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YORK TOLL PLAZA, MILE 8.8

MAINE TURNPIKE AUTHORITY

FINAL GEOTECHNICAL REPORT

STATE OF MAINE
PHILLIP
LANERGAN
No. 14068
LICENSED
PROFESSIONAL ENGINEER
9/25/17

January 31, 2017




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Contents

1. Introduction

This report presents our geotechnical foundation recommendations for the construction of a new toll plaza and administration building to be located near Mile 8.8 on the Maine Turnpike I-95 in York, ME. We also present recommendations for demolition of the existing toll plaza at Mile 7.3. This report is subject to the limitations contained herein.

All elevations in this report are presented in feet and are referenced to the North American Vertical Datum of 1988 (NAVD88).

2. Existing Site Conditions

The proposed toll plaza site is located near Mile 8.8 of the Maine Turnpike I-95 in York, ME. The existing ground surface elevations in the vicinity of the proposed toll plaza range from approximately 158 feet to 172 feet. Site grades are higher on the west and slope down to wetland areas on the east. Exposed bedrock outcrops are visible along the side of both the northbound and southbound roadways. The area of the proposed access road between Chases Pond Road and the Turnpike is currently heavily wooded and moderately sloping, with occasional bedrock outcrops present. Refer to Figure 1 of Appendix A for a Site Locus Plan.

3. Proposed Construction

Proposed construction currently consists of a new toll plaza canopy, a service-access tunnel extending below the entire toll plaza, an administration building, parking lot, two gantries for open road tolling (ORT) lanes, and an access road from Chases Pond Road. The existing 6-lane roadway will be widened to 15 lanes; 8 in the southbound direction and 7 in the northbound direction. The proposed toll plaza improvements are shown on Figures 2 through 9 of Appendix A, including the existing to toll plaza at Mile 7.3

4. Local Geology

According to the USGS Geologic Map of Maine, the site is primarily located in the Cretaceous alkali feldspar quartz syenite Formation. The rocks of this area are of Cretaceous age and consist mostly of quartz syenite. Additional rock formations within the site include the Silurian-Precambrian Z Kittery Formation (to the south), which consists of mostly metasedimentary rock, and the Cretaceous alkali feldspar syenite Formation (to the north), which consists of mostly alkali syenite. At the proposed York Toll Plaza site, borings indicated that bedrock types are predominately very fine grained, gray metawacke or fine to coarse grained, light gray granite, with occasional metasandstone Refer to Table 5 for approximate bedrock elevations and the exploration logs in Appendix B for detailed rock core sample descriptions.

5. Subsurface Exploration Program

5.1 January 2016 Explorations

Under the coordination of Jacobs, New England Boring Contractors (NEBC) of Derry, New Hampshire performed a total of 13 borings (B-1 through B-13) and 10 test pits (TP-4 through TP-13) in January 2016. Exploration locations are shown on Figures 5, 8 and 9 located in Appendix A of this report.

The soil samples were classified in the field by a Jacobs' representative in accordance with Burmister classification system and bedrock was classified in accordance with the International Society for Rock Mechanics rock classification system.

The borings were advanced using hollow-stem auger and rotary-wash techniques with 3-inch and 4-inch casing to depths ranging from approximately 6.3 to 23.0 feet below existing grade. SPTs were generally performed at 5 foot intervals using a 140-lb safety hammer with a rope and cathead unless otherwise noted on the logs (Note that boring B-12 had continuous sampling in the top 6.9 feet). Rock cores were performed in all borings except borings B-1, B-2, B-4 and B-5, which all terminated on probable bedrock. Bedrock elevations ranged from approximately 146.5 to 163.6 feet. Refer to the boring logs in Appendix B for additional information.

Two two-inch-diameter groundwater observation wells were installed in borings B-3 and B-13 at respective depths of 6 feet and 12 feet below the ground surface; both wells were completed at the surface with standpipes. Installation records of the observation wells are included with the boring logs in Appendix B.

A 6.5-inch diameter pavement core was collected at boring B-10 to determine an approximate asphalt thickness for the site. The pavement thickness was found to extend approximately 17 inches below the existing roadway grade.

Test Pits TP-4, TP-5, TP-6, TP-10, TP-11 and TP-12 were performed along the northbound and southbound shoulders of the turnpike. Test Pits TP-7, TP-8 and TP-9 were performed along the proposed access road. All test pits were performed with a Kubota KX080-4 excavator to depths between 2.75 feet and 7 feet below the ground surface. For additional details, refer to Section 7.6 herein, Table 7 and the test pit logs in Appendix B.

5.2 May 2016 Explorations

Under the coordination of Jacobs, crews from the Maine Turnpike Authority (MTA) of York, Maine conducted six test pits (TP-14 through TP-19) and 12 pavement measurement probes (PM-1 through PM-12) in May 2016 to estimate pavement thicknesses and verify the condition of the pavement subgrade. Exploration locations are shown on Figures 4 through 6 located in Appendix A of this report. All test pits were performed using a John Deere 401C excavator along the northbound and southbound shoulders to depths ranging from 3.5 to 4.5 feet below existing grade. The pavement probes were completed using a pneumatic powered drill, creating a hole approximately 2 inches in diameter in the pavement. All explorations were observed by a Jacobs representative and the observed soil was classified in accordance with the Burmister classification system. Refer to Table 1 below showing the measured pavement thicknesses at the probe locations. Refer to Table 7 in Section 7.6 summarizing the test pit information. Complete test pit logs are provided in Appendix B.

Table 1: Summary of Pavement Measurement Probes

Probe No.	Asphalt Thickness (in)
PM-1	14.0
PM-2	15.5
PM-3	14.0
PM-4	4.0
PM-5	12.5
PM-6	14.5
PM-7	14.5
PM-8	12.5
PM-9	12.0
PM-10	14.5
PM-11	16.0
PM-12	12.0

5.3 September/October 2016 Explorations

Under the coordination of Jacobs, New England Boring Contractors (NEBC) of Derry, New Hampshire performed a total of 25 borings (B-14 through B-22 and SB-1 through SB-15) and 24 test pits (TP-20 through TP-31 and SWM-1 through SWM-12) in September and October 2016. All explorations were observed by a Jacobs representative. Jacobs classified the soil samples in accordance with the Burmister classification system and bedrock was classified in accordance with the International Society for Rock Mechanics rock classification system. Exploration locations are shown on Figures 2 to 9 located in Appendix A of this report.

All borings were performed with a D-50 ATV drill rig and were advanced using rotary-wash techniques with 3-inch and 4-inch casing to depths ranging from approximately 8 to 32 feet below existing grade. SPTs were generally performed at 5 foot intervals using a 140-lb safety hammer with a rope and cathead unless otherwise noted on the logs. Rock cores were attempted in all borings excluding B-17, B-18, SB-1, SB-2, SB-4, SB-6A, SB-6B, SB-10 and SB-15. Refer to boring logs in Appendix B for additional details.

Two test pits were performed near the existing Toll Plaza administration building, 5 test pits were performed along the proposed access road, and 17 test pits were performed along the northbound and southbound shoulders of the Maine Turnpike. All test pits were conducted using a Kubota KX080-4 excavator to depths ranging from about 1 to 13 feet below ground surface. For additional details, refer to Section 7.6 and Table 7 and the test pit logs in Appendix B.

6. Laboratory Testing

6.1 Soil Testing

Laboratory tests were conducted by Thielsch Engineering in Cranston, RI and performed on representative soil samples to help evaluate the physical and engineering characteristics of selected split spoon samples and test pit samples. Grain size (ASTM D-422), natural moisture content (ASTM D-2216), Atterberg limits (ASTM D-4318) and soil classification (ASTM D-2488) were determined for selected samples. Four unconsolidated undrained triaxial (UU) tests were performed in accordance with ASTM D-2850 on undisturbed samples retrieved from SB-2 and SB-10. The laboratory results are summarized in Table 2 and Table 3 and complete laboratory data is presented in Appendix D.

Table 2: Summary of Laboratory Soil Classification Data

Exploration No.	Sample No.	Depth (ft)	USCS Soil Classification	AASHTO Soil Classification	% Gravel	% Sand	% Fines	Water Content (%)
B-2	S-2A	7.4 - 9.4	SM	A-4(0)	20.9	42.9	36.2	8.3
B-2	S-2B	7.4 - 9.4	GM	A-1-a	66.1	20.1	13.8	2.9
B-3 (OW)	S-2A	2.0 - 3.6	SM	A-4(0)	17.8	45.2	37.0	45.6
B-3 (OW)	S-2B	2.0 - 3.6	GP	A-1-a	93.4	5.0	1.6	1.7
B-4	S-2B	5.0 – 7.0	GW-GM	A-1-a	57.4	33.3	9.3	11.5
B-7	S-1	0.0 – 2.0	SP-SM	A-1-b	39.9	49.4	10.7	7.1
B-8	S-2	5.0 - 5.7	SM	A-1-b	18.9	58.4	22.7	14.8
B-10	S-1	1.4 - 3.4	SP-SM	A-1-a	35.8	52.5	11.7	8.6
B-10	S-2	3.4 - 5.4	SM	A-1-b	37.7	47.4	14.9	10.4
B-11	S-2	4.0 – 6.0	GM	A-1-a	44.9	42.0	13.1	9.9
B-12	S-3A	4.0 – 6.0	SM	A-1-b	21.2	62.4	16.4	8.8
B-12	S-3B	4.0 – 6.0	GP	A-1-a	75.2	20.1	4.7	1.6
TP-14	S-1	0.5 – 1.0	SP-SM	A-1-b	33.4	60.3	6.3	4.0
TP-14	S-2	2.2 - 2.5	SP-SM	A-3	5.3	85.3	9.4	11.0

Exploration No.	Sample No.	Depth (ft)	USCS Soil Classification	AASHTO Soil Classification	% Gravel	% Sand	% Fines	Water Content (%)
TP-15	S-1	0.7 – 1.0	SP-SM	A-1-b	30.6	62.7	6.7	6.2
TP-15	S-2	1.3 - 1.7	SW-SM	A-1-b	14.1	77.6	8.3	7.4
TP-16	S-1	0.3 – 1.0	SP	A-1-b	28.8	66.5	4.7	3.2
TP-16	S-2	2.0 - 2.5	SP	A-1-b	6.1	91.3	2.6	5.8
TP-17	S-1	0.7 – 1.0	SP	A-1-b	27.1	68.0	4.9	4.1
TP-17	S-2	1.7 - 2.5	SP	A-1-b	4.4	91.0	4.6	8.0
TP-17	S-3	2.9 - 3.3	SM	A-1-b	32.3	48.8	18.9	10.7
TP-18	S-1	0.5 – 1.0	SP-SM	A-1-b	39.0	54.0	7.0	4.0
TP-18	S-2	2.2 - 2.5	SP	A-1-b	9.1	89.6	1.3	4.6
TP-19	S-1	0.7 – 1.0	SP-SM	A-1-b	24.1	66.4	9.5	4.2
TP-19	S-2	1.7 - 2.1	SP-SM	A-1-b	16.1	73.8	10.1	5.3
TP-19	S-3	3.2 – 4.0	SM	A-2-4	29.2	43.7	27.1	9.2

Table 3: Summary of Laboratory Soil Test Data (Undisturbed Sample)

Boring No.	Sample No.	Depth (feet)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Confining Stress (psf)	Fail Stress (psf)	Soil Description
SB-2	UD-1	13.2	-	-	-	1200	1263	Grey lean clay
		13.8	40	20	20	-	-	
		14.3	-	-	-	2400	876	
SB-10	UD-1	29.2	-	-	-	2000	2491	Dark grey organic silt
		29.9	35	19	16	-	-	
		30.4	-	-	-	4000	1294	

6.2 Corrosivity Testing

One composite sample was prepared from eight soil samples collected from the granular fill portions of three borings (B-14, B-15 and B-16) and evaluated for corrosivity. One peat sample from boring B-14 was also tested. The corrosivity testing included the following suite of tests:

- Electrical Resistivity
- pH
- Sulfate
- Chloride

Based on the laboratory test results, the soils can be classified as corrosive in accordance with the FHWA Publication NHI-09-087. We recommend that existing fill within two feet of the tunnel (sides and bottom) be removed and replaced with new backfill material. The corrosivity results are presented in Table 4 and the complete lab data is presented in Appendix D.

Table 4: Soil Corrosion Property Test Summary

Boring No.	Sample Depth (feet)	Electrical Resistivity (ohms-cm)	Soil pH	Chlorides (ppm)	Sulfates (ppm)
B-14, B-15, B-16[1]	0-11	**1000**	5.55	**270**	185
B-14[2]	9-11	**900**	5.25	**1230**	**354**

Notes:

1. Composite sample. Sample Number S-1537 in lab data
2. Sample Number S-1538 in lab data
3. Bold numbers are considered corrosive.
4. FHWA Pub. NHI-09-087 defines soils as corrosive if:
    a. Electrical Resistivity < 3000 ohm-cm
    b. pH <5 or pH >10
    c. Chlorides > 100 ppm
    d. Sulfides > 200 ppm
    e. Organic Content > 1%

6.3 Rock Testing

Rock strength tests (unconfined compressive tests per ASTM D-2938) were performed on ten rock core samples. Bedrock unconfined compressive strengths ranged from 6,848 to 51,278 psi. The rock testing results are summarized in Table 5 and complete laboratory data is presented in Appendix D.

Table 5: Summary of Laboratory Rock Strength Data

Boring No.	Sample No.	Depth (ft)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Bedrock Type[1]
B-3 (OW)	C2	10.2 - 10.6	188.9	12,842	Metawacke
B-6	C3	14.1 - 14.5	168.0	33,762	Metawacke
B-7	C1	5.1 - 5.5	186.4	13,681	Metawacke
B-7	C3	13.5 - 13.9	183.9	21,374	Metawacke
B-8	C1	6.4 - 6.8	172.0	27,242	Metawacke
B-9	C1	13.1 - 13.5	174.2	31,465	Granite
B-10	C1	20.6 - 21.0	166.5	6,848	Granite[2]
B-11	C3	20.1 - 20.5	184.0	51,278	Metawacke
B-12	C2	22.0 - 22.4	170.5	14,406	Metawacke
B-13 (OW)	C1	10.0 - 10.4	183.2	33,305	Metawacke

Notes:

1. Bedrock types determined by Jacobs.
2. Sample fractured along heated joint.

7. Subsurface Conditions

The following generalized subsurface conditions at the proposed Toll Plaza site were inferred from the exploration data, with some interpretations.

Subsurface conditions along the existing Maine Turnpike generally consist of granular fill overlying granite and metawacke bedrock. Near the proposed administration building and access roadway, the subsurface conditions mostly consist of natural sands overlying similar bedrock types. Table 6 presents a summary of all

borings performed. Soil properties used in the foundation analysis are presented in Appendix F. Refer to the boring logs in Appendix B for additional information.

Table 6: Summary of Borings

Boring No.	Approx. Ground Surface Elev. (ft)	Approx. Fill Thickness (ft)	Top of Natural Soil Elev. (ft)	Approx. Top of WR/ Bedrock Elev. (ft)	Bottom of Boring Elev. (ft)	Approx. Groundwater Elev. During Drilling (ft)
B-1	163.5	NE	163.5	156.5[1]	156.3	162.0
B-2	172.6	NE	172.6	162.0[1]	161.8	NE
B-3 (OW)	168.7	NE	168.7	163.6	150.9	163.4
B-4	165.9	NE	165.9	156.7[1]	156.3	161.4
B-5	166.4	NE	166.4	160.3[1]	160.1	NE
B-6	164.1	NE	164.1	159.8	143.9	163.3
B-7	164.3	3.5	NE	160.8	149.3	160.3
B-8	164.5	6.2	NE	158.3	148.1	159.3
B-9	164.9	12.4	NE	152.5	141.9	155.4
B-10	165.9	13.0	NE	152.9	142.9	156.2
B-11	164.6	13.0	NE	151.6	141.6	156.6
B-12	164.5	18.0	NE	146.5	141.5	158.5
B-13 (OW)	158.1	10.0	NE	148.1	138.1	155.0
B-14	164.9	9.5	155.4	151.9	139.9	158.9
B-15	162.3	5.5	NE	156.8	147.3	157.3
B-16	165.1	9.5	NE	155.6	150.1	162.1
B-17	128.0	14.0	114.0	NE	97.0	122.0
B-18	127.2	9.0	118.2	NE	96.2	120.3
B-19	147.5	NE	147.5	140.0	135.0	144.5
B-20	154.6	NE	154.6	151.6	146.6	152.2
B-21	167.9	NE	167.9	164.9	154.9	161.7
B-22	161.8	NE	161.8	151.5	145.8	154.5
SB-1	53.4	4.0	49.4	38.9[1]	35.4	49.4
SB-2	51.7	6.0	45.7	30.2[1]	28.2	46.2
SB-3	122.3	12.5	NE	109.8	100.3	114.3
SB-4	120.7	7.0	NE	113.7[1]	112.7	NE
SB-5	134.7	4.0	NE	130.7	115.7	126.7
SB-6A	149.2	9.0	140.2	127.2[1]	125.7	142.5
SB-6B	149.2	10.0	139.2	NE	133.2	142.2
SB-7	147.3	5.3	NE	142.0	129.3	141.2
SB-8	145.1	4.0	NE	141.1	131.1	139.0
SB-9	141.9	4.0	137.9	132.1	120.9	139.4
SB-10	125.5	6.0	119.5	NE	93.5	121.7
SB-11	145.3	4.2	NE	141.1	128.3	134.3
SB-12	144.1	5.7	NE	138.4	128.1	142.1
SB-13	149.4	4.7	NE	144.7	131.9	136.9
SB-14	148.3	8.5	NE	139.8	133.3	NE
SB-15	136.0	12.5	123.5	112.0[1]	107.0	129.0

Notes:

1. Top of bedrock estimated based on drilling resistance.
2. NE = Not encountered.

7.1 Fill

A fill layer ranging from approximately 3.5 feet to 18 feet was encountered in borings B-7 through B-18 and SB-1 through SB-15. The fill layer generally consisted of mostly medium dense to very dense, brown, fine to coarse sand with varying amounts of gravel and silt. SPT N-values generally ranged from 11 blows per foot (bpf) to over 100 bpf (note that high blow counts over 100 bpf were likely due to the presence of cobbles and or/ boulders and refusal near the top of bedrock), with only 4 samples between 7 and 10 bpf (loose)

7.2 Organics

An organic layer of mostly soft to stiff, brown, fibrous peat with varying amounts of sand was encountered directly below the fill layer in B-14, SB-6A, and SB-6B. The thickness of this layer ranged from about 0.3 to 4 feet. SPT N-values for this layer ranged from 2 to 9 bpf.

7.3 Natural Deposits

A layer of natural sand deposits ranging from approximately 3 to 11 feet thick was generally encountered below the fill and organic layers or existing grade. The natural soil layer generally consisted of medium dense to dense sandy soil with varying amounts of gravel and silt. SPT N-values generally ranged from 12 bpf to over 100 bpf (note that high blow counts over 100 bpf were likely due to the presence of cobbles and or/ boulders and refusal near the top of bedrock), with only five samples between 4 and 10 bpf (loose), four of which were from the 0 to 2 foot range. Predominately, this layer was encountered above weathered/fractured rock or bedrock.

7.4 Cohesive Soils

Cohesive soils roughly 3.5 to 26 feet thick were encountered in borings B-17, B-18, SB-1, SB-2, SB-10 and SB-15 at depths varying between 6 and 31 feet below ground surface (Note that B-17, B-18, and SB-10 terminated within this layer). This layer consisted predominately of very soft to very stiff, gray clay and silt with varying amounts of sand and trace amounts of gravel. In boring SB-10, there were indications of trace amounts of organic material roughly 24 feet below ground surface. SPT N-values ranged between 0 (WOH) to 19 bpf. Field vane tests performed in borings B-18 and SB-10 indicate undrained shear strengths (Su) of 300 and 280 pounds per square foot (psf), respectively. Field pocket penetrometer tests indicate unconfined compressive strengths varying from 0 to 4.5 tons per square foot (tsf).

7.5 Weathered Bedrock & Bedrock

Bedrock was encountered at depths ranging between 0.5 feet to 24 feet below existing ground surface. In some borings, the top portions of bedrock appeared severely weathered and highly fractured. Weathered/fractured bedrock thicknesses ranged from 0.5 to about 7.0 feet.

The bedrock on site was mostly hard, slightly to moderately weathered, moderately to extremely fractured, very fine grained, gray metawacke and hard, slightly to moderately weathered, moderately to extremely fractured, fine to coarse grained, light gray granite. (Note that boring SB-5 encountered a fine to medium grained, light gray metasandstone.) The recovered bedrock core samples had a recovery ranging between 0% and 100% and the Rock Quality Designation (RQD) for the bedrock varied from 0% to 100% with an average RQD of about 39%.

Bedrock outcrops are also present along many portions of the side of the northbound and southbound roadways. Refer to Section 10.14 herein for a discussion of rock slope conditions.

7.6 Test Pits Data

A total of 40 test pits were performed throughout the York Toll Plaza site to determine general soil characteristics, depth to groundwater and depth to bedrock. Test pit subsurface information is summarized in Table 7 below. Detailed test pit logs are included in Appendix B.

Twenty-seven test pits were performed within the northbound and southbound embankments and near existing rock slopes along the Maine Turnpike roadway. The soils encountered overlying the bedrock were generally granular fill with occasional cobbles and boulders. Bedrock depths ranged from roughly 0.5 to 11 feet below existing grade.

Eleven test pits (SWM-5 through SWM-7, TP-7 through TP-9, TP-26 through TP-30) were performed in proximity to the proposed administration building and proposed access road from Chases Pond Road. The tests pits mostly encountered natural sands and gravels with occasional cobbles and boulders overlying shallow bedrock at roughly 2 to 13 feet below existing grade.

Two test pits (SWM-10 and SWM-11) were performed near the existing toll plaza administration building to determine the thickness of the fill layer. In SWM-10, the fill layer was roughly 7 feet thick (Note that SWM-11 was terminated in the fill stratum at a depth of 8 feet.)

Table 7: Summary of Test Pit Explorations

Test Pit No.	Approx. Station	Offset (ft)	Approx. Ground Surface Elev. (ft)	Depth to Bedrock (ft)	Approx. Top of WR/ Bedrock Elev. (ft)[2]	Bottom of Test Pit Elev. (ft)	Approx. Groundwater Elev. (ft)
SWM-1	295+81.0	81.0	108.0	5.7	102.3	102.3	NE
SWM-2	299+10.0	81.0	117.8	7.5	110.3	110.3	NE
SWM-3	313+40.8	94.8	119.9	5.6	114.3	114.3	NE
SWM-4	317+77.2	104.3	129.1	5.6	123.5	123.5	123.6
SWM-5	342+30.0	-255.0	165.4	5.0	160.4	160.4	NE
SWM-6	343+41.4	-273.4	169.0	4.5	164.5	164.5	NE
SWM-7	345+77.0	-191.3	165.1	6.5	158.6	158.6	NE
SWM-8	352+51.4	151.9	155.5	5.7	149.8	149.8	149.9
SWM-9	354+44.0	147.1	145.8	5.0	140.8	140.8	NE
SWM-10	262+63.3	-174.2	43.5	NE[3]	NE	32.7	33.5
SWM-11	265+55.3	-169.2	46.5	NE	NE	38.5	NE
SWM-12	291+61.1	-119.9	91.6	4.2	87.4	87.4	NE
TP-4	334+72.6	88.3	145.0	3.5	141.5	141.5	142.5
TP-5	337+03.6	-87.4	148.0	3.0	145.0	145.0	145.0
TP-6	339+89.9	-91.7	154.6	2.8	151.8	151.8	152.1
TP-7	22+97.6[1]	-9.2	182.2	7.0	175.2	175.2	179.2
TP-8	26+87.3[1]	-20.7	179.6	3.0	176.6	176.6	177.6
TP-9	30+31.6[1]	250.9	179.3	6.0	173.3	173.3	NE
TP-10	347+81.8	-194.2	165.6	4.0	161.6	161.6	NE
TP-11	349+96.2	-95.7	159.9	7.0	152.9	152.9	153.9
TP-12	349+95.1	90.0	161.0	7.0	154.0	154.0	NE
TP-13	354+95.3	-92.4	149.1	4.0	145.1	145.1	NE
TP-14	330+00.4	-71.7	151.2	4.5	146.7	146.7	NE
TP-15	330+00.4	81.1	149.8	4.0	145.8	145.8	NE
TP-16	351+99.9	-74.1	160.4	3.5	156.9	156.9	NE

Test Pit No.	Approx. Station	Offset (ft)	Approx. Ground Surface Elev. (ft)	Depth to Bedrock (ft)	Approx. Top of WR/ Bedrock Elev. (ft)[2]	Bottom of Test Pit Elev. (ft)	Approx. Groundwater Elev. (ft)
TP-17	351+99.9	66.8	160.7	4.5	156.2	156.2	NE
TP-18	368+01.3	-70.0	143.1	4.0	139.1	139.1	NE
TP-19	367+98.8	70.3	143.2	4.0	139.2	139.2	NE
TP-20	323+50.0	-100.0	143.9	3.0	140.9	140.9	NE
TP-21	333+97.9	149.2	159.2	11.0	148.2	148.2	NE
TP-22	337+50.0	-160.0	171.1	0.5	170.6	170.6	NE
TP-23	347+07.0	-206.8	170.5	4.0	166.5	166.5	NE
TP-24	351+51.4	-158.4	166.9	3.0	163.9	163.9	NE
TP-25	363+48.8	-121.0	158.8	0.7	158.1	158.1	NE
TP-26	32+00.1[1]	3.7	174.0	6.7	167.3	167.3	NE
TP-27	30+47.0[1]	1.4	180.2	13.0	167.2	167.2	NE
TP-28	29+10.0[1]	-40.2	187.0	2.0	185.0	185.0	NE
TP-29	28+14.5[1]	55.0	191.4	5.4	186.0	186.0	NE
TP-30	24+47.5[1]	3.2	196.3	2.8	193.5	193.5	NE
TP-31	306+64.4	80.8	120.7	9.3	111.4	111.4	NE

Notes:

1. Access road stationing and offset.
2. All bedrock elevations are based on excavator refusal.
3. NE = Not encountered.

7.7 Groundwater

Groundwater was generally encountered between 0.8 feet and 12.5 feet below ground surface in the borings and test pits. Groundwater was encountered in all borings excluding B-2, B-5, SB-4, SB-14, and all test pits excluding SWM-4, SWM-8, SWM-10, SWM-11, TP-11, and TP-4 through TP-8.

Two observation wells were installed in borings B-3 and B-13. Refer to Appendix B for monitoring well installation logs. A summary of observation well readings collected by Sebago Technics is summarized in Table 8 below.

Table 8: Summary of Observation Well Readings

Observation Well	Top of Steel Standpipe Elev. (ft)	Ground Surface Elev. (ft)	Groundwater Elev. (ft)				
			1/28/2016	3/9/2016	3/18/2016	4/14/2016	5/5/2016
B-3 (OW)	171.9	168.7	NE	163.3	164.0	163.2	NE
B-13 (OW)	161.2	158.1	155.5	155.5	155.5	155.5	155.6

The use of wash boring techniques may have altered the water level readings due to the introduction of water during the drilling process. Local or periodic variations of groundwater elevation should be expected as levels may be influenced by season, precipitation, construction activity and other factors. Therefore, groundwater elevations presented herein may not be representative of water levels encountered during construction. A summary of observation well readings collected by Sebago Technics is summarized in Table 8 below.

8. Seismic Design Parameters

8.1 International Building Code (IBC) 2015 Seismic Site Class

Jacobs performed seismic analyses to determine the appropriate site coefficient for structural design of the toll plaza and administration building. Per Chapter 20 of ASCE 7-10, we recommend the use of Site Class C for this site.

In accordance with Section 1613.3.4 of the 2015 IBC, for Site Class C we recommend the design response spectra for the toll plaza and administration building be developed using the following coefficients:

S_{DS}= 0.211 S_{D1}= 0.090

where:

- S_{DS} is the design spectral acceleration coefficient at 0.2-sec period
- S_{D1} is the design spectral acceleration coefficient at 1.0-sec period

Per the Structural Engineer, these structures are defined as Risk Category II (IBC Table 1604.5) and a resulting Seismic Design Category B (IBC Tables 1613.3.5(1) and 1613.3.5(2)). Refer to Appendix E for the Seismic Site Class calculations.

9. Liquefaction Potential

Based on the observed subsurface conditions including soil type and sample density and bedrock depth, the site is judged as not susceptible to liquefaction.

10. Geotechnical Recommendations

10.1 Toll Plaza Canopy

Based on our review of the boring data, it is recommended that the proposed toll plaza canopy be supported on spread footings supported on either aggregate base course (type A), existing granular fill material or crushed stone, overlying shallow bedrock. We conducted spread footing bearing resistance analyses in accordance with AASHTO 2014 procedures for the northbound and southbound toll plazas. In the analysis we assumed a 5 foot by 5 foot footing with maximum eccentricity (B/6), resulting in an effective footing width (B') of 3.33 feet. A resistance factor of 0.45 was used for all spread footing calculations.

For toll plaza canopies, to limit settlement to about 0.5 inch we recommend an allowable bearing capacity of 5 ksf. Refer to Appendix G for the Bearing Resistance calculations.

10.2 Administration Building

The proposed basement floor elevation of the administration building is 154.5 feet. Based on the observed bedrock elevations in this area, encountered at elevations ranging from 156.7 to 163.6 we recommend that the building be supported on spread footings bearing on bedrock. We recommend an allowable vertical bearing pressure of 12,000 psf, per Table 1806.2 of the 2015 IBC.

We performed bearing resistance calculations using the calculated Rock Mass Rating (RMR) in accordance with AASHTO 2010 procedures. We analyzed a 4 foot by 4 foot interior footing for the administration building bearing directly on rock. Strength limit values far exceeded the IBC recommendations, and expected

settlement under the design loading is expected to be negligible. Bearing resistance calculations are presented in Appendix G.

The rock beneath the footings may be overexcavated and replaced with 12 inches of aggregate base course (type A) or crushed stone. For compacted aggregate base course or crushed stone, we recommend an allowable bearing pressure of 5 ksf. We recommend the spread footings have a minimum width of three feet.

Individual footings should bear entirely on bedrock or on base course/crushed stone overlying the bedrock to avoid differential settlement and potential cracking. Wall footings transitioning from bearing on bedrock to base course/crushed stone should be designed with extra reinforcing over a 10 foot distance to limit the potential for differential settlement and cracking.

We recommend that an underdrain be installed around the perimeter of the foundation of the administration building. The bottom of the perimeter drain should be at the bottom of the footing elevation. The underdrain pipe should be minimum 4-inch diameter perforated pipe surrounded by 6 inches of ¾-inch crushed stone and wrapped in Mirafi 160N geotextile fabric or equal.

10.3 Service Access Tunnel

Employee access to the toll booths will be provided by a pedestrian tunnel originating at the basement of the proposed administration building. The proposed invert elevation of the tunnel at the administration building is 154.5 feet, about 10 to 12 feet below existing grades. The total length of the tunnel will be approximately 336 feet. The majority of the tunnel is planned to be constructed from precast reinforced concrete elements, each element with approximate external dimensions of 10’-6” H x 12’-0” W x 6’-8” L.

Based on the observed bedrock elevations in the vicinity of the tunnel and proposed tunnel invert elevations, excavation of soil and bedrock will be required to construct the tunnel (refer to subsurface profile on Figure 10 in Appendix A showing the proposed location of the tunnel and the subsurface conditions). We recommend the bedrock be over-excavated under the tunnel and replaced with a minimum of 2 feet of aggregate base course (type A). This will reduce potential stress increases on the tunnel section at the transition between bedrock and soil.

The bearing capacity of the tunnel section in soil was not a design concern as the weight of the soil removed for the installation of the tunnel will be greater than the weight of the tunnel section itself. In areas where additional fill will be placed above existing ground levels, the resulting increase in pressure on the supporting soils will be minimal. We also expect settlement of the tunnel section will be negligible provided the sub-base of the tunnel is properly compacted.

Groundwater levels in the vicinity of the proposed tunnel vary from approximately elevation 155 to 163 feet, generally increasing from east to west. The groundwater level is about 0.5 to 8.5 feet above the proposed tunnel invert elevation at the administration building. An underdrain system will be installed on both sides of the exterior of the tunnel and will drain by gravity to the western end where the drains will connect with the foundation drainage system for the administration building.

10.4 ORT Gantries

Based on the soil conditions encountered at the site, depth to bedrock and proposed design loading, we recommend that the ORT gantry structures be supported on three foot diameter drilled shafts. The drilled shafts should be installed at least 3 feet into bedrock, with a minimum shaft length of 10 feet below the proposed ground surface. Proposed ground surface is at approximately elevation 167.7 feet. Based on discussions with the structural engineer, we understand that the shafts may be subjected to vehicle impact loads. The gantry support locations located after the toll islands could be subjected to Traffic Level 4 (TL-4)

impacts, and the gantry support locations located within the center median could be subjected to TL-5 impacts. We evaluated the drilled shafts under Group II (Wind) and both Extreme II (Vehicle Impact) load cases.

Alternatively, the gantry structures could be supported on shallow foundations. However, based on expected construction sequencing, drilled shaft foundations will have less impact during construction and are the preferred alternative.

10.4.1 Axial Capacity

Using procedures from FHWA-NHI-10-016 and AASHTO LRFD 2014, we evaluated side friction and end bearing capacity of the proposed drilled shaft foundations. Our analyses indicated that all shafts will require a rock socket to carry the required vertical loads from the gantry structures. We recommend at least a 3 foot deep rock socket. Axial load calculations are presented in Appendix J.

10.4.2 Lateral Resistance

We evaluated the estimated drilled shaft head deflection using LPILE (v. 2013) software by Ensoft, Inc. For the TL-4 traffic impact condition, we recommend using one, three foot diameter drilled shaft per gantry support column location. The analysis indicates shaft head deflections less than about ½" under the Group II loading and less than about 1" under Extreme II (TL-4) loading.

For the TL-5 traffic impact condition, we recommend using two, three foot diameter drilled shafts per gantry support column location. The lateral analysis indicated pile head deflections less than about 1 inch under the Extreme II (TL-5) loading.

Our design soil profiles and soil properties, along with LPILE output files are presented in the gantry foundation calculations in Appendix J.

10.5 Intelligent Transportation System (ITS) Camera Foundations

Forty foot high ITS camera poles will be installed in the southeast and northwest corners of the proposed toll plaza. Borings B-19 through B-22 were completed at the approximate locations of the proposed camera poles. Based on the observed soil conditions at the borings, we recommend using a shallow foundation bearing on natural sandy soils, or existing dense fill overlying shallow bedrock. Site specific bearing capacity evaluations were not completed however based on review of the boring logs, the dense soils appear consistent to what was encountered in the borings at the toll plaza canopies. Therefore, we recommended using an allowable bearing capacity of 5 ksf for the camera pole foundations.

10.6 Shallow Foundation General Recommendations

Friction along the base of the shallow foundations may be used to resist horizontal forces. A coefficient of friction of 0.7 is recommended for cast-in-place concrete placed directly against bedrock, and 0.35 for cast-in-place concrete against sandy soils (IBC Table 1806.2). The coefficient of friction is an ultimate value, and it is recommended that a factor of safety of 1.5 be applied when determining the available sliding resistance. We recommend that the passive resistance component of the sliding resistance be neglected in the design to account for temporary conditions, and potential excavation in front of the footing. It is also recommended that the maximum pressure at the bottom of the shallow foundations under eccentric loading not exceed the recommended allowable bearing pressure.

It is recommended that the spread footing foundations for each structure should bear entirely within the same bearing strata to minimize the potential for differential settlement. To accomplish uniform bearing we recommend two approaches:

a) Over-excavate overburden soil as needed to expose bedrock and construct the footing directly on the rock. The bedrock should be excavated to provide a horizontal bearing surface to prevent sliding. As an alternative to lowering the foundation elevation to meet bedrock, lean concrete fill may be placed over the bedrock up to the bottom of proposed foundation elevation following removal of the overburden soils.

b) Over-excavate a minimum of 12 inches of bedrock and backfill with aggregate base course (type A) or crushed stone to provide a cushion below the footing to avoid differential settlement between the hard bedrock and relatively softer subgrade soils which could cause cracking of the footing. Alternatively, the structural engineer may consider adding reinforcing for continuous footings to provide the transition needed to span across locations where the subgrade changes from soil to rock.

10.7 Frost Protection

For frost protection, footings bearing on soil or weathered bedrock should be constructed a minimum of 76 inches below the final ground surface as measured from the ground to the bottom of footing, including consideration for sloping ground surfaces. In accordance with Section 1809.5 of the IBC, frost protection is not required for foundations installed entirely on solid unweathered rock. The exposed base should be kept free of standing water at all times. The site should be graded to carry any surface runoff away from the work areas.

10.8 Settlement

For shallow foundations, we anticipate a total settlement of about ½ inch, provided that topsoil, subsoil, and disturbed soils are removed and the foundation subgrades are prepared as described in Section 11 below.

For the drilled shafts socketed into bedrock, it is anticipated that settlements would be less than ¼ inch (generally equivalent to the elastic compression of the shaft, plus the inelastic compression within the bearing layer).

10.9 Sign Foundations

Subsurface explorations SB-1 through SB-15 were completed at the proposed sign locations and the logs are presented in Appendix B. The Contractor shall review the data and select appropriate soil parameters for foundation design. We recommend using drilled shaft foundations designed in accordance with Standard Detail 626 of the MaineDOT Standard Specification. In areas where construction staging and soil conditions permit, the Contractor may explore using shallow foundations.

10.10 Light Pole Foundations

We understand that new light poles will be installed throughout the project alignment. We recommend the foundations be designed in accordance with Standard Detail 626 of the MaineDOT Standard Specification. Due to the potential for variable soil conditions, we conservatively recommend using an angle of internal friction of 30 degrees for all foundation design. We also recommend that all unsuitable material (organic material, disturbed material) discovered during excavation for these foundations be removed, and the foundation depth be increased as needed.

10.11 ORT Slabs on Grade

The northbound and southbound ORT (Open Road Tolling) lanes will require a continuous 65' by 58'-9" reinforced concrete slab on grade. We understand that the tolling equipment in these slabs is sensitive to settlement. To limit potential settlement of these slabs, we recommend a minimum subgrade modulus of 250 pci for the subgrade. We recommend 12 inches of aggregate base course (type A) compacted to 98 percent of maximum dry density (modified proctor) be placed beneath the ORT slabs. Preparation of the subgrade beneath these slabs should be completed in accordance with the recommendations in Sections 11.1 and 11.2 herein. We estimate the settlement of the ORT slabs will be less than ¼". We recommend that plate load testing and compaction testing be conducted in the field before slab installation to verify the subgrade meets these requirements. Settlement calculations are presented in Appendix H.

10.12 Toll Plaza Slabs

It is our understanding that the toll plaza enclosures and crash barriers will be supported by a structural slab. We recommend 12 inches of compacted aggregate base course (type A) be placed beneath these slabs with a minimum subgrade modulus of 250 pci. The aggregate base course should be compacted to at least 98 percent of maximum dry density (modified proctor).

10.13 Pavement Design

Based on our review of the boring logs and laboratory data, we recommend using a resilient modulus of 6,000 psi in the highway pavement design.

10.13.1 Frost Susceptibility

Laboratory tests of the subgrade materials directly below the asphalt pavement (1.4 feet thick) at Boring B-10 indicate a fines content of 11.7% and 14.9% from depths of 1.4 to 3.4 feet and 3.4 to 4.8 feet, respectively. The current pavement design indicates sub-base type D for the proposed pavement section. MaineDOT Specification 703.06 requires that all sub-base material have less than 6% fines. Below all proposed new paved areas, we recommend non-frost susceptible materials for the sub-base and base course materials in accordance with MaineDOT standards and any material not meeting these requirements should be removed and replaced with suitable compacted material.

10.14 Rock Slopes

Jacobs performed a site visit on October 26, 2016 to observe the rock slopes along the northbound and southbound sides of the Maine Turnpike between Station 321+00 and Station 370+00. The purpose of the visit was to assess the general geological conditions (joint orientation, hardness, weathering, etc.) of the bedrock slopes based on the anticipated rock excavation required for the widened segments of the highway, the administration building and access road. Our assessment is based on interpretations made from visual observations of the exposed rock surface and from information obtained from nearby subsurface explorations (test pits and borings).

The exposed bedrock slopes generally appeared stable and consisted of hard bedrock (granite, metawacke) with slight to moderate weathering, and slight to moderate fracturing. Slopes were generally observed to be at about 6V:1H, with some isolated areas at about 45 degrees. Slope heights ranged from roughly 8 to about 25 feet above existing grade at the toe of slope. Four to five prominent joint sets were identified in the rock slopes. The joints were generally spaced between 0.2 and 3.0 feet apart. Predominant joint sets were orientated (a) vertical to about 60 degrees (from vertical) and were perpendicular to the roadway, (b) vertical to about 45 degrees (from vertical) and were parallel to the roadway. Potential failure modes at the existing rock face were generally observed to be minimal, although a localized high potential for wedge failure was observed near station 338+50 on the southbound side of the roadway. Additional potential for raveling and

toppling were also observed near the top of the rock slopes, although these impacts were estimated to be generally low. These joint sets are expected to be consistent in the rock mass during excavation, however, areas of different weathering, fracturing and joint orientations may be encountered.

Based on our field observations the rock mass joint set orientations are generally considered favorable for the proposed 4V:1H slope rock cuts. It is recommended that controlled blasting techniques be used to remove the bedrock. This includes the use of line drilling closely spaced angled holes at a 4V:1H slope no wider than two feet on center from the top of slope down to about one foot below the proposed bottom of excavation, and the use of smaller charges and more delays to perform controlled blasting. The closely spaced holes should allow the rock to break along the angled drill line surface. Following excavation, the exposed rock surface should be scaled by large excavator to remove any loose rock. A Jacobs geologist or geotechnical engineer should be on site during all rock excavation work. If required, steel mesh (rock netting) could be bolted to the rock face to limit the potential for movement of blocks of rock from the face in the future. Where blasting techniques are required, special precautions should be made to ensure the force is sufficient to remove the rock but not damage any surrounding rock or soils. It is recommended that the rock slopes be inspected after excavation by a qualified engineer to assess if rock slope support measures are required to mitigate risks related to raveling, toppling and wedge failure.

10.15 Original Toll Plaza Location (Mile 7.3)

The existing toll plaza and administration building at Mile 7.3 will be removed, and the roadway will be reconstructed with 4 northbound lanes and 3 southbound lanes. When the toll plaza is removed, the existing pedestrian tunnel will also be demolished, as shown in Figure 10.15-1 below. The tunnel roof, walls and bottom slab will be removed, with only the piles remaining. Due to the ongoing settlement in this area, removing the complete tunnel section will reduce the potential for differential settlement in this area. If a portion of the tunnel was left structurally connected to the piles, this could create a hard point and the roadway above the abandoned tunnel section could settle at a different rate from the surrounding area.

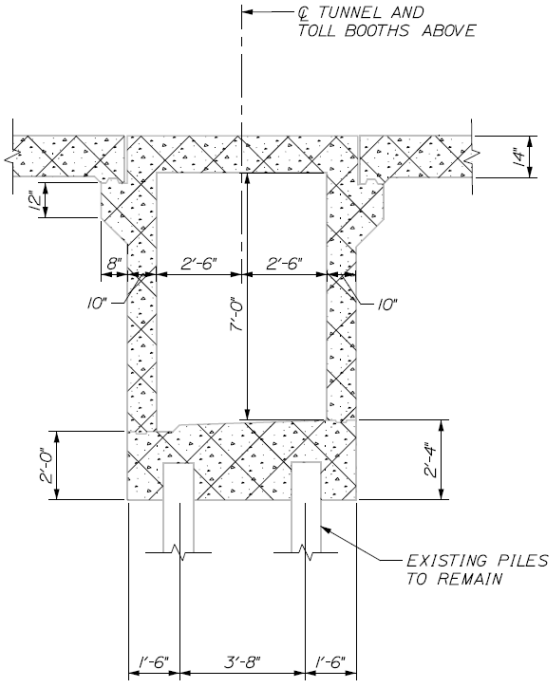

Figure 10.15-1: Demolition Plan of Existing Toll Plaza

The proposed grading through this area will result in up to approximately 1 feet of fill being placed to achieve required grading for the highway section. Jacobs previously submitted a geotechnical report in November 2014 titled "Geotechnical Conditions and Settlement Evaluation." In this report, we evaluated the continued settlement of soft clays in the area around the existing toll plaza. In a supplemental memo, dated March 2015, we evaluated the possibility of moving the toll plaza approximately 400 north from the existing location. In our analysis, we presented settlement calculations based on various amount of proposed fill heights. We updated this calculation for the planned one foot of fill, and estimate settlement in the vicinity of the existing toll plaza to be up to 2.5 inches. The settlement calculation is presented in Appendix I. All of the historical boring logs completed in the vicinity of the existing facility at Mile 7.3 are presented in Appendix K.

We understand that the Maine Turnpike Authority would like to avoid using mitigation measures to limit settlement, and will plan to repave the areas in the future, if necessary.

11. Construction Considerations

11.1 Subgrade Preparation

Prior to performing any required grading operations and excavations within the proposed locations of the toll plaza, administration building, parking lot, and access road these areas should be stripped of any topsoil, subsoil, vegetation, organics, stumps and/or boulders. Any areas that appear soft or unstable should also be removed and replaced with properly compacted aggregate base course (type A) or crushed stone as described in Section 11.2.

Within the proposed footprint of the spread footings, unsuitable fill or soft soils, or soils that are too wet should be removed within the bearing zone of influence defined by a one horizontal to one vertical (1H:1V) line sloping down and out from one foot outside the bottom exterior edges of the footing to natural granular soils. The exposed subgrade soils should be proof-compacted with a minimum of 10 passes of a minimum 10,000-lb (static weight) heavy vibratory roller. Loose or soft zones observed during proof-compaction should be over-excavated to firm and stable soils (or weathered bedrock) and replaced with compacted aggregate base course. Where exposed soil subgrades are at or near the groundwater level, static proof-compaction methods should be used in lieu of vibratory methods if approved by the geotechnical engineer. Exposed subgrade soils should be protected from disturbance at all times. Fill should not be placed over frozen soil. Soil subgrades should be protected against frost both during and after construction. A qualified geotechnical engineer should evaluate foundation subgrades and observe fill placement.

Proper drainage of construction areas should be provided to protect the subgrades from the detrimental effects of weather conditions. The exposed base should be kept free of standing water at all times. The site should be graded to carry any surface runoff away from the work areas.

11.2 Earthwork and Compaction

Structural fill placement should consist of aggregate base course or crushed stone in accordance with Subsection 703 of the MaineDOT Standard Specifications. Fill should be placed in loose layers of not more than 12 inches in thickness, unless otherwise specified, and compacted to at least 95 percent of the maximum dry density as determined by the Modified Proctor Test (ASTM D-1557). Aggregate base course beneath the ORT and toll plaza slabs should be compacted to at least 98 percent. In confined areas, place only 6-inch-thick layers and compact with manually operated, powered vibratory compaction equipment acceptable to the geotechnical engineer. Water should be added to the base course as required, and the fill should be compacted at a moisture content within 2% of the optimum moisture. Crushed stone should be placed in layers not more than 12 inches thick and compacted to an unyielding surface. Crushed stone should be wrapped in non-woven

filter fabric equivalent to Mirafi 160N or better, with a minimum overlap of at least two feet. Reference is also made to the following table:

Table 6: Material Specifications

Borrow Material	MaineDOT Standard Spec. No.	Use
Common Borrow	703.18	General Fill
Granular Borrow	703.19	Embankment Fill
Aggregate Base Course – Type A	703.06	Beneath Footings and Slabs
Rock Borrow	703.21	Embankment Fill
Crushed Stone	703.31	Beneath Footings and for Drainage

If foundations are not constructed immediately after grading and fill placement, the subgrade should be shaped so as to prevent ponding. If there is a substantial lapse in time between grading and foundation construction, or if the subgrade is severely disturbed, it should be proof-rolled with a large vibratory roller prior to construction. Soft spots observed during proof-rolling should be removed and replaced with compacted aggregate base course or crushed stone (wrapped in non-woven filter fabric (Mirafi 160N or equivalent)).

11.3 Protection of Existing Structures

The depth of excavation for the new spread footing foundations and proposed access tunnel should be performed so as not to undermine or impact the adjacent roadway or structures. It is recommended that an imaginary 1.5H:1V line extending outward and upward from all edges of the proposed excavation bottom should be posted and checked on-site prior to any foundation excavation. Temporary excavation support will likely be required to protect the existing roadway during construction.

11.4 Temporary Excavation Support

Construction of the new administration building, toll plaza canopy foundations and access tunnel will require excavation of up to approximately 15 to 16 feet below the existing ground surface. Due to the depth of excavation, a temporary excavation support system will be required. The temporary earth support system should account for the excavation and removal of any suitable materials, as well as the installation of the new foundations and depth of undercut for foundation construction. We anticipate the feasible earth support alternatives may include soldier piles and lagging, but will be based on the means and methods. It may be necessary to predrill holes in areas of shallow bedrock to install the soldier piles.

The temporary earth support systems should be designed utilizing the following soil properties:

- Active earth pressure coefficient of 0.33
- At- rest earth pressure coefficient of 0.5
- Passive earth pressure coefficient of 3.0
- Saturated unit weight of 130 pcf (below the water table)
- Moist unit weight of 120 pcf (above the water table)

Temporary earth support systems should be selected by the Contractor and designed by an experienced Professional Engineer registered in the State of Maine, and retained by the Contractor. Where excavation sides are cut back and sloped, they should be in accordance with the Occupational Safety and Health Administration (OSHA) Construction Industry Standards.

11.5 Blasting/Rock Removal

Removal of bedrock will be required to construct the proposed foundation for the administration building, install the access tunnel under the proposed toll plaza, to widen the highway and construct the access road. Due to the amount and depth of required rock cuts, and the hardness of the rock, it is unlikely that the rock can be excavated using mechanical means (rock hammers and splitter) and blasting will likely be required. All rock excavation and blasting should be performed in accordance with Section 203.042 of the MaineDOT Standard Specifications and Maine Turnpike Authority Special Provision Section 105.2.7.

11.6 Reuse of Excavated Materials

Based on the soils encountered, it is possible that some of the material may be suitable for reuse on site as Aggregate Base Course. Soils not meeting this specification may still be reused for general backfill, provided that weather conditions are satisfactory, the moisture content can be controlled, and the materials can be compacted to the required density.

It may also be possible to reuse blasted rock as general backfill around the site. The rock must be broken down to various sizes in order to meet material requirements as shown in Table 6.

Stockpiled soils may require installation of run-off protection for erosion control. Stockpiles of fill materials should be maintained to prevent material from fluctuating from the optimum moisture content, freezing, separating due to migration of fine grained soils, and collection of snow or ice within the stockpiles. Reuse of on-site soils should be at the acceptance of the geotechnical engineer prior to placement.

11.7 Dewatering

Groundwater level readings indicate that groundwater will be encountered as high as 4 to 5 feet below final grade and up to approximately 13 feet above the bottom of excavation for the tunnel and administration building. The Contractor should be prepared to manage and control groundwater during foundation excavation, and to control surface water from entering excavations to provide a dry and stable subgrade. The Contractor should be responsible for selecting the dewatering methods based on their proposed methods and equipment used for excavation. The method of dewatering will depend on the time of year that the work is performed, size and depth of the open excavation, and the length of time the excavation is left open. Prior to construction, the dewatering plan should be reviewed by a Jacobs Registered Professional Geotechnical Engineer, or Engineer appointed by the Owner. Dewatering efforts must satisfy requirements of local, state, and federal environmental and conservation authorities.

12. Limitations

This report and the recommendations contained herein have been prepared for the exclusive use of Jacobs and Maine Turnpike and their representatives for specific application to the design and construction of the proposed toll plaza and administration building for the Maine Turnpike in York, ME at Mile 8.8.

This report was prepared in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made. The analysis, design and recommendations submitted in this report are based in part upon the data obtained from subsurface explorations available at the time of this report. Subsurface stratification variations between explorations are anticipated. The reported groundwater

levels were short-term observations and only represented the water levels at the time of the explorations and as noted on the exploration logs or as otherwise described herein. The nature and extent of variations between these explorations may not become evident until construction. If significant variations then appear, or if there are changes in the nature, design or location of the proposed structures, it may be necessary to reevaluate the recommendations of this report.

We appreciate the opportunity to be of service to you on this project. Please contact us if you have any questions regarding this report.

Very truly yours,

Jacobs Engineering Group

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Appendix A. **Figures**

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PROPOSED YORK PLAZA
TOLL BOOTHS

EXISTING YORK PLAZA
TOLL BOOTHS

Horse Hills
Middle Pond
Chases Pond
Scituate Pond
Boulter Pond
Young Hill
Payneton
Scotland
Cider Hill
Scituate
Beech Ridge
York Corner
York Heights
Cape Neddick
York Beach
Chases Pond
Junkins Brook
Smelt Brook
Bass Cove Cr
Cider Hill Cr
Mudflat Brook
York River
Cider Hill Creek
Dolly Gordon Brook
Little River
South Basin
Barrell Cem
Junkins Lot
Junkins Cem
Nowell Lot
Nowell Linscott Chadbourne Lot
Shaw Staples Stevens Lot
Simpson Lot
Shaw Lot
Smith Preble Lot
McIntire Lot
Chick Lot
Spinney Lot
Kingsbury Lot
Leavitt Lot
Adams Lot
Johnson Lot
Williams Lot
Grant Lot
Moody Lot
Cook Lot
Rogers Cook Lot
Cooks Bridge
Scotland Bridge
Second Parish Cem
Freethy Cem
Young Lot
Moulton Lot
Gowen Lot
Roberts Plaisted Lot
Plaisted Lot
Sayward Lot
Grover Lot
Blaisdell Lot
Carter Lot
Furbish Lot
Garey Lot
Woodward Lot
Lunt Lot
Preble Lot
Parsons Lot
Vincent Lot
Redden Lot
Grant Lot
Chase Shaw Lot
Chase Lot
Card Lot
Preble Lot
Todd Lot
Knickerbocker Cem
Simpson Lot
Hutchins Young Lot
First Parish Cem
Korean War Memorial Cem
World War II Memorial Cem
Revolutionary War Memorial Cem
Vietnam War Memorial Cem
Civil War Memorial
Donnell Lot
Town Farm Cem
Moody Cem
Linscott Rd S
Linscott Rd N
Mill Ln
Hill Rd
Nolen Path
Cider Hill Rd
Kingsbury Ln
Sargents Ln
New Boston Rd
Fall Mill Rd
Fall Mill Ext
Dog Rd
Chases Pond Rd
Sunrise Ter
Scituate Rd
Emus Way
Mid Dr
Birch Hill Rd
Scotland Bridge Rd
Riverwood Dr
Salt Weir Dr
Beech Ridge Rd
Leisure Ln
Brickyard Ct
Orchard Farms Rd
Millard Dr
Organug Ln
Hannaford Dr
Raydon Rd
Donica Rd
Perkins Dr
New Town Rd
Fieldstone Estates Rd
Old Post Rd
Ridge Rd
Webber Rd
Garrison Ave
Bluestone Ln
Styles Ln
Hemlock Ave
Beacon St Ext
Paul St
Harris St
Trafton St
Dean Rd
Rogers Rd
Dewey Rd
Ferncroft Rd
Long Sands Rd
Fernald Ave
Boban St
Meadowlark Dr
Sparrow Ln
Chases Pond Rd
Route 91
Interstate 95
US-1
Route 1
Route 1A

N

Date:2/1/2017

Filename: ...\d0259628\001_Geoplan1.dgn

Scale:
1000 0 1000 2000
Scale of Feet

No.	Revision	By	Date

Designed by:
JACOBS®

	By	Date		By	Date
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MAINE TURNPIKE

THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

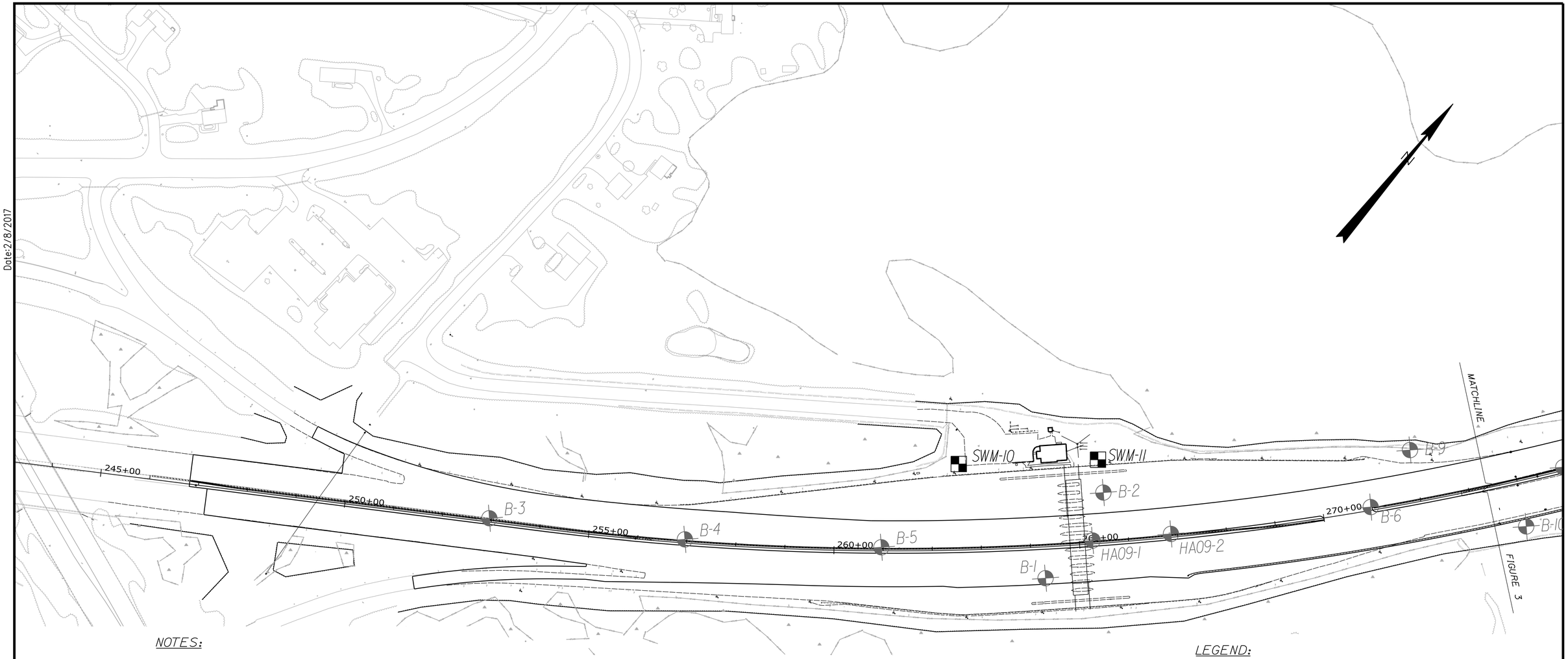
FIGURE 1
LOCUS PLAN

SHEET NUMBER: 1

CONTRACT:2017.09

1 OF 10

Date:2/8/2017



NOTES:

1. BORINGS B-1 THROUGH B-13 AND TEST PITS TP-4 THROUGH TP-13 WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS IN JANUARY 2016. EXPLORATIONS WERE OBSERVED AND LOGGED BY JACOBS. EXPLORATIONS WERE LOCATED BY INSTRUMENT SURVEY BY SEBAGO TECHNICS.
2. BORINGS B-14 THROUGH B-22 AND SB-1 THROUGH SB-15 WERE PERFORMED BY NEW ENGLAND BORINGS CONTRACTORS IN SEPTEMBER AND OCTOBER 2016. EXPLORATIONS WERE OBSERVED AND LOGGED BY JACOBS. EXPLORATIONS WERE LOCATED BY INSTRUMENT SURVEY BY SEBAGO TECHNICS.
3. PROBES PM-1 THROUGH PM-12 AND TEST PITS TP-14 THROUGH TP-19 WERE PERFORMED BY THE MAINE TURNPIKE AUTHORITY AND LOGGED BY JACOBS IN MAY 2016. EXPLORATION LOCATIONS WERE DETERMINED BY FIELD MEASUREMENTS.
4. TEST PITS SWM-1 THROUGH SWM-12 AND TP-20 THROUGH TP-31 WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS IN OCTOBER 2016. EXPLORATIONS WERE OBSERVED AND LOGGED BY JACOBS. EXPLORATIONS WERE LOCATED BY INSTRUMENT SURVEY BY SEBAGO TECHNICS.
5. BORINGS B-1 THROUGH B-10 IN THE VICINITY OF THE EXISTING TOLL PLAZA ON FIGURES 2 AND 3 WERE PERFORMED IN 2014 AND 2015 BY NEW ENGLAND BORINGS CONTRACTORS AND OBSERVED BY JACOBS.
6. BORINGS HA09-1 AND HA09-2 WERE PERFORMED BY MAINE TEST BORINGS FOR HALEY AND ALDRICH IN 2009.
7. FOR EXPLORATION LOGS SEE GEOTECHNICAL REPORT DATED FEBRUARY 2017.
8. CONTOURS AND ELEVATIONS SHOWN HEREIN ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

LEGEND:

B-1	BORINGS AT NEW TOLL PLAZA
SB-1	SIGN BORINGS
PM-10	PAVEMENT MEASUREMENT PROBE
TP-12	TEST PIT
SWM-9	STORMWATER MANAGEMENT TEST PIT
B-1 HA09-1	BORINGS AT EXISTING TOLL PLAZA
OW	OBSERVATION WELL

Scale:
100 0 100 200
Scale of Feet

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THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

FIGURE 2
SUBSURFACE EXPLORATION PLAN 1

SHEET NUMBER: 2

CONTRACT:2017.09

Filename: ...\d0259628\002_Geoplan2.dgn

Date:2/1/2017

NOTES:

1. FOR NOTES SEE FIGURE 2.

LEGEND:

B-1	BORINGS AT NEW TOLL PLAZA
SB-1	SIGN BORINGS
PM-10	PAVEMENT MEASUREMENT PROBE
TP-12	TEST PIT
SWM-9	STORMWATER MANAGEMENT TEST PIT
B-1 HA09-1	BORINGS AT EXISTING TOLL PLAZA
OW	OBSERVATION WELL

Scale:

100 0 100 200

Scale of Feet

No.	Revision	By	Date

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THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

FIGURE 3
SUBSURFACE EXPLORATION PLAN 2

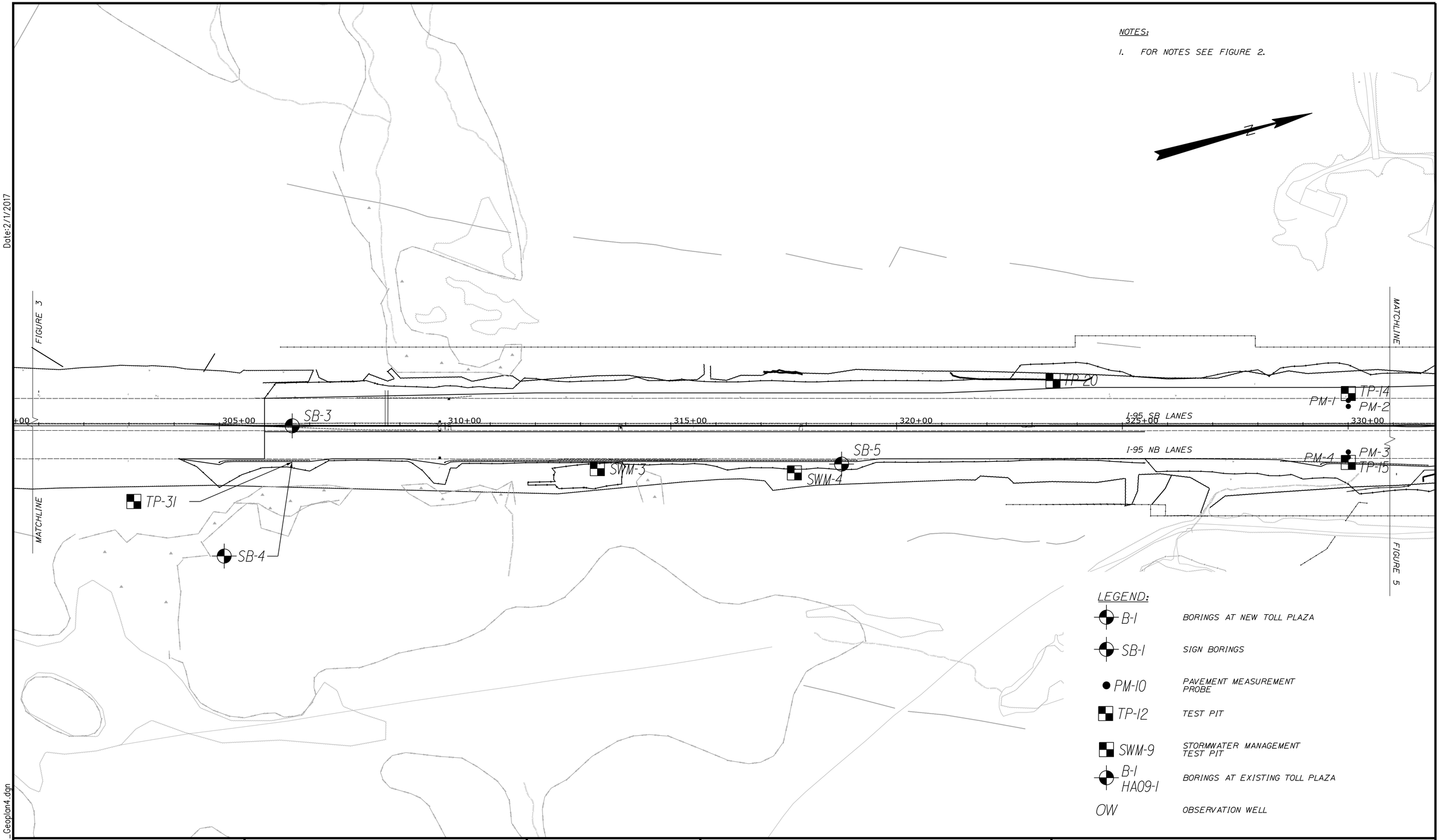
SHEET NUMBER: 3

CONTRACT:2017.09

Filename: ...\d0259628\003_Geoplan3.dgn

NOTES:

1. FOR NOTES SEE FIGURE 2.



LEGEND:

B-1	BORINGS AT NEW TOLL PLAZA
SB-1	SIGN BORINGS
PM-10	PAVEMENT MEASUREMENT PROBE
TP-12	TEST PIT
SWM-9	STORMWATER MANAGEMENT TEST PIT
B-1 HA09-1	BORINGS AT EXISTING TOLL PLAZA
OW	OBSERVATION WELL

Scale: 100 0 100 200 Scale of Feet

No.	Revision	By	Date

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THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

FIGURE 4
SUBSURFACE EXPLORATION PLAN 3

SHEET NUMBER: 4

CONTRACT:2017.09

Date:2/1/2017

Filename: ...\d0259628\004_Geoplan4.dgn

Date:2/8/2017

NOTES:

1. FOR NOTES SEE FIGURE 2.

TP-8
MATCHLINE - FIGURE 8
TP-29
TP-28
ACCESS ROAD
TP-27
TP-9
SWM-6
B-2
TP-26
B-3 (OW)
B-1
SWM-5
B-21
B-5
TP-23
TP-10
SWM-7
B-22
TP-22
B-4
B-8
B-6
TP-24
B-7
B-15
TP-5
TP-6
TP-11
TP-16
TP-13
PM-5
PM-6
B-16
330+00
SB-6A, SB-6B
335+00
340+00
345+00
350+00
355+00
360+00
B-9
B-10
PM-7
PM-8
SB-7
TP-4
B-14
B-11
B-13 (OW)
TP-12
TP-17
TP-21
B-19
B-12
B-20
SWM-8
SWM-9
SEE FIGURE 9
FIGURE 4
MATCHLINE
MATCHLINE
FIGURE 6

I-95 SB CASH LANES
I-95 SB ORT LANES
I-95 NB ORT LANES
I-95 NB CASH LANES

LEGEND:

B-1	BORINGS AT NEW TOLL PLAZA
SB-1	SIGN BORINGS
PM-10	PAVEMENT MEASUREMENT PROBE
TP-12	TEST PIT
SWM-9	STORMWATER MANAGEMENT TEST PIT
B-1 HA09-1	BORINGS AT EXISTING TOLL PLAZA
OW	OBSERVATION WELL

Filename: ...\d0259628\005_Geoplan5.dgn

Scale:
100 0 100 200
Scale of Feet

No.	Revision	By	Date

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YORK TOLL PLAZA

FIGURE 5
SUBSURFACE EXPLORATION PLAN 4

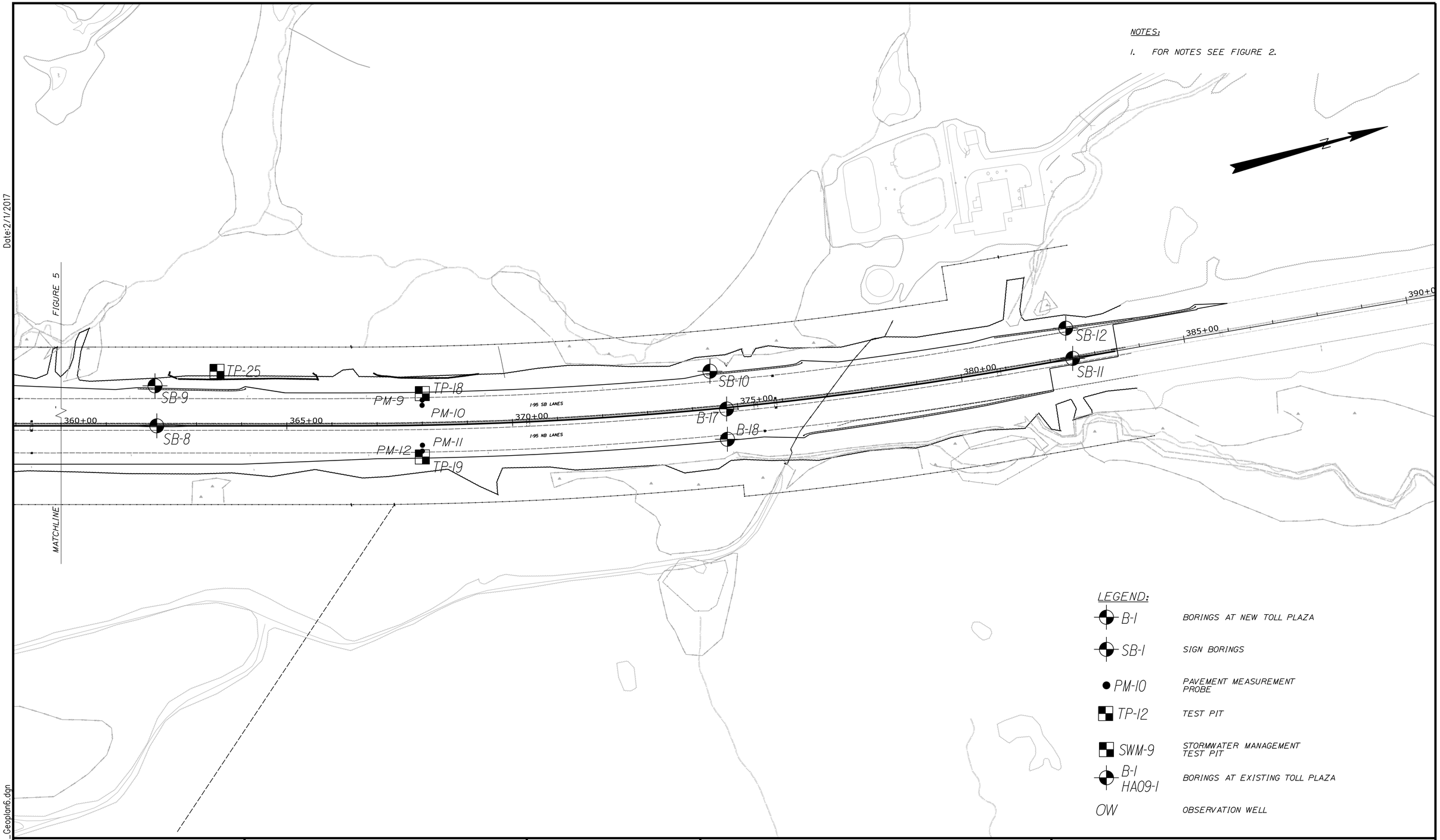
SHEET NUMBER: 5

CONTRACT:2017.09

Date:2/1/2017

NOTES:

1. FOR NOTES SEE FIGURE 2.



LEGEND:

B-1	BORINGS AT NEW TOLL PLAZA
SB-1	SIGN BORINGS
PM-10	PAVEMENT MEASUREMENT PROBE
TP-12	TEST PIT
SWM-9	STORMWATER MANAGEMENT TEST PIT
B-1 HA09-1	BORINGS AT EXISTING TOLL PLAZA
OW	OBSERVATION WELL

Scale: 100 0 100 200 Scale of Feet

No.	Revision	By	Date

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YORK TOLL PLAZA

FIGURE 6
SUBSURFACE EXPLORATION PLAN 5

SHEET NUMBER: 6

CONTRACT:2017.09

Filename: ...\d0259628\006_Geoplan6.dgn

Date:2/1/2017

NOTES:

1. FOR NOTES SEE FIGURE 2.

N

SB-15

SB-14

SB-13

430+00
425+00
420+00
415+00
410+00
405+00

LEGEND:

B-1	BORINGS AT NEW TOLL PLAZA
SB-1	SIGN BORINGS
PM-10	PAVEMENT MEASUREMENT PROBE
TP-12	TEST PIT
SWM-9	STORMWATER MANAGEMENT TEST PIT
B-1 HA09-1	BORINGS AT EXISTING TOLL PLAZA
OW	OBSERVATION WELL

Scale:
100 0 100 200
Scale of Feet

No.	Revision	By	Date

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YORK TOLL PLAZA

FIGURE 7
SUBSURFACE EXPLORATION PLAN 6

SHEET NUMBER: 7

CONTRACT:2017.09

Filename: ...\d0259628\007_Geoplan7.dgn

Date:2/1/2017

NOTES:

1. FOR NOTES SEE FIGURE 2.

CHASES POND ROAD

TP-7

ACCESS ROAD

TP-30

2510.00

TP-8

MATCHLINE FIGURE 5

TP-29

TP-28

LEGEND:

B-1	BORINGS AT NEW TOLL PLAZA
SB-1	SIGN BORINGS
PM-10	PAVEMENT MEASUREMENT PROBE
TP-12	TEST PIT
SWM-9	STORMWATER MANAGEMENT TEST PIT
B-1 HA09-1	BORINGS AT EXISTING TOLL PLAZA
OW	OBSERVATION WELL

Scale:

100 0 100 200

Scale of Feet

No.	Revision	By	Date

Designed by:

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	By	Date		By	Date
Designed	PL	02/17	Checked	PJM	02/17
Drawn	AMS	02/17	In Charge of	---	--/--

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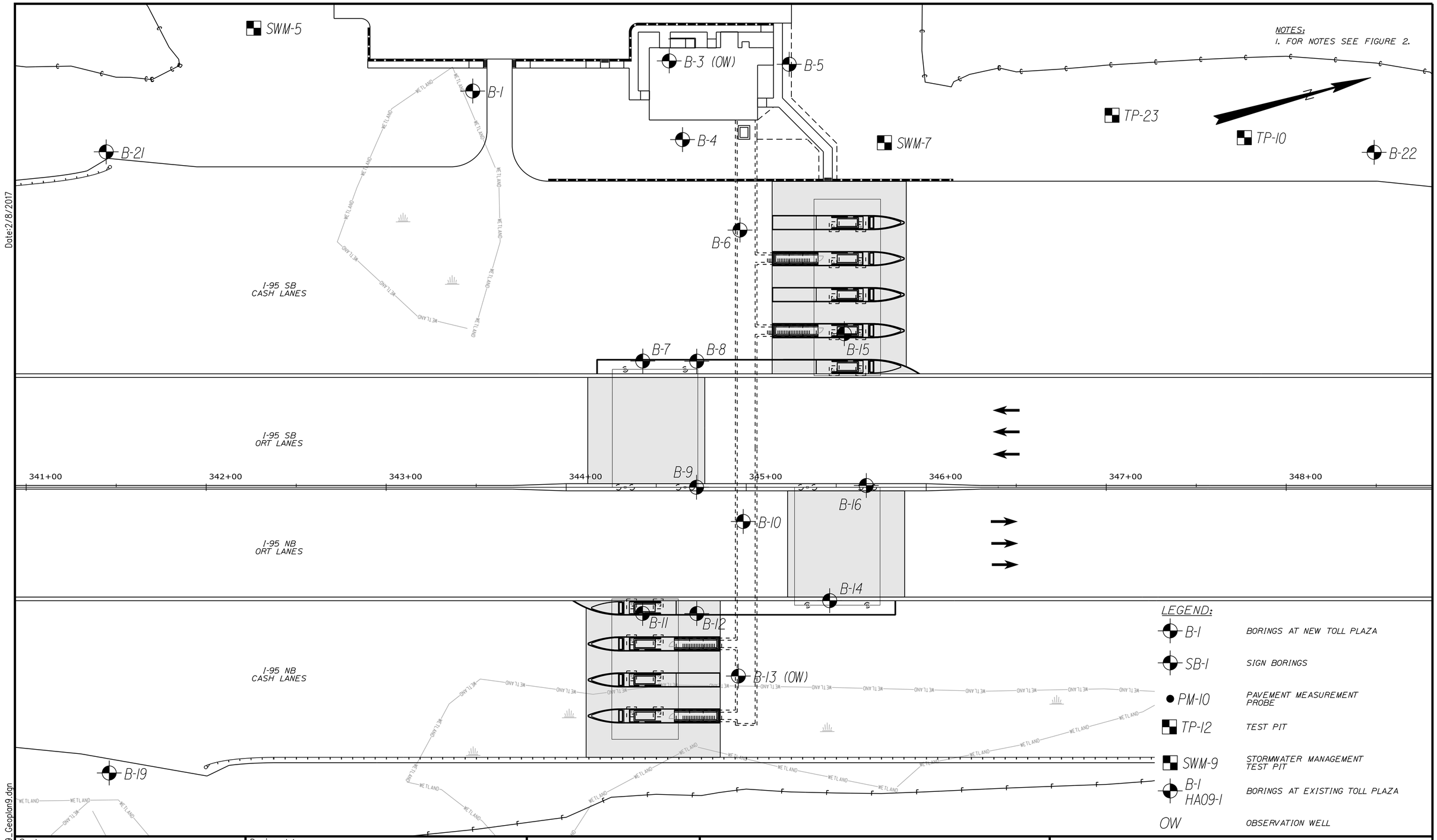
FIGURE 8
SUBSURFACE EXPLORATION PLAN 7

SHEET NUMBER: 8

CONTRACT:2017.09

Filename: ...\d0259628\008_Geoplan8.dgn



Date:2/8/2017

Filename: ...\d0259628\009_Geoplan9.dgn

Scale:

25 0 25 50

Scale of Feet

No.	Revision	By	Date

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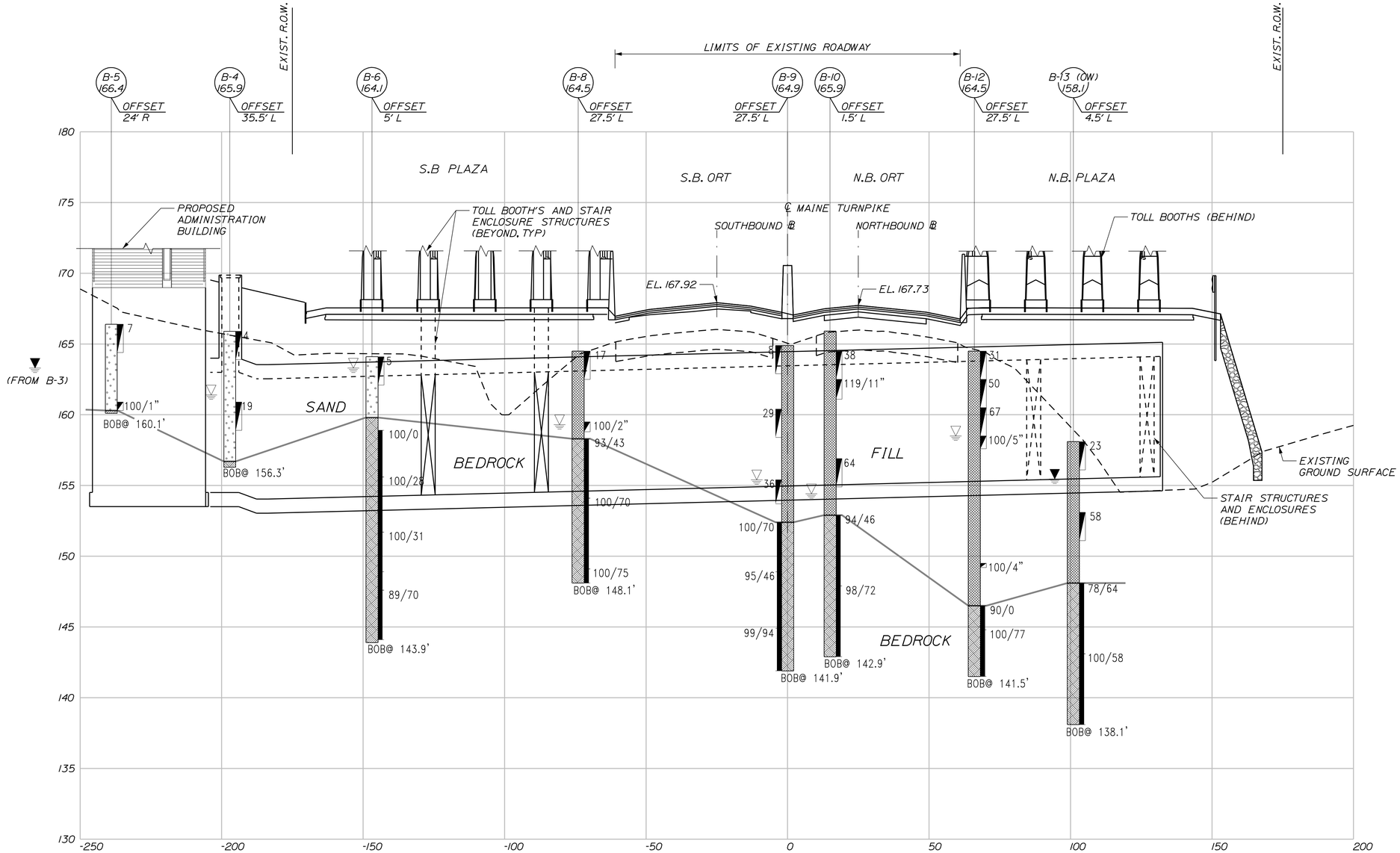
YORK TOLL PLAZA

FIGURE 9
SUBSURFACE EXPLORATION PLAN 8

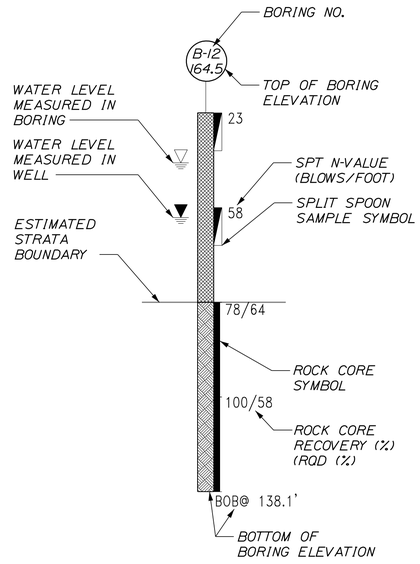
SHEET NUMBER: 9

CONTRACT:2017.09

Date:2/1/2017



SECTION A-A



LEGEND

NOTES:

1. THE STRATIFICATION LINES ARE BASED UPON INTERPRETATIONS BETWEEN WIDELY SPACED BORING LOCATIONS AND THUS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEEN SOIL TYPES AND TOP OF ROCK. REFER TO BORING LOGS FOR SPECIFIC CONDITIONS ENCOUNTERED IN EACH BORING.
2. THE STRATA DESCRIPTIONS SHOWN ON THIS PROFILE ARE HIGHLY GENERALIZED.
3. REFER TO FIGURE 5 FOR THE LOCATION OF THE SUBSURFACE PROFILE.
4. SEE FIGURE 2 FOR ADDITIONAL NOTES.

Filename: ...\010_Geotechnical Profile.dgn

Scale: Horiz. 25 0 25 Vert. 5 0 5 Scale of Feet

No.	Revision	By	Date

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THE GOLD STAR MEMORIAL HIGHWAY

MTA PROJECT MANAGER: R. NORWOOD

YORK TOLL PLAZA

FIGURE 10
GEOTECHNICAL PROFILE

SHEET NUMBER: 10

CONTRACT:2017.09

Appendix B. **Subsurface Exploration Logs**

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Borings

B-1 through B-22

SB-1 through SB-15

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LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-1
LOCATION	Maine Turnpike Mile 8.8		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Porter	ELEVATION	163.5
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	B-53 Mobile Drill	DATUM	NAVD88
0.0	Hollow Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126714
7.2	Terminated	01-22-2016 / 9:42 AM	1.5 Upon Completion (Augers pulled)			COORD E	2823935.9
						DATE START	1/22/16
						DATE END	1/22/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
160	0	2 3 6 9	9	S1	0 - 2	24/8		SAND	S1A (Top 6"): Moist, dark brown, fine to medium SAND, little(+) Silt, little organic material (roots, root fibers, leaves), trace Gravel (TOPSOIL). S1B (Bottom 2"): Wet, brown, fine to coarse SAND, little(+) Gravel, trace Silt.	
	5	13 100/5"	100/5"	S2	4.5 - 5.4	11/8			S2: Wet, very dense, dark brown, fine to medium SAND, some fine Gravel, little Silt (fine gravel in spoon tip, possible rock fragments).	1
155								7	Probable Bedrock at 7 ft.	
	10							7.2	Bottom of Borehole at 7.2 feet.	2 3
150										
	15									
145										
	20									
140										
	25									
135										
	30									
130										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Auger advancing slowly at 5.4 feet. Broke through at approx. 5.7 feet, possible cobble.
2. Hard drilling at 7 feet, probable top of bedrock. Auger to 7.2 feet.
3. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-2
LOCATION	Maine Turnpike Mile 8.8		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Porter	ELEVATION	172.6
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	B-53 Mobile Drill	DATUM	NAVD88
0.0	Hollow Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126774.5
10.8	Terminated	01-22-2016 /	None Encountered			COORD E	2823893.3
						DATE START	1/22/16
						DATE END	1/22/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
170	0	1 2 3 6	5	S1	0 - 2	24/7		SAND	S1A (Top 2"): Moist, dark brown, fine to coarse SAND, little organic material (roots, root fibers, leaves), little Silt (TOPSOIL). S1B (Bottom 5"): Moist, brown, fine to coarse SAND, some fine to coarse Gravel, little organic material (roots, root fibers), trace Silt (SUBSOIL).	1
	5									2
165		42 60 34 33	94	S2	7.4 - 9.4	24/15			S2A (Top 8"): Moist, dark brown, fine to coarse SAND and Silt, some(-) fine to coarse Gravel (USCS: SM, Fines: 36.2%). S2B (Bottom 7"): Moist, grayish brown, fine to coarse GRAVEL, some(-) fine to coarse Sand, little Silt (USCS: GM, Fines: 13.8%).	
	10	13 100/1"	100/1"	S3	10 - 10.6	7/1		10.6	S3: Moist, very dense, dark brown, fine to coarse SAND, little Gravel, trace Silt.	3
160								10.8	Probable Bedrock at 10.6 ft. Bottom of Borehole at 10.8 feet.	4 5
	15									
155										
	20									
150										
	25									
145										
	30									
140										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unified Soil Classification System (ASTM D-2487) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Harder drilling from 5 to 5.8 feet, probable cobble.
3. Spoon bouncing at 10.6 feet; top of probable bedrock.
4. Advanced auger to 10.8 feet.
5. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza			BORING NO.	B-3 (OW)	
	LOCATION	Maine Turnpike Mile 8.8				SHEET 1 OF 1	
	OWNER	Maine Turnpike Authority					
	JOB NUMBER	E2X71602					
INSPECTOR G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Porter	ELEVATION		168.7
METHOD OF DRILLING	GROUNDWATER READINGS		DRILL RIG	B-53 Mobile Drill	DATUM		NAVD88
0.0 Hollow Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID	N	126823.7
5.1 NX Rock Core	03-09-2016 / -	5.4 Monitoring Well Reading			COORD	E	2823948.6
17.8 Terminated					DATE START		1/21/16
					DATE END		1/21/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
165	0	1 2 2 3	4	S1	0 - 2	24/4		SAND	S1: Moist, loose, dark brown, fine to coarse SAND, little fine Gravel, little Silt, trace organic material (roots, root fibers, leaves) (TOPOSIL).	1
		8 17 32 100/1"	49	S2	2 - 3.58	19/4			S2A (Top 1"): Moist, red/brown, fine to coarse SAND and Silt, little fine Gravel, trace organic material (roots, root fibers) (USCS: SM, Fines: 37%). S2B (Bottom 3"): Moist, gray/brown, fine to coarse GRAVEL, trace Sand, trace Silt (rock fragments) (USCS: GP, Fines: 1.6%).	2
								5.1		3
160	10	RQD=51		C1	5.1 - 9.5	53/44		BEDROCK	C1: Hard, moderately weathered, moderately to extremely fractured, very fine grained, dark gray METAWACKE with very close to close, horizontal to vertical, iron-oxide stained fractures. Coring Times (min/ft): 2 - 2 - 2 - 2 - 1/4.8"	4
		RQD=49		C2	9.5 - 11.3	22/22			C2: Hard, slightly to moderately weathered, moderately fractured, very fine grained, dark gray METAWACKE with very close to close, horizontal to vertical, iron-oxide stained fractures (UCS: 12,842 psi). Coring Times (min/ft): 2 - 1/9.6"	
155		RQD=30		C3	11.3 - 15.1	46/42.5			C3: Hard, slightly to moderately weathered, extremely to moderately fractured, very fine grained, dark gray METAWACKE with very close to close, horizontal to vertical, iron-oxide stained fractures. Coring Times (min/ft): 2 - 2 - 2- 1/9.6"	
	15	RQD=42		C4	15.1 - 17.8	32/28.5			C4: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with very close to close, horizontal to vertical, iron-oxide stained fractures (coarse grained, dark gray Granite intrusions at 12" and bottom 10" of core). Coring Times (min/ft): 2 - 2- 1/8.4"	5
150								17.8	Bottom of Borehole at 17.8 feet.	
	20									
145										
	25									
140										
	30									
135										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

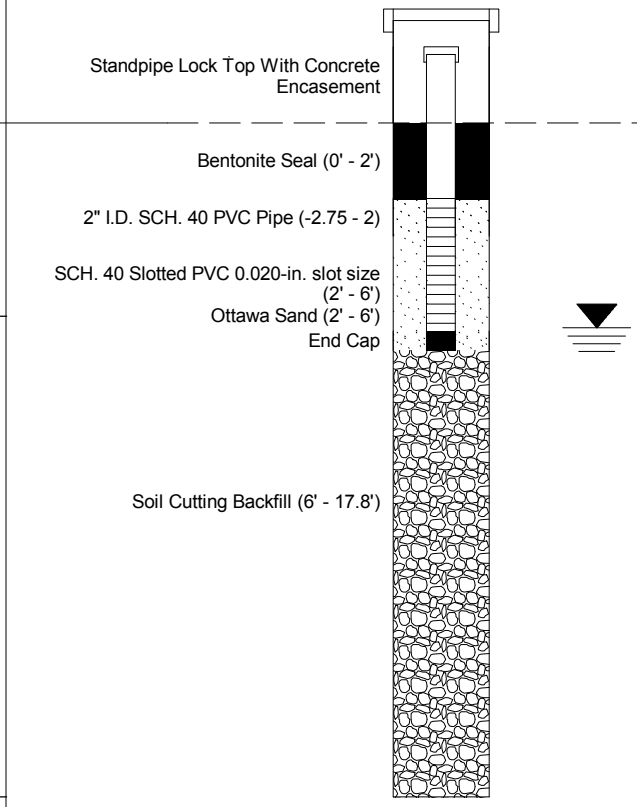
1. Borehole drilled approx. 8 feet east of marked location.
2. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
3. Auger refusal at 5.1 feet. Switched to rotary drilling techniques with 4" casing. Washed out hole and began rock core at 5.1 feet.
4. Complete water loss during core C1.
5. Upon completion of drilling, an observation well was installed with standpipe. Well screen set from 2' to 6' below surface. Refer to Monitoring Well log.

LOG OF MONITORING WELL

JACOBS	PROJECT	York Toll Plaza				BORING NO.	B-3 (OW)		
	LOCATION	Maine Turnpike Mile 8.8					SHEET 1 OF 1		
	OWNER	Maine Turnpike Authority							
	JOB NUMBER	E2X71602							
INSPECTOR G. Shay	CONTRACTOR	New England Boring Contractors		DRILLER	M. Porter		ELEVATION		168.7
METHOD OF DRILLING	GROUNDWATER READINGS			DRILL RIG	B-53 Mobile Drill		DATUM		NAVD88
0.0 Hollow Stem Auger	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Safety		GRID	N	126823.7
5.1 NX Rock Core	03-09-2016 / -	5.4	Monitoring Well Reading				COORD	E	2823948.6
17.8 Terminated							DATE START		1/21/16
							DATE END		1/21/16

DEPTH (FEET)	STRATA SYMBOL	ELEVATION (FEET)	MATERIAL DESCRIPTION
0			SAND
5		163.60	BEDROCK
10			
15			
		150.90	
20			
25			
30			
35			

WELL DIAGRAM



BORING NO. B-3 (OW)

LOG OF TEST BORING

JACOBS™

PROJECT	York Toll Plaza	BORING NO.	B-4
LOCATION	Maine Turnpike Mile 8.8		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Porter	ELEVATION	165.9
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	B-53 Mobile Drill	DATUM	NAVD88
0.0	Hollow Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126819.3
9.6	Terminated	01-22-2016 / 10:30 AM	4.5 Upon Completion (Augers pulled)			COORD E	2823992.7
						DATE START	1/22/16
						DATE END	1/22/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
165	0	1 2 2 15	4	S1	0 - 2	24/7		SAND	S1A (Top 2"): Moist, dark brown, fine to medium SAND, some organic material (roots, root fibers, twigs), trace Gravel (TOPSOIL). S1B (Bottom 5"): Moist, reddish/brown, fine to medium SAND, little Silt (SUBSOIL).	1
	5	10 9 10 17	19	S2	5 - 7	24/14			S2A (Top 5"): Wet, brown, fine to medium SAND, little Silt. S2B (Bottom 9"): Wet, dark brown, fine to coarse GRAVEL, some(+) fine to coarse Sand, trace(+) Silt (possible rock fragments) (USCS: GW-GM, Fines: 9.3%).	
160										
	9.2								Possible Bedrock at 9.2 ft.	
	9.6								Bottom of Borehole at 9.6 feet.	2 3
155	10									
150	15									
145	20									
140	25									
135	30									
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unified Soil Classification System (ASTM D-2487) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Hard drilling at 9.2 feet; top of possible bedrock. Advanced auger to 9.6 feet.
3. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-5
LOCATION	Maine Turnpike Mile 8.8		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Porter	ELEVATION	166.4
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	B-53 Mobile Drill	DATUM	NAVD88
0.0	Hollow Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126887.5
6.3	Terminated	01-22-2016 / 11:30 AM		None Encountered		COORD E	2823968
						DATE START	1/22/16
						DATE END	1/22/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
165	0	2 4 3 2	7	S1	0 - 2	24/4		SAND	S1: Moist, loose, dark brown, fine to medium SAND, trace Gravel, trace Silt, little organic material (roots, leaves) (coarse piece of gravel in spoon tip) (TOPSOIL).	
	5									
160		59 100/1"	100/1"	S2	5.5 - 6.1	7/7		6.1 6.3	S2: Wet, very dense, brown, fine to coarse SAND and fine to coarse Gravel, little(+) Silt (rock fragments in spoon tip). Possible Bedrock at 6.1 ft. Bottom of Borehole at 6.3 feet.	1 2
	10									
155										
	15									
150										
	20									
145										
	25									
140										
	30									
135										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Hard drilling at 6.1 feet. Advanced auger to 6.3 feet.
2. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO.	B-6	
	LOCATION	Maine Turnpike Mile 8.8		SHEET 1 OF 1	
	OWNER	Maine Turnpike Authority			
	JOB NUMBER	E2X71602			

INSPECTOR	G. Shay	CONTRACTOR	New England Boring		DRILLER	M. Porter	ELEVATION		164.1
METHOD OF DRILLING		GROUNDWATER READINGS			DRILL RIG	B-53 Mobile Drill	DATUM		NAVD88
0.0	Hollow Stem Auger	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Safety	GRID	N	126836.8
5.2	NX Rock Core	01-21-2016 / 4:00 PM	8	Upon Completion (In Casing)			COORD	E	2824049.6
20.2	Terminated	01-22-2016 / 7:30 AM	0.8	Casing Removed (14 hours stabilized)			DATE START		1/21/16
							DATE END		1/21/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
160	0	1 3 2 8	5	S1	0 - 2	12/5		SAND	S1A (Top 2.5"): Wet, dark brown, fine to coarse SAND, little Silt, little organic material (roots), trace Gravel (TOPSOIL). S1B (Bottom 2.5"): Wet, light brown, fine to coarse SAND, some Silt, little fine Gravel, trace organic material (roots, root fibers).	1
									4.3	2 3
	5	RQD=0		C1	5.2 - 8.5	40/40			C1: Hard, moderately weathered, extremely fractured, coarse grained, light gray/brown GRANITE with very close, horizontal to vertical, iron-oxide stained fractures. Coring Times (min/ft): 2 - 2 - 2 - 1/3.6"	
155	10	RQD=28		C2	8.5 - 12.4	47/47		BEDROCK	C2: Hard, slightly to moderately weathered, extremely fractured, coarse grained, light gray/brown GRANITE with close to very close, horizontal to moderately dipping, iron-oxide stained fractures. Coring Times (min/ft): 2 - 2 - 2 - 1.5/10.8"	4
150	15	RQD=31		C3	12.4 - 15.2	34/34			C3: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, horizontal to moderately dipping fractures (coarse grained, dark gray, granite intrusion from 25" to 30") (UCS: 33,762 psi). Coring Times (min/ft): 2 - 2 - 1/9.6"	5
		RQD=44		C4	15.2 - 16.7	18/16			C4: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close to very close, horizontal fractures. Coring Times (min/ft): 2- 1/4"	6
145	20	RQD=70		C5	16.7 - 20.2	42/42			C5 (0 to 26"): Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close to very close, horizontal fractures. (26" to 42"): Hard, slightly weathered, moderately to extremely fractured, coarse grained, white/pink GRANITE with horizontal to sub-vertical fractures. Coring Times (min/ft): 2 - 2 - 2 - 1/6"	7
									20.2 Bottom of Borehole at 20.2 feet.	
140	25									
135	30									
130	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unconfined compressive strength (ASTM D-7012) laboratory testing was conducted on selected rock core samples and performed by Thielsch Engineering.
2. Harder drilling at 3.7 feet. Advanced auger to 5.2 feet.
3. 4" casing installed to 4.3 feet. Roller bit to 5.1 feet, then begin rock core at 5.1 feet.
4. Wash color change from light brown to white/brown at 8.5 feet. White/brown to pink/ brown at 12 feet.
5. Core barrel jammed at 8.5 feet, 12.4 feet, 15.2 feet and 16.7 feet.
6. Slight to moderate water loss at 6 and 9 feet.
7. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-7
LOCATION	Maine Turnpike Mile 8.8		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	G. Leavitt	ELEVATION	164.3
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Strata Star 15	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126765.5
5.0	NX Rock Core	01-14-2016 / 2:25 PM	4 Upon Completion (In Casing)			COORD E	2824105.5
15.0	Terminated					DATE START	1/14/16
						DATE END	1/14/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		17 20 21 17	41	S1	0 - 2	24/9		FILL	S1: Dry, dense, brown, fine to coarse SAND and fine to coarse Gravel, little(-) Silt (USCS: SP-SM, Fines: 10.7%).	1
								3.5		
160	5									2
		RQD=14		C1	5 - 8.5	42/17		BEDROCK	C1: Hard, slight to moderately weathered, moderately to extremely fractured, very fine grained, dark gray METAWACKE with very close to close, moderately dipping to sub-horizontal fractures (UCS: 13,681 psi). Coring Times (min/ft): 5 - 3 - 3 - 2/6"	3
155	10	RQD=25		C2	8.5 - 12.5	48/45.5			C2: Hard, slightly to moderately weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, vertical to moderately dipping fractures (coarse grained granite intrusion from 14" to 30"). Coring Times (min/ft): 4 - 8 - 6 - 6	4
150	15	RQD=75		C3	12.5 - 15	30/30			C3: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, vertical to moderately dipping fractures (UCS: 21,374 psi). Coring Times (min/ft): 4 - 4 - 3/6"	5
								15	Bottom of Borehole at 15 feet.	
145	20									
140	25									
135	30									
130	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Harder drilling at 3.5 feet. Black rock fragments in wash. Roller bit to 5 feet and begin core.
3. Water loss from 6 to 8.5 feet, possible weathered/fractured section
4. Wash color change from brown to gray at 10 feet
5. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO.	B-8	
	LOCATION	Maine Turnpike Mile 8.8		SHEET 1 OF 1	
	OWNER	Maine Turnpike Authority			
	JOB NUMBER	E2X71602			

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Porter	ELEVATION		164.5
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	B-53 Mobile Drill	DATUM		NAVD88
0.0	Hollow Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID	N	126794.4
6.2	NX Rock Core	01-20-2016 / 10:15 AM	5.2 Upon Completion (In Casing)			COORD	E	2824113.5
16.4	Terminated					DATE START		1/19/16
						DATE END		1/20/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		9 9 8 10	17	S1	0 - 2	24/14		FILL	S1A (Top 9"): Dry, dark brown, fine to coarse SAND, little fine Gravel, little Silt, trace organic material (roots, root fibers) (TOPSOIL). S1B (Bottom 5"): Moist, light brown, fine to medium SAND, trace Gravel, trace Silt.	1 2
160		27 100/2"	100/2"	S2	5 - 5.7	8/4			S2: Wet, very dense, dark brown, fine to coarse SAND, some(-) Silt, little(+) fine Gravel, (piece of gravel in spoon tip) (USCS: SM, Fines: 22.7%)	3
								6.2		
				C1	6.2 - 10.4	50/46.5		BEDROCK	C1: Hard, moderately weathered, extremely to moderately fractured, very fine grained, dark gray METAWACKE with close to very close, horizontal to moderately dipping, iron-oxide stained fractures (coarse grained granite intrusion from 20" to 24", quartz in bottom 12") (UCS: 27,242 psi). Coring Times (min/ft): 2 - 2 - 2 - 2 - 0.5/2"	4
		RQD=43								
155	10									
				C2	10.4 - 15.4	60/60			C2: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE, with close to very close, sub-vertical to moderately dipping fractures. Coring Times (min/ft): 3 - 3 - 2 - 3 - 3	5
		RQD=70								
150	15									
		RQD=75		C3	15.4 - 16.4	12/12			C3: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE, with horizontal to moderately dipping fractures. Coring Times (min/ft): 2.5	6
								16.4	Bottom of Borehole at 16.4 feet.	
145	20									
140	25									
135	30									
130	35									

NOTES

1. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Harder drilling at 3.3 feet
3. 4" casing driven to 5.7 feet. Hard drilling as roller bit was advanced through probable rock to 6.2 feet. Begin rock core.
4. Gray wash at 6.2 feet
5. Core barrel jammed at 10.4 feet. Slight water loss at 8 feet. No water loss observed during remaining cores.
6. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-9
LOCATION	Maine Turnpike Mile 8.8		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	G. Leavitt	ELEVATION	164.9
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Strata Star 15	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126775.8
12.5	NX Rock Core	01-12-2016 / 9:30 AM	9.5 Before Drilling (In Casing)			COORD E	2824181
23.0	Terminated					DATE START	1/11/16
						DATE END	1/12/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		3 3 5 4	8	S1	0 - 2	24/11			S1A (Top 4"): Moist, dark brown, fine to coarse SAND, some Silt, little fine Gravel, trace organic material (roots, root fibers) (TOPSOIL). S1B (Bottom 7"): Moist, light brown, fine to medium SAND, little Silt, trace Gravel.	1 2
160	5	15 13 16 17	29	S2	4.5 - 6.5	24/10		FILL	S2: Wet, medium dense, brown, fine SAND, little Silt, trace Gravel (coarse piece of gravel in spoon tip).	3
155	10	16 23 13 100/2"	36	S3	9.5 - 11.2	20/9			S3: Wet, dense, brown, fine SAND, little(-) Silt, trace Gravel (1" piece of gravel in top of recovered sample).	4
								12.4		
		RQD=70		C1	12.4 - 16	43/43			C1: Hard, slightly weathered, moderately fractured, fine to medium grained, gray GRANITE with close, vertical to sub-vertical fractures (UCS: 31,465 psi). Coring Times (min/ft): 11 - 10 - 10 - 6/7"	
150	15									
		RQD=46		C2	16 - 20	48/45.6		BEDROCK	C2: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, vertical to sub-vertical fractures (coarse grained, dark gray, granite intrusions from 9" to 11" and 28" to 36"). Coring Times (min/ft): 5 - 5 - 5 - 5	5
145	20									
		RQD=94		C3	20 - 23	36/35.5			C3: Hard, slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, moderately dipping fractures (coarse grained granite intrusions from 12" to 14"). Coring Times (min/ft): 6 - 5 - 6	6
								23	Bottom of Borehole at 23 feet.	
140	25									
135	30									
130	35									

NOTES

1. Unconfined compressive strength (ASTM D-7012) laboratory testing was conducted on selected rock core samples and performed by Thielsch Engineering.
2. Brown wash from 2 ft to 11 ft. Gray wash from 11 ft to bottom of boring.
3. Occasional cobbles from 7 ft to 9 ft. Rig chatter and gravel in wash.
4. Advance casing to 11 feet. Roller bit to 12.4 feet and begin rock core.
5. Ran out of drilling water at 16 feet. Newer core barrel bit was used for remaining 7 feet.
6. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-10
LOCATION	Maine Turnpike Mile 8.8		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	G. Leavitt	ELEVATION	165.9
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Strata Star 15	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126795.8
13.0	NX Rock Core	01-14-2016 / 7:55 AM	9.7 Before Drilling (In Casing)			COORD E	2824206.2
23.0	Terminated					DATE START	1/12/16
						DATE END	1/14/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
165									0 FT to 1.4 FT Asphalt	1
		10 18 20 17	38	S1	1.4 - 3.4	24/11			S1: Wet, dense, brown, fine to coarse SAND and fine Gravel, little(-) Silt (USCS: SP-SM, Fines: 11.7%).	2
		11 19 100/5"	119/11"	S2	3.4 - 4.8	17/9			S2: Wet, very dense, brown, fine to coarse SAND and fine to coarse Gravel, little Silt (coarse piece of gravel in spoon tip) (USCS: SM, Fines: 14.9%).	
160	5							FILL		3
		15 24 40 32	64	S3	9 - 11	24/9			S3: Wet, very dense, reddish brown, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt.	4
155	10							13		5
		RQD=46		C1	13 - 18	60/56.5			C1: Hard, slightly weathered, moderately fractured, coarse grained, white/gray GRANITE with very close to close, vertical to moderately dipping fractures (UCS: 6,848 psi). Coring Times (min/ft): 9 - 10 - 10 - 9 - 10	6
150	15							BEDROCK		
		RQD=72		C2	18 - 23	60/59			C2: Hard, slightly weathered, moderately fractured, coarse grained, white/ dark gray GRANITE with close, vertical to sub-vertical fractures. Coring Times (min/ft): 7 - 6 - 7 - 7 - 8	7
145	20							23	Bottom of Borehole at 23 feet.	8
140	25									
135	30									
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Collected pavement core sample from 0 ft to 1.4 ft.
2. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
3. Rig chatter at 7 feet, probable cobble.
4. Wash color chance from dark brown to red/brown at approx. 8.5 feet. Gravel in wash.
5. Harder drilling at 12 feet. Advance casing to 12.5 feet. Roller bit to 13 feet through probable bedrock and begin core.
6. Wash color change to gray at approx. 14 feet.
7. Water loss from 21 to 23 feet.
8. Hole backfilled with bentonite clay and cold patch at surface.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza			BORING NO.	B-11	
	LOCATION	Maine Turnpike Mile 8.8				SHEET 1 OF 1	
	OWNER	Maine Turnpike Authority					
	JOB NUMBER	E2X71602					
INSPECTOR G. Shay	CONTRACTOR	New England Boring	DRILLER	G. Leavitt	ELEVATION	164.6	
METHOD OF DRILLING	GROUNDWATER READINGS		DRILL RIG	Strata Star 15	DATUM	NAVD88	
0.0 Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID	N	126728.4
13.0 NX Rock Core	11-15-2016 / 12:00 PM	8 Upon Completion (In Casing)			COORD	E	2824240.7
23.0 Terminated					DATE START		1/15/16
					DATE END		1/15/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		23 15 20 36	35	S1	0 - 2	24/12			S1A (Top 4"): Dry, dark brown, fine to coarse SAND, little fine Gravel, trace Silt, trace organic material (roots, root fibers) (TOPSOIL). S1B (Bottom 8"): Dry, brown, fine to coarse SAND, little fine Gravel, trace Silt (coarse piece of gravel in spoon tip).	1
160	5	22 40 55 36	95	S2	4 - 6	24/10		FILL	S2: Wet, very dense, gray/ dark brown, fine to coarse GRAVEL and fine to coarse Sand, little Silt (USCS: GM, Fines: 13.1%)	
155	10	16 15 20 20	35	S3	9 - 11	24/13			S3 (Top 3"): Wet, dark brown/ black, fine to medium SAND and Silt, little organic material (roots, root fibers) S3B (Bottom 10"): Wet, brown, fine to coarse SAND, some(-) fine to coarse Gravel, little Silt.	2
								13		
				C1	13 - 16.5	42/38			C1: Hard, slight to moderately weathered, moderately to extremely fractured, very fine grained, blue/gray, METAWACKE with very close to close, sub-vertical to sub-horizontal, iron-oxide stained fractures. Coring Times (min/ft): 8 - 8 - 7 - 6/6"	3
150	15	RQD=10								
				C2	16.5 - 20	42/42		BEDROCK	C2: Hard, slight to moderately weathered, extremely fractured, very fine grained, blue/gray, METAWACKE with very close, sub-vertical to sub-horizontal fractures (first 12" iron-oxide stained). Coring Times (min/ft): 5/6" - 6 - 7 - 8	
		RQD=11								
145	20			C3	20 - 23	36/36			C3: Hard, fresh, moderately fractured, very fine grained, blue/gray, METAWACKE with close, sub-vertical fractures (UCS: 51,278 psi). Coring Times (min/ft): 8 - 8 - 8	4
		RQD=57								
								23	Bottom of Borehole at 23 feet.	
140	25									
135	30									
130	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Harder drilling at 11.5 feet. Advance casing to 12.5 feet. Roller bit to 13 feet and begin core.
3. Wash color change from brown to gray at approx. 13 feet.
4. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-12
LOCATION	Maine Turnpike Mile 8.8		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Porter	ELEVATION	164.5
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	B-53 Mobile Drill	DATUM	NAVD88
0.0	Hollow Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126757.4
6.9	Wash Boring w/ 4" Casing	01-25-2016 / 10:00 AM	6 Sample S4 Wet			COORD E	2824248.7
18.0	NX Rock Core					DATE START	1/25/16
23.0	Terminated					DATE END	1/26/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
160	5	10 12 19 18	31	S1	0 - 2	24/8		FILL	S1A (Top 4"): Moist, dark brown, fine SAND, little fine Gravel, trace Silt, trace organic material (roots, root fibers) (TOPSOIL).	1
		12 21 29 32	50	S2	2 - 4	24/10			S1B (Bottom 4"): Moist, brown, fine to medium SAND, little fine Gravel, trace Silt.	
		17 29 38 53	67	S3	4 - 6	24/14			S2: Dry, very dense, light brown, fine to coarse SAND, trace Gravel, trace Silt.	
		36 100/5"	100/5"	S4	6 - 6.9	11/7			S3A (Top 12"): Moist, dark brown, fine to coarse SAND, some(-) fine Gravel, little Silt (USCS: SM, Fines: 16.4%)	
155	10								S3B (Bottom 2"): Dry, gray/ brown, fine to coarse GRAVEL, some(-) fine to medium Sand, trace Silt (USCS: GP, Fines: 4.7%)	2 3
									S4: Wet, very dense, brown, fine to coarse SAND, some(+) fine to coarse Gravel, little Silt (fine gravel in spoon tip).	
150	15	100/4"	100/4"	S5	15 - 15.3	4/0			S5: No recovery (coarse gravel fragments in wash).	4 5 6
								18		
145	20	RQD=0		C1	18 - 19.7	20/18		BEDROCK	C1: Hard, moderately weathered, extremely fractured, very fine grained, dark gray METAWACKE with very close to close, sub-vertical fractures. Coring Times (min/ft): 3 - 3/8.4"	
				C2	19.7 - 23	40/40			C2: Hard, slightly weathered, moderately to extremely fractured, very fine grained, dark gray METAWACKE with very close to close, horizontal to moderately dipping fractures (UCS: 14,406 psi).	7
		RQD=77							Coring Times (min/ft): 3 - 3 - 3 - 1/3.6"	
								23	Bottom of Borehole at 23 feet.	
140	25									
135	30									
130	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Unified Soil Classification System (ASTM D-2487), unconfined compressive strength (ASTM D-7012) and grain size distribution (ASTM D-422) laboratory tests were conducted on selected samples and performed by Thielsch Engineering.
2. Advanced augers to 6.9 feet. Rollerbit ahead to approx. 15 feet. Harder drilling from 6.9 feet to 8.5 feet and 13 feet to 13.5 feet, probable cobbles.
3. Augers removed from hole. Switched to rotary drilling techniques and washed out hole to 15 feet.
4. Piece of plastic material found in wash at 13 feet, probable fill material.
5. Fine to coarse sand in wash at 13.5 feet, probable fill.
6. 4" casing driven to 15.3 feet. Rollerbit ahead to 18 feet and begin rock core.
7. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza			BORING NO.	B-13 (OW)	
	LOCATION	Maine Turnpike Mile 8.8				SHEET 1 OF 1	
	OWNER	Maine Turnpike Authority					
	JOB NUMBER	E2X71602					
INSPECTOR G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Porter	ELEVATION	158.1	
METHOD OF DRILLING	GROUNDWATER READINGS		DRILL RIG	B-53 Mobile Drill	DATUM	NAVD88	
0.0 Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID	N	126770.5
10.0 NX Rock Core	01-25-2016 / 2:45 PM	3.1 Upon Completion (In Casing)			COORD	E	2824288.3
20.0 Terminated	01-28-2016 / 2:00 PM	2.64 Monitoring Well Reading			DATE START		1/25/16
					DATE END		1/25/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
155	0	2 11 12 14	23	S1	0 - 2	24/7		FILL	S1: Dry, medium dense, brown, fine to coarse SAND, some organic root material, little Silt, trace Gravel, organic odor (TOPSOIL).	1
	5	15 28 30 30	58	S2	5 - 7	24/7			S2: Wet, very dense, dark brown, fine to coarse SAND, some(+) fine to coarse Gravel, little Silt (pieces of coarse gravel in spoon tip).	2
150										3 4
	10			C1	10 - 15	60/47		BEDROCK	C1: Hard, very slightly weathered, moderately fractured, very fine grained, dark gray METAWACKE with close, horizontal to sub-vertical fractures (UCS: 33,305 psi). Coring Times (min/ft): 2 - 1 - 2 - 2 - 2	5
145		RQD=64								
	15			C2	15 - 20	60/60			C2 (0" to 6"): Hard, slightly weathered, very fine grained, dark gray METAWACKE. (6" to 18"): Hard, slightly weathered, moderately fractured, coarse grained, white GRANITE intrusion.	6 7
140		RQD=58								
	20							20	(18" to 60"): Hard, very slightly weathered, moderately to extremely fractured, very fine grained, dark gray METAWACKE, close to very close, sub-horizontal to vertical fractures. Coring Times (min/ft): 2 - 2 - 2 - 2 - 2 Bottom of Borehole at 20 feet.	
135										
	25									
130										
	30									
125										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

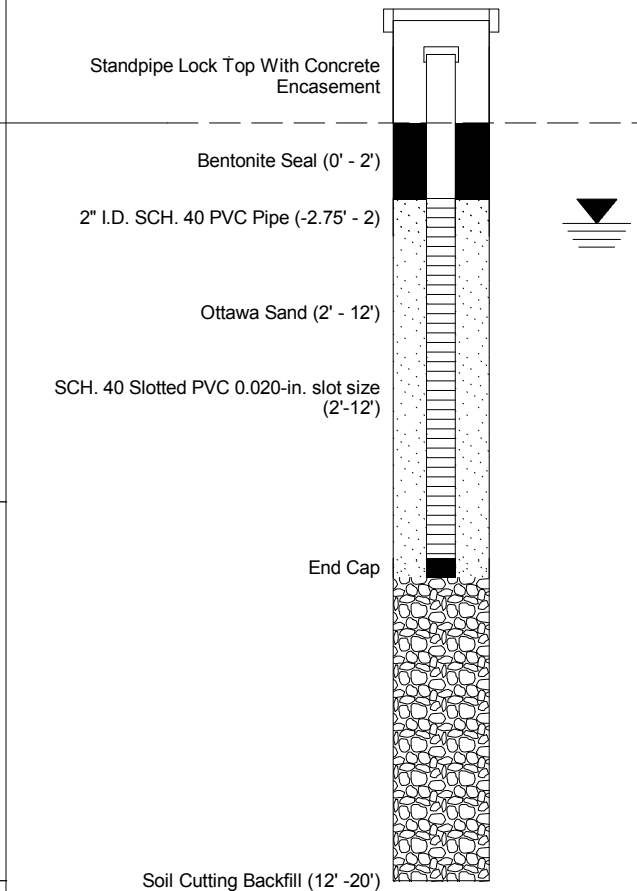
1. Borehole drilled approx. 46 feet west of marked location.
2. Unconfined compressive strength (ASTM D-7012) laboratory testing was conducted on selected rock core samples and performed by Thielsch Engineering.
3. Harder drilling at 8.4 feet, probable cobble.
4. Rig chatter at 9 feet.
5. Wash color change from gray to brown to gray at approx. 11 feet, possible gravel seam. Slight water loss.
6. Slight water loss from 17 to 20 feet.
7. Upon completion of drilling, an observation well was installed with standpipe. Well screen set from 2' to 12' below surface. Refer to Monitoring Well log.

