%) and no other gasses were detected, the gas readings were considered to be non-detect.

Detectable gas readings were observed in two monitoring wells, TB-111 and RW-08. At monitoring well TB-111, combustible gas at 100% LEL was sustained for 6 days after the well was installed and dissipated gradually during the subsequent 8 days. At monitoring well RW-08, combustible gas at 100% LEL was sustained for 206 days after the well was installed and dissipated gradually during the subsequent 28 days to a current reading of 3% LEL as of April 28, 2017.

The gas was observed and reported in the referenced monitoring wells and was not observed during drilling or upon completion of drilling in any of the boreholes. **It is very important to note that even though gas was not detected during drilling, it does not mean that there was no gas.** The heavy drilling mud used during the drilling process to keep the borehole open may tend to suppress the gas and preclude it from rising up to the top of the augers and hence it would not be detected. Cleaning the borehole by flushing out the drilling fluids may cause the borehole to collapse, and per our discussions with WSP, it was critical to properly grout the boreholes to minimize the creation of voids since several of these borings may be within the proposed tunnel alignment. Hence, flushing out the borehole upon completion of drilling was not an option.

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WSP obtained water samples from each of the 8 wells in order to test them for dissolved gasses. The results of water testing for dissolved gasses were reported by WSP under a separate cover. The final version of this report will include additional groundwater level and gas readings.

4.0 FIELD TEST RESULTS

4.1 IN-SITU FIELD VANE SHEAR TEST RESULTS

Field vane shear tests were generally performed using Acker vane shear test kit with a calibrated torque head, in general accordance with ASTM D-2573. The in-situ field vane tests were performed within the tunnel influence zone, where suitably soft to stiff clay layers were encountered. These tests were performed primarily to determine the in-place shear strength of the clay soils. Based on the results of the field vane shear tests, the silty clays were determined to be generally insensitive. Three vane shear tests were performed in sensitive clays, including: VS-2 from TB-119 at a depth of 77.5 feet (EL. 555.9 feet), VS-5 from TB-119 at a depth of 101.5 feet (EL. 531.9 feet), and VS-3 from TB-112 at a depth of 73.5 feet (EL. 559.1 feet). The results of these field vane shear tests are presented in detailed reports in Appendix D. The results of the field vane shear tests are also presented as estimated unconfined compressive strength on the Logs of Test Borings with a sample number prefix “VS”. The estimated unconfined compressive strength is calculated by multiplying the calculated in-situ shear strength by a factor of 2.

4.2 FALLING HEAD IN-SITU PERMEABILITY TEST RESULTS

The falling head in-situ permeability tests were performed in general accordance with ASTM D-4044 and the Naval Facility Engineering Command (NAVFAC) DM 7.01 (Table 15-C) for cased holes. The test was performed in all the groundwater monitoring wells. The following table summarizes the coefficient of Permeability, Km calculated at each test:

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Table 4.2 Summary of the coefficient of permeability, Km	
Monitoring well ID	Estimated coefficient of permeability, Km
TB-06	1.071E-07 cm/sec
SB-06	9.285E-08 cm/sec
TB-05	1.603E-07 cm/sec
RW-08	8.168E-07 cm/sec
SB-16B	1.853E-07 cm/sec
TB-111	1.146E-07 cm/sec
TB-03	2.147E-05 cm/sec
TB-01	1.595E-07 cm/sec

Graphical results of the falling head in-situ tests are included in Appendix H.

5.0 GENERAL QUALIFICATIONS

This report and the attached Logs of Test Borings are instruments of service, which have been prepared in accordance with generally accepted soil and foundation engineering practices. We make no other warranties either expressed or implied as to the information presented in this report.

Since the information obtained from test borings is specific to the *exact* test boring locations, soil and water information could be different from those occurring at other locations of the site. This report does not reflect variations which may occur between the borings. The nature and extent of these variations may not become evident until the time of construction.

This report and the associated soil boring logs should be made available to bidders prior to submitting their proposals and to the successful contractor and subcontractors for their

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information only, and to supply them with facts relative to the subsurface investigation, laboratory tests, etc.

The contents of this report have been prepared in order to aid in the evaluation of expected subsoil properties to assist the engineer in the design of this project. If you have any questions regarding this report, please contact us.

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APPENDIX A

Soil Boring Location Diagrams

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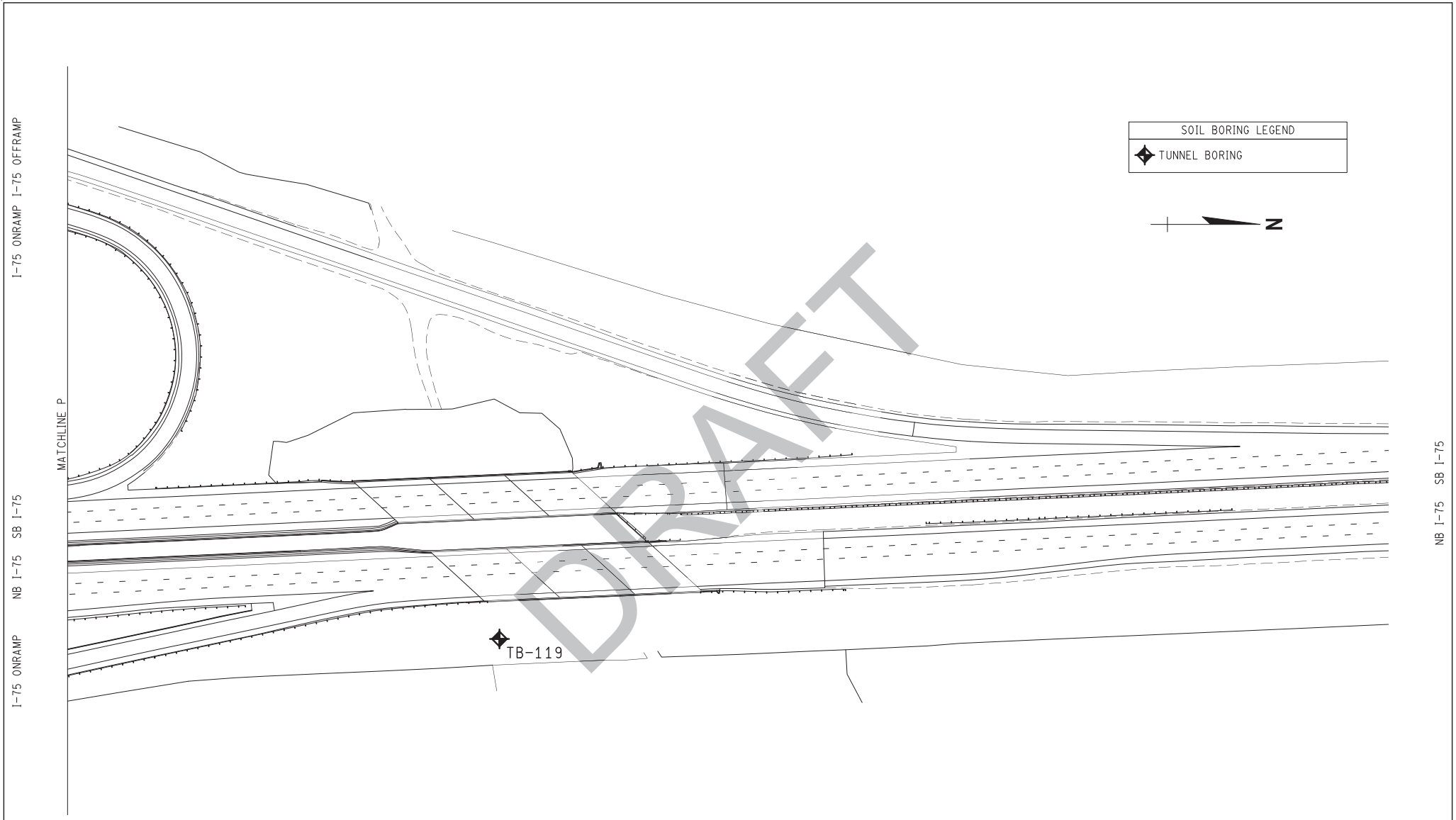

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FILE:

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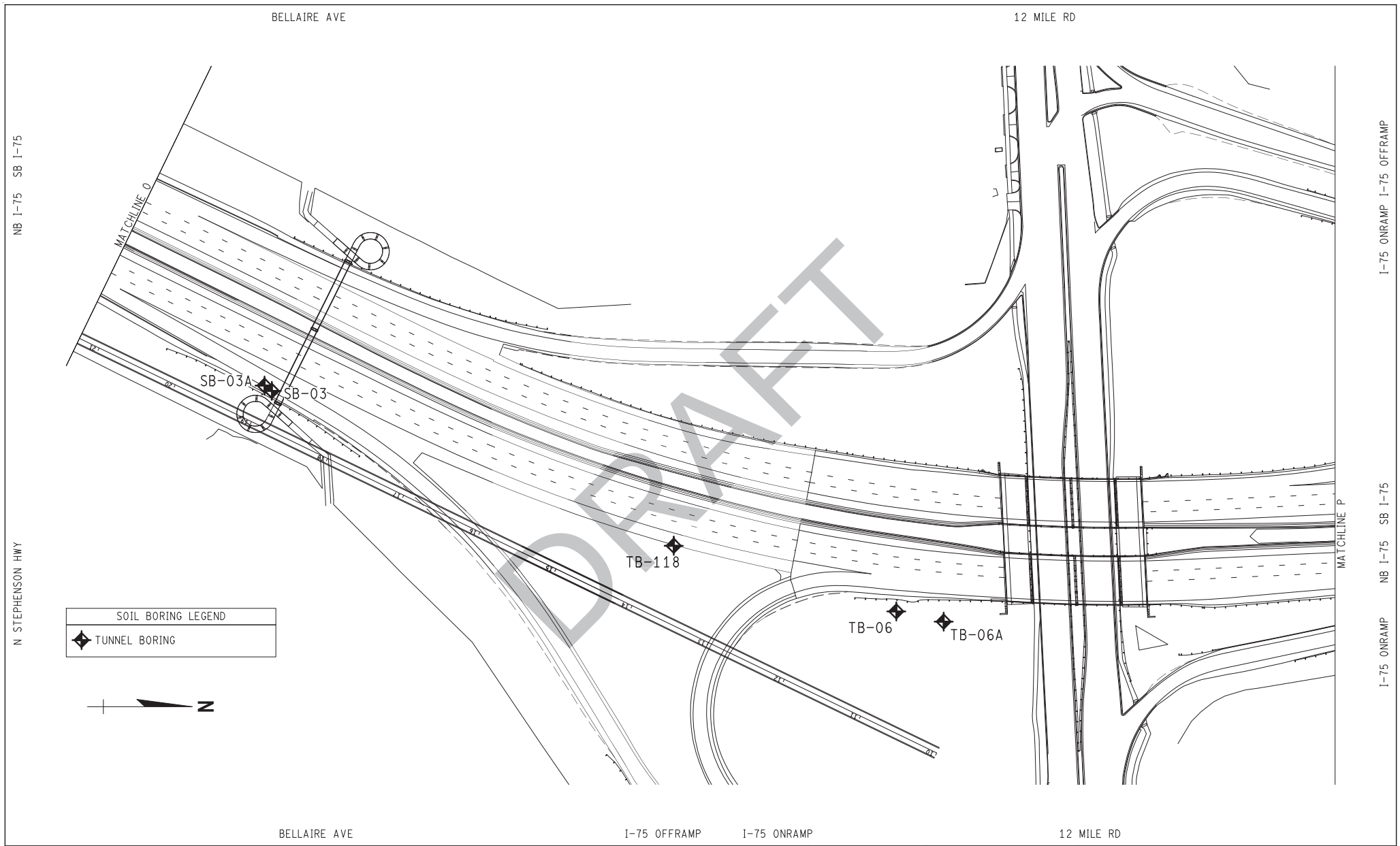
TSC: OAKLAND

CS: 63174
JN: 1221040

BORING LOCATION SHEET
I-75 MODERNIZATION TUNNEL DESIGN INVESTIGATION
N OF 8 MILE RD (M-102) TO S OF 12 MILE RD

DRAWING I75
SHEET SECT 1



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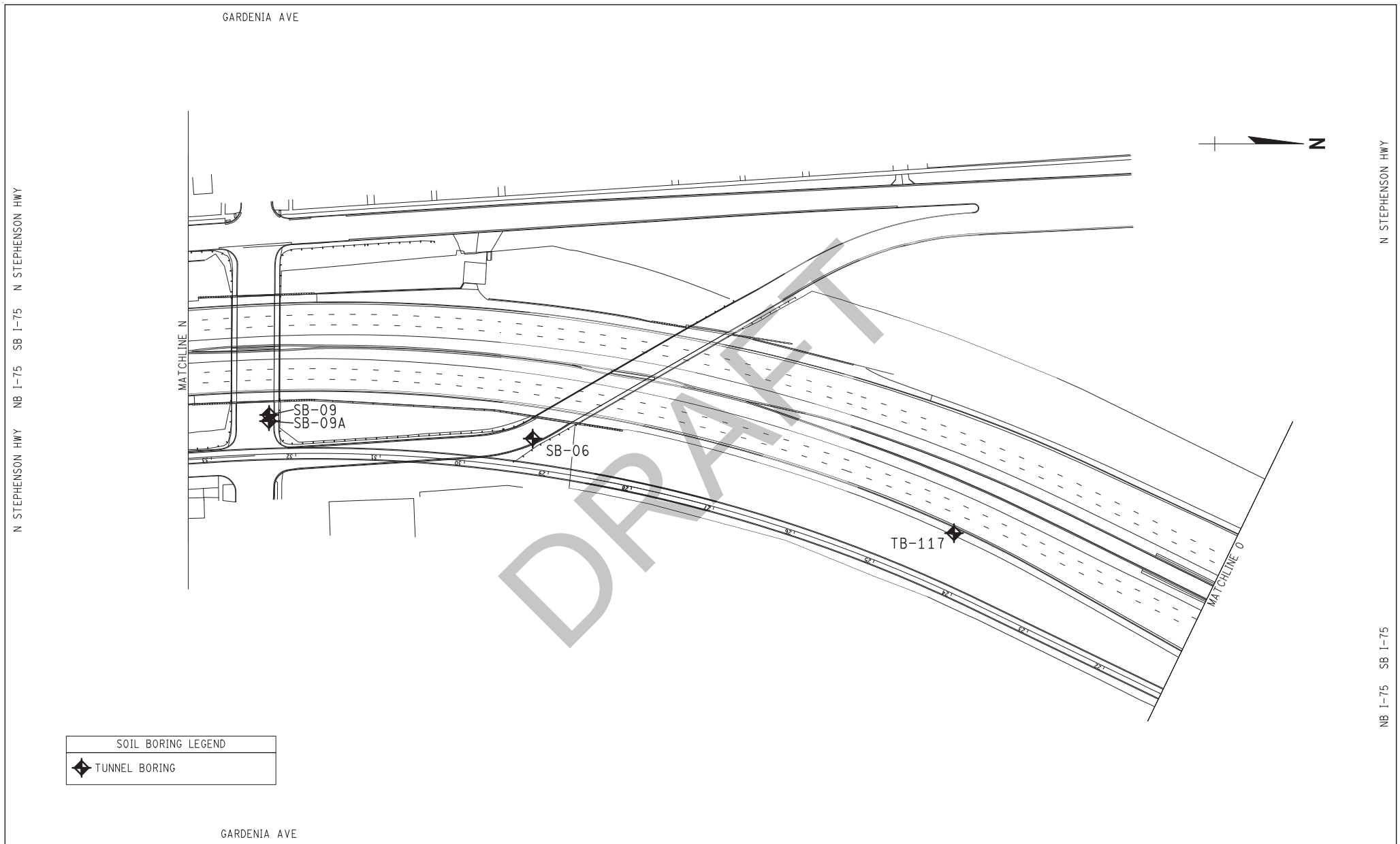

SOIL BORING LEGEND
✦ TUNNEL BORING

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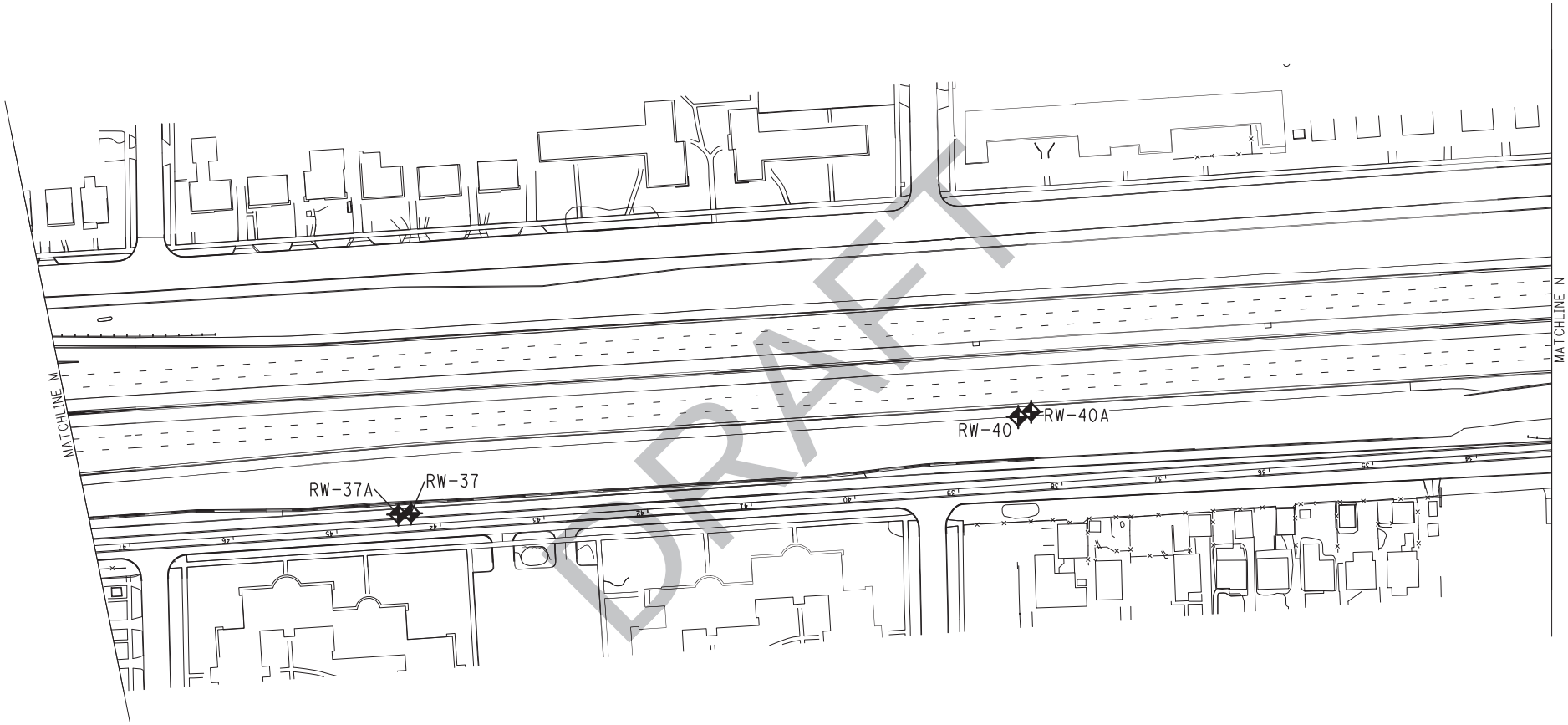
DRAWING I75
SHEET SECT 1

FARNUM AVE

FOREST AVE

SOIL BORING LEGEND
TUNNEL BORING



FARNUM AVE

FOREST AVE

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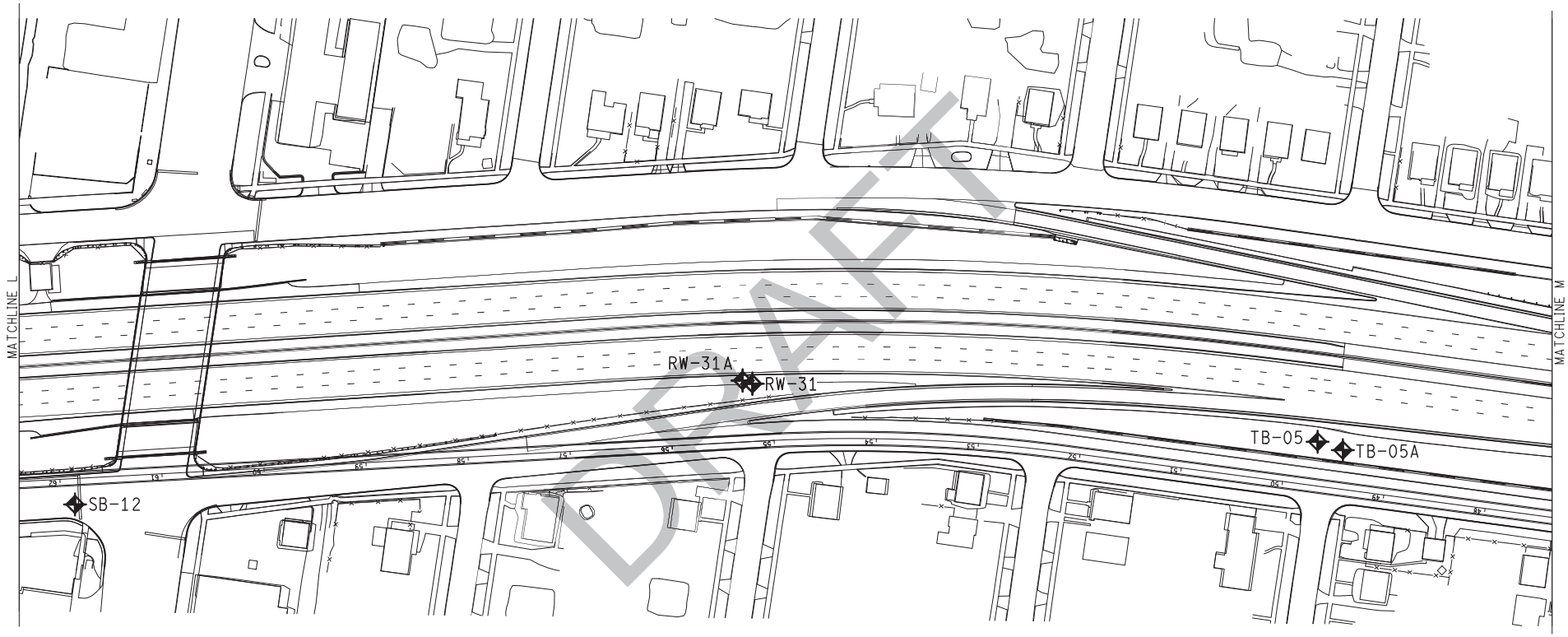
DRAWING I75
SHEET SECT 1

11 MILE RD MACE AVE BAXTER AVE UNIVERSITY AVE SPRAGUE AVE

SOIL BORING LEGEND
TUNNEL BORING



11 MILE RD MACE AVE BAXTER AVE UNIVERSITY AVE SPRAGUE AVE

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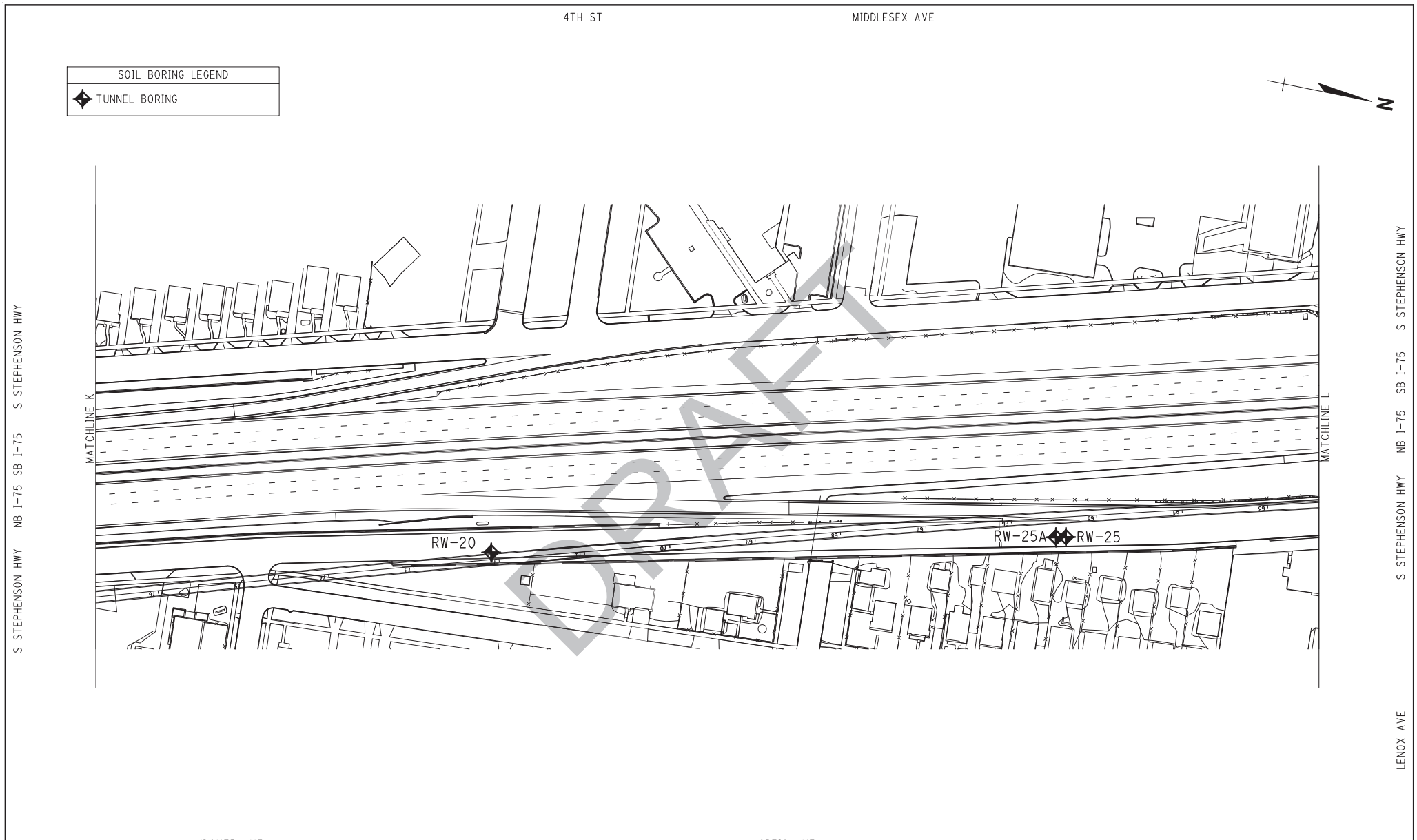

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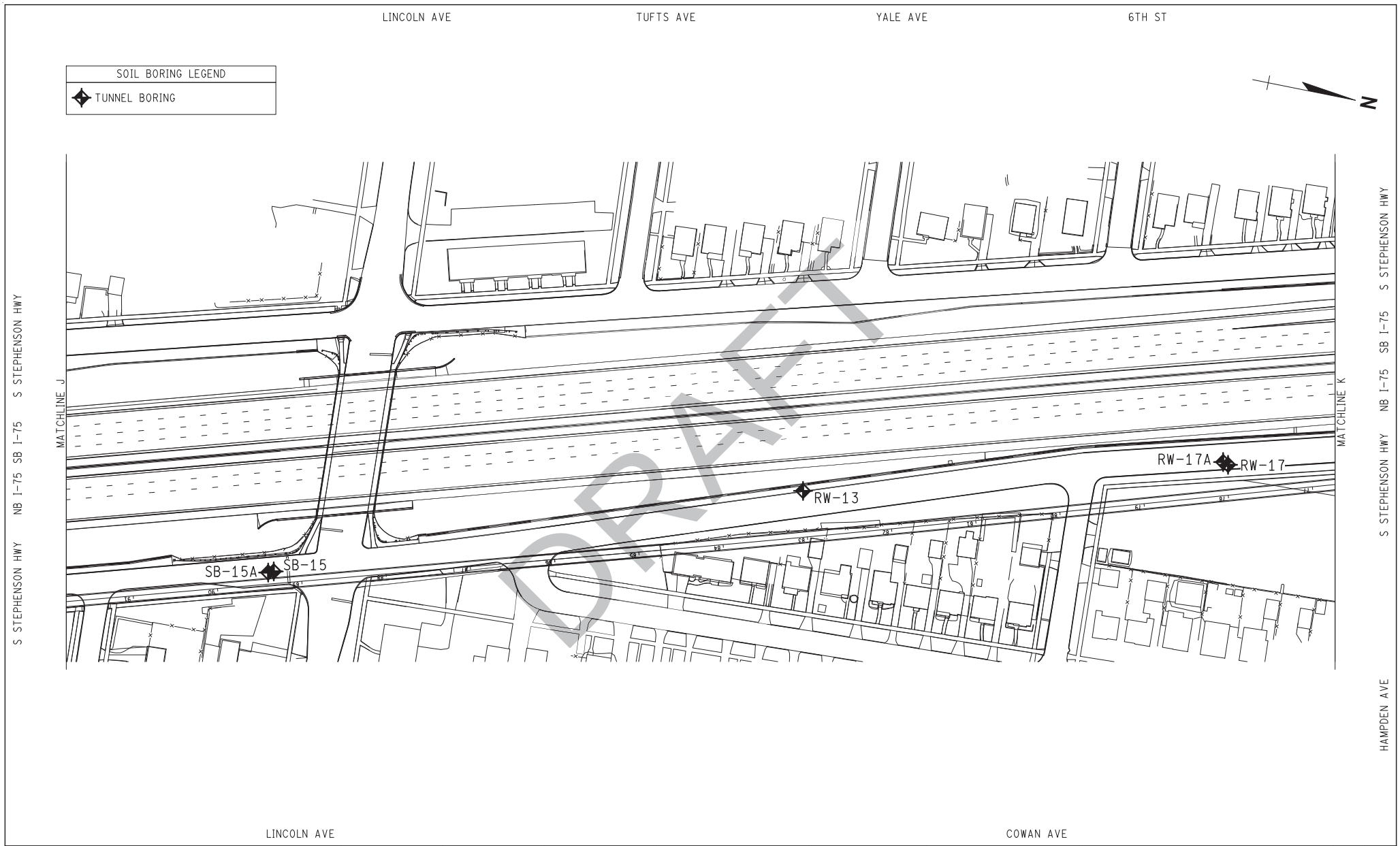

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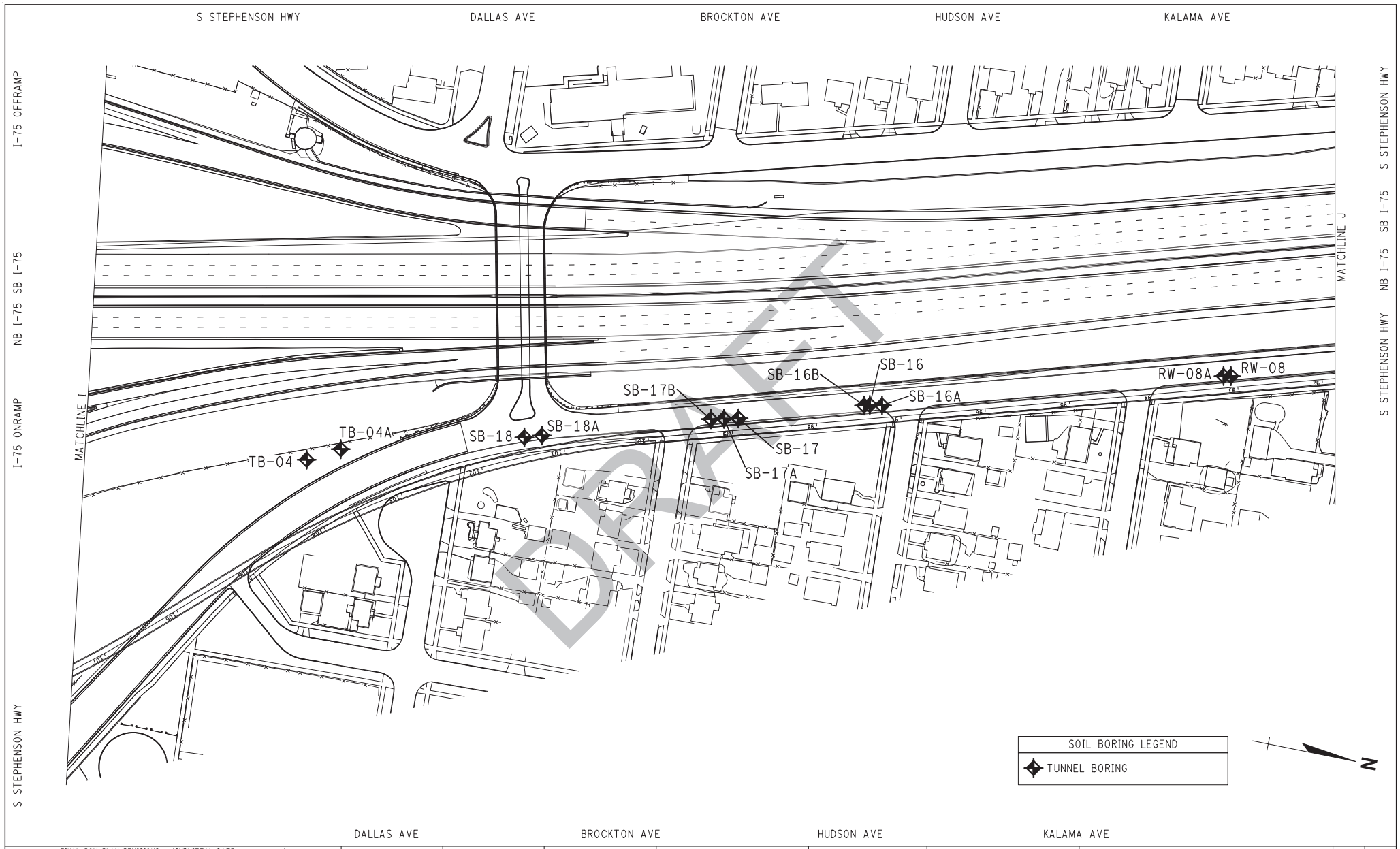

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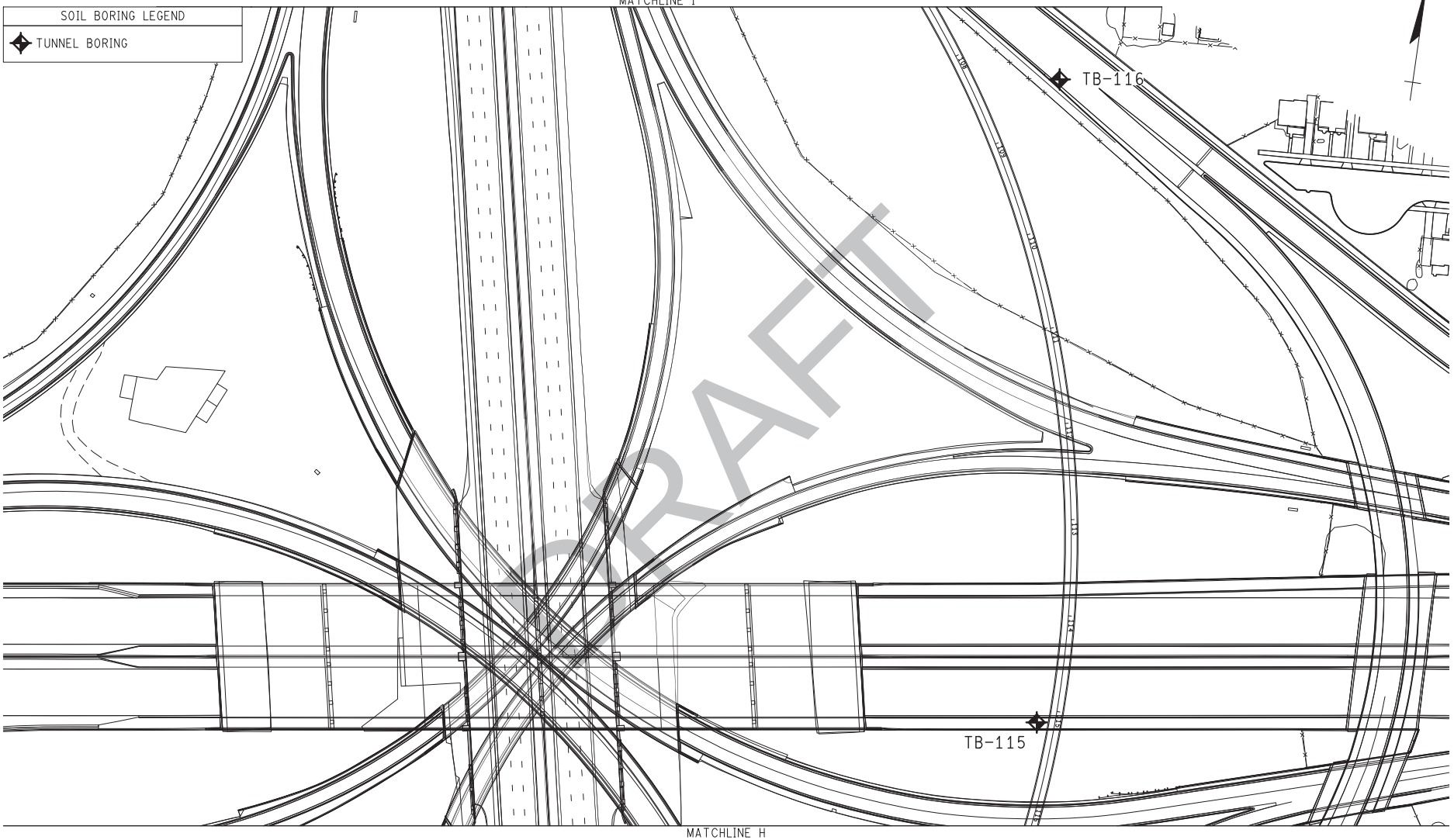

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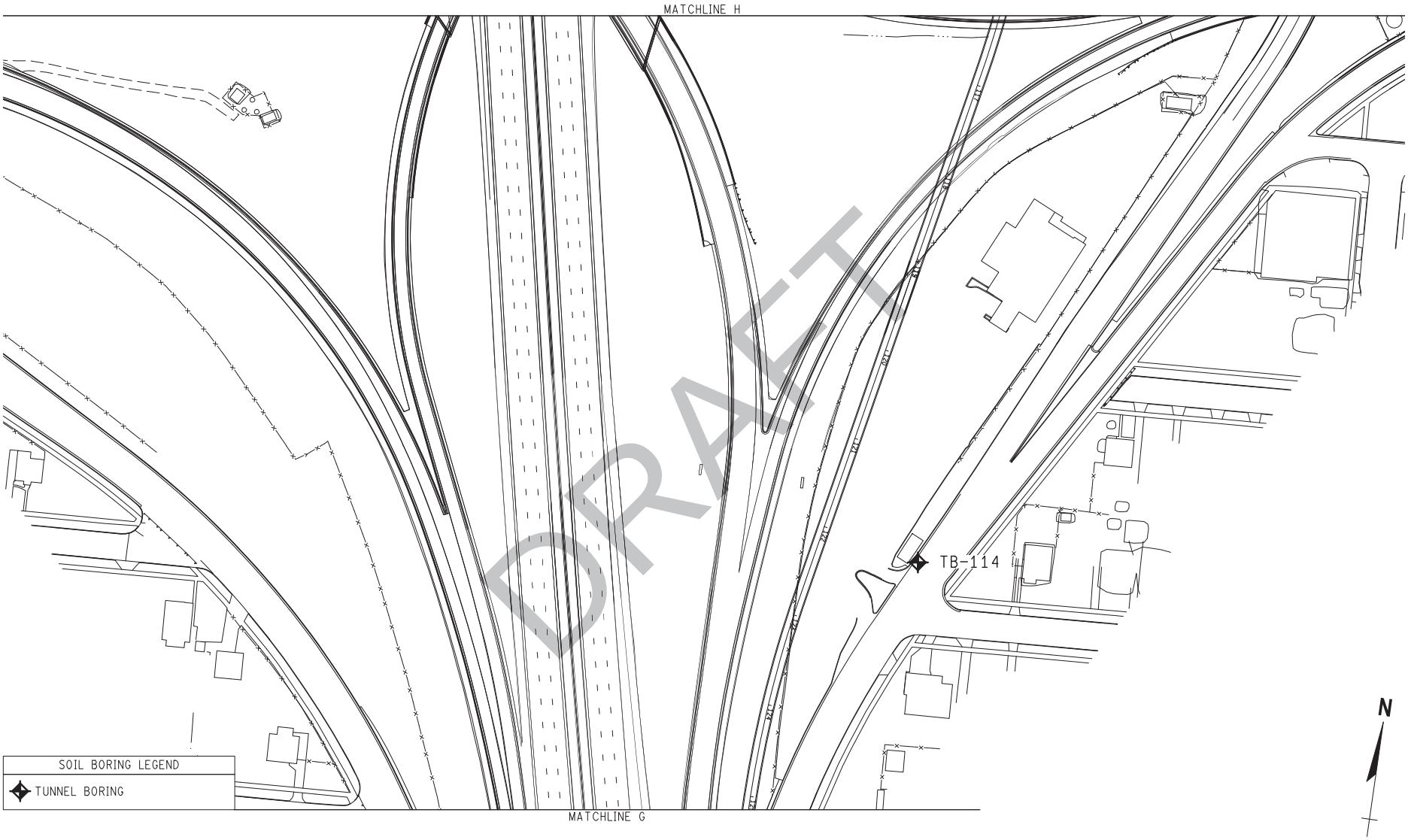

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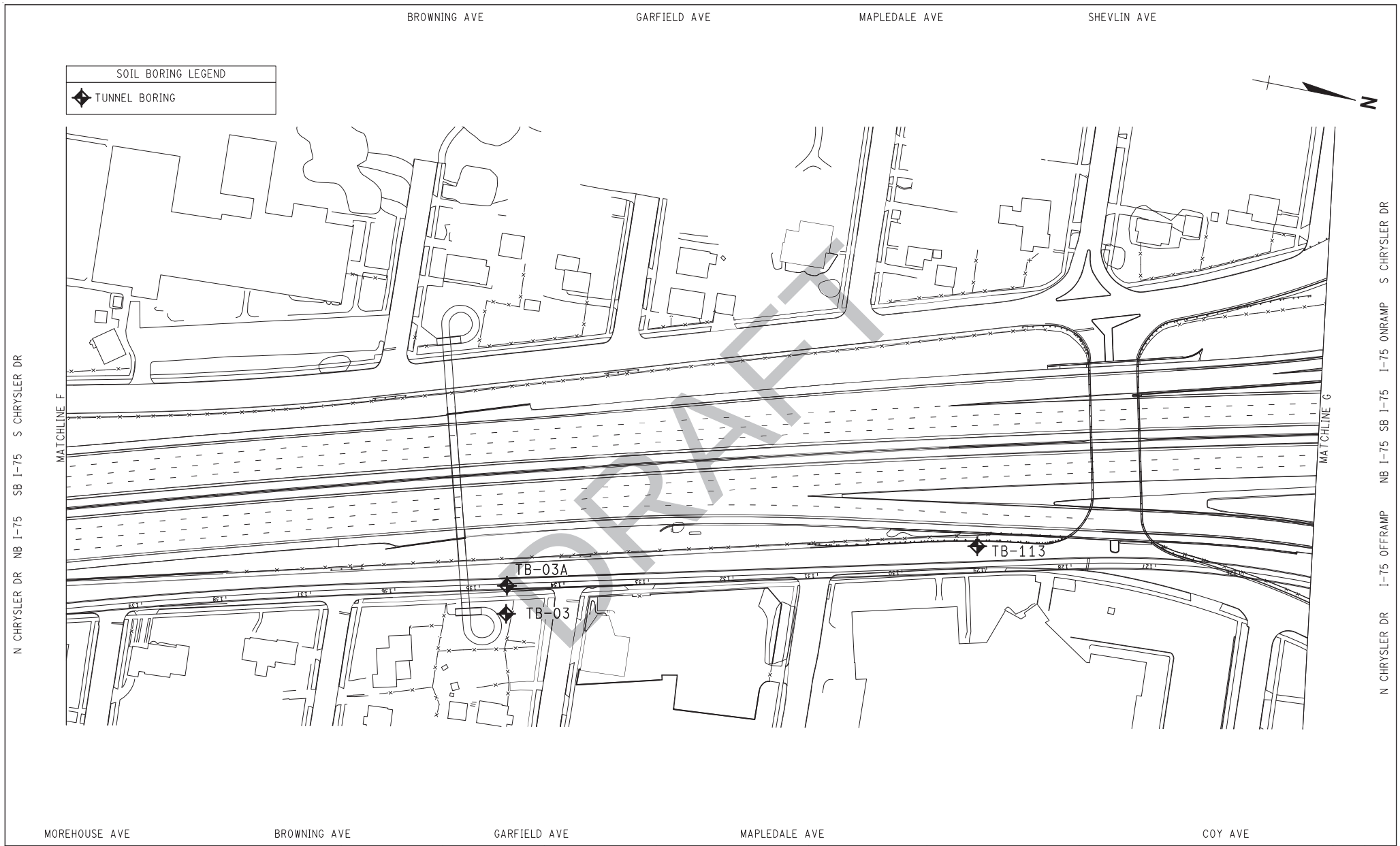

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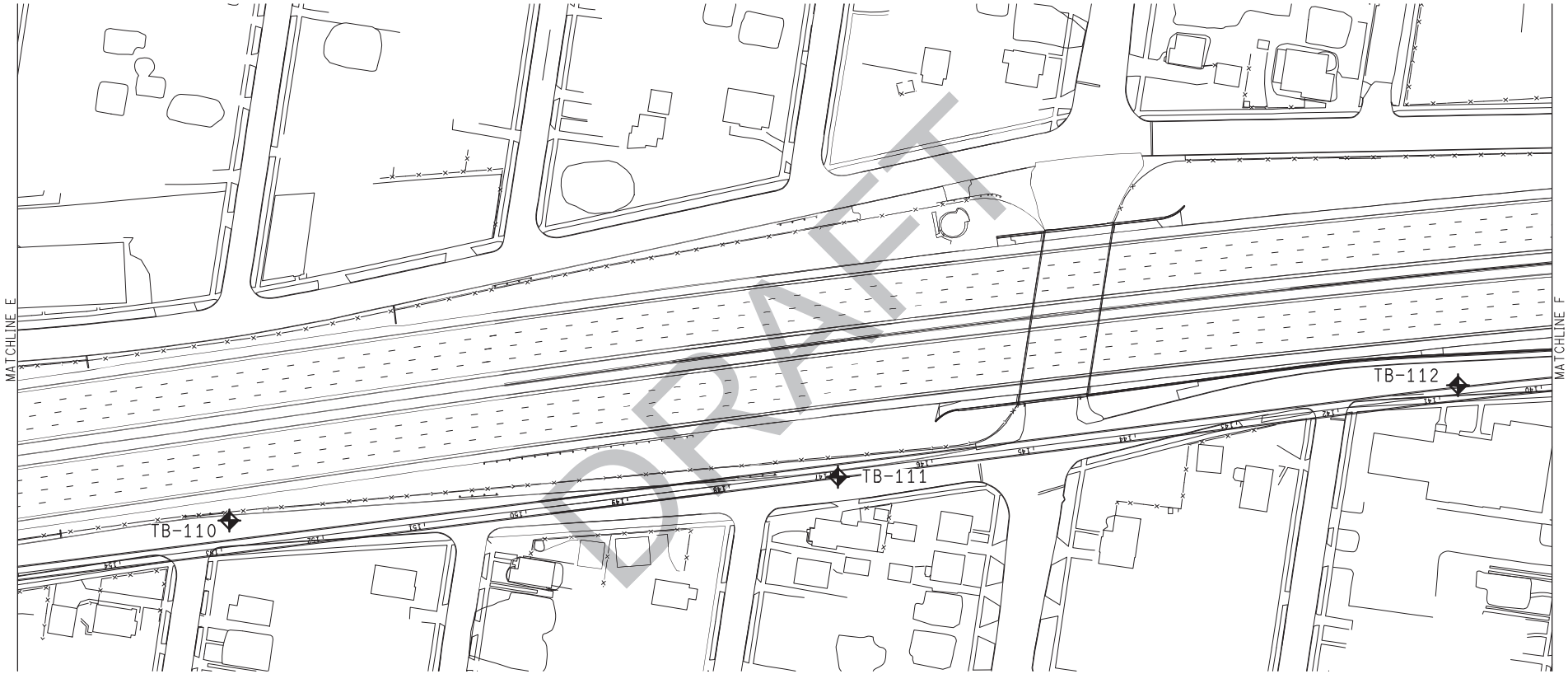
N OF 8 MILE RD (M-102) TO S OF 12 MILE RD

DRAWING I75
SHEET SECT 1

MANATEE CHESTNUT AVE HAMATA AVE WOODWARD HEIGHTS BLVD ANNABELLE AVE

SOIL BORING LEGEND
TUNNEL BORING



MANATEE CHESTNUT AVE HAMATA AVE WOODWARD HEIGHTS BLVD ANNABELLE AVE

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BORING LOCATION SHEET
I-75 MODERNIZATION TUNNEL DESIGN INVESTIGATION
N OF 8 MILE RD (M-102) TO S OF 12 MILE RD

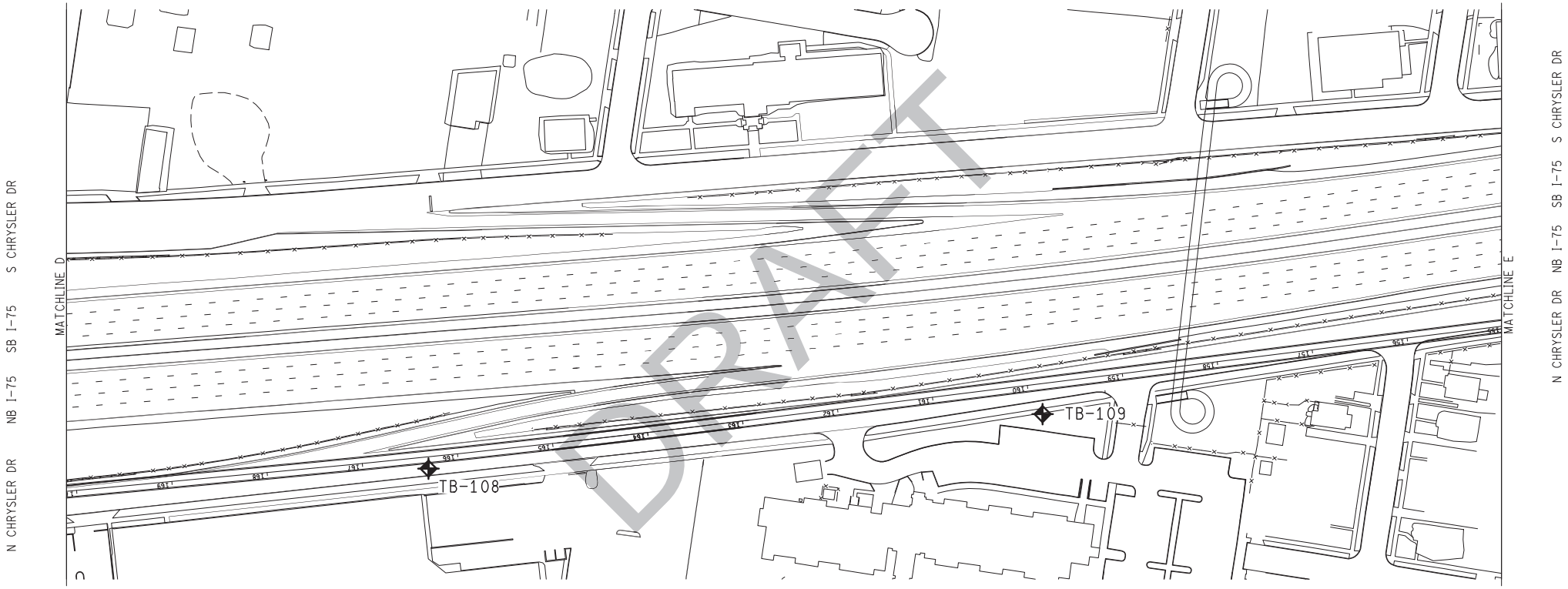
DRAWING I75
SHEET SECT 1

BRECKENRIDGE AVE

ORCHARD AVE

SONOMA

SOIL BORING LEGEND
TUNNEL BORING



SONOMA

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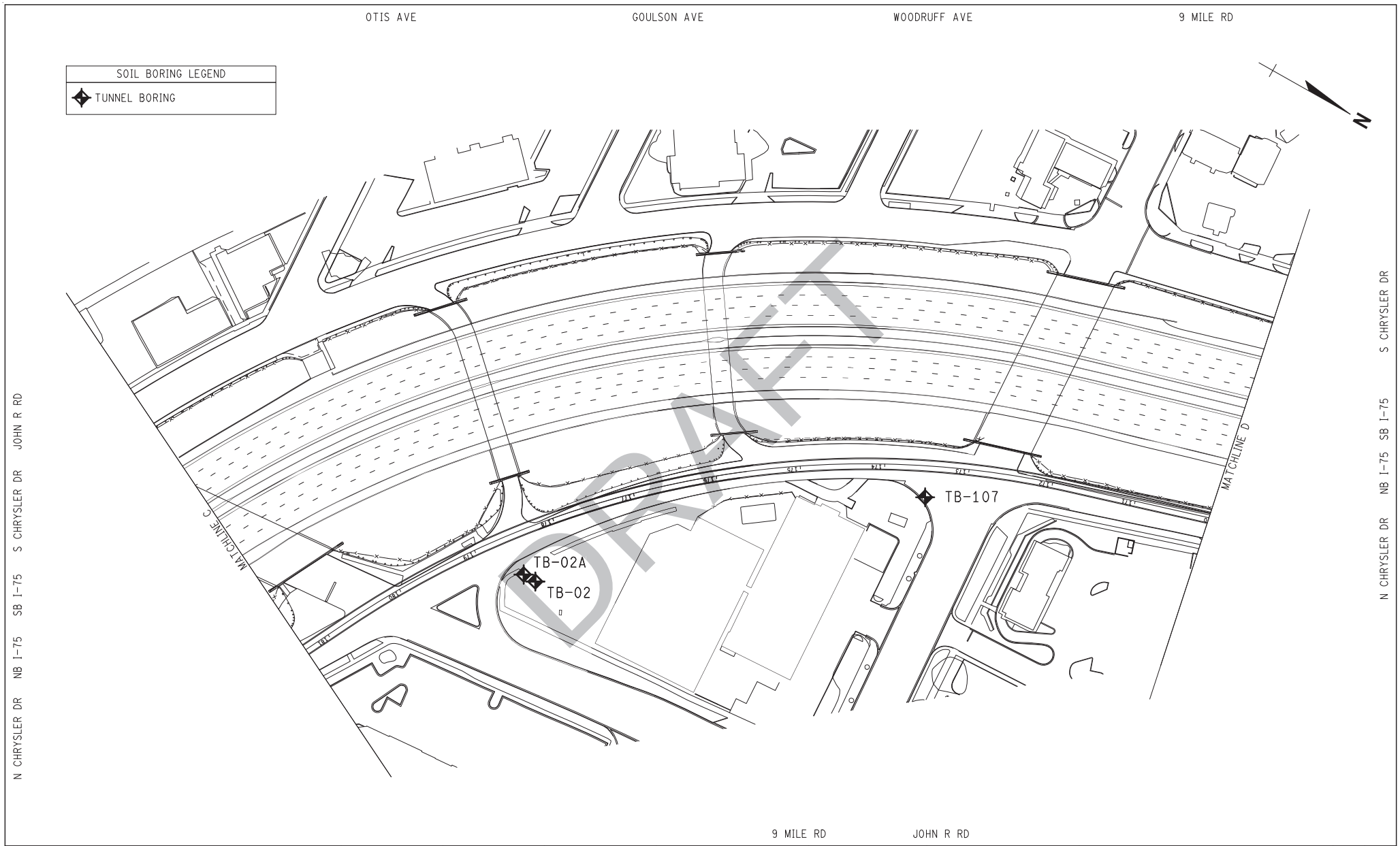
I-75 MODERNIZATION TUNNEL DESIGN INVESTIGATION

N OF 8 MILE RD (M-102) TO S OF 12 MILE RD

DRAWING I75

SHEET SECT 1



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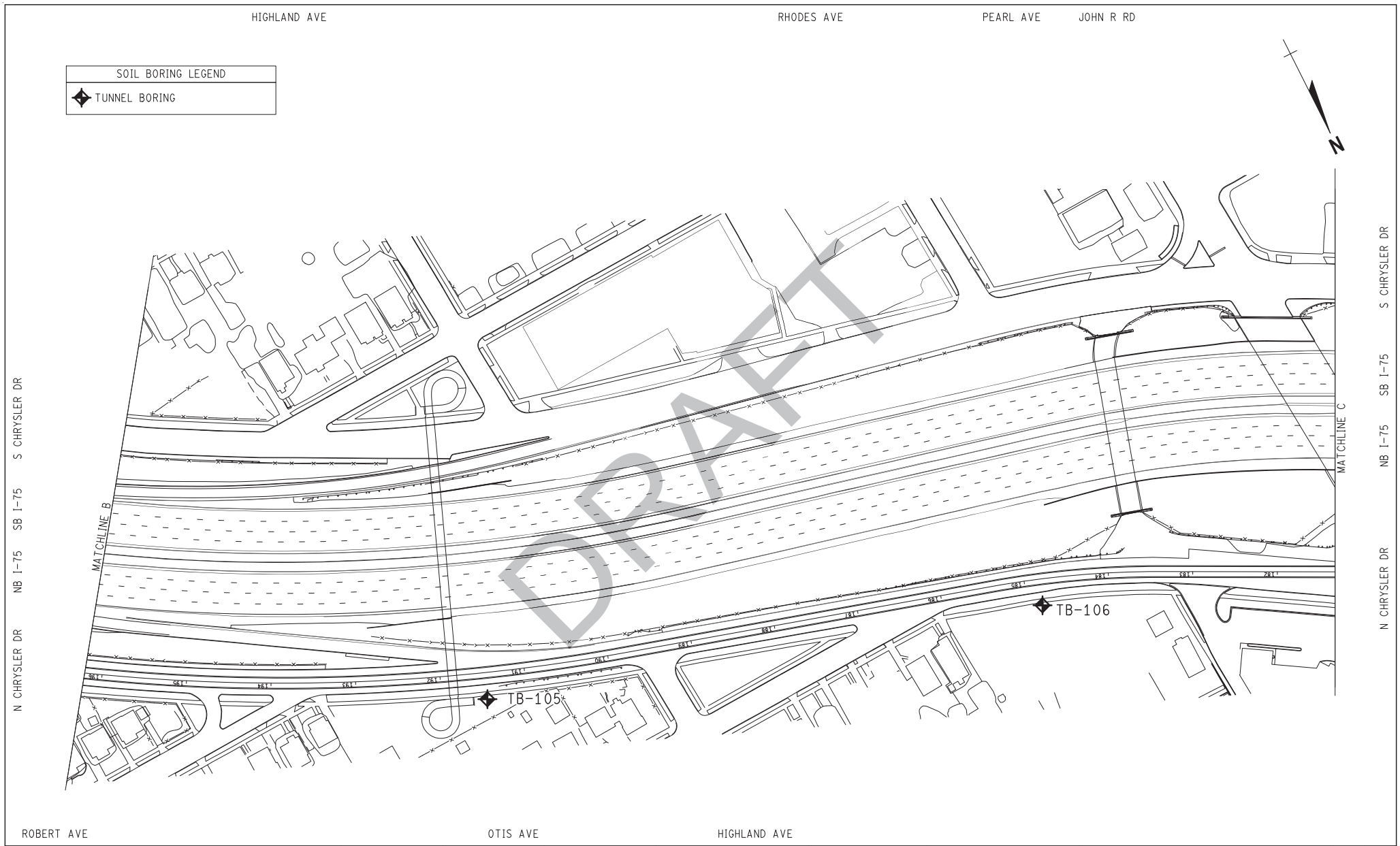

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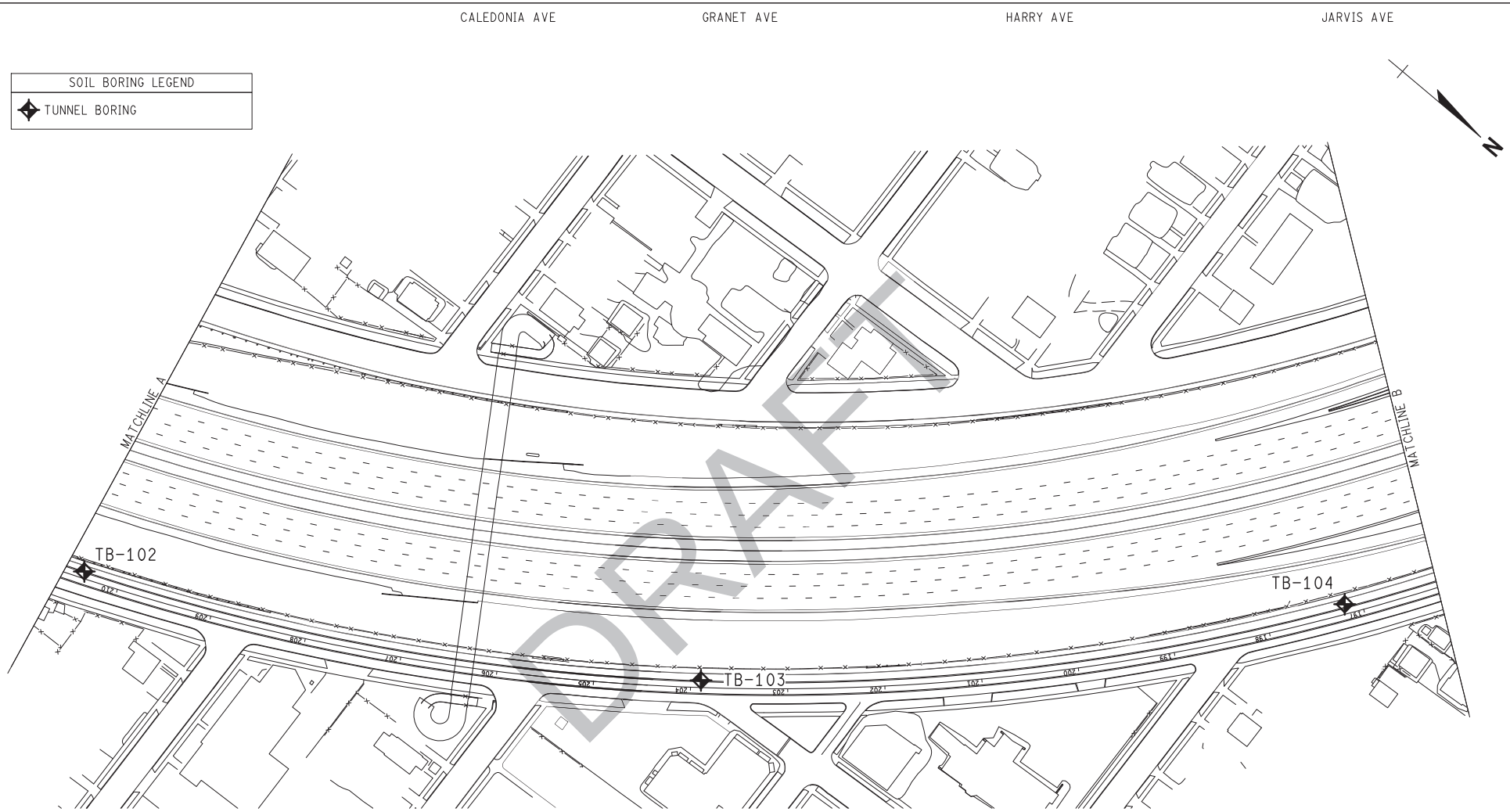

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DRAWING I75
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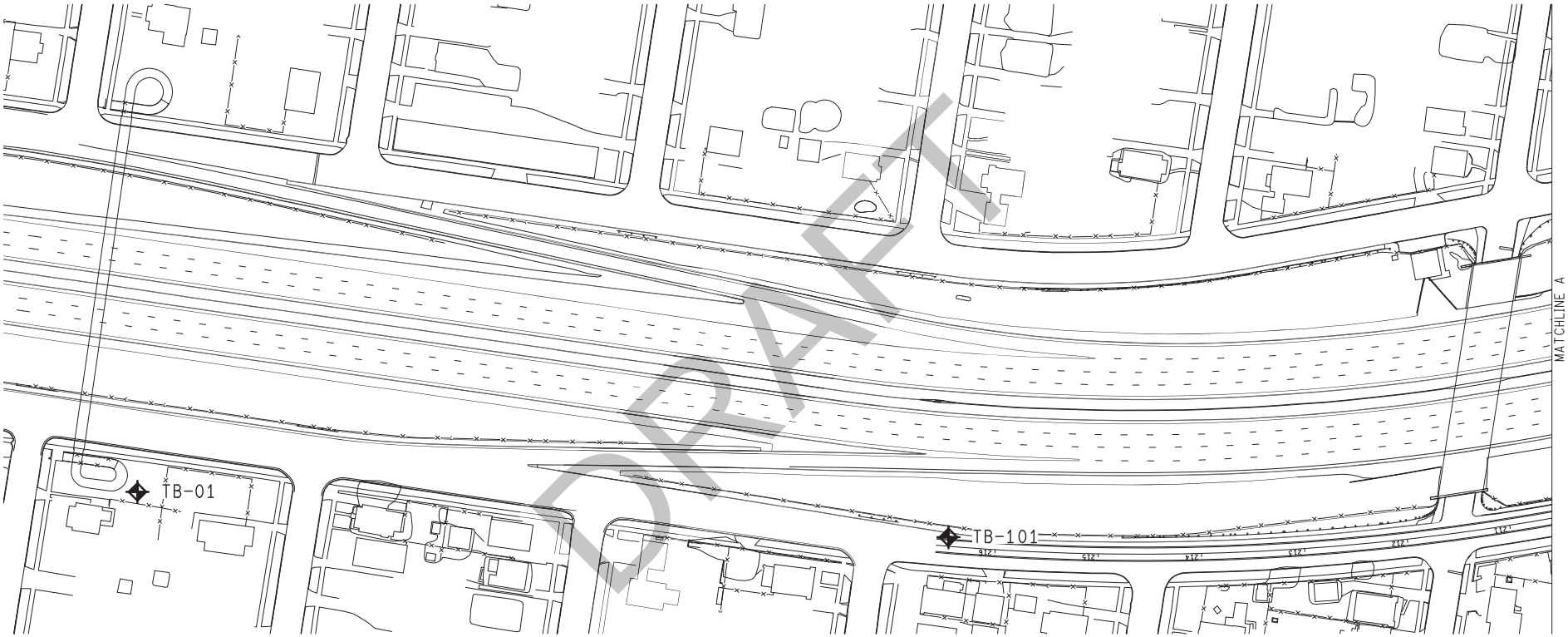

SOIL BORING LEGEND
✦ TUNNEL BORING

ELZA AVE MAXLOW AVE EVELYN AVE MADGE AVE MEYERS AVE

FINAL ROW PLAN REVISIONS (SUBMITTAL DATE:)							
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BORING LOCATION SHEET
I-75 MODERNIZATION TUNNEL DESIGN INVESTIGATION
N OF 8 MILE RD (M-102) TO S OF 12 MILE RD

DRAWING I75
SHEET SECT 1

APPENDIX B

Logs of Test Borings

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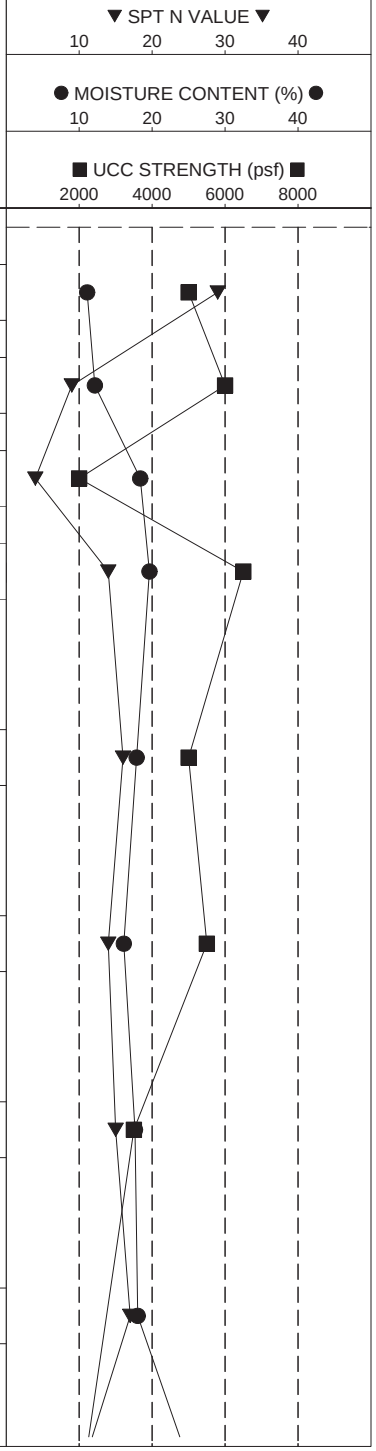
PROJECT NO. 2014195C **DATE STARTED:** 3/6/2017 **DATE COMPLETED:** 3/9/2017 **LOG OF TEST BORING** **TB-119**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.4 ft											
633.1	3 inches of TOPSOIL (0.3)	0										
	FILL - Very stiff lean clay with sand, trace gravel, trace roots above 5 ft., brown (CL)		SS1	7-8-21	29	2.5	5000*	11.1				
			SS2	4-4-5	9	5.0	6000*	12.2				
627.4	(6.0)	5										
	Stiff LEAN CLAY, trace sand, trace gravel, frequent fine sand seams above 8 ft., brown (CL)		SS3	2-3-1	4	7.5	2000*	18.4				
624.4	(9.0)		SS4	1-6-8	14	10.0	6500*	19.6				
		10										
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS5	4-7-9	16	15.0	5000*	17.9				
		15										
			SS6	5-7-7	14	20.0	5500*	16.1				
		20										
			SS7	4-6-9	15	25.0	3500*	17.6				
		25										
			SS8	7-7-10	17	30.0	<>	18.0				
		30										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460991.2
Northing: 369381.3

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: A. Patterson
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 120 ft.

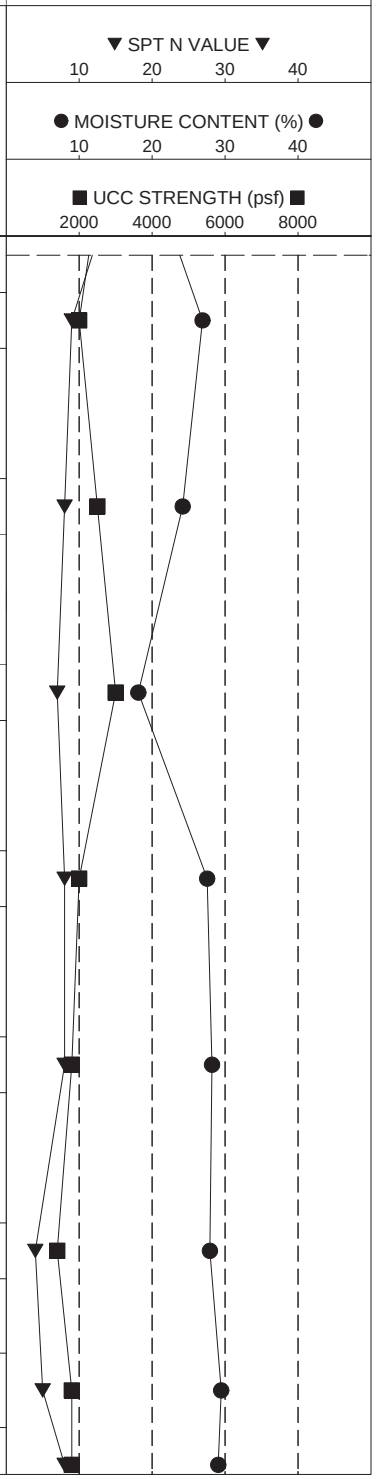
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 3/6/2017 **DATE COMPLETED:** 3/9/2017 **LOG OF TEST BORING TB-119**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.4 ft											
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	35	SS9	3-4-5	9	35.0	2000*	26.9				
		40	SS10	2-4-4	8	40.0	2500*	24.2				
		45	SS11	2-3-4	7	45.0	3000*	18.1				
583.4		50.0	SS12	1-4-4	8	50.0	2000*	27.5				
	Medium to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	55	SS13	1-3-5	8	55.0	1800#	28.2				
		60	SS14	1-1-3	4	60.0	1400#	27.9				
		65	SS15	1-2-3-4	5	64.0	1800#	29.5				



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460991.2
Northing: 369381.3

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

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Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
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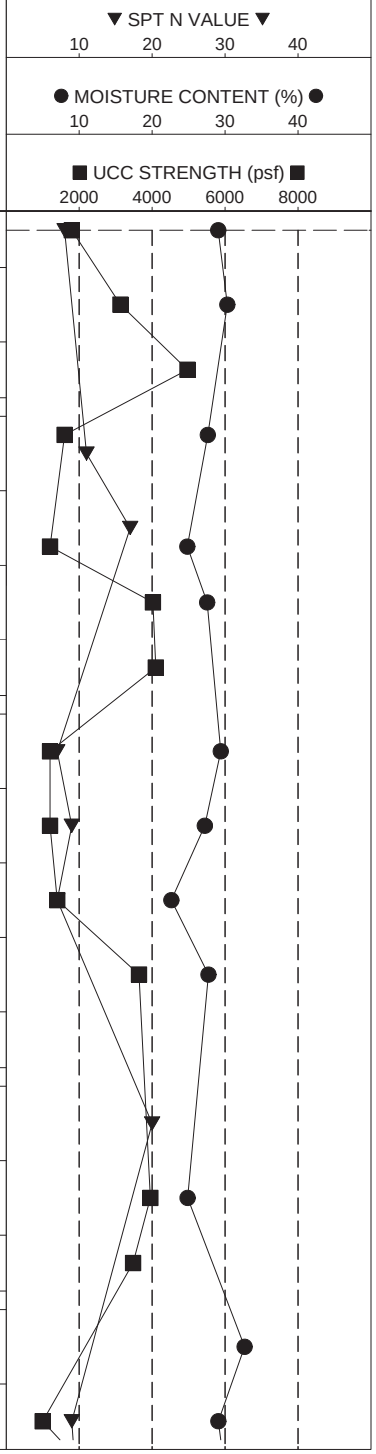
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 3/6/2017 **DATE COMPLETED:** 3/9/2017 **LOG OF TEST BORING TB-119**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.4 ft	65	SS16	0-4-4-4	8	66.0	1800#	29.1				
	Medium to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		ST17			68.0	3130	30.3	94			
			VS1			69.5	4970					
		70										
562.4		71.0	SS18	1-4-7-16	11	72.0	1600#	27.6				
	Medium dense SILTY FINE SAND, dark gray, moist (SM)											
560.4		73.0	SS19	6-9-8-8	17	74.0	1200#	24.8				
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	75	ST20			76.0	4020	27.5	97	39	18	97
			VS2			77.5	4100					
			SS21	3-3-4-5	7	80.0	1200#	29.4				
	NOTE: Vane shear test at 87.5 ft. terminated early due to high force gauge readings.	80	SS22	3-4-5-5	9	82.0	1200#	27.2				
			SS23	1-2-5-4	7	84.0	1400#	22.6				
		85	ST24			86.0	3640	27.7	99			
			VS3			87.5						
545.4		88.0										
	Medium dense SILT with sand, gray, moist (ML)		SS25	7-10-10-8	20	90.0				21	NP	83
543.4		90.0										
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	90	ST26			92.0	3950	24.9	98	42	19	97
			VS4			93.5	3480					
	NOTE: No recovery on Shelby tube attempt at 96 ft. due to sample falling out of sampler; direct pushed to 96 ft. to retrieve sample.	95	DP27			96.0	<>	32.7				
			SS28	3-4-5-9	9	98.0	1000#	29.1				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460991.2
Northing: 369381.3

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: A. Patterson
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
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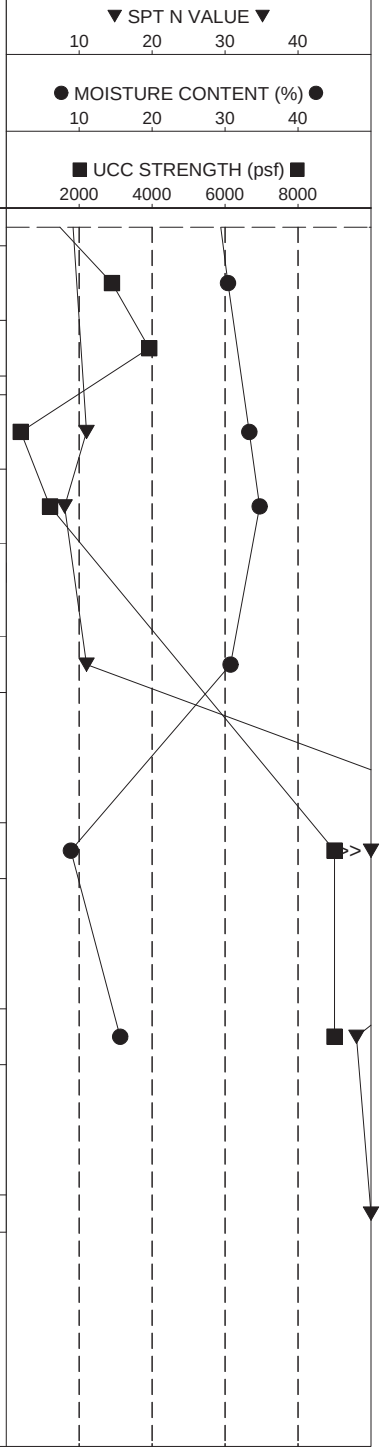
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 3/6/2017 **DATE COMPLETED:** 3/9/2017 **LOG OF TEST BORING TB-119**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.4 ft											
			ST29			100.0	2900	30.4	95	40	19	95
		100	VS5			101.5	3920					
531.4	102.0											
	Very soft to medium LEAN CLAY, trace sand, trace gravel, occasional silt seams, gray (CL)		SS30	3-5-6-6	11	104.0	400#	33.3				
		105	SS31	3-4-4-4	8	106.0	1200#	34.7				
			SS32	4-4-7	11	110.0	<>	30.7				
523.4	110.0	110										
	Hard LEAN CLAY, few sand, trace gravel, gray (CL)		SS33	28-30-50	80	115.0	9000+*	8.9				
		115										
			SS34	14-21-27	48	120.0	9000+*	15.6				
513.4	120.0	120										
	Extremely dense SILTY FINE SAND, trace gravel, occasional sandy clay seams, gray, moist (SM)		SS35	44-50	50+	124.5						
508.9	124.5											
	End of Boring at 124.5 ft. (Terminated upon SPT sample refusal)	125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460991.2
Northing: 369381.3

Coordinates/GSE determined by: Survey

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Torvane
* Penetrometer
<> Disturbed Sample

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Drill Rig: CME 75
Engineer on Rig: A. Patterson
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 120 ft.

