AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
- ENVIRONMENTAL
- GEOTECHNICAL
- MATERIALS
- FORENSICS

FACTUAL REPORT OF SUBSURFACE EXPLORATION

West Industrial Park Expansion
Wausau, Wisconsin

AET Project No. 12-02971

Date:

November 16, 2017

Prepared for:

City of Wausau
407 Grant Street
Wausau, Wisconsin 54403

www.amengtest.com

AMERICAN
ENGINEERING
TESTING, INC.

November 16, 2017

Mr. Allen Wesolowski, P.E., City Engineer
City of Wausau
407 Grant Street
Wausau, Wisconsin 54403

RE: Factual Report of Subsurface Exploration
West Industrial Park Expansion
Wausau, Wisconsin
AET Project No. 12-02971

Dear Mr. Wesolowski:

We are pleased to present the results of our subsurface exploration program we performed for a potential project in the Wausau West Industrial Park Expansion. These services were performed according to our proposal to you dated October 24, 2017.

We are submitting an electronic (PDF) version of this geotechnical report to you. Unless you request otherwise, we will not submit any printed copies of this report to you.

We have enjoyed working with you on this phase of the project. Please contact us if you have questions about this report or require further assistance.

Sincerely,

American Engineering Testing, Inc.

Benjamin B. Mattson, P.E.
Senior Geotechnical Engineer

4203 Schofield Avenue, Suite 1 ▪ Schofield, Wisconsin 54476 ▪ 715-359-3534 ▪ www.amengtest.com

Signature Page

Prepared for:

Mr. Allen Wesolowski, P.E., City Engineer
City of Wausau
407 Grant Street
Wausau, Wisconsin 54403

Prepared by:

American Engineering Testing, Inc.
4203 Schofield Avenue, Suite 1
Schofield, Wisconsin 54476
(715) 359-3534/www.amengtest.com

Report Authored By:

Benjamin B. Mattson, P.E.
Senior Geotechnical Engineer

TABLE OF CONTENTS

1.0 INTRODUCTION

The City of Wausau is working with a company to develop a lot in the West Industrial Park Expansion area. To assist planning and design, the City of Wausau authorized American Engineering Testing, Inc. (AET) to conduct a subsurface exploration program at the site. This factual report presents the results of the above services.

2.0 SCOPE OF SERVICE

AET's services were performed according to our proposal to the City of Wausau dated October 24, 2017. The authorized scope consists of the following:

- Four standard penetration test borings drilled to refusal on apparent bedrock.
- Visual/manual classification of the recovered soil samples.
- Preparation of this factual report.

These services are intended for geotechnical purposes. The scope is not intended to explore for the presence or extent of environmental contamination.

3.0 SUBSURFACE EXPLORATION

Our subsurface exploration program for this project consisted of drilling four borings with standard penetration testing (SPT) and sampling on October 27, 2017. Mr. Allen Wesolowski of the City of Wausau specified the number and approximate locations of the borings. The boring locations are shown on Figure 1 in Appendix A. Personnel from the City of Wausau obtained the surface elevations at our boring locations.

Prior to drilling, we contacted Wisconsin Diggers Hotline to locate public underground utilities at the site. We drilled the borings using 3¼-inch inside-diameter hollow-stem augers. Refer to Appendix A for details on the drilling and sampling methods, the classification methods, and the water level measurement details.

The boring logs are found in Appendix A and contain information concerning soil layering, geologic description, moisture condition, and USCS soil classifications. Relative density or consistency is also noted for the natural soils, which are based on the standard penetration resistance (N-value).

4.0 SITE CONDITIONS

4.1 Subsurface Soils

The generalized subsurface profile at the site consists of surficial topsoil overlying till and weathered bedrock. The till was sandy silt, sandy lean clay with gravel, clayey gravel, and silty gravel; most layers of till also had apparent cobbles.

The weathered bedrock was highly variable in composition and, at many locations, very similar to the overlying till. Thus, the transitions from till to weathered bedrock shown on our boring logs should be considered very approximate.