LOG OF MONITORING WELL

JACOBS	PROJECT	York Toll Plaza			BORING NO.	B-13 (OW)	
	LOCATION	Maine Turnpike Mile 8.8				SHEET 1 OF 1	
	OWNER	Maine Turnpike Authority					
	JOB NUMBER	E2X71602					
INSPECTOR G. Shay	CONTRACTOR	New England Boring Contractors		DRILLER	M. Porter	ELEVATION	158.1
METHOD OF DRILLING	GROUNDWATER READINGS			DRILL RIG	B-53 Mobile Drill	DATUM	NAVD88
0.0 Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Safety	GRID N	126770.5
10.0 NX Rock Core	01-25-2016 / 2:45 PM	3.1	Upon Completion (In Casing)			COORD E	2824288.3
20.0 Terminated	01-28-2016 / 2:00 PM	2.64	Monitoring Well Reading			DATE START	1/25/16
						DATE END	1/25/16

DEPTH (FEET)	STRATA SYMBOL	ELEVATION (FEET)	MATERIAL DESCRIPTION
0			FILL
10		148.10	BEDROCK
20		138.10	

WELL DIAGRAM



BORING NO.	B-13 (OW)

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-14
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	164.9
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126830.5
15.0	NX Rock Core	09-30-2016 / 12:15 PM	6 Upon Completion (Casing pulled)			COORD E	2824261.3
25.0	Terminated					DATE START	9/30/16
						DATE END	9/30/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		4 11 11 12	22	S1	0 - 2	24/10			S1A (Top 5"): Dry, dark brown, fine to medium SAND, little organic material, little Silt (Topsoil). S1B (Bottom 5"): Dry, brown, fine to coarse SAND, little fine to coarse Gravel, trace Silt.	
160	5	40 56 80 60	136	S2	4 - 6	24/8		FILL	S2: Wet, very dense, dark brown, fine to coarse GRAVEL and fine to coarse Sand, little Silt.	1
155	10	45 11 16 27	27	S3	9 - 11	24/9		9.5 9.8 SAND 13	S3A (Top 2"): Wet, gray, fine to coarse SAND, some Silt, trace Gravel. S3B (Middle 3"): Wet, dark brown, Fibrous PEAT. S3C (Bottom 4"): Wet, dark brown/gray, fine to coarse SAND, some fine Gravel, little Silt.	2
		100/1"	100/1"	S4	14 - 14.1	1/0		14.1	S4: No recovery.	3
150	15	RQD=74		C1	15 - 20	60/60		BEDROCK	C1: Hard, slightly weathered, moderately fractured, medium grained, blueish gray, GRANITE with closely to widely spaced horizontal to sub-horizontal fractures. Coring Times (min/ft): 2 - 6 - 3 - 3 - 3	4
145	20			C2	20 - 25	60/60			C2: Similar to C1 Coring Times (min/ft): 4 - 5 - 4 - 6 - 6	
140	25	RQD=64						25	Bottom of Borehole at 25 feet.	5
135	30									
130	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Hard drilling and rig chatter from 3 to 9 feet, possible cobbles within fill stratum.
2. Change in drilling action at 13 feet, possible weathered/fractured rock.
3. 1" of fine gravel wash recovered in spoon (probable rock fragments).
4. Hard drilling from 14 to 15 feet, start rock core.
5. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-15
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	162.3
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126877.5
7.0	NX Rock Core	10-05-2016 / 2:45PM	5 Upon Completion (Casing pulled)			COORD E	2824120.4
15.0	Terminated					DATE START	10/5/16
						DATE END	10/5/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
160	0	14 20 28 43	48	S1	0 - 2	24/14		FILL	S1: Dry, dense, light brown/dark brown, fine to coarse SAND, some(-) fine Gravel, trace Silt, trace Organic material (roots, grass, leaves).	
		60 78 65 65	143	S2	2 - 4	24/9			S2: Dry, very dense, light brown, fine to coarse SAND, some(-) fine to coarse Gravel, trace Silt.	
	5	100/3"	100/3"	S3	4 - 4.3	3/3			S3: Wet, very dense, light brown, fine to coarse SAND and fine Gravel, little Silt.	
								5.5		
155		RQD=0		C1	7 - 9	24/10		BEDROCK	C1: Hard, moderately weathered, extremely fractured, fine grained, gray, METAWACKE. Coring Times (min/ft): 3 - 4	
	10	RQD=0		C2	9 - 11	24/10			C2: Similar to C1 Coring Times (min/ft): 2 - 2	
		RQD=0		C3	11 - 12.5	18/0			C3: No recovery. Coring Times (min/ft): 4 - 7/6"	1
150		RQD=0		C4	12.5 - 15	30/30			C4: Hard, slightly weathered, extremely fractured, fine grained, gray METAWACKE with very closely spaced, moderately dipping to sub-vertical fractures. Coring Times (min/ft): 4 - 4 - 4/6"	
	15							15	Bottom of Borehole at 15 feet.	2
145	20									
140										
	25									
135										
	30									
130										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Core barrel jamming throughout coring from 7 to 12.5 feet. Roller bit through bedrock to 12.5 feet, reinsert core barrel for C4.
2. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-16
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	165.1
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126867
10.0	NX Rock Core	09-22-2016 / 3:00 PM	3 Upon Completion (In Casing)			COORD E	2824205
15.0	Terminated					DATE START	9/22/16
						DATE END	9/22/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
165		3 5 9 6	14	S1	0 - 2	24/10		FILL	S1: Dry, medium dense, dark brown, fine to coarse SAND, little fine Gravel, trace Silt, trace organic material (grass, roots, leaves).	
		4 38 100/3"	138/9"	S2	2 - 3.25	15/5			S2: Dry, very dense, dark brown, fine to coarse SAND, little fine Gravel, trace Silt, trace organic material (grass, roots, leaves).	
160	5	40 69 32 29	101	S3	4 - 6	24/5			S3: Wet, very dense, brown, fine to coarse GRAVEL, some (-) fine to coarse Sand, trace Silt (possible cobble fragments).	
		33 26 10 13	36	S4	6 - 8	24/0			S4: No recovery (cobble fragments in spoon tip).	1
								9.5		
155	10	RQD=35		C1	10 - 15	60/60		BEDROCK	C1: Hard, moderately weathered, moderately to extremely fractured, medium grained, gray GRANITE with closely spaced, horizontal to sub-horizontal fractures with iron oxide staining.	2
									Coring Times (min/ft): 6 - 6 - 12 - 12 - 12	
150	15							15	Bottom of Borehole at 15 feet.	3
145	20									
140	25									
135	30									
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Occasional hard drilling and rig chatter between 6 and 10 feet, possible cobbles.
2. Hard drilling at 9.5 feet, probable bedrock.
3. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-17
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	128.0
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) / REMARKS	SPT HAMMER	140 lb Safety	GRID N	129680.6
19.0	Open Hole	09-23-2016 / 1:45PM	6 / Upon Completion (Casing pulled)			COORD E	2824937.8
31.0	Terminated					DATE START	9/23/16
						DATE END	9/23/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
125		5 6 6 7	12	S1	0 - 2	24/18			S1A (Top 9"): Dry. dark brown, fine to coarse SAND, trace Silt, trace organic material (grass, roots) (TOPSOIL). S1B (Bottom 9"): Dry, light brown, fine to medium SAND, some(-) Silt, trace Gravel.	
120	5 ▼	19 47 26 28	73	S2	4 - 6	24/6		FILL	S2: Wet, very dense, brown, fine to coarse SAND and fine Gravel, little Silt.	1
	10	100/5"	100/5"	S3	9 - 9.4	5/2			S3: Wet, very dense, dark brown/gray, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt.	
115								14		
110	15	21 10 6 6	16	S4	14 - 16	24/8		SILTY SAND	S4: Wet, medium dense, gray, fine SAND, some Silt, trace Gravel.	2
								19		
105	20	WOH WOH 3 2	3	S5	19 - 21	24/24		CLAY AND SILT	S5: Wet, soft, gray, CLAY and SILT, trace Gravel. PP = 0.5 tsf	3
100	25	WOH WOH WOH WOH	0	S6	24 - 26	24/24			S6: Wet, very soft, gray, CLAY and SILT, trace Gravel. PP = 0.5 tsf	
95	30	WOH WOH WOH WOH	0	S7	29 - 31	24/14			S7: Wet, very soft, gray, CLAY and SILT, trace Gravel. PP = 0.5 tsf	
								31	Bottom of Borehole at 31 feet.	4
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Occasional rig chatter from 5 to 8 feet, possible cobbles.
2. Wash color change from brown to gray at 14 feet.
3. PP indicates pocket penetrometer and estimates unconfined compressive strength in tons per square foot (tsf).
4. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-18
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	127.2
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) / REMARKS	SPT HAMMER	140 lb Safety	GRID N	129664.7
14.0	Open Hole	10-03-2016 / 7:15AM	6.9 / Before Drilling (In Casing - 60 hours stabilized)			COORD E	2825003
31.0	Terminated					DATE START	9/30/16
						DATE END	10/3/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
125	0	3 8 9 11	17	S1	0 - 2	24/12		FILL	S1: Dry, medium dense, brown, fine to medium SAND, trace organic material (roots, leaves, grass), trace Silt, trace Gravel.	
	5	7 5 3 2	8	S2	4 - 6	24/9			S2: Wet, loose, grayish brown, fine to medium SAND, some Silt, trace Gravel.	1
120								9		
	10	10 6 5 6	11	S3	9 - 11	24/10			S3: Wet, stiff, gray, Clayey SILT, little fine Sand. PP = 3.5 - 4.5 tsf	2 3
115	15	4 6 8 8	14	S4	14 - 16	24/9			S4: Wet, stiff, gray, SILT and CLAY, some(-) fine Gravel, trace Sand.	
110	20	WOH 1 3 3	4	S5	18 - 20	24/24		SILT AND CLAY	S5: Wet, soft, dark gray, CLAY and SILT, trace Gravel. PP = 0.5 - 1.0 tsf	4
105	25	P U S H	0	UD-1	25 - 27	24/24			UD-1: Wet, dark gray, CLAY and SILT.	
100	30	WOH WOH WOH 3	0	S6	29 - 31	24/24			FV1 (29'-30'), Su = 300 psf S6: Wet, very soft, dark gray, CLAY and SILT, trace Gravel.	5 6
95	35							31	PP = 0.5 tsf Bottom of Borehole at 31 feet.	

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Slight rig chatter between 6 and 14 feet, gravel in wash.
2. PP indicates pocket penetrometer and estimates unconfined compressive strength in tons per square foot (tsf).
3. 4" casing installed to 9 feet.
4. A field vane test was attempted at 18 feet. Unable to penetrate stiff clay/silt later.
5. A field vane test (FV) was performed at 29 feet and the undrained shear strength (Su) was collected for the clay/silt layer. A 4-bladed, 1.75" by 5" rectangular filed vane was utilized for all tests.
6. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-19
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	147.5
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126419.2
7.5	NX Rock Core	09-29-2016 / 1:45 PM	3 Upon Completion (Casing pulled)			COORD E	2824247.9
12.5	Terminated					DATE START	9/29/16
						DATE END	9/29/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
145	0	4 10 15 7	25	S1	0 - 2	24/4		SAND	S1: Dry, medium dense, brown, fine SAND, little organic material (roots, leaves, grass), trace Silt.	
	5	37 47 37 47	84	S2	4 - 6	24/8			S2: Wet, very dense, brown, fine to medium SAND, trace Gravel, trace Silt.	1
140									7.5	
	10	RQD=37		C1	8 - 11.5	42/39		BEDROCK	C1A (Top 31"): Hard, slightly weathered, extremely to moderately fractured, fine grained, blue/gray METAWACKE, with very closely spaced to closely spaced, horizontal to moderately dipping fractures (granite intrusions throughout).	2
135		RQD=33		C2	11.5 - 12.5	12/11			C1B (Bottom 8"): Hard, slightly weathered, moderately fractured, medium grained, light gray GRANITE. Coring Times (min/ft): 4 - 3 - 3 - 2/6" C2: Hard, slightly weathered, moderately fractured, medium grained, light gray GRANITE with very closely to closely spaced sub-horizontal fractures. Coring Times (min/ft): 4 Bottom of Borehole at 12.5 feet.	3 4
	15								12.5	
130										
	20									
125										
	25									
120										
	30									
115										
	35									

NOTES

1. Hard drilling and gravel fragments in wash at 3 feet, probably cobble.
2. 4" casing refusal at 7.5 feet.
3. Complete water loss while coring from 11.5 to 12.5 feet.
4. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-20
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	154.6
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	127223.4
3.0	NX Rock Core	06-30-2016 / 8:45 AM	2.4 Upon Completion (Casing pulled)			COORD E	2824450.7
8.0	Terminated					DATE START	9/29/16
						DATE END	9/30/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		15 100/3"	100/3"	S1	0 - 0.7	8/8		SAND 3	S1: Dry, very dense, brown, fine to coarse SAND, little organic material (roots, grass, leaves), trace Silt (spoon bouncing).	
150	5	RQD=23		C1	3 - 8	60/60		BEDROCK 8	C1: Hard, slightly weathered, moderately to extremely fractured, fine grained, blue/gray METAWACKE with closely to very closely spaced, horizontal to moderately dipping fractures with iron oxide stained joints (granite intrusions throughout). Coring Times (min/ft): 4 - 2 - 4 - 9 - 4 Bottom of Borehole at 8 feet.	1 2
145	10									
140	15									
135	20									
130	25									
125	30									
120	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Slight water loss while coring from 7 to 8 feet.
2. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-21
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	167.9
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	126508.7
3.0	NX Rock Core	10-06-2016 / 2:15PM	6.2 Upon Completion (Casing pulled)			COORD E	2823914.7
13.0	Terminated					DATE START	10/6/16
						DATE END	10/6/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
165	0	2 4 8 100/2"	12	S1	0 - 1.67	20/8		SAND 3	S1: Dry, medium dense, light brown, fine to medium SAND, little fine Gravel, little Silt (spoon bouncing).	
		RQD=0		C1	3 - 5	24/24		BEDROCK	C1: Hard, slightly to moderately weathered, extremely fractured, fine grained, brown/ dark gray, METAWACKE with very closely spaced fractures. Coring Times (min/ft): 2 - 5	
	5			C2	5 - 7	24/24			C2: Similar to C1 Coring Times (min/ft): 2 - 4	1
		RQD=0		C3	7 - 12	60/60			C3: Hard, slightly weathered, moderately fractured, fine grained, gray/ blue METAWACKE with closely spaced, moderately dipping fractures. Coring Times (min/ft): 2 - 4 - 3 - 3 - 3	
160										
	10	RQD=83								
		RQD=75		C4	12 - 13	12/12		13	C4: Hard, slightly weathered, moderately fractured, fine grained, gray/ blue METAWACKE with closely spaced, moderately dipping fractures. Coring Time (min/ft): 3 Bottom of Borehole at 13 feet.	2
155										
	15									
150										
	20									
145										
	25									
140										
	30									
135										
	35									

NOTES

1. Core barrel jammed at 5 feet and 7 feet.
2. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO.	B-22			
	LOCATION	Maine Turnpike					
	OWNER	Maine Turnpike Authority					
	JOB NUMBER	E2X71602		SHEET 1 OF 1			
INSPECTOR G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION		161.8
METHOD OF DRILLING	GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM		NAVD88
0.0 Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID	N	127188
12.0 NX Rock Core	10-06-2016 / 10:45 AM	7.3 Upon Completion (Casing pulled)			COORD	E	2824101
16.0 Terminated					DATE START		10/6/16
					DATE END		10/6/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
160	0	4 5 6 7	11	S1	0 - 2	24/10			S1A (Top 5"): Dry, dark brown, fine to medium SAND, little fine Gravel, little organic material (leaves, roots, grass) (TOPSOIL).	
		14 30 19 23	49	S2	2 - 4	24/10			S1B (Bottom 5"): Dry, light brown, fine SAND, trace Gravel, trace Silt. S2: Dry, dense, light brown, fine SAND, little fine Gravel, trace Silt.	
	5	14 25 15 27	40	S3	4 - 6	24/12		SAND	S3: Moist, dense, light brown, fine to medium SAND, trace Gravel, trace Silt.	1
155										
	10	27 42 100/3"	142/9"	S4	9 - 10.3	15/10			S4A (Top 7"): Wet, light brown, fine to medium SAND, trace Gravel, trace Silt.	
								10.3	S4B (Bottom 3"): Wet, light brown, fine GRAVEL, little(-) fine to coarse Sand, little(-) Silt (rock fragments).	2
150				C1	12 - 16	48/48		BEDROCK	C1: Hard, slightly weathered, moderately fractured, fine to medium grained, dark gray GRANITE with closely to very closely spaced, horizontal to moderately dipping fractures.	3 4
	15	RQD=40							Coring Times (min/ft): 3 - 2 - 2 - 2	
								16	Bottom of Borehole at 16 feet.	
145										
	20									
140										
	25									
135										
	30									
130										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Hard 4" casing driving from 4 to 9 feet.
2. Spoon bouncing at 10.3 feet.
3. Core barrel jammed at 16 feet.
4. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	SB-1
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	53.4
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	120742.5
9.0	Wash Boring - Open Hole	09-21-2016 / 9:00AM	4 Upon Completion (Casing pulled)			COORD E	2822335.3
18.0	Terminated					DATE START	9/21/16
						DATE END	9/21/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
50	0	5 3 28 41	31	S1	0 - 2	24/7		FILL 4	S1: Dry, dense, light/dark brown, fine to coarse SAND, little fine Gravel, little organic material (leaves, grass, roots), trace Silt.	
	5	15 11 8 7	19	S2	4 - 6	24/10		SILTY SAND 9	S2: Wet, very stiff, gray/brown, SILT and fine Sand.	
45	10	4 7 8 8	15	S3	9 - 11	24/24		SILT AND CLAY	S3: Wet, very stiff, brown/gray, CLAY and SILT. PP = 2 tsf	1
40	15	4 16 100/4"	116/10"	S4	14 - 15.3	24/10		14.5	S4A (Top 6"): Wet, gray, CLAY and SILT, trace Sand.	
								WR 18	S4B (Bottom 4"): Wet, gray, fine to coarse GRAVEL, some fine to medium Sand, little Silt (weathered rock fragments).	2
35	20							BR 18	Bottom of Borehole at 18 feet.	3
30	25									
25	30									
20	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. PP indicates pocket penetrometer and estimates unconfined compressive strength in tons per square foot (tsf).
2. Hard drilling at 16 feet, probable bedrock. Roller bit to 18 feet.
3. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza			BORING NO.	SB-2	
	LOCATION	Maine Turnpike				SHEET 1 OF 1	
	OWNER	Maine Turnpike Authority					
	JOB NUMBER	E2X71602					
INSPECTOR G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION		51.7
METHOD OF DRILLING	GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM		NAVD88
0.0 Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID	N	120698
9.0 Wash Boring - Open Hole	09-27-2016 / 10:45 AM	5.5 Upon Completion (Casing pulled)			COORD	E	2822406.3
23.5 Terminated					DATE START		9/27/16
					DATE END		9/27/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
50	0	2 5 5 15	10	S1	0 - 2	24/8		FILL	S1: Dry, medium dense, dark brown, fine to medium SAND, little fine Gravel, little organic material (roots, grass, leaves), trace Silt.	
	5	14 6 7 8	13	S2	4 - 6	24/0		6	S2: No recovery.	
45		7 9 8 6	17	S3	6 - 8	24/14		SILTY SAND	S3: Wet, medium dense, brown, fine SAND and Silt, trace Clay.	
	10	3 2 2 3	4	S4	9 - 11	24/14		11	S4: Wet, loose, brown, fine SAND and Silt, trace Clay.	
40		WOH WOH WOH 2	0	S5	11 - 13	24/20		SILTY CLAY	S5: Wet, very soft, gray, Silty CLAY. PP = 0.0 - 0.5 tsf	1
		P U S H	0	UD-1	13 - 15	24/20			UD-1: Wet, gray, Silty CLAY (USCS: CL, LL: 40%, PL: 20%).	
35	15	WOH WOH WOH WOH	0	S6	15 - 17	24/20		19	S6: Wet, very soft, gray, Silty CLAY, trace Sand.	
	20	7 4 3 8	7	S7	19 - 21	24/7		SAND 21.5	S7: Wet, loose, gray, fine SAND and Silt.	
30								BR 23.5	Bottom of Borehole at 23.5 feet.	2
25	25									3
	30									
20	35									

NOTES

1. PP indicates pocket penetrometer and estimates unconfined compressive strength in tons per square foot (tsf).
2. Hard drilling at approximately 21.5 feet. Rock fragments in wash, probable bedrock.
3. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	SB-3
LOCATION	Maine Turnpike		
OWNER	Maine Turnpike Authority		SHEET 1 OF 1
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	122.3
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	123100.1
14.0	NX Rock Core	09-21-2016 / 12:15PM	8 Upon Completion (Casing pulled)			COORD E	2823174.4
22.0	Terminated					DATE START	9/21/16
						DATE END	9/21/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
120	0	2 3 7 5	10	S1	0 - 2	24/14		FILL	S1: Moist, medium dense, brown/black, fine to coarse SAND, little fine Gravel, trace organic material (grass, leaves, roots), trace Silt.	
	5	33 35 19 7	54	S2	4 - 6	24/7			S2: Wet, very desne, black/dark brown, fine to coarse GRAVEL, little fine Sand (possible cobble fragments).	
115										1
	10	15 6 7 22	13	S3	9 - 11	24/7			S3: Wet, medium dense, reddish brown, fine to coarse SAND, some(-) fine Gravel, little Silt.	
110								12.5		2
	15	RQD=0		C1	14 - 19	60/58		BEDROCK	C1: Hard, slightly weathered, extremely fractured, fine to coarse grained, brown/white GRANITE, with iron-oxide stained joints/fractures. Coring Times (min/ft): 3 - 3 - 3 - 3 - 3	
105	20	RQD=0		C2	19 - 22	36/32			C2: Hard, slightly weathered, extremely fractured, fine to coarse grained, gray/brown GRANITE, with iron-oxide stained joints/fractures. Coring Times (min/ft): 3 - 3 - 3	
100								22	Bottom of Borehole at 22 feet.	3
95	25									
90	30									
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Wash color change to reddish brown at 8 feet.
2. Probable bedrock at 12.5 feet, start rock core at 14 feet.
3. Hole backfilled with soil cutting upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO.	SB-4			
	LOCATION	Maine Turnpike		SHEET 1 OF 1			
	OWNER	Maine Turnpike Authority					
	JOB NUMBER	E2X71602					
INSPECTOR: G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION		120.7
METHOD OF DRILLING	GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM		NAVD88
0.0 Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID	N	123078.2
8.0 Terminated	09-27-2016 /	None Encountered			COORD	E	2823252.1
					DATE START		9/27/16
					DATE END		9/27/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
120	0	3 5 7 10	12	S1	0 - 2	24/7		FILL	S1: Dry, medium dense, brown/ dark brown, fine to medium SAND, little fine Gravel, little organic material (roots, leaves), trace Silt.	1 2 3 4
115	5	25 22 33 50	55	S2	4 - 6	24/9			S2: Wet, very dense, brown, fine to coarse SAND, little fine Gravel, little Silt.	
								8	Bottom of Borehole at 8 feet.	
110	10									
105	15									
100	20									
95	25									
90	30									
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Complete water loss at approximately 8 feet.
2. Roller-bit refusal at 8 feet, probable weathered/fractured bedrock.
3. Borehole terminated due to very hard drilling (1500 psi down pressure) and difficulties seating 4" casing. Re-attempted hole roughly 5 and 20 feet north of existing stake, but encountered similiar difficulties with drilling.
4. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	SB-5
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	134.7
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	124251.2
9.0	NX Rock Core	09-28-2016 / 10:45 AM	8 Upon Completion (In Casing)			COORD E	2823577.5
19.0	Terminated					DATE START	9/28/16
						DATE END	9/28/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		2 2 9 10	11	S1	0 - 2	24/11		FILL	S1: Dry, medium dense, dark/brown, fine to medium SAND, little fine Gravel, trace Silt, trace organic material (roots, grass, leaves).	
130	5	100/1"	100/1"	S2	4 - 4.1	1/0		W/R	S2: No recovery (spoon bouncing).	1
125	10	RQD=0		C1	9 - 10	12/12		BEDROCK	C1: Hard, slightly weathered, extremely fractured, fine to medium grained, gray METAWACKE. Coring Times (min/ft) : 2.5	
		RQD=0		C2	10 - 12	24/14			C2: Similar to C1 Coring Times (min/ft): 2.5 - 4.5	2
120	15	RQD=17		C3	12 - 16	48/46			C3: Hard, slightly to moderately severely weathered, extremely to moderately fractured, fine to medium grained, brown/light gray METASANDSTONE with very closely spaced, horizontal to moderately dipping fractures with iron oxide stained joints. Coring Times (min/ft): 2 - 2 - 3 - 3	
115	20	RQD=68		C4	16 - 19	36/36			C4: Hard, slightly weathered, moderately fractured, fine grained, light gray/blue METASANDSTONE with closely spaced horizontal to moderately dipping fractures. Coring Times (min/ft): 2 - 2 - 2	
110	25							19	Bottom of Borehole at 19 feet.	3
105	30									
100	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Hard drilling at 4 feet, broke through, possible fractured/weathered rock.
2. Core barrel jammed at 10 feet, 12 feet, and 16 feet.
3. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO.	SB-6A	
	LOCATION	Maine Turnpike		SHEET 1 OF 1	
	OWNER	Maine Turnpike Authority			
	JOB NUMBER	E2X71602			

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION		149.2
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM		NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID	N	125482.8
23.5	Terminated	09-22-2016 / 9:00 AM	6.7 Upon Completion (In Casing)			COORD	E	2823830.7
						DATE START		9/21/16
						DATE END		9/22/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		3 4 7 9	11	S1	0 - 2	24/12		FILL	S1: Moist, medium dense, dark brown, fine to coarse SAND, little fine Gravel, little Silt, trace organic material (grass, roots, leaves).	
145	5	25 22 19 14	41	S2	4 - 6	24/0			S2: No recovery.	1
								9		
140	10	2 3 6 5	9	S3	9 - 11	24/1		PEAT	S3: Wet, stiff, brown, Fibrous PEAT.	
		PUSH	0	UD-1	11 - 13	24/11			UD-1: Brown, Fibrous PEAT, some fine to coarse Sand.	
								13		
135	15	14 6 7 9	13	S4	13 - 15	24/5		SAND	S4: Wet, medium dense, dark gray, fine to coarse SAND, little(+) Clayey Silt, trace Gravel.	2
		13 9 8 13	17	S5	15 - 17	24/15			S5: Wet, medium dense, gray, fine to coarse SAND, some Silt, little fine Gravel.	
130	20	11 19 12 10	31	S6	18 - 20	24/4			S6: Wet, dense, gray, fine to coarse SAND, little fine Gravel, trace Silt.	
								22		
								BR 23.5	Bottom of Borehole at 23.5 feet.	3
125	25									4
120	30									
115	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Redrove 2" spoon to collect sample. No recovery.
2. Rig chatter at 13 feet, possible cobble.
3. Hard drilling at 22 feet, probable bedrock.
4. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	SB-6B
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	149.2
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	125478
16.0	Terminated	09-22-2016 / 10:45 AM	7 Upon Completion (In Casing)			COORD E	2823829
						DATE START	9/22/16
						DATE END	9/22/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
										1
										2
145	5	15 18 15 19	33	S1	4 - 6	24/8		FILL	S1: Moist, dense, dark brown, fine to coarse SAND, little fine Gravel, trace Silt.	
		16 11 15 18	26	S2	6 - 8	24/7			S2: Moist, medium dense, dark brown, fine to coarse SAND, little fine Gravel, trace Silt.	
140	10	43 15 1 1	16	S3	8 - 10	24/3		9	S3: Wet, medium dense, brown, fine to coarse SAND, some Silt.	
		3 1 1 1	2	S4	10 - 12	24/7		PEAT 12	S4: Wet, soft, brown, Fibrous PEAT, little fine Sand.	
		2 2 4 12	6	S5	12 - 14	24/0		SAND	S5: No recovery (fine to coarse sand visible in wash)	
135	15	63 48 28 18	76	S6	14 - 16	24/6			S6: Wet, very dense, gray, fine to coarse SAND, some(-) Silt, trace Gravel.	3
								16	Bottom of Borehole at 16 feet.	
130	20									
125	25									
120	30									
115	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Drilled approximately 9 feet south of SB-6A to continue further delineation of the organic soil stratum.
2. Fine to coarse sand in wash from 0 to 4 feet.
3. Hole backfilled with soil cuttings and ottawa sand upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO.	SB-7			
	LOCATION	Maine Turnpike		SHEET 1 OF 1			
	OWNER	Maine Turnpike Authority					
	JOB NUMBER	E2X71602					
INSPECTOR: G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION		147.3
METHOD OF DRILLING	GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM		NAVD88
0.0 Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID	N	125470.1
5.5 NX Rock Core	09-29-2016 / 10:00 AM	6.1 Upon Completion (Casing pulled)			COORD	E	2823911.6
18.0 Terminated					DATE START		9/28/16
					DATE END		9/29/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
145	0	4 7 5 9	12	S1	0 - 2	24/8		FILL	S1: Dry, medium dense, dark brown/ brown, fine to medium SAND, little fine Gravel, trace Silt, trace organic material (roots, grass, leaves).	1
	5	15 25 100/3"	125/9"	S2	4 - 5.3	24/6			S2: Wet, very dense, brown, fine to coarse SAND and fine Gravel, trace Silt (rock fragments in tip).	
				C1	5.5 - 8.5	36/29		5.3	C1: Hard, slightly weathered, moderately fractured, fine to coarse grained, light gray, GRANITE with closely spaced, moderately dipping fractures.	2
140		RQD=58							Coring Times (min/ft): 4 - 4 - 2.5	
				C2	8.5 - 10	18/3			C2: Similar to C1, extremely fractured.	3 4
	10	RQD=0		C3	10 - 15	60/52		BEDROCK	Coring Times (min/ft): 1 - 0.5/6"	
135		RQD=53							C3 (Top 16"): Hard, slightly weathered, moderately fractured, medium grained, light brown, GRANITE.	5
									C3 (Bottom 36"): Hard, slightly weathered, moderately fractured, coarse grained, light gray, GRANITE with closely spaced, moderately dipping fractures.	
	15			C4	15 - 18	36/36			Coring Times (min/ft): 3 - 3 - 3 - 3 - 6	
130		RQD=53							C4: Hard, slightly weathered, moderately fractured, coarse grained, light gray, GRANITE with closely spaced, moderately dipping fractures.	
								18	Coring Times (min/ft): 3 - 3 - 3	
									Bottom of Borehole at 18 feet.	6
	20									
125										
	25									
120										
	30									
115										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Rig chatter and slightly harder drilling encountered at approximately 3 feet, probable cobbles.
2. Brownish gray wash at 5.5 feet during rock core.
3. Moderate water loss at 8 feet.
4. Core barrel broke though from 8.5 feet to approximately 9.0 feet, possible fractured rock.
5. 3" casing was inserted at 10 feet due to moderate water loss. Restart coring.
6. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	SB-8
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	145.1
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	128453.6
4.0	NX Rock Core	09-23-2016 / 11:45 AM	6.1 During Drilling (In Casing)			COORD E	2824640.5
14.0	Terminated					DATE START	9/23/16
						DATE END	9/23/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
145		5 10 15 16	25	S1	0 - 2	24/12		FILL	S1: Dry, medium dense, brown, fine to coarse SAND, little Silt, trace Gravel, trace organic material (roots, leaves, grass).	
								4		
140	5	RQD=38		C1	4 - 7.5	42/42		BEDROCK	C1: Hard, slightly weathered, moderately to extremely fractured, medium grained, gray GRANITE, with closely spaced horizontal to sub-vertical fractures with iron oxide staining. Coring Times (min/ft): 8 - 9 - 9 - 10/6"	
				C2	7.5 - 11.2	44/44			C2: Hard, slightly weathered, moderately to extremely fractured, medium grained, light gray, GRANITE with closely spaced horizontal to moderately dipping fractures.	
135	10	RQD=59							Coring Times (min/ft): 12 - 12 - 12 - 12/10"	
				C3	11.2 - 14	34/34			C3: Similar to C2	
		RQD=100							Coring Times (min/ft): 8 - 8 - 8/8"	
								14	Bottom of Borehole at 14 feet.	
130	15									1
125	20									
120	25									
115	30									
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	SB-9
LOCATION	Maine Turnpike		
OWNER	Maine Turnpike Authority		SHEET 1 OF 1
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	141.9
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	128473.2
14.0	NX Rock Core	10-04-2016 / 3:05 PM	2.5 Upon Completion (In Casing)			COORD E	2824553.9
21.0	Terminated					DATE START	10/4/16
						DATE END	10/4/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
140	0	10 15 8 9	23	S1	0 - 2	24/8		FILL	S1: Dry, medium dense, gray/brown, fine to coarse SAND, little fine Gravel, trace Silt, trace organic material (roots, grass, leaves).	1
								4		
135	5	4 4 7 11	11	S2	4 - 6	24/14		SANDY GRAVEL	S2: Wet, medium dense, orange brown, fine GRAVEL, some fine to coarse Sand, little Clayey Silt.	2 3
		7 100/3"	100/3"	S3	9 - 9.8	9/2		9.8	S3: Wet, very dense, orange/brown, fine to coarse SAND, little fine Gravel, little Clayey Silt.	4
130	10							W/R		
								14		
125	15	RQD=7		C1	14 - 19	60/47		BEDROCK	C1 (Top 22"): Hard, slightly weathered, extremely fractured, white METAWACKE with closely spaced to very closely spaced, sub-horizontal fractures with iron oxide stained joints. C1 (Bottom 25"): Hard to moderately hard, moderately to severely weathered, extremely fractured, fine grained, light gray METAWACKE. Coring Times (min/ft): 4 - 4 - 3 - 5 - 6	
	20	RQD=0		C2	19 - 21	24/24			C2: Hard, moderately weathered, extremely fractured, white METAWACKE with closely spaced to very closely spaced, sub-horizontal fractures with iron oxide stained joints.	
120								21	Coring Times (min/ft): 2 - 4 Bottom of Borehole at 21 feet.	5
	25									
115										
	30									
110										
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Slight rig chatter from 0 to 4 feet, possible cobbles.
2. Wash color change from grayish brown to orange brown at approximately 4 feet.
3. Slight rig chatter from 4 to 9 feet.
4. Hard drilling after 9.8 feet. Roller bit through probable weathered rock to 14 feet. Start rock core.
5. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	SB-10
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	125.5
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) / REMARKS	SPT HAMMER	140 lb Safety	GRID N	129667.1
14.0	Open Hole	10-05-2016 / 10:45 AM	3.8 / Upon Completion (Casing pulled)			COORD E	2824847.5
32.0	Terminated					DATE START	10/5/16
						DATE END	10/5/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
125		5 14 15 25	29	S1	0 - 2	24/7		FILL	S1: Dry, medium dense, dark brown, fine to coarse SAND, little fine Gravel, trace Silt, trace organic material (roots, grass) (TOPSOIL).	
	5	16 4 3 3	7	S2	4 - 6	24/0			S2: No recovery.	1
120								6		
		5 2 5 4	7	S3	6 - 8	24/8		CLAYEY SILT	S3: Wet, medium stiff, brown, Clayey SILT, little fine Sand, little wood fibers.	
	10	8 4 2 2	6	S4	9 - 11	24/8			S4: Wet, medium stiff, brown, Clayey SILT and fine Sand.	
115								14		
		3 3 4 4	7	S5	14 - 16	24/20		SILT AND CLAY	S5: Wet, medium stiff, gray, SILT and CLAY, trace Sand. PP = 0.75 - 1.50 tsf	2
110	15									
	20	2 2 2 2	4	S6	19 - 21	24/20			S6: Wet, soft, dark gray, CLAY and SILT. PP = 0.0 - 0.5 tsf	
105										
	25	WOH 1 1 2	2	S7	24 - 26	24/14			S7: Wet, very soft, dark gray, Organic CLAY and SILT. PP = 0.0 - 0.5 tsf	3
100										
	30	P U S H	0	UD-1	29 - 31	24/24			UD-1: Dark gray, Organic SILT, trace Sand (USCS: OL, LL: 35%, PL: 19%). FV1 (31.0'-32.0'), Su=280 psf	
95								32	Bottom of Borehole at 32 feet.	4 5
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Redrove 2" spoon and collected 5" of brown, fine to medium sand and silt, some wood.
2. PP indicates pocket penetrometer and estimates unconfined compressive strength in tons per square foot (tsf).
3. A field vane test (FV) was attempted at approximately 26 feet. Unable to penetrate into to stiff clay/silt layer.
4. A field vane test was performed at 31 feet and the undrained shear strength (Su) was collected for the clay/silt layer. A 4-bladed, 1.75" by 5" rectangular filed vane was utilized for all tests.
5. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO.	SB-11	
	LOCATION	Maine Turnpike		SHEET 1 OF 1	
	OWNER	Maine Turnpike Authority			
	JOB NUMBER	E2X71602			

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION		145.3
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM		NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID	N	130449.5
7.0	NX Rock Core	09-26-2016 / 9:30 AM	11 Upon Completion (Casing pulled)			COORD	E	2825032.2
17.0	Terminated					DATE START		9/26/16
						DATE END		9/26/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
145		5 11 10 10	21	S1	0 - 2	24/10		FILL	S1: Dry, medium dense, brown/dark brown, fine to medium SAND, little fine Gravel, little Silt.	
								4.2		
		100/2"	100/2"	S2	4 - 4.2	2/0		W/R	S2: No Recovery (2" of fine to medium sand recovered wash)	1
140	5							7		
				C1	7 - 12	60/60		BEDROCK	C1: Hard, slightly weathered, moderately to extremely fractured, medium to coarse grained, light gray GRANITE with closely to very closely spaced, horizontal to moderately dipping fractures with iron oxide staining. Coring Times (min/ft): 4 - 4 - 4 - 4 4	
135	10	RQD=56								
				C2	12 - 17	60/60			C2: Hard, slightly weathered, extremely fractured, medium to coarse grained, light gray/brown GRANITE with closely to very closely spaced, horizontal to vertical fractures with iron oxide staining. Coring Times (min/ft): 4 - 4 - 4 - 4 - 4	
130	15	RQD=0								
								17	Bottom of Borehole at 17 feet.	2
125	20									
120	25									
115	30									
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Hard drilling from 4 to 7 feet, possible weathered rock.
2. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	SB-12
LOCATION	Maine Turnpike		
OWNER	Maine Turnpike Authority		SHEET 1 OF 1
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	144.1
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	130452.3
6.0	NX Rock Core	10-04-2016 / 11:45 AM	2 Upon Completion (Casing pulled)			COORD E	2824963.6
16.0	Terminated					DATE START	10/4/16
						DATE END	10/4/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
140	0	6 13 11 13	24	S1	0 - 2	24/12		FILL	S1: Dry, medium dense, brown, fine to coarse SAND, trace Gravel, trace Silt (top 2" contains little organic material (roots, leaves, grass)).	
	5	40 54 56 100/2"	110	S2	4 - 5.7	24/14			S2: Wet, very dense, brown, fine to coarse SAND and fine Gravel, trace Silt, trace wood fibers.	
								5.7		
				C1	6 - 11	60/56		BEDROCK	C1: Hard, slightly weathered, extremely fractured, coarse grained, light gray/brown GRANITE with closely to very closely spaced horizontal to moderately dipping fractures with iron oxide stained joints.	1
135		RQD=33							Coring Times (min/ft): 2.5 - 2.5 - 2.5 - 2.5 - 2.5	
	10									
				C2	11 - 16	60/60			C2: Hard, slightly weathered, moderately fractured, coarse grained, light gray GRANITE with closely spaced, horizontal to sub-horizontal fractures with iron oxide stained joints.	
130		RQD=73							Coring Times (min/ft): 3 - 3 - 4 - 4 - 4	
	15									
								16	Bottom of Borehole at 16 feet.	
										2
125	20									
120	25									
115	30									
110	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Casing refusal at 5.7 feet.
2. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	SB-13
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	149.4
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	13367.6
7.5	NX Rock Core	09-26-2016 / 1:00 PM	12.5 Upon Completion (Casing pulled)			COORD E	2825349.4
17.5	Terminated					DATE START	9/26/16
						DATE END	9/26/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
									Asphalt Pavement 0" - 13"	
		18 17 25 27	42	S1	1.1 - 3.1	24/9		FILL	S1: Wet, dense, dark brown, fine to coarse SAND, some fine Gravel, little Silt.	
145	5	40 100/2"	100/2"	S2	4 - 4.7	8/6		4.7 W/R	S2: Wet, very dense, dark brown, fine to coarse SAND, some fine Gravel, little Silt (spoon bouncing).	1
								7.5		
				C1	7.5 - 12.5	60/57		BEDROCK	C1: Hard, slightly weathered, moderately to extremely fractured, fine to medium grained, light brown GRANITE with closely to very closely spaced horizontal to moderately dipping fractures.	2
140	10	RQD=54							Coring Times (min/ft): 5 - 5 - 4 - 4 - 4	
				C2	12.5 - 17.5	60/55			C2 (Top 25"): Similar to C1	
135	15	RQD=23							C2 (Bottom 30"): Hard, moderately weathered, extremely fractured, brown GRANITE.	
									Coring Times (min/ft): 4 - 4 - 5 - 5 - 5	
								17.5	Bottom of Borehole at 17.5 feet.	3
130	20									
125	25									
120	30									
115	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Hard drilling from 4.7 to 7.5 feet, probable weathered rock.
2. Complete water loss throughout core.
3. Borehole backfilled with Ottawa sand and concrete mix. Asphalt patch at surface.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	SB-14
LOCATION	Maine Turnpike		
OWNER	Maine Turnpike Authority		SHEET 1 OF 1
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	148.3
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	133677.9
10.0	NX Rock Core	10-04-2016 / 2:00PM		Not Encountered		COORD E	2825268
15.0	Terminated					DATE START	10/4/16
						DATE END	10/4/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
145	0	4 8 13 11	21	S1	0 - 2	24/12		FILL	S1: Dry, medium dense, brown/ dark brown, fine to coarse SAND, trace Gravel, trace Silt (top 2" contains little organic material (roots, leaves, grass)).	
	5	37 57 27 40	84	S2	4 - 6	24/0			S2: No recovery.	1
140								8.5		2
	10			C1	10 - 15	60/50		BEDROCK	C1: Hard, slightly weathered, moderately fractured, fine to coarse grained, white/gray/brown GRANITE with closely spaced, sub-horizontal to moderately dipping fractures with iron oxide stained joints.	3
135		RQD=58							Coring Times (min/ft): 4 - 3 - 3 - 3 - 3	
	15							15	Bottom of Borehole at 15 feet.	4
130	20									
125	25									
120	30									
115	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Redrove 2" spoon. Recovered 1" of fine gravel wash in spoon.
2. Hard drilling after 8.5 feet, probable fractured bedrock. 4" casing hit refusal at 8.5 feet. Roller bit to 10 feet.
3. Complete water loss while coring from 12 to 15 feet.
4. Hole backfilled with soil cuttings upon completion.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	SB-15
LOCATION	Maine Turnpike		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71602		

INSPECTOR	G. Shay	CONTRACTOR	New England Boring	DRILLER	M. Soucy	ELEVATION	136.0
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	D-50 ATV	DATUM	NAVD88
0.0	Wash Boring w/ 4" Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	134488
29.0	Terminated	10-03-2016 / 2:15PM	7 Upon Completion (Casing pulled)			COORD E	2825350.6
						DATE START	10/3/16
						DATE END	10/3/16

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
135		3 9 13 13	22	S1	0 - 2	24/12		FILL	S1: Dry, medium dense, brown, fine to coarse SAND, little fine Gravel, trace Silt (top 4" contains little organic material (roots, leaves, grass)).	1
130	5	47 95 38 38	133	S2	4 - 6	24/12			S2: Wet, very dense, brown, fine GRAVEL and fine to coarse Sand, little Silt.	
125	10	18 9 8 8	17	S3	9 - 11	24/2			S3: Wet, medium dense, brown, fine GRAVEL, some fine to coarse Sand.	
								12.5		
120	15	2 4 14 10	18	S4	14 - 16	24/12		SILT 16	S4: Wet, very stiff, gray, Clayey SILT, little fine Gravel, trace Sand.	2
115	20	13 11 12 11	23	S5	19 - 21	24/0		SAND 24	S5: No recovery.	3 4
110	25	100/1"	100/1"	S6	24 - 24.1	1/1		W/R 26	S6: Wet, very dense, white, fine to coarse SAND, some Silt, little fine Gravel (weathered rock).	5
105	30							BR 29	Bottom of Borehole at 29 feet.	6
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Hard driving of 4" casing from 4 to 9 feet.
2. Wash color change to gray at approximately 12.5 feet, probable strata change.
3. Slight rig chatter and slightly harder drilling between 16 and 19 feet.
4. Recovered 1" of brown sand and gravel wash in spoon.
5. Slightly harder drilling at 24 feet, probable weathered/fractured rock. Roller bit to 29 feet, probable bedrock. Rollerbit advancing approximately 2 min/ft with 1200 psi down pressure.
6. Hole backfilled with soil cuttings upon completion.

Test Pits

TP-4 through TP-31

SWM-1 through SWM-12

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LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

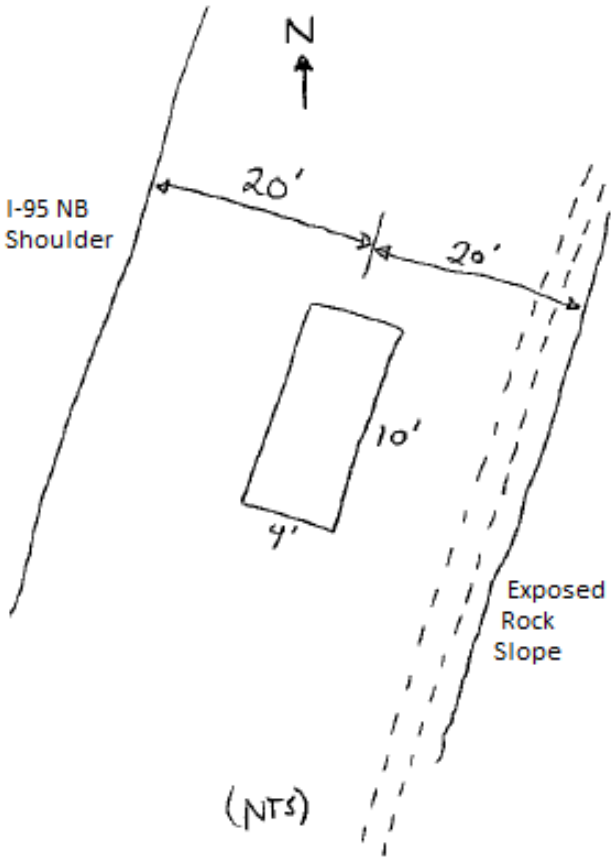
TEST PIT NO. TP-4

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		145.0
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-14-2016 / 1215	2.5	Observed	DATE START	1/14/2016	GRID	N	125783.4
					DATE END	1/14/2016	COORD	E	2824000.7

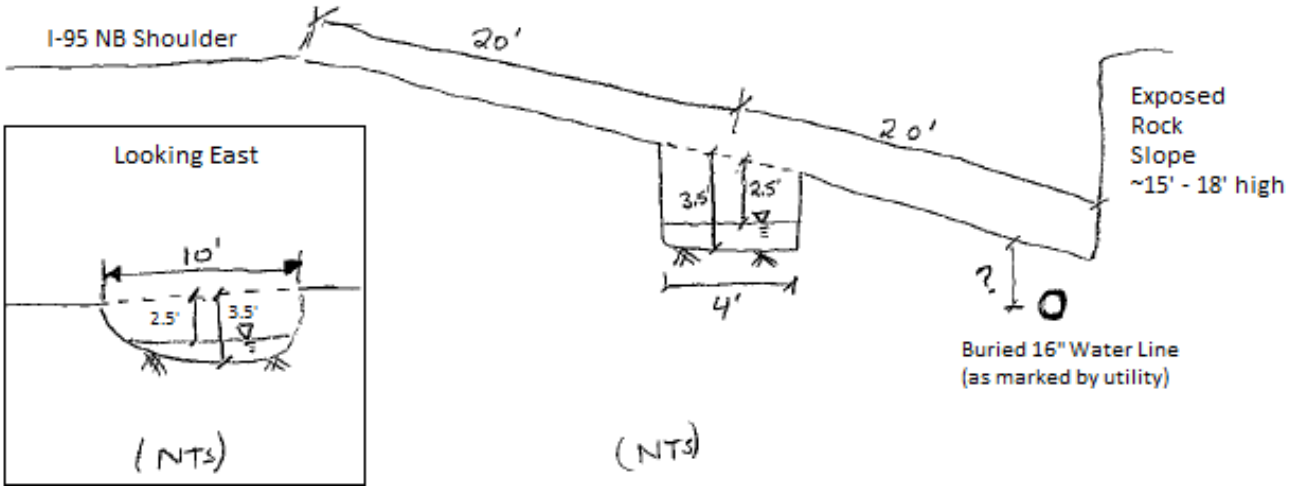
DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		144.50	Top 6" Topsoil
		141.50	Brown, medium to coarse SAND, some Gravel, trace Silt, with occasional cobbles and boulders (blast rock). (FILL)
5			Bedrock at 3.5'
10			
15			
20			

PLAN VIEW



SKETCHES

Looking North



Looking East

REMARKS:

1. Bedrock encountered at 3.5' deep. Mostly blasted rock (FILL) on top of bedrock.
2. Water encountered at 2.5' deep.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-4

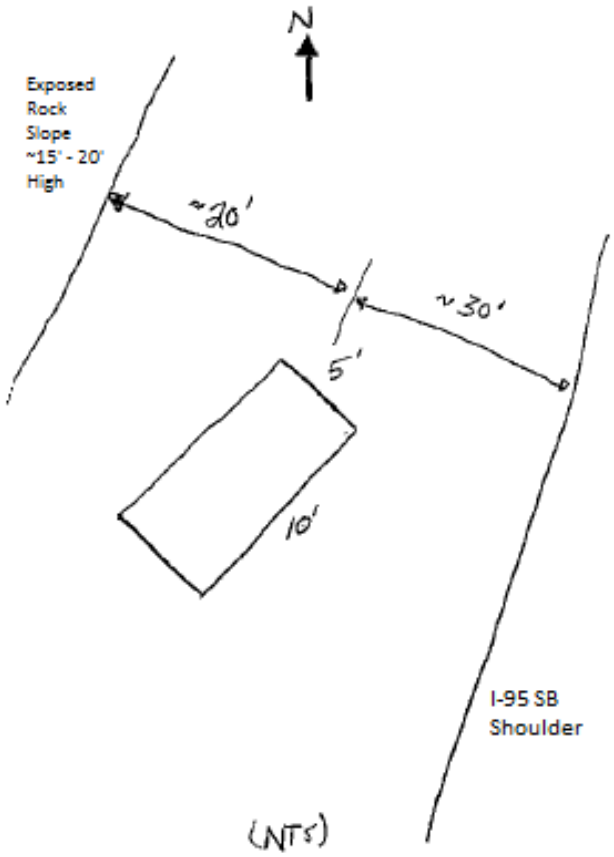
LOG OF TEST PIT

JACOBS	PROJECT	York Toll Plaza	TEST PIT NO. TP-5
	LOCATION	Maine Turnpike Mile 8.8	
	OWNER	Maine Turnpike Authority	SHEET 1 OF 1
	JOB NUMBER	E2X71602	

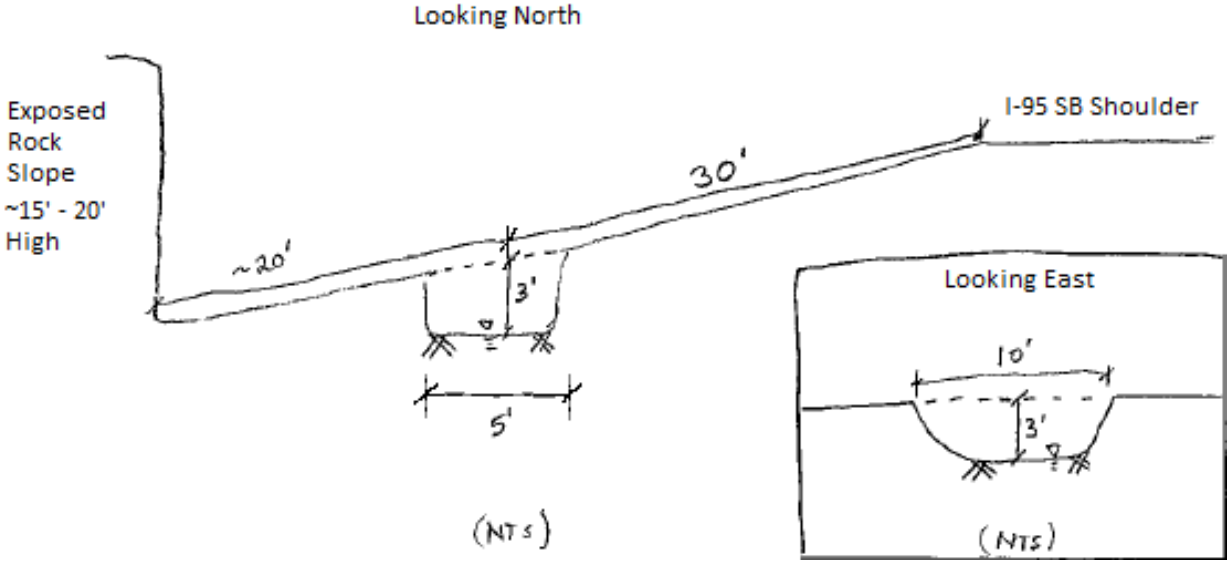
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		148.0
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-14-2016 / 1030	3	Observed	DATE START	1/14/2016	GRID	N	126052.5
					DATE END	1/14/2016	COORD	E	2823892.3

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		147.50	Top 6" Topsoil
			Brown, medium to coarse SAND, some Gravel, trace Silt, with little cobbles, occasional boulders and blast rock. (FILL)
		145.00	Bedrock at 3'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 3' deep.
2. Water encountered at 3' deep.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-5

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

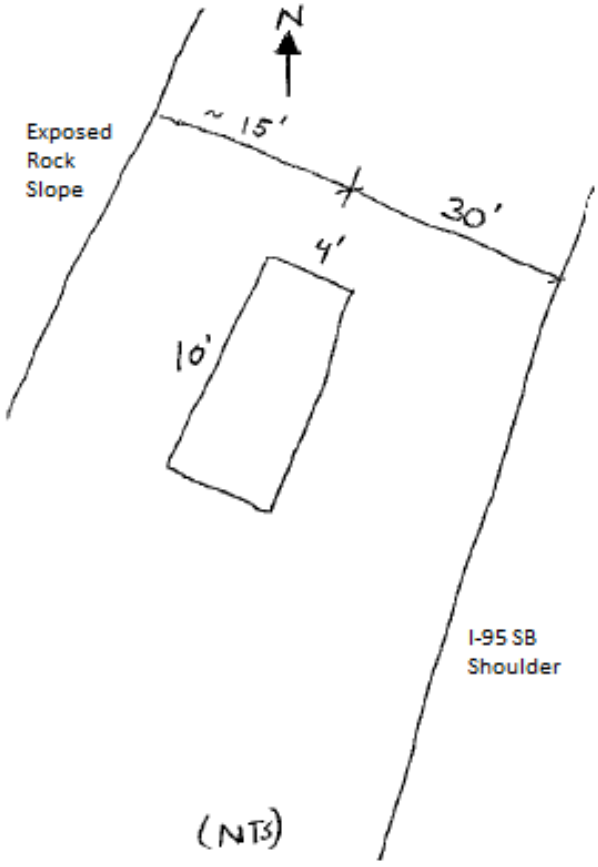
TEST PIT NO. TP-6

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		154.6
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-14-2016 / 1045	2.5	Observed	DATE START	1/14/2016	GRID	N	126329.8
					DATE END	1/14/2016	COORD	E	2823963.8

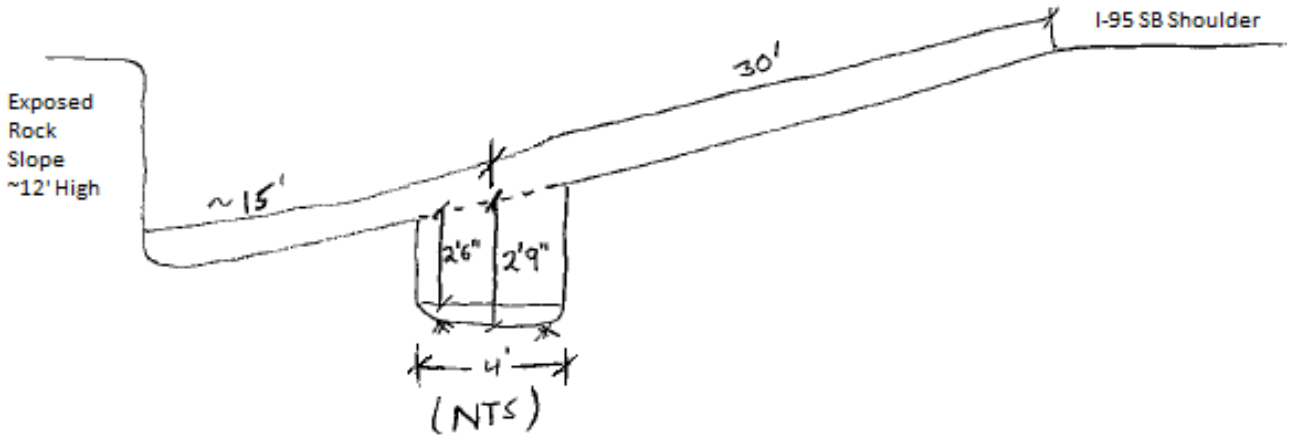
DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		154.10	Top 6" Topsoil
		~~151.85~~	Brown, medium to coarse SAND, some Gravel, trace Silt, with some cobbles and occasional boulders (blast rock). (FILL)
			Bedrock at 2.75'
5			
10			
15			
20			

PLAN VIEW



SKETCHES

Looking North



REMARKS:

1. Bedrock encountered at 2' 9" deep.
2. Water encountered at 2' 6" deep.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-6

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

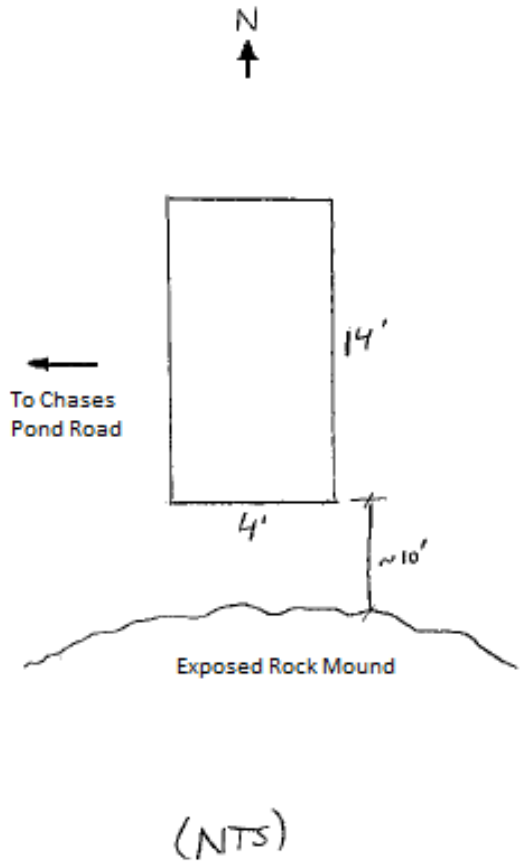
TEST PIT NO. TP-7

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		182.2
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-15-2016 / 1200	3	Estimate (Seepage)	DATE START	1/15/2016	GRID	N	126923.4
					DATE END	1/15/2016	COORD	E	2822927.8

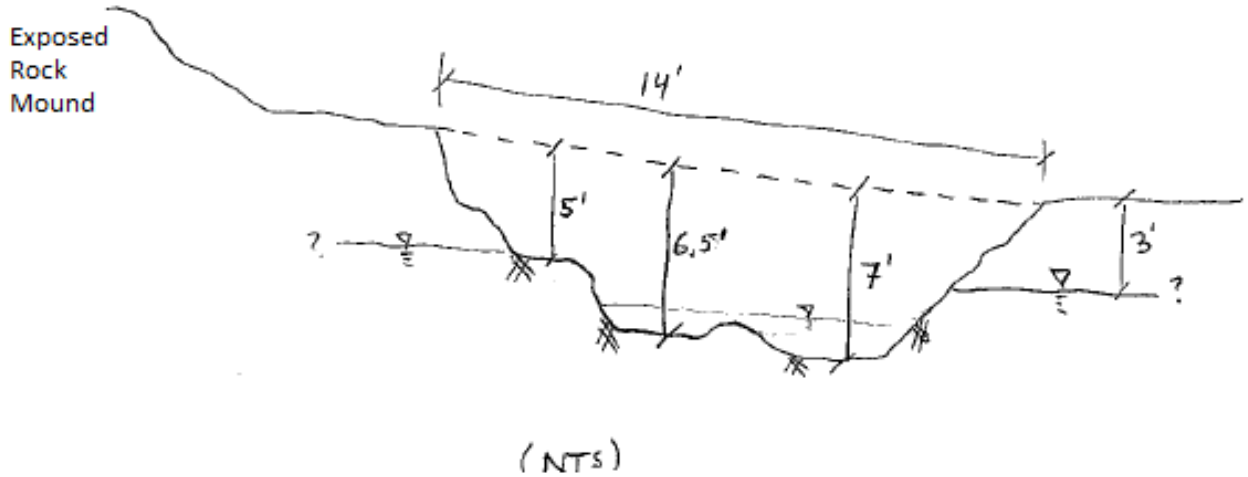
DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		181.70	Top 6" Topsoil
			Top 12" Roots
			Brown, medium to coarse SAND, some Gravel, trace Silt, with little cobbles and occasional boulders.
5		176.20	
		175.20	Brown, fine to coarse SAND, some Gravel, some Silt, with little cobbles.
			Bedrock at 7'
10			
15			
20			

PLAN VIEW



SKETCHES

Looking West



REMARKS:

1. Bedrock encountered at different shelf depths ranging from 5' - 7' deep.
2. Seeping water observed 3' below grade during excavation. Approximately 1" of water visible at bottom of excavation before backfilling.
3. Test pit performed along proposed Access Road.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-7

LOG OF TEST PIT

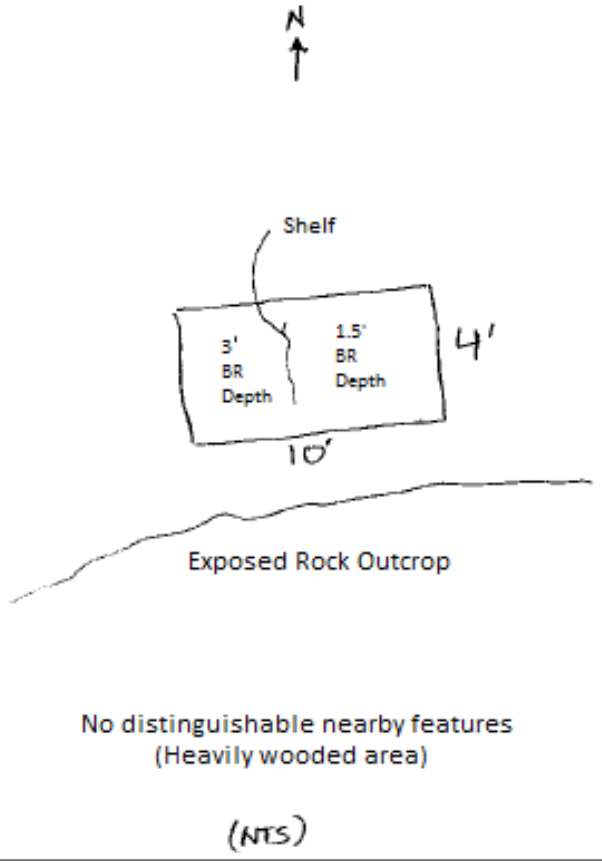
JACOBS

PROJECT	York Toll Plaza	TEST PIT NO.	TP-8
LOCATION	Maine Turnpike Mile 8.8		
OWNER	Maine Turnpike Authority		SHEET 1 OF 1
JOB NUMBER	E2X71602		

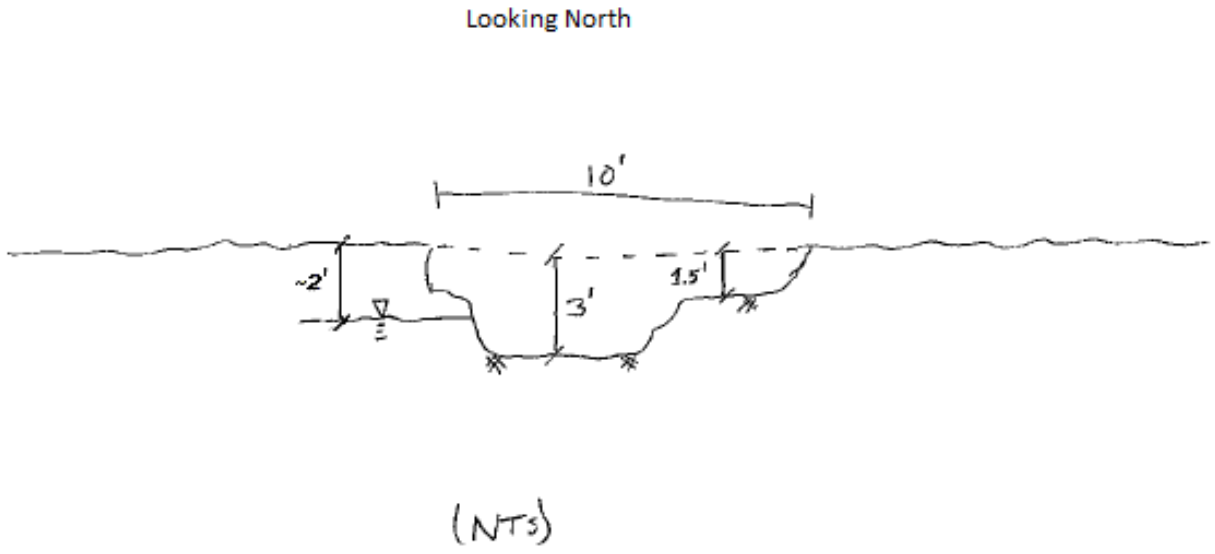
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION	179.6
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM	NAVD88
BUCKET	1/3 cu. yd	01-15-2016 / 1115	2	Estimate (Seepage)	DATE START	1/15/2016	GRID N	126797.1
					DATE END	1/15/2016	COORD E	2823281.4

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		178.60	Top 12" Topsoil
		176.60	Brown, fine to coarse SAND, some Gravel, trace Silt, with some cobbles and one 2.5' diameter boulder.
5			Bedrock at 3'
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 3' deep on western side of the test pit with a shelf to 1.5' deep on the eastern side.
2. Seeping water observed 2' below grade during excavation. However, no standing water visible before backfilling.
3. Test pit performed along proposed Access Road.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-8

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

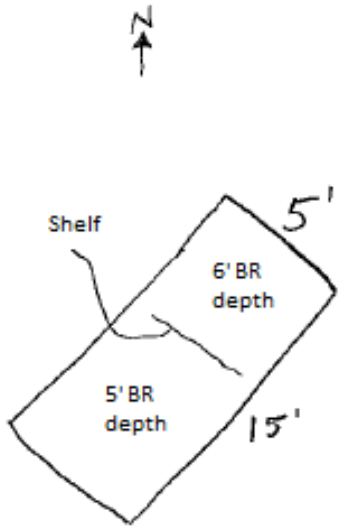
TEST PIT NO. TP-9

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		179.3
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-15-2016 / 1030		None Encountered	DATE START	1/15/2016	GRID	N	126558.8
					DATE END	1/15/2016	COORD	E	2823596.8

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
0		178.60	Top 8" Topsoil and roots
			Reddish brown, medium to coarse SAND, little Gravel, trace Silt, with little cobbles.
5			Brown, medium to coarse SAND and GRAVEL, trace Silt, with few cobbles and occasional boulders.
		173.30	Bedrock at 6'
10			
15			
20			

PLAN VIEW

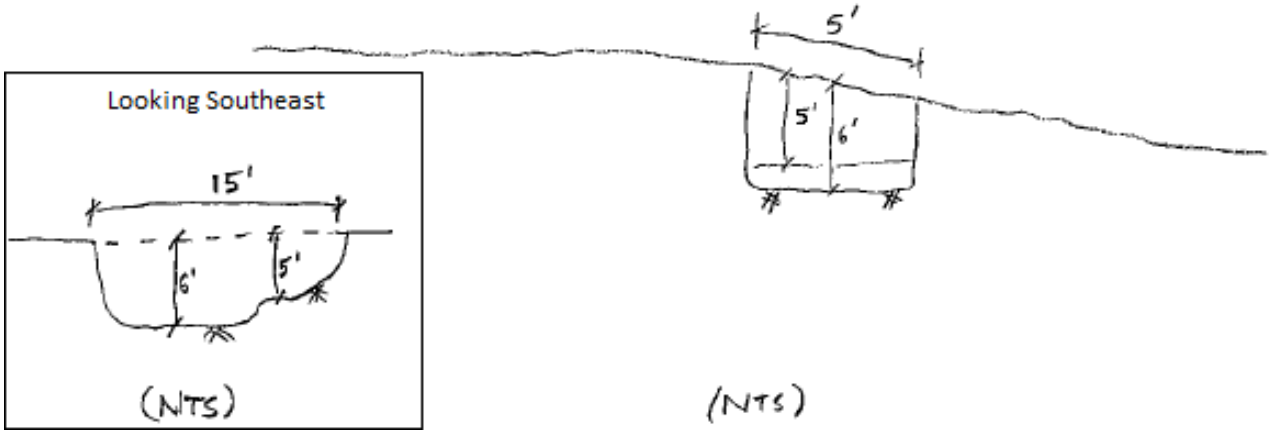


No distinguishable nearby features
(Heavily wooded area)

(NTS)

SKETCHES

Looking Northeast



(NTS)

REMARKS:

1. Bedrock encountered at 5' deep and dropping off a shelf to 6' deep on the north portion of the test pit.
2. No water was observed. However, soil was observed to be slightly moist 5' below grade.
3. Test pit performed along proposed Access Road.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-9

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

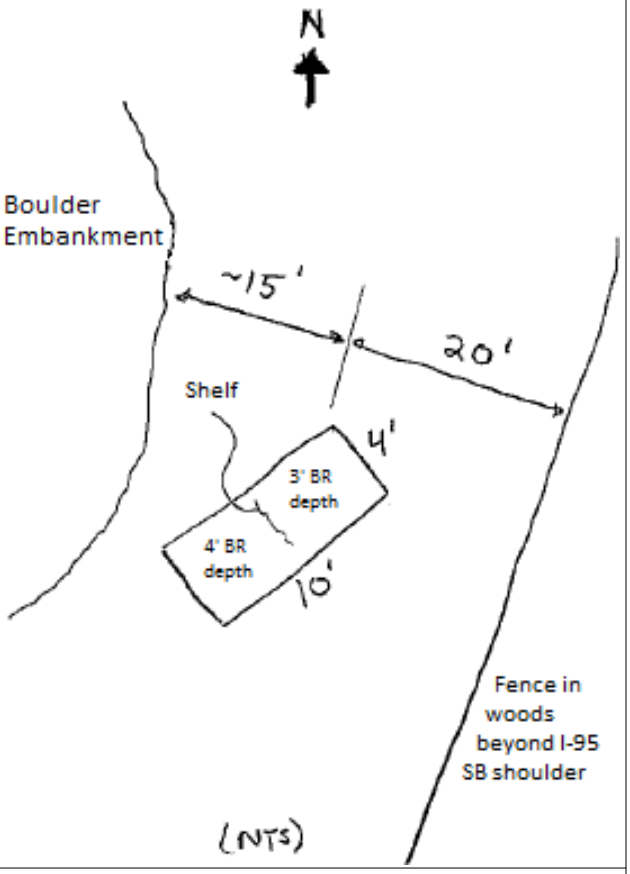
TEST PIT NO. TP-10

SHEET 1 OF 1

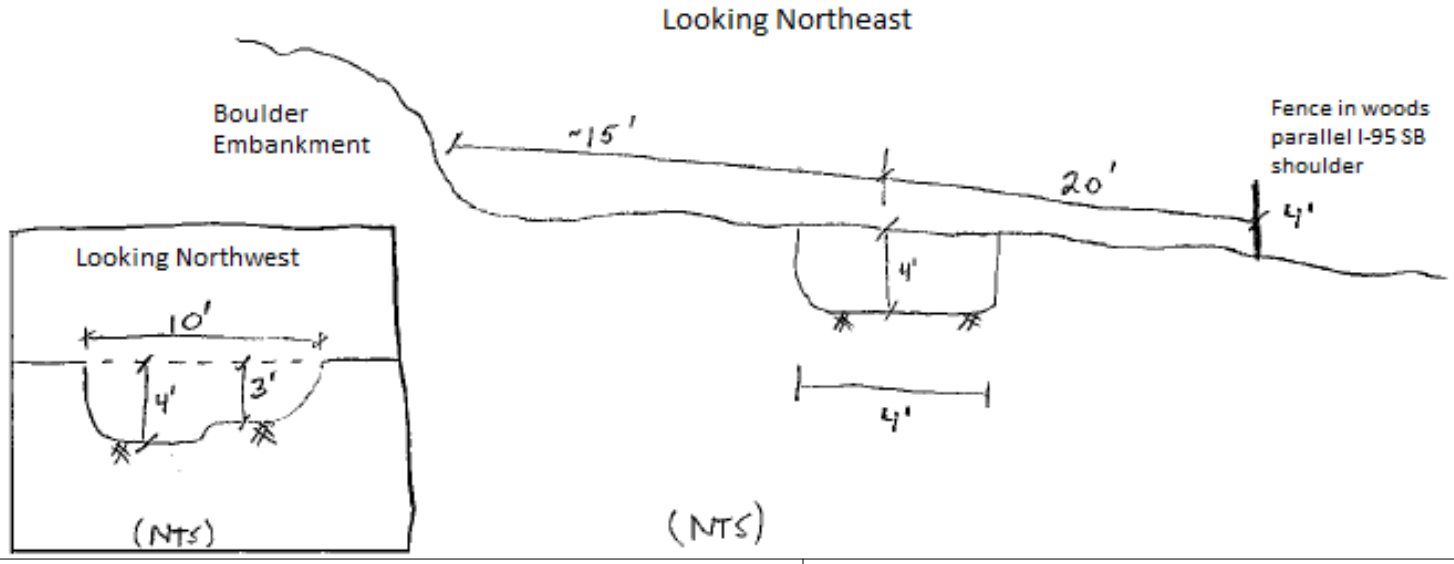
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		165.6
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-15-2016 / 0850		None Encountered	DATE START	1/15/2016	GRID	N	127120.6
					DATE END	1/15/2016	COORD	E	2824074.1

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		164.60	Top 12" Topsoil and roots
5			Brown, medium to coarse SAND, some Gravel, trace Silt, with little cobbles and several boulders.
		161.60	Bedrock at 4'
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 4' deep and rising to 3' deep on a shelf at the north end of the test pit.
2. No water was observed, but the bottom of the excavation was very moist.
3. Test pit performed along proposed Access Road.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-10

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

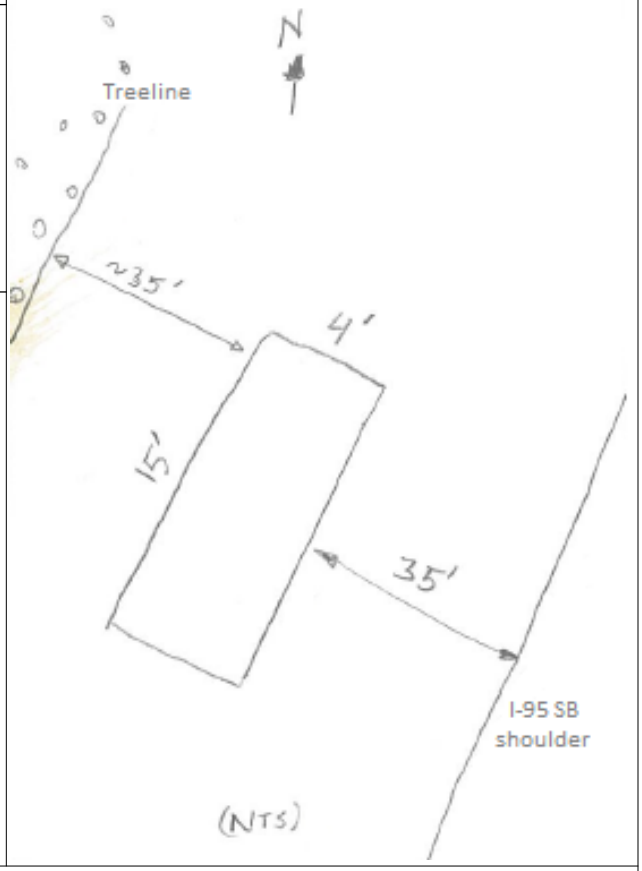
TEST PIT NO. TP-11

SHEET 1 OF 1

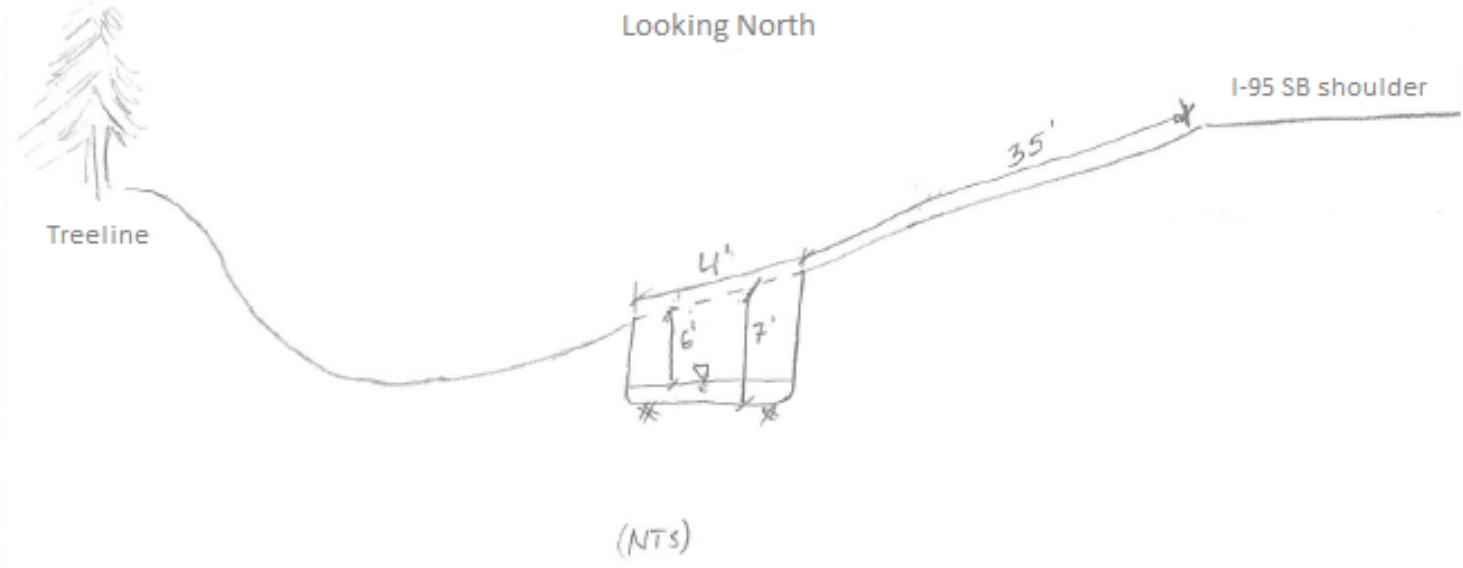
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		159.9
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-14-2016 / 0930	6	Observed	DATE START	1/14/2016	GRID	N	127301.4
					DATE END	1/14/2016	COORD	E	2824225.7

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		159.40	Top 6" Topsoil
5			Brown, fine to coarse SAND, some Gravel, trace Silt, with occasional cobbles and boulders. (FILL)
			Occasional large boulders (2' - 3' diameter) starting at 5' below grade.
		152.90	Bedrock at 7'
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 7' deep.
2. Water encountered at 6' deep.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-11

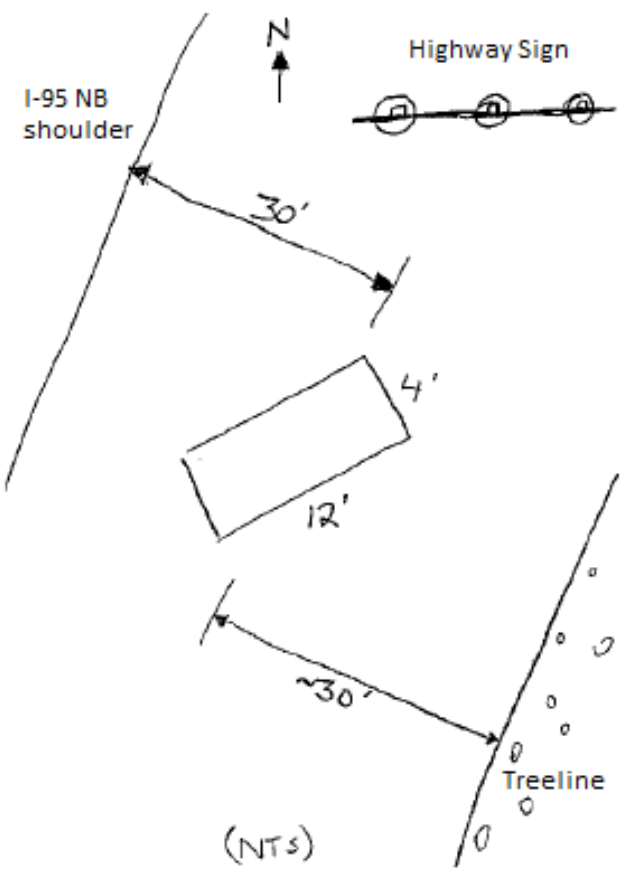
LOG OF TEST PIT

JACOBS	PROJECT	York Toll Plaza	TEST PIT NO. TP-12
	LOCATION	Maine Turnpike Mile 8.8	
	OWNER	Maine Turnpike Authority	SHEET 1 OF 1
	JOB NUMBER	E2X71602	

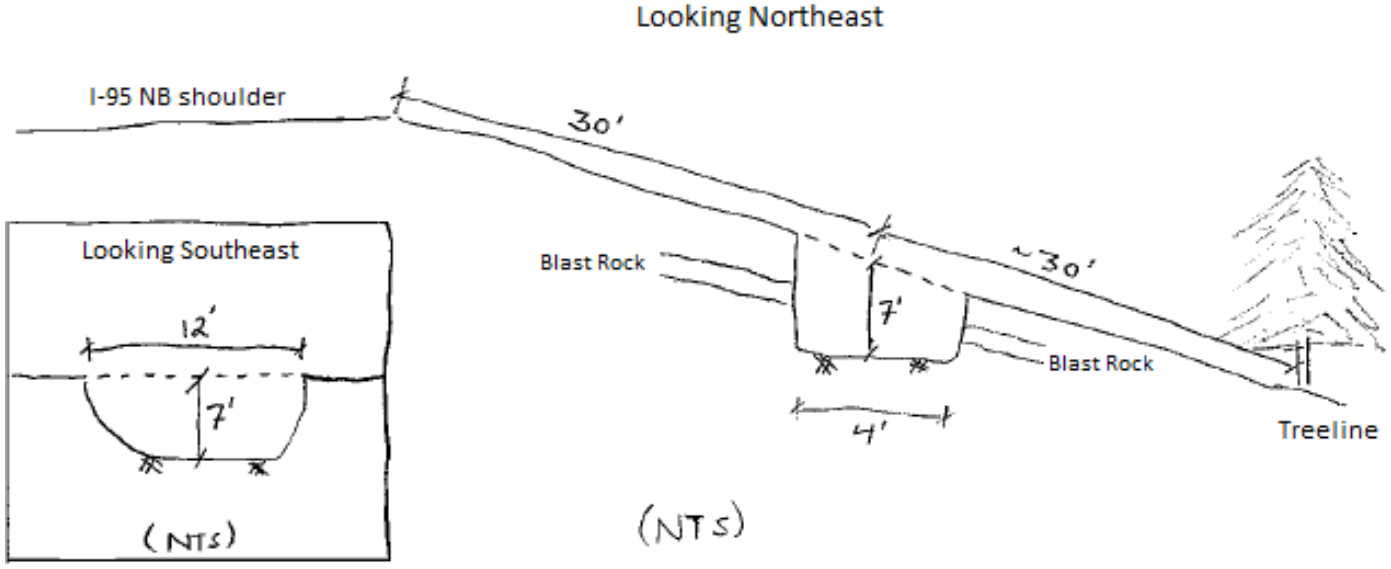
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		161.0
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-14-2016 / 1300		None Encountered	DATE START	1/14/2016	GRID	N	127251.3
					DATE END	1/14/2016	COORD	E	2824404.6

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
0		160.50	Top 6" Topsoil
5			Brown, medium to coarse SAND, some Gravel, trace Silt, with occasional cobbles and boulders (blast rock). (FILL) Some plant roots at 3' deep. 1' - 2' thick layer of cobbles and boulders (blast rock) at 4' below grade.
		154.00	Bedrock at 7'
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Bedrock encountered at 7' deep.
2. Water was not encountered.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-12

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

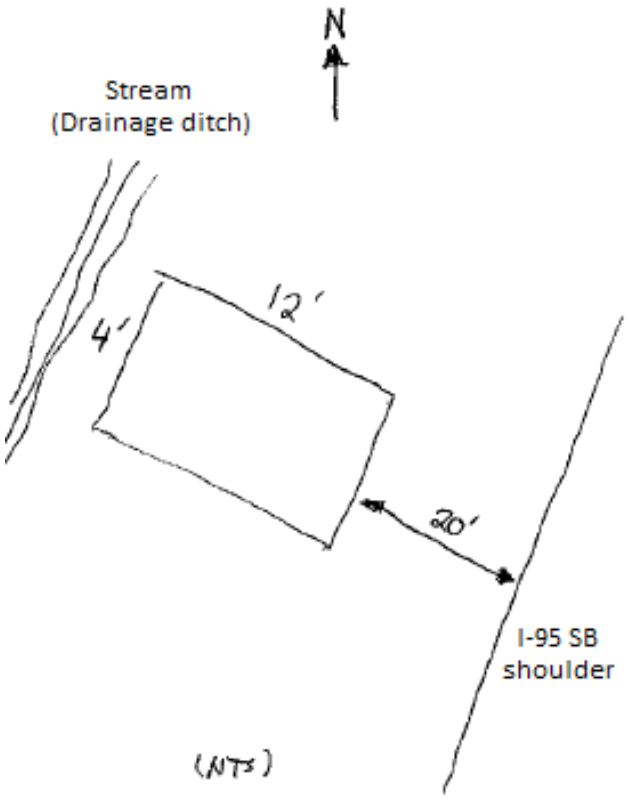
TEST PIT NO. TP-13

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		149.1
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	K. Toombs	DATUM		NAVD88
BUCKET	1/3 cu. yd	01-14-2016 / 0900		None Encountered	DATE START	1/14/2016	GRID	N	127781.9
					DATE END	1/14/2016	COORD	E	2824360.8

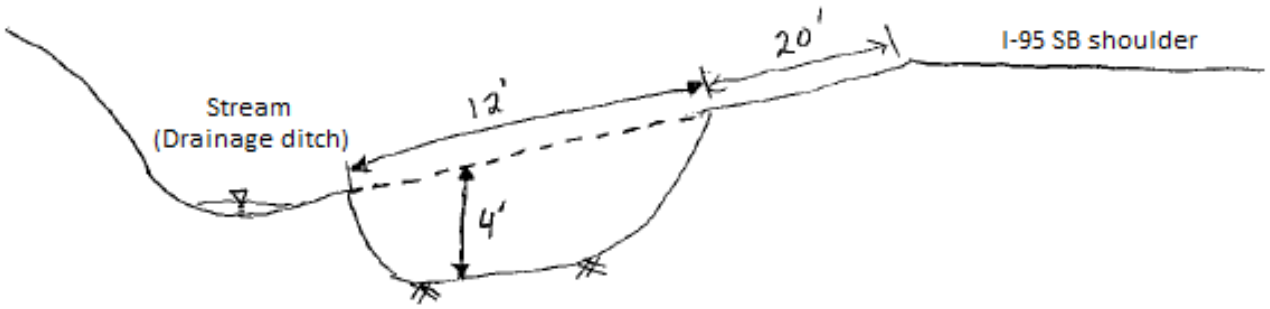
DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		148.60	Top 6" Topsoil
			Brown, medium to coarse SAND, some Gravel, trace Silt, with some cobbles and occasional small boulders. (FILL)
		145.10	Bedrock at 4'
5			
10			
15			
20			

PLAN VIEW



SKETCHES

Looking North



(NTS)

REMARKS:

1. Bedrock encountered at 4' deep.
2. Water was not encountered although exposed bedrock was visibly wet/moist.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-13

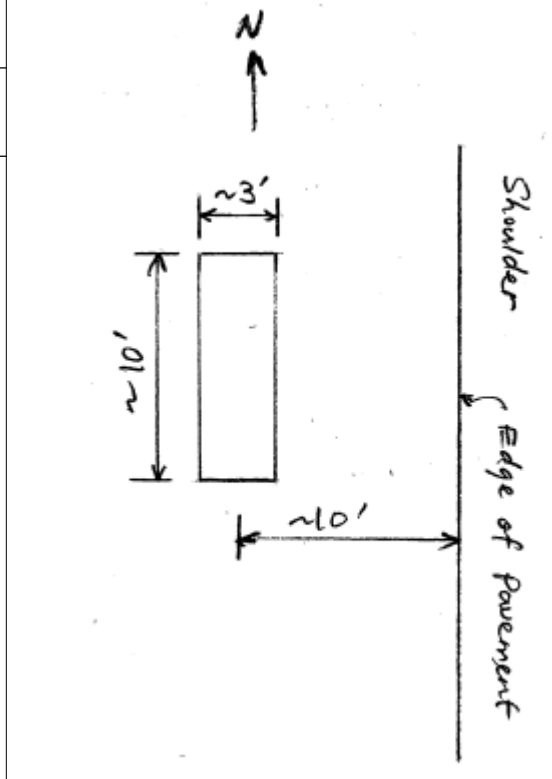
LOG OF TEST PIT

JACOBS	PROJECT	York Toll Plaza	TEST PIT NO. TP-14
	LOCATION	Maine Turnpike Mile 8.8	
	OWNER	Maine Turnpike Authority	SHEET 1 OF 1
	JOB NUMBER	E2X71602	

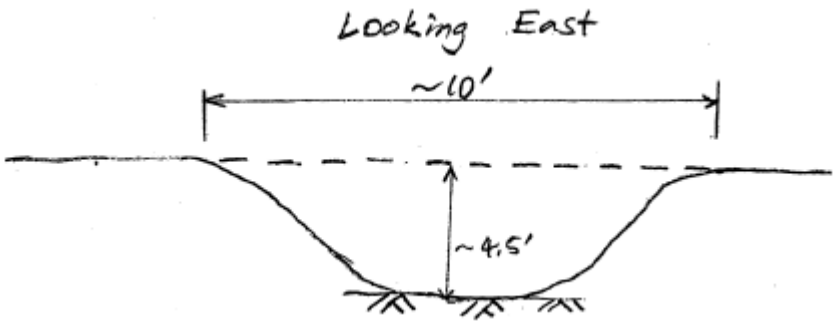
CONTRACTOR	MTA	GROUNDWATER READING			OPERATOR		ELEVATION	151.2
EXCAVATOR	John Deere 401C	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	D. Ha	DATUM	NAVD88
BUCKET	24"	05-17-2016 /		None Encountered	DATE START	5/17/2016	GRID N	125375
					DATE END	5/17/2016	COORD E	2823723.1

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		150.70	Top 6" Topsoil
			Brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt, with some cobbles and occasional small boulders. (FILL)
		148.70	Brown, fine to coarse SAND, trace Gravel, trace Silt. (FILL)
5		146.70	Bedrock at about 4.5'
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Test pit performed at approximate station 330+00 on southbound side of roadway.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-14

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

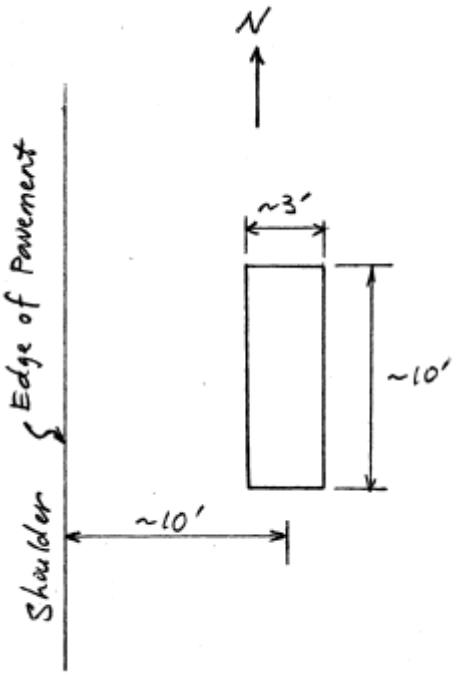
TEST PIT NO. TP-15

SHEET 1 OF 1

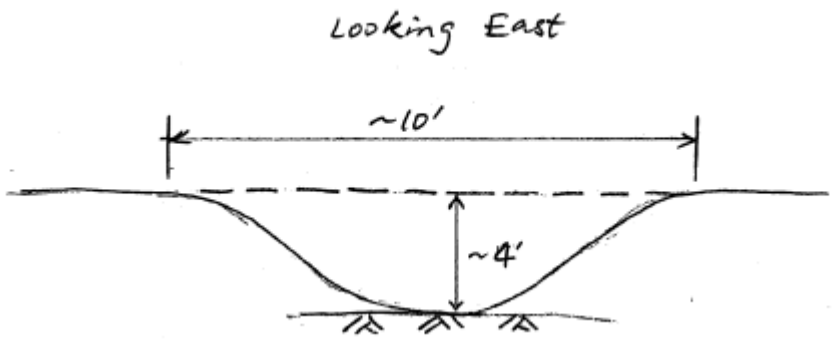
CONTRACTOR	MTA	GROUNDWATER READING			OPERATOR		ELEVATION		149.8
EXCAVATOR	John Deere 401C	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	D. Ha	DATUM		NAVD88
BUCKET	24"	05-17-2016 /		None Encountered	DATE START	5/17/2016	GRID	N	125334.6
					DATE END	5/17/2016	COORD	E	2823870.4

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		149.10	Top 8" Topsoil
			Brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt, with some cobbles and occasional small boulders. (FILL)
		147.50	Gray, fine to coarse SAND, some fine to coarse Gravel, some Silt. (FILL)
		145.80	Bedrock at about 4'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Test pit performed at approximate station 330+00 on northbound side of roadway.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-15

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

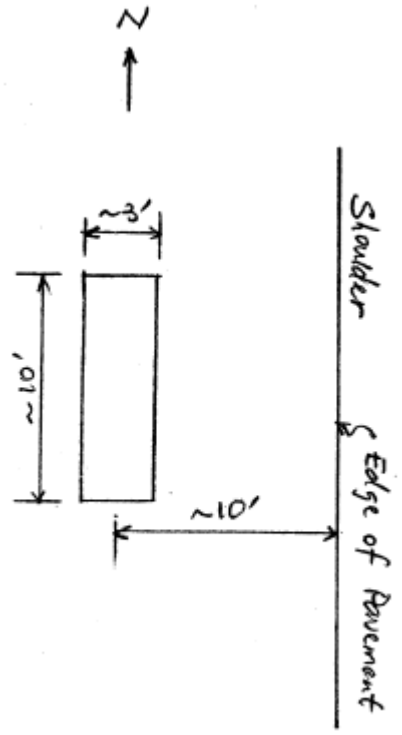
TEST PIT NO. TP-16

SHEET 1 OF 1

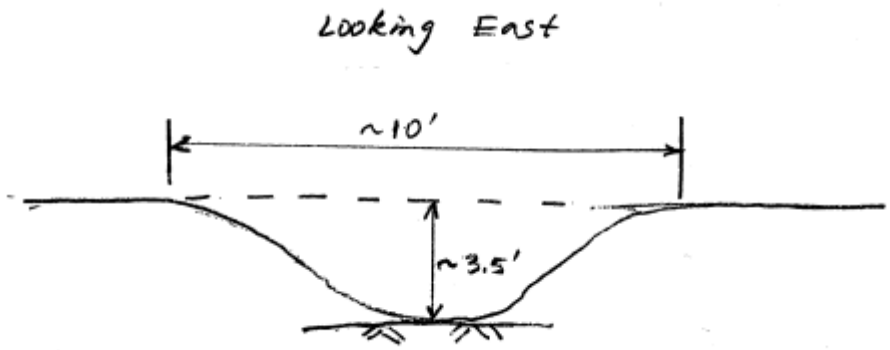
CONTRACTOR	MTA	GROUNDWATER READING			OPERATOR		ELEVATION	160.4
EXCAVATOR	John Deere 401C	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	D. Ha	DATUM	NAVD88
BUCKET	24"	05-17-2016 /		None Encountered	DATE START	5/17/2016	GRID N	127497
					DATE END	5/17/2016	COORD E	2824301.7

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		160.10	Top 4" Topsoil
			Brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt, with some cobbles and occasional small boulders. (FILL)
		158.40	Brown, fine to coarse SAND, trace Gravel, trace Silt. (FILL)
		156.90	Bedrock at about 3.5'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Test pit performed at approximate station 352+00 on southbound side of roadway.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-16

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

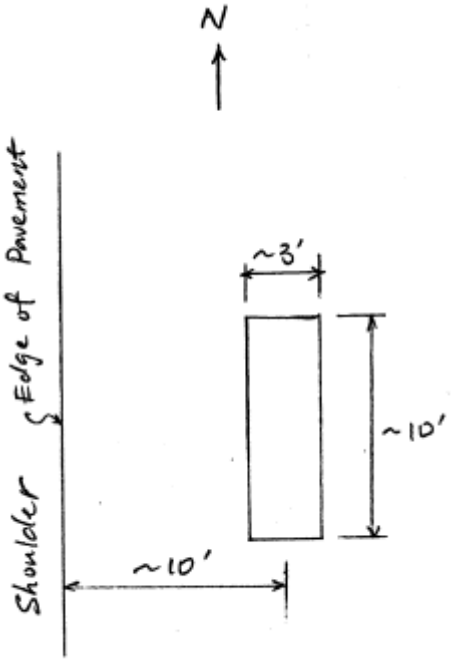
TEST PIT NO. TP-17

SHEET 1 OF 1

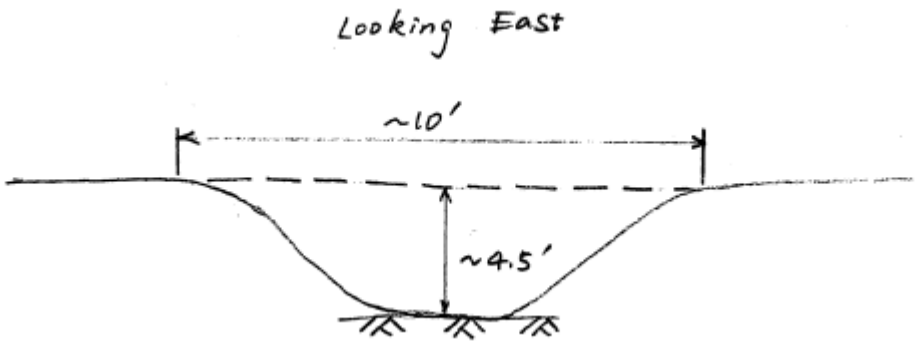
CONTRACTOR	MTA	GROUNDWATER READING			OPERATOR		ELEVATION		160.7
EXCAVATOR	John Deere 401C	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	D. Ha	DATUM		NAVD88
BUCKET	24"	05-17-2016 /		None Encountered	DATE START	5/17/2016	GRID	N	127459.8
					DATE END	5/17/2016	COORD	E	2824437.6

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		160.00	Top 8" Topsoil
			Brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt, with some cobbles and occasional small boulders. (FILL)
		157.70	Gray, fine to coarse SAND, some fine to coarse Gravel, little Silt. (FILL)
		156.20	Bedrock at about 4.5'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Test pit performed at approximate station 352+00 on northbound side of roadway.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-17

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike Mile 8.8
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

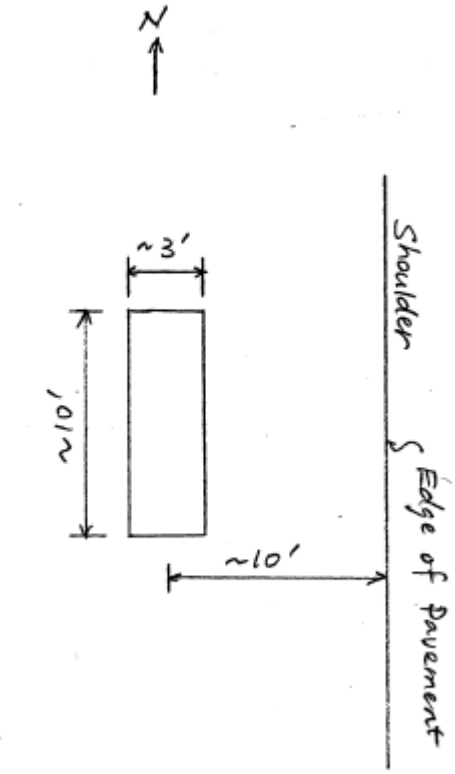
TEST PIT NO. TP-18

SHEET 1 OF 1

CONTRACTOR	MTA	GROUNDWATER READING			OPERATOR		ELEVATION	143.1
EXCAVATOR	John Deere 401C	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	D. Ha	DATUM	NAVD88
BUCKET	24"	05-17-2016 /		None Encountered	DATE START	5/17/2016	GRID N	129039.6
					DATE END	5/17/2016	COORD E	2824726.9

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		142.80	Top 4" Topsoil Brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt, with some cobbles and occasional small boulders. (FILL)
		140.90	Brown, fine to coarse SAND, trace Gravel, trace Silt. (FILL)
		139.10	Bedrock at about 4'
5			
10			
15			
20			

PLAN VIEW



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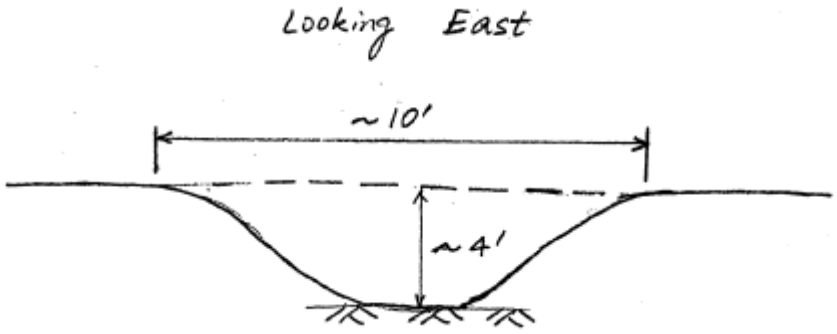


REMARKS:

1. Test pit performed at approximate station 368+00 on southbound side of roadway.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-18

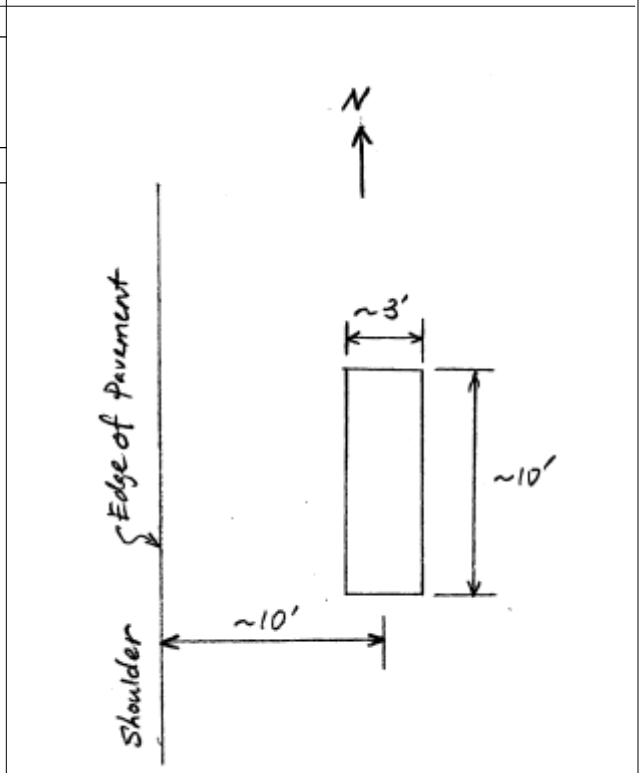
LOG OF TEST PIT

JACOBS	PROJECT	York Toll Plaza	TEST PIT NO. TP-19
	LOCATION	Maine Turnpike Mile 8.8	
	OWNER	Maine Turnpike Authority	SHEET 1 OF 1
	JOB NUMBER	E2X71602	

