Date: **March 2, 2012**

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Subject: **Subsurface Exploration Report**

SBA Designation:	**Site Number:**	CT11934-S
	Site Name:	Bridgewater 4
Engineering Firm Designation:	**TEP Project Number:**	120651.10
Site Data:	**Wewaka Brook Road, Bridgewater, CT 06752 (Litchfield County)** **Latitude N*41° 30' 31.5"*, Longitude W*73° 21' 16.0"*** **170 Foot - Proposed Monopole Tower & Precast Concrete Bridge**	

Dear Ms. Williams,

Tower Engineering Professionals, Inc. is pleased to submit this **"Subsurface Exploration Report"** to evaluate subsurface conditions in the tower area as they pertain to providing support for the tower foundation.

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions in this report are based on the applicable standards of TEP's practice in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

TEP assumes the current ground surface elevation; tower location and subsequent centerline provided are correct and are consistent with the elevation and centerline to be used for construction of the structure. Should the ground surface elevation be altered and/or the tower location be moved or shifted TEP should be contacted to determine if additional borings are necessary.

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the subsurface exploration. The soil conditions may vary from what is represented in the boring log. While some transitions may be gradual, subsurface conditions in other areas may be quite different. Should actual site conditions vary from those presented in this report, TEP should be provided the opportunity to amend its recommendations as necessary.

We at *Tower Engineering Professionals, Inc.* appreciate the opportunity of providing our continuing professional services to you and Environmental Corporation of America. If you have any questions or need further assistance on this or any other projects please give us a call.

Report Prepared/Reviewed by: Cory A. Bauer / John D. Longest, P.E.

Respectfully submitted by:

Pete Jernigan, P.E.

STATE OF CONNECTICUT
PETER G. JERNIGAN, JR.
00021509
LICENSED
PROFESSIONAL ENGINEER

3-2-2012

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1) PROJECT DESCRIPTION

Based on the preliminary drawings, it is understood a monopole communications tower will be constructed at the referenced site. The structure loads will be provided by the tower manufacturer. In addition the existing access road bridge structure will be replaced by a precast concrete bridge. The structure loads will be provided by the bridge manufacturer.

2) SITE EXPLORATION

The field exploration included the performance of six soil test borings (B-1, B-2, B-3, B-4, B-5 and B-6) to the planned depth of 35 to 36.5 feet (bgs) at the approximate centerline of the proposed bridge corners, to the planned depth 36 feet (bgs) at the approximate centerline of the access road west of the proposed bridge and to the auger refusal depth of 8 feet (bgs) at the approximate centerline of the proposed monopole tower. The borings were performed by an ATV mounted drill rig using continuous flight hollow stem augers to advance the hole. Split-spoon samples and Standard Penetration Resistance Values (N-values) were obtained in accordance with ASTM D 1586 at a frequency of 1 sample every 5 feet to the termination of the bridge and road borings and 2 samples to auger refusal in the tower boring.

The Split-spoon samples were transported to the TEP laboratory where they were classified by a Geotechnical Engineer in general accordance with the Unified Soil Classification System (USCS), using visual-manual identification procedures (ASTM D 2488).

Diamond-bit core drilling procedures were used to help determine the character and continuity of the rock in boring B-6. The core drilling procedures were in accordance with ASTM Specification D-2113. Rock core samples of the materials penetrated were protected and retained in a swivel-mounted inner tube of the core barrel. Upon completion of the drill run, the core barrel was brought to the surface and samples removed and placed in standard boxes. The samples were classified by a Geotechnical Engineer and the “Recovery” and “Rock Quality Designation” were determined.

The “Recovery” is the ratio of the sample length obtained to the length drilled, expressed as a percent. The “Rock Quality Designation” (RQD) is the percent of the recovered rock samples in lengths of four or more inches, compared to the total length of the core run. This designation is generally applied to samples of NWX size (2-1/8 inch diameter) or larger and to samples described as moderately hard or harder. The percent recovery and RQD are related to rock soundness and continuity. Generalized rock descriptions, percent recovery, and the RQD value are shown on the boring log.

A Boring Location Plan showing the approximate boring locations, the Boring Logs presenting the subsurface information obtained and a brief guide to interpreting the boring logs are included in the Appendix.

3) SITE CONDITIONS

The site is located off Wewaka Brook Road in Bridgewater, Litchfield County, Connecticut. The proposed tower and compound are to be located in a wooded area on a ridge. The ground topography is sloping. The proposed precast concrete bridge is to be located in a clearing along the access road. The ground topography is relatively flat to slightly sloping.

4) SUBSURFACE CONDITIONS

The following description of subsurface conditions is brief and general. For more detailed information, the individual Boring Logs contained in Appendix B - Boring Logs may be consulted.

