AMERICAN ENGINEERING TESTING, INC.

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REPORT OF GEOTECHNICAL EXPLORATION

Proposed Building Addition
Community Partners Campus
360 Grand Avenue
Wausau, Wisconsin

AET Project No. 12-21592

Date:

April 7, 2021

Prepared for:

REI Engineering, Inc.
4080 N. 20th Avenue
Wausau, Wisconsin 54401

www.amengtest.com

AMERICAN
ENGINEERING
TESTING, INC.

April 7, 2021

Mr. Jim Borysenko, P.E.
REI Engineering, Inc.
4080 N. 20th Avenue
Wausau, Wisconsin 54401

RE: Report of Geotechnical Exploration
Proposed Building Addition
Community Partners Campus
360 Grand Avenue
Wausau, Wisconsin
AET Project No. 12-21592

Dear Mr. Borysenko:

We are pleased to present the results of our subsurface exploration program for your Community Partners Campus project in Wausau, Wisconsin. These services were performed according to our proposal to you dated March 16, 2021.

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

We appreciate the opportunity to work 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

Signature Page

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BENJAMIN B.
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MI

April 7, 2021

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1.0 INTRODUCTION

REI Engineering, Inc. is providing planning and civil engineering services for a proposed building addition at 360 Grand Avenue in Wausau, Wisconsin. To assist planning and design, Mr. Jim Borysenko, P.E., of REI authorized American Engineering Testing, Inc. (AET) to conduct a subsurface exploration program at the site and perform a geotechnical engineering review for the project. This report presents the results of the above services and provides our engineering recommendations based on this data.

2.0 SCOPE OF SERVICE

AET's services were performed according to our proposal to REI dated March 16, 2021. The authorized scope consists of:

- Four standard penetration test borings to depths of 20 feet each. Due to the soil conditions encountered, the borings were extended to depths of 21.5 to 51.5 feet.
- Visual/manual classification of the recovered soil samples.
- Geotechnical engineering review based on the gained data and preparation of this 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 PROJECT INFORMATION

The project includes the design and construction of an addition to the building at 360 Grand Avenue, which is the potential new home for Wausau Community Partners Campus. The addition would cover a footprint of about 7,000 square feet; it will have up to two stories and provide space for non-profit organizations. The finished floor elevation will match the existing building at approximately 1213.8 feet. The above-stated information represents our understanding of the project and is an integral part of our engineering review. It is important we be contacted if there are changes from that described so we can evaluate if modifications to our recommendations are appropriate.

4.0 SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our subsurface exploration program for this project consisted of drilling a total of four borings with standard penetration testing (SPT) and sampling on March 23 and April 2, 2021. Mr. Borysenko specified the number (four), planned depths (20 feet), and locations of the borings, which are shown on Figure 1 in Appendix A. Due to the soil conditions encountered, the borings were extended to depths of 21.5 to 51.5 feet, following our discussions with Mr. Borysenko. Borings B-1 through B-3 were drilled in the proposed addition area, while B-4 was drilled on the west side of the existing building. The initial drilling attempt at B-3 encountered refusal at a depth of 5.3 feet; we moved 6 feet and continued B-3 to its termination depth.

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 classifications. Relative density or consistency is also noted for the natural soils, which are based on the standard penetration resistance (N-value).

5.0 SITE CONDITIONS

5.1 Surface Observations

The proposed addition area is occupied by bituminous-paved parking lot space. The ground surface is relatively flat in the proposed addition area, with those boring elevations differing by less than 1 foot.

5.2 Subsurface Soils

Below the surficial pavement, we encountered fill to depths of about 12, 14.5, 43, and 48 feet in borings B-1 through B-4, respectively. The fill was mostly sand with varying silt and gravel contents; there was also some trace debris in several of the fill layers. The underlying soils were coarse alluvium, consisting of loose to dense sand with varying silt and gravel contents.

5.3 Groundwater

We measured groundwater at a depth of 46.7 feet in B-4 at the time of drilling and did not observe water levels in the remaining borings. Groundwater levels will fluctuate due to varying seasonal and annual rainfall and snow melt amounts and other factors. The installation of piezometers for obtaining additional water level measurements was beyond our scope of service.

6.0 BUILDING RECOMMENDATIONS

6.1 Approach Discussion

The existing fill we encountered in our borings does not appear to have been placed and compacted in a systematic manner adequate for reliably supporting the building addition. Thus, soil correction should be performed prior to constructing the addition. It is our opinion soil correction could be performed by using rammed-aggregate piers (RAPs). Subcutting and replacement of the fill is not feasible due to the depth of the fill. Driven piles might be a suitable option, although the piles would be driven deeper than our borings and driven piles would likely be more expensive than using RAPs. Details of our recommendations are provided in the following sections.