CONTRACTOR	MTA	GROUNDWATER READING			OPERATOR		ELEVATION	143.2
EXCAVATOR	John Deere 401C	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	D. Ha	DATUM	NAVD88
BUCKET	24"	05-17-2016 /		None Encountered	DATE START	5/17/2016	GRID N	129002.6
					DATE END	5/17/2016	COORD E	2824862.3

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		142.50	Top 8" Topsoil
			Brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt, with some cobbles and occasional small boulders. (FILL)
		140.00	
		139.20	Gray, fine to coarse SAND, some fine to coarse Gravel, some Silt. (FILL)
5			Bedrock at about 4'
10			
15			
20			

PLAN VIEW



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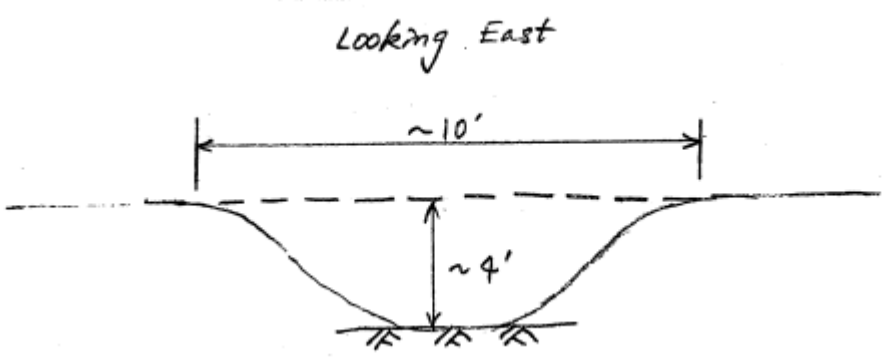


REMARKS:

1. Test pit performed at approximate station 368+00 on northbound side of roadway.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-19

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

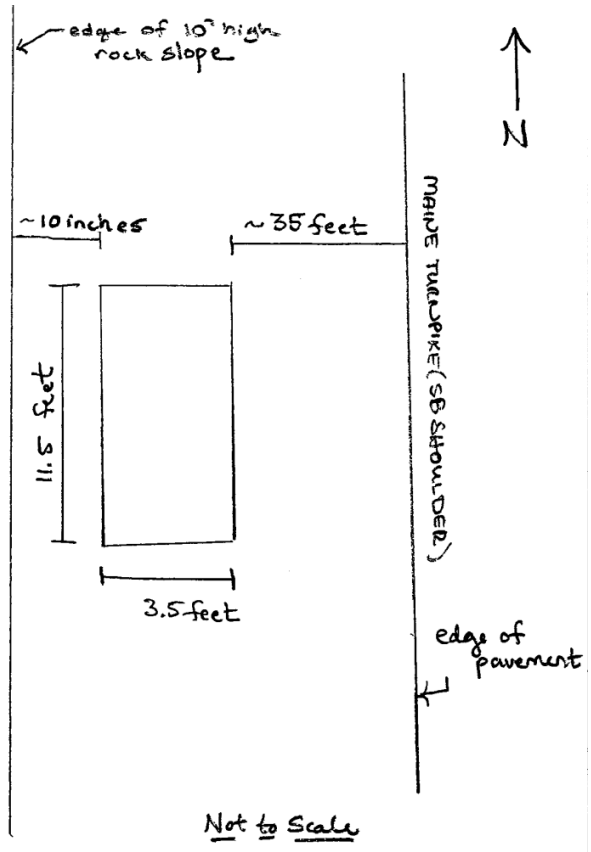
TEST PIT NO. TP-20

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		143.9
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-19-2016 / 10:00AM	2.3	Upon Completion	DATE START	10/19/2016	GRID	N	124751.7
					DATE END	10/19/2016	COORD	E	2823523

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
0		143.40	Dry, dark brown, fine to coarse SAND and organic material (grass, leaves, roots), trace Silt (TOPSOIL).
		140.90	Dry, dark brown, fine to coarse SAND and fine to coarse Gravel, trace Cobbles (FILL).
			Dry, brown/gray, coarse GRAVEL, little fine to coarse Sand (FRACTURED/WEATHERED BEDROCK).
			Bedrock at 3'
5			
10			
15			
20			

PLAN VIEW



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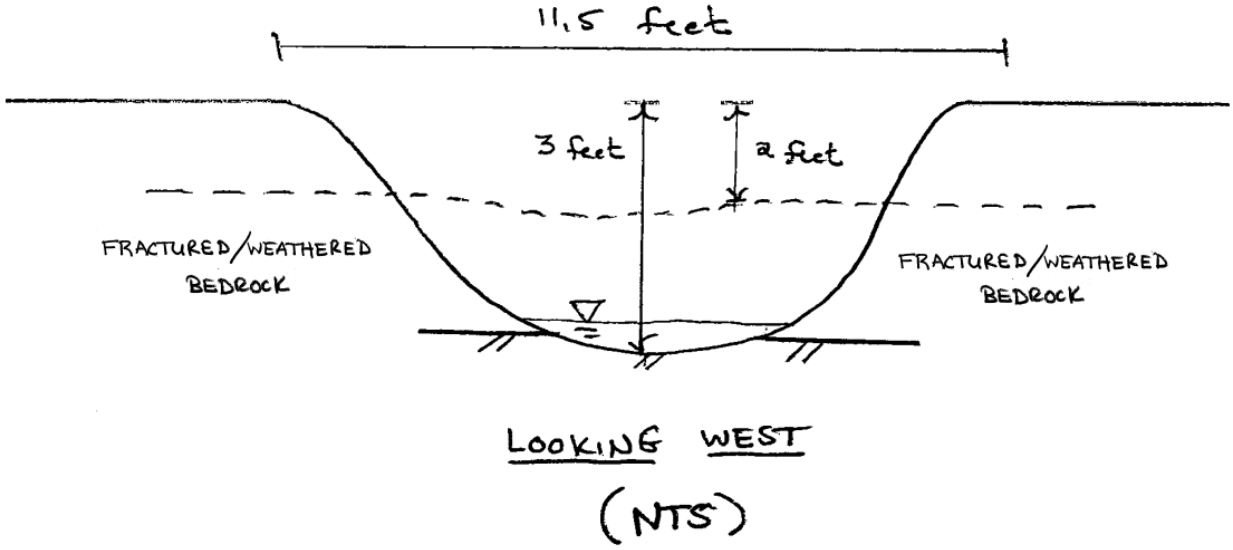


LOOKING WEST

(NTS)

REMARKS:

1. Excavator hit refusal at 3 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-20

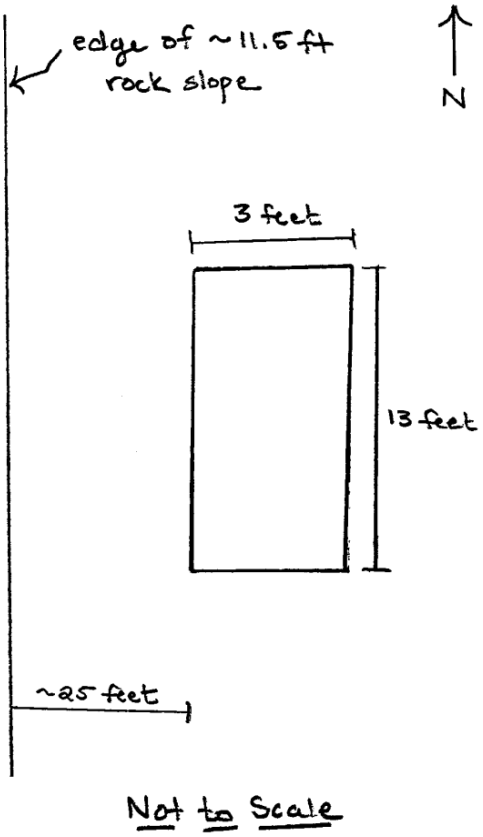
LOG OF TEST PIT

JACOBS	PROJECT	York Toll Plaza	TEST PIT NO. TP-21
	LOCATION	Maine Turnpike	SHEET 1 OF 1
	OWNER	Maine Turnpike Authority	
	JOB NUMBER	E2X71602	

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		159.2
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-17-2016 /		None Encountered	DATE START	10/17/2016	GRID	N	125696.6
					DATE END	10/17/2016	COORD	E	2824040.2

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
0		158.70	Dry, dark brown, fine to coarse SAND, little fine Gravel, some organic material (leaves, grass, roots), trace Silt (TOPSOIL).
			Dry, light brown, fine to coarse SAND and fine to coarse Gravel, little Silt, little Cobbles.
5			
10			Bedrock at 11'
		148.20	
15			
20			

PLAN VIEW



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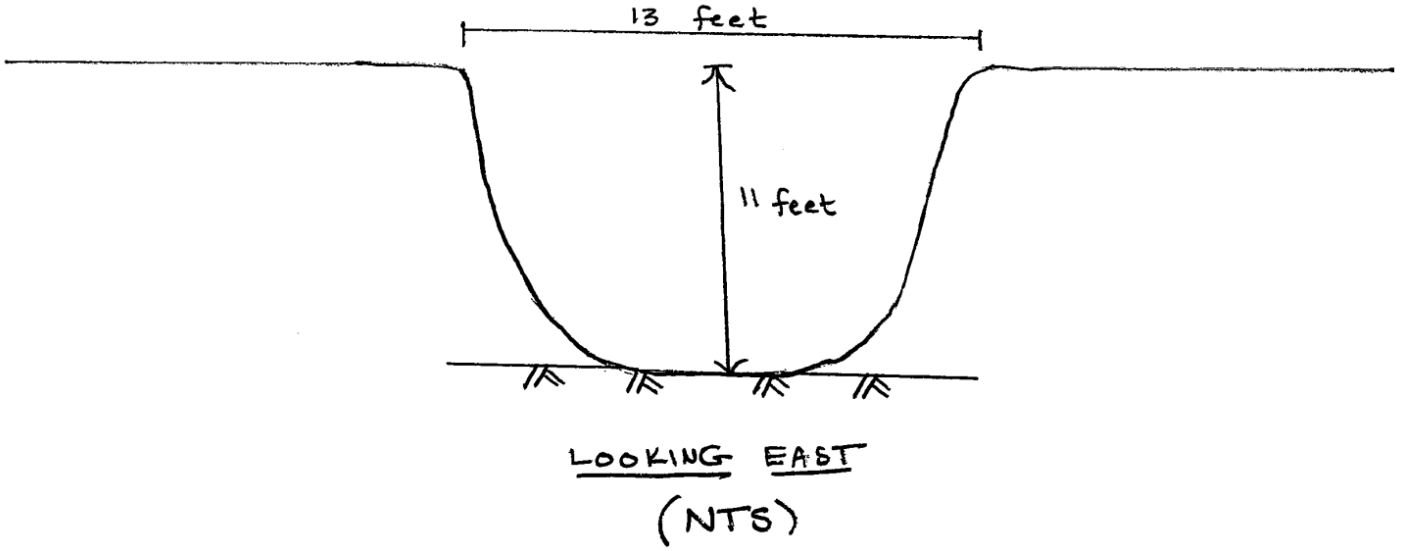


REMARKS:

1. Excavator hit refusal at 11 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-21

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

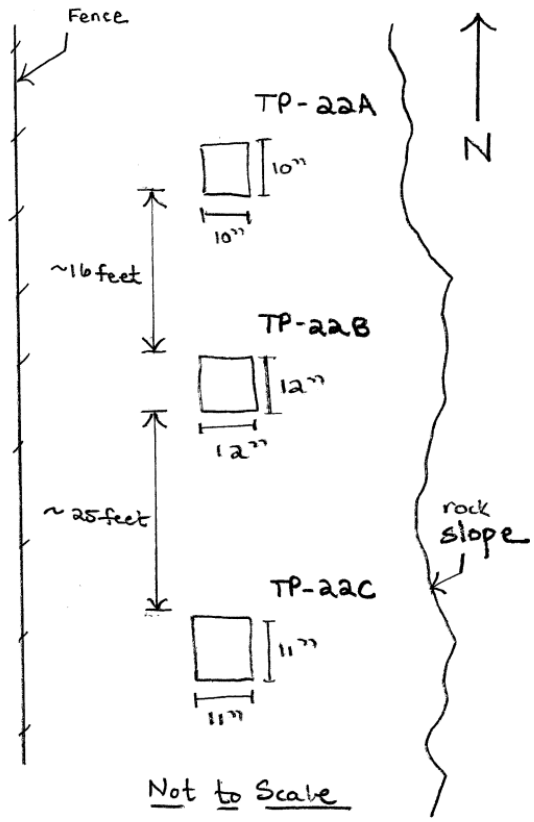
TEST PIT NO. TP-22

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		171.1
EXCAVATOR	N/A	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	N/A	10-19-2016 /		None Encountered	DATE START	10/19/2016	GRID	N	126117.8
					DATE END	10/19/2016	COORD	E	2823834.9

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
0		170.60	Dry, dark brown, fine to coarse SAND and organic material (leaves, roots, grass), trace Silt (TOPSOIL).
			Bedrock at 0.5'
5			
10			
15			
20			

PLAN VIEW



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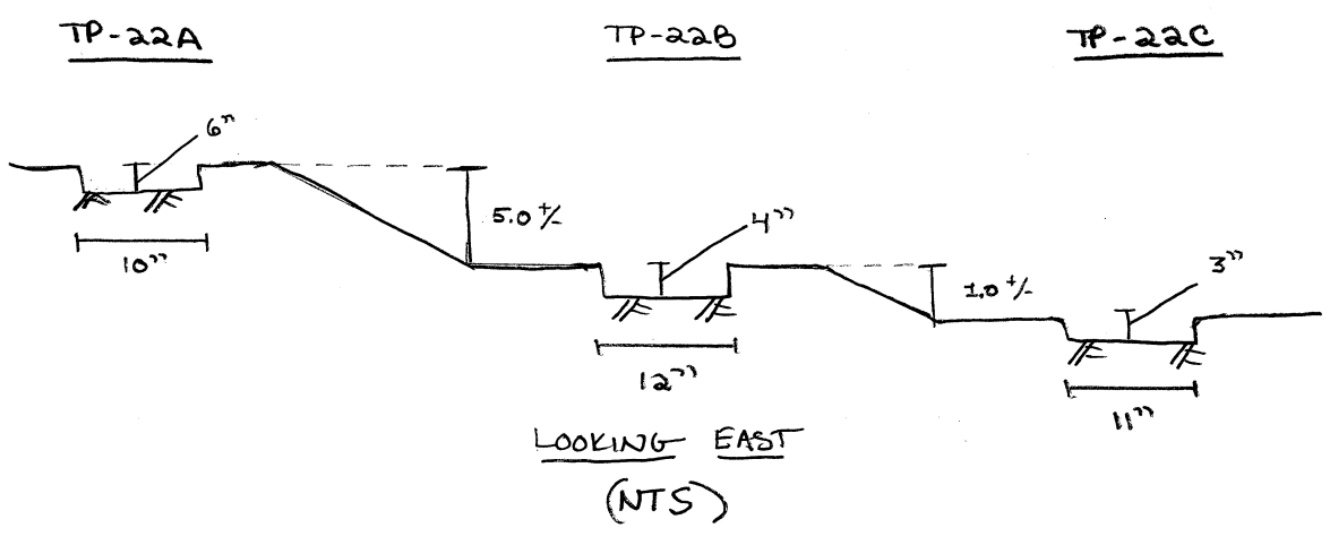


REMARKS:

1. Three test pits were excavated using a hand shovel.
2. TP-22B performed at original staked location.
3. Rock outcroppings visible throughout area.
4. Bedrock depth based on TP-22A.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-22

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

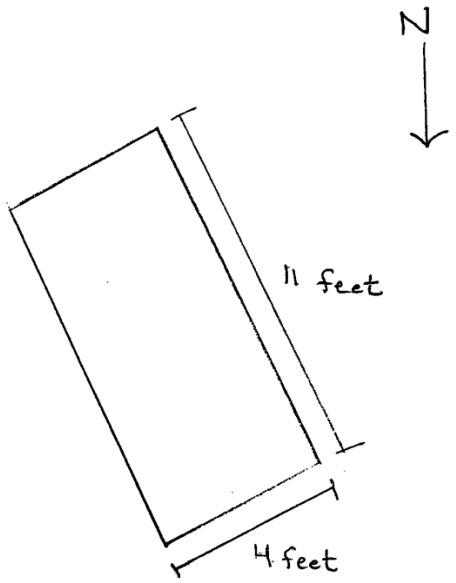
TEST PIT NO. TP-23

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		170.5
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-18-2016 /		None Encountered	DATE START	10/18/2016	GRID	N	127053
					DATE END	10/18/2016	COORD	E	2824042.7

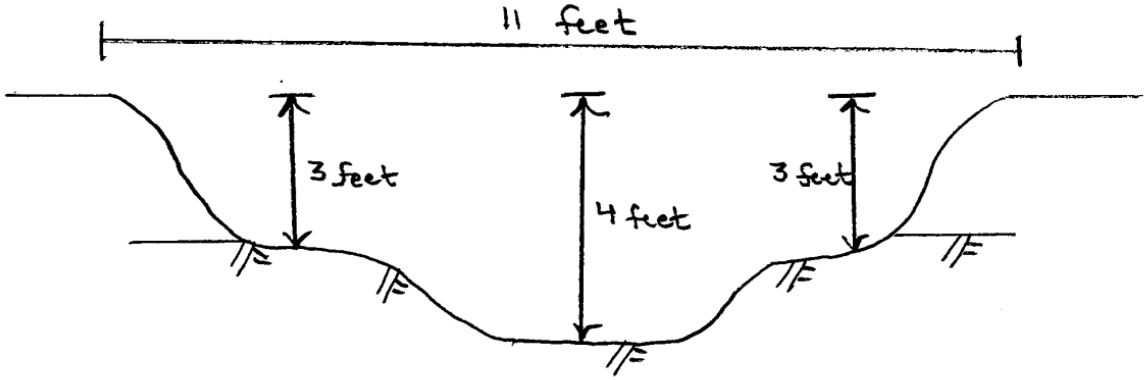
DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		170.00	Dry, dark brown, fine to coarse SAND, some organic material (leaves, grass, roots), trace Silt (TOPSOIL).
			Dry, light brown, fine to coarse SAND, some Cobbles (protruding roots throughout).
			Bedrock at 4'
		166.50	
5			
10			
15			
20			

PLAN VIEW



Not to Scale

SKETCHES



LOOKING NORTHEAST

(NTS)

REMARKS:

1. Excavator hit refusal at 4 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-23

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

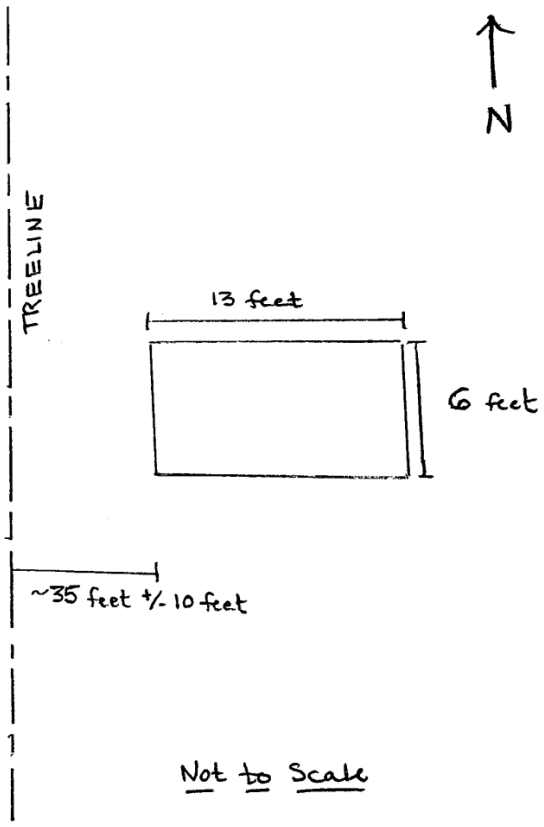
TEST PIT NO. TP-24

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		166.9
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-18-2016 /		None Encountered	DATE START	10/18/2016	GRID	N	127472
					DATE END	10/18/2016	COORD	E	2824206.6

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		166.20	Wet, dark brown, fine to coarse SAND and organic material (leaves, grass, roots), trace Silt (TOPSOIL).
			Dry, light brown, fine to medium SAND, some Cobbles, some Boulders, trace Silt.
		163.90	Bedrock at 3'
5			
10			
15			
20			

PLAN VIEW



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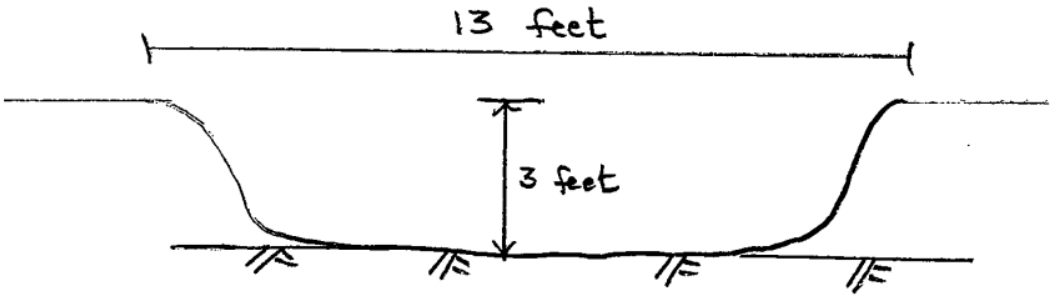


LOOKING SOUTH

(NTS)

REMARKS:

1. Excavator hit refusal at 3 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-24

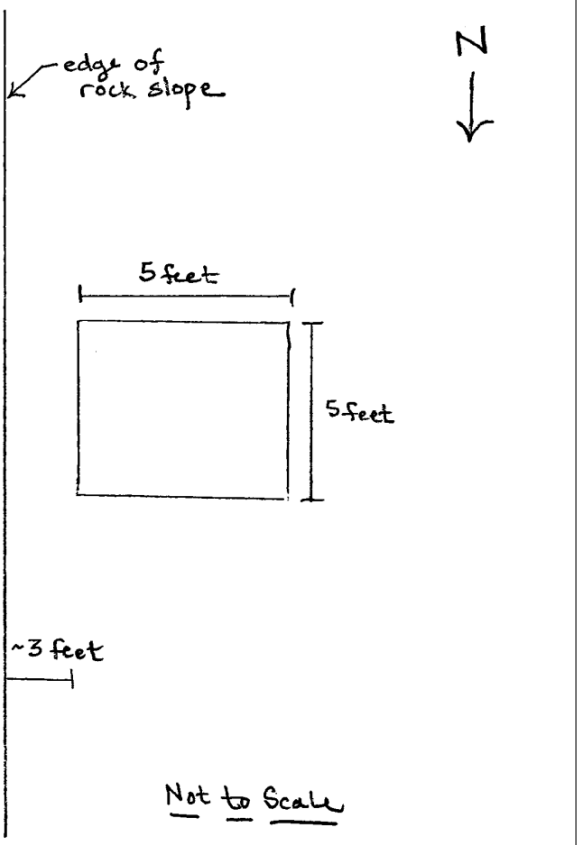
LOG OF TEST PIT

JACOBS	PROJECT	York Toll Plaza	TEST PIT NO. TP-25
	LOCATION	Maine Turnpike	SHEET 1 OF 1
	OWNER	Maine Turnpike Authority	
	JOB NUMBER	E2X71602	

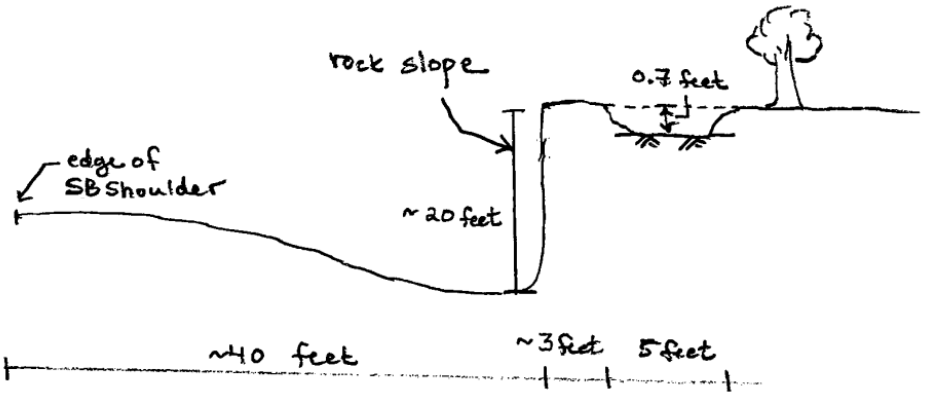
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION	158.8
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM	NAVD88
BUCKET	1/3 cu. yd	10-18-2016 /		None Encountered	DATE START	10/18/2016	GRID N	128614
					DATE END	10/18/2016	COORD E	2824559.3

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		158.10	Dry, dark brown, fine to coarse SAND, some fine to coarse Gravel, little organic material (leaves, grass, roots) (TOPSOIL). Bedrock at 0.7'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



LOOKING SOUTH

(NTS)

REMARKS:

1. Rock outcroppings visible throughout area.
2. Excavator hit refusal at 8 inches on probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-25

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

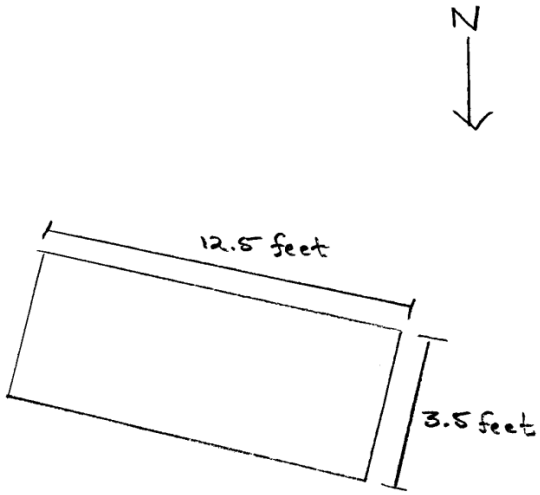
TEST PIT NO. TP-26

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		174.0
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-18-2016 /		None Encountered	DATE START	10/18/2016	GRID	N	126766.9
					DATE END	10/18/2016	COORD	E	2823785.6

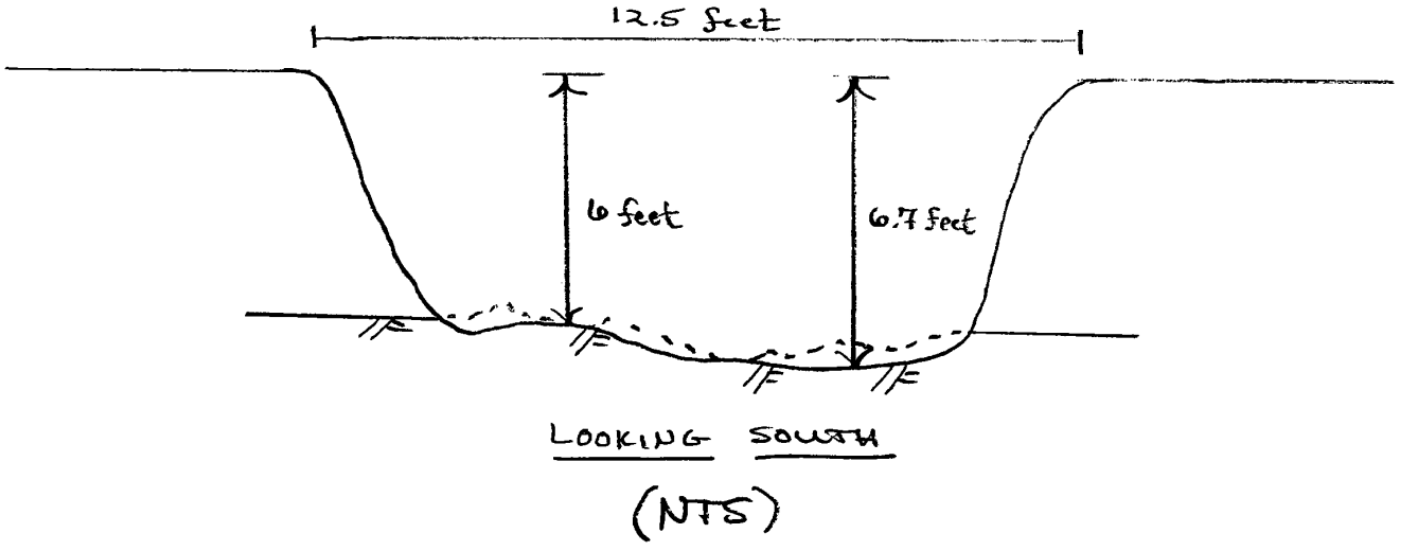
DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		173.50	Dry, dark brown, fine to coarse SAND and organic material (leaves, grass, roots) (TOPSOIL).
			Dry, brown, fine to coarse SAND, little Silt.
5		168.50	Dry, brown, coarse GRAVEL (BEDROCK FRAGMENTS).
		167.30	Bedrock at 6.7'
10			
15			
20			

PLAN VIEW



Not to Scale

SKETCHES



LOOKING SOUTH

(NTS)

REMARKS:

1. Excavator hit refusal at 6.7 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-26

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

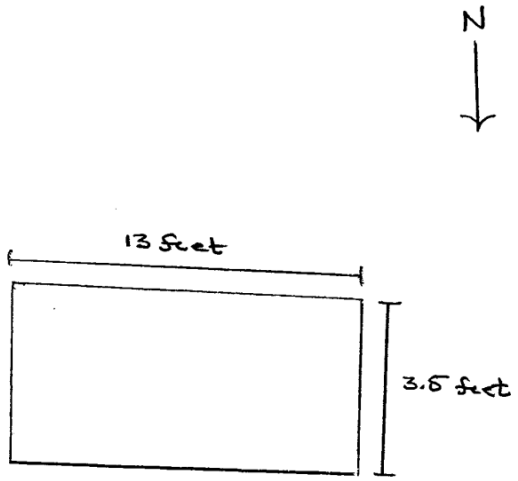
TEST PIT NO. TP-27

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		180.2
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-18-2016 /		None Encountered	DATE START	10/18/2016	GRID	N	126805.2
					DATE END	10/18/2016	COORD	E	2823637.7

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		179.50	Dry, dark brown, fine to coarse SAND and organic material (leaves, grass, roots).
			Dry, brown, fine to medium SAND, little Silt, little fine Gravel.
5			
		174.20	Dry, brown, coarse GRAVEL and fine to coarse Sand (FRACTURED/WEATHERED BEDROCK).
10			
			Bedrock at 13'
		167.20	
15			
20			

PLAN VIEW



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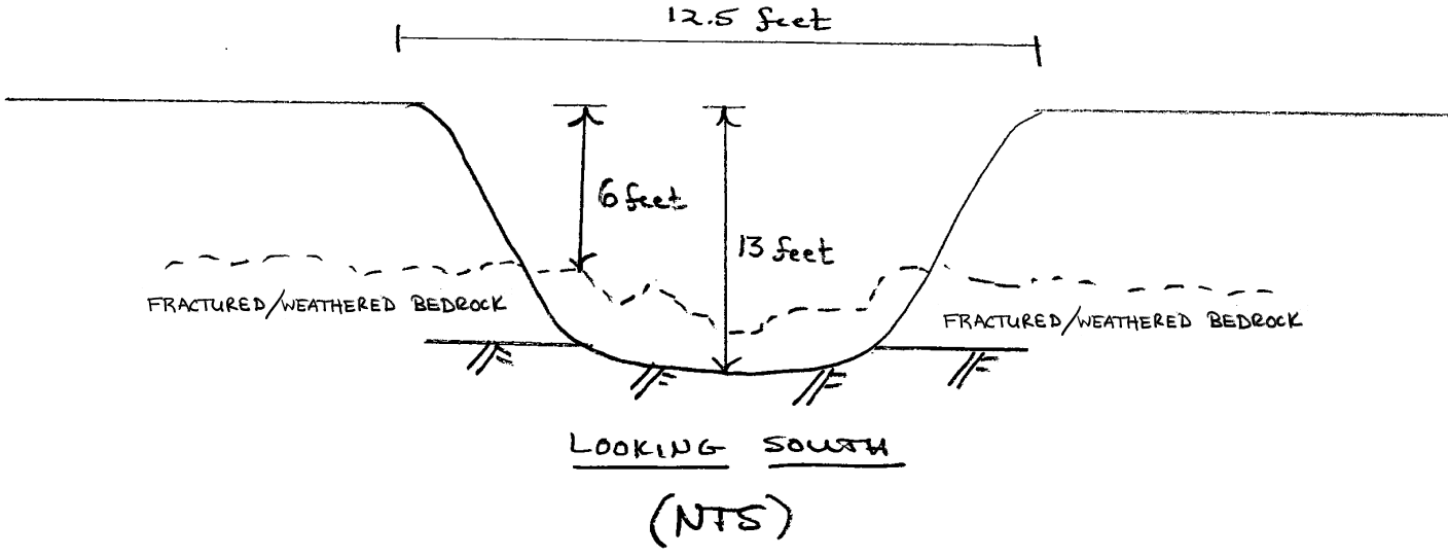


REMARKS:

1. Excavator hit refusal at 13 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-27

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

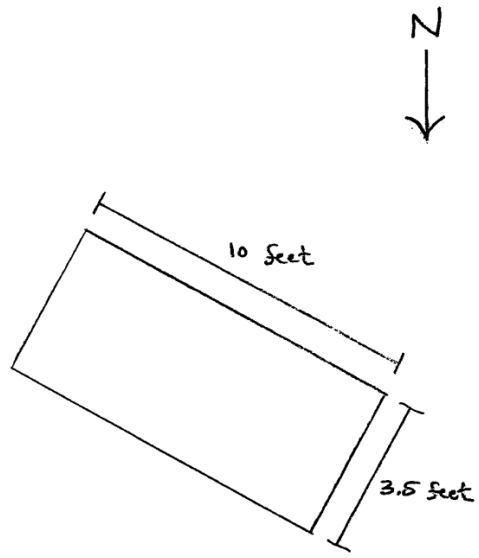
TEST PIT NO. TP-28

SHEET 1 OF 1

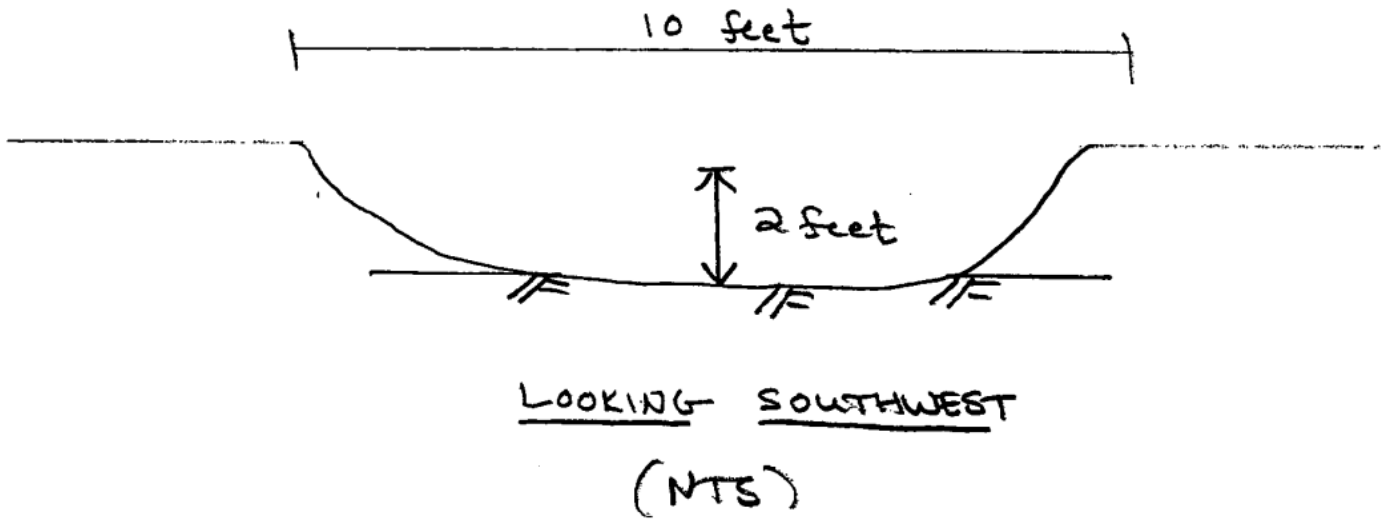
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		187.0
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-18-2016 /		None Encountered	DATE START	10/18/2016	GRID	N	126845.9
					DATE END	10/18/2016	COORD	E	2823495.7

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		186.30	Dry, brown, fine to coarse SAND and organic material (leaves, grass, roots) (TOPSOIL).
		185.00	Dry, brown, fine to medium SAND, little coarse Gravel, trace Silt.
			Bedrock at 2'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Excavator hit refusal at 2 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-28

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

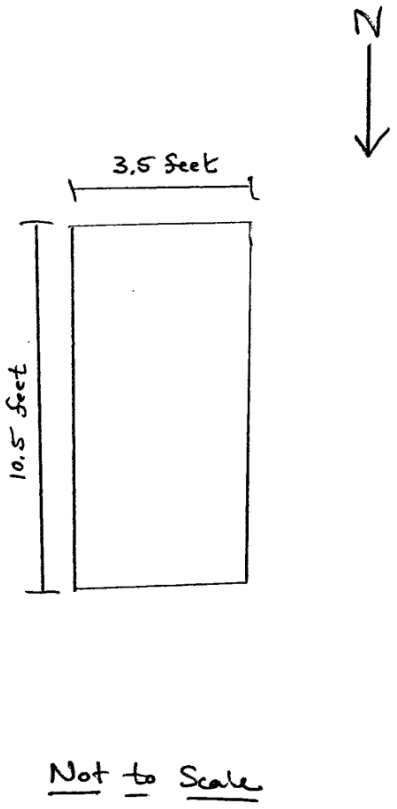
TEST PIT NO. TP-29

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		191.4
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-18-2016 /		None Encountered	DATE START	10/18/2016	GRID	N	126735.3
					DATE END	10/18/2016	COORD	E	2823417.1

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		190.70	Dry, brown, fine to coarse SAND and organic material (leaves, grass, roots) (TOPSOIL).
			Dry, brown, fine to medium SAND, little Silt.
		189.40	Dry, brown, coarse GRAVEL and fine to coarse Sand (FRACTURED/ WEATHERED BEDROCK).
5			Bedrock at 5.4'
		186.00	
10			
15			
20			

PLAN VIEW



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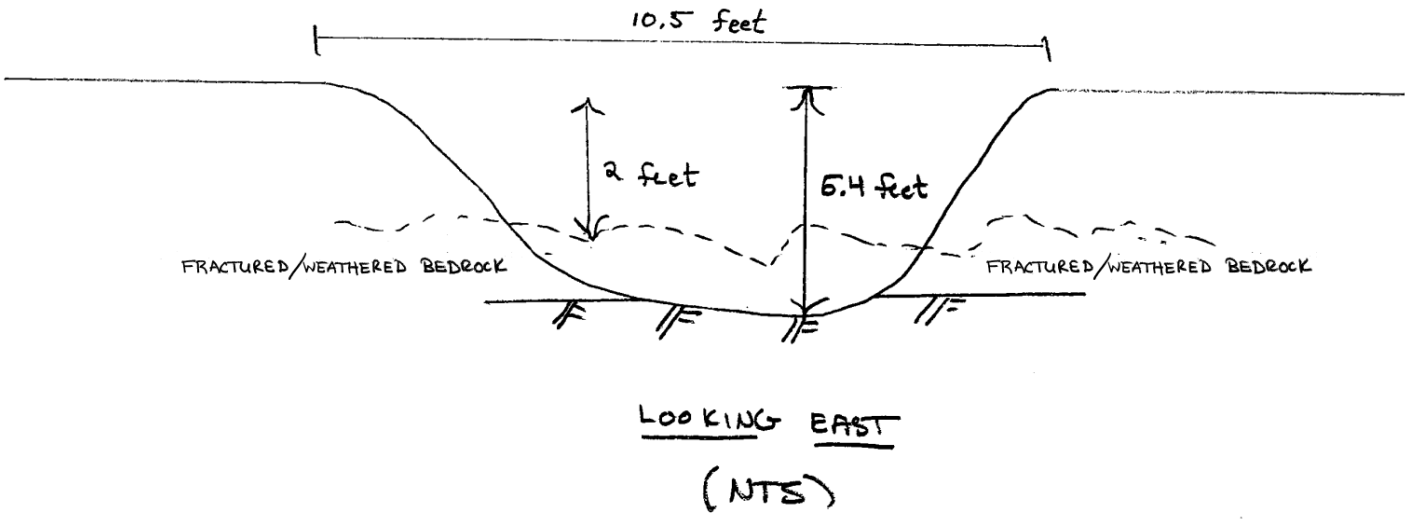


REMARKS:

1. Excavator hit refusal at 5.4 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-29

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

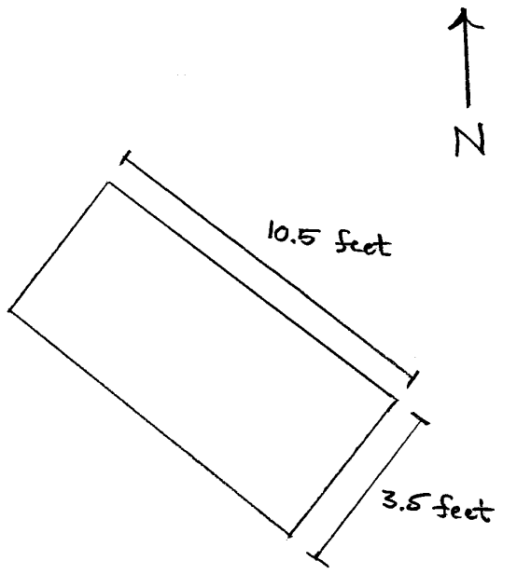
TEST PIT NO. TP-30

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION	196.3
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM	NAVD88
BUCKET	1/3 cu. yd	10-19-2016 /		None Encountered	DATE START	10/19/2016	GRID N	126833.8
					DATE END	10/19/2016	COORD E	2823049.8

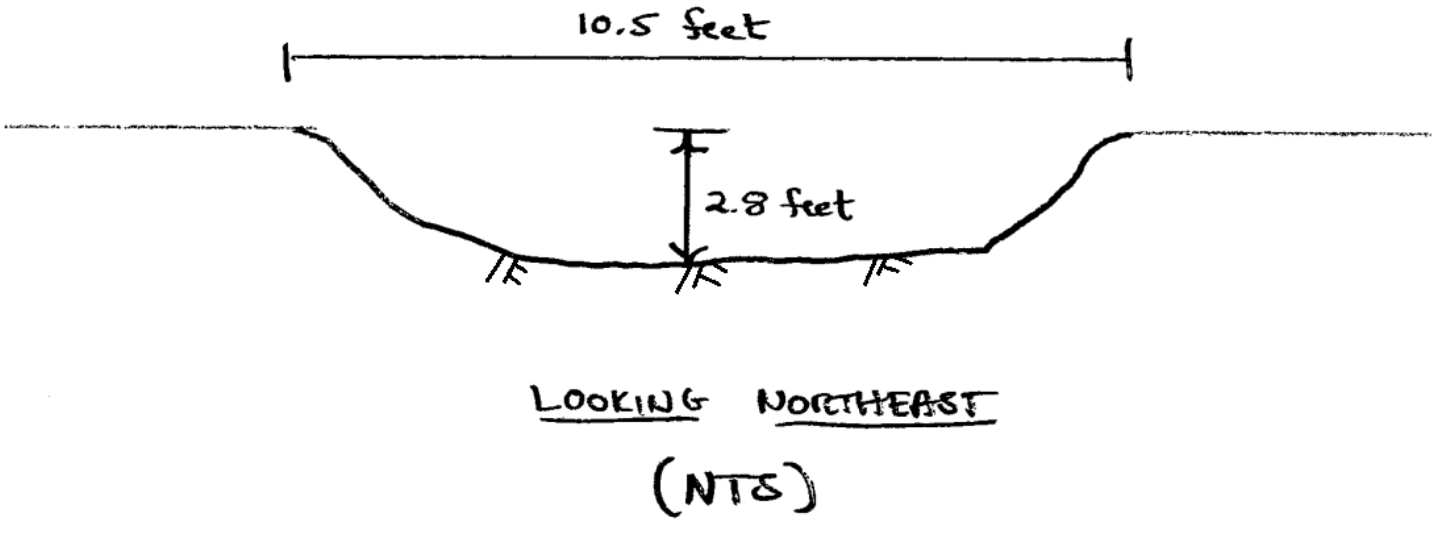
DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		195.60	Dry, dark brown, fine to coarse SAND and organic material (leaves, roots, grass), trace Silt (TOPSOIL).
			Dry, light brown, fine to coarse SAND, some Cobbles, trace Boulders (roots protruding throughout).
		193.50	Bedrock at 2.8'
5			
10			
15			
20			

PLAN VIEW



Not to Scale

SKETCHES



LOOKING NORTHEAST

(NTS)

REMARKS:

1. Excavator hit refusal at 2.8 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-30

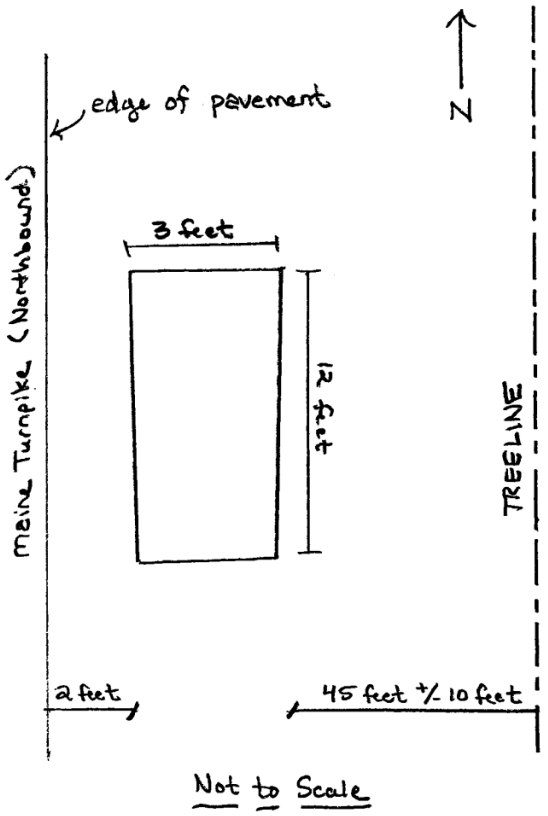
LOG OF TEST PIT

JACOBS	PROJECT	York Toll Plaza	TEST PIT NO. TP-31
	LOCATION	Maine Turnpike	
	OWNER	Maine Turnpike Authority	SHEET 1 OF 1
	JOB NUMBER	E2X71602	

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION	120.7
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM	NAVD88
BUCKET	1/3 cu. yd	10-17-2016 /		None Encountered	DATE START	10/17/2016	GRID N	123078.2
					DATE END	10/17/2016	COORD E	2823252.1

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		120.00	Dry, dark brown, fine to coarse SAND, some organic material (leaves, grass, roots).
			0.7'-3.5': Dry, light brown, fine to medium SAND, little fine Gravel, trace Silt (FILL).
5			3.5'-6.5': Dry, dark brown, fine to coarse GRAVEL and fine to coarse Sand, trace Silt (FILL).
		114.20	Moist, dark brown, COBBLES and fine to coarse Gravel (FRACTURED/WEATHERED BEDROCK).
			Bedrock at 9.3'
10		111.40	
15			
20			

PLAN VIEW



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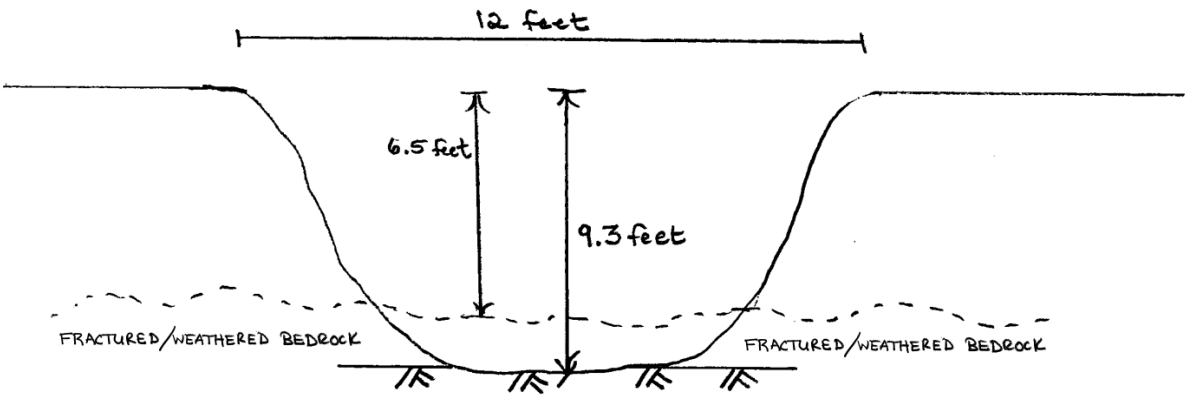


LOOKING WEST
(NTS)

REMARKS:

1. Excavator pulling up fractured/weathered rock fragments at approximately 6.5 feet.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. TP-31

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

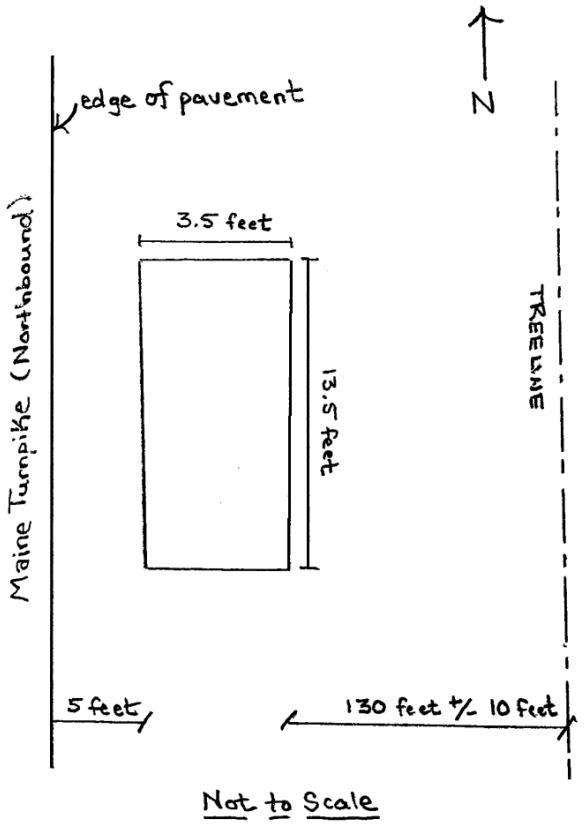
TEST PIT NO. SWM-1

SHEET 1 OF 1

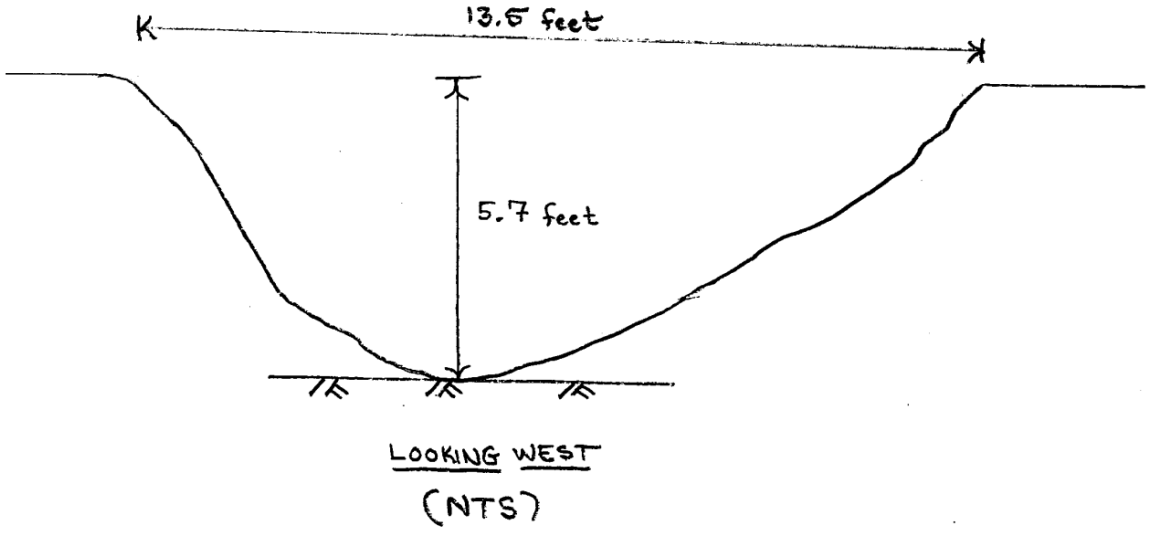
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		108.0
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-17-2016 /		None Encountered	DATE START	10/17/2016	GRID	N	122031.3
					DATE END	10/17/2016	COORD	E	2822965.2

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
0		107.50	Dry, dark brown, fine to coarse SAND, little organic material (grass, roots, leaves), trace Silt (TOPSOIL).
			Dry, brown, fine to coarse SAND and fine to coarse Gravel, some(-) Cobbles ranging from 3" to 12" in diameter, trace Silt (FILL).
		105.50	Dry, brown, fine to coarse GRAVEL and fine to coarse Sand (FRACTURED/WEATHERED BEDROCK).
5			Bedrock at 5.7'
		102.30	
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Excavator hit refusal at 5.7 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-1

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

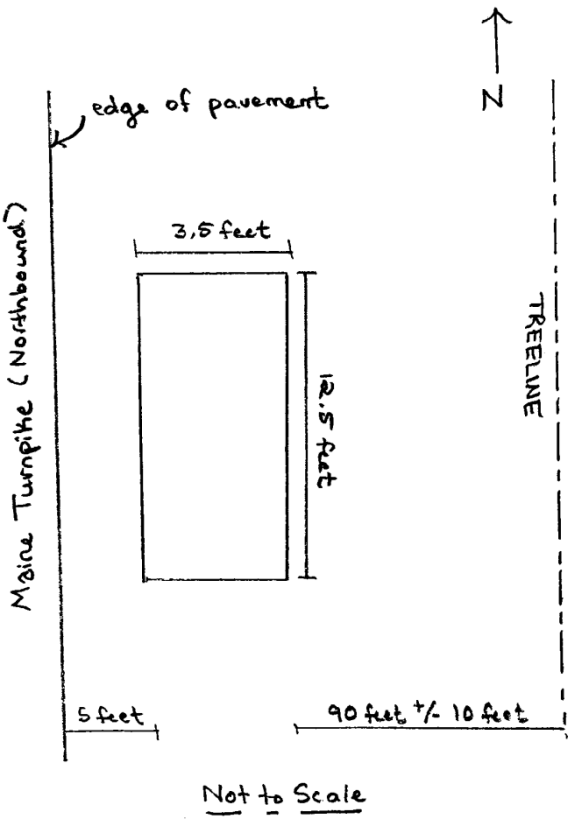
TEST PIT NO. SWM-2

SHEET 1 OF 1

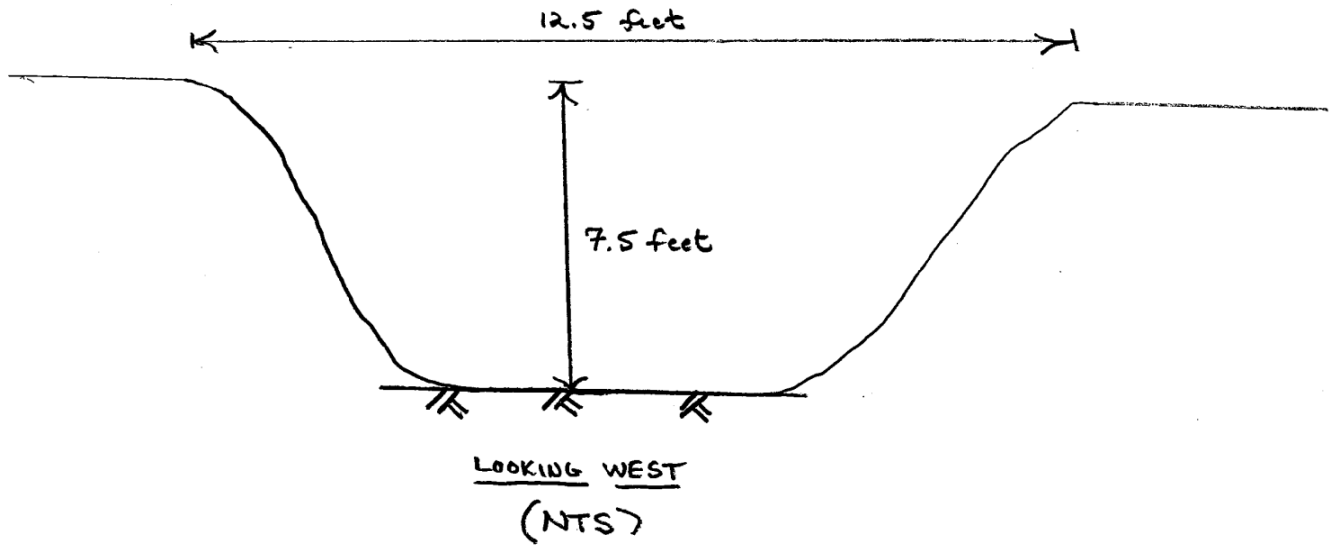
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		117.8
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-17-2016 /		None Encountered	DATE START	10/17/2016	GRID	N	122350.6
					DATE END	10/17/2016	COORD	E	2823053

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		117.30	Dry, dark brown, fine to medium SAND and organic material (grass, leaves), trace Silt (TOPSOIL).
			0.5'-2.5': Dry, brown, fine to medium SAND, little fine Gravel, trace Silt (FILL).
			2.5'-7.5': Dry, dark brown, fine to coarse GRAVEL and fine to coarse Sand, little Cobbles ranging from 3" to 12" in diameter, trace Silt (FILL).
5			
			Bedrock at 7.5'
		110.30	
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Excavator hit refusal at 7.5 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-2

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

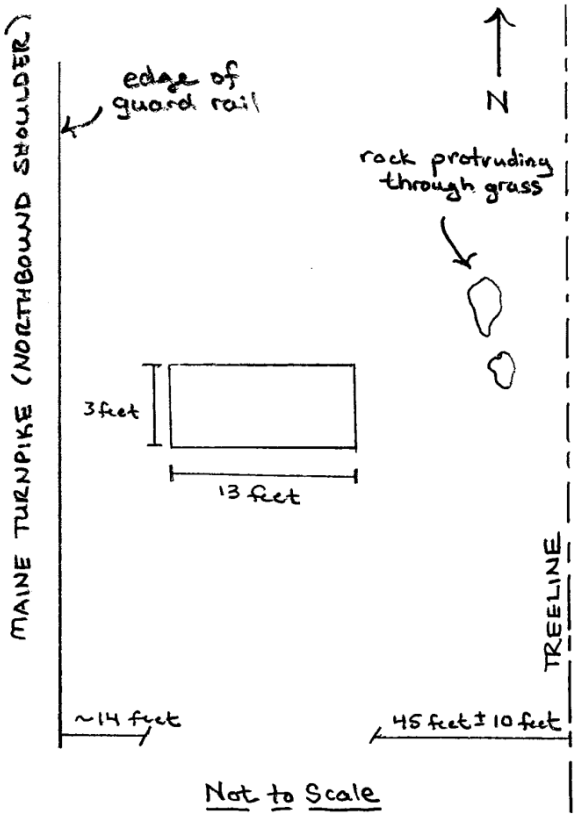
TEST PIT NO. SWM-3

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION	119.9
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM	NAVD88
BUCKET	1/3 cu. yd	10-17-2016 /		None Encountered	DATE START	10/17/2016	GRID N	123726.9
					DATE END	10/17/2016	COORD E	2823444.3

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		119.40	Dry, dark brown, fine to coarse SAND, some organic material (grass, leaves, roots), trace Silt (TOPSOIL).
		118.90	Dry, brown, fine to coarse SAND and fine to coarse Gravel (FILL).
5			Dry to moist, reddish brown, COBBLES and fine to coarse Gravel, little fine to coarse Sand (FRACTURED/WEATHERED BEDROCK).
			Bedrock at 5.6'
		114.30	
10			
15			
20			

PLAN VIEW



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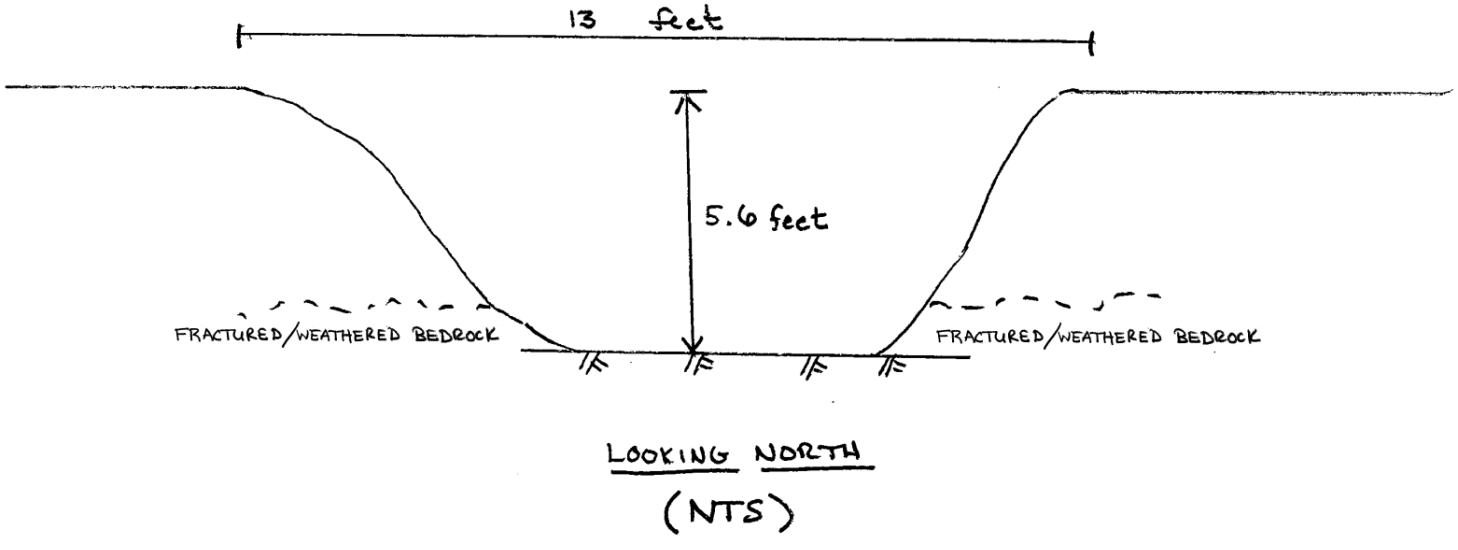


REMARKS:

1. Excavator hit refusal at 5.6 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-3

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

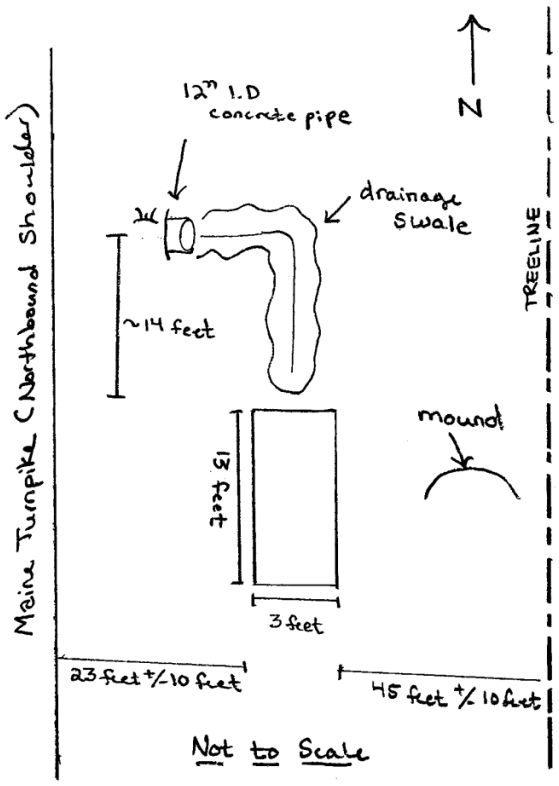
TEST PIT NO. SWM-4

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		129.1
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-17-2016 / 10:30AM	5.5	Upon Completion	DATE START	10/17/2016	GRID	N	124145.3
					DATE END	10/17/2016	COORD	E	2823568.7

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
0		128.60	Dry, dark brown, fine to coarse SAND and organic material (leaves, roots, grass), trace Silt (TOPSOIL).
			Dry, brown, fine to coarse SAND and fine to coarse Gravel, trace Silt (FILL).
		126.60	Dry, brown/gray, coarse GRAVEL and Cobbles (FRACTURED/WEATHERED BEDROCK).
			Bedrock at 5.6'
5		123.50	
10			
15			
20			

PLAN VIEW



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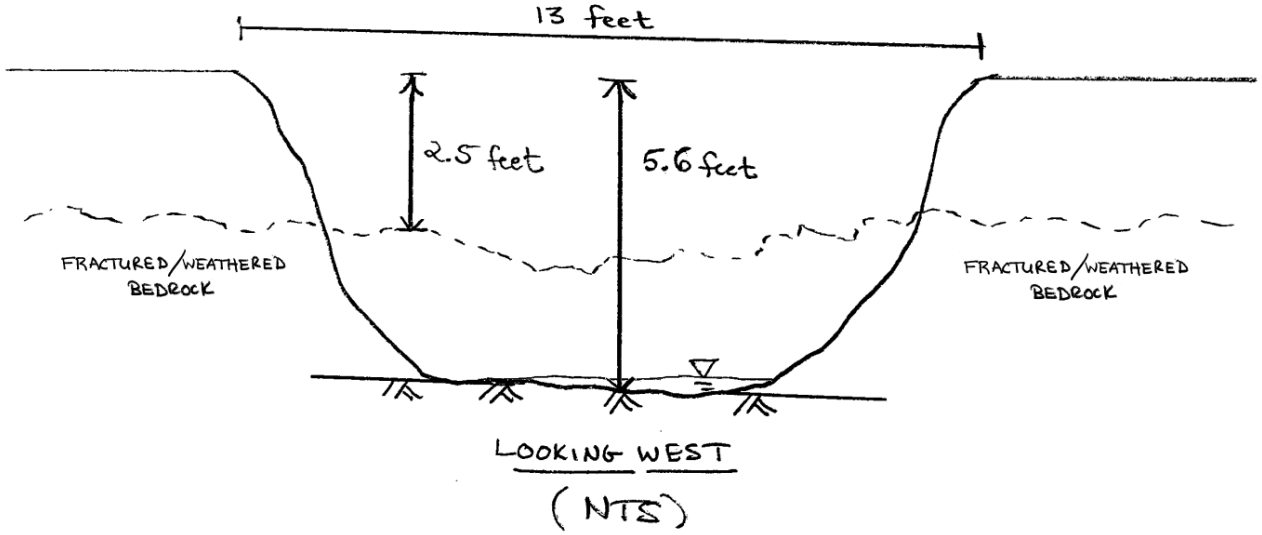


REMARKS:

1. Excavator hit refusal at 5.6 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-4

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

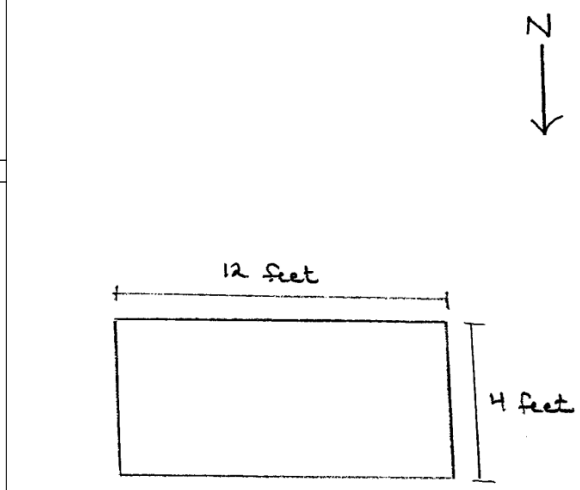
TEST PIT NO. SWM-5

SHEET 1 OF 1

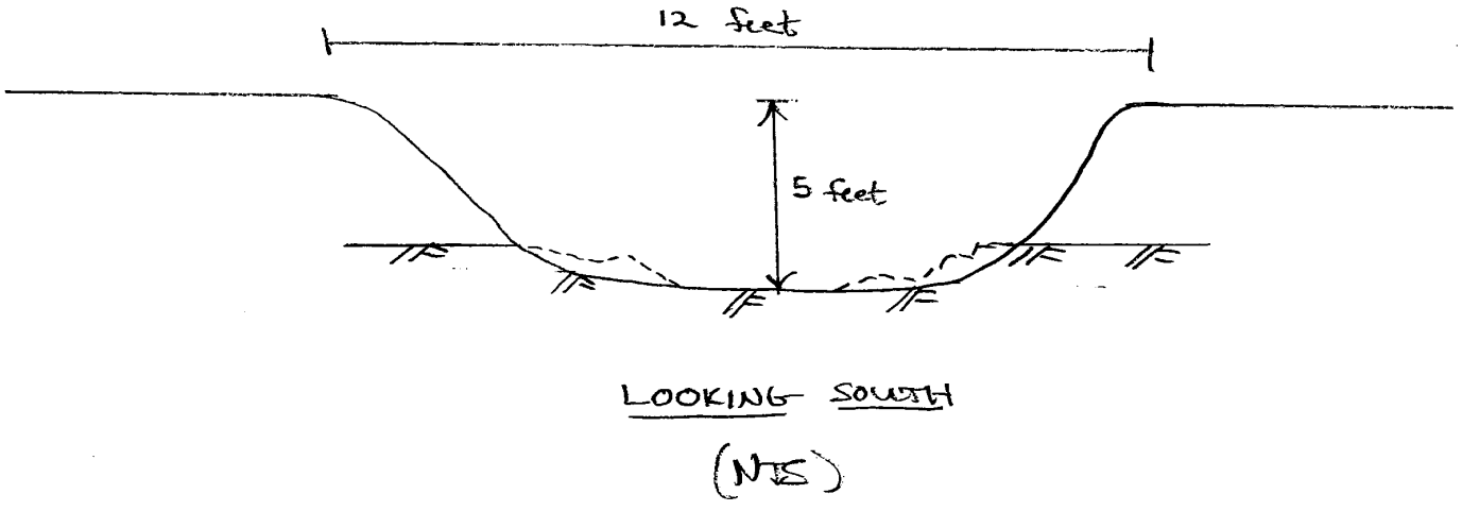
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		165.4
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-18-2016 /		None Encountered	DATE START	10/18/2016	GRID	N	126605.9
					DATE END	10/18/2016	COORD	E	2823870.1

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		164.70	Dry, dark brown, fine to coarse SAND and organic material (leaves, grass, roots) (TOPSOIL).
			Dry, dark brown, fine to coarse SAND, some(-) Boulders, some(-) Cobbles, trace Gravel, trace Silt.
		160.90	
5		160.40	Dry, brown, coarse GRAVEL, trace Sand (BEDROCK FRAGMENTS).
			Bedrock at 5'
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Excavator pulling up large rounded boulders ranging from 1 to 3 feet in diameter at approximately 1 feet below existing grade.
2. Excavator hit refusal at 5 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-5

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

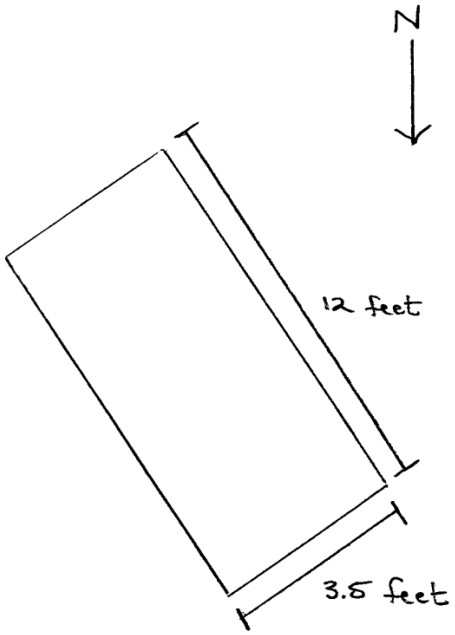
TEST PIT NO. SWM-6

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		169.0
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-18-2016 /		None Encountered	DATE START	10/18/2016	GRID	N	126718.2
					DATE END	10/18/2016	COORD	E	2823881.8

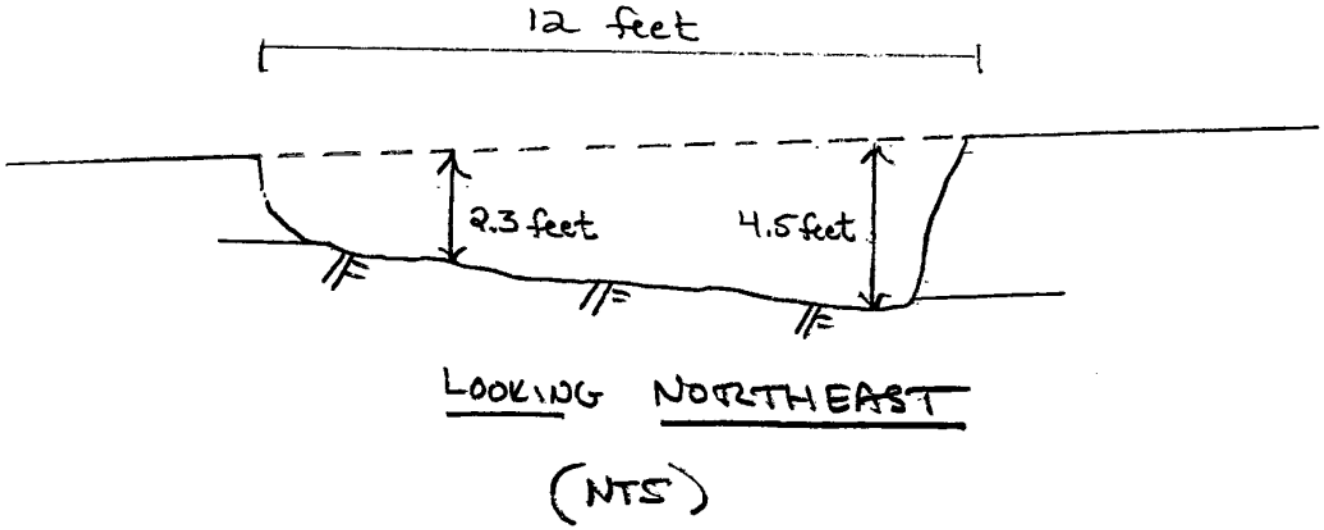
DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		168.50	Dry, dark brown, fine to coarse SAND and organic material (leaves, roots, grass), trace Silt (TOPSOIL).
			Dry, light brown, fine to coarse SAND, some fine to coarse Gravel, little Cobbles.
		164.60	
5		164.50	Dry, brown/gray, coarse GRAVEL, little fine to coarse Sand (BEDROCK FRAGMENTS).
			Bedrock at 4.5'
10			
15			
20			

PLAN VIEW



Not to Scale

SKETCHES



REMARKS:

1. Excavator hit refusal at 4.5 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-6

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

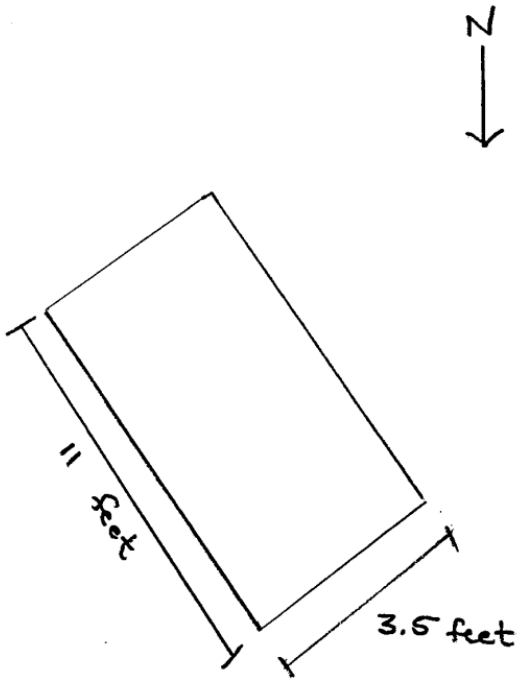
TEST PIT NO. SWM-7

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		165.1
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-18-2016 /		None Encountered	DATE START	10/18/2016	GRID	N	126927
					DATE END	10/18/2016	COORD	E	2824024

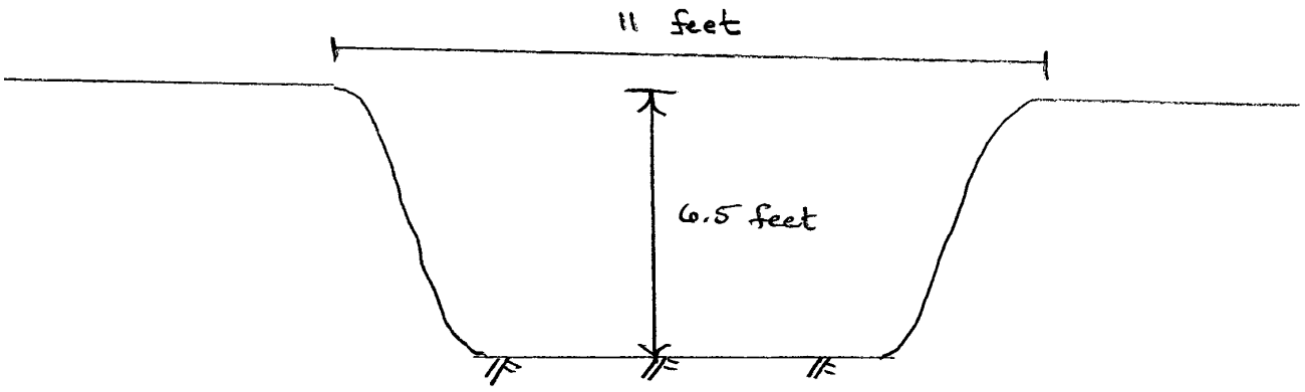
DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		164.60	Dry, dark brown, fine to coarse SAND and organic material (leaves, grass, roots), trace Silt (TOPSOIL).
			0.5'-1': Dry, dark brown, fine to coarse SAND and rounded Boulders, trace Roots (FILL).
			1'-6.3': Dry, tan, fine to coarse SAND, some Cobbles, some Boulders (FILL).
5		158.80	
		158.60	Moist, brown/gray, coarse GRAVEL, little fine to coarse SAND (ROCK FRAGMENTS).
			Bedrock at 6.5'
10			
15			
20			

PLAN VIEW



Not to Scale

SKETCHES



LOOKING SOUTHWEST

(NTS)

REMARKS:

1. Excavator hit refusal at 6.5 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-7

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

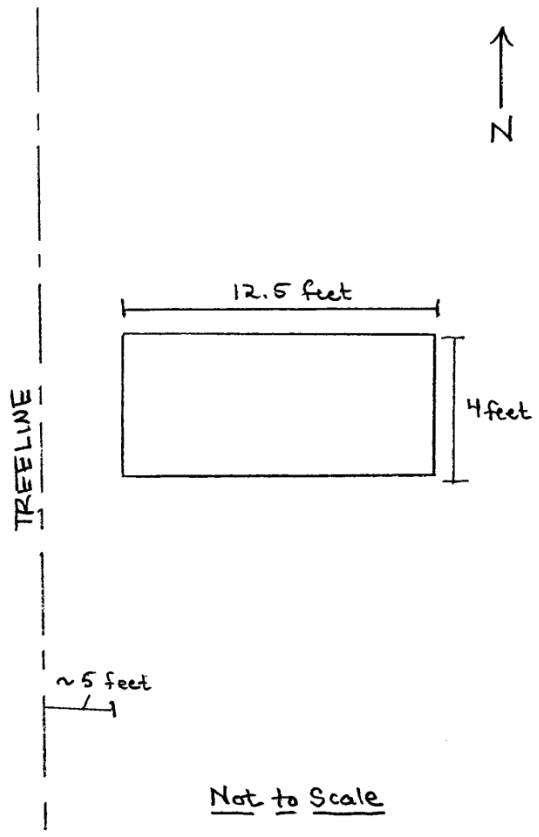
TEST PIT NO. SWM-8

SHEET 1 OF 1

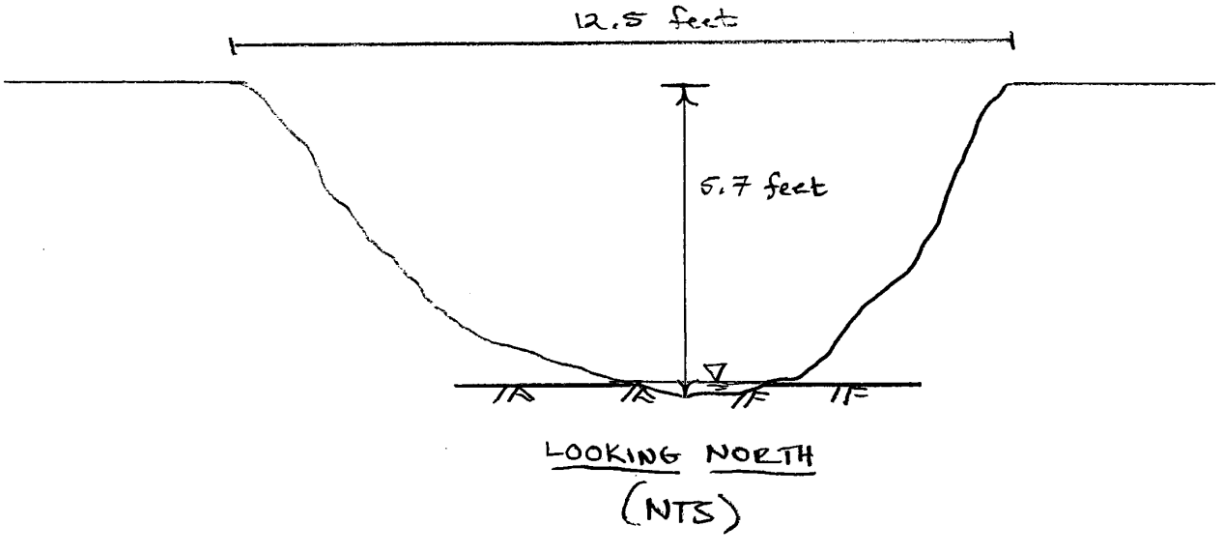
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		155.5
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-17-2016 / 1:55PM	5.6	Upon Completion	DATE START	10/17/2016	GRID	N	127483.6
					DATE END	10/17/2016	COORD	E	2824532.3

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
0		155.00	Dry, dark brown, fine to coarse SAND, some organic material (leaves, grass, roots), trace Silt (TOPSOIL).
			Dry, light brown, fine to coarse SAND, some fine Gravel, little Cobbles, trace Boulders (FILL).
5		149.80	Bedrock at 5.7'
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Excavator hit refusal at 5.7 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS	
< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-8

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

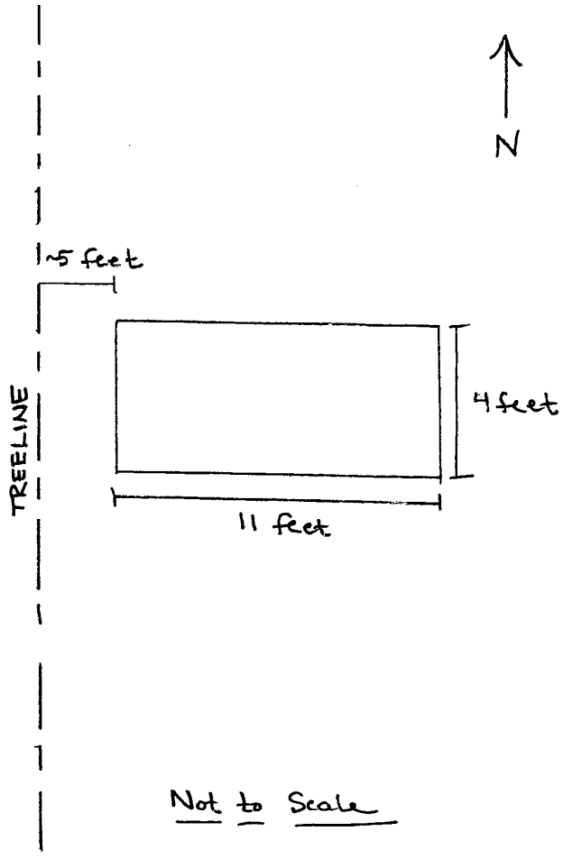
TEST PIT NO. SWM-9

SHEET 1 OF 1

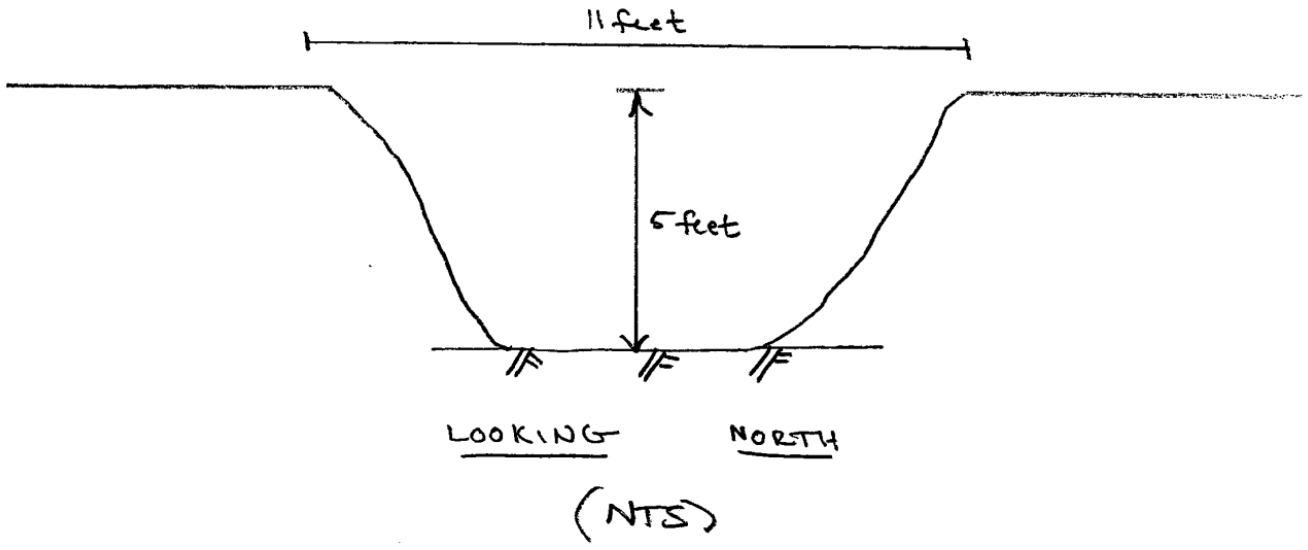
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION		145.8
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM		NAVD88
BUCKET	1/3 cu. yd	10-17-2016 /		None Encountered	DATE START	10/17/2016	GRID	N	127673.5
					DATE END	10/17/2016	COORD	E	2824579.5

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		145.30	Dry, dark brown, fine to coarse SAND, some organic material (leaves, grass, roots), trace Silt (TOPSOIL).
			Dry, light brown, fine to coarse SAND, some Cobbles, little fine to coarse Gravel, trace Boulders, trace Silt (FILL).
		141.30	
5		140.80	Dry, brown/gray, coarse GRAVEL, little fine to coarse Sand (BEDROCK FRAGMENTS).
			Bedrock at 5'
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Excavator hit refusal at 5 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-9

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

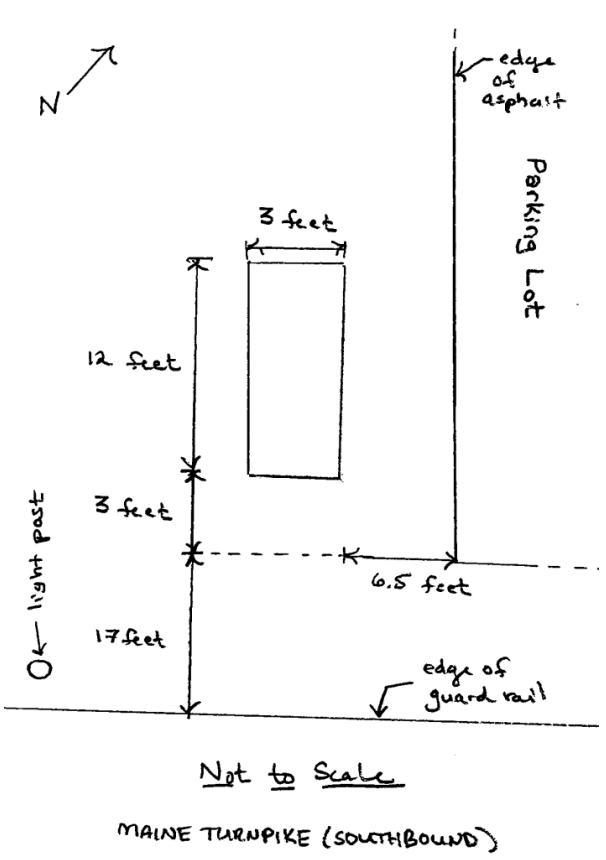
TEST PIT NO. SWM-10

SHEET 1 OF 1

CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION	43.5
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM	NAVD88
BUCKET	1/3 cu. yd	10-19-2016 / 2:30PM	10	Upon Completion	DATE START	10/19/2016	GRID N	119419.7
					DATE END	10/19/2016	COORD E	2821024

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		43.00	Dry, dark brown, fine to coarse SAND and organic material (grass, leaves, roots), trace Silt (TOPSOIL).
			0.5'-5.4': Wet, dark brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt (FILL).
5			5.4'-7.5': Wet, dark brown, fine to coarse SAND, some(-) fine to coarse Gravel, little Cobbles, little Boulders (FILL).
		36.00	Wet, gray/brown, Clayey SILT.
10		32.70	
15			
20			

PLAN VIEW



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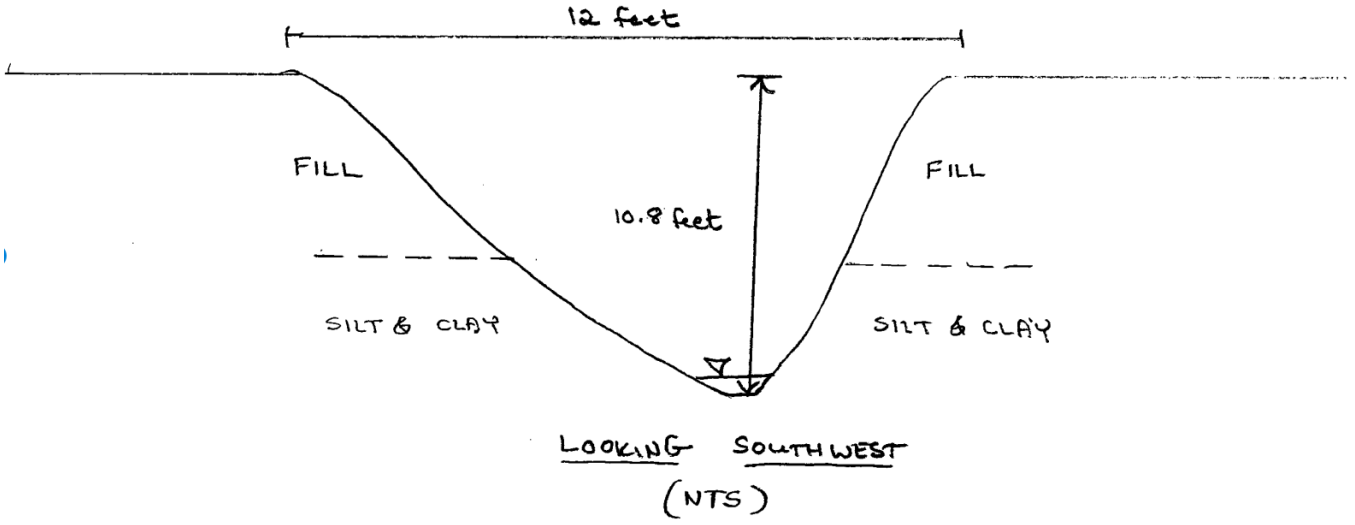


REMARKS:

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-10

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

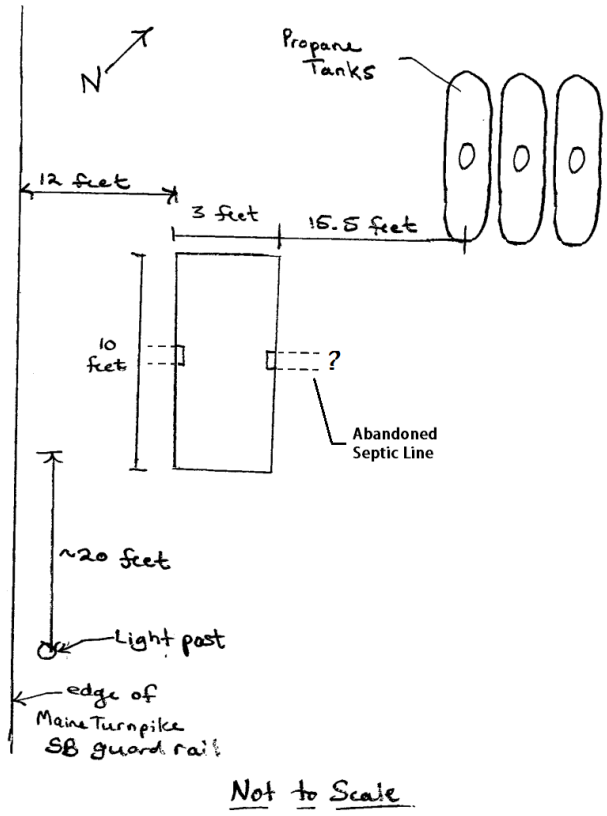
TEST PIT NO. SWM-11

SHEET 1 OF 1

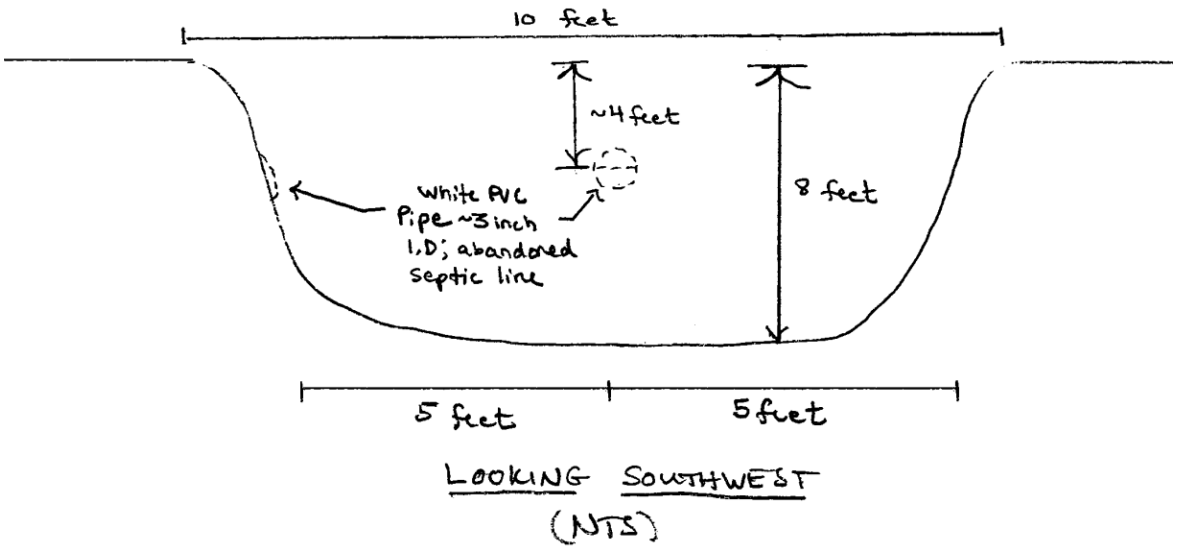
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION	46.5
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM	NAVD88
BUCKET	1/3 cu. yd	10-19-2016 /		None Encountered	DATE START	10/19/2016	GRID N	119607.6
					DATE END	10/19/2016	COORD E	2821236

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		46.00	Dry, dark brown, fine to coarse SAND and organic material (grass, leaves, roots), trace Silt (TOPSOIL).
			Dry to Moist, light brown, fine to coarse SAND, some fine to coarse Gravel, little rounded Cobbles (FILL).
5			
		38.50	
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Test pit moved 7 feet south from original marked location to avoid electric line interference.
2. Test pit had to be abandoned due to unmarked utility encountered during excavation (determined to be a discontinued septic line).

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-11

LOG OF TEST PIT

JACOBS

PROJECT	York Toll Plaza
LOCATION	Maine Turnpike
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71602

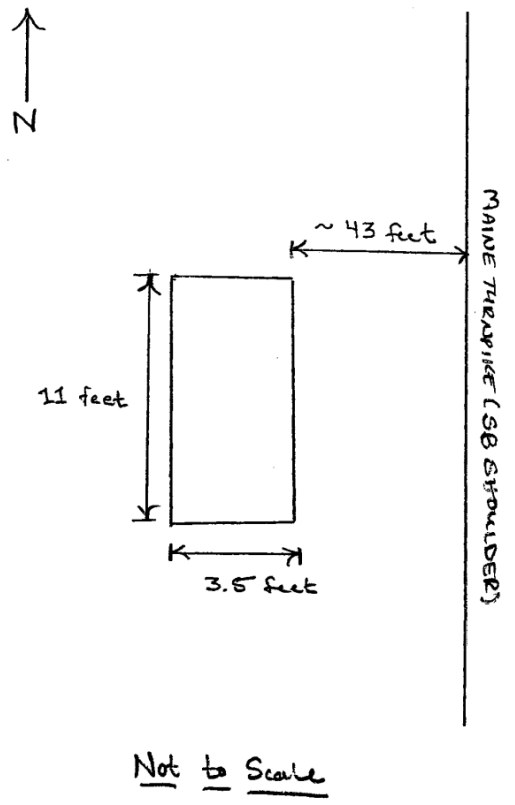
TEST PIT NO. SWM-12

SHEET 1 OF 1

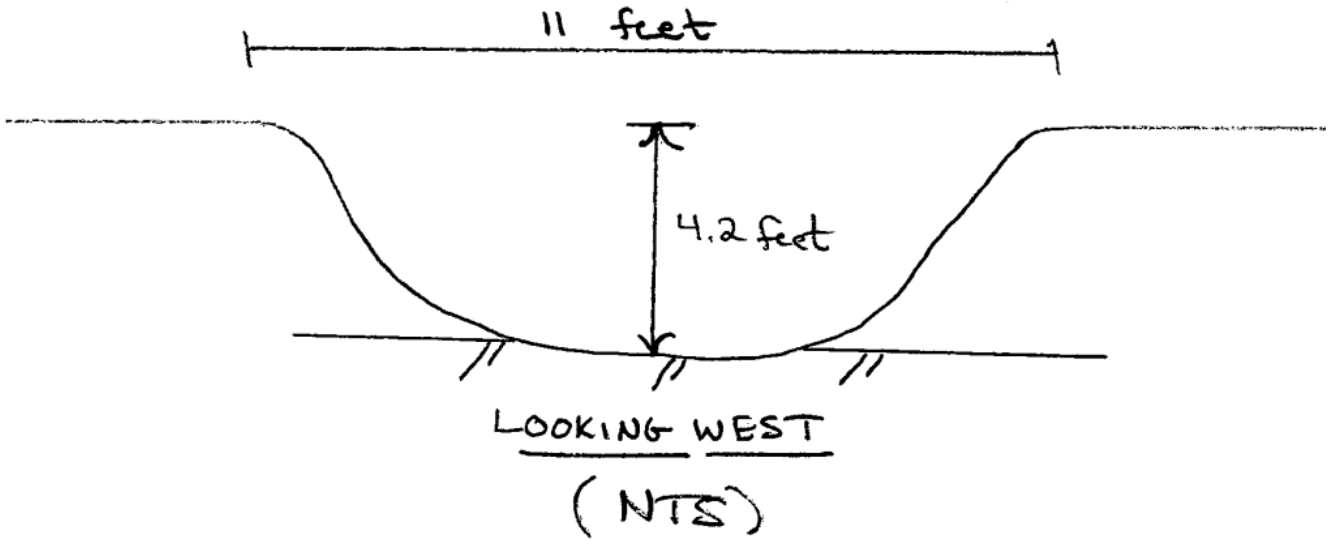
CONTRACTOR	New England Boring	GROUNDWATER READING			OPERATOR	D. Thompson	ELEVATION	91.6
EXCAVATOR	Kubota KX080-4	DATE/TIME	DEPTH(ft)	REMARKS	INSPECTOR	G. Shay	DATUM	NAVD88
BUCKET	1/3 cu. yd	10-19-2016 /		None Encountered	DATE START	10/19/2016	GRID N	121694.4
					DATE END	10/19/2016	COORD E	2822646.3

DEPTH (ft)	STRATA SYMBOL	ELEV (ft)	FIELD CLASSIFICATION AND REMARKS
		90.90	Dry, dark brown, fine to coarse SAND and organic material (leaves, roots, grass), trace Silt (TOPSOIL).
		89.60	Dry, dark brown, fine to coarse SAND, some fine to coarse Gravel, trace Cobbles (FILL).
			Dry, brown/gray, coarse GRAVEL, little fine to coarse Sand (FRACTURED/WEATHERED BEDROCK).
		87.40	Bedrock at 4.2'
5			
10			
15			
20			

PLAN VIEW



SKETCHES



REMARKS:

1. Excavator hit refusal at 4.2 feet, probable bedrock.

LEGEND

WATER LEVEL | JAR SAMPLE | BAG SAMPLE

RELATIVE PROPORTIONS

< 10%	TRACE
10 - 20%	LITTLE
20 - 35%	SOME
35 - 50%	AND

TEST PIT NO. SWM-12

Appendix C. **Rock Core Photos**

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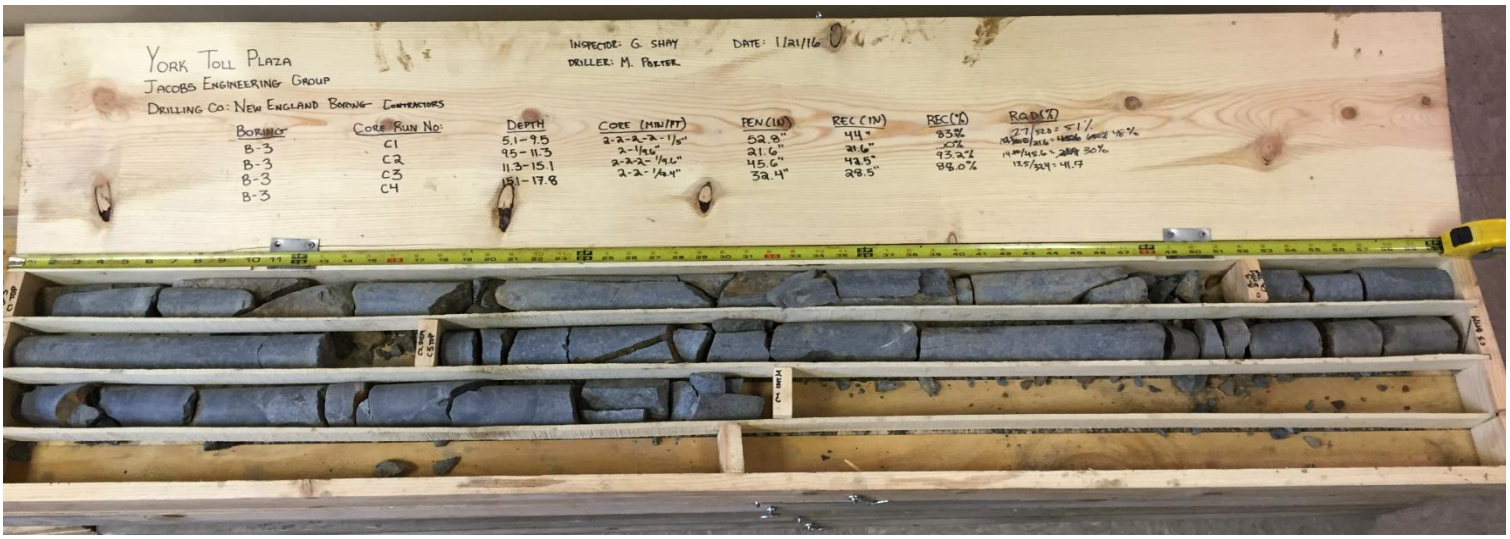
York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-3 (OW)
Bedrock Type: METAWACKE

B-3 (DRY)



B-3 (WET)

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-8 & B-6

Bedrock Type: (B-6) GRANITE/ METAWACKE
(B-8) METAWACKE

B-6 & B-8 (DRY)

(Continued on next page)

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-8 & B-6

Bedrock Type: (B-6) GRANITE/ METAWACKE
(B-8) METAWACKE

B-6 & B-8 (WET)

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-7 & B-11
Bedrock Type: METAWACKE

B-7 & B-11 (DRY)

B-7 & B-11 (WET)

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-9 & B-10
Bedrock Type: (B-9) GRANITE/ METAWACKE
(B-10) GRANITE

B-9 & B-10 (DRY)

B-9 & B-10 (WET)

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-12
Bedrock Type: METAWACKE

B-12 (DRY)

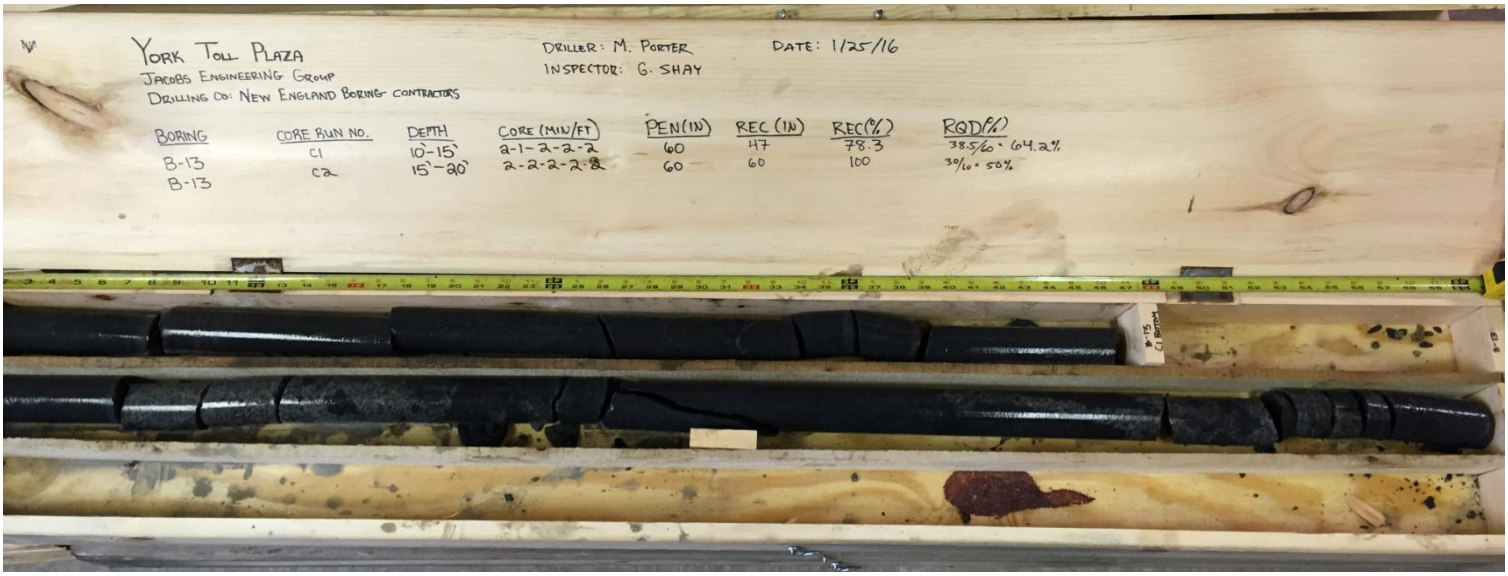
B-12 (WET)

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-13 (OW)
Bedrock Type: METAWACKE

B-13 (DRY)

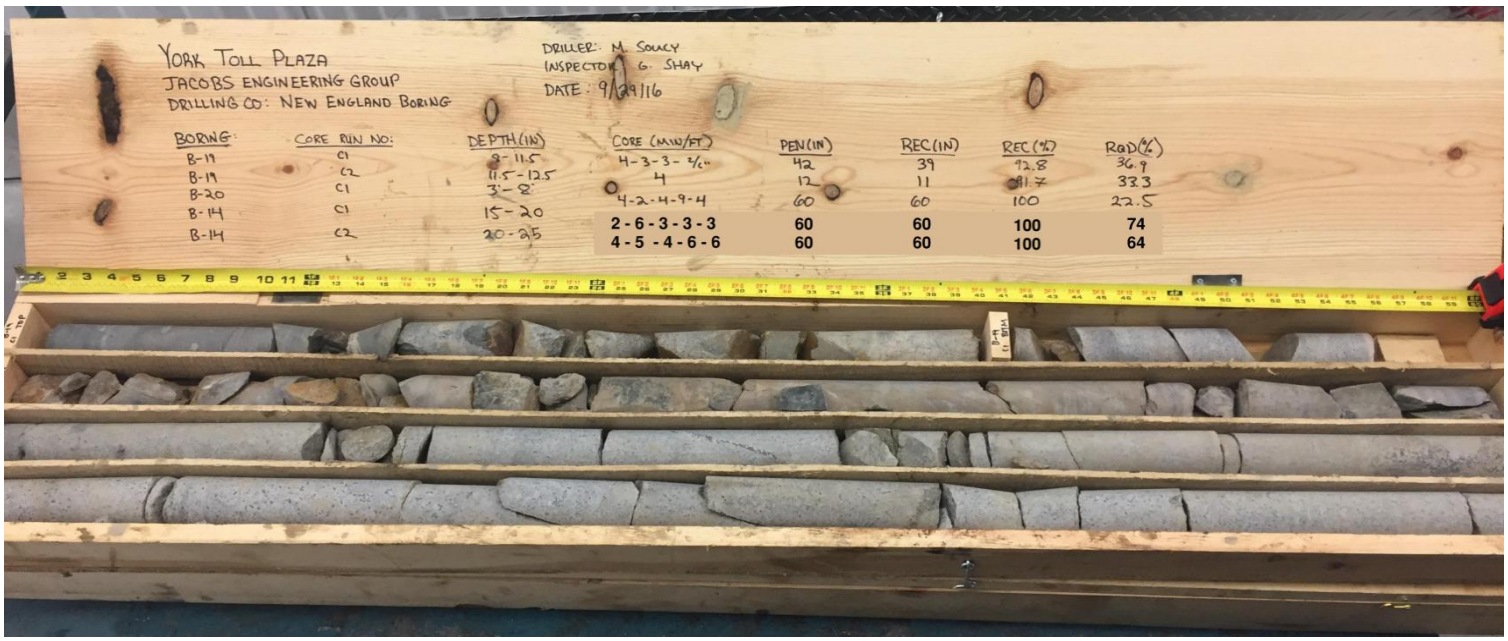
B-13 (WET)



York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-14, B-19, B-20
Bedrock Type: GRANITE (B-14), METAWACKE/GRANITE (B-19), METAWACKE (B-20)

DRY



WET

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. B-15, B-21, B-22
Bedrock Type: METWACKE (B-15 & B-21), GRANITE (B-22)

DRY

WET

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. SB-3, B-16
Bedrock Type: GRANITE

DRY

WET

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. SB-5, SB-7
Bedrock Type: METAWACKE/ METASANDSTONE (SB-5), GRANITE (SB-7)

DRY

WET

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. SB-8, SB-11
Bedrock Type: GRANITE

DRY

WET

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. SB-9, SB-12, SB-14
Bedrock Type: METAWACKE (SB-9), GRANITE (SB-12 & SB-14)

DRY

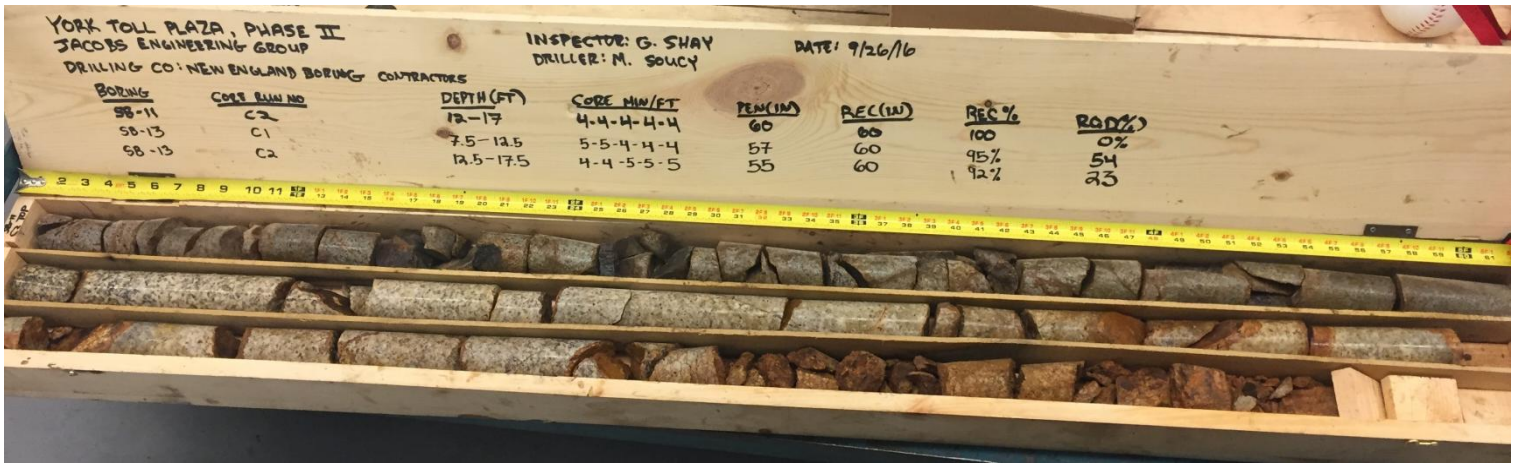
WET

York Toll Plaza (Mile 8.8)
Rock Core Photos

Boring No. SB-11, SB-13
Bedrock Type: GRANITE

DRY

WET



Appendix D. **Laboratory Testing Results**

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January 2016 Explorations

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THIELSCH ENGINEERING

State of Maine - Department of Transportation
Laboratory Testing Summary Sheet

York Toll Plaza

MDOT Project Number:

Jacobs Engineering Group, Inc.
Project Number: E2X71602

Town(s): York, ME

Boring & Sample Identification Number	Station (Feet)	Sample No.	Depth (Feet)	Lab Number	Organic %	W.C.	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
B-2		S-2A	7.4-9.4	16-S-162		8.3			SM	A-4(0)	0
B-2		S-2B	7.4-9.4	16-S-163		2.9			GM	A-1-a	I
B-3		S-2A	2-3.6	16-S-164		45.6			SM	A-4(0)	III
B-3		S-2B	2-3.6	16-S-165		1.7			GP	A-1-a	0
B-4		S-2B	5-7	16-S-166		11.5			GW-GM	A-1-a	0
B-7		S-1	0-2	16-S-167		7.1			SP-SM	A-1-b	II
B-8		S-2	5-5.7	16-S-168		14.8			SM	A-1-b	II
B-10		S-1	1.4-3.4	16-S-169		8.6			SP-SM	A-1-a	II
B-10		S-2	3.4-5.4	16-S-170		10.4			SM	A-1-b	II
B-11		S-2	4-6	16-S-171		9.9			GM	A-1-a	0
B-12		S-3A	4-6	16-S-172		8.8			SM	A-1-b	II
B-12		S-3B	4-6	16-S-173		1.6			GP	A-1-a	0

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MDOT and Corps of Engineers Classification Systems.