4.1) Soil

The USCS classification of the materials encountered in the boring include SP-SM, SP, SW-SM, SM and Gneiss. The Standard Penetration Resistance ("N" Values) recorded in the materials ranged from 5 blows per foot to 100 blows per 1 inch of penetration.

4.2) Rock

Gneiss was encountered at a depth of 8 feet (bgs) in boring B-1. Refusal of auger advancement was encountered at a depth of 8 feet (bgs) in boring B-1.

4.3) Subsurface Water

Subsurface water was encountered at a depth of 4 to 9 feet (bgs) in borings B-1, B-3 and B-6 at the time of drilling. It should be noted the subsurface water level will fluctuate during the year, due to seasonal variations and construction activity in the area.

4.4) Frost

The TIA frost depth for Litchfield County Connecticut is 40 inches.

5) TOWER FOUNDATION DESIGN

Based on the boring data, it is the opinion of TEP that a pier extending to a single large mat foundation can used to support the new tower. The following presents TEP's conclusions and recommendations regarding the foundation type.

5.1) Shallow Foundation

The foundation should bear a minimum of 3.5 feet below the ground surface to penetrate the frost depth and with sufficient depth to withstand the overturning of the tower. To resist the overturning moment, the weight of the concrete and any soil directly above the foundation can be used. A friction factor of 0.50 can be utilized at this depth. The values are based on the current ground surface elevation.

Table 1A –Shallow Foundation Analysis Parameters – Boring B-6

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2,3] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight (pcf)
Top	Bottom					
0	4	SM	1975	-	31	117
4	8	SM	11175	-	45	122
8	13	Gneiss[3]	67,300[4]	-	45	145

Notes:
1) The bearing values provided are net allowable with a minimum factor of safety of 2 with anticipated settlement less than 1 inch. Bearing may be increased by 1/3 for transient loading (e.g. wind or earthquake loading)
2) These values should be considered ultimate soil parameters
3) In cases where the shear failure is likely to develop along planes of discontinuity or through highly fractured rock masses cohesion cannot be relied upon to provide resistance to failure
4) Due to the fractured nature of the rock sample. Cohesion of the rock cannot be relied upon for strength parameters. Indicated layers have been evaluated as a granular material

Table 1B – Rock Parameters – Boring B-6

Depth		Rock	Recovery (%)	Rock Quality Designation (%)	Unconfined Compressive Strength (psi)	Grout/Rock[1,2] Bond Stress (psi)	Effective Unit Weight (pcf)
Top	Bottom						
8	13	Gneiss	100	70	8830	875	145

Notes:
1) These values should be considered ultimate rock parameters. A minimum factor of safety of 4 should be utilized
2) The rock encountered is not considered competent, see section 5.2 for design recommendations

5.2) Rock Anchor Foundations

Rock anchor design considerations are being provided should they become necessary for foundation installation. The rock anchors should consist of high strength grouted rock bolts (tensioned anchors). The anchors should extend into the competent rock and have the embedment necessary to resist the applied loads. Group effects can cause significant reductions in calculated resistance. Considerations for group effects should be given for rock anchor designs that utilize multiple closely spaced anchors. Competent rock was not encountered at the time of the exploration. Rock competency is typically estimated based on compressive strength of the intact rock, RQD value, joint spacing, condition of the joints, and ground water conditions.

Embedment depths for cement grout bonded rock anchors are often determined by using the rock cone method. Unlike a mechanical anchor, a bonded anchor must include a bond length in the embedment depth. The bond length allows the applied tensile load to be transferred to the surrounding rock. Therefore the embedment depth of a pre-stressed bonded rock anchor is made up of the free-stress length and the bond length.

Bond resistance values are typically estimated from the unconfined compressive strength of the rock. However, design values obtained from laboratory tests on small specimens should be adjusted to account for scale effects. For bond resistance values, TEP recommends an ultimate value of 875 psi be used for design. TEP recommends that a factor of safety of 4 be utilized given the limited extent of the boring. The bond resistance value should be applied to rock that is considered competent. Rock samples with near 100% recovery, RQD values greater than 75%, slightly rough to very rough rock surfaces and joint gaps less than 1 mm can be considered competent. TEP recommends that 50% of all rock anchor or a minimum of 4 be proof loaded to 80% of their design load to verify their adequacy.

6) TOWER SOIL RESISTIVITY

Soil resistivity was performed at the TEP laboratory in accordance with ASTM G187-05 (Standard Test Method for Measurement of Soil Resistivity Using the Two Electrode Soil Box Method). Test results indicated a result of 145,000 ohms/cm.