DRAFT

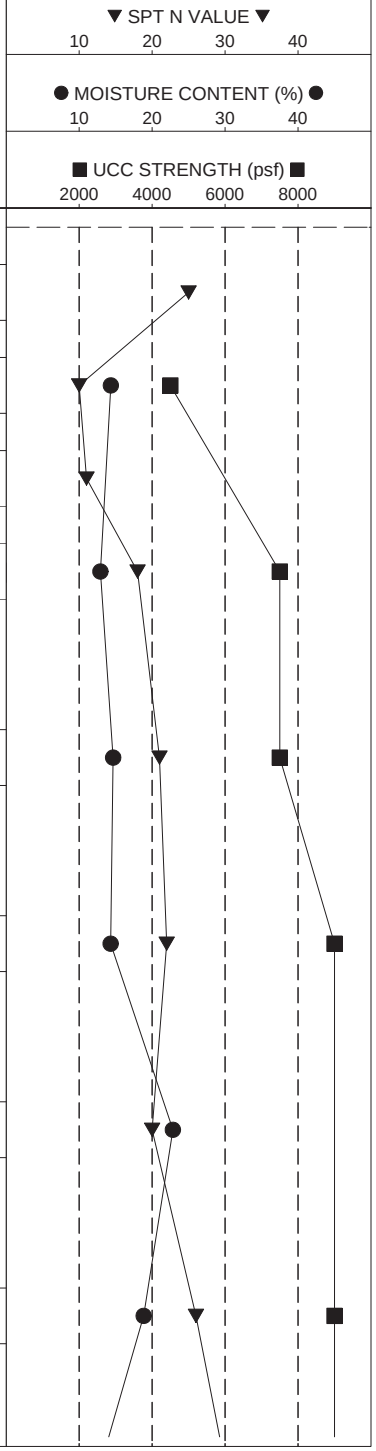
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/12/2015 **DATE COMPLETED:**10/14/2015 **LOG OF TEST BORING TB-06**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 657.6 ft	
657.0	7 inches of CLAYEY TOPSOIL, brown	0.6
654.6	FILL - Medium dense silty fine sand, trace clay, trace gravel, trace topsoil, roots, and wood pieces, dark brown, moist (SM)	3.0
652.6	FILL - Very stiff lean clay, with sand, trace gravel, occasional topsoil pockets, brown (CL)	5.0
649.1	FILL - Medium dense silty fine sand, trace clay, trace gravel, dark gray, moist (SM)	8.5
	Very stiff to hard LEAN CLAY with sand, trace gravel, gray (CL)	
634.1	Medium dense SILTY FINE SAND, trace clay, trace organics and roots, black, moist (SM) (An LOI test on SS7 indicated an organic content of 4.8%)	23.5
629.1	Hard LEAN CLAY, trace sand, trace gravel, brown (CL)	28.5

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	8-12-13	25	2.5						
SS2	5-4-6	10	5.0	4500*	14.3				
SS3	3-5-6	11	7.5						
SS4	5-8-10	18	10.0	7500*	12.9				
SS5	8-10-11	21	15.0	7500*	14.7				
SS6	8-11-11	22	20.0	9000+*	14.3				
SS7	10-8-12	20	25.0		22.8				
SS8	7-10-16	26	30.0	9000+*	18.8				



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460985.7
Northing: 368372.1

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

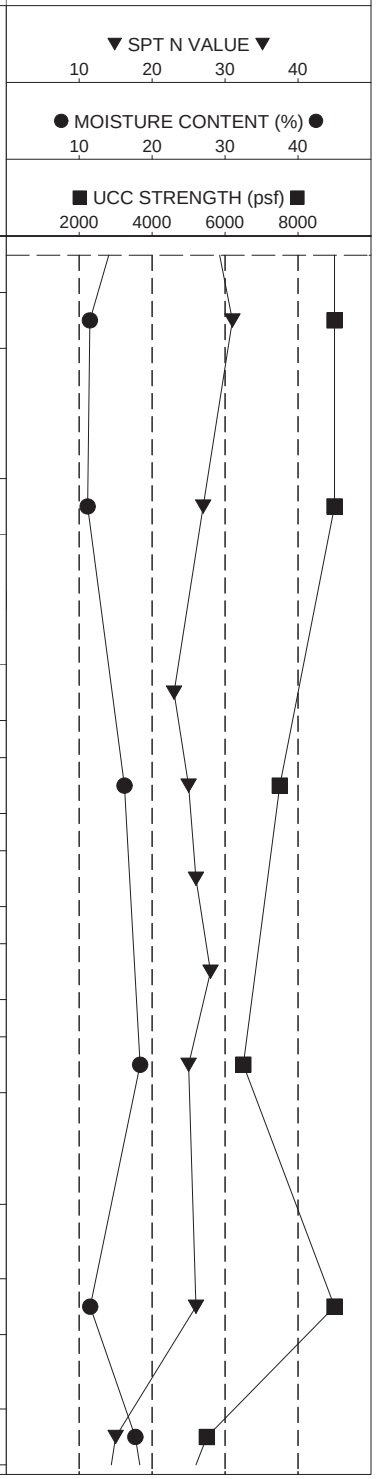
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/12/2015 **DATE COMPLETED:**10/14/2015 **LOG OF TEST BORING TB-06**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 657.6 ft											
624.1	33.5											
	Hard to very stiff LEAN CLAY, few sand, trace gravel, gray (CL) (Driller reported possible cobble at 51.5 ft.) NOTE: No recovery on SPT sample attempts at 45, 50, and 52.5 ft. due to possible cobble; no recovery on Shelby tube attempt at 60 ft. due to possible cobble.	35	SS9	8-13-18	31	35.0	9000+*	11.5				
		40	SS10	8-12-15	27	40.0	9000+*	11.2				
		45	NR11	7-10-13	23	45.0						
			SS12	6-10-15	25	47.5	7500*	16.2				
		50	NR13	10-12-14	26	50.0						
			NR14	10-13-15	28	52.5						
		55	SS15	8-10-15	25	55.0	6500*	18.4				
			NR16			60.0						
597.6	60.0	60	SS17	8-10-16	26	61.5	9000+*	11.5	125	30	14	72
	Hard to very stiff LEAN CLAY with sand, trace gravel, gray (CL)	65	SS18	6-7-8	15	65.0	5500*	17.7				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460985.7
Northing: 368372.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

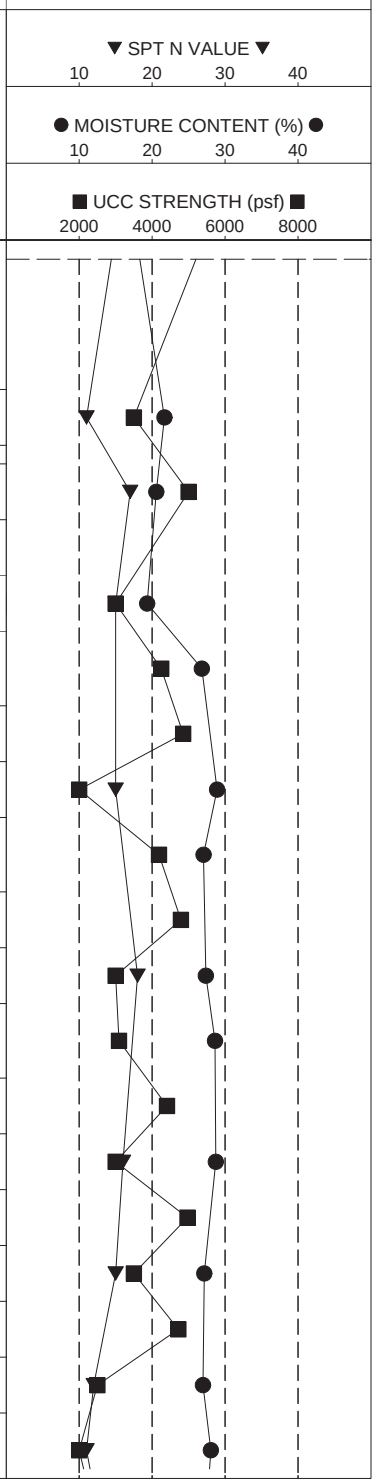
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/12/2015 **DATE COMPLETED:**10/14/2015 **LOG OF TEST BORING TB-06**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 657.6 ft	65										
590.6	Hard to very stiff LEAN CLAY with sand, trace gravel, gray (CL) 67.0											
587.1	Stiff FAT CLAY, few sand, trace gravel, gray (CH) 70.5	70	SS19	3-5-6	11	70.0	3500*	21.7	102	54	32	92
582.6	Very stiff to stiff LEAN CLAY, few sand, trace gravel, gray (CL) 75.0		SS20	5-8-9	17	72.0	5000*	20.6				
		75	SS21	5-7-8	15	75.0	3000*	19.3				
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		ST22			77.0	4250	26.8	99	39	17	97
			VS1			78.5	4850					
			SS23	4-6-9	15	80.0	2000*	28.9				
		80	ST24			82.0	4190	27.1	99			
			VS2			83.5	4790					
			SS25	4-8-10	18	85.0	3000*	27.4	99	45	24	96
		85	ST26			87.0	3090	28.6	98			
			VS3			88.5	4410					
			SS27	5-8-8	16	90.0	3000*	28.7	99	47	25	97
		90	VS4			91.5	4970					
			SS28	5-7-8	15	93.0	3500*	27.1				
563.1			VS5			94.5	4720					
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL) 94.5	95	SS29	4-5-7	12	96.0	2500*	27.0				
			SS30	3-5-6-7	11	98.0	2000#	28.1				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460985.7
Northing: 368372.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

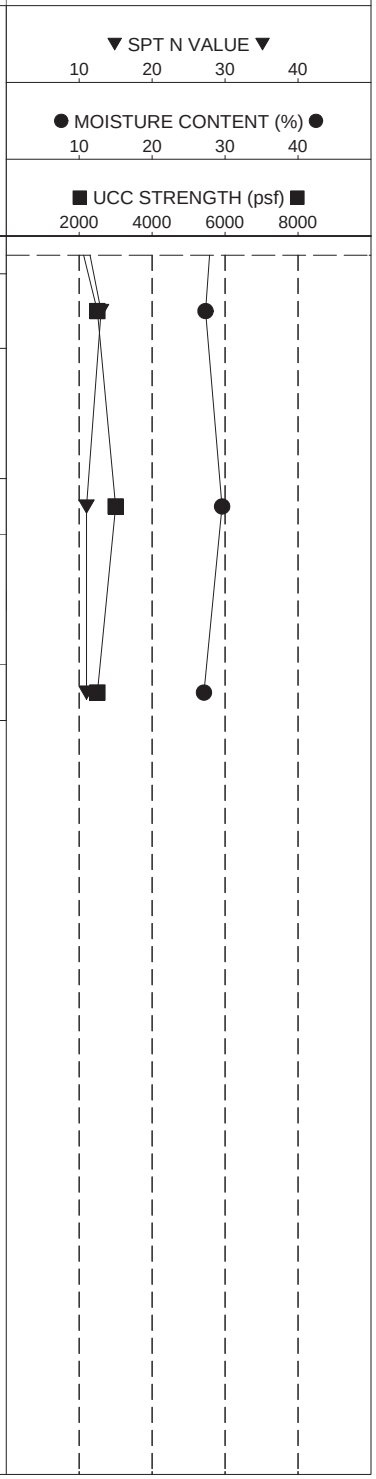
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/12/2015 **DATE COMPLETED:**10/14/2015 **LOG OF TEST BORING TB-06**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 657.6 ft											
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS31	4-6-7-9	13	100.0	2500*	27.3				
		100										
			SS32	3-5-6	11	105.0	3000*	29.6				
		105										
			SS33	3-5-6	11	110.0	2500*	27.1				
547.6	110.0	110										
	End of Boring at 110 ft.											
		115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460985.7
Northing: 368372.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

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Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/3/2016 **DATE COMPLETED:** 10/6/2016 **LOG OF TEST BORING** **TB-06A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	FIELD DATA: SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	LABORATORY DATA: UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 657.4 ft	0										
		5										
		10										
	Profile drilled to 36 ft. NOTE: Auger refusal at 24 ft. on possible obstruction. Boring relocated 9 ft. N and continued.	15										
		20										
		25										
		30										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

DRAFT

GROUNDWATER READINGS

First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460998.3
Northing: 368428.2

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 143 ft.

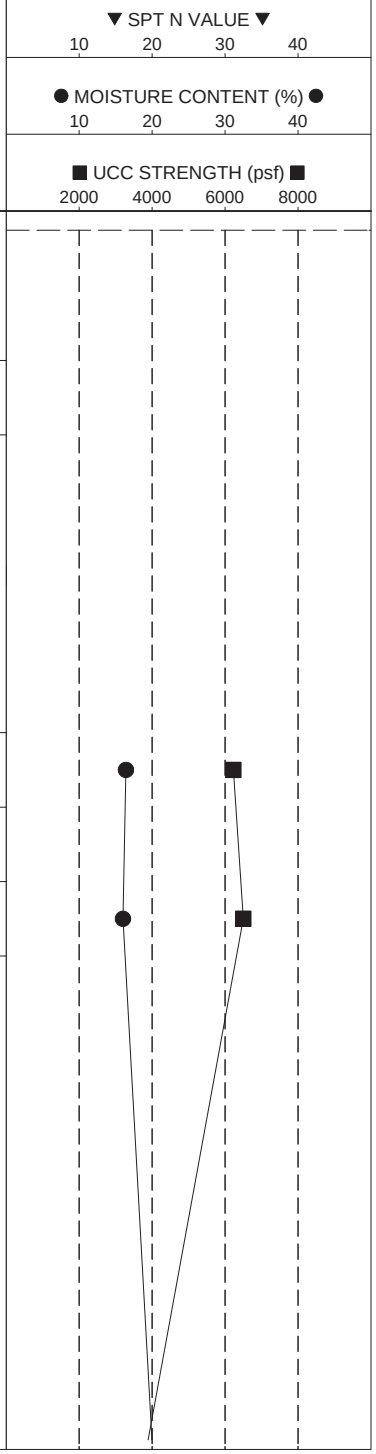
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/3/2016 **DATE COMPLETED:** 10/6/2016 **LOG OF TEST BORING** **TB-06A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 657.4 ft											
621.4	36.0	35										
	Shelby tube sampling; no SPT samples NOTE: No recovery on Shelby tube attempt at 38 ft. due to sample falling out of sampler.		NR1			38.0						
613.4	44.0	40										
	Very stiff LEAN CLAY with sand, few gravel, gray (CL) NOTE: No recovery on Shelby tube attempt at 67.5 ft. due to sample falling out of sampler.	45	ST2			48.0	6230	16.4	118			
		50	ST3			52.0	6500*	16.0	114	33	17	70
		55										
		60										
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460998.3
Northing: 368428.2

Coordinates/GSE determined by: Survey

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* Penetrometer
<> Disturbed Sample

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Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 143 ft.

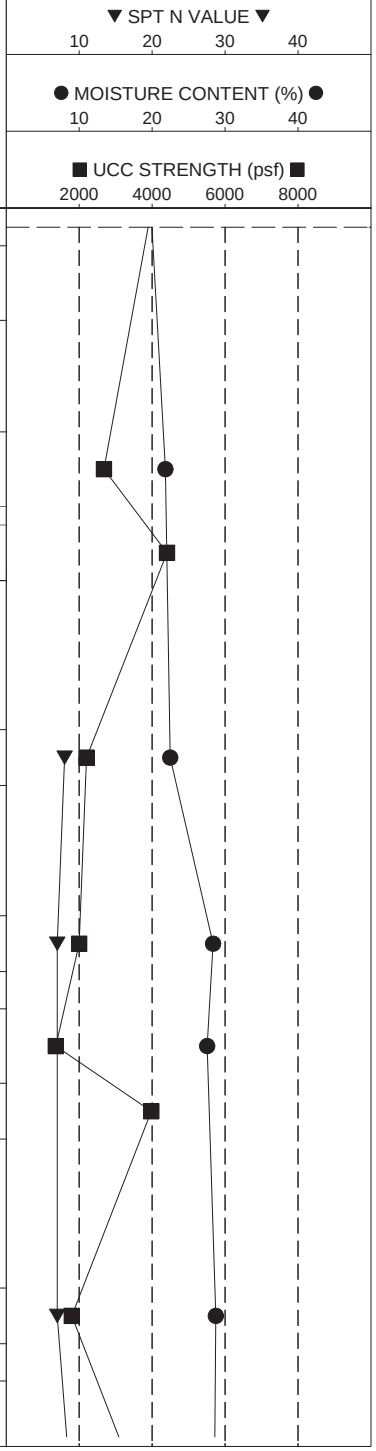
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/3/2016 **DATE COMPLETED:** 10/6/2016 **LOG OF TEST BORING** **TB-06A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 657.4 ft	65										
	Very stiff LEAN CLAY with sand, few gravel, gray (CL)		NR4			67.5						
	NOTE: No recovery on Shelby tube attempt at 67.5 ft. due to sample falling out of sampler.											
587.4		70.0										
		70	ST5			72.5	2680	21.8	111	35	16	91
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)		VS1			74.5	4410					
		75										
578.9		78.5										
			SS6	2-3-5	8	80.0	2200#	22.5				
		80										
			SS7	1-3-4	7	85.0	2000*	28.4				
		85										
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		ST8			88.0	1360	27.5	97	41	19	97
	NOTE: No recovery on Shelby tube attmept at 98 ft. due to sample falling out of sampler.		VS2			89.5	3980					
		90										
			SS9	1-3-4	7	95.0	1800#	28.7				
		95										
			NR10			98.0						



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460998.3
Northing: 368428.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 143 ft.

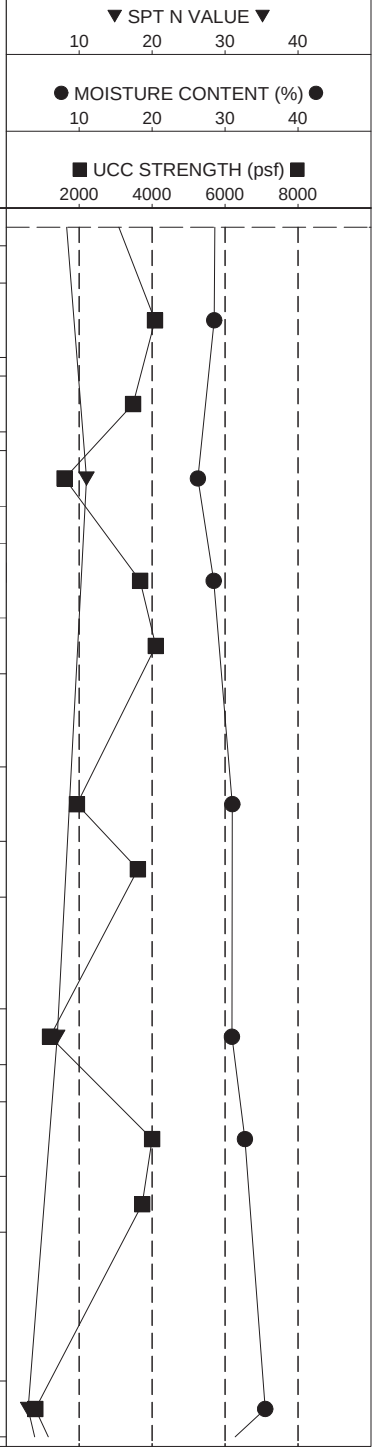
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/3/2016 **DATE COMPLETED:** 10/6/2016 **LOG OF TEST BORING** **TB-06A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 657.4 ft											
558.4	99.0											
		100	ST11			101.0	4080	28.5	97	43	21	97
			VS3			103.0	3480					
			SS12	3-4-7	11	105.0	1600#	26.3				
		105										
			ST13			108.0	3670	28.4	95	40	19	98
			VS4			109.5	4100					
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	110										
	NOTE: No recovery on Shelby tube attmept at 98 ft. due to sample falling out of sampler.		ST14			114.0	1940	31.0	94			
		115	VS5			115.5	3610					
			SS15	1-3-4	7	120.0	1200#	30.9				
		120										
			ST16			123.0	4000	32.7	92	40	19	97
			VS6			124.5	3730					
532.4	125.0	125										
	Soft LEAN CLAY, trace sand, trace gravel, gray (CL)											
			SS17	1-1-2	3	130.0	800#	35.5				
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

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Method Notes: WR drilling started at 10 ft.
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Backfilled With: Cement-Bentonite Grout
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QA/QC By: JA
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DRAFT

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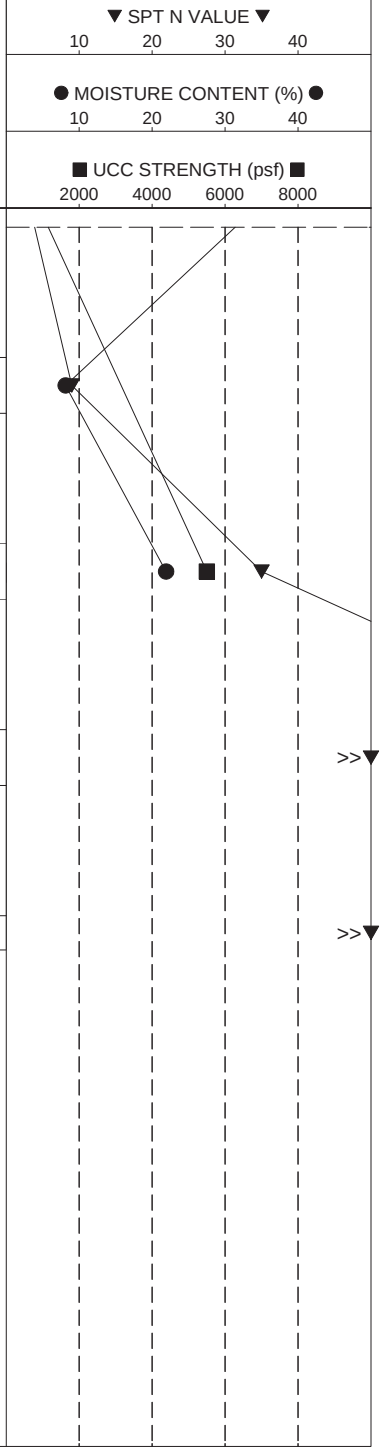
I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/3/2016 **DATE COMPLETED:** 10/6/2016 **LOG OF TEST BORING TB-06A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 657.4 ft	130										
524.9	Soft LEAN CLAY, trace sand, trace gravel, gray (CL) 132.5											
522.4	Loose SILTY FINE SAND, few gravel, gray, moist (SM) 135.0		SS18	11-6-3	9	135.0		8.1				26
		135										
517.4	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL) 140.0		SS19	5-17-18	35	140.0	5500*	21.9				
		140										
	Alternating layers of LEAN CLAY and extremely dense SILT, with sand, trace gravel, gray (CL) (ML)		SS20	39-46-45	91	145.0	<>					
		145										
508.4	149.0		SS21	35-50/5"	50 +	149.4						
508.0	Extremely dense SILTY FINE SAND, gray, moist (SM) 149.4											
		150										
	End of Boring at 149.4 ft. (Terminated upon SPT sample refusal)											
		155										
		160										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

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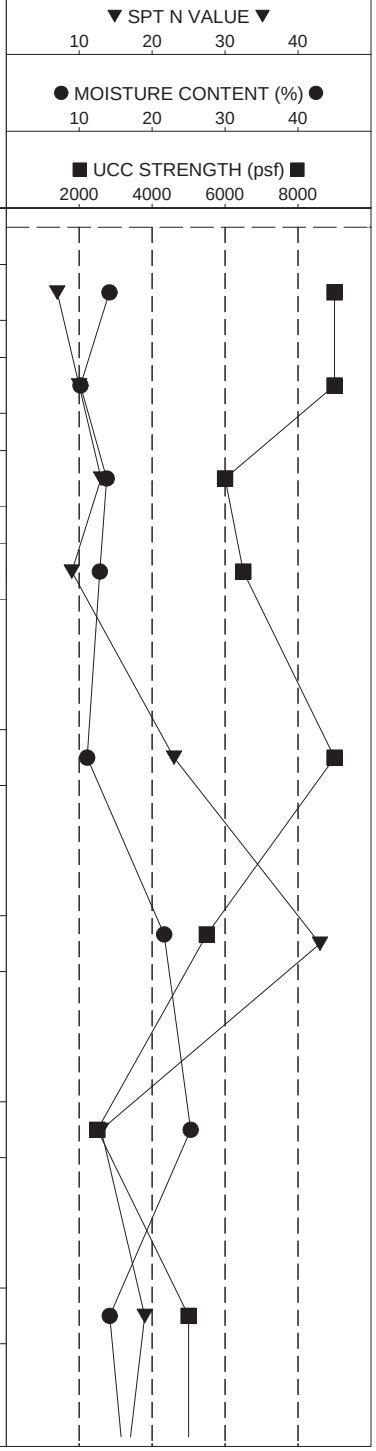
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 2/6/2017 **DATE COMPLETED:** 2/20/2017 **LOG OF TEST BORING TB-118**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 655.9 ft	
655.4	6 inches of TOPSOIL	0.5
	FILL - Hard to very stiff lean clay, few sand, trace gravel, trace roots above 7.5 ft., occasional silt partings and fine sand partings, brown to gray (CL)	
646.9		9.0
	FILL - Alternating seams and layers of silt, silty fine sand and sandy lean clay, trace gravel, gray/brown/dark brown, moist (ML)(SM)(CL)	
640.9		15.0
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL) (Possible Fill)	
636.9		19.0
	Dense poorly graded FINE SAND with silt, trace gravel, brown, moist (SP-SM) (Possible Fill)	
632.4		23.5
630.9	Alternating layers of poorly graded FINE SAND and stiff LEAN CLAY, trace gravel, brown, moist (SP)(CL) (Possible Fill)	25.0
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	3-3-4	7	2.5	9000*	14.2				
SS2	3-4-6	10	5.0	9000+*	10.2				
SS3	3-5-8	13	7.5	6000*	13.8				
SS4	4-4-5	9	10.0	6500*	12.8				
SS5	6-13-10	23	15.0	9000*	11.1				
SS6	10-21-22	43	20.0	5500*	21.7				
SS7	5-5-8	13	25.0	2500*	25.3				
SS8	4-8-11	19	30.0	5000*	14.2				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460908.6
Northing: 368109.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
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DRAFT

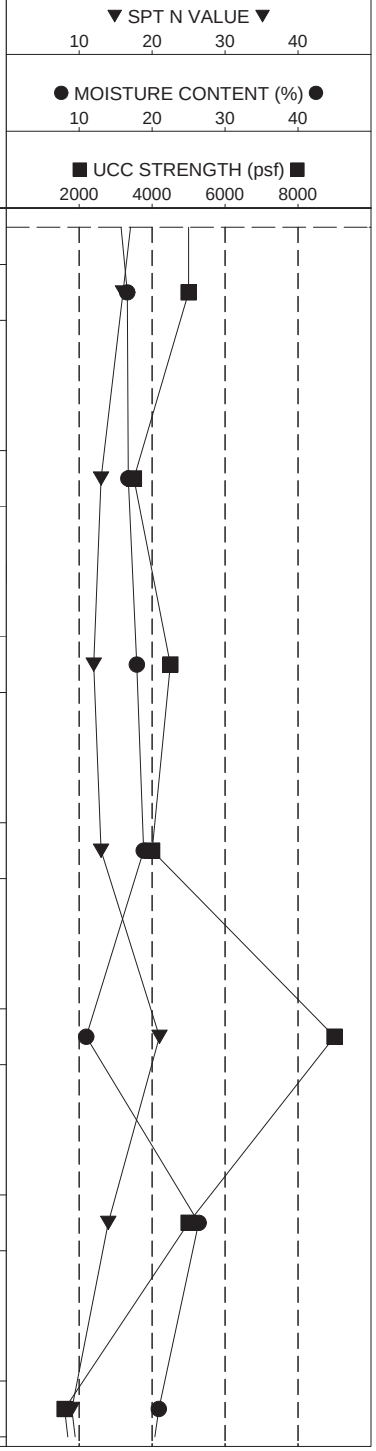
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

LOG OF TEST BORING I-75 DESIGN BUILD MODERNIZATION 2018.GPJ SOMAT.GDT 7/28/17

PROJECT NO. 2014195C **DATE STARTED:** 2/6/2017 **DATE COMPLETED:** 2/20/2017 **LOG OF TEST BORING TB-118**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 655.9 ft											
620.9	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL) 35.0	35	SS9	4-7-9	16	35.0	5000*	16.6				
	Stiff to very stiff LEAN CLAY with sand, trace gravel, gray (CL)	40	SS10	4-6-7	13	40.0	3500*	16.7		35	18	76
		45	SS11	4-5-7	12	45.0	4500*	17.9				
		50	SS12	4-4-9	13	50.0	4000*	18.8				
602.4	53.5	55	SS13	6-10-11	21	55.0	9000*	11.0				
	Hard to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)											
595.9	60.0	60	SS14	4-5-9	14	60.0	5000*	26.4				
	Medium to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	65	SS15	2-4-5	9	65.0	1600#	20.9				



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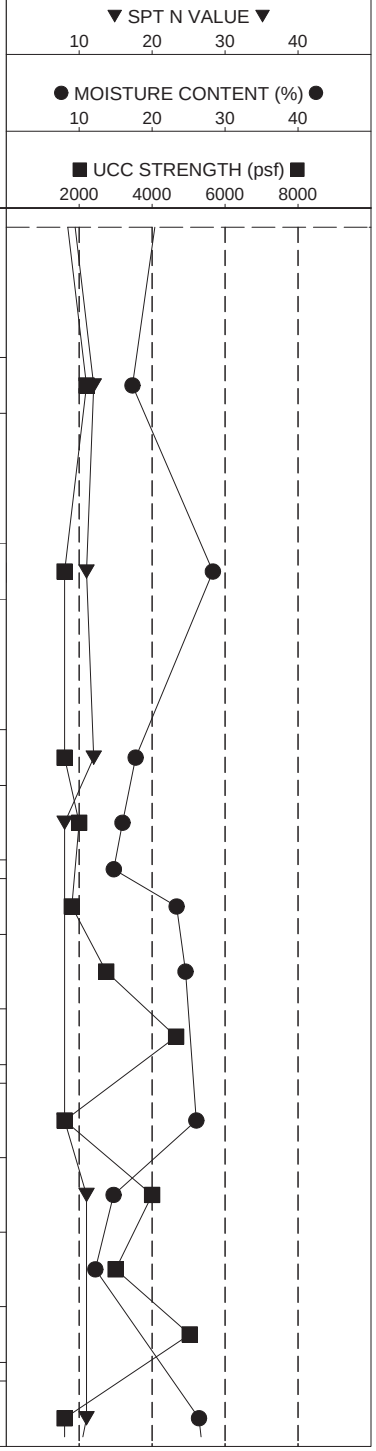
	Ground Surface Elevation 655.9 ft	65										
	Medium to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)											
			SS16	3-5-7	12	70.0	2200#	17.3				
585.9		70.0										
	Medium to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	70										
			SS17	3-5-6	11	75.0	1600#	28.3				
		75										
			SS18	4-5-7	12	80.0	1600#	17.7				
		80										
			SS19	2-3-5-7	8	82.0	2000#	15.9				
573.9		82.0										
	Medium to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		ST20			82.5	<>	14.7				
			DP21			84.0	1800#	23.4				
		85	ST22			86.0	2740	24.6	101			
	NOTE: Poor recovery on Shelby tube ST20 at 84 ft.; direct pushed to 84 ft. to retrieve sample.		VS1			87.5	4660					
			SS23	2-3-5-7	8	90.0	1600#	26.1				
565.9		90.0										
	Very stiff to stiff SANDY LEAN CLAY, trace gravel, gray (CL)	90	SS24	3-5-6-8	11	92.0	4000*	14.7				
			ST25			94.0	3000*	12.2		24	8	56
561.9		94.0										
	Very stiff to soft LEAN CLAY, trace sand, trace gravel, gray (CL)	95	VS2			95.5	5030					
			SS26	3-5-6-6	11	98.0	1600#	26.4				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460908.6
Northing: 368109.1

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* Penetrometer
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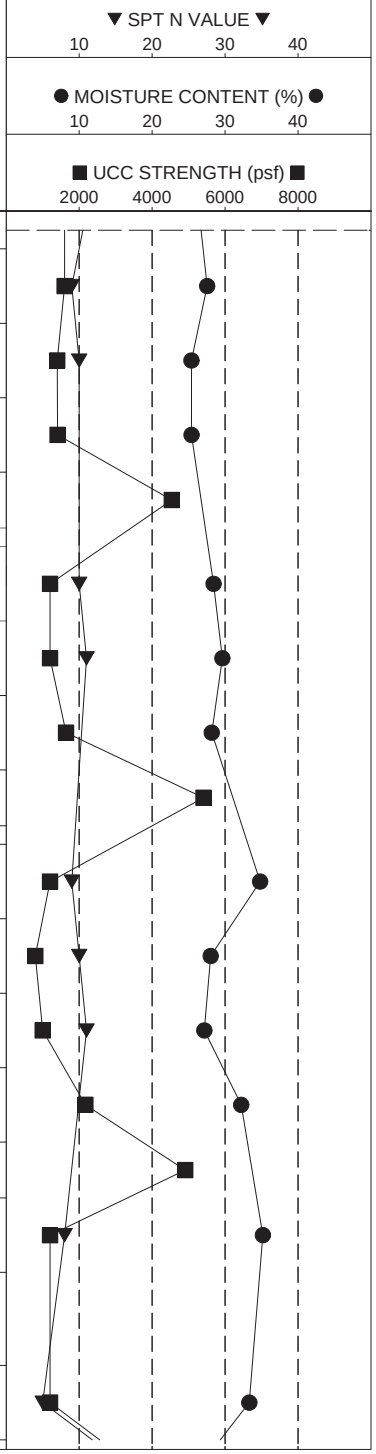
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 2/6/2017 **DATE COMPLETED:** 2/20/2017 **LOG OF TEST BORING TB-118**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 655.9 ft											
	Very stiff to soft LEAN CLAY, trace sand, trace gravel, gray (CL)		SS27	2-4-5-7	9	100.0	1600#	27.5				
		100	SS28	2-4-6-7	10	102.0	1400#	25.4				
			ST29			104.0	1410	25.4	101	41	19	94
		105	VS3			105.5	4540					
			SS30	1-5-5-6	10	108.0	1200#	28.4				
			SS31	1-5-6-6	11	110.0	1200#	29.6				
		110	ST32			112.0	1640	28.2	98	42	20	95
			VS4			113.5	5410					
		115	SS33	1-4-5-4	9	116.0	1200#	34.8				
			SS34	2-5-5-5	10	118.0	800#	28.0				
			SS35	2-5-6-6	11	120.0	1000#	27.2				
		120	ST36			122.0	2170	32.2	91			
			VS5			123.5	4910					
		125	SS37	2-4-4-5	8	125.5	1200#	35.2				
			SS38	2-2-3-4	5	130.0	1200#	33.3				
		130										



DRAFT

GROUNDWATER READINGS
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Upon Completion: n/a

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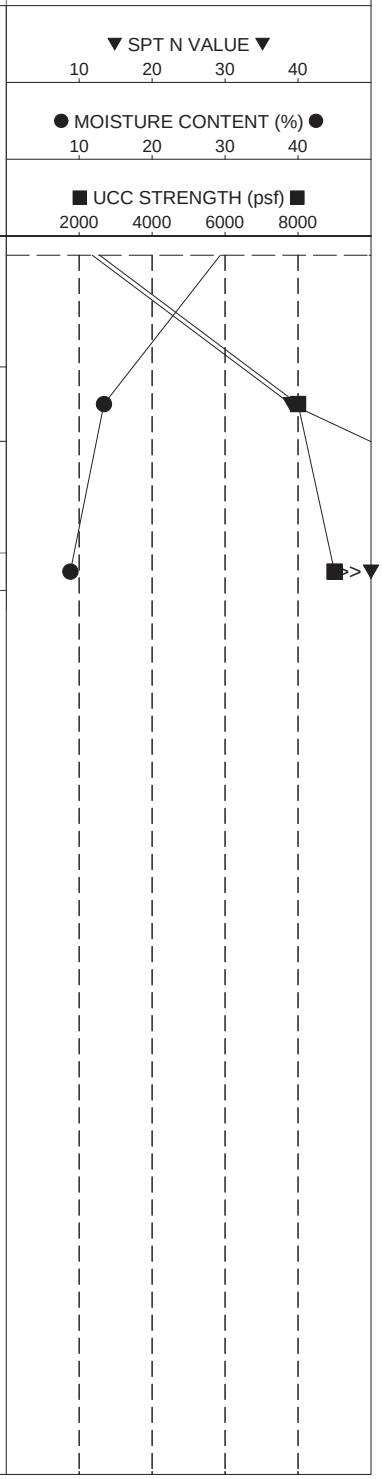
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 2/6/2017 **DATE COMPLETED:** 2/20/2017 **LOG OF TEST BORING TB-118**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 655.9 ft	130										
522.9	Very stiff to soft LEAN CLAY, trace sand, trace gravel, gray (CL) 133.0											
520.9	Hard LEAN CLAY with sand, trace gravel, gray (CL) 135.0		SS39	8-15-24-45	39	135.0	8000*	13.4				
		135										
516.9	Hard LEAN CLAY with sand, trace gravel, occasional fine sand partings, gray (CL) (Possible Hardpan) 139.0		SS40	36-88	88+	139.0	9000+*	8.8				
	End of Boring at 139 ft. (Terminated upon SPT sample refusal on possible hardpan)	140										
		145										
		150										
		155										
		160										



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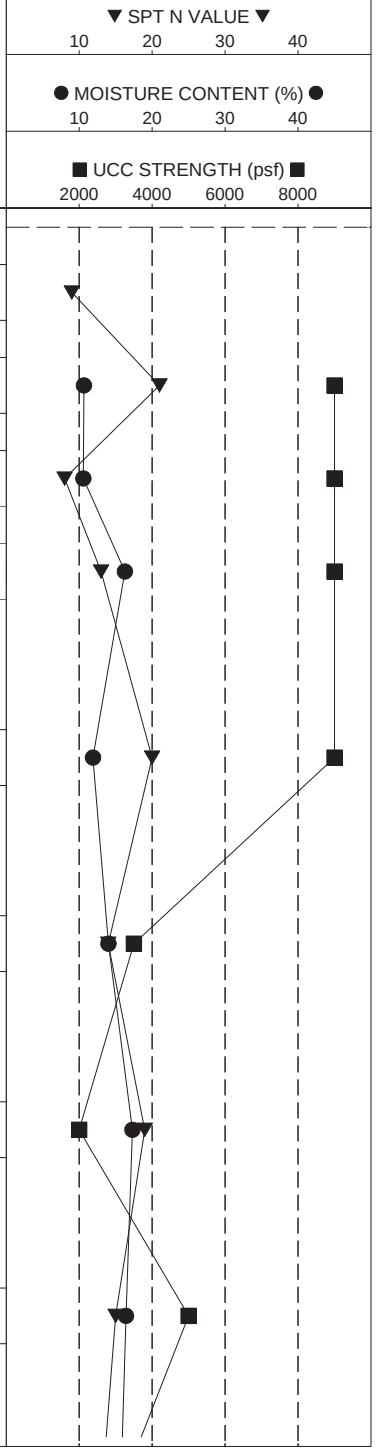
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/12/2016 **DATE COMPLETED:** 9/14/2016 **LOG OF TEST BORING** **SB-03**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
639.5	Ground Surface Elevation 639.9 ft	0
638.9	4 inches of ASPHALTIC CEMENT CONCRETE	0.3
	7 inches of PORTLAND CEMENT CONCRETE	0.9
636.4	FILL - Loose poorly-graded fine to medium sand with silt and gravel, trace coarse sand, brown, moist (SP-SM)	3.5
631.4	Hard LEAN CLAY, trace sand, trace gravel, gray-brown (CL)	8.5
626.4	Hard LEAN CLAY, trace sand, trace gravel, occasional silt partings, brown (CL)	13.5
621.4	Hard LEAN CLAY, few sand, trace gravel, gray (CL)	18.5
609.9	Stiff to very stiff SANDY LEAN CLAY, few gravel, gray (CL)	30.0

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	4-4-5	9	2.5						
SS2	8-9-12	21	5.0	9000+*	10.6				
SS3	7-3-5	8	7.5	9000+*	10.6				
SS4	5-5-8	13	10.0	9000*	16.3				
SS5	6-9-11	20	15.0	9000*	11.9				
SS6	4-6-8	14	20.0	3500*	14.0				
SS7	7-9-10	19	25.0	2000*	17.3				
SS8	5-6-9	15	30.0	5000*	16.4	121	36	20	65



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460725.3
Northing: 367633.8

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 112 ft.

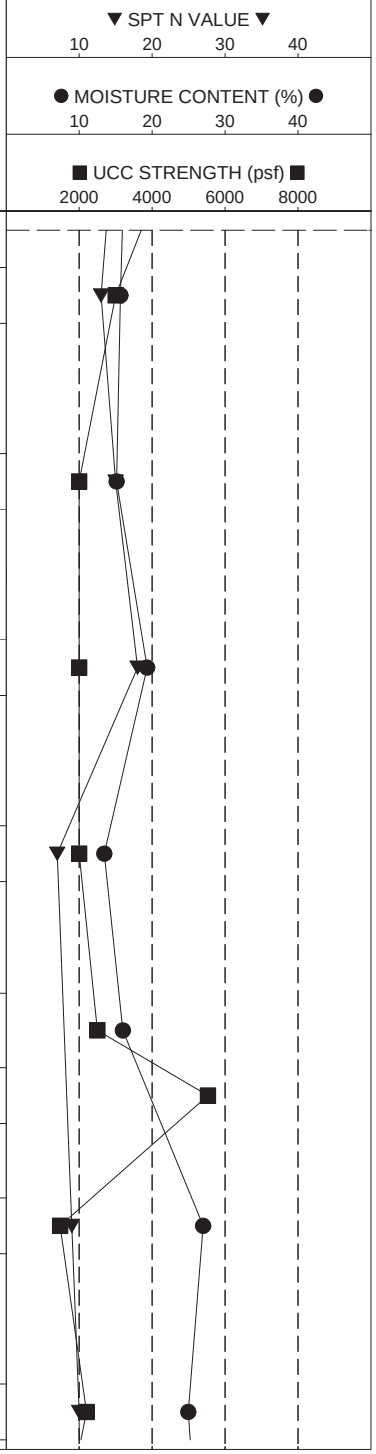
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/12/2016 **DATE COMPLETED:** 9/14/2016 **LOG OF TEST BORING** **SB-03**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 639.9 ft											
	Stiff LEAN CLAY with sand, trace to few gravel, occasional fine sand partings 48.5-50 ft., gray (CL)	35	SS9	5-6-7	13	35.0	3000*	15.7				
		40	SS10	5-7-8	15	40.0	2000*	15.1				
		45	SS11	5-8-10	18	45.0	2000*	19.3				
589.9		50.0	SS12	4-3-4	7	50.0	2000*	13.4				
	Stiff to very stiff SANDY SILTY CLAY, few gravel, gray (CL-ML)	50	ST13			55.0	2500	16.0	116	22	7	65
583.4		56.5	VS1			56.5	5530					
	Medium to stiff LEAN CLAY, trace sand, gray (CL)	55	SS14	3-4-5	9	60.0	1480	27.0	100			
		60	SS15	4-4-6	10	65.0	2200#	25.0				
		65										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460725.3
Northing: 367633.8

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
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Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 112 ft.

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Somat Engineering, Inc.

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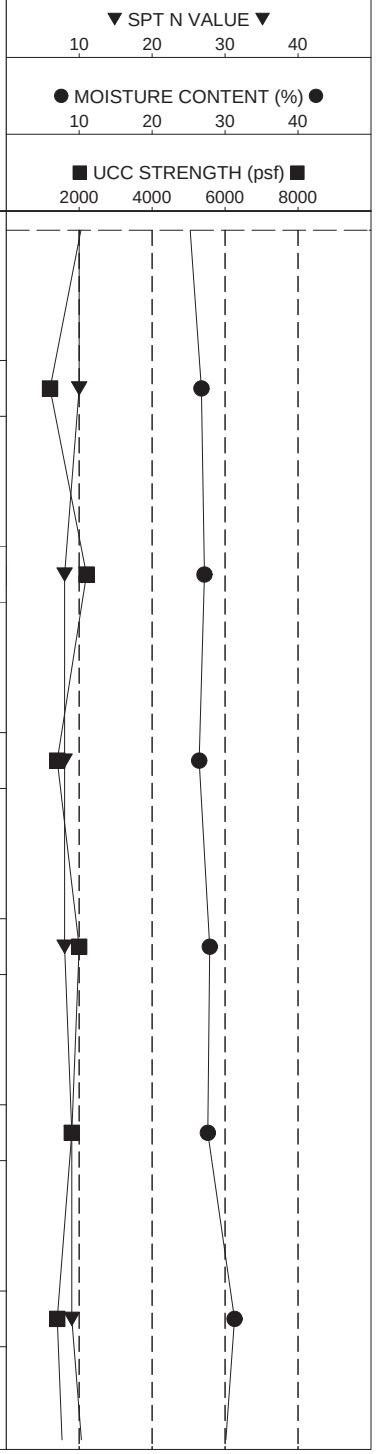
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/12/2016 **DATE COMPLETED:** 9/14/2016 **LOG OF TEST BORING** **SB-03**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 639.9 ft	65										
			SS16	3-4-6	10	70.0	1200#	26.8				
		70										
			SS17	3-4-4	8	75.0	2200#	27.2		47	25	96
	Medium to stiff LEAN CLAY, trace sand, gray (CL)	75										
			SS18	3-4-4	8	80.0	1400#	26.5				
		80										
			SS19	4-4-4	8	85.0	2000#	27.9				
		85										
551.4	88.5											
			SS20	3-4-5	9	90.0	1800#	27.6				
		90										
	Medium to soft SANDY LEAN CLAY, trace gravel, gray (CL)											
			SS21	4-4-5	9	95.0	1400#	31.3				
		95										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

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Northing: 367633.8

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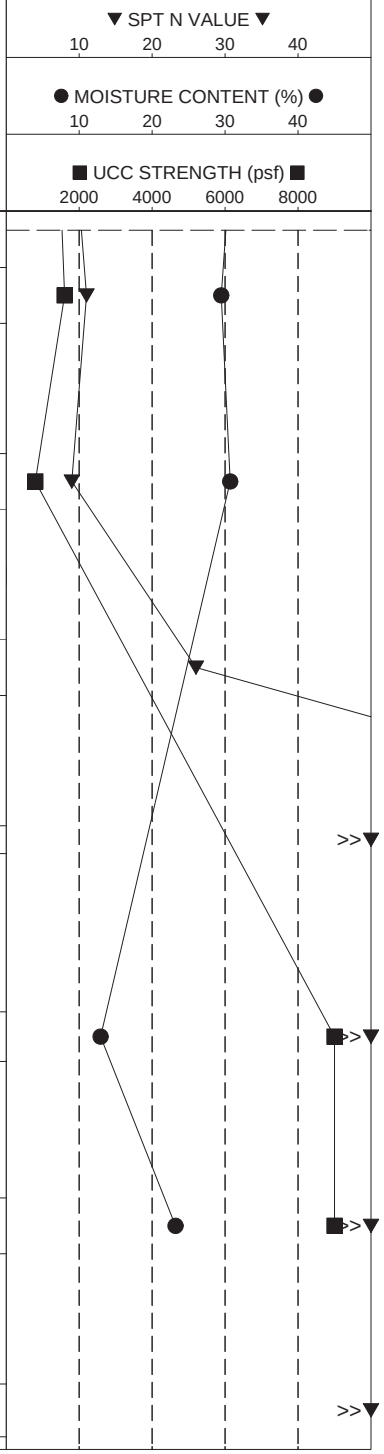
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/12/2016 **DATE COMPLETED:** 9/14/2016 **LOG OF TEST BORING** **SB-03**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 639.9 ft											
	Medium to soft SANDY LEAN CLAY, trace gravel, gray (CL)	100	SS22	4-5-6	11	100.0	1600#	29.5				
		105	SS23	4-5-4	9	105.0	800#	30.7		44	24	
530.9	109.0		SS24	5-11-15	26	110.0						61
	Medium dense SANDY SILT, trace gravel, gray, moist (ML)	110										
526.4	113.5		SS25	23-53/3"	53 +	114.3	<>					52
	SANDY LEAN CLAY, few gravel, occasional sandy silt pockets, gray (CL)	115										
521.4	118.5		SS26	26-45-40/4"	85/10"	119.8	9000+*	12.9		32	15	
	Hard LEAN CLAY, trace sand, trace gravel, frequent silt partings below 120 ft., gray (CL)	120										
	NOTE: Driller reported possible cobbles 125-126 ft.		SS27	10-23-29	52	125.0	9000+*	23.2				
511.4	128.5	125										
			SS28	30-36-50/5"	86/11"	129.9						
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460725.3
Northing: 367633.8

Coordinates/GSE determined by: Survey

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* Penetrometer
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I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/12/2016 **DATE COMPLETED:** 9/14/2016 **LOG OF TEST BORING** **SB-03**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 / ● MOISTURE CONTENT (%) ● 10 20 30 40 / ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
	Ground Surface Elevation 639.9 ft	130											
506.4	Extremely dense SILT, trace sand, trace gravel, gray, moist (ML) 133.5												
504.9	Extremely dense SILTY FINE SAND, trace gravel, gray, moist (SM) 135.0	135	SS29	18-53-47/3"	100/9"	134.8							>>▼
	Extremely dense FINE GRAVEL (possible fractured bedrock), trace silt, trace sand, gray, wet (GP)	140	SS30	75/5"	75 +	138.9							>>▼
495.9	144.0		SS31	80	80+	144.0							>>▼
	End of Boring at 144 ft. (Boring continued as Rock Core)	145											
		150											
		155											
		160											

DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460725.3
Northing: 367633.8

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I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/11/2016 **DATE COMPLETED:**10/12/2016 **LOG OF TEST BORING** **SB-03A**

LOG OF SOIL PROFILE			FIELD DATA				LABORATORY DATA					
ELEVATION ft		DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 639.6 ft	0										
		5										
		10										
		15										
	Profile drilled to 68 ft.	20										
		25										
		30										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460719.1
Northing: 367624.6

Coordinates/GSE determined by:
Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/11/2016 **DATE COMPLETED:**10/12/2016 **LOG OF TEST BORING** **SB-03A**

LOG OF SOIL PROFILE				FIELD DATA				LABORATORY DATA						
ELEVATION ft			DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 / ● MOISTURE CONTENT (%) ● 10 20 30 40 / ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
		Ground Surface Elevation 639.6 ft												
			35											
			40											
			45											
		Profile drilled to 68 ft.												
			50											
			55											
			60											
			65											

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460719.1
Northing: 367624.6

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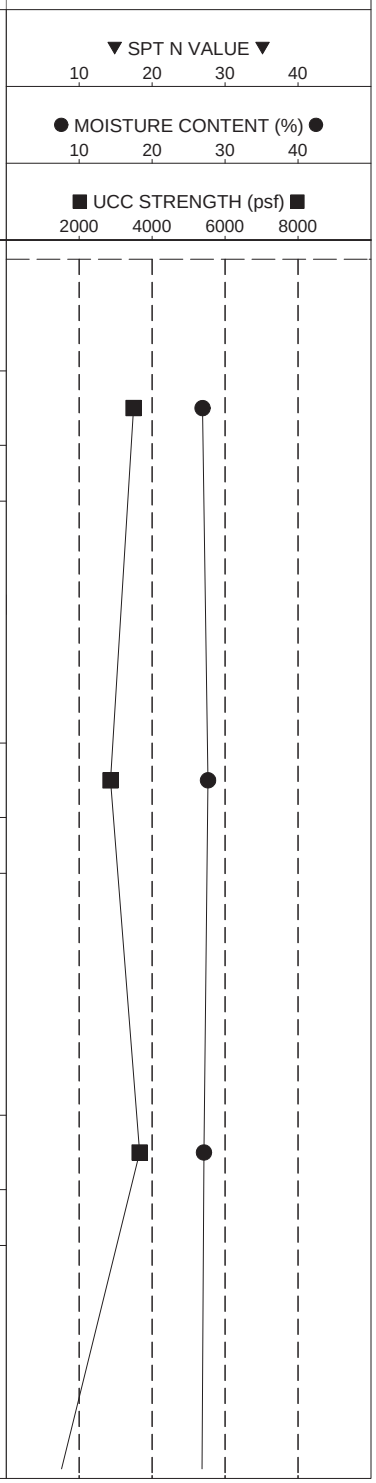
PROJECT NO. 2014195C **DATE STARTED:**10/11/2016 **DATE COMPLETED:**10/12/2016 **LOG OF TEST BORING** **SB-03A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 639.6 ft	65										
	Profile drilled to 68 ft.											
571.6	68.0											
		70	ST1			70.0	3490	26.9	100			
			VS1			71.5						
		75										
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		ST2			80.0	2860	27.7	99	38	18	95
	NOTE: Vane shear tests at 71.5, 81.5, and 91.5 ft. terminated early due to high force gauge readings.	80	VS2			81.5						
		85										
			ST3			90.0	3660	27.1	99			
		90	VS3			91.5						
548.1	91.5											
	Medium LEAN CLAY, trace sand, trace gravel, gray (CL)	95										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460719.1
Northing: 367624.6

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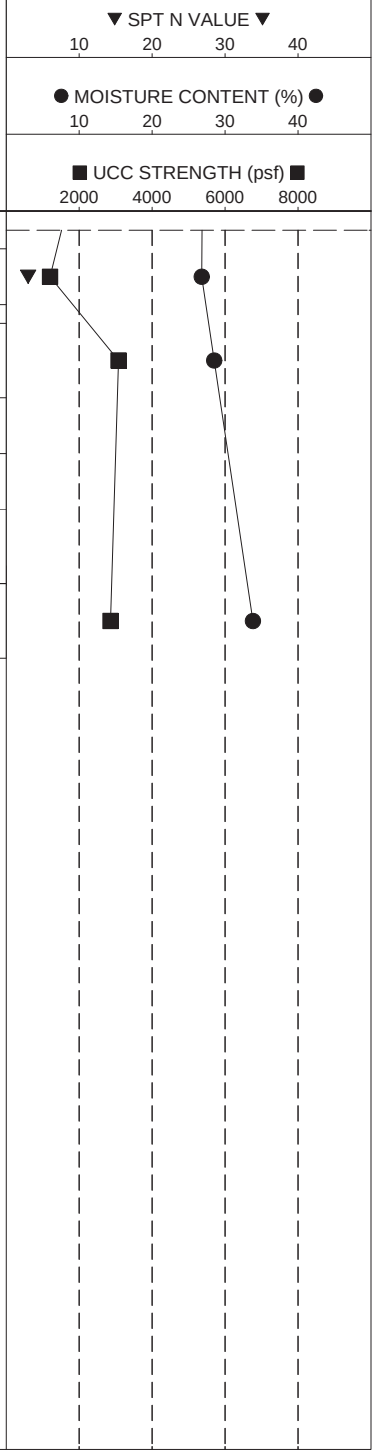
ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 639.6 ft											
540.1	99.5		SS4	0-0-3	3	99.5	1200#	26.8				
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	100	ST5			102.0	3080	28.5	95			
	NOTE: Vane shear test at 103.5 ft. terminated early due to high force gauge readings. No recovery on Shelby tube attempt at 107 ft. due to sample falling out of sampler.		VS4			103.5						
		105	NR6			107.0						
530.6	109.0		ST7			109.0	2860	33.8	92			
	End of Boring at 109 ft.	110										
		115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460719.1
Northing: 367624.6

Coordinates/GSE determined by: Survey

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<> Disturbed Sample

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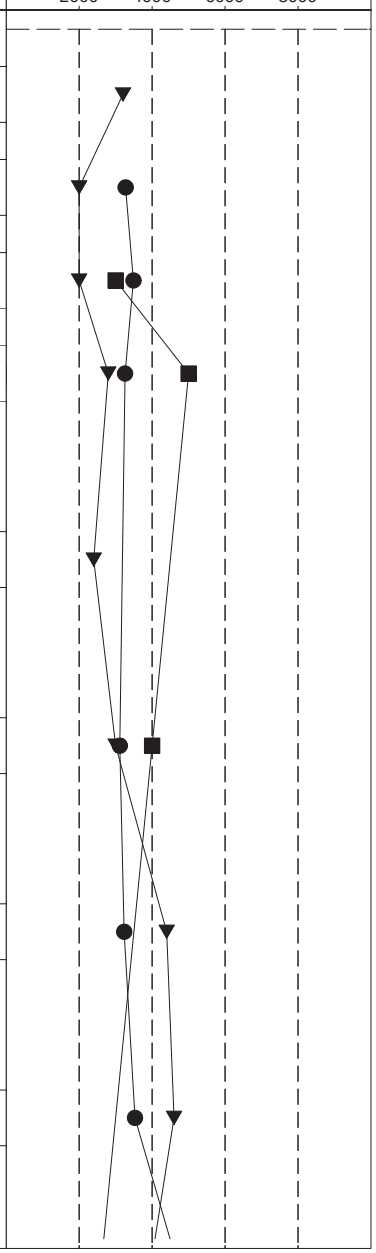
I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 2/6/2017 **DATE COMPLETED:** 2/20/2017 **LOG OF TEST BORING TB-117**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 622.4 ft	0										
621.7	8 inches of ASPHALTIC CEMENT CONCRETE	0.7										
621.5	Field Engineer reported 3 inches of gravel FILL (Base Material)	0.9										
619.9	FILL - Medium dense poorly graded fine to medium sand, trace silt, trace gravel, brown, moist (SP)	2.5	SS1	8-9-7	16	2.5						
		5	SS2	4-5-5	10	5.0	<>	16.4				
			SS3	2-4-6	10	7.5	3000*	17.4				
			SS4	3-5-9	14	10.0	5000*	16.3				
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	10										
	NOTE: Poor recovery on SPT sample SS2 at 5 ft. No recovery on SPT sample attempt at 15 ft. due to sample falling out of sampler.		NR5	3-5-7	12	15.0						
		15										
			SS6	3-6-9	15	20.0	4000*	15.6				
		20										
597.4		25.0	SS7	5-9-13	22	25.0	<>	16.2				
		25										
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS8	7-10-13	23	30.0	<>	17.7				
		30										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460473.2
Northing: 367161.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: N. Otto
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 100 ft.

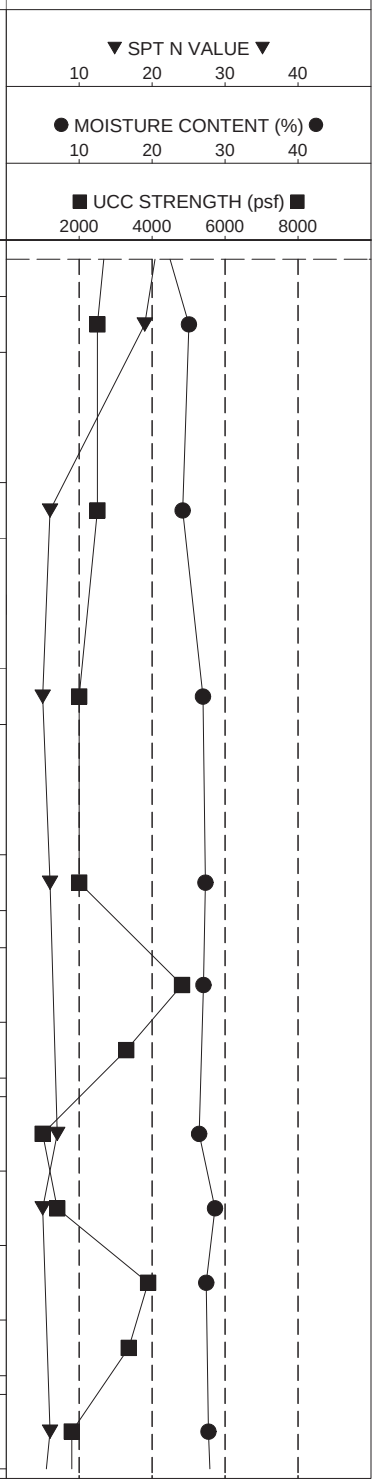
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 2/6/2017 **DATE COMPLETED:** 2/20/2017 **LOG OF TEST BORING TB-117**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 622.4 ft											
587.4	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL) 35.0											
		35	SS9	5-9-10	19	35.0	2500*	25.0				
		40	SS10	1-3-3	6	40.0	2500*	24.2				
		45	SS11	1-2-3	5	45.0	2000*	27.0				
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	50	SS12	2-3-3	6	50.0	2000#	27.3				
			ST13			53.0	4820	27.0	99			
			VS1			54.5	3290					
		55	SS14	1-3-4-6	7	57.0	1000#	26.4				
			SS15	1-2-3-4	5	59.0	1400#	28.6				
		60	ST16			61.0	3890	27.4	99			
			VS2			62.5	3360					
		65	SS17	2-3-3-3	6	65.0	1800#	27.7				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
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Backfilled With: Cement-Bentonite Grout/Patch
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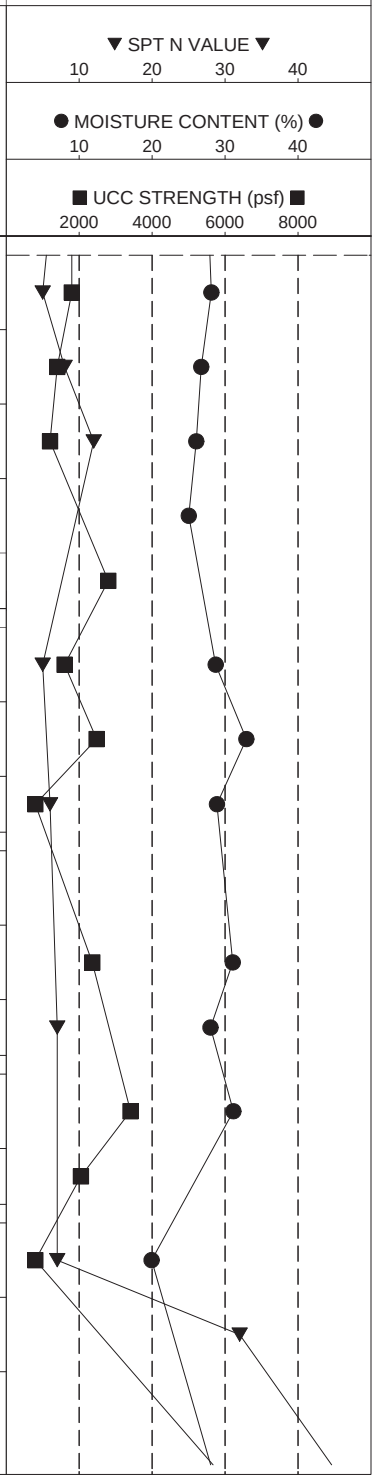
PROJECT NO. 2014195C **DATE STARTED:** 2/6/2017 **DATE COMPLETED:** 2/20/2017 **LOG OF TEST BORING TB-117**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 622.4 ft											
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	65	SS18	1-2-3-4	5	67.0	1800#	28.1				
			SS19	2-3-5-6	8	69.0	1400#	26.7				
		70	SS20	3-5-7-8	12	71.0	1200#	26.1				
551.4	71.0											
			ST21			73.0	<>	25.0				
			VS3			74.5	2800					
		75	SS22	2-2-3-3	5	77.0	1600#	28.7				
			ST23			79.0	2480	32.9	92	43	21	98
	Stiff to soft LEAN CLAY, trace sand, occasional silt seams below 90 ft., gray (CL)	80	SS24	1-3-3	6	80.5	800#	28.9				
	NOTE: Poor recovery on Shelby tube ST21 at 73 ft. No recovery on Shelby tube attempt at 83 ft. due to sample falling out of sampler.		NR25			83.0						
			ST26			85.0	2360	31.0	95	41	19	97
		85	SS27	1-3-4	7	86.5	<>	28.0				
			ST28			89.0	3410	31.1	94			
		90	VS4			90.5	2050					
			SS29	5-4-3-3	7	93.0	800#	19.9				
529.4	93.0											
	Dense CLAYEY FINE SAND, trace gravel, gray, moist (SC)		SS30	4-13-19-28	32	95.0						49
527.4	95.0	95										
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)											



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460473.2
Northing: 367161.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: N. Otto
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 100 ft.

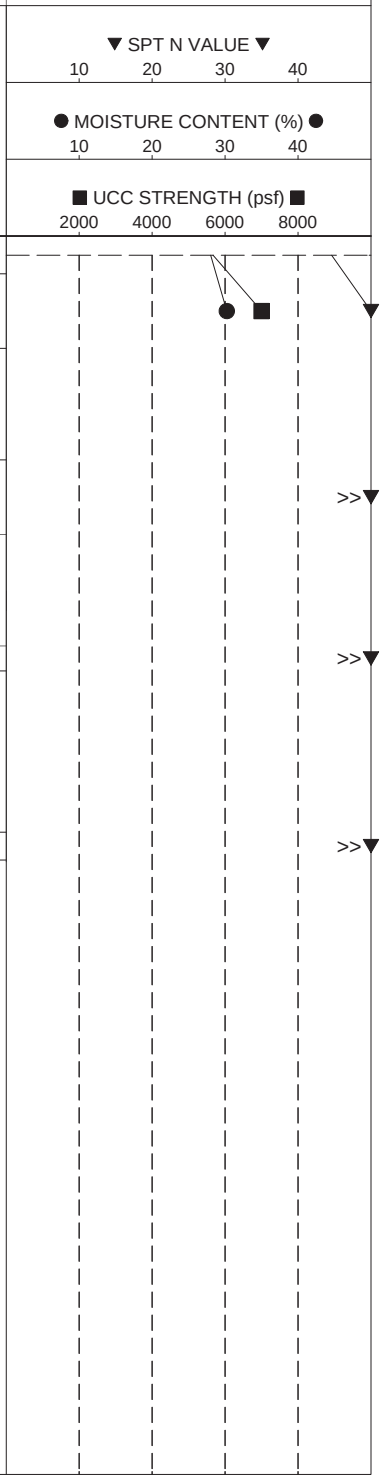
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 2/6/2017 **DATE COMPLETED:** 2/20/2017 **LOG OF TEST BORING TB-117**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 622.4 ft											
522.4	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL) 100.0		SS31	8-16-34-47	50	100.0	7000*	30.2				
	Very dense to extremely dense SILTY FINE SAND, occasional silty fine to medium sand layers, fine gravel layer at approximately 113 ft., gray, moist (SM)	100										
			SS32	17-43-35-39	78	105.0						
		105										
			SS33	70-50/2"	50 +	108.7						
		110										
508.6	113.8		SS34	77-50/3"	50 +	113.8						
	End of Boring at 113.8 ft. (Terminated upon SPT sample refusal)	115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460473.2
Northing: 367161.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: N. Otto
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 100 ft.

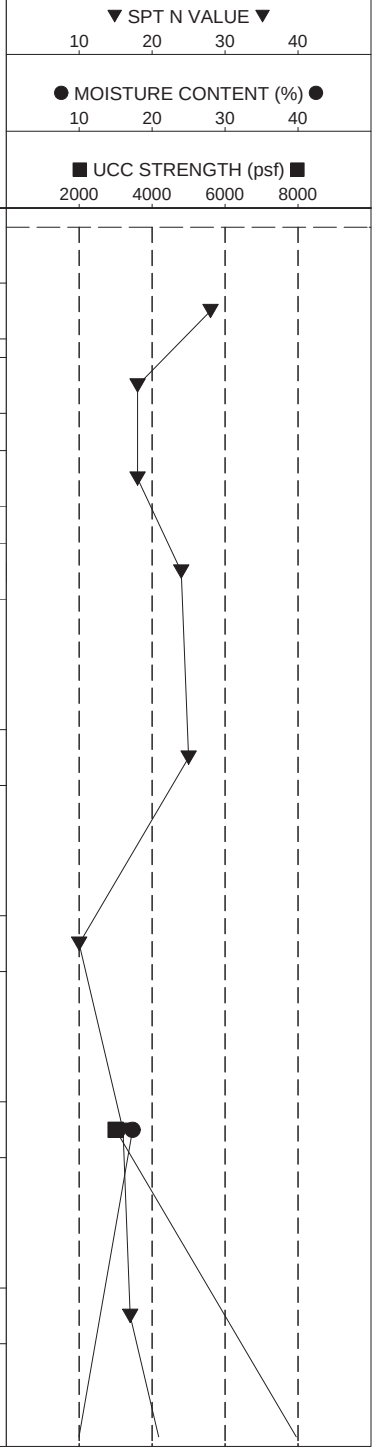
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/6/2016 **DATE COMPLETED:** 10/10/2016 **LOG OF TEST BORING** **SB-06**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 638.1 ft	0										
636.7	16.5 inches of PORTLAND CEMENT CONCRETE (1.4)											
636.5	Field Engineer reported 3 inches of gravel FILL (1.6)		SS1	8-15-13	28	3.0						
			SS2	7-8-10	18	5.0						
		5	SS3	20-9-9	18	7.5						
	FILL - Medium dense poorly-graded fine to coarse sand, trace silt, trace gravel, brown, moist (SP)		SS4	8-12-12	24	10.0						
	NOTE: Driller reported possible cobble at 13.5 ft.	10										
			SS5	19-13-12	25	15.0						
		15										
618.4	(19.7)		SS6	5-5-5	10	20.0						
		20										
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS7	4-7-9	16	25.0	3000*	17.3				
		25										
			SS8	5-7-10	17	30.0	<>					
607.1	(31.0)	30										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460361.4
Northing: 366663.2

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: L. Martinez/S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 119 ft.

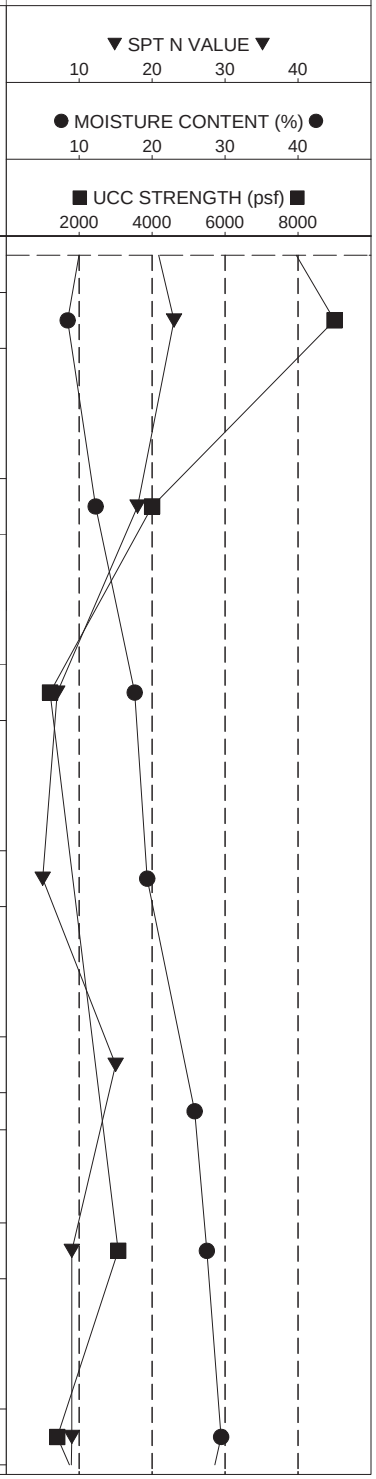
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/6/2016 **DATE COMPLETED:** 10/10/2016 **LOG OF TEST BORING** **SB-06**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 638.1 ft											
	Hard to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	35	SS9	5-11-12	23	35.0	9000+*	8.4				
		40	SS10	6-9-9	18	40.0	4000*	12.3				
594.6	43.5											
	Medium to stiff SANDY LEAN CLAY, trace gravel, gray (CL)	45	SS11	5-3-4	7	45.0	1200#	17.6		28	14	67
	NOTE: No recovery on SPT sample attempt at 55 ft. due to sample falling out of sampler, direct pushed to 56 ft. to retrieve sample.	50	SS12	2-2-3	5	50.0	<>	19.3				
		55	NR13	11-8-7	15	55.0						
			DP14			56.0	<>	25.8				
578.1	60.0	60	SS15	3-4-5	9	60.0	3070	27.5	94			
	Medium to very stiff LEAN CLAY, trace to few sand, trace gravel, gray (CL)	65	SS16	3-4-5	9	65.0	1400#	29.5				



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460361.4
Northing: 366663.2

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: L. Martinez/S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 119 ft.

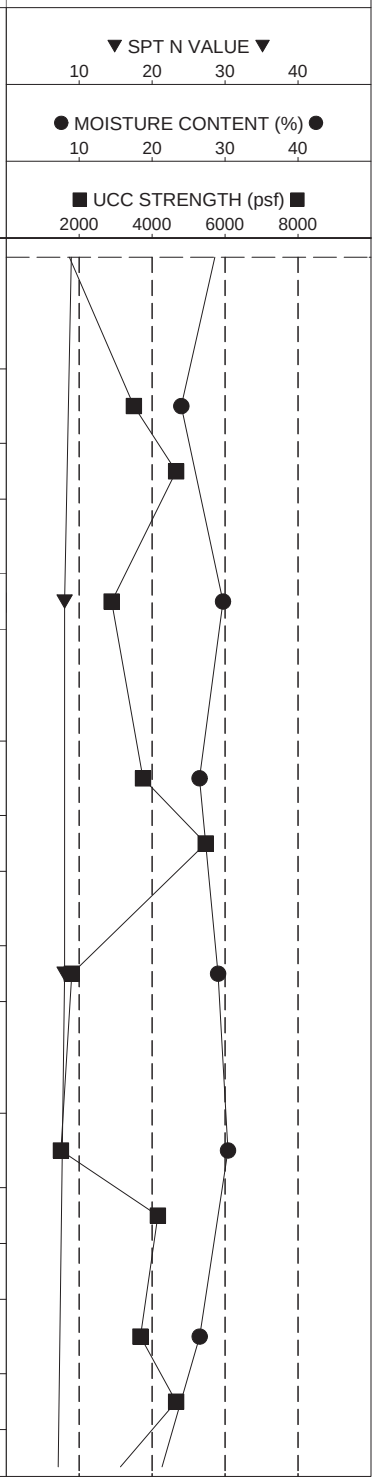
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/6/2016 **DATE COMPLETED:** 10/10/2016 **LOG OF TEST BORING** **SB-06**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 638.1 ft	65										
			ST17			70.0	3500*	24.0	100	38	20	89
		70	VS1			71.5	4660					
			SS18	3-3-5	8	75.0	2890	29.7	98			
		75										
			ST19			80.0	3750	26.5	99			
		80	VS2			81.5	5470					
	Medium to very stiff LEAN CLAY, trace to few sand, trace gravel, gray (CL)		SS20	3-4-4	8	85.0	1800#	29.0				
		85										
			ST21			90.0	1500*	30.4	94	48	28	95
		90	VS3			91.5	4160					
			ST22			95.0	3680	26.5	99			
		95	VS4			96.5	4660					



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460361.4
Northing: 366663.2

Coordinates/GSE determined by: Survey

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Torvane
* Penetrometer
<> Disturbed Sample

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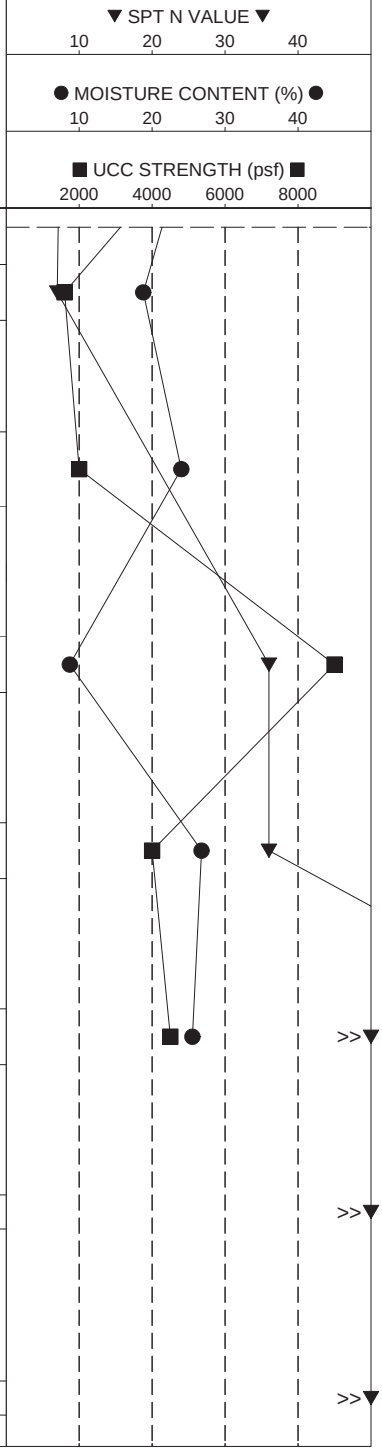
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/6/2016 **DATE COMPLETED:** 10/10/2016 **LOG OF TEST BORING** **SB-06**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 638.1 ft											
	Medium to very stiff LEAN CLAY, trace to few sand, trace gravel, gray (CL)	100	SS23	3-3-4	7	100.0	1600#	18.8				
			ST24			105.0	2000	24.0	93	23	8	99
533.1	Hard SANDY LEAN CLAY, trace gravel, gray (CL)	105.0 / 105	SS25	11-18-18	36	110.0	9000+*	8.7				56
524.1	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	114.0 / 110	SS26	11-15-21	36	115.0	4000*	26.8				
519.1	Extremely dense poorly graded FINE SAND, trace silt and gravel, occasional silty fine sand pockets, gray, moist (SP)	119.0 / 115	SS27	12-39-44	83	120.0	4500*	25.5				>>
518.1	Extremely dense poorly-graded FINE TO MEDIUM SAND with silt, trace gravel, gray, wet (SP-SM)	120.0 / 120	SS28	46-50/5"	50 +	124.4						>>
508.7		129.4 / 125	SS29	30-50/5"	50 +	129.4						>>
		130										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460361.4
Northing: 366663.2

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: L. Martinez/S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 119 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/6/2016 **DATE COMPLETED:** 10/10/2016 **LOG OF TEST BORING** **SB-06**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 638.1 ft	130										
503.1	Extremely dense well-graded FINE TO COARSE SAND with silt, trace gravel, gray, wet (SP-SM) 135.0	135	SS30	48-45-45	90	135.0						
493.1	Extremely dense CLAYEY SAND, trace silt, trace gravel, gray, wet (SC) 145.0	140	SS31	40-50/1"	50 +	139.1						
			SS32	50/5"	50 +	143.9						
483.1	Extremely dense mixed CLAYEY SAND and SHALE pieces, dark gray, wet (SC) 155.0	145	SS33	38-50/0"	50 +	148.9						
		150	SS34	50/5"	50 +	153.9						
	Extremely weathered SHALE, black	155	SS35	50/4"	50 +	158.8						
		160										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460361.4
Northing: 366663.2

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: L. Martinez/S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 119 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/6/2016 **DATE COMPLETED:** 10/10/2016 **LOG OF TEST BORING** **SB-06**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 638.1 ft											
474.5	163.6		SS36	50/1"	50 +	163.6						
	End of Boring at 163.6 ft. (Boring continued as Rock Core)	165										
		170										
		175										
		180										
		185										
		190										
		195										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

>>▼

DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460361.4
Northing: 366663.2

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: L. Martinez/S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 119 ft.

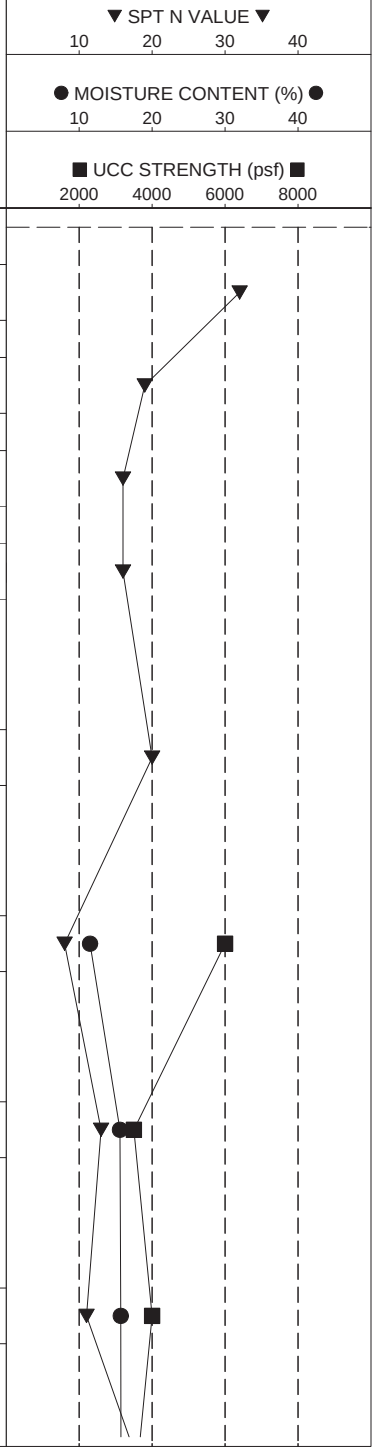
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/7/2016 **DATE COMPLETED:** 11/9/2016 **LOG OF TEST BORING** **SB-09**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.4 ft	0										
635.5	11 inches of PORTLAND CEMENT CONCRETE (0.9)											
	FILL - Dense to medium dense poorly graded fine to coarse sand, trace silt, trace gravel, occasional lean clay layers below 7.5 ft., brown, moist (SP)		SS1	12-14-18	32	2.5						
			SS2	10-7-12	19	5.0						
		5	SS3	5-7-9	16	7.5						
			SS4	7-8-8	16	10.0						
		10										
			SS5	9-9-11	20	15.0						
		15										
617.9	(18.5)											
616.4	Very stiff LEAN CLAY, trace sand, trace gravel, brown (CL) (20.0)		SS6	3-4-4	8	20.0	6000*	11.5				
		20										
			SS7	4-6-7	13	25.0	3500*	15.6				
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	25										
			SS8	3-4-7	11	30.0	4000*	15.7				
		30										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460333.4
Northing: 366352.1

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 125 ft.