6.2 Overview of Rammed-Aggregate Piers

Rammed-aggregate piers (RAPs) are an intermediate design-build soil reinforcement system that can be used to support structures (including foundations and floor slabs) as an alternative to soil overexcavation (subcutting) and deep foundations. The system allows the use of conventional spread footings and floor slabs cast on-grade, and typically provides settlement control to within ¾ to 1 inch or less, but lower settlements can be achieved. For this project, RAPs should be used to support the footings; whether they are also used to support the floor slab will depend on the level of risk the project owner is willing to accept.

RAPs are installed by ramming 1-foot-thick lifts of aggregate into a cavity (shaft) that is created by drilled or displacement methods. The rammed aggregate lifts form a very stiff, high-density composite aggregate pier. The first lift of aggregate forms a bulb below the bottoms of the piers thereby pre-stressing and pre-straining the soils to a depth equal to at least one pier diameter below the pier.

Ramming takes place with a high-energy beveled tamper or mandrel that both densifies the aggregate and forces the aggregate laterally into the sidewalls of the shaft. This action increases the lateral stress in surrounding soil thereby further stiffening the stabilized composite soil mass. The result of RAP installation is a significant strengthening and stiffening of subsurface soils that can then support floor slabs and spread footings. After installation of the RAPs, the foundations may be constructed as conventional spread footings.

If a RAP system is selected, Quality Assurance Testing should be performed during installation, including documentation of the shaft lengths, the amount of aggregate used, and tests on the compacted aggregate lifts.

6.3 Site Preparation

With a RAP system at this site, all surficial pavement and underground utilities should be removed but existing fill could be left in place. If there is large debris (e.g. the obstruction we encountered in boring B-3) in the subsurface profile, it is possible these materials would have to be removed prior to RAP installation; this would depend on the size and hardness of the debris.

New fill below the addition should be granular soil having less than 12% by weight passing the No. 200 sieve, and having a maximum aggregate size of 1 inch. Fill placed to attain grade for foundation and/or slab support should be compacted in thin lifts, such that the entire lift achieves a compaction level of at least 95% of its maximum modified Proctor dry density. For granular soils, a lift thickness on the order of 8 inches may be appropriate, although this should be reviewed in the field at the time of construction. If the ground improvement design includes differing fill requirements, those requirements should be followed.

6.4 Foundation Design Recommendations

As a preliminary estimate of an allowable bearing pressure that can be used for conventional footing foundation design, following ground improvement with RAPs, we anticipate a value on the order of 4,000 to 6,000 psf would be achievable. The RAP contractor would select the allowable bearing pressure that can be used for design. We recommend that perimeter foundations for heated building spaces bear a minimum of 4 feet below exterior grade for protection from frost penetration. Interior footings in heated areas should bear at least 18 inches below the finished floor elevation to provide confinement to the bearing stratum. Footings in unheated areas should be extended to a minimum of 5 feet below surrounding grade.

6.5 Floor Slab Design

Whether RAPs are used to support the floor slab will depend on the level of risk the project owner is willing to accept. The primary risk consists of excessive total and/or differential settlement.

We recommend the placement of a 6-inch-thick layer of WisDOT 305 dense-graded base course below the floor slab. Interior backfill in under slab utility trenches and in footing trenches should be held to the same requirements of Section 6.3. Provided our site preparation recommendations are followed, the structural engineer can use a modulus of subgrade reaction of 225 pounds per cubic inch to design the floor slab thickness and reinforcement.

We recommend a vapor retarder be placed under the floor slab. The purpose of a vapor retarder is to reduce the potential for the upward migration of water vapor from the soil into and through the concrete slab. Water vapor migrating upward through the slab can damage floor coverings such as the carpeting, wood, or paint/sealers and contribute to excess humidity and microbial growth in the building. Various methods of vapor retarder construction are described in Part 2, Section 302.2R of the American Concrete Institute *Manual of Concrete Practice*.

The slab-on-grade should be designed and constructed following the recommendations of the Portland Cement Association and the American Concrete Institute. The slab should have construction joints/control joints at spacings recommended by the Portland Cement Association and the American Concrete Institute to mitigate, but not eliminate, slab curling and cracking. The floor slab should be cast independent of the foundation walls of the building to allow relative movement of the slabs and footings to occur without causing excessive distress to the structure.

