GEOTECHNICAL ENGINEERING REPORT

SUMMIT METRO PARKS VALLEYVIEW PHASE 2
CUYAHOGA STREET
SUMMIT COUNTY
AKRON, OHIO

Prepared For:

EnviroScience

ATTENTION:
Angelina Joseph

GPD Project No. 2017381.01
May 22, 2019

Delbert J. Channels, P.E.
Director of Geotechnical Engineering

STATE OF OHIO
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GPD Group - Glaus, Pyle, Schomer, Burns & DeHaven, Inc.

Contents

SECTION 1

1.0 Introduction

GPD Group is pleased to submit this Geotechnical Report for the aforementioned project. The purpose of this study was to obtain information on the subsurface conditions at the proposed project site and, based on this information, to provide geotechnical recommendations regarding the design and construction of foundations for the new culvert and the reuse of cut material from along the Cuyahoga River for use as Roadway and path construction. One (1) Boring took place to a depth of 13.5 feet below the existing ground surface near the location of the culvert/bridge and nine (9) Test Pits took place to depths of 7 feet each, along locations next to the Cuyahoga River. Individual Boring & Test Pit Logs and Boring & Test Pit Location Plans are attached.

1.1 Project Description

The site for the proposed work is located off of Cuyahoga Road in Akron (Summit County), Ohio. The culvert will replace an existing Ford along the oil/gas well access road. Proposed cuts will also take place along the Cuyahoga River to restore the flood plain and the excess soil will be used as fill in other portions of the park for fill to construct roads and trails. A Site Location Map of the park is attached. The culvert/bridge will consist of a three-sided concrete box culvert supported on a shallow foundation system. The new structure will support one lane and will span less than 20 feet over a small creek. The structure is assumed to bear approximately 4 feet below the existing elevation of the ford.

1.2 Purpose and Scope

The purposes of this report were to investigate subsurface conditions within the proposed culvert, provide geotechnical engineering recommendations for foundation design for the structure and to provide recommendations pertaining to the reuse of earthwork material in other areas of the site. Specifically, the scope of work included the following:

- Conducting a field exploration program consisting of site reconnaissance and drilling a sample boring at a selected location near the proposed culvert to explore subsurface conditions and collect soil samples.
- Conducting a field exploration program to observe test pits excavated by others in areas as chosen by the client to help determine soil properties relevant to its proposed use elsewhere on the metro parks property.
- Conducting geotechnical engineering laboratory test on sampled soils to assist with soil classifications and estimation of engineering properties.

- Develop geotechnical engineering recommendations for the design and construction of foundations and provide recommendations and guidelines for the reuse of site soils.

SECTION 2

2.0 Site Conditions

Areas of our field exploration program took place at the former Valleyview Golf Club. The property will be under restoration to return it to a natural state. The elevation at Soil Boring B-1 is close to the existing elevation of the ford at an elevation of 758 above sea level. The grades across the entire site are generally flat and are typical of a river valley area. Any changes in grade are thought to be man-made.

2.1 Subsurface Exploration Program

The subsurface exploration consisted of drilling and sampling one (1) boring at the site to an attempted depth of 20 feet below existing grade. Sampling below at depth of 12 feet was not possible due to sand heave within the augers, with the boring terminated at 13.5 feet. The boring location was laid out by GPD personnel as close as possible to the area of the proposed culvert. The test pit subsurface exploration took place at nine (9) locations along the Cuyahoga River to attempted depths of 12 feet. The depths of exploration were cut to 7 feet due to the use of a compact excavator. Each location was located at the time of the exploration with the help of a hand-held GPS unit.

The borings were drilled with a track-mounted 6620 Geoprobe rotary drill rig using hollow stem augers and an automatic SPT hammer to advance the boreholes. Representative soil samples were obtained by the split-barrel sampling procedure in general accordance with the appropriate ASTM standards. In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the total 18-inch penetration or the middle 12 inches of the total 24-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (N-Value). This value is used to estimate the in-situ relative density of cohesion-less soils and the consistency of cohesive soils. The sampling depths and penetration distance, plus the standard penetration resistance values, are shown on the boring logs. The samples were sealed and returned to the laboratory for testing and classification.