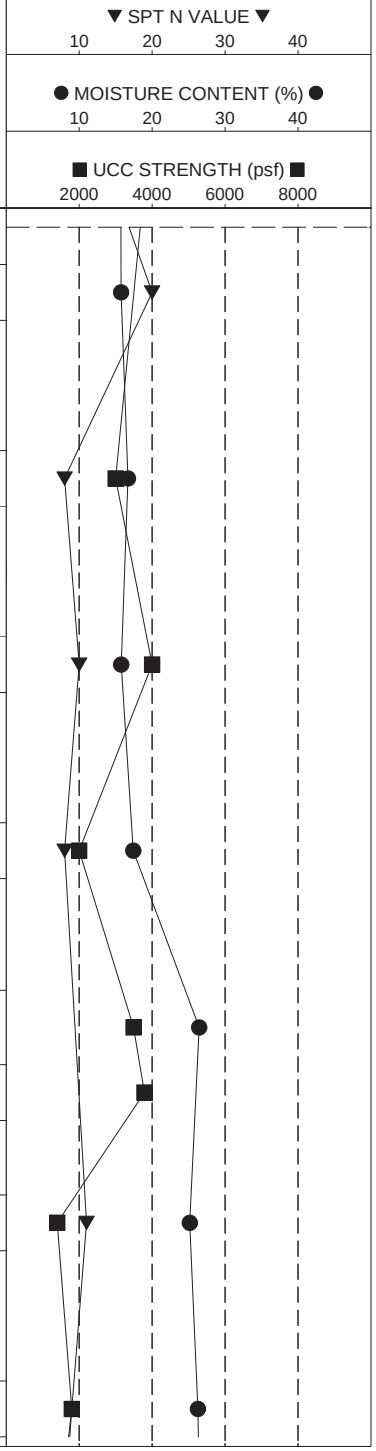
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/7/2016 **DATE COMPLETED:** 11/9/2016 **LOG OF TEST BORING** **SB-09**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.4 ft											
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS9	6-9-11	20	35.0	<>	15.7				
		35										
			SS10	3-3-5	8	40.0	3000*	16.7				
		40										
			SS11	3-4-6	10	45.0	4000*	15.8				
		45										
			SS12	2-4-4	8	50.0	2000*	17.4				
586.4		50.0										
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	50										
			ST13			55.0	3490	26.5	101			
		55	VS1			56.5	3790					
			SS14	4-5-6	11	60.0	1400#	25.2				
		60										
			SS15	3-4-5	9	65.0	1800#	26.3				
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460333.4
Northing: 366352.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 125 ft.

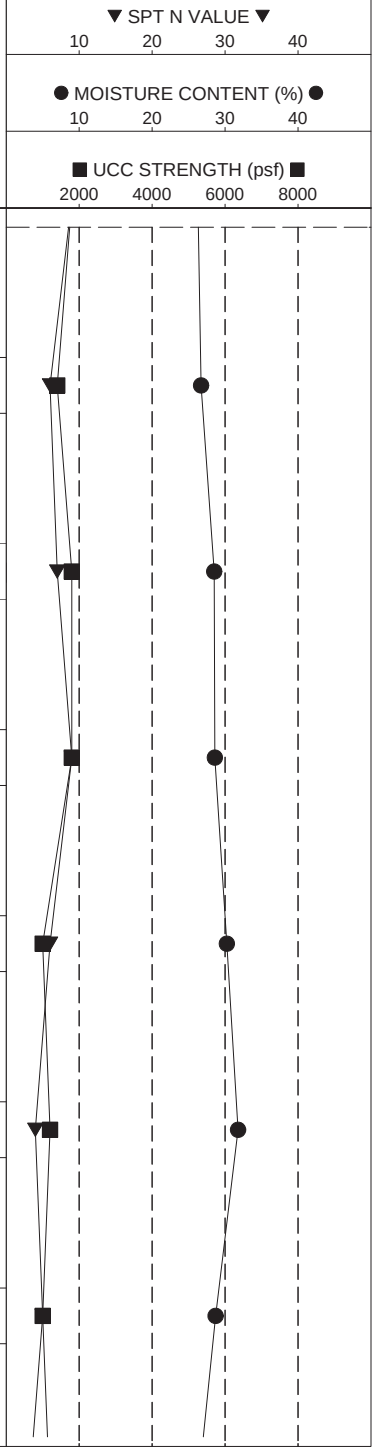
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/7/2016 **DATE COMPLETED:** 11/9/2016 **LOG OF TEST BORING** **SB-09**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.4 ft	65										
			SS16	2-3-3	6	70.0	1400#	26.7				
		70										
			SS17	3-3-4	7	75.0	1800#	28.5				
		75										
			SS18	3-4-5	9	80.0	1800#	28.6				
		80										
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS19	2-3-3	6	85.0	1000#	30.2				
		85										
			SS20	2-2-2	4	90.0	1200#	31.8				
		90										
			SS21	1-2-3	5	95.0	1000#	28.7				
		95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460333.4
Northing: 366352.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 125 ft.

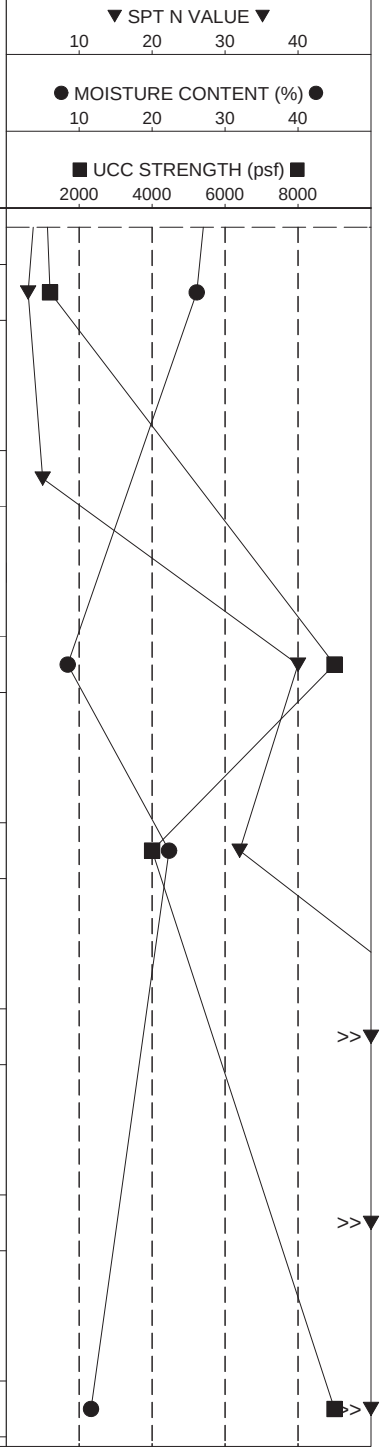
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/7/2016 **DATE COMPLETED:** 11/9/2016 **LOG OF TEST BORING** **SB-09**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.4 ft											
536.4	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL) 100.0	100	SS22	2-1-2	3	100.0	1200#	26.1				
531.4	Loose SILT, trace sand, gray (ML) 105.0	105	SS23	7-2-3	5	105.0						
526.4	Hard LEAN CLAY, with sand, trace gravel, gray (CL) 110.0	110	SS24	6-12-28	40	110.0	9000+*	8.4				
517.9	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL) 118.5	115	SS25	7-11-21	32	115.0	4000*	22.3				
516.4	Very dense SILTY FINE SAND, trace gravel, gray, wet (SM) 120.0	120	SS26	20-32-33	65	120.0						
510.4	Very dense SILTY FINE TO COARSE SAND, trace gravel, gray, wet (SM) 126.0	125	SS27	16-28-37	65	125.0						
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)	130	SS28	21-37-50	87	130.0	9000+*	11.6				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460333.4
Northing: 366352.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 125 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/7/2016 **DATE COMPLETED:** 11/9/2016 **LOG OF TEST BORING** **SB-09**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.4 ft	130										
502.9	Hard LEAN CLAY, trace sand, trace gravel, gray (CL) 133.5											
		135	SS29	21-41-43	84	135.0						
	Extremely dense well-graded FINE TO COARSE SAND with silt, few gravel, gray, wet (SP-SM)		SS30	21-47-40	87	140.0						
		140										
492.9	143.5											
	Extremely dense poorly graded FINE TO MEDIUM SAND with silt, few gravel, gray, wet (SP-SM)		SS31	22-43-46	89	145.0						
		145										
	NOTE: Cave-in reported at 145 ft.											
487.9	148.5		SS32	48-50/2"	50 +	149.2						
	Completely weathered dark gray SHALE (Residual Soil)	150										
482.6	153.8		SS33	50/3"	50 +	153.8						
	End of Boring at 153.8 ft. (Boring continued as Rock Core)	155										
		160										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460333.4
Northing: 366352.1

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 125 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 3/16/2017 **DATE COMPLETED:** 3/23/2017 **LOG OF TEST BORING** **SB-09A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.6 ft	0										
635.7	11 inches of PORTLAND CEMENT CONCRETE	0.9										
634.6	FILL - Poorly graded fine to coarse sand, few gravel, trace silt, brown, moist (SP)	2.0										
		5										
		10										
		15										
	Profile drilled to 59 ft.											
		20										
		25										
		30										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460340.7
Northing: 366351.9

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 45
Engineer on Rig: A. Patterson
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

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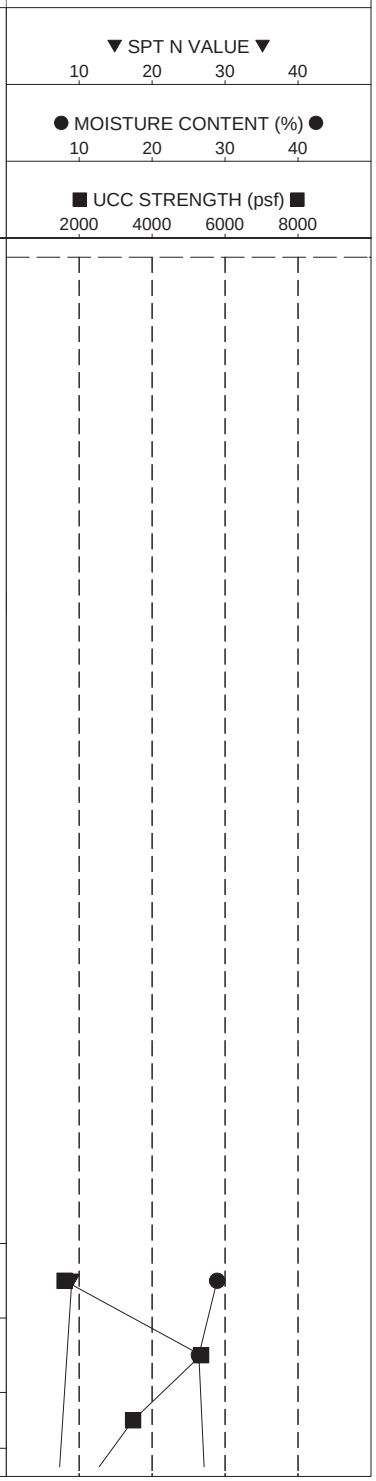
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 3/16/2017 **DATE COMPLETED:** 3/23/2017 **LOG OF TEST BORING** **SB-09A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.6 ft											
	Profile drilled to 59 ft.	35, 40, 45, 50, 55										
577.6	59.0											
	Medium to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	60	SS1	2-4-5-6	9	61.0	1600#	28.9				
			ST2			63.0	5340	26.4	100			
			VS1			64.5	3480					
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460340.7
Northing: 366351.9

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 45
Engineer on Rig: A. Patterson
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

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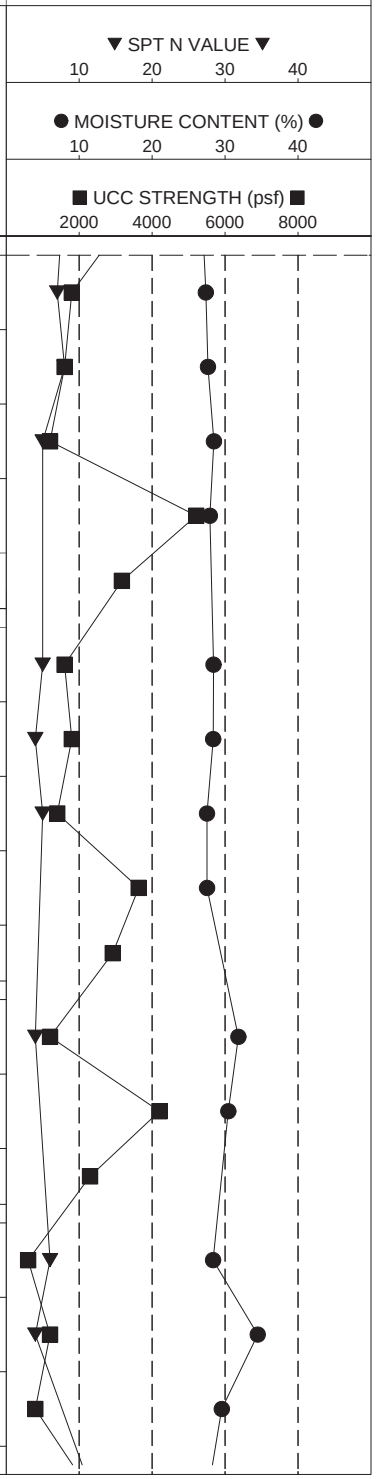
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 3/16/2017 **DATE COMPLETED:** 3/23/2017 **LOG OF TEST BORING** **SB-09A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.6 ft	65										
	Medium to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS3	1-3-4-5	7	67.0	1800#	27.4				
			SS4	1-3-5-6	8	69.0	1600#	27.7				
		70	SS5	1-2-3-5	5	71.0	1200#	28.5				
			ST6			73.0	5210	27.9	98	43	21	96
			VS2			74.5	3170					
		75	SS7	1-2-3-4	5	77.0	1600#	28.4				
			SS8	1-2-2-4	4	79.0	1800#	28.4				
		80	SS9	1-2-3-5	5	81.0	1400#	27.5				
			ST10			83.0	3630	27.5	96	40	19	96
			VS3			84.5	2920					
		85	SS11	1-2-2-4	4	87.0	1200#	31.8				
			ST12			89.0	4200	30.4	93	45	22	98
		90	VS4			90.5	2300					
545.6		91.0										
	Soft to medium LEAN CLAY, trace sand, trace gravel, occasional silt layers below 99 ft., gray (CL)		SS13	3-3-3-4	6	93.0	600#	28.4				
			SS14	1-2-2-3	4	95.0	1200#	34.5				
	NOTE: No recovery on Shelby tube attempt at 97 ft. due to sample falling out of sampler; direct pushed	95	DP15			97.0	800#	29.5				



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460340.7
Northing: 366351.9

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 45
Engineer on Rig: A. Patterson
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

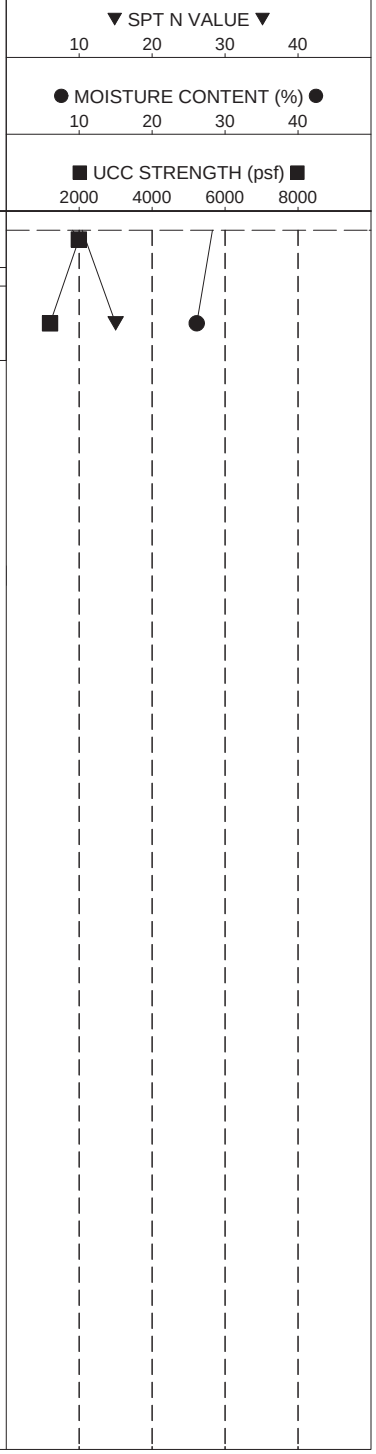
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 3/16/2017 **DATE COMPLETED:** 3/23/2017 **LOG OF TEST BORING** **SB-09A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.6 ft to 97 ft. to retrieve sample.		VS5			98.5	1990					
535.6	101.0	100	SS16	7-6-9-7	15	101.0	1200#	26.1				
	End of Boring at 101 ft.											
		105										
		110										
		115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460340.7
Northing: 366351.9

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 45
Engineer on Rig: A. Patterson
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

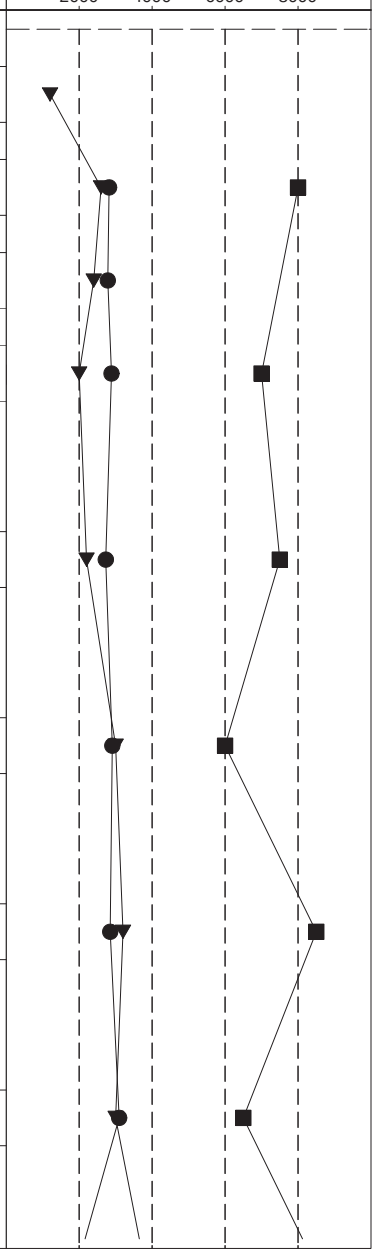
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/15/2016 **DATE COMPLETED:** 9/15/2016 **LOG OF TEST BORING** **RW-40**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 630.6 ft											
630.6	1 inch of TOPSOIL (0.1)	0										
628.1	FILL - Loose well-graded fine to coarse sand, trace silt, trace gravel, brown, moist (SW) (2.5)		SS1	4-3-3	6	2.5						
		5	SS2	4-6-7	13	5.0	8000*	14.1				
			SS3	3-4-8	12	7.5	<>	13.9				
		10	SS4	2-4-6	10	10.0	7000*	14.4				
	Hard to very stiff LEAN CLAY, trace sand, trace gravel, Field Engineer reported sand seams 29-30 ft., gray (CL)	15	SS5	1-4-7	11	15.0	7500*	13.7				
		20	SS6	3-6-9	15	20.0	6000*	14.5				
		25	SS7	3-6-10	16	25.0	8500	14.3	124			
600.6	(30.0)	30	SS8	4-5-10	15	30.0	6500*	15.5				
	Hard LEAN CLAY, few sand, trace gravel, gray (CL)											



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: none

BORING LOCATION INFORMATION
Easting: 13460353.2
Northing: 365742.0

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 45B
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA
Method Notes:
Hammer Type: Automatic
Backfilled With: Cuttings
Checked By: ALOG
QA/QC By: JA
Remarks:

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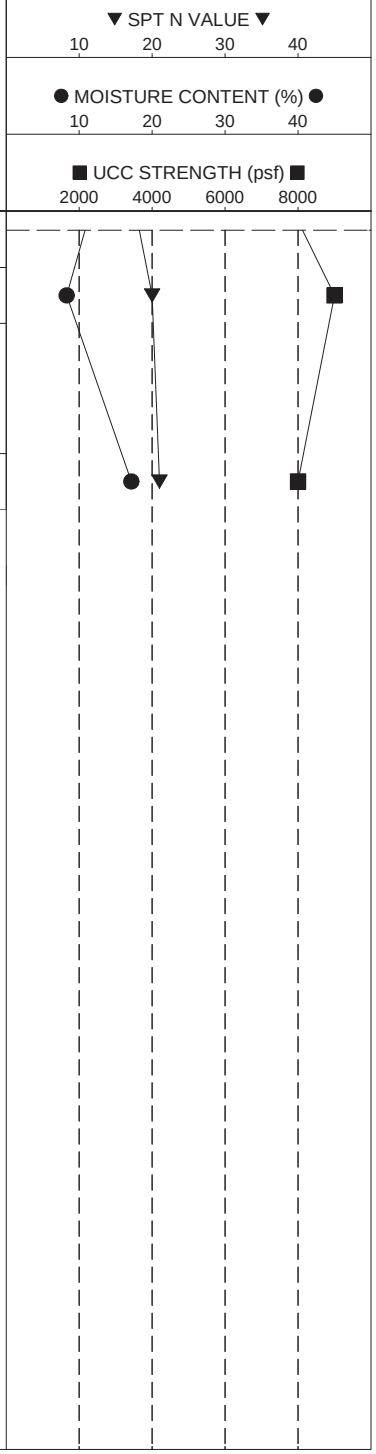
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/15/2016 **DATE COMPLETED:** 9/15/2016 **LOG OF TEST BORING RW-40**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 630.6 ft											
595.6	Hard LEAN CLAY, few sand, trace gravel, gray (CL) 35.0	35	SS9	4-8-12	20	35.0	9000+*	8.3				
590.6	Hard LEAN CLAY, trace sand, trace gravel, gray (CL) 40.0	40	SS10	5-7-14	21	40.0	8000*	17.2				
	End of Boring at 40 ft.	45, 50, 55, 60, 65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: none

BORING LOCATION INFORMATION
Easting: 13460353.2
Northing: 365742.0

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 45B
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA
Method Notes:
Hammer Type: Automatic
Backfilled With: Cuttings
Checked By: ALOG
QA/QC By: JA
Remarks:

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

LOG OF TEST BORING I-75 DESIGN BUILD MODERNIZATION 2018.GPJ SOMAT.GDT 7/28/17

PROJECT NO. 2014195C **DATE STARTED:**10/13/2016 **DATE COMPLETED:**10/19/2016 **LOG OF TEST BORING** **RW-40A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 / ● MOISTURE CONTENT (%) ● 10 20 30 40 / ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
	Ground Surface Elevation 629.8 ft	0											
629.5	4 inches of PORTLAND CEMENT CONCRETE (0.3)												
628.8	Field Engineer reported brown gravelly sand FILL (Base Material) (1.0)												
	Field Engineer reported brown SILTY SAND	5											
623.8	(6.0)												
		10											
		15											
	Profile drilled to 38.5 ft.	20											
		25											
		30											

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460348.1
Northing: 365755.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 9 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling at 110 ft.

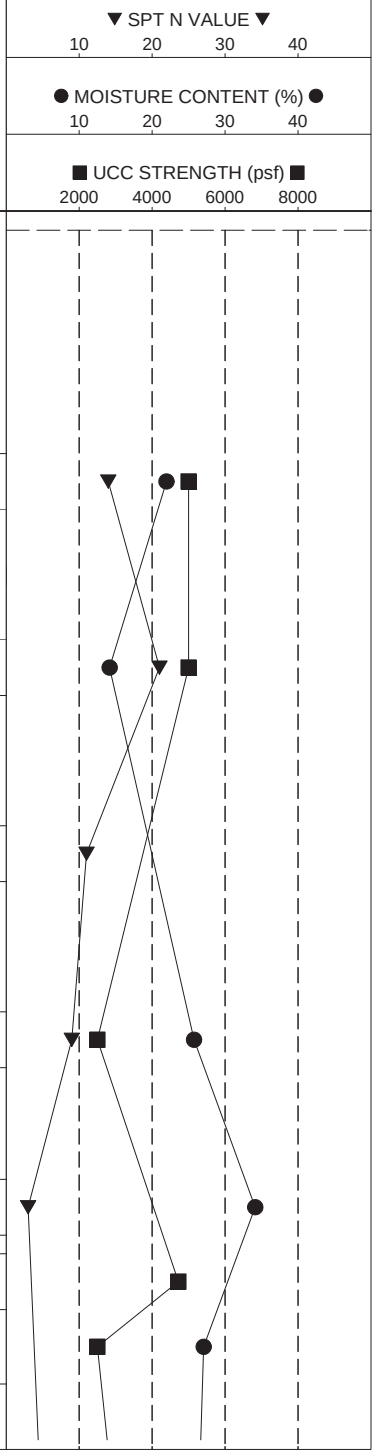
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/13/2016 **DATE COMPLETED:**10/19/2016 **LOG OF TEST BORING RW-40A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 629.8 ft											
	Profile drilled to 38.5 ft.	35										
591.3	38.5											
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	40	SS1	4-6-8	14	40.0	5000*	22.0				
587.3	42.5											
	Very stiff LEAN CLAY with sand, trace gravel, gray (CL)		SS2	8-10-11	21	45.0	5000*	14.2				
584.8	45.0	45										
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		NR3	2-5-6	11	50.0						
	NOTE: No recovery on SPT sample attempt at 50 ft. due to sample falling out of sampler.	50	SS4	1-3-6	9	55.0	2500*	25.7		44	23	93
		55	SS5	1-0-3	3	59.5	<>	34.1				
		60	VS1			61.5	4720					
568.3	61.5											
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	65	ST6			63.5	2500*	27.1		40	22	96



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460348.1
Northing: 365755.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 9 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling at 110 ft.

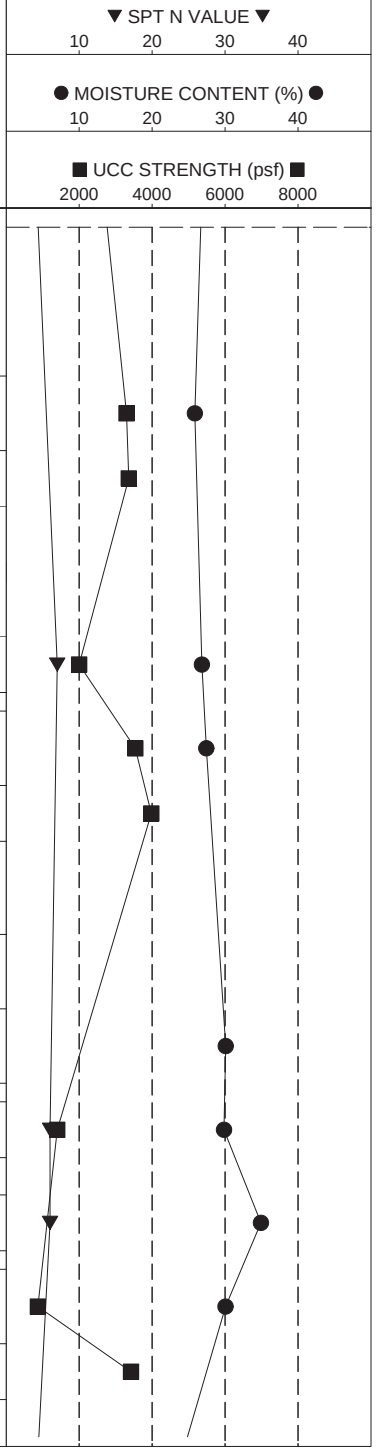
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/13/2016 **DATE COMPLETED:**10/19/2016 **LOG OF TEST BORING RW-40A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 629.8 ft											
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	65										
		70	ST7			71.0	3300	25.9	101			
			VS2			72.5	3360					
		75										
			SS8	2-3-4	7	77.5	2000#	26.8				
			ST9			80.0	3540	27.4	98	40	22	97
		80	VS3			81.5	3980					
548.3	81.5											
	Medium to soft LEAN CLAY, trace sand, trace gravel, gray (CL)	85	NR10			86.0						
			DP11			88.0	<>	30.1				
	NOTE: No recovery on Shelby tube attempts at 86 and 88 ft. due to sample falling out of sampler, direct pushed at 88 ft. to retrieve sample		SS12	1-3-3	6	90.0	1400#	29.9				
		90	SS13	0-2-4	6	92.5	<>	34.9				
			ST14			95.0	870	30.1	91			
534.8	95.0											
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	95	VS4			96.5	3420					



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460348.1
Northing: 365755.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 9 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling at 110 ft.

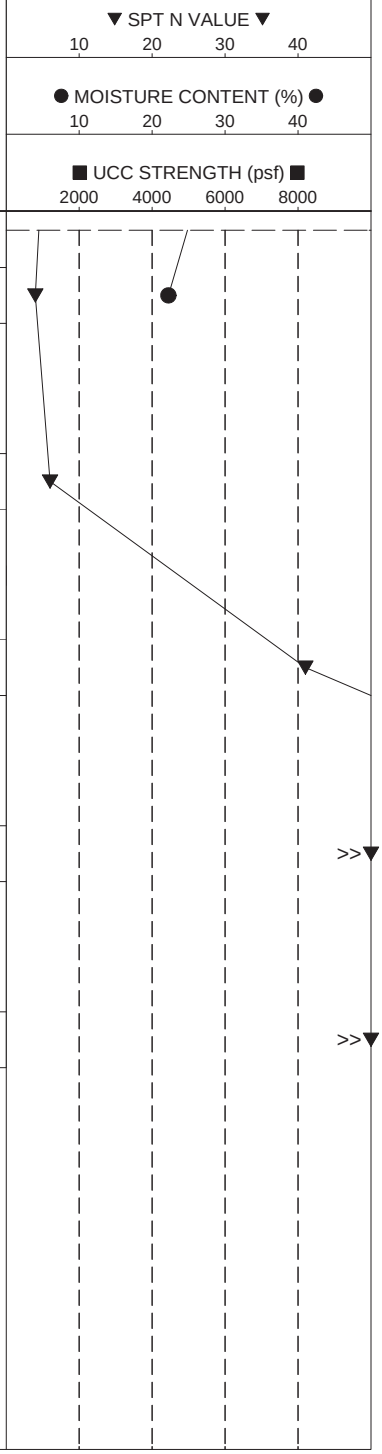
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/13/2016 **DATE COMPLETED:** 10/19/2016 **LOG OF TEST BORING** **RW-40A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 629.8 ft											
529.8	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL) 100.0	100	SS15	0-1-3	4	100.0	<>	22.2				
522.8	LEAN CLAY, few sand, gray (CL) 107.0	105	SS16	4-4-2	6	105.0	<>			30	14	94
	Dense to extremely dense SILTY FINE SAND, frequent lean clay pockets above 110 ft., gray, moist (SM)	110	SS17	8-19-22	41	110.0						
		115	SS18	14-50-51	101	115.0						
512.8	Extremely dense poorly-graded FINE TO COARSE SAND with silt, trace gravel, gray, wet (SP-SM) 117.0											
509.8		120	SS19	22-58-72	130	120.0						
	End of Boring at 120 ft.	125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460348.1
Northing: 365755.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 9 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling at 110 ft.

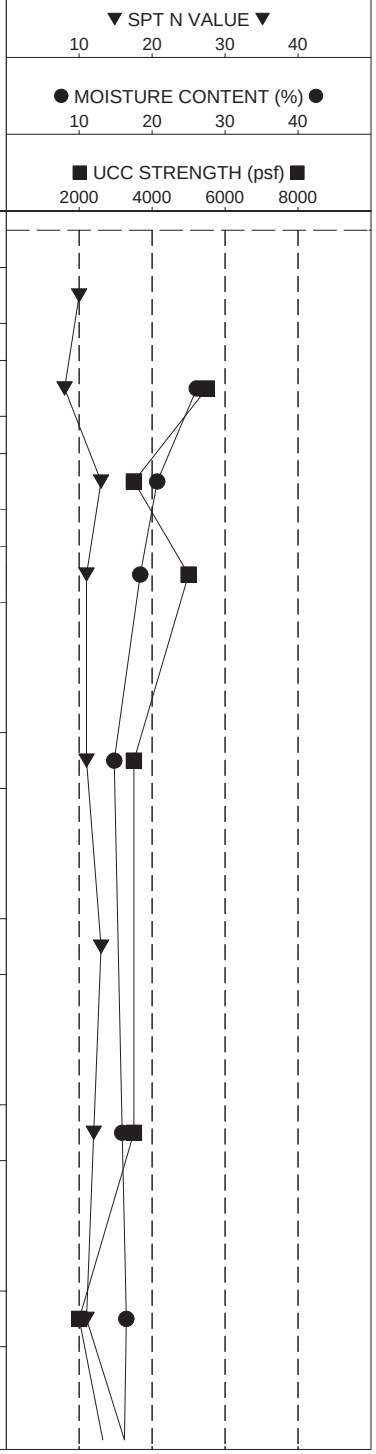
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/14/2016 **DATE COMPLETED:** 11/15/2016 **LOG OF TEST BORING** **RW-37**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.5 ft	0										
635.8	8 inches of PORTLAND CEMENT CONCRETE	0.7										
635.5	Field Engineer reported FILL	1.0										
	FILL - Medium dense to loose poorly graded fine to medium sand with silt, trace gravel, occasional silty fine sand layers, brown, moist to wet (SP-SM)		SS1	3-4-6	10	2.5						
632.5		4.0	SS2	4-2-6	8	5.0	5500*	26.1				
631.5		5.0	SS3	4-6-7	13	7.5	3500*	20.7				
	Very stiff LEAN CLAY, trace sand, trace gravel, brown (CL)		SS4	3-5-6	11	10.0	5000*	18.4				
626.5	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	10.0	SS5	3-4-7	11	15.0	3500*	14.8				
	Stiff LEAN CLAY, few sand, trace gravel, gray (CL)		NR6	5-6-7	13	20.0						
	NOTE: No recovery on SPT sample attempt at 20 ft. due to sample falling out of sampler. Sample SS9 at 35 ft taken from auger cuttings.		SS7	3-5-7	12	25.0	3500*	15.9				
			SS8	2-5-6	11	30.0	2000*	16.5				



DRAFT

GROUNDWATER READINGS

First Encountered: 4 feet
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460445.8
Northing: 365157.8

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 4 inch SSA/WR
Method Notes:
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: Wash rotary starting at 20 ft.

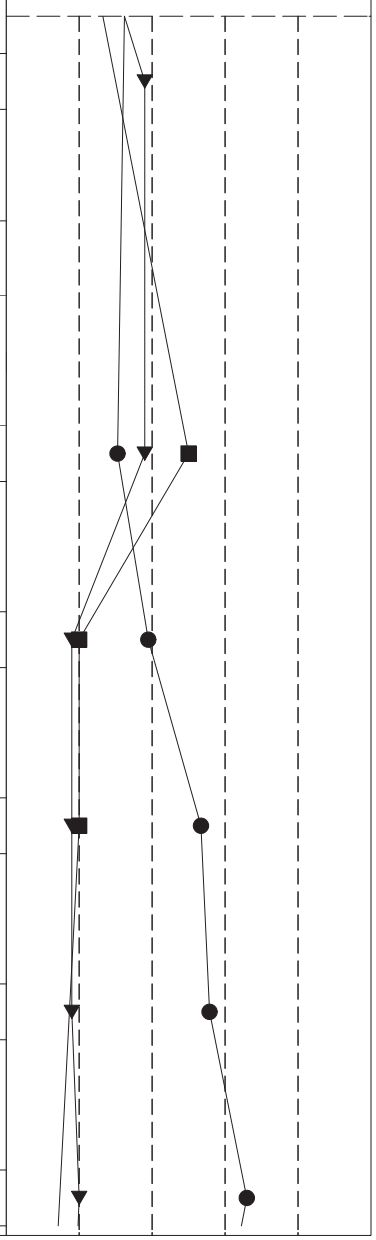
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/14/2016 **DATE COMPLETED:** 11/15/2016 **LOG OF TEST BORING** **RW-37**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.5 ft											
601.5	35.0	35	SS9	7-8-11	19	35.0	<>					
			ST10			40.0	<>					
		40										
			SS11	5-9-10	19	45.0	5000*	15.3				
		45										
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS12	2-3-6	9	50.0	2000*	19.5				
		50										
			SS13	2-4-5	9	55.0	2000*	26.7				
		55										
			SS14	3-4-5	9	60.0	<>	27.9				
		60										
			SS15	3-4-6	10	65.0	<>	33.0				
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: 4 feet
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460445.8
Northing: 365157.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 4 inch SSA/WR
Method Notes:
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: Wash rotary starting at 20 ft.

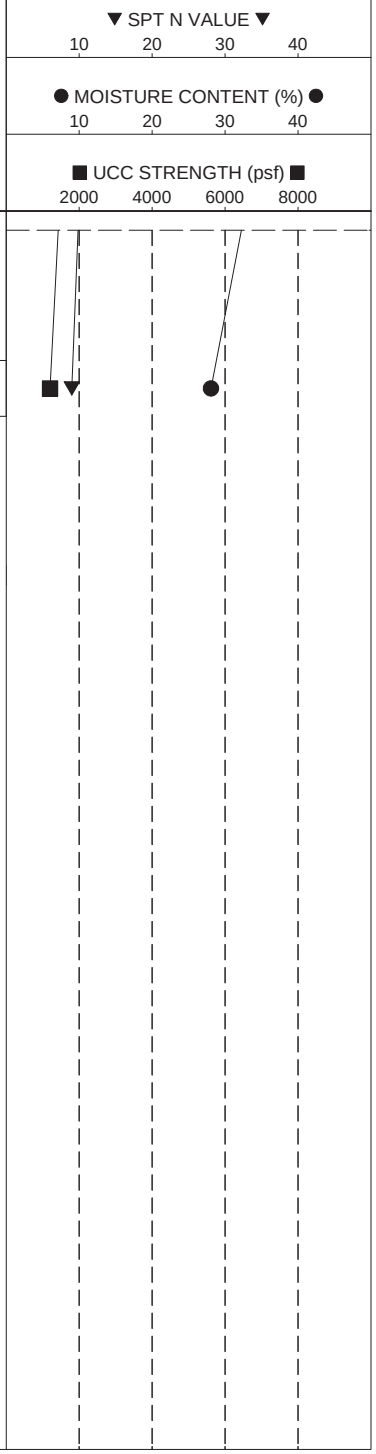
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/14/2016 **DATE COMPLETED:** 11/15/2016 **LOG OF TEST BORING** **RW-37**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.5 ft	65										
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)											
566.5	70.0		SS16	3-4-5	9	70.0	1200#	28.1				
	End of Boring at 70 ft.	70										
		75										
		80										
		85										
		90										
		95										



DRAFT

GROUNDWATER READINGS
First Encountered: 4 feet
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460445.8
Northing: 365157.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 4 inch SSA/WR
Method Notes:
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: Wash rotary starting at 20 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/27/2017 **DATE COMPLETED:** 2/1/2017 **LOG OF TEST BORING** **RW-37A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 / ● MOISTURE CONTENT (%) ● 10 20 30 40 / ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
	Ground Surface Elevation 636.4 ft	0											
635.6	9 inches of PORTLAND CEMENT CONCRETE (0.8)												
	Profile drilled to 62 ft.	5, 10, 15, 20, 25, 30											

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460447.0
Northing: 365145.5

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Hiske/R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

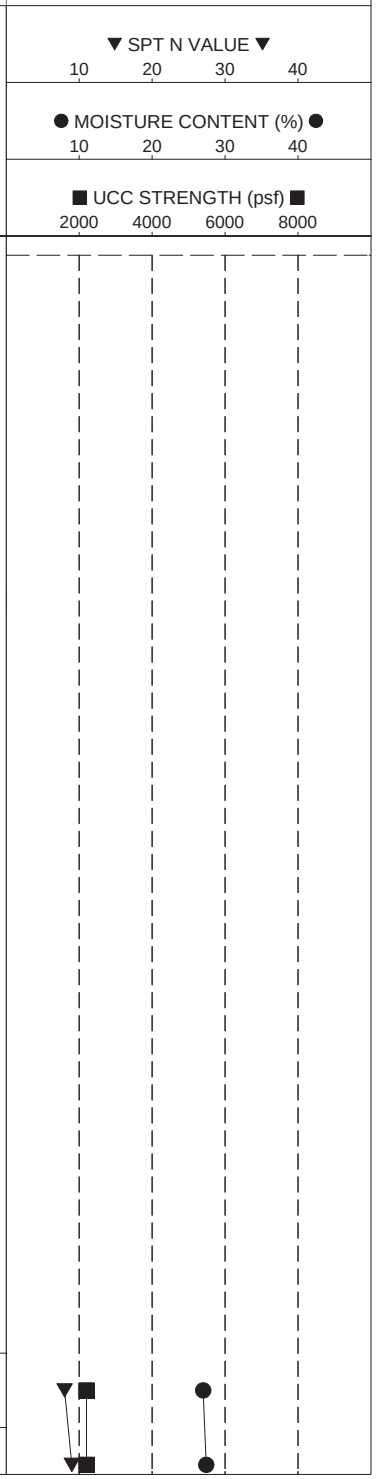
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/27/2017 **DATE COMPLETED:** 2/1/2017 **LOG OF TEST BORING** **RW-37A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.4 ft											
	Profile drilled to 62 ft.	35, 40, 45, 50, 55, 60										
574.4	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL) (62.0)	65	SS1	2-3-5-6	8	64.0	2200#	27.0				



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460447.0
Northing: 365145.5

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Hiske/R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

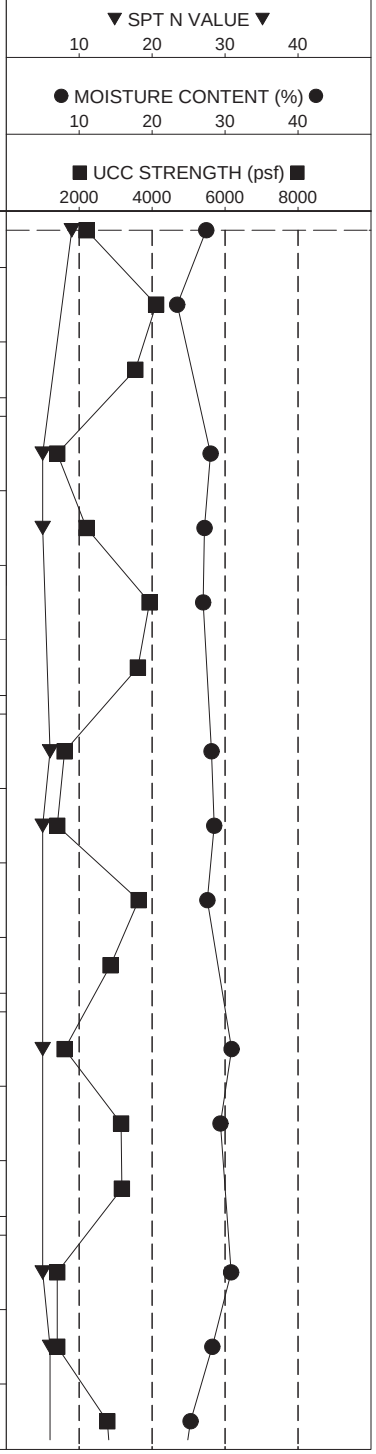
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/27/2017 **DATE COMPLETED:** 2/1/2017 **LOG OF TEST BORING** **RW-37A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.4 ft											
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	65	SS2	3-4-5-5	9	66.0	2200#	27.4				
			ST3			68.0	4110	23.4	103			
			VS1			69.5	3540					
566.4	70.0	70										
	Medium to stiff LEAN CLAY, trace sand, gray (CL)		SS4	2-2-3-4	5	72.0	1400#	28.0				
			SS5	2-2-3-5	5	74.0	2200#	27.2				
		75	ST6			76.0	3930	27.0	98			
			VS2			77.5	3610					
			SS7	2-3-3-4	6	80.0	1600#	28.1				
		80	SS8	2-2-3-5	5	82.0	1400#	28.5				
			ST9			84.0	3630	27.6	98	43	21	97
		85	VS3			85.5	2860					
			SS10	2-2-3-4	5	88.0	1600#	30.9				
			ST11			90.0	3150	29.4	95	47	25	98
		90	VS4			91.5	3170					
			SS12	1-2-3-3	5	94.0	1400#	30.8				
		95	SS13	1-2-4-4	6	96.0	1400#	28.3				
			ST14			98.0	2770	25.3	100			



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460447.0
Northing: 365145.5

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Hiske/R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

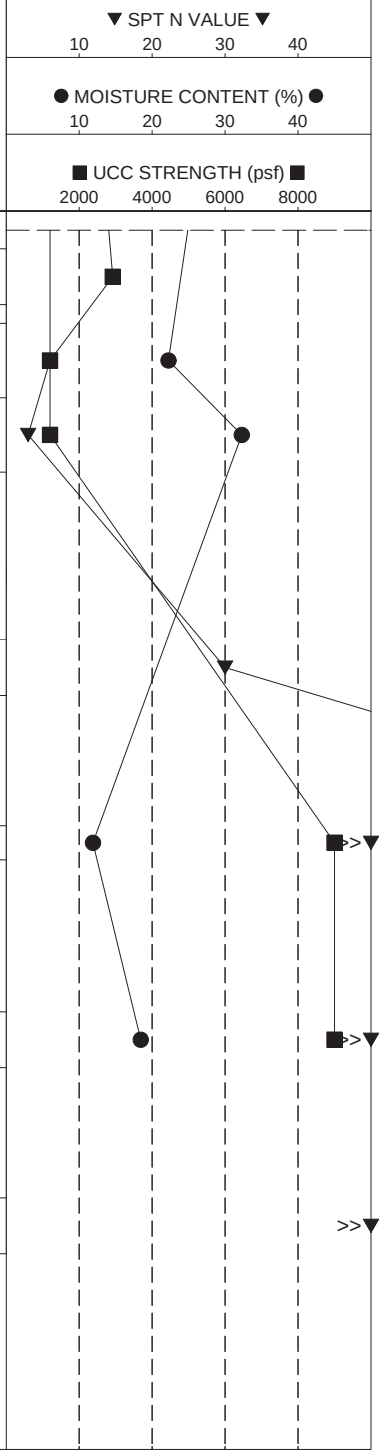
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/27/2017 **DATE COMPLETED:** 2/1/2017 **LOG OF TEST BORING** **RW-37A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.4 ft											
	Medium to stiff LEAN CLAY, trace sand, gray (CL)		VS5			99.5	2920					
		100	SS15	1-2-4-4	6	102.0	1200#	22.2				
			SS16	1-1-2-3	3	104.0	1200#	32.3				
		105										
527.9	108.5											
	Dense SILTY FINE SAND, trace gravel, gray, moist (SM)		SS17	20-17-13	30	110.0						47
		110										
522.9	113.5											
	Hard LEAN CLAY, few sand, trace gravel, gray (CL)		SS18	17-50/5"	50 +	114.4	9000+*	11.9				
		115										
			SS19	16-35-56	91	120.0	9000+*	18.4				
516.4	120.0	120										
	Very dense SILT, trace sand, gray, moist (ML)											
			SS20	15-24-36	60	125.0						
511.4	125.0	125										
	End of Boring at 125 ft.											
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460447.0
Northing: 365145.5

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Hiske/R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

DRAFT

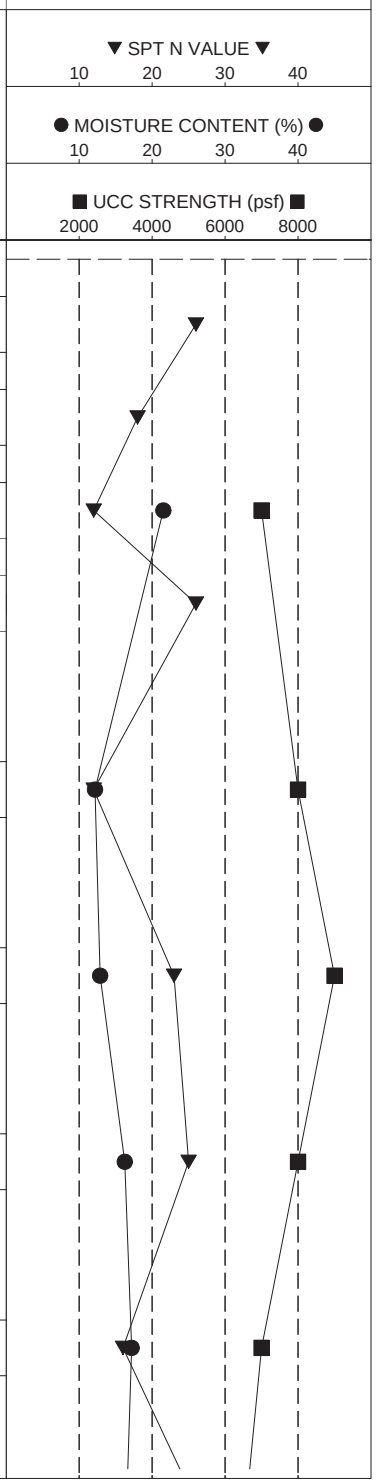
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/19/2015 **DATE COMPLETED:**10/20/2015 **LOG OF TEST BORING TB-05**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 637.0 ft	
636.3	8 inches of SANDY TOPSOIL, brown	0.7
633.5	FILL - Medium dense silty fine sand, trace topsoil, trace clay, trace gravel, occasional clay pockets and sandy silt pockets, brown, moist (SM)	3.5
632.0	Medium dense poorly graded FINE SAND, with silt, trace gravel, brown, moist (SP-SM)	5.0
629.0	Very stiff LEAN CLAY, trace sand, trace gravel, occasional sandy silt seams, brown (CL)	8.0
	Very stiff to hard LEAN CLAY, few sand, trace gravel, gray (CL) NOTE: Poor sample recovery in SPT sample SS4 at 10 ft.	
617.0	Very stiff LEAN CLAY with sand, trace gravel, gray (CL)	20.0

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	7-13-13	26	2.5						
SS2	9-10-8	18	5.0						
SS3	5-5-7	12	7.5	7000*	21.5				
SS4	8-11-15	26	10.0	<>					
SS5	7-6-6	12	15.0	8000*	12.2				
SS6	6-10-13	23	20.0	9000+*	12.9				
SS7	7-11-14	25	25.0	8000*	16.3				
SS8	5-6-10	16	30.0	7000*	17.2				



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460449.7
Northing: 364612.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

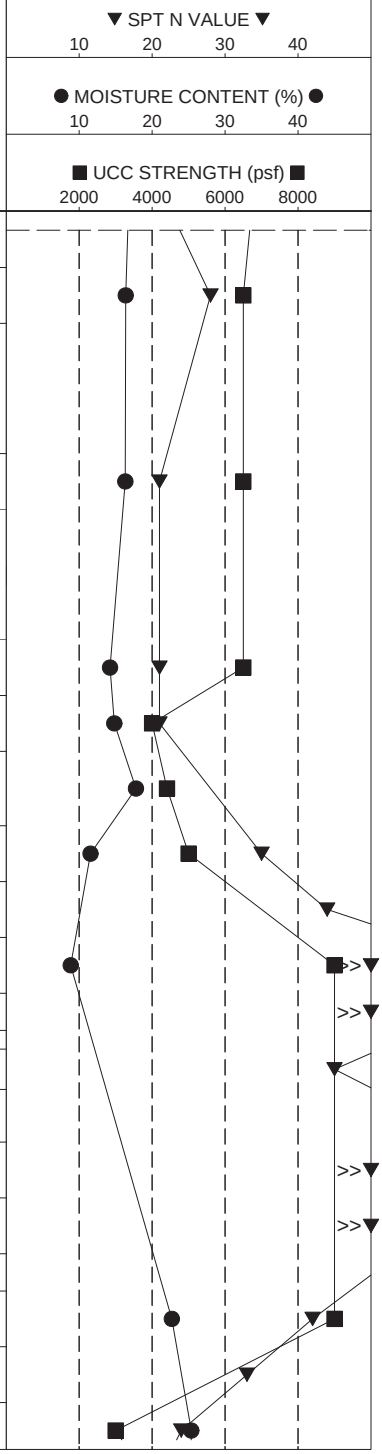
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/19/2015 **DATE COMPLETED:**10/20/2015 **LOG OF TEST BORING** **TB-05**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 637.0 ft											
	Very stiff LEAN CLAY with sand, trace gravel, gray (CL)		SS9	6-13-15	28	35.0	6500*	16.4				
		35										
			SS10	6-8-13	21	40.0	6500*	16.3	119	35	18	85
		40										
			SS11	6-9-12	21	45.0	6500*	14.2				
592.0		45.0										
590.5	Very stiff FAT CLAY, few sand, trace gravel, gray (CH)	45	SS12	5-8-13	21	46.5	4000*	14.8	114	51	28	91
		46.5										
	Very stiff LEAN CLAY, few sand, trace gravel, gray (CL)		ST13			48.5	4410	17.8	121			
	NOTE: No recovery on SPT sample attempt at 44 ft. due to sample falling out of sampler.		SS14	7-12-23	35	50.0	5000*	11.6				
		50	NR15	7-23-21	44	51.5						
585.5		51.5										
	Hard SANDY LEAN CLAY, trace gravel, gray (CL)		SS16	10-31-36	67	53.0	9000+*	8.8				
	NOTE: No recovery on SPT sample attempt at 54 ft. due to possible cobble.		NR17	21-63	63+	54.0						
582.0		55.0										
		55	SS18	47-45	45+	55.6	<>					
	Very dense SILTY SAND, few gravel, gray, moist (SM)		SS19	33-37-35	72	58.5						48
	NOTE: No recovery on SPT sample attempt at 60 ft. due to possible cobble.		NR20	33-29-30	59	60.0						
		60										
576.0		61.0										
			SS21	12-19-23	42	62.5	9000+*	22.7	103	44	23	94
			NR22	11-15-18	33	64.0						
		65	SS23	7-11-13	24	65.5	3000*	25.4				



GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460449.7
Northing: 364612.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

DRAFT

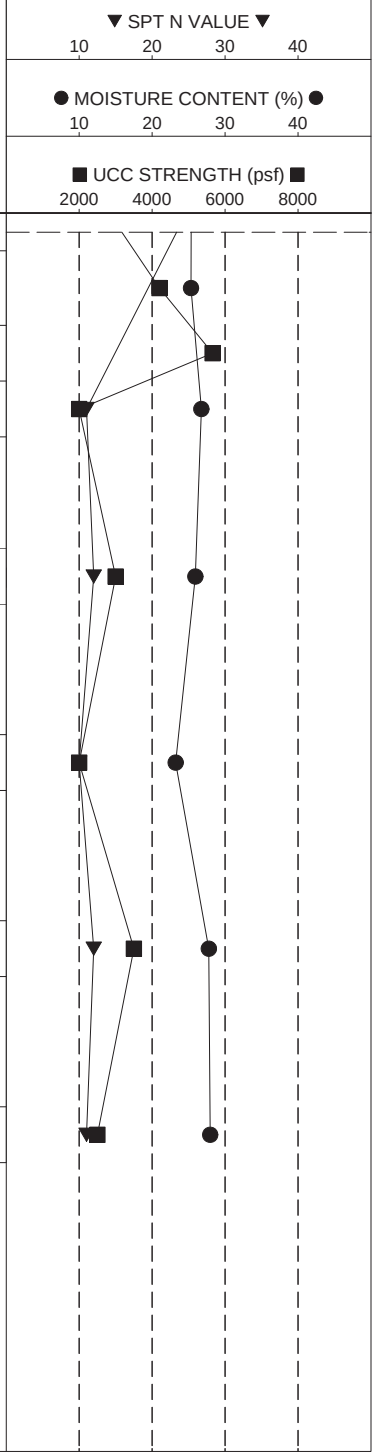
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

LOG OF TEST BORING I-75 DESIGN BUILD MODERNIZATION 2018.GPJ SOMAT.GDT 7/28/17

PROJECT NO. 2014195C **DATE STARTED:**10/19/2015 **DATE COMPLETED:**10/20/2015 **LOG OF TEST BORING TB-05**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 637.0 ft	65										
			ST24			67.5	4200	25.3	102	39	17	96
			VS1			69.0	5660					
		70	SS25	4-5-6	11	70.5	2000#	26.7				
			SS26	4-5-7	12	75.0	3000*	25.9	104	38	18	94
		75										
	Hard to stiff LEAN CLAY, few sand, trace gravel, gray (CL) NOTE: No recovery on SPT sample attempt at 64 ft. due to possible cobble. Poor sample recovery in SPT sample SS27 at 80 ft.		SS27	3-4-6	10	80.0	2000*	23.2				
		80										
			SS28	3-5-7	12	85.0	3500*	27.8				
		85										
547.0	90.0		SS29	4-5-6	11	90.0	2500*	28.0				
	End of Boring at 90 ft.	90										
		95										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460449.7
Northing: 364612.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/21/2016 **DATE COMPLETED:**10/26/2016 **LOG OF TEST BORING** **TB-05A**

LOG OF SOIL PROFILE				FIELD DATA				LABORATORY DATA						
ELEVATION ft			DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 ● MOISTURE CONTENT (%) ● 10 20 30 40 ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
		Ground Surface Elevation 636.9 ft	0											
			5											
			10											
			15											
		Profile drilled to 63 ft.	20											
			25											
			30											

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460452.3
Northing: 364639.0

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 118 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/21/2016 **DATE COMPLETED:**10/26/2016 **LOG OF TEST BORING** **TB-05A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.9 ft											
		35										
		40										
		45										
	Profile drilled to 63 ft.											
		50										
		55										
		60										
573.9	63.0											
			ST1			65.0		28.3				
		65										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460452.3
Northing: 364639.0

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 118 ft.

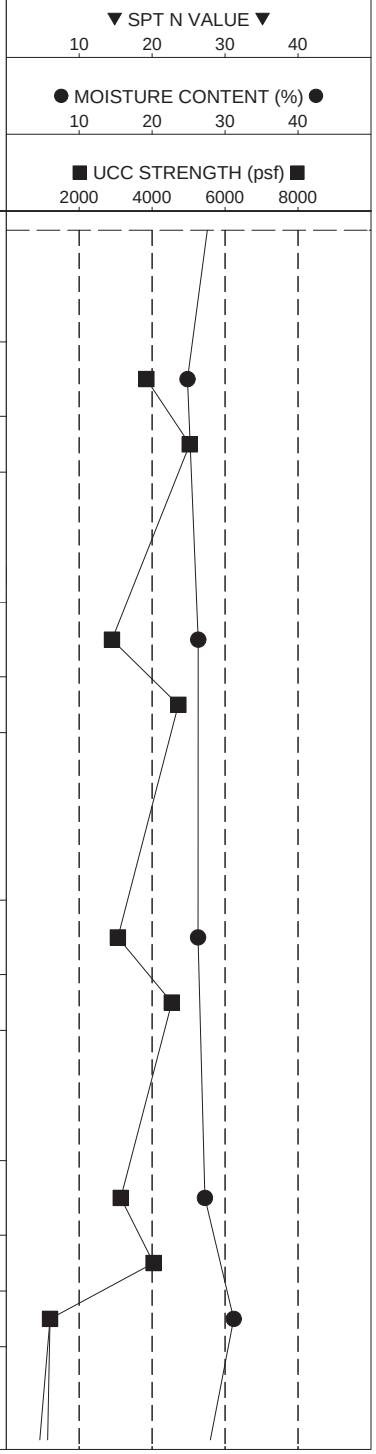
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/21/2016 **DATE COMPLETED:**10/26/2016 **LOG OF TEST BORING** **TB-05A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.9 ft	65										
			ST2			70.0	3840	24.9	103			
		70	VS1			71.5	5030					
		75	ST3			77.0	2900	26.3	100	37	17	95
			VS2			78.5	4720					
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: Poor sample recovery in Shelby tube ST1 at 65 ft.	80										
			ST4			85.0	3060	26.3	101			
		85	VS3			86.5	4540					
		90	ST5			92.0	3140	27.2	99	39	17	98
			VS4			93.5	4040					
543.4		93.5										
	Soft to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	95	SS6	0-2-4	6	95.0	1200#	31.2				



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460452.3
Northing: 364639.0

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 118 ft.

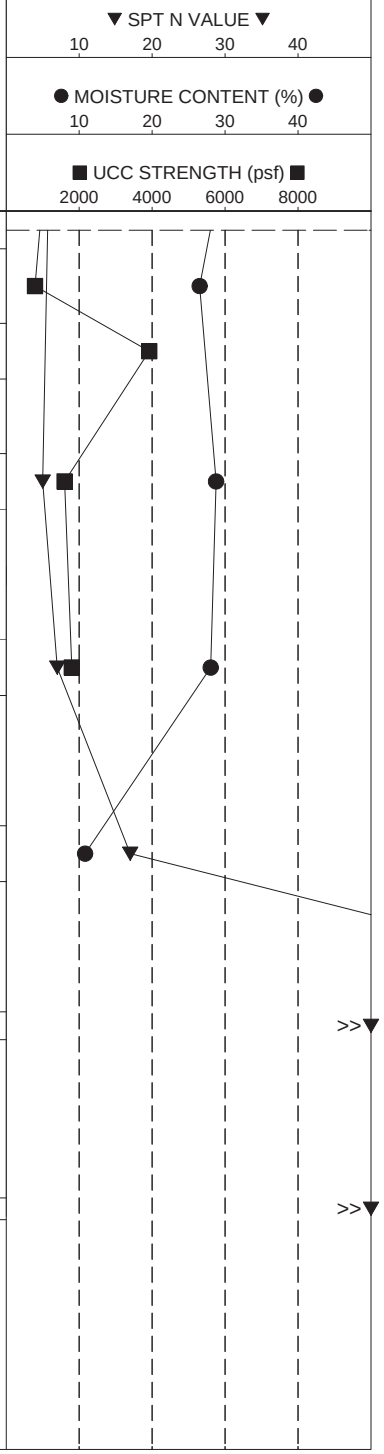
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/21/2016 **DATE COMPLETED:** 10/26/2016 **LOG OF TEST BORING** **TB-05A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.9 ft											
	Soft to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		ST7			100.0	790	26.5	96			
		100	VS5			101.5	3920					
535.4	101.5											
	Medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS8	0-1-4	5	105.0	1600#	28.8				
		105										
527.4	109.5		SS9	0-3-4	7	110.0	1800#	28.0				
	Medium dense SANDY SILT, trace gravel, gray, wet (ML)	110										
			SS10	6-5-12	17	115.0		10.8				57
		115										
518.4	118.5											
517.9	119.0		SS11	53-50/3"	50 +	119.3						
	Extremely dense poorly graded FINE SAND, trace silt, trace gravel, gray, wet (SP)	120										
	Extremely dense poorly graded MEDIUM TO COARSE SAND, trace silt, trace gravel, gray, wet (SP)											
512.9	124.0		SS12	94	94+	124.1						
	End of Boring at 124 ft. (Terminated upon SPT sample refusal)	125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460452.3
Northing: 364639.0

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 118 ft.

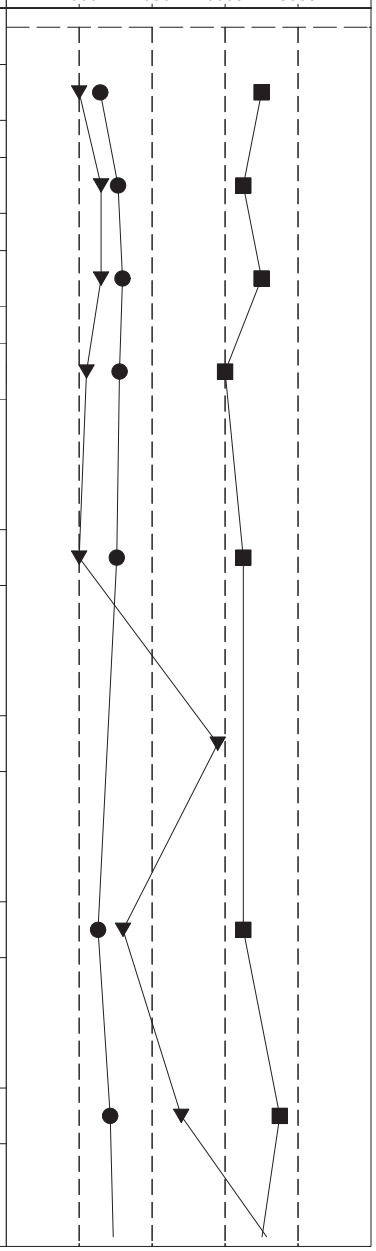
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/31/2016 **DATE COMPLETED:**10/31/2016 **LOG OF TEST BORING RW-31**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 626.2 ft											
625.8	4.5 inches of TOPSOIL (0.4)	0										
624.7	Field Engineer reported sand FILL (1.5)		SS1	10-6-4	10	2.5	7000*	12.9				
			SS2	4-5-8	13	5.0	6500*	15.3				
		5	SS3	3-6-7	13	7.5	7000*	15.9				
			SS4	2-5-6	11	10.0	6000*	15.5				
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	10										
	NOTE: No recovery in SPT sample attempt at 20 ft.		SS5	2-4-6	10	15.0	6500*	15.1				
		15										
			NR6	9-15-14	29	20.0						
		20										
602.7	(23.5)											
			SS7	2-6-10	16	25.0	6500*	12.6				
	Very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	25										
596.7	(29.5)		SS8	25-15-9	24	30.0	7500*	14.2				
	Dense SILTY FINE SAND, trace gravel, occasional lean clay layers, gray, moist (SM)	30										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: none

BORING LOCATION INFORMATION
Easting: 13460503.0
Northing: 364059.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 55
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA
Method Notes:
Hammer Type: Automatic
Backfilled With: Cuttings
Checked By: ALOG
QA/QC By: JA
Remarks:

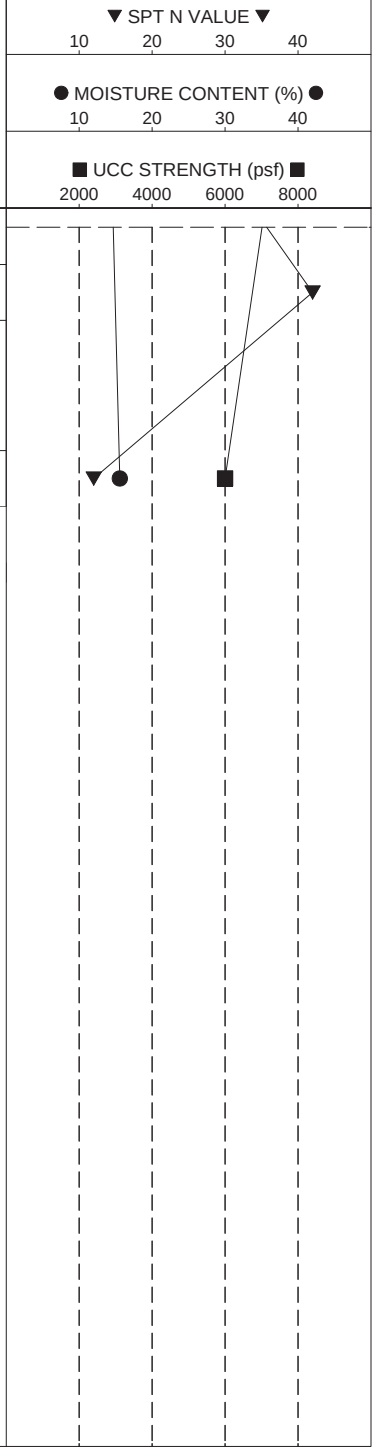
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/31/2016 **DATE COMPLETED:**10/31/2016 **LOG OF TEST BORING RW-31**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 626.2 ft											
	Dense SILTY FINE SAND, trace gravel, occasional lean clay layers, gray, moist (SM)	35	SS9	14-22-20	42	35.0						
587.7	38.5											
586.2	Very stiff LEAN CLAY, few sand, trace gravel, gray (CL) 40.0	40	SS10	2-5-7	12	40.0	6000*	15.6				
	End of Boring at 40 ft.	45										
		50										
		55										
		60										
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: none

BORING LOCATION INFORMATION
Easting: 13460503.0
Northing: 364059.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 55
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA
Method Notes:
Hammer Type: Automatic
Backfilled With: Cuttings
Checked By: ALOG
QA/QC By: JA
Remarks:

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 2/22/2017 **DATE COMPLETED:** 3/3/2017 **LOG OF TEST BORING** **RW-31A**

LOG OF SOIL PROFILE				FIELD DATA				LABORATORY DATA						
ELEVATION ft			DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 ● MOISTURE CONTENT (%) ● 10 20 30 40 ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
625.4		Ground Surface Elevation 625.8 ft 5 inches of ASPHALTIC CEMENT CONCRETE 0.4	0											
		Profile drilled to 40 ft.	5											
			10											
			15											
			20											
			25											
			30											

DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460501.9
Northing: 364049.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Wajed
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling at 96 ft.

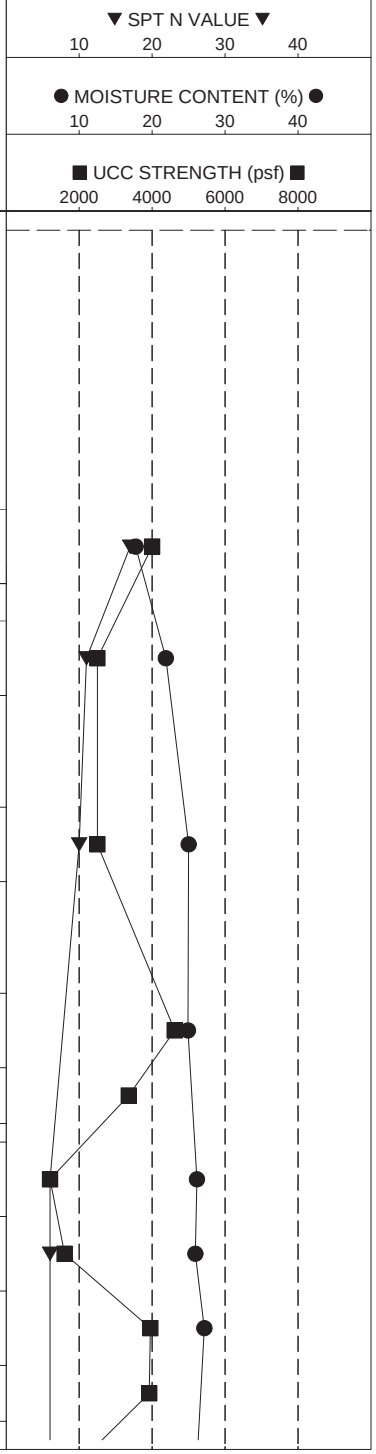
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 2/22/2017 **DATE COMPLETED:** 3/3/2017 **LOG OF TEST BORING RW-31A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 625.8 ft											
	Profile drilled to 40 ft.	35										
585.8		40.0										
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	40	SS1	8-9-8-11	17	42.0	4000*	17.7				
		45	SS2	3-5-6-8	11	45.0	2500*	21.9				
		50	SS3	2-4-6-8	10	50.0	2500*	25.0				
		55	ST4			55.0	4620	24.9	101			
			VS1			56.5	3360					
568.8		57.0										
	Medium to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	60	SS5	2-2-4-5	6	59.0	1200#	26.1				
			SS6	1-3-3-5	6	61.0	1600#	25.9				
			ST7			63.0	3950	27.2	99	40	19	96
			VS2			64.5	3920					
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460501.9
Northing: 364049.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Wajed
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling at 96 ft.

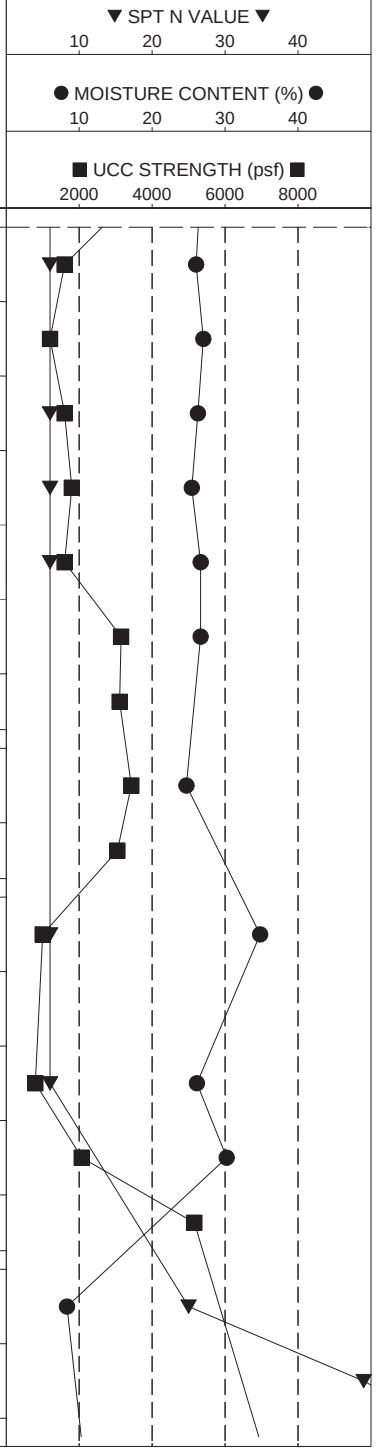
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 2/22/2017 **DATE COMPLETED:** 3/3/2017 **LOG OF TEST BORING** **RW-31A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 625.8 ft											
	Medium to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	65	SS8	1-3-3-5	6	67.0	1600#	26.0				
			SS9	1-2-4-3	6	69.0	1200#	27.0				
		70	SS10	4-3-3-4	6	71.0	1600#	26.3				
			SS11	1-2-4-5	6	73.0	1800#	25.4				
			SS12	1-2-4-5	6	75.0	1600#	26.7				
		75	ST13			77.0	3150	26.6	100			
			VS3			78.5	3110					
		80	ST14			81.0	3430	24.7	101	39	19	95
			VS4			82.5	3050					
			SS15	2-2-4-4	6	85.0	1000#	34.8				
540.8	85.0	85										
	Soft to very stiff LEAN CLAY, trace sand, gray (CL)		SS16	1-2-4-4	6	89.0	800#	26.1				
		90	ST17			91.0	2070	30.2	96	48	24	98
			VS5			92.5	5160					
533.3	92.5											
	Medium dense to very dense SILTY CLAYEY SAND, few gravel, gray, moist (SC-SM)		SS18	8-9-16-15	25	95.0		8.3		14	NP	48
		95	SS19	18-25-24-32	49	97.0						



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460501.9
Northing: 364049.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Wajed
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling at 96 ft.

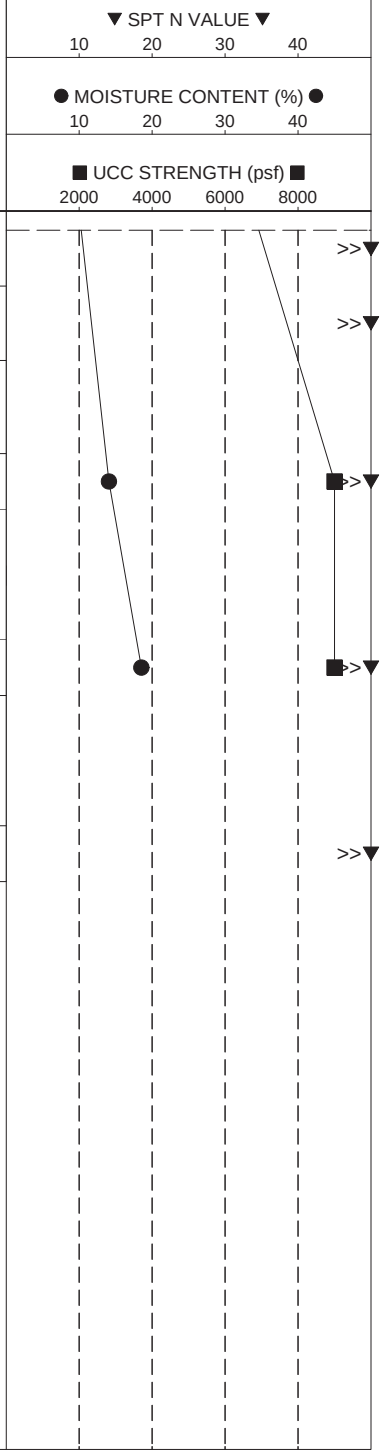
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 2/22/2017 **DATE COMPLETED:** 3/3/2017 **LOG OF TEST BORING** **RW-31A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 625.8 ft											
524.8	Medium dense to very dense SILTY CLAYEY SAND, few gravel, gray, moist (SC-SM) 101.0	100	SS20	12-24-44-50	68	99.0						
			SS21	7-17-57-33	74	101.0						
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)	105	SS22	18-29-54	83	105.0	9000+*	14.1				
515.8	110.0		SS23	20-32-44	76	110.0	9000+*	18.5				
510.8	Extremely dense poorly graded FINE SAND, trace silt, trace gravel, gray, moist (SP) 115.0	110	SS24	29-40-43	83	115.0						
	End of Boring at 115 ft.	115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460501.9
Northing: 364049.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Wajed
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling at 96 ft.

DRAFT

Somat Engineering, Inc.

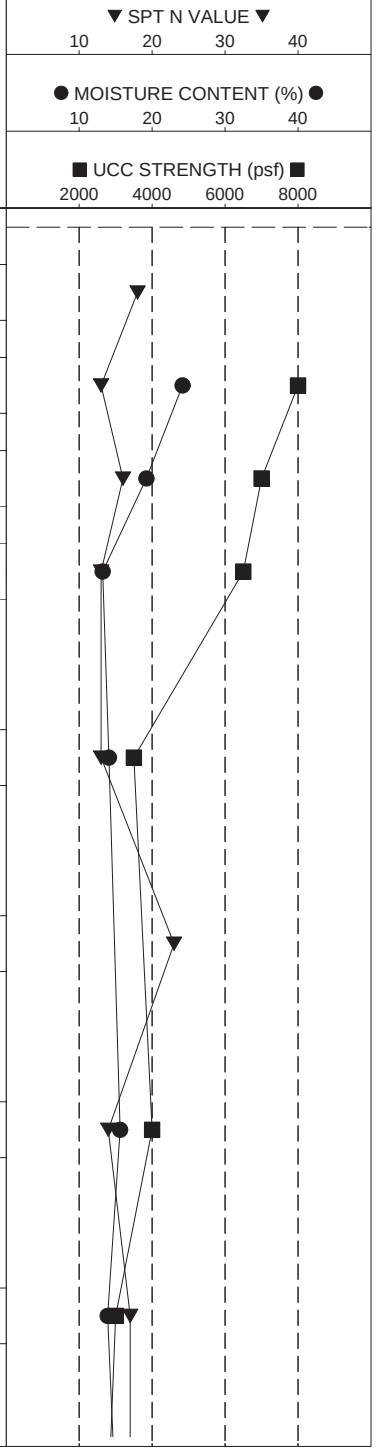
I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

LOG OF TEST BORING I-75 DESIGN BUILD MODERNIZATION 2018.GPJ SOMAT.GDT 7/28/17

PROJECT NO. 2014195C **DATE STARTED:** 9/27/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING** **SB-12**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 636.5 ft	
635.8	8 inches of PORTLAND CEMENT CONCRETE	0.7
632.0	FILL - Medium dense poorly graded fine sand, trace silt, trace gravel, occasional lean clay pockets, brown, moist (SP)	4.5
627.5	Hard to very stiff LEAN CLAY, trace sand, trace gravel, brown (CL)	9.0
617.5	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: Driller reported possible cobble at 17 ft.	19.0
613.0	Medium dense SILTY FINE TO MEDIUM SAND, few gravel, occasional sandy clay seams, gray, moist (SM)	23.5
	Very stiff to stiff SANDY LEAN CLAY, trace gravel, gray (CL) NOTE: Field Engineer reported layers of fine to coarse gravel, with sand and clay 23.5-24 ft. and 34-34.5 ft.	

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	6-8-10	18	2.5						
SS2	5-6-7	13	5.0	8000*	24.2				
SS3	4-7-9	16	7.5	7000*	19.2				
SS4	3-5-8	13	10.0	6500*	13.2				
SS5	2-6-7	13	15.0	3500*	14.1				
SS6	13-14-9	23	20.0						44
SS7	3-6-8	14	25.0	4000*	15.6				
SS8	3-7-10	17	30.0	3000*	13.9				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460749.7
Northing: 363432.7

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 750X
Engineer on Rig: C. Schroeder
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 103 ft.

