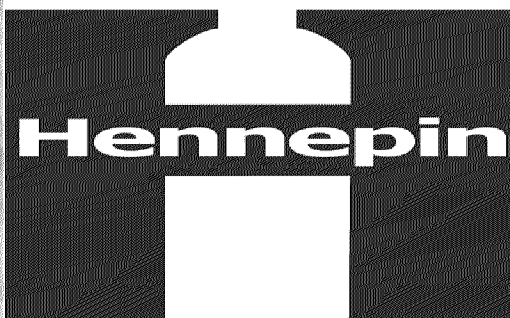




PRELIMINARY GEOTECHNICAL REPORT

HENNEPIN COUNTY MEDICAL EXAMINERS SITE

BLOOMINGTON, MN

DECEMBER 19, 2016

Prepared for:
Hennepin County Public Works
701 Fourth Avenue South, Suite 700
Minneapolis, MN 55415

WSB PROJECT NO. 03392-010



PRELIMINARY GEOTECHNICAL REPORT

**PROPOSED HENNEPIN COUNTY MEDICAL EXAMINERS BUILDING
6701 WEST 78TH STREET
BLOOMINGTON, MINNESOTA**

**FOR
HENNEPIN COUNTY**

December 19, 2016

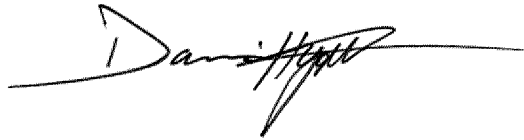
Prepared by:

The logo for WSB & Associates, Inc. is a large, stylized, three-dimensional letter 'B' with a fine grid pattern. The text 'WSB & Associates, Inc.' is positioned above the top bar of the 'B', and '540 Gateway Boulevard' is positioned between the top and middle bars. 'Burnsville, MN 55337' is positioned between the middle and bottom bars, and '(952)-737-4660' is positioned below the bottom bar.

**WSB & Associates, Inc.
540 Gateway Boulevard
Burnsville, MN 55337
(952)-737-4660**

CERTIFICATION

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



Darin E. Hyatt, PE

Date: December 19, 2016

Lic. No. 41316



540 Gateway Boulevard | Suite 100 | Burnsville, MN 55337 | (952) 737-4660

December 19, 2016

Ms. Brianna D. Boos
Hennepin County Public Works
Environment and Energy Department
Land and Water, Contaminated Lands Unit
701 Fourth Avenue South, Suite 700
Minneapolis, MN 55415-1842

Re: Preliminary Geotechnical Report
Hennepin County Medical Examiners Site
6701 West 78th Street
Bloomington, MN
WSB Project No. 03392-010

Dear Ms. Boos:

We have conducted a preliminary geotechnical subsurface exploration program for the above referenced project. This report contains our soil boring logs, an evaluation of the conditions encountered in the borings and our preliminary recommendations for suitable foundation type, a range of allowable soil bearing pressures for footing design, and other geotechnical related design and construction considerations.

If you have any questions concerning this report or our preliminary recommendations please call us at (952) 737-4660.

Sincerely,

WSB & Associates, Inc.

A handwritten signature in black ink, appearing to read "Darin Hyatt", with a long horizontal flourish extending to the right.

Darin Hyatt, PE
Senior Geotechnical Engineer

A handwritten signature in black ink, appearing to read "Joe Carlson", with a long horizontal flourish extending to the right.

Joe Carlson, EIT
Graduate Geotechnical Engineer

Attachment
Preliminary Geotechnical Report

DEH/tmw

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TITLE SHEET

CERTIFICATION SHEET

LETTER OF TRANSMITTAL

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Appendix A

Boring Location Map

Test Pit Map

Logs of Penetration Test Borings

Symbols and Terminology on Test Boring Log

Notice to Report Users Boring Log Information

Unified Soil Classification Sheet (USCS)

1. INTRODUCTION

1.1 Project Location

This site is located at 6701 West 78th Street in Bloomington, Minnesota. The boring locations can be seen on the map in **Appendix A**.

The area was a vacant lot at the time of drilling with sporadic shrubs throughout. Nine Mile Creek runs along the western end of the site and there is a pond located at the south end of the site. It is our understanding that a structure that previously occupied this land was demolished and removed from the site.

1.2 Project Description

Very little design information is available at this time, however, we understand the building at this site will generally be less than three (3) stories, slab-on-grade structure with a finished floor elevation within about two feet (2') of existing grades. We have assumed wall loads will be less than 12 kips per linear foot and column loads will be less than 250 kips each. It is also assumed, underground utilities will have invert elevations within fifteen feet (15') of existing grades.

WSB has developed preliminary foundation recommendations for this project. When the architect and/or structural engineer develops additional information about final design column loadings, building configuration, or other significant factors, the recommendations presented herein may no longer apply. We anticipate that additional soil borings and a final geotechnical report will be completed when the final design information is completed. We recommend the additional soil borings be performed within the planned building and pavement areas to better characterize the subsurface conditions at this site.

1.3 Purpose and Project Scope of Services

Ms. Brianna Boos with the Hennepin County Public Works authorized our proposal. In order to assist the City in evaluating this site for potential development, we have completed a subsurface exploration program and prepared a preliminary geotechnical report for the referenced site. This stated purpose was a significant factor in determining the scope and level of service provided. Should the purpose of the report change the report immediately ceases to be valid and use of it without WSB's prior review and written authorization shall be at the user's sole risk.

Our authorized scope of work has been limited to:

1. Mobilization / Demobilization of a Truck Mounted Drill Rig.
2. Clearing underground utilities utilizing the Gopher State One Call.
3. Drilling 22 standard penetration borings to depths of about 25 feet.
4. Sealing the borings per Minnesota Department of Health procedures.
5. Perform soil classification and analysis.
6. Review of readily available project information and geologic data.
7. Providing this preliminary geotechnical report containing:
 - A. Summary of our initial findings.
 - B. Discussion of subsurface soil and groundwater conditions and how they may affect potential future construction.
 - C. Estimated range of allowable bearing capacities of the soils.
 - D. Preliminary recommendations for foundations.
 - E. A discussion of soils for use as structural fill and site fill.

2. PROCEDURES

2.1 Boring Layout and Soil Sampling Procedures

Hennepin County Public Works requested we complete 22 soil borings at this site, recommended the boring depths and selected the desired locations. The boring locations were staked using existing site features as guides and elevated by our drilling crew. Bore hole elevations were referenced to the top of the top nut of a hydrant located on West 78th Street near the western entrance to the site. The elevation of that benchmark was indicated as 842.73 on a site plan provided to us.

We drilled the borings on November 17, 18, 21 and 22, 2016, with a truck-mounted CME-55 drill rig operated by a two-person crew. The drill crew advanced the borings using continuous hollow stem augers. Drilling methods, crew chief, depths, sampling interval, casing usage, groundwater observations, test data and other drilling information are indicated on the boring logs.

Generally, the drill crew sampled the soil in advance of the auger tip at two and one-half (2½) foot intervals of depth to fifteen feet (15') and at five foot (5') intervals thereafter. The soil samples were obtained using a split-barrel sampler which was driven into the ground during standard penetration tests in accordance with ASTM D 1586, Standard Method of Penetration Test and Split-Barrel Sampling of Soils.

The materials encountered were described on field logs and representative samples were containerized, and transported to our laboratory for further examination and testing.

The samples were visually examined to estimate the distribution of grain sizes, plasticity, consistency, moisture condition, color, presence of lenses and seams, and apparent geologic origin. We classified the soils according to type using the Unified Soil Classification System (USCS). A chart describing the Unified Soil Classification System is included in **Appendix A**.

2.2 Groundwater Measurements and Borehole Abandonment

The drill crew observed the borings for free groundwater while drilling and after completion. These observations and measurements are noted on the boring logs. The crew backfilled the borings with soil cuttings; to comply with Minnesota Department of Health regulations.

2.3 Boring Log Procedures and Qualifications

The subsurface conditions encountered by the test borings are illustrated on the attached boring logs. Similar soils were grouped into the strata shown on the boring logs, and the appropriate estimated USCS classification symbols were also added. The depths and thickness of the subsurface strata indicated on the boring logs were estimated from the drilling results.