A Field log of the boring and test pits were prepared by the drill crew and a geologist. The log and test pits included visual classifications of the materials encountered during drilling and excavation as well as the driller's and geologist's interpretation of the subsurface conditions between samples. The final boring log and test pits included with this report represent an interpretation of the field logs & test pits and include modifications based on observations made by a senior Geotechnical Engineer and the results of laboratory testing.

2.2 Laboratory Testing

The samples were classified in the laboratory based on visual observation, texture and plasticity. The descriptions of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. A brief description of this classification system is attached to this report. Information from these tests was used in conjunction with field penetration test data to evaluate soil strength in-situ, volume change potential, and soil classification.

2.3 Subsurface Conditions

Soil Boring Soils – The native soils at the boring location consisted of a 12 inch layer of topsoil followed by black silt with a trace of organics to a depth of 3 feet below the site grades. At a depth of 3 feet to the soil boring termination depth of 13.5 feet a sand with varying amounts of gravel was encountered. Soil consistencies were generally very loose to loose and moistures were moist in the upper 3 feet of sampling and wet to saturated below that depth.

Test Pit Soils – Under topsoil thicknesses of 5 to 24 inches, the native soils at most of the test pit locations consisted of a sand & silt with varying amounts of gravel. These sand and silt soils were generally damp to saturated and were loose to medium dense. Damp to moist and medium stiff to very stiff clay layers were found in some of the boring locations. The exception was found in Test Pit TP-9 were the entire depth of the sample consisted of a clay. Test pits TP-6 & TP-7 consisted of a sand & gravel fill to the termination depth of 7 feet. These soils most likely represent fill of flood plain areas during construction of the golf course.

2.3.1 Groundwater Conditions

The Borings and Test Pits were monitored while drilling and immediately after completion for the presence and level of groundwater. Water levels observed in the borings are noted on the boring & test pit logs. Ground water was encountered at Boring B-1 starting at a depth of 4 feet below the site grades. Groundwater was only encountered in Test Pits TP-1 & TP-2 at depths of approximately 5 feet below site grades. These water level observations provide an approximate indication of the groundwater conditions existing on the site at the time the borings or test pits took place. Fluctuations of the groundwater level can occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

SECTION 3

3.0 Engineering Recommendations

The following engineering recommendations are based on information provided to GPD Group regarding the work taking place at the site, the field and laboratory testing performed on the soil encountered at this site, and other information discussed in this report. This report does not reflect

variations that may occur between borings & test pits, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, GPD should be immediately notified so that further evaluation and supplemental recommendations can be provided (if warranted).

3.1 Geotechnical Considerations

Based on the information obtained during the course of this study, the following geotechnical considerations should be taken into account during the planning, design and construction phases of the project. These geotechnical considerations are provided as a summary of the primary issues we believe are associated with this site. This report must be read in its entirety for a full description of our geotechnical recommendations:

- There is the possibility of the presence of very loose silt soils at the bearing subgrade for the proposed culvert. If encountered, those subgrades should be undercut to an approved subgrade and backfilled with #57 limestone. There is also the possibility of water seepage into the excavations. As such, a stone mat should be anticipated to protect the bearing surface from deteriorating. The stone mat should consist of #57 crushed limestone and should be a minimum of 1 foot thick. Localized dewatering should also be anticipated. With this said, in order to minimize the risk of construction issues and future settlement associated with the new structure, it is highly recommended that the undercutting of unsuitable materials, selection of engineered fill and backfilling and compaction operations should be closely monitored by GPD Group on a full-time basis to verify that the disturbed areas are adequately repaired.

- Contingent upon proper site preparation and thorough evaluation of the foundation excavations, it is our opinion that the proposed culvert structure can be supported on conventional shallow foundations.

- Soils cut from along the river to reconstruct the flood plains were found to be generally acceptable for use as fill elsewhere at the site for construction of roads and trails. Some moisture conditioning (drying) of some of the soils should be anticipated. The fill soils found in Test Pits TP-6 & TP-7 are also considered suitable for reuse as fill provided inclusions of cobbles and bricks do not exceed allowable amounts. All fill should be placed and compacted as per the recommendations of this report.