6.6 Exterior Slabs and Sidewalks

Where exterior slabs and sidewalks abut the building, silty and clayey soils should be subcut to a depth of 4 feet below bottom of slab/sidewalk and replaced with non-frost susceptible (NFS) granular fill. This NFS fill subbase layer should consist of sand or a sand and gravel mix having less than 5% by weight passing the No. 200 sieve. This fill should be compacted to at least 95% of its maximum modified Proctor dry density. The purpose of constructing the NFS subgrade is to reduce the potential for the characteristic heave (including differential heave) that can occur when silty and clayey soils freeze each winter. This heaving can raise the slabs to jam doors or damage the structure.

As an alternative, the slabs/sidewalks should be designed as structural slabs supported on footings bearing at least 5 feet deep. An air gap of at least 2 inches should be left below the slab, and insulation panels should cover the vertical frost walls to act as a bondbreaker and to prevent adfreezing between the backfilled soils and the frost walls.

For either option, the design should include transition zones from the frost-protected slabs/sidewalks to unprotected (or less protected) areas. The purpose of this is to reduce the risk of abrupt transitions in frost heave of slabs and pavements.

6.7 Seismic Design Considerations

According to the International Building Code, the Site Class is determined by properties of the top 100 feet of the subsurface profile. Based on our borings and geologic conditions at the site, it is our opinion the project site should be classified as Site Class D per Table 1613.5.2 of the IBC.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Groundwater

Based on the conditions found in our borings, it is our opinion the contractor will probably not encounter the static groundwater table at the site. It is possible perched water will be encountered within the fill. If water is encountered in the excavations, it should be promptly pumped out before compacted fill or concrete are placed. The contractor should not be allowed to place fill or concrete into standing water, or over softened soils in an attempt to displace these materials. This technique can result in trapping softened soils under footings and/or floor slabs, resulting in excessive post-construction settlement, even if the softened zone is only a few inches thick.

7.2 Disturbance of Soils

The soils at this site are sensitive to disturbance and will become easily disturbed under construction traffic, especially when wet. If soils become disturbed, they should be subcut to the underlying undisturbed soils, followed by placement of new compacted fill.

7.3 Excavation Backsloping

If excavation faces are not retained, the excavations should maintain maximum allowable slopes in accordance with *OSHA Regulations (Standards 29 CFR), Part 1926, Subpart P, "Excavations"* (can be found on www.osha.gov). Even with the required OSHA sloping, water seepage or surface runoff can potentially induce sideslope erosion or running which could require slope maintenance.

7.4 Observation and Testing

The recommendations in this report are based on the subsurface conditions found at our test boring locations. Since the soil conditions can be expected to vary away from the soil boring locations, we recommend on-site observation by a geotechnical engineer/technician during construction to evaluate these potential changes. Soil density testing should also be performed on new fill placed in order to document that project specifications for compaction have been met.

8.0 ASTM STANDARDS

When we refer to an ASTM Standard in this report, we mean that our services were performed in general accordance with that standard. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

9.0 LIMITATIONS

Within the limitations of scope, budget, and schedule, we have endeavored to provide our services according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, 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. 12-21592

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. 12-21592

A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling four standard penetration test borings. The boring locations are shown on Figure 1.

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 (AET rig number 5) we used for this project has a measured energy transfer ratio of 82%. 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	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] $Cu = D_{60} / D_{10,} \qquad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥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 ≥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 ≥30% plus No. 200, predominantly sand, add “sandy” to group name.

[M] If soil contains ≥30% plus No. 200, predominantly gravel, add “gravelly” to group name.

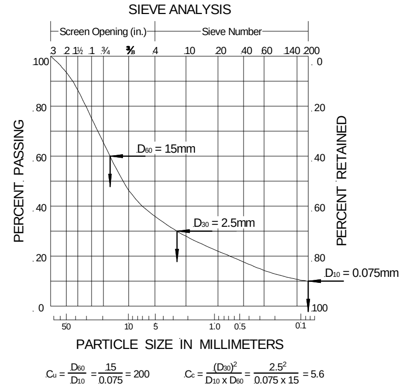
[N] PI≥4 and plots on or above “A” line.

[O] PI<4 or plots below “A” line.

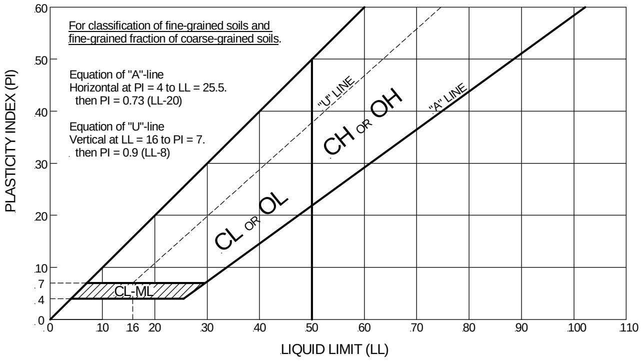
[P] PI plots on or above “A” line.