The transition between materials (horizontal and vertical) is approximate and is usually far more gradual than shown. Information on actual subsurface conditions exists only at the specific locations indicated and is relevant only to the time exploration was performed. Subsurface conditions and groundwater levels at other locations may differ from conditions found at the indicated locations. The nature and extent of which would not become evident until exposed by construction excavation. These stratification lines were used for our analytical purposes and, due to the aforementioned limitations, should not be used as a basis of design or construction cost estimates.

3. EXPLORATION RESULTS

3.1 Site and Geology

At the time of drilling, the site was an undeveloped lot with sporadic shrubs.

Based on review of online topographic maps, this site appears to gently slope to the southeast. Nine Mile Creek traverses the western side of the site.

The Hennepin County Geologic Atlas indicates the surficial geology of the area is mostly organic deposits much of which have been drained and filled.

3.2 Subsurface Soil and Groundwater Conditions

Soil Borings

The boring profile generally consisted of fill overlying alluvial and glacially deposited soils.

The fills encountered ranged from about 2 to 12 feet below grade and consisted of a mixture of lean clay, silty sand and sands. Below the fill in Boring PB-15, buried topsoil was encountered to a depth of about 5 feet.

Below the fills and buried topsoil, we encountered deposits consisting of sands and silty sands, lean clays and to a lesser extent fat clays. These soils were generally brown to gray in color and ranged from moist to saturated or waterbearing.

The soils encountered were generally similar to the soils described in the Geologic Atlas.

Test Pits

Six test pits were excavated to better evaluate environmental contamination concerns. Similar to the soil borings the test pits encountered fill soils consisting of silty sand and sand to depths of about 2 to 7 ½ feet. It should be noted that the native soils below the fill in test pit 1 was dark in color. An organic test on that material indicated it had about 3 percent organic material classifying it as slightly organic. Underlying the fill naturally deposited soils consisting of silty sand, sand and silt were encountered.

3.3 Strength Characteristics

The penetration resistance N-values of the materials encountered were recorded during drilling and are indicated as blows per foot (BPF). Those values provide an indication of soil strength characteristics and are located on the boring log sheets. Also, visual-manual classification techniques and apparent moisture contents were also utilized to make an engineering judgment of the consistency of the materials. The following table presents a summary of the penetration resistances in the soils and remarks regarding the material strengths of the soils.

Table 1: Penetration Resistances

Soil Type	Classification	Penetration Resistances	Remarks
Fill	Mixed Soils	3 - 28 BPF, average 13 BPF	Variable compaction
Coarse Alluvium	SP, SM	3 to 20 BPF	Very loose to medium dense
Fine Alluvium	CL, CH	1 to 12 BPF	Very soft to firm
Till	CL	6 to 22 BPF	Soft to hard

The preceding is a generalized description of soil conditions at this site. Variations from the generalized profile exist and should be assessed from the boring logs, the normal geologic character of the deposits, and the soils uncovered during site excavation.

3.4 Groundwater Conditions

WSB took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of the report. Note that groundwater levels may fluctuate due to seasonal variations, e.g. precipitation, snowmelt and rainfall, and/or other factors not evident at the time of measurement.

Our borings were only left open for a short period of time; as such, groundwater levels may not have had sufficient time to stabilize at their hydrostatic level.

Table 2 below is a summary of the estimated water levels at our borings.

Table 2: Groundwater Measurements

Boring No.	Ground Surface Elevation	Depth to Groundwater after Drilling	Estimated Groundwater Elevation
PB-1	839.4	15	824 ½
PB-2	831.6	23	809
PB-3	829.6	23	807
PB-4	826.4	NE	---
PB-5	825.9	8	818
PB-6	832.2	18 ½	814
PB-7	830.8	15	816
PB-8	828.8	22	807
PB-9	826.1	25	801 ½
PB-10	825.1	9	816 ½
PB-11	830.9	18 ½	812 ½
PB-12	829.8	12	818
PB-13	828.0	8	820
PB-14	825.7	8	818
PB-15	825.4	9	816 ½
PB-16	828.1	15 ½	813
PB-17	826.8	9 ½	817 ½
PB-18	825.9	11 ½	814 ½
PB-19	824.3	22	802 ½
PB-20	825.7	18	808
PB-21	825.1	11	814 ½
PB-22	824.4	19	805 ½

Groundwater Depths and Elevations are rounded to the highest ½ foot. NE – indicates groundwater not encountered during drilling and sampling.

As can be seen in the table above, water levels observed during drilling varied widely from about elevation 801 ½ to 824 1/2. Piezometers would allow for a more long term monitoring of water levels. Piezometer installation was beyond the scope of this evaluation. Based on information provided on a survey provided to us, the pond on the south side of the site had a water elevation of 820.5 feet in July of 2014. That same survey indicated a delineated wetland adjacent to Nine Mile Creek had a limit of about 820 feet in July of 2014. It is our opinion that the hydrostatic water level at this site will be near that of the pond and Nine Mile Creek.

4. PRELIMINARY ENGINEERING ANALYSIS AND RECOMMENDATIONS

The existing fills were mostly composed of sands with silt and silty sands and in a few instances clayey soils were noted. In some of the fill we noted pieces of wood, limestone, cobbles, and pieces of concrete or bituminous. It is likely these fills were placed following removal of organic soils. With the exception of Boring PB-15, the borings did not encounter any materials containing appreciable organic matter within or beneath the fill. Given the site was occupied by a previous structure it is possible that some of the fill, at least within previous building footprints was placed as a structural fill. However, it is unknown what occurred during and following demolition of the previous structure. Variable blows per foot (BPF) were also encountered within the fill, we are uncertain of the exact footprint of previous buildings or the magnitude of previous structural loadings, no observation or compaction testing documentation was made available to us and in one boring buried topsoil was encountered. As such, the existing fill is considered undocumented. It is our opinion, placing a building of the magnitude proposed on or within the existing fill would have a high risk of detrimental settlement.

Flexible (bituminous paved) parking lots are lightly loaded and more tolerant of movement compared to a building. Therefore consideration can be given to leaving the existing fill in place beneath proposed parking lots. However, with this approach the owner would need to accept a slight risk of increased long-term settlement.

In general, the native soils underlying the fill appear suitable for support of potential structures but they too would need to be further evaluated, especially where very soft and soft clayey soils exist.

Consideration could also be given to supporting proposed structures on deep or intermediate foundations such as driven pile or Geopiers®. These options would not require the removal of the existing fill.

It is our opinion that groundwater could be encountered by excavations at this site. Dewatering should be anticipated.

4.1 Preliminary Building Area Preparation

Unless information regarding the placement and compaction of the existing fill is provided to us for evaluation, we recommend the existing fill be removed from beneath the new building and an appropriate oversize area, and be replaced with compacted backfill.

Table 3 indicates the approximate minimum excavation depths to remove existing fill soils based on the findings of our soil borings. Excavation depths and bottom elevations were rounded to the lowest 1/2 foot/elevation. Those depths will likely vary and should be observed and adjusted during construction. Furthermore, it may be necessary to extend excavations to include partial removal of the soft natural clays depending on footing elevations, structural loads and condition of the clays at the time of construction.

Table 3. Approximate Minimum Excavation Depths at the Boring Locations

Boring	Ground Surface Elevation	Approximate Min. Excavation Depth*, feet	Approximate Bottom Elevation
PB-1	839.4	12	827
PB-2	831.6	7	824
PB-3	829.6	7	822 ½
PB-4	826.8	9	817 ½
PB-5	825.9	7	818 ½
PB-6	832.2	7	825
PB-7	830.8	9	821 ½
PB-8	828.8	10	818 ½
PB-9	826.6	11	815 ½
PB-10	825.1	7	818
PB-11	830.9	12	818 ½
PB-12	829.8	9	820 ½
PB-13	828.0	7	821
PB-14	825.7	7	818 ½
PB-15	825.4	5	821
PB-16	828.1	7 ½	820 ½
PB-17	826.8	9	817 ½
PB-18	825.9	7	818 ½
PB-19	824.3	9	815
PB-20	825.7	7	818 ½
PB-21	825.1	7	818
PB-22	824.1	5	819

* - Excavation depths may vary depending on the condition of the exposed soils at the time of construction and on final design grades and loads.