The following report sections provide detailed recommendations regarding the geotechnical considerations presented above. In the event changes in the project design occur, GPD Group must review this report to determine if modifications to our recommendations are warranted.

3.2 Culvert Foundation Systems

Shallow spread footings can be used for transmitting structural loads to the subsoil. With design and construction of foundations as prescribed below, any settlements occurring will be within typical tolerable limits.

In general, structural fill properly selected and compacted as outlined in this report would capable of supporting a net allowable bearing pressure of 2,000 psf. The following provisions for foundation design and construction would apply:

- All foundation subgrades consist of undisturbed loose to medium dense granular soils, medium stiff to stiff cohesive soils, or better, and be free of soft, very loose, or organic soils and miscellaneous inclusions; and be approved by our geotechnical engineer or their representative prior to concrete placement.

- If present, such deleterious conditions should be remedied by undercutting as directed by the geotechnical engineer, and replacement with compacted crushed stone, as directed by our personnel. If crushed stone is used, the undercut as needed so that the undercut width equals the depth of the undercut below the footing plus the footing width (see figure 1).

- Foundation subgrades be concreted in a dry and frost-free condition, and as soon after exposure as possible.

- The ground surface surrounding the structure be graded so as to effect surface drainage of water away from all exterior foundation walls and members.

- All exterior footings be located below the depth of potential frost penetration per local code (3.5 feet), and the potential scour depth as determined by others.

- All footings be proportioned to carry no more than the recommended 2,000 psf net allowable pressure. The net pressure is defined as the sum of all structural loads, weight of foundation concrete, floor loadings, and soil above footings divided by the corresponding bearing area; less any existing effective overburden pressure at bearing elevation.

- All strip footings should have a width no less than 16 inches, and contain sufficient reinforcing to span any local, more compressible zones.

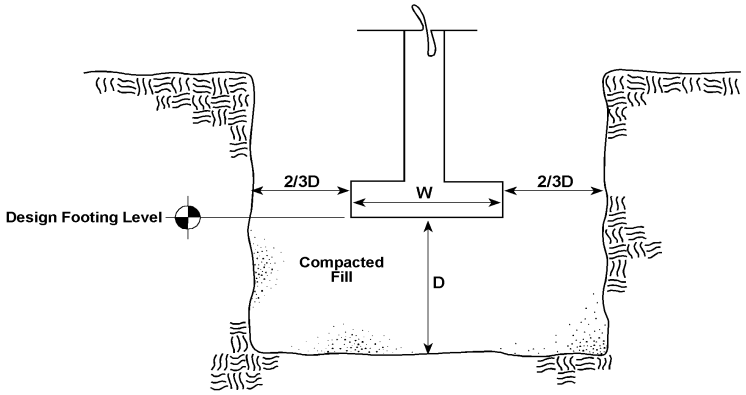


Figure 1: Foundation Over-excavation and Backfill

3.3 Excavations

Excavation walls shall be sloped or shored per the requirements of OSHA regulations. Based on the borings performed at this site, we recommend that the excavations be designed using an OSHA Type “C” soil classification. The excavation bottom shall be graded to provide a smooth, firm and stable foundation that is free from rocks and other obstructions. Excavations that extend greater than 20 feet shall be designed and approved by a professional engineer.

3.4 Site Preparation

All surface vegetation should be removed and the topsoil should be stripped. All surfaces cut to subgrade elevation or subgrades to receive fill should be proof-rolled under the direction of an on-site geotechnical engineer or their representative. Any soft, loose, yielding, or obviously contaminated zones should either be undercut, or be improved in place as directed by the engineer.

Any fill or backfill required within building limits should be select material, as approved by a qualified geotechnical engineer. For all filling operations, the following should be observed:

- Prior to use, the approved fill material should be tested as outlined in ASTM D-698 to determine the maximum dry density and optimum moisture content for silty or cohesive soils, or ASTM D-4253 and D-4254 for clean granular soils. For each change in borrow material, additional tests will be required.

- For all fill or backfill used, the fill material should be placed on the approved subgrade in controlled lifts, with each lift compacted to a stable condition, and to a minimum of 98% maximum dry density per ASTM D-698 at a moisture content within 1.5% of optimum for cohesive or silty borrow. Controlled lifts of granular material should be compacted to 80% relative density per ASTM D-4254.