[Q] PI plots below “A” line.

[R] Fiber Content description shown below.



$C_u = \frac{D_{60}}{D_{10}} = \frac{15}{0.075} = 200 \qquad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = \frac{2.5^2}{0.075 \times 15} = 5.6$



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.

SURVEY NOTES:

1. FIELDWORK PERFORMED BY REI ON 2-12-2021.
2. TITLE WORK FOR THE PROJECT SITE WAS NOT PROVIDED TO REI FOR REVIEW, THEREFORE REI WAS UNABLE TO VERIFY THE EXISTENCE OF EASEMENTS OR OTHER ENCUMBRANCES OUTSIDE OF WHAT WAS FOUND DURING TOPOGRAPHIC SURVEY AND BOUNDARY MAPPING.
3. PUBLIC UTILITIES - THE SOURCE INFORMATION FROM PLANS AND MARKINGS PROVIDED BY OTHERS WAS COMBINED WITH OBSERVED SURFACE EVIDENCE OF UTILITIES TO DEVELOP THE APPROXIMATED LOCATION OF THE UNDERGROUND UTILITIES. HOWEVER, LACKING EXCAVATION, THE EXACT LOCATION OF ALL UNDERGROUND FEATURES CANNOT BE ACCURATELY, COMPLETELY OR RELIABLY DEPICTED. IN ADDITION, IN SOME JURISDICTIONS, 811 UTILITY LOCATE REQUESTS FROM SURVEYORS MAY BE IGNORED OR PARTIALLY RESPONDED TO. WHERE ADDITIONAL OR MORE DETAILED INFORMATION IS REQUIRED, THE CLIENT IS ADVISED THAT EXCAVATION AND/OR A PRIVATE UTILITY LOCATE REQUEST MAY BE NECESSARY. DIGGER'S TICKET #20210601375
4. PRIVATE UTILITIES WERE NOT MARKED OR MAPPED AS A PART OF THIS SURVEY. NON-METALLIC UTILITIES OR UTILITIES WITHOUT TRACER WIRE MAY EXIST BUT WOULD NOT BE IDENTIFIED.
5. ELEVATIONS AS SHOWN ON THE MAP ARE BASED ON THE NAVD 88 DATUM AND ESTABLISHED BY THE WISCORS NETWORK.
6. BEARINGS ARE BASED ON THE MARATHON COUNTY COORDINATE SYSTEM, NAD 83(2011) DATUM AND REFERENCED TO THE WEST RIGHT-OF-WAY LINE OF GRAND AVENUE, MEASURED TO BEAR SOUTH 14°51'08" EAST .
7. THE PROPERTY IS NOT LOCATED IN A 100 YEAR FLOOD PLANE.
8. SURVEY WAS WAS COMPLETED DURING SNOW COVERED CONDITIONS WHICH MAY IMPACT THE SURVEY ACCURACY AND THE ABILITY TO LOCATE CERTAIN FEATURES.

TOPOGRAPHIC SURVEY

LOT 4 OF CERTIFIED SURVEY MAP NUMBER 5576, RECORDED IN VOLUME 20, ON PAGE 169, AS DOCUMENT NUMBER 912900, FILED IN THE MARATHON COUNTY REGISTER OF DEEDS OFFICE; LOCATED IN PART OF GOVERNMENT LOT 1 AND PART OF THE SOUTHEAST 1/4 OF THE NORTHWEST 1/4 OF SECTION 36, TOWNSHIP 29 NORTH, RANGE 7 EAST, CITY OF WAUSAU, MARATHON COUNTY, WISCONSIN.