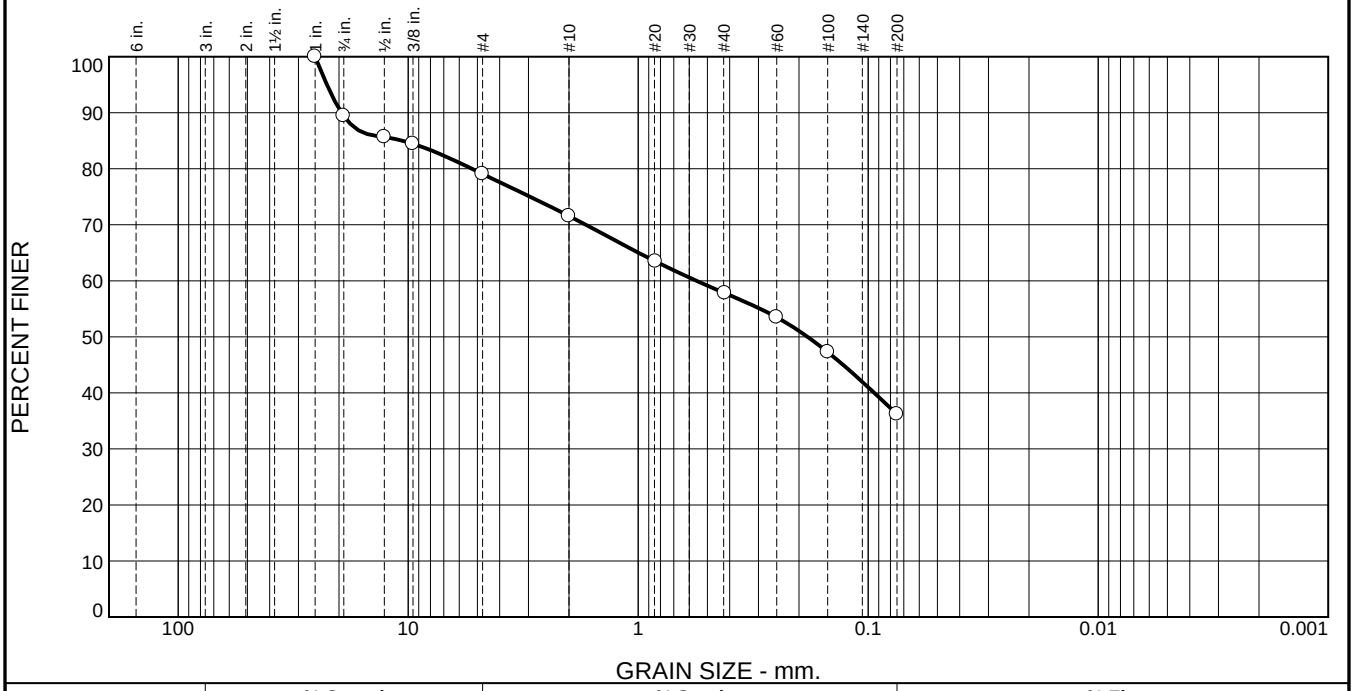
GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.6	10.3	7.5	13.7	21.7	36.2	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	89.5		
.5"	85.7		
.375"	84.5		
#4	79.1		
#10	71.6		
#20	63.5		
#40	57.8		
#60	53.5		
#100	47.3		
#200	36.2		

* (no specification provided)

Material Description

Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 19.4994 D_{85}= 10.5918 D_{60}= 0.5573
D_{50}= 0.1835 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = 0

Date Received: 2/23/16 **Date Tested:** 2/24/16

Tested By: MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 7.4-9.4' **Date Sampled:**

Sample Number: B-2: S-2A

Thielsch Engineering Inc.

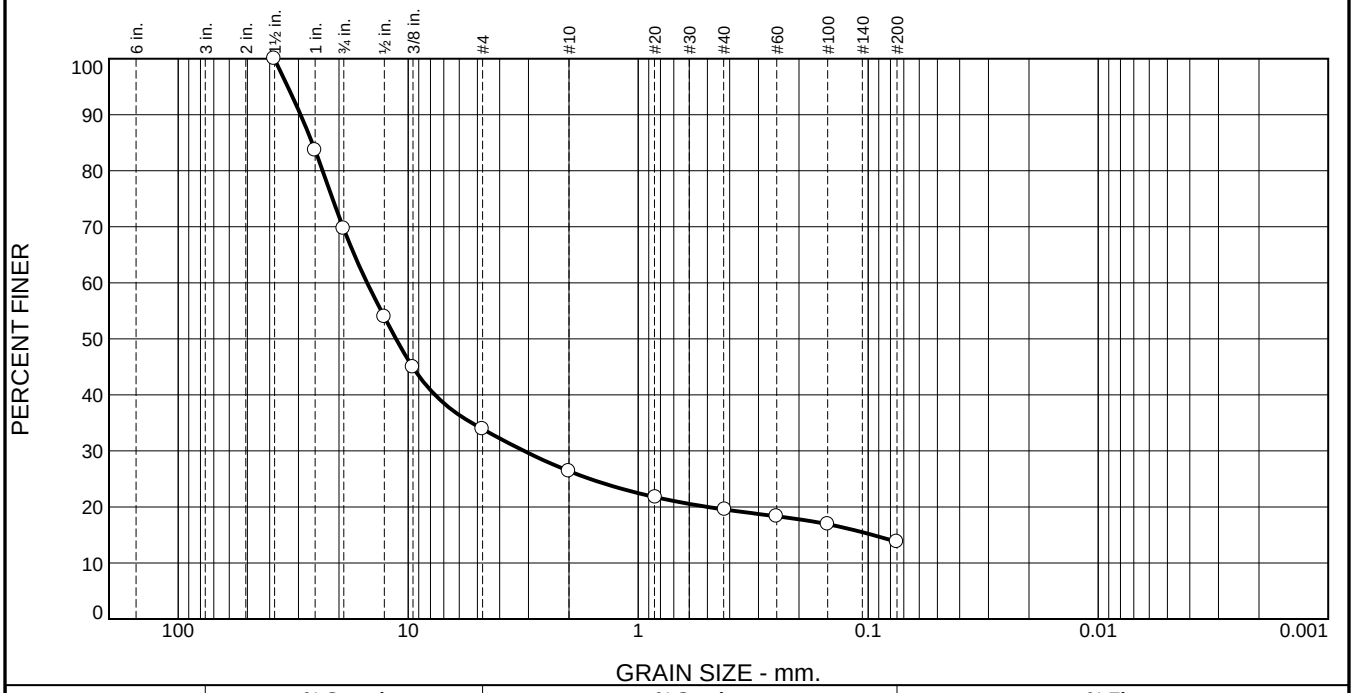
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-162

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	30.4	35.7	7.5	6.8	5.8	13.8	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	83.7		
0.75"	69.7		
.5"	53.9		
.375"	44.9		
#4	33.9		
#10	26.4		
#20	21.7		
#40	19.5		
#60	18.3		
#100	16.9		
#200	13.8		

* (no specification provided)

Material Description

Brown silty gravel with sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 29.3694 D_{85}= 26.1444 D_{60}= 15.0765
D_{50}= 11.2970 D_{30}= 3.1330 D_{15}= 0.0957
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = I

Date Received: 2/23/16 **Date Tested:** 2/24/16

Tested By: MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 7.4-9.4' **Date Sampled:**

Sample Number: B-2: S-2B

Thielsch Engineering Inc.

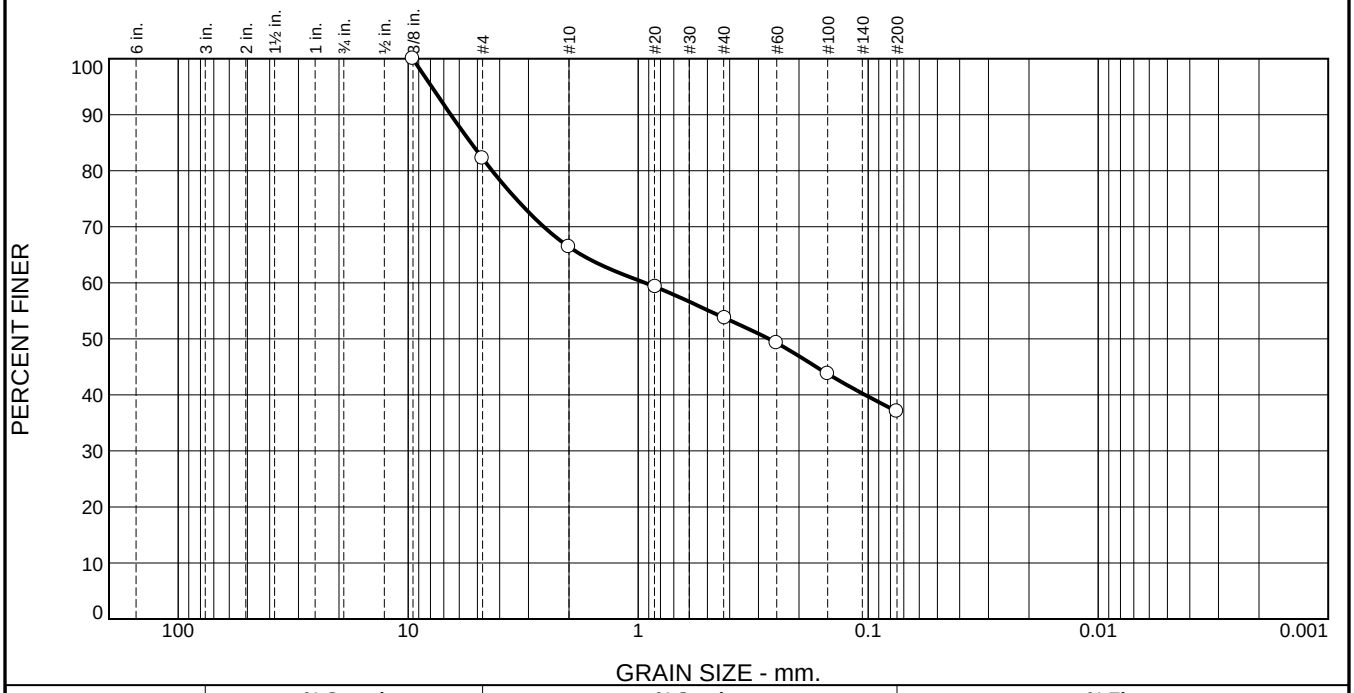
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-163

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	17.8	15.8	12.6	16.8	37.0	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375"	100.0		
#4	82.2		
#10	66.4		
#20	59.3		
#40	53.7		
#60	49.3		
#100	43.7		
#200	37.0		

* (no specification provided)

Material Description

Red-brown silty sand with gravel (with Organics)

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 6.5227 D_{85}= 5.3394 D_{60}= 0.9332
D_{50}= 0.2702 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = III

Date Received: 2/23/16 **Date Tested:** 2/24/16

Tested By: MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 2-3.6' **Date Sampled:**

Sample Number: B-3: S-2A

Thielsch Engineering Inc.

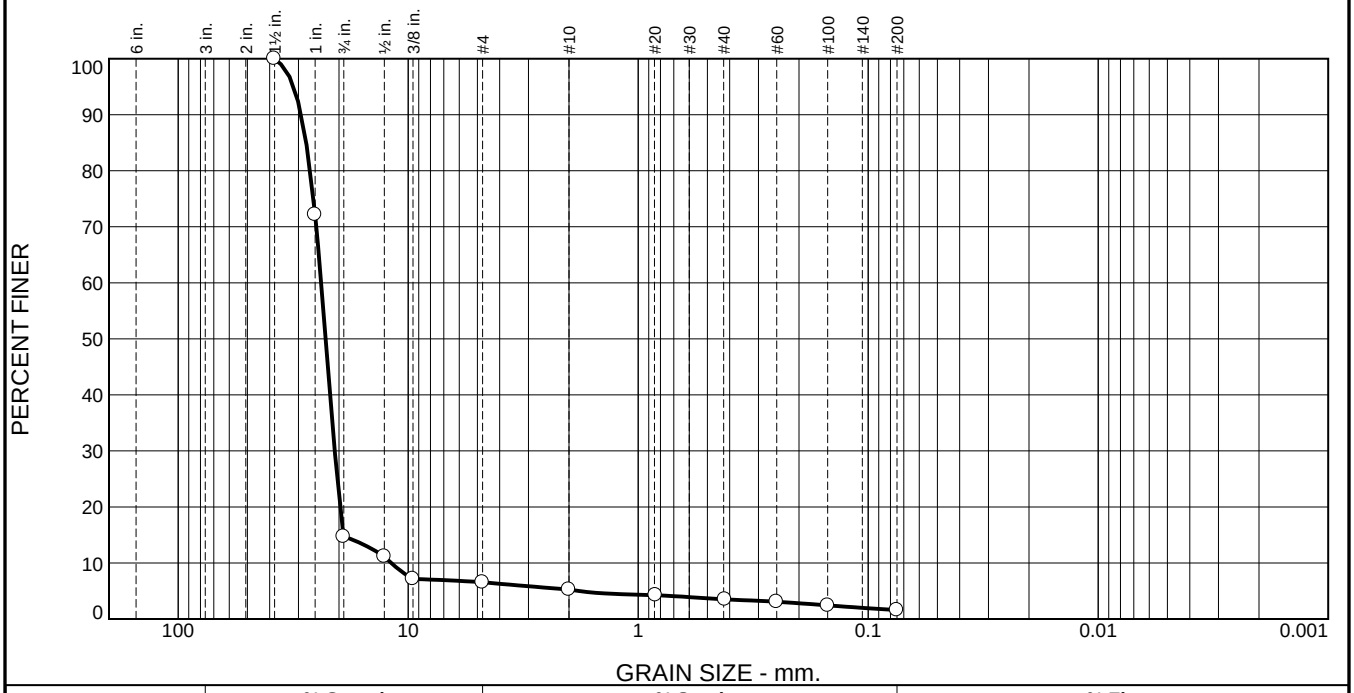
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-164

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	85.3	8.1	1.3	1.8	1.9	1.6	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	72.2		
0.75"	14.7		
.5"	11.2		
.375"	7.1		
#4	6.6		
#10	5.3		
#20	4.2		
#40	3.5		
#60	3.1		
#100	2.4		
#200	1.6		

* (no specification provided)

Material Description

Brown poorly graded gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 29.1980 D_{85}= 27.7590 D_{60}= 23.8885
D_{50}= 22.8320 D_{30}= 20.8498 D_{15}= 19.1403
D_{10}= 11.8631 C_u= 2.01 C_c= 1.53

Remarks

Maine DOT Frost = 0

Date Received: 2/23/16 **Date Tested:** 2/24/16

Tested By: MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 2-3.6' **Date Sampled:**

Sample Number: B-3: S-2B

Thielsch Engineering Inc.

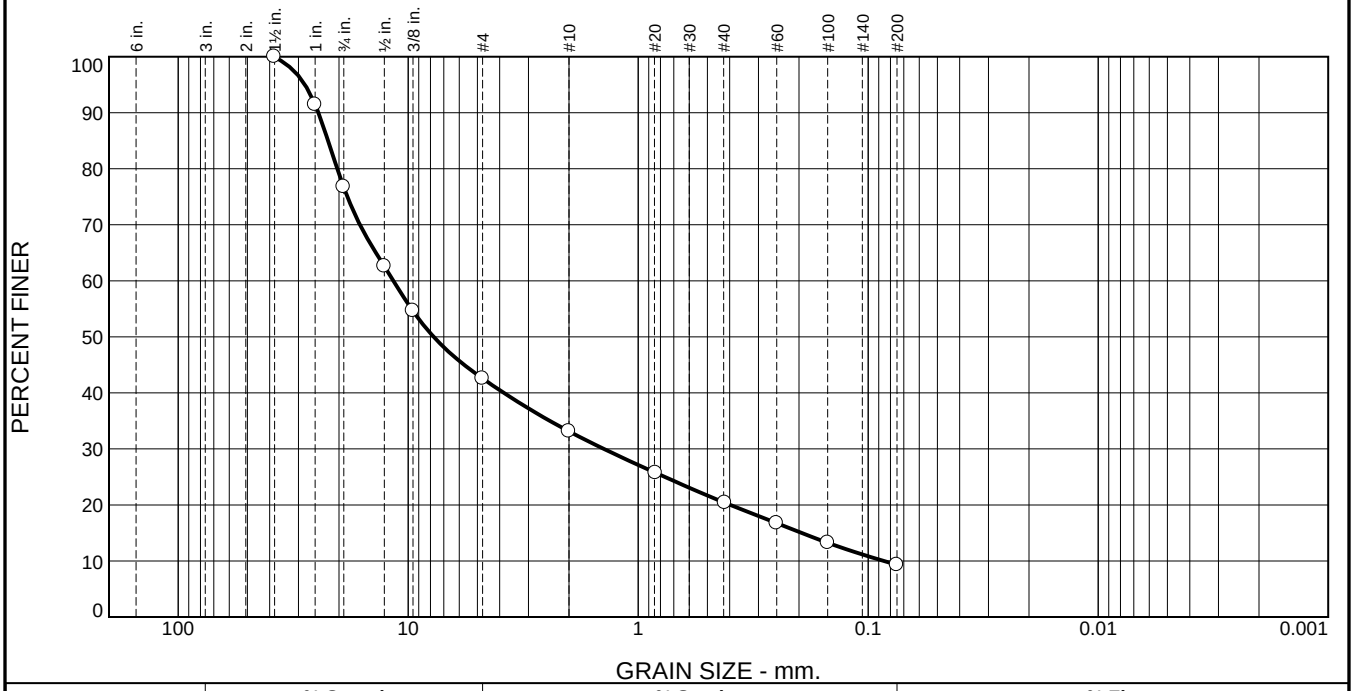
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-165

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	23.4	34.0	9.5	12.6	11.2	9.3	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	91.5		
0.75"	76.8		
.5"	62.6		
.375"	54.6		
#4	42.6		
#10	33.1		
#20	25.7		
#40	20.4		
#60	16.8		
#100	13.2		
#200	9.3		

* (no specification provided)

Material Description

Brown well-graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GW-GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 24.5732 D_{85}= 22.2860 D_{60}= 11.6004
D_{50}= 7.7454 D_{30}= 1.4097 D_{15}= 0.1946
D_{10}= 0.0854 C_u= 135.83 C_c= 2.01

Remarks

Maine DOT Frost = 0

Date Received: 2/23/16 **Date Tested:** 2/24/16

Tested By: MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 5-7' **Date Sampled:**

Sample Number: B-4: S-2B

Thielsch Engineering Inc.

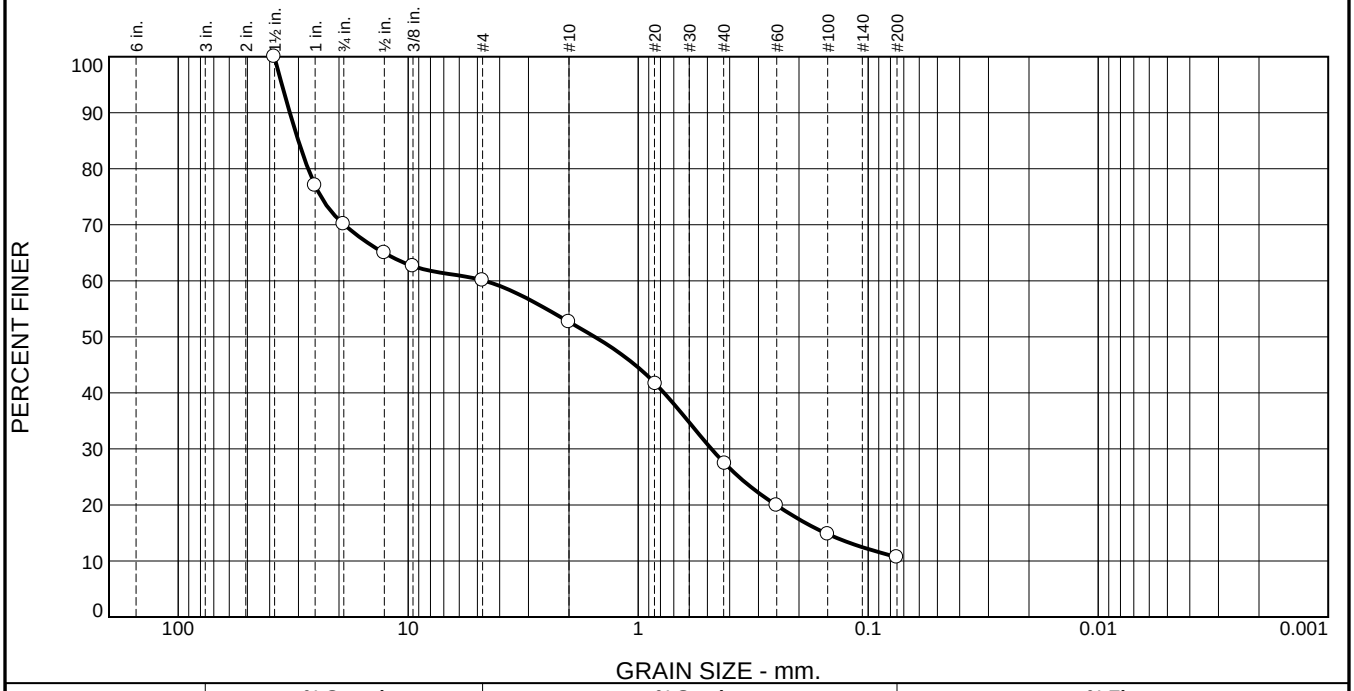
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-166

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	29.9	10.0	7.4	25.1	16.9	10.7	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	77.0		
0.75"	70.1		
.5"	65.0		
.375"	62.6		
#4	60.1		
#10	52.7		
#20	41.6		
#40	27.4		
#60	19.9		
#100	14.8		
#200	10.7		

* (no specification provided)

Material Description

Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 32.6878 D_{85}= 30.0273 D_{60}= 4.6508
D_{50}= 1.5435 D_{30}= 0.4802 D_{15}= 0.1537
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = II

Date Received: 2/23/16 **Date Tested:** 2/25/16

Tested By: MS/AS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 0-2' **Date Sampled:**

Sample Number: B-7: S-1

Thielsch Engineering Inc.

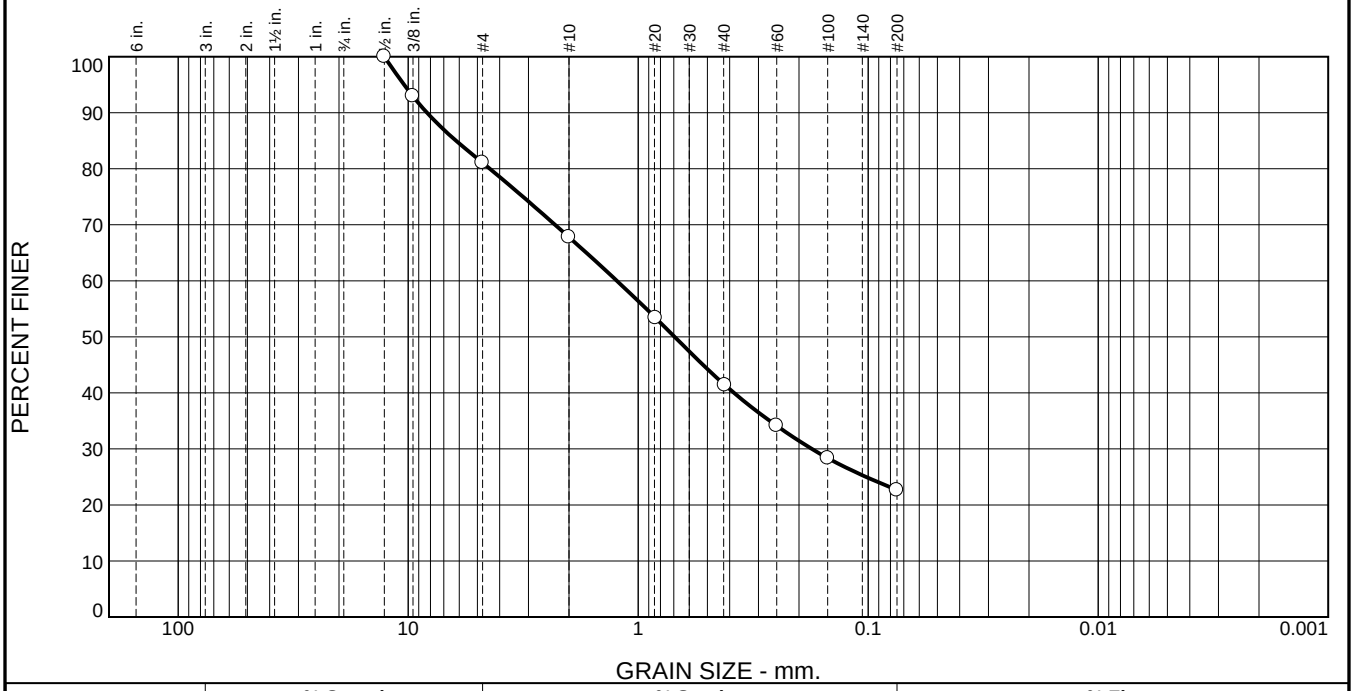
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-167

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	18.9	13.3	26.2	18.9	22.7	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	93.0		
#4	81.1		
#10	67.8		
#20	53.4		
#40	41.4		
#60	34.1		
#100	28.4		
#200	22.7		

* (no specification provided)

Material Description

Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 8.2883 D_{85}= 6.1900 D_{60}= 1.2375
D_{50}= 0.6942 D_{30}= 0.1757 D_{15}=
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = II

Date Received: 2/23/16 **Date Tested:** 2/25/16

Tested By: MS/AS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 5-5.7' **Date Sampled:**

Sample Number: B-8: S-2

Thielsch Engineering Inc.

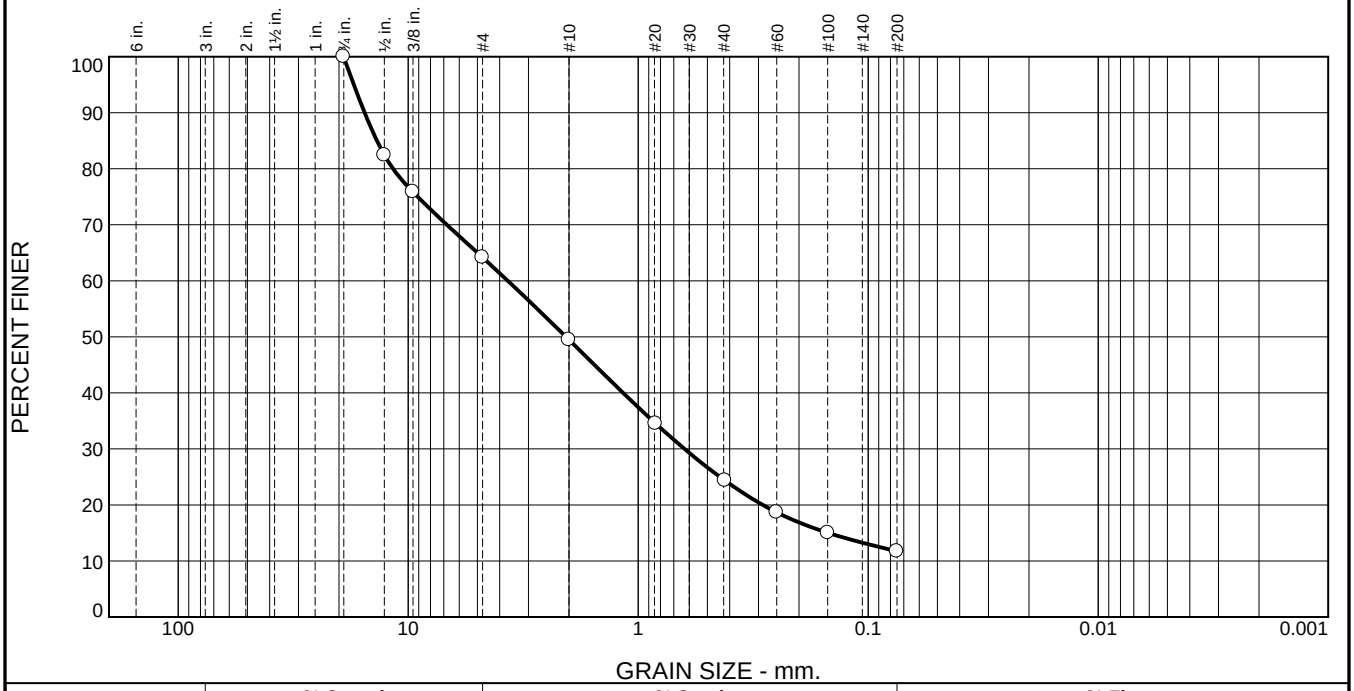
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-168

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.1	35.7	14.7	25.0	12.8	11.7	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
.5"	82.4		
.375"	75.9		
#4	64.2		
#10	49.5		
#20	34.5		
#40	24.4		
#60	18.7		
#100	15.0		
#200	11.7		

* (no specification provided)

Material Description

Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 15.4595 D_{85}= 13.6829 D_{60}= 3.6877
D_{50}= 2.0589 D_{30}= 0.6287 D_{15}= 0.1490
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = II

Date Received: 2/23/16 **Date Tested:** 2/25/16

Tested By: MS/AS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 1.4-3.4' **Date Sampled:**

Sample Number: B-10: S-1

Thielsch Engineering Inc.

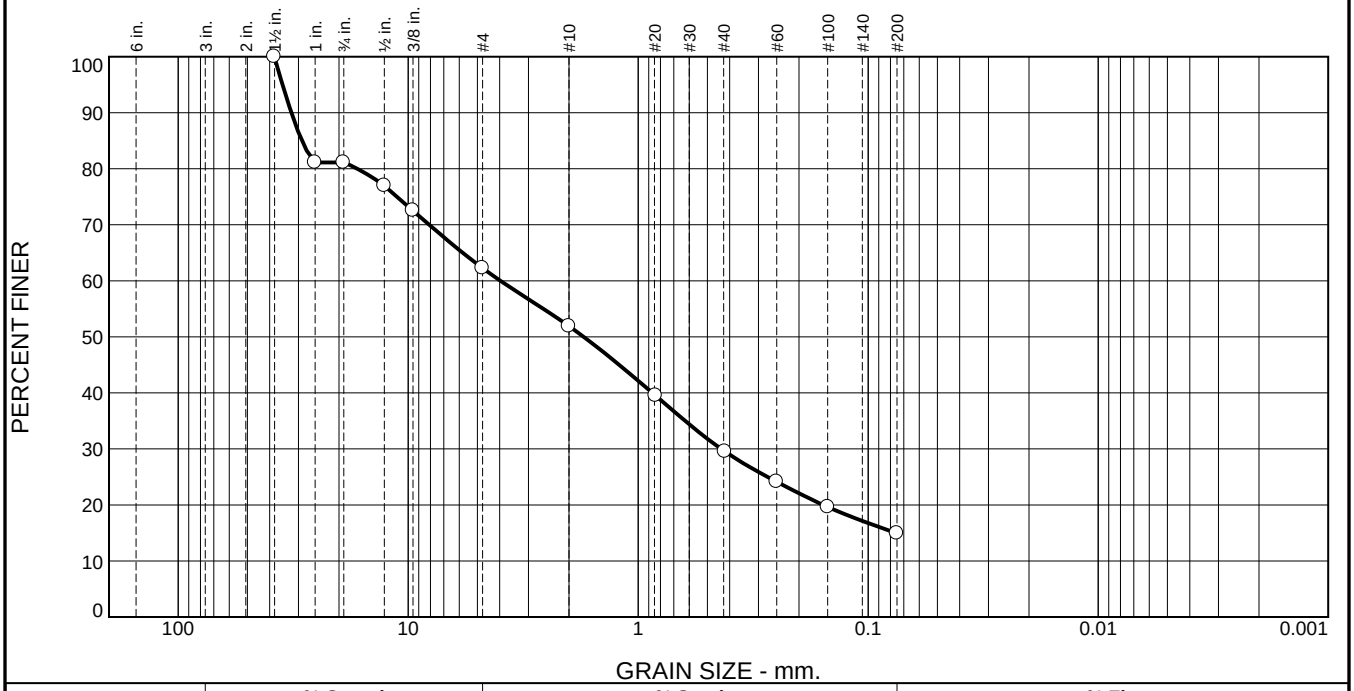
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-169

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.9	18.8	10.4	22.2	14.8	14.9	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	81.1		
0.75"	81.1		
.5"	77.0		
.375"	72.5		
#4	62.3		
#10	51.9		
#20	39.5		
#40	29.6		
#60	24.1		
#100	19.6		
#200	14.9		

* (no specification provided)

Material Description

Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 32.2010 D_{85}= 28.9845 D_{60}= 3.9668
D_{50}= 1.7258 D_{30}= 0.4355 D_{15}= 0.0756
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = II

Date Received: 2/23/16 **Date Tested:** 2/25/16

Tested By: MS/AS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 3.4-5.4' **Date Sampled:**

Sample Number: B-10: S-2

Thielsch Engineering Inc.

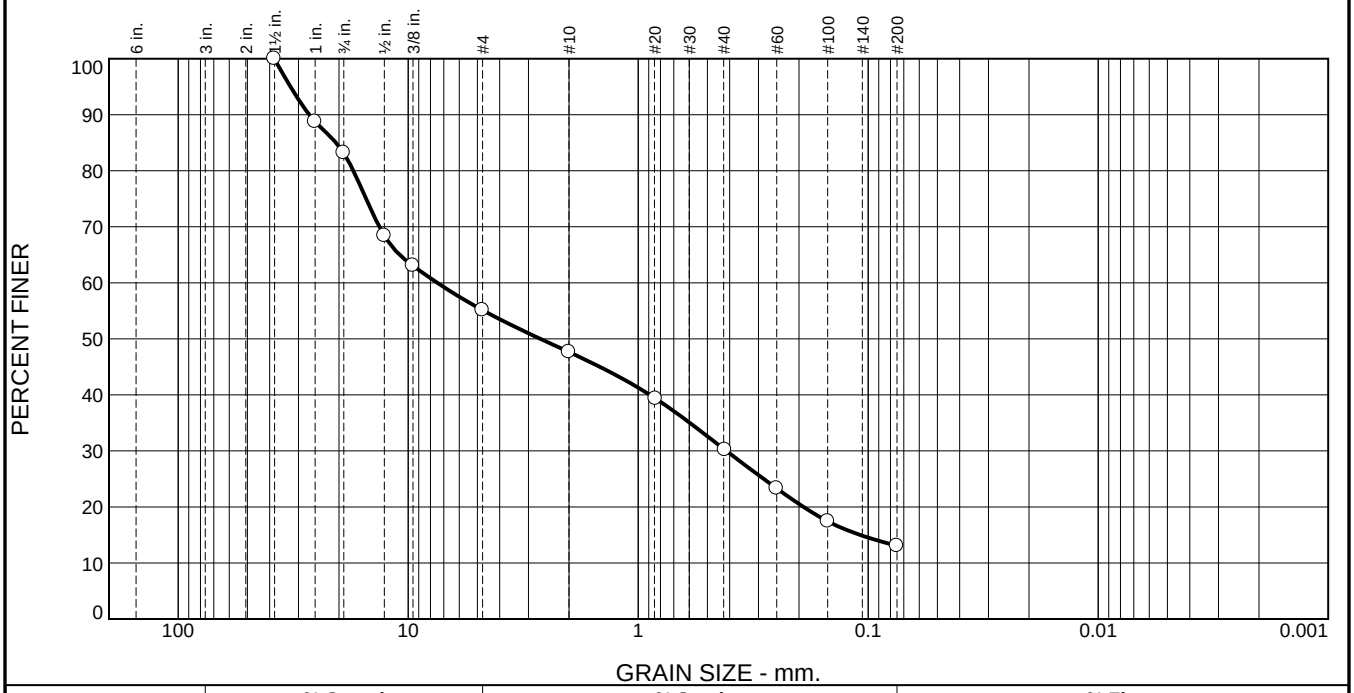
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	16.9	28.0	7.4	17.3	17.3	13.1	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	88.8		
0.75"	83.2		
.5"	68.4		
.375"	63.1		
#4	55.1		
#10	47.7		
#20	39.3		
#40	30.2		
#60	23.3		
#100	17.4		
#200	13.1		

* (no specification provided)

Material Description

Brown silty gravel with sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 26.9300 D_{85}= 20.5818 D_{60}= 7.4649
D_{50}= 2.6612 D_{30}= 0.4135 D_{15}= 0.1083
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = 0

Date Received: 2/23/16 **Date Tested:** 2/25/16

Tested By: MS/AS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 4-6' **Date Sampled:**

Sample Number: B-11: S-2

Thielsch Engineering Inc.

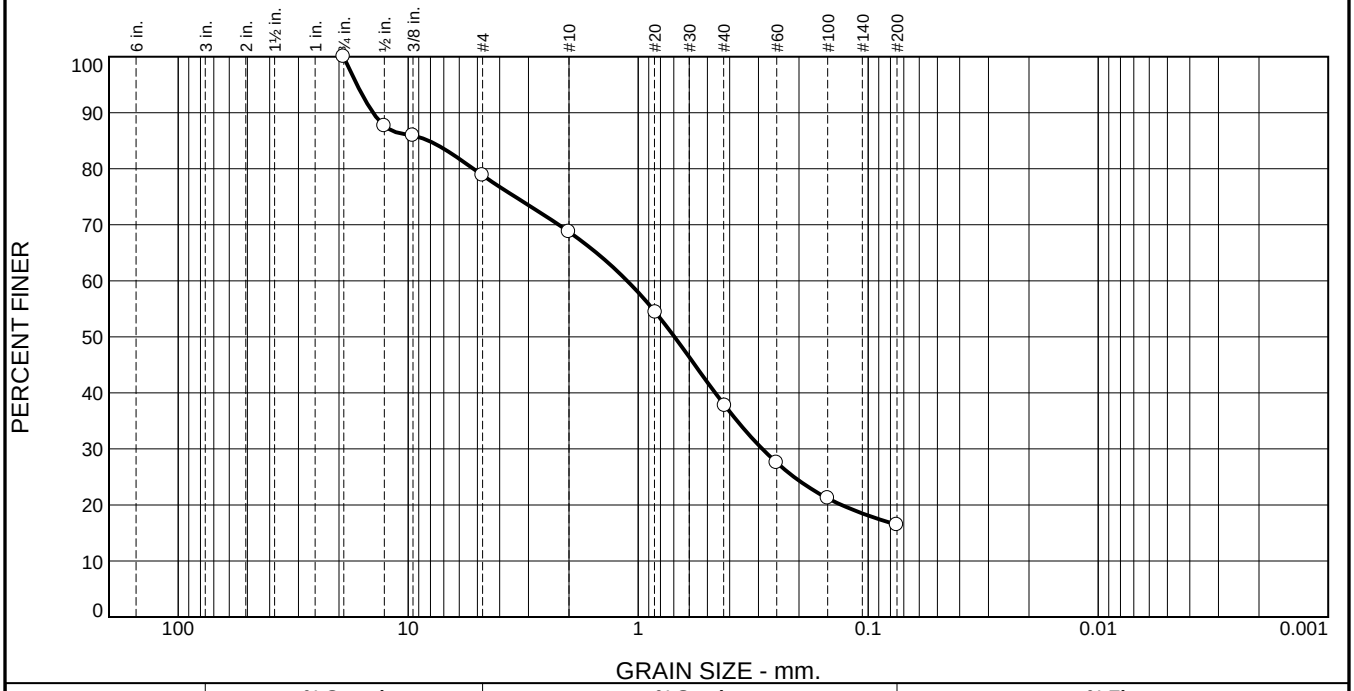
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-171

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.1	21.1	10.1	30.7	21.6	16.4	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
.5"	87.6		
.375"	85.9		
#4	78.8		
#10	68.7		
#20	54.4		
#40	37.7		
#60	27.6		
#100	21.2		
#200	16.4		

* (no specification provided)

Material Description

Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 14.2188 D_{85}= 8.1536 D_{60}= 1.1164
D_{50}= 0.6953 D_{30}= 0.2886 D_{15}=
D_{10}= C_u= C_c=

Remarks

Maine DOT Frost = II

Date Received: 2/23/16 **Date Tested:** 2/25/16

Tested By: MS/AS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 4-6' **Date Sampled:**

Sample Number: B-12: S-3A

Thielsch Engineering Inc.

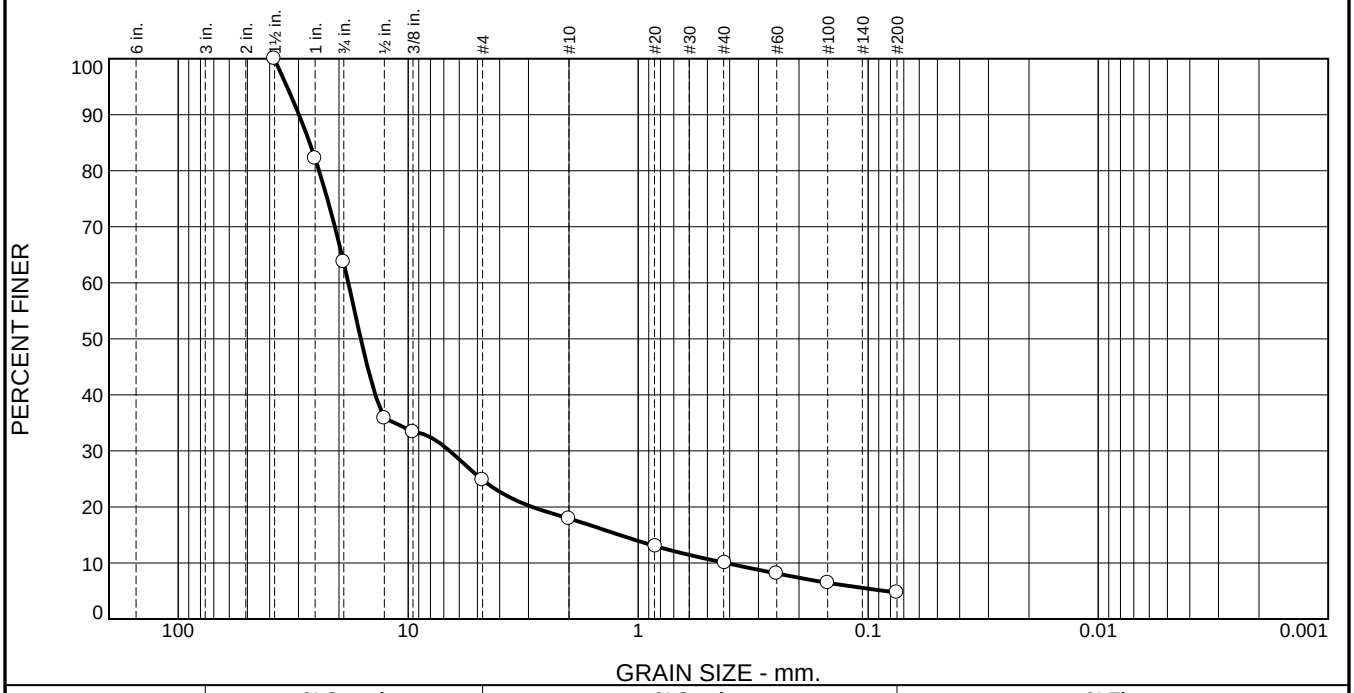
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-172

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	36.4	38.8	6.9	7.8	5.4	4.7	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	82.2		
0.75"	63.8		
.5"	35.8		
.375"	33.4		
#4	24.8		
#10	17.9		
#20	13.0		
#40	10.0		
#60	8.1		
#100	6.5		
#200	4.7		

* (no specification provided)

Material Description

Brown poorly graded gravel with sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 29.8358 D_{85}= 26.8137 D_{60}= 18.2067
D_{50}= 16.0670 D_{30}= 6.5988 D_{15}= 1.2044
D_{10}= 0.4164 C_u= 43.72 C_c= 5.74

Remarks

Maine DOT Frost = 0

Date Received: 2/23/16 **Date Tested:** 2/25/16

Tested By: MS/AS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Borings **Depth:** 4-6' **Date Sampled:**

Sample Number: B-12: S-3B

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-173

THIELSCH ENGINEERING
195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
http://www.thielsch.com

Client Information:
Jacobs Engineering Group
Boston, MA
PM: Phillip Lanergan
Assigned By: Phillip Lanergan

Laboratory Information
Project Name:
York Toll Plaza Relocation
York, ME
TEI Project Number: 74-16-0002.98
Report Date: 2/24/2016

LABORATORY TESTING DATA SHEET

Boring ID	Sample No.	Depth (ft)	Lab No.	Identification Tests								Resistivity					Laboratory Log and Rock Description
				Do in.	L in.	(1) Unit Wt. PCF	(2) Wet Density PCF	(3) Other Tests	(4) Strength PSI	(5) Strain %	(6) Conf. Stress	(7) E sec PSI EE+06	(8) Poisson's Ratio	σt PSI	Is_{50} PSI		
B-3	C2	10.2-10.6	16-R-140	1.985	4.530	188.9		U	12,842								
B-6	C3	14.1-14.5	16-R-141	1.985	4.572	168.0		U	33,762								
B-7	C1	5.1-5.5	16-R-142	1.978	4.575	186.4		U	13,681								
B-7	C3	13.5-13.9	16-R-143	1.972	4.526	183.9		U	21,374								
B-8	C1	6.4-6.8	16-R-144	1.988	4.536	172.0		U	27,242								
B-9	C1	13.1-13.5	16-R-145	1.981	4.535	174.2		U	31,465								
B-10	C1	20.6-21.0	16-R-146	1.975	4.517	166.5		U	6,848								*Sample fractured along healed joints*
B-11	C3	20.1-20.5	16-R-147	1.969	4.550	184.0		U	51,278								
B-12	C2	22.0-22.4	16-R-148	1.989	4.544	170.5		U	14,406								
B-13	C1	10.0-10.4	16-R-149	1.988	4.570	183.2		U	33,305								

(1) Volume Determined By Measuring Dimensions
(2) Determined by Measuring Dimensions and Weight of Saturated Sample

(3) P=Petrographic PLD=Point Load (diametrical), PLA= Point Load (Axial) RST= Splitting Tensile
U= Unconfined Compressive Strength
(4) Taken at Peak Deviator Stress

(5) Strain at Peak Deviator Stress
(6) Represents Confining Stress on Triaxial Tests
(7) Represents Secant Modulus at 50% of Total Failure Stress
(8) Represents Secant Poisson's Ratio at 50% of Total Failure Stress

Reviewed By  Date Reviewed 2/24/2016

May 2016 Explorations

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THIELSCH ENGINEERING

State of Maine - Department of Transportation
Laboratory Testing Summary Sheet

York Toll Plaza

MDOT Project Number:

Jacobs Engineering Group, Inc.
Project Number: E2X71602

Town(s): York, ME

Test Pit & Sample Identification Number	Station (Feet)	Sample No.	Depth (inches)	Lab Number	Organic %	W.C.	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
TP-14		S-1	6" - 12"	16-S-633		4.0			SP-SM	A-1-b	0
TP-14		S-2	26" - 30"	16-S-634		11.0			SP-SM	A-3	0
TP-16		S-1	4" - 12"	16-S-635		3.2			SP	A-1-b	0
TP-16		S-2	24" - 30"	16-S-636		5.8			SP	A-1-b	0
TP-18		S-1	6" - 12"	16-S-637		4.0			SP-SM	A-1-b	0
TP-18		S-2	26" - 30"	16-S-638		4.6			SP	A-1-b	0
TP-19		S-1	8" - 12"	16-S-639		4.2			SP-SM	A-1-b	0
TP-19		S-2	20" - 25"	16-S-640		5.3			SP-SM	A-1-b	II
TP-19		S-3	38" - 48"	16-S-641		9.2			SM	A-2-4	II
TP-17		S-1	8" - 12"	16-S-642		4.1			SP	A-1-b	0
TP-17		S-2	20" - 30"	16-S-643		8.0			SP	A-1-b	0
TP-17		S-3	35" - 40"	16-S-644		10.7			SM	A-1-b	II
TP-15		S-1	8" - 12"	16-S-645		6.2			SP-SM	A-1-b	0
TP-15		S-2	16" - 20"	16-S-646		7.4			SW-SM	A-1-b	0

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MDOT and Corps of Engineers Classification Systems.

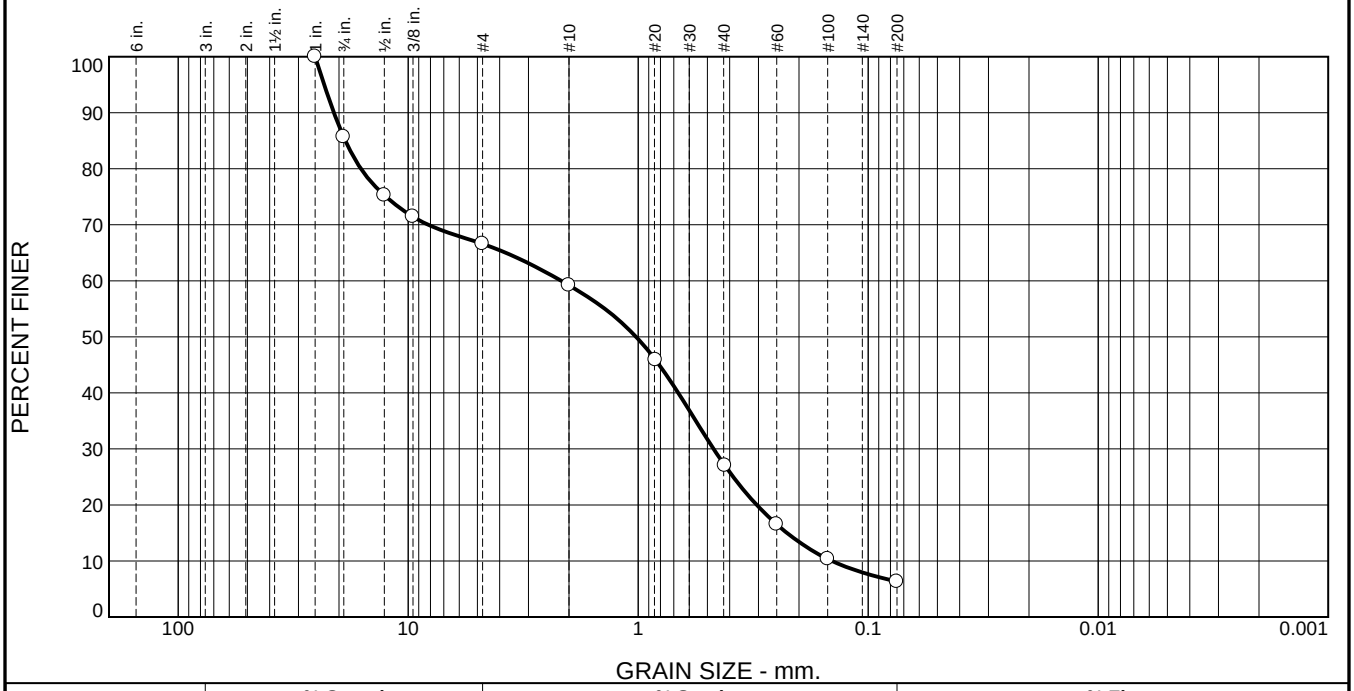
GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.4	19.0	7.4	31.9	21.0	6.3	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	85.7		
.5"	75.3		
.375"	71.5		
#4	66.6		
#10	59.2		
#20	45.9		
#40	27.0		
#60	16.6		
#100	10.4		
#200	6.3		

* (no specification provided)

Material Description

Red-brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 21.0217 D_{85}= 18.7661 D_{60}= 2.1593
D_{50}= 1.0207 D_{30}= 0.4700 D_{15}= 0.2253
D_{10}= 0.1437 C_u= 15.03 C_c= 0.71

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 6-12" **Date Sampled:**

Sample Number: TP-14/S-1

Thielsch Engineering Inc.

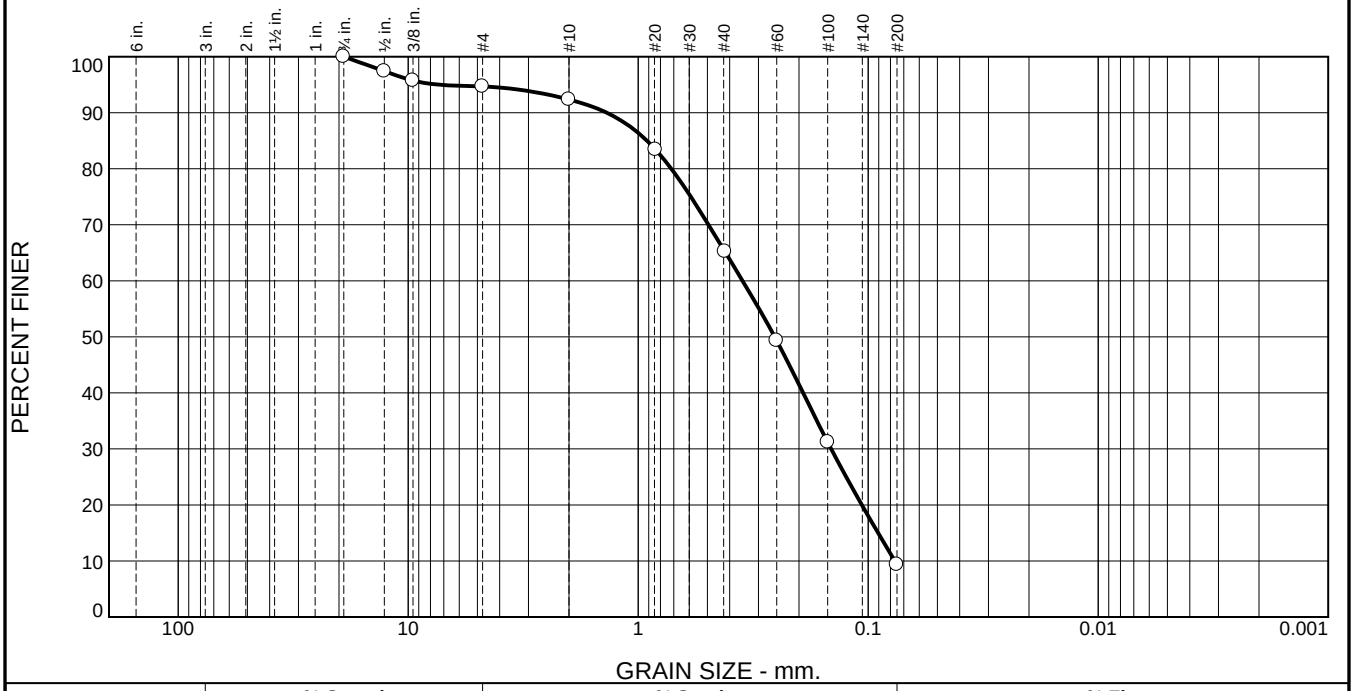
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-633

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.3	2.3	26.8	56.2	9.4	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
.5"	97.4		
.375"	95.7		
#4	94.7		
#10	92.4		
#20	83.4		
#40	65.2		
#60	49.3		
#100	31.2		
#200	9.4		

* (no specification provided)

Material Description

Yellow-brown poorly graded sand with silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 1.3692 D_{85}= 0.9153 D_{60}= 0.3517
D_{50}= 0.2550 D_{30}= 0.1449 D_{15}= 0.0905
D_{10}= 0.0766 C_u= 4.59 C_c= 0.78

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 26-30" **Date Sampled:**

Sample Number: TP-14/S-2

Thielsch Engineering Inc.

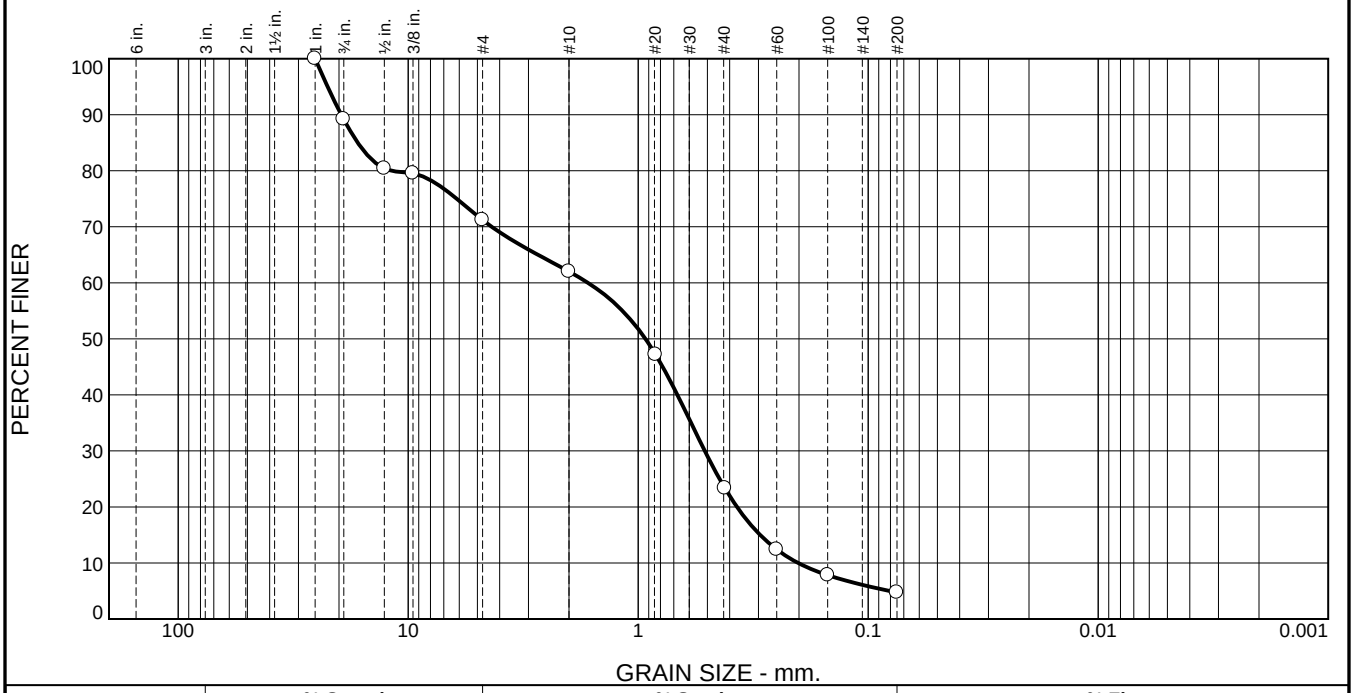
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-634

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.9	17.9	9.2	38.3	19.0	4.7	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	89.2		
.5"	80.4		
.375"	79.5		
#4	71.2		
#10	62.0		
#20	47.2		
#40	23.4		
#60	12.4		
#100	7.8		
#200	4.7		

* (no specification provided)

Material Description

Red-brown poorly graded sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 19.5469 D_{85}= 16.5618 D_{60}= 1.6532
D_{50}= 0.9296 D_{30}= 0.5131 D_{15}= 0.2948
D_{10}= 0.2016 C_u= 8.20 C_c= 0.79

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 4-12" **Date Sampled:**

Sample Number: TP-16/S-1

Thielsch Engineering Inc.

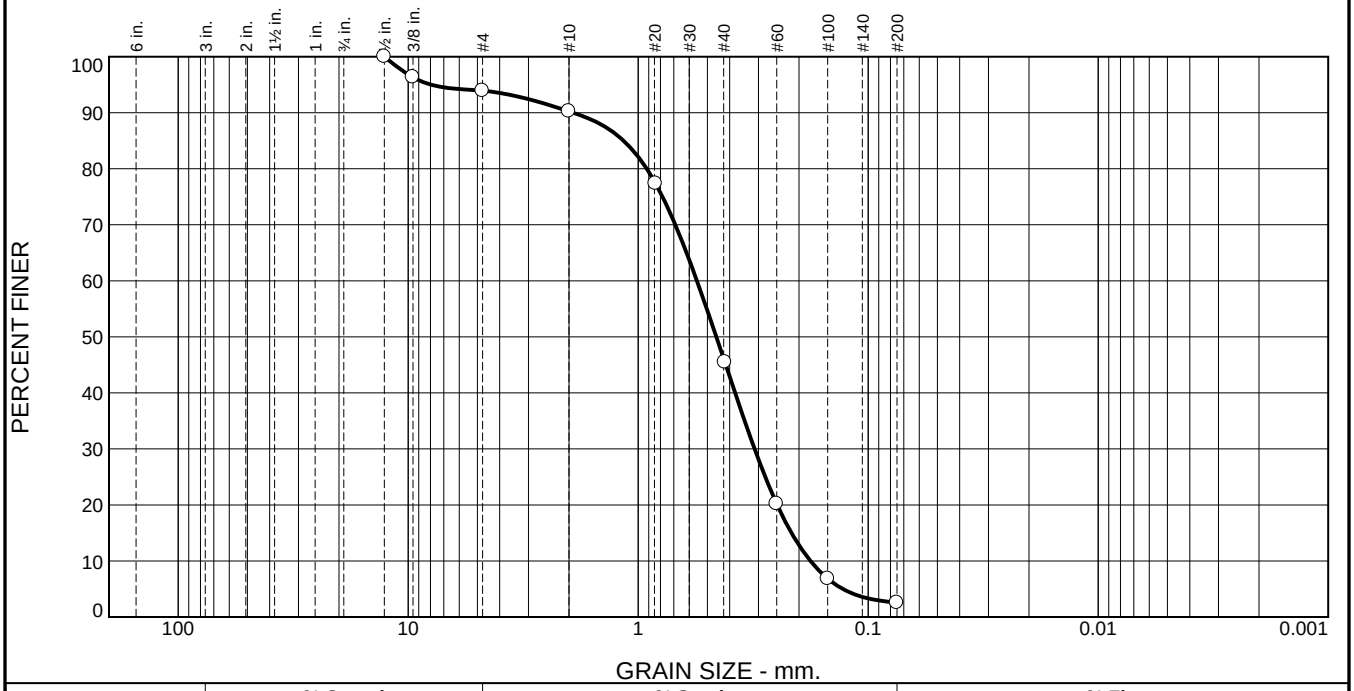
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-635

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.1	3.7	44.1	43.5	2.6	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	96.3		
#4	93.9		
#10	90.2		
#20	77.4		
#40	45.5		
#60	20.2		
#100	6.9		
#200	2.6		

* (no specification provided)

Material Description

Yellow-brown poorly graded sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 1.9187 D_{85}= 1.1569 D_{60}= 0.5554
D_{50}= 0.4573 D_{30}= 0.3118 D_{15}= 0.2155
D_{10}= 0.1782 C_u= 3.12 C_c= 0.98

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 24-30" **Date Sampled:**

Sample Number: TP-16/S-2

Thielsch Engineering Inc.

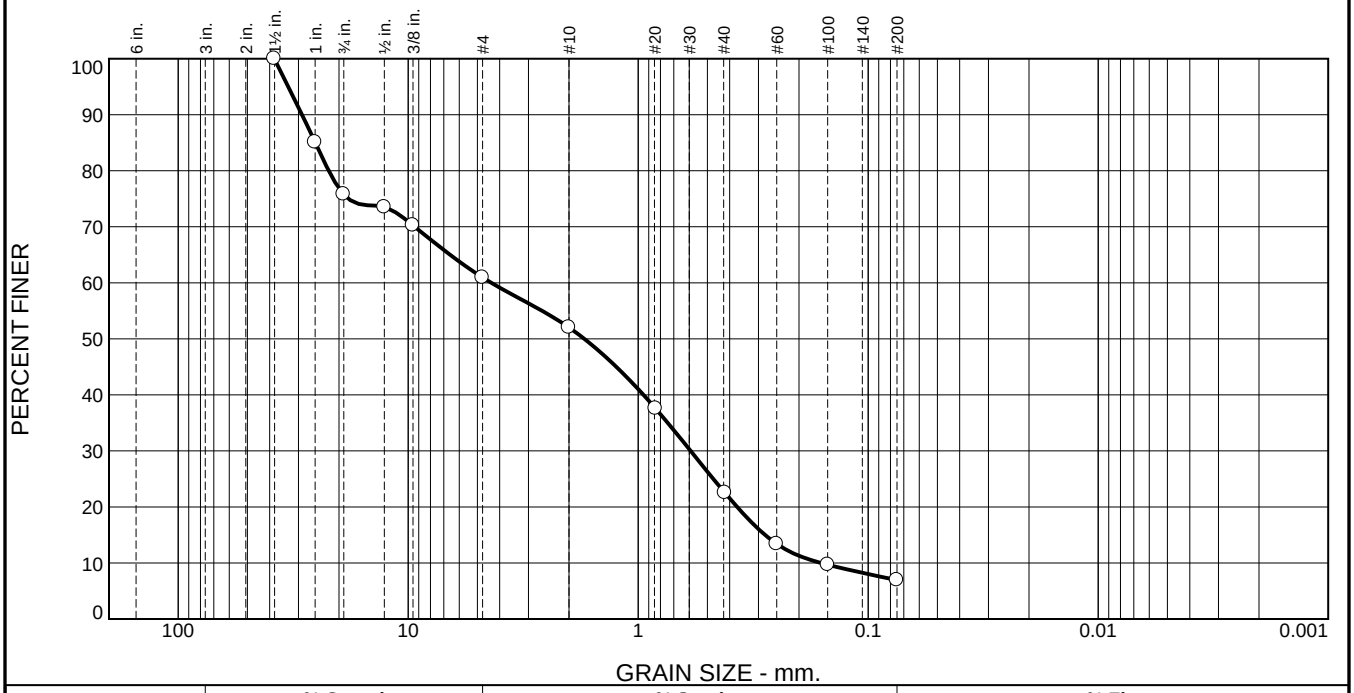
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-636

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	24.2	14.8	9.0	29.2	15.8	7.0	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	85.1		
0.75"	75.8		
.5"	73.5		
.375"	70.3		
#4	61.0		
#10	52.0		
#20	37.6		
#40	22.5		
#60	13.4		
#100	9.7		
#200	7.0		

* (no specification provided)

Material Description

Red-brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 28.9593 D_{85}= 25.3356 D_{60}= 4.3484
D_{50}= 1.7137 D_{30}= 0.5915 D_{15}= 0.2806
D_{10}= 0.1601 C_u= 27.16 C_c= 0.50

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 6-12" **Date Sampled:**

Sample Number: TP-18/S-1

Thielsch Engineering Inc.

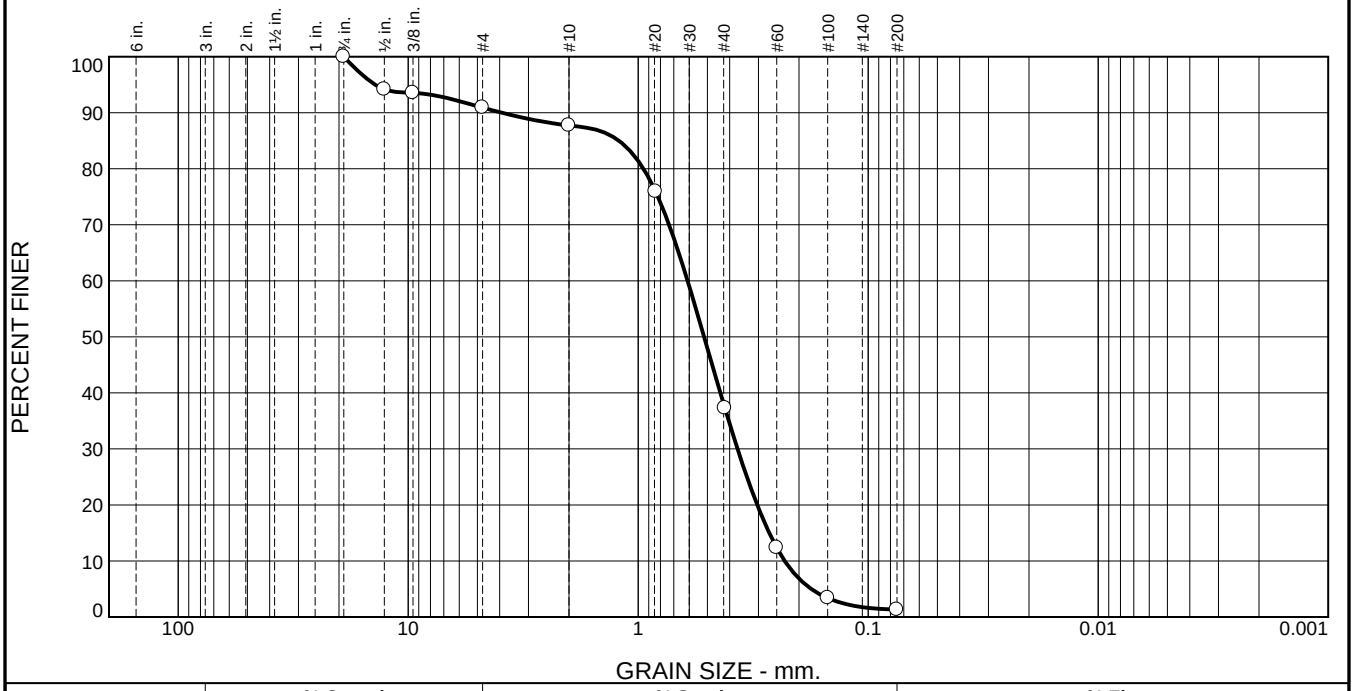
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-637

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.1	3.2	49.7	36.7	1.3	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
.5"	94.2		
.375"	93.6		
#4	90.9		
#10	87.7		
#20	75.9		
#40	37.3		
#60	12.4		
#100	3.4		
#200	1.3		

* (no specification provided)

Material Description

Yellow-brown poorly graded sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 3.9139 D_{85}= 1.2122 D_{60}= 0.6099
D_{50}= 0.5168 D_{30}= 0.3699 D_{15}= 0.2694
D_{10}= 0.2306 C_u= 2.65 C_c= 0.97

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 26-30" **Date Sampled:**

Sample Number: TP-18/S-2

Thielsch Engineering Inc.

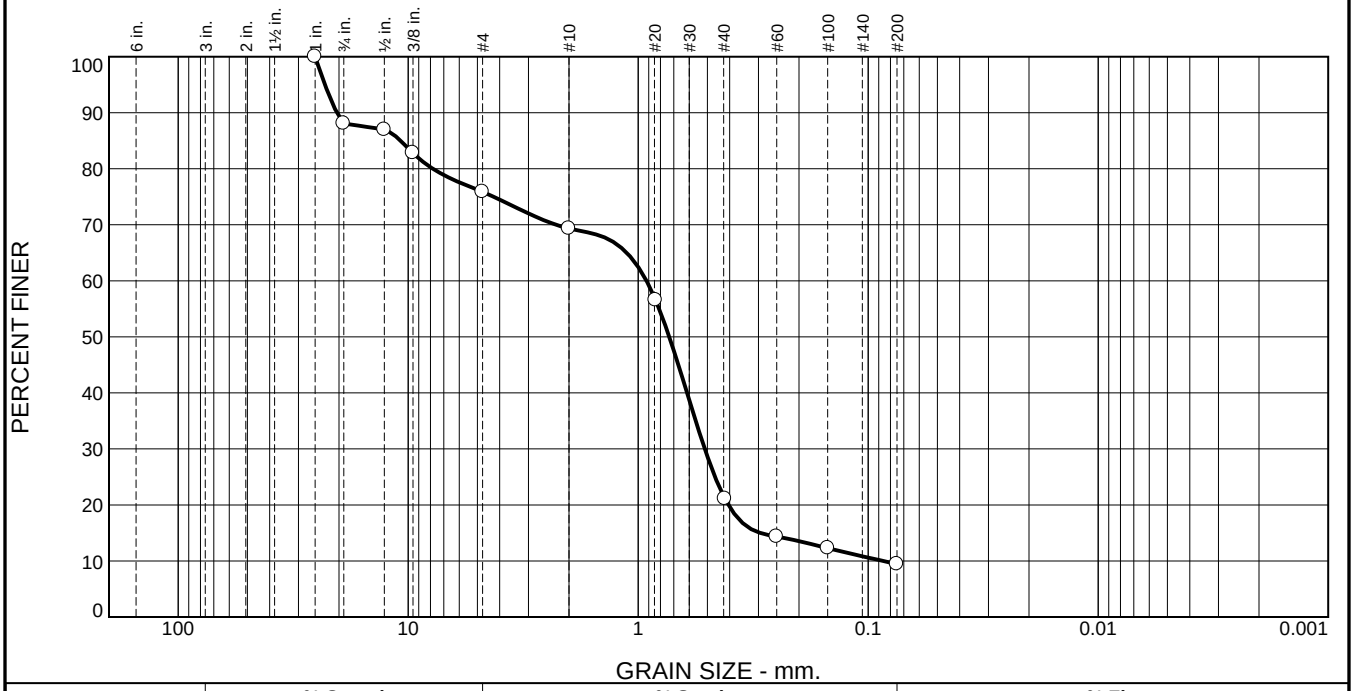
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-638

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.9	12.2	6.6	47.8	12.0	9.5	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	88.1		
.5"	87.0		
.375"	82.8		
#4	75.9		
#10	69.3		
#20	56.6		
#40	21.1		
#60	14.4		
#100	12.3		
#200	9.5		

* (no specification provided)

Material Description

Red-brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 20.4150 D_{85}= 10.7943 D_{60}= 0.9201
D_{50}= 0.7325 D_{30}= 0.5131 D_{15}= 0.2947
D_{10}= 0.0860 C_u= 10.70 C_c= 3.33

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 8-12" **Date Sampled:**

Sample Number: TP-19/S-1

Thielsch Engineering Inc.

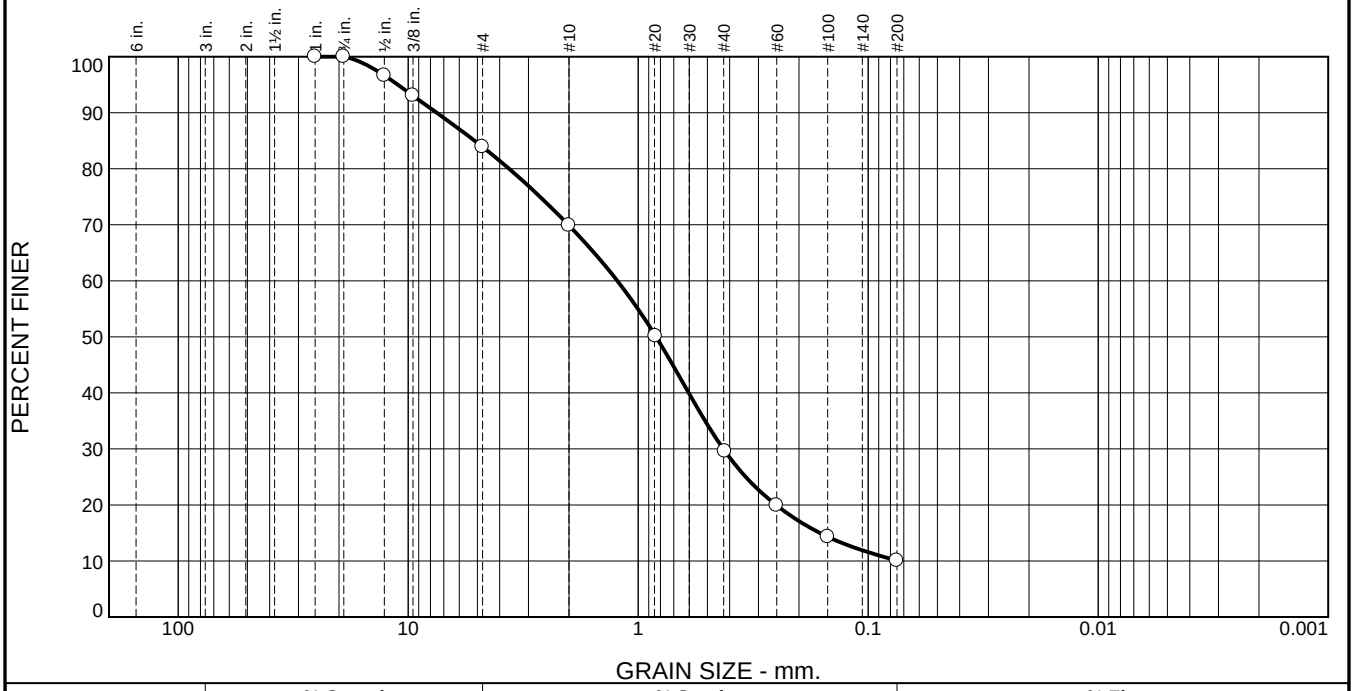
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-639

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	16.1	14.0	40.0	19.8	10.1	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	100.0		
.5"	96.7		
.375"	93.1		
#4	83.9		
#10	69.9		
#20	50.2		
#40	29.6		
#60	19.9		
#100	14.3		
#200	10.1		

* (no specification provided)

Material Description

Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 7.5232 D_{85}= 5.1404 D_{60}= 1.2324
D_{50}= 0.8355 D_{30}= 0.4267 D_{15}= 0.1622
D_{10}= C_u= C_c=

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 20-25" **Date Sampled:**

Sample Number: TP-19/S-2

Thielsch Engineering Inc.

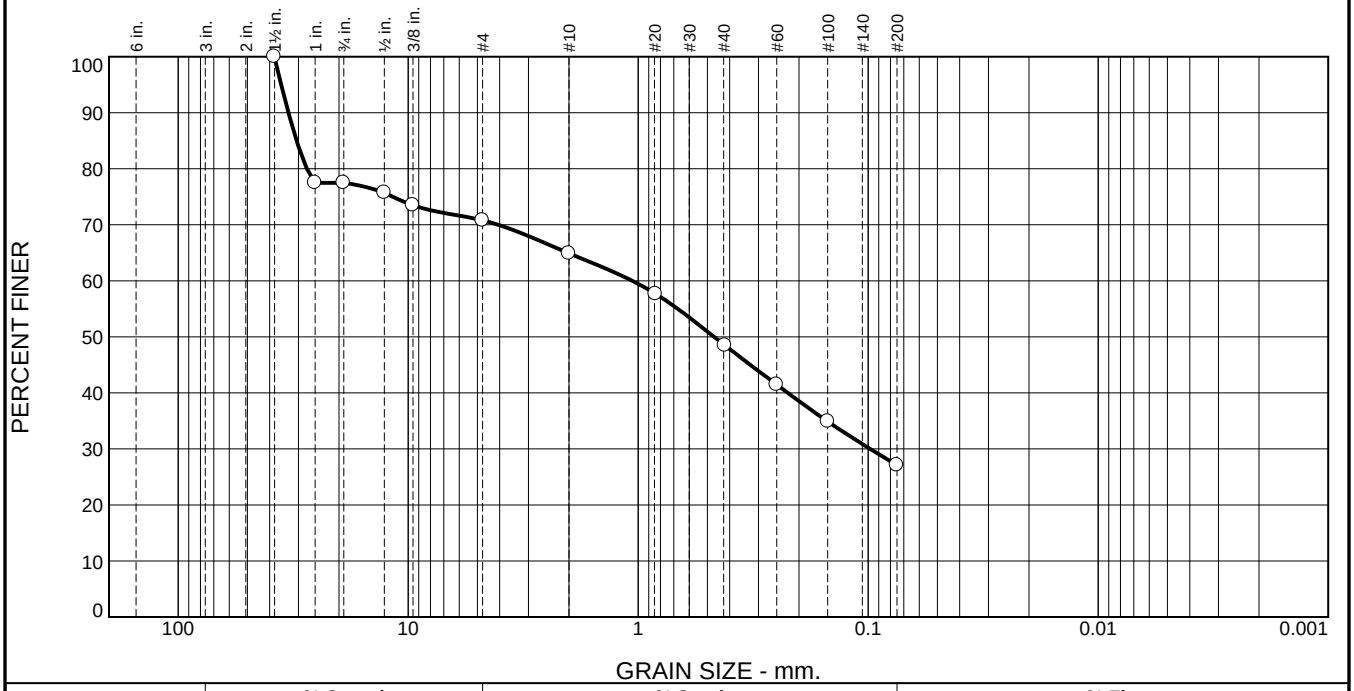
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-640

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	22.5	6.7	5.9	16.2	21.6	27.1	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	77.5		
0.75"	77.5		
.5"	75.7		
.375"	73.5		
#4	70.8		
#10	64.9		
#20	57.7		
#40	48.5		
#60	41.5		
#100	34.9		
#200	27.1		

* (no specification provided)

Material Description

Gray silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 33.1349 D_{85}= 30.5623 D_{60}= 1.0602
D_{50}= 0.4677 D_{30}= 0.0980 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 38-48" **Date Sampled:**

Sample Number: TP-19/S-3

Thielsch Engineering Inc.

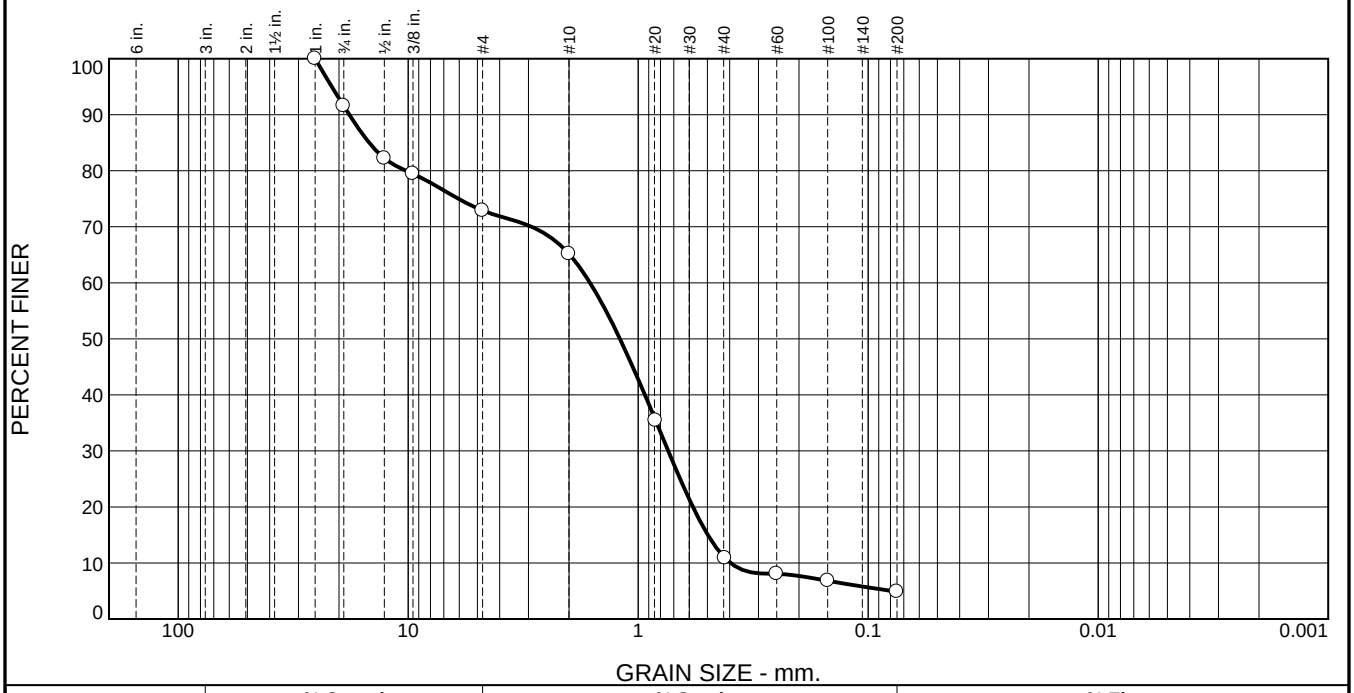
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-641

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.5	18.6	7.7	54.1	6.2	4.9	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	91.6		
.5"	82.2		
.375"	79.5		
#4	72.9		
#10	65.2		
#20	35.4		
#40	10.9		
#60	8.1		
#100	6.8		
#200	4.9		

* (no specification provided)

Material Description

Red-brown poorly graded sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 18.0315 D_{85}= 14.7757 D_{60}= 1.6187
D_{50}= 1.2007 D_{30}= 0.7402 D_{15}= 0.4978
D_{10}= 0.3970 C_u= 4.08 C_c= 0.85

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 8-12" **Date Sampled:**

Sample Number: TP-17/S-1

Thielsch Engineering Inc.

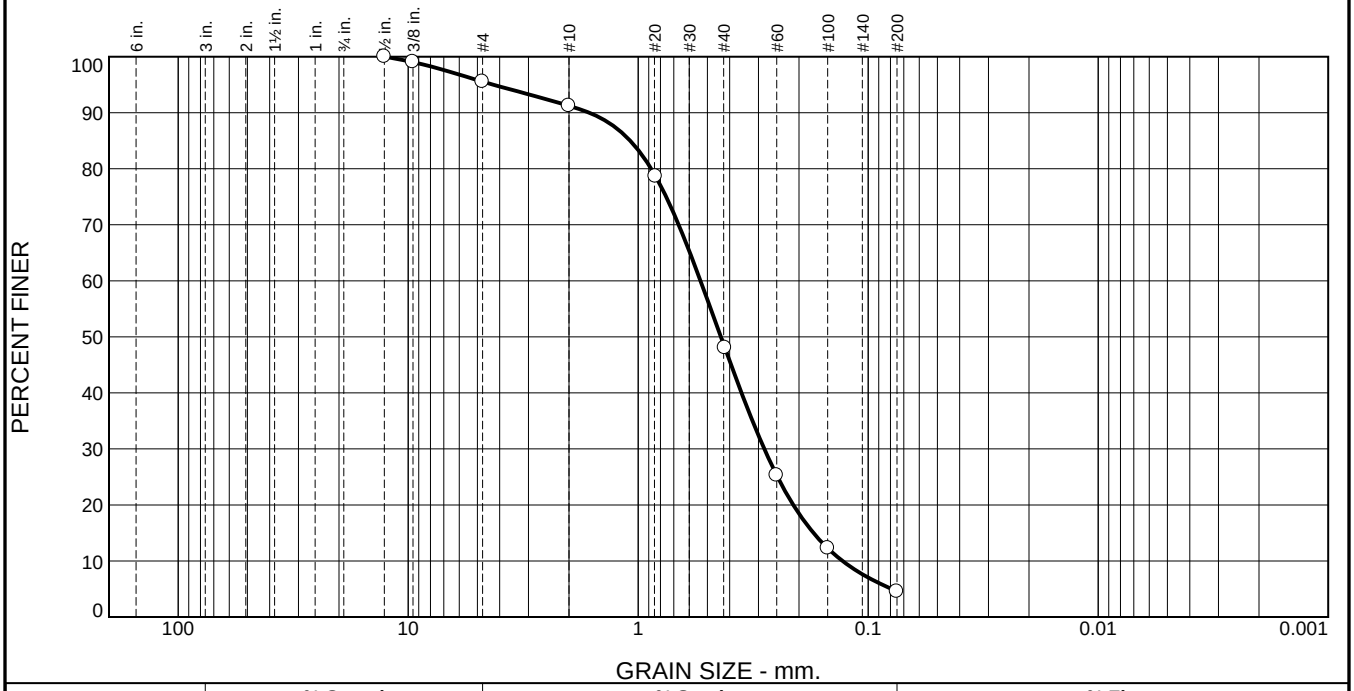
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-642

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.4	4.4	42.6	44.0	4.6	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	99.0		
#4	95.6		
#10	91.2		
#20	78.7		
#40	48.0		
#60	25.3		
#100	12.3		
#200	4.6		

* (no specification provided)

Material Description

Yellow-brown poorly graded sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 1.6322 D_{85}= 1.0829 D_{60}= 0.5358
D_{50}= 0.4370 D_{30}= 0.2830 D_{15}= 0.1729
D_{10}= 0.1293 C_u= 4.14 C_c= 1.16

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 20-30" **Date Sampled:**

Sample Number: TP-17/S-2

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-643

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.9	19.4	9.2	22.6	17.0	18.9	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	87.2		
.5"	83.9		
.375"	79.1		
#4	67.7		
#10	58.5		
#20	46.9		
#40	35.7		
#60	28.7		
#100	24.0		
#200	18.9		

* (no specification provided)

Material Description

Gray silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 20.7344 D_{85}= 16.7424 D_{60}= 2.3146
D_{50}= 1.0318 D_{30}= 0.2793 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 35-40" **Date Sampled:**

Sample Number: TP-17/S-3

Thielsch Engineering Inc.

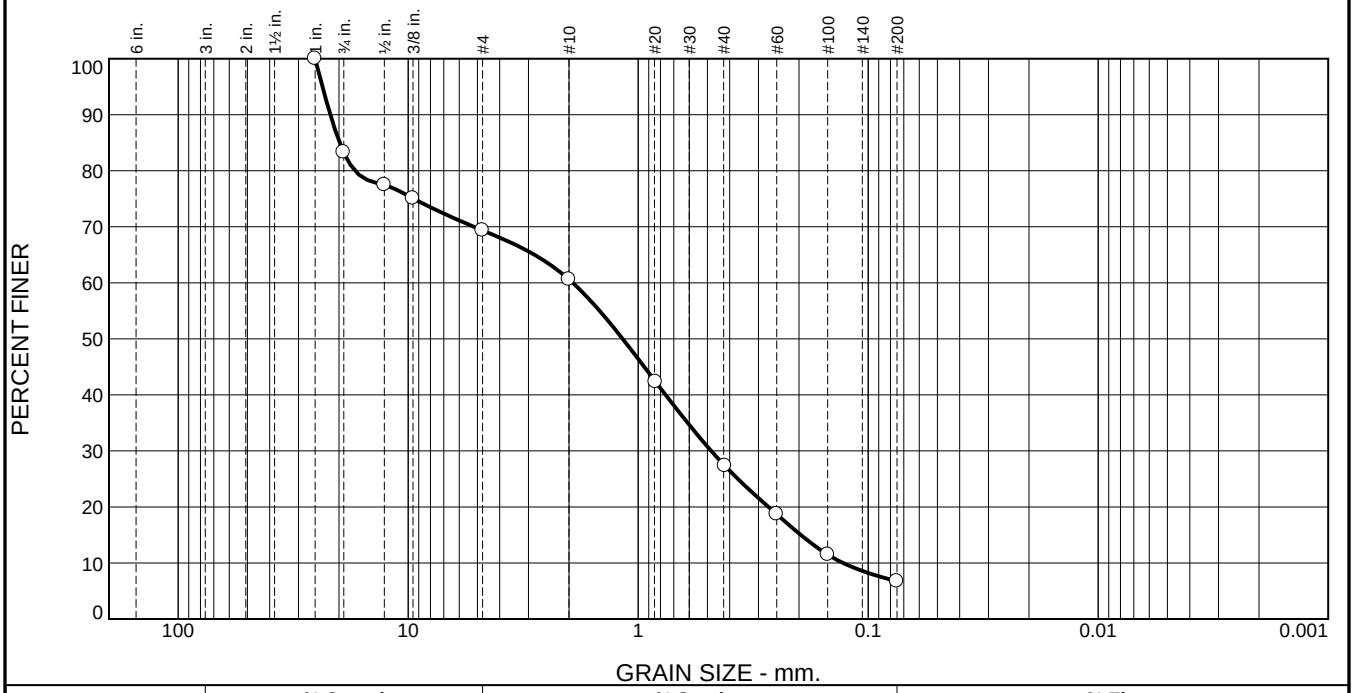
Cranston, RI

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Project No: E2X71602 **Figure** 16-S-644

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	16.8	13.8	8.8	33.0	20.9	6.7	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	83.3		
.5"	77.5		
.375"	75.1		
#4	69.4		
#10	60.6		
#20	42.3		
#40	27.4		
#60	18.7		
#100	11.5		
#200	6.7		

* (no specification provided)

Material Description

Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 21.7942 D_{85}= 19.8578 D_{60}= 1.9246
D_{50}= 1.1680 D_{30}= 0.4812 D_{15}= 0.1961
D_{10}= 0.1286 C_u= 14.96 C_c= 0.94

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 8-12"
Sample Number: TP-15/S-1 **Date Sampled:**

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.
Project: York Toll Plaza
York, ME
Project No: E2X71602 **Figure** 16-S-645

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.1	14.0	5.7	41.8	30.1	8.3	

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
.5"	92.6		
.375"	91.8		
#4	85.9		
#10	80.2		
#20	65.2		
#40	38.0		
#60	24.4		
#100	14.4		
#200	8.3		

* (no specification provided)

Material Description

Yellow-brown well-graded sand with silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SW-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 7.1488 D_{85}= 4.2875 D_{60}= 0.7285
D_{50}= 0.5709 D_{30}= 0.3192 D_{15}= 0.1560
D_{10}= 0.0987 C_u= 7.38 C_c= 1.42

Remarks

Date Received: 5/18/16 **Date Tested:** 5/20/16

Tested By: RR/MS

Checked By: Matthew Polsky

Title: Laboratory Manager

Source of Sample: Test Pit **Depth:** 16-20"
Sample Number: TP-15/S-2

Date Sampled:

Thielsch Engineering Inc.

Cranston, RI

Client: Jacobs Engineering Group, Inc.
Project: York Toll Plaza
York, ME
Project No: E2X71602 **Figure** 16-S-646

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October 2016 Explorations

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LABORATORY TESTING DATA SHEET

Project Name: York Toll Plaze | Project Location: York, ME | Reviewed By: [signature]
Project No.: E2X71602 | Assigned By: P. Lanergan | Date Reviewed: 11.22.16
Project Manager: Phillip Lanergan | Date: 11.22.16 | Client: Jacobs Engineering Group

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	Org %	Specif Gravity	Dry unit wt. pcf	Strength Tests: Torvane or Type Test	σ_c psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol. $\frac{C_c}{1+e_0}$	Laboratory Log and Soil Description
SB-2	UD-1	13-15	16-S-1535		Average Total Unit Weight (13.0-15.0') = ~116.4 pcf													
		13'-1"		45.6								Tv = 0.050 tsf						Grey lean clay (13.0 to 15.0')
		13'-2" to 13'-8"		44.1							78.3	UU	1200	σ_1-σ_3 Max	1263	19.2		
		13'-9"		43.6	40	20												Grey lean clay (CL)
		14'-3" - 14'-9"		38.7							83.6	UU	2400	σ_1-σ_3 Max	876	5.0		
		14'-10"		40.3								Tv = 0.075 tsf						

THIELSCH ENGINEERING
195 Frances Avenue
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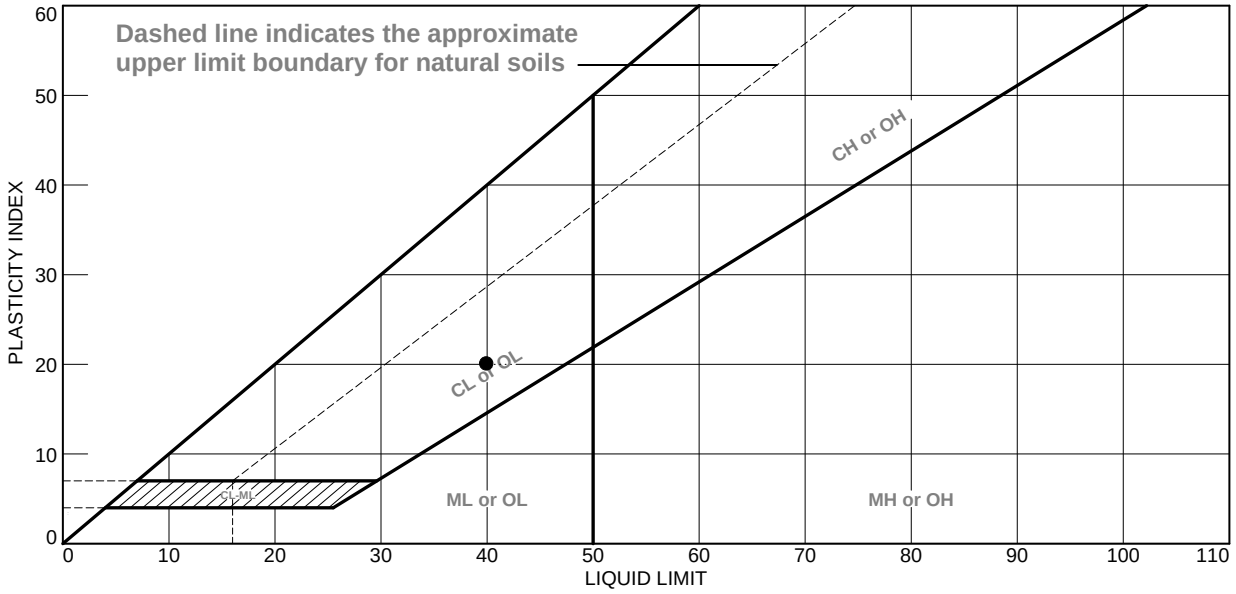
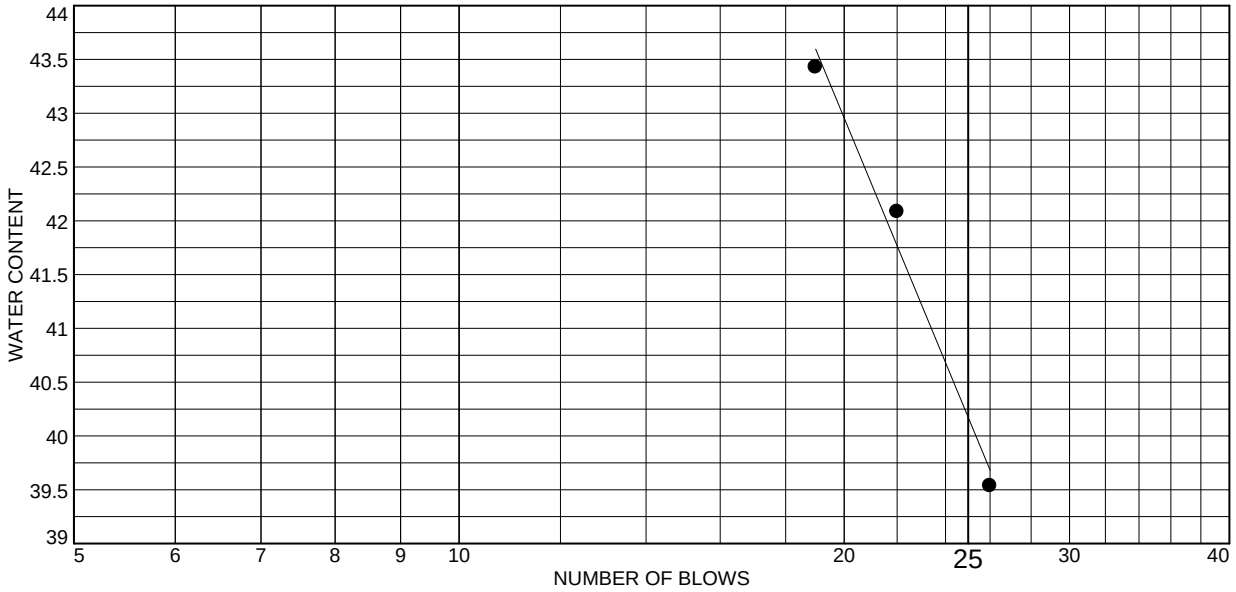
401-467-6454

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Grey Clay	40	20	20			

Project No. E2X71602 **Client:** Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME

Source of Sample: E2X71602 **Depth:** 13-15
Sample Number: SB-2 / UD-1

Remarks:

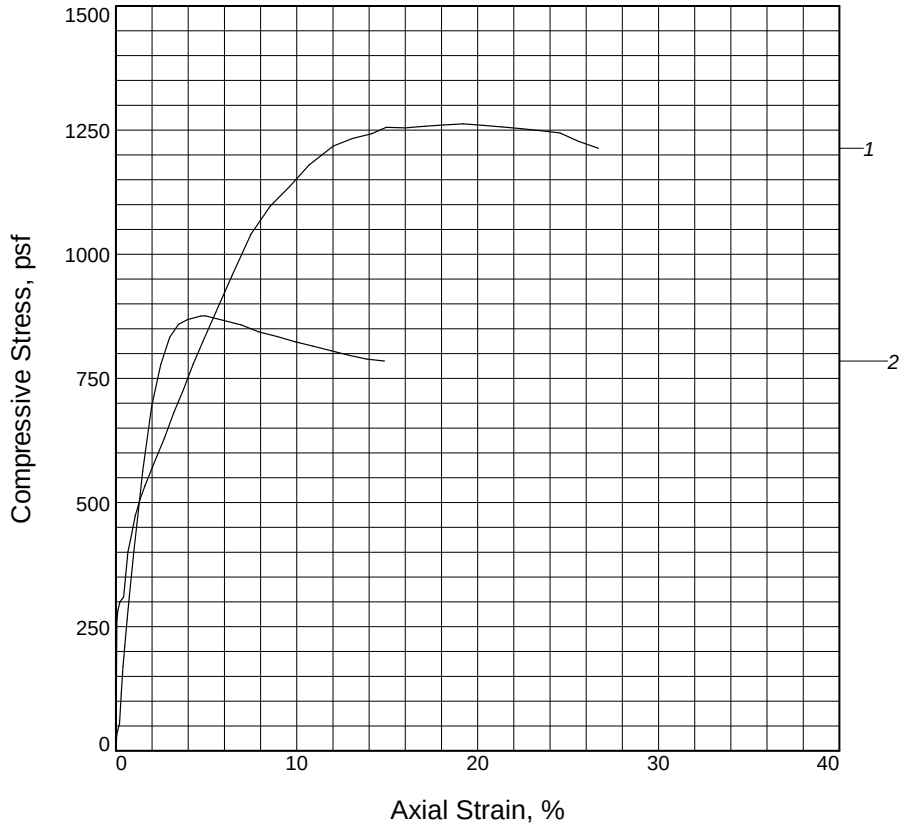
Thielsch Engineering Inc.

Cranston, RI

Figure L-1535

Tested By: IA **Checked By:** MJC

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1	2		
Fail. Stress, psf	1263	876		
Ult. Stress, psf				
Cell pressure, psf	1200	2400		
Strain rate, in./min.	0.03	0.03		
Water content, %	44.1	38.7		
Wet density, pcf	112.8	116.0		
Dry density, pcf	78.3	83.6		
Saturation, %	106.8	106.9		
Void ratio	1.0738	0.9404		
Specimen diameter, in.	2.81	2.83		
Specimen height, in.	3.75	4.08		
Height/diameter ratio	1.33	1.44		

Description: Grey Clay

LL = 40	**PL =** 20	**PI =** 20	**Assumed GS=** 2.6	**Type:** Tube Sample

Project No.: E2X71602
Date Sampled: 10.03.16
Remarks:
UD-1 13.3-13.8'
UD-2 14.4-14.9'

Figure U-1535

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME
Source of Sample: E2X71602 **Depth:** 13-15
Sample Number: SB-2 / UD-1

UNCONSOLIDATED UNDRAINED TEST
Thielsch Engineering Inc.
Cranston, RI

Tested By: RR **Checked By:** MJC

LABORATORY TESTING DATA SHEET

Project Name: York Toll Plaze | Project Location: York, ME | Reviewed By: [signature]
Project No.: E2X71602 | Assigned By: P. Lanergan | Date Reviewed: 11.22.16
Project Manager: Phillip Lanergan | Date: 11.22.16 | Client: Jacobs Engineering Group

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	Org %	Specif Gravity	Dry unit wt. pcf	Strength Tests: Torvane or Type Test	σ_c psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol. $\frac{C_c}{1+e_0}$	Laboratory Log and Soil Description
SB-10	UD-1	29-31	16-S-1536		Average Total Unit Weight (29.0-31.0') = ~122.8 pcf													
		29'-1"		33.9								Tv = .175 tsf						Dark Grey organic silt (29.0 to 31.0')
		29'-2" - 29'-7"		33.3							88.2	UU	2000	σ_1-σ_3 Max	2491	9.2		small sand lenses
		29'-11"		38.1	35	19												Dark Grey organic silt
		30'-5" - 30'-10"		35.1							89.9	UU	4000	σ_1-σ_3 Max	1294	17.3		no sand lenses
		30'-10"		32.3								Tv = .175 tsf						

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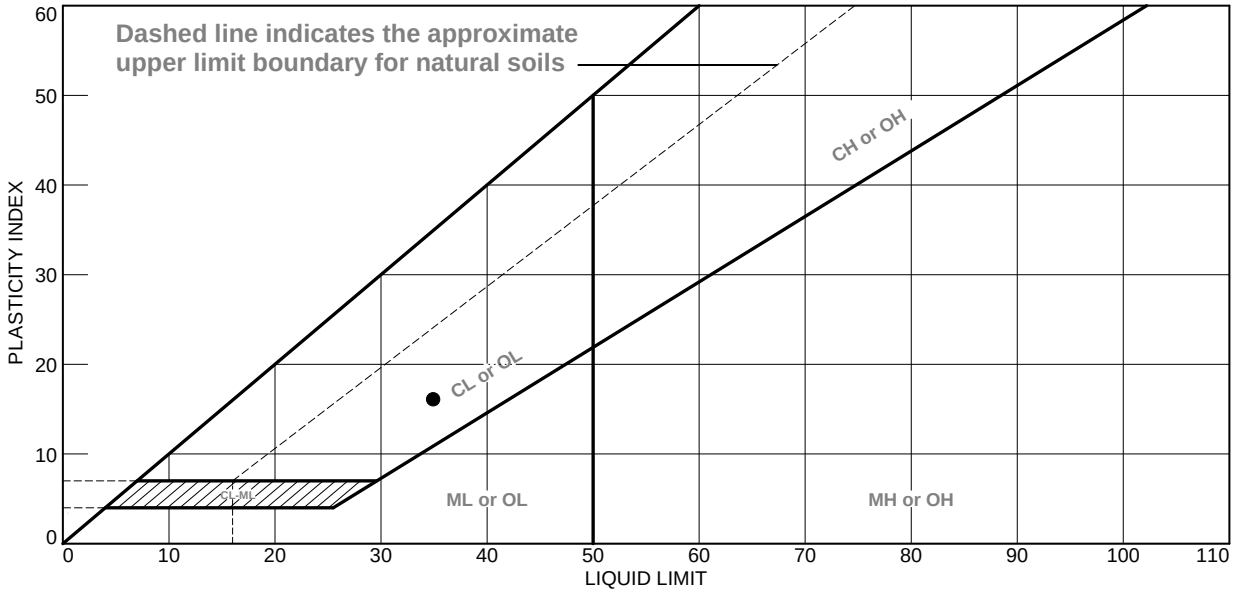
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark Grey Organic Silt	35	19	16			

Project No. E2X71602 **Client:** Jacobs Engineering Group, Inc.

Project: York Toll Plaza

York, ME

Source of Sample: E2X71602 **Depth:** 29-31

Sample Number: SB-10 / UD-1

Thielsch Engineering Inc.