7) TOWER CONSTRUCTION CONSIDERATIONS - SHALLOW FOUNDATION

7.1) Excavation

The boring data indicates excavation to the expected subgrade level for the shallow foundation will extend through sand and rock. A large tracked excavator should be able to remove the soil materials with minimal difficulty. A large tracked excavator with rock teeth and/or a pneumatic hammer will be necessary to remove the rock materials with difficulty. TEP anticipates the depth to the surface of the rock will vary outside of the boring location.

Excavations should be sloped or shored in accordance with local, state and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. It is the responsibility of the contractor for site safety. This information is provided as a service and under no circumstance should TEP be assumed responsible for construction site safety.

7.2) Dewatering/Foundation Evaluation/Subgrade Preparation

As previously discussed, subsurface water was encountered in the boring at a depth of 4 feet (bgs). Therefore, dewatering (using pumped sumps or well points) may be required for construction purposes at this site. The subsurface water level should be kept below the bottom level of any excavation. After dewatering and excavation to the design elevation for the footing, the materials should be evaluated by a Geotechnical Engineer or a representative of the Geotechnical Engineer prior to reinforcement and concrete placement. This evaluation should include probing, shallow hand auger borings and dynamic cone penetrometer testing (ASTM STP-399) to help verify that suitable residual material lies directly under the foundation and to determine the need for any undercut and replacement of unsuitable materials. Loose surficial material should be compacted in the excavation prior to reinforcement and concrete placement to stabilize surface soil that may have become loose during the excavation process. TEP recommends a 6-inch layer of compacted crushed stone be placed just after excavation to aid in surface stability.

7.3) Rock Anchor Installation

Rock anchor materials verification and installation should be evaluated by a Geotechnical Engineer or a representative of the Geotechnical Engineer during installation to verify compliance with materials manufacturer and foundation design specifications.

7.4) Fill Placement and Compaction

Backfill materials placed above the shallow foundation to the design subgrade elevation should not contain more than 5 percent by weight of organic matter, waste, debris or any otherwise deleterious materials. To be considered for use, backfill materials should have a maximum dry density of at least 100 pounds per cubic foot as determined by standard Proctor (ASTM D 698), a Liquid Limit no greater than 40, a Plasticity Index no greater than 20, a maximum particle size of 4 inches, and 20 percent or less of the material having a particle size between 2 and 4 inches. Because small handheld or walk-behind compaction equipment will most likely be used, backfill should be placed in thin horizontal lifts not exceeding 6 inches (loose).

Fill placement should be monitored by a qualified Materials Technician working under the direction of a Geotechnical Engineer. In addition to the visual evaluation, a sufficient amount of in-place field density tests should be conducted to confirm the required compaction is being attained.

7.5) Reuse of Excavated Soil

The sand that meets the above referenced criteria can be utilized as backfill based on dry soil and site conditions at the time of construction.

8) BRIDGE FOUNDATION DESIGN

Based on the information provided to TEP, the existing bridge structure will be replaced by a precast concrete bridge. TEP was not provided with bridge drawings or plans. TEP assumes the bridge will be supported on shallow foundations. TEP would like the opportunity to review the precast bridge plans when available to provide any revisions to the geotechnical report.

8.1) Shallow Foundation

The foundations should bear a minimum of 3.5 feet below the ground surface to penetrate the frost depth.

Table 1C –Shallow Foundation Analysis Parameters – Boring B-1

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight (pcf)
Top	Bottom					
0	5	SP-SM	1850	-	32	117
5	9	SW-SM/Boulder[4]	8875[5]	-	41	120
9	15	SP	20200	-	45	60
15	20	SP	23625	-	45	60
20	25	SP	25800	-	45	60
25	30	SP-SM	27225	-	45	60

Table 1D –Shallow Foundation Analysis Parameters – Boring B-2

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight[3] (pcf)
Top	Bottom					
0	5	SW-SM	7300	-	45	122
5	9.5	SW-SM	8825	-	40	120
9.5	15	SP-SM	9050	-	40	58
15	20	SP-SM	21350	-	45	60
20	25	SP-SM	33375	-	45	60
25	30	SP-SM	33075	-	45	60

Table 1E –Shallow Foundation Analysis Parameters – Boring B-3

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight (pcf)
Top	Bottom					
0	5	SM	1850	-	32	117
5	7.4	SW-SM/Boulder[4]	8375[5]	-	41	120
7.4	15	SP-SM	8925	-	41	58
15	20	SP-SM	11125	-	42	58
20	25	SP-SM	12150	-	45	60
25	30	SW-SM	12825	-	45	60

Table 1F –Shallow Foundation Analysis Parameters – Boring B-4

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight[3] (pcf)
Top	Bottom					
0	5	SM	1575	-	31	117
5	10	SM	5800	-	34	55
10	15	SP-SM	17325	-	45	60
15	20	SP-SM	22625	-	45	60
20	25	SP-SM	24700	-	45	60
25	30	SP-SM	26075	-	45	60