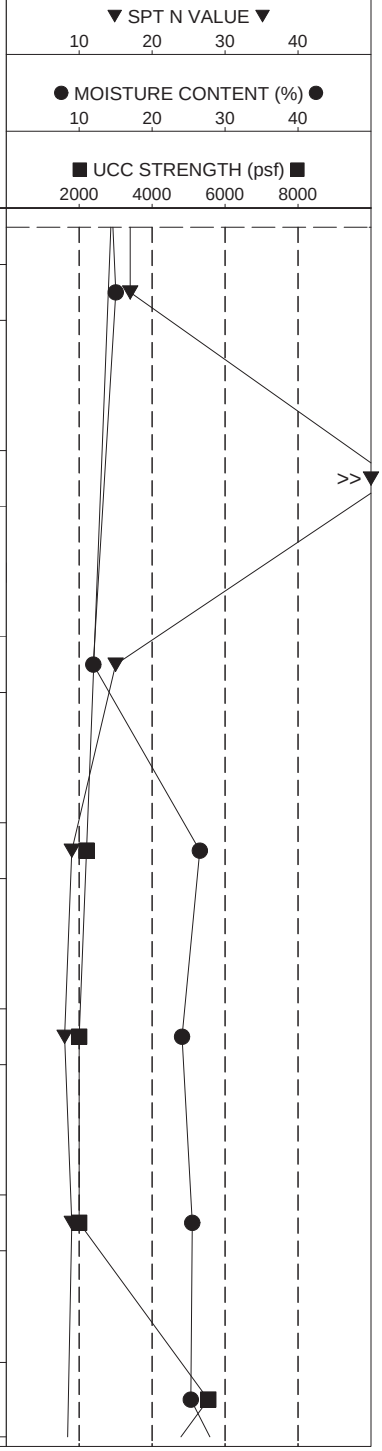
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/27/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING** **SB-12**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.5 ft											
	Very stiff to stiff SANDY LEAN CLAY, trace gravel, gray (CL)	35	SS9	5-7-10	17	35.0	<>	15.0		29	14	67
597.5	NOTE: Field Engineer reported layers of fine to coarse gravel, with sand and clay 23.5-24 ft. and 34-34.5 ft.	39.0	SS10	17-35-18	53	40.0						
	Very dense SILTY FINE SAND, trace gravel, gray, moist (SM)	40										
592.0		44.5	SS11	4-7-8	15	45.0	<>	11.9				
	LEAN CLAY, trace sand, trace gravel, gray (CL)	45										
587.5		49.0	SS12	3-3-6	9	50.0	3650	26.5	96			
	Very stiff to medium LEAN CLAY, trace to few sand, trace gravel, gray (CL)	50										
	NOTE: No recovery on Shelby tube attempt at 80 ft. due to sample falling out of sampler.	55	SS13	1-3-5	8	55.0	2000#	24.1				
		60	SS14	1-3-6	9	60.0	2000#	25.5				
		65	ST15			65.0	5540	25.3	101	40	19	94



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460749.7
Northing: 363432.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 750X
Engineer on Rig: C. Schroeder
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 103 ft.

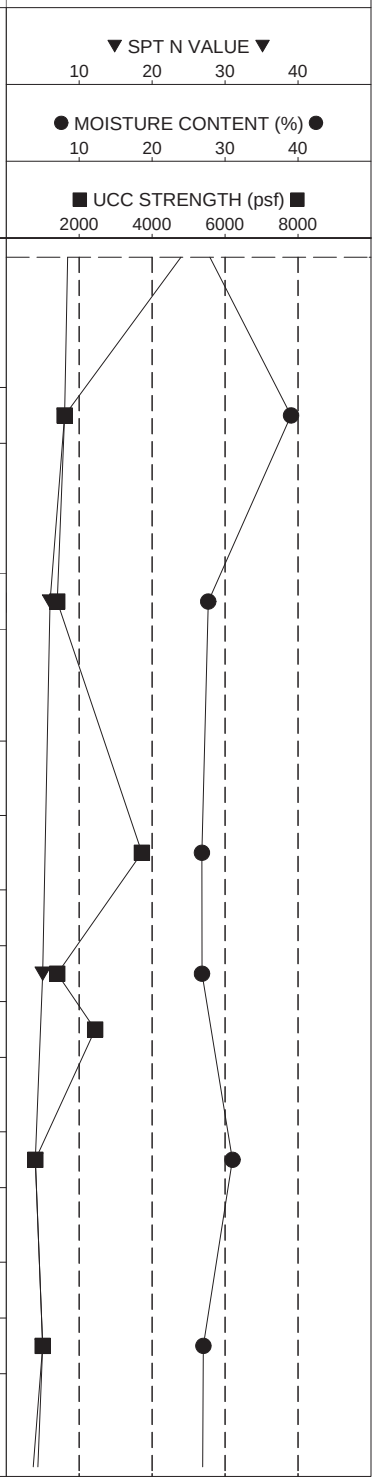
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/27/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING** **SB-12**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.5 ft	65										
			SS16	2-3-5	8	70.0	1600#	39.0				
		70										
	Very stiff to medium LEAN CLAY, trace to few sand, trace gravel, gray (CL) NOTE: No recovery on Shelby tube attempt at 80 ft. due to sample falling out of sampler.		SS17	1-2-4	6	75.0	2550	27.7	102			
		75										
			NR18			80.0						
		80										
			ST19			82.0	3720	26.8	101	39	19	90
			SS20	0-2-3	5	85.0	1400#	26.8				
		85										
550.0		86.5	VS1			86.5	2440					
	Soft to medium LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: No recovery on Shelby tube attempt at 92 ft. due to sample falling out of sampler.		SS21	0-2-2	4	90.0	800#	31.0				
		90										
			NR22			92.0						
			SS23	0-2-3	5	95.0	1000#	27.0				
		95										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460749.7
Northing: 363432.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 750X
Engineer on Rig: C. Schroeder
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 103 ft.

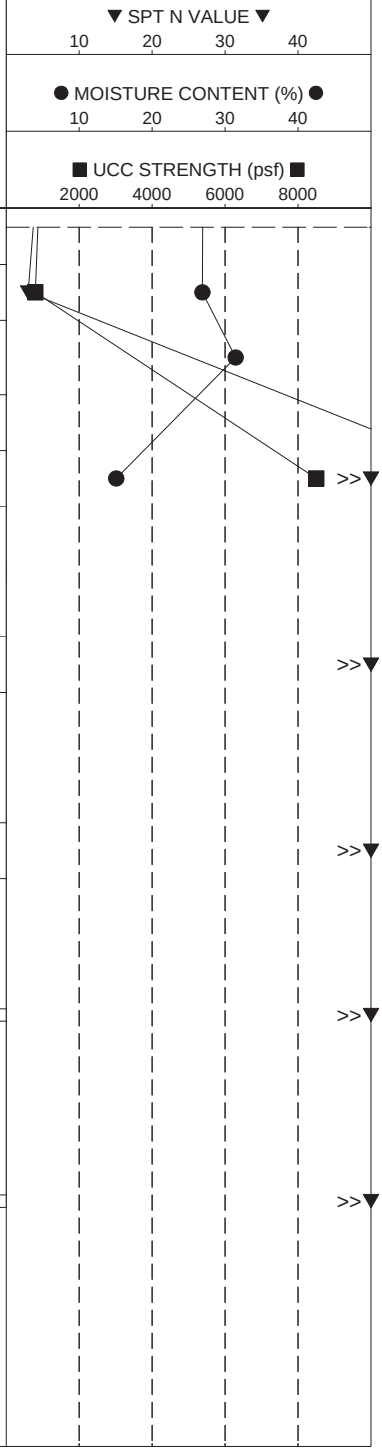
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/27/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING** **SB-12**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 636.5 ft											
536.5		100.0	SS24	0-0-3	3	100.0	800#	26.9				
	Hard LEAN CLAY, few sand, few gravel, gray (CL)	100	ST25			102.0	<>	31.4		43	23	86
531.5		105.0	SS26	12-26-41	67	105.0	8500*	15.1				
	Extremely dense SILT with sand, occasional lean clay seams, gray, moist (ML)	105										
526.5		110.0	SS27	12-22-87	109	110.0						
	Extremely dense poorly graded FINE SAND with silt, trace gravel, trace shale pieces, gray, moist (SP-SM)	110	SS28	37-47-54	101	115.0						
		115										
517.9		118.6	SS29	103/4"	103 +	118.8						
	Extremely dense poorly graded FINE GRAVEL, trace silt, trace coarse sand, weathered dark gray shale at 123.8 ft., gray, moist (GP)	120										
512.7		123.8	SS30	100/4"	100 +	123.8						
	End of Boring at 123.8 ft. (Boring continued as Rock Core)	125										
		130										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460749.7
Northing: 363432.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 750X
Engineer on Rig: C. Schroeder
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 103 ft.

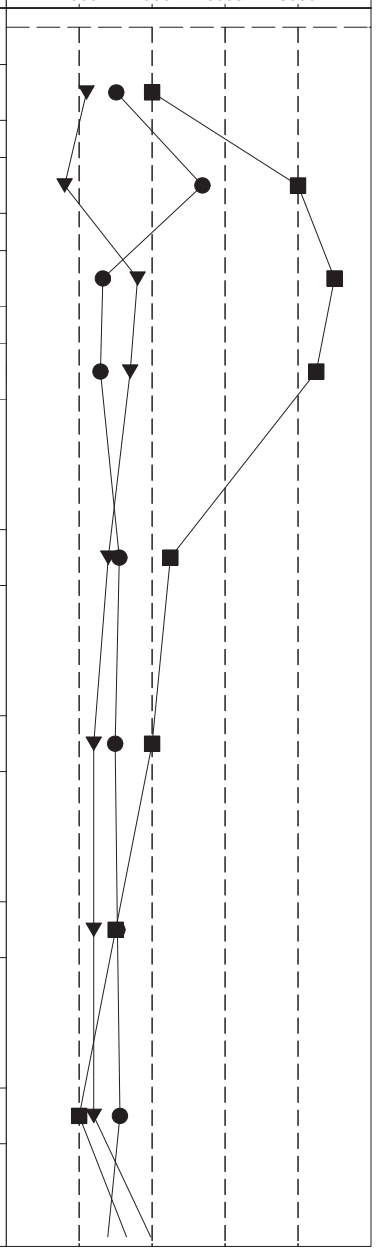
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/15/2016 **DATE COMPLETED:** 11/15/2016 **LOG OF TEST BORING** **RW-25**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.7 ft	0										
634.0	9 inches of PORTLAND CEMENT CONCRETE	0.8										
633.7		1.0										
632.7	Field Engineer reported 3 inches of FILL	2.0	SS1	7-7-4	11	2.5	4000*	15.1				
632.2		2.5										
	FILL - Medium dense poorly graded fine to medium sand, trace silt, trace gravel, brown, moist (SP)		SS2	2-3-5	8	5.0	8000*	26.9				
		5										
	FILL - Very stiff sandy lean clay, trace gravel, dark brown (CL) NOTE: Foreign odor was detected in SPT sample at 2.5 ft.		SS3	4-8-10	18	7.5	9000+*	13.3				
624.7		10.0	SS4	5-8-9	17	10.0	8500*	12.9				
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: Foreign odor was detected in SPT sample at 5 ft.	10										
			SS5	6-6-8	14	15.0	4500*	15.5				
		15										
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS6	4-6-6	12	20.0	4000*	14.9				
		20										
			SS7	3-5-7	12	25.0	3000*	15.2				
		25										
604.7		30.0	SS8	3-5-7	12	30.0	2000*	15.6				
	Medium dense CLAYEY FINE SAND/SANDY LEAN CLAY, trace gravel, gray (SC)/(CL)	30										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13460836.4
Northing: 363093.5

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes:
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks:

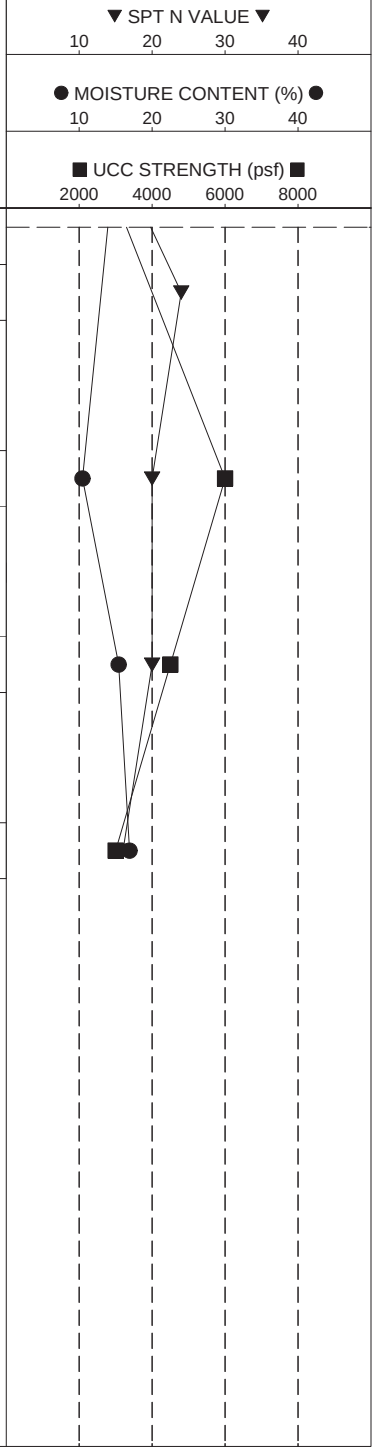
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/15/2016 **DATE COMPLETED:** 11/15/2016 **LOG OF TEST BORING RW-25**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.7 ft											
599.7		35.0	SS9	7-11-13	24	35.0						
	Very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	35										
		40	SS10	9-10-10	20	40.0	6000*	10.5				
589.7		45.0	SS11	7-8-12	20	45.0	4500*	15.4				
	Stiff LEAN CLAY, trace sand, trace gravel, frequent fine sand partings and pockets, gray (CL)	45										
584.7		50.0	SS12	7-8-8	16	50.0	3000*	16.9				
	End of Boring at 50 ft.	50										
		55										
		60										
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460836.4
Northing: 363093.5

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes:
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks:

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/26/2017 **DATE COMPLETED:** 2/1/2017 **LOG OF TEST BORING** **RW-25A**

LOG OF SOIL PROFILE			FIELD DATA				LABORATORY DATA						
ELEVATION ft		DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 ● MOISTURE CONTENT (%) ● 10 20 30 40 ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
	Ground Surface Elevation 634.7 ft	0											
		5											
		10											
		15											
	Profile drilled to 50 ft.	20											
		25											
		30											

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460839.0
Northing: 363082.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: R. Calkins/S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 115 ft.

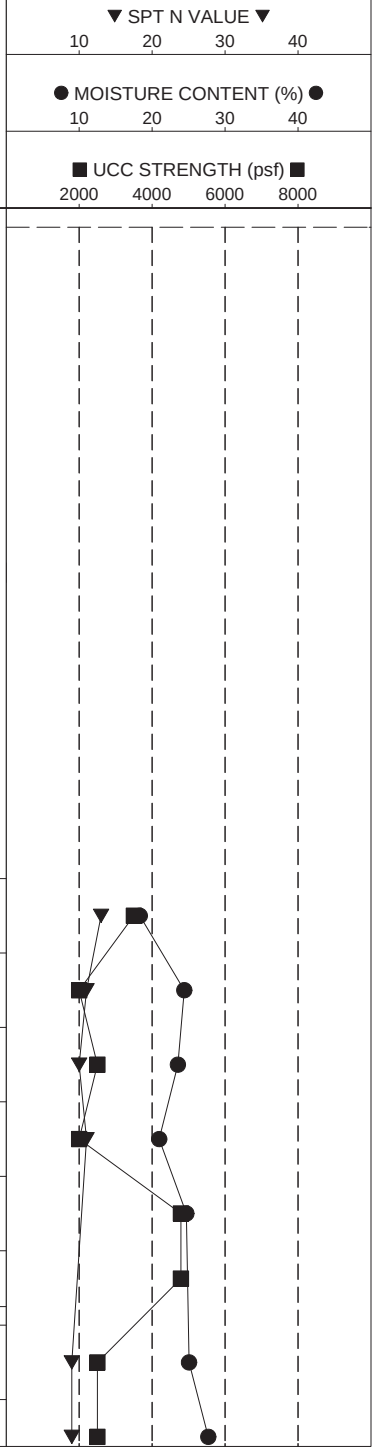
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/26/2017 **DATE COMPLETED:** 2/1/2017 **LOG OF TEST BORING** **RW-25A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.7 ft											
	Profile drilled to 50 ft.	35, 40, 45										
584.7		50.0										
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	50	SS1	5-5-8-8	13	52.0	3500*	18.3				
			SS2	3-5-6-6	11	54.0	2000*	24.4				
		55	SS3	3-5-5-5	10	56.0	2500*	23.5				
			SS4	4-5-6-7	11	58.0	2000*	21.0				
			ST5			60.0	4790	24.7	103			
		60	VS1			61.5	4790					
572.7		62.0										
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS6	3-4-5-7	9	64.0	2500*	25.1				
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460839.0
Northing: 363082.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: R. Calkins/S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 115 ft.

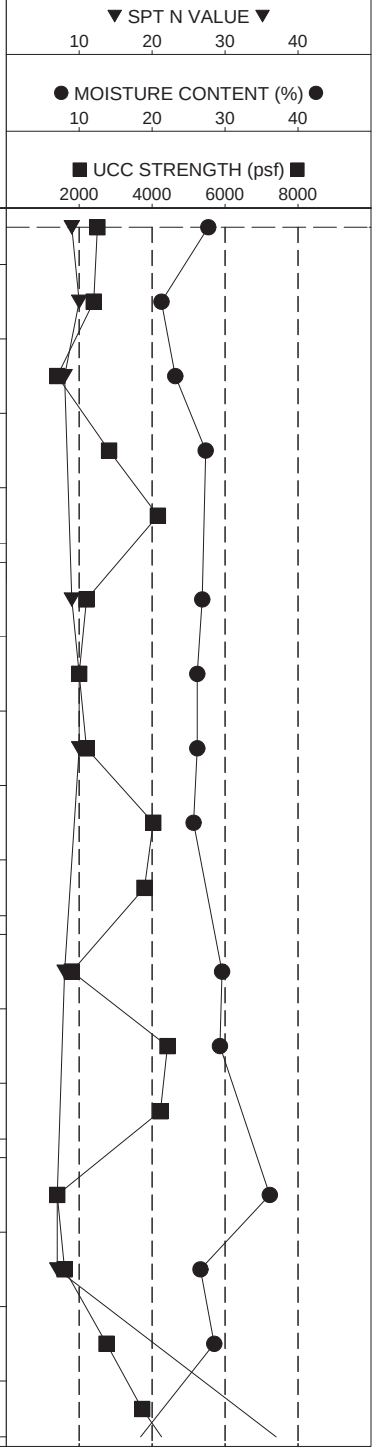
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/26/2017 **DATE COMPLETED:** 2/1/2017 **LOG OF TEST BORING** **RW-25A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.7 ft	65	SS7	3-4-5-6	9	66.0	2500*	27.7				
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS8	3-5-5-6	10	68.0	2400#	21.3				
			SS9	2-3-5-6	8	70.0	1400#	23.2				
564.7	70.0	70	ST10			72.0	2820	27.3	98			
			VS2			73.5	4160					
		75	SS11	2-4-5-6	9	76.0	2200#	26.9				
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS12	2-5-5-7	10	78.0	2000#	26.2				
			SS13	2-5-5-7	10	80.0	2200#	26.2				
		80	ST14			82.0	4030	25.7	101	39	18	95
			VS3			83.5	3790					
550.7	84.0	85	SS15	2-4-4-6	8	86.0	1800#	29.6				
			ST16			88.0	4420	29.3	96			
			VS4			89.5	4230					
	Medium to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	90	SS17	1-3-4-6	7	92.0	1400#	36.1				
			SS18	1-3-4-6	7	94.0	1600#	26.6				
		95	ST19			96.0	2750	28.5	99	42	21	94
			VS5			97.5	3730					



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460839.0
Northing: 363082.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: R. Calkins/S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 115 ft.

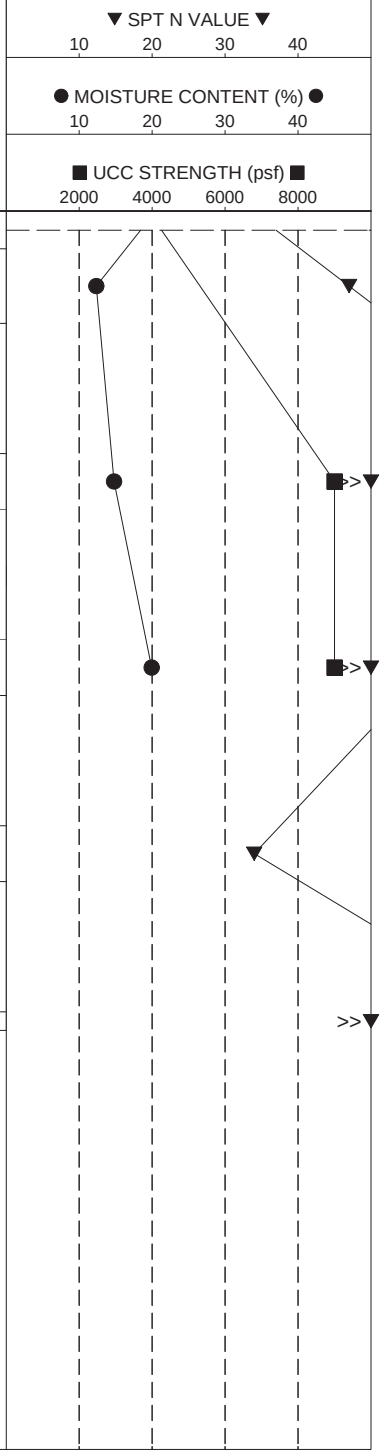
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/26/2017 **DATE COMPLETED:** 2/1/2017 **LOG OF TEST BORING RW-25A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.7 ft											
536.2	98.5											
534.7	SANDY SILTY CLAY, few gravel, gray, (CL-ML) 100.0		SS20	9-19-28-49	47	100.0	<>	12.3		19	7	54
		100										
			SS21	18-30-52	82	105.0	9000+*	14.8				
		105										
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)											
			SS22	16-21-37	58	110.0	9000+*	19.9				
		110										
521.2	113.5											
	Dense SILT, occasional lean clay layers, Field Engineer reported 6-inch silty sand layer 114.5-115 ft., gray, moist (ML)		SS23	8-13-21	34	115.0						
		115										
517.7	117.0											
	Completely weathered black SHALE											
515.7	119.0		SS24	72	72+	119.0						
	End of Boring at 119 ft. (Terminated upon SPT sample refusal on possible bedrock)	120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460839.0
Northing: 363082.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: R. Calkins/S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 115 ft.

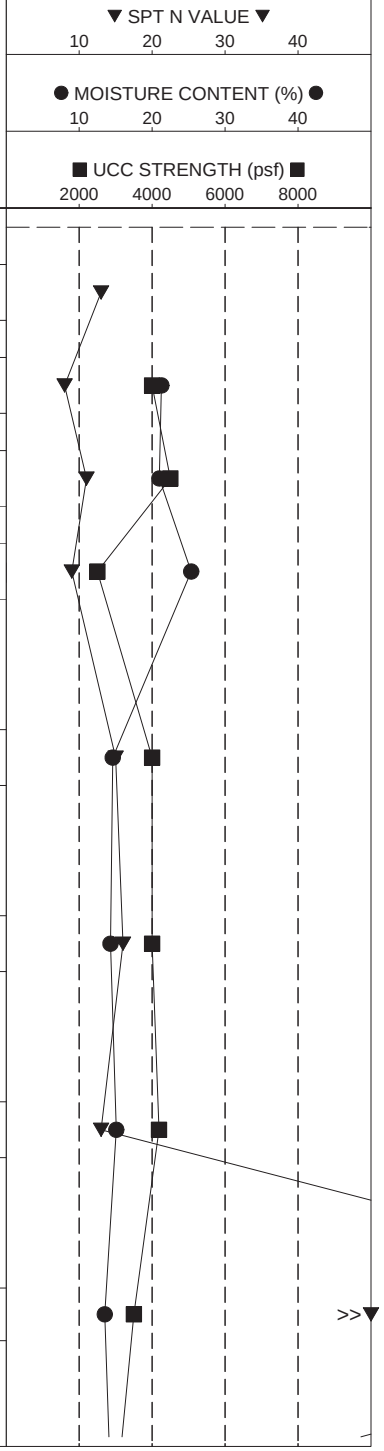
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/23/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING** **RW-20**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.1 ft	0										
633.3	10 inches of PORTLAND CEMENT CONCRETE (0.8)											
	FILL - Medium dense poorly-graded fine to medium sand with silt, trace coarse sand, trace gravel, brown, moist (SP-SM)		SS1	6-8-5	13	2.5						
630.1	(4.0)		SS2	5-4-4	8	5.0	4000*	21.3				
		5	SS3	3-5-6	11	7.5	4500*	21.0				
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, occasional sandy silt partings and seams above 7.5 ft., brown to gray (CL)		SS4	2-4-5	9	10.0	2500*	25.4				
		10										
620.6	(13.5)		SS5	4-6-9	15	15.0	4000*	14.6				
		15										
			SS6	4-7-9	16	20.0	4000*	14.3				
	Very stiff to stiff LEAN CLAY, few sand, trace gravel, gray (CL)	20										
	NOTE: SPT sampler refusal at 29.9 ft. on possible obstruction. Boring relocated 5 ft. S and 3 ft. E and continued.		SS7	3-6-7	13	25.0	4190	15.1	125			
		25										
			SS8	4-7-13/5"	20/11"	29.9	3500*	13.5				
		30										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460986.4
Northing: 362438.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS from vane shear test estimated by 2x field shear strength. Possible obstruction at 29.9 ft., boring relocated 5 ft. S and 3 ft. E and continued. Driller reported hard drilling at 95 ft.

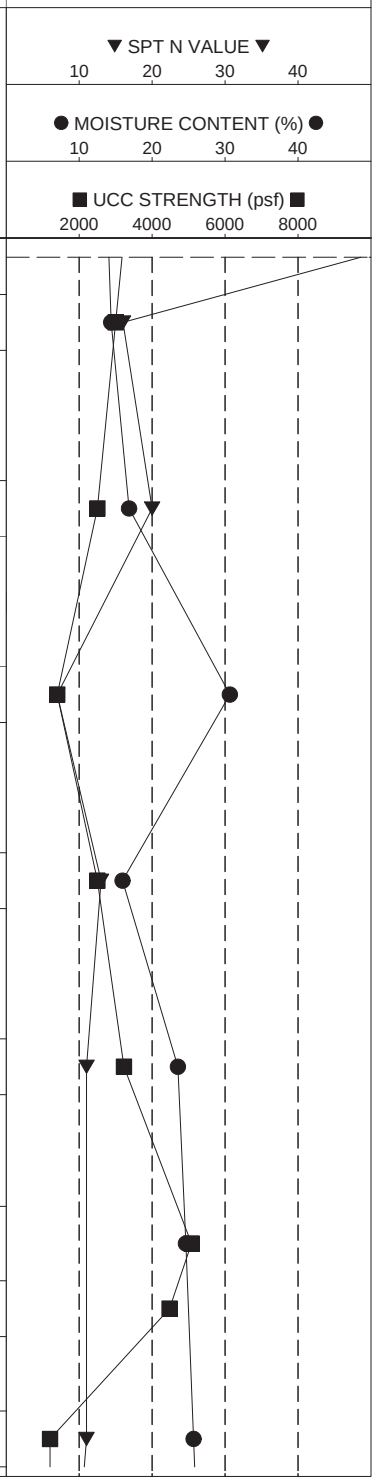
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/23/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING RW-20**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.1 ft											
	Very stiff to stiff LEAN CLAY, few sand, trace gravel, gray (CL)	35	SS9	4-7-9	16	35.0	3000*	14.4				
	NOTE: SPT sampler refusal at 29.9 ft. on possible obstruction.		SS10	4-8-12	20	40.0	2500*	16.8				
594.1	Boring relocated 5 ft. S and 3 ft. E and continued.	40.0 40										
	Medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS11	4-3-4	7	45.0	1400#	30.7				
589.1		45.0 45										
	Stiff LEAN CLAY, few sand, trace gravel, gray (CL)	50	SS12	4-5-8	13	50.0	2500*	15.9				
579.1		55.0 55	SS13	4-4-7	11	55.0	3230	23.5	107			
	Very stiff to medium LEAN CLAY, few sand, trace gravel, gray (CL)		ST14			60.0	5080	24.6	103	37	16	94
	NOTE: Vane shear test at 81.5 ft. terminated early due to possible cobble.	60	VS1			61.5	4480					
		65	SS15	3-6-5	11	65.0	1200#	25.7				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460986.4
Northing: 362438.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS from vane shear test estimated by 2x field shear strength. Possible obstruction at 29.9 ft., boring relocated 5 ft. S and 3 ft. E and continued. Driller reported hard drilling at 95 ft.

DRAFT

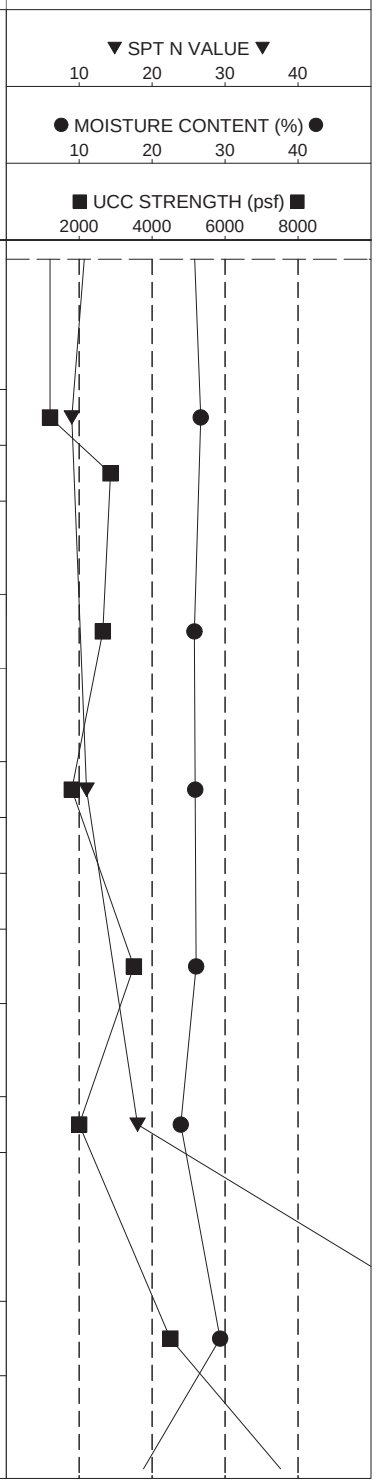
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

LOG OF TEST BORING I-75 DESIGN BUILD MODERNIZATION 2018.GPJ SOMAT.GDT 7/28/17

PROJECT NO. 2014195C **DATE STARTED:** 9/23/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING RW-20**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.1 ft	65										
			SS16	2-4-5	9	70.0	1200#	26.7				
		70	VS2			71.5	2860					
	Very stiff to medium LEAN CLAY, few sand, trace gravel, gray (CL) NOTE: Vane shear test at 81.5 ft. terminated early due to possible cobble.	75	ST17			76.0	2650	25.8	101	39	18	92
			SS18	4-5-6	11	80.0	1800#	25.9				
		80	VS3			81.5						
552.1		82.0										
	Stiff SANDY LEAN CLAY, gray (CL)		ST19			85.0	3500*	26.0	102	27	12	63
549.1		85.0										
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL) NOTE: Driller reported possible cobble at 85 ft.	85	SS20	6-8-10	18	89.0	2000*	23.9				
		90										
			ST21			95.0	4500*	29.3	95	43	22	85
539.1		95.0										
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)	95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460986.4
Northing: 362438.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS from vane shear test estimated by 2x field shear strength. Possible obstruction at 29.9 ft., boring relocated 5 ft. S and 3 ft. E and continued. Driller reported hard drilling at 95 ft.

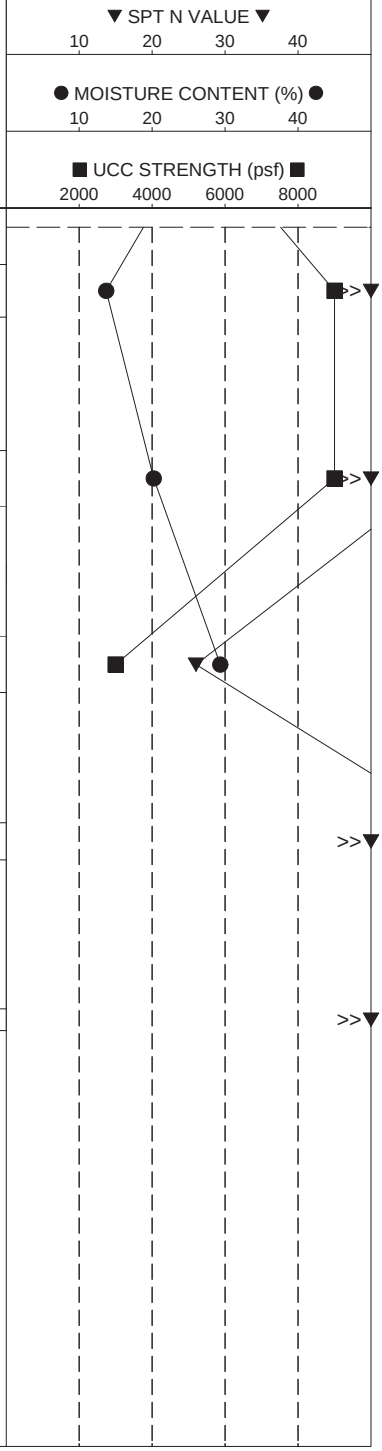
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/23/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING RW-20**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.1 ft											
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)	100	SS22	25-40-50/5"	90/11"	99.9	9000+*	13.7				
			SS23	14-27-32	59	105.0	9000+*	20.2				
529.1		105.0										
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	105										
			SS24	10-11-15	26	110.0	3000*	29.3				
524.1		110.0										
	Extremely dense mixed CLAYEY SAND and completely weathered SHALE pieces, trace gravel, dark gray, moist (SC)	110										
			SS25	31-65	65+	114.5						
	NOTE: Driller reported possible cobble at 117-118 ft.	115										
515.0		119.1	SS26	60-54/1"	54 +	119.1						
	End of Boring at 119.1 ft. (Terminated due to SPT sample refusal on possible obstruction)	120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13460986.4
Northing: 362438.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS from vane shear test estimated by 2x field shear strength. Possible obstruction at 29.9 ft., boring relocated 5 ft. S and 3 ft. E and continued. Driller reported hard drilling at 95 ft.

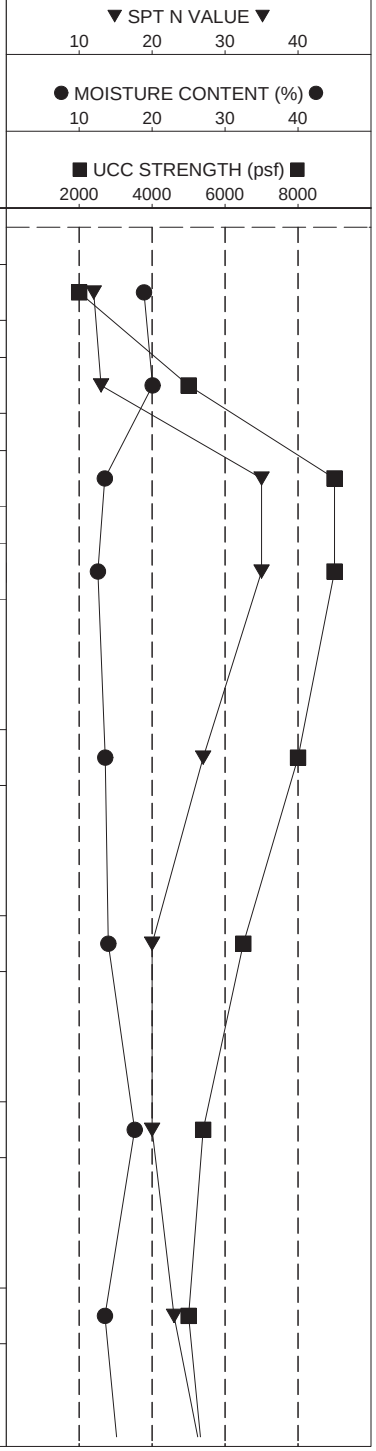
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/1/2016 **DATE COMPLETED:** 9/1/2016 **LOG OF TEST BORING** **RW-17**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.0 ft	0										
633.4	7 inches of PORTLAND CEMENT CONCRETE	0.6										
632.0	FILL - Medium dense poorly graded fine to medium sand, trace silt, trace gravel, brown, moist (SP)	2.0	SS1	8-7-5	12	2.5	2000*	18.9				
			SS2	3-5-8	13	5.0	5000*	20.1				
629.0	FILL - Stiff to very stiff lean clay, few sand, trace roots, trace gravel, dark gray to mottled brown and gray (CL)	5.0										
		5	SS3	6-15-20	35	7.5	9000*	13.5				
			SS4	6-15-20	35	10.0	9000*	12.6				
	Hard LEAN CLAY, few sand, trace gravel, gray (CL)	10										
			SS5	10-12-15	27	15.0	8000*	13.6				
		15										
615.5		18.5										
			SS6	6-8-12	20	20.0	6500*	14.0				
		20										
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS7	6-9-11	20	25.0	5400	17.6	119			
		25										
			SS8	5-9-14	23	30.0	5000*	13.5				
		30										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: none

BORING LOCATION INFORMATION
Easting: 13461130.6
Northing: 361867.7

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: D 50
Engineer on Rig: M. Wajed
Drilling Method: 2 1/4 inch HSA
Method Notes:
Hammer Type: Manual
Backfilled With: Cuttings/Patch
Checked By: ALOG
QA/QC By: JA
Remarks:

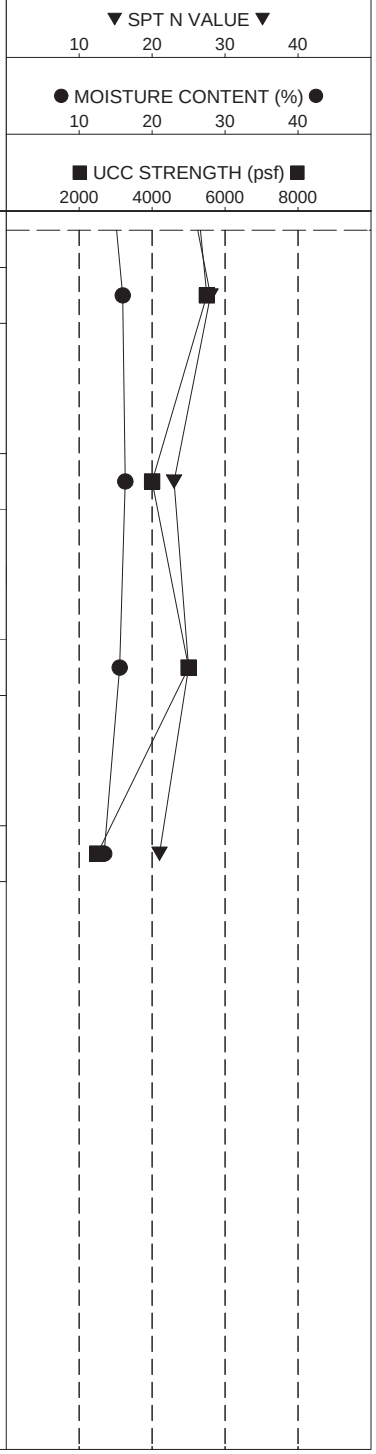
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/1/2016 **DATE COMPLETED:** 9/1/2016 **LOG OF TEST BORING** **RW-17**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.0 ft											
			SS9	8-12-16	28	35.0	5500*	16.0				
		35										
			SS10	8-10-13	23	40.0	4000*	16.3				
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	40										
			SS11	8-10-15	25	45.0	5000*	15.6				
		45										
			SS12	5-9-12	21	50.0	2500*	13.4				
584.0	50.0	50										
	End of Boring at 50 ft.											
		55										
		60										
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: none

BORING LOCATION INFORMATION
Easting: 13461130.6
Northing: 361867.7

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: D 50
Engineer on Rig: M. Wajed
Drilling Method: 2 1/4 inch HSA
Method Notes:
Hammer Type: Manual
Backfilled With: Cuttings/Patch
Checked By: ALOG
QA/QC By: JA
Remarks:

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/19/2017 **DATE COMPLETED:** 1/26/2017 **LOG OF TEST BORING** **RW-17A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.0 ft	0										
633.3	8 inches of PORTLAND CEMENT CONCRETE 0.7											
	Profile drilled to 50 ft.	5										
		10										
		15										
		20										
		25										
		30										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

DRAFT

GROUNDWATER READINGS

First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461128.5
Northing: 361861.4

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Wajed/S. Swaminathan
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

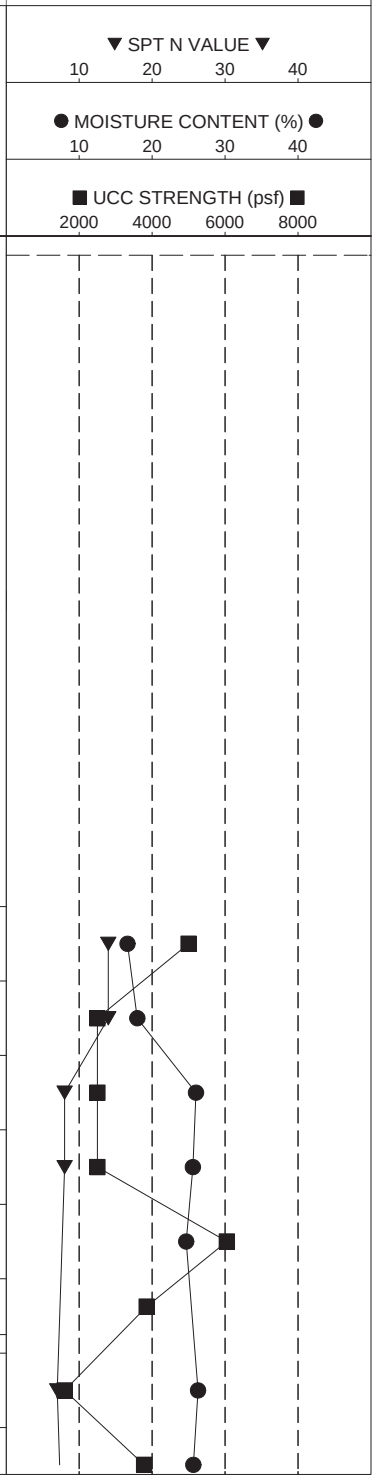
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/19/2017 **DATE COMPLETED:** 1/26/2017 **LOG OF TEST BORING** **RW-17A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.0 ft											
	Profile drilled to 50 ft.	35, 40, 45										
584.0	50.0	50										
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS1	4-6-8-13	14	52.0	5000*	16.6				
			SS2	5-6-8-10	14	54.0	2500*	18.0				
		55	SS3	1-3-5-7	8	56.0	2500*	26.0				
			SS4	1-3-5-6	8	58.0	2500*	25.6				
576.0	58.0											
	Very stiff to medium LEAN CLAY, few sand, trace gravel, gray (CL)		ST5			60.0	6050	24.7	103	39	18	93
		60	VS1			61.5	3850					
			SS6	2-3-4-5	7	64.0	1600#	26.3				
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461128.5
Northing: 361861.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Wajed/S. Swaminathan
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
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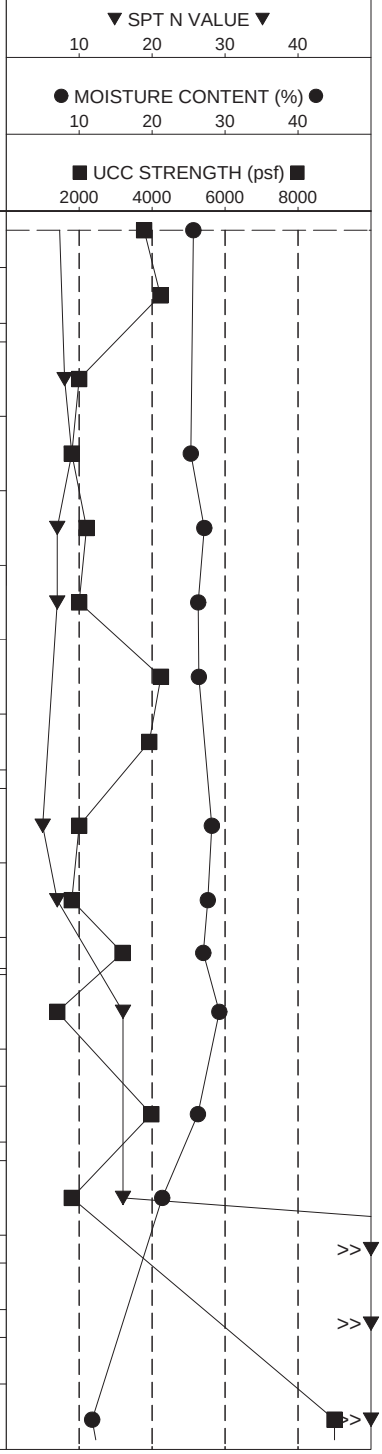
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/19/2017 **DATE COMPLETED:** 1/26/2017 **LOG OF TEST BORING** **RW-17A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.0 ft	65	ST7			66.0	3780	25.6	102	42	21	93
566.5	Very stiff to medium LEAN CLAY, few sand, trace gravel, gray (CL) 67.5		VS2			67.5	4230					
			SS8	2-3-5-6	8	70.0	2000#					
		70	SS9	1-4-5-6	9	72.0	1800#	25.3				
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS10	2-3-4-5	7	74.0	2200#	27.1				
558.0	76.0	75	SS11	2-4-3-5	7	76.0	2000#	26.3				
			ST12			78.0	4240	26.4	101	42	22	94
	Very stiff to medium LEAN CLAY, few sand, trace gravel, gray (CL)		VS3			79.5	3920					
		80										
	NOTE: Poor recovery on Shelby tube ST15 at 84.8 ft.		SS13	1-2-3-4	5	82.0	2000#	28.2				
			SS14	1-3-4-5	7	84.0	1800#	27.6				
549.2	84.8		ST15			84.8	3190	27.0	98			
548.0	Medium dense poorly graded FINE SAND, trace silt, trace gravel, gray, moist (SP) 86.0	85	SS16	14-9-7-8	16	87.0	1400#	29.2				
	Medium to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		VS4			89.5	3980	26.3				
544.5	89.5	90										
543.0	Medium dense SILTY FINE SAND/SANDY SILT, gray, wet (SM/ML) 91.0		SS17	5-7-9-12	16	92.0	1800#	21.4				
542.0	Medium LEAN CLAY, trace sand, trace gravel, gray (CL) 92.0		SS18	53-80/3"	80 +	92.8						
	Extremely dense SILTY FINE SAND/SANDY SILT, gray, wet (SM/ML)		SS19	60-50/3"	50 +	94.8						
		95										
538.0	96.0											
537.0	Hard LEAN CLAY, trace sand, trace gravel, gray 97.0		SS20	17-34-36-50/5"	70	97.9	9000+*	11.8				



GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461128.5
Northing: 361861.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Wajed/S. Swaminathan
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

DRAFT

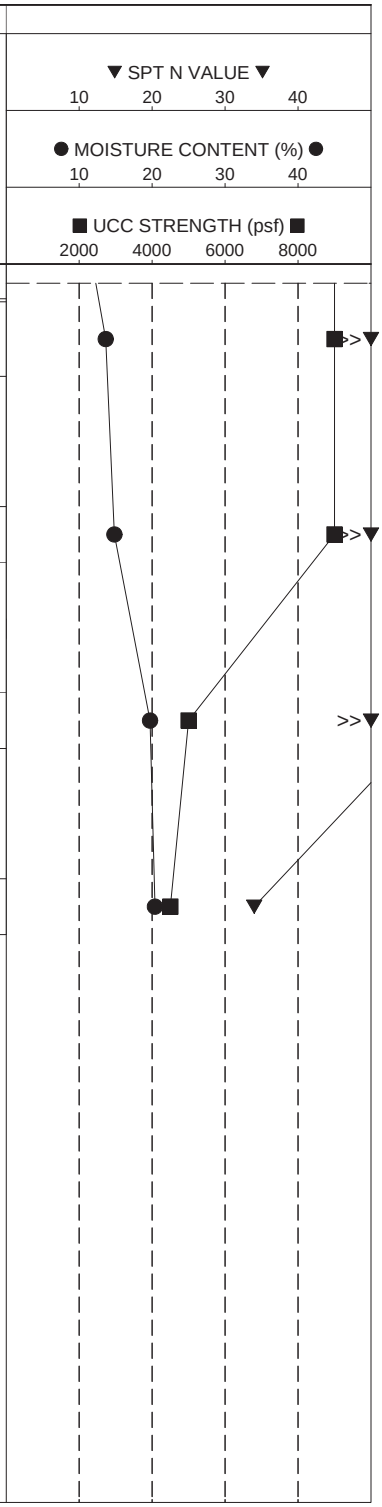
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

LOG OF TEST BORING I-75 DESIGN BUILD MODERNIZATION 2018.GPJ SOMAT.GDT 7/28/17

PROJECT NO. 2014195C **DATE STARTED:** 1/19/2017 **DATE COMPLETED:** 1/26/2017 **LOG OF TEST BORING** **RW-17A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.0 ft											
536.0	(CL) 98.0											
	Very dense SILTY FINE SAND/SANDY SILT, trace gravel, gray, wet (SM/ML)		SS21	13-29-38-55	67	100.0	9000*	13.6				
		100										
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)											
			SS22	17-66-54	120	105.0	9000*	14.8				
529.0	105.0	105										
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS23	13-21-37	58	110.0	5000*	19.7				
		110										
			SS24	11-15-19	34	115.0	4500*	20.4				
519.0	115.0	115										
	End of Boring at 115 ft.											
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461128.5
Northing: 361861.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
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Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
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DRAFT

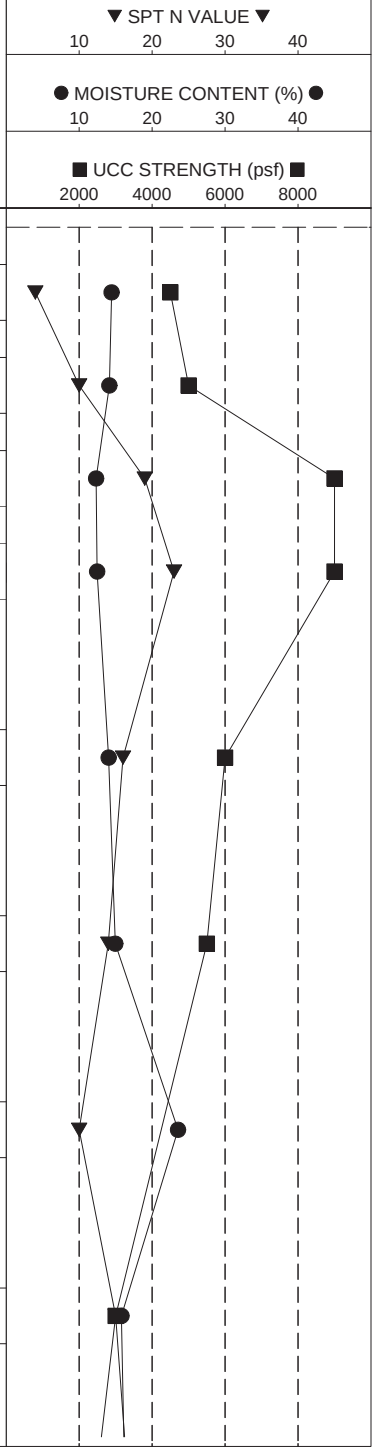
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/23/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING** **RW-13**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 635.2 ft	
634.5	8 inches of PORTLAND CEMENT CONCRETE	0.7
633.2	FILL - Poorly-graded fine to medium sand with silt, trace coarse sand, trace gravel, occasional sandy lean clay seams, brown, moist (SP-SM)	2.0
629.2	Very stiff SANDY LEAN CLAY, few gravel, brown (CL)	6.0
627.2	Medium dense CLAYEY SAND, few gravel, brown (SC) (Based on Atterberg Limits, SPT sample at 7.5 ft. reacts similar to CL)	8.0
625.2	Hard SANDY LEAN CLAY, few gravel, brown (CL)	10.0
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	
615.2	Stiff SANDY LEAN CLAY, trace gravel, gray (CL)	20.0

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	2-2-2	4	2.5	4500*	14.4				
SS2	3-4-6	10	5.0	5000*	14.1				
SS3	4-8-11	19	7.5	9000*	12.3		22	9	48
SS4	7-11-12	23	10.0	9000*	12.5				
SS5	4-7-9	16	15.0	6000*	14.0				
SS6	5-5-9	14	20.0	5500*	15.0				
SS7	3-4-6	10	25.0	<>	23.6				
SS8	5-7-8	15	30.0	3000*	15.8				



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461259.9
Northing: 361380.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 93 ft.

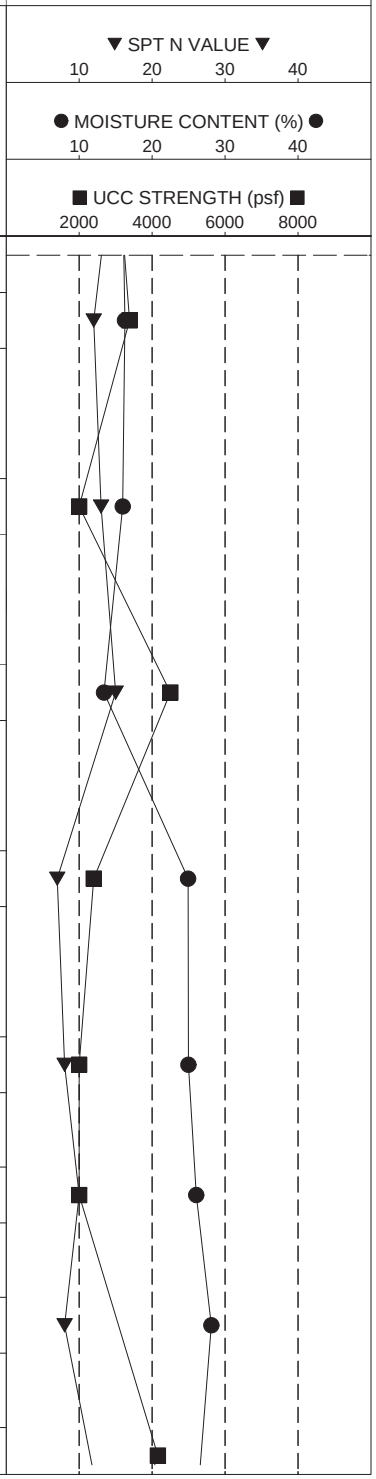
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/23/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING RW-13**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 635.2 ft											
	Stiff SANDY LEAN CLAY, trace gravel, gray (CL)	35	SS9	3-5-7	12	35.0	3380	16.3	117			
		40	SS10	4-6-7	13	40.0	2000*	16.0		29	15	67
595.2	Very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	40.0										
		45	SS11	6-6-9	15	45.0	4500*	13.4				
590.2	Stiff to very stiff LEAN CLAY, trace to few sand, trace gravel, gray (CL)	45.0										
	NOTE: No recovery on Shelby tube attempts at 57, 60.5, and 64 ft. due to sample falling out of sampler.	50	SS12	2-3-4	7	50.0	2400#	24.9				
		55	SS13	3-3-5	8	55.0	2000*	25.0				
			NR14			57.0						
			SS15	1-5-5	10	58.5	2000#	26.0				
		60	NR16			60.5						
			SS17	2-4-4	8	62.0	<>	28.1				
			NR18			64.0						
		65	VS1			65.5	4160					



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461259.9
Northing: 361380.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 93 ft.

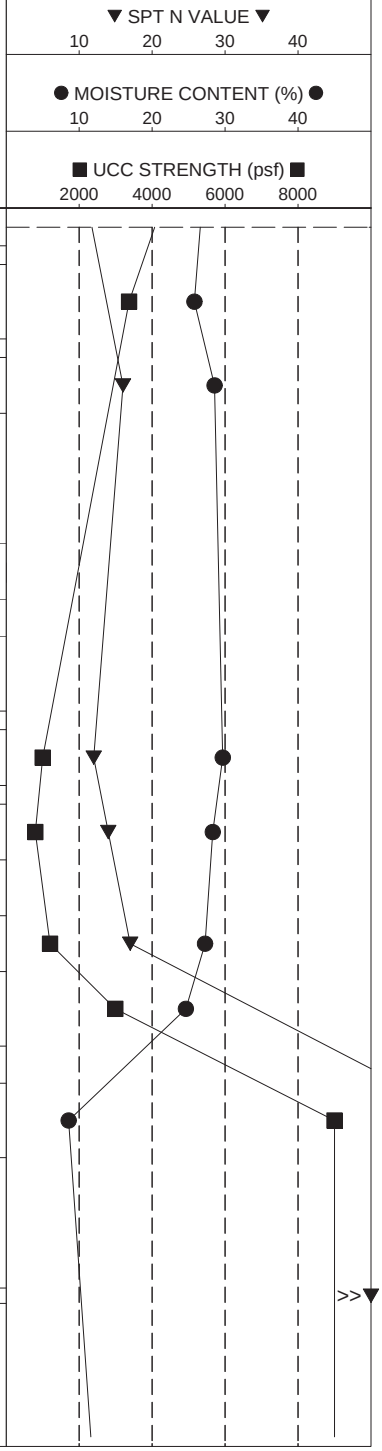
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/23/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING RW-13**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 635.2 ft	65										
			ST19			68.0	3370	25.8	100	47	26	92
			SS20	6-6-10	16	70.0	<>	28.6				
565.2		70.0										
	Medium to soft LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: Vane shear test at 75 ft. terminated early due to possible cobble. No recovery on Shelby tube attempt at 78 ft. due to sample falling out of sampler.	70										
			VS2			75.0						
		75										
			NR21			78.0						
			SS22	3-6-6	12	80.0	1000#	29.7				
		80										
			SS23	3-5-9	14	82.0	800#	28.3				
553.2		82.0										
	Medium to stiff LEAN CLAY, few sand, trace gravel, gray (CL)		SS24	3-8-9	17	85.0	1200#	27.3				
		85										
			ST25			87.0	2990	24.6	105	44	25	91
547.2		88.0										
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: No recovery on SPT sample attempt at 93.9 ft. due to sampler refusal on possible boulder or cobble.		ST26			90.0	9000+*	8.6				
		90										
			NR27	50/5"	50 +	93.9						
		95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461259.9
Northing: 361380.7

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 93 ft.

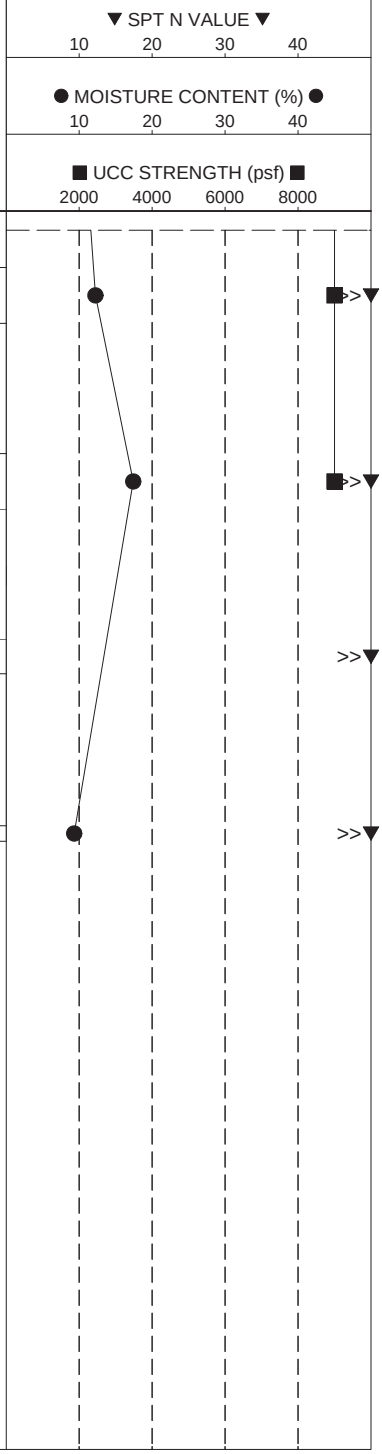
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/23/2016 **DATE COMPLETED:** 10/3/2016 **LOG OF TEST BORING RW-13**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 635.2 ft											
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)		SS28	14-29-46	75	100.0	9000+*	12.2				
	NOTE: No recovery on SPT sample attempt at 93.9 ft. due to sampler refusal on possible boulder or cobble.	100										
530.2		105.0	SS29	12-24-34	58	105.0	9000*	17.4				
	Extremely dense SILTY FINE SAND, trace clay, trace gravel, gray, moist (SM)	105										
525.2		110.0	SS30	36-50/5"	50 +	109.4						
	Hard LEAN CLAY, few sand, trace gravel, gray (CL) (Possible Hardpan)	110										
521.3		113.9	SS31	55/5"	55 +	113.9	<>	9.3				
	End of Boring at 113.9 ft. (Terminated due to SPT sample refusal on possible hardpan)	115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461259.9
Northing: 361380.7

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 93 ft.

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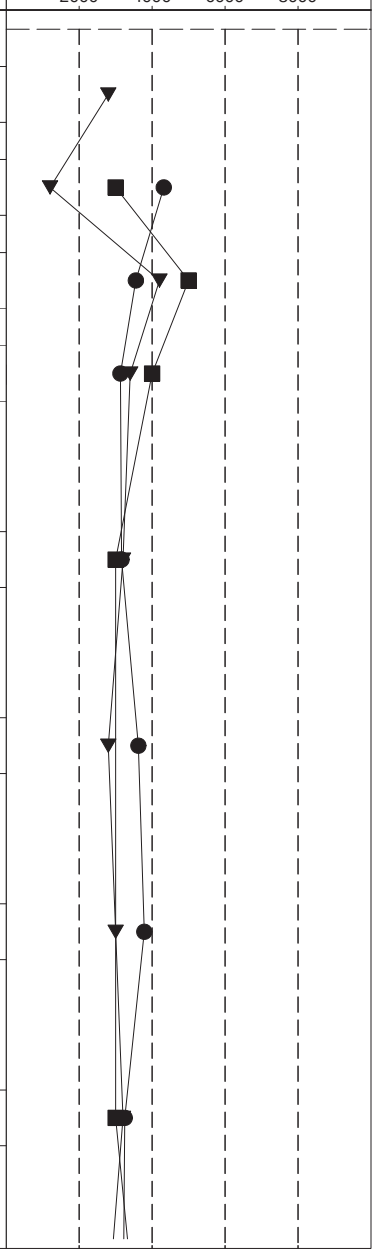
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/7/2016 **DATE COMPLETED:** 9/9/2016 **LOG OF TEST BORING** **SB-15**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.2 ft	0										
632.5	9 inches of PORTLAND CEMENT CONCRETE	0.8										
632.2		1.0										
631.2	Field Engineer reported 3 inches of gravel FILL	2.0	SS1	5-9-5	14	2.5						
	FILL - Medium dense poorly graded fine to medium sand, trace silt, trace gravel, brown, moist (SP)		SS2	1-2-4	6	5.0	3000*	21.6				
626.2	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, brown (CL)	7.0	SS3	4-8-13	21	7.5	5000*	17.8				
			SS4	3-7-10	17	10.0	4000*	15.7				
			SS5	4-7-9	16	15.0	3000*	15.8				
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS6	3-6-8	14	20.0	<>	18.1				
			SS7	4-6-9	15	25.0	<>	18.9				
			SS8	3-6-10	16	30.0	3000*	16.2				



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461476.7
Northing: 360786.6

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 750X
Engineer on Rig: M. Wajed
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 5 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: Driller reported hard drilling starting at 90 ft.

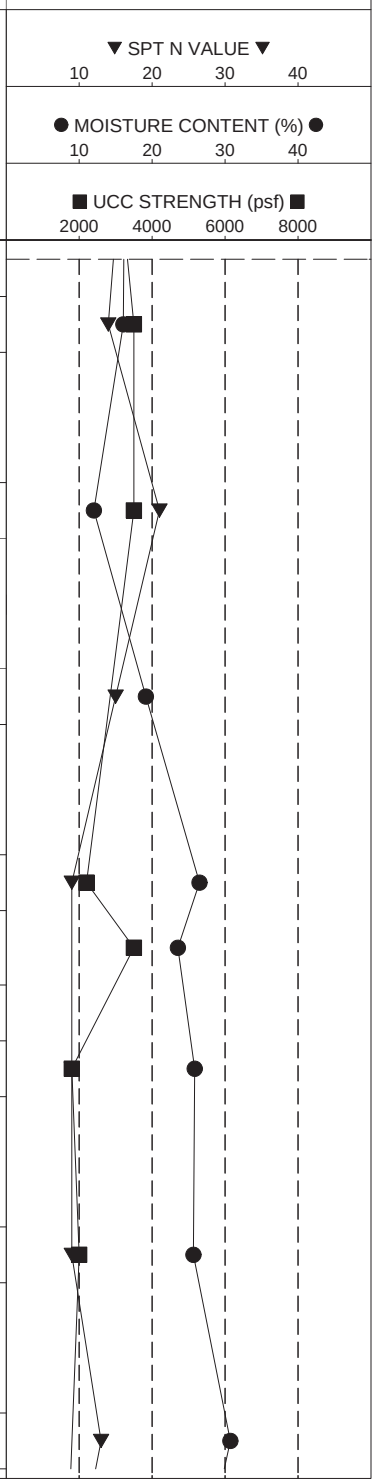
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/7/2016 **DATE COMPLETED:** 9/9/2016 **LOG OF TEST BORING** **SB-15**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.2 ft											
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS9	3-5-9	14	35.0	3500*	16.1				
		35										
			SS10	5-9-12	21	40.0	4550	12.0	133			
		40										
			SS11	5-6-9	15	45.0	<>	19.1				
		45										
			SS12	1-4-5	9	50.0	2200#	26.5				
		50										
			ST13			52.0	3500	23.5	106			
			SS14	2-4-5	9	55.0	1800#	25.8				
578.2		55.0										
		55										
	Medium LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: Poor recovery on SPT sample SS21 at 90 ft.		SS15	2-4-5	9	60.0	1420	25.7	103			
		60										
			SS16	3-5-8	13	65.0	<>	30.7				
		65										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461476.7
Northing: 360786.6

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 750X
Engineer on Rig: M. Wajed
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 5 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: Driller reported hard drilling starting at 90 ft.

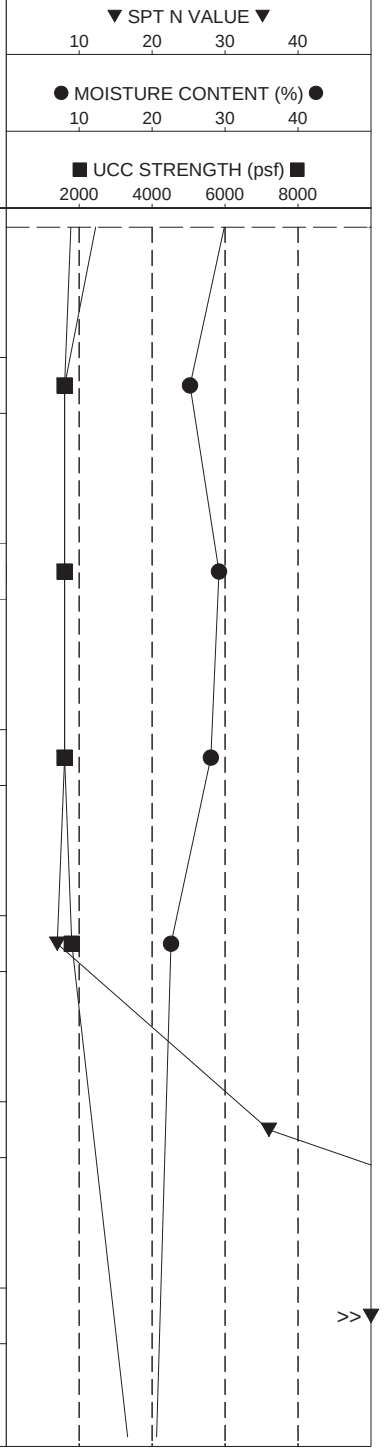
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/7/2016 **DATE COMPLETED:** 9/9/2016 **LOG OF TEST BORING** **SB-15**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.2 ft	65										
			SS17	2-4-4	8	70.0	1600#	25.2				
		70										
			SS18	3-4-4	8	75.0	1600#	29.2				
		75										
	Medium LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: Poor recovery on SPT sample SS21 at 90 ft.		SS19	2-4-4	8	80.0	1930	28.1	99			
		80										
			SS20	2-3-4	7	85.0	1800#	22.6				
		85										
543.2		90.0	SS21	10-20-16	36	90.0	<>					
		90										
	Extremely dense poorly graded FINE SAND, trace silt, trace gravel, gray, moist (SP)		SS22	40-54-56	110	95.0						
		95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461476.7
Northing: 360786.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 750X
Engineer on Rig: M. Wajed
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 5 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: Driller reported hard drilling starting at 90 ft.

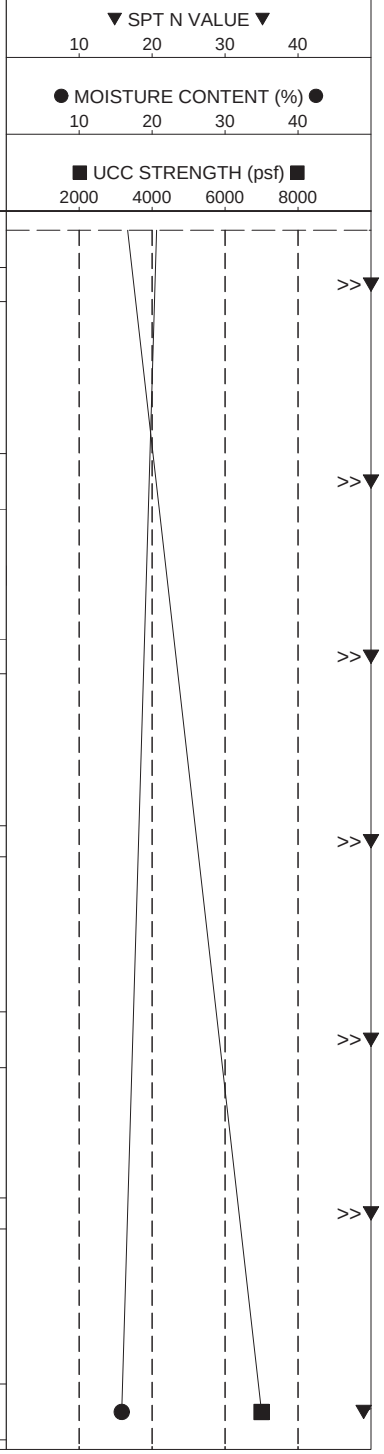
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/7/2016 **DATE COMPLETED:** 9/9/2016 **LOG OF TEST BORING** **SB-15**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.2 ft											
533.2		100.0	SS23	45-50/5"	50 +	99.4						
		100										
			SS24	15-48-44	92	105.0						
		105										
			SS25	34-50/5"	50 +	109.4						
		110										
	Extremely dense CLAYEY SAND, trace silt, trace gravel, gray, moist (SC)		SS26	35-50/4"	50 +	114.3						
		115										
			SS27	15-21-38	59	120.0						
		120										
			SS28	54-60/4"	60 +	124.3						
508.2		125.0										
		125										
	Very stiff LEAN CLAY, trace sand, trace gravel, occasional clayey silt seams, gray (CL)		SS29	17-21-28	49	130.0	7000*	15.8				
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461476.7
Northing: 360786.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 750X
Engineer on Rig: M. Wajed
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 5 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: Driller reported hard drilling starting at 90 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/7/2016 **DATE COMPLETED:** 9/9/2016 **LOG OF TEST BORING** **SB-15**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 / ● MOISTURE CONTENT (%) ● 10 20 30 40 / ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
	Ground Surface Elevation 633.2 ft	130											
501.2	132.0												
	End of Boring at 132 ft. (Boring continued as Rock Core)	135											
		140											
		145											
		150											
		155											
		160											

DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461476.7
Northing: 360786.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 750X
Engineer on Rig: M. Wajed
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 5 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: Driller reported hard drilling starting at 90 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/9/2017 **DATE COMPLETED:** 1/18/2017 **LOG OF TEST BORING** **SB-15A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.2 ft	0										
632.3	10 inches of PORTLAND CEMENT CONCRETE (0.8)											
	Profile drilled	5, 10, 15, 20, 25, 30										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461479.4
Northing: 360780.4

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins/M. Wajed
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 91 ft.

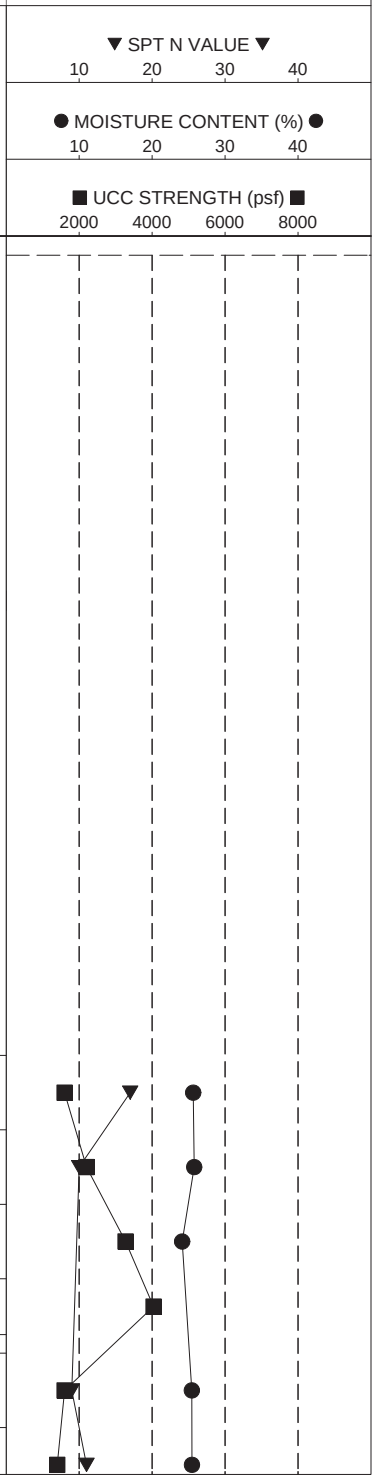
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/9/2017 **DATE COMPLETED:** 1/18/2017 **LOG OF TEST BORING** **SB-15A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.2 ft											
	Profile drilled	35, 40, 45, 50										
579.2		54.0										
	Medium to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	55	SS1	6-8-9-9	17	56.0	1600#	25.6				
			SS2	3-4-6-6	10	58.0	2200#	25.8				
575.2		58.0										
	Very stiff to medium LEAN CLAY, few to trace sand, trace gravel, gray (CL)		ST3			60.0	3270	24.1	103	38	17	95
		60	VS1			61.5	4040					
			SS4	3-4-5-7	9	64.0	1600#	25.4				
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461479.4
Northing: 360780.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins/M. Wajed
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 91 ft.

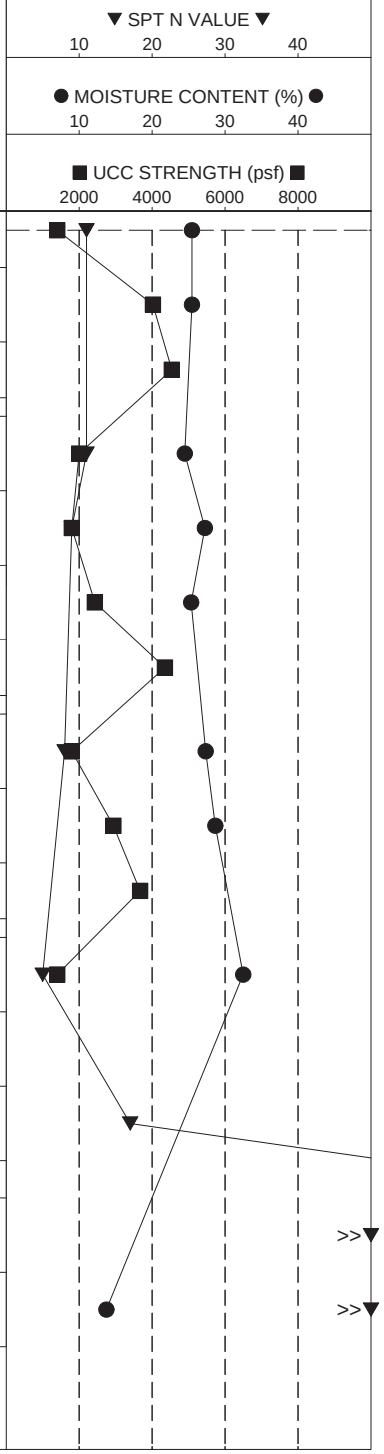
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/9/2017 **DATE COMPLETED:** 1/18/2017 **LOG OF TEST BORING** **SB-15A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.2 ft	65	SS5	3-5-6-7	11	66.0	1400#	25.5				
	Very stiff to medium LEAN CLAY, few to trace sand, trace gravel, gray (CL)		ST6			68.0	4020	25.5	102	40	18	95
			VS2			69.5	4540					
		70	SS7	2-5-6-7	11	72.0	2000#	24.5				
561.2	72.0		SS8	2-4-5-5	9	74.0	1800#	27.2				
		75	ST9			76.0	2430	25.3	99			
			VS3			77.5	4350					
	Medium to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS10	3-4-4-6	8	80.0	1800#	27.3				
		80	ST11			82.0	2940	28.7	97	37	17	98
	NOTE: No recovery on Shelby tube attempt at 88 ft. due to sample falling out of sampler. No recovery on SPT sample attempt at 90 ft. due to possible cobble.		VS4			83.5	3670					
		85	SS12	2-3-2-4	5	86.0	1400#	32.5				
			NR13			88.0						
		90	NR14	8-10-7-14	17	90.0						
542.2	91.0											
	Extremely dense poorly graded FINE SAND with silt, trace gravel, gray, moist (SP-SM)		SS15	17-45-79-96	124	93.0						
538.2	95.0		SS16	6-50-98-89	148	95.0		13.7				10
	End of Boring at 95 ft.	95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461479.4
Northing: 360780.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins/M. Wajed
Drilling Method: 4 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 91 ft.

DRAFT

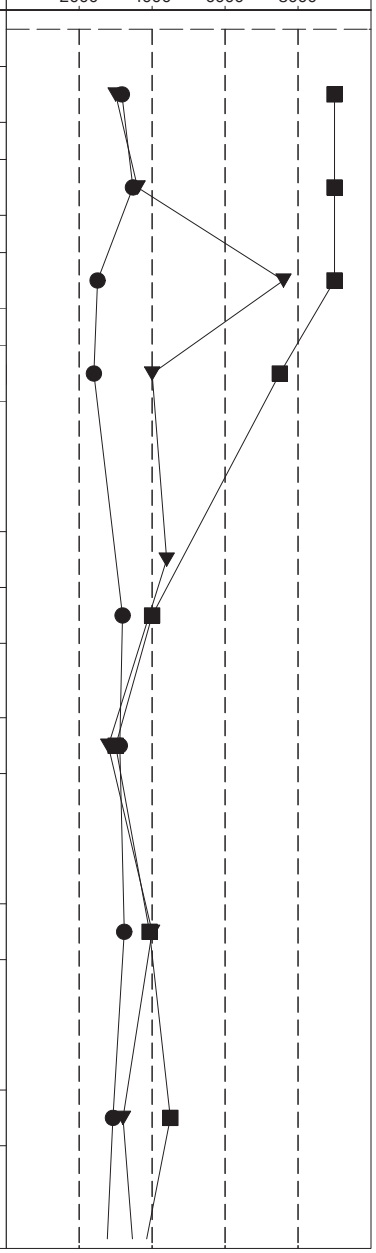
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/30/2016 **DATE COMPLETED:** 9/6/2016 **LOG OF TEST BORING RW-08**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 634.1 ft	
633.5	7 inches of PORTLAND CEMENT CONCRETE	0.6
632.3	FILL - Poorly graded fine sand, trace silt, trace gravel, brown, moist (SP)	1.8
628.6	Hard LEAN CLAY, trace sand, trace gravel, mottled brown and gray (CL)	5.5
620.6	Hard to very stiff LEAN CLAY, trace sand, trace gravel, brown to gray (CL)	13.5
609.1	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: No recovery on SPT sampler attempt at 15 ft. due to sample falling out of sampler; direct pushed to 16.5 ft. to retrieve sample.	25.0
	Very stiff to stiff LEAN CLAY, few sand, trace gravel, gray (CL)	

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	29-7-8	15	2.5	9000+*	15.9				
SS2	5-8-10	18	5.0	9000*	17.4				
SS3	9-16-22	38	7.5	9000*	12.5				
SS4	7-9-11	20	10.0	7500*	12.0				
NR5	6-9-13	22	15.0						
DP6			16.5	4000*	16.0				
SS7	4-6-8	14	20.0	3000*	15.6				
SS8	5-8-12	20	25.0	3930	16.2	121			
SS9	4-7-9	16	30.0	4500*	14.6				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461583.2
Northing: 360426.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 750
Engineer on Rig: C. Kennedy
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 89 ft. Methane gas was encountered in monitoring well at 100% LEL.