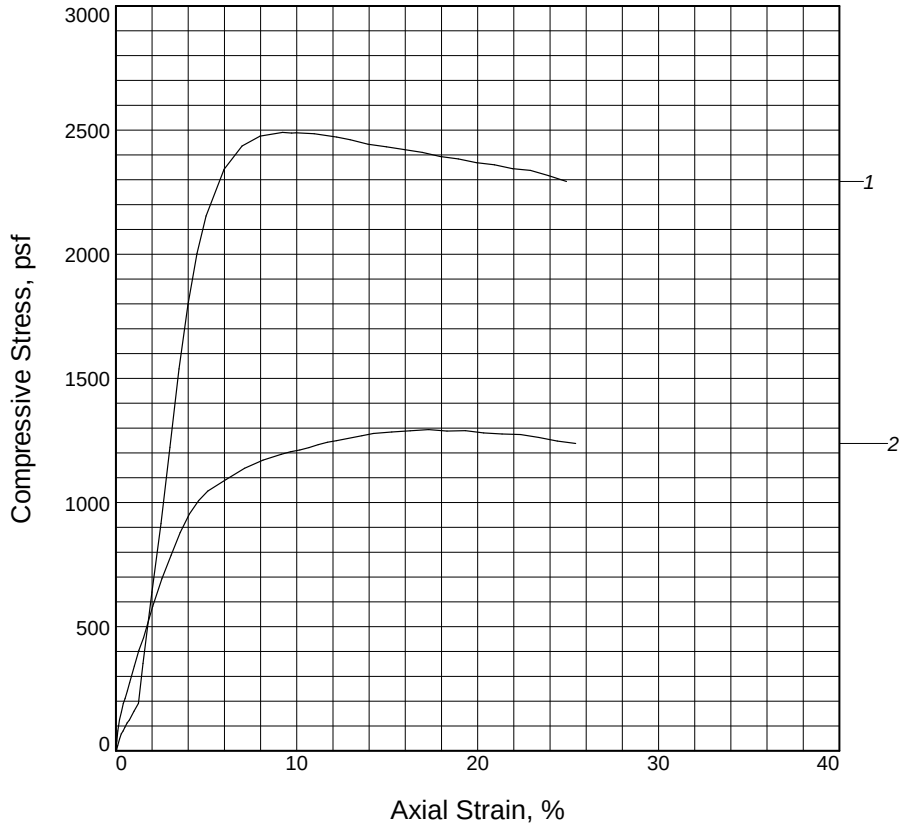
Cranston, RI

Remarks:

Figure L-1536

Tested By: IA **Checked By:** MJC

UNCONSOLIDATED UNDRAINED TEST



Sample No.	1	2		
Fail. Stress, psf	2491	1294		
Ult. Stress, psf				
Cell pressure, psf	2000	4000		
Strain rate, in./min.	0.03	0.03		
Water content, %	33.3	35.1		
Wet density, pcf	117.6	121.5		
Dry density, pcf	88.2	89.9		
Saturation, %	103.2	113.4		
Void ratio	0.8394	0.8050		
Specimen diameter, in.	2.82	2.76		
Specimen height, in.	4.09	3.99		
Height/diameter ratio	1.45	1.45		

Description: Dark Grey Organic Silt

LL = 35	**PL =** 19	**PI =** 16	**Assumed GS=** 2.6	**Type:** Tube Sample

Project No.: E2X71602
Date Sampled: 10.31.16
Remarks:
UD-1 29.2-29.7'
UD-2 30.5-30.10'

Figure UU-1536

Client: Jacobs Engineering Group, Inc.

Project: York Toll Plaza
York, ME
Source of Sample: E2X71602 **Depth:** 29-31
Sample Number: SB-10 / UD-1

UNCONSOLIDATED UNDRAINED TEST
Thielsch Engineering Inc.
Cranston, RI

Tested By: RR **Checked By:** MJC

CERTIFICATE OF ANALYSIS

Matthew Colman
Thielsch Engineering, Inc.
195 Frances Avenue
Cranston, RI 02910

RE: York Toll Plaza (74-16-0002.01)
ESS Laboratory Work Order Number: 1611174

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 1:58 pm, Nov 14, 2016

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with NELAC Standards, A2LA and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: York Toll Plaza

ESS Laboratory Work Order: 1611174

SAMPLE RECEIPT

The following samples were received on November 07, 2016 for the analyses specified on the enclosed Chain of Custody Record.

The client did not deliver the samples in a cooler.

Lab Number	Sample Name	Matrix	Analysis
1611174-01	S-1537	Soil	9038, 9045, 9050A, 9250
1611174-02	S-1538	Soil	9038, 9045, 9050A, 9250

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: York Toll Plaza

ESS Laboratory Work Order: 1611174

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: York Toll Plaza

ESS Laboratory Work Order: 1611174

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: York Toll Plaza
Client Sample ID: S-1537
Date Sampled: 11/07/16 09:00
Percent Solids: 91

ESS Laboratory Work Order: 1611174
ESS Laboratory Sample ID: 1611174-01
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Chloride	**WL 270** (33)		9250		1	EEM	11/08/16 16:16	mg/kg dry	CK60831
Corrosivity (pH)	**5.55** (N/A)		9045		1	JLK	11/07/16 20:15	S.U.	CK60750
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.7 ºC.**								
Resistivity	**WL 0.001** (N/A)		9050A		1	JLK	11/07/16 17:14	Mohms-cm	CK60748
Sulfate	**WL 185** (54)		9038		1	EEM	11/08/16 16:30	mg/kg dry	CK60823

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: York Toll Plaza
Client Sample ID: S-1538
Date Sampled: 11/07/16 09:00
Percent Solids: 52

ESS Laboratory Work Order: 1611174
ESS Laboratory Sample ID: 1611174-02
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Chloride	**WL 1230** (58)		9250		1	EEM	11/08/16 16:22	mg/kg dry	CK60831
Corrosivity (pH)	**5.25** (N/A)		9045		1	JLK	11/07/16 20:15	S.U.	CK60750
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.7 ºC.**								
Resistivity	**WL 0.0009** (N/A)		9050A		1	JLK	11/07/16 17:14	Mohms-cm	CK60748
Sulfate	**WL 354** (96)		9038		1	EEM	11/08/16 16:30	mg/kg dry	CK60823

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: York Toll Plaza

ESS Laboratory Work Order: 1611174

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CK60823 - General Preparation										
Blank										
Sulfate	ND	5	mg/kg wet							
LCS										
Sulfate	10		mg/L	9.988		96	80-120			
Batch CK60831 - General Preparation										
Blank										
Chloride	ND	3	mg/kg wet							
LCS										
Chloride	29		mg/L	30.00		96	90-110			

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: York Toll Plaza ESS Laboratory Work Order: 1611174

Notes and Definitions

Z-10	Soil pH measured in water at 20.7 ºC.
WL	Results obtained from a deionized water leach of the sample.
U	Analyte included in the analysis, but not detected
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: York Toll Plaza

ESS Laboratory Work Order: 1611174

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/documents/AllLabs.xls

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.depweb.state.pa.us/portal/server.pt/community/labs/13780/laboratory_accreditation_program/590095

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1611174

Turn Time	5	Days	Reporting Limits
Regulatory State	New York		

Is this project for any of the following?:
○CT RCP ○MA MCP ○RGP ○DOD

Electonic Deliverables ☐Data Checker ☐Excel ☐Other (Please Specify →)

Company Name: Jacobs Engineering Group, Inc.	Project # 74-16-0002.01	Project Name: York Toll Plaza		
Contact Person: Matt Colman	Address: Thielsch Engineering			
City: Cranston	State: RI	Zip Code 02910	PO #	
Telephone Number	FAX Number	Email Address		

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	pH	Sulfate	Chloride	Resistivity
1	11.07.16	0900	Composite	Soil	S-1537	X	X	X	X
2	11.07.16	0900	Grab	Soil	S-1538	X	X	X	X

Analysis

Container Type:	AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial	AG	AG	AG	AG
Container Volume:	1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*	10	10	10	10
Preservation Code:	1-Non Preserved, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Na2S2O3, 8-ZnAce, NaOH, 9-NH4Cl, 10- Other*	1	1	1	1
	Number of Containers:	2	2	2	2

Laboratory Use Only

Cooler Present: no ○Drop Off
Seals Intact: n/a ○Pickup
Cooler Temperature: 20.3 no ice RL 11/7/16 Technician Hours →

Sampled by : Phil Lanergan/ Rebecca Roth

Comments: Please specify "Other" preservative and containers types in this space

Please CC: mcolman@thielsch.com

Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)	Relinquished by: (Signature, Date & Time)	Received by: (Signature, Date & Time)
11.07.16 1028	11/7/16 1031		

Appendix E. **Seismic Site Class Evaluation**

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JACOBS

JOB	York Toll Plaza		
SUBJECT	Seismic Site Class		
CALCULATED BY	PJL	**DATE**	6/22/2016
CHECKED BY	GJS	**DATE**	7/14/2016

International Building Code (IBC) 2015 - Seismic Site Class Summary

PURPOSE:

Determine seismic site class for the proposed Toll Plaza Administration Building and Toll Plaza Canopies in accordance with the 2015 IBC.

SUBSURFACE INFORMATION:

SPT borings performed by New England Boring Contractors, Inc and observed by Jacobs in January 2016.

APPROACH:

1) Determine Site Class in accordance with Chapter 20 of ASCE 7-10 as specified by IBC 2015

a) Check for three categories of Site Class F requiring site-specific evaluation:
- Peats or highly organic clays greater than 10 feet in thickness
- Thick layers (greater than 25 feet) of high plastic clay (PI > 75)
- Very thick soft/medium stiff clays (greater than 120 feet)

b) Categorize the site using one of the V_s, N and s_u methods.

c) Determine the appropriate Site Class based on the boring-specific results.

2) Determine site coefficients and response parameters in accordance with Section 1613 of the 2015 IBC

SITE CLASS:

Per ASCE Table 20.3-1, borings B-4 through B-13 indicate Site Class C, and B-4 indicates Site Class D. The very loose soil encountered in Boring B-4 will be removed during construction, so the Site Class determination at this boring will not govern.

Shallow bedrock at the site indicates Site Class B, however we recommend **Site Class C** for the following reasons
- Site specific shear wave velocity measurements are unavailable.
- Presence of fractured bedrock in some of the borings.
- Distance between bottom of footings for the NB toll plaza and bedrock will be greater than 10 feet.

Approx. Project Coordinates

Lat	43.18013
Long	-70.6490

Seismic Coefficients (975-Year Return Period)

S_S =	0.264	(Probabilistic Seismic Hazard Deaggregation 0.2-sec period)
S_1 =	0.079	(Probabilistic Seismic Hazard Deaggregation 1.0-sec period)

Site Coefficient For Site Class C

F_A =	1.2	(See IBC 2015 Table 1613.3.3(1))
F_V =	1.7	(See IBC 2015 Table 1613.3.3(2))

Maximum Spectral Response Acceleration Parameters

$Sm_S = Ss \times F_A$ =	0.317	(IBC 2015 Eq. 16-37)
$Sm_1 = S_1 \times F_V$ =	0.134	(IBC 2015 Eq. 16-38)

Design Spectral Response Acceleration Parameters

$S_{DS} = 2/3\ Sm_s$ =	0.211	(IBC 2015 Eq. 16-39)
$S_{D1} = 2/3\ Sm_1$ =	0.090	(IBC 2015 Eq. 16-40)

Risk Category

II (IBC 2015 Table 1604.5)

Seismic Design Category (SDC)

B (IBC 2015 Tables 1613.3.5(1) and 1613.3.5(2))

JACOBS

JOB	York Toll Plaza		
SUBJECT	Seismic Site Class		
CALCULATED BY	PJL	**DATE**	6/22/2016
CHECKED BY	GJS	**DATE**	7/14/2016

ASCE 7-10 Chapter 20

Table 20.3-1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard rock	>5,000 ft/s	NA	NA
B. Rock	2,500 to 5,000 ft/s	NA	NA
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the following characteristics: —Plasticity index $PI > 20$, —Moisture content $w \geq 40\%$, —Undrained shear strength $\bar{s}_u < 500$ psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1 ft/s = 0.3048 m/s; 1 lb/ft^2 = 0.0479 kN/m^2.

2015 IBC - Section 1613

TABLE 1613.3.3(1)
VALUES OF SITE COEFFICIENT F_a [a]

SITE CLASS	MAPPED SPECTRAL RESPONSE ACCELERATION AT SHORT PERIOD				
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	Note b	Note b	Note b	Note b	Note b

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at short period, S_s.
b. Values shall be determined in accordance with Section 11.4.7 of ASCE 7.

TABLE 1613.3.3(2)
VALUES OF SITE COEFFICIENT F_v [a]

SITE CLASS	MAPPED SPECTRAL RESPONSE ACCELERATION AT 1-SECOND PERIOD				
	$S_1 \leq 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \geq 0.5$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	Note b	Note b	Note b	Note b	Note b

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at 1-second period, S_1.
b. Values shall be determined in accordance with Section 11.4.7 of ASCE 7.

JACOBS

JOB	York Toll Plaza		
SUBJECT	Seismic Site Class		
CALCULATED BY	PJL	**DATE**	6/22/2016
CHECKED BY	GJS	**DATE**	7/14/2016

TABLE 1613.3.5(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATIONS

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

TABLE 1613.3.5(2)
SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

TABLE 1604.5
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing elementary school, secondary school or day care facilities with an occupa load greater than 250. • Buildings and other structures containing adult education facilities, such as colleges and universities, with an occupant load greater than 500. • Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities. • Group I-3 occupancies. • Any other occupancy with an occupant load greater than 5,000[a]. • Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code*; and Are sufficient to pose a threat to the public if released [b].
IV	Buildings and other structures designated as essential facilities, including but not limited to: • Group I-2 occupancies having surgery or emergency treatment facilities. • Fire, rescue, ambulance and police stations and emergency vehicle garages. • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. • Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures. • Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code*; and Are sufficient to pose a threat to the public if released [b]. • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

ATTACHMENTS: Refer to the attached calculation sheets for further information.

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Seismic Site Class Evaluation

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-4	S-1	4	5	1.25	
	S-2	19	4.2	0.22	
	Bedrock	100	90.8	0.91	
					42
Total Depth =		100			
Depth to Bedrock =		9.2	sum	2.38	

N_{bar} = Σ Di / ΣDi/Ni = 42

Per ASCE Table 20.3-1, $15 \le N_{bar} \le 50$, Site Class D

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-5	S-1	7	5.5	0.79	
	S-2	100	0.6	0.01	
	Bedrock	100	93.9	0.94	
					58
Total Depth =		100			
Depth to Bedrock =		6.1	sum	1.73	

N_{bar} = Σ Di / ΣDi/Ni = 58

Per ASCE Table 20.3-1, $N_{bar} > 50$, Site Class C

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-6	S-1	5	4.3	0.86	
	Bedrock	100	95.7	0.96	
					55
Total Depth =		100			
Depth to Bedrock =		4.3	sum	1.82	

N_{bar} = Σ Di / ΣDi/Ni = 55

Per ASCE Table 20.3-1, $N_{bar} > 50$, Site Class C

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Seismic Site Class Evaluation

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-7	S-1	41	3.5	0.09	
	Bedrock	100	96.5	0.97	
					95
	Total Depth =	100			
	Depth to Bedrock =	3.5	sum	1.05	

N_{bar} = Σ Di / ΣDi/Ni = 95

Per Table 1613.5.2, N_{bar} > 50, Site Class C

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-8	S-1	17	5	0.29	
	S-2	100	1.2	0.01	
	Bedrock	100	93.8	0.94	
					80
	Total Depth =	100			
	Depth to Bedrock =	6.2	sum	1.24	

N_{bar} = Σ Di / ΣDi/Ni = 80

Per ASCE Table 20.3-1, N_{bar} > 50, Site Class C

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-9	S-1	8	4.5	0.56	
	S-2	29	5	0.17	
	S-3	36	3	0.08	
	Bedrock	100	87.5	0.88	
					59
	Total Depth =	100			
	Depth to Bedrock =	12.5	sum	1.69	

N_{bar} = Σ Di / ΣDi/Ni = 59

Per ASCE Table 20.3-1, N_{bar} > 50, Site Class C

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-10	S-1	38	3.4	0.09	
	S-2	100	5.6	0.06	
	S-3	64	4	0.06	
	Bedrock	100	87	0.87	
					93
	Total Depth =	100			
	Depth to Bedrock =	13	sum	1.08	

N_{bar} = Σ Di / ΣDi/Ni = 93

Per ASCE Table 20.3-1, N_{bar} > 50, Site Class C

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Seismic Site Class Evaluation

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-11	S-1	35	4	0.11	
	S-2	95	5	0.05	
	S-3	35	4	0.11	
	Bedrock	100	87	0.87	
					87
	Total Depth =	100			
	Depth to Bedrock =	13	sum	1.15	

N_{bar} = Σ Di / ΣDi/Ni = 87

Per ASCE Table 20.3-1, N_{bar} > 50, Site Class C

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-12	S-1	31	2	0.06	
	S-2	50	2	0.04	
	S-3	67	2	0.03	
	S-4	100	9	0.09	
	S-5	100	3	0.03	
	Bedrock	100	82	0.82	**93**
	Total Depth =	100			
	Depth to Bedrock =	18	sum	1.07	

N_{bar} = Σ Di / ΣDi/Ni = 93

Per ASCE Table 20.3-1, N_{bar} > 50, Site Class C

Boring No.	Sample No.	N Value	Di	Di/N_i	N_{bar}
B-13	S-1	23	5	0.22	
	S-2	58	5	0.09	
	Bedrock	100	90	0.90	
					83
	Total Depth =	100			
	Depth to Bedrock =	10	sum	1.20	

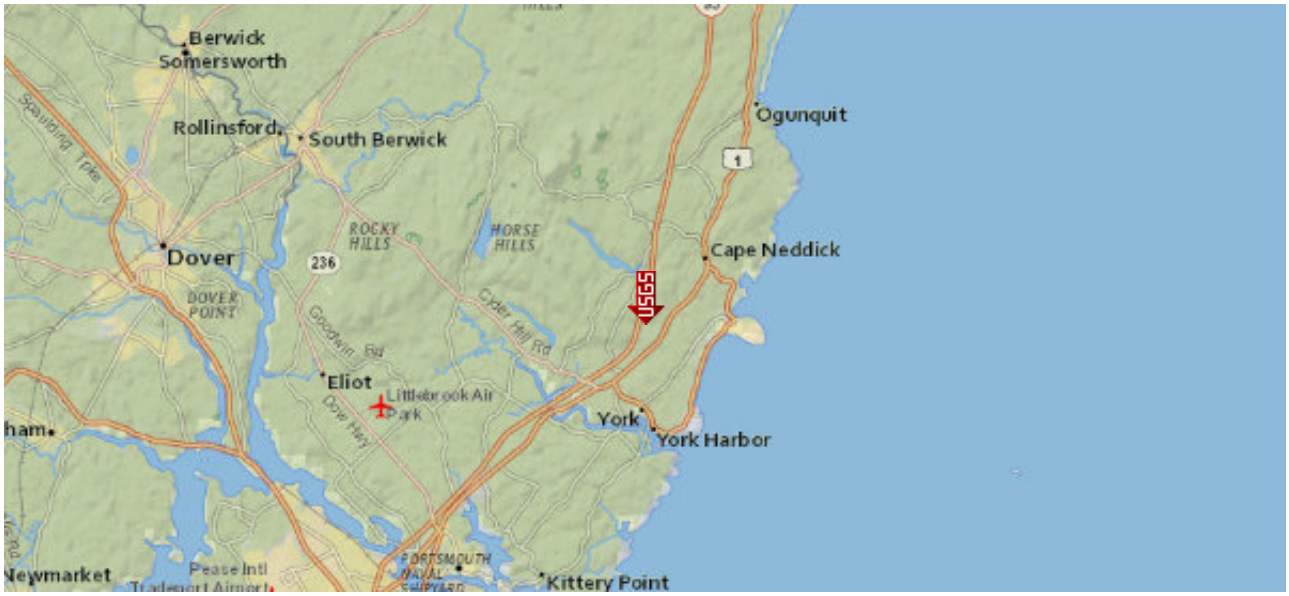
N_{bar} = Σ Di / ΣDi/Ni = 83

Per ASCE Table 20.3-1, N_{bar} > 50, Site Class C

USGS Design Maps Summary Report

User–Specified Input

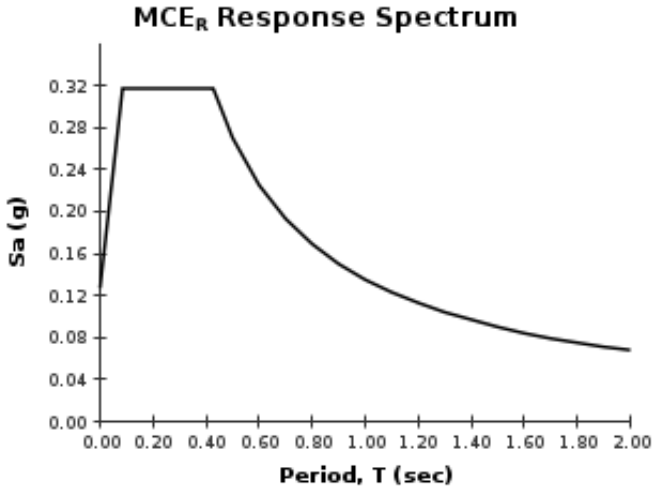
Report Title	York Toll Plaza Thu March 10, 2016 14:11:53 UTC
Building Code Reference Document	2012 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	43.18013°N, 70.649°W
Site Soil Classification	Site Class C – "Very Dense Soil and Soft Rock"
Risk Category	I/II/III

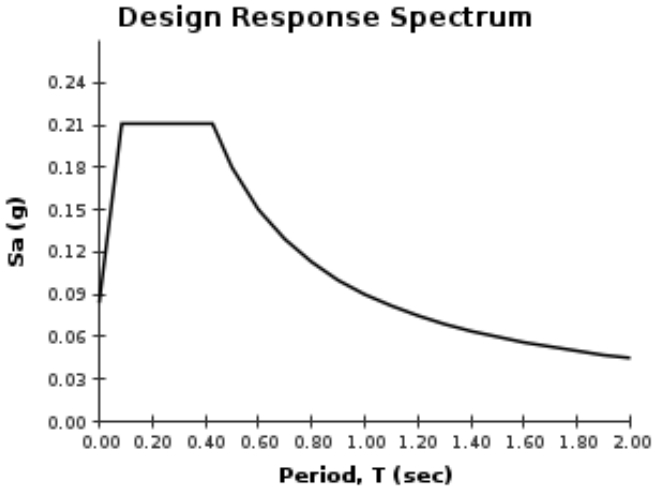


USGS–Provided Output

S_S =	0.264 g	S_{MS} =	0.317 g	S_{DS} =	0.211 g
S_1 =	0.079 g	S_{M1} =	0.135 g	S_{D1} =	0.090 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





USGS Design Maps Detailed Report

2012 International Building Code (43.18013°N, 70.649°W)

Site Class C – "Very Dense Soil and Soft Rock", Risk Category I/II/III

Section 1613.3.1 — Mapped acceleration parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2012 International Building Code are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 1613.3.3.

From Figure 1613.3.1(1) [1]	S_S = 0.264 g
From Figure 1613.3.1(2) [2]	S_1 = 0.079 g

Section 1613.3.2 — Site class definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Section 1613.

2010 ASCE-7 Standard – Table 20.3-1
SITE CLASS DEFINITIONS

Site Class	$\overline{v}_S$	$\overline{N}$ or $\overline{N}_{ch}$	$\overline{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index *PI* > 20, • Moisture content *w* ≥ 40%, and • Undrained shear strength $\overline{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 1613.3.3 — Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters

TABLE 1613.3.3(1)
VALUES OF SITE COEFFICIENT F_a

Site Class	Mapped Spectral Response Acceleration at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = C and S_S = 0.264 g, F_a = 1.200

TABLE 1613.3.3(2)
VALUES OF SITE COEFFICIENT F_v

Site Class	Mapped Spectral Response Acceleration at 1–s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.079 g, F_v = 1.700

Equation (16-37):	$S_{MS} = F_a S_S = 1.200 \times 0.264 = 0.317$ g
Equation (16-38):	$S_{M1} = F_v S_1 = 1.700 \times 0.079 = 0.135$ g

Section 1613.3.4 — Design spectral response acceleration parameters

Equation (16-39):	$S_{DS} = ⅔ S_{MS} = ⅔ \times 0.317 = 0.211$ g
Equation (16-40):	$S_{D1} = ⅔ S_{M1} = ⅔ \times 0.135 = 0.090$ g

Section 1613.3.5 — Determination of seismic design category

TABLE 1613.3.5(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATION

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 0.211 g, Seismic Design Category = B

TABLE 1613.3.5(2)
SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.090 g, Seismic Design Category = B

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 1613.3.5(1) or 1613.3.5(2)" = B

Note: See Section 1613.3.5.1 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 1613.3.1(1)*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(1).pdf
2. *Figure 1613.3.1(2)*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(2).pdf

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Appendix F. **Soil Property Summary**

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343 Congress Street
Boston, MA 02210
617/242-9222

JOB	York Toll Plaza		
SUBJECT	Recommended Soil Properties		
CALCULATED BY	PJL	DATE	3/9/2016
CHECKED BY	GJS	DATE	3/11/2016

Recommended Soil Properties

Purpose:

The purpose of this evaluation was to select representative soil properties for the proposed toll plaza and associated structures near Mile 8.8 on the Maine Turnpike I-95 in York, ME. The soil properties will be used in our engineering analyses.

Approach:

We evaluated field SPT N-values and corrected these for hammer efficiency and overburden pressure. Corrected N values were then used to estimate the angle of internal friction of the subsurface soils. Judgement was then applied to select the unit weight and friction angles for design.

Unit Weight:

A saturated unit weight in pounds per cubic foot (pcf) was used. The buoyant unit weight, if necessary, can be determined by subtracting the unit weight of water (62.4 pcf).

Angle of Internal Friction:

An angle of internal friction (ϕ) in degrees was used. We used Mohr-Coulumb's drained properties for each soil.

References:

1) AASHTO LRFD Bridge Design Specification, 7th Edition, 2014.
2) T.William Lambe, Robert V. Whitman. 1969. Soil Mechanics. 1st Edition, John Wiley & Sons, New York.

Subsurface Investigation and SPT Correlations

We reviewed Standard Penetration Test (SPT) N- values obtained during our subsurface investigation. We estimated angles of internal friction for soils based on N_{60} and $N_{1,60}$ values. The borings were drilled using a safety hammer that was lifted and dropped with either a rope and cathead (60% efficiency) , automatic hammer (73% efficiency) or a donut hammer (45%). Our field N values were corrected to N_{60} and $N_{1,60}$ (refer to the attached spreadsheets). N-values indicating refusal on obstructions, cobbles, boulders, or weathered bedrock were neglected in our evaluation.

Note: N-Values for Borings B-1 through B-5 were not included in this evaluation as those soils will be removed as part of the regrading of that area for the new Administration Building and Parking Area.

Soil Layer	N_{60ave}	$N_{1,60ave}$
Overburden	35	56

Results:

We selected the following soil properties for each layer/soil type:

Soil Type	Unit Weight (pcf)	Friction Angle (deg)
Existing Fill	125	34
Proposed Fill	125	34

JACOBS

343 Congress Street
Boston, MA 02210
617/242-9222

JOB	York Toll Plaza		
SUBJECT	Recommended Soil Properties		
CALCULATED BY	PJL	DATE	3/9/2016
CHECKED BY	GJS	DATE	3/11/2016

References:

AASHTO Table 10.4.6.2.4-1 recommends using the following correlation to select friction angles of granular soils.

Table 10.4.6.2.4-1—Correlation of *SPT* $N1_{60}$ Values to Drained Friction Angle of Granular Soils (modified after Bowles, 1977)

$N1_{60}$	ϕ_f
<4	25–30
4	27–32
10	30–35
30	35–40
50	38–43

In Soil Mechanics, Lambe and Whitman presented the following N value and friction angle relationships (applies to overburden depths up to 40 feet):

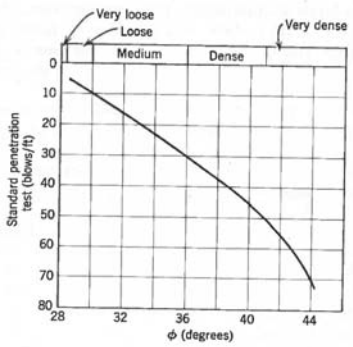

Fig. 11.14 Correlation between friction angle and penetration resistance (From Peck, Hanson, and Thornburn, 1953).

Table 11.3 Summary of Friction Angle Data for Use in Preliminary Design

	Friction Angles							
	Slope Angle of Repose		At Ultimate Strength		At Peak Strength			
					Medium Dense		Dense	
Classification	$i(^\circ)$	Slope (vert. to hor.)	$\phi_{cv}(^\circ)$	$\tan\phi_{cv}$	$\phi(^\circ)$	$\tan\phi$	$\phi(^\circ)$	$\tan\phi$
Silt (nonplastic)	26 to 30	1 on 2 to 1 on 1.75	26 to 30	0.488 to 0.577	28 to 32	0.532 to 0.625	30 to 34	0.577 to 0.675
Uniform fine to medium sand	26 to 30	1 on 2 to 1 on 1.75	26 to 30	0.488 to 0.577	30 to 34	0.577 to 0.675	32 to 36	0.675 to 0.726
Well-graded sand	30 to 34	1 on 1.75 to 1 on 1.50	30 to 34	0.577 to 0.675	34 to 40	0.675 to 0.839	38 to 46	0.839 to 1.030
Sand and gravel	32 to 36	1 on 1.60 to 1 on 1.40	32 to 36	0.625 to 0.726	36 to 42	0.726 to 0.900	40 to 48	0.900 to 1.110

CALCULATION SHEET

Sheet No. 1

Project:	York Toll Plaza		Authored by:	PJL	Date	3/9/2016
Job No.	E2X71602		Checked by:	GJS	Date	3/11/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. B-6
Ground Surface Elevation 164.10 ft (NAVD 88)
Ground Water Depth during Drilling 0.80 ft
Hammer Efficiency 60 %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.1	1	5	n/a	n/a	2.00	1.00	**5.0**	55	**10.0**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf]

$\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
$\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 2

Project:	York Toll Plaza		Authored by:	PJL	Date	3/9/2016
Job No.	E2X71602		Checked by:	GJS	Date	3/11/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. B-7
Ground Surface Elevation 164.30 ft (NAVD 88)
Ground Water Depth during Drilling 4.00 ft
Hammer Efficiency 60 %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.3	1	41	n/a	n/a	1.92	1.00	**41.0**	130	**78.5**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf]

$\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
$\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 3

Project:	York Toll Plaza		Authored by:	PJL	Date	3/9/2016
Job No.	E2X71602		Checked by:	GJS	Date	3/11/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. B-8
Ground Surface Elevation 164.50 ft (NAVD 88)
Ground Water Depth during Drilling 5.20 ft
Hammer Efficiency 60 %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.5	1	17	n/a	n/a	1.93	1.00	**17.0**	124	**32.8**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf]

$\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
$\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 4

Project:	York Toll Plaza		Authored by:	PJL	Date	3/9/2016
Job No.	E2X71602		Checked by:	GJS	Date	3/11/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. B-9
Ground Surface Elevation 164.90 ft (NAVD 88)
Ground Water Depth during Drilling 9.50 ft
Hammer Efficiency 60 %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.9	1	8	n/a	n/a	1.95	1.00	**8.0**	116	**15.6**
159.4	5.5	29	n/a	n/a	1.35	1.00	**29.0**	701	**39.2**
154.4	10.5	36	n/a	n/a	1.22	1.00	**36.0**	1,039	**44.0**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf]

$\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
$\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 5

Project:	York Toll Plaza		Authored by:	PJL	Date	3/9/2016
Job No.	E2X71602		Checked by:	GJS	Date	3/11/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. B-10
Ground Surface Elevation 165.90 ft (NAVD 88)
Ground Water Depth during Drilling 9.70 ft
Hammer Efficiency 60 %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
164.9	1	38	n/a	n/a	1.92	1.00	**38.0**	130	**72.8**
161.8	4.1	100	n/a	n/a	1.44	1.00	**100.0**	533	**144.4**
155.9	10	64	n/a	n/a	1.26	1.00	**64.0**	932	**80.5**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf]

$\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
$\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 6

Project:	York Toll Plaza		Authored by:	PJL	Date	3/9/2016
Job No.	E2X71602		Checked by:	GJS	Date	3/11/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. B-11
Ground Surface Elevation 164.60 ft (NAVD 88)
Ground Water Depth during Drilling 8.00 ft
Hammer Efficiency 60 %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.6	1	35	n/a	n/a	1.92	1.00	**35.0**	130	**67.1**
159.6	5	95	n/a	n/a	1.38	1.00	**95.0**	650	**130.9**
154.6	10	35	n/a	n/a	1.24	1.00	**35.0**	988	**43.3**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf]

$\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
$\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 7

Project:	York Toll Plaza		Authored by:	PJL	Date	3/9/2016
Job No.	E2X71602		Checked by:	GJS	Date	3/11/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. B-12
Ground Surface Elevation 164.50 ft (NAVD 88)
Ground Water Depth during Drilling 8.80 ft
Hammer Efficiency 60 %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.5	1	31	n/a	n/a	1.92	1.00	**31.0**	130	**59.4**
161.5	3	50	n/a	n/a	1.55	1.00	**50.0**	390	**77.4**
159.5	5	67	n/a	n/a	1.38	1.00	**67.0**	650	**92.3**
158.0	6.5	100	n/a	n/a	1.29	1.00	**100.0**	845	**129.0**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf]

$\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
$\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 8

Project:	York Toll Plaza		Authored by:	PJL	Date	3/9/2016
Job No.	E2X71602		Checked by:	GJS	Date	3/11/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. B-13
Ground Surface Elevation 158.10 ft (NAVD 88)
Ground Water Depth during Drilling 2.60 ft
Hammer Efficiency 60 %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
157.1	1	23	n/a	n/a	1.92	1.00	**23.0**	128	**44.2**
152.1	6	58	n/a	n/a	1.49	1.00	**58.0**	466	**86.4**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf]

$\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
$\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

Appendix G. **Bearing Resistance Calculations**

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	Project				Job Ref.	
JACOBS	York Toll Plaza– Mile 8.8				E2X71602	
	Section				Sheet no./rev.	
	Toll Plaza Canopy Footing - NB				Rev 1	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	PJL	7/18/16	PJM	7/28/16		

Summary:

Evaluate bearing resistance for the proposed foundation for the northbound toll plaza canopy.

Design Codes

- 2015 International Building Code (IBC)
- AASHTO LRFD 2014 Bridge Design Specifications

Input/Analysis Assumptions

- Groundwater at elevation 163.2
- Proposed elevation of NB roadway at toll plaza = 167.7 feet
- Bottom of footing shall be minimum 6.3 feet below finished grade for frost protection.
- Bearing soils consist of compacted gravel borrow or medium dense to dense fill material.
- Soil conditions based on Boring B-12. Soil profile and properties used in analysis presented in Table 1 below.
- Surficial unsuitable soils present must be removed and replaced with compacted gravel borrow prior to construction.
- Assume 5'x5' footings. Max footing eccentricity was conservatively estimated to be in the middle third (B/6) of the corresponding footing dimension (Section 10.6.3.3)
- IBC 2015 Building Code provides presumptive load bearing values of various soils in Table 1806.2, however per Section 1806.2, higher values can be used if data can substantiated. Therefore, bearing resistance was evaluated using procedures per AASHTO LRFD 2014 Design Specifications (attached).

Table 1: Soil Profile and Properties for Analysis

Strata	Thickness (ft)	Unit Weight (pcf)	Friction Angle (Φ)
Gravel Borrow/Fill	18	125	34
Bedrock	-	-	-

Conclusions

- Due to the amount of gravel borrow to be placed in areas the proposed footings, we recommend the following:
  - To limit settlement to about 0.5 inch for an effective width (B') of about 3.3 feet (footing width of 5 feet), a maximum service design bearing resistance not to exceed 5 ksf is recommended.

Calculated by: PJL Date: 7/1/16
Reviewed by: PJM Date:7/29/16

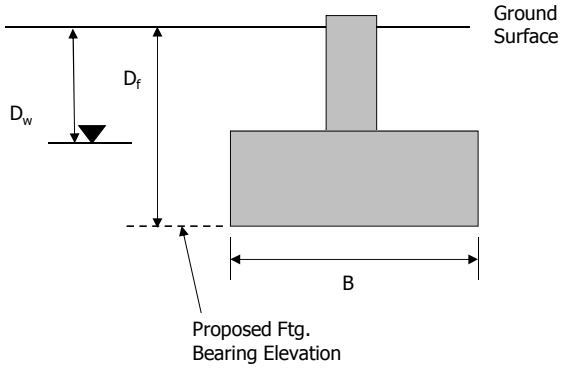
Purpose

Assess net factored bearing resistance of shallow footing for Northbound Toll Plaza Canopy.

Assumptions

1) Footing on compacted gravel borrow or dense to medium dense fill material
2) Approx. NB roadway elevation of 167.7 feet.
3) Assume groundwater at elev. 163.2 feet
4) Design Parameters are as follows:

γ	Φ_f	D_w	L	D_f
125	**34**	**4.5**	**5**	**6.3**



Bearing Capacity Factors (AASHTO Table 10.6.3.1.2a-1)

Φ_f	N_c	N_q	N_γ
34	42.2	29.4	41.1

Calculate Effective Footing Width (B') and Length (L):

B	5	footing width (ft)
Max e/B	0.167	(Max e = B/6)
e	0.83	eccentricity (ft)
$B'=B-2e_B$	3.33	ft.

Nominal Bearing Resistance

$$q_n = c*N_{cm} + \gamma*D_f*N_{qm}*C_{wq} + 0.5*\gamma*B'*N_{\gamma m}*C_{w\gamma}$$

c	**0**	cohesion
γ	125	total unit weight (pcf)
D_f	6.3	Depth of footing (ft)
B'	3.33	Effective footing width (ft)
L	5	Footing Length
B'/L	0.667	
D_f/B'	1.890	
C_{wq}	0.5	Table 10.6.3.1.2a-2
$C_{w\gamma}$	0.5	Table 10.6.3.1.2a-2

$N_{cm} = N_c*s_c*i_c$

	N_c	42.2	
	s_c	1.46	Table 10.6.3.1.2a-3
	i_c	**1**	AASHTO Section 10.6.3.1.2
N_{cm}	61.6		

$N_{qm} = N_q*s_q*d_q*i_q$

	N_q	29.4	
	s_q	1.45	Table 10.6.3.1.2a-3
	d_q	1.20	Table 10.6.3.1.2a-4
	i_q	**1**	AASHTO P. 10-70
N_{qm}	51.2		

$N_{ym} = N_\gamma * s_\gamma * i_\gamma$

	N_γ	41.1	
	s_γ	0.733	Table 10.6.3.1.2a-3
	i_γ	**1**	AASHTO P. 10-70
N_{ym}	30.1		
q_n	23,295	psf	

Factored Bearing Resistance

$q_r = RF * q_n$

RF	**0.45**		Table 10.5.5.2.2-1
q_r	10,483	psf	

Settlement Calculation

$S_e = [q_o * (1-v^2) * \sqrt{(A')}] / (144 * E_s * \beta_z)$ Equation 10.6.2.4.2-1

v	**0.3**	Poisson's Ratio (Table C10.4.6.3-1)
E_s (ksi)	**6.94**	Young's Modulus (Table C10.4.6.3-1)
β_z	1.07	Shape/Rigidity Factor (Table 10.6.2.4.2-1)
B'	3.33	Effective Footing Width (ft)
L	5	Length of Footing (ft)
A' = B' * L	16.7	Footing Area (ft^2)

Solve for q_o for a given settlement (S_e):

S_e =	**0.50**	Given Settlement (in)
	0.75	
	1.00	
	1.25	
	1.50	

q_o =	12.0	ksf for 0.5 inches settlement	(Applied Vertical Stress)
	18.0	ksf for 0.75 inches settlement	
	24.0	ksf for 1 inches settlement	
	30.0	ksf for 1.25 inches settlement	
	36.0	ksf for 1.5 inches settlement	

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AASHTO 2014 References

Table C10.4.6.3-1—Elastic Constants of Various Soils (modified after U.S. Department of the Navy, 1982; Bowles, 1988)

Soil Type	Typical Range of Young's Modulus Values, E_s (ksi)	Poisson's Ratio, ν (dim)
Clay:		
Soft sensitive	0.347–2.08	0.4–0.5 (undrained)
Medium stiff to stiff	2.08–6.94	
Very stiff	6.94–13.89	
Loess	2.08–8.33	0.1–0.3
Silt	0.278–2.78	0.3–0.35
Fine Sand:		
Loose	1.11–1.67	0.25
Medium dense	1.67–2.78	
Dense	2.78–4.17	
Sand:		
Loose	1.39–4.17	0.20–0.36
Medium dense	4.17–6.94	
Dense	6.94–11.11	0.30–0.40
Gravel:		
Loose	4.17–11.11	0.20–0.35
Medium dense	11.11–13.89	
Dense	13.89–27.78	0.30–0.40
Estimating E_s from $SPT N$ Value		
Soil Type		E_s (ksi)
Silts, sandy silts, slightly cohesive mixtures		$0.056\ N1_{60}$
Clean fine to medium sands and slightly silty sands		$0.097\ N1_{60}$
Coarse sands and sands with little gravel		$0.139\ N1_{60}$
Sandy gravel and gravels		$0.167\ N1_{60}$
Estimating E_s from q_c (static cone resistance)		
Sandy soils		$0.028 q_c$

Table 10.6.3.1.2a-2—Coefficients C_{wq} and $C_{w\gamma}$ for Various Groundwater Depths

D_w	C_{wq}	$C_{w\gamma}$
0.0	0.5	0.5
D_f	1.0	0.5
$>1.5B + D_f$	1.0	1.0

Table 10.6.3.1.2a-4—Depth Correction Factor d_q

Friction Angle, ϕ_f (degrees)	D_f/B	d_q
32	1	1.20
	2	1.30
	4	1.35
	8	1.40
37	1	1.20
	2	1.25
	4	1.30
	8	1.35
42	1	1.15
	2	1.20
	4	1.25
	8	1.30

Table 10.6.3.1.2a-1—Bearing Capacity Factors N_c (Prandtl, 1921), N_q (Reissner, 1924), and N_γ (Vesic, 1975)

ϕ_f	N_c	N_q	N_γ	ϕ_f	N_c	N_q	N_γ
0	5.14	1.0	0.0	23	18.1	8.7	8.2
1	5.4	1.1	0.1	24	19.3	9.6	9.4
2	5.6	1.2	0.2	25	20.7	10.7	10.9
3	5.9	1.3	0.2	26	22.3	11.9	12.5
4	6.2	1.4	0.3	27	23.9	13.2	14.5
5	6.5	1.6	0.5	28	25.8	14.7	16.7
6	6.8	1.7	0.6	29	27.9	16.4	19.3
7	7.2	1.9	0.7	30	30.1	18.4	22.4
8	7.5	2.1	0.9	31	32.7	20.6	26.0
9	7.9	2.3	1.0	32	35.5	23.2	30.2
10	8.4	2.5	1.2	33	38.6	26.1	35.2
11	8.8	2.7	1.4	34	42.2	29.4	41.1
12	9.3	3.0	1.7	35	46.1	33.3	48.0
13	9.8	3.3	2.0	36	50.6	37.8	56.3
14	10.4	3.6	2.3	37	55.6	42.9	66.2
15	11.0	3.9	2.7	38	61.4	48.9	78.0
16	11.6	4.3	3.1	39	67.9	56.0	92.3
17	12.3	4.8	3.5	40	75.3	64.2	109.4
18	13.1	5.3	4.1	41	83.9	73.9	130.2
19	13.9	5.8	4.7	42	93.7	85.4	155.6
20	14.8	6.4	5.4	43	105.1	99.0	186.5
21	15.8	7.1	6.2	44	118.4	115.3	224.6
22	16.9	7.8	7.1	45	133.9	134.9	271.8

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AASHTO 2014 References (cont.)

Table 10.6.3.1.2a-3—Shape Correction Factors s_c, s_γ, s_q

Factor	Friction Angle	Cohesion Term (s_c)	Unit Weight Term (s_γ)	Surcharge Term (s_q)
Shape Factors s_c, s_γ, s_q	$\phi_f = 0$	$1+\left(\frac{B}{5L}\right)$	1.0	1.0
	$\phi_f > 0$	$1+\left(\frac{B}{L}\right)\left(\frac{N_q}{N_c}\right)$	$1-0.4\left(\frac{B}{L}\right)$	$1+\left(\frac{B}{L}\tan\phi_f\right)$

Table 10.5.5.2.2-1—Resistance Factors for Geotechnical Resistance of Shallow Foundations at the Strength Limit State

Method/Soil/Condition			Resistance Factor
Bearing Resistance	φ_b	Theoretical method (Munfakh et al., 2001), in clay	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *CPT*	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *SPT*	0.45
		Semi-empirical methods (Meyerhof, 1957), all soils	0.45
		Footings on rock	0.45
		Plate Load Test	0.55
Sliding	φ_τ	Precast concrete placed on sand	0.90
		Cast-in-Place Concrete on sand	0.80
		Cast-in-Place or precast Concrete on Clay	0.85
		Soil on soil	0.90
	φ_{ep}	Passive earth pressure component of sliding resistance	0.50

Table 10.6.2.4.2-1—Elastic Shape and Rigidity Factors, EPRI (1983)

L/B	Flexible, β_z (average)	β_z Rigid
Circular	1.04	1.13
1	1.06	1.08
2	1.09	1.10
3	1.13	1.15
5	1.22	1.24
10	1.41	1.41

JACOBS	Project: York Toll Plaza– Mile 8.8				Job Ref.: E2X71602	
	Section: Toll Plaza Canopy Footing - SB				Sheet no./rev.: Rev 1	
	Calc. by: PJL	Date: 7/18/16	Chk'd by:	Date:	App'd by:	Date:

Summary:

Evaluate bearing resistance for the proposed foundation for the southbound toll plaza canopy.

Design Codes

- 2015 International Building Code (IBC)
- AASHTO LRFD 2014 Bridge Design Specifications

Input/Analysis Assumptions

- Groundwater at elevation 163.2.
- Proposed elevation of SB roadway at toll plaza = 167.7 feet
- Bottom of footing shall be minimum 6.3 feet below finished grade for frost protection.
- Bearing soils consist of medium dense to dense fill material overlying shallow bedrock.
- Bedrock elevation based on most conservative elevation from Borings B-4, B-6, and B-8. Soil profile and properties used in analysis presented in Table 1 below.
- Surficial unsuitable soils present must be removed and replaced with compacted gravel borrow prior to construction.
- Assume 5'x5' footings. Max footing eccentricity was conservatively estimated to be in the middle third (B/6) of the corresponding footing dimension (Section 10.6.3.3)
- IBC 2015 Building Code provides presumptive load bearing values of various soils in Table 1806.2, however per Section 1806.2, higher values can be used if data can substantiated. Therefore, bearing resistance was evaluated using procedures per AASHTO LRFD 2014 Design Specifications (attached).

Table 1: Soil Profile and Properties for Analysis

Strata	Thickness (ft)	Unit Weight (pcf)	Friction Angle (Φ)
Gravel Borrow	9.2	125	34
Bedrock	-	-	-

Conclusions

- Due to the shallow bedrock, we also evaluated bearing resistance using an alternative method. However, due to varying thicknesses of overburden soils and depth to bedrock, we recommend the following:
  - To limit settlement to about 0.5 inch for an effective width (B') of about 3.3 feet (footing width of 5 feet), a maximum service design bearing resistance not to exceed 5 ksf is recommended.

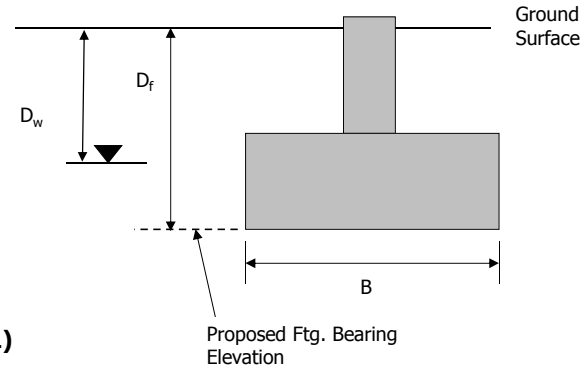
Calculated by: PJL Date: 7/18/2016
Reviewed by: PJM Date: 7/28/16

Purpose

Assess net factored bearing resistance of shallow footing for Southbound Toll Plaza Canopy.

Assumptions

1) Footing on medium dense to dense gravel borrow over shallow bedrock.
2) Approx. NB roadway elevation of 167.7 feet.
3) Assume groundwater at elev. 163.2 feet.
4) Design Parameters are as follows:



γ	Φ_f	D_w	L	D_f
125	**34**	**4.5**	**5**	**6.3**

Bearing Capacity Factors (AASHTO Table 10.6.3.1.2a-1)

Φ_f	N_c	N_q	N_γ
34	42.2	29.4	41.1

Calculate Effective Footing Width (B') and Length (L):

B	5	footing width (ft)
Max e/B	0.167	(Max e = B/6)
e	0.83	eccentricity (ft)
$B'=B-2e_B$	3.33	ft.

Nominal Bearing Resistance

$$q_n = c*N_{cm} + \gamma*D_f*N_{qm}*C_{wq} + 0.5*\gamma*B'*N_{\gamma m}*C_{w\gamma}$$

c	**0**	cohesion
γ	125	total unit weight (pcf)
D_f	5	Depth of footing (ft)
B'	3.33	Effective footing width (ft)
L	5	Footing Length
B'/L	0.667	
D_f/B'	1.500	
C_{wq}	0.5	Table 10.6.3.1.2a-2
$C_{w\gamma}$	0.5	Table 10.6.3.1.2a-2

$N_{cm} = N_c*s_c*i_c$

N_c	42.2	
s_c	1.46	Table 10.6.3.1.2a-3
i_c	**1**	AASHTO Section 10.6.3.1.2
N_{cm}	61.6	

$N_{qm} = N_q*s_q*d_q*i_q$

N_q	29.4	
s_q	1.45	Table 10.6.3.1.2a-3
d_q	1.20	Table 10.6.3.1.2a-4
i_q	**1**	AASHTO P. 10-70
N_{qm}	51.2	

$N_{ym} = N_\gamma * s_\gamma * i_\gamma$

	N_γ	41.1	
	s_γ	0.733	Table 10.6.3.1.2a-3
	i_γ	**1**	AASHTO P. 10-70
N_{ym}	30.1		
q_n	19,135	psf	

Factored Bearing Resistance

$q_r = RF * q_n$

RF	**0.45**		Table 10.5.5.2.2-1
q_r	8,611	psf	

Settlement Calculation

$S_e = [q_o * (1-v\text{^}2) * \sqrt{(A')}] / (144 * E_s * \beta_z)$ Equation 10.6.2.4.2-1

v	**0.3**	Poisson's Ratio (Table C10.4.6.3-1)
E_s (ksi)	**6.94**	Young's Modulus (Table C10.4.6.3-1)
β_z	1.07	Shape/Rigidity Factor (Table 10.6.2.4.2-1)
B'	3.33	Effective Footing Width (ft)
L	5	Length of Footing (ft)
A' = B' * L	16.7	Footing Area (ft^2)

Solve for q_o for a given settlement (S_e):

S_e =	**0.50**	Given Settlement (in)
	0.75	
	1.00	
	1.25	
	1.50	

q_o =	12.0	ksf for 0.5 inches settlement	(Applied Vertical Stress)
	18.0	ksf for 0.75 inches settlement	
	24.0	ksf for 1 inches settlement	
	30.0	ksf for 1.25 inches settlement	
	36.0	ksf for 1.5 inches settlement	

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AASHTO 2014 References

Table C10.4.6.3-1—Elastic Constants of Various Soils (modified after U.S. Department of the Navy, 1982; Bowles, 1988)

Soil Type	Typical Range of Young's Modulus Values, E_s (ksi)	Poisson's Ratio, ν (dim)
Clay:		
Soft sensitive	0.347–2.08	0.4–0.5 (undrained)
Medium stiff to stiff	2.08–6.94	
Very stiff	6.94–13.89	
Loess	2.08–8.33	0.1–0.3
Silt	0.278–2.78	0.3–0.35
Fine Sand:		
Loose	1.11–1.67	0.25
Medium dense	1.67–2.78	
Dense	2.78–4.17	
Sand:		
Loose	1.39–4.17	0.20–0.36
Medium dense	4.17–6.94	
Dense	6.94–11.11	0.30–0.40
Gravel:		
Loose	4.17–11.11	0.20–0.35
Medium dense	11.11–13.89	
Dense	13.89–27.78	0.30–0.40
Estimating E_s from $SPT N$ Value		
Soil Type		E_s (ksi)
Silts, sandy silts, slightly cohesive mixtures		$0.056\ N1_{60}$
Clean fine to medium sands and slightly silty sands		$0.097\ N1_{60}$
Coarse sands and sands with little gravel		$0.139\ N1_{60}$
Sandy gravel and gravels		$0.167\ N1_{60}$
Estimating E_s from q_c (static cone resistance)		
Sandy soils		$0.028 q_c$

Table 10.6.3.1.2a-2—Coefficients C_{wq} and $C_{w\gamma}$ for Various Groundwater Depths

D_w	C_{wq}	$C_{w\gamma}$
0.0	0.5	0.5
D_f	1.0	0.5
$>1.5B + D_f$	1.0	1.0

Table 10.6.3.1.2a-4—Depth Correction Factor d_q

Friction Angle, ϕ_f (degrees)	D_f/B	d_q
32	1	1.20
	2	1.30
	4	1.35
	8	1.40
37	1	1.20
	2	1.25
	4	1.30
	8	1.35
42	1	1.15
	2	1.20
	4	1.25
	8	1.30

Table 10.6.3.1.2a-1—Bearing Capacity Factors N_c (Prandtl, 1921), N_q (Reissner, 1924), and N_γ (Vesic, 1975)

ϕ_f	N_c	N_q	N_γ	ϕ_f	N_c	N_q	N_γ
0	5.14	1.0	0.0	23	18.1	8.7	8.2
1	5.4	1.1	0.1	24	19.3	9.6	9.4
2	5.6	1.2	0.2	25	20.7	10.7	10.9
3	5.9	1.3	0.2	26	22.3	11.9	12.5
4	6.2	1.4	0.3	27	23.9	13.2	14.5
5	6.5	1.6	0.5	28	25.8	14.7	16.7
6	6.8	1.7	0.6	29	27.9	16.4	19.3
7	7.2	1.9	0.7	30	30.1	18.4	22.4
8	7.5	2.1	0.9	31	32.7	20.6	26.0
9	7.9	2.3	1.0	32	35.5	23.2	30.2
10	8.4	2.5	1.2	33	38.6	26.1	35.2
11	8.8	2.7	1.4	34	42.2	29.4	41.1
12	9.3	3.0	1.7	35	46.1	33.3	48.0
13	9.8	3.3	2.0	36	50.6	37.8	56.3
14	10.4	3.6	2.3	37	55.6	42.9	66.2
15	11.0	3.9	2.7	38	61.4	48.9	78.0
16	11.6	4.3	3.1	39	67.9	56.0	92.3
17	12.3	4.8	3.5	40	75.3	64.2	109.4
18	13.1	5.3	4.1	41	83.9	73.9	130.2
19	13.9	5.8	4.7	42	93.7	85.4	155.6
20	14.8	6.4	5.4	43	105.1	99.0	186.5
21	15.8	7.1	6.2	44	118.4	115.3	224.6
22	16.9	7.8	7.1	45	133.9	134.9	271.8

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AASHTO 2014 References (cont.)

Table 10.6.3.1.2a-3—Shape Correction Factors s_c, s_γ, s_q

Factor	Friction Angle	Cohesion Term (s_c)	Unit Weight Term (s_γ)	Surcharge Term (s_q)
Shape Factors s_c, s_γ, s_q	$\phi_f = 0$	$1+\left(\frac{B}{5L}\right)$	1.0	1.0
	$\phi_f > 0$	$1+\left(\frac{B}{L}\right)\left(\frac{N_q}{N_c}\right)$	$1-0.4\left(\frac{B}{L}\right)$	$1+\left(\frac{B}{L}\tan\phi_f\right)$

Table 10.5.5.2.2-1—Resistance Factors for Geotechnical Resistance of Shallow Foundations at the Strength Limit State

Method/Soil/Condition			Resistance Factor
Bearing Resistance	φ_b	Theoretical method (Munfakh et al., 2001), in clay	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *CPT*	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *SPT*	0.45
		Semi-empirical methods (Meyerhof, 1957), all soils	0.45
		Footings on rock	0.45
		Plate Load Test	0.55
Sliding	φ_τ	Precast concrete placed on sand	0.90
		Cast-in-Place Concrete on sand	0.80
		Cast-in-Place or precast Concrete on Clay	0.85
		Soil on soil	0.90
	φ_{ep}	Passive earth pressure component of sliding resistance	0.50

Table 10.6.2.4.2-1—Elastic Shape and Rigidity Factors, EPRI (1983)

L/B	Flexible, β_z (average)	β_z Rigid
Circular	1.04	1.13
1	1.06	1.08
2	1.09	1.10
3	1.13	1.15
5	1.22	1.24
10	1.41	1.41

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CALCULATION SHEET

Sheet No. 1

Project:	York Toll Plaza	Originator by:	PJL	Date:	7/7/2016
Project No.:		Revised by:		Date:	
Jacobs No.:	E2X71602	Checked by:	AMS	Date:	7/18/2016
Subject:	Administration Building	Recheck by:		Date:	

Estimation of Rock Mass Rating (RMR)

References:

1. AASHTO LRFD Bridge Design Specification 2010.

Assumptions

1. Basement floor elevation = 154.5, bottom of footing elevation = 153, evaluated interior footing (highest bearing pressure)
2. Bedrock classification and strength based on boring B-3.

Method:

The rock mass rating (RMR) is evaluated based on the five parameters in the Table 10.4.6-4-1 as well as the adjustment according to Table 10.4.6.4-2. The rock classification is determined in accordance with Table 10.4.6.4-3.

Table 10.4.6.4-1 Geomechanics Classification of Rock Masses (AASHTO LRFD 2012)

Parameter			Range of Values							Run 1
1	Strength of intact rock material	Point load strength index (ksf)	> 175	85 - 175	45 - 85	20 -45	For this low range, uniaxial compressive test is preferred			
		Uniaxial compressive strength (ksf)	>4,320	2,160-4,320	1,080-2,160	520-1,080	215-520	70-215	20-70	
	Relative Rating		**15**	**12**	**7**	**4**	**2**	**1**	**0**	7
2	Drill core quality RQD (%)		90-100	75-90	50-75	25-50	<25			
	Relative Rating		**20**	**17**	**13**	**8**	**3**			8
3	Spacing of joints		>10 ft	3-10 ft	1-3 ft	2 in. - 1 ft	< 2 in.			
	Relative Rating		**30**	**25**	**20**	**10**	**5**			10
4	Condition of joints		. Very rough surfaces . Not continuous . No separation . Hard joint wall rock	. Slightly rough surfaces . Separation < 0.05 in. . Hard joint wall rock	. Slightly rough surfaces . Separation < 0.05 in. . Soft joint wall rock	. Slicken-sided surfaces or . Gouge <0.2 in. thick or . Joints open 0.05-0.2 in. . Continuous joints	. Soft gouge >0.2 in. thick or . Joints open >0.2 in. . Continuous joints			
	Relative Rating		**25**	**20**	**12**	**6**	**0**			12
5	Ground water conditions (use one of the three evaluation criteria as appropriate to the method of exploration)	Inflow per 30 ft tunnel length	None	<400 gal./hr	400-2,000 gal./hr	>2,000 gal./hr				
		Ratio = joint water pressure / major principal stress	0	0.0-0.2	0.2-0.5	>0.5				
		General conditions	Completely Dry	Moist only (interstitial water)	Water under moderate pressure	Severe water problems				
	Relative Rating*		**10**	**7**	**4**	**0**				4
								RMR prior to Adjustment	=	**41**

Table 10.4.6.4-2 Geomechanics Rating Adjustment for Joint Orientations.

Strike and Dip Orientations of Joints		Very Favorable	Favorable	Fair	Unfavorable	Very Unfavorable		
Ratings*	Tunnels	0	-2	-5	-10	-12		
	Foundations	0	-2	-7	-15	-25		-7
	Slopes	0	-5	-25	-50	-60		
						RMR after Adjustment	=	**34**

Table 10.4.6.4-3 Geomechanics Rack Mass Classes Determined from Total Ratings

RMR Rating	100- 81	80- 61	60 - 41	40 - 21	< 20	34
Ratings	I	II	III	IV	V	Class IV
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock	Poor Rock

Note: *In order to avoid double counting the effects of groundwater (an effective stress parameter in numerical analysis) and joint orientation, Hoek and Brown (1988) suggested that the rating for groundwater should always be set at 10 (completely dry) and the rating for joint orientation should always be set to zero (very favorable).

Results:

RMR of the Rock:	**34**
Rock Mass Classification:	**Class IV , Poor Rock**

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CALCULATION SHEET

Project:	York Toll Plaza	Originator by:	PJL	Date:	7/7/2016
Project No.:		Revised by:		Date:	
Jacobs No.:	E2X71602	Checked by:	AMS	Date:	7/18/2016
Subject:	Administration Building	Recheck by:		Date:	

Estimation of Rock Mass Strength

References:

1. AASHTO LRFD Bridge Design Specification 2010.

Method:

The shear strength of fractured rock masses is evaluated using the Hoek and Brown criteria, in which the shear strength is represented as a curved envelope. The shear strength of the rock nmass is determined as:

$$\tau = \left(\cot\phi_i^{'} - \cos\phi_i^{'}\right) m\frac{q_u}{8}$$ Eqn. 10.4.6.4-1

in which:

$$\phi_i^{'} = \tan^{-1}\left\{4h\cos^2\left[30 + 0.33\sin^{-1}\left(h^{\frac{-3}{2}}\right)\right] - 1\right\}^{\frac{-1}{2}}$$

$$h = 1 + \frac{16\left(m\sigma_n^{'} + sq_u\right)}{3m^2 q_u}$$

where:

τ = the shear strength of the rock mass (ksf)

ϕ'_i = the instantaneous friction angle of the rock mass (degrees)

q_u = average unconfined compressive strength of rock mass core (ksf)

σ'_n = effective normal stress (ksf)

m, s = constants from Table10.4.6.4-4 (dim)

The instantaneous cohesion at a discrete value of normal stress is taken as:

$$c_i = \tau - \sigma_n^{'}\tan\phi_i^{'}$$ Eqn. C10.4.6.4-1

Analyses:

The Rock Mass Rating (RMR)	=	34		
Rock Type Selection	=	E (amphibolite, gabbro gneiss, granite, norite, quartz-diorite)		
Average q_u	=	1849	ksf	from lab test (minimum value used)
Effective normal stress, σ'_n	=	4.6	ksf	from Structural Analysis
Fractured rock mass parameters (AASHTO Table 10.4.6.4-4 (Hoek and Brown, 1988):				
m	=	2.2586E-01		
s	=	1.6841E-05		
h	=	1.06		
τ	=	8.75	ksf	Eqn. 10.4.6.4-1

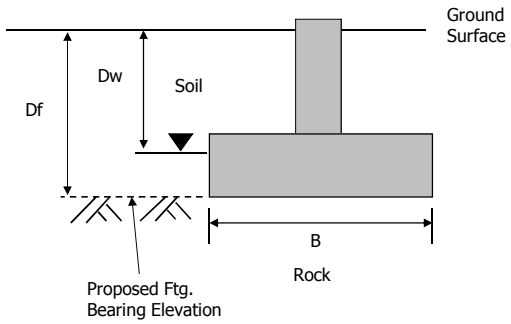
Results:

The instantaneous friction angle and cohesion:

ϕ'_i =	**51.86**	degree	
c_i =	**2.89**	ksf	Eqn. C10.4.6.4-1

Purpose

Assess net factored bearing resistance and elastic settlement of shallow footing for the Administrative Building Following AASHTO LRFD Bridge Design Specification 2010



Assumptions

1) Footing sits 4' below existing grade on ledge.
2) Footing is 4 feet wide x 4 feet long
3) Groundwater assumed at bottom of footing
4) Rock instantaneous friction angle (ϕ'_i) and cohesion (c_i) from RMR based shear strength evaluation. (AASHTO Section 10.4.6.4)
5) Design Parameters are as follows:

γ_{soil} (pcf)	Φ'_i (degree)	D_w (ft)	L (ft)	D_f (ft)
120	**42**	**4**	**4**	**4**

Bearing Capacity Factors (AASHTO Table 10.6.3.1.2a-1)

Φ'_i (degree)	Nc	Nq	Nγ
42	93.7	85.4	155.6

Calculate Effective Footing Width (B'):

B	**4**	footing width (ft)	
e/B	**0.250**	(Max e = B/4)	AASHTO 10.6.3.3
e	1.00	eccentricity (ft)	
B'=B-2e	2.00	ft.	

Nominal Bearing Resistance

*qn = c*Ncm + γ*Df *Nqm*Cwq+0.5*γ*B'*Nγm*Cwγ*

c_i (psf)	**2890**	instantaneous cohesion
γ (pcf)	120	total unit weight of overburden soil
Df (ft)	4	Depth of footing
B' (ft)	2.00	Effective footing width
L (ft)	4	Length of footing
B'/L	0.500	
Df/B'	2.000	
Cwq	1	Table 10.6.3.1.2a-2
Cwγ	0.5	Table 10.6.3.1.2a-2

*Ncm = Nc*sc*ic*

Nc	93.7		
sc	1.46	Table 10.6.3.1.2a-3	
ic	**1**	AASHTO Section 10.6.3.1.2	(no inclination)
Ncm	136.8		

*Nqm = Nq*sq*dq*iq*

Nq	85.4		
sq	1.45	Table 10.6.3.1.2a-3	
dq	1.20	Table 10.6.3.1.2a-4	
iq	**1**	AASHTO Section 10.6.3.1.2	(no inclination)
Nqm	148.6		

*Nγm = Nγ*sγ*iγ*

Nγ	155.6		
sγ	0.8	Table 10.6.3.1.2a-3	
iγ	**1**	AASHTO Section 10.6.3.1.2	(no inclination)
Nγm	124.5		

qn 474,150 psf

Factored Bearing Resistance

*qr = RF*qn* Eqn. 10.6.3.1.1-1

where,

RF = resistance factor = 0.45 Table 10.5.5.2.2-1

qr 213,368 psf

213 ksf

> **120** ksf AASHTO Table C10.6.2.6.1-1 (granite, metamoprphic rock)

Use qr= **120** ksf

Maximum Bearing Pressure

From Structure Analysis (worst case)

p_{max} (ksf) = 4.6 < 120 ksf **OK**

SETTLEMENT CALCULATIONS:

For square footings:

$$\rho = q_o\left(1-\nu^2\right)\frac{rI_p}{144\,E_m}$$ Eqn. 10.6.2.4.4-1

$$I_p = \frac{\left(\sqrt{\pi}\right)}{\beta_z}$$ Eqn. 10.6.2.4.4-2

$$E_m = 145\left(10^{\frac{RMR-10}{40}}\right)$$ Eqn. 10.4.6.5-1

where: q_o = applied vert. stress (ksf)
ν = Poisson's Ratio (dim)
E_m = Rock Mass Modulus (ksi)
β_z = Shape/Rigidity Factor (dim)
I_p = influence coefficient to account for rigidity and dimensions of footing (dim)
r = B/2 (ft)

B' = eff. width of footing (ft) =	2.0	(from bearing resistance calcs)
L = length of footing (ft):	4.0	(from bearing resistance calcs)
L/B' =	2.0	
β_z = Shape/Rigidity Factor =	1.08	Table 10.6.2.4.2-1
I_p =	1.6	Eqn. 10.6.2.4.4-4
RMR =	34	(from RMR calculation sheet)
E_m = Rock Mass Modulus (ksi) =	577	Eqn. 10.4.6.5-1
ν = Poisson's Ratio =	0.20	Table C10.4.6.5-2 (mean value for Granite)
q_o (ksf) =	4.6	From Structure Analysis
ρ (ft) =	0.00009	Eqn. 10.6.2.4.4-3
ρ (in) =	0.00	

Appendix H. **ORT Slab Settlement Calculations**

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JACOBS	Project: York Toll Plaza– Mile 8.8				Job Ref.: E2X71602	
	Section: ORT Slab Settlement				Sheet no./rev.: Rev 0	
	Calc. by: PJL	Date: 7/14/16	Chk'd by: AMS	Date: 7/14/16	App'd by: PJM	Date: 7/28/16

Purpose

Determine estimated settlement of open road tolling (ORT) slabs.

Design Codes/References

- AASHTO LRFD Bridge Specifications, 7th edition
- WINSAF-I software by Prototype Engineering

Input/Analysis Assumptions

- ORT slab is 12 inches thick.
- Proposed roadway elevation = 167.7 ft
- Groundwater elevation = 156 ft
- ORT Slabs are 58'-9" wide x by 65' long.
- Assumed 250 psf load across entire ORT slab.
- Soil profile and bedrock elevation based on boring B-10.
- Average N-value of existing fill based on borings B-9 and B-10.
- Sand assumed to be a normally consolidated, clean well graded fine to coarse sand
- Compression Index (C_c) = 1/ Bearing Capacity Factor (C')
- Bearing Capacity Factor determined by AASHTO Figure 10.6.2.4.2-1 (See below)

Layer	Top Elev (ft)	Bottom Elev (ft)	Unit Weight (pcf)	Avg. $(N_1)_{60}$	Bearing Capacity Factor (C')	C_c
Compacted Fill	166.7	165.7	130	75 [1]	230	0.004
Existing Fill	165.7	152.9	125	50 [2]	140	0.007
Bedrock	152.9	-		-	-	-

Notes:

1. Assumed required density and compaction is achieved.
2. See N value correction sheets (attached).

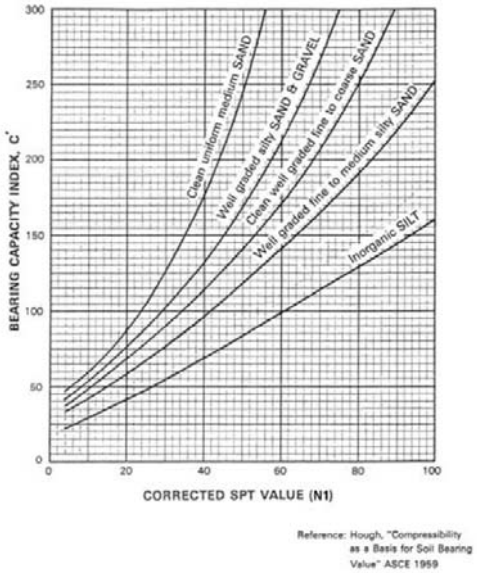

Figure 10.6.2.4.2-1—Bearing Capacity Index versus Corrected SPT (modified from Cheney and Chassie, 2000, after Hough, 1959)

Conclusions

We recommend 12 inches of compacted gravel borrow (MaineDOT Spec 703.20) be placed under the ORT slabs. The gravel borrow should be compacted to at least 98 percent of the maximum dry density as determined by the Modified Proctor Test. We estimate settlement of the ORT slabs should be less than ¼".

Attachments:

1. WINSAF-I Output File

RECTANGULAR LOADS

Increment of stresses obtained using : Boussinesq

Settlement for X = 29.40 (ft) Y = 32.50 (ft)

Footing #	Corner Point P1 X1(ft)	Y1(ft)	Corner Point P2 X2(ft)	Y2(ft)	Load (psf)
1	0.00	0.00	58.75	65.00	250.00

Foundation Elev. = 166.70 (ft) Ground Surface Elev.= 166.70 (ft)
Water table Elev. = 156.00 (ft) Unit weight of Wat. = 62.40 (pcf)

N°.	Layer Type	Thick. (ft)	Comp. Ratio	Recomp. Ratio	Swell. Ratio	Unit Weight (pcf)	Primary Settlement (in.)	Secondary Settlement (in.)
1	COMP.	1.0	0.004	0.004	0.004	130.00	0.03	0.00
2	COMP.	12.8	0.007	0.007	0.007	125.00	0.14	0.00
					Total Settlement =		0.18	0.00

N§.	Sublayer Thick. (ft)	Elev. (ft)	Soil Stresses Initial (psf)	Increment (psf)	Max.Past Press. (psf)	Settlement (in.)
1	1.00	166.20	65.00	250.00	65.00	0.03
2	2.56	164.42	290.00	249.92	290.00	0.06
3	2.56	161.86	610.00	249.29	610.00	0.03
4	2.56	159.30	930.00	247.57	930.00	0.02
5	2.56	156.74	1250.00	244.41	1250.00	0.02
6	2.56	154.18	1456.43	239.65	1456.43	0.01
				Total Settlement =		0.18 (in.)

CALCULATION SHEET

Sheet No. 1

Project:	York Toll Plaza - Mile 8.8		Authored by:	PJL	Date	6/8/2016
Job No.	E2X71602		Checked by:	AMS	Date	7/14/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. B-9
Ground Surface Elevation 164.90 ft (NAVD 88)
Ground Water Depth during Drilling 9.50 ft
Hammer Efficiency 73 %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.9	1	8	n/a	n/a	1.95	1.22	**9.7**	118	**19.0**
159.9	5	29	n/a	n/a	1.38	1.22	**35.3**	638	**48.8**
154.9	10	36	n/a	n/a	1.24	1.22	**43.8**	976	**54.4**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf]

$\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
$\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

CALCULATION SHEET

Sheet No. 2

Project:	York Toll Plaza - Mile 8.8		Authored by:	PJL	Date	6/8/2016
Job No.	E2X71602		Checked by:	AMS	Date	7/14/2016

Corrected N Value for Estimation of Soil Strength Parameters

Boring No. B-10
Ground Surface Elevation 165.90 ft (NAVD 88)
Ground Water Depth during Drilling 9.70 ft
Hammer Efficiency 73 %

References:
1. FHWA-IF-02-034 (2002)
2. FHWA-NHI-10-0.16 (May 2010)
3. NAVFAC DM-7 (March 1971)
4. IDOT AGMU Memo 10.2

Elevation of Sample	Boring Data				SPT Correction Factor		Corrected SPT N Value, N_{60}	Vertical Effective Stress	Corrected SPT N Value, $N_{1,60}$
	Sample Depth	SPT N Value	UC Strength, Qu	Plastic Index (PI)					
(ft)	(ft)	(blows/ft)	(tsf)	(%)	C_N	C_E	(blows/ft)	(psf)	(blows/ft)
163.9	2	38	n/a	n/a	1.68	1.22	**46.2**	260	**77.9**
161.9	4	100	n/a	n/a	1.45	1.22	**121.7**	520	**176.7**
155.9	10	64	n/a	n/a	1.26	1.22	**77.9**	926	**98.1**

Notation: N_{60} = SPT blow count corrected for hammer efficiency (blows/ft)
$N_{1,60}$ = SPT blow count corrected for hammer efficiency and overburden pressure.
C_N = SPT correction factor for overburden pressure, CN = min[0.77*log(40/σ'v),2]

Max Unit Weight: $\gamma_{granular,\ dry}$ = 130 [pcf]
$\gamma_{granular,\ submerged}$ = 67.6 [pcf]

Notes: 1) Overburden pressure calculated using a unit weight based on IDOT AGMU Memo 10.2:

Above Water Table: $\gamma_{granular} = 95*(N_{60})^{0.095}$ [pcf]
Below water table: $\gamma_{granular} = 105*(N_{60})^{0.07} - 62.4$ [pcf]

$\gamma_{cohesive} = 121.5*(Qu)^{0.095}$ [pcf]
$\gamma_{cohesive} = 121.5*(Qu)^{0.095} - 62.4$ [pcf]

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Appendix I. **Existing Toll Plaza Area Settlement Calculations**

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Page from Jacobs Memo, "Supplemental Memoradndum to Jacobs 11/11/2014 Geotechnical Memorandum," dated March 2, 2015

JACOBS

Authored by: DH Date: 2/16/2015
Checked by: PJM Date: 2/27/2015

Proposed York Toll Plaza File #: E2X71601

Table C-1: Evaluation of Maximum Past Pressure

Boring	Depth (ft)	Elevation (ft)	Estimate of Maximum Past Pressure (tsf)			
			Casagrande	Log-Log	Strain Energy	Average
B-1	23	24.5	1.3	1.2	1.5	1.3
B-1	66.0	-18.5	2.0	1.7	1.7	1.8
B-2	16.4	30.3	4.0	3.5	3.2	3.6
B-2	43.4	3.3	1.2	1.4	0.8	1.1
B-9	12.9	25.9	0.8	0.9	0.7	0.8
B-9	24.9	13.9	0.9	1.0	0.8	0.9
B-9	63	-24.2	2.0	1.8	1.8	1.9
B-10	6.9	31.3	3.9	3.3	3.4	3.5
B-10	41.8	-3.6	2.0	1.9	1.8	1.9
HA09-1	35.2	12.0	1.3	1.4	1.4	1.4

Notes:

1) Values shown in yellow highlighted areas are considered most representative for design considering potential sample disturbance effects.

Table C-2: Summary of Consolidation Parameters

Boring	Depth (ft)	Elevation (ft)	CR[1)]	RR[1)]	Cα (loading)	Cα (reloading)
B-1	23	24.5	0.14	0.012	0.00438	0.00038
B-1	66.0	-18.5	0.17	0.015	0.00400	0.00037
B-2	16.4	30.3	0.12	0.010	0.00325	0.00031
B-2	43.4	3.3	0.17	0.018	0.00475	0.00050
B-9	12.9	25.9	0.17	0.012	0.00488	0.00050
B-9	24.9	13.9	0.14	0.009	0.00450	0.00044
B-9	63	-24.2	0.20	0.013	0.00437	0.00025
B-10	6.9	31.3	0.13	0.013	0.00425	0.00025
B-10	41.8	-3.6	0.23	0.013	0.00475	0.00045
HA09-1	35.2	12.0	0.13	0.016	N/A	N/A
		Minimum	0.12	0.009	0.00325	0.00025
		Maximum	0.23	0.018	0.00488	0.00050
		Average	0.16	0.013	0.00435	0.00038

Notes: 1) CR and RR values are based on Engineer's estimates from the lab data.

STRIP FOOTING UNIFORM VERTICAL LOADING

Project Name: York Toll Plaza — Project Number : E2X71601
Client : Maine Turnpike Authority — Project Manager: Thom Morin
Date : 7/19/2016 — Computed by : PL

Increment of stresses obtained using : Boussinesq

Settlement for X = 0.00 (ft)

Width of strip b = 300.00 (ft) — Foundation Elev. = 45.00 (ft)
Ground Surface Elev. = 45.00 (ft) — p load/unit area = 120.00 (psf)
Water table Elev. = 40.00 (ft) — Unit weight of Wat. = 62.40 (pcf)

N°.	Layer Type	Thick. (ft)	Comp. Ratio	Recomp. Ratio	Swell. Ratio	Unit Weight (pcf)	Primary Settlement (in.)	Secondary Settlement (in.)
1	INCOMP.	0.5				150.00	0.00	0.00
2	INCOMP.	9.5				120.00	0.00	0.00
3	COMP.	5.0	0.160	0.013	0.013	118.00	0.04	0.00
4	COMP.	56.5	0.160	0.013	0.013	118.00	2.24	0.00
					Total Settlement =		2.28	0.00

N§.	Sublayer Thick. (ft)	Elev. (ft)	Soil Stresses Initial (psf)	Increment (psf)	Max.Past Press. (psf)	Settlement (in.)
1	INCOMP.					
2	INCOMP.					
3	1.67	34.17	949.33	119.98	15879.32	0.01
4	1.67	32.50	1042.00	119.97	10000.00	0.01
5	1.67	30.83	1134.67	119.96	4120.67	0.01
6	9.42	25.29	1442.78	119.89	1443.38	0.62
7	9.42	15.88	1966.35	119.64	1966.13	0.46
8	9.42	6.46	2489.92	119.20	2489.69	0.37
9	9.42	-2.96	3013.48	118.52	3012.85	0.30
10	9.42	-12.38	3537.05	117.58	3536.71	0.26
11	9.42	-21.79	4060.62	116.39	4060.57	0.22
					Total Settlement =	2.28 (in.)

Appendix J. **Gantry Foundation Calculations**

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Axial Capacity Calculations

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Jacobs Engineering Group
343 Congress Street
Boston, MA 02210
617-242-9222

CALCULATION WORKSHEET

Project	York Toll Plaza		
Page	1	**of**	1
Calc By	PJL	**DATE**	11/15/2016
Checked By	DH	**DATE**	11/22/2016

PURPOSE: Evaluate axial capacity of drilled shaft gantry foundations

INPUT: Vertical Loading (provided by Jacobs Structural Group)

P = 40 kips Group II

ASSUMPTIONS: - Minimum 15 foot embedment into soil or three foot rock socket, whichever occurs first to satisfy lateral stability of shaft, based on lateral loading provided by Jacobs Structural Group.
- Three foot diameter drilled shaft.

Weight of Drilled Shaft

15 total length (ft)
3 dia (ft)
7.07 cross sectional area (sq-ft)
150 pcf (unit weight concrete)
15.9 Total weight of shaft (kips) (W)

Required Design Load

P + W = 55.9 kips

Evaluate Capacity in Soil

Pile Embedment = 15 ft (Assume 15 foot embedment)

Side Friction **(FHWA NHI-10-016, Section 13.3.5.1)**

Effective Vertical Stress at Mid Point of Layer
Dry Fill = 250 psf
Submerged Fill = 844 psf

At-Rest Earth Pressure
$K_o = 1 - \sin \Phi$
$K_o = 0.44$ assume 34 deg

Circumference (π D) = 9.42 ft
Friction Factor = 0.3 NAVFAC 7.02, Chapter 3, Table 1
Resistance Factor = 0.55 AASHTO Table 10.5.5.2.4-1
Allowable Capacity = 7 kips

End Bearing

Assume bearing capacity in sandy soils = 5 ksf See bearing capacity calculations (Section 10.1 and Appendix G)
Tip Area = 7.07 sf
Resistance Factor = 0.5 AASHTO Table 10.5.5.2.4-1
Bearing Resistance = 17.7 kips

Total Factored Vertical Resistance = 24.7 kips

32 kips < 55.9 kips **Need Rock Socket**

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CALCULATION SHEET

Sheet No.

Project:	York Toll Plaza	Originator by:	PJL	Date:	11/18/2016
Project No.:		Revised by:		Date:	
Jacobs No.:	E2X71602	Checked by:	DH	Date:	11/22/2016
Subject:	Gantry Drilled Shafts	Recheck by:		Date:	

Reference:

1.AASHTO LRFD 2012.

Assumptions:

1. From Lab Testing:

Uniaxial Compressive Strength of Rock,	q_u =	986	ksf	(avg. of lab tests)
Drilled Core Quality (Average)	RQD =	47	%	(avg within rock socket)

2. Compressive Strength of Concrete, f'_c = 4,000 psi

3. Resistance Factor

Side Resistance Factor in Rock,	Φ_{qs} =	0.55
Tip Resistance Factor in Rock,	Φ_{qp} =	0.5

Results:

	Nominal Resistance			**Factored Resistance**		
Unit Side Resistance,	q_s =	17.34	ksf	q_{sfac} =	9.54	ksf
UnitTip Resistance,	q_p =	37.12	ksf	q_{pfac} =	18.56	ksf

Summary of Drilled Shaft Resistance

Shaft Diameter, D	Rock Socket Diameter, D'	Rock Socket Length	Nominal Side Resistance, Rs	Nominal Tip Resistance, Rp	Nominal Axial Compression Resistance, Rn	Factored Axial Compression Resistance, R_R	Required Concrete Compressive Strength, f'_c
(ft)	(ft)	(ft)	(kips)	(kips)	(kips)	(kips)	(psi)
3	2.5	0	0	182	182	91	4,000
	2.5	2	272	182	455	241	4,000
	2.5	3	409	182	591	316	4,000
	2.5	4	545	182	727	391	4,000
	2.5	5	681	182	863	466	4,000
	2.5	6	817	182	999	540	4,000
	2.5	7	953	182	1,135	615	4,000
	2.5	8	1,089	182	1,272	690	4,000
	2.5	9	1,226	182	1,408	765	4,000
	2.5	10	1,362	182	1,544	840	4,000
	2.5	15	2,043	182	2,225	1,214	4,000
	2.5	20	2,723	182	2,906	1,589	4,000

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CALCULATION SHEET

Sheet No. 2 of 3

Project:	York Toll Plaza		Originator by:	PJL	Date:	11/17/2016
Project No.:			Revised by:		Date:	
Jacobs No.:	E2X71602		Checked by:	DH	Date:	11/22/2016
Subject:	Gantry Drilled Shafts		Recheck by:		Date:	

Estimation of RMR of the Rock

References:

1. AASHTO LRFD 2012.

Method:

The rock mass rating (RMR) is evaluated based on the five parameters in the Table 10.4.6-4-1 as well as the adjustment according to Table 10.4.6.4-2. The rock classification is determined in accordance with Table 10.4.6.4-3.

Table 10.4.6.4-1 Geomechanics Classification of Rock Masses (AASHTO LRFD 2012)

	Parameter		Range of Values							Run 1
1	Strength of intact rock material	Point load strength index (ksf)	> 175	85 - 175	45 - 85	20 -45	For this low range, uniaxial compressive test is preferred			
		Uniaxial compressive strength (ksf)	>4,320	2,160-4,320	1,080-2,160	520-1,080	215-520	70-215	20-70	
	Relative Rating		**15**	**12**	**7**	**4**	**2**	**1**	**0**	4
2	Drill core quality RQD (%)		90-100	75-90		50-75		25-50	<25	
	Relative Rating		**20**	**17**		**13**		**8**	**3**	8
3	Spacing of joints		>10 ft	3-10 ft		1-3 ft		2 in. - 1 ft	< 2 in.	
	Relative Rating		**30**	**25**		**20**		**10**	**5**	10
4	Condition of joints		. Very rough surfaces . Not continuous . No separation . Hard joint wall rock	. Slightly rough surfaces . Separation < 0.05 in. . Hard joint wall rock		. Slightly rough surfaces . Separation < 0.05 in. . Soft joint wall rock		. Slicken-sided surfaces or . Gouge <0.2 in. thick or . Joints open 0.05-0.2 in. . Continuous joints	. Soft gouge >0.2 in. thick or . Joints open >0.2 in. . Continuous joints	
	Relative Rating		**25**	**20**		**12**		**6**	**0**	6
5	Ground water conditions (use one of the three evaluation criteria as appropriate to the method of exploration)	Inflow per 30 ft tunnel length	None	<400 gal./hr		400-2,000 gal./hr		>2,000 gal./hr		
		Ratio = joint water pressure / major principal stress	0	0.0-0.2		0.2-0.5		>0.5		
		General conditions	Completely Dry	Moist only (interstitial water)		Water under moderate pressure		Severe water problems		
	Relative Rating*		**10**	**7**		**4**		**0**		7

RMR prior to Adjustment = **35**

Table 10.4.6.4-2 Geomechanics Rating Adjustment for Joint Orientations.

Strike and Dip Orientations of Joints		Very Favorable	Favorable	Fair	Unfavorable	Very Unfavorable	
Ratings*	Tunnels	0	-2	-5	-10	-12	
	Foundations	0	-2	-7	-15	-25	0
	Slopes	0	-5	-25	-50	-60	

RMR after Adjustment = **35**

Table 10.4.6.4-3 Geomechanics Rack Mass Classes Determined from Total Ratings

RMR Rating	100- 81	80- 61	60 - 41	40 - 21	< 20	35
Ratings	I	II	III	IV	V	Class IV
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock	Poor Rock

Note: *In order to avoid double counting the effects of groundwater (an effective stress parameter in numerical analysis) and joint orientation, Hoek and Brown (1988) suggested that the rating for groundwater should always be set at 10 (completely dry) and the rating for joint orientation should always be set to zero (very favorable).

Results: RMR of the Rock: **35**

Rock Mass Classification: **Class IV , Poor Rock**

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CALCULATION SHEET

Sheet No.

Project:	York Toll Plaza	Originator by:	PJL	Date:	11/18/2016
Project No.:		Revised by:		Date:	
Jacobs No.:	E2X71602	Checked by:	DH	Date:	11/22/2016
Subject:	Gantry Drilled Shafts	Recheck by:		Date:	

Estimation of Rock Mass Strength

References:

1. AASHTO LRFD 2012.

Method:

The shear strength of fractured rock masses is evaluated using the Hoek and Brown criteria, in which the shear strength is represented as a curved envelope. The shear strength of the rock nmass is determined as:

$$\tau = \left(\cot\phi_i^{'} - \cos\phi_i^{'}\right) m\frac{q_u}{8} \qquad \text{(AASHTO 10.4.6.4-1)}$$

in which:

$$\phi_i^{'} = \tan^{-1}\left\{4h\cos^2\left[30 + 0.33\sin^{-1}\left(h^{\frac{-3}{2}}\right)\right] - 1\right\}^{\frac{-1}{2}}$$

$$h = 1 + \frac{16\left(m\sigma_n^{'} + sq_u\right)}{3m^2 q_u}$$

where:

τ = the shear strength of the rock mass (ksf)

ϕ'_i = the instantaneous friction angle of the rock mass (degrees)

q_u = average unconfined compressive strength of rock mass core (ksf)

σ'_n = effective normal stress (ksf)

m,s = constants from Table10.4.6.4-4

The instantaneous cohesion at a discrete value of normal stress is taken as:

$$c_i = \tau - \sigma_n^{'}\tan\phi_i^{'} \qquad \text{(AASHTO C10.4.6.4-1)}$$

Analyses:

The Rock Mass Rating (RMR)	=	35	(after adjustment)
Rock Type Selection	=	E (amphibolite, gabbro gneiss, granite, norite, quartz-diorite)	
Average q_u	=	986	ksf
Effective normal stress, σ'_n	=	1	ksf

Fractured rock mass parameters (AASHTO Table 10.4.6.4-4 (Hoekand Brown, 1988):

m	=	0.24255592	
s	=	1.9878E-05	
h	=	1.02410219	
τ	=	2.64367012	ksf

Results:

The instantaneous friction angle and cohesion:

ϕ'_i =	**58.71**	degree
c_i =	**1.00**	ksf

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CALCULATION SHEET

Sheet No.

Project:	York Toll Plaza	Originator by:	PJL	Date:	11/17/2016
Project No.:		Revised by:		Date:	
Jacobs No.:	E2X71602	Checked by:	DH	Date:	11/22/2016
Subject:	Gantry Drilled Shafts	Recheck by:		Date:	

Estimation of Rock Mass Elastic Modulus

References:

1. AASHTO LRFD 2012.

Method:

The elastic modulus of a rock mass (Em) is to be taken as the lesser of the intact modulus of a sample rock core (Ei) or the modulus determined from one of the following equations:

$$E_m = 145\left(10^{\frac{RMR-10}{40}}\right) \quad \text{(AASHTO 10.4.6.5-1)}$$

or

$$E_m = \left(\frac{E_m}{E_i}\right)E_i \quad \text{(AASHTO 10.4.6.5-2)}$$

where:

Em = Elastic modulus of the rock mass (ksi)

Ei = Elasto modulus of intact rock (ksi)

Input:

Rock Name	Granite			
Rock Type Selection	E (amphibolite, gabbro gneiss, granite, norite, quartz-diorite)			
Rock Joints	Closed			
The Rock Mass Rating (RMR) ?	Yes	=	35	(after adjustment)
Rock Quality Designation (RQD)		=	47	
Intact modulus of the samples of rock core	N/A	Ei =		ksi

Analysis:

1. Intact modulus of the samples of rock core — Ei = N/A ksi

   Intact modulus from Table C10.4.6.5-1 (Kulhawy, 1978): Ei = 930 ksi

2. Elastic modulus by RMR — Em = 611.5 ksi

3. Elastic modulus by RQD and Joints:

   Ratio of Em/Ei based on Table 10.4.6.5-1:

   Table 10.4.6.5-1 Estimation of Em based on RQD (after O'Neil and Reese, 1999)

RQD (%)	Em/Ei	
	Closed Joint	Open Joint
100	1	0.6
70	0.7	0.1
50	0.15	0.1
20	0.05	0.05

Em/Ei = 0.14

Em based on Ei from the sample of rock core: Em = N/A ksi

Em based on Ei from Table C10.4.6.5-1 (Kulhawy, 1978): Em = 129 ksi

Results:

Elastic modulus of the rock mass: Em = **611** ksi

Poisson's ratio for intact rock (Kulhawy, 1978, Table C10.4.6.5-2) γ = **0.22**

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CALCULATION SHEET

Sheet No. 3 of 3

Project:	York Toll Plaza	Originator by:	PJL	Date:	11/18/2016
Project No.:		Revised by:		Date:	
Jacobs No.:	E2X71602	Checked by:	DH	Date:	11/22/2016
Subject:	Gantry Drilled Shafts	Recheck by:		Date:	

Estimation of Drilled Shaft Unit Resistance in Rock

Reference:

1.AASHTO LRFD 2012.

Drilled shaft: Concrete compressive strength, fc' = 4,000 psi

Rock Properties:

The Rock Mass Rating (RMR)? Yes = 35 **(after adjustment)**

Rock Type Selection = E (amphibolite, gabbro gneiss, granite, norite, quartz-diorite)

Name	q_u (psi)	RQD (%)	Joints	Ei (ksi)		Em (ksi) Based on		Em/Ei	α_E
				Test	Kulhawy (1978)	RMR	Kulhawy (1978)		
Granite	6,848	47	Closed	N/A	930	611	129	0.14	0.58

RQD = Rock Quality Designation

Em = Rock mass modulus

Ei = Modulus of elasticity of intact rock (AASHTO Table 10.4.6.5-1 and Table C10.4.6.5-1)

α_E = Reduction factor to account for jointing in rock (AASHTO Table 10.8.3.5.4b-1)

q_u = uniaxial compressive strength of rock (ksf)

Table 10.8.3.5.4b-1 Estimation of α_E (O'Neil and Reese, 1999)

Em/Ei	α_E
1	1
0.5	0.8
0.3	0.7
0.1	0.55
0.05	0.45

Table 10.4.6.5-1 Estimation of Em based on RQD (after O'Neil and Reese, 1999)

RQD (%)	Em/Ei	
	Closed Joint	Open Joint
100	1	0.6
70	0.7	0.1
50	0.15	0.1
20	0.05	0.05

1. Shaft Unit Side Resistance

1). Refer to Horvath and Kenney (1997):

$$q_s = \min\left[0.65\alpha_E p_a\left(\frac{q_u}{p_a}\right)^{0.5}, 7.8 p_a\left(\frac{f_c'}{p_a}\right)^{0.5}\right]$$ (AASHTO 10.8.3.5.4b-1)

where pa = atmospheric pressure (2.116 ksf)

= min [17.3 22.7] ksf

Note: The side of the rock socket is considered to be smooth or where the rock is drilled using a drilling fluid.

= **17.3** ksf

= **120.4** psi

2). Refer to Kulhawy and Prakoso (2007)

$$q_s = 0.5\left(\frac{q_u}{p_a}\right)^{0.5} p_a$$ = 22.84 ksf

2. Shaft Unit Tip Resistance

a. The base of the drilled shaft to a depth of 2.0D is either intact or tightly joint and the the depth of the socket is greater than 1.5D (O'Neill and Reese, 1999):

$q_p = 2.5\ q_u$ (AASHTO 10.8.3.5.4c-1) = 2,465.28 ksf Upper bound

= 17,120.00 psi

b. The rock below the base of the shaft to a depth of 2.0D is jointed, the joints have random orientation, and the condition of the joints can be evaluated as:

Fractured rock mass parameters (AASHTO Table 10.4.6.4-4 (Hoek and Brown, 1988):

$$q_p = \left[\sqrt{s} + \sqrt{m\sqrt{s} + s}\right] q_u$$ m = 0.242555918

s = 1.98775E-05

= 37.12 ksf Lower bound

(10.8.3.5.4c-2) = 257.79 psi

Results:

Drilled shaft unit side resistance, qs =	**17.34**	~	**22.84**	**ksf**
Drilled shaft unit tip resistance, qp =	**37.12**	ksf		

Lateral Analysis - LPILE

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JACOBS	Project				Job Ref.	
	York Toll Plaza– Mile 8.8				E2X71602	
	Section				Sheet no./rev.	
	Gantry – Drilled Shafts				Rev 3	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	PJL	12/15/2016	AMS	1/2/2017		

Purpose

Evaluate required embedment of gantry drilled shaft foundations to resist lateral loading.

Design Codes/References

- 2013 AASHTO Structural Support for Highway Signs, Luminaries and Traffic Signals, with 2015 Interim Revisions
- 2014 AASHTO LRFD Bridge Design Specifications
- LPILE Version 2013 by Ensoft, Inc.

Input/Analysis Assumptions

- Proposed Roadway Elevation = 167.7 feet
- Assumed groundwater four feet below proposed roadway surface (Elev. = 163.7 feet)
- Assumed 11 - #9 bars arranged in circle for shaft reinforcement for all shafts (Percentage of Steel = 1.08% (Shaft), 1.56% (Rock Socket))
- Based on the relatively short length of the shafts, a group reduction factor (P-multiplier) was not used.
- Loads used for analysis were based on loads provided by the Structural Engineer.
- Test Level 4 (TL-4) Vehicle Impact Loading
    - Assumed for drilled shaft locations after the toll booths (4 locations)
    - Analysis performed for two soil profiles, as shown in Tables 2 and 3 below.
        - Shallow bedrock profile based on bedrock elevation encountered in Boring B-7.
        - Deep bedrock profile based on bedrock elevation encountered in Boring B-14.
    - Evaluated one 3 foot diameter drilled shaft per support location with a 2.5 foot diameter rock socket.
- Test Level 5 (TL-5) Vehicle Impact loading
    - Assumed for drilled shaft locations within center median of Open Road Tolling (ORT) lane (4 locations)
    - Analysis performed on one soil profile, shown in Table 4 below.
        - Bedrock elevation based on Boring B-16.
    - Evaluated (2) 3 foot diameter drilled shafts per support location with a 2.5 foot diameter rock socket.
    - Impact loading divided evenly between both shafts

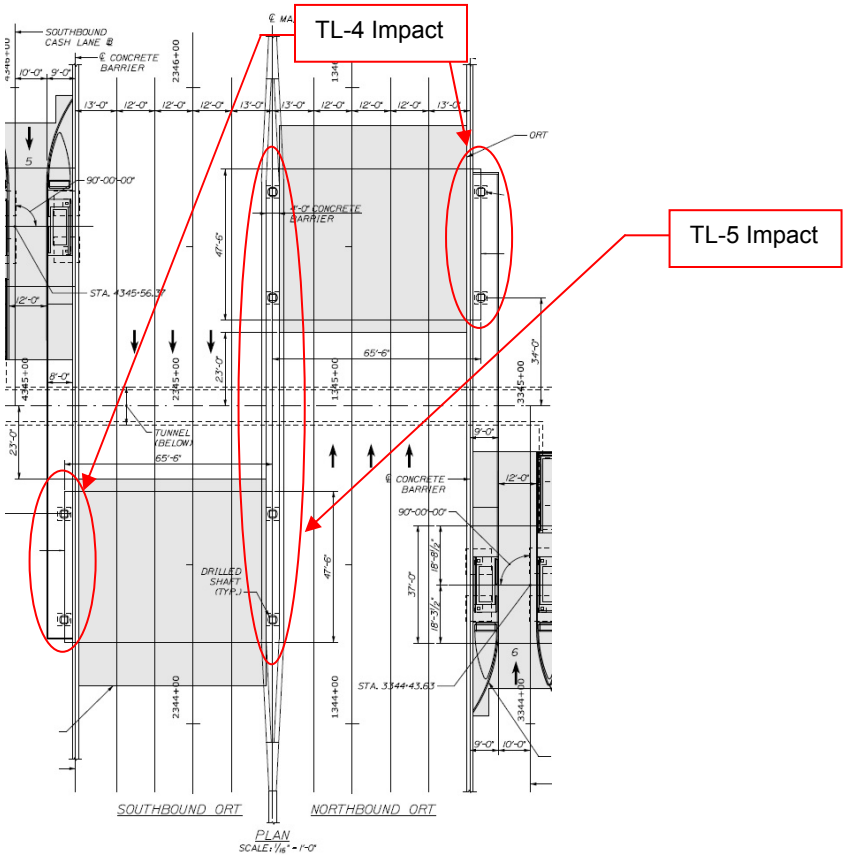


Table 1: Summary of Loads for Analysis

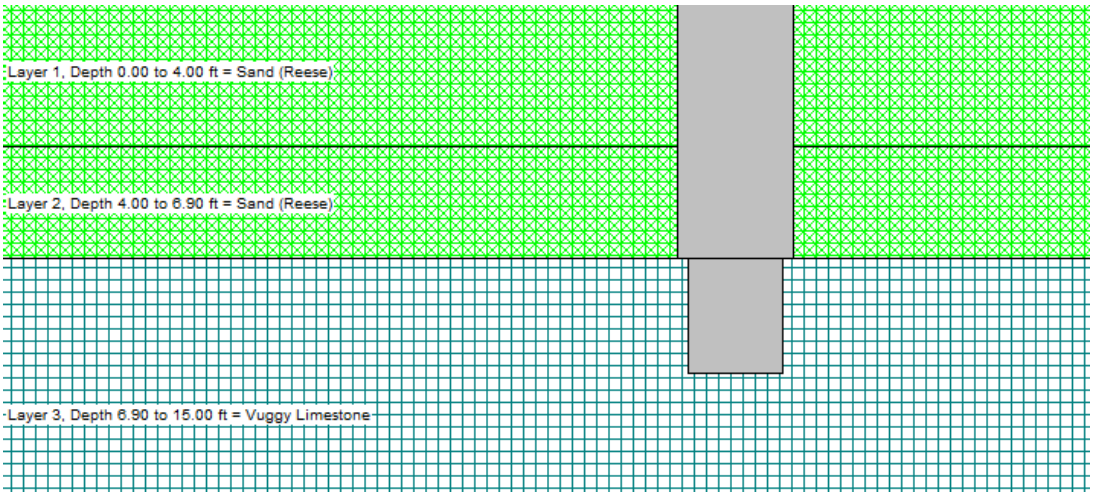
	Load Case	Loads			LPILE Input		
		Vertical (P)	Shear (V)	Moment (M)	Vertical (P)	Shear (V)	Moment (M)
		kips	kips	kip-ft	lbs	lbs	lbs-in
1	Group II (DL+W)	39.8	9.0	209.9	39800	9000	2518800
2	Extreme II (TL-4 Impact)	49.8	56.9	185.0	49800	56900	2220000
3	Extreme II (TL-5 Impact)	114.8	124.0	434.0	57400 [1]	62000 [1]	2604000 [1]

Notes:

1. Total load distributed evenly between the two shafts.

Table 2: Soil Profile and Properties for Lateral Analysis (Toll Island - Shallow Bedrock Profile)

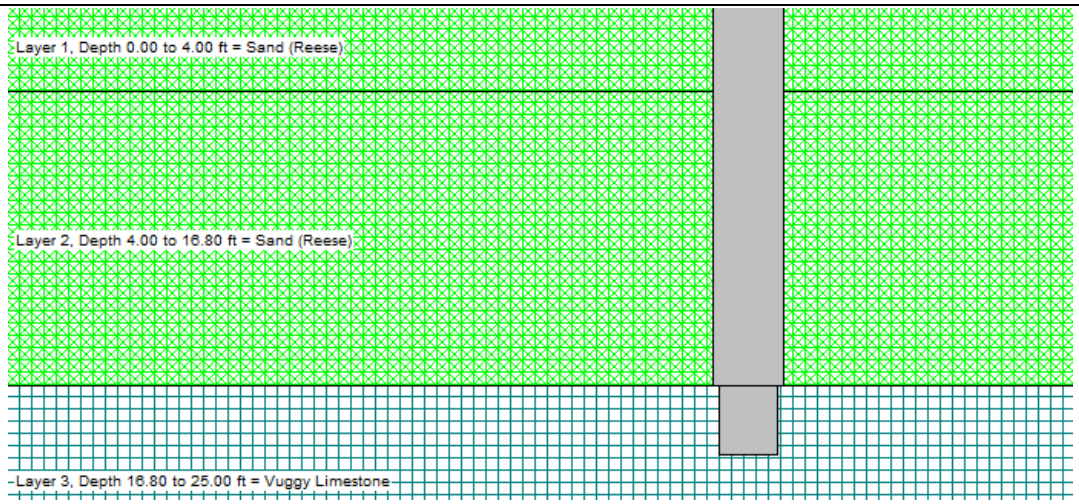
Layer	Layer Top Elev (ft)	Layer Bottom Elev (ft)	Top Depth[1] (ft)	Bottom Depth[1] (ft)	Φ (degrees)[2]	k (pci)[3]	γ' (pcf)[4]	UCS[5] (psi)
Dense Fill	167.7	163.7	0	4	34	135	125	--
Dense Fill (Submerged)	163.7	160.8	4	6.9	34	80	63	-
Bedrock	160.8	152.7	6.9	15.0	--	--	103	4,000



Toll Island – Shallow Bedrock Profile

Table 3: Soil Properties for Lateral Analysis (Toll Island - Deep Bedrock Profile)

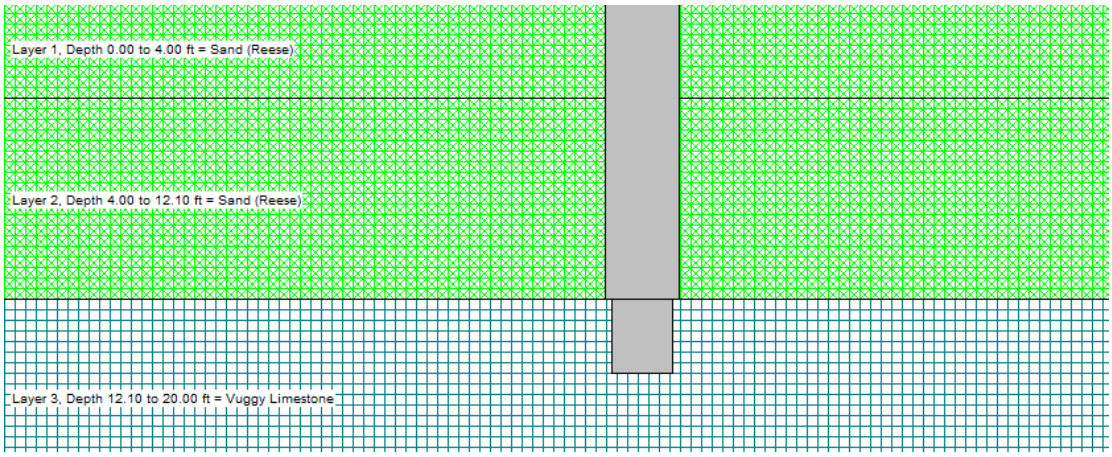
Layer	Layer Top Elev (ft)	Layer Bottom Elev (ft)	Top Depth[1] (ft)	Bottom Depth[1] (ft)	Φ (degrees)[2]	k (pci)[3]	γ' (pcf)[4]	UCS (psi)[5]
Dense Fill	167.7	163.7	0	4	34	135	125	--
Dense Fill (Submerged)	163.7	150.9	4	16.8	34	80	63	-
Bedrock	150.9	142.7	16.8	25.0	--	--	103	4,000



Toll Island – Deep Bedrock Profile

Table 4: Soil Properties for Lateral Analysis (ORT Lane - Center Median Locations)

Layer	Layer Top Elev (ft)	Layer Bottom Elev (ft)	Top Depth[1] (ft)	Bottom Depth[1] (ft)	Φ (degrees)[2]	k (pci)[3]	γ' (pcf)[4]	UCS (psi)[5]
Dense Fill	167.7	163.7	0	4	34	135	125	--
Dense Fill (Submerged)	163.7	155.6	4	12.1	34	80	63	-
Bedrock	155.6	147.7	12.1	20.0	--	--	103	4,000



ORT Lanes Profile

Notes:

1. Depth in reference to top of drilled shaft
2. Φ = angle of internal friction
3. k = horizontal modulus of subgrade reaction
4. γ' = effective unit weight
5. UCS = unconfined compressive strength

Conclusions:

TL-4 Vehicle Impact Loading

For the gantries located downstream of the toll both islands, we recommend using one three foot diameter drilled shaft per support location, terminating a minimum of 3 feet into bedrock. The analysis indicates pile head deflections are estimated to be less than ½" for Group II load cases and less than about 1" for Extreme load cases.

Table 5: Analysis Summary

Load Case	Results		
	Pile Head Deflection	Max. Moment	Max. Shear
	in	ft-kips	kips
	Shallow Bedrock Profile		
Group II	0.19	228.4	-103.7
Extreme II (TL-4)	0.41	477.7	-254.5
	Deep Bedrock Profile		
Group II	0.18	228.3	-19.5
Extreme II (TL-4)	0.81	419.3	56.9

TL-5 Vehicle Impact loading

For the gantries located within the center median of the ORT lane, we recommend using (2) three foot diameter drilled shafts per support location, terminating a minimum of 3 feet into bedrock. The analysis indicates pile head deflections are estimated to be less than 1" under the vehicle extreme impact loading.