LEGEND

⊕	BENCHMARK	EM	EXISTING ELECTRIC METER
●	1 3/4" O.D. IRON PIPE	MB	EXISTING MAIL DROP BOX
◉	3/4" IRON BAR (UNLESS NOTED)	—G—	EXISTING UNDERGROUND GAS
●	EXISTING BOLLARD	—E—	EXISTING UNDERGROUND ELECTRIC
	EXISTING MONUMENT SIGN	—T—	EXISTING UNDERGROUND TELEPHONE
	EXISTING SIGN	—SAN—	EXISTING SANITARY SEWER
⊜	EXISTING CATCH BASIN	—TV—	EXISTING CABLE TV
	EXISTING GUY ANCHOR	—FO—	EXISTING FIBER OPTIC CABLE
	EXISTING UTILITY POLE	—OH—	EXISTING OVERHEAD UTILITIES
	EXISTING LIGHT POLE	—SS—	EXISTING STORM SEWER
○CO	EXISTING SANITARY CLEAN OUT	—W—	EXISTING WATER LINE
♿	EXISTING HANDICAP STALL		EXISTING TREE LINE
MT	EXISTING TELEVISION MANHOLE	━	EXISTING PROPERTY LINE
MH	EXISTING MANHOLE		EXISTING CURB & GUTTER
MR	EXISTING STORM MANHOLE	---1226---	EXISTING MINOR CONTOUR (INTERVAL-1 FT.)
MS	EXISTING SANITARY SEWER MANHOLE	---1225---	EXISTING MAJOR CONTOUR (INTERVAL-5 FT.)
▥	EXISTING CURB INLET	▨	EXISTING LANDSCAPING
☒	EXISTING UTILITY PEDESTAL	▨	EXISTING CONCRETE
AC	EXISTING AIR CONDITIONING UNIT	126.00'	MEASURED BEARING/LENGTH
		(126.00')	RECORDED BEARING/LENGTH