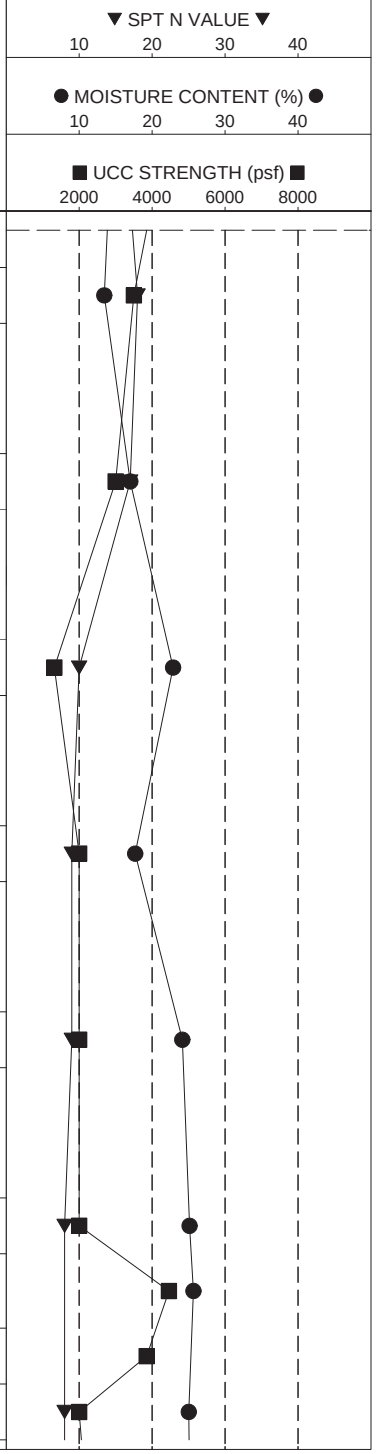
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/30/2016 **DATE COMPLETED:** 9/6/2016 **LOG OF TEST BORING RW-08**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.1 ft											
	Very stiff to stiff LEAN CLAY, few sand, trace gravel, gray (CL)	35	SS10	5-7-11	18	35.0	3500*	13.4				
		40	SS11	5-7-10	17	40.0	3000*	17.0				
590.6	43.5											
	Medium to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	45	SS12	2-4-6	10	45.0	1320	22.9	108			
		50	SS13	2-3-6	9	50.0	2000*	17.7				
	NOTE: No recovery on Shelby tube attempt at 72 ft. due to sample falling out of sampler; direct pushed to 72 ft. to retrieve sample.	55	SS14	2-4-5	9	55.0	2000*	24.1				
		60	SS15	2-4-4	8	60.0	2000*	25.1				
			ST16			62.0	4460	25.7	101	40	19	94
			VS1			63.5	3850					
		65	SS17	1-3-5	8	65.0	2000*	25.0				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461583.2
Northing: 360426.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 750
Engineer on Rig: C. Kennedy
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 89 ft. Methane gas was encountered in monitoring well at 100% LEL.

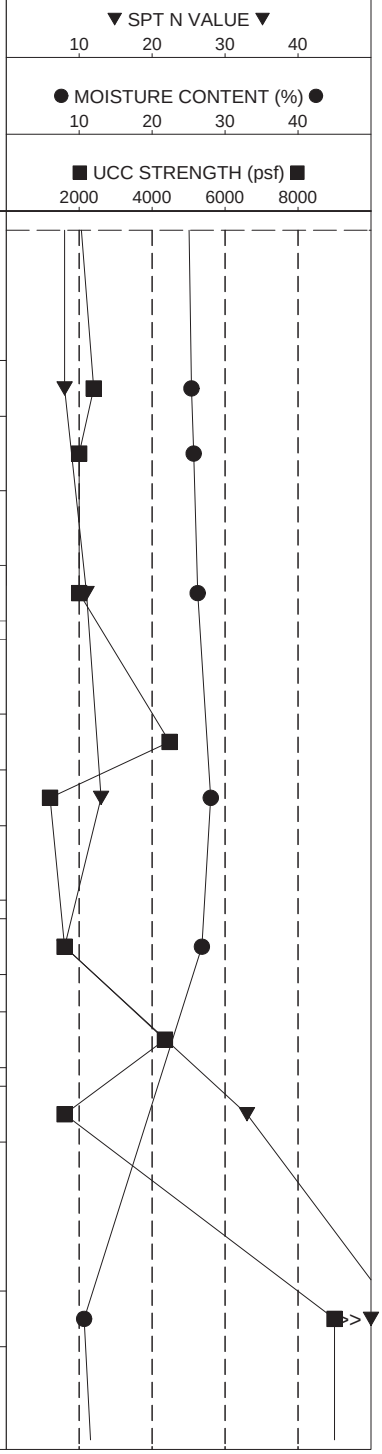
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/30/2016 **DATE COMPLETED:** 9/6/2016 **LOG OF TEST BORING RW-08**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.1 ft	65										
	Medium to very stiff LEAN CLAY, few sand, trace gravel, gray (CL) NOTE: No recovery on Shelby tube attempt at 72 ft. due to sample falling out of sampler; direct pushed to 72 ft. to retrieve sample.											
		70	SS18	3-3-5	8	70.0	2400#	25.4				
			DP19			72.0	2000#	25.7				
562.1	72.0											
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL) NOTE: No recovery on Shelby tube attempt at 74 ft. or on Denison sampler attempt at 78 ft. due to sample falling out of sampler.		NR20			74.0						
		75	SS21	3-5-6	11	75.5	2000#	26.2				
			NR22			78.0						
			VS2			79.5	4480					
554.6	79.5											
	Medium to very stiff LEAN CLAY with sand, trace gravel, gray (CL) NOTE: No recovery on Denison sampler attempt at 83 ft. due to sample falling out of sampler.	80	SS23	4-6-7	13	81.0	1200#	28.0				
			NR24			83.0						
			SS25	1-3-5	8	85.0	1600#	26.8				
		85	VS3			87.5	4350					
546.1	88.0											
	Medium LEAN CLAY with sand, trace gravel, gray (CL)		SS26	5-11-22	33	89.5	1600#					81
		90										
540.6	93.5											
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)		SS27	16-24-30	54	95.0	9000+*	10.7				
		95										



GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461583.2
Northing: 360426.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 750
Engineer on Rig: C. Kennedy
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 89 ft. Methane gas was encountered in monitoring well at 100% LEL.

DRAFT

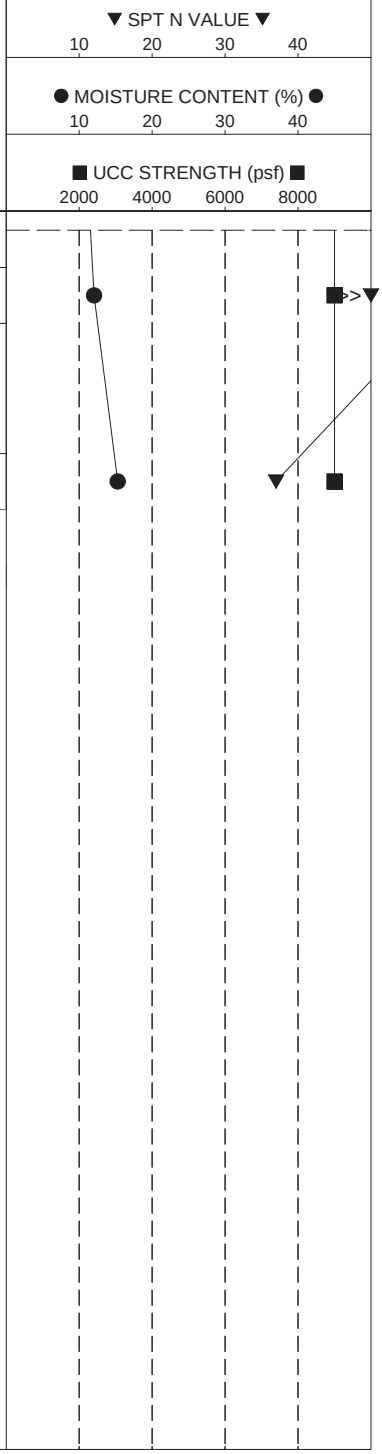
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

DRAFT

PROJECT NO. 2014195C **DATE STARTED:** 8/30/2016 **DATE COMPLETED:** 9/6/2016 **LOG OF TEST BORING** **RW-08**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.1 ft											
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)	100	SS28	10-25-36	61	100.0	9000+*	12.0				
529.1	105.0		SS29	9-16-21	37	105.0	9000*	15.3				
	End of Boring at 105 ft.	105										
		110										
		115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461583.2
Northing: 360426.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 750
Engineer on Rig: C. Kennedy
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 89 ft. Methane gas was encountered in monitoring well at 100% LEL.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/11/2016 **DATE COMPLETED:**10/12/2016 **LOG OF TEST BORING** **RW-08A**

LOG OF SOIL PROFILE				FIELD DATA				LABORATORY DATA						
ELEVATION ft			DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 ● MOISTURE CONTENT (%) ● 10 20 30 40 ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
		Ground Surface Elevation 634.0 ft	0											
			5											
			10											
			15											
		Profile drilled to 58.5 ft.	20											
			25											
			30											

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461584.8
Northing: 360417.8

Coordinates/GSE determined by:
Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: JD Hoksbergen
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 90 ft.

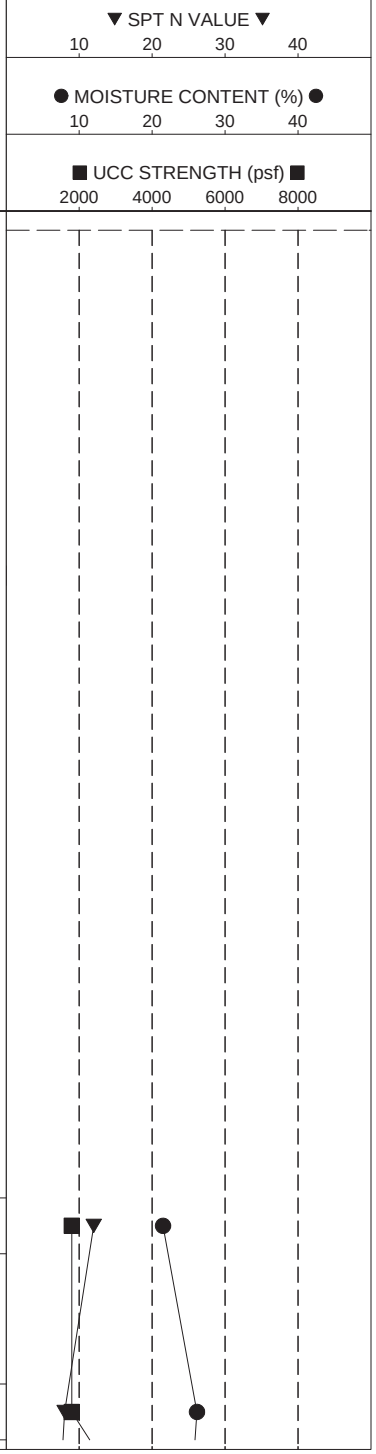
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/11/2016 **DATE COMPLETED:**10/12/2016 **LOG OF TEST BORING** **RW-08A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.0 ft											
	Profile drilled to 58.5 ft.	35, 40, 45, 50, 55										
575.5	Medium to very stiff LEAN CLAY, few sand, trace gravel, gray (CL) NOTE: Vane shear test at 70.5 ft. terminated early due to high force gauge readings.	58.5, 60, 65	SS1	3-5-7	12	60.0	1800#	21.5				
			SS2	2-3-5	8	65.0	1800#	26.2				



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461584.8
Northing: 360417.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: JD Hoksbergen
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 90 ft.

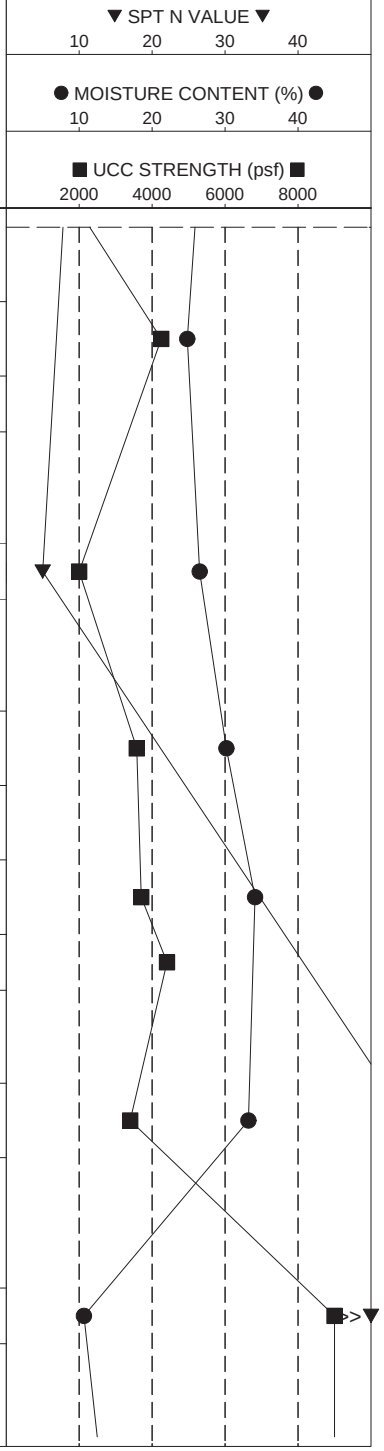
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/11/2016 **DATE COMPLETED:** 10/12/2016 **LOG OF TEST BORING** **RW-08A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.0 ft	65										
	Medium to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)		ST3			69.0	4250	24.8	101	44	23	94
		70	VS1			70.5						
	NOTE: Vane shear test at 70.5 ft. terminated early due to high force gauge readings.											
560.5	73.5		SS4	2-2-3	5	75.0	2000#	26.5				
		75										
			ST5			80.0	3580	30.2	95	46	27	97
		80										
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		ST6			84.0	3700	34.1	95			
		85	VS2			85.5	4410					
			ST7			90.0	3400#	33.2				
544.0	90.0	90										
	Hard LEAN CLAY, few sand, trace gravel, gray (CL)		SS8	37-32-41	73	95.0	9000+*	10.7				
		95										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461584.8
Northing: 360417.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: JD Hoksbergen
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 90 ft.

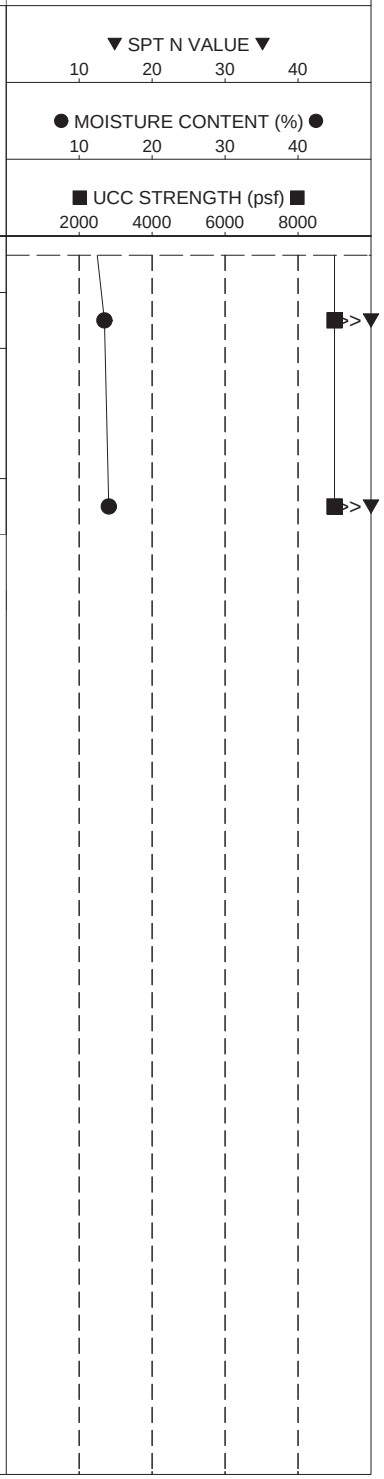
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/11/2016 **DATE COMPLETED:**10/12/2016 **LOG OF TEST BORING RW-08A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.0 ft											
	Hard LEAN CLAY, few sand, trace gravel, gray (CL)		SS9	13-33-41	74	100.0	9000+*	13.5				
		100										
			SS10	18-37-40	77	105.0	9000+*	14.1				
529.0	105.0	105										
	End of Boring at 105 ft.											
		110										
		115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461584.8
Northing: 360417.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: JD Hoksbergen
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 90 ft.

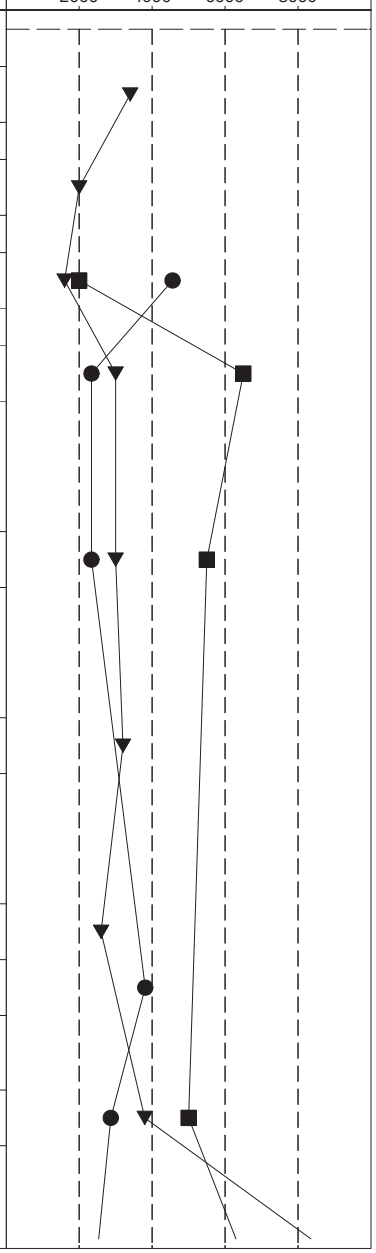
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/6/2016 **DATE COMPLETED:** 9/8/2016 **LOG OF TEST BORING** **SB-16**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft	0										
631.6	12 inches of PORTLAND CEMENT CONCRETE	1.0										
630.1	FILL - Medium dense poorly graded fine sand, trace silt, trace gravel, brown, moist (SP)	2.5	SS1	14-9-8	17	2.5						
			SS2	5-5-5	10	5.0						
627.1	FILL - Medium dense poorly graded fine sand, few gravel, trace clay and silt, brown, moist (SP)	5.5										
626.1	Stiff LEAN CLAY, trace sand, trace gravel, brown (CL)	6.5	SS3	4-3-5	8	7.5	2000*	22.8				
624.1	Loose SANDY SILT, trace clay, brown (ML)	8.5	SS4	5-6-9	15	10.0	6500*	11.7				
	Very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	10										
617.6		15.0	SS5	3-7-8	15	15.0	5500*	11.7				
	LEAN CLAY, few sand, trace gravel, gray (CL)	15	SS6	4-7-9	16	20.0	<>					
	NOTE: Poor recovery on SPT samples SS6 at 20 ft. and SS7 at 25 ft.	20										
			SS7	4-5-8	13	25.0	<>					
		25	DP8			26.5	<>	19.1				
605.6		27.0										
	Very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	30	SS9	7-8-11	19	30.0	5000*	14.3				



DRAFT

GROUNDWATER READINGS
First Encountered: 5.5 feet
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461700.8
Northing: 360015.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 45B
Engineer on Rig: L. Martinez
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 92 ft.

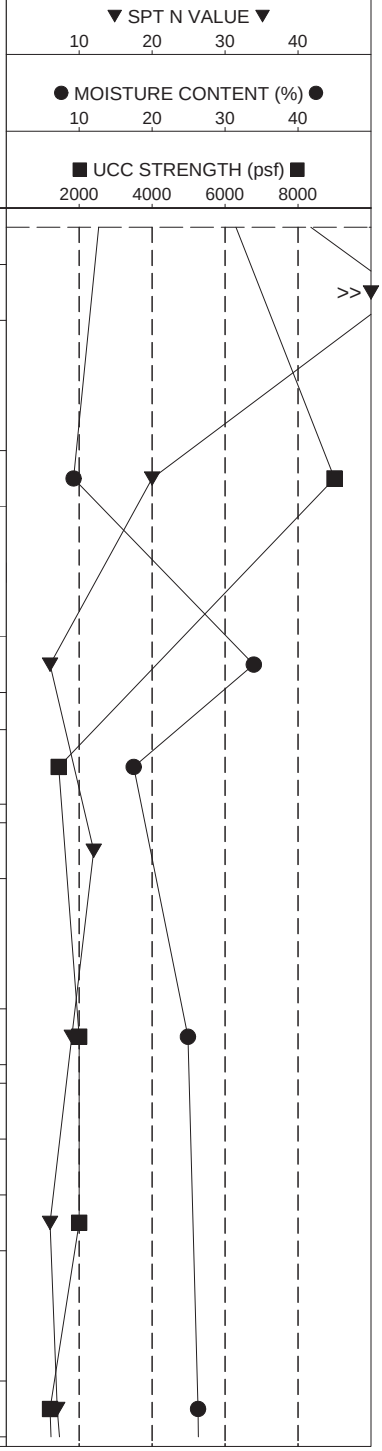
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/6/2016 **DATE COMPLETED:** 9/8/2016 **LOG OF TEST BORING** **SB-16**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft											
598.6	34.0											
	Very dense poorly graded fine to medium sand with silt, trace gravel, gray, wet (SP-SM)	35	SS10	7-25-29	54	35.0						
595.6	37.0											
	Hard LEAN CLAY, few sand, trace gravel, gray (CL)	40	SS11	5-7-13	20	40.0	9000*	9.2				
590.6	42.0											
	Medium LEAN CLAY, trace sand, trace gravel, gray (CL)	45	SS12	2-3-3	6	45.0	<>	33.9				
			ST13			48.0	1440	17.5	113			
583.6	49.0											
	Medium dense SILTY FINE TO MEDIUM SAND, trace gravel, occasional lean clay layers, dark gray, wet (SM)	50	SS14	3-5-7	12	50.0						
580.1	52.5											
	Stiff to soft LEAN CLAY, trace sand, trace gravel, gray (CL)	55	SS15	2-3-6	9	55.0	1990	24.9	106			
			VS1			57.0						
	NOTE: Vane shear test at 57 ft. terminated early due to high force gauge readings.	60	SS16	3-3-3	6	60.0	2000*					
		65	SS17	3-3-4	7	65.0	1200#	26.3				



GROUNDWATER READINGS
First Encountered: 5.5 feet
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461700.8
Northing: 360015.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 45B
Engineer on Rig: L. Martinez
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 92 ft.

DRAFT

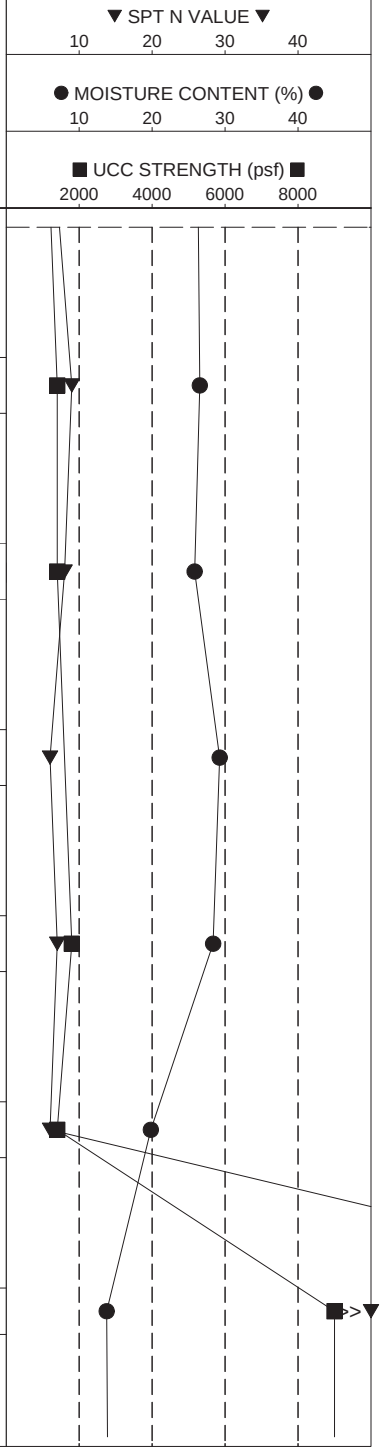
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

DRAFT

PROJECT NO. 2014195C **DATE STARTED:** 9/6/2016 **DATE COMPLETED:** 9/8/2016 **LOG OF TEST BORING** **SB-16**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft	65										
			SS18	3-4-5	9	70.0	1400#	26.5				
		70										
			SS19	3-3-5	8	75.0	920	25.8	105			
		75										
	Stiff to soft LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: Vane shear test at 57 ft. terminated early due to high force gauge readings.		SS20	2-2-4	6	80.0	<>	29.3				
		80										
			SS21	2-3-4	7	85.0	1800#	28.4				
		85										
			SS22	2-2-4	6	90.0	1400#	19.8				
		90										
540.6		92.0										
	Hard to very stiff LEAN CLAY, few sand, trace gravel, occasional fine sand layers below 100 ft., gray (CL) NOTE: Field Engineer reported possible cobble at		SS23	19-41-50/3"	91/9"	94.8	9000+*	13.8				
		95										



DRAFT

GROUNDWATER READINGS
First Encountered: 5.5 feet
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461700.8
Northing: 360015.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 45B
Engineer on Rig: L. Martinez
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 92 ft.

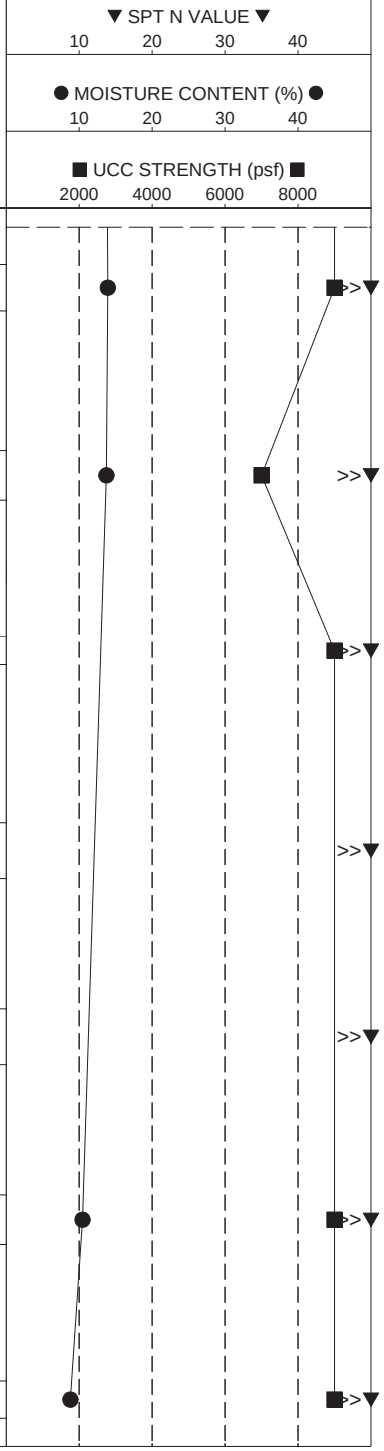
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/6/2016 **DATE COMPLETED:** 9/8/2016 **LOG OF TEST BORING** **SB-16**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft											
	92 and 102 ft.											
			SS24	23-45-50/3"	95/9"	99.8	9000+*	13.9				
		100										
	Hard to very stiff LEAN CLAY, few sand, trace gravel, occasional fine sand layers below 100 ft., gray (CL)		SS25	22-34-50/4"	84/10"	104.8	7000*	13.7				
		105										
	NOTE: Field Engineer reported possible cobble at 92 and 102 ft.											
523.1			SS26	41-50/3"	50 +	109.3	9000+*					
	109.5	110										
	Extremely dense SILTY FINE SAND, trace gravel, gray, moist (SM)		SS27	14-52-56	108	115.0						
		115										
513.6	119.0		SS28	27-29-37	66	120.0						
	Very dense FINE TO MEDIUM SAND with silt, trace gravel, dark gray, moist (SP/SM)	120										
510.9	121.7											
	Rock coring attempted, recovered granite cobbles											
509.1	123.5											
	NOTE: Heaving plugged core barrel		SS29	43-50-80/4"	130/10"	124.8	9000*	10.5				
	Hard LEAN CLAY/extremely dense CLAYEY SILT, few sand, trace gravel, occasional sand seams, Field Engineer reported cobbles at 130.5 and 131.5 ft., gray (CL/ML)	125										
			SS30	32-77	77+	129.5	9000*	8.8				
		130										



GROUNDWATER READINGS
First Encountered: 5.5 feet
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461700.8
Northing: 360015.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 45B
Engineer on Rig: L. Martinez
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 92 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

LOG OF TEST BORING I-75 DESIGN BUILD MODERNIZATION 2018.GPJ SOMAT.GDT 7/28/17

PROJECT NO. 2014195C **DATE STARTED:** 9/6/2016 **DATE COMPLETED:** 9/8/2016 **LOG OF TEST BORING** **SB-16**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft	130										
499.6		133.0										
498.8	Extremely weathered SHALE, black	133.8	SS31	107/3"	107 +	133.8						
	End of Boring at 133.8 ft. (Boring continued as Rock Core)	135										
		140										
		145										
		150										
		155										
		160										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

>>▼

DRAFT

GROUNDWATER READINGS

First Encountered: 5.5 feet
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461700.8
Northing: 360015.1

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 45B
Engineer on Rig: L. Martinez
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 92 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/11/2017 **DATE COMPLETED:** 1/11/2017 **LOG OF TEST BORING** **SB-16A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 / ● MOISTURE CONTENT (%) ● 10 20 30 40 / ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
	Ground Surface Elevation 632.4 ft	0											
631.6	10 inches of PORTLAND CEMENT CONCRETE (0.8)												
	Profile drilled	5											
		10											
		15											
		20											
		25											
		30											

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461698.5
Northing: 360029.4

Coordinates/GSE determined by:
Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks:

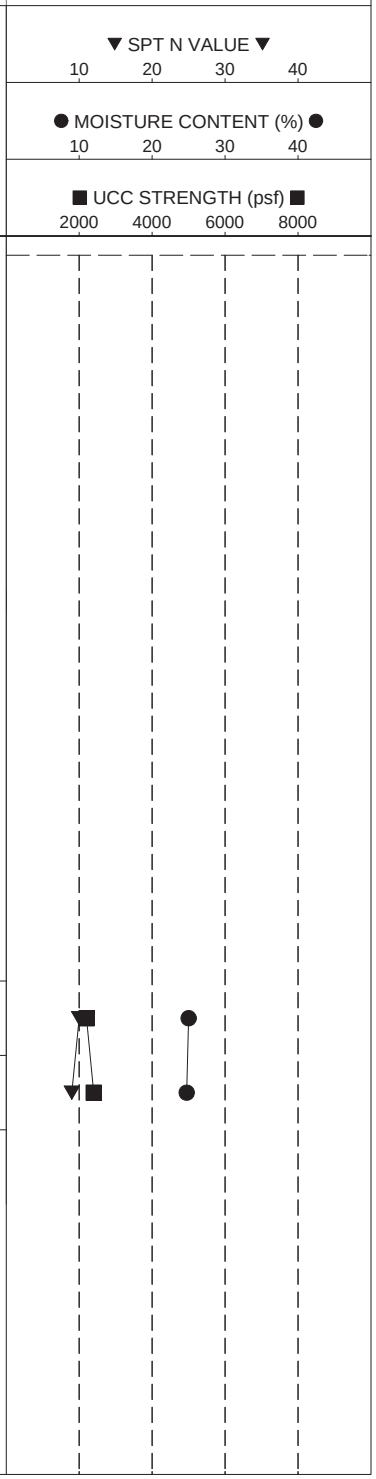
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/11/2017 **DATE COMPLETED:** 1/11/2017 **LOG OF TEST BORING** **SB-16A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.4 ft											
	Profile drilled	35, 40, 45, 50										
580.4		52.0										
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	55	SS1	4-4-6-6	10	54.0	2200#	25.0				
			SS2	2-4-5-6	9	56.0	2400#	24.7				
574.4		58.0										
	End of Boring at 58 ft. (Boring terminated at 58 ft. due to sand collapse)	60, 65										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461698.5
Northing: 360029.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks:

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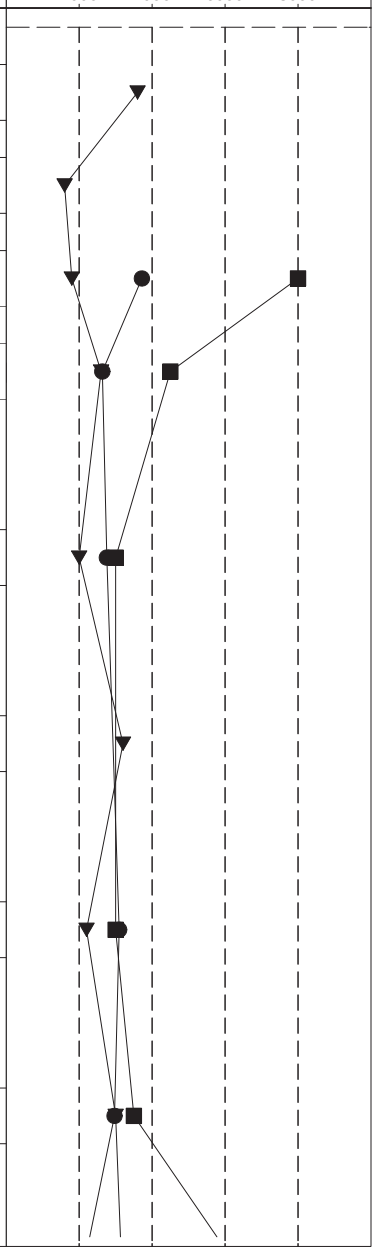
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/13/2017 **DATE COMPLETED:** 1/19/2017 **LOG OF TEST BORING** **SB-16B**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft	0										
631.8	10 inches of PORTLAND CEMENT CONCRETE 0.8											
	FILL - Medium dense to loose poorly graded fine sand, trace silt, trace gravel, brown (SP)		SS1	13-10-8	18	2.5						
			SS2	3-4-4	8	5.0						
626.6	6.0	5										
	Hard LEAN CLAY, trace sand, trace gravel, occasional sandy silt layers, brown (CL)		SS3	3-4-5	9	7.5	8000*	18.6				
624.1	8.5											
			SS4	4-5-8	13	10.0	4500*	13.2				
		10										
			SS5	4-4-6	10	15.0	3000*	13.8				
		15										
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)											
	NOTE: No recovery on SPT sample attempt at 20 ft. due to sample falling out of sampler.		NR6	5-7-9	16	20.0						
		20										
			SS7	4-4-7	11	25.0	3000*	15.5				
		25										
604.1	28.5											
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)		SS8	4-7-8	15	30.0	3500*	14.8				
		30										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461702.8
Northing: 360008.6

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

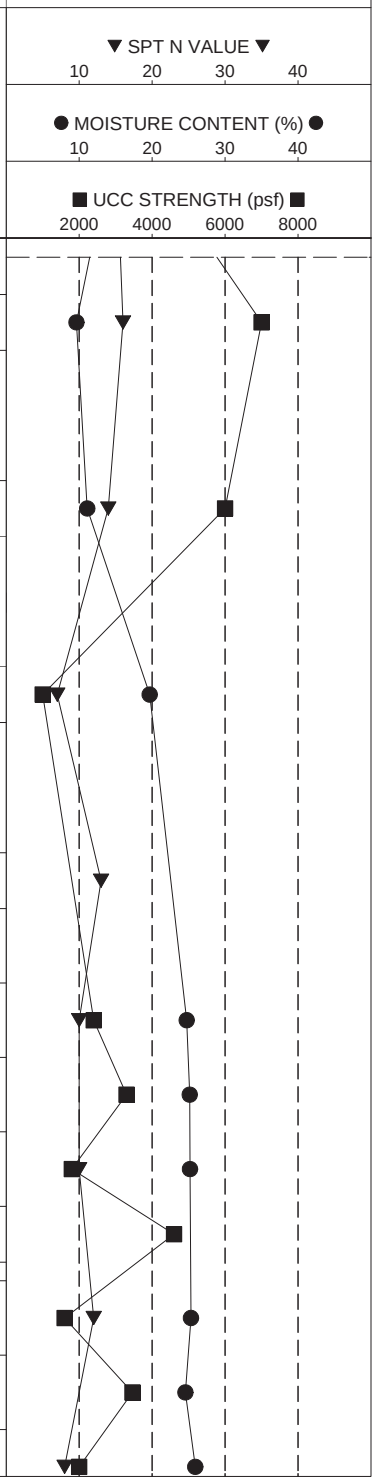
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/13/2017 **DATE COMPLETED:** 1/19/2017 **LOG OF TEST BORING** **SB-16B**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft											
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)		SS9	5-7-9	16	35.0	7000*	9.6				
		35										
			SS10	5-7-7	14	40.0	6000*	11.1				
		40										
589.6	43.0											
	Medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS11	3-3-4	7	45.0	1000#	19.7				
		45										
584.1	48.5											
	Medium dense SILTY CLAYEY SAND with gravel, occasional silty fine sand layers, gray, moist (SC-SM)		SS12	5-7-6	13	50.0				21	7	34
		50										
580.6	52.0											
	Very stiff to medium LEAN CLAY, few sand, trace to few gravel, gray (CL)		SS13	4-4-6-7	10	54.0	2400#	24.7				
		55	ST14			56.0	3300	25.2	103	40	19	93
			SS15	3-4-6-7	10	58.0	1800#	25.2				
	NOTE: Poor recovery on Shelby tube SS21 at 74 ft.		VS1			59.5	4600					
		60										
			SS16	4-6-6-7	12	62.0	1600#	25.3				
			ST17			64.0	3460	24.6	101			
		65										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461702.8
Northing: 360008.6

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

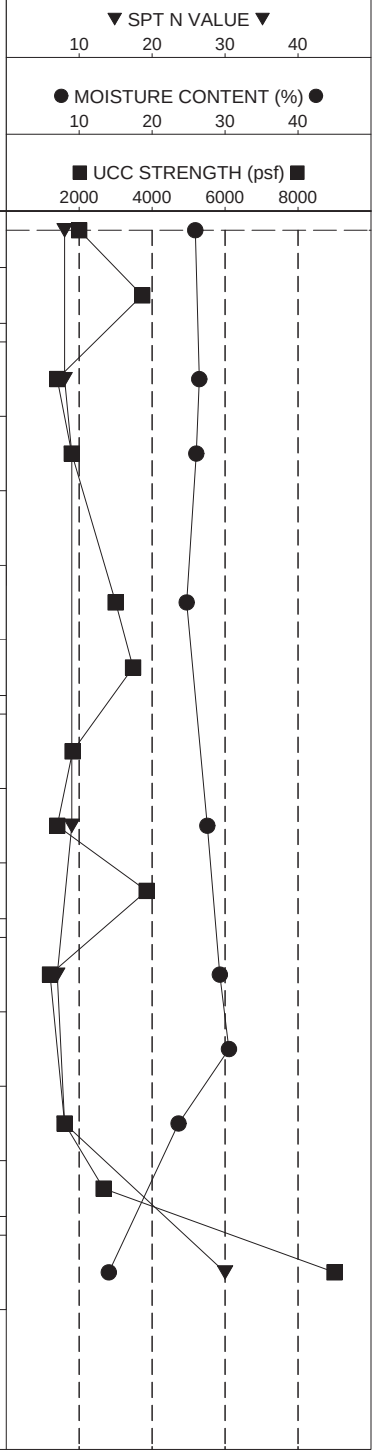
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 1/13/2017 **DATE COMPLETED:** 1/19/2017 **LOG OF TEST BORING** **SB-16B**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft	65	SS18	2-3-5-6	8	66.0	2000#	25.9				
			VS2			67.5	3730					
			SS19	2-3-5-6	8	70.0	1400#	26.5				
		70	SS20	2-4-5-7	9	72.0	1800#	26.1				
			ST21			74.0	<>					
		75	ST22			76.0	3000*	24.7		39	19	81
			VS3			77.5	3480					
	Very stiff to medium LEAN CLAY, few sand, trace to few gravel, gray (CL)		ST23			80.0	1820					
	NOTE: Poor recovery on Shelby tube SS21 at 74 ft.	80	SS24	3-4-5-6	9	82.0	1400#	27.6				
			VS4			83.5	3850					
		85	SS25	3-3-4-6	7	86.0	1200#	29.3				
			ST26			88.0	<>	30.5		37	16	89
			SS27	2-4-4-6	8	90.0	1600#	23.6				
		90	VS5			91.5	2670					
539.6		93.0	SS28	14-12-18-33	30	94.0	9000+#	14.1				
538.6	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)	94.0										
		95										
	End of Boring at 94 ft.											



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461702.8
Northing: 360008.6

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

DRAFT

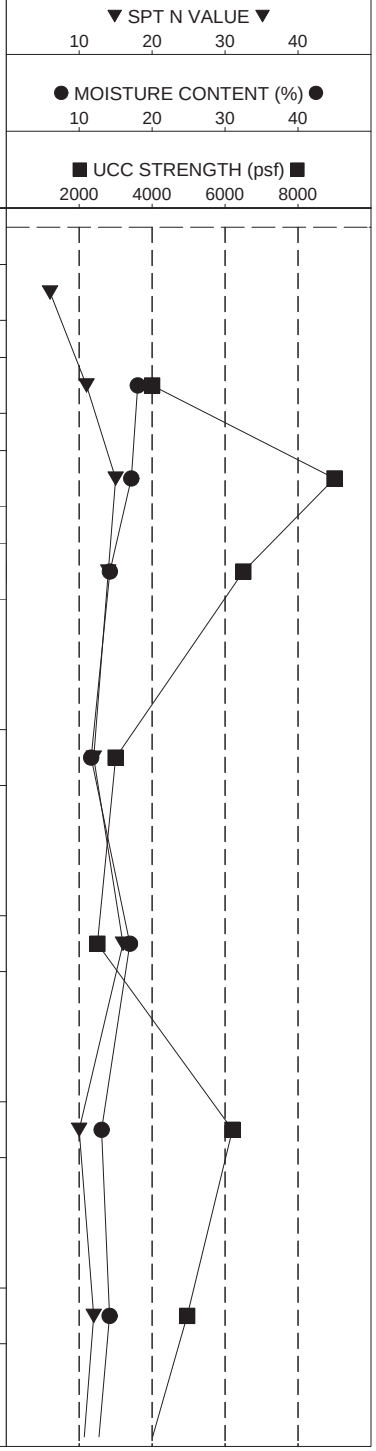
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/17/2016 **DATE COMPLETED:** 8/18/2016 **LOG OF TEST BORING** **SB-17**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
632.3	Ground Surface Elevation 632.8 ft	0
	6 inches of PORTLAND CEMENT CONCRETE	0.5
630.5	FILL - Loose poorly graded fine sand with silt, trace gravel, occasional lean clay seams, brown with occasional layers of black (SP-SM)	2.3
626.8	Very stiff LEAN CLAY, trace sand, trace gravel, frequent fine sand partings, mottled brown and gray (CL)	6.0
624.3	Hard LEAN CLAY/CLAYEY SILT, trace sand, trace gravel, brown (CL/ML)	8.5
	Very stiff to stiff LEAN CLAY, few sand, trace gravel, fine gravel layer at approximately 14 ft., gray (CL)	
611.8	Very stiff to stiff LEAN CLAY, few sand, trace gravel, gray (CL)	21.0

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	4-3-3	6	2.5						
SS2	3-4-7	11	5.0	4000*	18.0				
SS3	3-6-9	15	7.5	9000+*	17.1				
SS4	3-6-8	14	10.0	6500*	14.2				
SS5	5-5-7	12	15.0	3000*	11.6				
SS6	4-7-9	16	20.0	2500*	17.0				
SS7	3-5-5	10	25.0	6200	13.1	125			
SS8	3-5-7	12	30.0	4960	14.2	126			



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461747.0
Northing: 359865.4

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Valentine
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 7.5 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 120 ft.

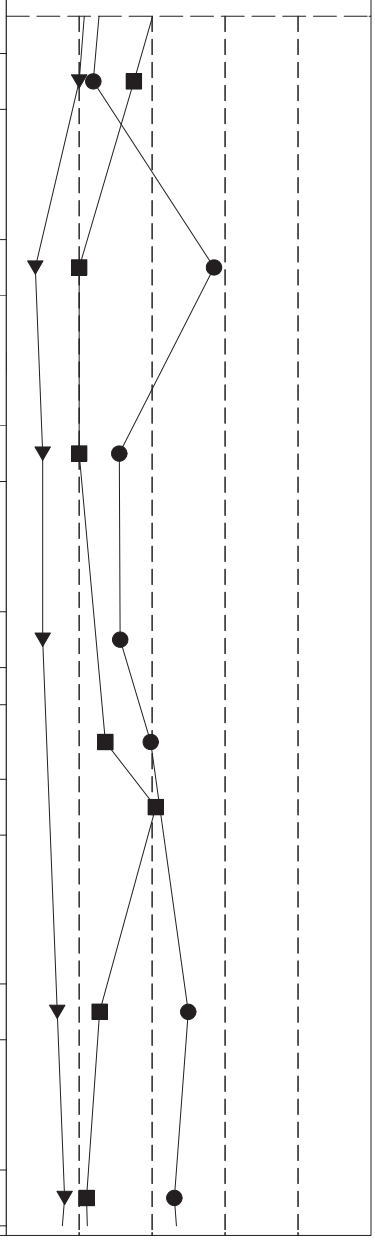
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/17/2016 **DATE COMPLETED:** 8/18/2016 **LOG OF TEST BORING** **SB-17**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.8 ft											
	Very stiff to stiff LEAN CLAY, few sand, trace gravel, gray (CL)	35	SS9	2-6-4	10	35.0	3500*	11.9				
		40	SS10	1-2-2	4	40.0	2000*	28.5				
		45	SS11	2-3-2	5	45.0	2000*	15.5				
582.8		50.0	SS12	2-3-2	5	50.0	<>	15.6				
	Very stiff to stiff SANDY LEAN CLAY, trace gravel, gray (CL)	50	ST13			53.0	2720	19.8	111	29	13	67
			VS1			54.5	4100					
		55										
		60	SS14	1-3-4	7	60.0	2560	24.9	103			
		65	SS15	2-4-4	8	65.0	2200#	23.0				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461747.0
Northing: 359865.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

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Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
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DRAFT

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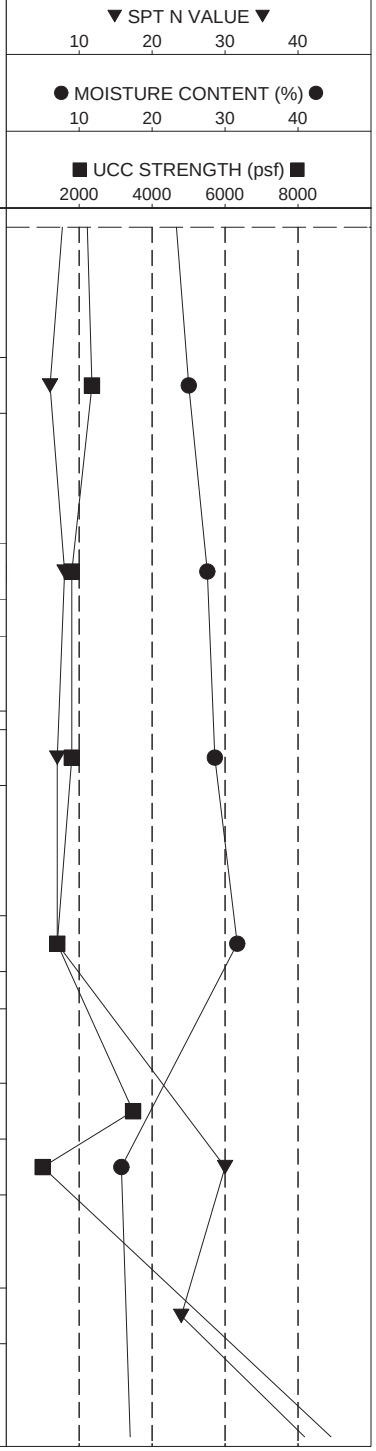
I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/17/2016 **DATE COMPLETED:** 8/18/2016 **LOG OF TEST BORING** **SB-17**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.8 ft	65										
	Very stiff to stiff SANDY LEAN CLAY, trace gravel, gray (CL)											
			SS16	2-3-3	6	70.0	2350	25.0	105			
562.8		70.0										
	Medium FAT CLAY, trace sand, gray (CH)	70										
			SS17	1-4-4	8	75.0	1800#	27.6				
		75										
	NOTE: No recovery on Shelby tube attempt at 78 ft. due to sample falling out of sampler.		NR18			78.0						
			SS19	2-3-4	7	80.0	1800#	28.6		52	29	98
		80										
			SS20	1-3-4	7	85.0	1400#	31.7				
547.8		85.0										
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	85										
			NR21			88.0						
			VS2			89.5	3480					
	NOTE: No recovery on Shelby tube attempt at 88 ft. due to sample falling out of sampler.	90	SS22	6-12-18	30	91.0	1000*	15.8				
538.3		94.5	SS23	6-12-12	24	95.0						
	Alternating layers of LEAN CLAY and SILTY FINE SAND, trace gravel, occasional clayey sand	95										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461747.0
Northing: 359865.4

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Valentine
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 7.5 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 120 ft.

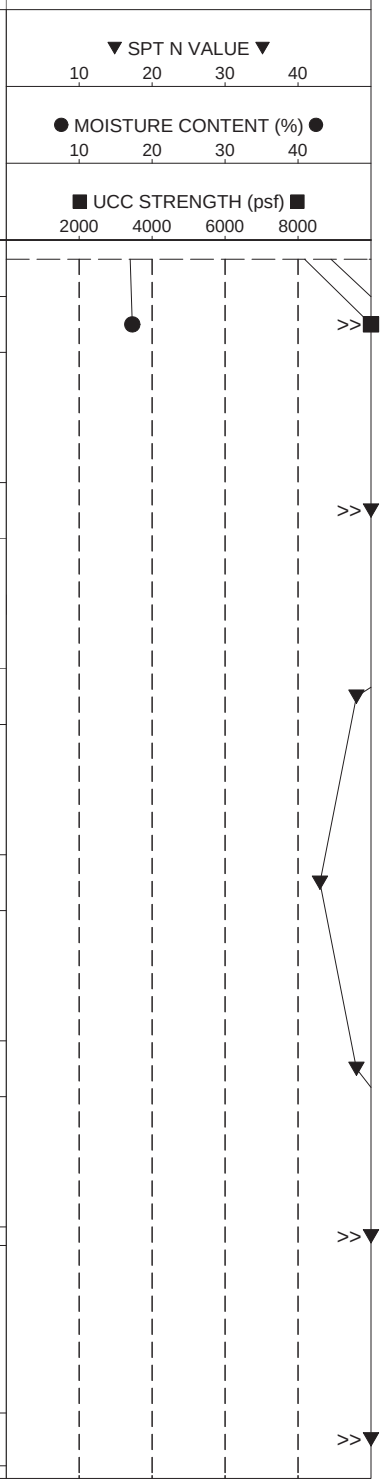
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/17/2016 **DATE COMPLETED:** 8/18/2016 **LOG OF TEST BORING** **SB-17**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
534.8	Ground Surface Elevation 632.8 ft seams, gray (CL)(SM) 98.0											
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)	100	SS24	12-21-29	50	100.0	10810	17.3	117			
530.3	102.5											
	Alternating layers of LEAN CLAY, CLAYEY SAND and CLAYEY SILT, trace gravel, occasional fine sand layers, gray, moist (CL)(SC)(ML)	105	SS25	41-48-40	88	105.0	<>					
522.8	110.0	110	SS26	25-22-26	48	110.0						
	Dense CLAYEY SILT, trace sand, gray, moist (ML)	115	SS27	11-17-26	43	115.0						
512.8	120.0	120	SS28	24-27-21	48	120.0						
	Extremely dense CLAYEY SAND, trace gravel, trace shale pieces, gray, moist (SC)	125	SS29	66	66+	124.0						
		130	SS30	28-42-50/5"	92/11"	129.9						



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461747.0
Northing: 359865.4

Coordinates/GSE determined by: Survey

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QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 120 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/17/2016 **DATE COMPLETED:** 8/18/2016 **LOG OF TEST BORING** **SB-17**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.8 ft	130										
499.3	Extremely dense CLAYEY SAND, trace gravel, trace shale pieces, gray, moist (SC) 133.5		SS31	23-50/5"	50 +	134.4						
		135										
494.2	Completely weathered SHALE pieces, dark gray 138.6		SS32	50/1"	50 +	138.6						
	End of Boring at 138.6 ft. (Boring continued as Rock Core)	140										
		145										
		150										
		155										
		160										

FIELD DATA

LABORATORY DATA

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

>>▼

>>▼

DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461747.0
Northing: 359865.4

Coordinates/GSE determined by: Survey

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* Penetrometer
<> Disturbed Sample

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Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 7.5 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 120 ft.

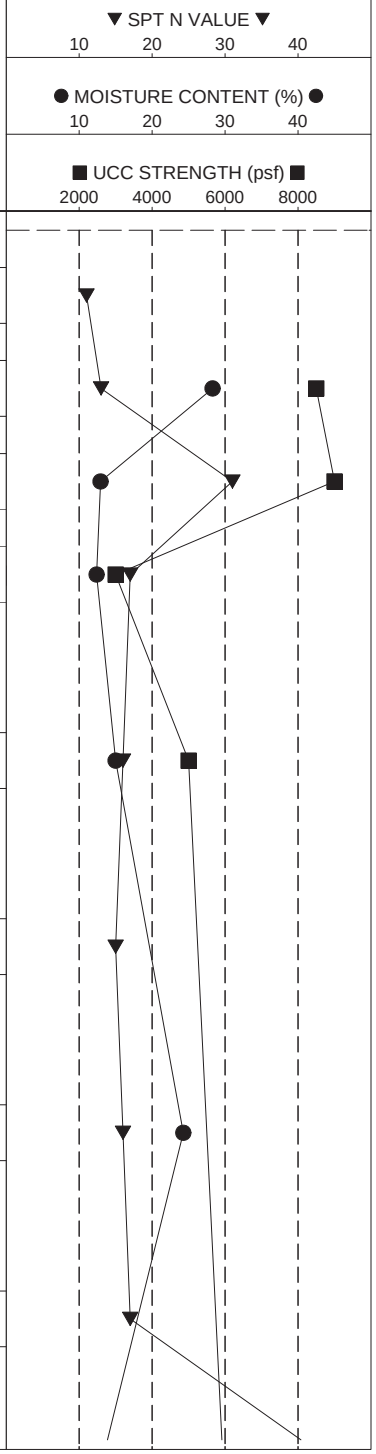
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/6/2016 **DATE COMPLETED:** 9/6/2016 **LOG OF TEST BORING** **SB-17A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.8 ft	0										
632.0	9 inches of PORTLAND CEMENT CONCRETE	0.8										
631.8		1.0										
630.8	Field Engineer reported 3 inches of sand and gravel FILL (Base Material)	2.0	SS1	5-7-4	11	2.5						
	FILL - Poorly graded fine sand, trace silt, trace gravel, brown, moist (SP)		SS2	2-5-8	13	5.0	8500*	28.3				
	Hard LEAN CLAY, trace sand, trace gravel, brown (CL)	5	SS3	8-15-16	31	7.5	9000*	12.9				
625.3		7.5										
			SS4	4-7-10	17	10.0	3000*	12.4				
		10										
			SS5	4-7-9	16	15.0	5000*	15.0	119	34	19	72
		15										
	Stiff to very stiff LEAN CLAY with sand, trace gravel, occasional fine sand layers below 30 ft., gray (CL)		NR6	5-6-9	15	20.0						
	NOTE: No recovery on SPT sample attempts at 20 and 30 ft. due to sample falling out of sampler.	20										
			SS7	4-6-10	16	25.0	<>	24.3				
		25										
			NR8	4-7-10	17	30.0						
		30										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461750.7
Northing: 359848.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 750X
Engineer on Rig: M. Wajed
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 5 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

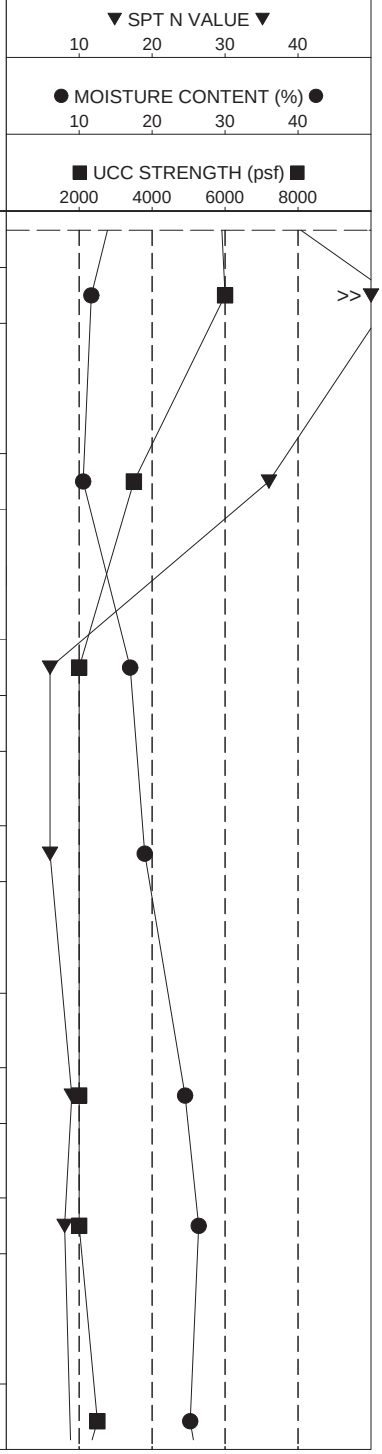
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/6/2016 **DATE COMPLETED:** 9/6/2016 **LOG OF TEST BORING** **SB-17A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.8 ft											
597.8	35.0	35	SS9	16-24-29	53	35.0	6000*	11.7				
	Stiff LEAN CLAY, trace sand, trace gravel, occasional fine sand layers, gray (CL) NOTE: Vane shear test at 46.5 ft. terminated early due to possible cobble.	40	SS10	7-19-17	36	40.0	3500*	10.5				
		45	SS11	2-3-3	6	45.0	2000*	17.0				
			VS1			46.5						
582.8	50.0	50	SS12	1-2-4	6	50.0	<>	19.0				
	Stiff to medium LEAN CLAY, trace to few sand, trace gravel, gray (CL) NOTE: No recovery on Shelby tube attempt at 55 ft. due to sample falling out of sampler.		NR13			55.0						
		55	SS14	1-5-4	9	56.5	2000#	24.5				
		60	SS15	2-3-5	8	60.0	1800	26.4	102			
		65	ST16			65.5	2500	25.2	100	38	18	92



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461750.7
Northing: 359848.7

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 750X
Engineer on Rig: M. Wajed
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 5 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

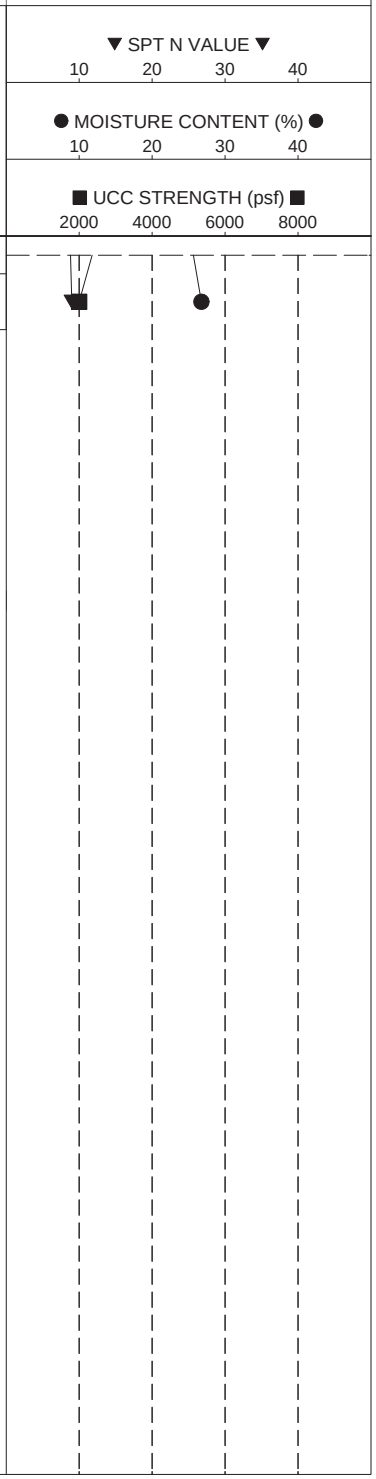
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 9/6/2016 **DATE COMPLETED:** 9/6/2016 **LOG OF TEST BORING** **SB-17A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.8 ft	65										
565.8	67.0		SS17	2-4-5	9	67.0	2000#	26.8				
	End of Boring at 67 ft.	70										
		75										
		80										
		85										
		90										
		95										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461750.7
Northing: 359848.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

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Engineer on Rig: M. Wajed
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 5 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/13/2016 **DATE COMPLETED:**10/14/2016 **LOG OF TEST BORING** **SB-17B**

LOG OF SOIL PROFILE				FIELD DATA				LABORATORY DATA						
ELEVATION ft			DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 ● MOISTURE CONTENT (%) ● 10 20 30 40 ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
		Ground Surface Elevation 632.8 ft	0											
			5											
			10											
			15											
		Profile drilled to 53 ft.	20											
			25											
			30											

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461754.4
Northing: 359833.7

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: C. Shroeder/S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

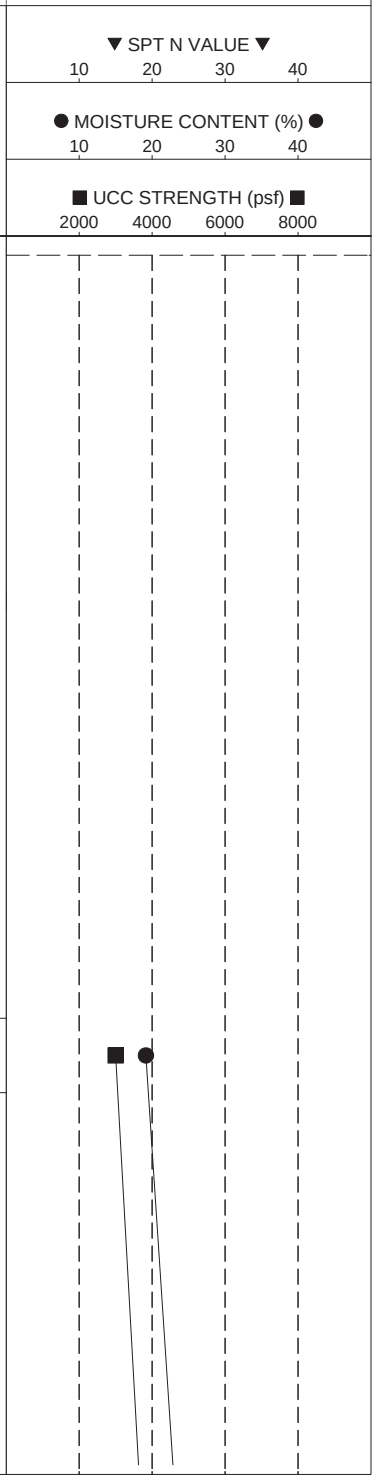
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/13/2016 **DATE COMPLETED:**10/14/2016 **LOG OF TEST BORING** **SB-17B**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.8 ft											
	Profile drilled to 53 ft.	35, 40, 45, 50										
579.8		53.0										
	Stiff to very stiff LEAN CLAY with sand, trace gravel, gray (CL)	55, 60, 65	ST1			55.0	3000*	19.2	117	31	15	79



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461754.4
Northing: 359833.7

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: C. Shroeder/S. Whoolery
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Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
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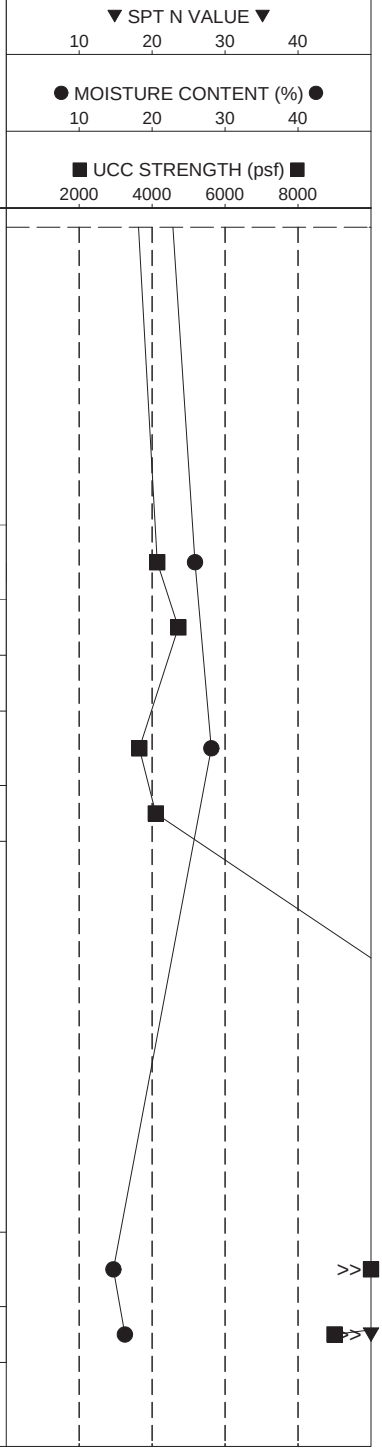
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/13/2016 **DATE COMPLETED:**10/14/2016 **LOG OF TEST BORING** **SB-17B**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.8 ft											
	Stiff to very stiff LEAN CLAY with sand, trace gravel, gray (CL)	65, 70, 75	ST2			75.0	4140	25.9	99			
			VS1			76.5	4720					
554.8		78.0										
	Stiff to very stiff LEAN CLAY, trace sand, gray (CL)	80, 85, 90	ST3			80.0	3650	28.1	98	40	21	98
			VS2			81.5	4100					
540.8		92.0										
	Very hard to hard LEAN CLAY, trace sand, trace gravel, gray (CL)	95	ST4			94.0	22720	14.7	124			
			SS5	19-34-50	53	95.5	9000+*	16.3				
537.3		95.5										
	End of Boring at 95.5 ft.											



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461754.4
Northing: 359833.7

Coordinates/GSE determined by: Survey

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Torvane
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<> Disturbed Sample

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Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
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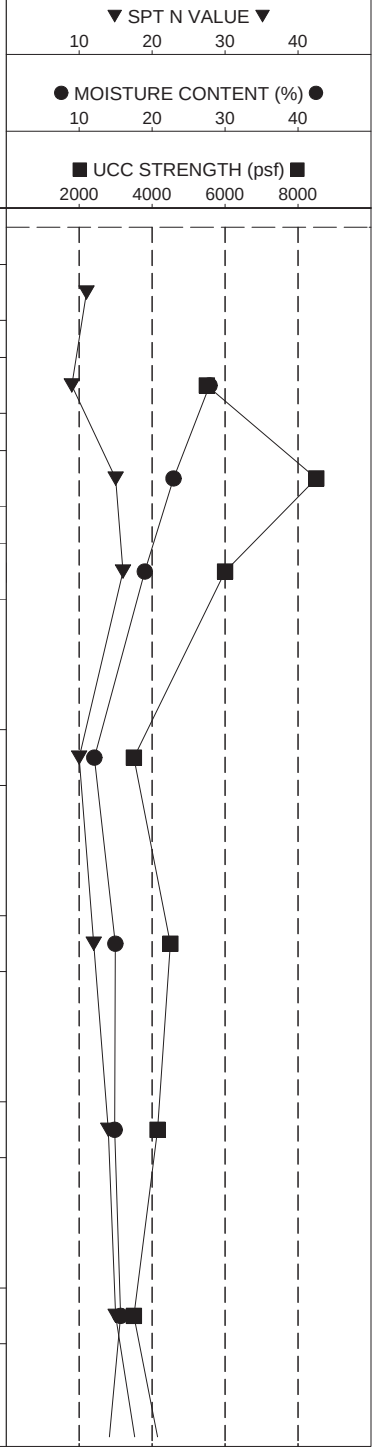
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/17/2016 **DATE COMPLETED:** 8/18/2016 **LOG OF TEST BORING** **SB-18**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 633.3 ft	0
632.6	8 inches of PORTLAND CEMENT CONCRETE	0.7
632.3		1.0
631.0	Field Engineer reported 4 inches of gravel FILL (Base Material)	2.3
	FILL - Medium dense poorly graded fine sand, trace silt, trace gravel, trace asphalt debris, occasional lean clay layers, brown, moist (SP)	
625.8	Very stiff to hard LEAN CLAY, trace sand, trace gravel, occasional silt partings, mottled brown and gray (CL)	7.5
620.8	Very stiff LEAN CLAY, trace sand, trace gravel, occasional fine sand partings and silt partings, brown (CL)	12.5
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	10-6-5	11	2.5						
SS2	3-4-5	9	5.0	5500*	27.9				
SS3	5-6-9	15	7.5	8500*	22.9				
SS4	4-8-8	16	10.0	6000*	19.0				
SS5	4-4-6	10	15.0	3500*	12.1				
SS6	5-5-7	12	20.0	4500*	15.0				
SS7	4-7-7	14	25.0	4150	14.9	124			
SS8	6-7-8	15	30.0	3500*	15.7				



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461819.0
Northing: 359622.4

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: C. Kennedy
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 92 ft.

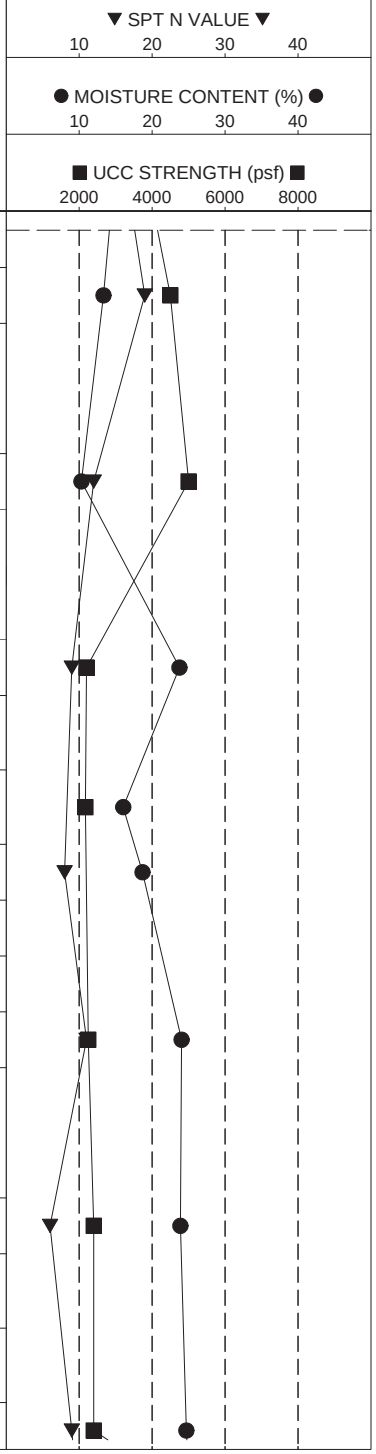
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/17/2016 **DATE COMPLETED:** 8/18/2016 **LOG OF TEST BORING** **SB-18**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.3 ft											
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	35	SS9	7-8-11	19	35.0	4500*	13.3				
		40	SS10	4-5-7	12	40.0	5000*	10.3				
592.3	41.0											
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	45	SS11	2-4-5	9	45.0	2200#	23.7				
			ST12			49.0	2170	16.0	122			
		50	SS13	4-4-4	8	50.5	<>	18.7				
			VS1			52.0						
	NOTE: Vane shear test at 52 ft. terminated early due to high force gauge readings. No recovery on Shelby tube attempt at 64 ft. due to sample falling out of sampler.	55	SS14	4-5-6	11	55.0	2250	24.0	107			
		60	SS15	2-3-3	6	60.0	2400#	23.9				
			NR16			64.0						
		65	SS17	4-4-5	9	65.5	2400#	24.7				



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461819.0
Northing: 359622.4

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<> Disturbed Sample

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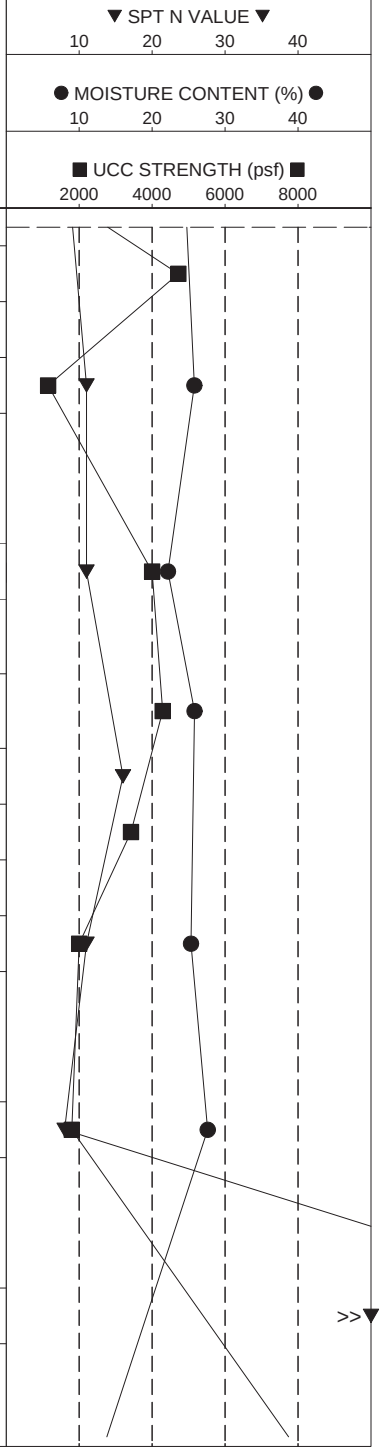
I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/17/2016 **DATE COMPLETED:** 8/18/2016 **LOG OF TEST BORING** **SB-18**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.3 ft											
567.8	65.5	65										
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		VS2			67.0	4720					
			SS18	4-5-6	11	70.0	1150	25.8	104			
563.3	70.0	70										
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS19	4-5-6	11	75.0	4000*	22.2				
		75										
			ST20			79.0	4290	25.8	100			
554.3	79.0											
552.8	Alternating seams of SANDY LEAN CLAY and SILTY FINE SAND, gray (CL)(SM)	80	SS21	7-7-9	16	80.5	<>					
	80.5		VS3			82.0	3420					
			SS22	3-5-6	11	85.0	2000#	25.3				
		85										
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS23	3-5-3	8	90.0	1800#	27.6				
		90										
541.3	92.0											
	Extremely dense CLAYEY SAND, trace gravel, gray (SC)		SS24	34-43-46	89	95.0						
		95										
536.3	97.0											



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461819.0
Northing: 359622.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: C. Kennedy
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 92 ft.

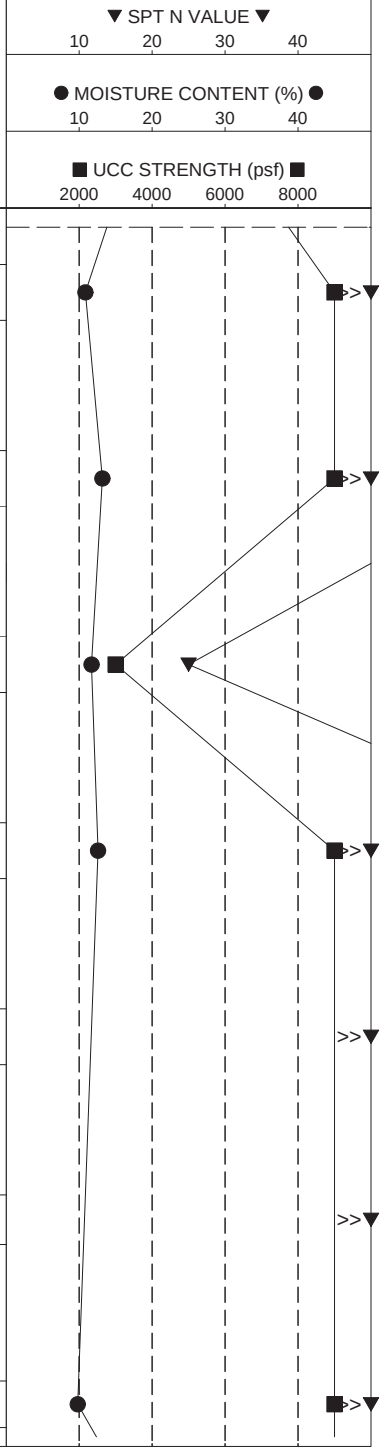
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/17/2016 **DATE COMPLETED:** 8/18/2016 **LOG OF TEST BORING** **SB-18**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.3 ft											
	Hard LEAN CLAY, few sand, trace gravel, occasional silty fine sand pockets, gray (CL)	100	SS25	22-46-46	92	100.0	9000+*	10.9				
		105	SS26	14-32-39	71	105.0	9000+*	13.2				
524.8	108.5											
	Stiff LEAN CLAY with sand, trace gravel, gray (CL)	110	SS27	7-11-14	25	110.0	3000*	11.7				
522.3	111.0											
	Hard LEAN CLAY, trace sand, trace gravel, occasional silt partings, gray (CL)	115	SS28	22-30-54	84	115.0	9000+*	12.6				
517.3	116.0											
	Very dense to extremely dense CLAYEY SILT, trace sand, trace gravel, driller reported possible gravel layer 125-126 ft., gray (CL)	120	SS29	26-36-38	74	120.0						
		125	SS30	41-56-50/4"	106/10"	124.8						
507.3	126.0											
	Hard LEAN CLAY, few sand, trace gravel, gray (CL)	130	SS31	39-46-50/3"	96/9"	129.8	9000+*	9.8				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461819.0
Northing: 359622.4

Coordinates/GSE determined by: Survey

KEY
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* Penetrometer
<> Disturbed Sample

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Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
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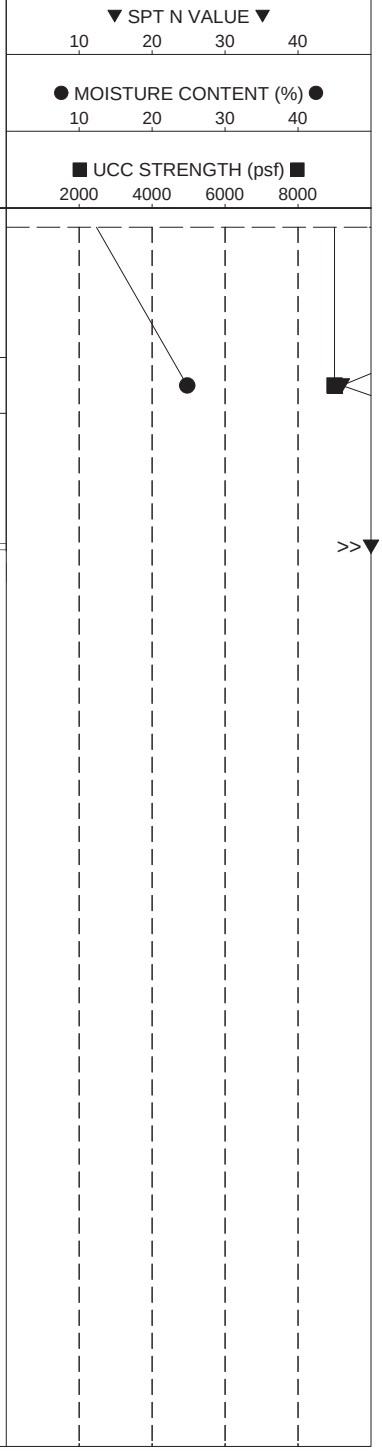
I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 8/17/2016 **DATE COMPLETED:** 8/18/2016 **LOG OF TEST BORING** **SB-18**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.3 ft	130										
	Hard LEAN CLAY, few sand, trace gravel, gray (CL)	135	SS32	12-20-26	46	135.0	9000+*	24.8				
495.3		138.0										
494.6	SHALE pieces, dark gray	138.7	SS33	74/2"	74 +	138.7						
	End of Boring at 138.7 ft. (Boring continued as Rock Core)	140										
		145										
		150										
		155										
		160										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461819.0
Northing: 359622.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: C. Kennedy
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 92 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/21/2016 **DATE COMPLETED:** 1/9/2017 **LOG OF TEST BORING** **SB-18A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.3 ft	0										
632.6	8 inches of PORTLAND CEMENT CONCRETE	0.7										
632.3	Field Engineer reported 4 inches of sand and gravel FILL (Base Material)	1.0										
		5										
		10										
		15										
	Profile drilled to 52 ft.											
		20										
		25										
		30										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461812.8
Northing: 359642.2

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: C. Schroeder
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 91 ft.