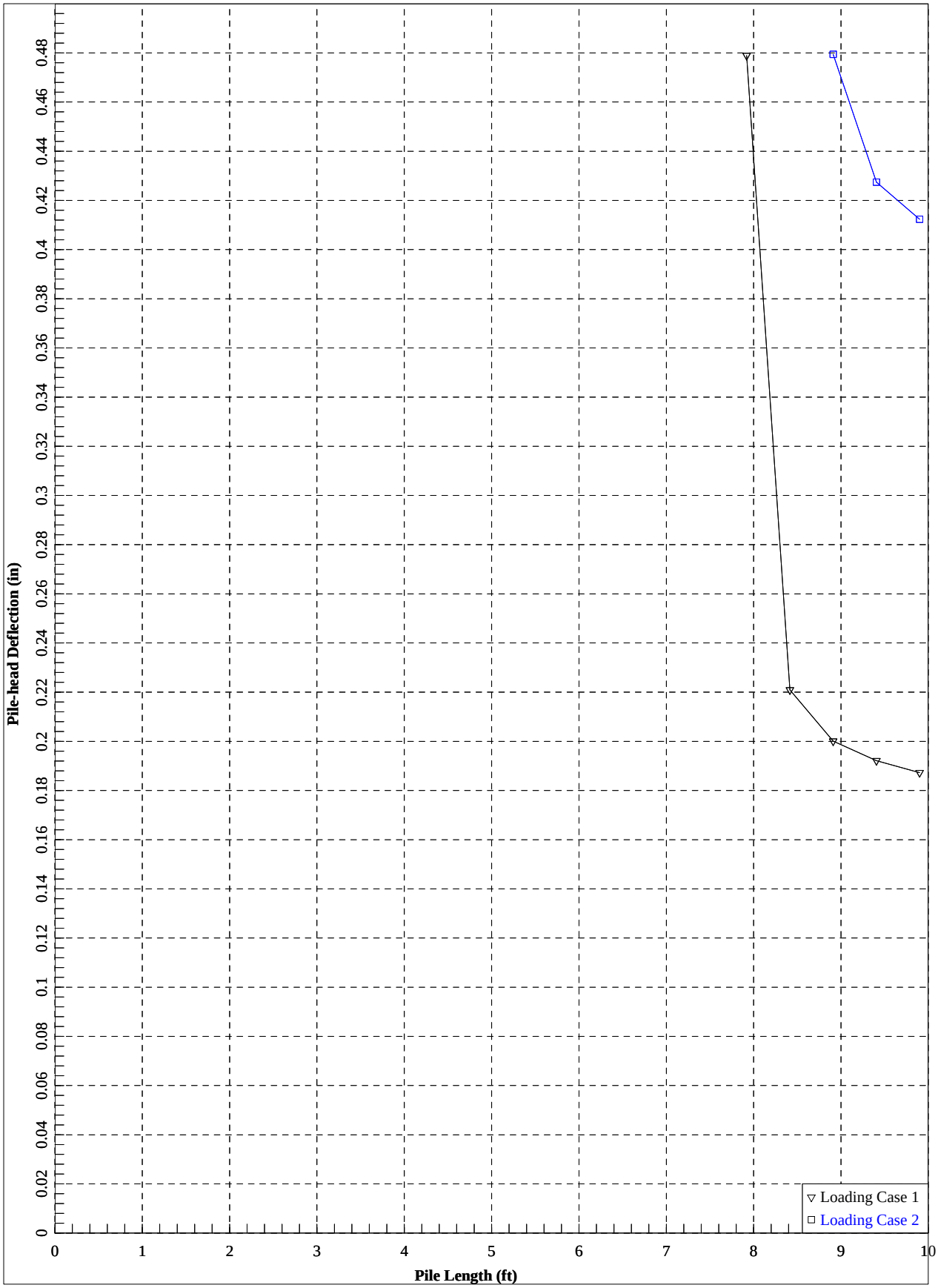
Table 6: Analysis Summary

Load Case	Results		
	Pile Head Deflection	Max. Moment	Max. Shear
	in	ft-kips	lbs
Extreme II (TL-5)	0.96	477.9	-171.3

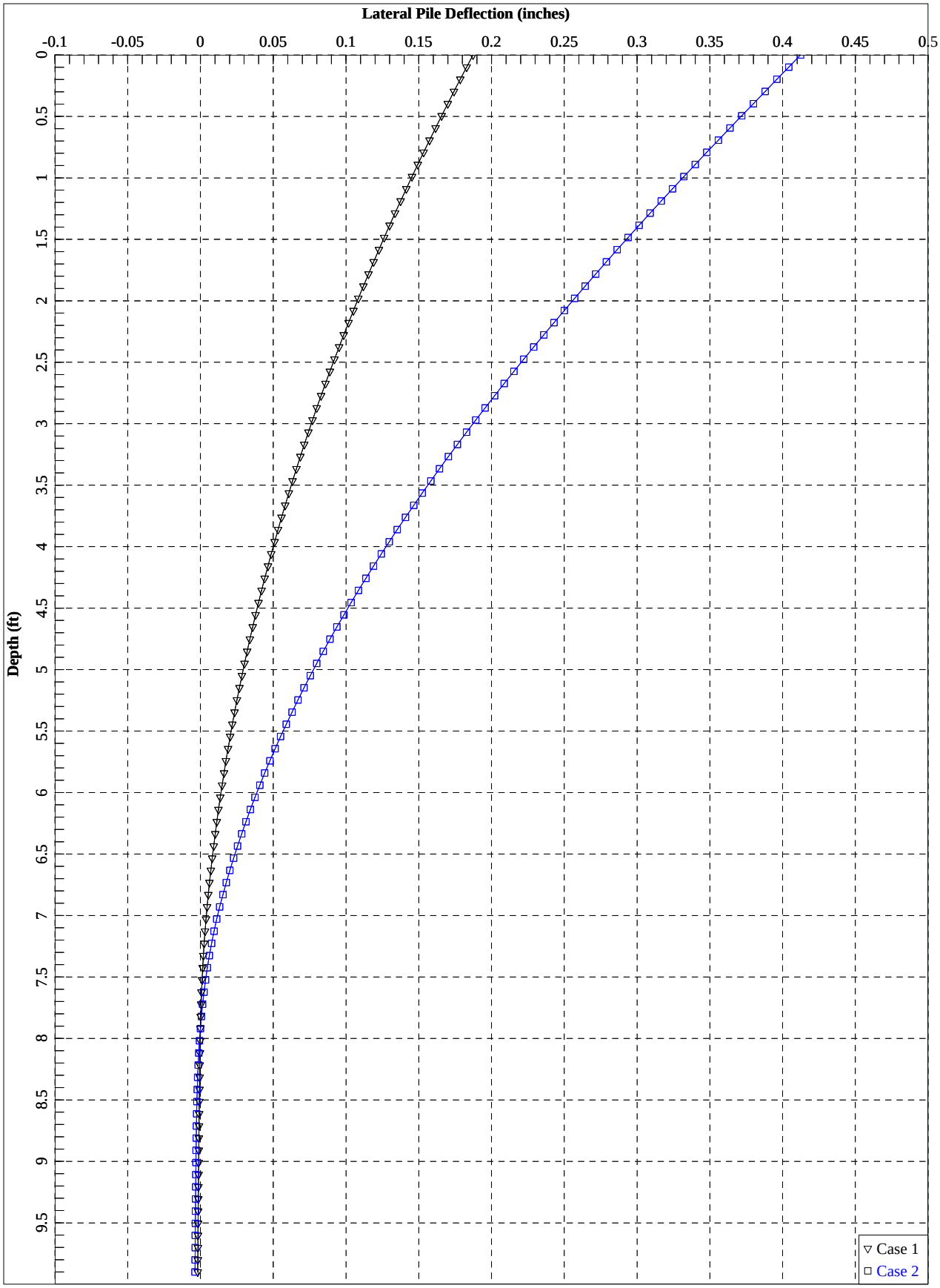
Attachments:

1. Reaction Diagrams - Shallow Bedrock (TL-4 Impact)
   a. Top Deflection vs Length
   b. Top Deflection
   c. Moment
   d. Shear
2. Reaction Diagrams - Deep Bedrock (TL-4 Impact)
   a. Top Deflection vs Length
   b. Top Deflection
   c. Moment
   d. Shear
3. Reaction Diagrams - ORT Lanes (TL-5 Impact)
   a. Top Deflection vs Length
   b. Top Deflection
   c. Moment
   d. Shear
4. LPILE Output – Toll Island - Shallow Bedrock Profile (TL-4 Impact)
5. LPILE Output – Toll Island - Deep Bedrock Profile (TL-4 Impact)
6. LPILE Output – ORT Lanes (TL-5 Impact)

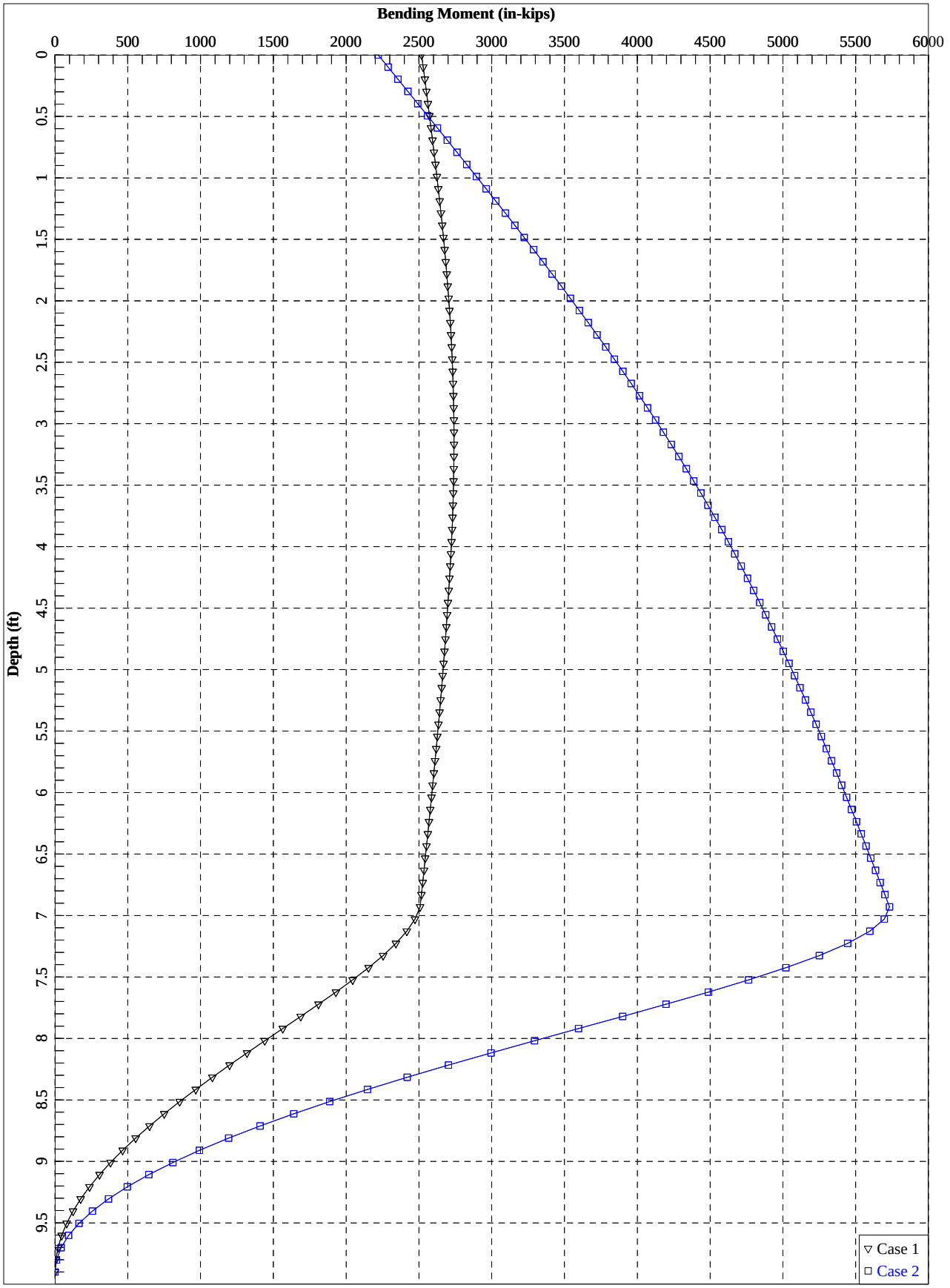
TL-4 Shallow Rock Profile



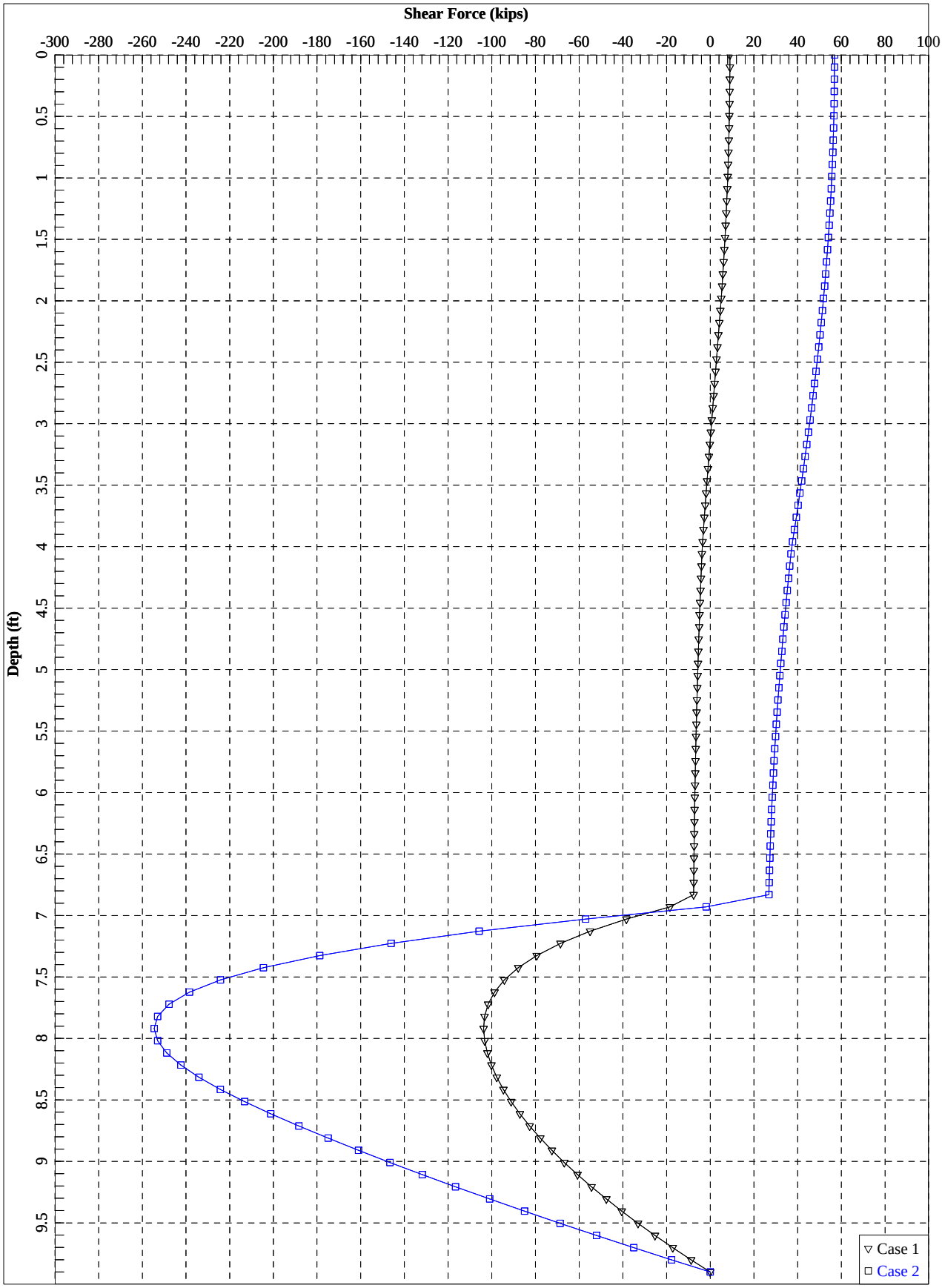
TL-4 Shallow Rock Profile



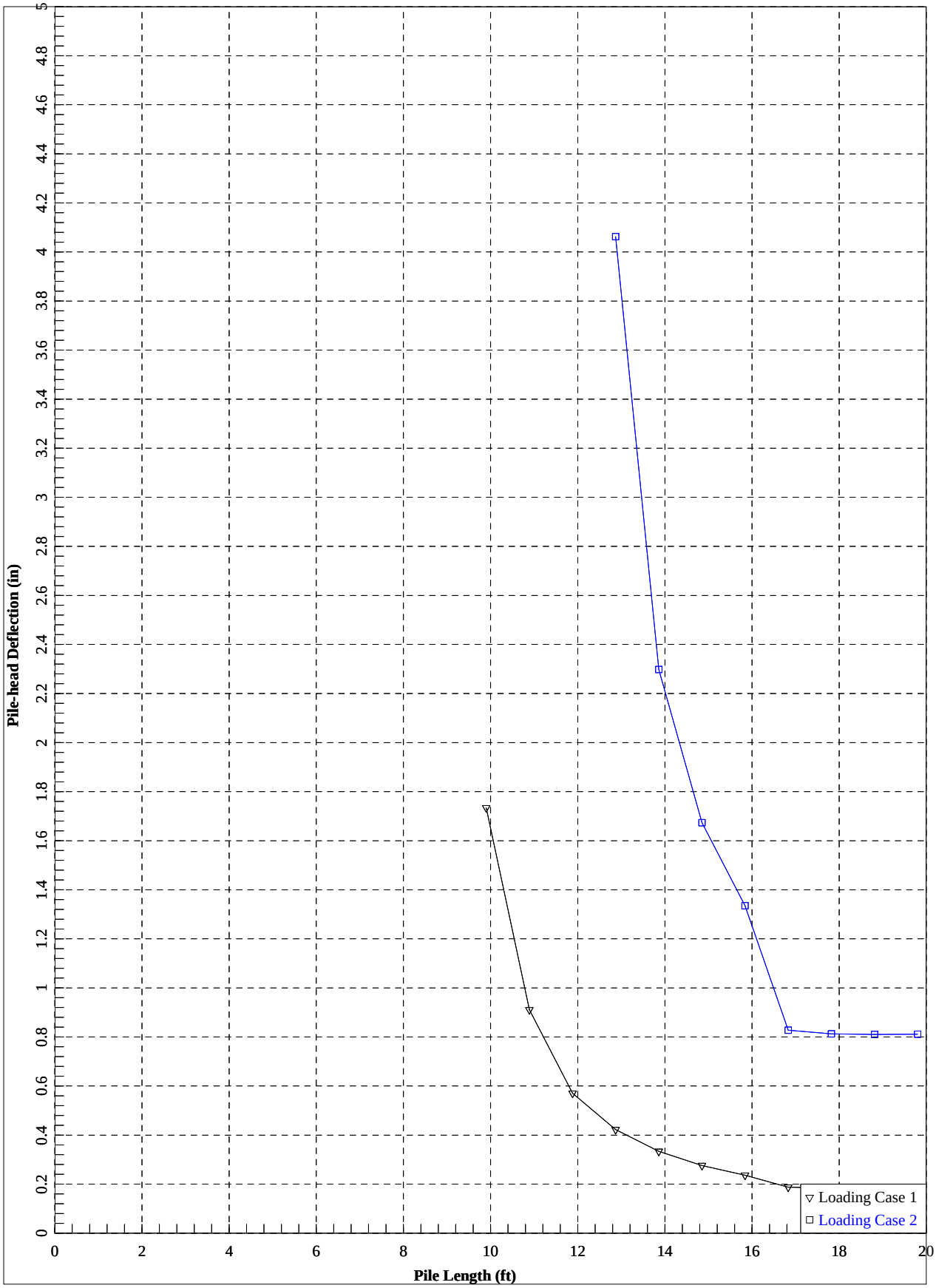
TL-4 Shallow Rock Profile



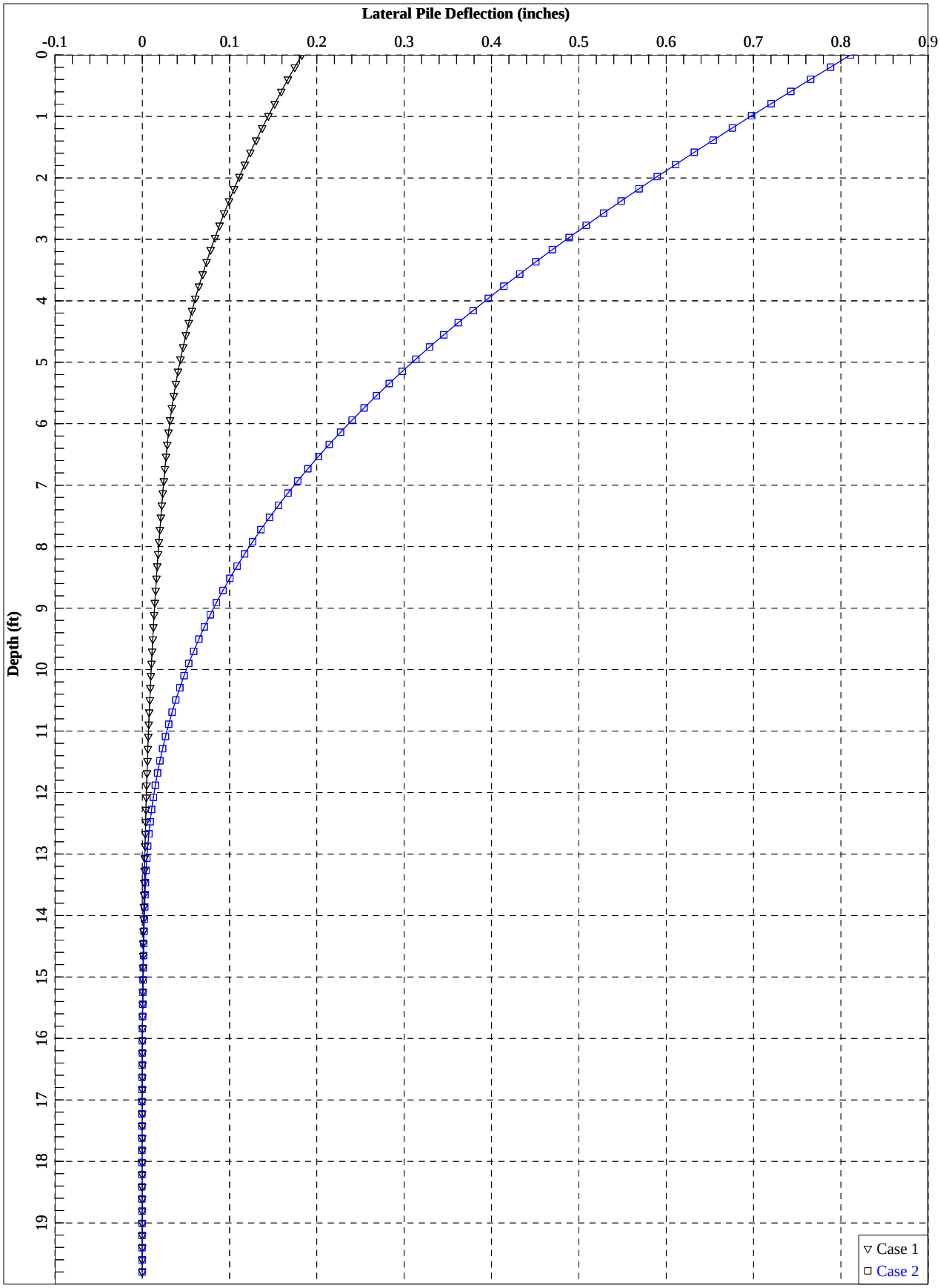
TL-4 Shallow Rock Profile



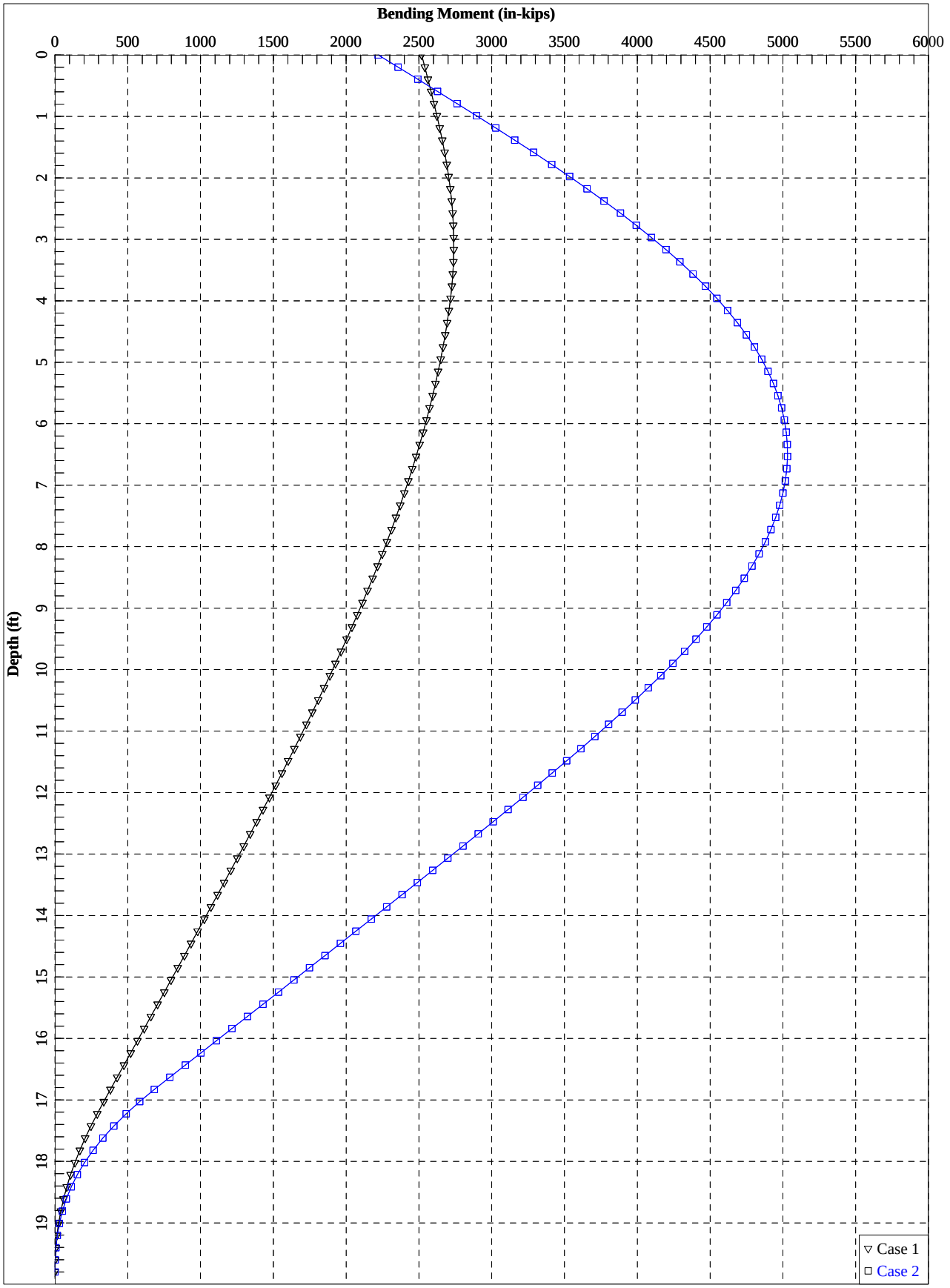
TL-4 Deep Rock Profile



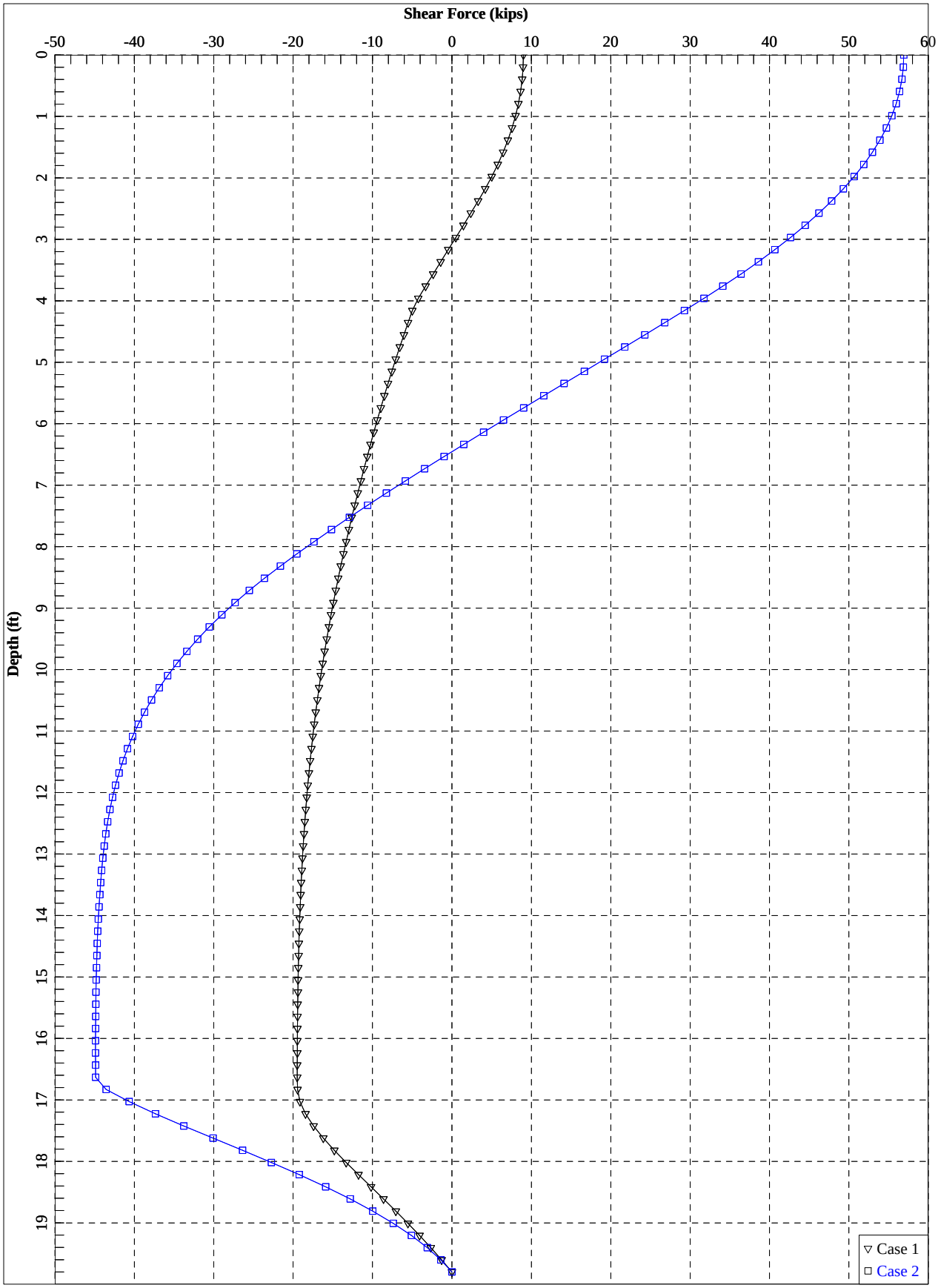
TL-4 Deep Rock Profile



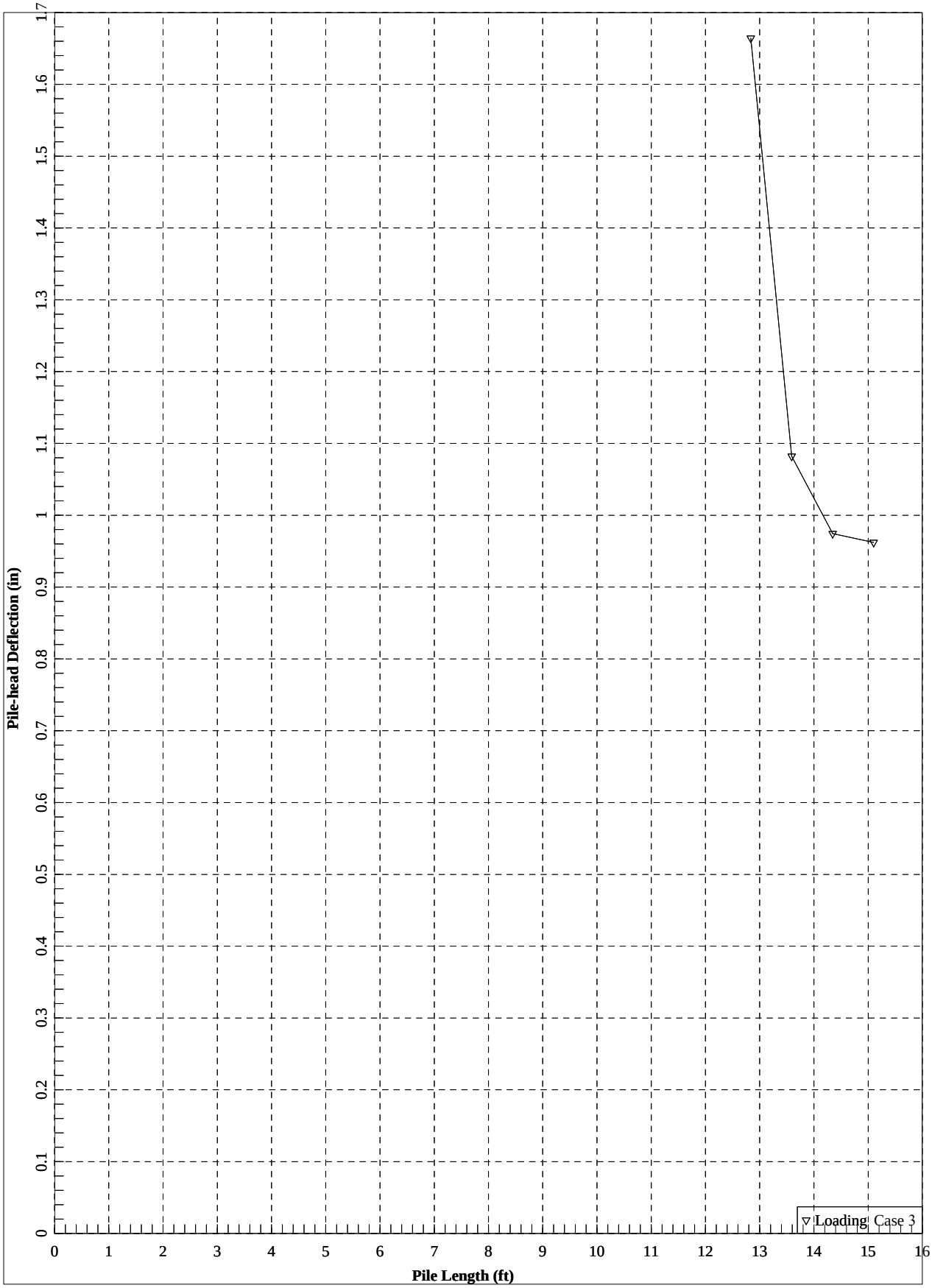
TL-4 Deep Rock Profile



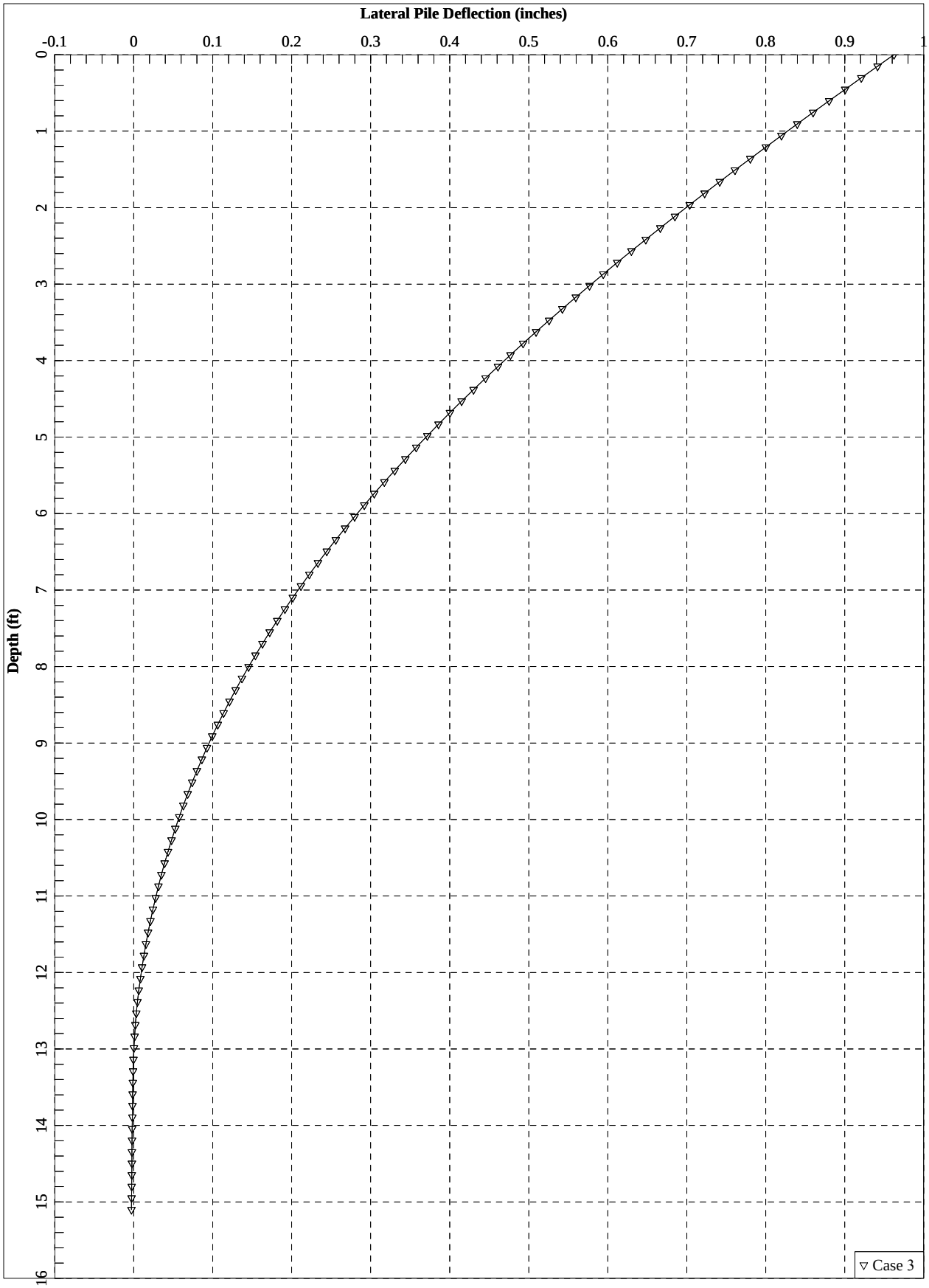
TL-4 Deep Rock Profile



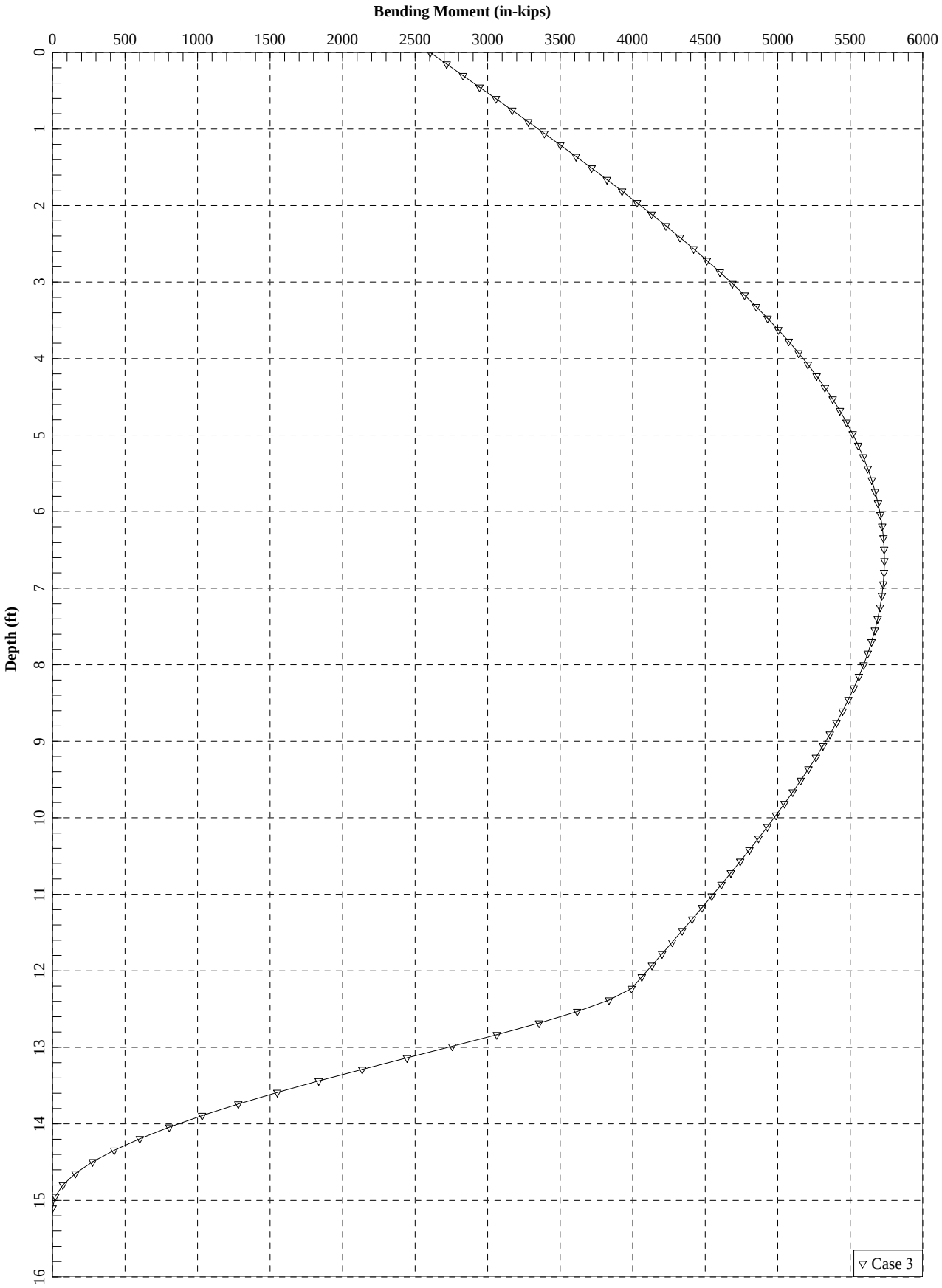
ORT Lanes - TL-5



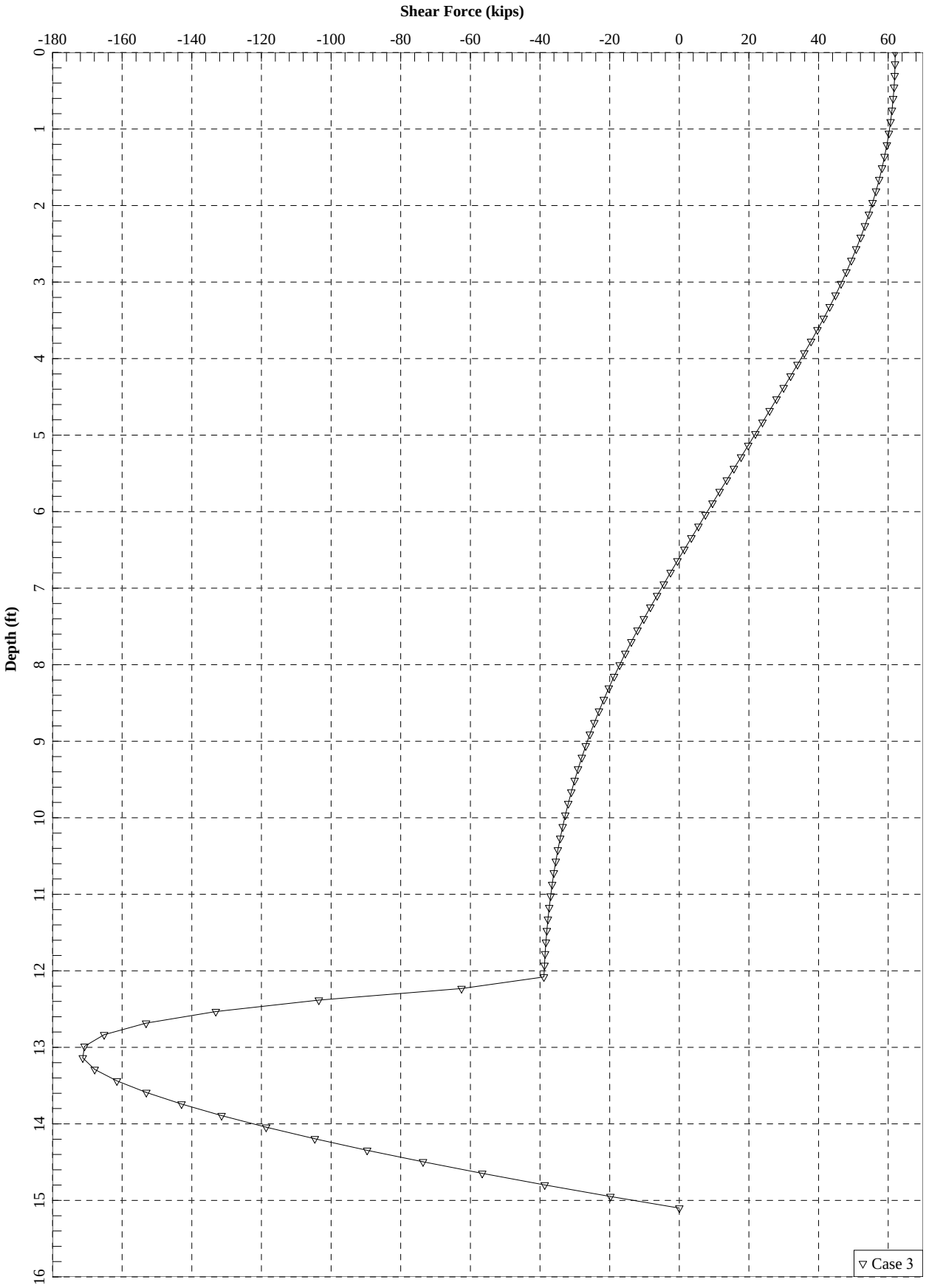
ORT Lanes - TL-5



ORT Lanes - TL-5



ORT Lanes - TL-5



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================================================================================

                  LPile Plus for Windows, Version 2013-07.004

               Analysis of Individual Piles and Drilled Shafts
              Subjected to Lateral Loading Using the p-y Method

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================================================================================

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--------------------------------------------------------------------------------
                           Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:        \\BOSFIL10\Group\INFRASTRUCTURE\GEOTECHNICAL\Maine Turnpike Authority - York Plaza\York Toll
Plaza\New Toll Location\Report\Analysis\Analysis\Gantry LPILE\
Name of input data file:       Toll Island - Shallow Rock Profile (TL-4 Impact).lp7d
Name of output report file:    Toll Island - Shallow Rock Profile (TL-4 Impact).lp7o
Name of plot output file:      Toll Island - Shallow Rock Profile (TL-4 Impact).lp7p
Name of runtime messeage file: Toll Island - Shallow Rock Profile (TL-4 Impact).lp7r


--------------------------------------------------------------------------------
                          Date and Time of Analysis
--------------------------------------------------------------------------------

               Date:  December 20, 2016     Time:   9:28:30


--------------------------------------------------------------------------------
                                Problem Title
--------------------------------------------------------------------------------