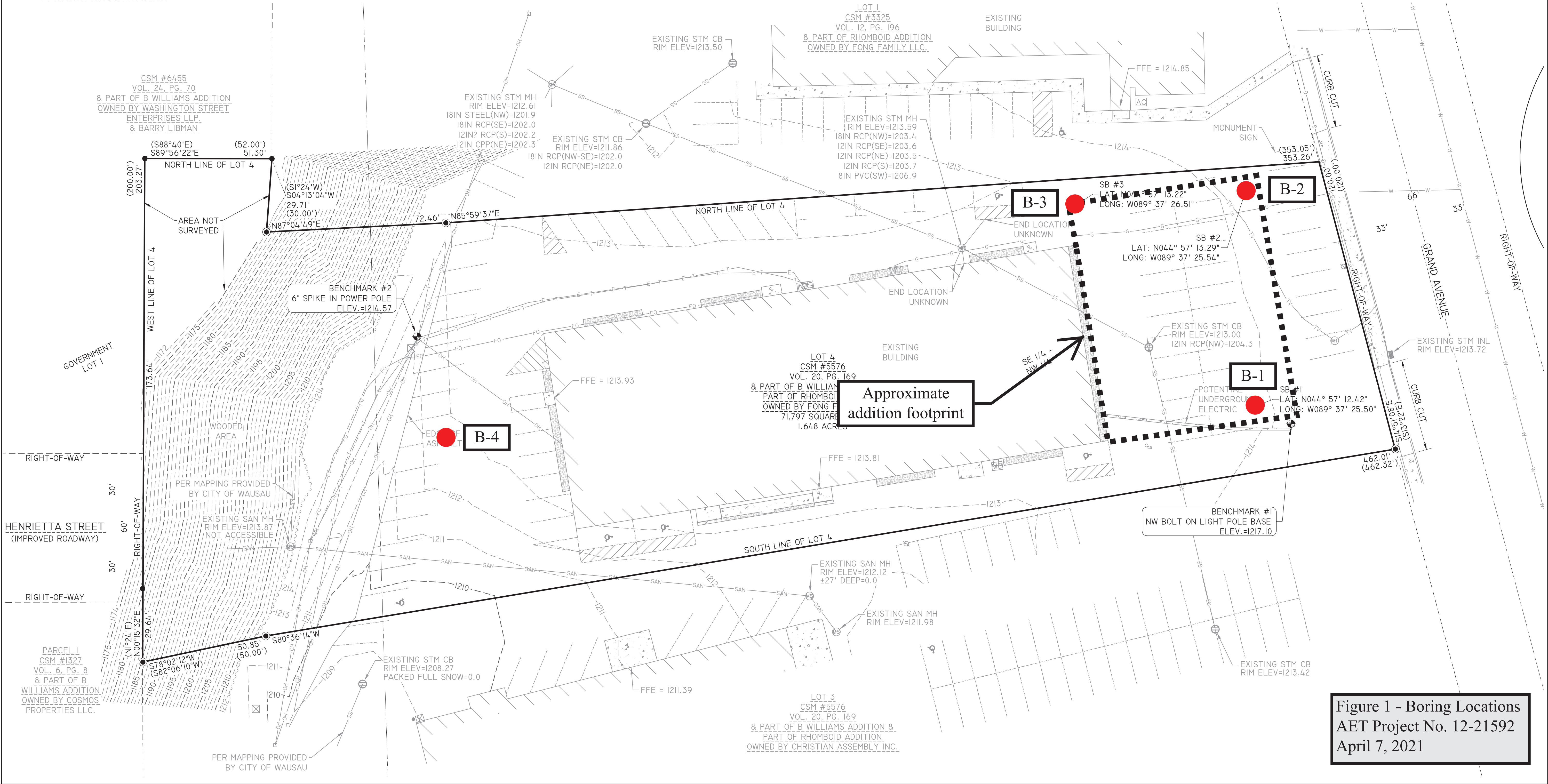


Figure 1 - Boring Locations
AET Project No. 12-21592
April 7, 2021

REI Engineering, INC.
4080 N. 20TH AVENUE
WAUSAU, WISCONSIN 54401
PHONE: 715.675.9784,FAX: 715.675.4060
EMAIL: MAIL@REIENGINEERING.COM

CIVIL & ENVIRONMENTAL ENGINEERING, SURVEYING

SCALE
0 20 40

DATE	REVISION	BY	CHK'D

DESIGNED BY:
SURVEYED BY: JJM
DRAWN BY: JAF
CHECKED BY: JWP
APPROVED BY: JWP
DATE: 2-15-2021

SOIL BORING MAP
COMMUNITY PARTNERS
360 GRAND AVENUE
WAUSAU, WI 54403

REI No. 9640
SHEET GEO

DRAWING FILE: P:\9600-9699\9640 - COMMUNITY PARTNERS\DWG\EXHIBITS\9640 SOIL BORING MAP.DWG LAYOUT: GEO
PLOTTED: MAR 09, 2021 - 3:37PM PLOTTED BY: MIKEM

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SUBSURFACE BORING LOG

AET No: **12-21592** Log of Boring No. **B-1 (p. 1 of 2)**

Project: **Proposed Building Addition; Community Partners Campus; Wausau, Wisconsin**

Surface Elevation **1213.9**

DEPTH IN FEET	ELEV. FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	qp	LL	PL	%-#200
	1213.7	2.5 inches of bituminous pavement	PAVEMENT									
	1213.1	FILL, sand with silt and gravel, fine to coarse grained, brown, moist (SP-SM)	FILL									
1		FILL, silty sand, fine to medium grained, gray, moist (SM)		11	M	SS	10					
2												
3				7	M	SS	23					
4												
5				5	M	SS	24					
6												
7												
8				4	M	SS	12					
9	1204.4											
10		FILL, silty sand, fine to medium grained, a little gravel, gray with some brown, moist (SM)		2	M	SS	4					
11												
12	1201.9	SAND WITH SILT and gravel, fine to medium grained, brown, moist, loose (SP-SM)	COARSE ALLUVIUM									
13				8	M	SS	10					
14	1199.4											
15		Gravelly SAND, fine to coarse grained, brown, moist, medium dense (SP)		16	M	SS	11					
16												
17												

DEPTH: DRILLING METHOD

0-19.5' 3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
4/2/21	**1115**	**21.5'**	**19.5'**	**20.0'**	**None**	**None**

BORING COMPLETED: **4/2/21**

DR: **MD** LG: **CV** Rig: **5**

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

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SUBSURFACE BORING LOG

AET No: **12-21592** Log of Boring No. **B-1 (p. 2 of 2)**

Project: **Proposed Building Addition; Community Partners Campus; Wausau, Wisconsin**

DEPTH IN FEET	ELEV. FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
								WC	qp	LL	PL	%-#200
18		Gravelly SAND, fine to coarse grained, brown, moist, medium dense (SP) *(continued)*		17	M	SS	12					
19												
20												
				30	M	SS	5					
21	1192.4											
		End of boring at 21.5 feet										

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SUBSURFACE BORING LOG

AET No: **12-21592** Log of Boring No. **B-2 (p. 1 of 2)**

Project: **Proposed Building Addition; Community Partners Campus; Wausau, Wisconsin**

Surface Elevation **1214.1**

DEPTH IN FEET	ELEV. FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	qp	LL	PL	%-#200
	1213.9	2.25 inches of bituminous pavement	PAVEMENT									
	1213.2	FILL, sand with silt and gravel, fine to coarse grained, brown, moist (SP-SM)	FILL									
1	1212.1	FILL, silty sand, fine to medium grained, gray, moist (SM)		16	M	SS	10					
2 3 4	1209.6	FILL, silty sand, fine to medium grained, a little gravel, gray with some brown, moist (SM)		21	M	SS	10					
5 6 7	1207.1	FILL, silty sand, fine to medium grained, a little gravel, gray, moist, with pieces of slag (SM)		17	M	SS	11					
8 9	1204.6	FILL, silty sand, fine to medium grained, black, moist to wet, with pieces of slag and broken glass (SM)		7	M/W	SS	5					
10 11 12	1202.1	FILL, sand, fine to medium grained, brown, moist, with a piece of apparent lead (SP)		4	M	SS	6					
13 14	1199.6	FILL, piece of concrete in tip of split spoon		7	M	SS	1					
15 16 17		Gravelly SAND, fine to coarse grained, brown, moist, medium dense to dense (SP)	COARSE ALLUVIUM	26	M	SS	11					

