November 9, 2023

Mr. Brandon Jones
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Subject: Geotechnical Engineering Study-Supplemental Addendum
Clearfield Municipal Operation Center Expansion
About 497 South Main Street
Clearfield, Utah
CMT Project Number: 19654

INTRODUCTION

A geotechnical study[1] has been recently completed by CMT Technical Services (CMT) for the referenced development in March 2023 which included the proposed construction of a new public works building and an addition to the exiting truck shop. From the time of the referenced report, the inclusion of a new material storage building is now part of the planned expansion. CMT is providing this addendum to address the need for additional recommendations related to the material storage building.

FIELD WORK

On October 16, 2023, CMT returned to the site and completed two additional bore holes extending to depths of about 11.5 to 16.5 feet below the ground surface within the limits of the material storage building. The locations of the additional bore holes are shown in the attached ***Figure 1, Site Plan***. Upon completion of the field investigation, the bore holes were backfilled with auger cuttings.

Samples of the subsurface soils encountered in the bore holes were collected at varying depths through the hollow stem drill augers. Relatively undisturbed samples of the subsurface soils were obtained by hydraulically pushing a 3-inch diameter (Shelby) tube into the undisturbed soils below the drill augers. Disturbed samples were collected utilizing a standard split spoon sampler. This standard split spoon sampler was driven 18 inches into the soils below the drill augers using a 140-pound hammer free-falling a distance of 30 inches. The number of hammer blows needed for each 6-inch interval was recorded. The sum of the hammer blows for the final 12 inches of penetration is known as a standard penetration test and this 'blow count' was recorded on the bore hole logs. The blow count provides a reasonable approximation of the relative density of granular soils, but only a limited indication of the relative consistency of fine-grained soils because the consistency of these soils is significantly influenced by the moisture content.

The subsurface soils encountered in the bore holes were classified in the field based upon visual and textural examination, logged and described in general accordance with ASTM[2] D-2488. These field classifications

[1] "Geotechnical Engineering Study, Clearfield Municipal Operation Center Expansion, About 497 South Main Street, Clearfield, Utah," CMT Project No. 19654, March 6, 2023.
[2] American Society for Testing and Materials

were supplemented by subsequent examination and testing of select samples in our laboratory. Graphical representation of the additional bore holes is shown on the attached **Figures B-1A and B-2A Bore Hole Logs**.

SUBSURFACE SOIL AND GROUNDWATER CONDITIONS

At bore holes B-1A and B-2A, the surface was blanketed with an aggregate base fill on the order of about 12 inches thick. The depth and lateral extent of onsite surface fill could vary both laterally and with depth across the site.

Below the surficial fill, natural soils we encountered comprised generally of fine-grained CLAY/SILT (CL/ML) with varying fine sand content extending to the full depth penetrated, about 16.5 feet below the ground surface at bore hole B-1A and to a depth of about 10 feet at bore hole B-2A. from about 10 feet extending to the full depth penetrated, about 11.5 feet, at bore hole B-2A a layer of silty SAND was encountered.

The silt/clay soils were moist to wet, generally brown in color, very soft to stiff in consistency based on SPT blow counts and based on laboratory testing, exhibit moderate pre-consolidation, moderate strength and moderately high compressibility characteristics. The natural silty sand was loose, wet, brown in color and anticipated to exhibit moderate strength and compressibility characteristics.

Groundwater was observed during drilling at a depth of about 5.0 feet below the ground surface.

LABORATORY TESTING

Selected samples of the subsurface soils were subjected to various laboratory tests to assess pertinent engineering properties, as follows:

1. Moisture Content, ASTM D-2216, Percent moisture representative of field conditions
2. Dry Density, ASTM D-2937, Dry unit weight representing field conditions
3. Atterberg Limits, ASTM D-4318, Plasticity and workability
4. Gradation Analysis, ASTM D-1140/C-117, Grain Size Analysis
5. One Dimension Consolidation, ASTM D-2435, Consolidation properties

Laboratory test results are presented on the attached bore hole logs B-1A and B-2A and in the following **Lab Summary Table**:

LAB SUMMARY TABLE

BORE HOLE	DEPTH (feet)	SOIL CLASS	SAMPLE TYPE	MOISTURE CONTENT(%)	GRADATION			ATTERBERG LIMITS		
					GRAV.	SAND	FINES	LL	PL	PI
B-1A	2.5	SM	SPT	19.1	0	50	49.9	22	20	2
	7.5	ML	Shelby	24	0	48	51.6			
	15	ML	SPT	27.2	0	34	66.4			
B-2A	2.5	CL-ML	SPT	20	0	41	59	24	18	6
	10	SM	SPT	27.5	0	68	32.3			

One-Dimensional Consolidation Tests

A consolidation test was performed on each of three near surface clay/silt samples between depths of about 2.0 and 8.0 feet from bore holes B-1A and B-2A. The results of the tests indicate that the samples tested were moderately over-consolidated and exhibit moderate strength and moderately high compressibility characteristic under the estimated loading conditions. The clay/silt soils will govern foundation design. Detailed results of the tests are maintained within our files and can be transmitted to you, upon your request.