Project Name: York Toll Plaza


Job Number: E2X71602


Client: Maine Turnpike


Engineer: Jacobs Engineering


Description: Gantry Foundation - Soil Profile
```

Program Options and Settings

Engineering Units of Input Data and Computations:
 - Engineering units are US Customary Units (pounds, feet, inches)

Analysis Control Options:
- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
 - Compute pile response under loading and nonlinear bending properties of pile
   (only if nonlinear pile properties are input)
 - Use of p-y modification factors for p-y curves not selected
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - No p-y curves to be computed and reported for user-specified depths
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1

Pile Structural Properties and Geometry

Total number of pile sections = 2

Total length of pile = 9.90 ft

Depth of ground surface below top of pile = 0.00 ft

Pile diameter values used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	36.0000000
2	6.900000	36.0000000
3	6.900000	30.0000000

4 9.900000 30.0000000

Input Structural Properties:

Pile Section No. 1:

Section Type	=	Drilled Shaft (Bored Pile)
Section Length	=	6.90000 ft
Section Diameter	=	36.00000 in

Pile Section No. 2:

Section Type	=	Drilled Shaft (Bored Pile)
Section Length	=	3.00000 ft
Section Diameter	=	30.00000 in

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	4.00000 ft
Effective unit weight at top of layer	=	125.00000 pcf
Effective unit weight at bottom of layer	=	125.00000 pcf
Friction angle at top of layer	=	34.00000 deg.
Friction angle at bottom of layer	=	34.00000 deg.
Subgrade k at top of layer	=	135.00000 pci
Subgrade k at bottom of layer	=	135.00000 pci

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	4.00000 ft
Distance from top of pile to bottom of layer	=	6.90000 ft
Effective unit weight at top of layer	=	63.00000 pcf
Effective unit weight at bottom of layer	=	63.00000 pcf
Friction angle at top of layer	=	34.00000 deg.
Friction angle at bottom of layer	=	34.00000 deg.
Subgrade k at top of layer	=	80.00000 pci
Subgrade k at bottom of layer	=	80.00000 pci

Layer 3 is strong rock (vuggy limestone)

Distance from top of pile to top of layer	=	6.90000 ft
Distance from top of pile to bottom of layer	=	15.00000 ft
Effective unit weight at top of layer	=	103.00000 pcf
Effective unit weight at bottom of layer	=	103.00000 pcf
Uniaxial compressive strength at top of layer	=	4000.00000 psi
Uniaxial compressive strength at bottom of layer	=	4000.00000 psi

(Depth of lowest soil layer extends 5.10 ft below pile tip)

Summary of Soil Properties

Layer Num.	Layer Soil Type (p-y Curve Criteria)	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	Uniaxial qu psi	kpy pci
1	Sand (Reese, et al.)	0.00	125.000	34.000	--	135.000
		4.000	125.000	34.000	--	135.000
2	Sand (Reese, et al.)	4.000	63.000	34.000	--	80.000
		6.900	63.000	34.000	--	80.000
3	Vuggy Limestone	6.900	103.000	--	4000.000	--
		15.000	103.000	--	4000.000	--

Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	1	V = 9000.00000 lbs	M = 2518800. in-lbs	39800.	Yes
2	1	V = 56900. lbs	M = 2220000. in-lbs	49800.	Yes

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	6.90000 ft
Shaft Diameter	=	36.00000 in
Concrete Cover Thickness	=	6.00000 in
Number of Reinforcing Bars	=	11 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	1017.87602 sq. in.
Total Area of Reinforcing Steel	=	11.00000 sq. in.
Area Ratio of Steel Reinforcement	=	1.08 percent
Edge-to-Edge Bar Spacing	=	5.31579 in
Maximum Concrete Aggregate Size	=	0.75000 in
Ratio of Bar Spacing to Aggregate Size	=	7.09
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	4083.379 kips
Tensile Load for Cracking of Concrete	=	-455.573 kips
Nominal Axial Tensile Capacity	=	-660.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.12800	1.00000	11.43600	0.00000
2	1.12800	1.00000	9.62058	6.18277
3	1.12800	1.00000	4.75069	10.40255
4	1.12800	1.00000	-1.62751	11.31960
5	1.12800	1.00000	-7.48899	8.64275
6	1.12800	1.00000	-10.97276	3.22189
7	1.12800	1.00000	-10.97276	-3.22189
8	1.12800	1.00000	-7.48899	-8.64275
9	1.12800	1.00000	-1.62751	-11.31960
10	1.12800	1.00000	4.75069	-10.40255
11	1.12800	1.00000	9.62058	-6.18277

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 5.31579 inches between Bars 8 and 9

Spacing to aggregate size ratio = 7.08772

Concrete Properties:

Compressive Strength of Concrete = 4000.00000 psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.34164 psi
Compression Strain at Peak Stress = 0.00189
Tensile Strain at Fracture of Concrete = -0.0001154
Maximum Coarse Aggregate Size = 0.75000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force kips
1	39.800
2	49.800

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 39.800 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000000625	228.7167885	365946862.	31.9179611	0.0000199	-0.000002551	0.0836865	0.5752505	
0.000001250	457.0482218	365638577.	24.9731538	0.0000312	-0.0000138	0.1303603	0.8987518	
0.000001875	684.5540465	365095491.	22.6592702	0.0000425	-0.0000250	0.1767624	1.2223103	
0.000002500	911.1891969	364475679.	21.5025659	0.0000538	-0.0000362	0.2228871	1.5458860	
0.000003125	1136.9476404	363823245.	20.8086389	0.0000650	-0.0000475	0.2687331	1.8694704	
0.000003750	1361.8278881	363154103.	20.3460745	0.0000763	-0.0000587	0.3143000	2.1930606	
0.000004375	1585.8294183	362475296.	20.0157076	0.0000876	-0.0000699	0.3595876	2.5166554	
0.000005000	1808.9520157	361790403.	19.7679600	0.0000988	-0.0000812	0.4045958	2.8402542	
0.000005625	2031.1955749	361101436.	19.5752899	0.0001101	-0.0000924	0.4493245	3.1638567	
0.000006250	2252.5600317	360409605.	19.4211729	0.0001214	-0.0001036	0.4937738	3.4874626	
0.000006875	2473.0453606	359715689.	19.2950940	0.0001327	-0.0001148	0.5379435	3.8110719	
0.000007500	2473.0453606	329739381.	12.6927945	0.0000952	-0.0001748	0.3881158	-5.0301672	C
0.000008125	2473.0453606	304374814.	12.4460088	0.0001011	-0.0001914	0.4115146	-5.5074966	C
0.000008750	2473.0453606	282633756.	12.2286379	0.0001070	-0.0002080	0.4346328	-5.9863081	C
0.000009375	2473.0453606	263791505.	12.0391104	0.0001129	-0.0002246	0.4576337	-6.4654293	C
0.0000100	2473.0453606	247304536.	11.8686330	0.0001187	-0.0002413	0.4803755	-6.9458964	C
0.0000106	2473.0453606	232757210.	11.7184565	0.0001245	-0.0002580	0.5030544	-7.4262881	C
0.0000113	2473.0453606	219826254.	11.5812845	0.0001303	-0.0002747	0.5254962	-7.9078809	C

0.0000119	2473.0453606	208256451.	11.4582074	0.0001361	-0.0002914	0.5478497	-8.3895923	C
0.0000125	2473.0453606	197843629.	11.3476458	0.0001418	-0.0003082	0.5701413	-8.8712284	C
0.0000131	2473.0453606	188422504.	11.2445206	0.0001476	-0.0003249	0.5922017	-9.3540418	C
0.0000138	2473.0453606	179857844.	11.1507117	0.0001533	-0.0003417	0.6141878	-9.8368787	C
0.0000144	2473.0453606	172037938.	11.0652413	0.0001591	-0.0003584	0.6361129	-10.3196400	C
0.0000150	2473.0453606	164869691.	10.9870677	0.0001648	-0.0003752	0.6579768	-10.8023255	C
0.0000156	2473.0453606	158274903.	10.9128980	0.0001705	-0.0003920	0.6796337	-11.2860305	C
0.0000163	2473.0453606	152187407.	10.8443523	0.0001762	-0.0004088	0.7012151	-11.7697739	C
0.0000169	2473.0453606	146550836.	10.7810404	0.0001819	-0.0004256	0.7227362	-12.2534408	C
0.0000175	2473.0453606	141316878.	10.7224021	0.0001876	-0.0004424	0.7441970	-12.7370309	C
0.0000181	2473.0453606	136443882.	10.6679540	0.0001934	-0.0004591	0.7655975	-13.2205441	C
0.0000188	2473.0453606	131895753.	10.6171726	0.0001991	-0.0004759	0.7869300	-13.7040373	C
0.0000194	2473.0453606	127641051.	10.5680775	0.0002048	-0.0004927	0.8080752	-14.1884239	C
0.0000200	2473.0453606	123652268.	10.5221858	0.0002104	-0.0005096	0.8291608	-14.6727322	C
0.0000206	2473.0453606	119905230.	10.4792067	0.0002161	-0.0005264	0.8501867	-15.1569619	C
0.0000213	2473.0453606	116378605.	10.4388834	0.0002218	-0.0005432	0.8711528	-15.6411131	C
0.0000219	2473.0453606	113053502.	10.4009885	0.0002275	-0.0005600	0.8920591	-16.1251853	C
0.0000225	2473.0453606	109913127.	10.3653201	0.0002332	-0.0005768	0.9129055	-16.6091786	C
0.0000231	2473.0453606	106942502.	10.3316978	0.0002389	-0.0005936	0.9336919	-17.0930926	C
0.0000238	2473.0453606	104128226.	10.2999605	0.0002446	-0.0006104	0.9544181	-17.5769272	C
0.0000244	2473.0453606	101458271.	10.2699632	0.0002503	-0.0006272	0.9750842	-18.0606822	C
0.0000256	2473.0453606	96509087.	10.2128648	0.0002617	-0.0006608	1.0160652	-19.0293023	C
0.0000269	2473.0453606	92020292.	10.1611358	0.0002731	-0.0006944	1.0567723	-19.9978772	C
0.0000281	2473.0453606	87930502.	10.1144077	0.0002845	-0.0007280	1.0972408	-20.9661236	C
0.0000294	2473.0453606	84188778.	10.0720441	0.0002959	-0.0007616	1.1374699	-21.9340398	C
0.0000306	2473.0453606	80752502.	10.0335124	0.0003073	-0.0007952	1.1774592	-22.9016242	C
0.0000319	2473.0453606	77585737.	9.9983636	0.0003187	-0.0008288	1.2172078	-23.8688751	C
0.0000331	2473.0453606	74657973.	9.9662165	0.0003301	-0.0008624	1.2567151	-24.8357907	C
0.0000344	2487.3217517	72358451.	9.9367454	0.0003416	-0.0008959	1.2959806	-25.8023694	C
0.0000356	2563.3953469	71954957.	9.9096702	0.0003530	-0.0009295	1.3350034	-26.7686093	C
0.0000369	2639.3600207	71575865.	9.8841165	0.0003645	-0.0009630	1.3737027	-27.7351853	C
0.0000381	2715.2244280	71219001.	9.8601828	0.0003759	-0.0009966	1.4121118	-28.7018228	C
0.0000394	2791.0008708	70882562.	9.8380786	0.0003874	-0.0010301	1.4502793	-29.6681064	C
0.0000406	2866.6889306	70564651.	9.8176367	0.0003988	-0.0010637	1.4882044	-30.6340342	C
0.0000419	2942.2881837	70263598.	9.7987098	0.0004103	-0.0010972	1.5258866	-31.5996042	C
0.0000431	3017.7982026	69977929.	9.7811678	0.0004218	-0.0011307	1.5633250	-32.5648144	C
0.0000444	3093.2185559	69706334.	9.7648953	0.0004333	-0.0011642	1.6005190	-33.5296628	C
0.0000456	3168.5488080	69447645.	9.7497893	0.0004448	-0.0011977	1.6374678	-34.4941474	C
0.0000469	3243.7885194	69200822.	9.7357581	0.0004564	-0.0012311	1.6741707	-35.4582662	C
0.0000481	3318.9372465	68964930.	9.7227194	0.0004679	-0.0012646	1.7106270	-36.4220170	C
0.0000494	3393.9945412	68739130.	9.7105994	0.0004795	-0.0012980	1.7468359	-37.3853979	C
0.0000506	3468.9599514	68522666.	9.6993313	0.0004910	-0.0013315	1.7827967	-38.3484066	C
0.0000519	3543.8330207	68314853.	9.6888550	0.0005026	-0.0013649	1.8185086	-39.3110411	C
0.0000531	3618.6132882	68115074.	9.6791161	0.0005142	-0.0013983	1.8539709	-40.2732991	C
0.0000544	3693.2997693	67922754.	9.6700650	0.0005258	-0.0014317	1.8891827	-41.2351801	C
0.0000556	3767.8930836	67737404.	9.6616568	0.0005374	-0.0014651	1.9241435	-42.1966786	C
0.0000569	3842.3921824	67558544.	9.6538504	0.0005491	-0.0014984	1.9588524	-43.1577941	C
0.0000581	3916.7965872	67385748.	9.6466083	0.0005607	-0.0015318	1.9933085	-44.1185244	C
0.0000594	3991.1058144	67218624.	9.6398961	0.0005724	-0.0015651	2.0275112	-45.0788672	C
0.0000606	4065.3193759	67056814.	9.6336826	0.0005840	-0.0015985	2.0614595	-46.0388201	C
0.0000619	4139.4367784	66899988.	9.6279386	0.0005957	-0.0016318	2.0951528	-46.9983808	C
0.0000631	4213.4575239	66747842.	9.6226376	0.0006074	-0.0016651	2.1285901	-47.9575471	C
0.0000644	4287.3811092	66600095.	9.6177551	0.0006191	-0.0016984	2.1617707	-48.9163164	C
0.0000656	4361.2070263	66456488.	9.6132683	0.0006309	-0.0017316	2.1946937	-49.8746865	C
0.0000669	4434.9347617	66316781.	9.6091565	0.0006426	-0.0017649	2.2273584	-50.8326549	C
0.0000681	4508.5637969	66180753.	9.6054001	0.0006544	-0.0017981	2.2597638	-51.7902191	C
0.0000694	4582.0936078	66048196.	9.6019812	0.0006661	-0.0018314	2.2919091	-52.7473767	C
0.0000706	4655.5236652	65918919.	9.5988831	0.0006779	-0.0018646	2.3237936	-53.7041251	C
0.0000719	4728.8534343	65792743.	9.5960903	0.0006897	-0.0018978	2.3554162	-54.6604618	C
0.0000731	4802.0823746	65669503.	9.5935883	0.0007015	-0.0019310	2.3867761	-55.6163843	C

0.0000744	4875.2099402	65549041.	9.5913637	0.0007134	-0.0019641	2.4178726	-56.5718898	C
0.0000794	5166.6948188	65092218.	9.5850000	0.0007608	-0.0020967	2.5396049	-60.0000000	CY
0.0000844	5456.5133999	64669788.	9.5822045	0.0008085	-0.0022290	2.6570485	-60.0000000	CY
0.0000894	5744.6266256	64275543.	9.5824485	0.0008564	-0.0023611	2.7701428	-60.0000000	CY
0.0000944	6030.9949765	63904583.	9.5853183	0.0009046	-0.0024929	2.8788254	-60.0000000	CY
0.0000994	6315.5771098	63552977.	9.5904869	0.0009531	-0.0026244	2.9830310	-60.0000000	CY
0.0001044	6593.5757563	63171983.	9.5955103	0.0010015	-0.0027560	3.0822292	-60.0000000	CY
0.0001094	6822.7089732	62379053.	9.5812433	0.0010479	-0.0028896	3.1723695	-60.0000000	CY
0.0001144	7002.1229748	61220747.	9.5484501	0.0010921	-0.0030254	3.2537140	-60.0000000	CY
0.0001194	7166.1992085	60030988.	9.5124429	0.0011355	-0.0031620	3.3296165	-60.0000000	CY
0.0001244	7299.1993838	58687030.	9.4659320	0.0011773	-0.0033002	3.3987123	-60.0000000	CY
0.0001294	7416.0351152	57322011.	9.4170604	0.0012183	-0.0034392	3.4628541	-60.0000000	CY
0.0001344	7531.9963700	56052066.	9.3731649	0.0012595	-0.0035780	3.5236426	-60.0000000	CY
0.0001394	7638.0634525	54802249.	9.3291305	0.0013002	-0.0037173	3.5801522	-60.0000000	CY
0.0001444	7722.5207742	53489321.	9.2788178	0.0013396	-0.0038579	3.6313632	-60.0000000	CY
0.0001494	7798.3760187	52206701.	9.2289843	0.0013786	-0.0039989	3.6787261	-60.0000000	CY
0.0001544	7873.4041657	51001808.	9.1833600	0.0014177	-0.0041398	3.7230027	-60.0000000	CY
0.0001594	7947.3378538	49865649.	9.1393136	0.0014566	-0.0042809	3.7637870	-60.0000000	CY
0.0001644	8019.8740924	48790109.	9.0984122	0.0014956	-0.0044219	3.8013974	-60.0000000	CY
0.0001694	8085.6835480	47738353.	9.0575138	0.0015341	-0.0045634	3.8353972	-60.0000000	CY
0.0001744	8139.6785604	46679160.	9.0135688	0.0015717	-0.0047058	3.8654770	-60.0000000	CY
0.0001794	8185.7944587	45635091.	8.9687996	0.0016088	-0.0048487	3.8921156	-60.0000000	CY
0.0001844	8229.6963704	44635641.	8.9263544	0.0016458	-0.0049917	3.9158062	-60.0000000	CY
0.0001894	8273.0508647	43686077.	8.8869857	0.0016830	-0.0051345	3.9366480	-60.0000000	CY
0.0001944	8315.8470781	42782493.	8.8504725	0.0017203	-0.0052772	3.9546039	-60.0000000	CY
0.0001994	8358.0297202	41921152.	8.8163736	0.0017578	-0.0054197	3.9696175	-60.0000000	CY
0.0002044	8399.2663436	41097328.	8.7827193	0.0017950	-0.0055625	3.9815548	-60.0000000	CY
0.0002094	8439.9407572	40310165.	8.7515102	0.0018323	-0.0057052	3.9905649	-60.0000000	CY
0.0002144	8478.6273579	39550448.	8.7216526	0.0018697	-0.0058478	3.9965801	-60.0000000	CY
0.0002194	8514.5316633	38812680.	8.6924955	0.0019069	-0.0059906	3.9996009	-60.0000000	CY
0.0002244	8544.9376333	38083288.	8.6622295	0.0019436	-0.0061339	3.9954174	-60.0000000	CY
0.0002294	8570.3592505	37363964.	8.6310553	0.0019797	-0.0062778	3.9989621	-60.0000000	CY
0.0002344	8593.3932528	36665145.	8.6006269	0.0020158	-0.0064217	3.9990787	-60.0000000	CY
0.0002394	8614.2062091	35986240.	8.5712212	0.0020517	-0.0065658	3.9971926	-60.0000000	CY
0.0002444	8634.6233575	35333497.	8.5436426	0.0020879	-0.0067096	3.9996212	-60.0000000	CY
0.0002494	8654.5331786	34704895.	8.5179075	0.0021242	-0.0068533	3.9957847	60.0000000	CY
0.0002544	8673.9284380	34098982.	8.4939200	0.0021606	-0.0069969	3.9976064	60.0000000	CY
0.0002594	8692.9592984	33515024.	8.4714252	0.0021973	-0.0071402	3.9997191	60.0000000	CY
0.0002644	8711.3537078	32950747.	8.4496269	0.0022339	-0.0072836	3.9954581	60.0000000	CY
0.0002694	8729.1322867	32405131.	8.4283497	0.0022704	-0.0074271	3.9969283	60.0000000	CY
0.0002744	8746.6035451	31878282.	8.4083736	0.0023070	-0.0075705	3.9993680	60.0000000	CY
0.0003044	8841.7295094	29048803.	8.3125388	0.0025301	-0.0084274	3.9947434	60.0000000	CY
0.0003344	8902.0518309	26622959.	8.2295571	0.0027518	-0.0092857	3.9984338	60.0000000	CY
0.0003644	8935.0736588	24521643.	8.1553847	0.0029716	-0.0101459	3.9990123	60.0000000	CY
0.0003944	8961.0873544	22722250.	8.1012646	0.0031949	-0.0110026	3.9981925	60.0000000	CYT
0.0004244	8982.0266041	21165306.	8.0583583	0.0034198	-0.0118577	3.9943897	60.0000000	CYT
0.0004544	8999.2662013	19805813.	8.0287822	0.0036481	-0.0127094	3.9861205	60.0000000	CYT
0.0004844	8999.2662013	18579130.	8.0483236	0.0038984	-0.0135391	3.9978607	60.0000000	CYT

Axial Thrust Force = 49.800 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000000625	228.4687779	365550045.	35.4213058	0.0000221	-0.000000362	0.0928699	0.6387487	
0.000001250	456.7106492	365368519.	26.7269235	0.0000334	-0.0000116	0.1394997	0.9623260	
0.000001875	684.1960103	364904539.	23.8307199	0.0000447	-0.0000228	0.1858644	1.2860079	
0.000002500	910.8226829	364329073.	22.3830502	0.0000560	-0.0000340	0.2319536	1.6097211	

0.000003125	1136.5762196	363704390.	21.5146127	0.0000672	-0.0000453	0.2777646	1.9334493	
0.000003750	1361.4529547	363054121.	20.9357400	0.0000785	-0.0000565	0.3232968	2.2571867	
0.000004375	1585.4516278	362388943.	20.5223139	0.0000898	-0.0000677	0.3685498	2.5809311	
0.000005000	1808.5717198	361714344.	20.2122840	0.0001011	-0.0000789	0.4135233	2.9046812	
0.000005625	2030.8129660	361033416.	19.9711807	0.0001123	-0.0000902	0.4582173	3.2284364	
0.000006250	2252.1752348	360348038.	19.7783240	0.0001236	-0.0001014	0.5026317	3.5521962	
0.000006875	2472.6584500	359659411.	19.6205545	0.0001349	-0.0001126	0.5467665	3.8759606	
0.000007500	2472.6584500	329687793.	13.4827193	0.0001011	-0.0001689	0.4119528	-4.8583585	C
0.000008125	2472.6584500	304327194.	13.1919436	0.0001072	-0.0001853	0.4358198	-5.3317358	C
0.000008750	2472.6584500	282589537.	12.9367699	0.0001132	-0.0002018	0.4593999	-5.8066196	C
0.000009375	2472.6584500	263750235.	12.7123460	0.0001192	-0.0002183	0.4827797	-6.2823934	C
0.0000100	2472.6584500	247265845.	12.5117750	0.0001251	-0.0002349	0.5059155	-6.7593852	C
0.0000106	2472.6584500	232720795.	12.3322231	0.0001310	-0.0002515	0.5288668	-7.2371712	C
0.0000113	2472.6584500	219791862.	12.1701416	0.0001369	-0.0002681	0.5516326	-7.7157663	C
0.0000119	2472.6584500	208223869.	12.0241863	0.0001428	-0.0002847	0.5742799	-8.1946833	C
0.0000125	2472.6584500	197812676.	11.8897268	0.0001486	-0.0003014	0.5967011	-8.6747240	C
0.0000131	2472.6584500	188393025.	11.7682737	0.0001545	-0.0003180	0.6190589	-9.1546883	C
0.0000138	2472.6584500	179829705.	11.6566159	0.0001603	-0.0003347	0.6412764	-9.6351494	C
0.0000144	2472.6584500	172011023.	11.5527160	0.0001661	-0.0003514	0.6633121	-10.1164240	C
0.0000150	2472.6584500	164843897.	11.4576498	0.0001719	-0.0003681	0.6852853	-10.5976223	C
0.0000156	2472.6584500	158250141.	11.3703576	0.0001777	-0.0003848	0.7071961	-11.0787441	C
0.0000163	2472.6584500	152163597.	11.2881440	0.0001834	-0.0004016	0.7289323	-11.5606371	C
0.0000169	2472.6584500	146527908.	11.2111680	0.0001892	-0.0004183	0.7505416	-12.0429471	C
0.0000175	2472.6584500	141294769.	11.1398416	0.0001949	-0.0004351	0.7720893	-12.5251803	C
0.0000181	2472.6584500	136422535.	11.0735808	0.0002007	-0.0004518	0.7935754	-13.0073365	C
0.0000188	2472.6584500	131875117.	11.0118793	0.0002065	-0.0004685	0.8149998	-13.4894156	C
0.0000194	2472.6584500	127621081.	10.9533284	0.0002122	-0.0004853	0.8362918	-13.9719611	C
0.0000200	2472.6584500	123632922.	10.8974471	0.0002179	-0.0005021	0.8574379	-14.4550806	C
0.0000206	2472.6584500	119886470.	10.8450831	0.0002237	-0.0005188	0.8785232	-14.9381221	C
0.0000213	2472.6584500	116360398.	10.7959263	0.0002294	-0.0005356	0.8995476	-15.4210854	C
0.0000219	2472.6584500	113035815.	10.7497021	0.0002351	-0.0005524	0.9205111	-15.9039701	C
0.0000225	2472.6584500	109895931.	10.7061665	0.0002409	-0.0005691	0.9414134	-16.3867763	C
0.0000231	2472.6584500	106925771.	10.6651016	0.0002466	-0.0005859	0.9622547	-16.8695037	C
0.0000238	2472.6584500	104111935.	10.6263127	0.0002524	-0.0006026	0.9830347	-17.3521521	C
0.0000244	2472.6584500	101442398.	10.5884407	0.0002581	-0.0006194	1.0036475	-17.8355584	C
0.0000256	2472.6584500	96493988.	10.5181077	0.0002695	-0.0006530	1.0446487	-18.8024686	C
0.0000269	2472.6584500	92005896.	10.4547317	0.0002810	-0.0006865	1.0854079	-19.7690559	C
0.0000281	2472.6584500	87916745.	10.3973869	0.0002924	-0.0007201	1.1259242	-20.7353187	C
0.0000294	2472.6584500	84175607.	10.3453052	0.0003039	-0.0007536	1.1661971	-21.7012555	C
0.0000306	2472.6584500	80739868.	10.2978441	0.0003154	-0.0007871	1.2062259	-22.6668646	C
0.0000319	2472.6584500	77573598.	10.2542370	0.0003269	-0.0008206	1.2459847	-23.6323521	C
0.0000331	2499.5930028	75459411.	10.2128570	0.0003383	-0.0008542	1.2853355	-24.5988616	C
0.0000344	2575.6610551	74928322.	10.1748271	0.0003498	-0.0008877	1.3244437	-25.5650316	C
0.0000356	2651.6406138	74432017.	10.1397964	0.0003612	-0.0009213	1.3633086	-26.5308603	C
0.0000369	2727.5312716	73966950.	10.1074614	0.0003727	-0.0009548	1.4019297	-27.4963459	C
0.0000381	2803.3326177	73530036.	10.0775586	0.0003842	-0.0009883	1.4403062	-28.4614866	C
0.0000394	2879.0442377	73118584.	10.0498581	0.0003957	-0.0010218	1.4784374	-29.4262806	C
0.0000406	2954.6657135	72730233.	10.0241581	0.0004072	-0.0010553	1.5163226	-30.3907261	C
0.0000419	3030.1966234	72362904.	10.0002810	0.0004188	-0.0010887	1.5539611	-31.3548212	C
0.0000431	3105.6365418	72014760.	9.9780697	0.0004303	-0.0011222	1.5913522	-32.3185640	C
0.0000444	3180.9850393	71684170.	9.9573849	0.0004419	-0.0011556	1.6284952	-33.2819526	C
0.0000456	3256.2416827	71369681.	9.9381027	0.0004534	-0.0011891	1.6653894	-34.2449852	C
0.0000469	3331.4060350	71069995.	9.9201123	0.0004650	-0.0012225	1.7020340	-35.2076597	C
0.0000481	3406.4776550	70783951.	9.9033143	0.0004766	-0.0012559	1.7384283	-36.1699743	C
0.0000494	3481.4371612	70510120.	9.8870945	0.0004882	-0.0012893	1.7744896	-37.1326789	C
0.0000506	3556.2991782	70247885.	9.8717981	0.0004998	-0.0013227	1.8102805	-38.0952038	C
0.0000519	3631.0682564	69996497.	9.8574898	0.0005114	-0.0013561	1.8458218	-39.0573512	C
0.0000531	3705.7439300	69755180.	9.8441012	0.0005230	-0.0013895	1.8811127	-40.0191189	C
0.0000544	3780.3257274	69523232.	9.8315705	0.0005346	-0.0014229	1.9161524	-40.9805046	C
0.0000556	3854.8131721	69300012.	9.8198411	0.0005462	-0.0014563	1.9509403	-41.9415062	C

0.0000569	3929.2057830	69084937.	9.8088615	0.0005579	-0.0014896	1.9854754	-42.9021214	C
0.0000581	4003.5030745	68877472.	9.7985848	0.0005695	-0.0015230	2.0197570	-43.8623478	C
0.0000594	4077.7045560	68677129.	9.7889679	0.0005812	-0.0015563	2.0537842	-44.8221832	C
0.0000606	4151.8097319	68483459.	9.7799713	0.0005929	-0.0015896	2.0875564	-45.7816253	C
0.0000619	4225.8175263	68296041.	9.7715588	0.0006046	-0.0016229	2.1210725	-46.7406733	C
0.0000631	4299.7286379	68114513.	9.7636969	0.0006163	-0.0016562	2.1543320	-47.6993213	C
0.0000644	4373.5419235	67938515.	9.7563548	0.0006281	-0.0016894	2.1873340	-48.6575688	C
0.0000656	4447.2568679	67767724.	9.7495042	0.0006398	-0.0017227	2.2200775	-49.6154134	C
0.0000669	4520.8729502	67601839.	9.7431188	0.0006516	-0.0017559	2.2525618	-50.5728525	C
0.0000681	4594.3896441	67440582.	9.7371742	0.0006633	-0.0017892	2.2847860	-51.5298836	C
0.0000694	4667.8064182	67283696.	9.7316478	0.0006751	-0.0018224	2.3167493	-52.4865043	C
0.0000706	4741.1227353	67130941.	9.7265187	0.0006869	-0.0018556	2.3484507	-53.4427120	C
0.0000719	4814.3380527	66982095.	9.7217674	0.0006988	-0.0018887	2.3798895	-54.3985041	C
0.0000731	4887.4518218	66836948.	9.7173758	0.0007106	-0.0019219	2.4110647	-55.3538779	C
0.0000744	4960.4634884	66695307.	9.7133269	0.0007224	-0.0019551	2.4419754	-56.3088309	C
0.0000794	5251.4779426	66160352.	9.7002584	0.0007700	-0.0020875	2.5629558	-60.0000000	CY
0.0000844	5540.8126876	65668891.	9.6915805	0.0008177	-0.0022198	2.6796317	-60.0000000	CY
0.0000894	5828.4290489	65213192.	9.6866277	0.0008657	-0.0023518	2.7919421	-60.0000000	CY
0.0000944	6114.2879841	64787157.	9.6848787	0.0009140	-0.0024835	2.8998239	-60.0000000	CY
0.0000994	6398.3463729	64385875.	9.6859205	0.0009625	-0.0026150	3.0032109	-60.0000000	CY
0.0001044	6677.3643604	63974748.	9.6879475	0.0010112	-0.0027463	3.1017252	-60.0000000	CY
0.0001094	6912.6475082	63201349.	9.6732841	0.0010580	-0.0028795	3.1916766	-60.0000000	CY
0.0001144	7094.7332806	62030455.	9.6385991	0.0011024	-0.0030151	3.2724831	-60.0000000	CY
0.0001194	7259.2358967	60810353.	9.6011642	0.0011461	-0.0031514	3.3478794	-60.0000000	CY
0.0001244	7396.4536993	59468974.	9.5561092	0.0011885	-0.0032890	3.4170136	-60.0000000	CY
0.0001294	7513.7594563	58077368.	9.5055656	0.0012298	-0.0034277	3.4805026	-60.0000000	CY
0.0001344	7629.3537833	56776586.	9.4590092	0.0012711	-0.0035664	3.5403761	-60.0000000	CY
0.0001394	7738.2140719	55520818.	9.4141336	0.0013121	-0.0037054	3.5962732	-60.0000000	CY
0.0001444	7824.3241276	54194453.	9.3624597	0.0013517	-0.0038458	3.6467471	-60.0000000	CY
0.0001494	7900.2556840	52888741.	9.3105644	0.0013908	-0.0039867	3.6932064	-60.0000000	CY
0.0001544	7974.9540423	51659621.	9.2628265	0.0014299	-0.0041276	3.7365251	-60.0000000	CY
0.0001594	8048.9456006	50503188.	9.2191363	0.0014693	-0.0042682	3.7767166	-60.0000000	CY
0.0001644	8122.1064963	49412055.	9.1790346	0.0015088	-0.0044087	3.8137239	-60.0000000	CY
0.0001694	8189.5560257	48351622.	9.1374743	0.0015477	-0.0045498	3.8468430	-60.0000000	CY
0.0001744	8245.2742732	47284727.	9.0929644	0.0015856	-0.0046919	3.8760295	-60.0000000	CY
0.0001794	8291.8228455	46226190.	9.0469304	0.0016228	-0.0048347	3.9016564	-60.0000000	CY
0.0001844	8335.4090019	45208998.	9.0028710	0.0016599	-0.0049776	3.9242631	-60.0000000	CY
0.0001894	8378.4413420	44242595.	8.9619873	0.0016972	-0.0051203	3.9440023	-60.0000000	CY
0.0001944	8420.9087278	43323003.	8.9240513	0.0017346	-0.0052629	3.9608358	-60.0000000	CY
0.0001994	8462.7996307	42446644.	8.8888588	0.0017722	-0.0054053	3.9747245	-60.0000000	CY
0.0002044	8504.1021085	41610286.	8.8562260	0.0018100	-0.0055475	3.9856277	-60.0000000	CY
0.0002094	8544.8037803	40811003.	8.8259877	0.0018479	-0.0056896	3.9935035	-60.0000000	CY
0.0002144	8583.8279123	40041180.	8.7958277	0.0018856	-0.0058319	3.9982678	-60.0000000	CY
0.0002194	8620.8054570	39297119.	8.7665487	0.0019232	-0.0059743	3.9999924	-60.0000000	CY
0.0002244	8651.2665046	38557177.	8.7355638	0.0019600	-0.0061175	3.9974751	-60.0000000	CY
0.0002294	8678.2720153	37834428.	8.7046529	0.0019966	-0.0062609	3.9997950	-60.0000000	CY
0.0002344	8701.1445185	37124883.	8.6734921	0.0020328	-0.0064047	3.9953434	-60.0000000	CY
0.0002394	8722.0050448	36436575.	8.6433153	0.0020690	-0.0065485	3.9987968	-60.0000000	CY
0.0002444	8742.1104035	35773342.	8.6147694	0.0021052	-0.0066923	3.9999989	-60.0000000	CY
0.0002494	8761.5816916	35134162.	8.5882542	0.0021417	-0.0068358	3.9961147	60.0000000	CY
0.0002544	8780.6818752	34518651.	8.5633708	0.0021783	-0.0069792	3.9990884	60.0000000	CY
0.0002594	8799.3932722	33925372.	8.5400491	0.0022151	-0.0071224	3.9993755	60.0000000	CY
0.0002644	8817.4978352	33352238.	8.5184470	0.0022521	-0.0072654	3.9956094	60.0000000	CY
0.0002694	8835.2745986	32799163.	8.4981694	0.0022892	-0.0074083	3.9987411	60.0000000	CY
0.0002744	8852.7168676	32265027.	8.4791549	0.0023265	-0.0075510	3.9999793	60.0000000	CY
0.0003044	8946.7306611	29393776.	8.3820269	0.0025513	-0.0084062	3.9974923	60.0000000	CY
0.0003344	9009.0169501	26942854.	8.2990279	0.0027750	-0.0092625	3.9997766	60.0000000	CY
0.0003644	9041.1882233	24812866.	8.2223149	0.0029960	-0.0101215	3.9999690	60.0000000	CY
0.0003944	9065.9440563	22988131.	8.1656524	0.0032203	-0.0109772	3.9997569	60.0000000	CYT
0.0004244	9086.0856220	21410511.	8.1255899	0.0034483	-0.0118292	3.9980064	60.0000000	CYT

0.0004544	9102.3279579	20032634.	8.0979152	0.0036795	-0.0126780	3.9913151	60.0000000 CYT
0.0004844	9102.3279579	18791903.	8.1152385	0.0039308	-0.0135067	3.9876989	60.0000000 CYT

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	39.800	8938.380	0.00300000
2	49.800	9041.629	0.00300000

Note note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318-08, Section
9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Axial Load No.	Resistance Factor for Moment	Nominal Moment Capacity in-kip	Ultimate (Factored) Axial Thrust kips	Ultimate (Factored) Moment Capacity in-kip	Bending Stiffness at Ult. Mom. Cap. kip-in^2
1	0.65	8938.380	25.870	5809.947	64190927.448
2	0.65	9041.629	32.370	5877.059	65140716.232
1	0.70	8938.380	27.860	6256.866	63625515.959
2	0.70	9041.629	34.860	6329.140	64483641.250
1	0.75	8938.380	29.850	6703.785	62790597.914
2	0.75	9041.629	37.350	6781.222	63633358.533

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	3.00000 ft
Shaft Diameter	=	30.00000 in
Concrete Cover Thickness	=	3.00000 in
Number of Reinforcing Bars	=	11 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	706.85835 sq. in.
Total Area of Reinforcing Steel	=	11.00000 sq. in.
Area Ratio of Steel Reinforcement	=	1.56 percent

Edge-to-Edge Bar Spacing = 5.31579 in
Maximum Concrete Aggregate Size = 0.75000 in
Ratio of Bar Spacing to Aggregate Size = 7.09
Offset of Center of Rebar Cage from Center of Pile = 0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 3025.918 kips
Tensile Load for Cracking of Concrete = -326.217 kips
Nominal Axial Tensile Capacity = -660.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.12800	1.00000	11.43600	0.00000
2	1.12800	1.00000	9.62058	6.18277
3	1.12800	1.00000	4.75069	10.40255
4	1.12800	1.00000	-1.62751	11.31960
5	1.12800	1.00000	-7.48899	8.64275
6	1.12800	1.00000	-10.97276	3.22189
7	1.12800	1.00000	-10.97276	-3.22189
8	1.12800	1.00000	-7.48899	-8.64275
9	1.12800	1.00000	-1.62751	-11.31960
10	1.12800	1.00000	4.75069	-10.40255
11	1.12800	1.00000	9.62058	-6.18277

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 5.31579 inches between Bars 8 and 9

Spacing to aggregate size ratio = 7.08772

Concrete Properties:

Compressive Strength of Concrete = 4000.00000 psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.34164 psi
Compression Strain at Peak Stress = 0.00189
Tensile Strain at Fracture of Concrete = -0.0001154
Maximum Coarse Aggregate Size = 0.75000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force kips
1	39.800
2	49.800

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 39.800 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000001250	231.7554811	185404385.	24.7811955	0.0000310	-0.000006524	0.1295157	0.8928808	
0.000002500	462.7188636	185087545.	19.9074213	0.0000498	-0.0000252	0.2067438	1.4324130	
0.000003750	692.3283859	184620903.	18.2837543	0.0000686	-0.0000439	0.2832078	1.9720458	
0.000005000	920.5462020	184109240.	17.4721541	0.0000874	-0.0000626	0.3588979	2.5117124	
0.000006250	1147.3674587	183578793.	16.9853052	0.0001062	-0.0000813	0.4338122	3.0513991	
0.000007500	1372.7909339	183038791.	16.6608109	0.0001250	-0.0001000	0.5079500	3.5911014	
0.000008750	1372.7909339	156890392.	12.0598680	0.0001055	-0.0001570	0.4297692	-4.5142460	C
0.0000100	1372.7909339	137279093.	11.6552625	0.0001166	-0.0001834	0.4730766	-5.2764739	C
0.0000113	1372.7909339	122025861.	11.3312321	0.0001275	-0.0002100	0.5157039	-6.0417480	C
0.0000125	1372.7909339	109823275.	11.0652882	0.0001383	-0.0002367	0.5577415	-6.8094580	C
0.0000138	1372.7909339	99839341.	10.8433622	0.0001491	-0.0002634	0.5992909	-7.5788968	C
0.0000150	1372.7909339	91519396.	10.6561530	0.0001598	-0.0002902	0.6404557	-8.3493234	C
0.0000163	1372.7909339	84479442.	10.4936593	0.0001705	-0.0003170	0.6811132	-9.1216755	C
0.0000175	1372.7909339	78445196.	10.3547066	0.0001812	-0.0003438	0.7215453	-9.8938613	C
0.0000188	1372.7909339	73215516.	10.2311407	0.0001918	-0.0003707	0.7615049	-10.6677547	C
0.0000200	1372.7909339	68639547.	10.1233223	0.0002025	-0.0003975	0.8012423	-11.4414730	C
0.0000213	1372.7909339	64601926.	10.0279087	0.0002131	-0.0004244	0.8407121	-12.2153637	C
0.0000225	1372.7909339	61012930.	9.9413994	0.0002237	-0.0004513	0.8797937	-12.9903618	C
0.0000238	1372.7909339	57801724.	9.8643649	0.0002343	-0.0004782	0.9186648	-13.7651061	C
0.0000250	1407.5725718	56302903.	9.7953853	0.0002449	-0.0005051	0.9573247	-14.5395956	C
0.0000263	1464.0931556	55774977.	9.7327602	0.0002555	-0.0005320	0.9957197	-15.3142487	C
0.0000275	1520.5057474	55291118.	9.6747939	0.0002661	-0.0005589	1.0337671	-16.0897268	C
0.0000288	1576.8629929	54847408.	9.6221813	0.0002766	-0.0005859	1.0716047	-16.8649438	C
0.0000300	1633.1646814	54438823.	9.5742543	0.0002872	-0.0006128	1.1092321	-17.6398987	C
0.0000313	1689.4106005	54061139.	9.5304519	0.0002978	-0.0006397	1.1466486	-18.4145904	C
0.0000325	1745.6005364	53710786.	9.4902994	0.0003084	-0.0006666	1.1838538	-19.1890177	C
0.0000338	1801.7342735	53384719.	9.4533924	0.0003191	-0.0006934	1.2208472	-19.9631796	C
0.0000350	1857.7745864	53079274.	9.4183408	0.0003296	-0.0007204	1.2575001	-20.7381340	C
0.0000363	1913.7552106	52793247.	9.3858585	0.0003402	-0.0007473	1.2939289	-21.5129286	C
0.0000375	1969.6799029	52524797.	9.3557935	0.0003508	-0.0007742	1.3301468	-22.2874495	C
0.0000388	2025.5484425	52272218.	9.3279130	0.0003615	-0.0008010	1.3661534	-23.0616951	C
0.0000400	2081.3606053	52034015.	9.3020133	0.0003721	-0.0008279	1.4019481	-23.8356645	C
0.0000413	2137.1161655	51808877.	9.2779154	0.0003827	-0.0008548	1.4375304	-24.6093561	C
0.0000425	2192.8148956	51595645.	9.2554612	0.0003934	-0.0008816	1.4728998	-25.3827689	C
0.0000438	2248.4565663	51393293.	9.2345111	0.0004040	-0.0009085	1.5080558	-26.1559015	C
0.0000450	2304.0409465	51200910.	9.2149405	0.0004147	-0.0009353	1.5429977	-26.9287526	C
0.0000463	2359.5678035	51017682.	9.1966386	0.0004253	-0.0009622	1.5777251	-27.7013209	C
0.0000475	2415.0369025	50842882.	9.1795062	0.0004360	-0.0009890	1.6122375	-28.4736051	C
0.0000488	2470.4480072	50675857.	9.1634543	0.0004467	-0.0010158	1.6465342	-29.2456038	C
0.0000513	2581.0789175	50362515.	9.1337347	0.0004681	-0.0010694	1.7143892	-30.7895492	C

0.0000538	2691.4636956	50073743.	9.1071202	0.0004895	-0.0011230	1.7813094	-32.3329637	C
0.0000563	2801.6140220	49806472.	9.0836067	0.0005110	-0.0011765	1.8473640	-33.8751789	C
0.0000588	2911.5278721	49557921.	9.0628052	0.0005324	-0.0012301	1.9125484	-35.4161830	C
0.0000613	3021.2031862	49325766.	9.0443905	0.0005540	-0.0012835	1.9768578	-36.9559636	C
0.0000638	3130.6378701	49108045.	9.0280887	0.0005755	-0.0013370	2.0402876	-38.4945084	C
0.0000663	3239.8297936	48903091.	9.0136669	0.0005972	-0.0013903	2.1028329	-40.0318047	C
0.0000688	3348.7767898	48709481.	9.0009268	0.0006188	-0.0014437	2.1644889	-41.5678396	C
0.0000713	3457.4766544	48525988.	8.9896975	0.0006405	-0.0014970	2.2252505	-43.1025999	C
0.0000738	3565.9271443	48351554.	8.9798317	0.0006623	-0.0015502	2.2851127	-44.6360722	C
0.0000763	3674.1259771	48185259.	8.9712015	0.0006841	-0.0016034	2.3440705	-46.1682430	C
0.0000788	3782.0703999	48026291.	8.9636953	0.0007059	-0.0016566	2.4021183	-47.6991003	C
0.0000813	3889.7589962	47873957.	8.9572154	0.0007278	-0.0017097	2.4592515	-49.2286253	C
0.0000838	3997.1888259	47727628.	8.9516758	0.0007497	-0.0017628	2.5154643	-50.7568061	C
0.0000863	4104.3574382	47586753.	8.9470006	0.0007717	-0.0018158	2.5707513	-52.2836279	C
0.0000888	4211.2623367	47450843.	8.9431228	0.0007937	-0.0018688	2.6251071	-53.8090758	C
0.0000913	4317.9009786	47319463.	8.9399825	0.0008158	-0.0019217	2.6785259	-55.3331342	C
0.0000938	4424.2707729	47192222.	8.9375265	0.0008379	-0.0019746	2.7310020	-56.8557874	C
0.0000963	4530.3690792	47068770.	8.9357073	0.0008601	-0.0020274	2.7825296	-58.3770195	C
0.0000988	4636.1932066	46948792.	8.9344821	0.0008823	-0.0020802	2.8331029	-59.8968142	C
0.0001013	4741.7404119	46832004.	8.9338127	0.0009045	-0.0021330	2.8827158	-60.0000000	CY
0.0001038	4847.0078982	46718148.	8.9336647	0.0009269	-0.0021856	2.9313622	-60.0000000	CY
0.0001063	4951.9928136	46606991.	8.9340067	0.0009492	-0.0022383	2.9790358	-60.0000000	CY
0.0001088	5056.6922490	46498320.	8.9348107	0.0009717	-0.0022908	3.0257304	-60.0000000	CY
0.0001113	5161.1032372	46391939.	8.9360511	0.0009941	-0.0023434	3.0714395	-60.0000000	CY
0.0001138	5265.2227504	46287673.	8.9377049	0.0010167	-0.0023958	3.1161565	-60.0000000	CY
0.0001163	5368.3272601	46179159.	8.9393611	0.0010392	-0.0024483	3.1597866	-60.0000000	CY
0.0001188	5465.9525896	46029074.	8.9386116	0.0010615	-0.0025010	3.2017870	-60.0000000	CY
0.0001213	5554.7859356	45812668.	8.9337406	0.0010832	-0.0025543	3.2417810	-60.0000000	CY
0.0001238	5634.5991463	45532114.	8.9247217	0.0011044	-0.0026081	3.2797802	-60.0000000	CY
0.0001263	5705.5515688	45192488.	8.9117254	0.0011251	-0.0026624	3.3158429	-60.0000000	CY
0.0001288	5768.8979958	44806975.	8.8955157	0.0011453	-0.0027172	3.3501613	-60.0000000	CY
0.0001313	5827.9440308	44403383.	8.8779771	0.0011652	-0.0027723	3.3831713	-60.0000000	CY
0.0001338	5886.5336670	44011467.	8.8612292	0.0011852	-0.0028273	3.4153501	-60.0000000	CY
0.0001363	5943.9646594	43625429.	8.8446209	0.0012051	-0.0028824	3.4465649	-60.0000000	CY
0.0001388	5997.5223228	43225386.	8.8263067	0.0012247	-0.0029378	3.4764329	-60.0000000	CY
0.0001413	6045.3137431	42798681.	8.8056507	0.0012438	-0.0029937	3.5048424	-60.0000000	CY
0.0001438	6087.8617869	42350343.	8.7829919	0.0012626	-0.0030499	3.5318921	-60.0000000	CY
0.0001463	6127.2361793	41895632.	8.7595672	0.0012811	-0.0031064	3.5578643	-60.0000000	CY
0.0001488	6166.4235259	41454948.	8.7371190	0.0012996	-0.0031629	3.5831339	-60.0000000	CY
0.0001588	6321.6139611	39821190.	8.6563710	0.0013742	-0.0033883	3.6771548	-60.0000000	CY
0.0001688	6450.9843649	38228055.	8.5744152	0.0014469	-0.0036156	3.7572801	-60.0000000	CY
0.0001788	6546.4390697	36623435.	8.4829839	0.0015163	-0.0038462	3.8230356	-60.0000000	CY
0.0001888	6639.5957487	35176666.	8.4023803	0.0015859	-0.0040766	3.8785836	-60.0000000	CY
0.0001988	6731.1868986	33867607.	8.3324035	0.0016561	-0.0043064	3.9239920	-60.0000000	CY
0.0002088	6811.2258396	32628627.	8.2650209	0.0017253	-0.0045372	3.9584443	-60.0000000	CY
0.0002188	6867.9715374	31396441.	8.1886608	0.0017913	-0.0047712	3.9816342	-60.0000000	CY
0.0002288	6916.9886739	30238202.	8.1158119	0.0018565	-0.0050060	3.9953820	-60.0000000	CY
0.0002388	6964.7986221	29171931.	8.0510038	0.0019222	-0.0052403	3.9999706	-60.0000000	CY
0.0002488	7011.3249451	28186231.	7.9935226	0.0019884	-0.0054741	3.9998916	-60.0000000	CY
0.0002588	7056.4512776	27271309.	7.9420863	0.0020550	-0.0057075	3.9992793	-60.0000000	CY
0.0002688	7099.8804312	26418160.	7.8938354	0.0021215	-0.0059410	3.9975176	60.0000000	CY
0.0002788	7139.9575393	25614197.	7.8490233	0.0021879	-0.0061746	3.9971918	60.0000000	CY
0.0002888	7173.0897059	24841869.	7.8041984	0.0022535	-0.0064090	3.9994247	60.0000000	CY
0.0002988	7198.7975092	24096393.	7.7583214	0.0023178	-0.0066447	3.9957604	60.0000000	CY
0.0003088	7219.3551795	23382527.	7.7128554	0.0023813	-0.0068812	3.9997680	60.0000000	CY
0.0003188	7237.5531264	22706049.	7.6700941	0.0024448	-0.0071177	3.9955393	60.0000000	CY
0.0003288	7254.9722691	22068357.	7.6293836	0.0025082	-0.0073543	3.9995867	60.0000000	CY
0.0003388	7271.5803745	21465920.	7.5906441	0.0025713	-0.0075912	3.9933124	60.0000000	CY
0.0003488	7287.7516134	20896779.	7.5550850	0.0026348	-0.0078277	3.9985331	60.0000000	CY
0.0003588	7303.5708575	20358386.	7.5223150	0.0026986	-0.0080639	3.9983784	60.0000000	CY

0.0003688	7318.8814721	19847814.	7.4923758	0.0027628	-0.0082997	3.9954282	60.0000000	CY
0.0003788	7333.9275875	19363505.	7.4646498	0.0028272	-0.0085353	3.9993059	60.0000000	CY
0.0003888	7348.6181148	18903198.	7.4391272	0.0028920	-0.0087705	3.9954924	60.0000000	CY
0.0003988	7362.9282353	18465024.	7.4156891	0.0029570	-0.0090055	3.9951470	60.0000000	CY
0.0004088	7377.0199744	18047755.	7.3939208	0.0030223	-0.0092402	3.9990582	60.0000000	CYT
0.0004188	7390.7214383	17649484.	7.3736677	0.0030877	-0.0094748	3.9974871	60.0000000	CYT
0.0004288	7404.0519305	17268926.	7.3551128	0.0031535	-0.0097090	3.9921938	60.0000000	CYT
0.0004388	7415.3193534	16901013.	7.3344624	0.0032180	-0.0099445	3.9971513	60.0000000	CYT
0.0004488	7425.8401746	16547833.	7.3139973	0.0032822	-0.0101803	3.9996487	60.0000000	CYT
0.0004588	7435.0316166	16207153.	7.2935777	0.0033459	-0.0104166	3.9954240	60.0000000	CYT
0.0004688	7442.2467246	15876793.	7.2723043	0.0034089	-0.0106536	3.9899464	60.0000000	CYT
0.0004788	7449.3757584	15560054.	7.2521989	0.0034720	-0.0108905	3.9951076	60.0000000	CYT
0.0004888	7454.4779387	15252129.	7.2306694	0.0035340	-0.0111285	3.9983363	60.0000000	CYT
0.0004988	7458.9673669	14955323.	7.2095665	0.0035958	-0.0113667	3.9998593	60.0000000	CYT
0.0005088	7463.3125393	14669902.	7.1897193	0.0036578	-0.0116047	3.9948860	60.0000000	CYT
0.0005188	7466.6530795	14393548.	7.1703047	0.0037196	-0.0118429	3.9863187	60.0000000	CYT
0.0005288	7469.7646557	14127214.	7.1520274	0.0037816	-0.0120809	3.9914027	60.0000000	CYT
0.0005388	7472.8268663	13870676.	7.1346160	0.0038438	-0.0123187	3.9955650	60.0000000	CYT

Axial Thrust Force = 49.800 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000001250	231.4390924	185151274.	27.2441094	0.0000341	-0.000003445	0.1423490	0.9821615	
0.000002500	462.3237690	184929508.	21.1418537	0.0000529	-0.0000221	0.2194789	1.5219094	
0.000003750	691.9147356	184510596.	19.1094580	0.0000717	-0.0000408	0.2958559	2.0618411	
0.000005000	920.1238339	184024767.	18.0936632	0.0000905	-0.0000595	0.3714616	2.6018312	
0.000006250	1146.9392050	183510273.	17.4843611	0.0001093	-0.0000782	0.4462920	3.1418530	
0.000007500	1372.3579100	182981055.	17.0782646	0.0001281	-0.0000969	0.5203459	3.6818976	
0.000008750	1372.3579100	156840904.	12.8497942	0.0001124	-0.0001501	0.4574103	-4.3138022	C
0.0000100	1372.3579100	137235791.	12.3741670	0.0001237	-0.0001763	0.5016487	-5.0679916	C
0.0000113	1372.3579100	121987370.	11.9907214	0.0001349	-0.0002026	0.5450099	-5.8265896	C
0.0000125	1372.3579100	109788633.	11.6754450	0.0001459	-0.0002291	0.5876836	-6.5882762	C
0.0000138	1372.3579100	99807848.	11.4113816	0.0001569	-0.0002556	0.6297650	-7.3523990	C
0.0000150	1372.3579100	91490527.	11.1873097	0.0001678	-0.0002822	0.6713521	-8.1182703	C
0.0000163	1372.3579100	84452794.	10.9943357	0.0001787	-0.0003088	0.7124701	-8.8857317	C
0.0000175	1372.3579100	78420452.	10.8258321	0.0001895	-0.0003355	0.7531255	-9.6547652	C
0.0000188	1372.3579100	73192422.	10.6791140	0.0002002	-0.0003623	0.7934795	-10.4241692	C
0.0000200	1372.3579100	68617896.	10.5481451	0.0002110	-0.0003890	0.8333855	-11.1950758	C
0.0000213	1372.3579100	64581549.	10.4322083	0.0002217	-0.0004158	0.8730118	-11.9662141	C
0.0000225	1372.3579100	60993685.	10.3288977	0.0002324	-0.0004426	0.9123671	-12.7375192	C
0.0000238	1415.8691549	59615543.	10.2345239	0.0002431	-0.0004694	0.9513027	-13.5101591	C
0.0000250	1472.5017193	58900069.	10.1499392	0.0002537	-0.0004963	0.9900236	-14.2825440	C
0.0000263	1529.0765599	58250536.	10.0737465	0.0002644	-0.0005231	1.0285294	-15.0546729	C
0.0000275	1585.5245685	57655439.	10.0033391	0.0002751	-0.0005499	1.0666733	-15.8277120	C
0.0000288	1641.8810908	57108908.	9.9386648	0.0002857	-0.0005768	1.1045303	-16.6010756	C
0.0000300	1698.1805977	56606020.	9.8796800	0.0002964	-0.0006036	1.1421738	-17.3741783	C
0.0000313	1754.4228748	56141532.	9.8257030	0.0003071	-0.0006304	1.1796031	-18.1470190	C
0.0000325	1810.6077040	55711006.	9.7761573	0.0003177	-0.0006573	1.2168178	-18.9195967	C
0.0000338	1866.7057163	55309799.	9.7299013	0.0003284	-0.0006841	1.2537403	-19.6925465	C
0.0000350	1922.7090340	54934544.	9.6864034	0.0003390	-0.0007110	1.2903495	-20.4660505	C
0.0000363	1978.6553945	54583597.	9.6461621	0.0003497	-0.0007378	1.3267453	-21.2392845	C
0.0000375	2034.5445757	54254522.	9.6088529	0.0003603	-0.0007647	1.3629272	-22.0122473	C
0.0000388	2090.3763530	53945196.	9.5741931	0.0003710	-0.0007915	1.3988947	-22.7849379	C
0.0000400	2146.1505003	53653763.	9.5419352	0.0003817	-0.0008183	1.4346473	-23.5573550	C
0.0000413	2201.8667897	53378589.	9.5118621	0.0003924	-0.0008451	1.4701844	-24.3294974	C
0.0000425	2257.5249918	53118235.	9.4837818	0.0004031	-0.0008719	1.5055055	-25.1013638	C

0.0000438	2313.1248753	52871426.	9.4575245	0.0004138	-0.0008987	1.5406101	-25.8729531	C
0.0000450	2368.6416855	52636482.	9.4323485	0.0004245	-0.0009255	1.5754098	-26.6450351	C
0.0000463	2424.0900078	52412757.	9.4085000	0.0004351	-0.0009524	1.6099565	-27.4171618	C
0.0000475	2479.4802032	52199583.	9.3861147	0.0004458	-0.0009792	1.6442875	-28.1890019	C
0.0000488	2534.8120330	51996144.	9.3650810	0.0004565	-0.0010060	1.6784022	-28.9605540	C
0.0000513	2645.2996272	51615602.	9.3266768	0.0004780	-0.0010595	1.7459806	-30.5027890	C
0.0000538	2755.5508345	51266062.	9.2925946	0.0004995	-0.0011130	1.8126872	-32.0438555	C
0.0000563	2865.5636676	50943354.	9.2622651	0.0005210	-0.0011665	1.8785175	-33.5837424	C
0.0000588	2975.3361071	50644019.	9.2352159	0.0005426	-0.0012199	1.9434669	-35.1224382	C
0.0000613	3084.8661006	50365161.	9.2110520	0.0005642	-0.0012733	2.0075307	-36.6599313	C
0.0000638	3194.1515620	50104338.	9.1894402	0.0005858	-0.0013267	2.0707042	-38.1962097	C
0.0000663	3303.1903706	49859477.	9.1700981	0.0006075	-0.0013800	2.1329825	-39.7312614	C
0.0000688	3411.9803702	49628805.	9.1527841	0.0006293	-0.0014332	2.1943609	-41.2650740	C
0.0000713	3520.5056379	49410605.	9.1368365	0.0006510	-0.0014865	2.2547436	-42.7985739	C
0.0000738	3628.7766336	49203751.	9.1224859	0.0006728	-0.0015397	2.3142042	-44.3309705	C
0.0000763	3736.7940502	49007135.	9.1096711	0.0006946	-0.0015929	2.3727570	-45.8620520	C
0.0000788	3844.5555276	48819753.	9.0982519	0.0007165	-0.0016460	2.4303966	-47.3918044	C
0.0000813	3952.0586619	48640722.	9.0881057	0.0007384	-0.0016991	2.4871177	-48.9202131	C
0.0000838	4059.3010051	48469266.	9.0791246	0.0007604	-0.0017521	2.5429149	-50.4472634	C
0.0000863	4166.2800639	48304696.	9.0712132	0.0007824	-0.0018051	2.5977827	-51.9729401	C
0.0000888	4272.9928413	48146398.	9.0642872	0.0008045	-0.0018580	2.6517152	-53.4972304	C
0.0000913	4379.4377585	47993838.	9.0582715	0.0008266	-0.0019109	2.7047073	-55.0201132	C
0.0000938	4485.6116147	47846524.	9.0530991	0.0008487	-0.0019638	2.7567528	-56.5415756	C
0.0000963	4591.5117239	47704018.	9.0487102	0.0008709	-0.0020166	2.8078459	-58.0616011	C
0.0000988	4697.1353479	47565928.	9.0450511	0.0008932	-0.0020693	2.8579805	-59.5801731	C
0.0001013	4802.4796949	47431898.	9.0420735	0.0009155	-0.0021220	2.9071506	-60.0000000	CY
0.0001038	4907.5419180	47301609.	9.0397341	0.0009379	-0.0021746	2.9553500	-60.0000000	CY
0.0001063	5012.3191135	47174768.	9.0379934	0.0009603	-0.0022272	3.0025724	-60.0000000	CY
0.0001088	5116.8083191	47051111.	9.0368161	0.0009828	-0.0022797	3.0488113	-60.0000000	CY
0.0001113	5221.0065125	46930396.	9.0361698	0.0010053	-0.0023322	3.0940602	-60.0000000	CY
0.0001138	5324.9106092	46812401.	9.0360253	0.0010278	-0.0023847	3.1383125	-60.0000000	CY
0.0001163	5428.4146978	46696040.	9.0363000	0.0010505	-0.0024370	3.1815488	-60.0000000	CY
0.0001188	5527.5913128	46548137.	9.0348540	0.0010729	-0.0024896	3.2232931	-60.0000000	CY
0.0001213	5618.1638032	46335372.	9.0294219	0.0010948	-0.0025427	3.2630518	-60.0000000	CY
0.0001238	5699.8999819	46059798.	9.0199703	0.0011162	-0.0025963	3.3008366	-60.0000000	CY
0.0001263	5773.4509849	45730305.	9.0069430	0.0011371	-0.0026504	3.3367659	-60.0000000	CY
0.0001288	5838.9418873	45351005.	8.9904753	0.0011575	-0.0027050	3.3708932	-60.0000000	CY
0.0001313	5898.1224820	44938076.	8.9715927	0.0011775	-0.0027600	3.4034653	-60.0000000	CY
0.0001338	5956.5549000	44534990.	8.9533963	0.0011975	-0.0028150	3.4351675	-60.0000000	CY
0.0001363	6014.5821323	44143722.	8.9360285	0.0012175	-0.0028700	3.4660381	-60.0000000	CY
0.0001388	6069.8813546	43746893.	8.9181492	0.0012374	-0.0029251	3.4958036	-60.0000000	CY
0.0001413	6119.5993150	43324597.	8.8981515	0.0012569	-0.0029806	3.5241472	-60.0000000	CY
0.0001438	6163.2601749	42874853.	8.8757893	0.0012759	-0.0030366	3.5510461	-60.0000000	CY
0.0001463	6202.9553020	42413370.	8.8522685	0.0012946	-0.0030929	3.5767745	-60.0000000	CY
0.0001488	6242.0361143	41963268.	8.8286423	0.0013133	-0.0031492	3.6015654	-60.0000000	CY
0.0001588	6396.9753031	40295907.	8.7433584	0.0013880	-0.0033745	3.6935793	-60.0000000	CY
0.0001688	6529.7887116	38695044.	8.6595876	0.0014613	-0.0036012	3.7720638	-60.0000000	CY
0.0001788	6626.8129798	37073080.	8.5683543	0.0015316	-0.0038309	3.8363868	-60.0000000	CY
0.0001888	6719.6395769	35600739.	8.4850462	0.0016016	-0.0040609	3.8898393	-60.0000000	CY
0.0001988	6810.7666409	34268008.	8.4118691	0.0016719	-0.0042906	3.9329452	-60.0000000	CY
0.0002088	6892.4498126	33017724.	8.3429988	0.0017416	-0.0045209	3.9651831	-60.0000000	CY
0.0002188	6952.5842225	31783242.	8.2694620	0.0018089	-0.0047536	3.9863626	-60.0000000	CY
0.0002288	7001.4442842	30607407.	8.1951145	0.0018746	-0.0049879	3.9976262	-60.0000000	CY
0.0002388	7048.7244124	29523453.	8.1278916	0.0019405	-0.0052220	3.9968213	-60.0000000	CY
0.0002488	7094.7286872	28521522.	8.0682060	0.0020070	-0.0054555	3.9972542	-60.0000000	CY
0.0002588	7139.4286382	27591995.	8.0152469	0.0020739	-0.0056886	3.9999541	-60.0000000	CY
0.0002688	7182.8258788	26726794.	7.9682978	0.0021415	-0.0059210	3.9991818	60.0000000	CY
0.0002788	7223.4817866	25913836.	7.9238417	0.0022088	-0.0061537	3.9967445	60.0000000	CY
0.0002888	7257.9015344	25135590.	7.8786780	0.0022750	-0.0063875	3.9999986	60.0000000	CY
0.0002988	7284.8350212	24384385.	7.8327051	0.0023400	-0.0066225	3.9982736	60.0000000	CY

0.0003088	7305.9560485	23663016.	7.7864224	0.0024041	-0.0068584	3.9973822	60.0000000	CY
0.0003188	7323.7688392	22976530.	7.7420874	0.0024678	-0.0070947	3.9981974	60.0000000	CY
0.0003288	7341.1418494	22330470.	7.7014109	0.0025318	-0.0073307	3.9985874	60.0000000	CY
0.0003388	7357.8909541	21720711.	7.6643585	0.0025963	-0.0075662	3.9969417	60.0000000	CY
0.0003488	7373.9998677	21144086.	7.6285097	0.0026604	-0.0078021	3.9998757	60.0000000	CY
0.0003588	7389.4016245	20597635.	7.5945815	0.0027246	-0.0080379	3.9934161	60.0000000	CY
0.0003688	7404.4719819	20079924.	7.5632611	0.0027890	-0.0082735	3.9984080	60.0000000	CY
0.0003788	7419.2624404	19588812.	7.5342639	0.0028536	-0.0085089	3.9995237	60.0000000	CY
0.0003888	7433.5761288	19121739.	7.5077583	0.0029186	-0.0087439	3.9935802	60.0000000	CY
0.0003988	7447.6715753	18677546.	7.4831229	0.0029839	-0.0089786	3.9983064	60.0000000	CY
0.0004088	7461.5434931	18254541.	7.4602330	0.0030494	-0.0092131	3.9999962	60.0000000	CYT
0.0004188	7474.9340960	17850589.	7.4392454	0.0031152	-0.0094473	3.9908635	60.0000000	CYT
0.0004288	7488.0773035	17464903.	7.4196284	0.0031812	-0.0096813	3.9965162	60.0000000	CYT
0.0004388	7500.4632077	17095073.	7.4006730	0.0032470	-0.0099155	3.9994905	60.0000000	CYT
0.0004488	7510.9865212	16737574.	7.3812697	0.0033123	-0.0101502	3.9960774	60.0000000	CYT
0.0004588	7521.2595666	16395116.	7.3632846	0.0033779	-0.0103846	3.9906798	60.0000000	CYT
0.0004688	7529.1168649	16062116.	7.3430981	0.0034421	-0.0106204	3.9957643	60.0000000	CYT
0.0004788	7536.1084342	15741219.	7.3219395	0.0035054	-0.0108571	3.9988067	60.0000000	CYT
0.0004888	7542.6656208	15432564.	7.3014766	0.0035686	-0.0110939	3.9999832	60.0000000	CYT
0.0004988	7546.9253990	15131680.	7.2795982	0.0036307	-0.0113318	3.9925566	60.0000000	CYT
0.0005088	7550.9123391	14842088.	7.2592875	0.0036932	-0.0115693	3.9885498	60.0000000	CYT
0.0005188	7554.5813660	14563048.	7.2399171	0.0037557	-0.0118068	3.9935276	60.0000000	CYT
0.0005288	7557.5906687	14293316.	7.2206440	0.0038179	-0.0120446	3.9970566	60.0000000	CYT

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 2

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	39.800	7372.212	0.00300000
2	49.800	7451.084	0.00300000

Note note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318-08, Section
9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Axial Load No.	Resistance Factor for Moment	Nominal Moment Capacity in-kip	Ultimate (Factored) Axial Thrust kips	Ultimate (Factored) Moment Capacity in-kip	Bending Stiffness at Ult. Mom. Cap. kip-in^2
1	0.65	7372.212	25.870	4791.938	46777711.449
2	0.65	7451.084	32.370	4843.204	47381395.126
1	0.70	7372.212	27.860	5160.548	46392504.495

2	0.70	7451.084	34.860	5215.758	46936475.589
1	0.75	7372.212	29.850	5529.159	45875097.016
2	0.75	7451.084	37.350	5588.313	46405495.402

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 9000.0 lbs
Applied moment at pile head = 2518800.0 in-lbs
Axial thrust load on pile head = 39800.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.1873	2518800.	9000.0000	-0.003694	0.000	1.546E+11	0.000	0.000	0.000
0.09900	0.1829	2529666.	8990.4290	-0.003675	0.000	1.546E+11	-16.1126	104.6635	0.000
0.198	0.1785	2540509.	8961.5496	-0.003650	0.000	1.034E+11	-32.5062	216.3021	0.000
0.297	0.1742	2551304.	8913.0542	-0.003618	0.000	8.476E+10	-49.1359	335.0653	0.000
0.396	0.1699	2562028.	8844.6886	-0.003579	0.000	7.205E+10	-65.9577	461.0953	0.000
0.495	0.1657	2572657.	8756.2503	-0.003537	0.000	7.191E+10	-82.9283	594.5197	0.000
0.594	0.1615	2583168.	8647.5882	-0.003494	0.000	7.185E+10	-100.0044	735.4743	0.000
0.693	0.1574	2593535.	8518.6026	-0.003451	0.000	7.180E+10	-117.1430	884.0973	0.000
0.792	0.1533	2603734.	8369.2446	-0.003408	0.000	7.175E+10	-134.3015	1040.5281	0.000
0.891	0.1493	2613742.	8199.5157	-0.003365	0.000	7.170E+10	-151.4375	1204.9076	0.000
0.990	0.1453	2623534.	8009.4672	-0.003321	0.000	7.165E+10	-168.5094	1377.3775	0.000
1.089	0.1414	2633087.	7799.2002	-0.003278	0.000	7.161E+10	-185.4755	1558.0805	0.000
1.188	0.1376	2642375.	7568.8647	-0.003234	0.000	7.156E+10	-202.2948	1747.1596	0.000
1.287	0.1337	2651376.	7318.6590	-0.003190	0.000	7.152E+10	-218.9268	1944.7580	0.000
1.386	0.1300	2660066.	7048.8296	-0.003146	0.000	7.148E+10	-235.3314	2151.0185	0.000
1.485	0.1263	2668422.	6759.6702	-0.003102	0.000	7.144E+10	-251.4690	2366.0832	0.000
1.584	0.1226	2676420.	6451.1288	-0.003057	0.000	7.140E+10	-267.9609	2596.4906	0.000
1.683	0.1190	2684039.	6123.0553	-0.003013	0.000	7.136E+10	-284.3513	2838.7959	0.000
1.782	0.1154	2691254.	5775.6530	-0.002968	0.000	7.133E+10	-300.5010	3092.3423	0.000
1.881	0.1119	2698042.	5409.2262	-0.002923	0.000	7.130E+10	-316.3791	3357.5080	0.000
1.980	0.1085	2704382.	5024.1155	-0.002878	0.000	7.127E+10	-331.9555	3634.6900	0.000
2.079	0.1051	2710252.	4620.6969	-0.002833	0.000	7.124E+10	-347.2004	3924.3067	0.000
2.178	0.1018	2715629.	4201.1679	-0.002788	0.000	7.122E+10	-359.0773	4191.6917	0.000
2.277	0.0985	2720497.	3772.0863	-0.002742	0.000	7.119E+10	-363.2823	4382.2231	0.000
2.376	0.0953	2724851.	3338.5118	-0.002697	0.000	7.118E+10	-366.6412	4572.7546	0.000
2.475	0.0921	2728685.	2901.4338	-0.002651	0.000	7.116E+10	-369.1804	4763.2860	0.000
2.574	0.0890	2731995.	2461.8104	-0.002606	0.000	7.114E+10	-370.9263	4953.8174	0.000
2.673	0.0859	2734780.	2020.5684	-0.002560	0.000	7.113E+10	-371.9053	5144.3489	0.000
2.772	0.0829	2737038.	1578.6033	-0.002514	0.000	7.112E+10	-372.1437	5334.8803	0.000
2.871	0.0799	2738769.	1136.7793	-0.002469	0.000	7.111E+10	-371.6678	5525.4118	0.000
2.970	0.0770	2739973.	695.9292	-0.002423	0.000	7.111E+10	-370.5041	5715.9432	0.000
3.069	0.0742	2740652.	256.8546	-0.002377	0.000	7.110E+10	-368.6787	5906.4746	0.000
3.168	0.0714	2740808.	-179.6740	-0.002331	0.000	7.110E+10	-366.2180	6097.0061	0.000
3.267	0.0686	2740445.	-612.9175	-0.002286	0.000	7.110E+10	-363.1481	6287.5375	0.000
3.366	0.0659	2739568.	-1042.1676	-0.002240	0.000	7.111E+10	-359.4952	6478.0690	0.000
3.465	0.0633	2738181.	-1466.7473	-0.002194	0.000	7.111E+10	-355.2853	6668.6004	0.000
3.564	0.0607	2736290.	-1886.0101	-0.002148	0.000	7.112E+10	-350.5444	6859.1318	0.000

3.663	0.0582	2733903.	-2299.3407	-0.002103	0.000	7.113E+10	-345.2984	7049.6633	0.000
3.762	0.0557	2731026.	-2706.1543	-0.002057	0.000	7.115E+10	-339.5730	7240.1947	0.000
3.861	0.0533	2727667.	-3105.8966	-0.002011	0.000	7.116E+10	-333.3940	7430.7262	0.000
3.960	0.0509	2723836.	-3498.0441	-0.001966	0.000	7.118E+10	-326.7869	7621.2576	0.000
4.059	0.0486	2719542.	-3805.0863	-0.001920	0.000	7.120E+10	-190.1193	4644.3974	0.000
4.158	0.0464	2714977.	-4028.3307	-0.001875	0.000	7.122E+10	-185.7129	4757.3049	0.000
4.257	0.0442	2710148.	-4246.2167	-0.001830	0.000	7.124E+10	-181.0986	4870.2124	0.000
4.356	0.0420	2705061.	-4458.5062	-0.001785	0.000	7.127E+10	-176.2911	4983.1199	0.000
4.455	0.0399	2699723.	-4664.9785	-0.001740	0.000	7.129E+10	-171.3053	5096.0275	0.000
4.554	0.0379	2694142.	-4865.4305	-0.001695	0.000	7.132E+10	-166.1560	5208.9350	0.000
4.653	0.0359	2688323.	-5059.6766	-0.001650	0.000	7.134E+10	-160.8577	5321.8425	0.000
4.752	0.0340	2682276.	-5247.5485	-0.001605	0.000	7.137E+10	-155.4250	5434.7500	0.000
4.851	0.0321	2676007.	-5428.8953	-0.001561	0.000	7.140E+10	-149.8726	5547.6575	0.000
4.950	0.0303	2669524.	-5603.5832	-0.001516	0.000	7.143E+10	-144.2147	5660.5651	0.000
5.049	0.0285	2662836.	-5771.4953	-0.001472	0.000	7.146E+10	-138.4657	5773.4726	0.000
5.148	0.0268	2655950.	-5932.5321	-0.001428	0.000	7.150E+10	-132.6400	5886.3801	0.000
5.247	0.0251	2648876.	-6086.6108	-0.001384	0.000	7.153E+10	-126.7517	5999.2876	0.000
5.346	0.0235	2641620.	-6233.6653	-0.001340	0.000	7.156E+10	-120.8148	6112.1951	0.000
5.445	0.0219	2634191.	-6373.6463	-0.001296	0.000	7.160E+10	-114.8435	6225.1027	0.000
5.544	0.0204	2626598.	-6506.5211	-0.001252	0.000	7.164E+10	-108.8516	6338.0102	0.000
5.643	0.0189	2618850.	-6632.2737	-0.001209	0.000	7.168E+10	-102.8530	6450.9177	0.000
5.742	0.0175	2610954.	-6750.9040	-0.001165	0.000	7.171E+10	-96.8614	6563.8252	0.000
5.841	0.0162	2602920.	-6862.4287	-0.001122	0.000	7.175E+10	-90.8906	6676.7327	0.000
5.940	0.0149	2594755.	-6966.8805	-0.001079	0.000	7.180E+10	-84.9541	6789.6403	0.000
6.039	0.0136	2586469.	-7064.3081	-0.001036	0.000	7.184E+10	-79.0654	6902.5478	0.000
6.138	0.0124	2578069.	-7154.7763	-0.000994	0.000	7.188E+10	-73.2379	7015.4553	0.000
6.237	0.0112	2569563.	-7238.3656	-0.000951	0.000	7.192E+10	-67.4849	7128.3628	0.000
6.336	0.0101	2560960.	-7315.1726	-0.000909	0.000	7.197E+10	-61.8197	7241.2703	0.000
6.435	0.009088	2552268.	-7385.3093	-0.000867	0.000	7.201E+10	-56.2554	7354.1779	0.000
6.534	0.008083	2543495.	-7448.9032	-0.000825	0.000	7.206E+10	-50.8051	7467.0854	0.000
6.633	0.007128	2534647.	-7506.0975	-0.000783	0.000	7.210E+10	-45.4816	7579.9929	0.000
6.732	0.006223	2525734.	-7557.0505	-0.000741	0.000	7.215E+10	-40.2980	7692.9004	0.000
6.831	0.005367	2516762.	-7601.9360	-0.000700	0.000	7.220E+10	-35.2669	7805.8079	0.000
6.930	0.004561	2507738.	-18460.	-0.000649	0.000	5.057E+10	-18244.	4752000.	0.000
7.029	0.003824	2472963.	-38383.	-0.000591	0.000	5.067E+10	-15297.	4752000.	0.000
7.128	0.003157	2416596.	-54970.	-0.000534	0.000	5.084E+10	-12627.	4752000.	0.000
7.227	0.002556	2342405.	-68544.	-0.000478	0.000	5.107E+10	-10225.	4752000.	0.000
7.326	0.002020	2253781.	-79418.	-0.000425	0.000	5.137E+10	-8081.3963	4752000.	0.000
7.425	0.001546	2153748.	-87892.	-0.000374	0.000	5.174E+10	-6185.7541	4752000.	0.000
7.524	0.001131	2044984.	-94255.	-0.000326	0.000	5.219E+10	-4525.0909	4752000.	0.000
7.623	0.000771	1929830.	-98775.	-0.000281	0.000	5.271E+10	-3085.6433	4752000.	0.000
7.722	0.000463	1810320.	-101709.	-0.000239	0.000	5.334E+10	-1852.8690	4752000.	0.000
7.821	0.000203	1688192.	-103292.	-0.000201	0.000	5.407E+10	-811.7072	4752000.	0.000
7.920	-1.330E-05	1564917.	-103742.	-0.000165	0.000	5.494E+10	53.1895	4752000.	0.000
8.019	-0.000189	1441716.	-103261.	-0.000133	0.000	5.598E+10	757.2773	4752000.	0.000
8.118	-0.000329	1319582.	-102029.	-0.000113	0.000	1.831E+11	1315.9679	4752000.	0.000
8.217	-0.000458	1199305.	-100158.	-0.000105	0.000	1.834E+11	1833.9838	4752000.	0.000
8.316	-0.000579	1081616.	-97694.	-9.775E-05	0.000	1.837E+11	2315.0902	4752000.	0.000
8.415	-0.000691	967194.	-94677.	-9.113E-05	0.000	1.840E+11	2762.9586	4752000.	0.000
8.514	-0.000795	856671.	-91147.	-8.524E-05	0.000	1.842E+11	3181.1489	4752000.	0.000
8.613	-0.000893	750638.	-87135.	-8.006E-05	0.000	1.845E+11	3573.0874	4752000.	0.000
8.712	-0.000986	649647.	-82671.	-7.555E-05	0.000	1.847E+11	3942.0527	4752000.	0.000
8.811	-0.001073	554220.	-77780.	-7.168E-05	0.000	1.849E+11	4291.1597	4752000.	0.000
8.910	-0.001156	464849.	-72485.	-6.841E-05	0.000	1.851E+11	4623.3410	4752000.	0.000
9.009	-0.001235	382002.	-66803.	-6.569E-05	0.000	1.852E+11	4941.3434	4752000.	0.000
9.108	-0.001312	306130.	-60751.	-6.349E-05	0.000	1.853E+11	5247.6986	4752000.	0.000
9.207	-0.001386	237664.	-54340.	-6.174E-05	0.000	1.854E+11	5544.7246	4752000.	0.000
9.306	-0.001459	177023.	-47581.	-6.042E-05	0.000	1.854E+11	5834.5135	4752000.	0.000
9.405	-0.001530	124617.	-40481.	-5.945E-05	0.000	1.854E+11	6118.9121	4752000.	0.000
9.504	-0.001600	80846.	-33045.	-5.879E-05	0.000	1.854E+11	6399.5163	4752000.	0.000

9.603	-0.001669	46108.	-25277.	-5.838E-05	0.000	1.854E+11	6677.6588	4752000.	0.000
9.702	-0.001739	20793.	-17180.	-5.817E-05	0.000	1.854E+11	6954.3974	4752000.	0.000
9.801	-0.001808	5294.3439	-8753.7483	-5.809E-05	0.000	1.854E+11	7230.5029	4752000.	0.000
9.900	-0.001877	0.000	0.000	-5.807E-05	0.000	1.854E+11	7506.4471	2376000.	0.000

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.1872655 inches
Computed slope at pile head = -0.0036941 radians
Maximum bending moment = 2740808. inch-lbs
Maximum shear force = -103742. lbs
Depth of maximum bending moment = 3.1680000 feet below pile head
Depth of maximum shear force = 7.9200000 feet below pile head
Number of iterations = 48
Number of zero deflection points = 1

Pile-head Deflection vs. Pile Length for Load Case 1

Boundary Condition Type 1, Shear and Moment

Shear = 9000. lb
Moment = 2518800. in- lb
Axial Load = 39800. lb

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.9000	0.1872655	2740808.	-103742.
9.4050	0.1921184	2739183.	-121128.
8.9100	0.2000891	2736917.	-148904.
8.4150	0.2209408	2732871.	-185553.
7.9200	0.4789373	2712392.	-238167.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 56900.0 lbs
Applied moment at pile head = 2220000.0 in-lbs
Axial thrust load on pile head = 49800.0 lbs

Depth X	Deflect. y	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. p	Soil Spr. Es*h	Distrib. Lat. Load

feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/in	lb/inch	lb/inch
0.00	0.4123	2220000.	56900.	-0.006831	0.000	3.604E+11	0.000	0.000	0.000
0.09900	0.4042	2288001.	56888.	-0.006824	0.000	3.604E+11	-19.7934	58.1722	0.000
0.198	0.3961	2355974.	56853.	-0.006816	0.000	3.600E+11	-40.0208	120.0256	0.000
0.297	0.3880	2423890.	56793.	-0.006808	0.000	3.598E+11	-60.6313	185.6307	0.000
0.396	0.3799	2491720.	56708.	-0.006799	0.000	2.926E+11	-81.5736	255.0622	0.000
0.495	0.3719	2559434.	56599.	-0.006783	0.000	1.394E+11	-102.7967	328.3985	0.000
0.594	0.3638	2627001.	56464.	-0.006752	0.000	7.465E+10	-124.2504	405.7132	0.000
0.693	0.3558	2694391.	56304.	-0.006709	0.000	7.417E+10	-145.8862	487.0650	0.000
0.792	0.3479	2761573.	56117.	-0.006665	0.000	7.377E+10	-167.6545	572.5251	0.000
0.891	0.3400	2828515.	55905.	-0.006620	0.000	7.339E+10	-189.5058	662.1671	0.000
0.990	0.3322	2895187.	55667.	-0.006574	0.000	7.303E+10	-211.3907	756.0660	0.000
1.089	0.3244	2961557.	55403.	-0.006526	0.000	7.270E+10	-233.2601	854.2989	0.000
1.188	0.3167	3027596.	55113.	-0.006477	0.000	7.238E+10	-255.0648	956.9444	0.000
1.287	0.3090	3093272.	54797.	-0.006427	0.000	7.207E+10	-276.7559	1064.0828	0.000
1.386	0.3014	3158554.	54455.	-0.006375	0.000	7.178E+10	-298.2848	1175.7960	0.000
1.485	0.2938	3223413.	54088.	-0.006322	0.000	7.150E+10	-319.6030	1292.1674	0.000
1.584	0.2864	3287816.	53696.	-0.006268	0.000	7.124E+10	-341.1664	1415.3737	0.000
1.683	0.2789	3351736.	53278.	-0.006212	0.000	7.099E+10	-362.6188	1544.3542	0.000
1.782	0.2716	3415140.	52834.	-0.006156	0.000	7.075E+10	-383.8384	1678.9477	0.000
1.881	0.2643	3477999.	52366.	-0.006098	0.000	7.052E+10	-404.7859	1819.3329	0.000
1.980	0.2571	3540283.	51873.	-0.006039	0.000	7.030E+10	-425.4222	1965.6989	0.000
2.079	0.2500	3601963.	51355.	-0.005978	0.000	7.009E+10	-445.7090	2118.2453	0.000
2.178	0.2429	3663011.	50814.	-0.005916	0.000	6.989E+10	-465.6081	2277.1838	0.000
2.277	0.2359	3723397.	50249.	-0.005854	0.000	6.970E+10	-485.0821	2442.7381	0.000
2.376	0.2290	3783096.	49662.	-0.005790	0.000	6.951E+10	-504.0939	2615.1456	0.000
2.475	0.2222	3842079.	49052.	-0.005724	0.000	6.934E+10	-522.6072	2794.6581	0.000
2.574	0.2154	3900321.	48420.	-0.005658	0.000	6.917E+10	-540.5859	2981.5429	0.000
2.673	0.2087	3957795.	47768.	-0.005590	0.000	6.900E+10	-557.9948	3176.0842	0.000
2.772	0.2021	4014479.	47095.	-0.005522	0.000	6.885E+10	-574.7990	3378.5843	0.000
2.871	0.1956	4070346.	46403.	-0.005452	0.000	6.870E+10	-590.9643	3589.3654	0.000
2.970	0.1892	4125376.	45691.	-0.005381	0.000	6.855E+10	-606.4574	3808.7709	0.000
3.069	0.1828	4179545.	44962.	-0.005309	0.000	6.841E+10	-621.7515	4040.4589	0.000
3.168	0.1765	4232833.	44214.	-0.005236	0.000	6.828E+10	-636.5832	4283.6148	0.000
3.267	0.1704	4285218.	43450.	-0.005162	0.000	6.815E+10	-650.7114	4537.4201	0.000
3.366	0.1643	4336680.	42669.	-0.005086	0.000	6.803E+10	-664.1063	4802.4180	0.000
3.465	0.1583	4387200.	41872.	-0.005010	0.000	6.791E+10	-676.7387	5079.1953	0.000
3.564	0.1524	4436761.	41061.	-0.004933	0.000	6.779E+10	-688.5798	5368.3868	0.000
3.663	0.1466	4485345.	40237.	-0.004855	0.000	6.768E+10	-699.6017	5670.6807	0.000
3.762	0.1408	4532938.	39399.	-0.004775	0.000	6.757E+10	-709.7771	5986.8246	0.000
3.861	0.1352	4579523.	38551.	-0.004695	0.000	6.747E+10	-719.0793	6317.6324	0.000
3.960	0.1297	4625089.	37691.	-0.004614	0.000	6.737E+10	-727.4822	6663.9919	0.000
4.059	0.1243	4669624.	36971.	-0.004532	0.000	6.728E+10	-485.7705	4644.3974	0.000
4.158	0.1189	4713468.	36399.	-0.004449	0.000	6.719E+10	-476.2153	4757.3049	0.000
4.257	0.1137	4756635.	35840.	-0.004365	0.000	6.710E+10	-466.0519	4870.2124	0.000
4.356	0.1085	4799139.	35292.	-0.004281	0.000	6.701E+10	-455.3129	4983.1199	0.000
4.455	0.1035	4840996.	34758.	-0.004195	0.000	6.693E+10	-444.0312	5096.0275	0.000
4.554	0.0986	4882221.	34238.	-0.004109	0.000	6.685E+10	-432.2400	5208.9350	0.000
4.653	0.0938	4922831.	33731.	-0.004022	0.000	6.677E+10	-419.9729	5321.8425	0.000
4.752	0.0890	4962843.	33240.	-0.003934	0.000	6.669E+10	-407.2638	5434.7500	0.000
4.851	0.0844	5002274.	32764.	-0.003845	0.000	6.661E+10	-394.1469	5547.6575	0.000
4.950	0.0799	5041145.	32304.	-0.003755	0.000	6.654E+10	-380.6566	5660.5651	0.000
5.049	0.0755	5079472.	31860.	-0.003665	0.000	6.647E+10	-366.8278	5773.4726	0.000
5.148	0.0712	5117277.	31432.	-0.003574	0.000	6.640E+10	-352.6956	5886.3801	0.000
5.247	0.0670	5154578.	31022.	-0.003482	0.000	6.633E+10	-338.2953	5999.2876	0.000
5.346	0.0629	5191397.	30629.	-0.003389	0.000	6.627E+10	-323.6626	6112.1951	0.000
5.445	0.0589	5227753.	30253.	-0.003296	0.000	6.620E+10	-308.8334	6225.1027	0.000
5.544	0.0551	5263668.	29895.	-0.003202	0.000	6.614E+10	-293.8441	6338.0102	0.000
5.643	0.0513	5299162.	29555.	-0.003107	0.000	6.608E+10	-278.7310	6450.9177	0.000

5.742	0.0477	5334258.	29233.	-0.003011	0.000	6.601E+10	-263.5310	6563.8252	0.000
5.841	0.0442	5368976.	28929.	-0.002915	0.000	6.595E+10	-248.2812	6676.7327	0.000
5.940	0.0408	5403337.	28643.	-0.002818	0.000	6.589E+10	-233.0190	6789.6403	0.000
6.039	0.0375	5437364.	28375.	-0.002720	0.000	6.584E+10	-217.7819	6902.5478	0.000
6.138	0.0343	5471078.	28125.	-0.002621	0.000	6.578E+10	-202.6079	7015.4553	0.000
6.237	0.0313	5504500.	27894.	-0.002522	0.000	6.573E+10	-187.5351	7128.3628	0.000
6.336	0.0283	5537652.	27680.	-0.002422	0.000	6.567E+10	-172.6020	7241.2703	0.000
6.435	0.0255	5570554.	27483.	-0.002322	0.000	6.562E+10	-157.8473	7354.1779	0.000
6.534	0.0228	5603227.	27305.	-0.002221	0.000	6.557E+10	-143.3100	7467.0854	0.000
6.633	0.0202	5635692.	27143.	-0.002119	0.000	6.551E+10	-129.0293	7579.9929	0.000
6.732	0.0178	5667969.	26998.	-0.002016	0.000	6.546E+10	-115.0448	7692.9004	0.000
6.831	0.0154	5700077.	26869.	-0.001913	0.000	6.541E+10	-101.3963	7805.8079	0.000
6.930	0.0132	5732037.	-1848.2136	-0.001787	0.000	4.591E+10	-48244.	4335187.	0.000
7.029	0.0112	5695898.	-57083.	-0.001640	0.000	4.607E+10	-44743.	4752000.	0.000
7.128	0.009325	5596602.	-105817.	-0.001494	0.000	4.639E+10	-37301.	4752000.	0.000
7.227	0.007635	5444654.	-146114.	-0.001353	0.000	4.667E+10	-30540.	4752000.	0.000
7.326	0.006109	5249596.	-178770.	-0.001218	0.000	4.690E+10	-24437.	4752000.	0.000
7.425	0.004742	5020040.	-204552.	-0.001088	0.000	4.717E+10	-18967.	4752000.	0.000
7.524	0.003524	4763708.	-224192.	-0.000965	0.000	4.748E+10	-14097.	4752000.	0.000
7.623	0.002449	4487473.	-238384.	-0.000850	0.000	4.784E+10	-9794.0473	4752000.	0.000
7.722	0.001505	4197409.	-247778.	-0.000742	0.000	4.826E+10	-6020.3377	4752000.	0.000
7.821	0.000684	3898841.	-252980.	-0.000643	0.000	4.873E+10	-2737.6589	4752000.	0.000
7.920	-2.333E-05	3596405.	-254551.	-0.000552	0.000	4.926E+10	93.3197	4752000.	0.000
8.019	-0.000628	3294095.	-253003.	-0.000470	0.000	4.988E+10	2512.1713	4752000.	0.000
8.118	-0.001140	2995325.	-248803.	-0.000395	0.000	5.059E+10	4558.1940	4752000.	0.000
8.217	-0.001567	2702985.	-242371.	-0.000329	0.000	5.143E+10	6269.9749	4752000.	0.000
8.316	-0.001921	2419490.	-234082.	-0.000270	0.000	5.243E+10	7685.0455	4752000.	0.000
8.415	-0.002210	2146838.	-224266.	-0.000219	0.000	5.365E+10	8839.6026	4752000.	0.000
8.514	-0.002442	1886659.	-213213.	-0.000175	0.000	5.517E+10	9768.2570	4752000.	0.000
8.613	-0.002626	1640265.	-201172.	-0.000138	0.000	5.712E+10	10504.	4752000.	0.000
8.712	-0.002769	1408692.	-188352.	-0.000107	0.000	5.987E+10	11077.	4752000.	0.000
8.811	-0.002880	1192752.	-174931.	-8.887E-05	0.000	1.834E+11	11518.	4752000.	0.000
8.910	-0.002980	993067.	-161007.	-8.180E-05	0.000	1.838E+11	11922.	4752000.	0.000
9.009	-0.003074	810208.	-146622.	-7.598E-05	0.000	1.842E+11	12295.	4752000.	0.000
9.108	-0.003161	644702.	-131808.	-7.129E-05	0.000	1.846E+11	12644.	4752000.	0.000
9.207	-0.003243	497041.	-116592.	-6.762E-05	0.000	1.848E+11	12973.	4752000.	0.000
9.306	-0.003322	367689.	-100993.	-6.484E-05	0.000	1.850E+11	13287.	4752000.	0.000
9.405	-0.003397	257088.	-85029.	-6.283E-05	0.000	1.851E+11	13589.	4752000.	0.000
9.504	-0.003471	165667.	-68710.	-6.148E-05	0.000	1.852E+11	13884.	4752000.	0.000
9.603	-0.003543	93841.	-52044.	-6.064E-05	0.000	1.852E+11	14173.	4752000.	0.000
9.702	-0.003615	42018.	-35036.	-6.021E-05	0.000	1.852E+11	14460.	4752000.	0.000
9.801	-0.003686	10603.	-17687.	-6.004E-05	0.000	1.852E+11	14746.	4752000.	0.000
9.900	-0.003758	0.000	0.000	-6.001E-05	0.000	1.852E+11	15031.	2376000.	0.000

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection	=	0.4123355	inches
Computed slope at pile head	=	-0.0068315	radians
Maximum bending moment	=	5732037.	inch-lbs
Maximum shear force	=	-254551.	lbs
Depth of maximum bending moment	=	6.9300000	feet below pile head
Depth of maximum shear force	=	7.9200000	feet below pile head
Number of iterations	=	29	

Number of zero deflection points = 1

Pile-head Deflection vs. Pile Length for Load Case 2

Boundary Condition Type 1, Shear and Moment

Shear = 56900. lb
Moment = 2220000. in- lb
Axial Load = 49800. lb

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
9.9000	0.4123355	5732037.	-254551.
9.4050	0.4274216	5711562.	-292269.
8.9100	0.4793939	5612536.	-365610.

Summary of Pile Response(s)

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

Load Case No.	Load Type No.	Pile-head Condition 1 V(lbs) or y(inches)	Pile-head Condition 2 in-lb, rad., or in-lb/rad.	Axial Loading lbs	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-head Rotation radians
1	1	V = 9000.0000	M = 2518800.	39800.	0.18726545	2740808.	-103742.	-0.00369408
2	1	V = 56900.	M = 2220000.	49800.	0.41233549	5732037.	-254551.	-0.00683147

The analysis ended normally.

LPile Plus for Windows, Version 2013-07.004

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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Files Used for Analysis

Path to file locations: \\BOSFIL10\Group\INFRASTRUCTURE\GEOTECHNICAL\Maine Turnpike Authority - York Plaza\York Toll Plaza\New Toll Location\Report\Analysis\Analysis\Gantry LPILE\
Name of input data file: Toll Island - Deep Rock Profile (TL-4 Impact).lp7d
Name of output report file: Toll Island - Deep Rock Profile (TL-4 Impact).lp7o
Name of plot output file: Toll Island - Deep Rock Profile (TL-4 Impact).lp7p
Name of runtime messeage file: Toll Island - Deep Rock Profile (TL-4 Impact).lp7r

Date and Time of Analysis

Date: December 20, 2016 Time: 9:35:09

Problem Title

Project Name: York Toll Plaza

Job Number: E2X71602

Client: Maine Turnpike

Engineer: Jacobs Engineering

Description: Gantry Foundation - Soil Profile

Program Options and Settings

Engineering Units of Input Data and Computations:
 - Engineering units are US Customary Units (pounds, feet, inches)

Analysis Control Options:
- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
 - Compute pile response under loading and nonlinear bending properties of pile
   (only if nonlinear pile properties are input)
 - Use of p-y modification factors for p-y curves not selected
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - No p-y curves to be computed and reported for user-specified depths
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1

Pile Structural Properties and Geometry

Total number of pile sections = 2

Total length of pile = 19.80 ft

Depth of ground surface below top of pile = 0.00 ft

Pile diameter values used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	36.0000000
2	16.800000	36.0000000
3	16.800000	30.0000000

4 19.800000 30.0000000

Input Structural Properties:

Pile Section No. 1:

Section Type	=	Drilled Shaft (Bored Pile)
Section Length	=	16.80000 ft
Section Diameter	=	36.00000 in

Pile Section No. 2:

Section Type	=	Drilled Shaft (Bored Pile)
Section Length	=	3.00000 ft
Section Diameter	=	30.00000 in

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	4.00000 ft
Effective unit weight at top of layer	=	125.00000 pcf
Effective unit weight at bottom of layer	=	125.00000 pcf
Friction angle at top of layer	=	34.00000 deg.
Friction angle at bottom of layer	=	34.00000 deg.
Subgrade k at top of layer	=	135.00000 pci
Subgrade k at bottom of layer	=	135.00000 pci

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	4.00000 ft
Distance from top of pile to bottom of layer	=	16.80000 ft
Effective unit weight at top of layer	=	63.00000 pcf
Effective unit weight at bottom of layer	=	63.00000 pcf
Friction angle at top of layer	=	34.00000 deg.
Friction angle at bottom of layer	=	34.00000 deg.
Subgrade k at top of layer	=	80.00000 pci
Subgrade k at bottom of layer	=	80.00000 pci

Layer 3 is strong rock (vuggy limestone)

Distance from top of pile to top of layer	=	16.80000 ft
Distance from top of pile to bottom of layer	=	50.00000 ft
Effective unit weight at top of layer	=	103.00000 pcf
Effective unit weight at bottom of layer	=	103.00000 pcf
Uniaxial compressive strength at top of layer	=	4000.00000 psi
Uniaxial compressive strength at bottom of layer	=	4000.00000 psi

(Depth of lowest soil layer extends 30.20 ft below pile tip)

Summary of Soil Properties

Layer Num.	Soil Type (p-y Curve Criteria)	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	Uniaxial qu psi	kpy pci
1	Sand (Reese, et al.)	0.00	125.000	34.000	--	135.000
		4.000	125.000	34.000	--	135.000
2	Sand (Reese, et al.)	4.000	63.000	34.000	--	80.000
		16.800	63.000	34.000	--	80.000
3	Vuggy Limestone	16.800	103.000	--	4000.000	--
		50.000	103.000	--	4000.000	--

Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	1	V = 9000.00000 lbs	M = 2518800. in-lbs	39800.	Yes
2	1	V = 56900. lbs	M = 2220000. in-lbs	49800.	Yes

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	16.80000 ft
Shaft Diameter	=	36.00000 in
Concrete Cover Thickness	=	6.00000 in
Number of Reinforcing Bars	=	11 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	1017.87602 sq. in.
Total Area of Reinforcing Steel	=	11.00000 sq. in.
Area Ratio of Steel Reinforcement	=	1.08 percent
Edge-to-Edge Bar Spacing	=	5.31579 in
Maximum Concrete Aggregate Size	=	0.75000 in
Ratio of Bar Spacing to Aggregate Size	=	7.09
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	4083.379 kips
Tensile Load for Cracking of Concrete	=	-455.573 kips
Nominal Axial Tensile Capacity	=	-660.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.12800	1.00000	11.43600	0.00000
2	1.12800	1.00000	9.62058	6.18277
3	1.12800	1.00000	4.75069	10.40255
4	1.12800	1.00000	-1.62751	11.31960
5	1.12800	1.00000	-7.48899	8.64275
6	1.12800	1.00000	-10.97276	3.22189
7	1.12800	1.00000	-10.97276	-3.22189
8	1.12800	1.00000	-7.48899	-8.64275
9	1.12800	1.00000	-1.62751	-11.31960
10	1.12800	1.00000	4.75069	-10.40255
11	1.12800	1.00000	9.62058	-6.18277

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 5.31579 inches between Bars 8 and 9

Spacing to aggregate size ratio = 7.08772

Concrete Properties:

Compressive Strength of Concrete = 4000.00000 psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.34164 psi
Compression Strain at Peak Stress = 0.00189
Tensile Strain at Fracture of Concrete = -0.0001154
Maximum Coarse Aggregate Size = 0.75000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force kips
1	39.800
2	49.800

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 39.800 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000000625	228.7167885	365946862.	31.9179611	0.0000199	-0.000002551	0.0836865	0.5752505	
0.000001250	457.0482218	365638577.	24.9731538	0.0000312	-0.0000138	0.1303603	0.8987518	
0.000001875	684.5540465	365095491.	22.6592702	0.0000425	-0.0000250	0.1767624	1.2223103	
0.000002500	911.1891969	364475679.	21.5025659	0.0000538	-0.0000362	0.2228871	1.5458860	
0.000003125	1136.9476404	363823245.	20.8086389	0.0000650	-0.0000475	0.2687331	1.8694704	
0.000003750	1361.8278881	363154103.	20.3460745	0.0000763	-0.0000587	0.3143000	2.1930606	
0.000004375	1585.8294183	362475296.	20.0157076	0.0000876	-0.0000699	0.3595876	2.5166554	
0.000005000	1808.9520157	361790403.	19.7679600	0.0000988	-0.0000812	0.4045958	2.8402542	
0.000005625	2031.1955749	361101436.	19.5752899	0.0001101	-0.0000924	0.4493245	3.1638567	
0.000006250	2252.5600317	360409605.	19.4211729	0.0001214	-0.0001036	0.4937738	3.4874626	
0.000006875	2473.0453606	359715689.	19.2950940	0.0001327	-0.0001148	0.5379435	3.8110719	
0.000007500	2473.0453606	329739381.	12.6927945	0.0000952	-0.0001748	0.3881158	-5.0301672	C
0.000008125	2473.0453606	304374814.	12.4460088	0.0001011	-0.0001914	0.4115146	-5.5074966	C
0.000008750	2473.0453606	282633756.	12.2286379	0.0001070	-0.0002080	0.4346328	-5.9863081	C
0.000009375	2473.0453606	263791505.	12.0391104	0.0001129	-0.0002246	0.4576337	-6.4654293	C
0.0000100	2473.0453606	247304536.	11.8686330	0.0001187	-0.0002413	0.4803755	-6.9458964	C
0.0000106	2473.0453606	232757210.	11.7184565	0.0001245	-0.0002580	0.5030544	-7.4262881	C
0.0000113	2473.0453606	219826254.	11.5812845	0.0001303	-0.0002747	0.5254962	-7.9078809	C

0.0000119	2473.0453606	208256451.	11.4582074	0.0001361	-0.0002914	0.5478497	-8.3895923	C
0.0000125	2473.0453606	197843629.	11.3476458	0.0001418	-0.0003082	0.5701413	-8.8712284	C
0.0000131	2473.0453606	188422504.	11.2445206	0.0001476	-0.0003249	0.5922017	-9.3540418	C
0.0000138	2473.0453606	179857844.	11.1507117	0.0001533	-0.0003417	0.6141878	-9.8368787	C
0.0000144	2473.0453606	172037938.	11.0652413	0.0001591	-0.0003584	0.6361129	-10.3196400	C
0.0000150	2473.0453606	164869691.	10.9870677	0.0001648	-0.0003752	0.6579768	-10.8023255	C
0.0000156	2473.0453606	158274903.	10.9128980	0.0001705	-0.0003920	0.6796337	-11.2860305	C
0.0000163	2473.0453606	152187407.	10.8443523	0.0001762	-0.0004088	0.7012151	-11.7697739	C
0.0000169	2473.0453606	146550836.	10.7810404	0.0001819	-0.0004256	0.7227362	-12.2534408	C
0.0000175	2473.0453606	141316878.	10.7224021	0.0001876	-0.0004424	0.7441970	-12.7370309	C
0.0000181	2473.0453606	136443882.	10.6679540	0.0001934	-0.0004591	0.7655975	-13.2205441	C
0.0000188	2473.0453606	131895753.	10.6171726	0.0001991	-0.0004759	0.7869300	-13.7040373	C
0.0000194	2473.0453606	127641051.	10.5680775	0.0002048	-0.0004927	0.8080752	-14.1884239	C
0.0000200	2473.0453606	123652268.	10.5221858	0.0002104	-0.0005096	0.8291608	-14.6727322	C
0.0000206	2473.0453606	119905230.	10.4792067	0.0002161	-0.0005264	0.8501867	-15.1569619	C
0.0000213	2473.0453606	116378605.	10.4388834	0.0002218	-0.0005432	0.8711528	-15.6411131	C
0.0000219	2473.0453606	113053502.	10.4009885	0.0002275	-0.0005600	0.8920591	-16.1251853	C
0.0000225	2473.0453606	109913127.	10.3653201	0.0002332	-0.0005768	0.9129055	-16.6091786	C
0.0000231	2473.0453606	106942502.	10.3316978	0.0002389	-0.0005936	0.9336919	-17.0930926	C
0.0000238	2473.0453606	104128226.	10.2999605	0.0002446	-0.0006104	0.9544181	-17.5769272	C
0.0000244	2473.0453606	101458271.	10.2699632	0.0002503	-0.0006272	0.9750842	-18.0606822	C
0.0000256	2473.0453606	96509087.	10.2128648	0.0002617	-0.0006608	1.0160652	-19.0293023	C
0.0000269	2473.0453606	92020292.	10.1611358	0.0002731	-0.0006944	1.0567723	-19.9978772	C
0.0000281	2473.0453606	87930502.	10.1144077	0.0002845	-0.0007280	1.0972408	-20.9661236	C
0.0000294	2473.0453606	84188778.	10.0720441	0.0002959	-0.0007616	1.1374699	-21.9340398	C
0.0000306	2473.0453606	80752502.	10.0335124	0.0003073	-0.0007952	1.1774592	-22.9016242	C
0.0000319	2473.0453606	77585737.	9.9983636	0.0003187	-0.0008288	1.2172078	-23.8688751	C
0.0000331	2473.0453606	74657973.	9.9662165	0.0003301	-0.0008624	1.2567151	-24.8357907	C
0.0000344	2487.3217517	72358451.	9.9367454	0.0003416	-0.0008959	1.2959806	-25.8023694	C
0.0000356	2563.3953469	71954957.	9.9096702	0.0003530	-0.0009295	1.3350034	-26.7686093	C
0.0000369	2639.3600207	71575865.	9.8841165	0.0003645	-0.0009630	1.3737027	-27.7351853	C
0.0000381	2715.2244280	71219001.	9.8601828	0.0003759	-0.0009966	1.4121118	-28.7018228	C
0.0000394	2791.0008708	70882562.	9.8380786	0.0003874	-0.0010301	1.4502793	-29.6681064	C
0.0000406	2866.6889306	70564651.	9.8176367	0.0003988	-0.0010637	1.4882044	-30.6340342	C
0.0000419	2942.2881837	70263598.	9.7987098	0.0004103	-0.0010972	1.5258866	-31.5996042	C
0.0000431	3017.7982026	69977929.	9.7811678	0.0004218	-0.0011307	1.5633250	-32.5648144	C
0.0000444	3093.2185559	69706334.	9.7648953	0.0004333	-0.0011642	1.6005190	-33.5296628	C
0.0000456	3168.5488080	69447645.	9.7497893	0.0004448	-0.0011977	1.6374678	-34.4941474	C
0.0000469	3243.7885194	69200822.	9.7357581	0.0004564	-0.0012311	1.6741707	-35.4582662	C
0.0000481	3318.9372465	68964930.	9.7227194	0.0004679	-0.0012646	1.7106270	-36.4220170	C
0.0000494	3393.9945412	68739130.	9.7105994	0.0004795	-0.0012980	1.7468359	-37.3853979	C
0.0000506	3468.9599514	68522666.	9.6993313	0.0004910	-0.0013315	1.7827967	-38.3484066	C
0.0000519	3543.8330207	68314853.	9.6888550	0.0005026	-0.0013649	1.8185086	-39.3110411	C
0.0000531	3618.6132882	68115074.	9.6791161	0.0005142	-0.0013983	1.8539709	-40.2732991	C
0.0000544	3693.2997693	67922754.	9.6700650	0.0005258	-0.0014317	1.8891827	-41.2351801	C
0.0000556	3767.8930836	67737404.	9.6616568	0.0005374	-0.0014651	1.9241435	-42.1966786	C
0.0000569	3842.3921824	67558544.	9.6538504	0.0005491	-0.0014984	1.9588524	-43.1577941	C
0.0000581	3916.7965872	67385748.	9.6466083	0.0005607	-0.0015318	1.9933085	-44.1185244	C
0.0000594	3991.1058144	67218624.	9.6398961	0.0005724	-0.0015651	2.0275112	-45.0788672	C
0.0000606	4065.3193759	67056814.	9.6336826	0.0005840	-0.0015985	2.0614595	-46.0388201	C
0.0000619	4139.4367784	66899988.	9.6279386	0.0005957	-0.0016318	2.0951528	-46.9983808	C
0.0000631	4213.4575239	66747842.	9.6226376	0.0006074	-0.0016651	2.1285901	-47.9575471	C
0.0000644	4287.3811092	66600095.	9.6177551	0.0006191	-0.0016984	2.1617707	-48.9163164	C
0.0000656	4361.2070263	66456488.	9.6132683	0.0006309	-0.0017316	2.1946937	-49.8746865	C
0.0000669	4434.9347617	66316781.	9.6091565	0.0006426	-0.0017649	2.2273584	-50.8326549	C
0.0000681	4508.5637969	66180753.	9.6054001	0.0006544	-0.0017981	2.2597638	-51.7902191	C
0.0000694	4582.0936078	66048196.	9.6019812	0.0006661	-0.0018314	2.2919091	-52.7473767	C
0.0000706	4655.5236652	65918919.	9.5988831	0.0006779	-0.0018646	2.3237936	-53.7041251	C
0.0000719	4728.8534343	65792743.	9.5960903	0.0006897	-0.0018978	2.3554162	-54.6604618	C
0.0000731	4802.0823746	65669503.	9.5935883	0.0007015	-0.0019310	2.3867761	-55.6163843	C

0.0000744	4875.2099402	65549041.	9.5913637	0.0007134	-0.0019641	2.4178726	-56.5718898	C
0.0000794	5166.6948188	65092218.	9.5850000	0.0007608	-0.0020967	2.5396049	-60.0000000	CY
0.0000844	5456.5133999	64669788.	9.5822045	0.0008085	-0.0022290	2.6570485	-60.0000000	CY
0.0000894	5744.6266256	64275543.	9.5824485	0.0008564	-0.0023611	2.7701428	-60.0000000	CY
0.0000944	6030.9949765	63904583.	9.5853183	0.0009046	-0.0024929	2.8788254	-60.0000000	CY
0.0000994	6315.5771098	63552977.	9.5904869	0.0009531	-0.0026244	2.9830310	-60.0000000	CY
0.0001044	6593.5757563	63171983.	9.5955103	0.0010015	-0.0027560	3.0822292	-60.0000000	CY
0.0001094	6822.7089732	62379053.	9.5812433	0.0010479	-0.0028896	3.1723695	-60.0000000	CY
0.0001144	7002.1229748	61220747.	9.5484501	0.0010921	-0.0030254	3.2537140	-60.0000000	CY
0.0001194	7166.1992085	60030988.	9.5124429	0.0011355	-0.0031620	3.3296165	-60.0000000	CY
0.0001244	7299.1993838	58687030.	9.4659320	0.0011773	-0.0033002	3.3987123	-60.0000000	CY
0.0001294	7416.0351152	57322011.	9.4170604	0.0012183	-0.0034392	3.4628541	-60.0000000	CY
0.0001344	7531.9963700	56052066.	9.3731649	0.0012595	-0.0035780	3.5236426	-60.0000000	CY
0.0001394	7638.0634525	54802249.	9.3291305	0.0013002	-0.0037173	3.5801522	-60.0000000	CY
0.0001444	7722.5207742	53489321.	9.2788178	0.0013396	-0.0038579	3.6313632	-60.0000000	CY
0.0001494	7798.3760187	52206701.	9.2289843	0.0013786	-0.0039989	3.6787261	-60.0000000	CY
0.0001544	7873.4041657	51001808.	9.1833600	0.0014177	-0.0041398	3.7230027	-60.0000000	CY
0.0001594	7947.3378538	49865649.	9.1393136	0.0014566	-0.0042809	3.7637870	-60.0000000	CY
0.0001644	8019.8740924	48790109.	9.0984122	0.0014956	-0.0044219	3.8013974	-60.0000000	CY
0.0001694	8085.6835480	47738353.	9.0575138	0.0015341	-0.0045634	3.8353972	-60.0000000	CY
0.0001744	8139.6785604	46679160.	9.0135688	0.0015717	-0.0047058	3.8654770	-60.0000000	CY
0.0001794	8185.7944587	45635091.	8.9687996	0.0016088	-0.0048487	3.8921156	-60.0000000	CY
0.0001844	8229.6963704	44635641.	8.9263544	0.0016458	-0.0049917	3.9158062	-60.0000000	CY
0.0001894	8273.0508647	43686077.	8.8869857	0.0016830	-0.0051345	3.9366480	-60.0000000	CY
0.0001944	8315.8470781	42782493.	8.8504725	0.0017203	-0.0052772	3.9546039	-60.0000000	CY
0.0001994	8358.0297202	41921152.	8.8163736	0.0017578	-0.0054197	3.9696175	-60.0000000	CY
0.0002044	8399.2663436	41097328.	8.7827193	0.0017950	-0.0055625	3.9815548	-60.0000000	CY
0.0002094	8439.9407572	40310165.	8.7515102	0.0018323	-0.0057052	3.9905649	-60.0000000	CY
0.0002144	8478.6273579	39550448.	8.7216526	0.0018697	-0.0058478	3.9965801	-60.0000000	CY
0.0002194	8514.5316633	38812680.	8.6924955	0.0019069	-0.0059906	3.9996009	-60.0000000	CY
0.0002244	8544.9376333	38083288.	8.6622295	0.0019436	-0.0061339	3.9954174	-60.0000000	CY
0.0002294	8570.3592505	37363964.	8.6310553	0.0019797	-0.0062778	3.9989621	-60.0000000	CY
0.0002344	8593.3932528	36665145.	8.6006269	0.0020158	-0.0064217	3.9990787	-60.0000000	CY
0.0002394	8614.2062091	35986240.	8.5712212	0.0020517	-0.0065658	3.9971926	-60.0000000	CY
0.0002444	8634.6233575	35333497.	8.5436426	0.0020879	-0.0067096	3.9996212	-60.0000000	CY
0.0002494	8654.5331786	34704895.	8.5179075	0.0021242	-0.0068533	3.9957847	60.0000000	CY
0.0002544	8673.9284380	34098982.	8.4939200	0.0021606	-0.0069969	3.9976064	60.0000000	CY
0.0002594	8692.9592984	33515024.	8.4714252	0.0021973	-0.0071402	3.9997191	60.0000000	CY
0.0002644	8711.3537078	32950747.	8.4496269	0.0022339	-0.0072836	3.9954581	60.0000000	CY
0.0002694	8729.1322867	32405131.	8.4283497	0.0022704	-0.0074271	3.9969283	60.0000000	CY
0.0002744	8746.6035451	31878282.	8.4083736	0.0023070	-0.0075705	3.9993680	60.0000000	CY
0.0003044	8841.7295094	29048803.	8.3125388	0.0025301	-0.0084274	3.9947434	60.0000000	CY
0.0003344	8902.0518309	26622959.	8.2295571	0.0027518	-0.0092857	3.9984338	60.0000000	CY
0.0003644	8935.0736588	24521643.	8.1553847	0.0029716	-0.0101459	3.9990123	60.0000000	CY
0.0003944	8961.0873544	22722250.	8.1012646	0.0031949	-0.0110026	3.9981925	60.0000000	CYT
0.0004244	8982.0266041	21165306.	8.0583583	0.0034198	-0.0118577	3.9943897	60.0000000	CYT
0.0004544	8999.2662013	19805813.	8.0287822	0.0036481	-0.0127094	3.9861205	60.0000000	CYT
0.0004844	8999.2662013	18579130.	8.0483236	0.0038984	-0.0135391	3.9978607	60.0000000	CYT

Axial Thrust Force = 49.800 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000000625	228.4687779	365550045.	35.4213058	0.0000221	-0.000000362	0.0928699	0.6387487	
0.000001250	456.7106492	365368519.	26.7269235	0.0000334	-0.0000116	0.1394997	0.9623260	
0.000001875	684.1960103	364904539.	23.8307199	0.0000447	-0.0000228	0.1858644	1.2860079	
0.000002500	910.8226829	364329073.	22.3830502	0.0000560	-0.0000340	0.2319536	1.6097211	

0.000003125	1136.5762196	363704390.	21.5146127	0.0000672	-0.0000453	0.2777646	1.9334493	
0.000003750	1361.4529547	363054121.	20.9357400	0.0000785	-0.0000565	0.3232968	2.2571867	
0.000004375	1585.4516278	362388943.	20.5223139	0.0000898	-0.0000677	0.3685498	2.5809311	
0.000005000	1808.5717198	361714344.	20.2122840	0.0001011	-0.0000789	0.4135233	2.9046812	
0.000005625	2030.8129660	361033416.	19.9711807	0.0001123	-0.0000902	0.4582173	3.2284364	
0.000006250	2252.1752348	360348038.	19.7783240	0.0001236	-0.0001014	0.5026317	3.5521962	
0.000006875	2472.6584500	359659411.	19.6205545	0.0001349	-0.0001126	0.5467665	3.8759606	
0.000007500	2472.6584500	329687793.	13.4827193	0.0001011	-0.0001689	0.4119528	-4.8583585	C
0.000008125	2472.6584500	304327194.	13.1919436	0.0001072	-0.0001853	0.4358198	-5.3317358	C
0.000008750	2472.6584500	282589537.	12.9367699	0.0001132	-0.0002018	0.4593999	-5.8066196	C
0.000009375	2472.6584500	263750235.	12.7123460	0.0001192	-0.0002183	0.4827797	-6.2823934	C
0.0000100	2472.6584500	247265845.	12.5117750	0.0001251	-0.0002349	0.5059155	-6.7593852	C
0.0000106	2472.6584500	232720795.	12.3322231	0.0001310	-0.0002515	0.5288668	-7.2371712	C
0.0000113	2472.6584500	219791862.	12.1701416	0.0001369	-0.0002681	0.5516326	-7.7157663	C
0.0000119	2472.6584500	208223869.	12.0241863	0.0001428	-0.0002847	0.5742799	-8.1946833	C
0.0000125	2472.6584500	197812676.	11.8897268	0.0001486	-0.0003014	0.5967011	-8.6747240	C
0.0000131	2472.6584500	188393025.	11.7682737	0.0001545	-0.0003180	0.6190589	-9.1546883	C
0.0000138	2472.6584500	179829705.	11.6566159	0.0001603	-0.0003347	0.6412764	-9.6351494	C
0.0000144	2472.6584500	172011023.	11.5527160	0.0001661	-0.0003514	0.6633121	-10.1164240	C
0.0000150	2472.6584500	164843897.	11.4576498	0.0001719	-0.0003681	0.6852853	-10.5976223	C
0.0000156	2472.6584500	158250141.	11.3703576	0.0001777	-0.0003848	0.7071961	-11.0787441	C
0.0000163	2472.6584500	152163597.	11.2881440	0.0001834	-0.0004016	0.7289323	-11.5606371	C
0.0000169	2472.6584500	146527908.	11.2111680	0.0001892	-0.0004183	0.7505416	-12.0429471	C
0.0000175	2472.6584500	141294769.	11.1398416	0.0001949	-0.0004351	0.7720893	-12.5251803	C
0.0000181	2472.6584500	136422535.	11.0735808	0.0002007	-0.0004518	0.7935754	-13.0073365	C
0.0000188	2472.6584500	131875117.	11.0118793	0.0002065	-0.0004685	0.8149998	-13.4894156	C
0.0000194	2472.6584500	127621081.	10.9533284	0.0002122	-0.0004853	0.8362918	-13.9719611	C
0.0000200	2472.6584500	123632922.	10.8974471	0.0002179	-0.0005021	0.8574379	-14.4550806	C
0.0000206	2472.6584500	119886470.	10.8450831	0.0002237	-0.0005188	0.8785232	-14.9381221	C
0.0000213	2472.6584500	116360398.	10.7959263	0.0002294	-0.0005356	0.8995476	-15.4210854	C
0.0000219	2472.6584500	113035815.	10.7497021	0.0002351	-0.0005524	0.9205111	-15.9039701	C
0.0000225	2472.6584500	109895931.	10.7061665	0.0002409	-0.0005691	0.9414134	-16.3867763	C
0.0000231	2472.6584500	106925771.	10.6651016	0.0002466	-0.0005859	0.9622547	-16.8695037	C
0.0000238	2472.6584500	104111935.	10.6263127	0.0002524	-0.0006026	0.9830347	-17.3521521	C
0.0000244	2472.6584500	101442398.	10.5884407	0.0002581	-0.0006194	1.0036475	-17.8355584	C
0.0000256	2472.6584500	96493988.	10.5181077	0.0002695	-0.0006530	1.0446487	-18.8024686	C
0.0000269	2472.6584500	92005896.	10.4547317	0.0002810	-0.0006865	1.0854079	-19.7690559	C
0.0000281	2472.6584500	87916745.	10.3973869	0.0002924	-0.0007201	1.1259242	-20.7353187	C
0.0000294	2472.6584500	84175607.	10.3453052	0.0003039	-0.0007536	1.1661971	-21.7012555	C
0.0000306	2472.6584500	80739868.	10.2978441	0.0003154	-0.0007871	1.2062259	-22.6668646	C
0.0000319	2472.6584500	77573598.	10.2542370	0.0003269	-0.0008206	1.2459847	-23.6323521	C
0.0000331	2499.5930028	75459411.	10.2128570	0.0003383	-0.0008542	1.2853355	-24.5988616	C
0.0000344	2575.6610551	74928322.	10.1748271	0.0003498	-0.0008877	1.3244437	-25.5650316	C
0.0000356	2651.6406138	74432017.	10.1397964	0.0003612	-0.0009213	1.3633086	-26.5308603	C
0.0000369	2727.5312716	73966950.	10.1074614	0.0003727	-0.0009548	1.4019297	-27.4963459	C
0.0000381	2803.3326177	73530036.	10.0775586	0.0003842	-0.0009883	1.4403062	-28.4614866	C
0.0000394	2879.0442377	73118584.	10.0498581	0.0003957	-0.0010218	1.4784374	-29.4262806	C
0.0000406	2954.6657135	72730233.	10.0241581	0.0004072	-0.0010553	1.5163226	-30.3907261	C
0.0000419	3030.1966234	72362904.	10.0002810	0.0004188	-0.0010887	1.5539611	-31.3548212	C
0.0000431	3105.6365418	72014760.	9.9780697	0.0004303	-0.0011222	1.5913522	-32.3185640	C
0.0000444	3180.9850393	71684170.	9.9573849	0.0004419	-0.0011556	1.6284952	-33.2819526	C
0.0000456	3256.2416827	71369681.	9.9381027	0.0004534	-0.0011891	1.6653894	-34.2449852	C
0.0000469	3331.4060350	71069995.	9.9201123	0.0004650	-0.0012225	1.7020340	-35.2076597	C
0.0000481	3406.4776550	70783951.	9.9033143	0.0004766	-0.0012559	1.7384283	-36.1699743	C
0.0000494	3481.4371612	70510120.	9.8870945	0.0004882	-0.0012893	1.7744896	-37.1326789	C
0.0000506	3556.2991782	70247885.	9.8717981	0.0004998	-0.0013227	1.8102805	-38.0952038	C
0.0000519	3631.0682564	69996497.	9.8574898	0.0005114	-0.0013561	1.8458218	-39.0573512	C
0.0000531	3705.7439300	69755180.	9.8441012	0.0005230	-0.0013895	1.8811127	-40.0191189	C
0.0000544	3780.3257274	69523232.	9.8315705	0.0005346	-0.0014229	1.9161524	-40.9805046	C
0.0000556	3854.8131721	69300012.	9.8198411	0.0005462	-0.0014563	1.9509403	-41.9415062	C

0.0000569	3929.2057830	69084937.	9.8088615	0.0005579	-0.0014896	1.9854754	-42.9021214	C
0.0000581	4003.5030745	68877472.	9.7985848	0.0005695	-0.0015230	2.0197570	-43.8623478	C
0.0000594	4077.7045560	68677129.	9.7889679	0.0005812	-0.0015563	2.0537842	-44.8221832	C
0.0000606	4151.8097319	68483459.	9.7799713	0.0005929	-0.0015896	2.0875564	-45.7816253	C
0.0000619	4225.8175263	68296041.	9.7715588	0.0006046	-0.0016229	2.1210725	-46.7406733	C
0.0000631	4299.7286379	68114513.	9.7636969	0.0006163	-0.0016562	2.1543320	-47.6993213	C
0.0000644	4373.5419235	67938515.	9.7563548	0.0006281	-0.0016894	2.1873340	-48.6575688	C
0.0000656	4447.2568679	67767724.	9.7495042	0.0006398	-0.0017227	2.2200775	-49.6154134	C
0.0000669	4520.8729502	67601839.	9.7431188	0.0006516	-0.0017559	2.2525618	-50.5728525	C
0.0000681	4594.3896441	67440582.	9.7371742	0.0006633	-0.0017892	2.2847860	-51.5298836	C
0.0000694	4667.8064182	67283696.	9.7316478	0.0006751	-0.0018224	2.3167493	-52.4865043	C
0.0000706	4741.1227353	67130941.	9.7265187	0.0006869	-0.0018556	2.3484507	-53.4427120	C
0.0000719	4814.3380527	66982095.	9.7217674	0.0006988	-0.0018887	2.3798895	-54.3985041	C
0.0000731	4887.4518218	66836948.	9.7173758	0.0007106	-0.0019219	2.4110647	-55.3538779	C
0.0000744	4960.4634884	66695307.	9.7133269	0.0007224	-0.0019551	2.4419754	-56.3088309	C
0.0000794	5251.4779426	66160352.	9.7002584	0.0007700	-0.0020875	2.5629558	-60.0000000	CY
0.0000844	5540.8126876	65668891.	9.6915805	0.0008177	-0.0022198	2.6796317	-60.0000000	CY
0.0000894	5828.4290489	65213192.	9.6866277	0.0008657	-0.0023518	2.7919421	-60.0000000	CY
0.0000944	6114.2879841	64787157.	9.6848787	0.0009140	-0.0024835	2.8998239	-60.0000000	CY
0.0000994	6398.3463729	64385875.	9.6859205	0.0009625	-0.0026150	3.0032109	-60.0000000	CY
0.0001044	6677.3643604	63974748.	9.6879475	0.0010112	-0.0027463	3.1017252	-60.0000000	CY
0.0001094	6912.6475082	63201349.	9.6732841	0.0010580	-0.0028795	3.1916766	-60.0000000	CY
0.0001144	7094.7332806	62030455.	9.6385991	0.0011024	-0.0030151	3.2724831	-60.0000000	CY
0.0001194	7259.2358967	60810353.	9.6011642	0.0011461	-0.0031514	3.3478794	-60.0000000	CY
0.0001244	7396.4536993	59468974.	9.5561092	0.0011885	-0.0032890	3.4170136	-60.0000000	CY
0.0001294	7513.7594563	58077368.	9.5055656	0.0012298	-0.0034277	3.4805026	-60.0000000	CY
0.0001344	7629.3537833	56776586.	9.4590092	0.0012711	-0.0035664	3.5403761	-60.0000000	CY
0.0001394	7738.2140719	55520818.	9.4141336	0.0013121	-0.0037054	3.5962732	-60.0000000	CY
0.0001444	7824.3241276	54194453.	9.3624597	0.0013517	-0.0038458	3.6467471	-60.0000000	CY
0.0001494	7900.2556840	52888741.	9.3105644	0.0013908	-0.0039867	3.6932064	-60.0000000	CY
0.0001544	7974.9540423	51659621.	9.2628265	0.0014299	-0.0041276	3.7365251	-60.0000000	CY
0.0001594	8048.9456006	50503188.	9.2191363	0.0014693	-0.0042682	3.7767166	-60.0000000	CY
0.0001644	8122.1064963	49412055.	9.1790346	0.0015088	-0.0044087	3.8137239	-60.0000000	CY
0.0001694	8189.5560257	48351622.	9.1374743	0.0015477	-0.0045498	3.8468430	-60.0000000	CY
0.0001744	8245.2742732	47284727.	9.0929644	0.0015856	-0.0046919	3.8760295	-60.0000000	CY
0.0001794	8291.8228455	46226190.	9.0469304	0.0016228	-0.0048347	3.9016564	-60.0000000	CY
0.0001844	8335.4090019	45208998.	9.0028710	0.0016599	-0.0049776	3.9242631	-60.0000000	CY
0.0001894	8378.4413420	44242595.	8.9619873	0.0016972	-0.0051203	3.9440023	-60.0000000	CY
0.0001944	8420.9087278	43323003.	8.9240513	0.0017346	-0.0052629	3.9608358	-60.0000000	CY
0.0001994	8462.7996307	42446644.	8.8888588	0.0017722	-0.0054053	3.9747245	-60.0000000	CY
0.0002044	8504.1021085	41610286.	8.8562260	0.0018100	-0.0055475	3.9856277	-60.0000000	CY
0.0002094	8544.8037803	40811003.	8.8259877	0.0018479	-0.0056896	3.9935035	-60.0000000	CY
0.0002144	8583.8279123	40041180.	8.7958277	0.0018856	-0.0058319	3.9982678	-60.0000000	CY
0.0002194	8620.8054570	39297119.	8.7665487	0.0019232	-0.0059743	3.9999924	-60.0000000	CY
0.0002244	8651.2665046	38557177.	8.7355638	0.0019600	-0.0061175	3.9974751	-60.0000000	CY
0.0002294	8678.2720153	37834428.	8.7046529	0.0019966	-0.0062609	3.9997950	-60.0000000	CY
0.0002344	8701.1445185	37124883.	8.6734921	0.0020328	-0.0064047	3.9953434	-60.0000000	CY
0.0002394	8722.0050448	36436575.	8.6433153	0.0020690	-0.0065485	3.9987968	-60.0000000	CY
0.0002444	8742.1104035	35773342.	8.6147694	0.0021052	-0.0066923	3.9999989	-60.0000000	CY
0.0002494	8761.5816916	35134162.	8.5882542	0.0021417	-0.0068358	3.9961147	60.0000000	CY
0.0002544	8780.6818752	34518651.	8.5633708	0.0021783	-0.0069792	3.9990884	60.0000000	CY
0.0002594	8799.3932722	33925372.	8.5400491	0.0022151	-0.0071224	3.9993755	60.0000000	CY
0.0002644	8817.4978352	33352238.	8.5184470	0.0022521	-0.0072654	3.9956094	60.0000000	CY
0.0002694	8835.2745986	32799163.	8.4981694	0.0022892	-0.0074083	3.9987411	60.0000000	CY
0.0002744	8852.7168676	32265027.	8.4791549	0.0023265	-0.0075510	3.9999793	60.0000000	CY
0.0003044	8946.7306611	29393776.	8.3820269	0.0025513	-0.0084062	3.9974923	60.0000000	CY
0.0003344	9009.0169501	26942854.	8.2990279	0.0027750	-0.0092625	3.9997766	60.0000000	CY
0.0003644	9041.1882233	24812866.	8.2223149	0.0029960	-0.0101215	3.9999690	60.0000000	CY
0.0003944	9065.9440563	22988131.	8.1656524	0.0032203	-0.0109772	3.9997569	60.0000000	CYT
0.0004244	9086.0856220	21410511.	8.1255899	0.0034483	-0.0118292	3.9980064	60.0000000	CYT

0.0004544	9102.3279579	20032634.	8.0979152	0.0036795	-0.0126780	3.9913151	60.0000000 CYT
0.0004844	9102.3279579	18791903.	8.1152385	0.0039308	-0.0135067	3.9876989	60.0000000 CYT

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	39.800	8938.380	0.00300000
2	49.800	9041.629	0.00300000

Note note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318-08, Section
9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Axial Load No.	Resistance Factor for Moment	Nominal Moment Capacity in-kip	Ultimate (Factored) Axial Thrust kips	Ultimate (Factored) Moment Capacity in-kip	Bending Stiffness at Ult. Mom. Cap. kip-in^2
1	0.65	8938.380	25.870	5809.947	64190927.448
2	0.65	9041.629	32.370	5877.059	65140716.232
1	0.70	8938.380	27.860	6256.866	63625515.959
2	0.70	9041.629	34.860	6329.140	64483641.250
1	0.75	8938.380	29.850	6703.785	62790597.914
2	0.75	9041.629	37.350	6781.222	63633358.533

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	3.00000 ft
Shaft Diameter	=	30.00000 in
Concrete Cover Thickness	=	3.00000 in
Number of Reinforcing Bars	=	11 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	706.85835 sq. in.
Total Area of Reinforcing Steel	=	11.00000 sq. in.
Area Ratio of Steel Reinforcement	=	1.56 percent

Edge-to-Edge Bar Spacing = 5.31579 in
Maximum Concrete Aggregate Size = 0.75000 in
Ratio of Bar Spacing to Aggregate Size = 7.09
Offset of Center of Rebar Cage from Center of Pile = 0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 3025.918 kips
Tensile Load for Cracking of Concrete = -326.217 kips
Nominal Axial Tensile Capacity = -660.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.12800	1.00000	11.43600	0.00000
2	1.12800	1.00000	9.62058	6.18277
3	1.12800	1.00000	4.75069	10.40255
4	1.12800	1.00000	-1.62751	11.31960
5	1.12800	1.00000	-7.48899	8.64275
6	1.12800	1.00000	-10.97276	3.22189
7	1.12800	1.00000	-10.97276	-3.22189
8	1.12800	1.00000	-7.48899	-8.64275
9	1.12800	1.00000	-1.62751	-11.31960
10	1.12800	1.00000	4.75069	-10.40255
11	1.12800	1.00000	9.62058	-6.18277

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 5.31579 inches between Bars 8 and 9

Spacing to aggregate size ratio = 7.08772

Concrete Properties:

Compressive Strength of Concrete = 4000.00000 psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.34164 psi
Compression Strain at Peak Stress = 0.00189
Tensile Strain at Fracture of Concrete = -0.0001154
Maximum Coarse Aggregate Size = 0.75000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force kips
1	39.800
2	49.800

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 39.800 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000001250	231.7554811	185404385.	24.7811955	0.0000310	-0.000006524	0.1295157	0.8928808	
0.000002500	462.7188636	185087545.	19.9074213	0.0000498	-0.0000252	0.2067438	1.4324130	
0.000003750	692.3283859	184620903.	18.2837543	0.0000686	-0.0000439	0.2832078	1.9720458	
0.000005000	920.5462020	184109240.	17.4721541	0.0000874	-0.0000626	0.3588979	2.5117124	
0.000006250	1147.3674587	183578793.	16.9853052	0.0001062	-0.0000813	0.4338122	3.0513991	
0.000007500	1372.7909339	183038791.	16.6608109	0.0001250	-0.0001000	0.5079500	3.5911014	
0.000008750	1372.7909339	156890392.	12.0598680	0.0001055	-0.0001570	0.4297692	-4.5142460	C
0.0000100	1372.7909339	137279093.	11.6552625	0.0001166	-0.0001834	0.4730766	-5.2764739	C
0.0000113	1372.7909339	122025861.	11.3312321	0.0001275	-0.0002100	0.5157039	-6.0417480	C
0.0000125	1372.7909339	109823275.	11.0652882	0.0001383	-0.0002367	0.5577415	-6.8094580	C
0.0000138	1372.7909339	99839341.	10.8433622	0.0001491	-0.0002634	0.5992909	-7.5788968	C
0.0000150	1372.7909339	91519396.	10.6561530	0.0001598	-0.0002902	0.6404557	-8.3493234	C
0.0000163	1372.7909339	84479442.	10.4936593	0.0001705	-0.0003170	0.6811132	-9.1216755	C
0.0000175	1372.7909339	78445196.	10.3547066	0.0001812	-0.0003438	0.7215453	-9.8938613	C
0.0000188	1372.7909339	73215516.	10.2311407	0.0001918	-0.0003707	0.7615049	-10.6677547	C
0.0000200	1372.7909339	68639547.	10.1233223	0.0002025	-0.0003975	0.8012423	-11.4414730	C
0.0000213	1372.7909339	64601926.	10.0279087	0.0002131	-0.0004244	0.8407121	-12.2153637	C
0.0000225	1372.7909339	61012930.	9.9413994	0.0002237	-0.0004513	0.8797937	-12.9903618	C
0.0000238	1372.7909339	57801724.	9.8643649	0.0002343	-0.0004782	0.9186648	-13.7651061	C
0.0000250	1407.5725718	56302903.	9.7953853	0.0002449	-0.0005051	0.9573247	-14.5395956	C
0.0000263	1464.0931556	55774977.	9.7327602	0.0002555	-0.0005320	0.9957197	-15.3142487	C
0.0000275	1520.5057474	55291118.	9.6747939	0.0002661	-0.0005589	1.0337671	-16.0897268	C
0.0000288	1576.8629929	54847408.	9.6221813	0.0002766	-0.0005859	1.0716047	-16.8649438	C
0.0000300	1633.1646814	54438823.	9.5742543	0.0002872	-0.0006128	1.1092321	-17.6398987	C
0.0000313	1689.4106005	54061139.	9.5304519	0.0002978	-0.0006397	1.1466486	-18.4145904	C
0.0000325	1745.6005364	53710786.	9.4902994	0.0003084	-0.0006666	1.1838538	-19.1890177	C
0.0000338	1801.7342735	53384719.	9.4533924	0.0003191	-0.0006934	1.2208472	-19.9631796	C
0.0000350	1857.7745864	53079274.	9.4183408	0.0003296	-0.0007204	1.2575001	-20.7381340	C
0.0000363	1913.7552106	52793247.	9.3858585	0.0003402	-0.0007473	1.2939289	-21.5129286	C
0.0000375	1969.6799029	52524797.	9.3557935	0.0003508	-0.0007742	1.3301468	-22.2874495	C
0.0000388	2025.5484425	52272218.	9.3279130	0.0003615	-0.0008010	1.3661534	-23.0616951	C
0.0000400	2081.3606053	52034015.	9.3020133	0.0003721	-0.0008279	1.4019481	-23.8356645	C
0.0000413	2137.1161655	51808877.	9.2779154	0.0003827	-0.0008548	1.4375304	-24.6093561	C
0.0000425	2192.8148956	51595645.	9.2554612	0.0003934	-0.0008816	1.4728998	-25.3827689	C
0.0000438	2248.4565663	51393293.	9.2345111	0.0004040	-0.0009085	1.5080558	-26.1559015	C
0.0000450	2304.0409465	51200910.	9.2149405	0.0004147	-0.0009353	1.5429977	-26.9287526	C
0.0000463	2359.5678035	51017682.	9.1966386	0.0004253	-0.0009622	1.5777251	-27.7013209	C
0.0000475	2415.0369025	50842882.	9.1795062	0.0004360	-0.0009890	1.6122375	-28.4736051	C
0.0000488	2470.4480072	50675857.	9.1634543	0.0004467	-0.0010158	1.6465342	-29.2456038	C
0.0000513	2581.0789175	50362515.	9.1337347	0.0004681	-0.0010694	1.7143892	-30.7895492	C

0.0000538	2691.4636956	50073743.	9.1071202	0.0004895	-0.0011230	1.7813094	-32.3329637	C
0.0000563	2801.6140220	49806472.	9.0836067	0.0005110	-0.0011765	1.8473640	-33.8751789	C
0.0000588	2911.5278721	49557921.	9.0628052	0.0005324	-0.0012301	1.9125484	-35.4161830	C
0.0000613	3021.2031862	49325766.	9.0443905	0.0005540	-0.0012835	1.9768578	-36.9559636	C
0.0000638	3130.6378701	49108045.	9.0280887	0.0005755	-0.0013370	2.0402876	-38.4945084	C
0.0000663	3239.8297936	48903091.	9.0136669	0.0005972	-0.0013903	2.1028329	-40.0318047	C
0.0000688	3348.7767898	48709481.	9.0009268	0.0006188	-0.0014437	2.1644889	-41.5678396	C
0.0000713	3457.4766544	48525988.	8.9896975	0.0006405	-0.0014970	2.2252505	-43.1025999	C
0.0000738	3565.9271443	48351554.	8.9798317	0.0006623	-0.0015502	2.2851127	-44.6360722	C
0.0000763	3674.1259771	48185259.	8.9712015	0.0006841	-0.0016034	2.3440705	-46.1682430	C
0.0000788	3782.0703999	48026291.	8.9636953	0.0007059	-0.0016566	2.4021183	-47.6991003	C
0.0000813	3889.7589962	47873957.	8.9572154	0.0007278	-0.0017097	2.4592515	-49.2286253	C
0.0000838	3997.1888259	47727628.	8.9516758	0.0007497	-0.0017628	2.5154643	-50.7568061	C
0.0000863	4104.3574382	47586753.	8.9470006	0.0007717	-0.0018158	2.5707513	-52.2836279	C
0.0000888	4211.2623367	47450843.	8.9431228	0.0007937	-0.0018688	2.6251071	-53.8090758	C
0.0000913	4317.9009786	47319463.	8.9399825	0.0008158	-0.0019217	2.6785259	-55.3331342	C
0.0000938	4424.2707729	47192222.	8.9375265	0.0008379	-0.0019746	2.7310020	-56.8557874	C
0.0000963	4530.3690792	47068770.	8.9357073	0.0008601	-0.0020274	2.7825296	-58.3770195	C
0.0000988	4636.1932066	46948792.	8.9344821	0.0008823	-0.0020802	2.8331029	-59.8968142	C
0.0001013	4741.7404119	46832004.	8.9338127	0.0009045	-0.0021330	2.8827158	-60.0000000	CY
0.0001038	4847.0078982	46718148.	8.9336647	0.0009269	-0.0021856	2.9313622	-60.0000000	CY
0.0001063	4951.9928136	46606991.	8.9340067	0.0009492	-0.0022383	2.9790358	-60.0000000	CY
0.0001088	5056.6922490	46498320.	8.9348107	0.0009717	-0.0022908	3.0257304	-60.0000000	CY
0.0001113	5161.1032372	46391939.	8.9360511	0.0009941	-0.0023434	3.0714395	-60.0000000	CY
0.0001138	5265.2227504	46287673.	8.9377049	0.0010167	-0.0023958	3.1161565	-60.0000000	CY
0.0001163	5368.3272601	46179159.	8.9393611	0.0010392	-0.0024483	3.1597866	-60.0000000	CY
0.0001188	5465.9525896	46029074.	8.9386116	0.0010615	-0.0025010	3.2017870	-60.0000000	CY
0.0001213	5554.7859356	45812668.	8.9337406	0.0010832	-0.0025543	3.2417810	-60.0000000	CY
0.0001238	5634.5991463	45532114.	8.9247217	0.0011044	-0.0026081	3.2797802	-60.0000000	CY
0.0001263	5705.5515688	45192488.	8.9117254	0.0011251	-0.0026624	3.3158429	-60.0000000	CY
0.0001288	5768.8979958	44806975.	8.8955157	0.0011453	-0.0027172	3.3501613	-60.0000000	CY
0.0001313	5827.9440308	44403383.	8.8779771	0.0011652	-0.0027723	3.3831713	-60.0000000	CY
0.0001338	5886.5336670	44011467.	8.8612292	0.0011852	-0.0028273	3.4153501	-60.0000000	CY
0.0001363	5943.9646594	43625429.	8.8446209	0.0012051	-0.0028824	3.4465649	-60.0000000	CY
0.0001388	5997.5223228	43225386.	8.8263067	0.0012247	-0.0029378	3.4764329	-60.0000000	CY
0.0001413	6045.3137431	42798681.	8.8056507	0.0012438	-0.0029937	3.5048424	-60.0000000	CY
0.0001438	6087.8617869	42350343.	8.7829919	0.0012626	-0.0030499	3.5318921	-60.0000000	CY
0.0001463	6127.2361793	41895632.	8.7595672	0.0012811	-0.0031064	3.5578643	-60.0000000	CY
0.0001488	6166.4235259	41454948.	8.7371190	0.0012996	-0.0031629	3.5831339	-60.0000000	CY
0.0001588	6321.6139611	39821190.	8.6563710	0.0013742	-0.0033883	3.6771548	-60.0000000	CY
0.0001688	6450.9843649	38228055.	8.5744152	0.0014469	-0.0036156	3.7572801	-60.0000000	CY
0.0001788	6546.4390697	36623435.	8.4829839	0.0015163	-0.0038462	3.8230356	-60.0000000	CY
0.0001888	6639.5957487	35176666.	8.4023803	0.0015859	-0.0040766	3.8785836	-60.0000000	CY
0.0001988	6731.1868986	33867607.	8.3324035	0.0016561	-0.0043064	3.9239920	-60.0000000	CY
0.0002088	6811.2258396	32628627.	8.2650209	0.0017253	-0.0045372	3.9584443	-60.0000000	CY
0.0002188	6867.9715374	31396441.	8.1886608	0.0017913	-0.0047712	3.9816342	-60.0000000	CY
0.0002288	6916.9886739	30238202.	8.1158119	0.0018565	-0.0050060	3.9953820	-60.0000000	CY
0.0002388	6964.7986221	29171931.	8.0510038	0.0019222	-0.0052403	3.9999706	-60.0000000	CY
0.0002488	7011.3249451	28186231.	7.9935226	0.0019884	-0.0054741	3.9998916	-60.0000000	CY
0.0002588	7056.4512776	27271309.	7.9420863	0.0020550	-0.0057075	3.9992793	-60.0000000	CY
0.0002688	7099.8804312	26418160.	7.8938354	0.0021215	-0.0059410	3.9975176	60.0000000	CY
0.0002788	7139.9575393	25614197.	7.8490233	0.0021879	-0.0061746	3.9971918	60.0000000	CY
0.0002888	7173.0897059	24841869.	7.8041984	0.0022535	-0.0064090	3.9994247	60.0000000	CY
0.0002988	7198.7975092	24096393.	7.7583214	0.0023178	-0.0066447	3.9957604	60.0000000	CY
0.0003088	7219.3551795	23382527.	7.7128554	0.0023813	-0.0068812	3.9997680	60.0000000	CY
0.0003188	7237.5531264	22706049.	7.6700941	0.0024448	-0.0071177	3.9955393	60.0000000	CY
0.0003288	7254.9722691	22068357.	7.6293836	0.0025082	-0.0073543	3.9995867	60.0000000	CY
0.0003388	7271.5803745	21465920.	7.5906441	0.0025713	-0.0075912	3.9933124	60.0000000	CY
0.0003488	7287.7516134	20896779.	7.5550850	0.0026348	-0.0078277	3.9985331	60.0000000	CY
0.0003588	7303.5708575	20358386.	7.5223150	0.0026986	-0.0080639	3.9983784	60.0000000	CY

0.0003688	7318.8814721	19847814.	7.4923758	0.0027628	-0.0082997	3.9954282	60.0000000	CY
0.0003788	7333.9275875	19363505.	7.4646498	0.0028272	-0.0085353	3.9993059	60.0000000	CY
0.0003888	7348.6181148	18903198.	7.4391272	0.0028920	-0.0087705	3.9954924	60.0000000	CY
0.0003988	7362.9282353	18465024.	7.4156891	0.0029570	-0.0090055	3.9951470	60.0000000	CY
0.0004088	7377.0199744	18047755.	7.3939208	0.0030223	-0.0092402	3.9990582	60.0000000	CYT
0.0004188	7390.7214383	17649484.	7.3736677	0.0030877	-0.0094748	3.9974871	60.0000000	CYT
0.0004288	7404.0519305	17268926.	7.3551128	0.0031535	-0.0097090	3.9921938	60.0000000	CYT
0.0004388	7415.3193534	16901013.	7.3344624	0.0032180	-0.0099445	3.9971513	60.0000000	CYT
0.0004488	7425.8401746	16547833.	7.3139973	0.0032822	-0.0101803	3.9996487	60.0000000	CYT
0.0004588	7435.0316166	16207153.	7.2935777	0.0033459	-0.0104166	3.9954240	60.0000000	CYT
0.0004688	7442.2467246	15876793.	7.2723043	0.0034089	-0.0106536	3.9899464	60.0000000	CYT
0.0004788	7449.3757584	15560054.	7.2521989	0.0034720	-0.0108905	3.9951076	60.0000000	CYT
0.0004888	7454.4779387	15252129.	7.2306694	0.0035340	-0.0111285	3.9983363	60.0000000	CYT
0.0004988	7458.9673669	14955323.	7.2095665	0.0035958	-0.0113667	3.9998593	60.0000000	CYT
0.0005088	7463.3125393	14669902.	7.1897193	0.0036578	-0.0116047	3.9948860	60.0000000	CYT
0.0005188	7466.6530795	14393548.	7.1703047	0.0037196	-0.0118429	3.9863187	60.0000000	CYT
0.0005288	7469.7646557	14127214.	7.1520274	0.0037816	-0.0120809	3.9914027	60.0000000	CYT
0.0005388	7472.8268663	13870676.	7.1346160	0.0038438	-0.0123187	3.9955650	60.0000000	CYT

Axial Thrust Force = 49.800 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000001250	231.4390924	185151274.	27.2441094	0.0000341	-0.000003445	0.1423490	0.9821615	
0.000002500	462.3237690	184929508.	21.1418537	0.0000529	-0.0000221	0.2194789	1.5219094	
0.000003750	691.9147356	184510596.	19.1094580	0.0000717	-0.0000408	0.2958559	2.0618411	
0.000005000	920.1238339	184024767.	18.0936632	0.0000905	-0.0000595	0.3714616	2.6018312	
0.000006250	1146.9392050	183510273.	17.4843611	0.0001093	-0.0000782	0.4462920	3.1418530	
0.000007500	1372.3579100	182981055.	17.0782646	0.0001281	-0.0000969	0.5203459	3.6818976	
0.000008750	1372.3579100	156840904.	12.8497942	0.0001124	-0.0001501	0.4574103	-4.3138022	C
0.0000100	1372.3579100	137235791.	12.3741670	0.0001237	-0.0001763	0.5016487	-5.0679916	C
0.0000113	1372.3579100	121987370.	11.9907214	0.0001349	-0.0002026	0.5450099	-5.8265896	C
0.0000125	1372.3579100	109788633.	11.6754450	0.0001459	-0.0002291	0.5876836	-6.5882762	C
0.0000138	1372.3579100	99807848.	11.4113816	0.0001569	-0.0002556	0.6297650	-7.3523990	C
0.0000150	1372.3579100	91490527.	11.1873097	0.0001678	-0.0002822	0.6713521	-8.1182703	C
0.0000163	1372.3579100	84452794.	10.9943357	0.0001787	-0.0003088	0.7124701	-8.8857317	C
0.0000175	1372.3579100	78420452.	10.8258321	0.0001895	-0.0003355	0.7531255	-9.6547652	C
0.0000188	1372.3579100	73192422.	10.6791140	0.0002002	-0.0003623	0.7934795	-10.4241692	C
0.0000200	1372.3579100	68617896.	10.5481451	0.0002110	-0.0003890	0.8333855	-11.1950758	C
0.0000213	1372.3579100	64581549.	10.4322083	0.0002217	-0.0004158	0.8730118	-11.9662141	C
0.0000225	1372.3579100	60993685.	10.3288977	0.0002324	-0.0004426	0.9123671	-12.7375192	C
0.0000238	1415.8691549	59615543.	10.2345239	0.0002431	-0.0004694	0.9513027	-13.5101591	C
0.0000250	1472.5017193	58900069.	10.1499392	0.0002537	-0.0004963	0.9900236	-14.2825440	C
0.0000263	1529.0765599	58250536.	10.0737465	0.0002644	-0.0005231	1.0285294	-15.0546729	C
0.0000275	1585.5245685	57655439.	10.0033391	0.0002751	-0.0005499	1.0666733	-15.8277120	C
0.0000288	1641.8810908	57108908.	9.9386648	0.0002857	-0.0005768	1.1045303	-16.6010756	C
0.0000300	1698.1805977	56606020.	9.8796800	0.0002964	-0.0006036	1.1421738	-17.3741783	C
0.0000313	1754.4228748	56141532.	9.8257030	0.0003071	-0.0006304	1.1796031	-18.1470190	C
0.0000325	1810.6077040	55711006.	9.7761573	0.0003177	-0.0006573	1.2168178	-18.9195967	C
0.0000338	1866.7057163	55309799.	9.7299013	0.0003284	-0.0006841	1.2537403	-19.6925465	C
0.0000350	1922.7090340	54934544.	9.6864034	0.0003390	-0.0007110	1.2903495	-20.4660505	C
0.0000363	1978.6553945	54583597.	9.6461621	0.0003497	-0.0007378	1.3267453	-21.2392845	C
0.0000375	2034.5445757	54254522.	9.6088529	0.0003603	-0.0007647	1.3629272	-22.0122473	C
0.0000388	2090.3763530	53945196.	9.5741931	0.0003710	-0.0007915	1.3988947	-22.7849379	C
0.0000400	2146.1505003	53653763.	9.5419352	0.0003817	-0.0008183	1.4346473	-23.5573550	C
0.0000413	2201.8667897	53378589.	9.5118621	0.0003924	-0.0008451	1.4701844	-24.3294974	C
0.0000425	2257.5249918	53118235.	9.4837818	0.0004031	-0.0008719	1.5055055	-25.1013638	C

0.0000438	2313.1248753	52871426.	9.4575245	0.0004138	-0.0008987	1.5406101	-25.8729531	C
0.0000450	2368.6416855	52636482.	9.4323485	0.0004245	-0.0009255	1.5754098	-26.6450351	C
0.0000463	2424.0900078	52412757.	9.4085000	0.0004351	-0.0009524	1.6099565	-27.4171618	C
0.0000475	2479.4802032	52199583.	9.3861147	0.0004458	-0.0009792	1.6442875	-28.1890019	C
0.0000488	2534.8120330	51996144.	9.3650810	0.0004565	-0.0010060	1.6784022	-28.9605540	C
0.0000513	2645.2996272	51615602.	9.3266768	0.0004780	-0.0010595	1.7459806	-30.5027890	C
0.0000538	2755.5508345	51266062.	9.2925946	0.0004995	-0.0011130	1.8126872	-32.0438555	C
0.0000563	2865.5636676	50943354.	9.2622651	0.0005210	-0.0011665	1.8785175	-33.5837424	C
0.0000588	2975.3361071	50644019.	9.2352159	0.0005426	-0.0012199	1.9434669	-35.1224382	C
0.0000613	3084.8661006	50365161.	9.2110520	0.0005642	-0.0012733	2.0075307	-36.6599313	C
0.0000638	3194.1515620	50104338.	9.1894402	0.0005858	-0.0013267	2.0707042	-38.1962097	C
0.0000663	3303.1903706	49859477.	9.1700981	0.0006075	-0.0013800	2.1329825	-39.7312614	C
0.0000688	3411.9803702	49628805.	9.1527841	0.0006293	-0.0014332	2.1943609	-41.2650740	C
0.0000713	3520.5056379	49410605.	9.1368365	0.0006510	-0.0014865	2.2547436	-42.7985739	C
0.0000738	3628.7766336	49203751.	9.1224859	0.0006728	-0.0015397	2.3142042	-44.3309705	C
0.0000763	3736.7940502	49007135.	9.1096711	0.0006946	-0.0015929	2.3727570	-45.8620520	C
0.0000788	3844.5555276	48819753.	9.0982519	0.0007165	-0.0016460	2.4303966	-47.3918044	C
0.0000813	3952.0586619	48640722.	9.0881057	0.0007384	-0.0016991	2.4871177	-48.9202131	C
0.0000838	4059.3010051	48469266.	9.0791246	0.0007604	-0.0017521	2.5429149	-50.4472634	C
0.0000863	4166.2800639	48304696.	9.0712132	0.0007824	-0.0018051	2.5977827	-51.9729401	C
0.0000888	4272.9928413	48146398.	9.0642872	0.0008045	-0.0018580	2.6517152	-53.4972304	C
0.0000913	4379.4377585	47993838.	9.0582715	0.0008266	-0.0019109	2.7047073	-55.0201132	C
0.0000938	4485.6116147	47846524.	9.0530991	0.0008487	-0.0019638	2.7567528	-56.5415756	C
0.0000963	4591.5117239	47704018.	9.0487102	0.0008709	-0.0020166	2.8078459	-58.0616011	C
0.0000988	4697.1353479	47565928.	9.0450511	0.0008932	-0.0020693	2.8579805	-59.5801731	C
0.0001013	4802.4796949	47431898.	9.0420735	0.0009155	-0.0021220	2.9071506	-60.0000000	CY
0.0001038	4907.5419180	47301609.	9.0397341	0.0009379	-0.0021746	2.9553500	-60.0000000	CY
0.0001063	5012.3191135	47174768.	9.0379934	0.0009603	-0.0022272	3.0025724	-60.0000000	CY
0.0001088	5116.8083191	47051111.	9.0368161	0.0009828	-0.0022797	3.0488113	-60.0000000	CY
0.0001113	5221.0065125	46930396.	9.0361698	0.0010053	-0.0023322	3.0940602	-60.0000000	CY
0.0001138	5324.9106092	46812401.	9.0360253	0.0010278	-0.0023847	3.1383125	-60.0000000	CY
0.0001163	5428.4146978	46696040.	9.0363000	0.0010505	-0.0024370	3.1815488	-60.0000000	CY
0.0001188	5527.5913128	46548137.	9.0348540	0.0010729	-0.0024896	3.2232931	-60.0000000	CY
0.0001213	5618.1638032	46335372.	9.0294219	0.0010948	-0.0025427	3.2630518	-60.0000000	CY
0.0001238	5699.8999819	46059798.	9.0199703	0.0011162	-0.0025963	3.3008366	-60.0000000	CY
0.0001263	5773.4509849	45730305.	9.0069430	0.0011371	-0.0026504	3.3367659	-60.0000000	CY
0.0001288	5838.9418873	45351005.	8.9904753	0.0011575	-0.0027050	3.3708932	-60.0000000	CY
0.0001313	5898.1224820	44938076.	8.9715927	0.0011775	-0.0027600	3.4034653	-60.0000000	CY
0.0001338	5956.5549000	44534990.	8.9533963	0.0011975	-0.0028150	3.4351675	-60.0000000	CY
0.0001363	6014.5821323	44143722.	8.9360285	0.0012175	-0.0028700	3.4660381	-60.0000000	CY
0.0001388	6069.8813546	43746893.	8.9181492	0.0012374	-0.0029251	3.4958036	-60.0000000	CY
0.0001413	6119.5993150	43324597.	8.8981515	0.0012569	-0.0029806	3.5241472	-60.0000000	CY
0.0001438	6163.2601749	42874853.	8.8757893	0.0012759	-0.0030366	3.5510461	-60.0000000	CY
0.0001463	6202.9553020	42413370.	8.8522685	0.0012946	-0.0030929	3.5767745	-60.0000000	CY
0.0001488	6242.0361143	41963268.	8.8286423	0.0013133	-0.0031492	3.6015654	-60.0000000	CY
0.0001588	6396.9753031	40295907.	8.7433584	0.0013880	-0.0033745	3.6935793	-60.0000000	CY
0.0001688	6529.7887116	38695044.	8.6595876	0.0014613	-0.0036012	3.7720638	-60.0000000	CY
0.0001788	6626.8129798	37073080.	8.5683543	0.0015316	-0.0038309	3.8363868	-60.0000000	CY
0.0001888	6719.6395769	35600739.	8.4850462	0.0016016	-0.0040609	3.8898393	-60.0000000	CY
0.0001988	6810.7666409	34268008.	8.4118691	0.0016719	-0.0042906	3.9329452	-60.0000000	CY
0.0002088	6892.4498126	33017724.	8.3429988	0.0017416	-0.0045209	3.9651831	-60.0000000	CY
0.0002188	6952.5842225	31783242.	8.2694620	0.0018089	-0.0047536	3.9863626	-60.0000000	CY
0.0002288	7001.4442842	30607407.	8.1951145	0.0018746	-0.0049879	3.9976262	-60.0000000	CY
0.0002388	7048.7244124	29523453.	8.1278916	0.0019405	-0.0052220	3.9968213	-60.0000000	CY
0.0002488	7094.7286872	28521522.	8.0682060	0.0020070	-0.0054555	3.9972542	-60.0000000	CY
0.0002588	7139.4286382	27591995.	8.0152469	0.0020739	-0.0056886	3.9999541	-60.0000000	CY
0.0002688	7182.8258788	26726794.	7.9682978	0.0021415	-0.0059210	3.9991818	60.0000000	CY
0.0002788	7223.4817866	25913836.	7.9238417	0.0022088	-0.0061537	3.9967445	60.0000000	CY
0.0002888	7257.9015344	25135590.	7.8786780	0.0022750	-0.0063875	3.9999986	60.0000000	CY
0.0002988	7284.8350212	24384385.	7.8327051	0.0023400	-0.0066225	3.9982736	60.0000000	CY

0.0003088	7305.9560485	23663016.	7.7864224	0.0024041	-0.0068584	3.9973822	60.0000000 CY
0.0003188	7323.7688392	22976530.	7.7420874	0.0024678	-0.0070947	3.9981974	60.0000000 CY
0.0003288	7341.1418494	22330470.	7.7014109	0.0025318	-0.0073307	3.9985874	60.0000000 CY
0.0003388	7357.8909541	21720711.	7.6643585	0.0025963	-0.0075662	3.9969417	60.0000000 CY
0.0003488	7373.9998677	21144086.	7.6285097	0.0026604	-0.0078021	3.9998757	60.0000000 CY
0.0003588	7389.4016245	20597635.	7.5945815	0.0027246	-0.0080379	3.9934161	60.0000000 CY
0.0003688	7404.4719819	20079924.	7.5632611	0.0027890	-0.0082735	3.9984080	60.0000000 CY
0.0003788	7419.2624404	19588812.	7.5342639	0.0028536	-0.0085089	3.9995237	60.0000000 CY
0.0003888	7433.5761288	19121739.	7.5077583	0.0029186	-0.0087439	3.9935802	60.0000000 CY
0.0003988	7447.6715753	18677546.	7.4831229	0.0029839	-0.0089786	3.9983064	60.0000000 CY
0.0004088	7461.5434931	18254541.	7.4602330	0.0030494	-0.0092131	3.9999962	60.0000000 CYT
0.0004188	7474.9340960	17850589.	7.4392454	0.0031152	-0.0094473	3.9908635	60.0000000 CYT
0.0004288	7488.0773035	17464903.	7.4196284	0.0031812	-0.0096813	3.9965162	60.0000000 CYT
0.0004388	7500.4632077	17095073.	7.4006730	0.0032470	-0.0099155	3.9994905	60.0000000 CYT
0.0004488	7510.9865212	16737574.	7.3812697	0.0033123	-0.0101502	3.9960774	60.0000000 CYT
0.0004588	7521.2595666	16395116.	7.3632846	0.0033779	-0.0103846	3.9906798	60.0000000 CYT
0.0004688	7529.1168649	16062116.	7.3430981	0.0034421	-0.0106204	3.9957643	60.0000000 CYT
0.0004788	7536.1084342	15741219.	7.3219395	0.0035054	-0.0108571	3.9988067	60.0000000 CYT
0.0004888	7542.6656208	15432564.	7.3014766	0.0035686	-0.0110939	3.9999832	60.0000000 CYT
0.0004988	7546.9253990	15131680.	7.2795982	0.0036307	-0.0113318	3.9925566	60.0000000 CYT
0.0005088	7550.9123391	14842088.	7.2592875	0.0036932	-0.0115693	3.9885498	60.0000000 CYT
0.0005188	7554.5813660	14563048.	7.2399171	0.0037557	-0.0118068	3.9935276	60.0000000 CYT
0.0005288	7557.5906687	14293316.	7.2206440	0.0038179	-0.0120446	3.9970566	60.0000000 CYT

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 2

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	39.800	7372.212	0.00300000
2	49.800	7451.084	0.00300000

Note note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318-08, Section
9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Axial Load No.	Resistance Factor for Moment	Nominal Moment Capacity in-kip	Ultimate (Factored) Axial Thrust kips	Ultimate (Factored) Moment Capacity in-kip	Bending Stiffness at Ult. Mom. Cap. kip-in^2
1	0.65	7372.212	25.870	4791.938	46777711.449
2	0.65	7451.084	32.370	4843.204	47381395.126
1	0.70	7372.212	27.860	5160.548	46392504.495

2	0.70	7451.084	34.860	5215.758	46936475.589
1	0.75	7372.212	29.850	5529.159	45875097.016
2	0.75	7451.084	37.350	5588.313	46405495.402

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 9000.0 lbs
Applied moment at pile head = 2518800.0 in-lbs
Axial thrust load on pile head = 39800.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.1828	2518800.	9000.0000	-0.003418	0.000	8.920E+10	0.000	0.000	0.000
0.198	0.1747	2540504.	8961.5982	-0.003351	0.000	8.920E+10	-32.3247	439.5268	0.000
0.396	0.1669	2562019.	8845.2149	-0.003274	0.000	7.196E+10	-65.6410	934.6898	0.000
0.594	0.1592	2583156.	8648.8920	-0.003189	0.000	7.185E+10	-99.6140	1486.8776	0.000
0.792	0.1517	2603722.	8371.4596	-0.003104	0.000	7.175E+10	-133.9149	2097.3811	0.000
0.990	0.1444	2623524.	8012.5207	-0.003017	0.000	7.165E+10	-168.2222	2767.3545	0.000
1.188	0.1374	2642368.	7572.4332	-0.002930	0.000	7.156E+10	-202.2219	3497.7690	0.000
1.386	0.1305	2660062.	7052.2903	-0.002842	0.000	7.148E+10	-235.6088	4289.3567	0.000
1.584	0.1239	2676418.	6453.1161	-0.002753	0.000	7.140E+10	-268.7465	5155.1846	0.000
1.782	0.1174	2691248.	5775.1002	-0.002664	0.000	7.133E+10	-301.9739	6109.9896	0.000
1.980	0.1112	2704365.	5019.1818	-0.002574	0.000	7.127E+10	-334.3211	7142.9563	0.000
2.178	0.1052	2715586.	4187.7038	-0.002483	0.000	7.122E+10	-365.5763	8256.8019	0.000
2.376	0.0994	2724735.	3298.8366	-0.002392	0.000	7.118E+10	-382.6284	9145.5091	0.000
2.574	0.0938	2731715.	2379.4557	-0.002301	0.000	7.114E+10	-391.2612	9907.6349	0.000
2.772	0.0885	2736477.	1442.6568	-0.002210	0.000	7.112E+10	-397.2901	10670.	0.000
2.970	0.0833	2738988.	494.3765	-0.002119	0.000	7.111E+10	-400.9257	11432.	0.000
3.168	0.0784	2739227.	-459.9485	-0.002027	0.000	7.111E+10	-402.3783	12194.	0.000
3.366	0.0737	2737186.	-1415.3803	-0.001936	0.000	7.112E+10	-401.8572	12956.	0.000
3.564	0.0692	2732867.	-2367.4766	-0.001844	0.000	7.114E+10	-399.5707	13718.	0.000
3.762	0.0649	2726284.	-3312.2882	-0.001753	0.000	7.117E+10	-395.7253	14480.	0.000
3.960	0.0609	2717459.	-4246.3545	-0.001662	0.000	7.121E+10	-390.5258	15243.	0.000
4.158	0.0570	2706420.	-4983.0980	-0.001572	0.000	7.126E+10	-229.6287	9566.2849	0.000
4.356	0.0534	2694076.	-5523.4061	-0.001482	0.000	7.132E+10	-225.1760	10018.	0.000
4.554	0.0500	2680453.	-6052.6128	-0.001392	0.000	7.138E+10	-220.2841	10470.	0.000
4.752	0.0468	2665578.	-6569.8121	-0.001303	0.000	7.145E+10	-215.0688	10921.	0.000
4.950	0.0438	2649480.	-7074.3713	-0.001215	0.000	7.153E+10	-209.6443	11373.	0.000
5.148	0.0410	2632190.	-7565.9272	-0.001127	0.000	7.161E+10	-204.1233	11824.	0.000
5.346	0.0384	2613740.	-8044.3823	-0.001040	0.000	7.170E+10	-198.6167	12276.	0.000
5.544	0.0361	2594160.	-8509.9004	-0.000954	0.000	7.180E+10	-193.2336	12728.	0.000
5.742	0.0339	2573481.	-8962.9027	-0.000869	0.000	7.190E+10	-188.0814	13179.	0.000
5.940	0.0319	2551732.	-9404.0626	-0.000784	0.000	7.201E+10	-183.2653	13631.	0.000
6.138	0.0302	2528941.	-9834.3015	-0.000700	0.000	7.213E+10	-178.8886	14083.	0.000
6.336	0.0286	2505132.	-10255.	-0.000617	0.000	7.227E+10	-175.0524	14534.	0.000
6.534	0.0272	2480327.	-10667.	-0.000556	0.000	1.451E+11	-171.8555	14986.	0.000
6.732	0.0260	2454548.	-11072.	-0.000526	0.000	3.122E+11	-168.7651	15437.	0.000
6.930	0.0247	2427815.	-11469.	-0.000509	0.000	3.598E+11	-165.4877	15889.	0.000
7.128	0.0236	2400146.	-11858.	-0.000493	0.000	3.599E+11	-162.0052	16341.	0.000

7.326	0.0224	2371560.	-12238.	-0.000477	0.000	3.600E+11	-158.3363	16792.	0.000
7.524	0.0213	2342079.	-12610.	-0.000462	0.000	3.601E+11	-154.4991	17244.	0.000
7.722	0.0202	2311725.	-12972.	-0.000446	0.000	3.602E+11	-150.5113	17696.	0.000
7.920	0.0192	2280520.	-13325.	-0.000431	0.000	3.603E+11	-146.3901	18147.	0.000
8.118	0.0182	2248486.	-13668.	-0.000416	0.000	3.604E+11	-142.1523	18599.	0.000
8.316	0.0172	2215649.	-14000.	-0.000402	0.000	3.605E+11	-137.8141	19051.	0.000
8.514	0.0163	2182032.	-14323.	-0.000387	0.000	3.606E+11	-133.3913	19502.	0.000
8.712	0.0153	2147661.	-14634.	-0.000373	0.000	3.607E+11	-128.8993	19954.	0.000
8.910	0.0145	2112561.	-14935.	-0.000359	0.000	3.608E+11	-124.3527	20405.	0.000
9.108	0.0136	2076758.	-15225.	-0.000345	0.000	3.609E+11	-119.7658	20857.	0.000
9.306	0.0128	2040277.	-15504.	-0.000331	0.000	3.611E+11	-115.1524	21309.	0.000
9.504	0.0121	2003145.	-15772.	-0.000318	0.000	3.612E+11	-110.5257	21760.	0.000
9.702	0.0113	1965387.	-16029.	-0.000305	0.000	3.613E+11	-105.8983	22212.	0.000
9.900	0.0106	1927031.	-16275.	-0.000292	0.000	3.614E+11	-101.2824	22664.	0.000
10.098	0.009939	1888101.	-16511.	-0.000280	0.000	3.615E+11	-96.6896	23115.	0.000
10.296	0.009289	1848625.	-16735.	-0.000268	0.000	3.617E+11	-92.1308	23567.	0.000
10.494	0.008667	1808627.	-16949.	-0.000256	0.000	3.618E+11	-87.6166	24018.	0.000
10.692	0.008074	1768134.	-17151.	-0.000244	0.000	3.619E+11	-83.1569	24470.	0.000
10.890	0.007509	1727170.	-17344.	-0.000232	0.000	3.620E+11	-78.7611	24922.	0.000
11.088	0.006970	1685760.	-17526.	-0.000221	0.000	3.621E+11	-74.4380	25373.	0.000
11.286	0.006458	1643929.	-17698.	-0.000210	0.000	3.623E+11	-70.1957	25825.	0.000
11.484	0.005972	1601701.	-17859.	-0.000200	0.000	3.624E+11	-66.0421	26277.	0.000
11.682	0.005510	1559099.	-18012.	-0.000189	0.000	3.625E+11	-61.9841	26728.	0.000
11.880	0.005073	1516146.	-18154.	-0.000179	0.000	3.627E+11	-58.0284	27180.	0.000
12.078	0.004659	1472864.	-18287.	-0.000169	0.000	3.628E+11	-54.1808	27631.	0.000
12.276	0.004268	1429276.	-18412.	-0.000160	0.000	3.629E+11	-50.4469	28083.	0.000
12.474	0.003900	1385402.	-18527.	-0.000151	0.000	3.631E+11	-46.8314	28535.	0.000
12.672	0.003552	1341263.	-18634.	-0.000142	0.000	3.632E+11	-43.3385	28986.	0.000
12.870	0.003226	1296878.	-18733.	-0.000133	0.000	3.633E+11	-39.9720	29438.	0.000
13.068	0.002920	1252267.	-18825.	-0.000125	0.000	3.634E+11	-36.7350	29890.	0.000
13.266	0.002634	1207447.	-18908.	-0.000117	0.000	3.636E+11	-33.6300	30341.	0.000
13.464	0.002366	1162437.	-18984.	-0.000109	0.000	3.637E+11	-30.6591	30793.	0.000
13.662	0.002116	1117254.	-19054.	-0.000101	0.000	3.639E+11	-27.8235	31245.	0.000
13.860	0.001883	1071912.	-19117.	-9.435E-05	0.000	3.640E+11	-25.1242	31696.	0.000
14.058	0.001667	1026428.	-19174.	-8.750E-05	0.000	3.641E+11	-22.5615	32148.	0.000
14.256	0.001468	980816.	-19224.	-8.096E-05	0.000	3.642E+11	-20.1351	32599.	0.000
14.454	0.001283	935090.	-19269.	-7.471E-05	0.000	3.644E+11	-17.8441	33051.	0.000
14.652	0.001113	889262.	-19309.	-6.876E-05	0.000	3.645E+11	-15.6871	33503.	0.000
14.850	0.000956	843346.	-19344.	-6.312E-05	0.000	3.646E+11	-13.6623	33954.	0.000
15.048	0.000813	797351.	-19374.	-5.777E-05	0.000	3.647E+11	-11.7670	34406.	0.000
15.246	0.000682	751290.	-19400.	-5.273E-05	0.000	3.649E+11	-9.9982	34858.	0.000
15.444	0.000562	705172.	-19422.	-4.799E-05	0.000	3.650E+11	-8.3524	35309.	0.000
15.642	0.000453	659006.	-19440.	-4.355E-05	0.000	3.651E+11	-6.8253	35761.	0.000
15.840	0.000355	612801.	-19455.	-3.941E-05	0.000	3.652E+11	-5.4122	36212.	0.000
16.038	0.000266	566566.	-19466.	-3.557E-05	0.000	3.653E+11	-4.1078	36664.	0.000
16.236	0.000186	520307.	-19474.	-3.204E-05	0.000	3.654E+11	-2.9065	37116.	0.000
16.434	0.000114	474031.	-19480.	-2.881E-05	0.000	3.656E+11	-1.8017	37567.	0.000
16.632	4.916E-05	427744.	-19483.	-2.588E-05	0.000	3.657E+11	-0.7867	38019.	0.000
16.830	-9.021E-06	381453.	-19441.	-2.204E-05	0.000	1.852E+11	36.0826	9504000.	0.000
17.028	-5.557E-05	335365.	-19134.	-1.744E-05	0.000	1.852E+11	222.2971	9504000.	0.000
17.226	-9.191E-05	290532.	-18433.	-1.343E-05	0.000	1.853E+11	367.6221	9504000.	0.000
17.424	-0.000119	247774.	-17429.	-9.977E-06	0.000	1.854E+11	477.5370	9504000.	0.000
17.622	-0.000139	207711.	-16200.	-7.058E-06	0.000	1.854E+11	557.2674	9504000.	0.000
17.820	-0.000153	170794.	-14811.	-4.633E-06	0.000	1.854E+11	611.6994	9504000.	0.000
18.018	-0.000161	137330.	-13318.	-2.659E-06	0.000	1.854E+11	645.3294	9504000.	0.000
18.216	-0.000166	107509.	-11764.	-1.090E-06	0.000	1.854E+11	662.2331	9504000.	0.000
18.414	-0.000167	81427.	-10186.	1.209E-07	0.000	1.854E+11	666.0426	9504000.	0.000
18.612	-0.000165	59104.	-8610.9850	1.021E-06	0.000	1.854E+11	659.9346	9504000.	0.000
18.810	-0.000162	40507.	-7058.7886	1.660E-06	0.000	1.854E+11	646.6280	9504000.	0.000
19.008	-0.000157	25561.	-5544.0698	2.083E-06	0.000	1.854E+11	628.3878	9504000.	0.000

19.206	-0.000152	14161.	-4076.3882	2.338E-06	0.000	1.854E+11	607.0344	9504000.	0.000
19.404	-0.000146	6189.1185	-2661.4913	2.468E-06	0.000	1.854E+11	583.9562	9504000.	0.000
19.602	-0.000140	1513.5042	-1302.3237	2.517E-06	0.000	1.854E+11	560.1242	9504000.	0.000
19.800	-0.000134	0.000	0.000	2.527E-06	0.000	1.854E+11	536.1079	4752000.	0.000

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.1827829 inches
Computed slope at pile head = -0.0034180 radians
Maximum bending moment = 2739227. inch-lbs
Maximum shear force = -19483. lbs
Depth of maximum bending moment = 3.1680000 feet below pile head
Depth of maximum shear force = 16.6320000 feet below pile head
Number of iterations = 78
Number of zero deflection points = 1

Pile-head Deflection vs. Pile Length for Load Case 1

Boundary Condition Type 1, Shear and Moment

Shear = 9000. lb
Moment = 2518800. in- lb
Axial Load = 39800. lb

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
19.8000	0.1827829	2739227.	-19483.
18.8100	0.1836350	2738887.	-20227.
17.8200	0.1836779	2738635.	-21966.
16.8300	0.1876856	2737310.	-22744.
15.8400	0.2362125	2728845.	-27021.
14.8500	0.2759888	2724375.	-29597.
13.8600	0.3337140	2719415.	-32625.
12.8700	0.4224746	2714051.	-36275.
11.8800	0.5704139	2708408.	-40671.
10.8900	0.9108916	2701260.	-46418.
9.9000	1.7339948	2694269.	-53267.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 56900.0 lbs
Applied moment at pile head = 2220000.0 in-lbs
Axial thrust load on pile head = 49800.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.8111	2220000.	56900.	-0.009623	0.000	3.604E+11	0.000	0.000	0.000
0.198	0.7882	2356332.	56843.	-0.009608	0.000	3.604E+11	-48.2524	145.4468	0.000
0.396	0.7654	2492390.	56668.	-0.009585	0.000	1.953E+11	-98.7375	306.4923	0.000
0.594	0.7427	2627887.	56371.	-0.009528	0.000	7.458E+10	-151.0630	483.2724	0.000
0.792	0.7202	2762521.	55948.	-0.009441	0.000	7.376E+10	-204.8530	675.8648	0.000
0.990	0.6978	2895988.	55397.	-0.009350	0.000	7.303E+10	-259.7366	884.3582	0.000
1.188	0.6757	3027978.	54713.	-0.009253	0.000	7.237E+10	-315.3503	1108.8347	0.000
1.386	0.6539	3158176.	53898.	-0.009151	0.000	7.178E+10	-371.3381	1349.3660	0.000
1.584	0.6322	3286265.	52948.	-0.009044	0.000	7.125E+10	-427.5896	1606.9016	0.000
1.782	0.6109	3411927.	51865.	-0.008932	0.000	7.076E+10	-484.0411	1882.6484	0.000
1.980	0.5898	3534843.	50649.	-0.008815	0.000	7.032E+10	-540.1400	2175.9497	0.000
2.178	0.5690	3654696.	49300.	-0.008693	0.000	6.992E+10	-595.4925	2486.6417	0.000
2.376	0.5485	3771172.	47820.	-0.008567	0.000	6.955E+10	-649.7687	2814.7334	0.000
2.574	0.5283	3883964.	46213.	-0.008436	0.000	6.921E+10	-702.6626	3160.2594	0.000
2.772	0.5084	3992774.	44483.	-0.008300	0.000	6.891E+10	-753.8769	3523.2097	0.000
2.970	0.4888	4097312.	42633.	-0.008160	0.000	6.863E+10	-803.1228	3903.5193	0.000
3.168	0.4696	4197299.	40668.	-0.008016	0.000	6.837E+10	-851.4762	4307.9145	0.000
3.366	0.4508	4292462.	38590.	-0.007869	0.000	6.813E+10	-897.8275	4732.6201	0.000
3.564	0.4322	4382539.	36404.	-0.007717	0.000	6.792E+10	-941.7123	5176.6135	0.000
3.762	0.4141	4467281.	34118.	-0.007562	0.000	6.772E+10	-982.8966	5639.8786	0.000
3.960	0.3963	4546456.	31737.	-0.007404	0.000	6.755E+10	-1021.1571	6122.3208	0.000
4.158	0.3789	4619847.	29282.	-0.007242	0.000	6.739E+10	-1044.9256	6552.5443	0.000
4.356	0.3619	4687320.	26791.	-0.007078	0.000	6.724E+10	-1051.8770	6906.2596	0.000
4.554	0.3453	4748835.	24284.	-0.006911	0.000	6.712E+10	-1058.7615	7286.1011	0.000
4.752	0.3290	4804353.	21759.	-0.006742	0.000	6.700E+10	-1066.2741	7699.5449	0.000
4.950	0.3132	4853831.	19220.	-0.006571	0.000	6.690E+10	-1071.4307	8127.4561	0.000
5.148	0.2978	4897241.	16671.	-0.006397	0.000	6.682E+10	-1074.1729	8569.7898	0.000
5.346	0.2828	4934565.	14118.	-0.006222	0.000	6.675E+10	-1074.4484	9026.4098	0.000
5.544	0.2682	4965804.	11568.	-0.006046	0.000	6.668E+10	-1072.2121	9497.0691	0.000
5.742	0.2541	4990968.	9026.1906	-0.005869	0.000	6.664E+10	-1067.4255	9981.3883	0.000
5.940	0.2404	5010085.	6498.7404	-0.005690	0.000	6.660E+10	-1060.0579	10479.	0.000
6.138	0.2271	5023196.	3986.2913	-0.005511	0.000	6.657E+10	-1054.7982	11038.	0.000
6.336	0.2142	5030332.	1488.2644	-0.005332	0.000	6.656E+10	-1047.9180	11626.	0.000
6.534	0.2017	5031530.	-990.7330	-0.005152	0.000	6.656E+10	-1038.7801	12236.	0.000
6.732	0.1897	5026843.	-3445.3343	-0.004973	0.000	6.657E+10	-1027.3825	12869.	0.000
6.930	0.1781	5016335.	-5870.1762	-0.004794	0.000	6.659E+10	-1013.7302	13525.	0.000
7.128	0.1669	5000083.	-8259.9163	-0.004615	0.000	6.662E+10	-997.8356	14205.	0.000
7.326	0.1562	4978176.	-10609.	-0.004437	0.000	6.666E+10	-979.7186	14907.	0.000
7.524	0.1458	4950717.	-12914.	-0.004260	0.000	6.671E+10	-960.0494	15643.	0.000
7.722	0.1359	4917818.	-15170.	-0.004085	0.000	6.678E+10	-939.5117	16425.	0.000
7.920	0.1264	4879594.	-17375.	-0.003910	0.000	6.685E+10	-916.5601	17227.	0.000
8.118	0.1173	4836176.	-19523.	-0.003738	0.000	6.694E+10	-891.2377	18048.	0.000
8.316	0.1087	4787705.	-21608.	-0.003567	0.000	6.704E+10	-863.6030	18885.	0.000
8.514	0.1004	4734340.	-23613.	-0.003398	0.000	6.714E+10	-823.8972	19502.	0.000
8.712	0.0925	4676303.	-25514.	-0.003232	0.000	6.727E+10	-776.8360	19954.	0.000
8.910	0.0850	4613861.	-27305.	-0.003068	0.000	6.740E+10	-730.1513	20405.	0.000
9.108	0.0779	4547278.	-28985.	-0.002907	0.000	6.754E+10	-684.0142	20857.	0.000
9.306	0.0712	4476814.	-30556.	-0.002748	0.000	6.770E+10	-638.5877	21309.	0.000
9.504	0.0649	4402727.	-32020.	-0.002593	0.000	6.787E+10	-594.0267	21760.	0.000
9.702	0.0589	4325268.	-33380.	-0.002440	0.000	6.805E+10	-550.4777	22212.	0.000
9.900	0.0533	4244684.	-34637.	-0.002291	0.000	6.825E+10	-508.0790	22664.	0.000
10.098	0.0480	4161213.	-35796.	-0.002145	0.000	6.846E+10	-466.9601	23115.	0.000

10.296	0.0431	4075090.	-36858.	-0.002002	0.000	6.868E+10	-427.2424	23567.	0.000
10.494	0.0385	3986538.	-37828.	-0.001863	0.000	6.892E+10	-389.0386	24018.	0.000
10.692	0.0342	3895773.	-38709.	-0.001727	0.000	6.918E+10	-352.4530	24470.	0.000
10.890	0.0303	3803003.	-39505.	-0.001595	0.000	6.945E+10	-317.5814	24922.	0.000
11.088	0.0266	3708424.	-40220.	-0.001467	0.000	6.975E+10	-284.5112	25373.	0.000
11.286	0.0233	3612225.	-40859.	-0.001343	0.000	7.006E+10	-253.3214	25825.	0.000
11.484	0.0203	3514581.	-41426.	-0.001222	0.000	7.039E+10	-224.0827	26277.	0.000
11.682	0.0175	3415657.	-41926.	-0.001105	0.000	7.075E+10	-196.8573	26728.	0.000
11.880	0.0150	3315609.	-42364.	-0.000993	0.000	7.113E+10	-171.6995	27180.	0.000
12.078	0.0128	3214578.	-42745.	-0.000884	0.000	7.154E+10	-148.6553	27631.	0.000
12.276	0.0108	3112696.	-43073.	-0.000779	0.000	7.198E+10	-127.7627	28083.	0.000
12.474	0.009080	3010080.	-43354.	-0.000678	0.000	7.246E+10	-109.0518	28535.	0.000
12.672	0.007586	2906837.	-43594.	-0.000582	0.000	7.297E+10	-92.5446	28986.	0.000
12.870	0.006316	2803060.	-43797.	-0.000489	0.000	7.353E+10	-78.2554	29438.	0.000
13.068	0.005262	2698831.	-43968.	-0.000401	0.000	7.414E+10	-66.1908	29890.	0.000
13.266	0.004413	2594218.	-44114.	-0.000316	0.000	7.480E+10	-56.3496	30341.	0.000
13.464	0.003759	2489276.	-44239.	-0.000236	0.000	7.644E+10	-48.7230	30793.	0.000
13.662	0.003290	2384051.	-44348.	-0.000190	0.000	3.599E+11	-43.2657	31245.	0.000
13.860	0.002858	2278580.	-44445.	-0.000174	0.000	3.603E+11	-38.1289	31696.	0.000
14.058	0.002462	2172891.	-44530.	-0.000160	0.000	3.606E+11	-33.3109	32148.	0.000
14.256	0.002100	2067013.	-44603.	-0.000146	0.000	3.609E+11	-28.8091	32599.	0.000
14.454	0.001770	1960971.	-44667.	-0.000132	0.000	3.612E+11	-24.6194	33051.	0.000
14.652	0.001471	1854788.	-44721.	-0.000120	0.000	3.616E+11	-20.7363	33503.	0.000
14.850	0.001200	1748486.	-44766.	-0.000108	0.000	3.619E+11	-17.1534	33954.	0.000
15.048	0.000957	1642086.	-44803.	-9.689E-05	0.000	3.622E+11	-13.8627	34406.	0.000
15.246	0.000740	1535607.	-44832.	-8.647E-05	0.000	3.625E+11	-10.8551	34858.	0.000
15.444	0.000546	1429066.	-44854.	-7.676E-05	0.000	3.628E+11	-8.1202	35309.	0.000
15.642	0.000375	1322477.	-44871.	-6.775E-05	0.000	3.632E+11	-5.6464	35761.	0.000
15.840	0.000224	1215855.	-44882.	-5.945E-05	0.000	3.634E+11	-3.4209	36212.	0.000
16.038	9.264E-05	1109214.	-44887.	-5.186E-05	0.000	3.638E+11	-1.4295	36664.	0.000
16.236	-2.197E-05	1002563.	-44889.	-4.496E-05	0.000	3.640E+11	0.3432	37116.	0.000
16.434	-0.000121	895913.	-44886.	-3.877E-05	0.000	3.644E+11	1.9135	37567.	0.000
16.632	-0.000206	789274.	-44880.	-3.328E-05	0.000	3.646E+11	3.2995	38019.	0.000
16.830	-0.000279	682653.	-43549.	-2.631E-05	0.000	1.845E+11	1116.6157	9504000.	0.000
17.028	-0.000331	582334.	-40649.	-1.817E-05	0.000	1.847E+11	1324.8905	9504000.	0.000
17.226	-0.000365	489494.	-37338.	-1.128E-05	0.000	1.849E+11	1461.9570	9504000.	0.000
17.424	-0.000385	404906.	-33773.	-5.530E-06	0.000	1.850E+11	1539.2293	9504000.	0.000
17.622	-0.000392	329008.	-30082.	-8.166E-07	0.000	1.850E+11	1567.0675	9504000.	0.000
17.820	-0.000389	261955.	-26374.	2.977E-06	0.000	1.851E+11	1554.7505	9504000.	0.000
18.018	-0.000378	203679.	-22732.	5.965E-06	0.000	1.852E+11	1510.4759	9504000.	0.000
18.216	-0.000360	153930.	-19225.	8.260E-06	0.000	1.852E+11	1441.3600	9504000.	0.000
18.414	-0.000338	112318.	-15905.	9.968E-06	0.000	1.852E+11	1353.4704	9504000.	0.000
18.612	-0.000313	78347.	-12810.	1.119E-05	0.000	1.852E+11	1251.8822	9504000.	0.000
18.810	-0.000285	51443.	-9967.5072	1.202E-05	0.000	1.852E+11	1140.7385	9504000.	0.000
19.008	-0.000256	30979.	-7396.6048	1.255E-05	0.000	1.852E+11	1023.3208	9504000.	0.000
19.206	-0.000226	16291.	-5109.1754	1.286E-05	0.000	1.852E+11	902.1248	9504000.	0.000
19.404	-0.000195	6696.8227	-3112.0681	1.300E-05	0.000	1.852E+11	778.9419	9504000.	0.000
19.602	-0.000164	1499.7149	-1408.6138	1.306E-05	0.000	1.852E+11	654.9422	9504000.	0.000
19.800	-0.000133	0.000	0.000	1.307E-05	0.000	1.852E+11	530.7596	4752000.	0.000

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection = 0.8110923 inches