4.2 Preliminary Foundation Recommendations

It is our opinion that the buildings may be supported on conventional spread footings bearing on naturally occurring firm clays or medium dense sands or structural fill if it is determined to have been engineered. It is our opinion the footings throughout may be designed for net allowable soil bearing pressures ranging from 2,000 to 3,500 pounds per square foot (psf), depending on building plans and site preparation.

4.3 Preliminary Pavement Recommendations

We recommend any organic soils be removed from within 3 feet of the top of subgrade elevation. Surface compaction of the pavement areas should then be completed. The surface compaction should be observed and tested.

4.3 Additional Soil Borings and Recommendations

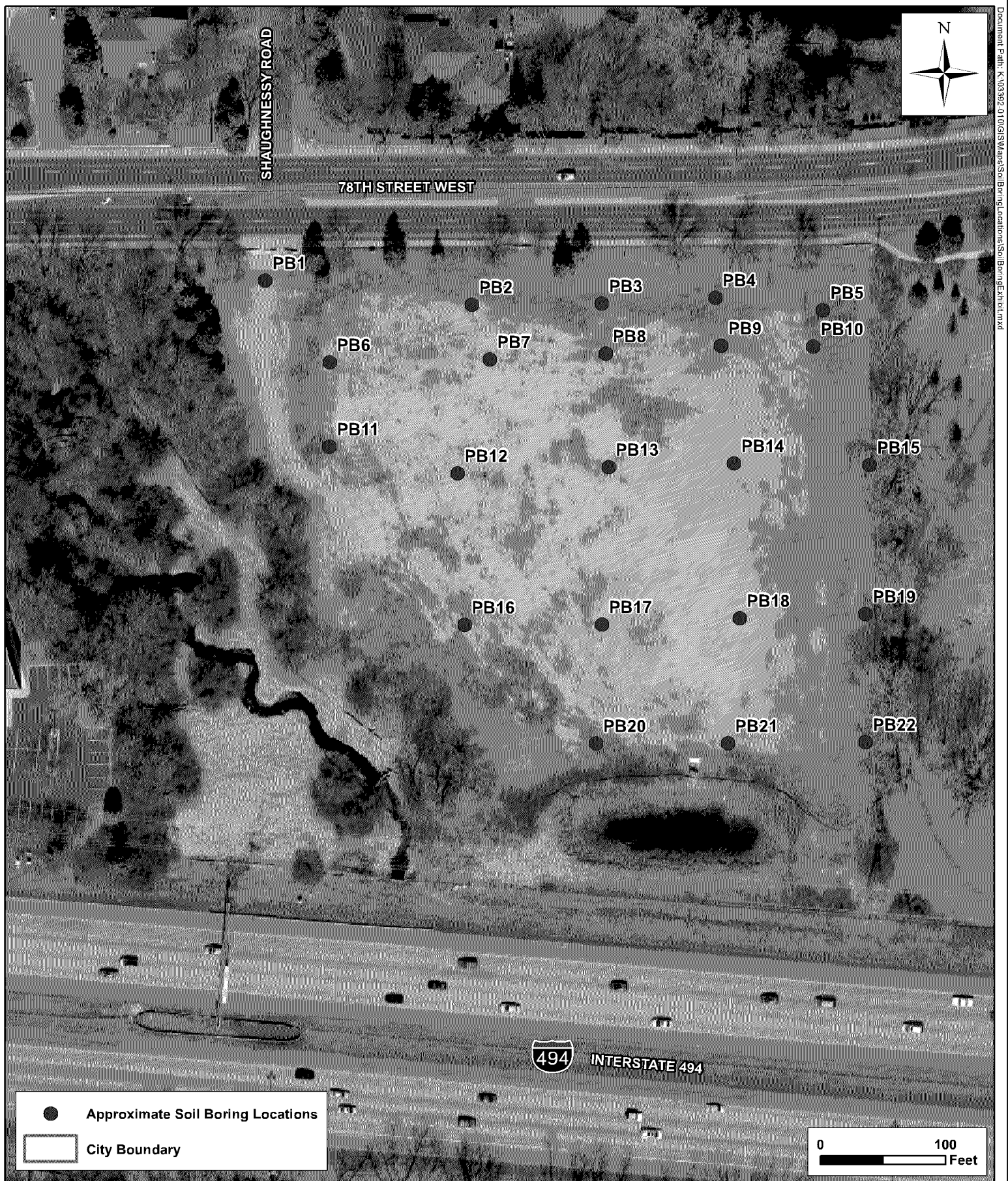
Given the size of the site, the spacing of our borings and the lack of specific design information, we recommend additional soil borings be performed once building locations and structural loadings have been established, to further evaluate the site. When a final geotechnical report is prepared, we will provide more detailed recommendations and discuss other geotechnical related items including construction safety, field observations and testing, and plan review and remarks.

5. STANDARD OF CARE

The preliminary recommendations and opinions contained in this report are based on our professional judgment. The soil testing and geotechnical engineering services performed for this project have been performed with the level of skill and diligence ordinarily exercised by reputable members of the same profession under similar circumstances, at the same time and in the same or a similar locale. No warranty, either express or implied, is made.