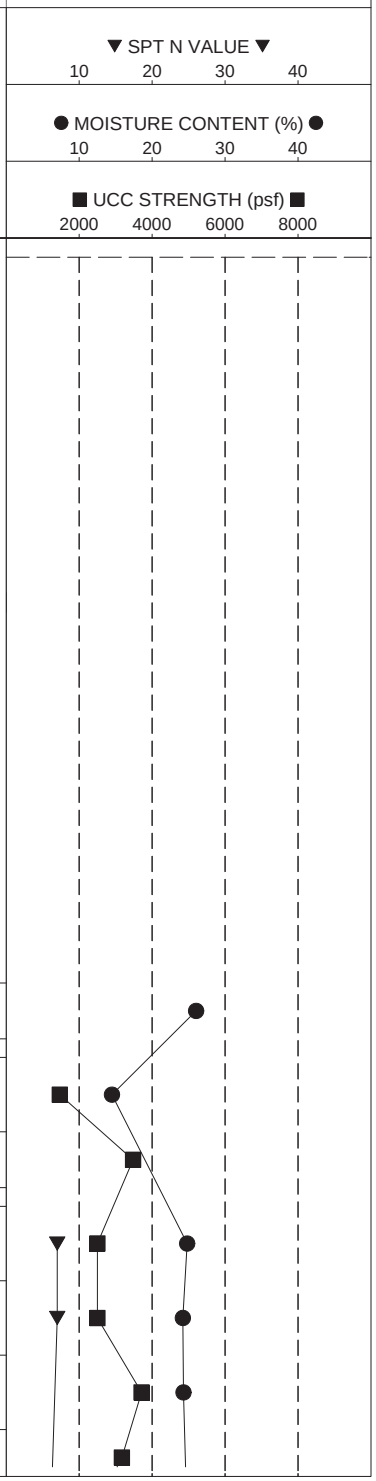
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/21/2016 **DATE COMPLETED:** 1/9/2017 **LOG OF TEST BORING** **SB-18A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.3 ft											
	Profile drilled to 52 ft.	35, 40, 45, 50										
581.3		52.0										
	Medium to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		DP1			53.5	<>	26.0				
		55	ST2			56.0	1470	14.5	105			
			VS1			57.5	3480					
	NOTE: No recovery on Shelby tube attempt at 54 ft. due to sample falling out of sampler; direct pushed at 53.4 ft. to retrieve sample. Poor sample recovery on STP sample SS7 at 70 ft.		SS3	3-3-4-5	7	60.0	2500*	24.8				
		60	SS4	2-3-4-5	7	62.0	2500*	24.2				
			ST5			64.0	3710	24.3	102	40	21	96
		65	VS2			65.5	3170					



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461812.8
Northing: 359642.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: C. Schroeder
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 91 ft.

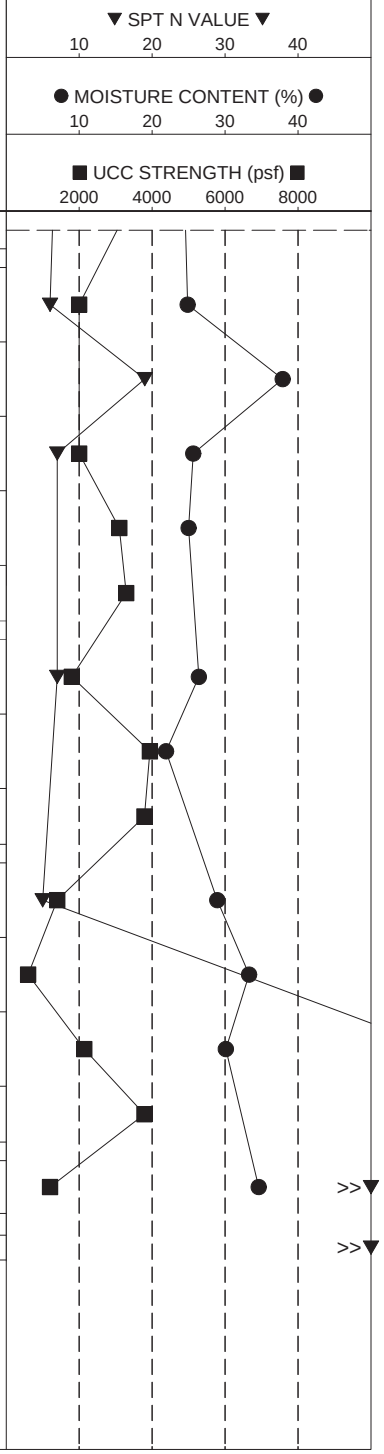
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/21/2016 **DATE COMPLETED:** 1/9/2017 **LOG OF TEST BORING** **SB-18A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.3 ft	65										
	Medium to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS6	2-2-4-5	6	68.0	2000*	24.9				
			SS7	7-8-11-12	19	70.0	<>	37.9				
	NOTE: No recovery on Shelby tube attempt at 54 ft. due to sample falling out of sampler; direct pushed at 53.4 ft. to retrieve sample. Poor sample recovery on STP sample SS7 at 70 ft.	70	SS8	2-2-5-5	7	72.0	2000*	25.6				
			ST9			74.0	3100	25.0	86			
		75	VS3			75.5	3290					
557.3	76.0											
	Stiff to soft LEAN CLAY, trace sand, trace gravel, gray (CL)		SS10	1-3-4-5	7	78.0	1800#	26.4				
			ST11			80.0	3940	21.9	107	42	22	98
	NOTE: No recovery on Shelby tube attempt at 86 ft. due to sample falling out of sampler; direct pushed to 86 ft. to retrieve sample.	80	VS4			81.5	3790					
			SS12	2-2-3-5	5	84.0	1400#	28.9				
		85	DP13			86.0	600#	33.3				
547.3	86.0											
	Stiff to medium LEAN CLAY, trace sand, gray (CL)		ST14			88.0	2140	30.1	93	46	25	99
			VS5			89.5	3790					
542.3	91.0	90	SS15	3-20-50/5"	70/11"	91.4	1200#	34.6				
	Extremely dense SILTY FINE SAND, trace gravel, gray, moist (SM)											
540.6	92.7		SS16	35-50/2"	50 +	92.7						
	End of Boring at 92.7 ft. (Terminated due to SPT sampler refusal)	95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461812.8
Northing: 359642.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: C. Schroeder
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 91 ft.

DRAFT

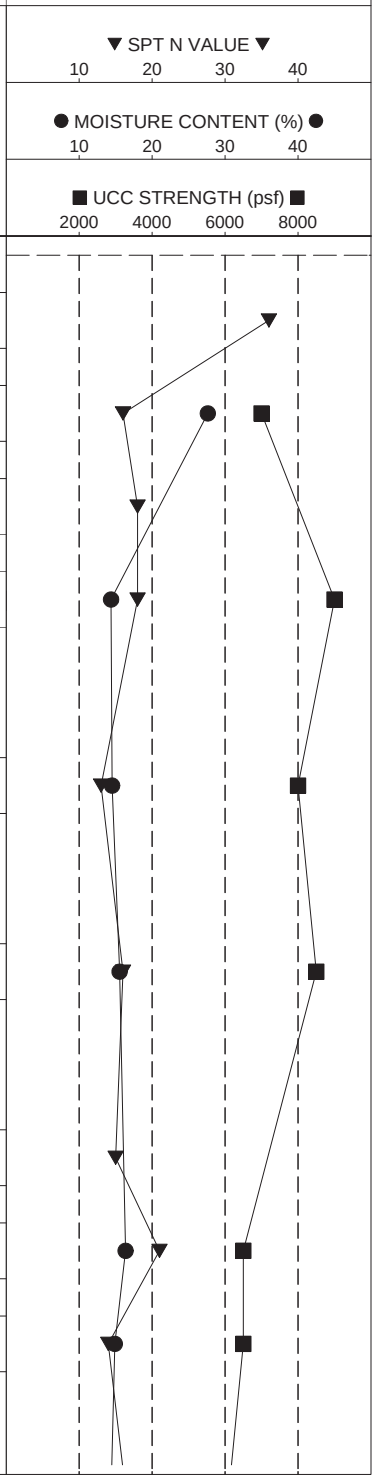
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/8/2015 **DATE COMPLETED:** 10/8/2015 **LOG OF TEST BORING** **TB-04**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
632.2	Ground Surface Elevation 632.5 ft	0
	4 inches of SANDY TOPSOIL, brownish black	0.3
628.5	FILL - Mixed dense poorly graded fine sand and topsoil, with silt, trace gravel, trace glass debris, dark brown, moist	4.0
626.0	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	6.5
623.5	Medium dense SANDY SILT, occasional clay seams, brown, moist (ML)	9.0
	Hard to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: No recovery on SPT sample attempt at 25 ft. due to sample falling out of sampler.	
604.0		28.5

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	22-19-17	36	2.5						
SS2	7-8-8	16	5.0	7000*	27.6				
SS3	6-8-10	18	7.5						
SS4	6-8-10	18	10.0	9000+*	14.4				
SS5	6-6-7	13	15.0	8000*	14.5				
SS6	5-7-9	16	20.0	8500*	15.5				
NR7	5-6-9	15	25.0						
SS8	6-9-12	21	27.5	6500*	16.4				
SS9	4-6-8	14	30.0	6500*	14.9	120	30	15	69



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461895.6
Northing: 359374.6

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

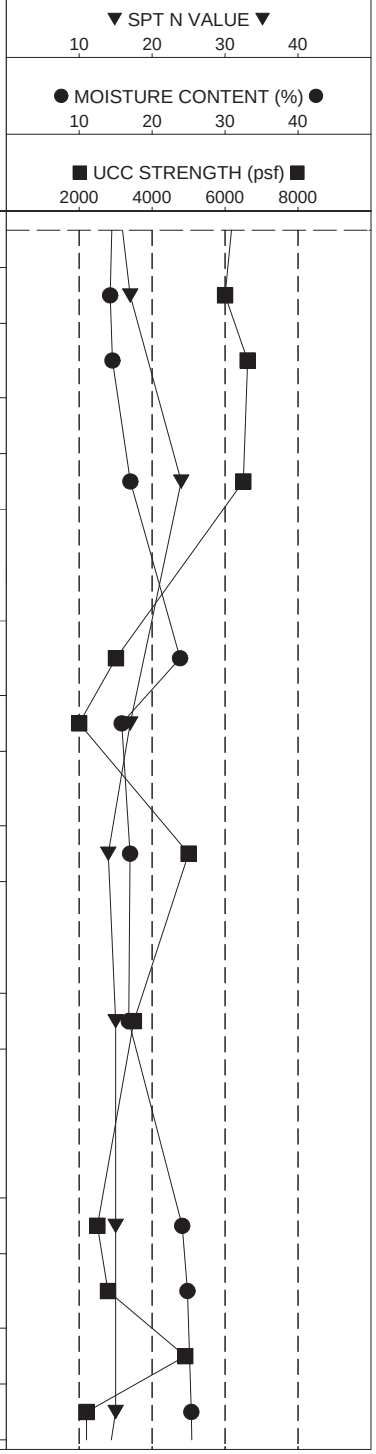
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/8/2015 **DATE COMPLETED:** 10/8/2015 **LOG OF TEST BORING TB-04**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.5 ft											
	Very stiff SANDY LEAN CLAY, trace gravel, gray (CL) NOTE: Vane shear test at 38.5 ft. terminated early due to high force gauge readings.	35	SS10	5-7-10	17	35.0	6000*	14.2				
			ST11			37.0	6620	14.6	124	25	10	69
			VS1			38.5						
			SS12	7-10-14	24	40.0	6500*	17.0				
		40										
589.5	43.0											
	Stiff LEAN CLAY, few sand, trace gravel, gray (CL)		ST13			45.0	3010	23.8	102	43	21	92
		45	SS14	5-8-9	17	46.5	2000*	15.8				
585.5	47.0											
	Very stiff to stiff LEAN CLAY with sand, trace gravel, gray (CL)		SS15	5-6-8	14	50.0	5000*	17.0				
		50										
			SS16	5-7-8	15	54.5	3500*	16.8	109	31	13	76
		55										
			SS17	4-6-9	15	60.0	2500*	24.1				
		60	ST18			62.0	2790	24.8	101			
570.5	62.0											
			VS2			63.5	4910					
			SS19	5-7-8	15	65.0	2200#	25.4	105	43	22	92
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461895.6
Northing: 359374.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

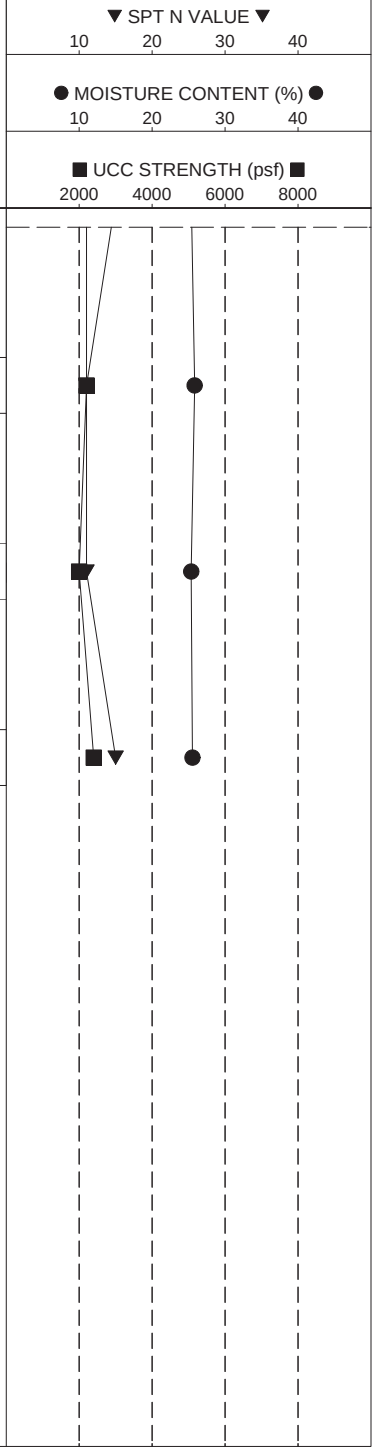
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/8/2015 **DATE COMPLETED:** 10/8/2015 **LOG OF TEST BORING** **TB-04**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.5 ft	65										
		70	SS20	4-5-6	11	70.0	2200#	25.8				
	Very stiff to stiff LEAN CLAY, few sand, trace gravel, gray (CL) NOTE: Poor recovery on SPT sample SS22 at 80 ft.	75	SS21	3-5-6	11	75.0	2000#	25.4				
552.5	80.0	80	SS22	6-7-8	15	80.0	2400#	25.5				
	End of Boring at 80 ft.	85										
		90										
		95										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13461895.6
Northing: 359374.6

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/11/2016 **DATE COMPLETED:**10/13/2016 **LOG OF TEST BORING** **TB-04A**

LOG OF SOIL PROFILE				FIELD DATA				LABORATORY DATA						
ELEVATION ft			DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 / ● MOISTURE CONTENT (%) ● 10 20 30 40 / ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
		Ground Surface Elevation 633.0 ft	0											
			5											
			10											
			15											
		Profile drilled to 56 ft.	20											
			25											
			30											

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461874.9
Northing: 359412.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 90 ft.

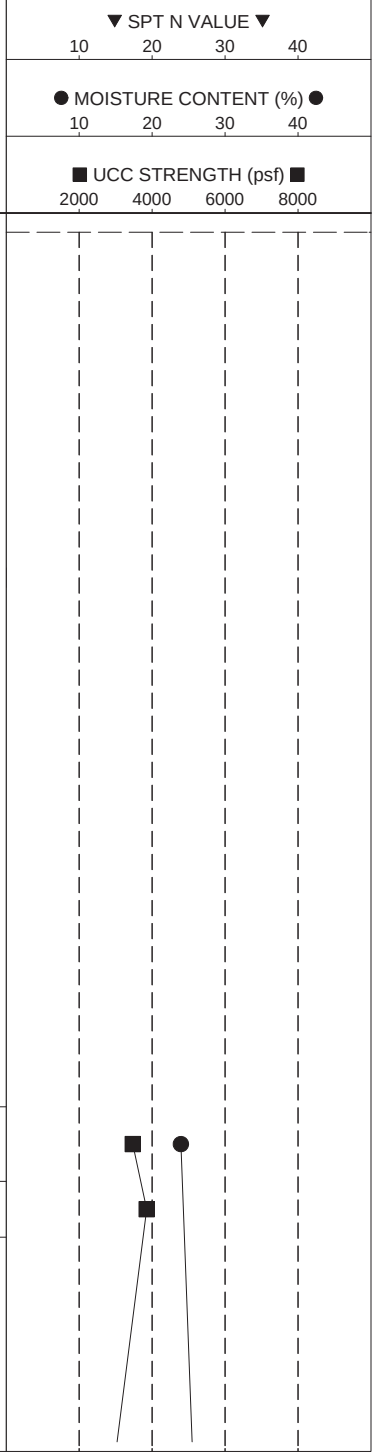
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/11/2016 **DATE COMPLETED:**10/13/2016 **LOG OF TEST BORING** **TB-04A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.0 ft											
	Profile drilled to 56 ft.	35, 40, 45, 50, 55										
577.0		56.0										
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	60, 65	ST1			58.0	3470	23.9	101	37	18	91
			VS1			59.5	3850					



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461874.9
Northing: 359412.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 90 ft.

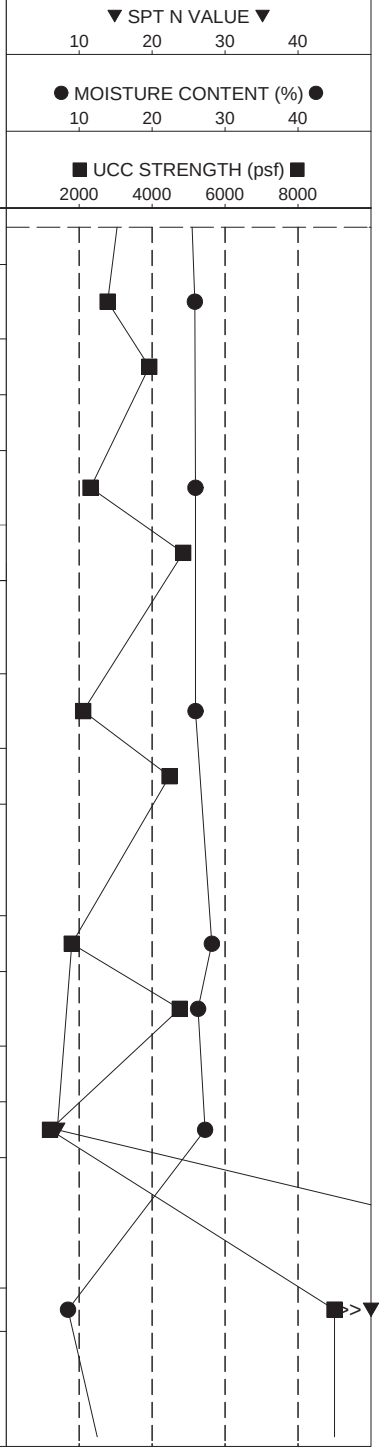
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/11/2016 **DATE COMPLETED:**10/13/2016 **LOG OF TEST BORING** **TB-04A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.0 ft	65										
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)		ST2			68.0	2780	25.9	102			
			VS2			69.5	3920					
		70										
			ST3			73.0	2310	25.9	101			
			VS3			74.5	4850					
		75										
			ST4			79.0	2110	25.9	103	36	16	88
552.5	80.5	80	VS4			80.5	4480					
	Medium to very stiff LEAN CLAY, trace sand, trace gravel, occasional clayey fine to medium sand layers above 85 ft., gray (CL)		SS5	2-4-5	9	85.0	1800#	28.2				
		85										
546.0	87.0		ST6			87.0	4760	26.3	99	35	16	99
	Medium LEAN CLAY with sand, trace gravel, occasional clayey fine to medium sand layers above 85 ft., gray (CL)											
543.0	90.0		SS7	2-3-4	7	90.0	1200#	27.3				82
		90										
	Hard SANDY LEAN CLAY, trace gravel, gray (CL)											
	NOTE: Driller reported cobbles 96-96.5 ft.		SS8	30-32-50/2"	82/8"	94.7	9000+*	8.5				53
		95										
536.5	96.5											



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461874.9
Northing: 359412.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 90 ft.

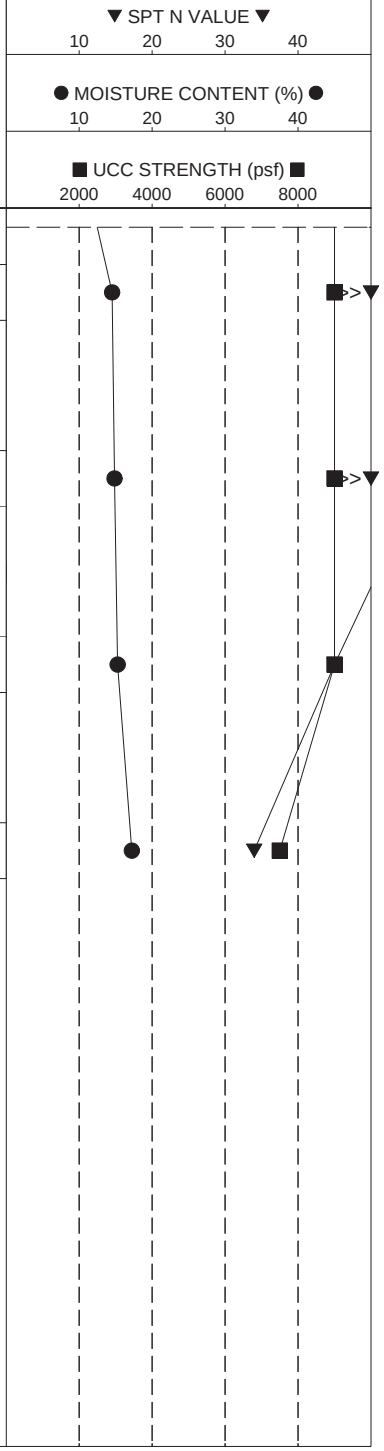
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/11/2016 **DATE COMPLETED:**10/13/2016 **LOG OF TEST BORING TB-04A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.0 ft											
	Hard to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS9	24-36-36	72	100.0	9000+*	14.5				
		100										
			SS10	16-24-33	57	105.0	9000+*	14.8				
		105										
			SS11	12-18-27	45	110.0	9000+*	15.3				
		110										
			SS12	9-14-20	34	115.0	7500*	17.2				
518.0	115.0	115										
	End of Boring at 115 ft.											
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13461874.9
Northing: 359412.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 90 ft.

DRAFT

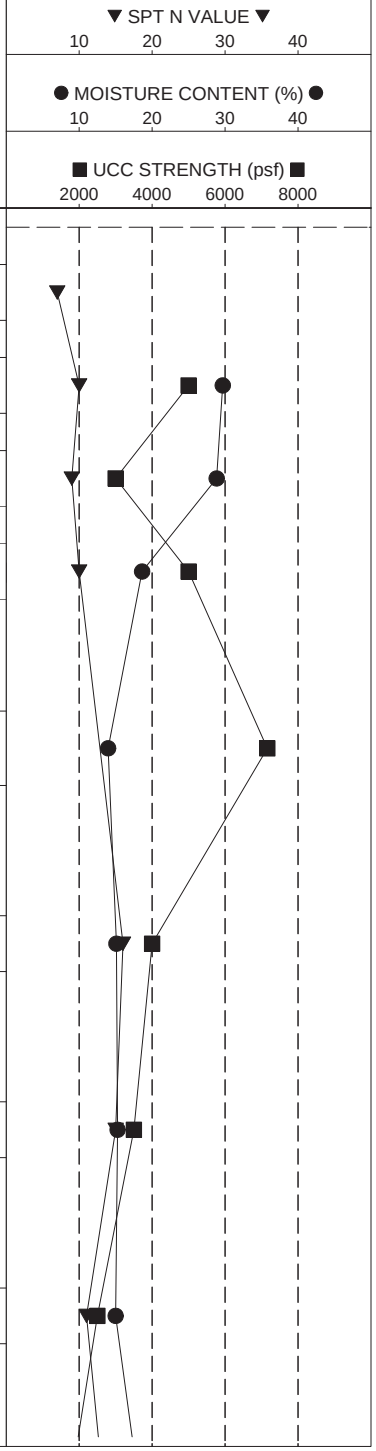
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/3/2016 **DATE COMPLETED:** 10/6/2016 **LOG OF TEST BORING TB-116**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 631.6 ft	0
630.6	12 inches of ASPHALTIC CEMENT CONCRETE	1.0
628.1	FILL - Loose poorly-graded fine to medium sand with silt, trace coarse sand, trace gravel, brown, moist (SP-SM)	3.5
624.1	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	7.5
621.6	Very stiff LEAN CLAY, trace sand, gray (CL)	10.0
	Very stiff to medium LEAN CLAY with sand, trace gravel, gray (CL) NOTE: Vane shear test at 36.5 ft. terminated early due to possible cobble.	

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	7-4-3	7	2.5						
SS2	4-4-6	10	5.0	5000*	29.7				
SS3	2-4-5	9	7.5	3000*	28.8				
SS4	4-4-6	10	10.0	5000*	18.6	119	28	11	99
ST5			15.0	7160	14.0	124			
SS6	5-7-9	16	20.0	4000*	15.1				
SS7	5-5-10	15	25.0	3500*	15.3				
SS8	4-5-6	11	30.0	2500*	15.0				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462338.6
Northing: 359097.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 128.5 ft.

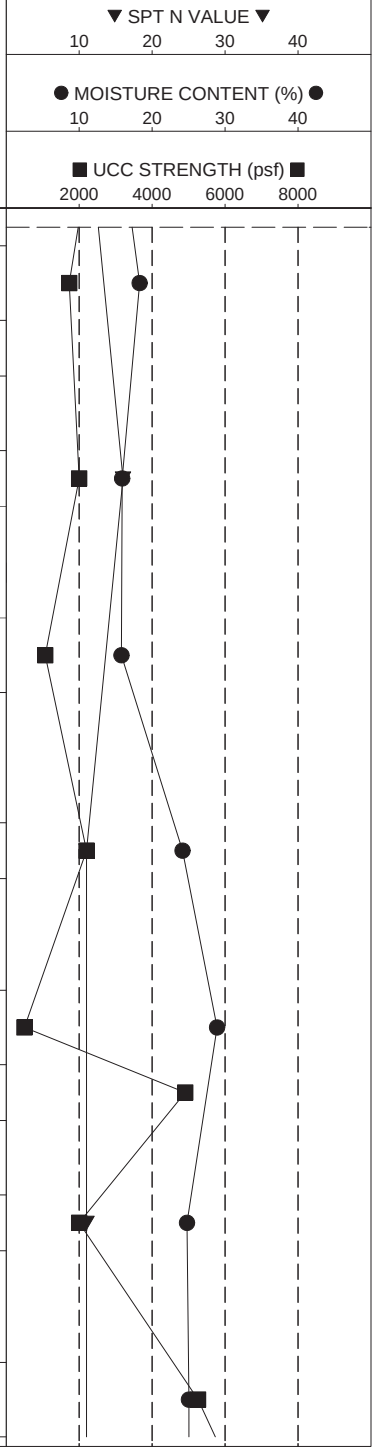
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/3/2016 **DATE COMPLETED:** 10/6/2016 **LOG OF TEST BORING TB-116**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.6 ft											
	Very stiff to medium LEAN CLAY with sand, trace gravel, gray (CL) NOTE: Vane shear test at 36.5 ft. terminated early due to possible cobble.	35	ST9			35.0	1730	18.3	118	28	12	73
			VS1			36.5						
			SS10	5-8-8	16	40.0	2000*	15.9				
591.6		40.0										
	Very stiff to medium LEAN CLAY, trace to few sand, trace gravel, gray (CL) NOTE: Driller reported possible cobble at 76 ft. and 92 ft.	40										
		45	ST11			45.0	1070	15.8	117			
		50	SS12	3-6-5	11	50.0	2200#	24.2				
		55	ST13			55.0	500*	28.9	99	45	26	89
			VS2			56.5	4910					
		60	SS15	5-5-6	11	60.0	2000*	24.8				
		65	ST16			65.0	5260	25.0	102			



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462338.6
Northing: 359097.8

Coordinates/GSE determined by: Survey

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Torvane
* Penetrometer
<> Disturbed Sample

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Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 128.5 ft.

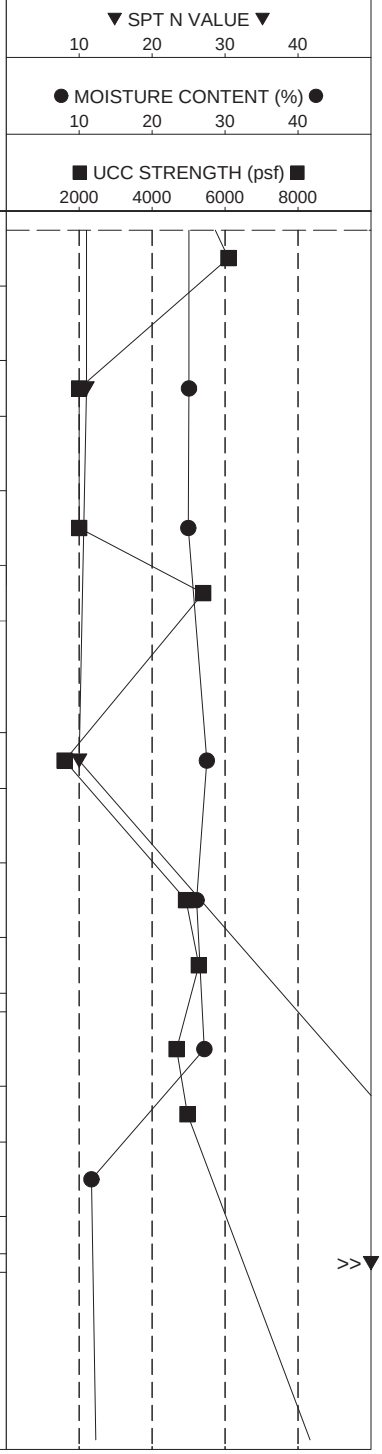
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/3/2016 **DATE COMPLETED:** 10/6/2016 **LOG OF TEST BORING TB-116**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.6 ft	65	VS3			66.5	6090					
			SS17	4-5-6	11	70.0	2000*	25.1				
		70	ST18			74.0	2000*	25.0	100	38	19	95
	Very stiff to medium LEAN CLAY, trace to few sand, trace gravel, gray (CL)		VS4			75.5	5400					
	NOTE: Driller reported possible cobble at 76 ft. and 92 ft.	75										
			SS19	3-5-5	10	80.0	1600#	27.5				
		80	ST20			84.0	4930	26.1	100			
			VS5			85.5	5280					
545.6		85 / 86.0										
	Very stiff SANDY LEAN CLAY, few gravel, gray (CL)		ST21			88.0	4670	27.2	100			
			VS6			89.5	4970					
	NOTE: Driller reported possible cobble at 92 ft.	90	ST22			91.5	<>	11.7		21	10	57
539.6		92.0										
	Extremely dense CLAYEY FINE SAND with silt, trace gravel, gray, moist (SC)		SS23	70	70+	93.0						
537.6		94.0										
	Hard SANDY LEAN CLAY, few gravel, gray (CL)	95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462338.6
Northing: 359097.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 128.5 ft.

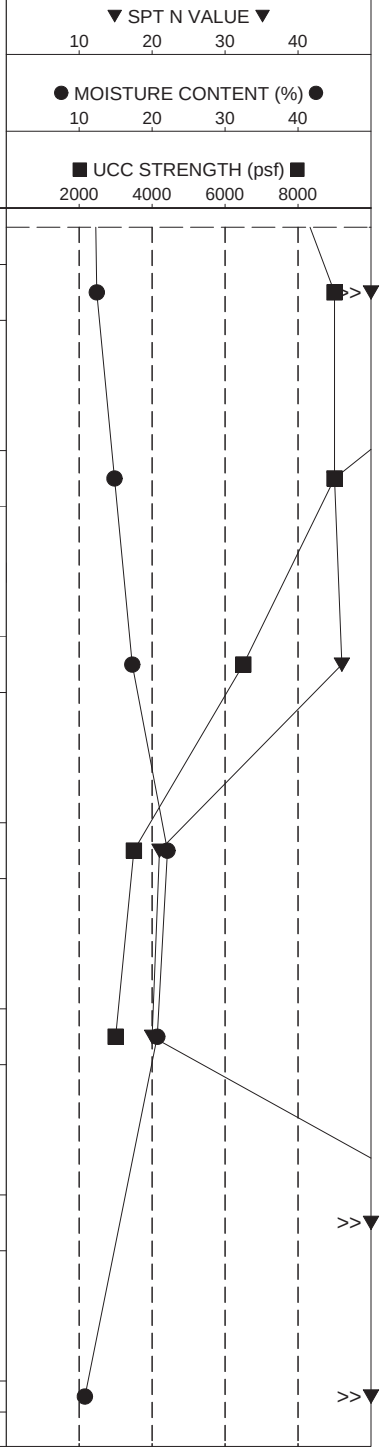
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/3/2016 **DATE COMPLETED:** 10/6/2016 **LOG OF TEST BORING TB-116**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.6 ft											
	Hard SANDY LEAN CLAY, few gravel, gray (CL)	100	SS24	19-33-44	77	100.0	9000+*	12.4		24	10	64
529.6	102.0											
	Hard LEAN CLAY, few sand, gray (CL)	105	SS25	15-19-26	45	105.0	9000+*	14.8		33	15	89
526.6	105.0											
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, occasional silt partings below 115 ft., gray (CL)	110	SS26	12-21-25	46	110.0	6500	17.3	117			
		115	SS27	7-9-12	21	115.0	3500*	22.1		42	22	
		120	SS28	6-10-10	20	120.0	3000*	20.7				96
510.1	121.5											
	Very dense SILTY FINE SAND, few gravel, gray, moist (SM) NOTE: Driller reported possible cobble at 123.5 ft.	125	SS29	31-30-36	66	125.0						
503.1	128.5											
	SANDY LEAN CLAY, trace gravel, moist (CL)	130	SS30	50-50/4"	50 +	129.3	<>	10.8		24	10	62



GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462338.6
Northing: 359097.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 128.5 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

LOG OF TEST BORING I-75 DESIGN BUILD MODERNIZATION 2018.GPJ SOMAT.GDT 7/28/17

PROJECT NO. 2014195C **DATE STARTED:** 10/3/2016 **DATE COMPLETED:** 10/6/2016 **LOG OF TEST BORING TB-116**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.6 ft	130										
498.1	SANDY LEAN CLAY, trace gravel, moist (CL)											
497.8	Completely weathered SHALE, dark gray (133.5 – 133.8)		SS31	106/3"	106 +	133.8						
	End of Boring at 133.8 ft. (Terminated upon SPT sample refusal on possible bedrock)	135										
		140										
		145										
		150										
		155										
		160										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

>>▼

DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13462338.6
Northing: 359097.8

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 128.5 ft.

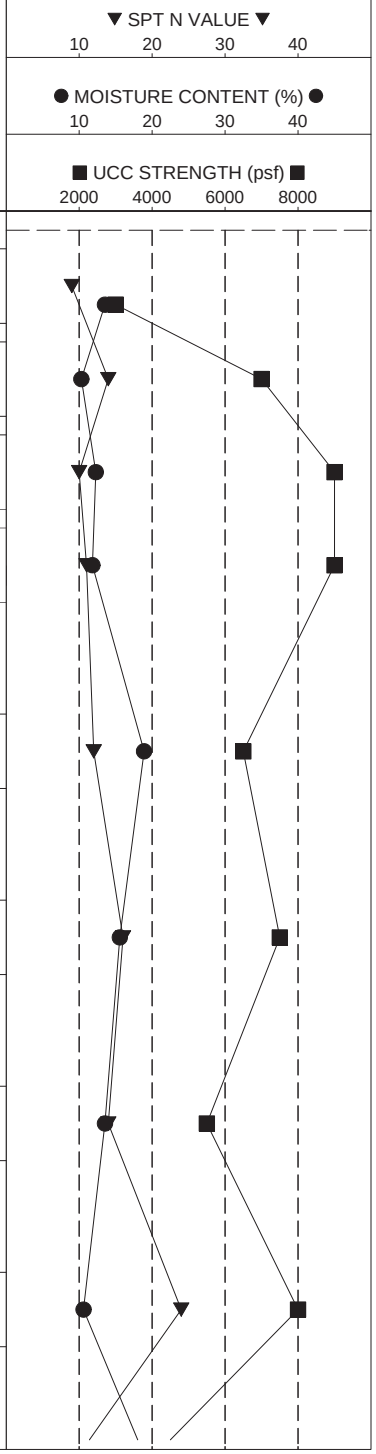
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 3/6/2017 **DATE COMPLETED:** 3/21/2017 **LOG OF TEST BORING TB-115**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
660.8	Ground Surface Elevation 661.3 ft	0										
	6.5 inches of PORTLAND CEMENT CONCRETE	0.5										
659.0	FILL - Loose poorly graded fine to coarse sand with silt, few gravel, brown, moist (SP-SM)	2.3	SS1	5-5-4-1	9	2.5	3000*	13.5				
	Stiff to hard LEAN CLAY, trace sand, trace gravel, occasional fine sand seams below 5 ft., gray (CL)	5	SS2	3-5-9-6	14	5.0	7000*	10.3				
			SS3	3-4-6-5	10	7.5	9000*	12.3				
			SS4	3-5-6-8	11	10.0	9000*	11.8				
651.3		10.0										
	Very stiff to hard LEAN CLAY, trace sand, trace gravel, occasional silt seams above 20 ft., gray (CL)	10										
			SS5	2-5-7-7	12	15.0	6500*	18.9				
		15										
			SS6	5-7-9-11	16	20.0	7500*	15.6				
		20										
			SS7	4-6-8-8	14	25.0	5500*	13.5				
		25										
			SS8	7-12-12-12	24	30.0	8000*	10.6				
631.3		30.0										
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	30										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462410.5
Northing: 358433.9

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Wajed
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 122 ft.

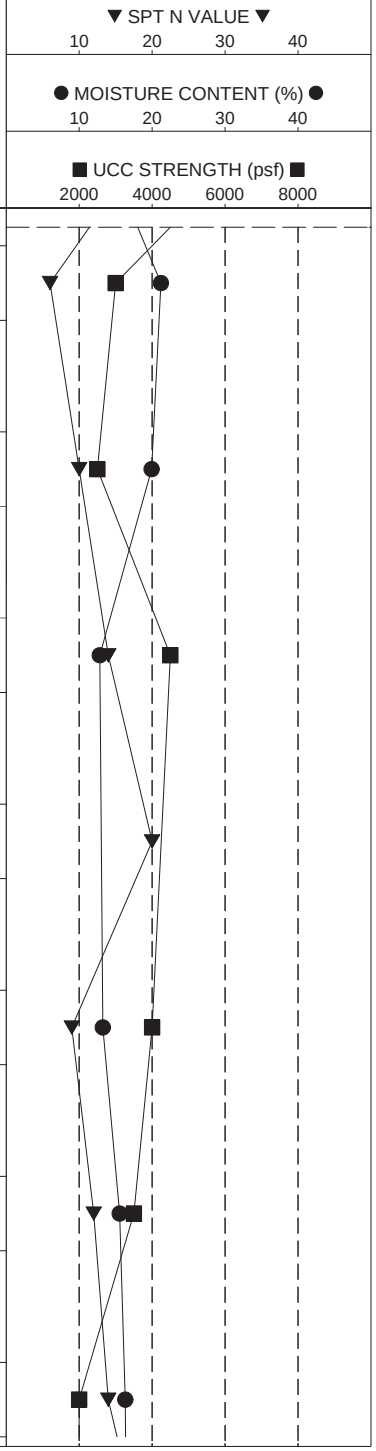
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 3/6/2017 **DATE COMPLETED:** 3/21/2017 **LOG OF TEST BORING TB-115**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 661.3 ft											
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	35	SS9	2-3-3-6	6	35.0	3000*	21.2				
		40	SS10	4-4-6-7	10	40.0	2500*	19.9				
618.3		43.0										
	Very stiff SANDY LEAN CLAY, trace gravel, gray (CL)	45	SS11	3-6-8-11	14	45.0	4500*	12.8		24	11	62
	NOTE: No recovery on SPT sample attempt at 50 ft. due to sample falling out of sampler.	50	NR12	7-10-10-10	20	50.0						
606.3		55.0	SS13	3-3-6-8	9	55.0	4000*	13.2				
	Very stiff to medium LEAN CLAY, few sand, trace gravel, gray (CL)	60	SS14	3-5-7-10	12	60.0	3500*	15.5				
		65	SS15	5-6-8-11	14	65.0	2000*	16.3				



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

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Easting: 13462410.5
Northing: 358433.9

Coordinates/GSE determined by: Survey

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<> Disturbed Sample

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I-75 Modernization Project
ORC Tunnel Design Investigation
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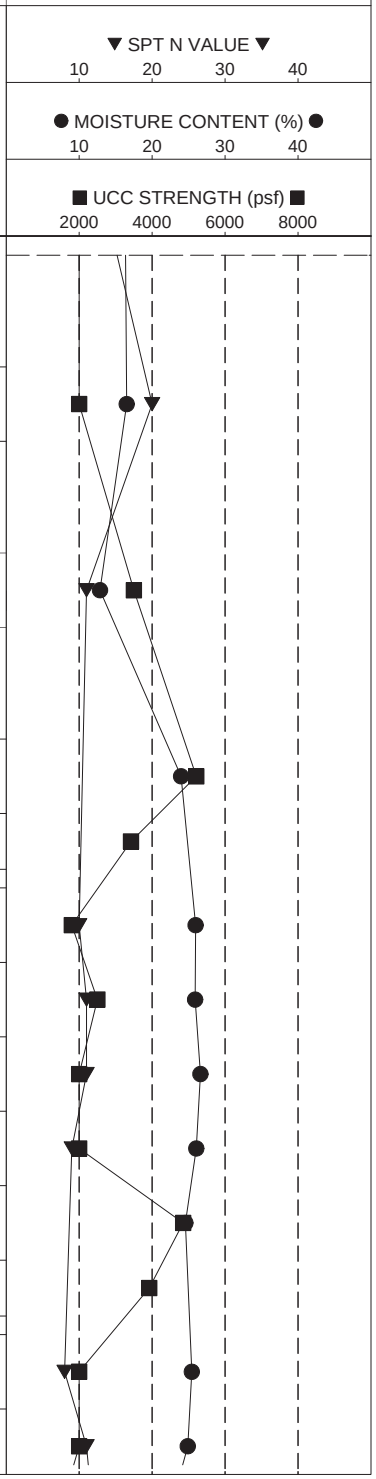
ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 661.3 ft	65										
			SS16	11-12-8-10	20	70.0	2000*	16.5				
		70										
			SS17	9-4-7-9	11	75.0	3500*	12.9				
		75										
			ST18			80.0	5210	24.0	103	42	21	94
	Very stiff to medium LEAN CLAY, few sand, trace gravel, gray (CL)	80	VS1			81.5	3420					
			SS19	2-4-6-7	10	84.0	1800#	26.0				
		85	SS20	2-4-7-7	11	86.0	2500*	25.9				
			SS21	2-5-6-6	11	88.0	2000*	26.6				
			SS22	2-4-5-7	9	90.0	2000*	26.0				
		90	ST23			92.0	4850	24.6	102	42	22	94
			VS2			93.5	3920					
		95	SS24	3-4-4-7	8	96.0	2000*	25.4				
			SS25	4-5-6-3	11	98.0	2000*	24.9				



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462410.5
Northing: 358433.9

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* Penetrometer
<> Disturbed Sample

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Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
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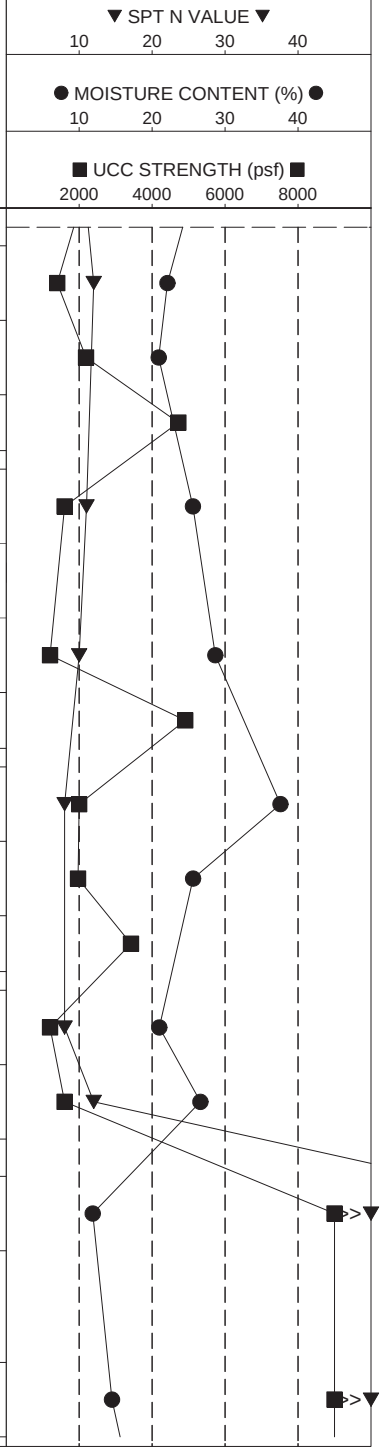
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 3/6/2017 **DATE COMPLETED:** 3/21/2017 **LOG OF TEST BORING TB-115**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 661.3 ft											
	Very stiff to medium LEAN CLAY, few sand, trace gravel, gray (CL)		SS26	3-5-7-7	12	100.0	1400#	22.1				
		100	ST27			102.0	2190	20.9	112	27	10	87
559.3	102.0		VS3			103.5	4720					
		105	SS28	3-4-7-8	11	106.0	1600#	25.6				
			NR29			108.0						
			SS30	2-5-5-6	10	110.0	1200#	28.7				
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	110	VS4			111.5	4910					
	NOTE: No recovery on Shelby tube attempt at 108 ft. due to sample falling out of sampler.		SS31	2-4-4-7	8	114.0	2000#	37.6				
		115	ST32			116.0	1970	25.6	101			
			VS5			117.5	3420					
			SS33	2-3-5-6	8	120.0	1200#	21.0				
		120	SS34	1-3-9-19	12	122.0	1600#	26.6				
539.8	121.5											
538.3	SANDY LEAN CLAY/CLAYEY FINE SAND, gray (CL)/(SC) 123.0											
			SS35	30-33-48-60	81	125.0	9000+*	11.9				
	Hard to very stiff SILTY CLAY, trace sand, trace gravel, occasional fine sand partings above 125 ft., gray (CL)	125										
			SS36	15-30-48-67	78	130.0	9000+*	14.5				
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462410.5
Northing: 358433.9

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Wajed
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 122 ft.

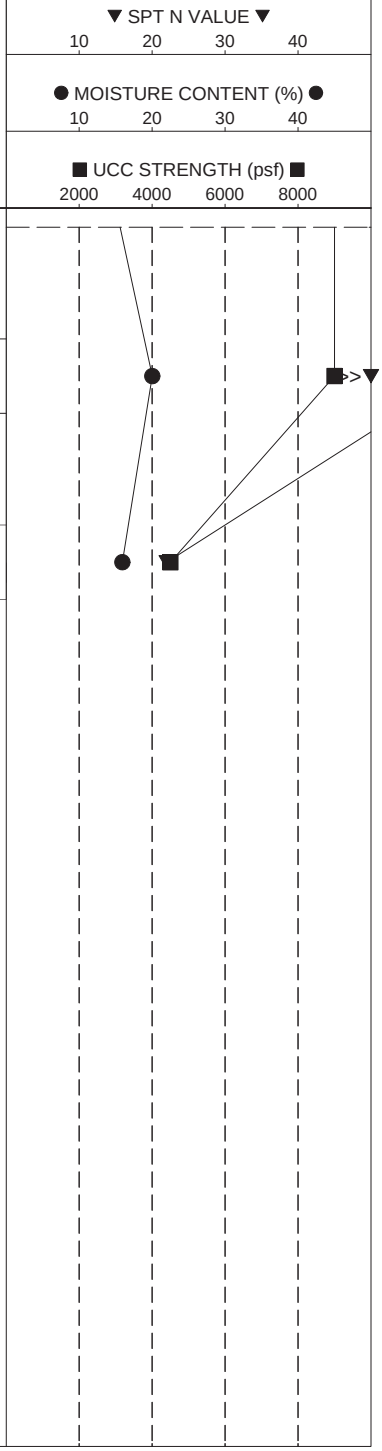
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 3/6/2017 **DATE COMPLETED:** 3/21/2017 **LOG OF TEST BORING TB-115**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 661.3 ft	130										
	Hard to very stiff SILTY CLAY, trace sand, trace gravel, occasional fine sand partings above 125 ft., gray (CL)		SS37	12-25-37-42	62	135.0	9000+*	20.0				
		135										
			SS38	6-9-13-16	22	140.0	4500*	15.9				
521.3		140.0										
	End of Boring at 140 ft.	140										
		145										
		150										
		155										
		160										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462410.5
Northing: 358433.9

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: M. Wajed
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 122 ft.

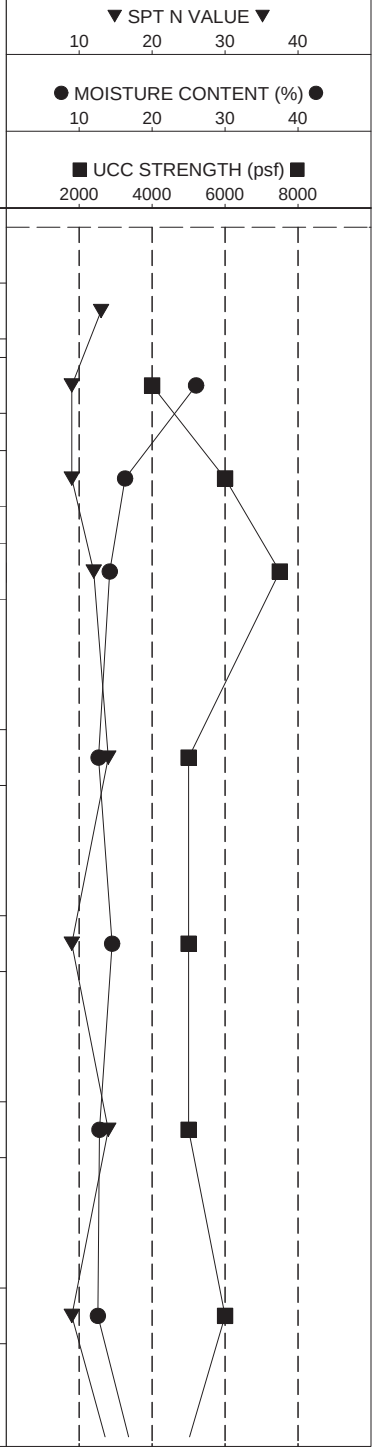
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/31/2016 **DATE COMPLETED:** 11/2/2016 **LOG OF TEST BORING TB-114**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.1 ft	0										
632.3	10 inches of ASPHALTIC CEMENT CONCRETE	0.8										
632.1	Field Engineer reported 2 inches of gravel FILL (Base Material)	1.0										
629.6	FILL - Medium dense poorly graded fine sand with silt, trace gravel, brown, moist (SP-SM)	3.5	SS1	6-6-7	13	3.0						
		5	SS2	3-4-5	9	5.0	4000*	26.0				
			SS3	3-4-5	9	7.5	6000*	16.3				
		10	SS4	5-5-7	12	10.0	7500*	14.2				
	Very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	15	SS5	3-6-8	14	15.0	5000*	12.7				
		20	SS6	4-4-5	9	20.0	5000*	14.5				
608.1		25	SS7	3-6-8	14	25.0	5000*	12.8				
	Very stiff SANDY LEAN CLAY, trace gravel, gray (CL)											
603.1		30	SS8	4-4-5	9	30.0	6000*	12.6		28	13	66



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13462416.0
Northing: 357735.1

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Direct pushed 24 in. to retrieve sample at vane shear locations.

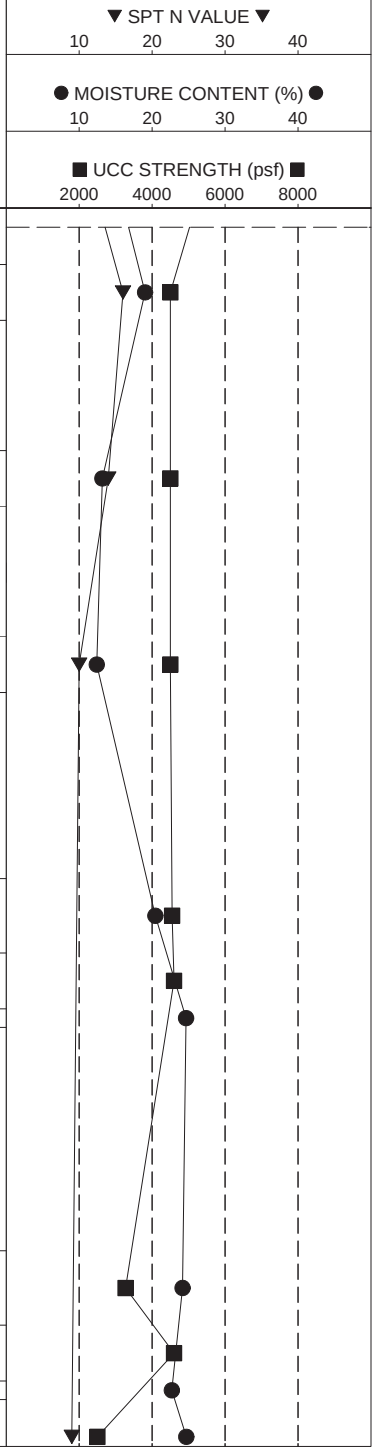
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/31/2016 **DATE COMPLETED:** 11/2/2016 **LOG OF TEST BORING TB-114**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.1 ft											
			SS9	4-6-10	16	35.0	4500*	19.0				
		35										
			SS10	6-7-7	14	40.0	4500*	13.2				
		40										
			SS11	6-4-6	10	45.0	4500*	12.4				
		45										
	Very stiff to stiff LEAN CLAY, few sand, trace gravel, silty fine sand layer at approximately 39 ft., gray (CL)	50										
			ST12			52.0	4550	20.4	109			
			VS1			53.5	4600					
			DP13			54.0	<>	24.7				
		55										
		60										
			ST14			62.0	3270	24.2	103	36	17	92
			VS2			63.5	4600					
569.6	63.5		DP15			64.0	<>	22.7				
		65										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13462416.0
Northing: 357735.1

Coordinates/GSE determined by: Survey

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* Penetrometer
<> Disturbed Sample

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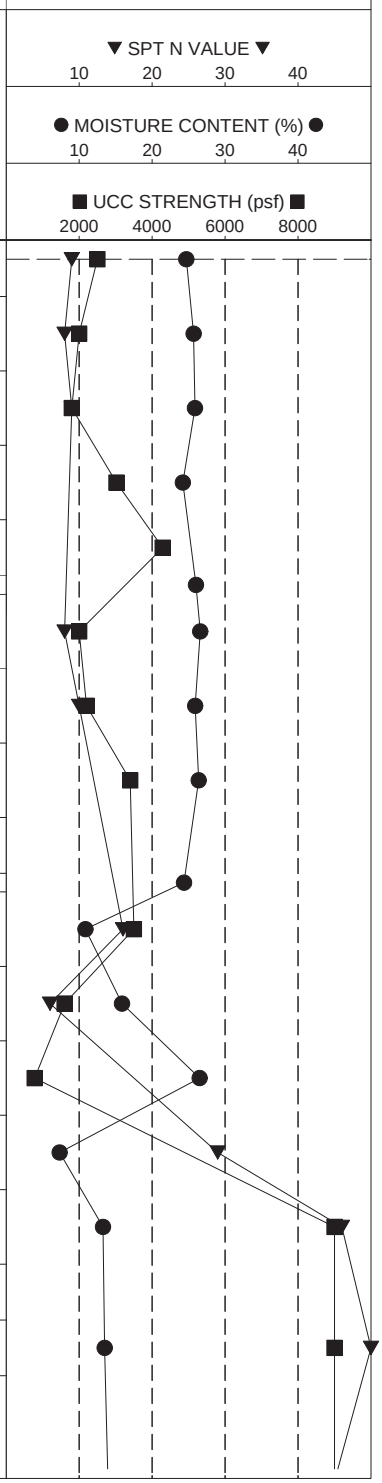
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/31/2016 **DATE COMPLETED:** 11/2/2016 **LOG OF TEST BORING TB-114**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.1 ft											
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	65	SS16	2-4-5-7	9	66.0	2500*	24.7				
			SS17	3-3-5-6	8	68.0	2000*	25.7				
			SS18	4-4-5-6	9	70.0	1800#	25.9				
563.1	70.0	70										
			ST19			72.0	3020	24.2	102	39	19	94
			VS3			73.5	4290					
			DP20			74.0	<>	26.0				
		75	SS21	2-4-4-6	8	76.0	2000#	26.6				
	Very stiff to soft LEAN CLAY, few sand, trace gravel, gray (CL)		SS22	3-4-6-8	10	78.0	2200#	25.9				
	NOTE: Vane shear test at 81.5 ft. terminated early due to high force gauge reading.		ST23			80.0	3400	26.4	102			
		80	VS4			81.5						
			DP24			82.0	<>	24.4				
			SS25	3-6-10-10	16	84.0	3500*	10.9				
		85	SS26	2-3-3-6	6	86.0	1600#	15.9				
			ST27			88.0	780	26.5	93			
545.1	88.0											
	Medium dense to dense SILTY FINE SAND, few gravel, gray, moist (SM)	90	SS28	4-8-21-36	29	90.0		7.3				48
542.1	91.0		SS29	16-17-29-34	46	92.0	9000*	13.3				
	Hard to very stiff LEAN CLAY, trace sand, trace gravel, silty fine sand and silty medium sand layers above 92 ft., gray (CL)		SS30	13-22-28	50	95.0	9000+*	13.5				
		95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462416.0
Northing: 357735.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
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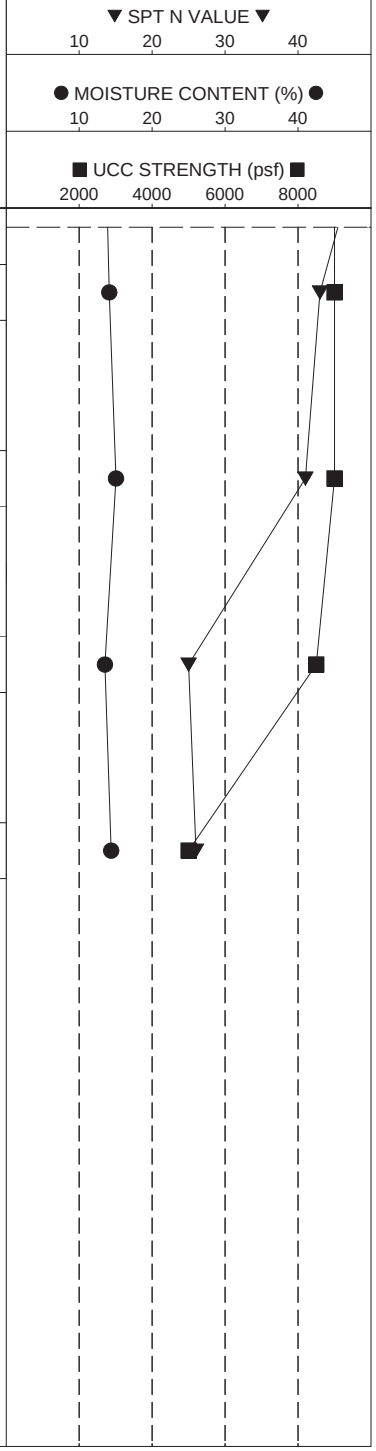
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/31/2016 **DATE COMPLETED:** 11/2/2016 **LOG OF TEST BORING TB-114**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.1 ft											
	Hard to very stiff LEAN CLAY, trace sand, trace gravel, silty fine sand and silty medium sand layers above 92 ft., gray (CL)		SS31	11-18-25	43	100.0	9000+*	14.1				
		100										
			SS32	11-16-25	41	105.0	9000+*	15.0				
		105										
			SS33	5-10-15	25	110.0	8500*	13.5				
		110										
			SS34	7-11-15	26	115.0	5000*	14.4				
518.1	115.0	115										
	End of Boring at 115 ft.											
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13462416.0
Northing: 357735.1

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
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Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
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Remarks: UCS at vane shear estimated by 2x field shear strength. Direct pushed 24 in. to retrieve sample at vane shear locations.

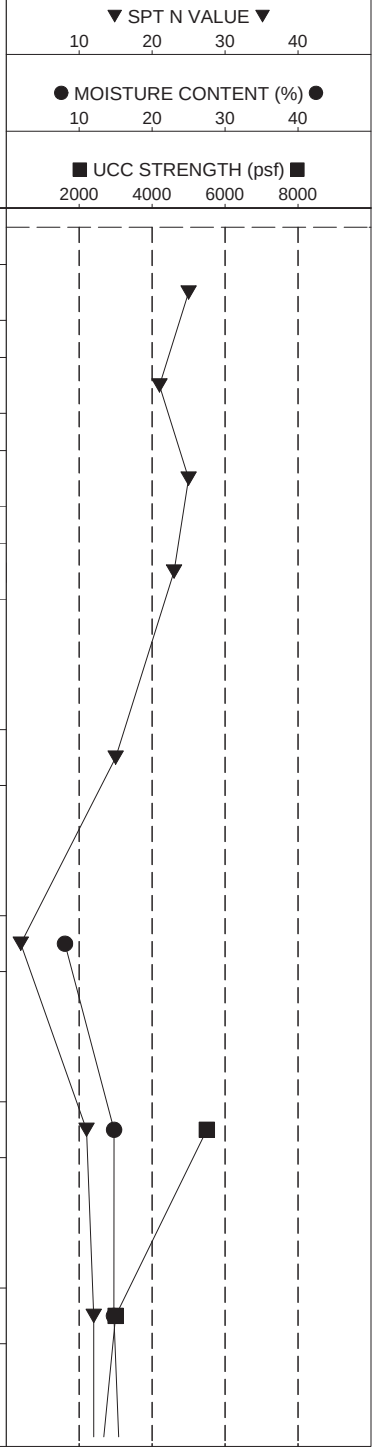
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/8/2016 **DATE COMPLETED:** 12/22/2016 **LOG OF TEST BORING TB-113**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
633.5	Ground Surface Elevation 633.7 ft	0										
632.8	2 inches of ASPHALTIC CEMENT CONCRETE (0.2)											
632.7	8 inches of PORTLAND CEMENT CONCRETE (0.9)											
	Field Engineer reported 2 inches of FILL (1.0)											
			SS1	8-11-14	25	2.5						
			SS2	6-10-11	21	5.0						
		5	SS3	9-12-13	25	7.5						
			SS4	7-12-11	23	10.0						
	Medium dense to very loose poorly graded FINE SAND with silt, trace gravel, brown, moist (SP-SM)	10										
			SS5	6-8-7	15	15.0						
		15										
			SS6	3-1-1	2	20.0		8.1				7
		20										
610.2		23.5										
			SS7	3-5-6	11	25.0	5500*	14.8				
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, occasional sandy silt seams 66-68 ft., gray (CL)	25										
	NOTE: Vane shear test attempt at 87 ft. cancelled; unable to extend more than 12 in. due to silt layer.		SS8	4-5-7	12	30.0	3000*	14.8				
		30										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13462310.1
Northing: 357051.5

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery/R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 87 ft.

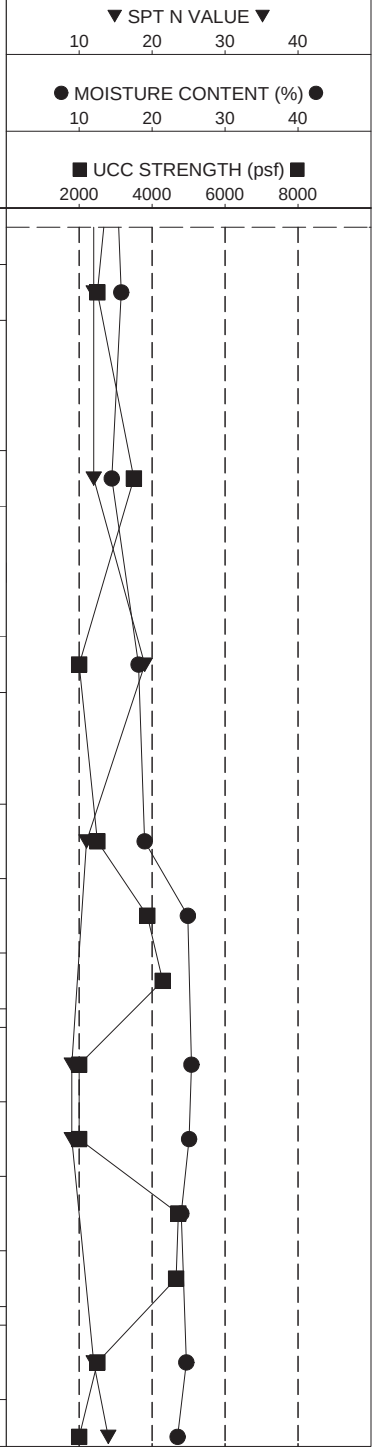
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/8/2016 **DATE COMPLETED:** 12/22/2016 **LOG OF TEST BORING TB-113**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.7 ft											
		35	SS9	5-5-7	12	35.0	2500*	15.8				
		40	SS10	6-5-7	12	40.0	3500*	14.5				
		45	SS11	8-9-10	19	45.0	2000*	18.1				
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, occasional sandy silt seams 66-68 ft., gray (CL)		SS12	3-5-6-7	11	50.0	2500*	19.0				
		50	ST13			52.0	3870	24.9	103	42	22	98
	NOTE: Vane shear test attempt at 87 ft. cancelled; unable to extend more than 12 in. due to silt layer.		VS1			53.5	4290					
		55	SS14	2-4-5-6	9	56.0	2000*	25.4				
			SS15	3-4-5-6	9	58.0	2000*	25.1				
			ST16			60.0	4720	24.0	103			
		60	VS2			61.5	4660					
			SS17	3-5-7-8	12	64.0	2500*	24.7				
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462310.1
Northing: 357051.5

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery/R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
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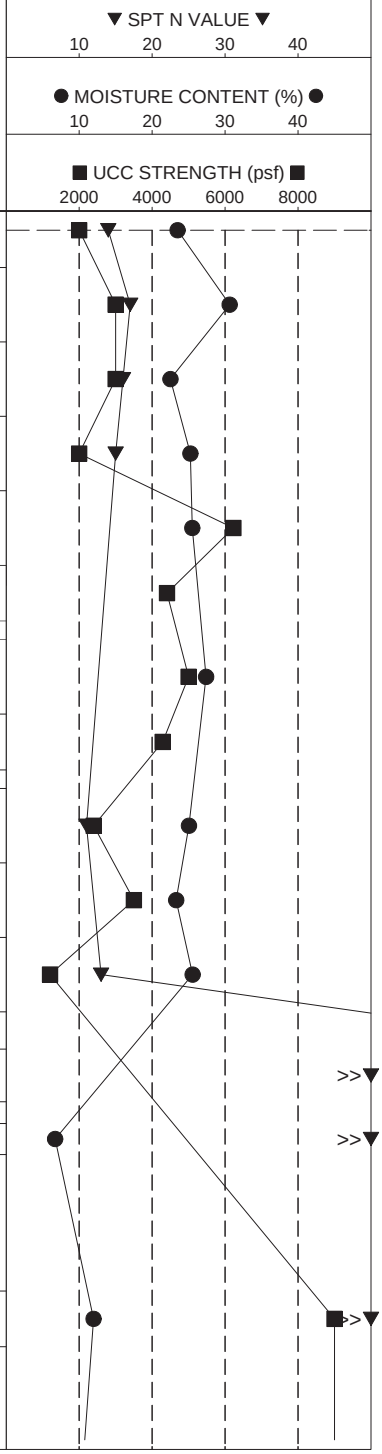
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/8/2016 **DATE COMPLETED:** 12/22/2016 **LOG OF TEST BORING TB-113**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.7 ft	65	SS18	3-6-8-9	14	66.0	2000*	23.5				
			SS19	4-9-8-7	17	68.0	3000*	30.6				
			SS20	7-8-8-9	16	70.0	3000*	22.5				
		70	SS21	4-6-9-9	15	72.0	2000*	25.2				
			ST22			74.0	6230	25.5	101			
		75	VS3			75.5	4410					
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, occasional sandy silt seams 66-68 ft., gray (CL)		ST23			78.0	5000	27.4	98	42	21	99
	NOTE: Vane shear test attempt at 87 ft. cancelled; unable to extend more than 12 in. due to silt layer.		VS4			79.5	4290					
		80	SS24	4-5-6-6	11	82.0	2400#	25.1				
			ST25			84.0	3500	23.3	105			
		85	SS26	3-6-7-8	13	86.0	1200#	25.6				
546.7		87.0	VS5			87.0						
			SS27	14-27-50/5"	77/11"	88.4						
	Extremely dense SANDY SILT, trace gravel, gray, moist (ML)	90	SS28	42-52/4"	52 +	89.8		6.7				55
540.2		93.5										
	Hard LEAN CLAY, trace sand, trace gravel, occasional fine sand seams, trace shale pieces below 100 ft., gray (CL)	95	SS29	21-42-53	95	95.0	9000+*	12.0				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462310.1
Northing: 357051.5

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

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Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 87 ft.

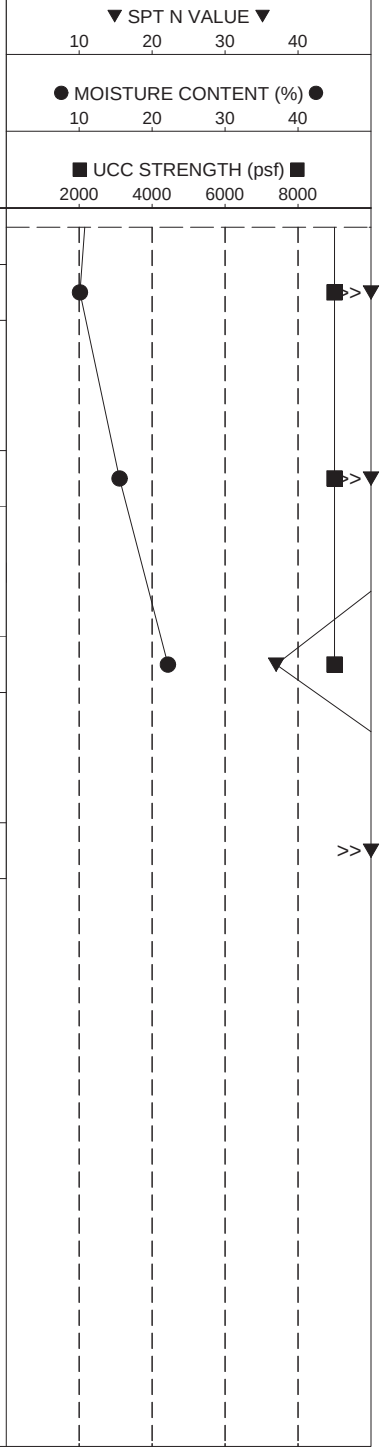
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/8/2016 **DATE COMPLETED:** 12/22/2016 **LOG OF TEST BORING** **TB-113**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.7 ft											
	Hard LEAN CLAY, trace sand, trace gravel, occasional fine sand seams, trace shale pieces below 100 ft., gray (CL)	100	SS30	26-39-45	84	100.0	9000+*	10.1				
		105	SS31	39-32-38	70	105.0	9000+*	15.5				
		110	SS32	8-17-20	37	110.0	9000+*	22.2				
520.2	113.5											
518.7	Very dense SANDY SILT, gray, moist (ML) 115.0	115	SS33	23-35-38	73	115.0						
	End of Boring at 115 ft.	120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462310.1
Northing: 357051.5

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery/R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 87 ft.

DRAFT

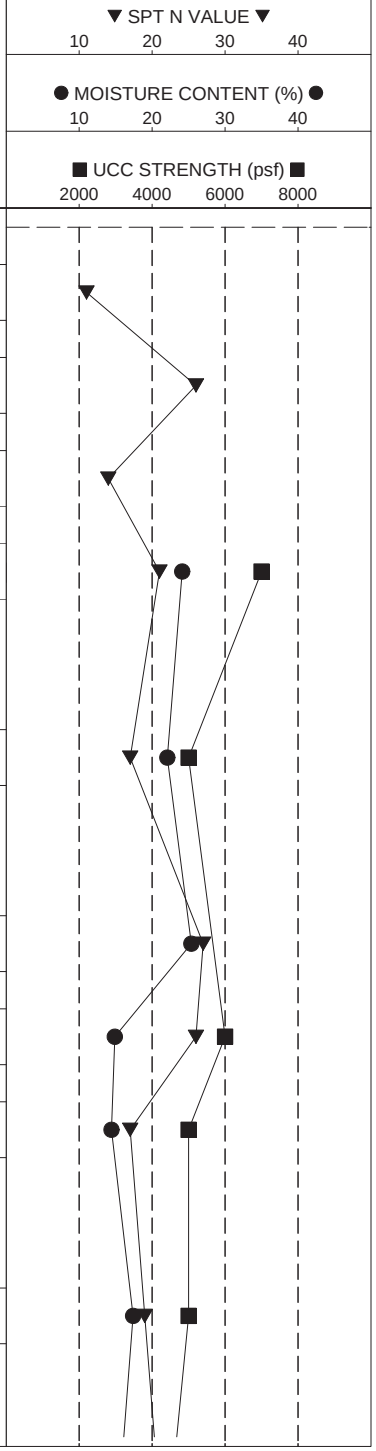
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/7/2015 **DATE COMPLETED:** 10/8/2015 **LOG OF TEST BORING** **TB-03**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 634.6 ft	0
632.1	30 inches of SANDY TOPSOIL, trace roots, brown	2.5
629.8	FILL - Medium dense poorly graded fine sand, trace silt, trace gravel, occasional topsoil seams with roots, brown, moist (SP)	4.8
629.6	FILL - Medium dense poorly graded fine sand with silt, trace gravel, gray (SP-SM)	5.0
626.6	FILL - Medium dense silt, trace sand, occasional topsoil layers, brown-gray (ML)	8.0
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: Poor recovery on SPT sample SS6 at 20 ft.	
604.6	Very stiff to stiff LEAN CLAY with sand, trace gravel, gray (CL)	30.0

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	5-5-6	11	2.5						
SS2	7-10-16	26	5.0						
SS3	18-8-6	14	7.5						
SS4	7-9-12	21	10.0	7000*	24.1				
SS5	4-6-11	17	15.0	5000*	22.1				
SS6	7-12-15	27	20.0	<>	25.4				
SS7	7-11-15	26	22.5	6000*	14.9				
SS8	5-7-10	17	25.0	5000*	14.4				
SS9	4-7-12	19	30.0	5000*	17.4				



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13462498.3
Northing: 356520.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: H. Bharadwaj/R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

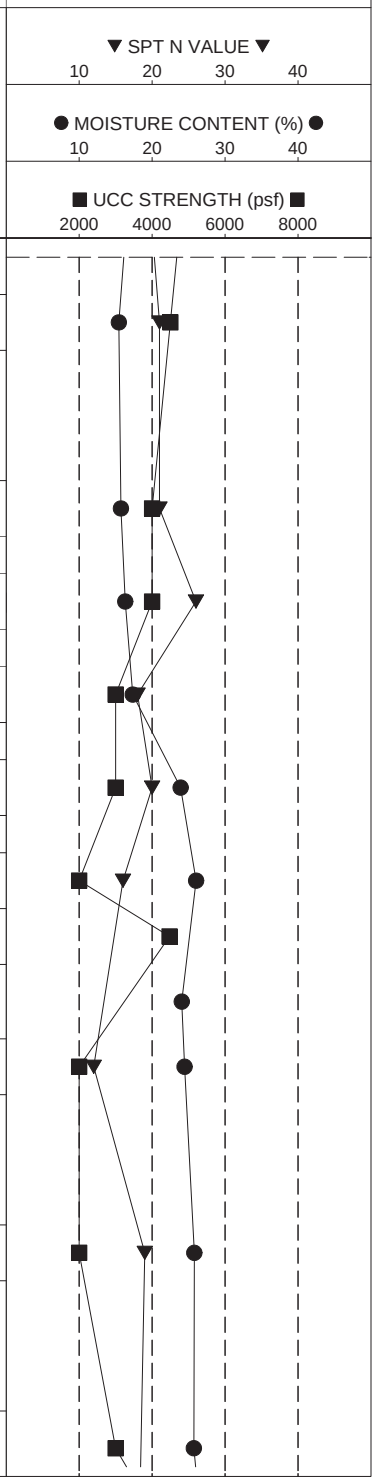
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/7/2015 **DATE COMPLETED:** 10/8/2015 **LOG OF TEST BORING** **TB-03**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.6 ft											
	Very stiff to stiff LEAN CLAY with sand, trace gravel, gray (CL)	35	SS10	4-9-12	21	35.0	4500*	15.4	120	32	16	73
		40	SS11	5-10-11	21	40.0	4000*	15.7				
			SS12	6-9-17	26	42.5	4000*	16.3				
		45	SS13	5-9-9	18	45.0	3000*	17.3	119	30	15	71
588.6	46.0											
	Very stiff to stiff LEAN CLAY, few sand, trace gravel, gray (CL) NOTE: Poor recovery on Shelby tubes ST16 at 53.5 ft. and ST19 at 65.5 ft.		SS14	5-9-11	20	47.5	3000*	23.9				
			SS15	5-7-9	16	50.0	2000#	26.0				
		50	VS1			51.5	4480					
			ST16			53.5	<>	24.1	107	38	17	
		55	SS17	4-5-7	12	55.0	2000*	24.4				
		60	SS18	5-8-11	19	60.0	2000#	25.8				
		65	ST19			65.5	3000*	25.7	104	34	15	93



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13462498.3
Northing: 356520.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: H. Bharadwaj/R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

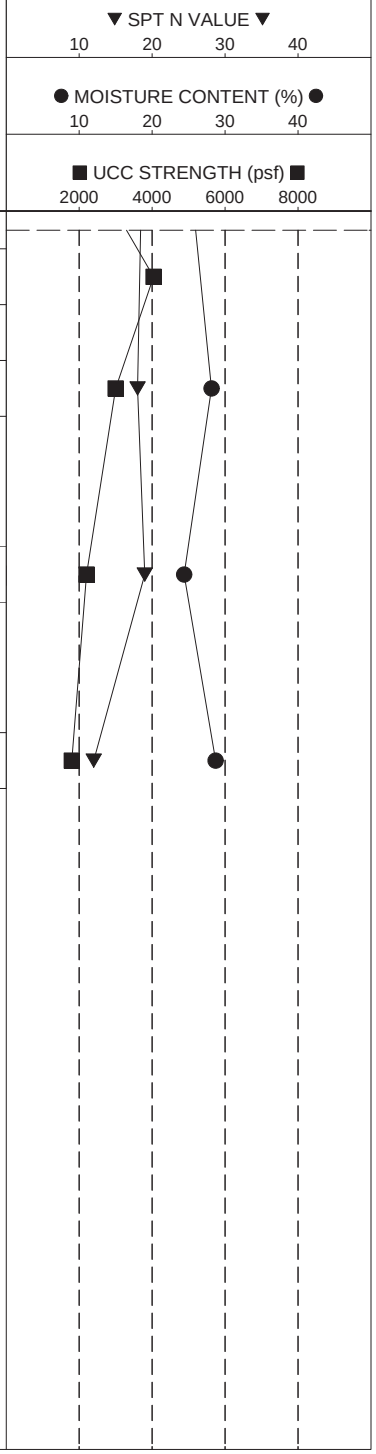
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/7/2015 **DATE COMPLETED:** 10/8/2015 **LOG OF TEST BORING** **TB-03**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.6 ft	65										
			VS2			67.0	4040					
566.6	68.0											
			SS20	6-7-11	18	70.0	3000*	28.1				
		70										
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS21	7-9-10	19	75.0	2200#	24.4				
		75										
554.6	80.0		SS22	4-5-7	12	80.0	1800#	28.7				
	End of Boring at 80 ft.	80										
		85										
		90										
		95										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13462498.3
Northing: 356520.7

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: H. Bharadwaj/R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/26/2016 **DATE COMPLETED:**10/29/2016 **LOG OF TEST BORING** **TB-03A**

LOG OF SOIL PROFILE				FIELD DATA				LABORATORY DATA						
ELEVATION ft			DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 / ● MOISTURE CONTENT (%) ● 10 20 30 40 / ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
		Ground Surface Elevation 633.5 ft	0											
			5											
			10											
			15											
		Profile drilled to 48.5 ft.	20											
			25											
			30											

DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462465.0
Northing: 356515.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 105 ft.