4.2 Groundwater

We did not observe a groundwater table in any of the four borings we drilled for this exploration.

5.0 LIMITATIONS

Within the limitations of scope, budget, and schedule, we have endeavored to perform our services according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, either express or implied, is intended. Important information regarding risk management and proper use of this report is given in Appendix B entitled “Geotechnical Report Limitations and Guidelines for Use.”

Appendix A

AET Project No. 12-02971

Geotechnical Field Exploration and Testing
Boring Log Notes
Unified Soil Classification System
Figure 1 – Boring Locations
Subsurface Boring Logs

Appendix A
Geotechnical Field Exploration and Testing
AET Project No. 12-02971

A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling and sampling two standard penetration test borings. The boring locations are shown on Figure 1 in Appendix A.

A.2 SAMPLING METHODS

A.2.1 Split-Spoon Samples (SS)

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586. The ASTM test method consists of driving a 2-inch O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30 inches. After an initial set of 6 inches, the number of hammer blows to drive the sampler the next 12 inches is known as the standard penetration resistance or N-value.

In the past, standard penetration N-value tests were performed using a rope and cathead for the lift and drop system. The energy transferred to the split-spoon sampler was typically limited to about 60% of its potential energy due to the friction inherent in that system. That converted energy provided what is known as an N_{60} blow count.

Most drill rigs today incorporate an automatic hammer lift and drop system, which has higher energy efficiency and subsequently results in lower N-values than the traditional N_{60} values. We use a Pile Driving Analyzer (PDA) and an instrumented rod to measure the actual energy generated by the automatic hammer system. The drill rig we used for this project (AET drill rig number 57) has a measured energy transfer ratio of 89%. The N-values reported on the boring logs and the corresponding relative densities and consistencies are from the field blow counts and have not been adjusted to N_{60} values.

A.2.2 Disturbed Samples (DS)/Spin-up Samples (SU)

Sample types described as “DS” or “SU” on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

A.2.3 Sampling Limitations

Unless actually observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Determining the thickness of “topsoil” layers is usually limited, due to variations in topsoil definition, sample recovery, and other factors. Visual-manual description often relies on color for determination, and transitioning changes can account for significant variation in thickness judgment. Accordingly, the topsoil thickness presented on the logs should not be the sole basis for calculating topsoil stripping depths and volumes. If more accurate information is needed relating to thickness and topsoil quality definition, alternate methods of sample retrieval and testing should be employed.

A.3 CLASSIFICATION METHODS

Soil descriptions shown on the boring logs are based on the Unified Soil Classification System (USCS). The USCS is described in ASTM: D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM: D2487 are possible. Otherwise, soil descriptions shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USCS, the descriptive terminology, and the symbols used on the boring logs.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

A.4 WATER LEVEL MEASUREMENTS

The ground water level measurements are shown at the bottom of the boring logs. The following information appears under "Water Level Measurements" on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