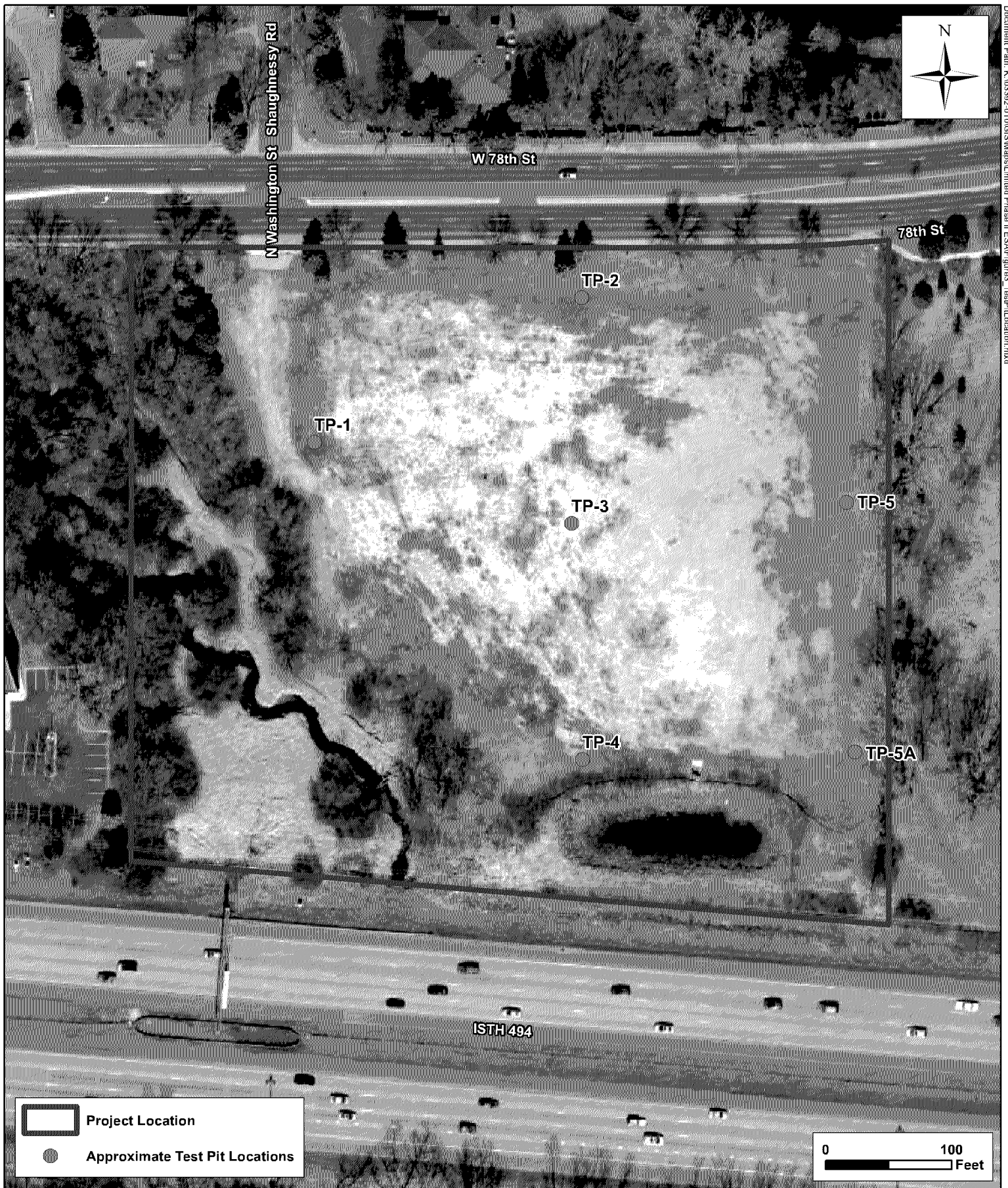
APPENDIX A

Boring Location Map
Test Pit Map
Logs of Penetration Test Borings
Symbols and Terminology on Test Boring Log
Notice to Report Users Boring Log Information
Unified Soil Classification Sheet (USCS)



Soil Boring Location Sketch
Preliminary Geotechnical Report
Proposed Hennepin County Medical Examiners Building
6701 W. 78th Street
Bloomington, MN





Test Pit Location
Preliminary Geotechnical Report
Proposed Hennepin County Medical Examiners Building
6701 West 78th Street
Bloomington, MN 55439





LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 839.4 ft

BORING NUMBER PB 1

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	838	CRUSHED ROCK 0 - 4" CLAYEY SAND WITH A LITTLE GRAVEL, brown, moist, firm to hard to firm to hard	SC	Fill Fill	14		1	HSA					
2	837						2	SB					
3	836						3	SB					
4	835						4	SB					
5	834						5	SB					
6	833						6	SB					
7	832						7	SB					
8	831						8	SB					
9	830						9	SB					
10	829						10	SB					
11	828						11	SB					
12	827						12	SB					
13	826	LEAN CLAY WITH SAND AND LITTLE GRAVEL, brown, moist, firm	CL	Glacial Till	9		6	SB					
14	825	SAND, fine grained, brown, water bearing, medium dense	SP	Coarse Alluvium	18	▽	7	SB					
15	824						8	SB					
16	823						9	SB					
17	822						10	SB					
18	821						11	SB					
19	820						12	SB					
20	819						13	SB					
21	818						14	SB					
22	817						15	SB					
23	816						16	SB					
24	815						17	SB					
25	814						18	SB					
26	813	End of Boring 25.0 ft.			7		9	SB					

WATER LEVEL MEASUREMENTS

START: 11/17/2016

END: 11/17/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/17/2016	10:00 am	25	24.5		14.6	824.8	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 831.6 ft

BORING NUMBER PB 2

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	831	FILL, mostly Silty Sand, a little Lean Clay, brown, dark brown		Fill	13		1	HSA					
2	830						2	SB					
3	829						3	SB					
4	828						4	SB					
5	827						5	SB					
6	826						6	SB					
7	825	SAND WITH GRAVEL, fine to medium grained, brown, moist, medium dense	SP	Coarse Alluvium	18		7	SB					
8	824						8	SB					
9	823						9	SB					
10	822						10	SB					
11	821						11	SB					
12	820						12	SB					
13	819	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, moist, firm to hard, a few lenses of water bearing sand	CL	Glacial Till	12		13	SB					
14	818						14	SB					
15	817						15	SB					
16	816						16	SB					
17	815						17	SB					
18	814						18	SB					
19	813	End of Boring 25.0 ft.			22		19	SB					
20	812						20	SB					
21	811						21	SB					
22	810						22	SB					
23	809						23	SB					
24	808						24	SB					
25	807						25	SB					
26	806						26	SB					

WATER LEVEL MEASUREMENTS

START: 11/22/2016

END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief: J. Tatro	Logged By: DAJ
11/22/2016	11:45 am	25	24.5		23.0	808.6	3 1/4" HSA 0' - 24.5'		

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 829.6 ft

BORING NUMBER PB 3

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	829	FILL, mostly Silty Sand, a little Sand and Gravel, brown, a few Cobbles		Fill	4	50/3	1	HSA					
2	828												
3	827						2	SB					
4	826												
5	825						3	SB					
6	824												
7	823	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, brown, moist, soft	CL	Glacial Till	7								
8	822						4	SB					
9	821												
10	820	SAND WITH GRAVEL, fine to medium grained, brown, moist to water bearing at 23', loose	SP	Coarse Alluvium	7		5	SB					
11	819												
12	818												
13	817						6	SB					
14	816												
15	815												
16	814						8	SB					
17	813												
18	812												
19	811												
20	810												
21	809						6	8	SB				
22	808												
23	807												
24	806												
25	805												
26	804												
		End of Boring 25.0 ft.			8		9	SB					

WATER LEVEL MEASUREMENTS

START: 11/22/2016

END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/22/2016	1:30 pm	25	24.5		23.0	806.6	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

Notes:

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 826.8 ft

BORING NUMBER PB 4

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	826	FILL, mostly Sand, a little Silty Sand and Gravel, dark brown, brown		Fill	9		1	HSA					
2	825												
3	824						2	SB					
4	823												
5	822						3	SB					
6	821												
7	820						4	SB					
8	819												
9	818												
10	817	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, moist, firm to soft to firm	CL	Glacial Till	11		5	SB					
11	816												
12	815						6	SB					
13	814												
14	813						7	SB					
15	812												
16	811						8	SB					
17	810												
18	809												
19	808	SAND, fine grained, gray, wet, loose	SP	Coarse Alluvium	7		9	SB					
20	807												
21	806												
22	805												
23	804												
24	803												
25	802												
26	801												
25	802	End of Boring 25.0 ft.			7		9	SB					
26	801												

WATER LEVEL MEASUREMENTS

START: 11/22/2016

END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/22/2016	11:00 am	25	24.5		None		3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.9 ft

BORING NUMBER PB 5

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	825	FILL, mostly Sand, a little Gravel, dark brown, brown		Fill	18		1	HSA					
2	824						2	SB					
3	823						3	SB					
4	822						4	SB					
5	821						5	SB					
6	820						6	SB					
7	819	SAND WITH GRAVEL, medium to fine grained, brown, wet to water bearing at 8', loose to medium dense	SP	Coarse Alluvium	10	▽	7	SB					
8	818						8	SB					
9	817						9	SB					
10	816						10	SB					
11	815						11	SB					
12	814						12	SB					
13	813	SAND, fine to medium grained, brown, water bearing, medium dense	SP	Coarse Alluvium	16		13	SB					
14	812						14	SB					
15	811						15	SB					
16	810						16	SB					
17	809						17	SB					
18	808						18	SB					
19	807	SAND WITH GRAVEL, medium to fine grained, brown, water bearing, medium dense	SP	Coarse Alluvium	16		19	SB					
20	806						20	SB					
21	805						21	SB					
22	804						22	SB					
23	803						23	SB					
24	802						24	SB					
25	801	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, moist, firm	CL	Glacial Till	9		9	SB					
26	800	End of Boring 25.0 ft.											

WATER LEVEL MEASUREMENTS

START: 11/22/2016

END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/22/2016	2:15 pm	25	24.5		8.0	817.9	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 832.2 ft

BORING NUMBER PB 6

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	831	CRUSHED LIMESTONE 0 - 4" FILL, a mixture of Sand, Silty Sand, a little Gravel		Fill Fill	15		1	HSA					
2	830						2	SB					
3	829						3	SB					
4	828						4	SB					
5	827						5	SB					
6	826						6	SB					
7	825	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, brown, moist, soft	CL	Glacial Till	6		7	SB					
8	824						8	SB	11	121			
9	823						9	SB					
10	822	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, wet, firm to soft to firm dense	CL	Glacial Till	9		10	SB					
11	821						11	SB					
12	820						12	SB					
13	819						13	SB					
14	818						14	SB					
15	817						15	SB					
16	816						16	SB					
17	815						17	SB					
18	814						18	SB					
19	813						19	SB					
20	812						20	SB					
21	811						21	SB					
22	810						22	SB					
23	809						23	SB					
24	808						24	SB					
25	807						25	SB					
26	806						26	SB					
		SAND WITH A LITTLE GRAVEL, fine to medium grained, gray, water bearing, medium dense	SP	Coarse Alluvium									
		End of Boring 25.0 ft.											