Table 1G –Shallow Foundation Analysis Parameters – Boring B-5

Depth		Soil	Static Bearing[1] (psf)	Cohesion[2] (psf)	Friction Angle[2] (degrees)	Effective Unit Weight[3] (pcf)
Top	Bottom					
0	5	SP-SM	1625	-	32	117
5	10	SP-SM	10275	-	45	56
10	15	SP-SM	15100	-	45	60
15	20	SP-SM	17125	-	45	60
20	25	SP-SM	18725	-	45	60
25	30	SP-SM	19750	-	45	60

Notes:

1. The bearing values provided are net allowable with a minimum factor of safety of 2 with anticipated settlement less than 1 inch. Bearing may be increased by 1/3 for transient loading (e.g. wind or earthquake loading)
2. These values should be considered ultimate soil parameters
3. Subsurface water level is based on an average groundwater elevation in nearby borings
4. Classifications are based on soil layers in additional borings in relatively close proximity
5. In order to bear on this layer, soils should be verified
6. $K_0 = 1-\sin\phi$
7. $K_a = \tan^2(45-\phi) = 1/K_p$

9) BRIDGE CONSTRUCTION CONSIDERATIONS - SHALLOW FOUNDATION

9.1) Excavation

The boring data indicates excavation to the expected subgrade level for the bridge foundations will extend through sand. A large tracked excavator should be able to remove the soil materials with minimal difficulty. Boulders and bedrock outcroppings are common to this geographic region and may be encountered outside of the boring locations.

Excavations should be sloped or shored in accordance with local, state and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. It is the responsibility of the contractor for site safety. This information is provided as a service and under no circumstance should TEP be assumed responsible for construction site safety.

9.2) Dewatering/Foundation Evaluation/Subgrade Preparation

As previously discussed, subsurface water was encountered in borings B-1 and B-3 at a depth of 7.4 to 9 feet (bgs) and anticipated to be at 5 feet (bgs) in borings B-4 and B-5. Therefore, dewatering (using pumped sumps or well points) may be required for construction purposes at this site. The subsurface water level should be kept below the bottom level of any excavation. After dewatering and excavation to the design elevation for the footing, the materials should be evaluated by a Geotechnical Engineer or a representative of the Geotechnical Engineer prior to reinforcement and concrete placement. This evaluation should include probing, shallow hand auger borings and dynamic cone penetrometer testing (ASTM STP-399) to help verify that suitable residual material lies directly under the foundation and to determine the need for any undercut and replacement of unsuitable materials. Loose surficial material should be compacted in the excavation prior to reinforcement and concrete placement to stabilize surface soil that may have become loose during the excavation process. TEP recommends a 6-inch layer of compacted crushed stone be placed just after excavation to aid in surface stability. TEP recommends a proper drainage system be installed to divert water away from underneath and behind abutments and foundations.

9.3) Fill Placement and Compaction

Backfill materials placed above the shallow foundation to the design subgrade elevation should not contain more than 5 percent by weight of organic matter, waste, debris or any otherwise deleterious materials. To be considered for use, backfill materials should have a maximum dry density of at least 100 pounds per cubic foot as determined by standard Proctor (ASTM D 698), a Liquid Limit no greater than 40, a Plasticity Index no greater than 20, a maximum particle size of 4 inches, and 20 percent or less of the material having a particle size between 2 and 4 inches and have a friction angle of at least 30 degrees. Because small handheld or walk-behind compaction equipment will most likely be used, backfill should be placed in thin horizontal lifts not exceeding 6 inches (loose).

Fill placement should be monitored by a qualified Materials Technician working under the direction of a Geotechnical Engineer. In addition to the visual evaluation, a sufficient amount of in-place field density tests should be conducted to confirm the required compaction is being attained.