LIQUEFACTION

As discussed in the referenced report, the site is located within an area designated by the Utah Geologic Survey (Davis County)[3] as having "moderate" liquefaction potential.

As completed previously with respect to the prior bore holes, we further evaluated the liquefaction potential from the new bore holes B-1A and B-2A using the procedures described in Youd et al[4] and Idriss & Boulanger[5], which only apply to the saturated silty/sandy deposits. Our new findings are similar to the previous findings in that isolated zones of the saturated silt/sand soils could liquefy under a major seismic event with maximum anticipated settlement resulting from the liquefaction on the order of 1.0 inch or less. This amount of settlement is generally considered tolerable for structures to provide life safety egress, although some relatively minor structural damage would be possible. Lateral spreading due to liquefaction is not anticipated to occur.

RECOMMENDATIONS

Our supplemental findings do not warrant any changes from the recommendations provided in the original report referenced herein. Therefore, it is our opinion that the recommendations provided in the Clearfield Municipal Operation Center Expansion, geotechnical report dated March 6, 2023, remain applicable with respect to the additional construction of the material storage building.

CLOSURE

[3] Utah Geological Survey, "Liquefaction-Potential Map for a Part of Davis County, Utah," Utah Geological Survey Public Information Series 24, August 1994. https://ugspub.nr.utah.gov/publications/public_information/pi-24.pdf

[4] Youd, T.L.; Idriss, I.M.; Andrus, R.D.; Arango, I.; Castro, G.; Christian, J.T.; Dobry, R.; Finn, W.D.L.; Harder, L.F. Jr.; Hynes, M.E.; Ishihara, K.; Koester, J.P.; Liao, S.C.; Marcuson, W.F. III; Martin, G.R.; Mitchell, J.K.; Moriwaki, Y.; Power, M.S.; Robertson, P.K.; Seed, R.B.; and Stokoe, K.H. II; October 2001, "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils," ASCE Journal of Geotechnical and Geoenvironmental Engineering, p 817-833.

[5] Idriss, I.M. and Boulanger, R.W., December 2010, "SPT-Based Liquefaction Triggering Procedures," Department of Civil & Environmental Engineering, University of California at Davis, Report No. UCD/CGM 10/02, 259 p.

This letter must be considered an addendum to the referenced report prepared by CMT and is therefore subject to the same limitations discussed therein. All other recommendations presented within the referenced report remain applicable. If you have any questions, please contact our office at 801-590-0394.