WATER LEVEL MEASUREMENTS

START: 11/17/2016

END: 11/17/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/17/2016	12:05 pm	25	24.5		18.5	813.7	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH\CMTHCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 830.8 ft

BORING NUMBER PB 7

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS						
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)			
1	830		FILL, mostly Sand, a little Silty Sand, a little Lean Clay, brown, dark brown, a few Cobbles		Fill	14		1	HSA						
2	829							2	SB						
3	828							3	SB						
4	827							4	SB						
5	826							5	SB						
6	825							6	SB						
7	824							7	SB						
8	823							8	SB						
9	822							9	SB						
10	821		SAND WITH GRAVEL, fine to medium grained, brown, moist, loose to medium dense	SP	Coarse Alluvium	9		5	SB						
11	820							6	SB						
12	819							7	SB						
13	818							8	SB						
14	817							9	SB						
15	816							10	SB						
16	815							11	SB						
17	814							12	SB						
18	813							13	SB						
19	812		SAND, fine to medium grained, brown, water bearing, medium dense	SP	Coarse Alluvium	13	▽	7	SB						
20	811							8	SB						
21	810							9	SB						
22	809							10	SB						
23	808							11	SB						
24	807							12	SB						
25	806							13	SB						
26	805							14	SB						
27	804							15	SB						
28	803	16	SB												
29	802	17	SB												
30	801	18	SB												
31	800	19	SB												
32	799	20	SB												
33	798	21	SB												
34	797	22	SB												
35	796	23	SB												
36	795	24	SB												
37	794	25	SB												
38	793	26	SB												
39	792	27	SB												
40	791	28	SB												
41	790	29	SB												
42	789	30	SB												
43	788	31	SB												
44	787	32	SB												
45	786	33	SB												
46	785	34	SB												
47	784	35	SB												
48	783	36	SB												
49	782	37	SB												
50	781	38	SB												
51	780	39	SB												
52	779	40	SB												
53	778	41	SB												
54	777	42	SB												
55	776	43	SB												
56	775	44	SB												
57	774	45	SB												
58	773	46	SB												
59	772	47	SB												
60	771	48	SB												
61	770	49	SB												
62	769	50	SB												
63	768	51	SB												
64	767	52	SB												
65	766	53	SB												
66	765	54	SB												
67	764	55	SB												
68	763	56	SB												
69	762	57	SB												
70	761	58	SB												
71	760	59	SB												
72	759	60	SB												
73	758	61	SB												
74	757	62	SB												
75	756	63	SB												
76	755	64	SB												
77	754	65	SB												
78	753	66	SB												
79	752	67	SB												
80	751	68	SB												
81	750	69	SB												
82	749	70	SB												
83	748	71	SB												
84	747	72	SB												
85	746	73	SB												
86	745	74	SB												
87	744	75	SB												
88	743	76	SB												
89	742	77	SB												
90	741	78	SB												
91	740	79	SB												
92	739	80	SB												
93	738	81	SB												
94	737	82	SB												
95	736	83	SB												
96	735	84	SB												
97	734	85	SB												
98	733	86	SB												
99	732	87	SB												
100	731	88	SB												
101	730	89	SB												
102	729	90	SB												
103	728	91	SB												
104	727	92	SB												
105	726	93	SB												
106	725	94	SB												
107	724	95	SB												
108	723	96	SB												
109	722	97	SB												
110	721	98	SB												
111	720	99	SB												
112	719	100	SB												
113	718	101	SB												
114	717	102	SB												
115	716	103	SB												
116	715	104	SB												
117	714	105	SB												
118	713	106	SB												
119	712	107	SB												
120	711	108	SB												
121	710	109	SB												
122	709	110	SB												
123	708	111	SB												
124	707	112	SB												
125	706	113	SB												
126	705	114	SB												
127	704	115	SB												
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133	698	121	SB												
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143	688	131	SB												
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147	684	135	SB												
148	683	136	SB												
149	682	137	SB												
150	681	138	SB												
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152	679	140	SB												
153	678	141	SB												
154	677	142	SB												
155	676	143	SB												
156	675	144	SB												
157	674	145	SB												
158	673	146	SB												
159	672	147	SB												
160	671	148	SB												
161	670	149	SB												
162	669	150	SB												
163	668	151	SB												
164	667	152	SB												
165	666	153	SB												
166	665	154	SB												
167	664	155	SB												
168	663	156	SB												
169	662	157	SB												
170	661	158	SB												
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179	652	167	SB												
180	651	168	SB												
181	650	169	SB												
182	649	170	SB												
183	648	171	SB												
184	647	172	SB												
185	646	173	SB												
186	645	174	SB												
187	644	175	SB												
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194	637	182	SB												
195	636	183	SB												
196	635	184	SB												
197	634	185	SB												
198	633	186	SB												
199	632	187	SB												
200	631	188	SB												
201	630	189	SB												
202	629	190	SB												
203	628	191	SB												
204	627	192	SB												
205	626	193	SB												
206	625	194	SB												
207	624	195	SB												
208	623	196	SB												
209	622	197	SB												
210	621	198	SB												
211	620	199	SB												
212	619	200	SB												
213	618	201	SB												
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262	569	250	SB												
263	568	251	SB												
264	567	252	SB												
265	566	253	SB												
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267	564	255	SB												
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276	555	264	SB												
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341	490	329	SB												
342	489	330	SB												
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344	487	332	SB												
345	486	333	SB												
346	485	334	SB												
347	484	335	SB												
348	483	336	SB												
349	482	337	SB												
350	481	338	SB												
351	480	339	SB												
352	479	340	SB												
353	478	341	SB												
354	477														

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 828.8 ft

BORING NUMBER PB 8

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	828	FILL, mostly Sand with Gravel, a little Silty Sand, brown		Fill	16		1	HSA					
2	827												
3	826						2	SB					
4	825												
5	824												
6	823						3	SB					
7	822												
8	821						4	SB					
9	820												
10	819	LEAN CLAY, gray, moist, firm	CL	Fine Alluvium	12		5	SB					
11	818												
12	817	SAND WITH GRAVEL, fine to medium grained, brown, wet, loose	SP	Coarse Alluvium	10		6	SB					
13	816												
14	815												
15	814	LEAN CLAY, dark gray, wet, soft	CL	Fine Alluvium	6		7	SB					
16	813												
17	812	SAND WITH GRAVEL, fine to medium grained, brown, wet to water bearing at 22', medium dense	SP	Coarse Alluvium	20	▽							
18	811												
19	810												
20	809						8	SB					
21	808												
22	807												
23	806												
24	805												
25	804						9	SB					
26	803	End of Boring 25.0 ft.			16								

WATER LEVEL MEASUREMENTS

START: 11/22/2016

END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/22/2016	8:05 am	25	24.5		22.0	806.8	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 826.1 ft

BORING NUMBER PB 9

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	825	FILL, mostly Sand, Sand with Gravel, brown		Fill	12		1	HSA					
2	824												
3	823						2	SB					
4	822												
5	821												
6	820						3	SB					
7	819												
8	818						4	SB					
9	817												
10	816												
11	815	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, moist to wet, firm to hard to firm to soft	CL	Glacial Till	10		5	SB					
12	814												
13	813						6	SB					
14	812												
15	811												
16	810						7	SB					
17	809												
18	808												
19	807												
20	806												
21	805						8	SB					
22	804												
23	803												
24	802												
25	801						9	SB					
26	800	End of Boring 25.0 ft.			8	▽	9	SB					