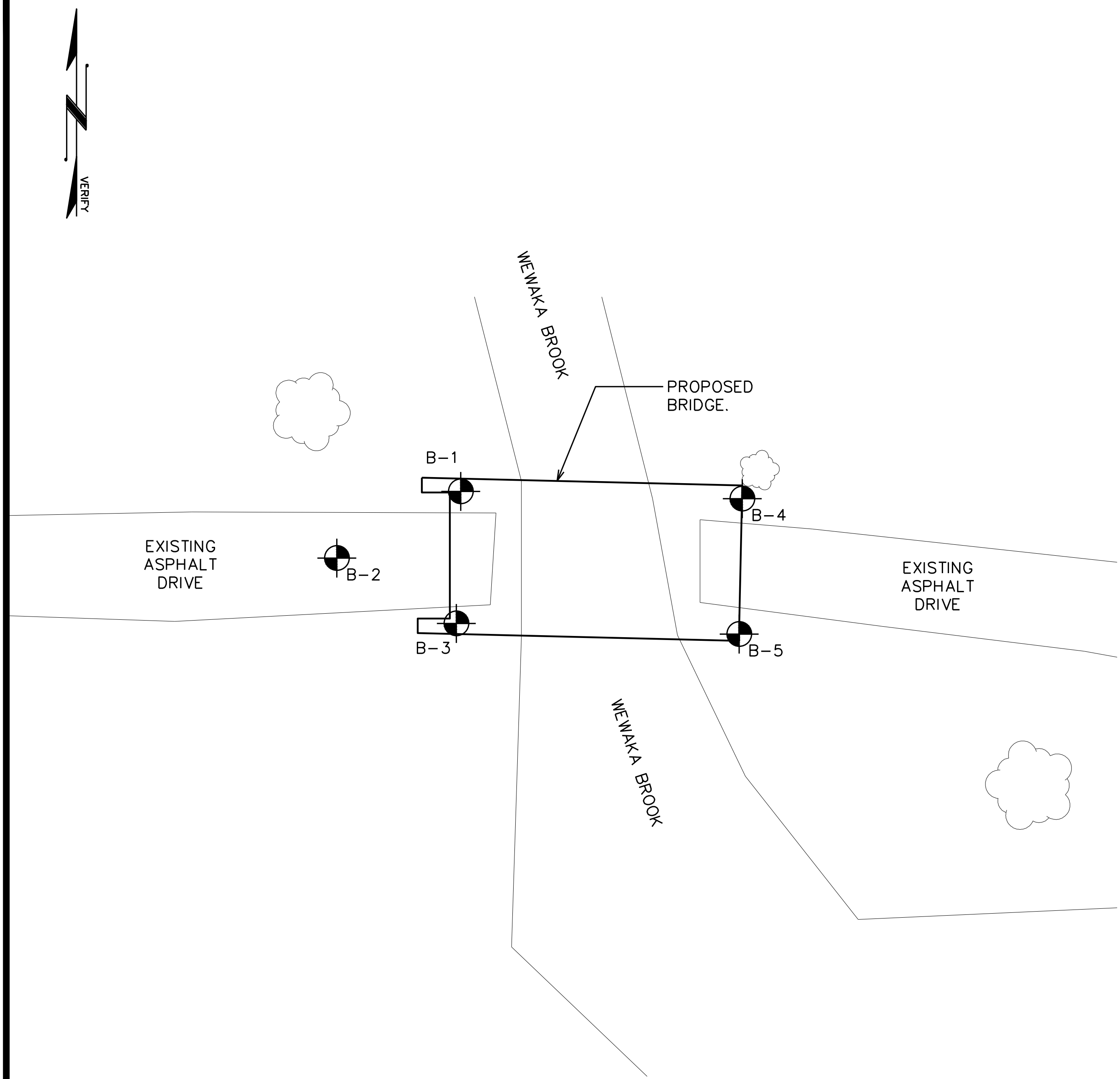
9.4) Reuse of Excavated Soil

The sand that meets the above referenced criteria can be utilized as backfill based on dry soil and site conditions at the time of construction.

If variability in the subsurface materials is encountered, a representative of the Geotechnical Engineer should verify that the design parameters are valid during construction. Modification to the design values presented above may be required in the field.

APPENDIX A

BORING LAYOUTS



BORING LAYOUT

SCALE: N.T.S.

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PROJECT INFORMATION:

BRIDGEWATER 4
SITE #: CT11934-S

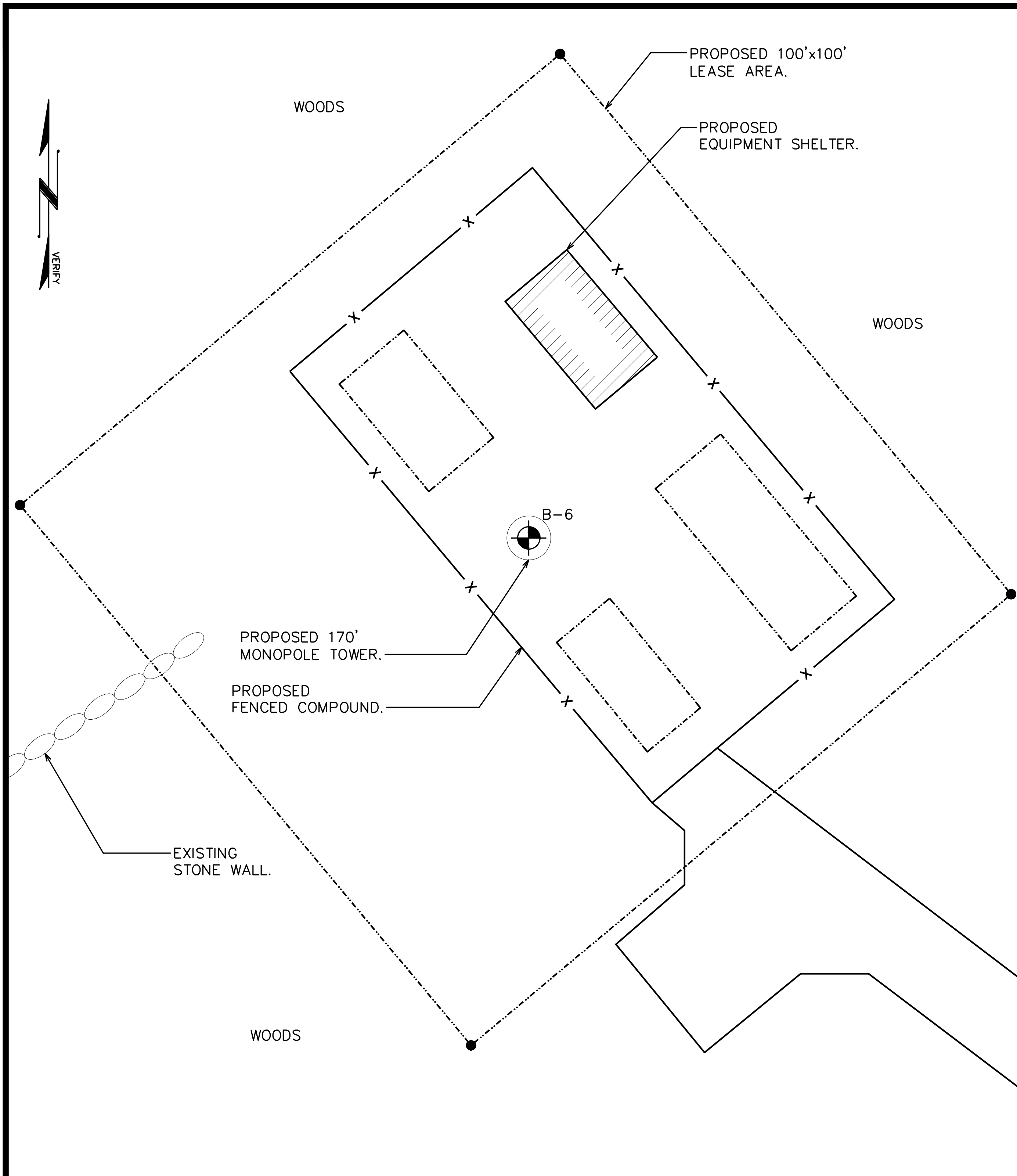
WEWAKA BROOK ROAD
BRIDGEWATER, CT 06752
(LITCHFIELD COUNTY)

REVISION: 0

TEP JOB #: 120651.10

SHEET NUMBER:

C-1



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SCALE: N.T.S.

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C-1

APPENDIX B

BORING LOGS

Project: CT11934-S Bridgewater 4
Project Location: Bridgewater, Connecticut
Project Number: 120651.10

Key to Log of Boring

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10

COLUMN DESCRIPTIONS

1 **Elevation, feet:** Elevation (MSL, feet)

2 **Depth, feet:** Depth in feet below the ground surface.

3 **Sample Type:** Type of soil sample collected at the depth interval shown.

4 **Sample Number:** Sample identification number.

5 **Sampling Resistance, blows/foot:** Number of blows to advance driven sampler foot (or distance shown) beyond seating interval using the hammer identified on the boring log.

6 **Relative Consistency:** Relative consistency of the subsurface material.

7 **USCS Symbol:** USCS symbol of the subsurface material.

8 **Graphic Log:** Graphic depiction of the subsurface material encountered.

9 **MATERIAL DESCRIPTION:** Description of material encountered. May include consistency, moisture, color, and other descriptive text.