- All filling operations should be observed by a qualified soils technician with field density tests made, to assure compaction to specification.

Proper moisture control of fine grained silty soils is critical in attaining the required compaction. It should be noted that both in-situ soils and new fill composed of fine grained soils are susceptible to disturbance by construction equipment traffic when wet. Thus, construction operations should be planned to prevent such disturbance and the resulting weakening of the subgrade soils. Such precautions would include, but not be limited to grading the site to prevent ponding of water, sealing the subgrade soils at the end of operations each day, and allowing wet subgrades to dry before operating heavy equipment on the soil.

SECTION 4

4.0 Additional Design and Construction Considerations

4.1 Subsurface Drainage

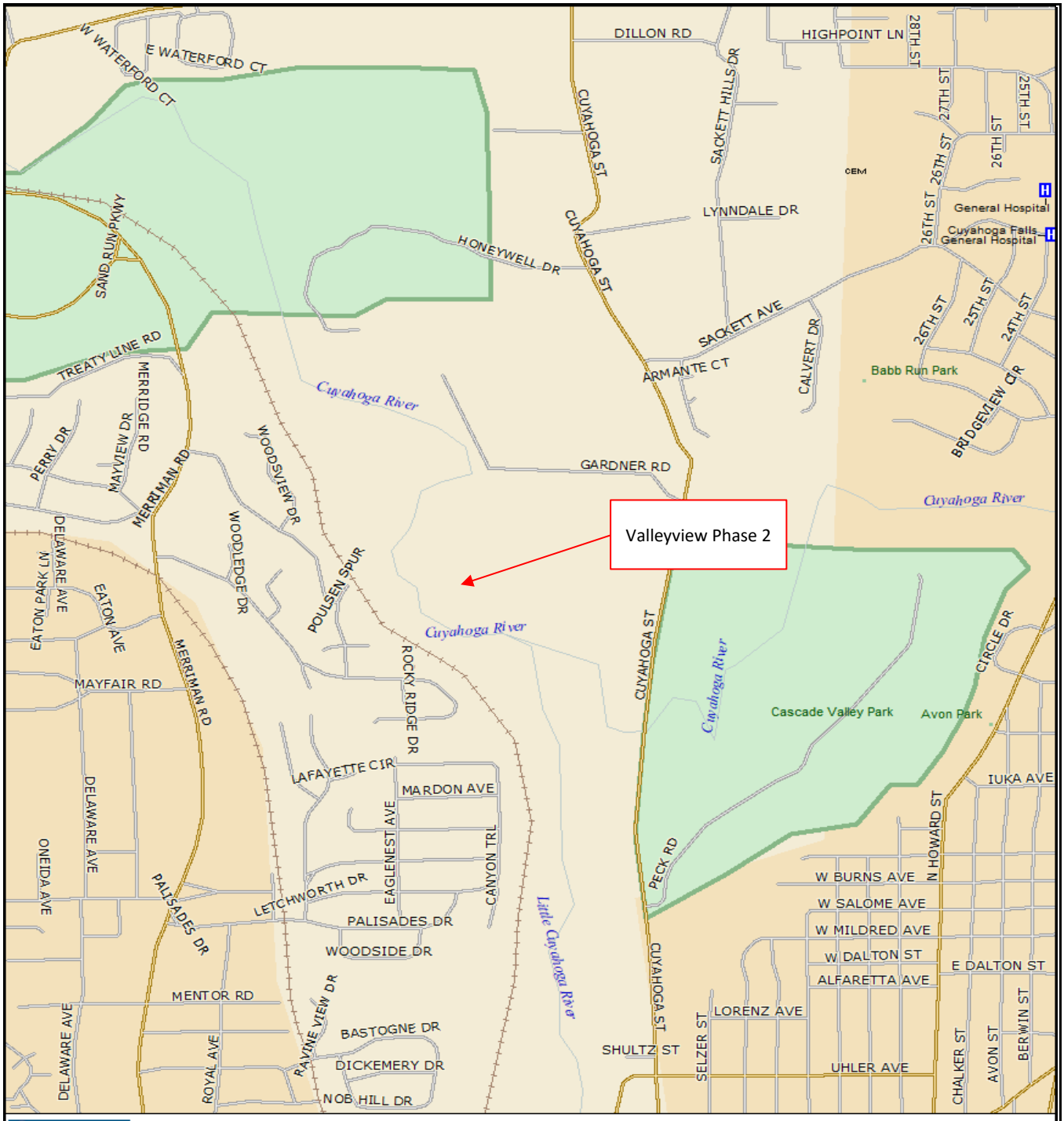
At the time of this investigation, groundwater was encountered in Boring B-1 at a depth of about 4.0 feet below grade. Dewatering methods, such as pumping from sumps or possibly setting temporary well points, should be anticipated for removal of any groundwater encountered during excavation at the site. Ground water was only encountered at Test Pit locations TP-1 & TP-2.