A.5 TEST STANDARD LIMITATIONS

Field and laboratory testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

A.6 SAMPLE STORAGE

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

BORING LOG NOTES

DRILLING AND SAMPLING SYMBOLS

Symbol	Definition
B, H, N:	Size of flush-joint casing
CA:	Crew Assistant (initials)
CAS:	Pipe casing, number indicates nominal diameter in inches
CC:	Crew Chief (initials)
COT:	Clean-out tube
DC:	Drive casing; number indicates diameter in inches
DM:	Drilling mud or bentonite slurry
DR:	Driller (initials)
DS:	Disturbed sample from auger flights
FA:	Flight auger; number indicates outside diameter in inches
HA:	Hand auger; number indicates outside diameter
HSA:	Hollow stem auger; number indicates inside diameter in inches
LG:	Field logger (initials)
MC:	Column used to describe moisture condition of samples and for the ground water level symbols
N (BPF):	Standard penetration resistance (N-value) in blows per foot (see notes)
NQ:	NQ wireline core barrel
PQ:	PQ wireline core barrel
RD:	Rotary drilling with fluid and roller or drag bit
REC:	In split-spoon (see notes) and thin-walled tube sampling, the recovered length (in inches) of sample. In rock coring, the length of core recovered (expressed as percent of the total core run). Zero indicates no sample recovered.
REV:	Revert drilling fluid
SS:	Standard split-spoon sampler (steel; 1d" is inside diameter; 2" outside diameter); unless indicated otherwise
SU	Spin-up sample from hollow stem auger
TW:	Thin-walled tube; number indicates inside diameter in inches
WASH:	Sample of material obtained by screening returning rotary drilling fluid or by which has collected inside the borehole after "falling" through drilling fluid
WH:	Sampler advanced by static weight of drill rod and 140-pound hammer
WR:	Sampler advanced by static weight of drill rod
94mm:	94 millimeter wireline core barrel
▼:	Water level directly measured in boring
▽:	Estimated water level based solely on sample appearance

TEST SYMBOLS

Symbol	Definition
CONS:	One-dimensional consolidation test
DEN:	Dry density, pcf
DST:	Direct shear test
E:	Pressuremeter Modulus, tsf
HYD:	Hydrometer analysis
LL:	Liquid Limit, %
LP:	Pressuremeter Limit Pressure, tsf
OC:	Organic Content, %
PERM:	Coefficient of permeability (K) test; F - Field; L - Laboratory
PL:	Plastic Limit, %
q_p:	Pocket Penetrometer strength, tsf (approximate)
q_c:	Static cone bearing pressure, tsf
q_u:	Unconfined compressive strength, psf
R:	Electrical Resistivity, ohm-cms
RQD:	Rock Quality Designation of Rock Core, in percent (aggregate length of core pieces 4" or more in length as a percent of total core run)
SA:	Sieve analysis
TRX:	Triaxial compression test
VSR:	Vane shear strength, remolded (field), psf
VSU:	Vane shear strength, undisturbed (field), psf
WC:	Water content, as percent of dry weight
%-200:	Percent of material finer than #200 sieve

STANDARD PENETRATION TEST NOTES

The standard penetration test consists of driving the sampler with a 140 pound hammer and counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM: D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest 0.1' below the slash.

The length of sample recovered, as shown on the "REC" column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM: D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

UNIFIED SOIL CLASSIFICATION SYSTEM
ASTM Designations: D 2487, D2488

AMERICAN ENGINEERING TESTING, INC.

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification: Group Symbol	Soil Classification: Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines more than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F.G.H]
			Fines classify as CL or CH	GC	Clayey gravel[F.G.H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well-graded sand[I]
			$Cu < 6$ and $1 > Cc > 3$[E]	SP	Poorly-graded sand[I]
		Sands with Fines more than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G.H.I]
			Fines classify as CL or CH	SC	Clayey sand[G.H.I]
Fine-Grained Soils 50% or more passes the No. 200 sieve (see Plasticity Chart below)	Silts and Clays Liquid limit less than 50	inorganic	PI>7 and plots on or above "A" line[J]	CL	Lean clay[K.L.M]
			PI<4 or plots below "A" line[J]	ML	Silt[K.L.M]
		organic	$\frac{\text{Liquid limit–oven dried}}{\text{Liquid limit – not dried}} < 0.75$	OL	Organic clay[K.L.M.N] Organic silt[K.L.M.O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K.L.M]
			PI plots below "A" line	MH	Elastic silt[K.L.M]
		organic	$\frac{\text{Liquid limit–oven dried}}{\text{Liquid limit – not dried}} < 0.75$	OH	Organic clay[K.L.M.P] Organic silt[K.L.M.Q]
Highly organic soil			Primarily organic matter, dark in color, and organic in odor	PT	Peat[R]