10 **REMARKS AND OTHER TESTS:** Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

TYPICAL MATERIAL GRAPHIC SYMBOLS

Well graded GRAVEL (GW)
Poorly graded GRAVEL (GP)
Well graded GRAVEL with Silt (GW-GM)
Well graded GRAVEL with Clay (GW-GC)
Poorly graded GRAVEL with Silt (GP-GM)
Poorly graded GRAVEL with Clay (GP-GC)
Silty GRAVEL (GM)
Clayey GRAVEL (GC)
Well graded SAND (SW)
Poorly graded SAND (SP)
Well graded SAND with Silt (SW-SM)
Well graded SAND with Clay (SW-SC)
Poorly graded SAND with Silt (SP-SM)
Poorly graded SAND with Clay (SP-SC)
Silty SAND (SM)
Clayey SAND (SC)
SILT, SILT w/SAND, SANDY SILT (ML)
Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
SILT, SILT w/SAND, SANDY SILT (MH)
Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
SILT, SILT with SAND, SANDY SILT (ML-MH)
Lean-Fat CLAY, CLAY w/SAND, SANDY CLAY (CL-CH)
SILTY CLAY (CL-ML)
Lean CLAY/PEAT (CL-OL)
Fat CLAY/SILT (CH-MH)
Fat CLAY/PEAT (CH-OH)
Silty SAND to Sandy SILT (SM-ML)
Silty SAND to Sandy SILT (SM-MH)
Clayey SAND to Sandy CLAY (SC-CL)
Clayey SAND to Sandy CLAY (SC-CH)
SILT to CLAY (CL/ML)
Silty to Clayey SAND (SC/SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

2-inch-OD unlined split spoon (SPT)
2.5-inch-OD Modified California w/ brass liners
3-inch-OD California w/ brass rings
Shelby Tube (Thin-walled, fixed head)
Grab Sample
Bulk Sample
Pitcher Sample
Other sampler

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting a given time)
Minor change in material properties within a stratum
Inferred or gradational contact between strata
Queried contact between strata

GENERAL NOTES

1. Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Figure 1 thru 6

Project: CT11934-S Bridgewater 4 Project Location: Bridgewater, Connecticut Project Number: 120651.10	**Log of Boring B-1** Sheet 1 of 1

Date(s) Drilled **February 21, 2012**	Logged By **Cory Bauer**	Checked By **John Longest**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type	Total Depth of Borehole **35 feet bgs**
Drill Rig Type **ATV**	Drilling Contractor **TEP**	Approximate Surface Elevation **489 feet AMSL**
Groundwater Level and Date Measured **9 feet ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 in drop, Auto Hammer**
Borehole Backfill **Cuttings**	Location **Approximate centerline of the proposed northwest bridge support**	

Elevation, feet	Depth, feet	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
489	0	S1	7	Loose	SP-SM	Dark brown, fine to medium, poorly graded SAND (SP-SM), with silt, moist	
484	5	S2	50/0"			No Recovery (ATD)	Driller Note: Bouncing on Boulder
479	10	S3	88/8"	Very Dense	SP	Light brown and light gray, fine to medium, poorly graded SAND (SP), wet	
474	15	S4	68		SP	with mica, trace silt, gray, moist	
469	20	S5	97/11"				
464	25	S6	147/11"	Very Dense	SP-SM	Gray, fine to medium, poorly graded SAND (SP-SM), with silt, moist	
459	30	S7	159				
454	35					Bottom of Boring at 35 feet bgs	Driller Note: Attempted to sample, sppon broke in hole
449	40						

Figure 1

Project: CT11934-S Bridgewater 4	**Log of Boring B-2**
Project Location: Bridgewater, Connecticut	Sheet 1 of 1
Project Number: 120651.10	

Date(s) Drilled **February 21, 2012**	Logged By **Cory Bauer**	Checked By **John Longest**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type	Total Depth of Borehole **36 feet bgs**
Drill Rig Type **ATV**	Drilling Contractor **TEP**	Approximate Surface Elevation **491 feet AMSL**
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 in drop, Auto Hammer**
Borehole Backfill **Cuttings**	Location **Approximate centerline of the proposed access road west of the proposed bridge**	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
491	0		S1	55	Very Dense	SW-SM		Brown, fine to medium, well graded SAND (SW-SM), with silt, with gravel, moist	
486	5		S2	21	Medium Dense	SW-SM		to medium dense, wet	
481	10		S3	23	Medium Dense	SP-SM		Brown and gray, fine to medium, poorly graded SAND (SP-SM), with silt, with mica, moist	
476	15		S4	60	Very Dense	SP-SM		to very dense, gray	
471	20		S5	113					
466	25		S6	159/9"					
461	30		S7	100/5"					
456	35		S9	100/6"				Bottom of Boring at 36 feet bgs	
451	40								

Figure 2

Q:\0651_Bridgewater\Geotech\Boring B-2.bgs [Basic Boring Log.tpl]

Project: CT11934-S Bridgewater 4
Project Location: Bridgewater, Connecticut
Project Number: 120651.10

Log of Boring B-3

Date(s) Drilled **February 20, 2012**	Logged By **Cory Bauer**	Checked By **John Longest**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type	Total Depth of Borehole **35.5 feet bgs**
Drill Rig Type **ATV**	Drilling Contractor **TEP**	Approximate Surface Elevation **489 feet AMSL**
Groundwater Level and Date Measured **7.4 feet ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 in drop, Auto Hammer**
Borehole Backfill **Cuttings**	Location **Approximate centerline of the proposed southwest bridge support**	