WATER LEVEL MEASUREMENTS

START: 11/22/2016

END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/22/2016	8:50 am	25	24.5		25.0	801.1	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.1 ft

BORING NUMBER PB 10

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL				USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS					
										No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)		
1	824		FILL, a mixture of Sand, Sand with Silt and Gravel, brown, dark brown					Fill	27		1	HSA					
2	823										2	SB					
3	822										3	SB					
4	821																
5	820																
6	819																
7	818		SAND WITH A LITTLE GRAVEL, fine to medium grained, brown, wet to water bearing at 9', medium dense				SP	Coarse Alluvium	12		4	SB					
8	817																
9	816																
10	815																
11	814																
12	813																
13	812																
14	811																
15	810																
16	809																
17	808																
18	807																
19	806																
20	805		LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, moist, hard				CL	Glacial Till	18		8	SB					
21	804																
22	803																
23	802																
24	801																
25	800																
26	799	End of Boring 25.0 ft.						18		9	SB						
WATER LEVEL MEASUREMENTS							START: 11/21/2016			END: 11/21/2016							
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:		Logged By:							
								J. Tatro		DAJ							
11/21/2016	2:00 pm	25	24.5		9.0	816.1	3 1/4" HSA 0' - 24.5'	Notes:									

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 830.9 ft

BORING NUMBER PB 11

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	830	CRUSHED LIMESTONE 0 - 13"		Fill			1	HSA					
2	829	FILL, a mixture of Silty Sand, Lean Clay, a few pieces of Limestone, a few pieces of Wood		Fill									
3	828				14		2	SB					
4	827												
5	826				3		3	SB					
6	825												
7	824												
8	823				7		4	SB					
9	822												
10	821				4		5	SB					
11	820												
12	819	LEAN CLAY, gray, wet, very soft	CL	Fine Alluvium									
13	818				1		6	SB					
14	817												
15	816	FAT CLAY, dark gray, saturated, very soft	CH	Fine Alluvium									
16	815				2		7	SB					
17	814												
18	813					▽							
19	812												
20	811	LEAN CLAY, dark gray, wet, very soft	CL	Fine Alluvium									
21	810				3		8	SB					
22	809												
23	808												
24	807	SAND WITH A LITTLE GRAVEL, brown, water bearing, loose	SP	Coarse Alluvium									
25	806				9		9	SB					
26	805	End of Boring 25.0 ft.											
WATER LEVEL MEASUREMENTS							START: 11/17/2016			END: 11/17/2016			
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD		Crew Chief:		Logged By:		
11/17/2016	1:35 pm	25	24.5		18.5	812.4	3 1/4" HSA 0' - 24.5'		J. Tatro		DAJ		
									Notes:				

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 829.8 ft

BORING NUMBER PB 12

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	829	FILL, a mostly Sand with Gravel, a few pieces of Limestone, brown, dark brown		Fill	8		1	HSA					
2	828												
3	827						2	SB					
4	826												
5	825												
6	824						3	SB					
7	823												
8	822						4	SB					
9	821	LEAN CLAY, gray, moist to wet, soft	CL	Fine Alluvium	8	▽							
10	820						5	SB					
11	819												
12	818												
13	817	SAND WITH A LITTLE GRAVEL, medium to fine grained, brown, water bearing, loose	SP	Coarse Alluvium	6		6	SB					
14	816												
15	815						7	SB					
16	814												
17	813												
18	812												
19	811												
20	810												
21	809	SAND WITH A LITTLE GRAVEL, fine to medium grained, gray, water bearing, loose	SP	Coarse Alluvium	7		8	SB					
22	808												
23	807												
24	806												
25	805	End of Boring 25.0 ft.			9		9	SB					
26	804												

WATER LEVEL MEASUREMENTS

START: 11/21/2016

END: 11/21/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/21/2016	11:20 am	25	24.5		12.0	817.8	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 828 ft

BORING NUMBER PB 13

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	827	FILL, a mixture of Sand, Sand with Silt, a little Gravel, brown		Fill	10		1	HSA					
2	826						2	SB					
3	825						3	SB					
4	824						4	SB					
5	823						5	SB					
6	822						6	SB					
7	821	SAND WITH A LITTLE GRAVEL, fine to medium grained, brown, wet to water bearing, very loose to loose	SP	Coarse Alluvium	9	▽	7	SB					
8	820						8	SB					
9	819						9	SB					
10	818						10	SB					
11	817						11	SB					
12	816						12	SB					
13	815	SAND WITH A LITTLE GRAVEL, medium to fine grained, brown, water bearing, loose	SP	Coarse Alluvium	8		13	SB					
14	814						14	SB					
15	813						15	SB					
16	812						16	SB					
17	811						17	SB					
18	810						18	SB					
19	809	SANDY LEAN CLAY WITH A LITTLE GRAVEL, gray, wet, firm	CL	Glacial Till	11		19	SB					
20	808						20	SB					
21	807						21	SB					
22	806						22	SB					
23	805						23	SB					
24	804						24	SB					
25	803	SAND, fine to medium grained, brown, water bearing, medium dense	SP	Coarse Alluvium	20		9	SB					
26	802	End of Boring 25.0 ft.											

WATER LEVEL MEASUREMENTS

START: 11/21/2016

END: 11/21/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/21/2016	1:00 pm	25	24.5		8.0	820	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEO\TECH\CMTHCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.7 ft

BORING NUMBER PB 14

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	825	FILL, a mixture of Sand, Sand with Silt, a little Gravel, brown		Fill	16		1	HSA					
2	824						2	SB					
3	823						3	SB					
4	822						4	SB					
5	821						5	SB					
6	820						6	SB					
7	819	SAND, fine to medium grained, brown, wet to water bearing at 8', loose	SP	Coarse Alluvium	8	▽	7	SB					
8	818						8	SB					
9	817						9	SB					
10	816	SAND WITH A LITTLE GRAVEL, medium to fine grained, brown, water bearing, very loose	SP	Coarse Alluvium	7		10	SB					
11	815						11	SB					
12	814						12	SB					
13	813	SAND, fine to medium grained, brown, water bearing, loose to medium dense	SP	Coarse Alluvium	6		13	SB					
14	812						14	SB					
15	811						15	SB					
16	810	SAND WITH GRAVEL, fine to medium grained, brown, water bearing, medium dense	SP	Coarse Alluvium	20		16	SB					
17	809						17	SB					
18	808						18	SB					
19	807	End of Boring 25.0 ft.			12		19	SB					
20	806						20	SB					
21	805						21	SB					
22	804	End of Boring 25.0 ft.			12		22	SB					
23	803						23	SB					
24	802						24	SB					
25	801	End of Boring 25.0 ft.			12		25	SB					
26	800						26	SB					

WATER LEVEL MEASUREMENTS

START: 11/21/2016

END: 11/21/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/21/2016	2:00 pm	25	24.5		8.0	817.7	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

 PROJECT NAME: HCPW - 6701 W 78th Street
 CLIENT/WSB #: 03392-010

 PROJECT LOCATION: Bloomington, MN
 SURFACE ELEVATION: 825.4 ft

BORING NUMBER PB 15

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	824	FILL, mostly Silty Sand with Gravel, brown, moist		Fill			1	HSA					
2	823												
3	822	ORGANIC CLAY, black, a few Roots, moist, firm	OL	Topsoil	10		2	SB					
4	821												
5	820	SILTY SAND WITH A LITTLE GRAVEL, gray, wet, loose	SM	Coarse Alluvium	7		3	SB					
6	819												
7	818	SAND, fine to medium grained, brown, wet to water bearing, loose	SP	Coarse Alluvium	10	▽	4	SB					
8	817												
9	816	SAND WITH GRAVEL, medium to coarse grained, brown, water bearing, medium dense to loose to medium dense	SP	Coarse Alluvium	11		5	SB					
10	815												
11	814				7		6	SB					
12	813												
13	812				10		7	SB					
14	811												
15	810												
16	809												
17	808												
18	807												
19	806												
20	805												
21	804				12		8	SB					
22	803												
23	802												
24	801												
25	800	End of Boring 25.0 ft.			12		9	SB					
26	799												