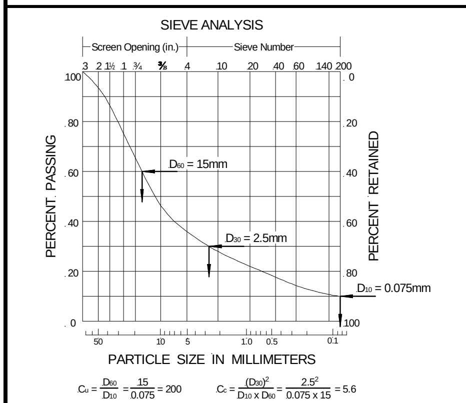
Notes

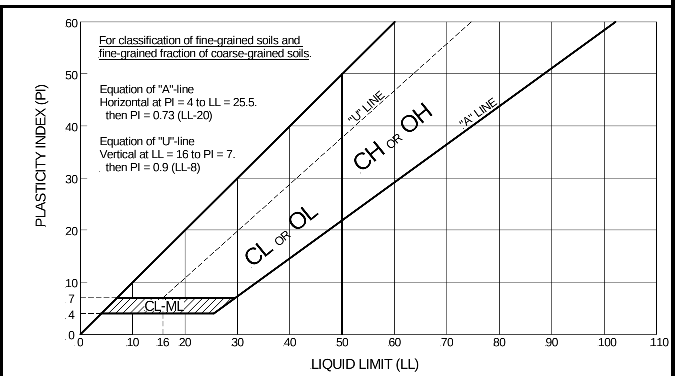
[A]Based on the material passing the 3-in (75-mm) sieve.
[B]If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C]Gravels with 5 to 12% fines require dual symbols:
- GW-GM well-graded gravel with silt
- GW-GC well-graded gravel with clay
- GP-GM poorly graded gravel with silt
- GP-GC poorly graded gravel with clay

[D]Sands with 5 to 12% fines require dual symbols:
- SW-SM well-graded sand with silt
- SW-SC well-graded sand with clay
- SP-SM poorly graded sand with silt
- SP-SC poorly graded sand with clay

[E]$Cu = D_{60} / D_{10}$, $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F]If soil contains $\geq$15% sand, add "with sand" to group name.
[G]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H]If fines are organic, add "with organic fines" to group name.
[I]If soil contains $\geq$15% gravel, add "with gravel" to group name.
[J]If Atterberg limits plot is hatched area, soils is a CL-ML silty clay.
[K]If soil contains 15 to 29% plus No. 200 add "with sand" or "with gravel", whichever is predominant.
[L]If soil contains $\geq$30% plus No. 200, predominantly sand, add "sandy" to group name.
[M]If soil contains $\geq$30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N]PI$\geq$4 and plots on or above "A" line.
[O]PI<4 or plots below "A" line.
[P]PI plots on or above "A" line.
[Q]PI plots below "A" line.
[R]Fiber Content description shown below.





Plasticity Chart

ADDITIONAL TERMINOLOGY NOTES USED BY AET FOR SOIL IDENTIFICATION AND DESCRIPTION

Grain Size

Term	Particle Size
Boulders	Over 12"
Cobbles	3" to 12"
Gravel	#4 sieve to 3"
Sand	#200 to #4 sieve
Fines (silt & clay)	Pass #200 sieve

Gravel Percentages

Term	Percent
A Little Gravel	3% - 14%
With Gravel	15% - 29%
Gravelly	30% - 50%

Consistency of Plastic Soils

Term	N-Value, BPF
Very Soft	less than 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	Greater than 30

Relative Density of Non-Plastic Soils

Term	N-Value, BPF
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	Greater than 50

Moisture/Frost Condition (MC Column)

- D (Dry): Absense of moisture, dusty, dry to touch.
- M (Moist): Damp, although free water not visible. Soil may still have a high water content (over "optimum").
- W (Wet/ Waterbearing): Free water visible intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt.
- F (Frozen): Soil frozen

Layering Notes

- Laminations: Layers less than ½" thick of differing material or color.
- Lenses: Pockets or layers greater than ½" thick of differing material or color.