Sincerely,

CMT Engineering Laboratories

PROFESSIONAL ENGINEER
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MATTHEW CLARK KRAMER
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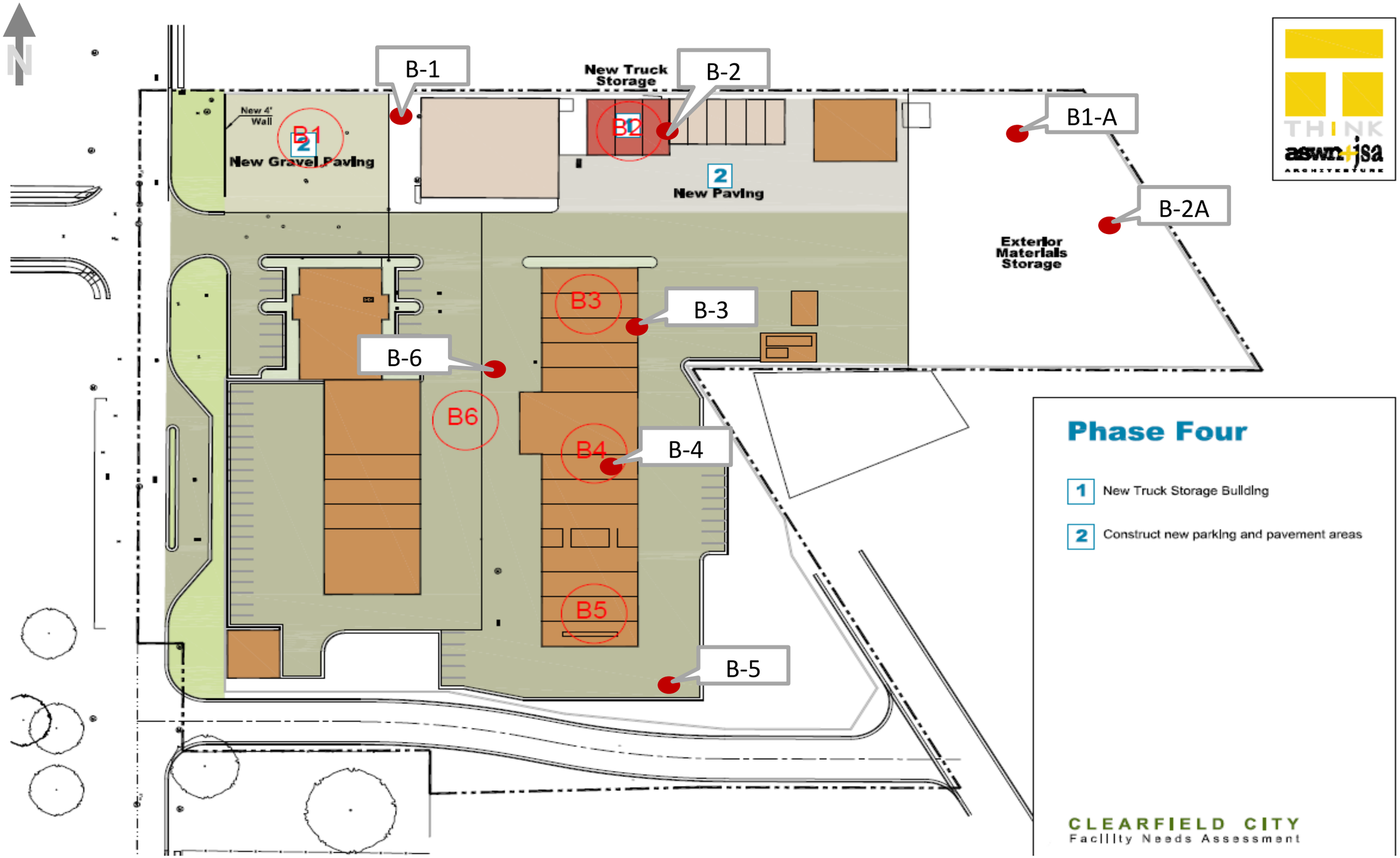
Matthew Clark Kramer, P.E.
Geotechnical Engineer
11/9/2023

Reviewed by:

Bryan N. Roberts, P.E.
Senior Geotechnical Engineer

Attachments: Site Plan and Bore Hole Logs B-1A and B-2A



CMT TECHNICAL SERVICES	**Clearfield Municipal Operation Center** About 497 South Main Street, Clearfield, Utah	**SITE PLAN**	Date: 17-Jan-2023 CMT No.: 19654	Figure: 1

Clearfield Municipal Operations Center Expansion — Bore Hole Log B-1A

About 497 South Main Street, Clearfield, Utah

Total Depth: 16.5'
Water Depth: 5'

Date: 10/16/23
Job #: 19654

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0	Fill; aggragate base												
	Light Gray Brown Silty SAND (ML-SM) moist, medium stiff/dense												
			1	6 5 4	9	19.1		0	50	50	22	20	2
4													
	wet loose/soft		2	2 2 1	3								
8	Light Gray Brown Sandy SILT (ML) wet, medium stiff		3			24	96	0	48	52			
	grades with oxidation												
	stiff		4	4 6 7	13								
12													
			5	2 4 4	8	27.2		0	34	66			
16	END AT 16.5'												
20													
24													
28													

Remarks: Groundwater encountered during drilling at depth of 5 feet.