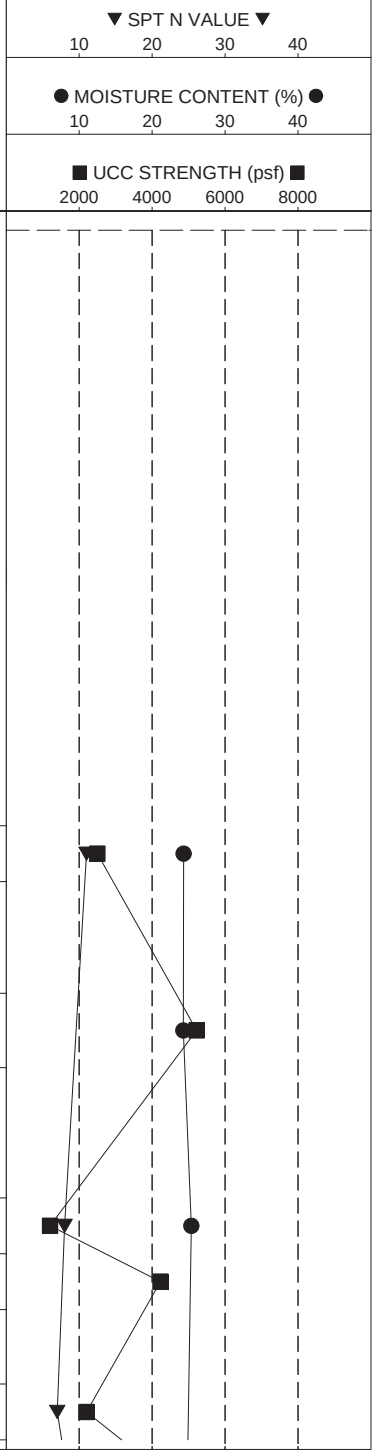
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/26/2016 **DATE COMPLETED:**10/29/2016 **LOG OF TEST BORING** **TB-03A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.5 ft											
	Profile drilled to 48.5 ft.	35, 40, 45										
585.0		48.5										
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	50	SS1	4-5-6	11	50.0	2500*	24.3				
		55	ST2			55.0	5220	24.3	104			
			SS3	2-4-4	8	60.0	1200#	25.4				
573.5		60.0										
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	60	VS1			61.5	4230					
		65	SS4	2-4-3	7	65.0	2200#					



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462465.0
Northing: 356515.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 105 ft.

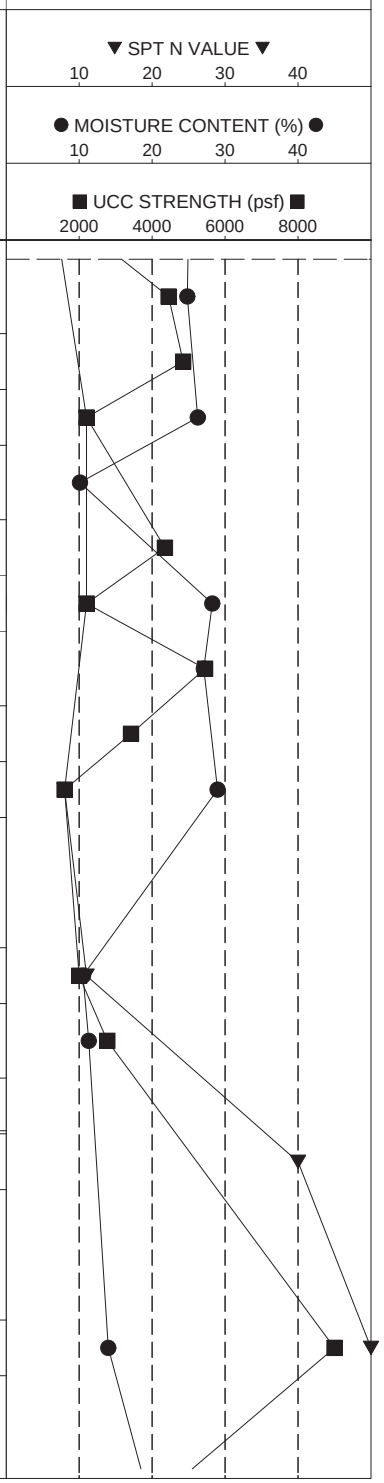
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/26/2016 **DATE COMPLETED:**10/29/2016 **LOG OF TEST BORING** **TB-03A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.5 ft	65										
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		ST5			67.0	4450	24.8	102			
			VS2			68.5	4850					
563.5		70.0	SS6	2-5-6	11	70.0	2200#	26.3				
	CLAYEY MEDIUM SAND with silt, trace gravel, gray, moist (SC) (Based on Atterberg Limits, Shelby tube sample at 72 ft. reacts similar to CL)	70	ST7			72.0	<>	10.1		25	10	29
561.5		72.0										
			VS3			73.5	4350					
			SS8	2-5-6	11	75.0	2200#	28.2				
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	75	ST9			77.0	5450	27.1	99			
			VS4			78.5	3420					
553.5		80.0	SS10	2-3-5	8	80.0	1600#	29.0		38	18	
	Stiff SANDY SILTY CLAY, few gravel, gray (CL-ML)	80										
	NOTE: Vane shear test at 88.4 ft. terminated early due to sand layer.		SS11	1-5-6	11	85.0	2000*	10.5				
		85	ST12			87.0	2770	11.3	130	17	6	53
545.5		88.0	VS5			88.4						
	Dense SILTY FINE SAND, trace gravel, gray, moist (SM)		SS13	6-14-26	40	90.0						
543.5		90.0										
	Hard to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	90										
			SS14	12-22-28	50	95.0	9000+*	14.0				
		95										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462465.0
Northing: 356515.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 105 ft.

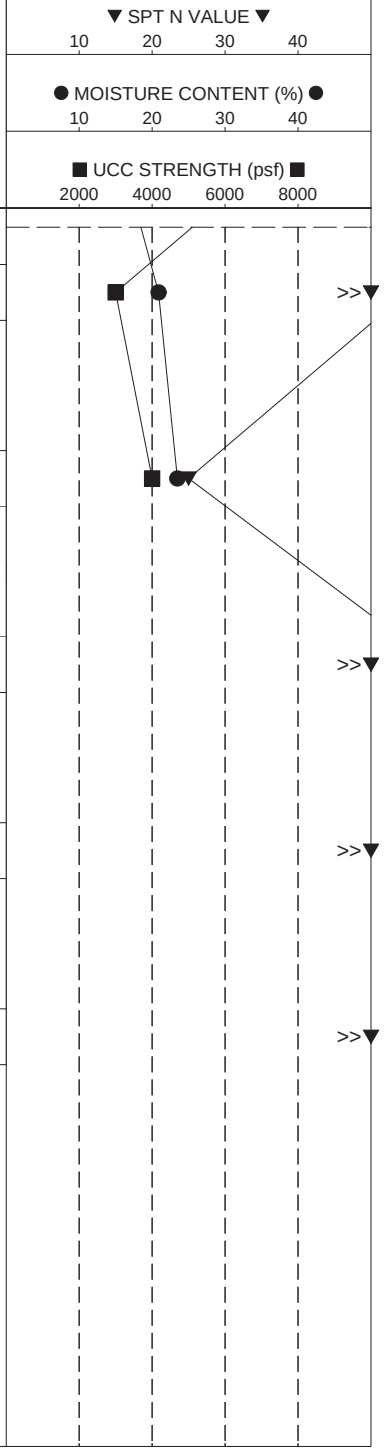
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/26/2016 **DATE COMPLETED:**10/29/2016 **LOG OF TEST BORING** **TB-03A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.5 ft											
533.5	Hard to stiff LEAN CLAY, trace sand, trace gravel, gray (CL) 100.0	100	SS15	16-23-32	55	100.0	3000*	20.9				
528.5	Very stiff LEAN CLAY, trace sand, gray (CL) 105.0	105	SS16	6-9-16	25	105.0	4000*	23.5		36	15	99
519.5	Very dense SILT with sand, gray, moist (ML) 114.0	110	SS17	25-30-29	59	110.0						
513.5	Very dense SILTY FINE SAND, trace gravel, gray, wet (SM) 120.0	115	SS18	25-30-33	63	115.0						
		120	SS19	21-31-44	75	120.0						
	End of Boring at 120 ft.	125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462465.0
Northing: 356515.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 105 ft.

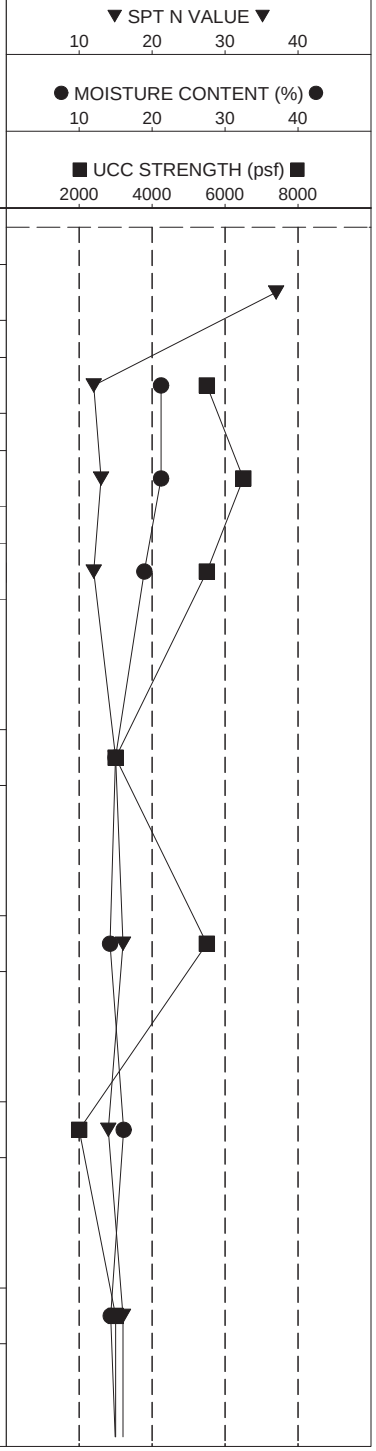
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/7/2016 **DATE COMPLETED:** 12/9/2016 **LOG OF TEST BORING TB-112**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft	0										
631.5	13 inches of ASPHALTIC CEMENT CONCRETE (1.1)											
	FILL - Dense poorly graded fine sand, trace silt, trace gravel, brown, moist (SP)		SS1	46-18-19	37	2.5						
628.6	(4.0)		SS2	7-4-8	12	5.0	5500*	21.2				
	Very stiff LEAN CLAY, trace sand, trace gravel, brown to gray (CL)	5	SS3	5-5-8	13	7.5	6500*	21.2	109			
622.6	(10.0)		SS4	5-5-7	12	10.0	5500*	18.9				
	Stiff to hard LEAN CLAY, trace sand, trace gravel, gray (CL)	10	SS5	5-6-9	15	15.0	3000*	15.0				
		15	SS6	5-7-9	16	20.0	5500*	14.2				
		20	SS7	5-6-8	14	25.0	2000*	16.1				
602.6	(30.0)	25	SS8	5-7-9	16	30.0	10170	14.3	120			
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	30										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462613.9
Northing: 355920.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan/M. Hiske
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 85 ft.

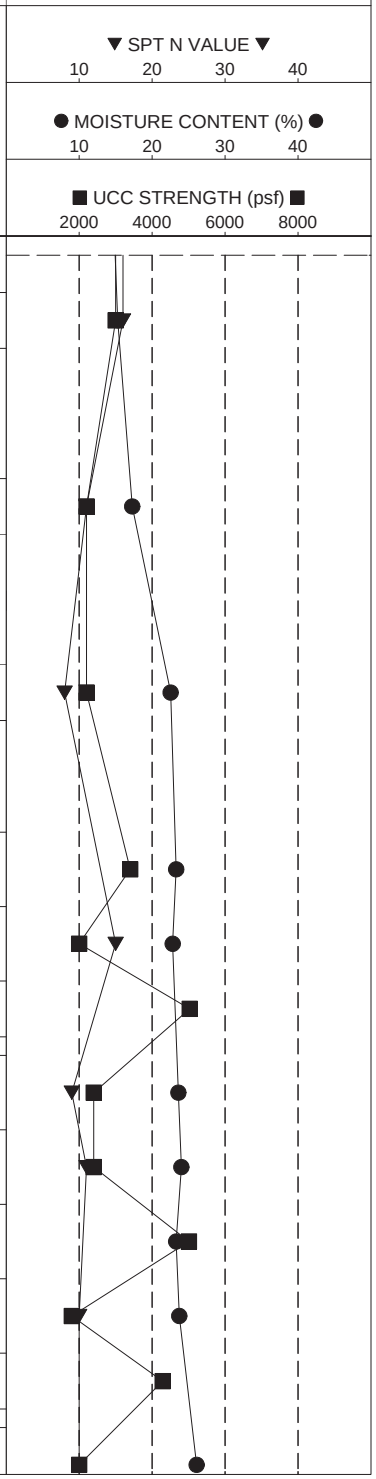
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/7/2016 **DATE COMPLETED:** 12/9/2016 **LOG OF TEST BORING TB-112**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft											
		35	SS9	4-6-10	16	35.0	3000*	15.3				
		40	SS10	4-4-7	11	40.0	2200#	17.3				
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	45	SS11	3-3-5	8	45.0	2200#	22.5				
			ST12			50.0	3400*	23.3		39	20	91
		50	SS13	4-6-9-8	15	52.0	2000#	22.8				
			VS1			53.5	5030					
		55	SS14	5-4-5-8	9	56.0	2400#	23.6				
			SS15	4-6-5-9	11	58.0	2400#	24.0				
			ST16			60.0	5010	23.3	105			
572.6		60.0 60	SS17	3-4-6-7	10	62.0	1800#	23.7				
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		VS2			63.5	4290					
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462613.9
Northing: 355920.4

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan/M. Hiske
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 85 ft.

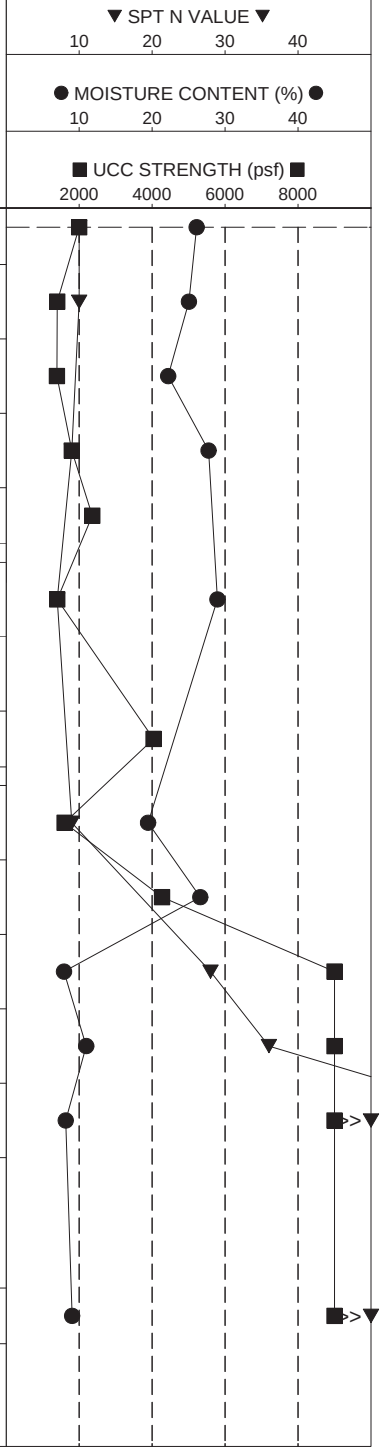
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/7/2016 **DATE COMPLETED:** 12/9/2016 **LOG OF TEST BORING TB-112**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft											
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	65	SS18	4-4-6-7	10	66.0	2000#	26.1				
			SS19	2-4-6-6	10	68.0	1400#	25.0				
564.6	68.0											
	Medium to very stiff LEAN CLAY with sand, trace gravel, gray (CL)		ST20			70.0	1390	22.2	107	34	19	81
		70	SS21	7-4-5-8	9	72.0	1800#	27.7				
			VS3			73.5	2360					
	NOTE: No recovery on Shelby tube at 78 ft. due to sample falling out of sampler.	75	SS22	3-3-4-5	7	76.0	1400#	28.9				
			NR23			78.0						
			VS4			79.5	4040					
552.6	80.0	80										
	Medium to very stiff LEAN CLAY, trace sand, gray (CL)		SS24	3-4-5-7	9	82.0	1600#	19.4				
			ST25			84.0	4270	26.6	99	43	25	98
548.6	84.0											
	Hard SANDY LEAN CLAY, few gravel, gray (CL)	85	SS26	20-11-17-40	28	86.0	9000+*	7.9				
			SS27	6-11-25-35	36	88.0	9000+*	11.0		20	8	59
			SS28	20-25-45-45	70	90.0	9000+*	8.2				
		90										
			SS29	27-30-50	80	95.0	9000+*	9.0		25	11	64
537.6	95.0	95										
	Extremely dense SILTY FINE SAND, occasional sandy silt layers, gray, moist (SM)											



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13462613.9
Northing: 355920.4

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan/M. Hiske
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 85 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/7/2016 **DATE COMPLETED:** 12/9/2016 **LOG OF TEST BORING** **TB-112**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.6 ft											
			SS30	50-50/4"	50 +	99.3						
	Extremely dense SILTY FINE SAND, occasional sandy silt layers, gray, moist (SM)	100										
528.2	104.4		SS31	36-50/5"	50 +	104.4						
	End of Boring at 104.4 ft. (Terminated upon SPT sample refusal)	105										
		110										
		115										
		120										
		125										
		130										

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

>>▼

DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13462613.9
Northing: 355920.4

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
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Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 85 ft.

DRAFT

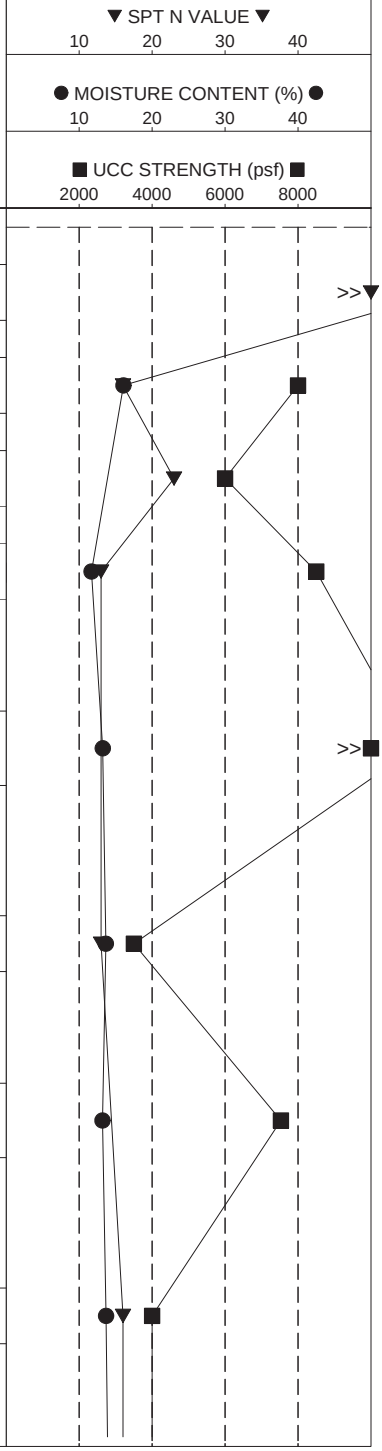
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/25/2016 **DATE COMPLETED:**10/28/2016 **LOG OF TEST BORING** **TB-111**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 631.8 ft	
631.6	2 inches of ASPHALTIC CEMENT CONCRETE	0.2
630.8	10 inches of PORTLAND CEMENT CONCRETE	1.0
627.8	FILL - Very dense poorly graded fine to medium sand, trace silt, trace gravel, brown, moist (SP)	4.0
626.8	Hard LEAN CLAY, few sand, trace gravel, brown (CL) (Possible Fill)	5.0
624.3	Very stiff SILTY CLAY, few sand, trace gravel, brown, moist (CL-ML)	7.5
	Hard LEAN CLAY, few sand, trace gravel, gray (CL)	
616.8	Stiff to very stiff SANDY LEAN CLAY, trace gravel, gray (CL)	15.0

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	27-36-24	60	2.5						
SS2	56-7-9	16	5.0	8000*	16.1				
SS3	6-13-10	23	7.5	6000*			25	6	94
SS4	5-6-7	13	10.0	8500*	11.7				
ST5			15.0	11200	13.2	127			
SS6	9-7-6	13	20.0	3500*	13.7				
ST7			25.0	7530	13.2	125	29	15	69
SS8	5-7-9	16	30.0	4000*	13.7				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462820.7
Northing: 355343.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 85 ft.
Methane gas was encountered in monitoring well at 100% LEL.

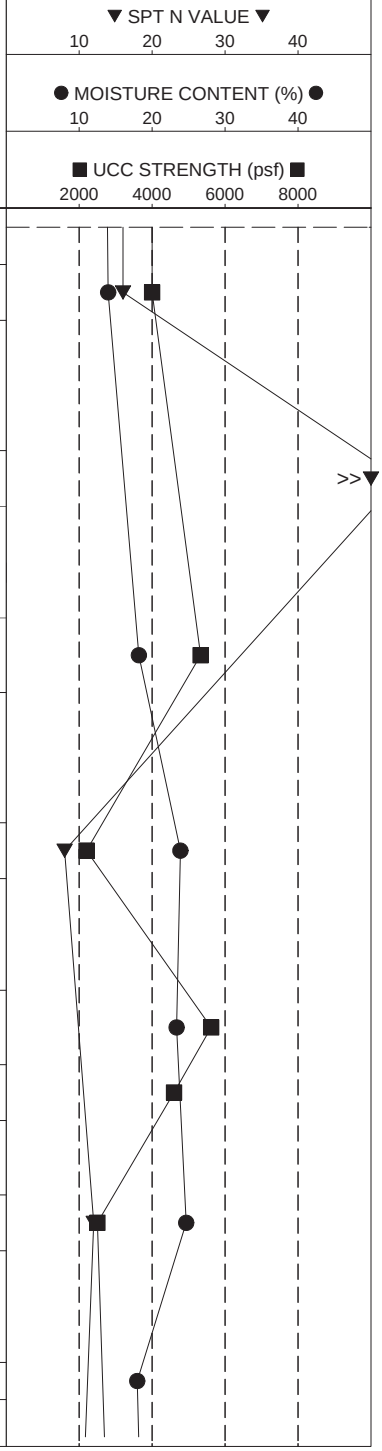
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/25/2016 **DATE COMPLETED:**10/28/2016 **LOG OF TEST BORING** **TB-111**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.8 ft											
	Stiff to very stiff SANDY LEAN CLAY, trace gravel, gray (CL)	35	SS9	6-9-7	16	35.0	4000*	14.0				
593.3		38.5										
591.8	Very dense SILTY FINE SAND, few gravel, occasional lean clay layers, gray, moist (SM)	40.0	SS10	48-37-17	54	40.0						30
	Very stiff LEAN CLAY with sand, trace gravel, gray (CL)	40										
			ST11			45.0	5330	18.2	113	31	14	83
586.8		45.0										
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	45										
			SS12	3-4-4	8	50.0	2200#	23.9				
		50										
	NOTE: Shelby tube performed at 64 ft. was pushed only 12 inches; unable to advance further due to sand layer.		ST13			55.0	5620	23.4	105	38	19	91
		55	VS1			56.5	4600					
			SS14	5-6-6	12	60.0	2500*	24.7				
		60										
567.8		64.0	ST15			64.0	<>	18.0				
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462820.7
Northing: 355343.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 85 ft.
Methane gas was encountered in monitoring well at 100% LEL.

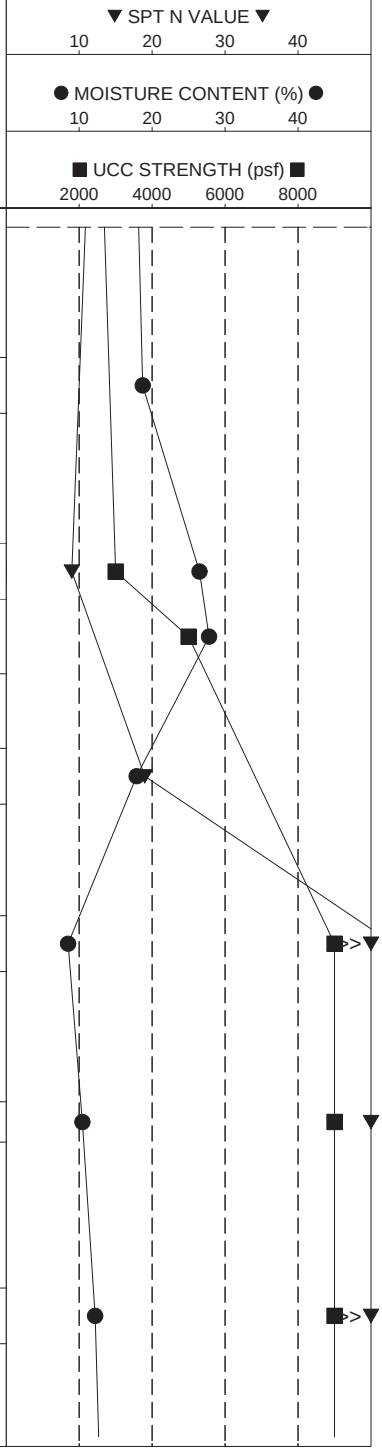
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/25/2016 **DATE COMPLETED:**10/28/2016 **LOG OF TEST BORING TB-111**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.8 ft	65										
	SILTY MEDIUM TO COARSE SAND, trace clay, trace gravel, occasional lean clay layers, gray, wet (SM)											
	NOTE: No recovery on Shelby tube attempt at 70 ft. due to sample falling out of sampler; direct pushed to 70 ft. to retrieve sample		DP16			70.0		18.7				
561.8		70.0 / 70										
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS17	3-4-5	9	75.0	3000*	26.5				
		75	ST18			77.0	5000*	27.8	97	44	22	98
	NOTE: No recovery on Shelby tube attempt at 79 ft. due to sample falling out of sampler		NR19			79.0						
		80	SS20	8-9-10	19	80.5	<>	17.9				
548.3		83.5										
		85	SS21	26-26-27	53	85.0	9000+*	8.5				
	Hard LEAN CLAY, few sand, trace gravel, occasional silt seams and layers, gray (CL)		SS22	48-50	50+	89.6	9000+*	10.4				
		90										
		95	SS23	28-30-42	72	95.0	9000+*	12.2				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462820.7
Northing: 355343.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 85 ft.
Methane gas was encountered in monitoring well at 100% LEL.

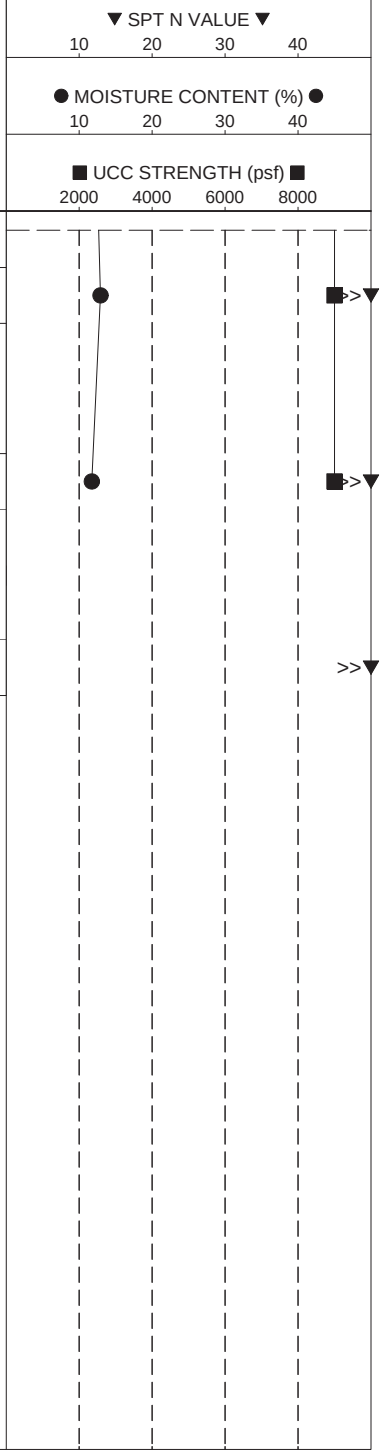
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/25/2016 **DATE COMPLETED:**10/28/2016 **LOG OF TEST BORING TB-111**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.8 ft											
	Hard LEAN CLAY, few sand, trace gravel, occasional silt seams and layers, gray (CL)	100	SS24	29-30-42	72	100.0	9000+*	12.9				
			SS25	20-30-41	71	105.0	9000+*	11.7				
526.8		105.0										
	Very dense SILT, trace sand, gray, moist (ML)	105										
			SS26	30-36-37	73	110.0						
521.8		110.0										
	End of Boring at 110 ft.	110										
		115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462820.7
Northing: 355343.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 85 ft.
Methane gas was encountered in monitoring well at 100% LEL.

DRAFT

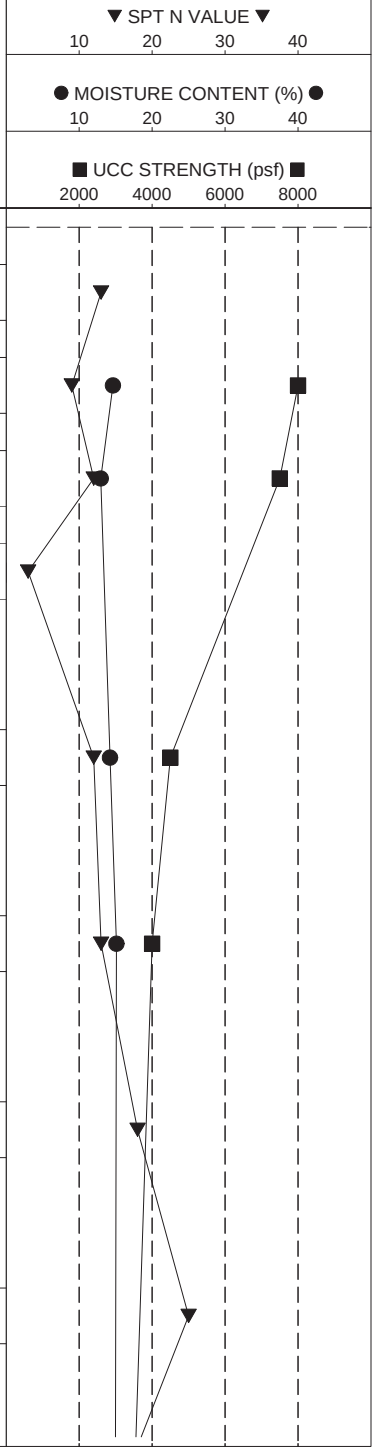
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/5/2016 **DATE COMPLETED:** 12/13/2016 **LOG OF TEST BORING** **TB-110**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 632.2 ft	
631.9	3 inches of ASPHALTIC CEMENT CONCRETE	0.3
631.0	11 inches of PORTLAND CEMENT CONCRETE	1.2
628.7	FILL - Medium dense poorly graded fine sand, trace silt, trace gravel, brown, moist (SP)	3.5
623.7	Hard to very stiff LEAN CLAY, few sand, trace gravel, brown (CL)	8.5
618.7	Very loose poorly graded FINE SAND, trace silt, trace gravel, brown, moist (SP)	13.5
612.2	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	20.0
	Stiff SANDY LEAN CLAY, trace gravel, gray (CL) NOTE: No recovery on SPT sample attempt at 30 ft. due to sample falling out of sampler.	

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	5-7-6	13	2.5						
SS2	3-4-5	9	5.0	8000*	14.6				
SS3	3-5-7	12	7.5	7500*	12.9				
SS4	1-2-1	3	10.0						
SS5	3-5-7	12	15.0	4500*	14.2				
SS6	3-5-8	13	20.0	4000*	15.1				
SS7	8-9-9	18	25.0	<>			27	14	57
NR8	9-12-13	25	30.0						



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462980.5
Northing: 354769.0

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins/S. Swaminathan
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 86 ft.

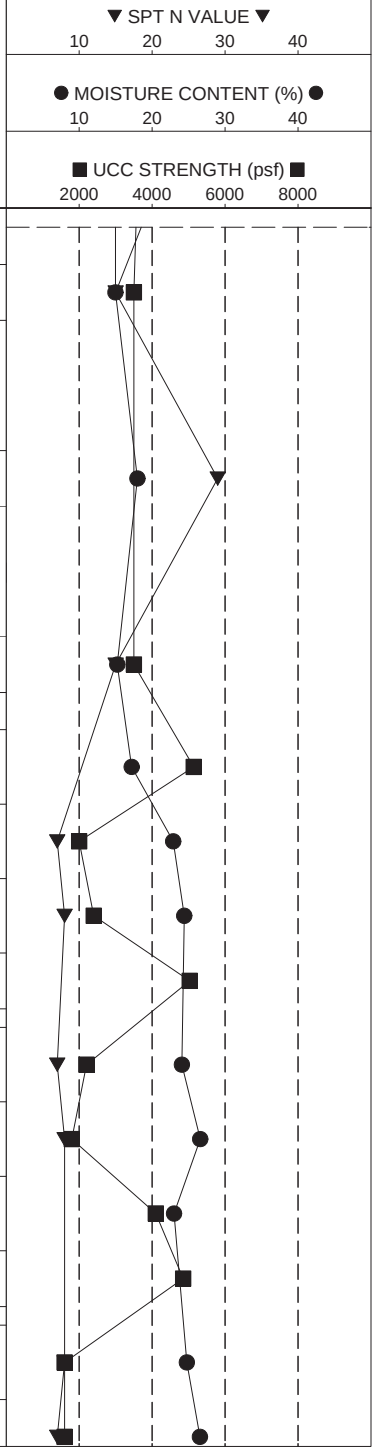
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/5/2016 **DATE COMPLETED:** 12/13/2016 **LOG OF TEST BORING** **TB-110**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.2 ft											
	Stiff SANDY LEAN CLAY, trace gravel, gray (CL)	35	SS9	3-5-10	15	35.0	3500*	15.0				
	NOTE: No recovery on SPT sample attempt at 30 ft. due to sample falling out of sampler.		SS10	8-15-14	29	40.0	<>	18.0		27	13	59
592.2		40.0										
	Very stiff to medium LEAN CLAY, trace sand, gray (CL)	40										
			SS11	3-7-8	15	45.0	3500*	15.2				
		45										
			ST12			48.0	5140	17.2	113			
			SS13	2-3-4-5	7	50.0	2000#	22.9				
		50										
			SS14	2-3-5-6	8	52.0	2400#	24.4				
			VS1			53.5	5030					
		55	SS15	2-3-4-6	7	56.0	2200#	24.1				
			SS16	2-4-4-6	8	58.0	1800#	26.6				
			ST17			60.0	4100	23.0	104	39	20	98
		60	VS2			61.5	4850					
570.2		62.0										
			SS18	3-3-5-6	8	64.0	1600#	24.8				
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462980.5
Northing: 354769.0

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins/S. Swaminathan
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 86 ft.

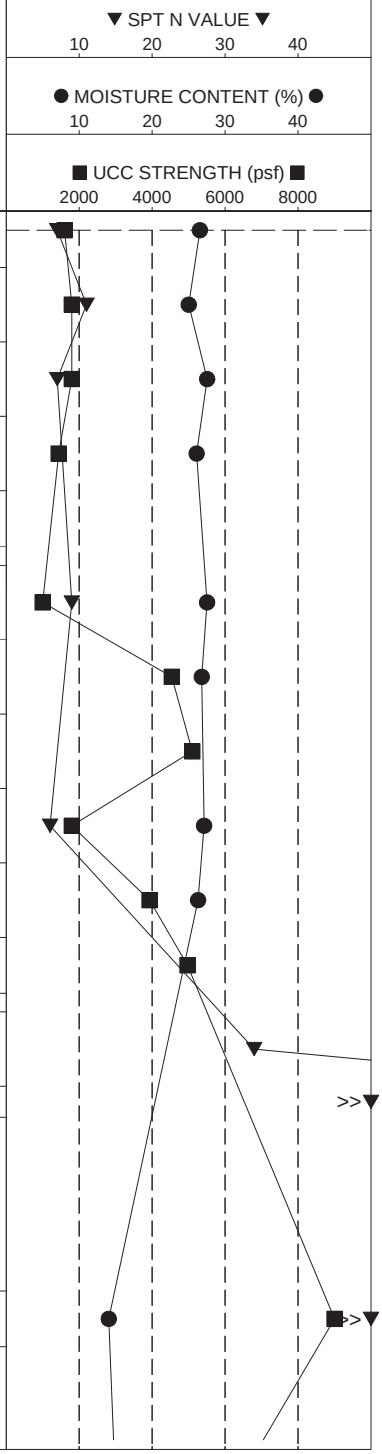
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/5/2016 **DATE COMPLETED:** 12/13/2016 **LOG OF TEST BORING** **TB-110**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.2 ft	65	SS19	3-3-4-5	7	66.0	1600#	26.6				
			SS20	3-5-6-7	11	68.0	1800#	25.0				
			SS21	2-3-4-5	7	70.0	1800#	27.5				
		70	ST22			72.0	1440	26.1	99			
			VS3			73.5						
	Medium to very stiff LEAN CLAY, few sand, trace gravel, gray (CL) NOTE: Vane shear test at 73.5 ft. terminated early due to high force gauge readings.	75	SS23	3-4-5-7	9	76.0	1000#	27.5				
			ST24			78.0	4540	26.8	99	26	12	90
			VS4			80.0	5100					
		80	SS25	2-2-4-4	6	82.0	1800#	27.1				
			ST26			84.0	3930	26.3	98			
		85	VS5			85.5	4970					
546.2		86.0										
	Dense to extremely dense SILTY FINE SAND, trace gravel, gray, wet (SM)		SS27	3-13-21-30	34	88.0						
543.4		88.8	SS28	35-60/4"	60 +	88.8						
	Hard to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	90										
			SS29	12-25-35	60	95.0	9000#	14.1				
		95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13462980.5
Northing: 354769.0

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins/S. Swaminathan
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 86 ft.

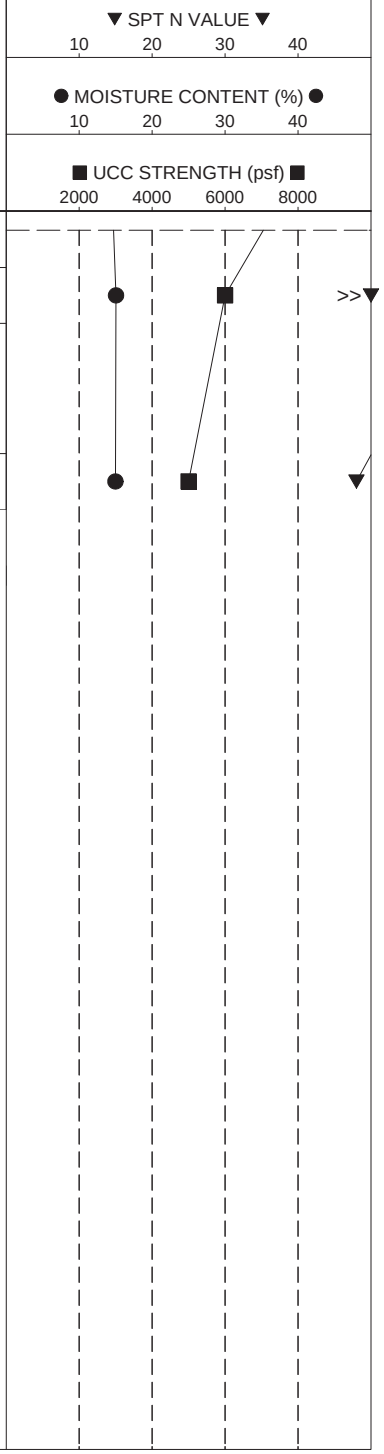
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/5/2016 **DATE COMPLETED:** 12/13/2016 **LOG OF TEST BORING** **TB-110**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.2 ft											
	Hard to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS30	15-25-37	62	100.0	6000#	15.1				
		100										
527.2			SS31	15-19-29	48	105.0	5000#	15.0				
		105.0										
	End of Boring at 105 ft.	105										
		110										
		115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13462980.5
Northing: 354769.0

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins/S. Swaminathan
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 86 ft.

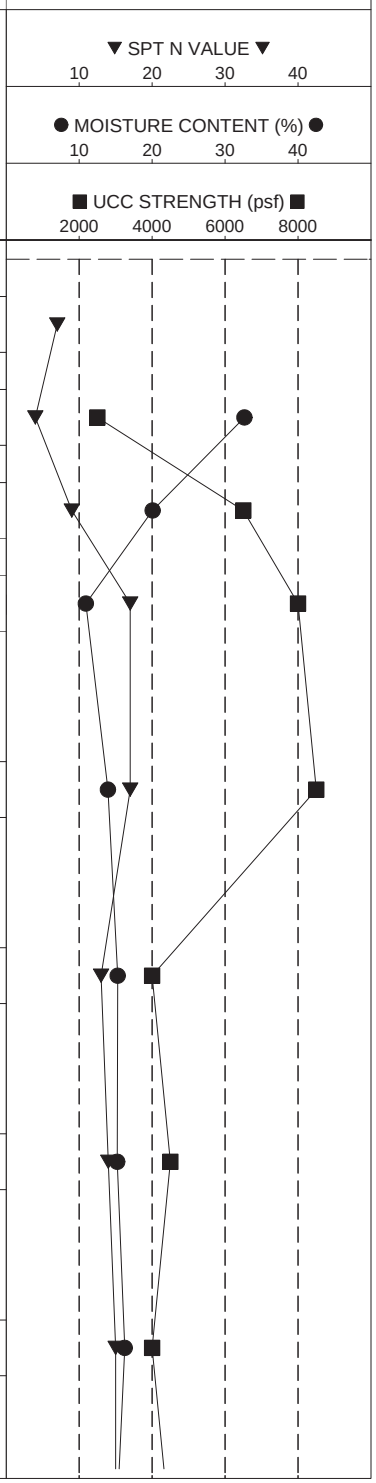
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/24/2016 **DATE COMPLETED:**10/25/2016 **LOG OF TEST BORING TB-109**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.8 ft	0										
631.3	Sandy TOPSOIL (2.5)		SS1	4-3-4	7	2.5						
628.8	Stiff LEAN CLAY, trace sand, trace gravel, occasional fine sand seams, brown (CL) (5.0)		SS2	2-2-2	4	5.0	2500*	32.6				
626.3	Very stiff LEAN CLAY, trace sand, trace gravel, trace roots, occasional silt seams, mottled brown and gray (CL) (7.5)	5	SS3	3-4-5	9	7.5	6500*	20.1				
			SS4	5-7-10	17	10.0	8000*	10.9				
		10										
			SS5	5-7-10	17	15.0	8500*	13.9		31	16	73
		15										
	Hard to stiff LEAN CLAY with sand, trace gravel, gray (CL)		SS6	4-5-8	13	20.0	4000*	15.3				
		20										
			SS7	5-6-8	14	25.0	4500*	15.2				
		25										
			SS8	4-6-9	15	30.0	4000*	16.2		32	16	76
		30										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13463256.1
Northing: 354124.0

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Swaminathan
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 115 ft.

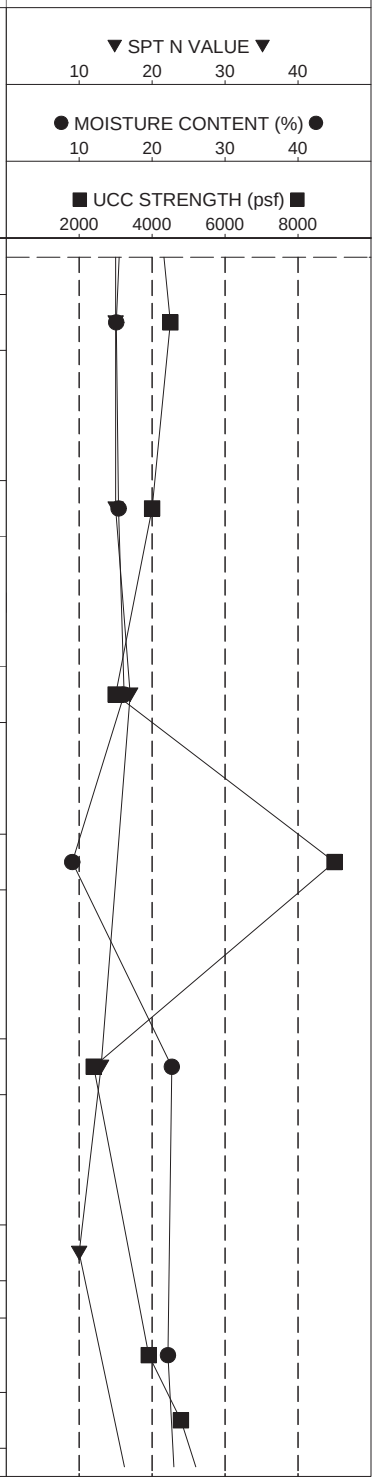
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/24/2016 **DATE COMPLETED:**10/25/2016 **LOG OF TEST BORING TB-109**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.8 ft											
	Hard to stiff LEAN CLAY with sand, trace gravel, gray (CL)	35	SS9	4-6-9	15	35.0	4500*	15.1				
		40	SS10	4-6-9	15	40.0	4000*	15.4				
		45	SS11	4-8-9	17	45.0	3000*	16.2				
585.8		48.0										
	Hard SANDY SILTY CLAY, trace gravel, gray (CL-ML)		ST12			49.5	9000+*	9.0		18	6	51
583.8		50.0										
	NOTE: Shelby tube performed at 49.5 ft was pushed only 18 inches; unable to advance further due to possible cobble.	50										
			SS13	3-6-7	13	55.0	2400#	22.7				
	Stiff LEAN CLAY with sand, trace gravel, gray (CL)	55										
			SS14	2-4-6	10	60.0	<>					
		60										
			ST15			63.0	3910	22.2	107			
570.8		63.0										
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		VS1			64.5	4790					
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13463256.1
Northing: 354124.0

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Swaminathan
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 115 ft.

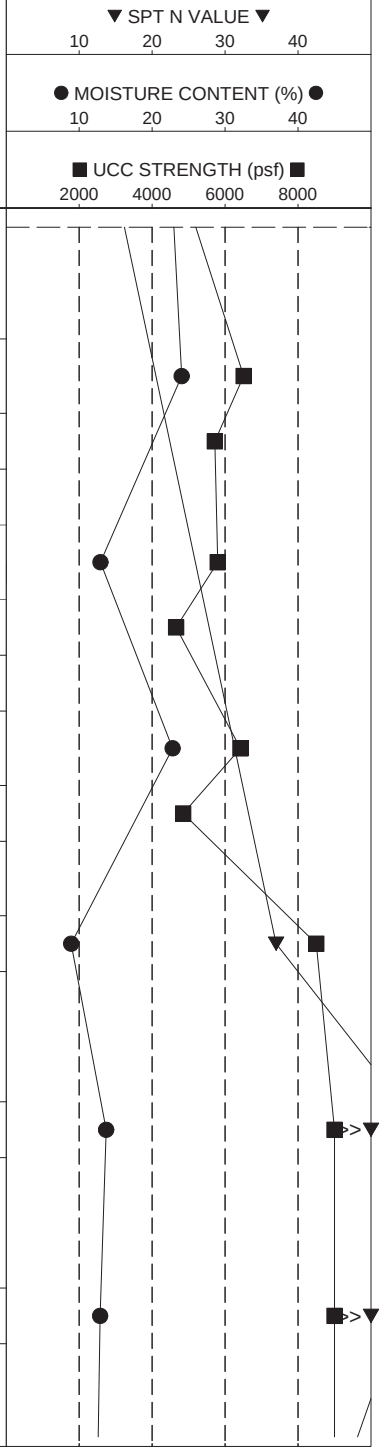
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/24/2016 **DATE COMPLETED:**10/25/2016 **LOG OF TEST BORING TB-109**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.8 ft	65										
			ST16			70.0	6510	24.0	103	41	20	95
		70	VS2			71.5	5720					
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		ST17			75.0	5800	12.9	123			
		75	VS3			76.5	4660					
			ST18			80.0	6420	22.8	106			
		80	VS4			81.5	4850					
549.8		84.0	SS19	6-11-26	37	85.0	8500*	8.9				
		85										
			SS20	14-24-33	57	90.0	9000+*	13.7				
	Hard to very stiff LEAN CLAY with sand, trace gravel, gray (CL)	90										
			SS21	17-27-27	54	95.0	9000+*	12.9				
		95										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13463256.1
Northing: 354124.0

Coordinates/GSE determined by: Survey

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Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Swaminathan
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
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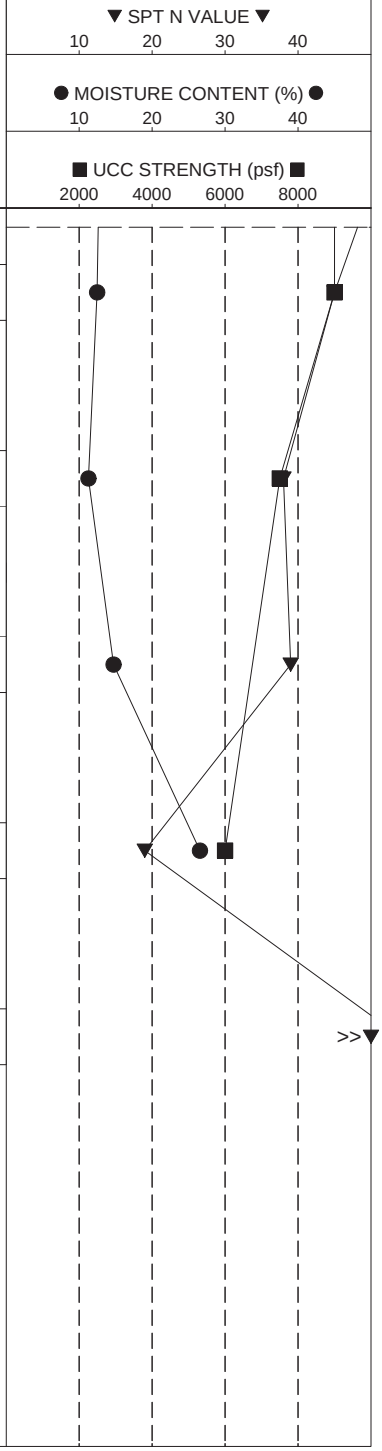
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/24/2016 **DATE COMPLETED:**10/25/2016 **LOG OF TEST BORING TB-109**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.8 ft											
	Hard to very stiff LEAN CLAY with sand, trace gravel, gray (CL)		SS22	12-20-25	45	100.0	9000+*	12.5				
		100										
			SS23	12-16-22	38	105.0	7500*	11.3				
		105										
			SS24	15-17-22	39	110.0	<>	14.7				
523.8	110.0	110										
	Very stiff LEAN CLAY, trace sand, trace gravel, frequent silt partings and seams, gray (CL)		SS25	5-8-11	19	115.0	6000*	26.6				
518.8	115.0	115										
	Alternating layers of very dense SILTY FINE SAND and SANDY SILT, gray, moist (SM)(ML)		SS26	15-22-32	54	120.0						
513.8	120.0	120										
	End of Boring at 120 ft.											
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13463256.1
Northing: 354124.0

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Swaminathan
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
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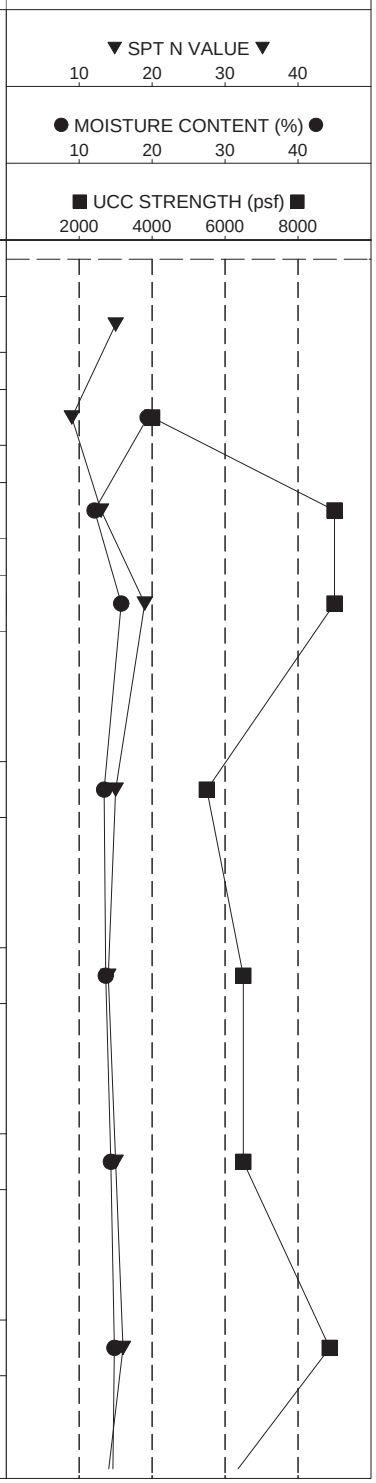
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/13/2016 **DATE COMPLETED:** 12/21/2016 **LOG OF TEST BORING** **TB-108**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 632.0 ft	0
631.7	3 inches of ASPHALTIC CEMENT CONCRETE	0.3
631.2		0.8
631.0	6 inches of PORTLAND CEMENT CONCRETE	1.0
629.5	Field Engineer reported 3 inches of gravel FILL (Base Material)	2.5
627.0	FILL - Medium dense poorly graded fine sand with silt, trace gravel, brown, moist (SP-SM)	5.0
	FILL - Stiff lean clay, trace sand, trace gravel, occasional fine sand partings and clayey fine sand seams, brown and gray (CL)	
619.0	Hard LEAN CLAY, trace sand, trace gravel, brown (CL)	13.0
617.0	Very stiff SANDY LEAN CLAY, few gravel, gray (CL)	15.0
602.0	Very stiff to hard LEAN CLAY, trace sand, trace gravel, gray (CL)	30.0
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	5-6-9	15	2.5						
SS2	8-4-5	9	5.0	4000*	19.4				
SS3	5-6-7	13	7.5	9000*	12.1				
SS4	6-7-12	19	10.0	9000*	15.8				
SS5	5-6-9	15	15.0	5500*	13.4		29	14	64
SS6	5-5-9	14	20.0	6500*	13.6				
SS7	3-7-8	15	25.0	6500*	14.3				
SS8	4-7-9	16	30.0	8870	14.8	124			



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13463439.1
Northing: 353505.9

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: M. Hiske/R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

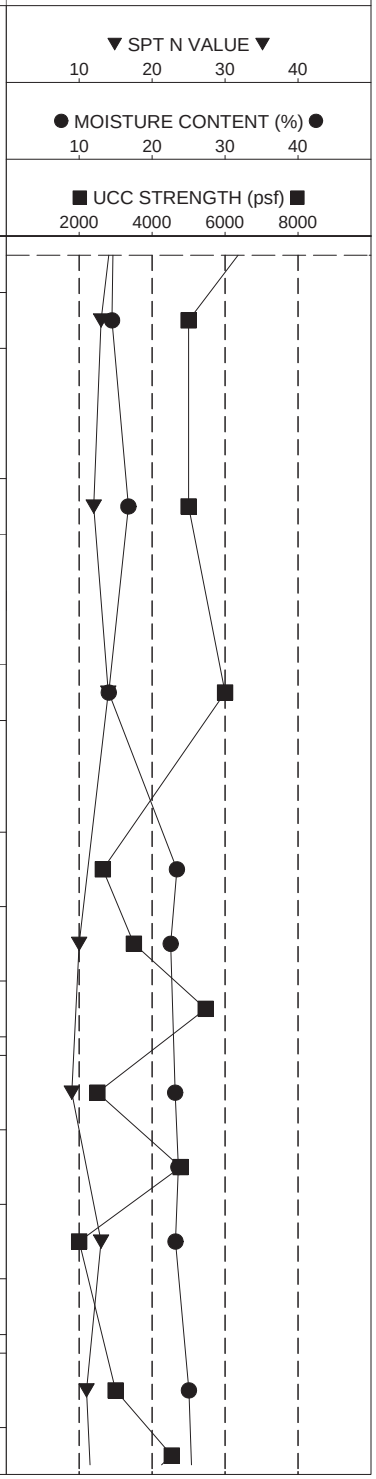
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/13/2016 **DATE COMPLETED:** 12/21/2016 **LOG OF TEST BORING** **TB-108**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.0 ft											
			SS9	3-5-8	13	35.0	5000*	14.5				
		35										
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS10	4-5-7	12	40.0	5000*	16.7				
		40										
			SS11	4-7-7	14	45.0	6000*	14.1				
		45										
			ST12			50.0	2650	23.4	105	41	22	97
582.0		50.0										
		50	SS13	4-4-6-9	10	52.0	3500*	22.5				
			VS1			53.5	5470					
		55	SS14	3-4-5-5	9	56.0	2500*	23.2				
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		ST15			58.0	4780	23.6	103	35	16	96
	NOTE: Vane shear test at 61.5 ft. terminated early due to high force gauge readings.		SS16	3-6-7-7	13	60.0	2000*	23.2				
		60	VS2			61.5						
			SS17	3-5-6-8	11	64.0	3000*	25.0				
		65	VS3			65.5	4540					



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13463439.1
Northing: 353505.9

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: M. Hiske/R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

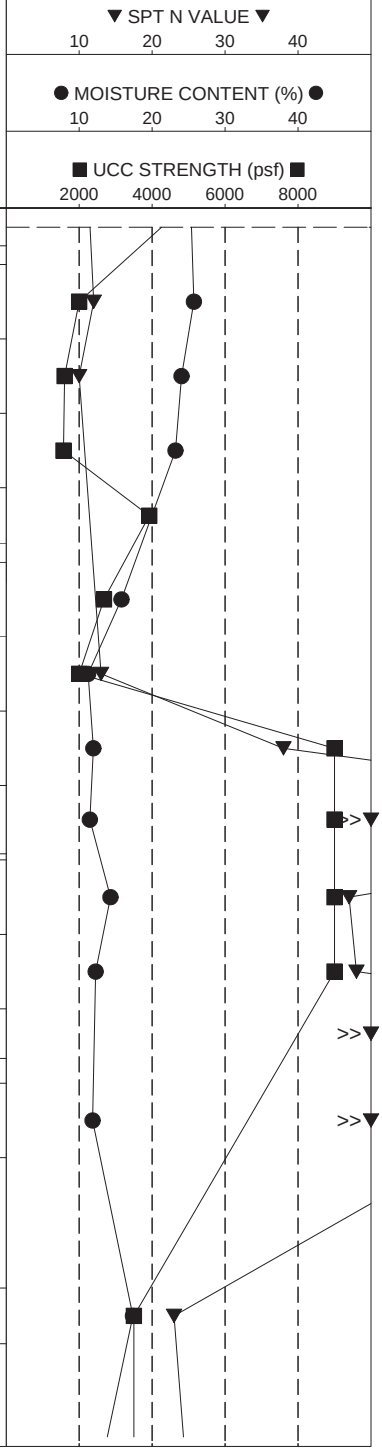
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/13/2016 **DATE COMPLETED:** 12/21/2016 **LOG OF TEST BORING** **TB-108**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.0 ft	65										
564.0		68.0	SS18	3-6-6-6	12	68.0	2000#	25.7				
	Medium to stiff LEAN CLAY, few sand, trace gravel, gray (CL)	70	SS19	3-4-6-5	10	70.0	1600#	24.0				
			ST20			72.0	1570	23.2	106	25	10	89
			VS4			73.5	3920					
556.0		75 76.0	ST21			76.0	2680	15.8	120	29	14	88
	Stiff to hard LEAN CLAY with sand, trace gravel, occasional fine sand seams, gray (CL)		SS22	4-6-7-8	13	78.0	2000*	11.2				
			SS23	13-18-20-24	38	80.0	9000+*	11.9				
		80	SS24	17-32-33-50/4"	65	81.8	9000+*	11.5				
			SS25	13-20-27-30	47	84.0	9000+*	14.3				
546.0		85 86.0	SS26	12-17-31-46	48	86.0	9000*	12.3				
	Extremely dense to very dense SILTY FINE SAND, trace gravel, occasional lean clay layers, gray, moist (SM)		SS27	26-29-50/4"	79/10"	87.3						
		90	SS28	20-36-34	70	90.0		11.8				36
538.5		93.5										
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	95	SS29	5-10-13	23	95.0	3500*	17.4				



GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13463439.1
Northing: 353505.9

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: M. Hiske/R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

DRAFT

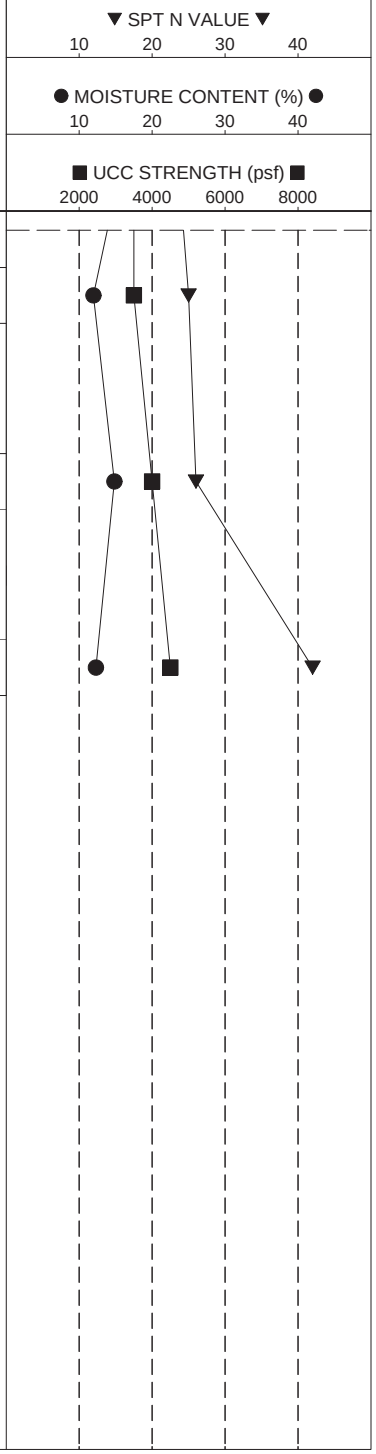
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

LOG OF TEST BORING I-75 DESIGN BUILD MODERNIZATION 2018.GPJ SOMAT.GDT 7/28/17

PROJECT NO. 2014195C **DATE STARTED:** 12/13/2016 **DATE COMPLETED:** 12/21/2016 **LOG OF TEST BORING TB-108**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.0 ft											
	Stiff to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS30	5-12-13	25	100.0	3500*	12.0				
		100										
			SS31	6-10-16	26	105.0	4000*	14.8				
		105										
522.0			SS32	12-17-25	42	110.0	4500*	12.3				
		110.0										
	End of Boring at 110 ft.	110										
		115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13463439.1
Northing: 353505.9

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: M. Hiske/R. Calkins
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

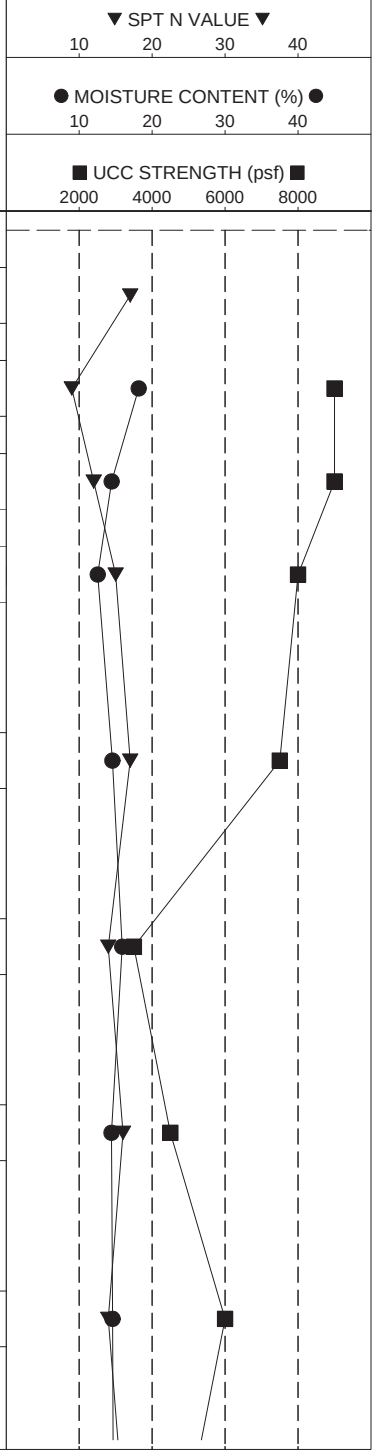
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/21/2016 **DATE COMPLETED:**10/22/2016 **LOG OF TEST BORING TB-107**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.2 ft	0										
632.4	9 inches of PORTLAND CEMENT CONCRETE	0.8										
	FILL - Medium dense poorly graded fine sand with silt, trace gravel, brown, moist (SP-SM)		SS1	6-8-9	17	2.5						
629.7		3.5										
	FILL - Hard lean clay, trace sand, trace gravel, brown (CL)	5	SS2	2-4-5	9	5.0	9000*	18.2				
627.2		6.0										
	Hard to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)		SS3	4-5-7	12	7.5	9000+*	14.5				
			SS4	6-7-8	15	10.0	8000*	12.5				
		10										
			SS5	6-8-9	17	15.0	7500*	14.6				
618.2		15.0										
	Stiff to very stiff LEAN CLAY with sand, trace gravel, gray (CL)	15										
			SS6	4-6-8	14	20.0	3500*	15.9		27	12	71
		20										
			SS7	4-7-9	16	25.0	4500*	14.4				
		25										
			SS8	4-6-8	14	30.0	6000*	14.6				
		30										



DRAFT

GROUNDWATER READINGS

First Encountered: 7 feet
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13463680.4
Northing: 352835.6

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: Driller reported hard drilling starting at 72 ft.

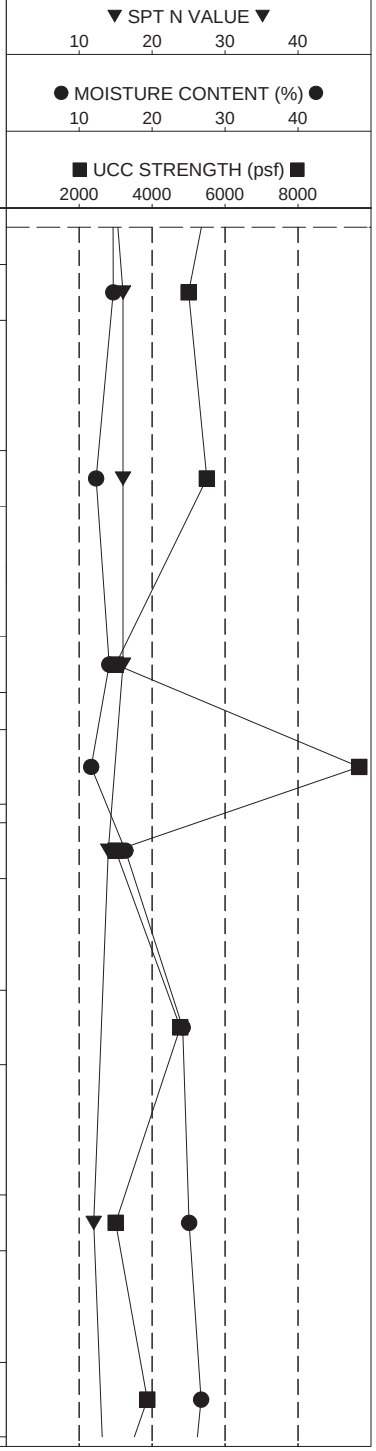
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/21/2016 **DATE COMPLETED:**10/22/2016 **LOG OF TEST BORING TB-107**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.2 ft											
	Stiff to very stiff LEAN CLAY with sand, trace gravel, gray (CL)	35	SS9	5-6-10	16	35.0	5000*	14.7				
594.7	38.5											
	Very stiff SANDY LEAN CLAY, trace gravel, gray (CL)	40	SS10	4-7-9	16	40.0	5500*	12.3		28	13	66
589.7	43.5											
	Stiff to hard LEAN CLAY, trace sand, trace gravel, gray (CL)	45	SS11	4-7-9	16	45.0	3000*	14.1				
			ST12			48.0	9680	11.6	128			
585.2	48.0											
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)	50	SS13	5-7-7	14	50.0	3000*	16.3				
		55	ST14			55.0	4770	24.2	104	38	18	92
		60	SS15	3-5-7	12	60.0	3000*	25.1				
		65	ST16			65.0	3870	26.7	102			



DRAFT

GROUNDWATER READINGS
First Encountered: 7 feet
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13463680.4
Northing: 352835.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: Driller reported hard drilling starting at 72 ft.

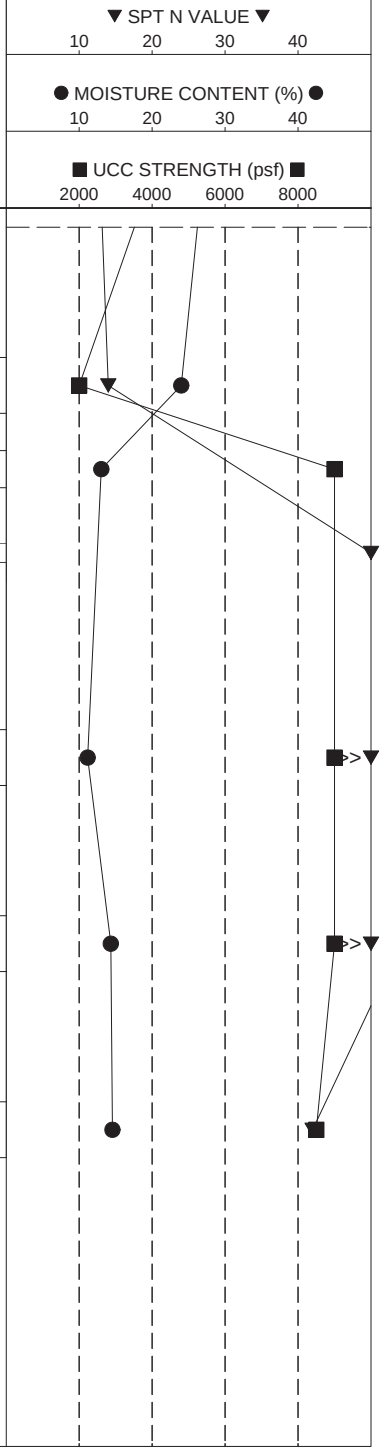
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/21/2016 **DATE COMPLETED:** 10/22/2016 **LOG OF TEST BORING** **TB-107**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 633.2 ft	65										
	Stiff to very stiff LEAN CLAY, few sand, trace gravel, gray (CL)											
			SS17	4-6-8	14	70.0	2000#	24.0				
563.2		70.0										
	Hard SANDY SILTY CLAY, few gravel, gray (CL-ML)	70										
			ST18			72.0	9000+*	13.0		20	7	56
	NOTE: Shelby tube performed at 72 ft was pushed only 12 inches; unable to advance further due to hard soils.											
559.7		73.5										
			SS19	50	50+	74.0						
	Extremely dense SILTY FINE SAND, trace gravel, gray, wet (SM)	75										
554.7		78.5										
	Hard LEAN CLAY with sand, trace gravel, gray (CL)		SS20	17-29-32	61	80.0	9000+*	11.2				
		80										
			SS21	17-24-30	54	85.0	9000*	14.3				
548.2		85.0										
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)	85										
			SS22	10-17-25	42	90.0	8500*	14.6				
543.2		90.0										
	End of Boring at 90 ft.	90										
		95										



DRAFT

GROUNDWATER READINGS

First Encountered: 7 feet
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13463680.4
Northing: 352835.6

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: Driller reported hard drilling starting at 72 ft.

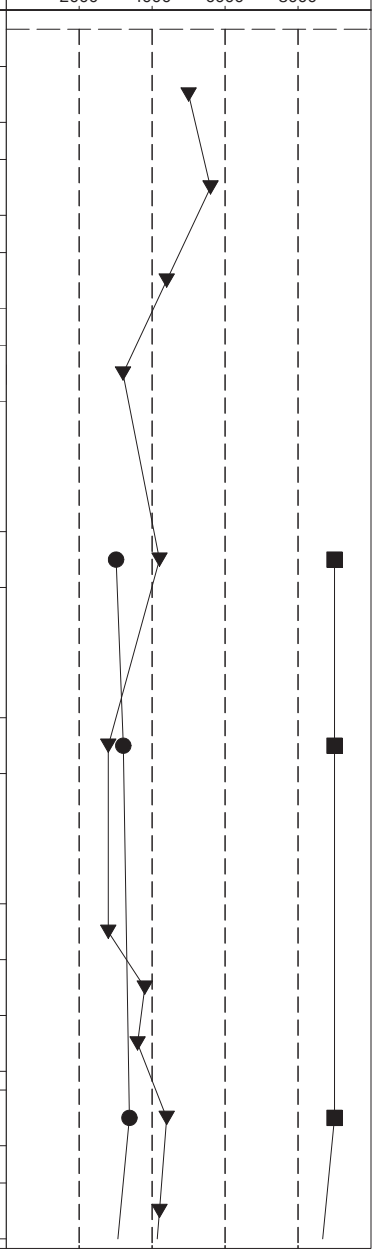
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/14/2015 **DATE COMPLETED:**10/15/2015 **LOG OF TEST BORING** **TB-02**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.8 ft	0										
633.8	12 inches of CLAYEY TOPSOIL, brownish black	1.0										
	Medium dense poorly graded FINE TO MEDIUM SAND, trace silt, trace gravel, brown, moist (SP)		NR1	0-0-25	25	2.5						
	NOTE: No recovery on SPT sample attempt at 2.5 ft. due to possible cobble.	5	SS2	7-11-17	28	5.0						
628.3		6.5	SS3	6-10-12	22	7.5						
	Medium dense SANDY SILT, gray, moist (ML)	10	SS4	6-7-9	16	10.0						
621.3		13.5										
	Hard LEAN CLAY with gravel, trace sand, gray (CL)	15	SS5	7-10-11	21	15.0	9000+*	15.1				
	NOTE: No recovery on SPT sample attempts at 25, 26.5, and 28 ft. due to possible cobble.	20	SS6	9-6-8	14	20.0	9000+*	16.0				
		25	NR7	5-6-8	14	25.0						
			NR8	7-8-11	19	26.5						
			NR9	7-8-10	18	28.0						
606.3		28.5										
		30	SS10	6-9-13	22	30.0	9000+*	16.9	120	30	15	72
			NR11	5-10-11	21	32.5						



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13463994.5
Northing: 352482.8

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

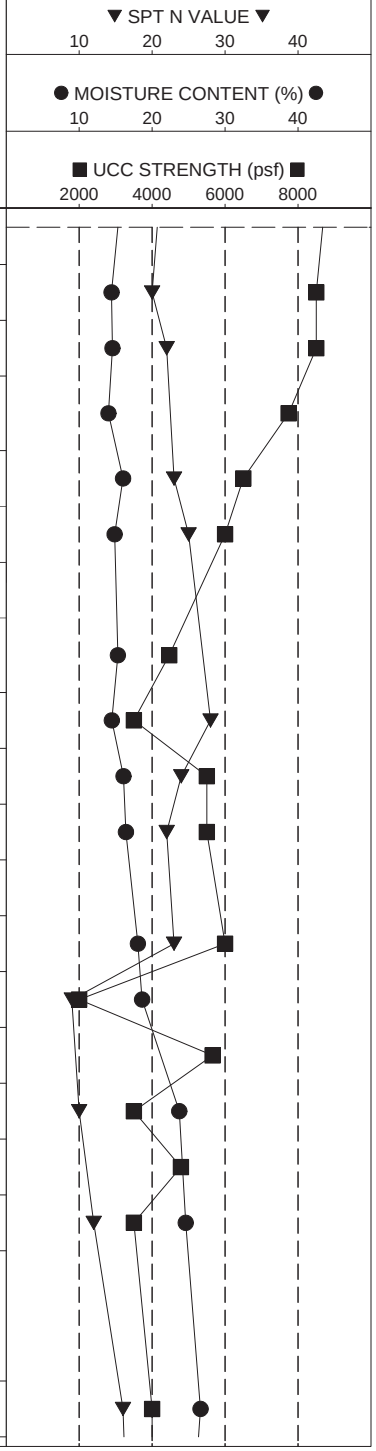
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/14/2015 **DATE COMPLETED:**10/15/2015 **LOG OF TEST BORING TB-02**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.8 ft											
	Hard to very stiff LEAN CLAY with sand, trace gravel, gray (CL)	35	SS12	6-9-11	20	35.0	8500*	14.4				
			SS13	6-10-12	22	36.5	8500*	14.6	124	29	13	72
			ST14			38.5	7740	14.0	122			
	NOTE: No recovery on SPT sample attempt at 32.5 ft. due to sample falling out of sampler.		SS15	5-10-13	23	40.0	6500*	16.0				
594.8		40.0										
	Very stiff SANDY LEAN CLAY, trace gravel, gray (CL)	40	SS16	6-10-15	25	41.5	6000*	14.9	123	29	14	70
592.8		42.0	VS1			43.0						
	Very stiff to stiff LEAN CLAY with sand, few gravel, possible cobble/boulder reported at 42 to 43 ft., gray (CL)		ST17			45.0	4470	15.3	120			
		45	SS18	9-12-16	28	46.5	3500*	14.5				
	NOTE: Vane shear tests at 43 and 51 ft. terminated early due to high force gauge readings.		SS19	7-11-13	24	48.0	5500*	16.1				
			SS20	5-9-13	22	49.5	5500*	16.4	119	30	14	75
		50	VS2			51.0						
583.8		51.0										
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS21	7-10-13	23	52.5	6000*	18.0				
			SS22	6-4-5	9	54.0	2000*	18.6				
		55	VS3			55.5	5660					
			SS23	4-5-5	10	57.0	3500*	23.7				
			VS4			58.5	4790					
			SS24	3-5-7	12	60.0	3500*	24.6				
		60										
			SS25	4-7-9	16	65.0	4000*	26.6				
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13463994.5
Northing: 352482.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

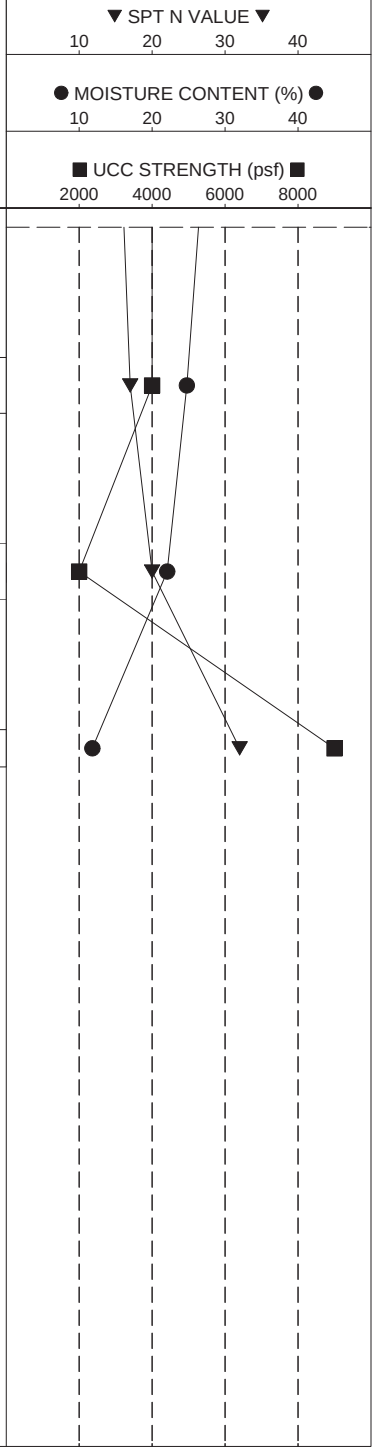
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/14/2015 **DATE COMPLETED:**10/15/2015 **LOG OF TEST BORING TB-02**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.8 ft	65										
		70	SS26	4-7-10	17	70.0	4000*	24.8				
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	75	SS27	5-10-10	20	75.0	2000*	22.1				
556.3	78.5											
555.3	Hard LEAN CLAY, few sand, trace gravel, gray (CL) 79.5	80	SS28	24-32	32+	79.5	9000+*	11.8				
	End of Boring at 79.5 ft. (Terminated due to SPT sampler refusal on possible obstruction)	85										
		90										
		95										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13463994.5
Northing: 352482.8

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: R. Calkins
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength.