Peat Description

Term	Fiber Content (Visual Estimate)
Fibric Peat:	Greater than 67%
Hemic Peat:	33 – 67%
Sapric Peat:	Less than 33%

Organic Description (if no lab tests)

Soils are described as *organic*, if soil is not peat and is judged to have sufficient organic fines content to influence the Liquid Limit properties. *Slightly organic* used for borderline cases.

Root Inclusions

- With roots: Judged to have sufficient quantity of roots to influence the soil properties.
- Trace roots: Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.

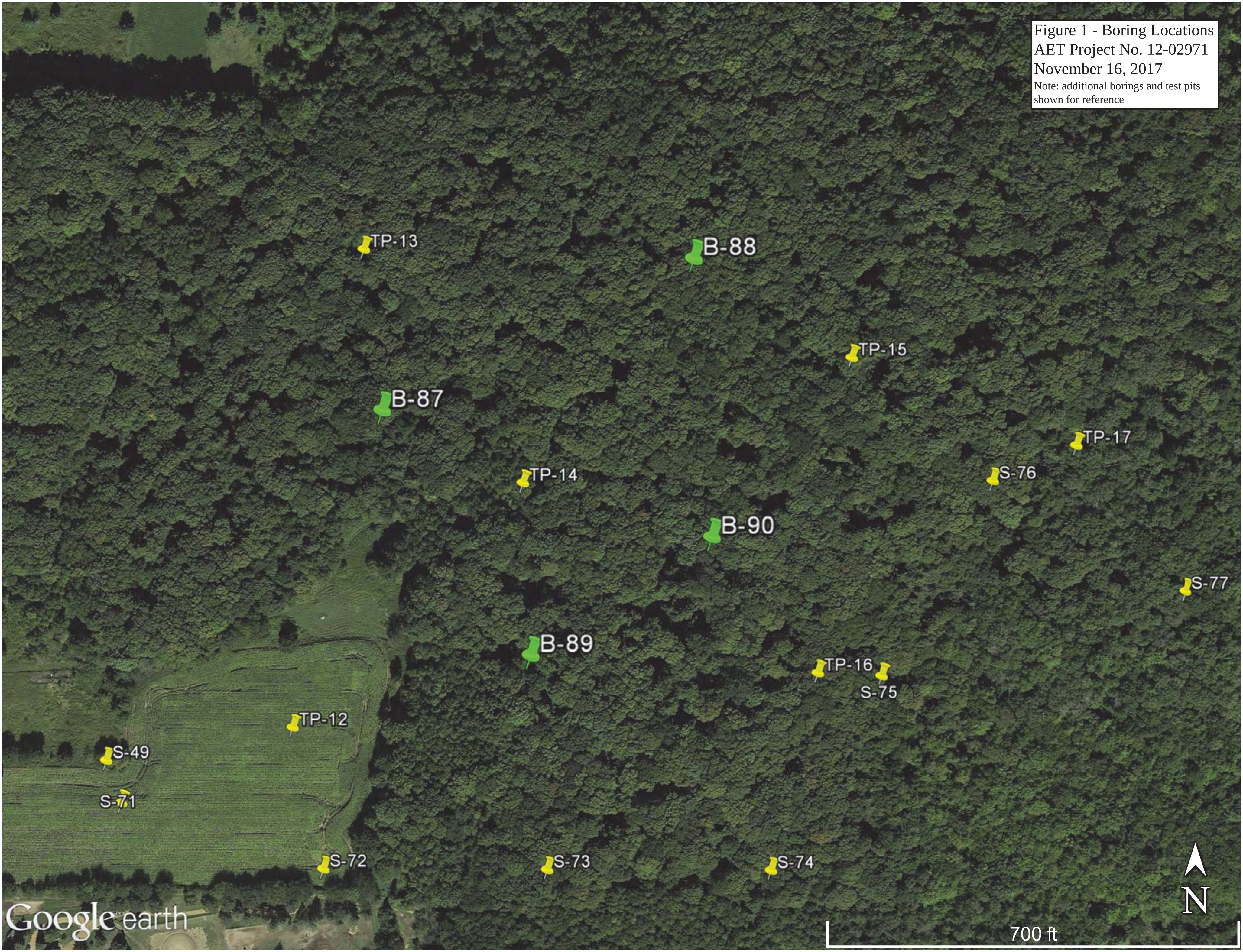


Figure 1 - Boring Locations
AET Project No. 12-02971
November 16, 2017
Note: additional borings and test pits shown for reference