DEPTH:	DRILLING METHOD
0-24.5'	**3.25" HSA**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
4/2/21	**0859**	**26.5'**	**24.5'**	**23.0'**	**None**	**None**

BORING COMPLETED: **4/2/21**

DR: **MD** LG: **CV** Rig: **5**

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

SUBSURFACE BORING LOG

AET No: **12-21592** Log of Boring No. **B-2 (p. 2 of 2)**

Project: **Proposed Building Addition; Community Partners Campus; Wausau, Wisconsin**

DEPTH IN FEET	ELEV. FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
								WC	qp	LL	PL	%-#200
18		Gravelly SAND, fine to coarse grained, brown, moist, medium dense to dense (SP) *(continued)*	COARSE ALLUVIUM *(continued)*	19	M	SS	8					
19												
20				44	M	SS	6					
21												
22												
23				36	M	SS	6					
24	1189.6											
25		SILTY SAND, fine to medium grained, brown, moist, medium dense (SM)		27	M	SS	2					
26	1187.6											
		End of boring at 26.5 feet										

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SUBSURFACE BORING LOG

AET No: **12-21592** Log of Boring No. **B-3 (p. 1 of 3)**

Project: **Proposed Building Addition; Community Partners Campus; Wausau, Wisconsin**

DEPTH IN FEET	ELEV. FEET	Surface Elevation **1213.5** MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	qp	LL	PL	%-#200
	1213.3	1.5 inches of bituminous pavement	PAVEMENT									
1	1212.8	FILL (7.5 inches of rotten granite), sand with silt and gravel, fine to coarse grained, brown, moist (SP-SM)	FILL	10	M	SS	18					
2	1211.5	FILL, silty sand, fine to medium grained, gray, a little gravel, moist (SM)										
3		FILL, silty sand, fine to medium grained, a little gravel, dark brown to brown with some black, moist (SM)		19	M	SS	24					
4												
5	1209.0	FILL, silty sand with gravel, fine to medium grained, brown with some black, moist, with pieces of brick and slag (SM)		50/.4	M	SS	1					
6												
7		-- initial boring attempt encountered refusal at 5.3 feet										
8				2	M	SS	14					
9												
10	1204.0	FILL, silty sand, fine to medium grained, gray, moist (SM)										
11				5	M	SS	8					
12												
13				5	M	SS	14					
14												
15												
16				6	M	SS	12					
17												

DEPTH:	DRILLING METHOD
0-44.5'	**3.25" HSA**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
3/23/21	**1415**	**46.5'**	**44.5'**	**44.5'**	**None**	**None**

BORING COMPLETED: **3/23/21**

DR: **KS** LG: **CC** Rig: **5**

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

AET_CORP W-ELEV 12-21592.GPJ AET+CPT+WELL.GDT 4/7/21

SUBSURFACE BORING LOG

AET No: **12-21592** Log of Boring No. **B-3 (p. 2 of 3)**

Project: **Proposed Building Addition; Community Partners Campus; Wausau, Wisconsin**

DEPTH IN FEET	ELEV. FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
								WC	qp	LL	PL	%-#200
18	1195.0	FILL, silty sand, fine to medium grained, gray, moist (SM) *(continued)*		5	M	SS	18					
19	1194.0	FILL, silty sand, fine to medium grained, black and brown, moist, with pieces of slag (SM)										
20		FILL, silty sand with gravel, fine to medium grained, brown, moist (SM)		7	M	SS	12					
21	1192.1											
22		FILL, silty sand, fine to medium grained, a little gravel, gray, moist (SM)										
23												
24												
25				9	M	SS	13					
26												
27												
28	1185.5	FILL, silty sand, fine grained, white, moist (SM)										
29												
30				8	M	SS	24					
31												
32												
33	1180.5	FILL, silty sand, fine to medium grained, gray, moist (SM)										
34												
35				10	M	SS	24					
36												
37												
38												

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SUBSURFACE BORING LOG

AET No: **12-21592**

Log of Boring No. **B-3 (p. 3 of 3)**

Project: **Proposed Building Addition; Community Partners Campus; Wausau, Wisconsin**