4.2 General Comments

GPD Group should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. GPD should also be retained to provide testing and observation during site preparation and fill placement operations as well as during the foundation construction phase of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, GPD should be immediately notified so that further evaluation and supplemental recommendations can be provided. The scope of services for this project does not include either specifically or by implication any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken.

This report has been prepared for the exclusive use of **EnviroScience** for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless GPD Group reviews the changes and either verifies or modifies the conclusions of this report in writing.



GPD GROUP®

SITE LOCATION MAP

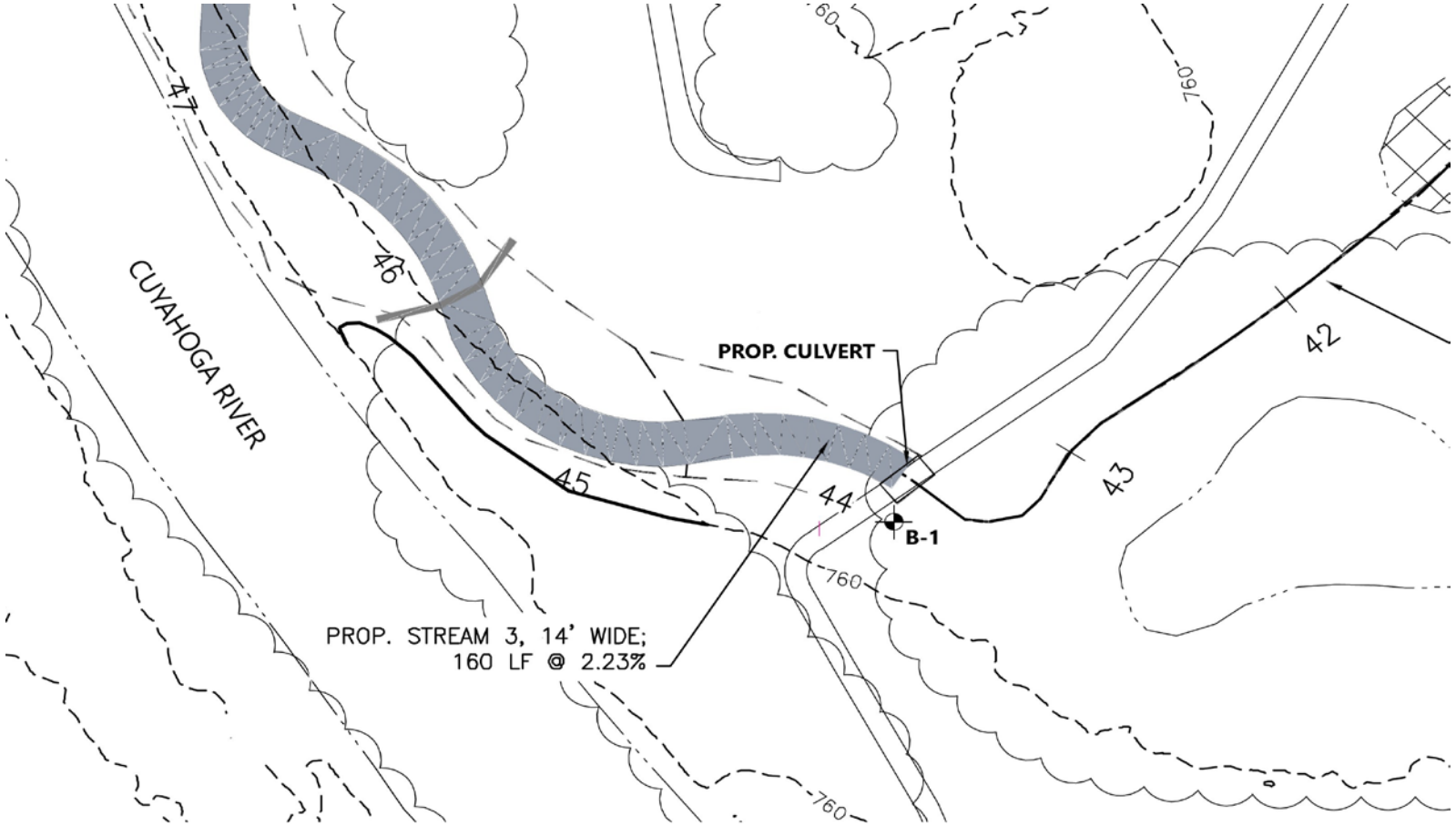
Summit Metro Parks Valleyview Phase 2

1070 Cuyahoga Street, Akron, Ohio

GPD Project Number: 2017381.01

Date: May 2019

SOIL BORING LOCATION PLAN



Legend

Soil Boring: ⊕

N

PROJECT: Summit Metro Parks Valleyview Phase 2

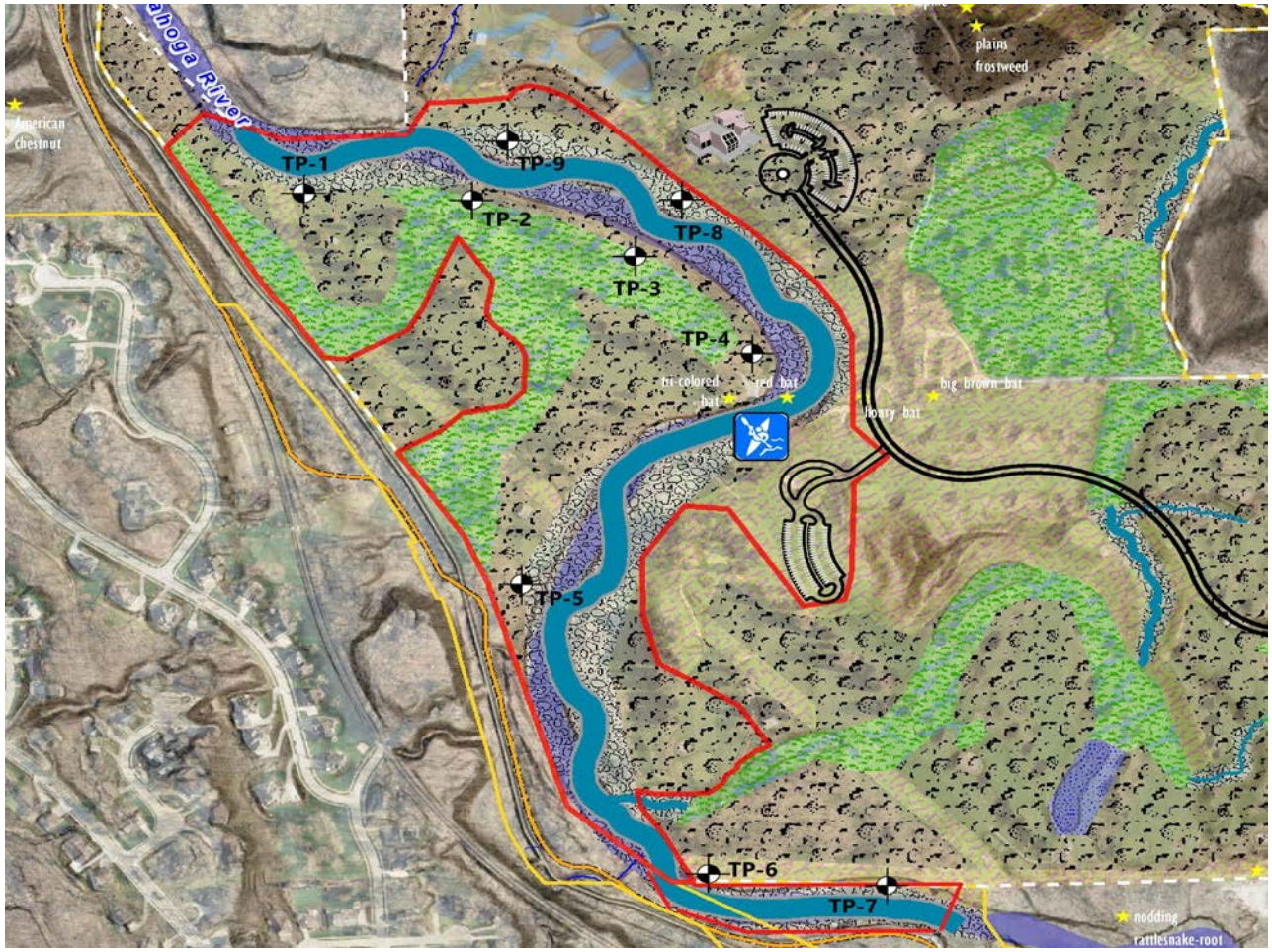
PROJECT NUMBER: 2017381.01 **DATE**: 5/21/19