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **12-02971** Log of Boring No. **B-87 (p. 1 of 1)**

Project: **West Industrial Park Expansion; Wausau, Wisconsin**

Surface Elevation **1369.0**

DEPTH IN FEET	ELEV. FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	qp	LL	PL	%-#200
	1368.7	SILT with organics and sand, dark brown, moist (OL)	TOPSOIL									
1		Sandy SILT, a little gravel, brown, moist, loose (ML)	TILL	6	M	SS	11					
2	1367.0	Sandy LEAN CLAY with gravel, brown, hard, with apparent cobbles (CL)										
3				36	M	SS	13					
4	1364.5	CLAYEY GRAVEL with sand, brown and gray, moist, medium dense to dense, with apparent cobbles (GC)										
5				44	M	SS	14					
6												
7												
8				23	M	SS	15					
9	1359.5	Weathered bedrock with the fabric of SILTY GRAVEL with sand, gray, moist, very dense, with apparent cobbles (GM)	WEATHERED BEDROCK									
10				68	M	SS	14					
11												
12				50/.4	M	SS	4					
13	1356.0	*Auger refusal - end of boring at 13.0 feet*										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-13.0'	**3.25" HSA**	**10/27/17**	**0845**	**12.9'**	**13.0'**	**13.0'**	**None**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **10/27/17**

DR: **MD** LG: **LL** Rig: **57**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-ELEV 12-02971.GPJ AET+CPT+WELL.GDT 11/16/17

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **12-02971** Log of Boring No. **B-88 (p. 1 of 1)**

Project: **West Industrial Park Expansion; Wausau, Wisconsin**

DEPTH IN FEET	ELEV. FEET	Surface Elevation 1360.8 MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	qp	LL	PL	%-#200
	1360.3	SILT with organics and sand, dark brown, moist (OL)	TOPSOIL									
1		Sandy SILT with gravel, brown, moist, medium dense (ML)	TILL	19	M	SS	10					
2	1358.8	SILTY GRAVEL with sand, brown, moist, dense to very dense, with apparent cobbles (GM)										
3				36	M	SS	12					
4												
5				58	M	SS	11					
6												
7												
8				78/.9	M	SS	10					
9												
10				50/.2	M	SS	0					
11												
12	1348.8	Weathered bedrock with the fabric of CLAYEY GRAVEL with sand, dark gray, moist, dense, with apparent cobbles (GC)	WEATHERED BEDROCK									
13				34	M	SS	10					
14	1346.8	*End of boring at 14.0 feet*										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-14.0'	**3.25" HSA**	**10/27/17**	**0945**	**14.0'**	**14.0'**	**14.0'**	**None**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **10/27/17**

DR: **MD** LG: **LL** Rig: **57**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-ELEV 12-02971.GPJ AET+CPT+WELL.GDT 11/16/17

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **12-02971** Log of Boring No. **B-89 (p. 1 of 1)**

Project: **West Industrial Park Expansion; Wausau, Wisconsin**

DEPTH IN FEET	ELEV. FEET	Surface Elevation **1376.5** MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	qp	LL	PL	%-#200
	1376.2	SILT with organics and sand, dark brown, moist (OL)	TOPSOIL									
1		Sandy SILT, a little gravel, brown, moist, loose (ML)	TILL	6	M	SS	12					
2	1374.5	Weathered bedrock with the fabric of SILTY GRAVEL with sand, dark gray, moist, very dense, with apparent cobbles (GM)	WEATHERED BEDROCK	50/.1	M	SS	3					
	1373.9	*Auger refusal - end of boring at 2.6 feet. Moved 6 feet north and attempted boring again; encountered auger refusal at 2.0 feet*										