Coordinates: 41.1066665°, -112.0238549°
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Steve Laird
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Figure: 2

Clearfield Municipal Operations Center Expansion — Bore Hole Log — B-2A

About 497 South Main Street, Clearfield, Utah

Total Depth: 11.5'
Water Depth: 5'

Date: 10/16/23
Job #: 19654

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0	Fill; aggragate base												
	Gray Brown Sandy Clay/Silt (CL-ML) very moist, medium stiff												
			6	2 3 5	8	20		0	41	59	24	18	6
4													
	grades brown wet		7	3 2 2	4								
8			8	1 1 3	4								
	Brown Silty SAND (SM) loose		9	3 4 5	9	27.5		0	68	32.3			
12	END AT 11.5'												
16													
20													
24													
28													

Remarks: Groundwater encountered during drilling at depth of 5 feet.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push
Logged By: Steve Laird
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Figure: 3

Clearfield Municipal Operations Center Expansion

About 497 South Main Street, Clearfield, Utah

Key to Symbols

Date: 10/16/23
Job #: 19654

① Depth (ft)	② GRAPHIC LOG	③ Soil Description	④ Sample Type	⑤ Sample #	⑥⑦ Blows(N) Total	⑧ Moisture (%)	⑨ Dry Density(pcf)	⑩ Gradation Gravel %	Sand %	Fines %	Atterberg LL	PL	PI

COLUMN DESCRIPTIONS

Depth (ft.): Depth (feet) below the ground surface (including groundwater depth - see below right).

Graphic Log: Graphic depicting type of soil encountered (see below).

Soil Description: Description of soils, including Unified Soil Classification Symbol (see below).

Sample Type: Type of soil sample collected; sampler symbols are explained below-right.

Sample #: Consecutive numbering of soil samples collected during field exploration.

Blows: Number of blows to advance sampler in 6" increments, using a 140-lb hammer with 30" drop.

Total Blows: Number of blows to advance sampler the 2nd and 3rd 6" increments.

Moisture (%): Water content of soil sample measured in laboratory (percentage of dry weight).

Dry Density (pcf): The dry density of a soil measured in laboratory (pounds per cubic foot).

Gradation: Percentages of Gravel, Sand and Fines (Silt/Clay), from lab test results of soil passing No. 4 and No. 200 sieves.

Atterberg: Individual descriptions of Atterberg Tests are as follows:

LL = Liquid Limit (%): Water content at which a soil changes from plastic to liquid behavior.

PL = Plastic Limit (%): Water content at which a soil changes from liquid to plastic behavior.

PI = Plasticity Index (%): Range of water content at which a soil exhibits plastic properties (= Liquid Limit - Plastic Limit).

STRATIFICATION	
Description	**Thickness**
Seam	Up to ½ inch
Lense	Up to 12 inches
Layer	Greater than 12 in.
Occasional	1 or less per foot
Frequent	More than 1 per foot

MODIFIERS
Trace
<5%
Some
5-12%
With
> 12%

MOISTURE CONTENT
Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp / moist to the touch, but no visible water.
Saturated: Visible water, usually soil below groundwater.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS		TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material is larger than No. 200 sieve size.	**GRAVELS** The coarse fraction retained on No. 4 sieve.	**CLEAN GRAVELS** (< 5% fines)	GW		Well-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
			GP		Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
		GRAVELS WITH FINES (≥ 12% fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS The coarse fraction passing through No. 4 sieve.	**CLEAN SANDS** (< 5% fines)	SW		Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP		Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (≥ 12% fines)	SM		Silty Sands, Sand-Silt Mixtures
			SC		Clayey Sands, Sand-Clay Mixtures
FINE-GRAINED SOILS More than 50% of material is smaller than No. 200 sieve size.	**SILTS AND CLAYS** Liquid Limit less than 50%		ML		Inorganic Silts and Very Fine Sands, Silty or Clayey Fine Sands or Clayey Silts with Slight
			CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean
			OL		Organic Silts and Organic Silty Clays o f Low Plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%		MH		Inorganic Silts, Micacious or Diatomacious Fine Sand or Silty Soils with Plasticity (Elastic Silts)
			CH		Inorganic Clays of High Plasticity, Fat Clays
			OH		Organic Silts and Organic Clays of Medium to High Plasticity
HIGHLY ORGANIC SOILS			PT		Peat, Humus, Swamp Soils with High Organic Contents

Note: Dual Symbols are used to indicate borderline soil classifications (i.e. GP-GM, SC-SM, etc.).

SAMPLER SYMBOLS

- Block Sample
- Bulk/Bag Sample
- Modified California Sampler 3.5" OD, 2.42" ID
- D&M Sampler
- Rock Core
- Standard Penetration Split Spoon Sampler
- Thin Wall (Shelby Tube)

WATER SYMBOL

- Encountered Water Level
- Measured Water Level

(see Remarks on Logs)

1. The results of laboratory tests on the samples collected are shown on the logs at the respective sample depths.
2. The subsurface conditions represented on the logs are for the locations specified. Caution should be exercised if interpolating between or extrapolating beyond the exploration locations.
3. The information presented on each log is subject to the limitations, conclusions, and recommendations presented in this report.

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Figure: 4