WATER LEVEL MEASUREMENTS

START: 11/21/2016

END: 11/21/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/21/2016	3:00 pm	25	24.5		8.8	816.6	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 828.1 ft

BORING NUMBER PB 16

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	827	FILL, mostly Silty Sand, crushed Limestone at grade, gray, brown		Fill	12		1	HSA					
2	826						2	SB					
3	825						3	SB					
4	824												
5	823												
6	822												
7	821												
8	820	SAND WITH A LITTLE GRAVEL, fine to medium grained, brown, wet, very loose to loose	SP	Coarse Alluvium	3		4	SB					
9	819												
10	818						5	SB					
11	817												
12	816	SILTY SAND WITH A LITTLE GRAVEL, gray, wet, loose	SM	Coarse Alluvium	7		6	SB					
13	815												
14	814	SAND WITH A LITTLE GRAVEL, fine to medium grained, gray, water bearing 15 1/2', loose to very loose to loose	SP	Coarse Alluvium	5	▽	7	SB					
15	813												
16	812												
17	811												
18	810												
19	809												
20	808												
21	807						8	SB					
22	806												
23	805												
24	804												
25	803						9	SB					
26	802	End of Boring 25.0 ft.											

WATER LEVEL MEASUREMENTS

START: 11/17/2016

END: 11/17/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/17/2016	2:45 pm	25	24.5		15.5	812.6	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

Notes:

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ



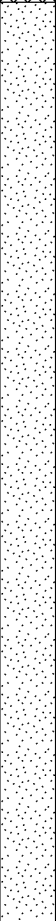
LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
 CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
 SURFACE ELEVATION: 826.8 ft

BORING NUMBER PB 17

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL				USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS										
										No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)							
1	826		FILL, mostly Sand, a little Sand with Silt, a little Gravel, brown					Fill	14		1	HSA										
2	825										2	SB										
3	824									14	3	SB										
4	823																					
5	822								14	4	SB											
6	821																					
7	820								12	5	SB											
8	819																					
9	818		SAND WITH A LITTLE GRAVEL, fine to medium grained, brown, water bearing at 9.5', loose				SP	Coarse Alluvium	▽	7	6	SB										
10	817																					
11	816									8	7	SB										
12	815																					
13	814								5	8	SB											
14	813																					
15	812									SAND, fine to medium grained, brown, water bearing, loose				SP	Coarse Alluvium	14	9	SB				
16	811																					
17	810	12	8	SB																		
18	809																					
19	808																					
20	807																					
21	806																					
22	805																					
23	804																					
24	803																					
25	802	End of Boring 25.0 ft.						14		9	SB											
26	801																					
WATER LEVEL MEASUREMENTS							START: 11/21/2016			END: 11/21/2016												
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD		Crew Chief:		Logged By:											
									J. Tatro		DAJ											
11/21/2016	10:30 am	25	24.5		9.5	817.3	3 1/4" HSA 0' - 24.5'		Notes:													

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.9 ft

BORING NUMBER PB 18

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	825	FILL, mostly Silty Sand, a few pieces of Limestone, brown		Fill	12		1	HSA					
2	824						2	SB					
3	823						3	SB					
4	822						4	SB					
5	821						5	SB					
6	820						6	SB					
7	819	SAND WITH A LITTLE GRAVEL, fine to medium grained, brown, wet to water bearing at 11.5', loose	SP	Coarse Alluvium	6	▽	7	SB					
8	818						8	SB					
9	817						9	SB					
10	816						10	SB					
11	815						11	SB					
12	814						12	SB					
13	813	SILTY SAND WITH GRAVEL, gray, water bearing, medium dense	SM	Coarse Alluvium	9		13	SB					
14	812						14	SB					
15	811						15	SB					
16	810						16	SB					
17	809						17	SB					
18	808						18	SB					
19	807	End of Boring 25.0 ft.			14		19	SB					
20	806						20	SB					
21	805						21	SB					
22	804						22	SB					
23	803						23	SB					
24	802						24	SB					
25	801	End of Boring 25.0 ft.			14		25	SB					
26	800						26	SB					

WATER LEVEL MEASUREMENTS

START: 11/18/2016

END: 11/18/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/18/2016	2:30 pm	25	24.5		11.5	814.4	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 824.3 ft

BORING NUMBER PB 19

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	823	FILL, a mixture of Sand, Silty Sand, a little Gravel, a few pieces of Limestone		Fill	8		1	HSA					
2	822												
3	821						2	SB					
4	820												
5	819												
6	818						3	SB					
7	817												
8	816						4	SB					
9	815	SAND WITH GRAVEL, fine to medium grained, brown, wet, medium dense to very loose	SP	Coarse Alluvium	12								
10	814						5	SB					
11	813												
12	812												
13	811						6	SB					
14	810												
15	809												
16	808						7	SB					
17	807	SAND WITH GRAVEL, fine to medium grained, gray, wet to water bearing at 22', loose	SP	Coarse Alluvium	5	▽							
18	806												
19	805												
20	804						8	SB					
21	803												
22	802												
23	801												
24	800												
25	799	End of Boring 25.0 ft.			6		9	SB					
26	798												

WATER LEVEL MEASUREMENTS

START: 11/18/2016

END: 11/18/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/18/2016	1:45 pm	25	24.5		22.0	802.3	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.7 ft

BORING NUMBER PB 20

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	825	FILL, a mixture of Silty Sand, Sand, a little Gravel, a few pieces of Limestone, dark brown, brown		Fill	8		1	HSA					
2	824												
3	823						2	SB					
4	822												
5	821						3	SB					
6	820												
7	819	LEAN CLAY, gray, wet, very soft	CL	Fine Alluvium	2		4	SB	21	91			
8	818												
9	817												
10	816						5	SB					
11	815												
12	814												
13	813	FAT CLAY, gray, wet, soft	CH	Fine Alluvium	6		6	SB					
14	812												
15	811						7	SB					
16	810												
17	809												
18	808												
19	807	SILTY SAND WITH A LITTLE GRAVEL, gray, water bearing, loose, a few lenses of Clay	SP	Coarse Alluvium	5		8	SB					
20	806												
21	805												
22	804												
23	803												
24	802												
25	801	End of Boring 25.0 ft.			8		9	SB					
26	800												

WATER LEVEL MEASUREMENTS

START: 11/18/2016

END: 11/18/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/18/2016	9:45 am	25	24.5		18.0	807.7	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



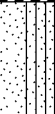
LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.1 ft

BORING NUMBER PB 21

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	824			Fill	13		1	HSA					
2	823						2	SB					
3	822						3	SB					
4	821						4	SB					
5	820				4		3	SB					
6	819												
7	818		CH	Fine Alluvium	3		4	SB	23	95			
8	817												
9	816												
10	815		SP-SM	Coarse Alluvium	7	▽	5	SB					
11	814												
12	813		CH	Fine Alluvium	10		6	SB					
13	812												
14	811												
15	810		SP	Coarse Alluvium	8		7	SB					
16	809												
17	808												
18	807												
19	806												
20	805												
21	804												
22	803												
23	802												
24	801												
25	800		SP	Coarse Alluvium	7		9	SB					
26	799	End of Boring 25.0 ft.											
WATER LEVEL MEASUREMENTS							START: 11/18/2016			END: 11/18/2016			
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:		Logged By:			
								J. Tatro		DAJ			
11/18/2016	11:45 am	25	24.5		11.0	814.1	3 1/4" HSA 0' - 24.5'	Notes:					

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ



LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010

PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 824.4 ft

BORING NUMBER PB 22

PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
							No.	TYPE	MC (%)	DD (pcf)	LL (%)	PL (%)	
1	823	FILL, a mixture of Sand with Silt, Silty Sand, a little Gravel, a few pieces of Limestone		Fill	16		1	HSA					
2	822												
3	821						2	SB					
4	820												
5	819	SAND WITH SILT AND A LITTLE GRAVEL, brown, wet, loose	SP-SM	Coarse Alluvium	8		3	SB					
6	818												
7	817												
8	816						4	SB					
9	815	LEAN CLAY, dark gray, wet, soft	CL	Fine Alluvium	6								
10	814						5	SB					
11	813												
12	812												
13	811	FAT CLAY, dark gray, wet to saturated at 19', very soft	CH	Fine Alluvium	2	▽	6	SB					
14	810												
15	809						7	SB					
16	808												
17	807												
18	806												
19	805												
20	804						8	SB					
21	803												
22	802												
23	801												
24	800												
25	799						9	SB					
26	798	End of Boring 25.0 ft.											