DEPTH:	DRILLING METHOD
0-2.6'	**3.25" HSA**

BORING COMPLETED: **10/27/17**

DR: **MD** LG: **LL** Rig: **57**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10/27/17	**1115**	**2.6'**	**2.6'**	**2.6'**	**None**	**None**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-ELEV 12-02971.GPJ AET+CPT+WELL.GDT 11/16/17

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **12-02971** Log of Boring No. **B-90 (p. 1 of 1)**

Project: **West Industrial Park Expansion; Wausau, Wisconsin**

Surface Elevation **1356.0**

DEPTH IN FEET	ELEV. FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	qp	LL	PL	%-#200
	1355.6	SILT with organics and sand, dark brown, moist (OL)	TOPSOIL									
1		Sandy SILT, a little gravel, brown, moist, very loose (ML)	TILL	4	M	SS	14					
2	1354.0	SILTY GRAVEL with sand, dark gray and brown, moist, medium dense to very dense, with apparent cobbles (GM)										
3				26	M	SS	15					
4												
5												
				41	M	SS	16					
6												
7				50/.3	M	SS	5					
8												
9	1346.5											
	1346.1	Weathered bedrock with the fabric of GRAVEL, dark gray, moist, very dense, with apparent cobbles (GP)	WEATHERED BEDROCK	50/.4	M	SS	1					
		Auger refusal - end of boring at 9.9 feet										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-9.9'	**3.25" HSA**	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		10/27/17	**1030**	**9.9'**	**9.9'**	**9.9'**	**None**	**None**	
BORING COMPLETED:	**10/27/17**								
DR: **MD** LG: **LL**	Rig: **57**								

AET_CORP W-ELEV 12-02971.GPJ AET+CPT+WELL.GDT 11/16/17

Appendix B

AET Project No. 12-02971

Geotechnical Report Limitations and Guidelines for Use

Appendix B
Geotechnical Report Limitations and Guidelines for Use
AET Project No. 12-02971

B.1 REFERENCE

This appendix provides information to help you manage your risks relating to subsurface problems which are caused by construction delays, cost overruns, claims, and disputes. This information was developed and provided by GBA[1], of which, we are a member firm.

B.2 RISK MANAGEMENT INFORMATION

B.2.1 Geotechnical Services are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. And no one, not even you, should apply the report for any purpose or project except the one originally contemplated.

B.2.2 Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

B.2.3 A Geotechnical Engineering Report is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typically, factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, always inform your geotechnical engineer of project changes, even minor ones, and request an assessment of their impact. Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.

B.2.4 Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. Do not rely on a geotechnical engineering report whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. Always contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

---

1 Geoprofessional Business Association, 1300 Piccard Drive, LL14, Rockville, MD 20850
Telephone: 301/565-2733: www.geoprofessional.org

B.2.5 Most Geotechnical Findings Are Professional Opinions
Site exploration identified subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

B.2.6 A Report's Recommendations Are Not Final
Do not over-rely on the construction recommendations included in your report. Those recommendations are not final, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.

B.2.7 A Geotechnical Engineering Report Is Subject to Misinterpretation
Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

B.2.8 Do Not Redraw the Engineer's Logs
Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognizes that separating logs from the report can elevate risk.

B.2.9 Give Contractors a Complete Report and Guidance
Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, but preface it with a clearly written letter of transmittal. In the letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

B.2.10 Read Responsibility Provisions Closely
Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their report. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

B.2.11 Geoenvironmental Concerns Are Not Covered
The equipment, techniques, and personnel used to perform a geoenvironmental study differ significantly from those used to perform a geotechnical study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated environmental problems have led to numerous project failures. If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. Do not rely on an environmental report prepared for someone else.