```
Computed slope at pile head      =     -0.0096228 radians
Maximum bending moment           =      5031530. inch-lbs
Maximum shear force              =        56900. lbs
Depth of maximum bending moment  =      6.5340000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             79
Number of zero deflection points =              1
```

Pile-head Deflection vs. Pile Length for Load Case 2

Boundary Condition Type 1, Shear and Moment

```
Shear      =          56900.  lb
Moment     =        2220000. in- lb
Axial Load =          49800.  lb
```

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
19.8000	0.8110923	5031530.	56900.
18.8100	0.8100424	5031713.	56900.
17.8200	0.8126859	5028102.	56900.
16.8300	0.8276165	5014449.	56900.
15.8400	1.3347201	4759202.	-64005.
14.8500	1.6736282	4649075.	-68498.
13.8600	2.2981250	4580728.	-74324.
12.8700	4.0624122	4620001.	-85469.

Summary of Pile Response(s)

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

Load Case No.	Load Type No.	Pile-head Condition 1 V(lbs) or y(inches)	Pile-head Condition 2 in-lb, rad., or in-lb/rad.	Axial Loading lbs	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-head Rotation radians
1	1	V = 9000.0000	M = 2518800.	39800.	0.18278291	2739227.	-19483.	-0.00341800
2	1	V = 56900.	M = 2220000.	49800.	0.81109230	5031530.	56900.	-0.00962285

The analysis ended normally.

LPile Plus for Windows, Version 2013-07.004

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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Files Used for Analysis

Path to file locations: \\BOSFIL10\Group\INFRASTRUCTURE\GEOTECHNICAL\Maine Turnpike Authority - York Plaza\York Toll Plaza\New Toll Location\Report\Analysis\Analysis\Gantry LPILE\
Name of input data file: ORT Lanes (TL-5 Impact).lp7d
Name of output report file: ORT Lanes (TL-5 Impact).lp7o
Name of plot output file: ORT Lanes (TL-5 Impact).lp7p
Name of runtime messeage file: ORT Lanes (TL-5 Impact).lp7r

Date and Time of Analysis

Date: January 3, 2017 Time: 12:22:56

Problem Title

Project Name: York Toll Plaza

Job Number: E2X71602

Client: Maine Turnpike

Engineer: Jacobs Engineering

Description: Gantry Foundation - Soil Profile

Program Options and Settings

Engineering Units of Input Data and Computations:
 - Engineering units are US Customary Units (pounds, feet, inches)

Analysis Control Options:
- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:
 - Static loading specified

Computational Options:
 - Use unfactored loads in computations (conventional analysis)
 - Compute pile response under loading and nonlinear bending properties of pile
   (only if nonlinear pile properties are input)
 - Analysis uses p-y modification factors for p-y curves
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Computation of pile-head foundation stiffness matrix not selected
 - Push-over analysis of pile not selected
 - Buckling analysis of pile not selected

Output Options:
 - No p-y curves to be computed and reported for user-specified depths
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1

Pile Structural Properties and Geometry

Total number of pile sections = 2

Total length of pile = 15.10 ft

Depth of ground surface below top of pile = 0.00 ft

Pile diameter values used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	36.0000000
2	12.100000	36.0000000
3	12.100000	30.0000000

4	15.100000	30.0000000

Input Structural Properties:

Pile Section No. 1:

Section Type	=	Drilled Shaft (Bored Pile)
Section Length	=	12.10000 ft
Section Diameter	=	36.00000 in

Pile Section No. 2:

Section Type	=	Drilled Shaft (Bored Pile)
Section Length	=	3.00000 ft
Section Diameter	=	30.00000 in

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	4.00000 ft
Effective unit weight at top of layer	=	125.00000 pcf
Effective unit weight at bottom of layer	=	125.00000 pcf
Friction angle at top of layer	=	34.00000 deg.
Friction angle at bottom of layer	=	34.00000 deg.
Subgrade k at top of layer	=	0.0000 pci
Subgrade k at bottom of layer	=	0.0000 pci

NOTE: Internal default values for subgrade k will be computed for this soil layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	4.00000 ft
Distance from top of pile to bottom of layer	=	12.10000 ft
Effective unit weight at top of layer	=	63.00000 pcf
Effective unit weight at bottom of layer	=	63.00000 pcf
Friction angle at top of layer	=	34.00000 deg.
Friction angle at bottom of layer	=	34.00000 deg.
Subgrade k at top of layer	=	0.0000 pci
Subgrade k at bottom of layer	=	0.0000 pci

NOTE: Internal default values for subgrade k will be computed for this soil layer.

Layer 3 is strong rock (vuggy limestone)

Distance from top of pile to top of layer	=	12.10000 ft
Distance from top of pile to bottom of layer	=	20.00000 ft
Effective unit weight at top of layer	=	103.00000 pcf
Effective unit weight at bottom of layer	=	103.00000 pcf
Uniaxial compressive strength at top of layer	=	4000.00000 psi
Uniaxial compressive strength at bottom of layer	=	4000.00000 psi

(Depth of lowest soil layer extends 4.90 ft below pile tip)

Summary of Soil Properties

Layer Num.	Soil Type (p-y Curve Criteria)	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	Uniaxial qu psi	kpy pci
1	Sand (Reese, et al.)	0.00	125.000	34.000	--	default
		4.000	125.000	34.000	--	default
2	Sand (Reese, et al.)	4.000	63.000	34.000	--	default
		12.100	63.000	34.000	--	default
3	Vuggy Limestone	12.100	103.000	--	4000.000	--
		20.000	103.000	--	4000.000	--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult
1	12.100	1.0000	1.0000
2	0.000	1.0000	1.0000

Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
3	1	V = 62000. lbs	M = 2604000. in-lbs	57400.	Yes

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	12.10000 ft
Shaft Diameter	=	36.00000 in
Concrete Cover Thickness	=	6.00000 in
Number of Reinforcing Bars	=	11 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	1017.87602 sq. in.
Total Area of Reinforcing Steel	=	11.00000 sq. in.
Area Ratio of Steel Reinforcement	=	1.08 percent
Edge-to-Edge Bar Spacing	=	5.31579 in
Maximum Concrete Aggregate Size	=	0.75000 in
Ratio of Bar Spacing to Aggregate Size	=	7.09
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	4083.379 kips
Tensile Load for Cracking of Concrete	=	-455.573 kips
Nominal Axial Tensile Capacity	=	-660.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.12800	1.00000	11.43600	0.00000
2	1.12800	1.00000	9.62058	6.18277
3	1.12800	1.00000	4.75069	10.40255
4	1.12800	1.00000	-1.62751	11.31960
5	1.12800	1.00000	-7.48899	8.64275

6	1.12800	1.00000	-10.97276	3.22189
7	1.12800	1.00000	-10.97276	-3.22189
8	1.12800	1.00000	-7.48899	-8.64275
9	1.12800	1.00000	-1.62751	-11.31960
10	1.12800	1.00000	4.75069	-10.40255
11	1.12800	1.00000	9.62058	-6.18277

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 5.31579 inches between Bars 8 and 9

Spacing to aggregate size ratio = 7.08772

Concrete Properties:

Compressive Strength of Concrete	=	4000.00000 psi
Modulus of Elasticity of Concrete	=	3604997. psi
Modulus of Rupture of Concrete	=	-474.34164 psi
Compression Strain at Peak Stress	=	0.00189
Tensile Strain at Fracture of Concrete	=	-0.0001154
Maximum Coarse Aggregate Size	=	0.75000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	57.400

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 57.400 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000000625	228.2773724	365243796.	38.0863366	0.0000238	0.000001304	0.0998486	0.6870524	
0.000001250	456.4162115	365132969.	28.0605336	0.0000351	-0.000009924	0.1464422	1.0106693	
0.000001875	683.8762786	364734015.	24.7213638	0.0000464	-0.0000211	0.1927774	1.3344367	
0.000002500	910.4927313	364197093.	23.0524137	0.0000576	-0.0000324	0.2388388	1.6582500	

0.000003125	1136.2406315	363597002.	22.0512796	0.0000689	-0.0000436	0.2846229	1.9820847	
0.000003750	1361.1135359	362963610.	21.3839749	0.0000802	-0.0000548	0.3301284	2.3059323	
0.000004375	1585.1092242	362310680.	20.9074010	0.0000915	-0.0000660	0.3753548	2.6297890	
0.000005000	1808.2267784	361645356.	20.5500215	0.0001028	-0.0000772	0.4203018	2.9536531	
0.000005625	2030.4657535	360971690.	20.2720987	0.0001140	-0.0000885	0.4649693	3.2775236	
0.000006250	2251.8258974	360292144.	20.0497922	0.0001253	-0.0000997	0.5093571	3.6013999	
0.000006875	2472.3071032	359608306.	19.8679324	0.0001366	-0.0001109	0.5534652	3.9252815	
0.000007500	2472.3071032	329640947.	14.0490675	0.0001054	-0.0001646	0.4289945	-4.7351779	C
0.000008125	2472.3071032	304283951.	13.7290371	0.0001115	-0.0001810	0.4532690	-5.2051831	C
0.000008750	2472.3071032	282549383.	13.4486173	0.0001177	-0.0001973	0.4772481	-5.6767383	C
0.000009375	2472.3071032	263712758.	13.1997381	0.0001237	-0.0002138	0.5009283	-6.1498837	C
0.0000100	2472.3071032	247230710.	12.9772236	0.0001298	-0.0002302	0.5243410	-6.6244051	C
0.0000106	2472.3071032	232687727.	12.7794514	0.0001358	-0.0002467	0.5476151	-7.0993690	C
0.0000113	2472.3071032	219760631.	12.5981656	0.0001417	-0.0002633	0.5705685	-7.5761234	C
0.0000119	2472.3071032	208194282.	12.4361906	0.0001477	-0.0002798	0.5934559	-8.0527993	C
0.0000125	2472.3071032	197784568.	12.2863011	0.0001536	-0.0002964	0.6160662	-8.5309658	C
0.0000131	2472.3071032	188366255.	12.1504010	0.0001595	-0.0003130	0.6385867	-9.0092411	C
0.0000138	2472.3071032	179804153.	12.0259442	0.0001654	-0.0003296	0.6609834	-9.4878797	C
0.0000144	2472.3071032	171986581.	11.9097268	0.0001712	-0.0003463	0.6831618	-9.9675951	C
0.0000150	2472.3071032	164820474.	11.8033714	0.0001771	-0.0003629	0.7052766	-10.4472334	C
0.0000156	2472.3071032	158227655.	11.7056950	0.0001829	-0.0003796	0.7273276	-10.9267944	C
0.0000163	2472.3071032	152141976.	11.6127920	0.0001887	-0.0003963	0.7491344	-11.4076467	C
0.0000169	2472.3071032	146507088.	11.5267467	0.0001945	-0.0004130	0.7708667	-11.8885108	C
0.0000175	2472.3071032	141274692.	11.4469998	0.0002003	-0.0004297	0.7925362	-12.3692976	C
0.0000181	2472.3071032	136403151.	11.3728999	0.0002061	-0.0004464	0.8141429	-12.8500070	C
0.0000188	2472.3071032	131856379.	11.3025780	0.0002119	-0.0004631	0.8355943	-13.3313482	C
0.0000194	2472.3071032	127602947.	11.2358208	0.0002177	-0.0004798	0.8569025	-13.8132357	C
0.0000200	2472.3071032	123615355.	11.1733701	0.0002235	-0.0004965	0.8781488	-14.2950453	C
0.0000206	2472.3071032	119869435.	11.1148347	0.0002292	-0.0005133	0.8993330	-14.7767769	C
0.0000213	2472.3071032	116343864.	11.0598695	0.0002350	-0.0005300	0.9204552	-15.2584303	C
0.0000219	2472.3071032	113019753.	11.0081687	0.0002408	-0.0005467	0.9415152	-15.7400054	C
0.0000225	2472.3071032	109880316.	10.9586824	0.0002466	-0.0005634	0.9624483	-16.2220097	C
0.0000231	2472.3071032	106910577.	10.9109805	0.0002523	-0.0005802	0.9832336	-16.7046111	C
0.0000238	2472.3071032	104097141.	10.8659046	0.0002581	-0.0005969	1.0039576	-17.1871331	C
0.0000244	2472.3071032	101427984.	10.8232527	0.0002638	-0.0006137	1.0246202	-17.6695756	C
0.0000256	2472.3071032	96480277.	10.7445129	0.0002753	-0.0006472	1.0657609	-18.6342213	C
0.0000269	2472.3071032	91992822.	10.6735089	0.0002869	-0.0006806	1.1066551	-19.5985464	C
0.0000281	2472.3071032	87904253.	10.6087872	0.0002984	-0.0007141	1.1472593	-20.5628953	C
0.0000294	2472.3071032	84163646.	10.5480401	0.0003098	-0.0007477	1.1874165	-21.5285508	C
0.0000306	2472.3071032	80728395.	10.4926228	0.0003213	-0.0007812	1.2273290	-22.4938768	C
0.0000319	2490.3259320	78127872.	10.4419101	0.0003328	-0.0008147	1.2669964	-23.4588718	C
0.0000331	2566.4844137	77478775.	10.3953710	0.0003443	-0.0008482	1.3064179	-24.4235341	C
0.0000344	2642.5526482	76874259.	10.3525520	0.0003559	-0.0008816	1.3455928	-25.3878621	C
0.0000356	2718.5302293	76309620.	10.3130631	0.0003674	-0.0009151	1.3845205	-26.3518541	C
0.0000369	2794.4167472	75780793.	10.2765671	0.0003789	-0.0009486	1.4232003	-27.3155084	C
0.0000381	2870.1775250	75283345.	10.2420648	0.0003905	-0.0009820	1.4615405	-28.2796045	C
0.0000394	2945.8160494	74814376.	10.2094234	0.0004020	-0.0010155	1.4995498	-29.2440770	C
0.0000406	3021.3640387	74372038.	10.1790884	0.0004135	-0.0010490	1.5373126	-30.2081988	C
0.0000419	3096.8210688	73953936.	10.1508548	0.0004251	-0.0010824	1.5748282	-31.1719681	C
0.0000431	3172.1867102	73557953.	10.1245412	0.0004366	-0.0011159	1.6120959	-32.1353831	C
0.0000444	3247.4605295	73182209.	10.0999869	0.0004482	-0.0011493	1.6491150	-33.0984417	C
0.0000456	3322.6420895	72825032.	10.0770489	0.0004598	-0.0011827	1.6858847	-34.0611420	C
0.0000469	3397.7309488	72484927.	10.0555992	0.0004714	-0.0012161	1.7224044	-35.0234822	C
0.0000481	3472.7266621	72160554.	10.0355233	0.0004830	-0.0012495	1.7586733	-35.9854602	C
0.0000494	3547.6287801	71850709.	10.0167182	0.0004946	-0.0012829	1.7946906	-36.9470740	C
0.0000506	3622.4368492	71554308.	9.9990912	0.0005062	-0.0013163	1.8304556	-37.9083216	C
0.0000519	3697.1504117	71270369.	9.9825584	0.0005178	-0.0013497	1.8659676	-38.8692010	C
0.0000531	3771.7690057	70998005.	9.9670440	0.0005295	-0.0013830	1.9012257	-39.8297102	C
0.0000544	3846.2921647	70736408.	9.9524791	0.0005412	-0.0014163	1.9362293	-40.7898469	C
0.0000556	3920.7194181	70484843.	9.9388008	0.0005528	-0.0014497	1.9709775	-41.7496092	C

0.0000569	3995.0502907	70242642.	9.9259522	0.0005645	-0.0014830	2.0054696	-42.7089949	C
0.0000581	4069.2843030	70009192.	9.9138808	0.0005762	-0.0015163	2.0397047	-43.6680019	C
0.0000594	4143.4209706	69783932.	9.9025390	0.0005880	-0.0015495	2.0736822	-44.6266280	C
0.0000606	4217.4471066	69566138.	9.8915313	0.0005997	-0.0015828	2.1073390	-45.5854889	C
0.0000619	4291.3719709	69355507.	9.8810852	0.0006114	-0.0016161	2.1407201	-46.5441401	C
0.0000631	4365.1990159	69151668.	9.8712718	0.0006231	-0.0016494	2.1738438	-47.5023904	C
0.0000644	4438.9277263	68954217.	9.8620556	0.0006349	-0.0016826	2.2067092	-48.4602373	C
0.0000656	4512.5575806	68762782.	9.8534037	0.0006466	-0.0017159	2.2393157	-49.4176785	C
0.0000669	4586.0874299	68577008.	9.8452858	0.0006584	-0.0017491	2.2716620	-50.3747131	C
0.0000681	4659.5180413	68396595.	9.8376737	0.0006702	-0.0017823	2.3037478	-51.3313349	C
0.0000694	4732.8481957	68221235.	9.8305415	0.0006820	-0.0018155	2.3355719	-52.2875433	C
0.0000706	4806.0773501	68050653.	9.8238648	0.0006938	-0.0018487	2.3671336	-53.2433356	C
0.0000719	4879.2049556	67884591.	9.8176212	0.0007056	-0.0018819	2.3984319	-54.1987093	C
0.0000731	4952.2304574	67722810.	9.8117898	0.0007175	-0.0019150	2.4294659	-55.1536618	C
0.0000744	5025.1532949	67565086.	9.8063509	0.0007293	-0.0019482	2.4602348	-56.1081903	C
0.0000794	5315.8067921	66970794.	9.7881739	0.0007769	-0.0020806	2.5806405	-59.9220095	C
0.0000844	5604.7709070	66426914.	9.7750145	0.0008248	-0.0022127	2.6967298	-60.0000000	CY
0.0000894	5892.0070563	65924554.	9.7661028	0.0008728	-0.0023447	2.8084411	-60.0000000	CY
0.0000944	6177.4740391	65456679.	9.7608355	0.0009212	-0.0024763	2.9157105	-60.0000000	CY
0.0000994	6461.1306945	65017667.	9.7587342	0.0009698	-0.0026077	3.0184717	-60.0000000	CY
0.0001044	6740.9224946	64583689.	9.7584845	0.0010185	-0.0027390	3.1164613	-60.0000000	CY
0.0001094	6979.9628626	63816803.	9.7431058	0.0010657	-0.0028718	3.2061709	-60.0000000	CY
0.0001144	7165.0099530	62644896.	9.7074299	0.0011103	-0.0030072	3.2866528	-60.0000000	CY
0.0001194	7329.7366372	61400935.	9.6678842	0.0011541	-0.0031434	3.3614473	-60.0000000	CY
0.0001244	7469.8643011	60059210.	9.6221368	0.0011968	-0.0032807	3.4302345	-60.0000000	CY
0.0001294	7587.6706211	58648662.	9.5714917	0.0012383	-0.0034192	3.4934572	-60.0000000	CY
0.0001344	7703.2292098	57326357.	9.5246106	0.0012799	-0.0035576	3.5529620	-60.0000000	CY
0.0001394	7813.6176920	56061831.	9.4787960	0.0013211	-0.0036964	3.6083252	-60.0000000	CY
0.0001444	7901.5876839	54729612.	9.4264120	0.0013609	-0.0038366	3.6582885	-60.0000000	CY
0.0001494	7977.5756148	53406364.	9.3729473	0.0014001	-0.0039774	3.7040539	-60.0000000	CY
0.0001544	8052.0202964	52158836.	9.3235981	0.0014393	-0.0041182	3.7466380	-60.0000000	CY
0.0001594	8125.7529272	50985116.	9.2784090	0.0014787	-0.0042588	3.7860821	-60.0000000	CY
0.0001644	8198.7593358	49878384.	9.2370219	0.0015183	-0.0043992	3.8223455	-60.0000000	CY
0.0001694	8268.1589945	48815699.	9.1975704	0.0015578	-0.0045397	3.8551738	-60.0000000	CY
0.0001744	8325.4032030	47744248.	9.1537605	0.0015962	-0.0046813	3.8838186	-60.0000000	CY
0.0001794	8372.2803684	46674734.	9.1067691	0.0016335	-0.0048240	3.9086648	-60.0000000	CY
0.0001844	8415.6229984	45644057.	9.0614794	0.0016707	-0.0049668	3.9304381	-60.0000000	CY
0.0001894	8458.4067986	44664854.	9.0194415	0.0017081	-0.0051094	3.9493291	-60.0000000	CY
0.0001944	8500.6204131	43733095.	8.9804220	0.0017456	-0.0052519	3.9652991	-60.0000000	CY
0.0001994	8542.2520823	42845152.	8.9442117	0.0017833	-0.0053942	3.9783082	-60.0000000	CY
0.0002044	8583.2896186	41997747.	8.9106226	0.0018211	-0.0055364	3.9883151	-60.0000000	CY
0.0002094	8623.7203803	41187918.	8.8794855	0.0018591	-0.0056784	3.9952770	-60.0000000	CY
0.0002144	8663.2104491	40411477.	8.8504429	0.0018973	-0.0058202	3.9991470	-60.0000000	CY
0.0002194	8700.2314638	39659175.	8.8224657	0.0019354	-0.0059621	3.9969682	-60.0000000	CY
0.0002244	8731.9054061	38916570.	8.7918555	0.0019727	-0.0061048	3.9986416	-60.0000000	CY
0.0002294	8760.1186871	38191253.	8.7611766	0.0020096	-0.0062479	3.9999997	-60.0000000	CY
0.0002344	8782.6645249	37472702.	8.7293060	0.0020459	-0.0063916	3.9970440	-60.0000000	CY
0.0002394	8803.7661052	36778135.	8.6987003	0.0020823	-0.0065352	3.9995744	-60.0000000	CY
0.0002444	8823.5336117	36106531.	8.6695283	0.0021186	-0.0066789	3.9961099	60.0000000	CY
0.0002494	8842.7727057	35459740.	8.6423028	0.0021552	-0.0068223	3.9976921	60.0000000	CY
0.0002544	8861.6437544	34836929.	8.6167394	0.0021919	-0.0069656	3.9997504	60.0000000	CY
0.0002594	8880.0034882	34236158.	8.5929089	0.0022288	-0.0071087	3.9950769	60.0000000	CY
0.0002644	8897.8942729	33656338.	8.5706709	0.0022659	-0.0072516	3.9973351	60.0000000	CY
0.0002694	8915.4526784	33096808.	8.5497912	0.0023031	-0.0073944	3.9995699	60.0000000	CY
0.0002744	8932.5788485	32556096.	8.5303139	0.0023405	-0.0075370	3.9969442	60.0000000	CY
0.0003044	9026.3211916	29655265.	8.4355523	0.0025676	-0.0083899	3.9989240	60.0000000	CY
0.0003344	9090.0700143	27185256.	8.3527108	0.0027929	-0.0092446	3.9987916	60.0000000	CY
0.0003644	9121.5009420	25033279.	8.2742213	0.0030149	-0.0101026	3.9957170	60.0000000	CYT
0.0003944	9145.3789822	23189551.	8.2154917	0.0032400	-0.0109575	3.9984477	60.0000000	CYT
0.0004244	9164.6675322	21595682.	8.1737405	0.0034687	-0.0118088	3.9994717	60.0000000	CYT

0.0004544	9180.0604623	20203709.	8.1450028	0.0037009	-0.0126566	3.9950288	60.0000000 CYT
0.0004844	9180.0604623	18952383.	8.1616917	0.0039533	-0.0134842	3.9857364	60.0000000 CYT

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	57.400	9119.388	0.00300000

Note note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318-08, Section
9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Axial Load No.	Resistance Factor for Moment	Nominal Moment Capacity in-kip	Ultimate (Factored) Axial Thrust kips	Ultimate (Factored) Moment Capacity in-kip	Bending Stiffness at Ult. Mom. Cap. kip-in^2
1	0.65	9119.388	37.310	5927.602	65866214.447
1	0.70	9119.388	40.180	6383.572	65137704.082
1	0.75	9119.388	43.050	6839.541	64267301.219

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	3.00000 ft
Shaft Diameter	=	30.00000 in
Concrete Cover Thickness	=	3.00000 in
Number of Reinforcing Bars	=	11 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	706.85835 sq. in.
Total Area of Reinforcing Steel	=	11.00000 sq. in.
Area Ratio of Steel Reinforcement	=	1.56 percent
Edge-to-Edge Bar Spacing	=	5.31579 in
Maximum Concrete Aggregate Size	=	0.75000 in
Ratio of Bar Spacing to Aggregate Size	=	7.09
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 3025.918 kips
Tensile Load for Cracking of Concrete = -326.217 kips
Nominal Axial Tensile Capacity = -660.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.12800	1.00000	11.43600	0.00000
2	1.12800	1.00000	9.62058	6.18277
3	1.12800	1.00000	4.75069	10.40255
4	1.12800	1.00000	-1.62751	11.31960
5	1.12800	1.00000	-7.48899	8.64275
6	1.12800	1.00000	-10.97276	3.22189
7	1.12800	1.00000	-10.97276	-3.22189
8	1.12800	1.00000	-7.48899	-8.64275
9	1.12800	1.00000	-1.62751	-11.31960
10	1.12800	1.00000	4.75069	-10.40255
11	1.12800	1.00000	9.62058	-6.18277

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 5.31579 inches between Bars 8 and 9

Spacing to aggregate size ratio = 7.08772

Concrete Properties:

Compressive Strength of Concrete = 4000.00000 psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.34164 psi
Compression Strain at Peak Stress = 0.00189
Tensile Strain at Fracture of Concrete = -0.0001154
Maximum Coarse Aggregate Size = 0.75000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	57.400

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in

concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 57.400 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Run Msg
0.000001250	231.1846887	184947751.	29.1181123	0.0000364	-0.000001102	0.1520994	1.0500941	
0.000002500	461.9748789	184789952.	22.0806391	0.0000552	-0.0000198	0.2291497	1.5899713	
0.000003750	691.5433356	184411556.	19.7372747	0.0000740	-0.0000385	0.3054583	2.1301161	
0.000005000	919.7424833	183948497.	18.5661723	0.0000928	-0.0000572	0.3809987	2.6703450	
0.000006250	1146.5515546	183448249.	17.8637494	0.0001116	-0.0000759	0.4557647	3.2106171	
0.000007500	1371.9654010	182928720.	17.3956041	0.0001305	-0.0000945	0.5297543	3.7509189	
0.000008750	1595.9822196	182397968.	17.0613088	0.0001493	-0.0001132	0.6029667	4.2912446	
0.0000100	1595.9822196	159598222.	12.8930949	0.0001289	-0.0001711	0.5222008	-4.9175026	C
0.0000113	1595.9822196	141865086.	12.4697853	0.0001403	-0.0001972	0.5662207	-5.6702951	C
0.0000125	1595.9822196	127678578.	12.1196332	0.0001515	-0.0002235	0.6093988	-6.4272580	C
0.0000138	1595.9822196	116071434.	11.8258452	0.0001626	-0.0002499	0.6519143	-7.1871317	C
0.0000150	1595.9822196	106398815.	11.5756231	0.0001736	-0.0002764	0.6938492	-7.9493539	C
0.0000163	1595.9822196	98214290.	11.3593448	0.0001846	-0.0003029	0.7352365	-8.7137212	C
0.0000175	1595.9822196	91198984.	11.1716718	0.0001955	-0.0003295	0.7762104	-9.4792515	C
0.0000188	1595.9822196	85119052.	11.0067638	0.0002064	-0.0003561	0.8167654	-10.2460096	C
0.0000200	1595.9822196	79799111.	10.8603003	0.0002172	-0.0003828	0.8569006	-11.0140258	C
0.0000213	1595.9822196	75105046.	10.7299825	0.0002280	-0.0004095	0.8966950	-11.7827107	C
0.0000225	1595.9822196	70932543.	10.6134442	0.0002388	-0.0004362	0.9361774	-12.5518526	C
0.0000238	1595.9822196	67199251.	10.5073470	0.0002495	-0.0004630	0.9752470	-13.3222522	C
0.0000250	1595.9822196	63839289.	10.4122123	0.0002603	-0.0004897	1.0140983	-14.0923960	C
0.0000263	1595.9822196	60799323.	10.3257314	0.0002711	-0.0005164	1.0526596	-14.8628494	C
0.0000275	1634.5068294	59436612.	10.2456509	0.0002818	-0.0005432	1.0908249	-15.6344684	C
0.0000288	1690.9112200	58814303.	10.1728449	0.0002925	-0.0005700	1.1287736	-16.4058280	C
0.0000300	1747.2570175	58241901.	10.1064055	0.0003032	-0.0005968	1.1665053	-17.1769271	C
0.0000313	1803.5364738	57713167.	10.0454254	0.0003139	-0.0006236	1.2040033	-17.9478956	C
0.0000325	1859.6658728	57220488.	9.9877227	0.0003246	-0.0006504	1.2410898	-18.7201963	C
0.0000338	1915.7373720	56762589.	9.9345656	0.0003353	-0.0006772	1.2779607	-19.4922313	C
0.0000350	1971.7507484	56335736.	9.8854684	0.0003460	-0.0007040	1.3146156	-20.2639994	C
0.0000363	2027.7057772	55936711.	9.8400121	0.0003567	-0.0007308	1.3510539	-21.0354997	C
0.0000375	2083.6022321	55562726.	9.7978336	0.0003674	-0.0007576	1.3872750	-21.8067308	C
0.0000388	2139.4398852	55211352.	9.7586168	0.0003781	-0.0007844	1.4232786	-22.5776917	C
0.0000400	2195.1707501	54879269.	9.7211419	0.0003888	-0.0008112	1.4589364	-23.3494752	C
0.0000413	2250.8291392	54565555.	9.6858964	0.0003995	-0.0008380	1.4943401	-24.1213088	C
0.0000425	2306.4291800	54268922.	9.6529494	0.0004103	-0.0008647	1.5295272	-24.8928648	C
0.0000438	2361.9706411	53987900.	9.6221049	0.0004210	-0.0008915	1.5644974	-25.6641418	C
0.0000450	2417.4532872	53721184.	9.5931887	0.0004317	-0.0009183	1.5992501	-26.4351386	C
0.0000463	2472.8768814	53467608.	9.5660453	0.0004424	-0.0009451	1.6337847	-27.2058541	C
0.0000475	2528.2411849	53226130.	9.5405358	0.0004532	-0.0009718	1.6681006	-27.9762868	C
0.0000488	2583.5459571	52995815.	9.5165354	0.0004639	-0.0009986	1.7021974	-28.7464354	C
0.0000513	2693.9759360	52565384.	9.4726236	0.0004855	-0.0010520	1.7697312	-30.2858756	C
0.0000538	2804.1386438	52170021.	9.4329571	0.0005070	-0.0011055	1.8362847	-31.8250654	C
0.0000563	2914.0267922	51804921.	9.3968234	0.0005286	-0.0011589	1.9018312	-33.3642442	C
0.0000588	3023.6733260	51466780.	9.3644689	0.0005502	-0.0012123	1.9664946	-34.9022235	C
0.0000613	3133.0761715	51152264.	9.3354374	0.0005718	-0.0012657	2.0302703	-36.4389916	C
0.0000638	3242.2332197	50858560.	9.3093446	0.0005935	-0.0013190	2.0931534	-37.9745365	C

0.0000663	3351.1423261	50583280.	9.2858642	0.0006152	-0.0013723	2.1551391	-39.5088458	C
0.0000688	3459.8013103	50324383.	9.2647174	0.0006369	-0.0014256	2.2162225	-41.0419071	C
0.0000713	3568.2079548	50080112.	9.2456647	0.0006588	-0.0014787	2.2763987	-42.5737076	C
0.0000738	3676.3600040	49848949.	9.2284993	0.0006806	-0.0015319	2.3356624	-44.1042344	C
0.0000763	3784.2551635	49629576.	9.2130415	0.0007025	-0.0015850	2.3940087	-45.6334742	C
0.0000788	3891.8910987	49420839.	9.1991346	0.0007244	-0.0016381	2.4514322	-47.1614136	C
0.0000813	3999.2654341	49221728.	9.1866413	0.0007464	-0.0016911	2.5079278	-48.6880387	C
0.0000838	4106.3757517	49031352.	9.1754407	0.0007684	-0.0017441	2.5634900	-50.2133357	C
0.0000863	4213.2195905	48848923.	9.1654261	0.0007905	-0.0017970	2.6181133	-51.7372902	C
0.0000888	4319.7944449	48673740.	9.1565030	0.0008126	-0.0018499	2.6717922	-53.2598876	C
0.0000913	4426.0965205	48505167.	9.1485351	0.0008348	-0.0019027	2.7245098	-54.7812511	C
0.0000938	4532.1198993	48342612.	9.1412926	0.0008570	-0.0019555	2.7762259	-56.3017979	C
0.0000963	4637.8673511	48185635.	9.1349455	0.0008792	-0.0020083	2.8269863	-57.8208979	C
0.0000988	4743.3370862	48033793.	9.1294317	0.0009015	-0.0020610	2.8767854	-59.3385290	C
0.0001013	4848.5257215	47886674.	9.1246954	0.0009239	-0.0021136	2.9256169	-60.0000000	CY
0.0001038	4953.4303709	47743907.	9.1206862	0.0009463	-0.0021662	2.9734743	-60.0000000	CY
0.0001063	5058.0480903	47605158.	9.1173588	0.0009687	-0.0022188	3.0203514	-60.0000000	CY
0.0001088	5162.3758761	47470123.	9.1146718	0.0009912	-0.0022713	3.0662416	-60.0000000	CY
0.0001113	5266.4106629	47338523.	9.1125881	0.0010138	-0.0023237	3.1111384	-60.0000000	CY
0.0001138	5370.1493221	47210104.	9.1110737	0.0010364	-0.0023761	3.1550350	-60.0000000	CY
0.0001163	5473.5886595	47084634.	9.1100977	0.0010590	-0.0024285	3.1979245	-60.0000000	CY
0.0001188	5574.3139620	46941591.	9.1083305	0.0010816	-0.0024809	3.2395142	-60.0000000	CY
0.0001213	5666.2106224	46731634.	9.1024802	0.0011037	-0.0025338	3.2790895	-60.0000000	CY
0.0001238	5749.3181890	46459137.	9.0926571	0.0011252	-0.0025873	3.3166951	-60.0000000	CY
0.0001263	5824.1436860	46131831.	9.0792248	0.0011463	-0.0026412	3.3524320	-60.0000000	CY
0.0001288	5891.0248965	45755533.	9.0624344	0.0011668	-0.0026957	3.3863797	-60.0000000	CY
0.0001313	5951.2736524	45343037.	9.0430713	0.0011869	-0.0027506	3.4187320	-60.0000000	CY
0.0001338	6009.6617448	44932050.	9.0238138	0.0012069	-0.0028056	3.4500781	-60.0000000	CY
0.0001363	6067.7988033	44534303.	9.0055161	0.0012270	-0.0028605	3.4806081	-60.0000000	CY
0.0001388	6123.7085053	44134836.	8.9870218	0.0012469	-0.0029156	3.5100901	-60.0000000	CY
0.0001413	6174.3746786	43712387.	8.9666153	0.0012665	-0.0029710	3.5381883	-60.0000000	CY
0.0001438	6219.3089201	43264758.	8.9440418	0.0012857	-0.0030268	3.5648785	-60.0000000	CY
0.0001463	6259.9329506	42802960.	8.9201320	0.0013046	-0.0030829	3.5903560	-60.0000000	CY
0.0001488	6299.0718937	42346702.	8.8965003	0.0013234	-0.0031391	3.6149621	-60.0000000	CY
0.0001588	6453.9025734	40654504.	8.8097447	0.0013985	-0.0033640	3.7058255	-60.0000000	CY
0.0001688	6589.3704860	39048121.	8.7246360	0.0014723	-0.0035902	3.7830416	-60.0000000	CY
0.0001788	6687.3270146	37411620.	8.6312031	0.0015428	-0.0038197	3.8458812	-60.0000000	CY
0.0001888	6780.3527999	35922399.	8.5483587	0.0016135	-0.0040490	3.8980898	-60.0000000	CY
0.0001988	6871.0776812	34571460.	8.4727126	0.0016840	-0.0042785	3.9394211	-60.0000000	CY
0.0002088	6954.0559665	33312843.	8.4027619	0.0017541	-0.0045084	3.9699445	-60.0000000	CY
0.0002188	7016.2051238	32074081.	8.3287494	0.0018219	-0.0047406	3.9893852	-60.0000000	CY
0.0002288	7065.4235254	30887097.	8.2556356	0.0018885	-0.0049740	3.9988411	-60.0000000	CY
0.0002388	7112.3682421	29790024.	8.1869184	0.0019546	-0.0052079	3.9982829	-60.0000000	CY
0.0002488	7157.9430724	28775651.	8.1255864	0.0020212	-0.0054413	3.9970074	-60.0000000	CY
0.0002588	7202.2378956	27834736.	8.0710995	0.0020884	-0.0056741	3.9974719	-60.0000000	CY
0.0002688	7245.2550394	26959089.	8.0227245	0.0021561	-0.0059064	3.9998285	60.0000000	CY
0.0002788	7286.4532028	26139742.	7.9792810	0.0022242	-0.0061383	3.9983458	60.0000000	CY
0.0002888	7322.1134210	25357969.	7.9361162	0.0022916	-0.0063709	3.9951497	60.0000000	CY
0.0002988	7350.0832042	24602789.	7.8899670	0.0023571	-0.0066054	3.9994519	60.0000000	CY
0.0003088	7371.5764469	23875551.	7.8431767	0.0024216	-0.0068409	3.9949906	60.0000000	CY
0.0003188	7389.1605959	23181680.	7.7975327	0.0024855	-0.0070770	3.9994374	60.0000000	CY
0.0003288	7406.1980470	22528359.	7.7558077	0.0025497	-0.0073128	3.9934660	60.0000000	CY
0.0003388	7422.7402727	21912148.	7.7175811	0.0026143	-0.0075482	3.9986906	60.0000000	CY
0.0003488	7438.8771417	21330114.	7.6824276	0.0026792	-0.0077833	3.9974014	60.0000000	CY
0.0003588	7454.4856602	20779054.	7.6502893	0.0027445	-0.0080180	3.9964059	60.0000000	CY
0.0003688	7469.3715205	20255923.	7.6179427	0.0028091	-0.0082534	3.9996570	60.0000000	CY
0.0003788	7483.8541048	19759351.	7.5881753	0.0028740	-0.0084885	3.9931219	60.0000000	CY
0.0003888	7498.0038622	19287470.	7.5606961	0.0029392	-0.0087233	3.9966007	60.0000000	CY
0.0003988	7511.9314293	18838700.	7.5351494	0.0030046	-0.0089579	3.9996330	60.0000000	CYT
0.0004088	7525.5213069	18411061.	7.5116069	0.0030704	-0.0091921	3.9939926	60.0000000	CYT

0.0004188	7538.8008538	18003107.	7.4898320	0.0031364	-0.0094261	3.9946528	60.0000000	CYT
0.0004288	7551.7975386	17613522.	7.4694067	0.0032025	-0.0096600	3.9986754	60.0000000	CYT
0.0004388	7564.6093499	17241275.	7.4503685	0.0032688	-0.0098937	3.9998383	60.0000000	CYT
0.0004488	7575.1642263	16880589.	7.4307372	0.0033345	-0.0101280	3.9891176	60.0000000	CYT
0.0004588	7585.3204027	16534758.	7.4119822	0.0034002	-0.0103623	3.9946922	60.0000000	CYT
0.0004688	7594.3324484	16201243.	7.3931288	0.0034655	-0.0105970	3.9983827	60.0000000	CYT
0.0004788	7601.5187589	15877846.	7.3733448	0.0035300	-0.0108325	3.9999286	60.0000000	CYT
0.0004888	7608.4952609	15567254.	7.3548948	0.0035947	-0.0110678	3.9930252	60.0000000	CYT
0.0004988	7613.4527315	15265068.	7.3343866	0.0036580	-0.0113045	3.9890796	60.0000000	CYT
0.0005088	7617.2699317	14972521.	7.3134714	0.0037207	-0.0115418	3.9939506	60.0000000	CYT
0.0005188	7621.0314314	14691145.	7.2935739	0.0037835	-0.0117790	3.9974053	60.0000000	CYT
0.0005288	7624.2201274	14419329.	7.2739102	0.0038461	-0.0120164	3.9994051	60.0000000	CYT

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 2

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	57.400	7510.943	0.00300000

Note note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318-08, Section
9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding
bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Axial Load No.	Resistance Factor for Moment	Nominal Moment Capacity in-kip	Ultimate (Factored) Axial Thrust kips	Ultimate (Factored) Moment Capacity in-kip	Bending Stiffness at Ult. Mom. Cap. kip-in^2
1	0.65	7510.943	37.310	4882.113	47840964.194
1	0.70	7510.943	40.180	5257.660	47349591.681
1	0.75	7510.943	43.050	5633.208	46807036.402

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 62000.0 lbs
Applied moment at pile head = 2604000.0 in-lbs
Axial thrust load on pile head = 57400.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/in	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.9622	2604000.	62000.	-0.0114	0.000	1.166E+11	0.000	0.000	0.000
0.151	0.9415	2717531.	61965.	-0.0114	0.000	1.166E+11	-38.7454	74.5672	0.000
0.302	0.9209	2830931.	61858.	-0.0113	0.000	7.554E+10	-78.8954	155.2351	0.000
0.453	0.9004	2944064.	61678.	-0.0113	0.000	7.482E+10	-120.2665	242.0204	0.000
0.604	0.8801	3056796.	61422.	-0.0112	0.000	7.417E+10	-162.6782	334.9396	0.000
0.755	0.8599	3168985.	61088.	-0.0111	0.000	7.357E+10	-205.9526	434.0086	0.000
0.906	0.8398	3280490.	60675.	-0.0110	0.000	7.302E+10	-249.9148	539.2424	0.000
1.057	0.8199	3391166.	60181.	-0.0110	0.000	7.251E+10	-294.3929	650.6547	0.000
1.208	0.8001	3500866.	59607.	-0.0109	0.000	7.204E+10	-339.2179	768.2569	0.000
1.359	0.7805	3609444.	58952.	-0.0108	0.000	7.160E+10	-384.2237	892.0577	0.000
1.510	0.7610	3716751.	58215.	-0.0107	0.000	7.120E+10	-429.2637	1022.1019	0.000
1.661	0.7417	3822638.	57396.	-0.0106	0.000	7.082E+10	-474.4581	1159.0775	0.000
1.812	0.7226	3926957.	56496.	-0.0105	0.000	7.046E+10	-519.4860	1302.6270	0.000
1.963	0.7037	4029560.	55514.	-0.0104	0.000	7.013E+10	-564.2166	1452.8286	0.000
2.114	0.6850	4130300.	54451.	-0.0103	0.000	6.982E+10	-608.5232	1609.7648	0.000
2.265	0.6664	4229031.	53309.	-0.0102	0.000	6.953E+10	-652.2834	1773.5221	0.000
2.416	0.6481	4325608.	52088.	-0.0101	0.000	6.926E+10	-695.3785	1944.1906	0.000
2.567	0.6300	4419891.	50790.	-0.009949	0.000	6.900E+10	-737.6939	2121.8637	0.000
2.718	0.6120	4511740.	49415.	-0.009831	0.000	6.876E+10	-779.1187	2306.6376	0.000
2.869	0.5943	4601018.	47967.	-0.009711	0.000	6.854E+10	-819.5383	2498.5873	0.000
3.020	0.5769	4687592.	46446.	-0.009588	0.000	6.833E+10	-858.8852	2697.9232	0.000
3.171	0.5596	4771334.	44855.	-0.009462	0.000	6.813E+10	-897.9308	2907.5750	0.000
3.322	0.5426	4852114.	43193.	-0.009334	0.000	6.795E+10	-935.6401	3124.7824	0.000
3.473	0.5258	4929808.	41465.	-0.009204	0.000	6.777E+10	-971.8983	3349.5702	0.000
3.624	0.5092	5004298.	39673.	-0.009071	0.000	6.761E+10	-1006.5940	3581.9510	0.000
3.775	0.4929	5075469.	37819.	-0.008935	0.000	6.746E+10	-1039.6193	3821.9227	0.000
3.926	0.4768	5143213.	35907.	-0.008798	0.000	6.731E+10	-1070.8698	4069.4670	0.000
4.077	0.4610	5207425.	33945.	-0.008659	0.000	6.718E+10	-1094.3795	4301.4918	0.000
4.228	0.4454	5268030.	31955.	-0.008517	0.000	6.706E+10	-1101.6873	4481.4974	0.000
4.379	0.4301	5325004.	29954.	-0.008374	0.000	6.695E+10	-1107.4514	4665.2293	0.000
4.530	0.4151	5378325.	27942.	-0.008229	0.000	6.685E+10	-1113.0136	4858.5779	0.000
4.681	0.4003	5427978.	25919.	-0.008082	0.000	6.675E+10	-1120.1512	5070.2551	0.000
4.832	0.3858	5473937.	23884.	-0.007934	0.000	6.666E+10	-1125.8659	5287.8109	0.000
4.983	0.3716	5516184.	21840.	-0.007785	0.000	6.659E+10	-1130.1270	5511.2775	0.000
5.134	0.3576	5554705.	19790.	-0.007634	0.000	6.652E+10	-1132.9060	5740.6728	0.000
5.285	0.3439	5589490.	17736.	-0.007482	0.000	6.645E+10	-1134.1766	5975.9981	0.000
5.436	0.3305	5620536.	15681.	-0.007330	0.000	6.640E+10	-1133.9146	6217.2354	0.000
5.587	0.3173	5647843.	13628.	-0.007176	0.000	6.635E+10	-1132.0982	6464.3439	0.000
5.738	0.3045	5671416.	11580.	-0.007021	0.000	6.631E+10	-1128.7079	6717.2566	0.000
5.889	0.2919	5691268.	9538.9257	-0.006866	0.000	6.627E+10	-1123.7266	6975.8766	0.000
6.040	0.2796	5707413.	7507.3144	-0.006710	0.000	6.624E+10	-1118.6699	7249.9883	0.000
6.191	0.2676	5719870.	5483.9072	-0.006554	0.000	6.622E+10	-1114.6714	7548.5109	0.000
6.342	0.2558	5728650.	3469.0163	-0.006397	0.000	6.620E+10	-1109.2700	7856.4425	0.000
6.493	0.2444	5733772.	1465.1899	-0.006240	0.000	6.619E+10	-1102.4590	8173.9987	0.000
6.644	0.2332	5735258.	-525.0136	-0.006083	0.000	6.619E+10	-1094.2336	8501.3900	0.000
6.795	0.2223	5733135.	-2499.0295	-0.005926	0.000	6.620E+10	-1084.5918	8838.8199	0.000
6.946	0.2118	5727435.	-4454.2910	-0.005769	0.000	6.621E+10	-1073.5335	9186.4818	0.000
7.097	0.2014	5718193.	-6388.2341	-0.005613	0.000	6.622E+10	-1061.0614	9544.5568	0.000
7.248	0.1914	5705451.	-8298.3014	-0.005456	0.000	6.624E+10	-1047.1806	9913.2098	0.000
7.399	0.1817	5689255.	-10179.	-0.005301	0.000	6.627E+10	-1028.7390	10261.	0.000
7.550	0.1722	5669665.	-12013.	-0.005145	0.000	6.631E+10	-995.0029	10470.	0.000
7.701	0.1630	5646791.	-13784.	-0.004991	0.000	6.635E+10	-960.7390	10679.	0.000

7.852	0.1541	5620748.	-15494.	-0.004837	0.000	6.640E+10	-926.0365	10888.	0.000
8.003	0.1455	5591648.	-17140.	-0.004684	0.000	6.645E+10	-890.9829	11097.	0.000
8.154	0.1371	5559606.	-18723.	-0.004532	0.000	6.651E+10	-855.6641	11306.	0.000
8.305	0.1291	5524740.	-20241.	-0.004381	0.000	6.657E+10	-820.1640	11515.	0.000
8.456	0.1213	5487165.	-21695.	-0.004231	0.000	6.664E+10	-784.5649	11724.	0.000
8.607	0.1137	5446998.	-23084.	-0.004083	0.000	6.672E+10	-748.9467	11932.	0.000
8.758	0.1065	5404357.	-24409.	-0.003935	0.000	6.680E+10	-713.3879	12141.	0.000
8.909	0.0995	5359358.	-25670.	-0.003790	0.000	6.688E+10	-677.9646	12350.	0.000
9.060	0.0927	5312119.	-26866.	-0.003645	0.000	6.698E+10	-642.7509	12559.	0.000
9.211	0.0863	5262754.	-27999.	-0.003502	0.000	6.707E+10	-607.8191	12768.	0.000
9.362	0.0800	5211378.	-29069.	-0.003361	0.000	6.718E+10	-573.2391	12977.	0.000
9.513	0.0741	5158106.	-30077.	-0.003221	0.000	6.728E+10	-539.0791	13186.	0.000
9.664	0.0684	5103049.	-31023.	-0.003083	0.000	6.740E+10	-505.4047	13395.	0.000
9.815	0.0629	5046319.	-31909.	-0.002947	0.000	6.752E+10	-472.2799	13604.	0.000
9.966	0.0577	4988024.	-32735.	-0.002812	0.000	6.764E+10	-439.7661	13813.	0.000
10.117	0.0527	4928271.	-33503.	-0.002679	0.000	6.778E+10	-407.9228	14022.	0.000
10.268	0.0480	4867165.	-34214.	-0.002549	0.000	6.791E+10	-376.8074	14231.	0.000
10.419	0.0435	4804808.	-34870.	-0.002420	0.000	6.805E+10	-346.4750	14440.	0.000
10.570	0.0392	4741301.	-35471.	-0.002293	0.000	6.820E+10	-316.9788	14649.	0.000
10.721	0.0352	4676740.	-36019.	-0.002168	0.000	6.835E+10	-288.3698	14857.	0.000
10.872	0.0314	4611218.	-36517.	-0.002045	0.000	6.851E+10	-260.6970	15066.	0.000
11.023	0.0278	4544829.	-36965.	-0.001924	0.000	6.868E+10	-234.0070	15275.	0.000
11.174	0.0244	4477658.	-37366.	-0.001805	0.000	6.885E+10	-208.3447	15484.	0.000
11.325	0.0212	4409791.	-37721.	-0.001688	0.000	6.903E+10	-183.7528	15693.	0.000
11.476	0.0183	4341309.	-38033.	-0.001574	0.000	6.922E+10	-160.2719	15902.	0.000
11.627	0.0155	4272289.	-38303.	-0.001461	0.000	6.941E+10	-137.9408	16111.	0.000
11.778	0.0130	4202804.	-38533.	-0.001351	0.000	6.961E+10	-116.7961	16320.	0.000
11.929	0.0106	4132924.	-38727.	-0.001242	0.000	6.982E+10	-96.8725	16529.	0.000
12.080	0.008466	4062715.	-38886.	-0.001136	0.000	7.003E+10	-78.2029	16738.	0.000
12.231	0.006503	3992239.	-62523.	-0.001010	0.000	4.923E+10	-26011.	7248000.	0.000
12.382	0.004806	3836343.	-103506.	-0.000866	0.000	4.953E+10	-19224.	7248000.	0.000
12.533	0.003363	3617314.	-133111.	-0.000731	0.000	4.997E+10	-13453.	7248000.	0.000
12.684	0.002158	3354102.	-153120.	-0.000605	0.000	5.058E+10	-8633.0118	7248000.	0.000
12.835	0.001171	3062532.	-165186.	-0.000491	0.000	5.135E+10	-4684.0732	7248000.	0.000
12.986	0.000380	2755571.	-170805.	-0.000389	0.000	5.234E+10	-1518.3801	7248000.	0.000
13.137	-0.000239	2443615.	-171315.	-0.000300	0.000	5.360E+10	955.8731	7248000.	0.000
13.288	-0.000708	2134789.	-167883.	-0.000224	0.000	5.524E+10	2831.3807	7248000.	0.000
13.439	-0.001050	1835252.	-161514.	-0.000160	0.000	5.743E+10	4199.3452	7248000.	0.000
13.590	-0.001287	1549497.	-153045.	-0.000123	0.000	1.825E+11	5147.6267	7248000.	0.000
13.741	-0.001496	1280641.	-142960.	-0.000109	0.000	1.831E+11	5984.3853	7248000.	0.000
13.892	-0.001682	1031434.	-131441.	-9.769E-05	0.000	1.837E+11	6729.2948	7248000.	0.000
14.043	-0.001850	804319.	-118640.	-8.864E-05	0.000	1.841E+11	7400.4530	7248000.	0.000
14.194	-0.002004	601502.	-104674.	-8.173E-05	0.000	1.845E+11	8014.2481	7248000.	0.000
14.345	-0.002146	424998.	-89635.	-7.669E-05	0.000	1.848E+11	8585.2319	7248000.	0.000
14.496	-0.002282	276682.	-73588.	-7.326E-05	0.000	1.849E+11	9126.0125	7248000.	0.000
14.647	-0.002412	158329.	-56580.	-7.112E-05	0.000	1.849E+11	9647.1401	7248000.	0.000
14.798	-0.002539	71652.	-38637.	-7.000E-05	0.000	1.849E+11	10157.	7248000.	0.000
14.949	-0.002665	18323.	-19775.	-6.956E-05	0.000	1.849E+11	10662.	7248000.	0.000
15.100	-0.002791	0.000	0.000	-6.947E-05	0.000	1.849E+11	11165.	3624000.	0.000

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.9622053 inches

```
Computed slope at pile head      =     -0.0114347 radians
Maximum bending moment           =      5735258. inch-lbs
Maximum shear force              =       -171315. lbs
Depth of maximum bending moment  =     6.6440000 feet below pile head
Depth of maximum shear force     =    13.1370000 feet below pile head
Number of iterations             =            23
Number of zero deflection points =             1
```

Pile-head Deflection vs. Pile Length for Load Case 3

Boundary Condition Type 1, Shear and Moment

```
Shear      =         62000.  lb
Moment     =       2604000. in- lb
Axial Load =         57400.  lb
```

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
15.1000	0.9622053	5735258.	-171315.
14.3450	0.9744257	5725087.	-211981.
13.5900	1.0821118	5647805.	-276791.
12.8350	1.6642985	5360300.	-205723.

Summary of Pile Response(s)

Definitions of Pile-head Loading Conditions:

```
Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians
```

Load Case No.	Load Type No.	Pile-head Condition 1 V(lbs) or y(inches)	Pile-head Condition 2 in-lb, rad., or in-lb/rad.	Axial Loading lbs	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-head Rotation radians
3	1	V = 62000.	M = 2604000.	57400.	0.96220532	5735258.	-171315.	-0.01143473

The analysis ended normally.

Appendix K. **Existing Toll Plaza Historical Boring Logs**

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LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-1
LOCATION	Turnpike Northbound		
OWNER	Maine Turnpike Authority		SHEET 1 OF 3
JOB NUMBER	E2X71601		

INSPECTOR	P. Lanergan	CONTRACTOR	New England Boring Contractors	DRILLER	S. Cooley	ELEVATION	47.5
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Mobile Drill	DATUM	NAVD88
0.0	Wash Boring w/Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	119354.2
14.0	Wash Boring - Open Hole	10-07-2014 / 8:00 AM	12.7 During Drilling (In Casing)			COORD E	2821308.2
76.0	Terminated					DATE START	10/6/14
						DATE END	10/7/14

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
									0' - 2' - Asphalt Pavement	
45		100/8"	100+	S1	2 - 2.66	8/8		FILL	S1: Moist, brown, very dense, fine to coarse SAND, some fine gravel (FILL)	
	5	35 100/7"	100+	S2	4 - 5.1	13/7			S2: Wet, brown, very dense, fine to coarse SAND, some fine gravel, trace silt (FILL)	1
40										
	10	4 20 100/8"	100+	S3	9 - 10.66	20/2			S3: Wet, brown, very dense, fine to coarse GRAVEL (FILL)	2
35								14		
	15	3 4 5 6	9	S4	15 - 17	24/12		SILTY CLAY	S4: Wet, grey/brown, stiff, silty CLAY	3
30										
	20	3 2 1 1	3	S5	20 - 22	24/21			S5: Wet, grey soft, silty CLAY PP = 0.5 tsf.	
25		PUSH	PUSH	UD-1	22 - 24	24/17.5			UD-1: Wet, grey, silty clay PP = 0.5 tsf.	
	25	1 1 2 1	3	S6	24 - 26	24/24			S6: Similar to S5 PP = 0 tsf.	
20										
	30	WOR WOH 1 1	1	S7	30 - 32	24/24			S7: Wet, dark grey, very soft, silty CLAY PP = 0 tsf.	
15								35		
	35									

NOTES

1. Hard drilling from 6' to 8.5'.
2. Change in drilling resistance at 14'.
3. Casing broke off at 10', move hole 3' south and re-drill.

LOG OF TEST BORING

JACOBS™

PROJECT	York Toll Plaza
LOCATION	Turnpike Northbound
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71601

BORING NO. B-1

SHEET 2 OF 3

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
10	40	WOR 4 2 2	6	S8	35 - 37	24/21			S8: Wet, black, medium stiff, silty CLAY, slight organic odor PP = 0.25 tsf.	
5	45	3 1 1 1	2	S9	40 - 42	24/24			S9: Wet, dark grey, soft, silty CLAY, slight organic odor PP = 0.25 tsf.	
0	50	WOR/24"	0	S10	45 - 47	24/6			S10: Similar to S9, very soft PP = 0 tsf.	
-5	55	WOR/24"	0	S11	50 - 52	24/10		SILTY CLAY	S11: Wet, grey, very soft, silty CLAY PP = 0 tsf.	
-10	60	WOR/24"	0	S12	55 - 57	24/1			S12: Similar to S11 PP = 0 tsf.	
-15	65	WOR/24"	0	S13	60 - 62	24/22			S13: Similar to S11 PP = 0 tsf.	4
-20	70	PUSH	PUSH	UD-2	65 - 67	24/24			UD-2: Wet, grey, silty CLAY PP = 0.5 tsf.	
-25		WOR/24"	0	S14	67 - 69	24/24			S14A: Similar to S11	5
								69.5		
								TILL	S14B: Wet, grey, fine to coarse SAND, some silty clay, trace fine gravel (TILL)	
								74.5		6

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

4. Push spoon to 64' to recover sample.
5. Spoon sank and stopped at 69.5' from weight of rods. Hit hammer additional 13 blows from 69.5' to 70' to recover sample (S14B).
6. Hard drilling 70' - 74.5'.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO. B-1
	LOCATION	Turnpike Northbound	
	OWNER	Maine Turnpike Authority	SHEET 3 OF 3
	JOB NUMBER	E2X71601	

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
	75							76	Possible bedrock encountered at 74.5'	7
-30									Bottom of Borehole at 76 feet.	8
	80									
-35										
	85									
-40										
	90									
-45										
	95									
-50										
	100									
-55										
	105									
-60										
	110									
-65										

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

7. Rollerbit to 76' through possible bedrock.
8. Backfilled hole using soil cuttings and sand to 2' below surface. Mixed and placed 4000 PSI concrete up to roadway surface.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-2
LOCATION	Turnpike Southbound		SHEET 1 OF 3
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71601		

INSPECTOR	P. Lanergan	CONTRACTOR	New England Boring Contractors	DRILLER	S. Cooley	ELEVATION	46.7
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Mobile Drill	DATUM	NAVD88
0.0	Wash Boring w/Casing	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	119557.8
14.0	Wash Boring - Open Hole	10-08-2014 / 8:30 AM	12.5 During Drilling (In Casing)			COORD E	2821292.5
79.5	Terminated					DATE START	10/7/14
						DATE END	10/8/14

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
45									0' - 2' - Asphalt	
		100/10"	100+	S1	2 - 2.83	10/6		2 FILL	S1: Moist, light brown, very dense, fine to coarse SAND, some fine gravel (FILL)	
	5	32 100/10"	100+	S2	5 - 7	16/8			S2: Moist, brown/black, very dense, fine to coarse SAND, some fine gravel (FILL)	
40										
	10	63 52 69 72	121	S3	10 - 12	24/4			S3: Moist, brown/black, very dense, fine to coarse GRAVEL, some fine to coarse SAND (FILL)	
35								14		
	15	PUSH	PUSH	UD-1	14.5 - 16.5	24/24		SILTY CLAY	UD-1: Wet, brown, silty CLAY PP = 1 tsf.	1
30		1 2 2 1	4	S4	16.5 - 18.5	24/24			S4: Wet, brown, soft, silty CLAY PP = 0.25 tsf.	2
	20	WOR/24"	0	S5	20 - 22	24/8			S5: Wet, grey, very soft, silty CLAY PP = 0 tsf.	
25										
	25	WOR/24"	0	S6	25 - 27	24/14			S6: Wet, dark grey, very soft, silty CLAY PP = 0 tsf.	
20										
	30	WOR/24"	0	S7	30 - 32	24/18			S7: Similar to S6 PP = 0 tsf.	
15										
	35							35		

NOTES

1. Change in drilling resistance at 14'.
2. PP reading = 0.5 tsf in upper 12" of recovered sample.

LOG OF TEST BORING

JACOBS™

PROJECT	York Toll Plaza
LOCATION	Turnpike Southbound
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71601

BORING NO. B-2

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
10		WOR/24"	0	S8	35 - 37	24/17			S8: Similar to S6 PP = 0 tsf.	
	40	WOR/24"	0	S9	40 - 42	24/20			S9: Similar to S6 PP = 0 tsf.	
5		PUSH	PUSH	UD-2	42 - 44	24/24			UD-2: Wet, grey, silty CLAY PP = 0.5 tsf.	
	45	WOR/24"	0	S10	44 - 46	24/24			S10: Similar to S6 PP = 0 tsf.	
0										
	50	WOR/24"	0	S11	50 - 52	24/13			S11: Wet, grey, very soft, silty CLAY PP = 0 tsf.	
-5										
	55	WOR/24"	0	S12	55 - 57	24/9		SILTY CLAY	S12: Similar to S11 PP = 0 tsf.	
-10										
	60	WOR/24"	0	S13	60 - 62	24/4			S13: Similar to S11 PP = 0 tsf.	
-15										
	65	WOR/24"	0	S14	65 - 67	24/24			S14: Wet, grey, very soft, silty CLAY PP = 0.25 tsf.	
-20										
	70	WOR/24"	0	S15	70 - 72	24/13			S15: Similar to S14	3
-25										
		WOR/18"	0	S16A	74 - 76	24/24				4

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

3. Two 1/2" diameter pieces of gravel in tip of spoon.
4. Spoon sample taken at 74' sank to 75.5' from weight of rods, 2 additional blows dropped spoon to 77'. Hit spoon additional 41 blows for 12" to recover sample from 77'-78' (S16B).

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO. B-2
	LOCATION	Turnpike Southbound	
	OWNER	Maine Turnpike Authority	SHEET 3 OF 3
	JOB NUMBER	E2X71601	

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
	75	2/18"							S16A - Similar to S14	
-30									77	
									S16B: Wet, grey, fine to coarse SAND, some clay, little fine gravel (TILL)	4
									78	
									79.5 Possible bedrock encountered at 78'	5
	80									
-35									Bottom of Borehole at 79.5 feet.	6
	85									
-40										
	90									
-45										
	95									
-50										
	100									
-55										
	105									
-60										
	110									
-65										

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

4. Spoon sample taken at 74' sank to 75.5' from weight of rods, 2 additional blows dropped spoon to 77'. Hit spoon additional 41 blows for 12" to recover sample from 77'-78' (S16B).
5. Rollerbit to 79.5' through possible bedrock.
6. Backfill hole using soil cuttings and sand to 2' below surface. Mixed and placed 4000 PSI concrete up to roadway surface.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-3
LOCATION	Turnpike Median		SHEET 1 OF 1
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71601		

INSPECTOR	A. Telesco	CONTRACTOR	New England Boring Contractors	DRILLER	M. Porter	ELEVATION	46.9
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Mobile B-53	DATUM	NAVD88
0.0	Solid Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	118718.5
5.0	Wash Boring w/Casing	01-13-2015 / 9:00 AM	4.75 During Drilling (Uncased)			COORD E	2820362.2
32.0	Terminated					DATE START	1/13/15
						DATE END	1/13/15

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
45	0	75 66 15 10	81	S1	0 - 2	24/17		FILL	Moist, brown, fine to coarse SAND, some fine to medium Gravel (FILL).	1
	5									
40		3 3 4 6	7	S2	5 - 7	24/12		SILTY CLAY	Wet, brown/grey, medium stiff, Silty CLAY, trace fine Sand lenses.	
35	10	3 4 3 10	7	S3	10 - 12	24/22			Wet, grey/brown, medium stiff, Silty CLAY, trace fine Sand lenses.	
30	15	WOH 9 10 11	19	S4	15 - 17	24/12			Wet, grey, very stiff, Silty CLAY. PP = 0.25 tsf.	
								16		
25	20	14 7 5 6	12	S5	20 - 22	24/7		TILL	Wet, grey, medium dense, fine to coarse SAND AND SILT, some fine to coarse Gravel (TILL).	
20	25	32 16 7 5	23	S6	25 - 27	24/10			Wet, grey, medium dense, fine to coarse SAND, some fine to coarse Gravel, some Silt (TILL).	
15	30	6 9 8 12	17	S7	30 - 32	24/11			Wet, grey, medium dense, fine SAND, some Silt, trace Gravel (TILL).	
								32		
	35								Bottom of Borehole at 32 feet.	2

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Blow counts for sample S1 are unrepresentative of soil density due to frozen ground at time of sampling.
2. Borehole backfilled with soil cuttings and topped with sand to original ground elevation.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-4
LOCATION	Turnpike Median		SHEET 1 OF 2
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71601		

INSPECTOR	A. Telesco	CONTRACTOR	New England Boring Contractors	DRILLER	M. Porter	ELEVATION	46.1
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Mobile B-53	DATUM	NAVD88
0.0	Solid Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	118937.2
5.0	Wash Boring w/Casing	01-13-2015 / 2:30 PM	4.75 During Drilling (Uncased)			COORD E	2820695.8
61.2	Terminated					DATE START	1/13/15
						DATE END	1/15/15

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
45									0 - 10" Asphalt Pavement, drilled through with auger	
		20 20 15 13	35	S1	1 - 3	24/15		FILL	Moist, brown, fine to coarse SAND, some fine to medium Gravel (FILL).	1
	5									
40		3 4 11 11	15	S2	5 - 7	24/13			Wet, dark brown, medium dense, fine to coarse SAND, trace Gravel (FILL).	
								7		
	10	10 8 7 7	15	S3	10 - 12	24/4			Wet, grey/brown, stiff, Silty CLAY, little fine to coarse Sand.	
35										
	15	WOH/12" 1 1	1	S4	15 - 17	24/24			Wet, dark grey, very soft, Silty CLAY. PP = 0.25 tsf.	
30		PUSH	PUSH	UD-1	17 - 19	24/24			Similar to S4	
	20	WOR/18" WOH/6"	0	S5	19 - 21	24/24		SILTY CLAY	Similar to S4 PP = 0 tsf.	
25										
	25	WOR/12" WOH/12"	0	S6	25 - 27	24/24			Wet, dark grey, very soft, Silty CLAY, trace fine Sand lenses. PP = 0 tsf.	
20										
	30	WOR/24"	0	S7	30 - 32	24/24			Similar to S4 PP = 0 tsf.	
15										
	35							35		

NOTES

1. Blow counts for sample S1 are unrepresentative of soil density due to frozen ground at time of sampling.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza
LOCATION	Turnpike Median
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71601

BORING NO. B-4

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
10		WOR/24"	0	S8	35 - 37	24/12			Similar to S4 PP = 0 tsf.	
	40									
5		WOR/24"	0	S9	40 - 42	24/20			Similar to S4 PP = 0 tsf.	
	45									
0		WOR/24"	0	S10	45 - 47	24/11		SILTY CLAY	Similar to S4 PP = 0 tsf.	
	50									
-5		WOR/24"	0	S11	50 - 52	24/15			Similar to S4 PP = 0 tsf.	
	55									
-10		WOR/18" WOH/6"	0	S12	55 - 57	24/19			Similar to S4 PP = 0 tsf.	
								58.5		
	60							TILL		
-15		86 87 100/2"	100+	S13	60 - 61.2	14/9		61.2	Wet, grey, very dense, fine to coarse GRAVEL, some Silt, trace Sand (TILL); bottom 3" contains possible weathered rock.	2
									Bottom of Borehole at 61.2 feet.	
	65									
-20										
	70									
-25										

NOTES

2. Borehole tremie grouted to 4 feet below grade, then topped with sand and cold asphalt patch.

LOG OF TEST BORING

JACOBS™

PROJECT	York Toll Plaza	BORING NO.	B-5
LOCATION	Turnpike Median		SHEET 1 OF 2
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71601		

INSPECTOR	A. Telesco	CONTRACTOR	New England Boring Contractors	DRILLER	M. Porter	ELEVATION	46.6
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Mobile B-53	DATUM	NAVD88
0.0	Solid Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	119181
11.0	Wash Boring w/Casing	01-15-2015 / 2:30 PM	6.2 During Drilling (Uncased)			COORD E	2821014.6
15.0	Wash Boring - Open Hole					DATE START	1/15/15
62.0	Terminated					DATE END	1/20/15

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
45		42 54 47 43	101	S1	1.5 - 3.5	24/16			0 - 16" Asphalt Pavement, drilled through with auger Moist, brown, very dense, fine to coarse SAND, some fine to coarse Gravel (FILL)	
40	5	41 100/2"	100+	S2	5 - 5.7	8/8		FILL	Moist, brown, fine to coarse SAND, little Gravel, likely pushing cobble (FILL)	
	10							10.5		1
35		3 6 8 14	14	S3	11 - 13	24/19			Wet, grey/brown, stiff, Silty CLAY. PP = 1.5 tsf.	
30	15	4 3 3 4	6	S4	15 - 17	24/18			Wet, grey, medium stiff, Silty CLAY, trace fine Sand lenses PP = 1.25 tsf.	2
25	20	1 1 2 2	3	S5	20 - 22	24/22		SILTY CLAY	Wet, grey, soft, Silty CLAY, bottom 6" contained little fine Sand PP = 0 tsf.	
20	25	1 1 WOH 1	1	S6	25 - 27	24/22			Wet, dark grey, very soft, Silty CLAY PP = 0 tsf.	
15	30	1 WOH/18"	0	S7	30 - 32	24/24			Similar to S6 PP = 0 tsf.	
	35							35		

NOTES

1. Possible boulders or cobbles encountered from 9.5 to 10.6 feet based on rollerbit action.
2. Used 3 inch casing to a depth of 15 feet and then continued the boring using open hole techniques.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO. B-5
	LOCATION	Turnpike Median	
	OWNER	Maine Turnpike Authority	SHEET 2 OF 2
	JOB NUMBER	E2X71601	

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
10		WOH/24"	0	S8	35 - 37	24/13			Similar to S6 PP = 0 tsf.	
	40									
5		WOR/24"	0	S9	40 - 42	24/24			Wet, grey, very soft, Silty CLAY PP = 0 tsf.	
	45	WOR/24"	0	S10	45 - 47	24/22		SILTY CLAY	Similar to S9 PP = 0 tsf.	
0										
	50	WOR/24"	0	S11	50 - 52	24/24			Similar to S9 PP = 0 tsf.	
-5										
	55	WOR/18" 38	0	S12	55 - 57	24/24			Top 20": Similar to S9 PP = 0 tsf.	
-10								56.7		
								TILL	Bottom 4": Wet, grey, fine to coarse SAND and SILT, some fine Gravel (TILL)	
	60	11 11 14 15	25	S13	60 - 62	24/8			Wet, grey, medium dense, fine to coarse SAND, some Silt, little Gravel (TILL).	3
-15								62		4
									Bottom of Borehole at 62 feet.	
	65									
-20										
	70									
-25										

NOTES

3. Bottom 5 feet of borehole collapsed while attempting to sample at 60 feet, inserted 3" casing to 60 feet and continued.
4. Borehole tremie grouted to 3 feet below grade, then topped with sand and cold asphalt patch.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-6
LOCATION	Turnpike Median		SHEET 1 OF 3
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71601		

INSPECTOR	A. Telesco	CONTRACTOR	New England Boring Contractors	DRILLER	M. Porter	ELEVATION	44.7
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Mobile B-53	DATUM	NAVD88
0.0	Solid Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	119886.2
5.0	Wash Boring w/Casing	01-21-2015 / 7:15 AM	5 In Casing (after ~16 hrs stabilization)			COORD E	2821727
77.0	Terminated					DATE START	1/20/15
						DATE END	1/22/15

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		14 25 26 41	51	S1	1 - 3	24/14		FILL	0 - 12" Ashpalt Pavement, drilled through with auger Moist, brown, very dense, fine to coarse SAND, some fine to coarse Gravel (FILL)	
40	5	9 15 18 44	33	S2	5 - 7	24/20			Moist, brown, dense, fine to coarse SAND, little fine to coarse Gravel, trace Silt (FILL)	1
35	10	14 16 17 22	33	S3	10 - 12	24/10		9.5	Wet, grey, hard, Silty CLAY, some fine Sand lenses.	
30	15	2 2 2 2	4	S4	15 - 17	24/15			Wet, grey, soft, Silty CLAY PP = 0.5 tsf.	
25	20	WOR/24"	0	S5	20 - 22	24/24		SILTY CLAY	Wet, dark grey, very soft, Silty CLAY PP = 0 tsf.	
									FV1 (22.5' - 23'), Su = 227 psf / 38 psf	2
20	25	WOR/24"	0	S6	25 - 27	24/24			Similar to S5, slight organic odor PP = 0 tsf.	
15	30	WOR/24"	0	S7	30 - 32	24/24			Similar to S5 PP = 0 tsf.	
10	35							35		

NOTES

1. Cobbles encountered from a depth of 7 to 9.5 feet.
2. Field vane testing performed. The first value represents the undrained shear strength of the clay; the second value represents the remolded shear strength. A 2" x 6.5" field vane, tapered top and bottom (iT = iB = 30 degree) was utilized for all tests.

LOG OF TEST BORING

JACOBS	PROJECT: York Toll Plaza LOCATION: Turnpike Median OWNER: Maine Turnpike Authority JOB NUMBER: E2X71601	BORING NO.	B-6 SHEET 2 OF 3

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		WOR/24"	0	S8	35 - 37	24/24			Wet, dark grey, very soft, Silty CLAY, trace fine Sand lenses. PP = 0 tsf.	
5	40	WOR 1 WOH/12"	1	S9	40 - 42	24/24			Similar to S8 PP = 0 tsf.	
0	45	WOR/24"	0	S10	45 - 47	24/24			Wet, dark grey, very soft, SIlty CLAY. PP = 0 tsf.	
-5	50	WOR/24"	0	S11	50 - 52	24/24			Similar to S10 PP = 0 tsf.	
-10	55	WOR/24"	0	S12	55 - 57	24/24		SILTY CLAY	Similar to S10 PP = 0 tsf.	
-15	60	WOR/24"	0	S13	60 - 62	24/24			Similar to S10 PP = 0 tsf.	
-20	65	WOR/24"	0	S14	65 - 67	24/24			Similar to S10 PP = 0 tsf.	
-25	70	WOR/24"	0	S15	70 - 72	24/24			Similar to S10 PP = 0 tsf.	
-30								74		3

NOTES

3. Sudden resistance increase occurred when casing was advanced to 74 feet, possible strata change.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO. B-6
	LOCATION	Turnpike Median	
	OWNER	Maine Turnpike Authority	SHEET 3 OF 3
	JOB NUMBER	E2X71601	

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
	75	9 17 22 18	39	S16	75 - 77	24/8		TILL	Wet, grey, dense, fine to coarse GRAVEL, some Silty Clay, trace Sand (TILL).	
									77	
									Bottom of Borehole at 77 feet.	4
-35	80									
-40	85									
-45	90									
-50	95									
-55	100									
-60	105									
-65	110									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

4. Borehole plugged with bentonite chips from 75 to 65 feet below grade, tremie grouted to 4 feet, then capped with 2 feet of bentonite chips, 1 foot of sand and 1 foot of cold asphalt patch.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-7
LOCATION	Turnpike Median		SHEET 1 OF 2
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71601		

INSPECTOR	D. Ha	CONTRACTOR	New England Boring Contractors	DRILLER	R. Leonard	ELEVATION	43.7
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Mobile Drill	DATUM	NAVD88
0.0	Solid Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	120194.2
4.0	Wash Boring w/Casing	01-21-2015 / 9:00 AM	3.2 Upon Completion (In Casing)			COORD E	2821978.5
9.0	Wash Boring - Open Hole					DATE START	1/20/15
48.2	Terminated					DATE END	1/21/15

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		11 10 19 18	29	S1	0 - 2	24/10		FILL	Moist, brown, fine to coarse SAND, little Silt, trace Gravel (TOPSOIL).	1
40	5	2 1 1 2	2	S2	4 - 6	24/8			Moist, brown, very loose, medium to coarse SAND, trace Gravel, trace Silt (FILL)	
									8.5	
35	10	4 8 8 9	16	S3	9 - 11	24/20		SILTY CLAY	Wet, grey, very stiff, Silty CLAY PP = 1.5 tsf.	2
30	15	WOH/24"	0	S4	14 - 16	24/22			Wet, grey, very soft, Silty CLAY PP = 0.4 tsf.	
25	20	WOR/24"	0	S5	19 - 21	24/18			Similar to S4 PP = 0 tsf. FV1 (21.5' - 22'), Su = 680 psf / 113 psf FV2 (22.5' - 23'), Su = 567 psf / 76 psf	3
20	25	WOR/24"	0	S6	24 - 26	24/8			Similar to S4 PP = 0 tsf.	
15	30	WOR/24"	0	S7	29 - 31	24/20			Similar to S4 PP = 0 tsf.	
10	35	WOR/24"	0	S8	34 - 36	24/11			35 Similar to S4	

NOTES

1. Blow counts for sample S1 are unrepresentative of soil density due to frozen ground at time of sampling.
2. Sand seams in spoon sample.
3. Field vane testing performed. The first value represents the undrained shear strength of the clay; the second value represents the remolded shear strength. A 2" x 6.5" field vane, tapered top and bottom (iT = iB = 30 degree) was utilized for all tests.

LOG OF TEST BORING

JACOBS™

PROJECT	York Toll Plaza
LOCATION	Turnpike Median
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71601

BORING NO. B-7

SHEET 2 OF 2

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
									PP = 0.05 tsf.	
5	40	WOR/24"	0	S9	39 - 41	24/24		SILTY CLAY	Similar to S4 PP = 0.1 tsf.	
0	45	WOR WOH 6 6	6	S10	44 - 46	24/20		45	Top 12": Similar to S4, PP = 0.2 tsf	
								TILL	Bottom 8": Wet, grey, fine to coarse GRAVEL, some fine Sand, little Clayey Silt (TILL)	
								47.2	Possible bedrock encounterd at 47.2'	4
-5	50							48.2	Bottom of Borehole at 48.2 feet.	5
-10	55									
-15	60									
-20	65									
-25	70									
-30										

NOTES

4. Rollerbit from 47.2 to 48.2 feet through possible bedrock.
5. Borehole plugged with 2 bags of bentonite chips, then backfilled with soil cuttings and sand to original ground elevation.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza			BORING NO.	B-8	
	LOCATION	Turnpike Median				SHEET 1 OF 2	
	OWNER	Maine Turnpike Authority					
	JOB NUMBER	E2X71601					
INSPECTOR D. Ha	CONTRACTOR	New England Boring Contractors	DRILLER	R. Leonard	ELEVATION	48.2	
METHOD OF DRILLING	GROUNDWATER READINGS		DRILL RIG	Mobile Drill	DATUM	NAVD88	
0.0 Solid Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID	N	120527.6
4.0 Wash Boring w/Casing	01-20-2015 / 11:40 AM	3.3 Upon Completion (In Casing)			COORD	E	2822207.3
9.0 Wash Boring - Open Hole					DATE START		1/20/15
34.0 Terminated					DATE END		1/20/15

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
45	0	18 25 18 25	43	S1	0 - 2	24/19		FILL	Moist, brown, fine to coarse SAND, little Silt, trace Gravel, trace Organics. (TOPSOIL)	1
	5	19 25 7 6	32	S2	4 - 6	24/14		4.8	Top 10": Moist, brown, dense, fine to medium SAND, little Gravel, trace Silt (FILL) PP = 1.3 tsf. Bottom 4": Wet, grey, silty CLAY	
40	10	PUSH	PUSH	FV	9 - 11	24/24			Wet, grey, Silty CLAY. FV1 (9.5' - 10'), Su = 3591 psf / 265 psf FV2 (10.5' - 11'), Su = 3213 psf / 869 psf	2 3
		2 1 2 2	3	S3	11 - 13	24/20			Wet, grey, soft, Silty CLAY PP = 0.5 tsf.	4
35	15	WOR/18" WOH/6"	0	S4	14 - 16	24/21			Wet, grey, very soft, Silty CLAY PP = 0.25 tsf.	
30	20	WOR/18" WOH/6"	0	S5	19 - 21	24/21		SILTY CLAY	Similar to S4 PP = 0.2 tsf.	
25	25	WOR/24"	0	S6	24 - 26	24/22			Similar to S4 PP = 0.15 tsf.	
20	30	WOR/9" WOH/9" 2	0	S7	29 - 31	24/19			Similar to S4 PP = 0.13 tsf.	
								31.5		
15								32.3	Possible TILL Possible bedrock encountered at 32.3'	5 6 7
	35							34		8

NOTES

1. Blow counts for sample S1 are unrepresentative of soil density due to frozen ground at time of sampling.
2. Field vane testing performed. The first value represents the undrained shear strength of the clay; the second value represents the remolded shear strength. A 2" x 6.5" field vane, tapered top and bottom (iT = iB = 30 degree) was utilized for all tests.
3. Sampled through field vane zone to obtain sample for identification purposes.
4. Sand seams in spoon sample S3.
5. Possible till encountered at 31.5 feet based on rollerbit action.
6. Rollerbit from 32.3 feet to 34 feet through possible bedrock.
7. Attempt to sample at 34 feet, spoon refusal, no recovery.
8. Borehole plugged with 2 bags of bentonite chips, then backfilled with soil cuttings and sand to original ground elevation.

LOG OF TEST BORING

JACOBS™

PROJECT	York Toll Plaza
LOCATION	Turnpike Median
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71601

BORING NO. B-8

SHEET 2 OF 2

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
									Bottom of Borehole at 34 feet.	

10
5
0
-5
-10
-15
-20
-25

40
45
50
55
60
65
70

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-9
LOCATION	Turnpike Southbound off Shoulder		SHEET 1 OF 3
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71601		

INSPECTOR	D. Ha	CONTRACTOR	New England Boring Contractors	DRILLER	R. Leonard	ELEVATION	38.8
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Mobile Drill	DATUM	NAVD88
0.0	Solid Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	120020.3
4.0	Wash Boring w/Casing	01-15-2015 / 1:30 PM	-1 Upon Completion (In Casing), Artesian Condition			COORD E	2821708.1
10.0	Wash Boring - Open Hole					DATE START	1/14/15
77.5	Terminated					DATE END	1/15/15

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		18 10 16 15	26	S1	0 - 2	24/10		FILL	Moist, dark brown, SILT AND CLAY, little fine SAND, trace Organics (TOPSOIL).	1
35								4		
	5	3 12 10 11	22	S2	4 - 6	24/16			Wet, grey, very stiff, Silty CLAY, with a few fine Sand lenses. PP = 1.25 tsf.	
									FV1 (6.5' - 7'), Su = 4347 psf / 945 psf FV2 (7.5' - 8'), Su = 3591 psf / 1701 psf	2
30										
	10	PUSH	PUSH	-	10 - 12	24/12			Wet, grey, very soft, Silty CLAY PP = 0.25 tsf.	3
		PUSH	PUSH	UD-1	12 - 14	24/24			Wet, grey, very soft, Silty CLAY	4
25										
	15	WOR/24"	0	S3	14 - 16	24/24			Wet, grey, very soft, Silty CLAY PP = 0 tsf.	
20								SILTY CLAY		
	20	WOR/18" WOH/6"	0	S4	19 - 21	24/21			Similar to S3 PP = 0 tsf.	
		PUSH	PUSH	-	22 - 24	24/6			Similar to S3 PP = 0.1 tsf.	5
15										
	25	PUSH	PUSH	UD-2	24 - 26	24/24			Similar to S3	
									FV3 (26.5' - 27'), Su = 397 psf / 132 psf FV4 (27.5' - 28'), Su = 454 psf / 57 psf	
10										
	30	WOR/24"	0	S5	29 - 31	24/24			Similar to S3 PP = 0.1 tsf.	
5										
	35	WOR/24"	0	S6	34 - 36	24/24		35	Similar to S3	

NOTES

1. Blow counts for sample S1 are unrepresentative of soil density due to frozen ground at time of sampling.
2. Field vane testing performed. The first value represents the undrained shear strength of the clay; the second value is the remolded shear strength. 2" x 6.5" field vane, tapered top and bottom (iT = iB = 30 degree). Same field vane used for all tests.
3. Tried to obtain undisturbed tube sample from a depth of 10 to 12 feet. Approximately 12" of soil fell off from bottom of tube during retrieving. Abandoned sample.
4. Shelby tube penetrated 24" with weight of rod.
5. Tried to obtain undisturbed tube sample from a depth of 22 to 24 feet. Approximately 18" of soil fell off from bottom of tube during retrieving. Abandoned sample.

LOG OF TEST BORING

JACOBS™

PROJECT	York Toll Plaza
LOCATION	Turnpike Southbound off Shoulder
OWNER	Maine Turnpike Authority
JOB NUMBER	E2X71601

BORING NO. B-9

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
									PP = 0.2 tsf.	
0	40	WOR/24"	0	S7	39 - 41	24/24			Similar to S3 PP = 0 tsf. FV5 (41.5' - 42'), Su = 680 psf / 132 psf FV6 (42.5' - 43'), Su = 624 psf / 95 psf	
-5	45	WOR/9" WOH/9" 3	0	S8	44 - 46	24/6			Similar to S3 PP = 0 tsf.	
-10	50	WOR/24"	0	S9	49 - 51	24/24			Similar to S3 PP = 0 tsf.	
-15	55	WOR/24"	0	S10	54 - 56	24/24		SILTY CLAY	Similar to S3 PP = 0.05 tsf.	
-20	60	WOR/24"	0	S11	59 - 61	24/24			Similar to S3 PP = 0.2 tsf.	
		PUSH	PUSH	UD-3	62 - 64	24/24			Similar to S3 PP = 0.25 tsf.	
-25	65	WOR/6" WOH/18"	0	S12	64 - 66	24/0			No Recovery	6
-30	70	2 1 6 9	7	S13A	69 - 71	24/0			No Recovery	
		WOR 11 15 10	26	S13B	71 - 73	24/24		73	Wet, grey, medium dense, Silty CLAY, some fine SAND.	7
-35		12	27	S14	74 - 76	24/10				

NOTES

6. Soil catcher was inserted in the wrong direction for S12 and S13A.
7. Artesian conditions encountered as borehole was advanced beyond a depth of 73 feet.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO. B-9
	LOCATION	Turnpike Southbound off Shoulder	
	OWNER	Maine Turnpike Authority	
	JOB NUMBER	E2X71601	SHEET 3 OF 3

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
	75	17 10 11						TILL	Wet, grey, medium dense, fine to coarse SAND, some Gravel, little Silt (TILL)	
									77.2	
									77.5 Possible bedrock encountered at 77.2'	8
-40										9
	80								Bottom of Borehole at 77.5 feet.	
-45										
	85									
-50										
	90									
-55										
	95									
-60										
	100									
-65										
	105									
-70										
	110									
-75										

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

8. Roller bit was used to advance borehole from a depth of 77.2 feet to 77.5 feet through possible bedrock.
9. Borehole plugged with 3 to 4 bags of bentonite chips, then back filled with soil cuttings and sand to original ground elevation.

LOG OF TEST BORING

JACOBS

PROJECT	York Toll Plaza	BORING NO.	B-10
LOCATION	Turnpike Northbound off Shoulder		SHEET 1 OF 2
OWNER	Maine Turnpike Authority		
JOB NUMBER	E2X71601		

INSPECTOR	D. Ha	CONTRACTOR	New England Boring Contractors	DRILLER	R. Leonard	ELEVATION	38.2
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Mobile Drill	DATUM	NAVD88
0.0	Solid Stem Auger	DATE/TIME	DEPTH(ft) REMARKS	SPT HAMMER	140 lb Safety	GRID N	120054.7
4.0	Wash Boring - Open Hole	01-13-2015 / 1:40 PM	-2.4 Upon Completion (In Casing), Artesian Condition			COORD E	2821997.4
49.0	Wash Boring w/Casing					DATE START	1/12/15
51.9	Terminated					DATE END	1/13/15

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
35	0	15 21 12 8	33	S1	0 - 2	24/3		FILL	Moist, brown to black, Organic SILT, trace fibers (TOPSOIL)	1
									4.3	
	5	2 3 4 4	7	S2	4 - 6	24/14			Top 3": wet, brown, fine to coarse SAND, trace Silt, trace Gravel (FILL)	
									Bottom 11": wet, grey, silty CLAY w/ sand seams PP = 1.3 tsf.	
		PUSH	PUSH	UD-1	6 - 8	24/24			Wet, grey, Silty CLAY PP = 1 tsf.	
30		1 2 2 2	4	S3	8 - 10	24/22			Wet, grey, medium stiff, Silty CLAY PP = 0.75 tsf.	
	10									
25									FV1 (13.5' - 14'), Su = 416 psf / 95 psf FV2 (14.5' - 15'), Su = 340 psf / 113 psf	2
	15	WOR/24"	0	S4	15 - 17	24/24			Wet, grey, very soft, Silty CLAY PP = 0.125 tsf.	
20										
	20	WOR/12" WOH/12"	0	S5	19 - 21	24/15			Similar to S4 PP = 0 tsf.	
15								SILTY CLAY		
	25	WOR/24"	0	S6	24 - 26	24/24			Similar to S4 PP = 0 tsf.	
10									FV3 (28.5' - 29'), Su = 416 psf / 95 psf FV4 (29.5' - 30'), Su = 529 psf / 113 psf	
	30	WOR/24"	0	S7	30 - 32	24/24			Similar to S4 PP = 0 tsf.	
5										
	35	WOR/18"	0	S8	34 - 36	24/21			Similar to S4	

NOTES

1. Blow counts for sample S1 are unrepresentative of soil density due to frozen ground at time of sampling.
2. Field vane testing performed. The first value represents the undrained shear strength of the clay; the second value represents the remolded shear strength. A 2" x 6.5" field vane, tapered top and bottom (iT = iB = 30 degree) was utilized for all tests.

LOG OF TEST BORING

JACOBS	PROJECT	York Toll Plaza	BORING NO. B-10
	LOCATION	Turnpike Northbound off Shoulder	
	OWNER	Maine Turnpike Authority	SHEET 2 OF 2
	JOB NUMBER	E2X71601	

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
		WOH/6"							PP = 0.05 tsf.	
0										
	40	WOR/24"	0	S9	39 - 41	24/24			Similar to S4 PP = 0.05 tsf.	
		PUSH	PUSH	UD-2	41 - 43	24/20			Wet, grey, Silty CLAY.	3
-5		WOR/12" 3 15	3	S10	43 - 45	24/10			Wet, grey, soft, Silty CLAY, little Gravel. FV5 (43.5' - 44'), Su = 1890 psf / 567 psf	4 5
	45							44.5		
-10								TILL		
	50	19 40 10 100/5"	50	S11	49 - 51	23/10			Wet, grey, very dense, fine SAND, some fine to coarse Gravel, trace Silt (TILL).	6
								51.5		
								51.9	Possible bedrock encountered at 51.5'	7 8
-15									Bottom of Borehole at 51.9 feet.	
	55									
-20										
	60									
-25										
	65									
-30										
	70									
-35										

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

3. Shelby tube penetrated 24" with weight of rod.
4. Artesian conditions encountered as borehole was advanced beyond a depth of 44.5 feet.
5. S10 was sampled through the zone of soil disturbed by field vane testing.
6. Installed 4" casing to 49' for S11 due to borehole collapsing in till layer.
7. Roller bit was used to advance borehole from a depth of 51.5 to 51.9 feet through possible bedrock.
8. Borehole plugged with 3 to 4 bags of bentonite chips, then back filled with soil cuttings and sand to original ground elevation.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA09-1

Project York Toll Plaza Evaluation, York, Maine
Client HNTB Corporation
Contractor Maine Test Borings, Inc.

File No. 36199-000
Sheet No. 1 of 4
Start 30 March 2009
Finish 31 March 2009
Driller R. Leonard
H&A Rep. M. Snow
Elevation 48.0 +/-
Datum NGVD 29
Location See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	--	Rig Make & Model: Mobile B-53
Inside Diameter (in.)	4.0	1 3/8	--	Bit Type: Roller Bit
Hammer Weight (lb)	300	140	-	Drill Mud: None
Hammer Fall (in.)	30	30	-	Casing: HSA to 10', HW spun to 10'
				Hoist/Hammer: Winch Safety Hammer
				PID Make & Model: NA

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0						-20 in. BITUMINOUS CONCRETE-										
	6 29 37 41	S1 18	1.5 3.5	1.7	SW	Very dense, brown, well-graded SAND with gravel (SW), mps 0.75 in., dry -FILL-		20	20	30	30					
5	23 36 31 38	S2 20	5.0 7.0		SW	Very dense, brown, well-graded SAND with gravel (SW), mps >1 in., dry	10	20	10	30	25	5				
10	58 47 45 28	S3 14	10.0 12.0		GW	Very dense, brown-gray, well-graded GRAVEL with sand (GW), mps >1 in., bonded, moist -FILL-	20	30	10	15	15	10				
				12.5												
15	2 2 3	S4 18	15.5 17.0		CL	Medium stiff, brown-gray, mottled silty CLAY (CL), wet -MARINE DEPOSIT-						100				
20																

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/31/09	2:10	3.75	-	6.0	4.0

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 85.1
Rock Cored (ft) --
Samples 7S, 2U

Boring No. HA09-1

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

*Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA09-1
File No. 36199-000
Sheet No. 2 of 4

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	1 WOR WOR WOH	S5 24	20.0 22.0	20.0	CL	Soft to medium stiff, gray, silty CLAY (CL), wet, with occasional gray silty fine sand seams -MARINE DEPOSIT-					5	95				
		U1 24	22.0 24.0													
25						FV1 (24.3-25.0 ft), Su=2,240/820 psf (2 in. x 8.5 in. field vane) FV2 (25.0-26.0 ft), Su=4,900/1,840 psf (2 in. x 8.5 in. field vane) Note: Probable sand layers in vane intervals.										
30	2 1 2 3	S6 24	30.0 32.0		CL-ML	Soft to medium stiff, gray, alternating layers (~4 in. layers) of silty CLAY and gray, fine, sandy SILT (CL-ML), slight organic odor, wet -MARINE DEPOSIT-					20	80				
35		U2 24	35.0 37.0		CL	Gray, silty CLAY (CL), wet						100				
						FV3 (38.3-39.0 ft), Su=810/200 psf (2 in. x 8.5 in. field vane) FV4 (39.3-39.8 ft), Su=650/160 psf (2 in. x 8.5 in. field vane)										
40	WOR WOR WOR WOR	S7 24	40.0 42.0		CL	Medium stiff, gray, silty CLAY (CL), with occasional gray, silty fine sand seams, wet -MARINE DEPOSIT-					5	95				
						Note: AW rod probe from 42.0 to 85.1 ft. Hydraulic push to 83.1 ft.										
45																

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA09-1

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA09-1
File No. 36199-000
Sheet No. 3 of 4

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50						Note: Continued AW rod probe.										
55																
60																
65																
70																
75																

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA09-1

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA09-1
File No. 36199-000
Sheet No. 4 of 4

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
80						Note: Continued AW rod probe. Note: Hydraulic refusal at 83.3 ft, drive with 140 lb. hammer. Drive with 140 lb. hammer — Blow counts/ft. 83.3 to 84.3 ft — 22 84.3 to 85.1 ft — 56										
85				85.1		Bottom of Exploration at 85.1 ft										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA09-1

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA09-2

Project York Toll Plaza Evaluation, York, Maine
Client HNTB Corporation
Contractor Maine Test Borings, Inc.

File No. 36199-000
Sheet No. 1 of 3
Start 31 March 2009
Finish 31 March 2009
Driller R. Leonard
H&A Rep. M. Snow
Elevation 46.1 +/-
Datum NGVD 29
Location See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	--	Rig Make & Model: Mobile B-53
Inside Diameter (in.)	4.0	1 3/8	--	Bit Type: Roller Bit
Hammer Weight (lb)	300	140	-	Drill Mud: None
Hammer Fall (in.)	30	30	-	Casing: HW spun to 5'
				Hoist/Hammer: Winch Safety Hammer
				PID Make & Model: NA

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0						-9 in. BITUMINOUS CONCRETE-										
				0.8												
	35 49 41 41	S1 20	2.0 4.0		SW	Very dense, brown, well-graded SAND with gravel (SW), mps >1 in., moist	5	20	10	30	30	5				
						-FILL-										
5	20 25 29 68	S2 4	5.0 7.0		SW	Very dense, brown, well-graded SAND with gravel (SW), mps >1 in., wet	5	10	10	35	35	5				
						-FILL-										
10						Note: Cobbles at 10.0 ft. Advanced boring to 10.5 ft.										
	30 21 12 13	S3 12	10.5 12.5		GW	Medium dense, brown, well-graded GRAVEL with sand (GW), mps >1 in., wet	10	40	10	15	15	10				
				11.5		-FILL-										
					CL	Hard, gray-brown, mottled, silty CLAY (CL), blocky, trace organics, wet						100				
	3 4 4 4	S4 24	12.5 14.5		CL	-MARINE DEPOSIT- Stiff, gray-brown, mottled, silty CLAY (CL), blocky, trace fine sand and organics, wet					5	95				
15	2 1 3 2	S5 24	14.5 16.5		CL	Medium stiff, brown-gray, mottled, silty CLAY (CL), blocky, trace fine sand and organics, wet -MARINE DEPOSIT-					5	95				
						Note: Change in drill action and wash water color to gray at 17.0 ft.										
				17.0												
20																

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/31/09	2:10	0.25	-	4.9	3.4

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 71.4
Rock Cored (ft) --
Samples 6S
Boring No. HA09-2

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA09-2
File No. 36199-000
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	WOR WOH WOH WOH	S6 24	20.0 22.0		CL	Soft, gray, silty CLAY (CL), with frequent gray silty fine sand seams, wet -MARINE DEPOSIT- FV1 (22.3-23.0 ft), Su=400/120 psf (2 in. x 8.5 in. field vane) FV2 (23.3-24.0 ft), Su=200/80 psf (2 in. x 8.5 in. field vane) Note: AW rod probe from 22.0 to 71.4 ft. Hydraulic push to 69.9 ft.					5	95				
25																
30																
35																
40																
45																

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA09-2

HALEY & ALDRICH

TEST BORING REPORT

Boring No. HA09-2
File No. 36199-000
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50						Note: Continued AW rod probe.										
55																
60																
65																
70						Note: Hydraulic refusal at 69.9 ft, drive with 140 lb. hammer. Drive with 140 lb. hammer — Blow counts/ft. 69.9 to 70.9 ft — 32 70.9 to 71.4 ft — 20/5" 71.4 ft — 60/0"										
				71.4		Bottom of Exploration at 71.4 ft										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA09-2