WATER LEVEL MEASUREMENTS

START: 11/18/2016

END: 11/18/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
11/18/2016	12:30 pm	25	24.5		19.0	805.4	3 1/4" HSA 0' - 24.5'	J. Tatro	DAJ

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST. BLOOMINGTON MN.GPJ

Notes:



SYMBOLS AND TERMINOLOGY ON TEST BORING LOG

SYMBOLS			
Drilling and Sampling		Laboratory Testing	
<u>Symbol</u>	<u>Description</u>	<u>Symbol</u>	<u>Description</u>
HSA	3-1/4" LD. Hollow stem auger	W	Water content, % (ASTM** D2216)
_FA	4", 6" or 10" diameter flight auger	D	Dry density, pcf
_HA	2", 4", or 6" hand auger	LL	Liquid limit (ASTM D4318)
_DC	2-1/2", 4", 5", or 6" steel drive casing	PL	Plastic limit (ASTM D4318)
_RC	Size A, B or N rotary casing		
PD	Pipe drill or cleanout tube		-Inserts in last column (Qu or RQD)-
CS	Continuous split barrel sampling	Qu	Unconfined compressive strength, psf (ASTM D2166)
DM	Drilling mud	Pq	Penetrometer reading, tsf (ASTM D1558)
JW	Jetting water	Ts	Torvane reading, tsf
SB	2" O.D. split barrel sampling	G	Specific gravity (ASTM D854)
_L	2-1/2" or 3-1/2" O.D. SB liner sampler	SL	Shrinkage limits (ASTM D427)
_T	2" or 3" thin walled tube sample	OC	Organic content-combustion method (ASTM D2974)
3TP	3" thin walled tube using pitcher sampler	SP	Swell pressure, tsf (ASTM D4546)
_TO	2" or 3" thin walled tube using Osterberg sampler	PS	Percent swell under pressure (ASTM D4546)
W	Wash sample	FS	Free swell, % (ASTM D4546)
B	Bag sample	SS	Shrink swell, % (ASTM D4546)
P	Test pit sample	pH	Hydrogen ion content-Meter Method (ASTM D4972)
_Q	BQ, NQ, or PQ wire line system	SC	Sulfate content, parts/million or mg/l
_X	AX, BX, or NX double tube barrel	CC	Chloride content, parts/million or mg/l
N	Standard penetration test, blows per foot	C*	One dimensional consolidation (ASTM D2435)
CR	Core recovery, percent	Qc*	Triaxial compression (ASSTM D2850 and D4767)
WL	Water level	D.S.*	Direct Shear (ASTM D3080)
▼	Water level	K*	Coefficient of permeability, cm/sec (ASTM D2434)
NMR	No measurement recorded, primarily due to presence of drilling or coring fluid.	P*	Pinhole test (ASTM D4647)
		DH*	Double hydrometer (ASTM D4221)
		MA*	Particle size analysis (ASTM D422)
		R	Laboratory electrical resistivity, ohm-cm (ASTM G57)
		E*	Pressuremeter deformation modulus, tsf (ASTM D4719)
		PM*	Pressuremeter test (ASTM D4719)
		VS*	Field vane shear (ASTM D2573)
		IR*	Infiltrimeter test (ASTM D3385)
		RQD	Rock quality designation, percent
			*Results shown on attached data sheet or graph
			**ASTM designates American Society for Testing and Materials

TERMINOLOGY							
Particle Sizes				Soil layering and Moisture			
<u>Type</u>	<u>Size Range</u>	<u>Term</u>	<u>Visual Observation</u>				
Boulders	> 12"	Lamination	Up to 1/4" thick stratum				
Cobbles	3" – 12"	Varved	Altering laminations of any combination of clay, silt, fine sand, or colors				
Coarse gravel	3/4" – 3"	Lenses	Small pockets of different soils in a soil mass				
Fine gravel	#4 sieve – 3/4"	Stratified	Altering layers of varying materials or colors				
Coarse sand	#4 - #10 sieve	Layer	1/4" to 12" thick stratum				
Medium sand	#10-#40 sieve	Dry	Powdery, no noticeable water				
Fine sand	#40-#200 sieve	Moist	Damp, below saturation				
Silt	100% passing #200 sieve and > 0.005mm	Waterbearing	Pervious soil below water				
Clay	100% passing #200 sieve and < 0.005mm	Wet	Saturated, above liquid limit				
Gravel Content				Standard Penetration Resistance			
Coarse-Grained Soils		Fine-Grained Soils		Cohesionless Soils		Cohesive Soils	
<u>% Gravel</u>	<u>Description</u>	<u>% Gravel</u>	<u>Description</u>	<u>N-Value</u>	<u>Relative Density</u>	<u>N-Value</u>	<u>Consistency</u>
2-15	A little gravel	< 5	Trace of gravel	0-4	Very loose	0-4	Very soft
16-49	With gravel	5-15	A little gravel	5-10	Loose	5-8	Soft
		16-30	With gravel	11-30	Medium dense	9-15	Firm
		31-49	Gravelly	31-50	Dense	16-30	Hard
				> 50	Very dense	> 30	Very hard



NOTICE TO REPORT USERS BORING LOG INFORMATION

Subsurface Profiles

The subsurface stratification lines on the graphic representation of the test borings show an approximate boundary between soil types or rock. The transition between materials is approximate and is usually far more gradual than shown. Estimating excavation depths, soil volumes and other computations relying on the subsurface strata may not be possible to any degree of accuracy.

Water Level

WSB & Associates, Inc. took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of this report. The groundwater level may fluctuate due to seasonal variations caused by precipitation, snowmelt, rainfalls, construction or remediation activities, and/or other factors not evident at the time of measurement.

The actual determination of the subsurface water level is an interpretative process. Subsurface water level may not be accurately depicted by the levels indicated on the boring logs. Normally, a subsurface exploration obtains general information regarding subsurface features for design purposes. An accurate determination of subsurface water levels is not possible with a typical scope of work. The use of the subsurface water level information provided for estimating purposes or other site review can present a moderate to high risk of error.

The following information is obtained in the field and noted under "Water Level Measurements" at the bottom of the log.

Sampled Depth: The lowest depth of soil sampling at the time a water level measurement is taken.

Casing Depth: The depth to the bottom of the casing or hollow-stem auger at the time of water level measurement.

Cave-In Depth: The depth at which the measuring tape stops in the bore hole.

Water Level: The point in the bore hole at which free-standing water is encountered by a measuring tape dropped from the surface inside the casing.

Drilling Fluid Level: Similar to the water level, except the liquid in the bore hole is a drilling fluid.

Obstruction Depths

Obstructions and/or obstruction depths may be noted on the boring logs. Obstruction indicates the sampling equipment encountered resistance to penetration. It must be realized that continuation of drilling, the use of other drilling equipment or further exploration may provide information other than that depicted on the logs. The correlation of obstruction depths on the log with construction features such as rock excavation, foundation depths, or buried debris cannot normally be determined with any degree of accuracy. For example, penetration of weathered rock by soil sampling equipment may not correlate with removal by certain types of construction equipment. Using this information for estimating purposes often results in a high degree of misinterpretation.

Accurately identifying the obstruction or estimating depths where hard rock is present over the site requires a scope of service beyond the normal geotechnical exploration program. The risk of using the information noted on the boring logs for estimating purposes must be understood.



UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)		
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 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 (More than 12% fines)	
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 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 (More than 12% fines)	
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)		
SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent GW, GP, SW, SP
 More than 12 percent GM, GC, SM, SC
 5 to 12 percent Borderline cases requiring dual symbols

PLASTICITY CHART