Elevation, feet	Depth, feet	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
489	0	S1	6	Loose	SM	Dark brown, fine silty SAND (SM), trace roots, trace gravel, moist	
484	5	S2	50/2"			No Recovery (ATD)	Driller Note: Bouncing on boulder
479	10	S3	23	Medium Dense	SP-SM	Light brown, fine to medium, poorly graded SAND (SP-SM), with silt, wet	
474	15	S4	24		SP-SM	trace gravel	
469	20	S5	70	Very Dense	SP-SM	to very dense, with mica, no gravel, moist, gray	
464	25	S6	100/6"	Very Dense	SW-SM	Gray, fine to medium, well graded SAND (SW-SM), with fine to coarse gravel, with silt, with mica, moist	
459	30	S7	100/5"	Very Dense	SP-SM	Gray, fine to medium, poorly graded SAND (SP-SM), with silt, with mica, moist	
454	35	S9	100/5"			Bottom of Boring at 35.5 feet bgs	
449	40						

Figure 3

Project: CT11934-S Bridgewater 4
Project Location: Bridgewater, Connecticut
Project Number: 120651.10

Log of Boring B-4

Date(s) Drilled **February 20, 2012**	Logged By **Cory Bauer**	Checked By **John Longest**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type	Total Depth of Borehole **36.5 feet bgs**
Drill Rig Type **ATV**	Drilling Contractor **TEP**	Approximate Surface Elevation **486 feet AMSL**
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 in drop, Auto Hammer**
Borehole Backfill **Cuttings**	Location **Approximate centerline of the proposed northeast bridge support**	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
486	0		S1	5	Loose	SM		Dark brown, fine silty SAND (SM), trace roots, moist	
481	5		S2	10		SM		no roots	
476	10		S3	48	Dense	SP-SM		Gray, fine to medium, poorly graded SAND (SP-SM), with silt, with mica, moist	
471	15		S4	63	Very Dense	SP-SM		to very dense	
466	20		S5	64					
461	25		S6	72					
456	30		S7	105					
451	35		S9	156					
	36.5							Bottom of Boring at 36.5 feet bgs	
446	40								

Figure 4

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Project: CT11934-S Bridgewater 4
Project Location: Bridgewater, Connecticut
Project Number: 120651.10

Log of Boring B-5

Date(s) Drilled **February 20, 2012**	Logged By **Cory Bauer**	Checked By **John Longest**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type	Total Depth of Borehole **36.5 feet bgs**
Drill Rig Type **ATV**	Drilling Contractor **TEP**	Approximate Surface Elevation **486 feet AMSL**
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 in drop, Auto Hammer**
Borehole Backfill **Cuttings**	Location **Approximate centerline of the proposed southeast bridge support**	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
486	0		S1	6	Loose	SP-SM		Dark brown, fine to medium, poorly graded SAND (SP-SM), with silt, moist	
481	5		S2	29	Medium Dense	SP-SM		to medium dense, with mica, gray	
476	10		S3	47	Dense	SP-SM		to dense	
471	15		S4	41					
466	20		S5	51	Very Dense	SP-SM		to very dense	
461	25		S6	91		SP-SM		light gray and light brown	
456	30		S7	158		SP-SM		gray	
451	35		S9	142					
								Bottom of Boring at 36.5 feet bgs	
446	40								

Figure 5

Project: CT11934-S Bridgewater 4
Project Location: Bridgewater, Connecticut
Project Number: 120651.10

Log of Boring B-6

Date(s) Drilled **February 20, 2012**	Logged By **Cory Bauer**	Checked By **John Longest**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type	Total Depth of Borehole **13 feet bgs**
Drill Rig Type **ATV**	Drilling Contractor **TEP**	Approximate Surface Elevation **583 feet AMSL**
Groundwater Level and Date Measured **4 feet ATD**	Sampling Method(s) **SPT, Other**	Hammer Data **140 lb, 30 in drop, Auto Hammer**
Borehole Backfill **Cuttings**	Location **Approximate centerline of the proposed monopole tower**	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
583	0		S1	5	Loose	SM		Brown, fine silty SAND (SM), trace gravel, trace roots, moist (ATD) ▽	
578	5		S2	100/1"				No Recovery	Driller Note: Steady grinding
			R1			GNEISS		Auger Refusal at 8 feet bgs-Rock Core-Gray, moderately fractured GNEISS (Recovery 100%, Rock Quality Designation 70%, Unconfined Compressive Strength 8830 psi)	Rec=100%, RQD=70%
573	10								
								Bottom of Boring at 13 feet bgs	
568	15								