DEPTH IN FEET	ELEV. FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
								WC	qp	LL	PL	%-#200
39 40	1173.0	FILL, silty sand, fine to medium grained, gray, moist (SM) *(continued)*		9	M	SS	18					
41 42	1170.5	FILL, silty sand, fine to medium grained, brown with some black, moist, with pieces of slag and glass, with trace organics (SM)										
43 44 45 46	1167.0	SILTY SAND with gravel, fine to medium grained, brown, waterbearing, loose (SM)	COARSE ALLUVIUM	9	W	SS	19					
		End of boring at 46.5 feet Initial attempt encountered refusal at a depth of 5.3 feet. Moved 6 feet north, blind drilled to 4.5 feet, and resumed sampling. (The second N-value at 4.5 feet to 6.5 feet was 4.)										

AET_CORP W-ELEV 12-21592.GPJ AET+CPT+WELL.GDT 4/7/21

SUBSURFACE BORING LOG

AET No: **12-21592** Log of Boring No. **B-4 (p. 1 of 3)**

Project: **Proposed Building Addition; Community Partners Campus; Wausau, Wisconsin**

Surface Elevation **1212.7**

DEPTH IN FEET	ELEV. FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
								WC	qp	LL	PL	%-#200
	1212.5	2.25 inches of bituminous pavement	PAVEMENT									
	1212.1	FILL (4.75 inches), silty sand with gravel, fine to coarse grained, brown, moist (SM)	FILL									
1				18	M	SS	6					
2		FILL, silty sand, fine to medium grained, a little gravel, gray, moist (SM)										
3				10	M	SS	12					
4												
5				12	M	SS	14					
6												
7												
8				4	M	SS	22					
9												
10				43	M	SS	12					
11												
12		-- possible cobbles from about 10 to 16 feet										
13				4	M	SS	24					
14												
	1198.2	FILL, sand with silt and gravel, fine to medium grained, brown, moist, with some small pieces of concrete (SP-SM)										
15				36	M	SS	24					
	1197.2	FILL, silty sand, fine to medium grained, gray, moist (SM)										
16												
17												

DEPTH: DRILLING METHOD	WATER LEVEL MEASUREMENTS						
0-49.5' **3.25" HSA**	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
	3/23/21	**1006**	**51.5'**	**49.5'**	**50.2'**	**None**	**47.7'**
	3/23/21	**1016**	**51.5'**	**49.5'**	**49.5'**	**None**	**46.7'**
BORING COMPLETED: **3/23/21**							
DR: **KS** LG: **CC** Rig: **5**							

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

AET_CORP W-ELEV 12-21592.GPJ AET+CPT+WELL.GDT 4/7/21

SUBSURFACE BORING LOG

AET No: **12-21592** Log of Boring No. **B-4 (p. 2 of 3)**

Project: **Proposed Building Addition; Community Partners Campus; Wausau, Wisconsin**

DEPTH IN FEET	ELEV. FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
								WC	qp	LL	PL	%-#200
18		FILL, silty sand, fine to medium grained, gray, moist (SM) *(continued)*		8	M	SS	24					
19												
20												
				6	M	SS	20					
21												
22												
23												
24												
25												
				15	M	SS	24					
26												
27												
28												
29												
30												
				7	M	SS	24					
31												
32												
33												
34												
35												
				14	M	SS	24					
36												
37												
38												

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SUBSURFACE BORING LOG

AET No: **12-21592** Log of Boring No. **B-4 (p. 3 of 3)**

Project: **Proposed Building Addition; Community Partners Campus; Wausau, Wisconsin**

DEPTH IN FEET	ELEV. FEET	MATERIAL DESCRIPTION		GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
									WC	qp	LL	PL	%-#200
39		FILL, silty sand, fine to medium grained, gray, moist (SM) *(continued)*	▩										
40			▩										
			▩		24	M	SS	24					
41			▩										
42			▩										
43			▩										
44			▩										
45			▩										
			▩		6	M	SS	24					
46			▩										
			▩			▼							
47			▩										
48	1164.7	SAND, fine to medium grained, brown, waterbearing, loose (SP)	⠂	COARSE ALLUVIUM									
49			⠂										
50			⠂										
			⠂		10	W	SS	24					
51	1161.2		⠂										
		End of boring at 51.5 feet											

Appendix B

AET Project No. 12-21592

Geotechnical Report Limitations and Guidelines for Use

Appendix B
Geotechnical Report Limitations and Guidelines for Use
AET Project No. 12-21592

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, 15800 Crabbs Branch Way, Suite 300, Rockville, MD 20855
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.