LOCATION: 1070 Cuyahoga Street, Akron, Ohio

GPD GEOTECHNICAL SERVICES, INC.®

520 South Main Street, Suite 2531 ☐ Akron, Ohio 44311 ☐ (330)733-6748

TEST PIT LOCATION PLAN



Legend

Soil Boring: ⌖

N

PROJECT: Summit Metro Parks Valleyview Phase 2

PROJECT NUMBER: 2017381.01 **DATE**: 5/21/19

LOCATION: 1070 Cuyahoga Street, Akron, Ohio

GPD GEOTECHNICAL SERVICES, INC.®

520 South Main Street, Suite 2531 ☐ Akron, Ohio 44311 ☐ (330)733-6748

Boring Number: B-1

CLIENT Enviroscience Inc. **PROJECT NAME** Summit Metro Parks Valley View Phase 2

PROJECT NUMBER 2017381.01 **PROJECT LOCATION** Akron, Ohio

DATE STARTED April 25, 2019 **COMPLETED** April 25, 2019 **GROUND ELEVATION** _____ **HOLE SIZE** 6 in

DRILLING CONTRACTOR GPD Geotechnical Services, Inc. **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem Auger - 2 1/4" ID ▽ **AT TIME OF DRILLING** 4.00 ft

LOGGED BY Dave Campana **CHECKED BY** Thomas Kratz **AT END OF DRILLING** ---None

NOTES 6620 Geoprobe

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	GRAPHIC LOG	MATERIAL DESCRIPTION
0					12" TOPSOIL.
					1.0
	SS 1	44	3-1-1 (2)		Moist, very loose, black SILT, minor sand & clay, trace of organics.
					3.0
					Wet, brown & black, fine to medium SAND, minor silt, trace of organics & roots.
	SS 2	89	1-2-4 (6)		▽
5					Wet to saturated, loose, brown, medium to coarse SAND & GRAVEL.
					Saturated, loose, gray, medium to coarse SAND, some gravel.
	SS 3	100	2-3-5 (8)		
10					
					12.0
					No sampling; SAND heave.
					13.5
					Boring terminated at 13.5 feet

Test Pit Number: TP-1

CLIENT Enviroscience
PROJECT NAME Summit Metro Parks Valleyview Phase 2
PROJECT NUMBER 2017381.01
PROJECT LOCATION 1070 Cuyahoga St, Akron, OH 44313
DATE STARTED May 9, 2019 **COMPLETED** May 9, 2019
GROUND ELEVATION _____ **TEST PIT SIZE** 24 in
EXCAVATION CONTRACTOR River Reach Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Excavator
▽ **AT TIME OF EXCAVATION** 5.50 ft, Slow in-flow.
LOGGED BY Nick Burgess **CHECKED BY** Nick Burgess
AT END OF EXCAVATION ---
NOTES Test pit took place with a compact excavator with a 24" wide bucket.