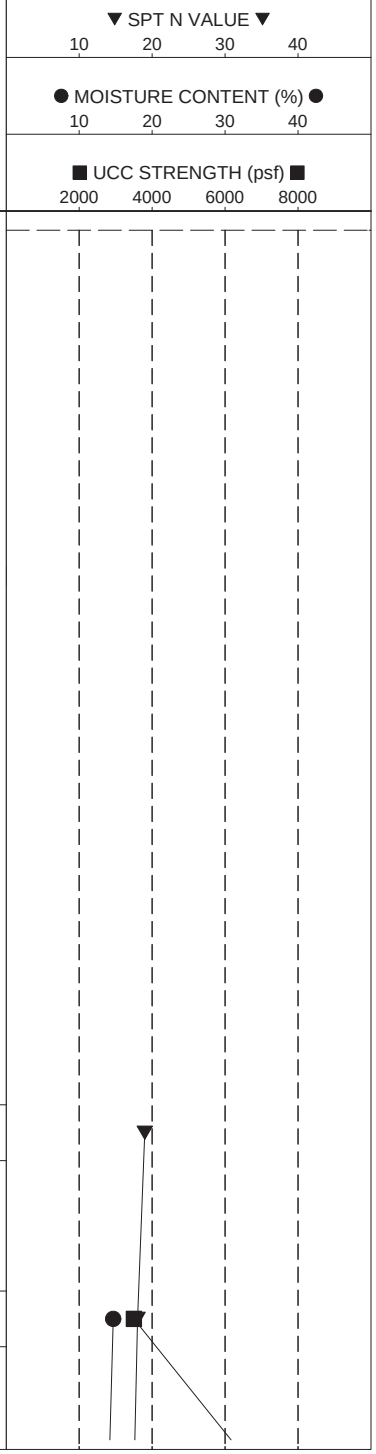
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/21/2016 **DATE COMPLETED:**10/24/2016 **LOG OF TEST BORING** **TB-02A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.7 ft	0										
	Profile drilled to 23.5 ft.	5, 10, 15, 20										
611.2		23.5										
	Stiff to very stiff LEAN CLAY with sand, trace gravel, gray (CL)	25	NR1	5-8-11	19	25.0						
	NOTE: No recovery on SPT sample attempt at 25 ft. due to sample falling out of sampler.	30	SS2	4-7-11	18	30.0	3500*	14.7				



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13463993.4
Northing: 352467.3

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: JD Hoksbergen
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 75 ft.

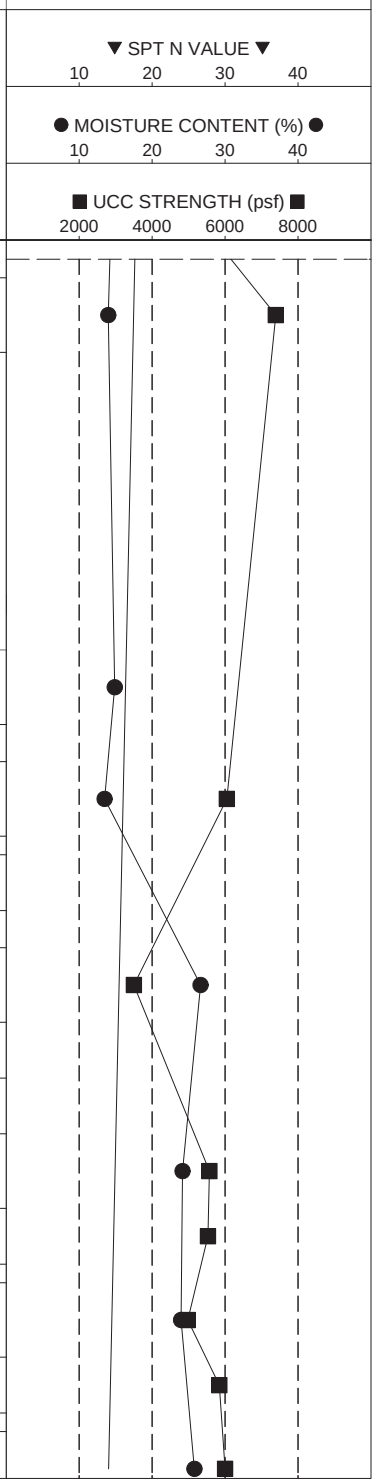
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/21/2016 **DATE COMPLETED:**10/24/2016 **LOG OF TEST BORING** **TB-02A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.7 ft											
599.7	35.0	35	ST3			35.0	7390	14.0	122	28	14	71
	Very stiff LEAN CLAY with sand, trace gravel, gray (CL) NOTE: No recovery on Shelby tube attempt at 45 ft. due to sample falling out of sampler; direct pushed to 45 ft. to retrieve sample. Driller reported possible cobble at 48 ft. Vane shear test at 50 ft. terminated early due to possible cobble.	40										
		45	DP4			45.0	<>	14.9				
			ST5			48.0	6050	13.5	126			
		50	VS1			50.0						
583.7	51.0											
	Very stiff FAT CLAY, few sand, trace gravel, gray (CH) NOTE: Vane shear test at 54.5 ft. terminated early due to possible cobble.		ST6			53.0	3500*	26.6		52	28	93
			VS2			54.5						
578.7	56.0	55										
	Very stiff LEAN CLAY, few to trace sand, trace gravel, gray (CL)		ST7			58.0	5570	24.2	104	42	23	92
			VS3			59.5	5530					
		60	ST8			62.0	4980	24.0	104			
			VS4			63.5	5840					
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13463993.4
Northing: 352467.3

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: JD Hoksbergen
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 75 ft.

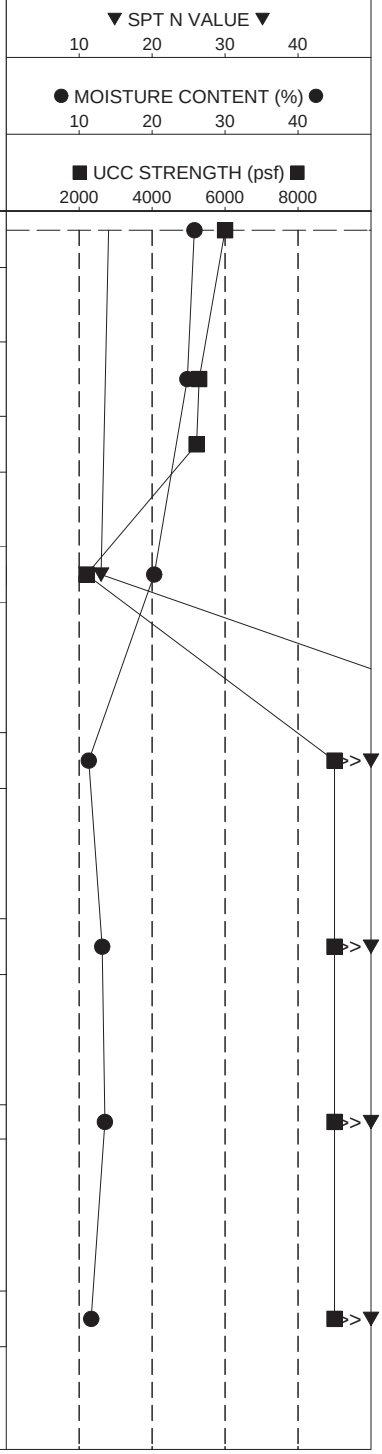
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/21/2016 **DATE COMPLETED:**10/24/2016 **LOG OF TEST BORING** **TB-02A**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.7 ft	65	ST9			66.0	6000*	25.8	101	45	26	96
	Very stiff LEAN CLAY, few to trace sand, trace gravel, gray (CL)		ST10			70.0	5290	24.8	102			
		70	VS5			71.5	5220					
563.2		71.5										
	Stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS11	5-6-7	13	75.0	2200#	20.3				
559.7		75.0										
	Hard LEAN CLAY, few sand, trace gravel, occasional fine sand partings, gray (CL)	75	SS12	25-36-50	86	80.0	9000+*	11.3				
		80	SS13	22-36-45	81	85.0	9000+*	13.2				
	NOTE: Driller reported cobbles at 75 ft., 88 ft. and 91 ft.	85										
			SS14	20-50/5"	50 +	89.4	9000+*	13.5				
		90										
			SS15	25-30-36	66	95.0	9000+*	11.7				
539.7		95.0										
	End of Boring at 95 ft.	95										



DRAFT

GROUNDWATER READINGS
First Encountered: n/a
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13463993.4
Northing: 352467.3

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: JD Hoksbergen
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 75 ft.

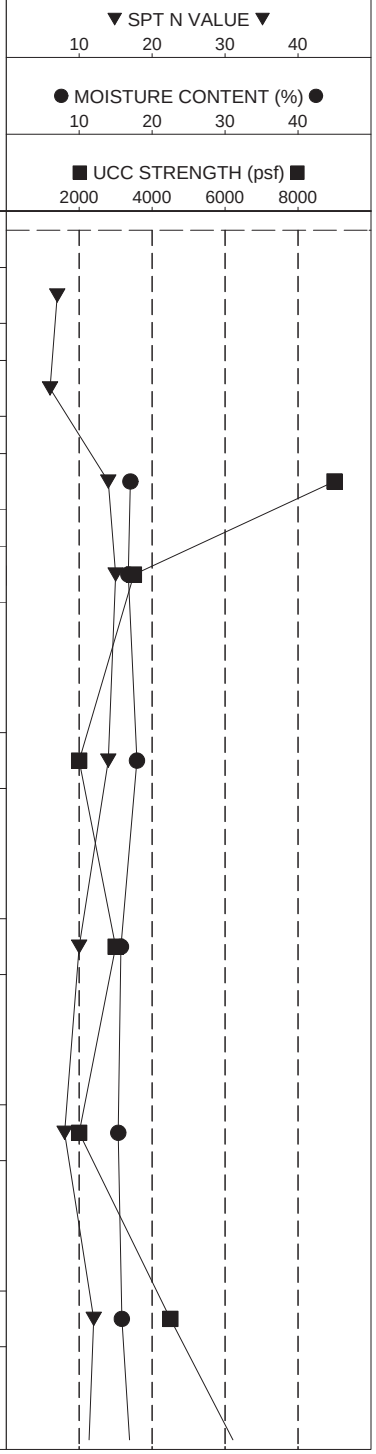
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/5/2016 **DATE COMPLETED:** 12/7/2016 **LOG OF TEST BORING** **TB-106**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.1 ft	0										
633.1	Field Engineer reported TOPSOIL and FILL (1.0)											
	FILL - Loose poorly graded fine sand, trace silt, trace gravel, brown, moist (SP)		SS1	2-4-3	7	2.5						
			SS2	2-2-4	6	5.0						
628.1	(6.0)	5										
626.6	Hard LEAN CLAY, trace sand, trace gravel, brown (CL) (Possible Fill) (7.5)		SS3	3-6-8	14	7.5	9000*	17.0				
			SS4	5-6-9	15	10.0	3500*	16.7				
		10										
	Stiff LEAN CLAY, trace sand, trace gravel, brown (CL)		SS5	6-6-8	14	15.0	2000*	17.9				
		15										
			SS6	3-4-6	10	20.0	3000*	15.7				
		20										
			SS7	3-3-5	8	25.0	2000*	15.4				
609.1	(25.0)	25										
	Very stiff to stiff LEAN CLAY with sand, trace gravel, gray (CL)		SS8	4-5-7	12	30.0	4500*	15.8		30	17	72
		30										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13464524.9
Northing: 352166.8

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 78 ft.

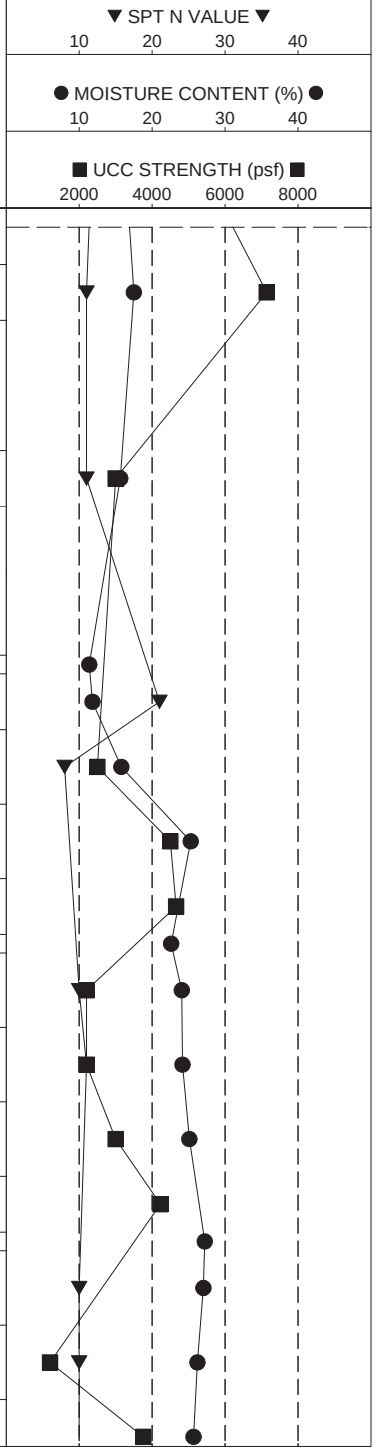
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/5/2016 **DATE COMPLETED:** 12/7/2016 **LOG OF TEST BORING TB-106**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.1 ft											
	Very stiff to stiff LEAN CLAY with sand, trace gravel, gray (CL)		SS9	5-4-7	11	35.0	7140	17.5	120			
		35										
			SS10	4-4-7	11	40.0	3000*	15.6				
594.1		40.0										
	Stiff LEAN CLAY, few sand, trace gravel, occasional fine sand partings below 46 ft., gray (CL)	40										
	NOTE: Shelby tube sampler refusal at 44.5 ft., sample taken from cuttings due to observed sampler damage. Poor recovery on SPT sample SS12 at 46 ft.		ST11			44.5	<>	11.4				
		45	SS12	24-14-7	21	46.0	<>	11.8				
			SS13	4-4-4-5	8	48.0	2500*	15.8				
586.1		48.0										
	Very stiff to stiff LEAN CLAY, few sand, gray (CL)		ST14			50.0	4500*	25.3				
		50	VS1			51.5	4660					
			DP15			52.0	<>	22.6				
			SS16	2-4-6-6	10	54.0	2200#	24.1				
		55	SS17	4-5-6-7	11	56.0	2200#	24.2				
			ST18			58.0	3000*	25.1		43	24	94
			VS2			59.5	4230					
574.1		60.0	DP19			60.0	<>	27.2				
	Medium to very stiff LEAN CLAY, trace sand, gray (CL)	60	SS20	3-4-6-7	10	62.0	<>	27.0				
			SS21	2-5-5-7	10	64.0	1200#	26.2				
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13464524.9
Northing: 352166.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 78 ft.

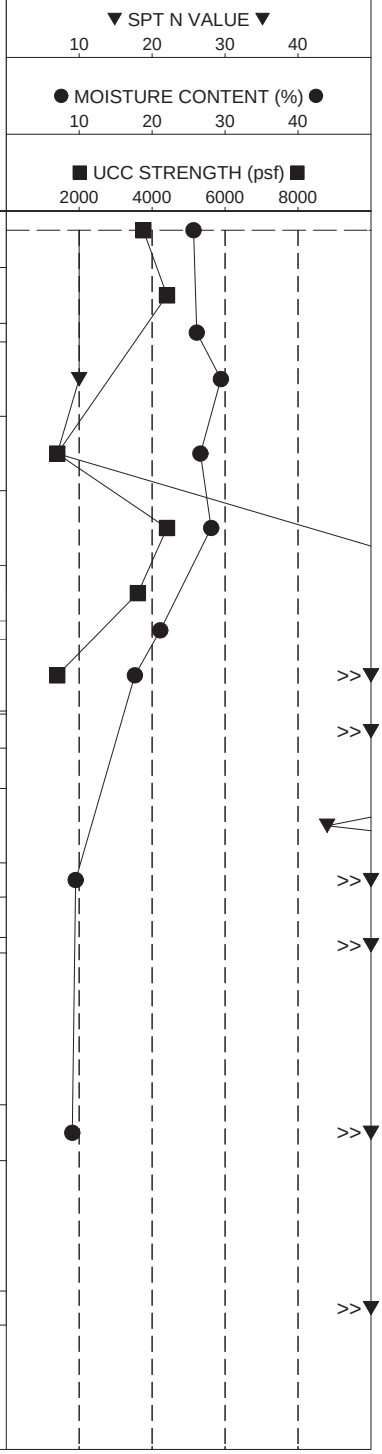
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 12/5/2016 **DATE COMPLETED:** 12/7/2016 **LOG OF TEST BORING TB-106**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 634.1 ft	65	ST22			66.0	3760	25.7	101			
			VS3			67.5	4410					
			DP23			68.0	<>	26.1				
			SS24	3-4-6-6	10	70.0	<>	29.4				
	Medium to very stiff LEAN CLAY, trace sand, gray (CL)	70	SS25	2-3-4-5	7	72.0	1400#	26.6				
			ST26			74.0	4410	28.1	99	43	23	98
		75	VS4			75.5	3610					
			DP27			76.0	<>	21.1				
556.6		77.5	SS28	5-6-12-50/5"	18	77.9	1400#	17.6				
	Extremely dense CLAYEY FINE SAND/SANDY LEAN CLAY, trace gravel, gray, moist (SC/CL)		SS29	14-50/5"	50 +	78.9						
554.1		80.0										
	Dense SILTY FINE SAND, trace gravel, gray, moist (SM)	80	SS30	12-21-23-35	44	82.0						
552.1		82.0										
	Extremely dense CLAYEY FINE SAND/SANDY LEAN CLAY, trace gravel, gray, moist (SC/CL)		SS31	27-50/5"	50 +	82.9		9.5				
550.1		84.0	SS32	50/5"	50 +	84.4						
	Extremely dense SILTY FINE SAND, trace gravel, gray, moist (SM)	85										
546.1		88.0										
	Extremely dense CLAYEY SAND with gravel, gray, moist (SC)		SS33	29-43-45	88	90.0		9.1		20	8	41
544.1		90.0										
	Alternating seams of extremely dense SANDY SILT and SILTY SANDY CLAY, trace gravel, trace shale pieces, gray, moist (ML/SM)	90										
539.7		94.4	SS34	47-50/5"	50 +	94.4						
	End of Boring at 94.4 ft. (Terminated upon SPT sample refusal)	95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13464524.9
Northing: 352166.8

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 78 ft.

DRAFT

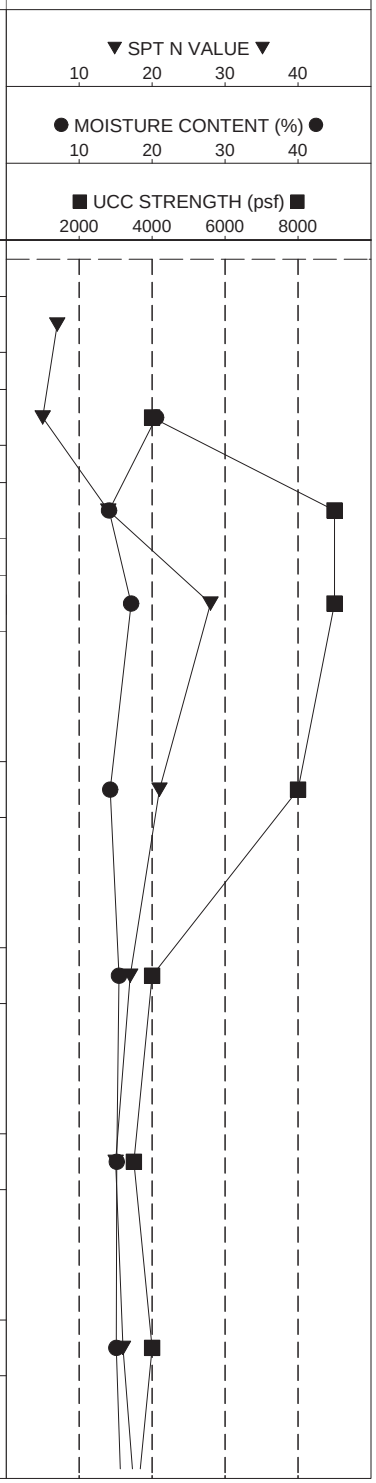
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/19/2016 **DATE COMPLETED:**10/21/2016 **LOG OF TEST BORING TB-105**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 632.9 ft	0
631.9	12 inches of TOPSOIL	1.0
628.9	FILL - Loose crushed limestone aggregate	4.0
626.9	FILL - Very stiff LEAN CLAY, trace sand, trace gravel, mottled brown and gray (CL)	6.0
619.4	Hard LEAN CLAY, few sand, trace gravel, brown (CL)	13.5
	Hard to stiff LEAN CLAY with sand, trace gravel, gray (CL) NOTE: No recovery on SPT sample attempt at 35 ft. due to sample falling out of sampler	

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	9-5-2	7	2.5						
SS2	2-2-3	5	5.0	4000*	20.5				
SS3	3-5-9	14	7.5	9000+*	14.1				
SS4	5-11-17	28	10.0	9000+*	17.1				
SS5	6-9-12	21	15.0	8000*	14.2		31	15	72
SS6	4-8-9	17	20.0	4000*	15.5				
SS7	4-6-9	15	25.0	3500*	15.2				
SS8	4-8-8	16	30.0	6330	15.1	123			



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13465160.7
Northing: 351971.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 95 ft.

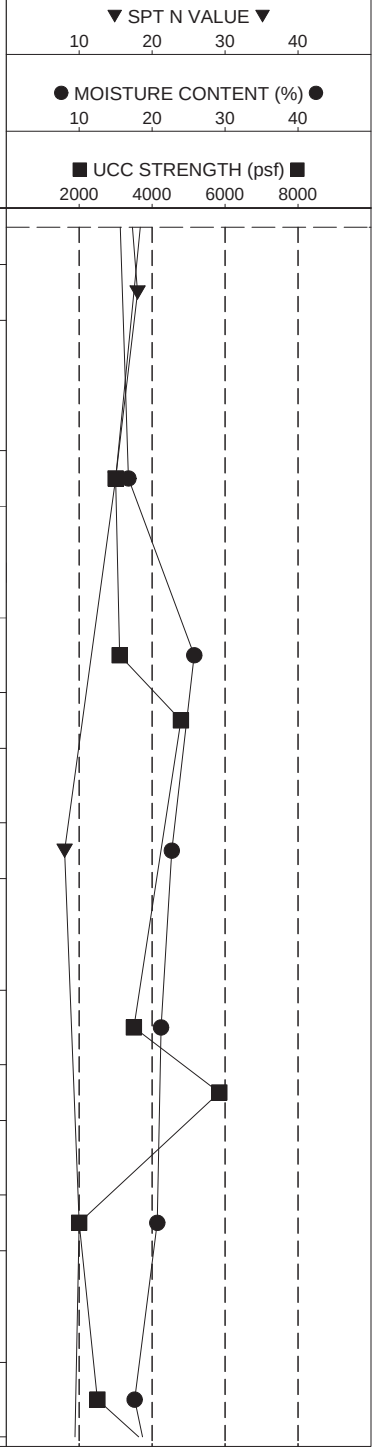
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/19/2016 **DATE COMPLETED:**10/21/2016 **LOG OF TEST BORING TB-105**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.9 ft											
	Hard to stiff LEAN CLAY with sand, trace gravel, gray (CL)		NR9	7-8-10	18	35.0						
	NOTE: No recovery on SPT sample attempt at 35 ft. due to sample falling out of sampler	35										
			SS10	4-6-9	15	40.0	3000*	16.8				
592.9		40.0										
	Stiff LEAN CLAY, few sand, trace gravel, gray (CL)	40										
			ST11			45.0	3110	25.8	102	45	23	92
587.9		45.0										
	Very stiff to stiff LEAN CLAY with sand, few to trace gravel, gray (CL)	45	VS1			46.5	4790					
			SS12	3-3-5	8	50.0	<>	22.7				
		50										
			ST13			55.0	3500*	21.2		25	11	75
		55	VS2			56.5	5840					
			SS14	4-4-6	10	60.0	2000*	20.7				
		60										
			ST15			65.0	2500*	17.6	104	30	16	76
		65										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13465160.7
Northing: 351971.6

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 95 ft.

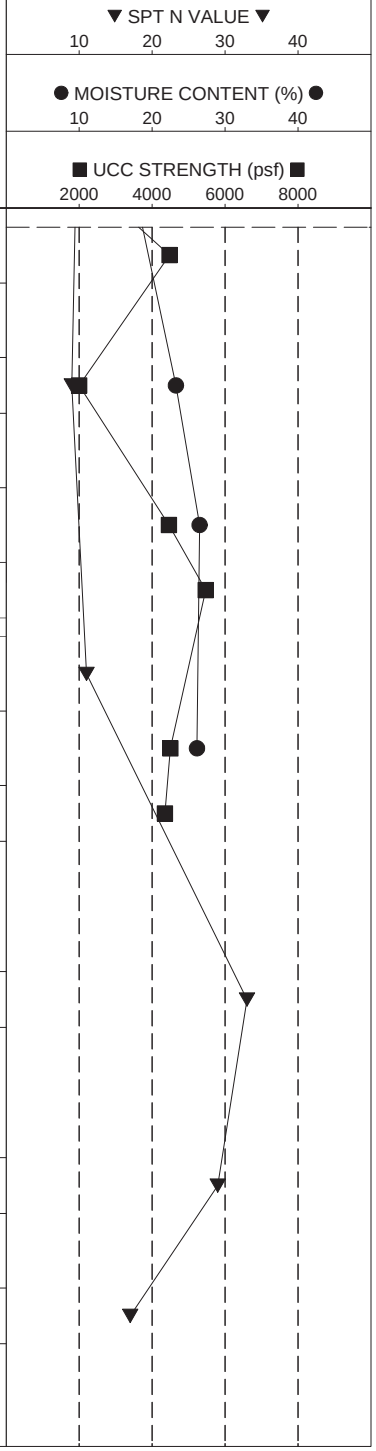
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/19/2016 **DATE COMPLETED:**10/21/2016 **LOG OF TEST BORING TB-105**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.9 ft	65										
	Very stiff to stiff LEAN CLAY with sand, few to trace gravel, gray (CL)		VS3			66.5	4480					
			SS16	3-4-5	9	70.0	2000#	23.3				
560.9		70										
	Very stiff LEAN CLAY, trace sand, gray (CL)		ST17			74.0	4460	26.5	99	38	19	98
		75	VS4			75.5	5470					
			SS18	4-5-6	11	78.0	<>					
			ST19			80.0	4500	26.1	102			
		80										
551.4			VS5			81.5	4350					
	Dense SILTY FINE SAND, trace clay and gravel, gray, wet (SM)	85										
546.4			SS20	13-16-17	33	86.5						
	Medium dense poorly graded MEDIUM TO COARSE SAND with silt, trace gravel, gray, wet (SP-SM)	90	SS21	11-14-15	29	91.5						
537.9			SS22	8-8-9	17	95.0						
	Driller reported gravelly sand, unable to advance SPT sampler due to collapse	95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13465160.7
Northing: 351971.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 95 ft.

DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/19/2016 **DATE COMPLETED:**10/21/2016 **LOG OF TEST BORING TB-105**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	▼ SPT N VALUE ▼ 10 20 30 40 / ● MOISTURE CONTENT (%) ● 10 20 30 40 / ■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000
	Ground Surface Elevation 632.9 ft												
	Driller reported gravelly sand, unable to advance SPT sampler due to collapse	100											
		105											
		110											
519.4	113.5												
	End of Boring at 113.5 ft.	115											
		120											
		125											
		130											

DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13465160.7
Northing: 351971.6

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 95 ft.

DRAFT

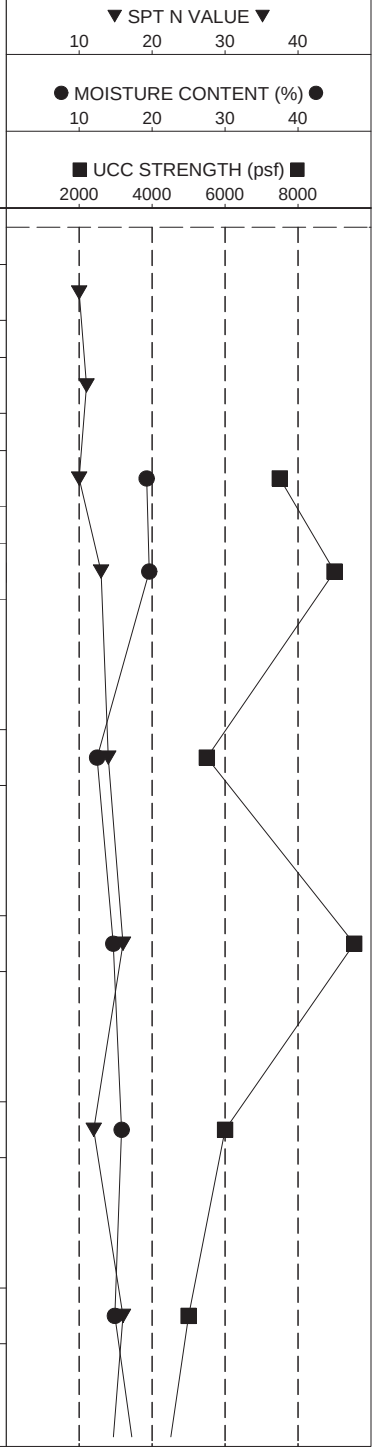
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/29/2016 **DATE COMPLETED:** 12/1/2016 **LOG OF TEST BORING** **TB-104**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 631.2 ft	
631.0	2.5 inches of ASPHALTIC CEMENT CONCRETE	0.2
630.3	7.5 inches of PORTLAND CEMENT CONCRETE	0.9
629.2	FILL - Medium dense poorly graded fine sand, with silt, trace gravel, occasional seams of black and gray fine sand, brown, moist (SP-SM)	2.0
624.7	Medium dense SILTY FINE SAND, trace gravel, occasional sandy silt layers, brown, moist (SM) (Possible Fill)	6.5
	Very stiff to hard LEAN CLAY, trace sand, trace gravel, occasional silt partings above 7.5 ft., brown to gray (CL)	
611.2	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	20.0

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	3-4-6	10	2.5						
SS2	7-6-5	11	5.0						
SS3	5-4-6	10	7.5	7500*	19.2				
SS4	3-4-9	13	10.0	9000*	19.6				
SS5	4-6-8	14	15.0	5500*	12.5				
SS6	3-7-9	16	20.0	9540	14.7	124			
SS7	2-5-7	12	25.0	6000*	15.8				
SS8	3-6-10	16	30.0	5000*	14.9				



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13465647.6
Northing: 351668.2

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: C. Schroeder
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 77 ft.

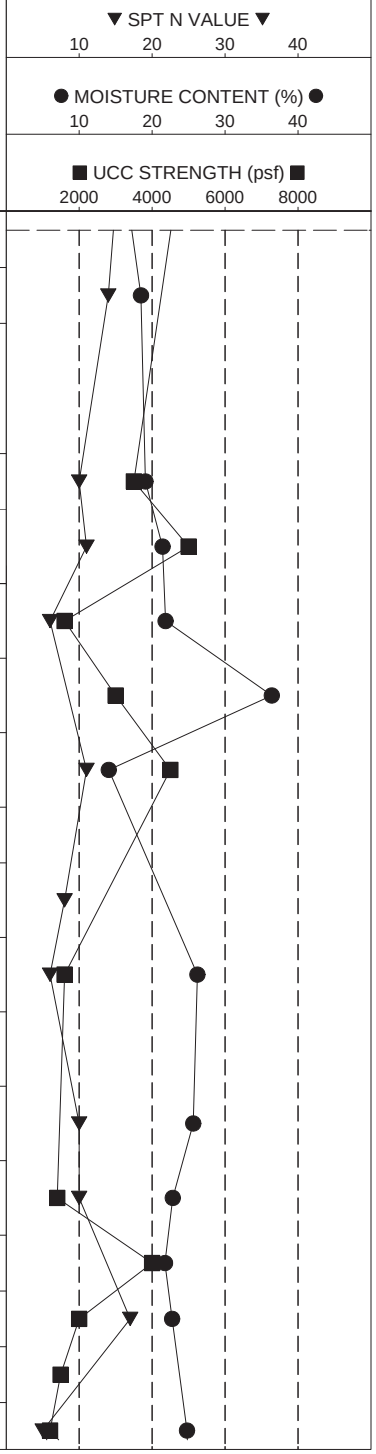
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/29/2016 **DATE COMPLETED:** 12/1/2016 **LOG OF TEST BORING TB-104**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.2 ft											
	Very stiff to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	35	SS9	4-6-8	14	35.0	<>	18.5				
			SS10	3-4-6	10	40.0	3500*	19.1				
591.2		40.0										
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	40	SS11	3-5-6-7	11	42.0	5000*	21.4				
			SS12	1-3-3-4	6	44.0	1600#	21.8				
587.2		44.0										
	Very stiff LEAN CLAY, trace sand, gray (CL)	45	ST13			46.0	3000*	36.4		53	31	97
	NOTE: Vane shear test at 49.5 ft. terminated early due to high force gauge readings.		SS14	3-5-6-9	11	48.0	4500*	14.1				
			VS1			49.5						
580.7		50.5										
	Loose SILT, trace sand, gray (ML)	50	SS15	3-3-5-4	8	51.5						
579.2		52.0										
	Medium to very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)		SS16	4-3-3-2	6	53.5	1600#	26.2				
		55	NR17			55.5						
	NOTE: No recovery on Shelby tube sample attempt at 55.5 ft. due to possible cobble. Shelby tube sampler refusal at 61 ft.		SS18	4-4-6-8	10	57.5	<>	25.6				
			SS19	2-4-6-6	10	59.5	1400#	22.8				
		60	ST20			61.0	4000*	21.8				
			SS21	10-12-5	17	62.5	2000#	22.7				
568.7		62.5										
	Medium to very stiff LEAN CLAY, few sand, gray (CL)		VS2			64.0	1490					
		65	SS22	3-3-2	5	65.5	1200#	24.8				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13465647.6
Northing: 351668.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: C. Schroeder
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 77 ft.

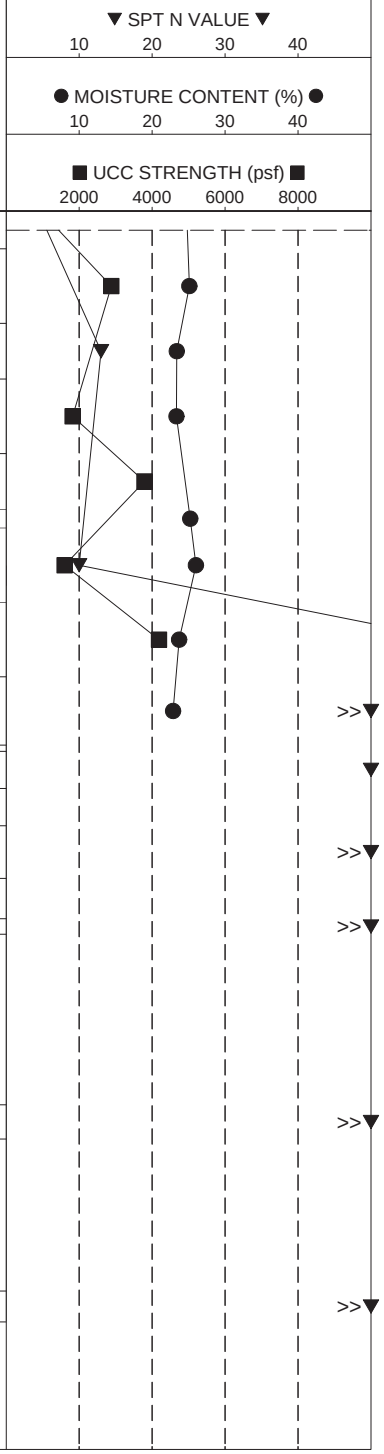
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/29/2016 **DATE COMPLETED:** 12/1/2016 **LOG OF TEST BORING TB-104**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.2 ft	65										
	Medium to very stiff LEAN CLAY, few sand, gray (CL)		ST23			67.5	2880	25.1	103	38	20	94
			SS24	4-6-7	13	69.0	<>	23.4				
		70	ST25			71.0	1820	23.3	105			
			VS3			72.5	3790					
			DP26			73.0	<>	25.2				
			SS27	2-4-6-5	10	75.0	1600#	26.0				
		75	ST28			77.0	4190	23.7	106	37	19	95
554.2	77.0											
	Medium dense to extremely dense CLAYEY FINE SAND, trace gravel, frequent sandy lean clay seams, gray, moist (SC)		SS29	3-6-14-50/4"	20	78.8	<>	22.9				41
			SS30	37-50	50+	80.0						
		80										
550.2	81.0											
	Extremely dense poorly graded FINE TO MEDIUM SAND with silt, trace gravel, gray, moist (SP-SM)		SS31	38-43-50/5"	93/11"	82.4						
547.2	84.0		SS32	50/5"	50 +	83.9						
546.2	Extremely dense SILTY FINE TO COARSE SAND, few gravel, gray, wet (SM)	85										
	85.0											
	Extremely dense poorly graded FINE SAND with silt, trace gravel, gray, wet (SP-SM)		SS33	41-50/5"	50 +	89.4						
541.2	90.0	90										
	Extremely dense poorly graded FINE TO MEDIUM SAND with silt, trace gravel, gray, wet (SP-SM)		34	34-50/4"	50 +	94.3						
536.9	94.3											
	End of Boring at 94.3 ft. (Terminated upon SPT sample refusal)	95										



GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13465647.6
Northing: 351668.2

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: C. Schroeder
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 77 ft.

DRAFT

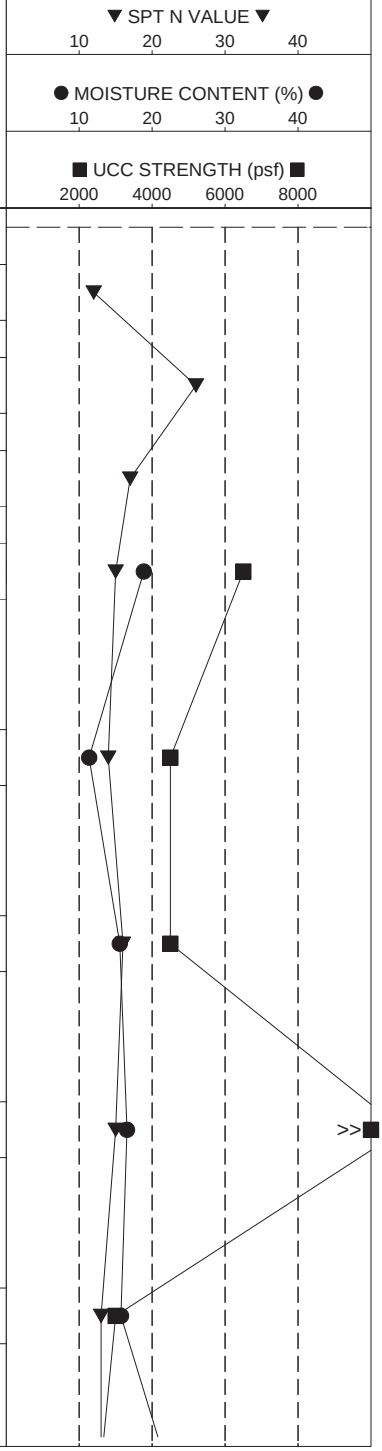
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

DRAFT

PROJECT NO. 2014195C **DATE STARTED:**10/17/2016 **DATE COMPLETED:**10/18/2016 **LOG OF TEST BORING** **TB-103**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.7 ft											
632.0	9 inches of PORTLAND CEMENT CONCRETE (0.8)	0										
	FILL - Medium dense poorly graded fine sand with silt, trace gravel, trace topsoil above 2.5 ft., brown, moist (SP-SM)		SS1	4-6-6	12	2.5						
			SS2	11-12-14	26	5.0						
		5	SS3	24-10-7	17	7.5						
623.7	(9.0)		SS4	4-6-9	15	10.0	6500*	18.9				
	Very stiff to hard LEAN CLAY, trace sand, trace gravel, gray (CL)	10										
			SS5	4-6-8	14	15.0	4500*	11.4				
		15										
			SS6	4-7-9	16	20.0	4500*	15.6				
		20										
607.7	(25.0)		SS7	4-5-10	15	25.0	10870	16.6	119			
	Stiff LEAN CLAY with sand, trace gravel, gray (CL)	25										
			SS8	4-5-8	13	30.0	3000*	15.7				
		30										



DRAFT

GROUNDWATER READINGS
First Encountered: 7 feet
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13466133.5
Northing: 351211.7

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 87 ft.

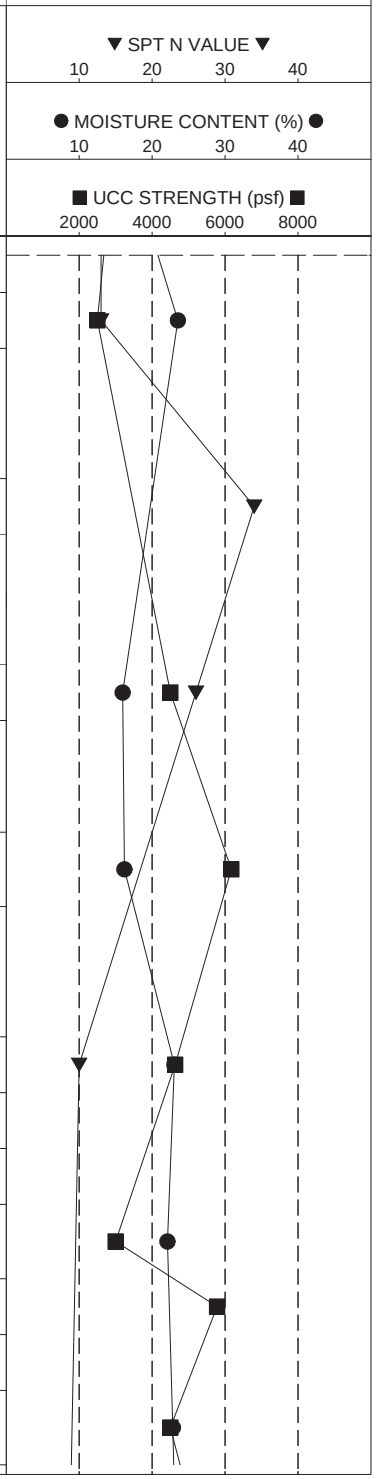
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/17/2016 **DATE COMPLETED:**10/18/2016 **LOG OF TEST BORING TB-103**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.7 ft											
	Stiff LEAN CLAY with sand, trace gravel, gray (CL)	35	SS9	4-5-8	13	35.0	2500*	23.5		46	26	83
593.7		39.0	SS10	4-14-20	34	40.0						35
	Dense to medium dense SILTY FINE SAND with gravel, gray, moist (SM)	40										
588.7		44.0	SS11	15-17-9	26	45.0	4500*	16.0				
	Very stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	45										
582.7		50.0	ST12			50.0	6170	16.2	118			
	Very stiff to stiff LEAN CLAY, few sand, trace gravel, gray (CL)	50										
	NOTE: Vane shear test at 56.5 ft. terminated early due to high force gauge readings.	55	SS13	3-4-6	10	55.0	4630	23.0	109			
			VS1			56.5						
			ST14			60.0	3000*	22.1	102	34	18	87
		60	VS2			61.5	5780					
			ST15			65.0	4500	22.8	105	37	17	92
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: 7 feet
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13466133.5
Northing: 351211.7

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 87 ft.

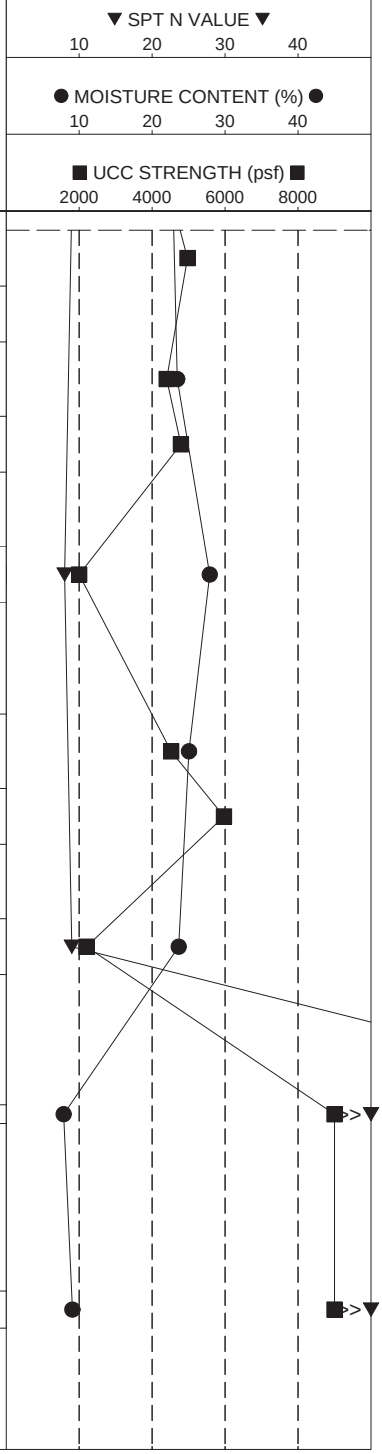
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/17/2016 **DATE COMPLETED:**10/18/2016 **LOG OF TEST BORING TB-103**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.7 ft	65	VS3			66.5	4970					
	Very stiff to stiff LEAN CLAY, few sand, trace gravel, gray (CL)		ST16			70.0	4400	23.4	102			
		70	VS4			71.5	4790					
	NOTE: Vane shear test at 56.5 ft. terminated early due to high force gauge readings.		SS17	3-4-4	8	75.0	2000*	27.9				
557.7	75.0	75										
	Very stiff to stiff LEAN CLAY, trace sand, gray (CL)		ST18			80.0	4520	25.1	103	38	18	97
		80	VS5			81.5	5970					
			SS19	4-4-5	9	85.0	2200#	23.6				
		85										
545.7	87.0											
	Hard LEAN CLAY, trace sand, trace gravel, gray (CL)		SS20	100	100+	89.0	9000+*	7.9				
		90										
538.2	94.5		SS21	43-60	60+	94.5	9000+*	9.1				
	End of Boring at 94.5 ft. (Terminated upon SPT sample refusal)	95										



DRAFT

GROUNDWATER READINGS
First Encountered: 7 feet
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13466133.5
Northing: 351211.7

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 75
Engineer on Rig: S. Swaminathan
Drilling Method: 4 inch SSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 87 ft.

DRAFT

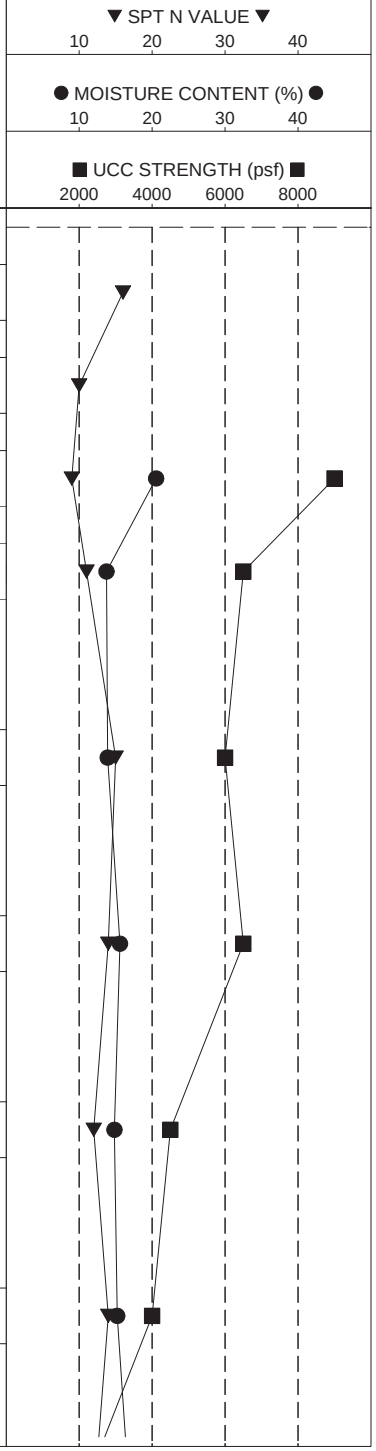
Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/28/2016 **DATE COMPLETED:** 12/1/2016 **LOG OF TEST BORING TB-102**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 632.5 ft	
631.9	8 inches of PORTLAND CEMENT CONCRETE	0.7
631.5	Field Engineer reported 4 inches of FILL	1.0
	FILL - Medium dense poorly graded fine sand, trace silt, trace gravel, brown, moist (SP)	
626.5		6.0
	Hard LEAN CLAY, trace sand, trace gravel, dark brown (CL) (Possible Fill)	
624.5		8.0
	Very stiff SILTY CLAY, few sand, occasional silt layers, gray (CL-ML)	
622.5		10.0
	Very stiff to stiff LEAN CLAY, few sand, gray (CL)	
	NOTE: Poor recovery on Shelby tube ST11 at 44 ft. Vane shear test at 45.5 ft terminated early due to high force gauge readings.	

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	8-7-9	16	2.5						
SS2	6-5-5	10	5.0						
SS3	3-4-5	9	7.5	9000*	20.6				
SS4	3-4-7	11	10.0	6500*	13.7		24	7	87
SS5	4-7-8	15	15.0	6000*	13.9				
SS6	3-6-8	14	20.0	6500*	15.6				
SS7	3-5-7	12	25.0	4500*	14.8	123			
SS8	3-6-8	14	30.0	4000*	15.2				



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13466456.8
Northing: 350654.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 87 ft.

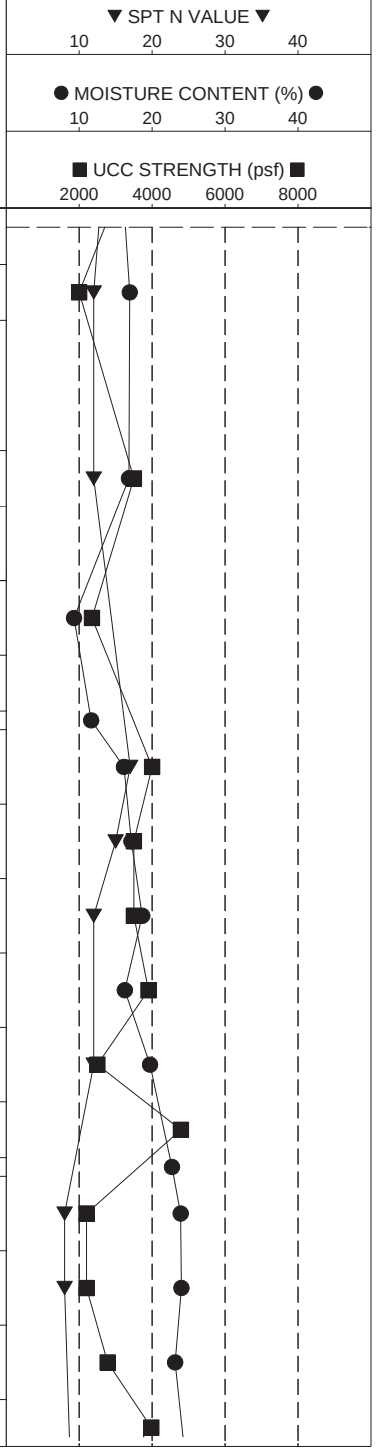
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/28/2016 **DATE COMPLETED:** 12/1/2016 **LOG OF TEST BORING TB-102**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.5 ft											
			SS9	3-4-8	12	35.0	2000*	16.9				
		35										
	Very stiff to stiff LEAN CLAY, few sand, gray (CL)		SS10	3-5-7	12	40.0	3500*	16.8				
	NOTE: Poor recovery on Shelby tube ST11 at 44 ft. Vane shear test at 45.5 ft terminated early due to high force gauge readings.	40										
			ST11			44.0	2350	9.3	128			
		45	VS1			45.5						
586.5	46.0		DP12			46.0	<>	11.6				
	Very stiff to stiff LEAN CLAY with sand, trace gravel, gray (CL)		SS13	4-7-10-14	17	48.0	4000*	16.1				
			SS14	4-6-9-10	15	50.0	3500*	17.2				
		50	SS15	3-5-7-9	12	52.0	3500*	18.6				
			ST16			54.0	3900	16.3	116	29	14	74
		55	SS17	4-5-7-9	12	56.0	2500*	19.7				
576.5	56.0		VS2			57.5	4790					
			DP18			58.0	<>	22.7				
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)		SS19	1-3-5-6	8	60.0	2200#	23.9				
		60	SS20	2-3-5-5	8	62.0	2200#	24.0				
			ST21			64.0	2780	23.1	105			
		65	VS3			65.5	3980					



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13466456.8
Northing: 350654.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 87 ft.

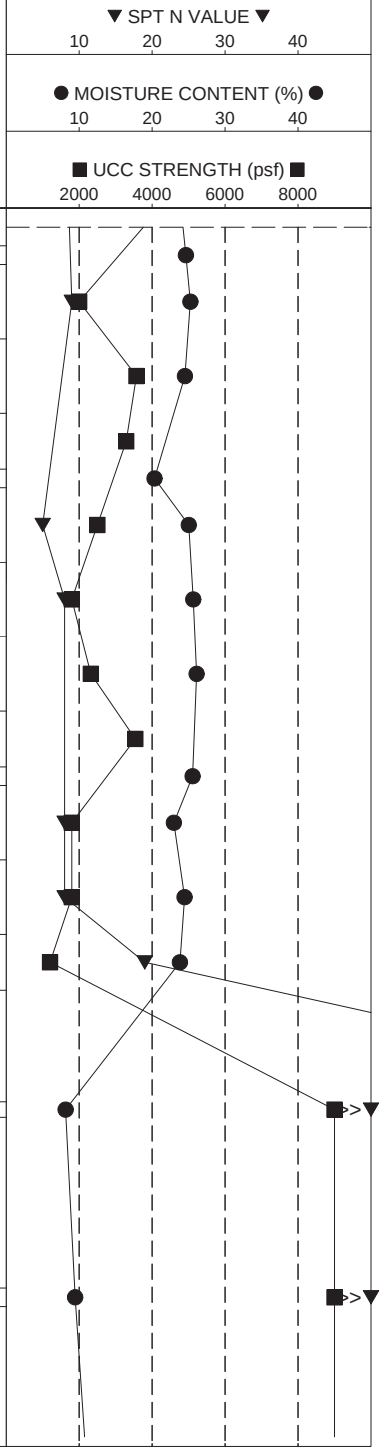
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/28/2016 **DATE COMPLETED:** 12/1/2016 **LOG OF TEST BORING TB-102**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.5 ft											
	Very stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	65	DP22			66.0	<>	24.6				
			SS23	2-4-5-7	9	68.0	2000*	25.2				
			ST24			70.0	3570	24.5	103	41	24	96
		70	VS4			71.5	3290					
			DP25			72.0	<>	20.3				
			SS26	1-1-4-5	5	74.0	2500*	25.0				
		75	SS27	2-4-4-6	8	76.0	1800#	25.6				
			ST28			78.0	2320	26.1	102			
			VS5			79.5	3540					
		80	DP29			80.0	<>	25.5				
			SS30	2-3-5-5	8	82.0	1800#	23.0				
			SS31	2-4-4-7	8	84.0	1800#	24.4				
		85	SS32	5-8-11	19	85.5	1200#	23.8				
545.5		87.0										
	Hard LEAN CLAY, with sand, trace gravel, frequent clayey sand seams, occasional silty sand layers, gray (CL)		SS33	50/5"	50 +	88.9	9000+*	8.1				
		90										
			SS34	60	60+	94.0	9000+*	9.4				
		95										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13466456.8
Northing: 350654.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 87 ft.

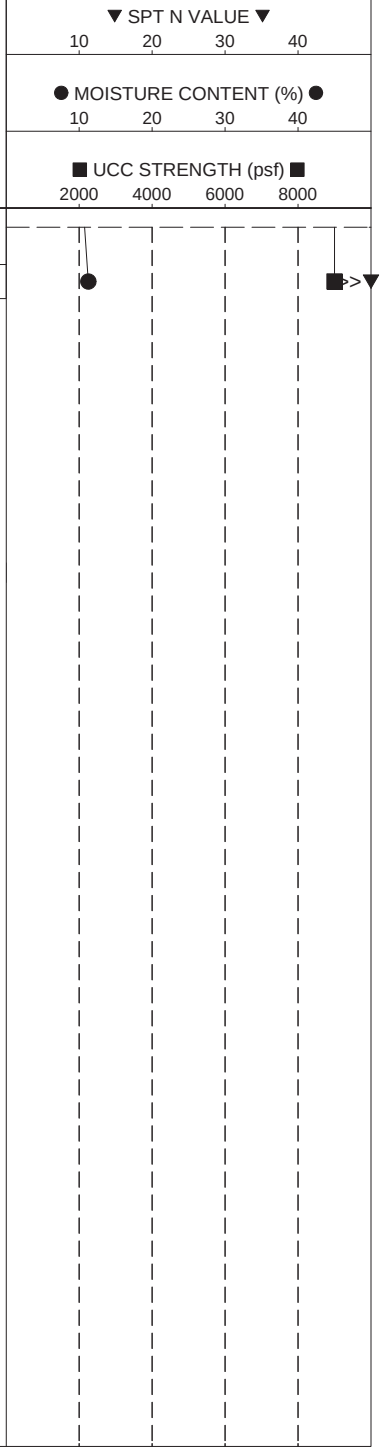
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 11/28/2016 **DATE COMPLETED:** 12/1/2016 **LOG OF TEST BORING** **TB-102**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.5 ft											
533.1	99.4		SS35	37-50/5"	50 +	99.4	9000+*	11.3				
	End of Boring at 99.4 ft. (Terminated upon SPT sample refusal)	100										
		105										
		110										
		115										
		120										
		125										
		130										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13466456.8
Northing: 350654.1

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 87 ft.

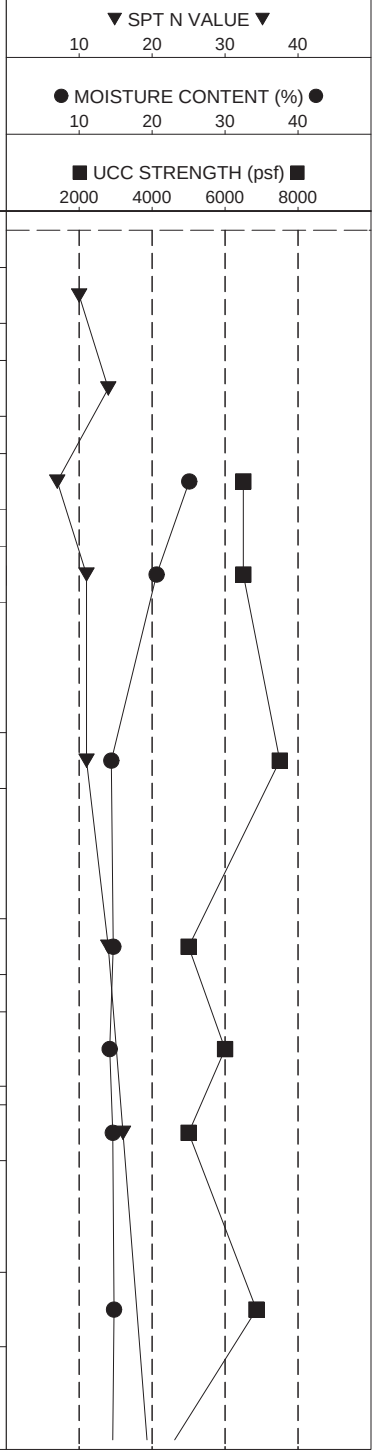
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/17/2016 **DATE COMPLETED:**10/21/2016 **LOG OF TEST BORING TB-101**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.5 ft	0										
630.8	8 inches of PORTLAND CEMENT CONCRETE	0.7										
629.0	FILL - Medium dense poorly graded fine sand with topsoil, trace silt, trace gravel, dark brown, moist (SP)	2.5	SS1	4-5-5	10	2.5						
			SS2	4-6-8	14	5.0						
626.5	Medium dense poorly graded FINE SAND, trace silt, trace gravel, brown, moist (SP) (Possible Fill)	5.0										
		5	SS3	2-2-5	7	7.5	6500*	25.1				
			SS4	3-5-6	11	10.0	6500*	20.6				
		10										
			SS5	3-5-6	11	15.0	7500*	14.4				
		15										
	Very stiff to stiff SANDY LEAN CLAY, trace gravel, gray (CL)		SS6	5-6-8	14	20.0	5000*	14.7				
		20										
			ST7			23.0	6000*	14.2		25	11	66
			SS8	3-7-9	16	25.0	5000*	14.6				
		25										
			ST9			30.0	6860	14.8	122			
		30										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13466604.4
Northing: 350068.3

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 92 ft.

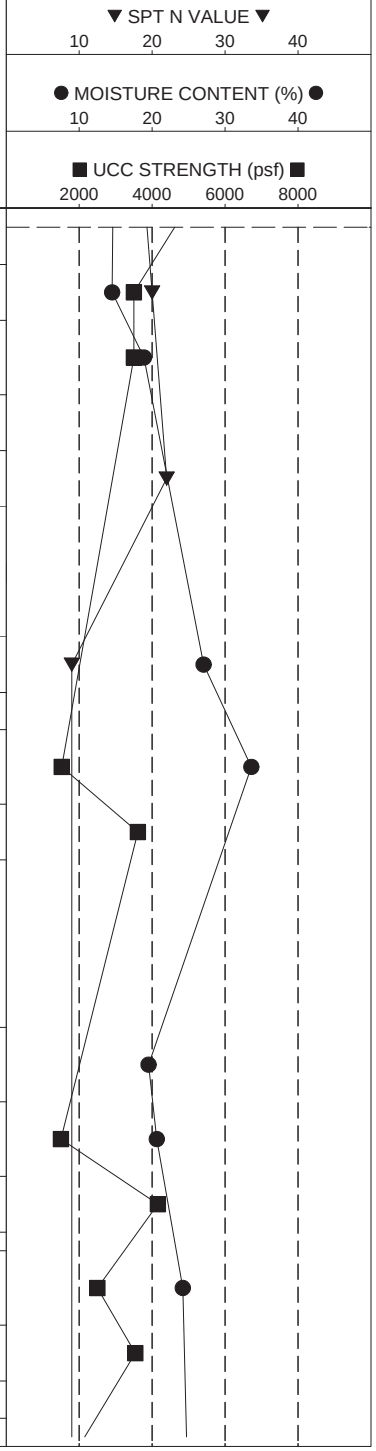
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/17/2016 **DATE COMPLETED:**10/21/2016 **LOG OF TEST BORING TB-101**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.5 ft											
	Very stiff to stiff SANDY LEAN CLAY, trace gravel, gray (CL)	35	SS10	5-7-13	20	35.0	3500*	14.5				
			ST11			37.0	3500*	18.9				
594.5	37.0											
	Medium dense SILTY FINE SAND, few gravel, gray, moist (SM)	40	SS12	16-12-10	22	40.0						34
588.5	43.0											
	Medium to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)	45	SS13	3-4-5	9	45.0	<>	27.1				
			ST14			48.0	1520	33.6	93			
			VS1			49.5	3610					
	NOTE: No recovery on Shelby tube attempt at 56 ft. due to sample falling out of sampler, direct pushed to 56 ft. to retrieve sample	50										
		55	DP15			56.0	<>	19.5				
			ST16			58.0	1500*	20.6		26	10	
573.5	58.0											
	Very stiff to stiff LEAN CLAY, few sand, few to trace gravel, gray (CL)		VS2			59.5	4160					
		60	ST17			62.0	2500*	24.2	102	40	22	83
	NOTE: No recovery on Shelby tube attempt at 75 and 78 ft. due to sample falling out of sampler, direct pushed to 75 ft. to retrieve sample		VS3			63.5	3540					
		65										



DRAFT

GROUNDWATER READINGS
First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION
Easting: 13466604.4
Northing: 350068.3

Coordinates/GSE determined by: Survey

KEY
Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 92 ft.

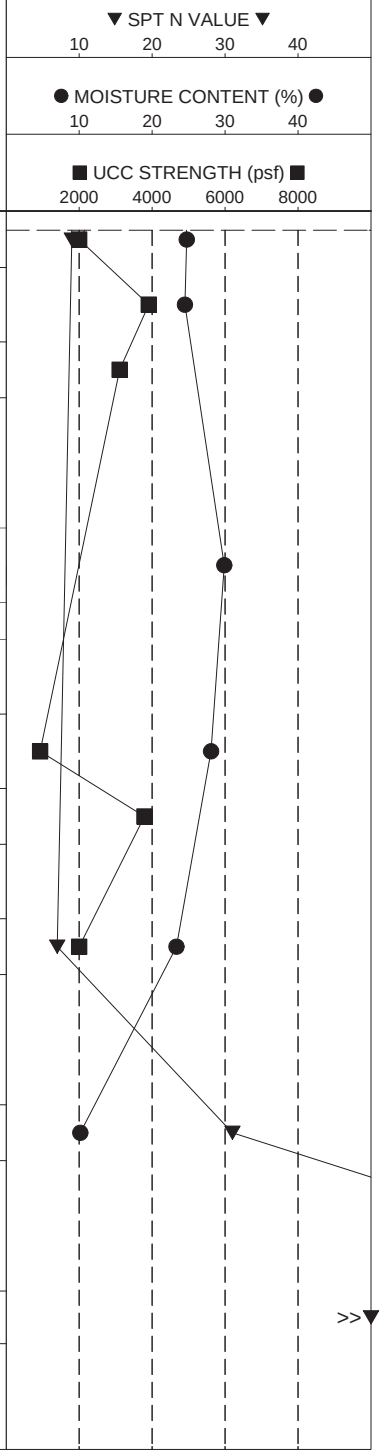
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/17/2016 **DATE COMPLETED:**10/21/2016 **LOG OF TEST BORING TB-101**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.5 ft	65	SS18	3-4-5	9	66.0	2000#	24.7				
			ST19			68.0	3910	24.5	101	39	19	90
			VS4			69.5	3110					
		70										
	Very stiff to stiff LEAN CLAY, few sand, few to trace gravel, gray (CL)											
	NOTE: No recovery on Shelby tube attempt at 75 and 78 ft. due to sample falling out of sampler, direct pushed to 75 ft. to retrieve sample		DP20			75.0	<>	29.9				
		75										
			NR21			78.0						
553.5	78.0											
			ST22			80.0	930	28.1	97	39	19	96
		80										
			VS5			81.5	3790					
	Soft to stiff LEAN CLAY, trace sand, trace gravel, gray (CL)											
			SS23	2-3-4	7	85.0	2000#	23.3				
		85										
543.0	88.5											
			SS24	9-13-18	31	90.0		10.2				44
	Dense SILTY FINE SAND, trace gravel, gray, wet (SM)	90										
539.5	92.0											
	Extremely dense to very dense poorly-graded FINE TO COARSE SAND with silt, trace gravel, occasional lean clay/clayey sand layers, gray, wet (SP-SM)		SS25	31-43-50/5"	93/11"	94.9						
		95										



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13466604.4
Northing: 350068.3

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: DLZ
Drill Rig: CME 55
Engineer on Rig: S. Whoolery
Drilling Method: 2 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Cement-Bentonite Grout/Patch
Checked By: ALOG
QA/QC By: JA
Remarks: UCS at vane shear estimated by 2x field shear strength. Driller reported hard drilling starting at 92 ft.

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Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:**10/17/2016 **DATE COMPLETED:**10/21/2016 **LOG OF TEST BORING TB-101**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 631.5 ft											
531.5	100.0		SS26	28-30-34	64	100.0						
	End of Boring at 100 ft.	100										
		105										
		110										
		115										
		120										
		125										
		130										

FIELD DATA | LABORATORY DATA

▼ SPT N VALUE ▼ 10 20 30 40

● MOISTURE CONTENT (%) ● 10 20 30 40

■ UCC STRENGTH (psf) ■ 2000 4000 6000 8000

>>▼

DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13466604.4
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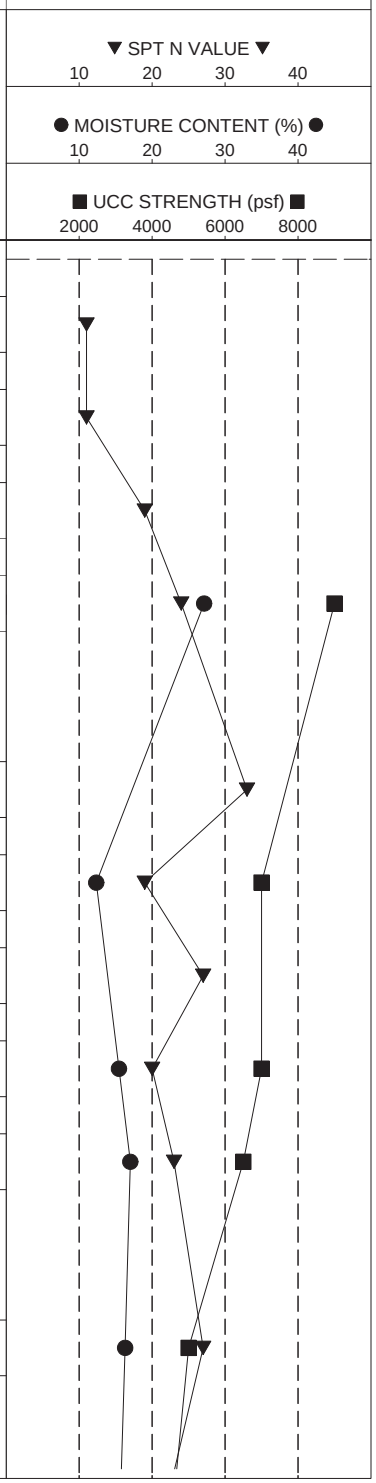
I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/6/2015 **DATE COMPLETED:** 10/6/2015 **LOG OF TEST BORING** **TB-01**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)
	Ground Surface Elevation 632.5 ft	0
631.5	12 inches of CLAYEY TOPSOIL, brown	1.0
629.5	FILL - Medium dense mixed poorly graded fine sand and topsoil, trace silt, trace clay, trace gravel, brown and dark brown, moist	3.0
624.5	FILL - Alternating layers of medium dense poorly graded fine sand and topsoil, trace silt, brown and dark brown, moist (SP)	8.0
	Hard LEAN CLAY, few sand, trace gravel, gray (CL) NOTE: No recovery on SPT sample attempt at 15 ft. due to sample falling out of sampler.	10 15
616.5		16.0
	Very stiff SANDY LEAN CLAY, trace gravel, gray (CL) NOTE: Poor recovery on SPT sample SS7 at 20 ft.	
612.5		20.0
	Very stiff LEAN CLAY with sand, trace gravel, occasional clayey sand seams below 40 ft., gray (CL)	20 25 30

SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
SS1	7-6-5	11	2.5						
SS2	5-5-6	11	5.0						
SS3	3-8-11	19	7.5						
SS4	8-10-14	24	10.0	9000*	27.1				
NR5	22-17-16	33	15.0						
SS6	5-8-11	19	17.5	7000*	12.3		31	15	70
SS7	9-11-16	27	20.0	<>					
SS8	8-9-11	20	22.5	7000*	15.5				
SS9	6-9-14	23	25.0	6500*	17.0	119	35	18	75
SS10	5-10-17	27	30.0	5000*	16.3	120			



DRAFT

GROUNDWATER READINGS

First Encountered: none
Upon Completion: n/a

BORING LOCATION INFORMATION

Easting: 13466716.4
Northing: 349288.8

Coordinates/GSE determined by: Survey

KEY

Torvane
* Penetrometer
<> Disturbed Sample

Drilling Company: Brax Drilling
Drill Rig: CME 75
Engineer on Rig: H. Bharadwaj
Drilling Method: 3 1/4 inch HSA/WR
Method Notes: WR drilling started at 10 ft.
Hammer Type: Automatic
Backfilled With: Monitoring Well
Checked By: ALOG
QA/QC By: JA
Remarks:

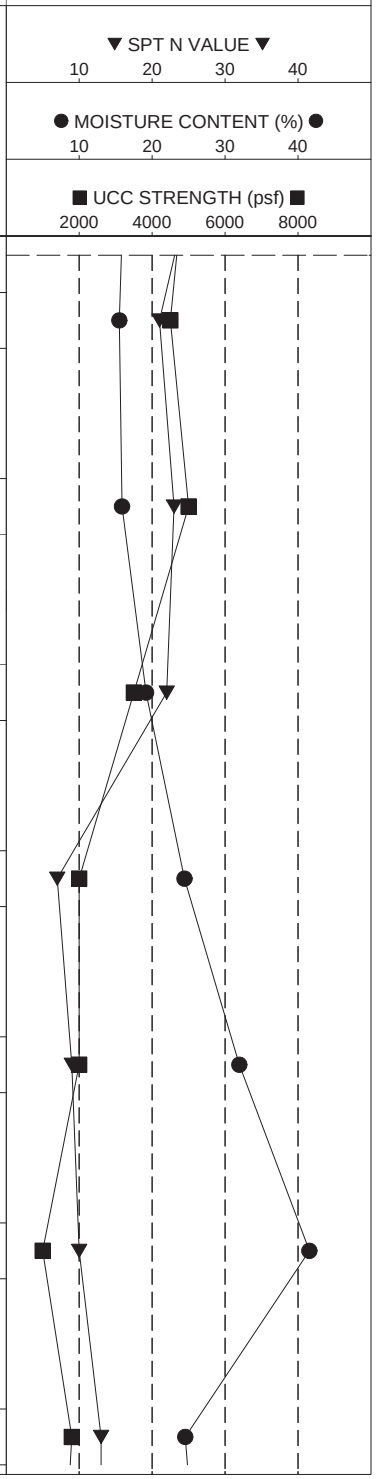
DRAFT

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C **DATE STARTED:** 10/6/2015 **DATE COMPLETED:** 10/6/2015 **LOG OF TEST BORING** **TB-01**

ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.5 ft											
	Very stiff LEAN CLAY with sand, trace gravel, occasional clayey sand seams below 40 ft., gray (CL)	35	SS11	5-9-12	21	35.0	4500*	15.5	120			
		40	SS12	5-9-14	23	40.0	5000*	15.9		30	14	70
589.5	43.0											
	Stiff SANDY LEAN CLAY, trace gravel, gray (CL)	45	SS13	13-11-11	22	45.0	3500*	19.2				65
585.5	47.0											
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL)	50	SS14	3-3-4	7	50.0	2000*	24.4		30	13	
	NOTE: No recovery on SPT sample attempt at 70 ft. due to sample falling out of sampler. Poor recovery on SPT samples SS19 at 72.5 and SS21 at 80 ft.	55	SS15	3-4-5	9	55.0	2000#	32.0				
		60	SS16	3-4-6	10	60.0	1000#	41.6				
		65	SS17	4-6-7	13	65.0	1800#	24.5				



DRAFT

GROUNDWATER READINGS
First Encountered: none
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BORING LOCATION INFORMATION
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ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

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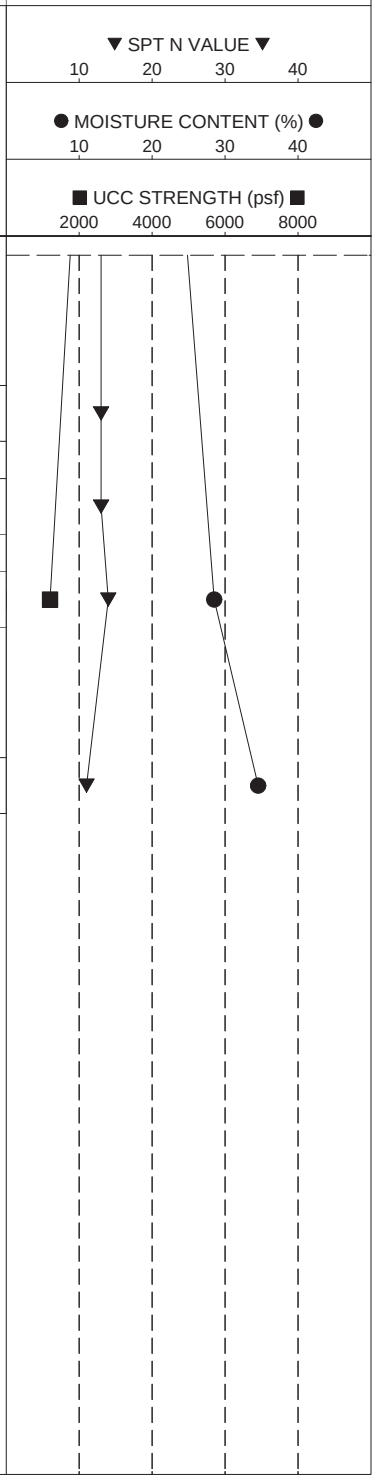
ELEVATION ft	LOG OF SOIL PROFILE	DEPTH (ft)	SAMPLE NO.	NO. OF BLOWS FOR 6-inch DRIVE	N VALUE	SAMPLE TIP DEPTH (ft)	UNCONFINED COMP STRENGTH (psf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200
	Ground Surface Elevation 632.5 ft	65										
	Stiff to medium LEAN CLAY, trace sand, trace gravel, gray (CL) NOTE: No recovery on SPT sample attempt at 70 ft. due to sample falling out of sampler. Poor recovery on SPT samples SS19 at 72.5 and SS21 at 80 ft.	70	NR18	4-6-7	13	70.0						
			SS19	5-6-7	13	72.5	<>					
		75	SS20	4-6-8	14	75.0	1200#	28.5				
552.5	80.0	80	SS21	3-5-6	11	80.0	<>	34.5				
	End of Boring at 80 ft.	85										
		90										
		95										



DRAFT

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