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			6" TOPSOIL
0.5			Damp, loose, brown, very fine to coarse SAND and SILT.
1.5			Damp/moist, very stiff, gray, silty CLAY.
2.5			
3.0			Moist, loose, black/gray, very fine SAND and SILT, trace of organics and clay. (Possible pocket of decomposed tree)
5.0			▽ Wet, loose-medium dense, gray, very fine SAND and SILT.
			Test pit terminated at 7.0 feet

Test Pit Number: TP-2

CLIENT Enviroscience
PROJECT NAME Summit Metro Parks Valleyview Phase 2
PROJECT NUMBER 2017381.01
PROJECT LOCATION 1070 Cuyahoga St, Akron, OH 44313
DATE STARTED May 9, 2019 **COMPLETED** May 9, 2019
GROUND ELEVATION _____ **TEST PIT SIZE** 24 in
EXCAVATION CONTRACTOR River Reach Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Excavator
▽ **AT TIME OF EXCAVATION** 5.00 ft, Fast in-flow
LOGGED BY Nick Burgess **CHECKED BY** Nick Burgess
AT END OF EXCAVATION ---
NOTES Test pit took place with a compact excavator with a 24" wide bucket.

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			10" TOPSOIL
0.8			Damp, loose to medium dense, brown, very fine to fine SAND & SILT, traces of roots.
2.5			Moist, loose, brown, very fine to fine SAND & SILT, trace of roots.
5.0			▽ Wet to saturated, loose, brown, very fine SAND & SILT, trace of roots.
6.0			Wet, medium dense, brown, fine to coarse SAND & GRAVEL.
			Test pit terminated at 7.0 feet

Test Pit Number: TP-3

CLIENT Enviroscience
PROJECT NAME Summit Metro Parks Valleyview Phase 2
PROJECT NUMBER 2017381.01
PROJECT LOCATION 1070 Cuyahoga St, Akron, OH 44313
DATE STARTED May 9, 2019 **COMPLETED** May 9, 2019
GROUND ELEVATION _____ **TEST PIT SIZE** 24 in
EXCAVATION CONTRACTOR River Reach Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Excavator
AT TIME OF EXCAVATION ---None
LOGGED BY Nick Burgess **CHECKED BY** Nick Burgess
AT END OF EXCAVATION ---
NOTES Test pit took place with a compact excavator with a 24" wide bucket.

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			5" TOPSOIL
0.4			Damp, loost, brown, fine to coarse SAND & GRAVEL.
2.5			
3.0			Damp/moist, loose to medium dense, brown, very fine to medium SAND & SILT.
			Moist to wet, loose, brown, very fine SAND and SILT.
5.0			
			Test pit terminated at 7.0 feet

Test Pit Number: TP-4

CLIENT Enviroscience
PROJECT NAME Summit Metro Parks Valleyview Phase 2
PROJECT NUMBER 2017381.01
PROJECT LOCATION 1070 Cuyahoga St, Akron, OH 44313
DATE STARTED May 9, 2019 **COMPLETED** May 9, 2019
GROUND ELEVATION _____ **TEST PIT SIZE** 24 in
EXCAVATION CONTRACTOR River Reach Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Excavator
AT TIME OF EXCAVATION ---None
LOGGED BY Nick Burgess **CHECKED BY** Nick Burgess
AT END OF EXCAVATION ---
NOTES Test pit took place with a compact excavator with a 24" wide bucket.

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			24" TOPSOIL
2.0			Moist, loose, brown very fine to fine SAND & SILT, traces of roots.
2.5			
5.0			
			Test pit terminated at 7.0 feet

Test Pit Number: TP-5

CLIENT Enviroscience
PROJECT NAME Summit Metro Parks Valleyview Phase 2
PROJECT NUMBER 2017381.01
PROJECT LOCATION 1070 Cuyahoga St, Akron, OH 44313
DATE STARTED May 9, 2019 **COMPLETED** May 9, 2019
GROUND ELEVATION _____ **TEST PIT SIZE** 24 in
EXCAVATION CONTRACTOR River Reach Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Excavator
AT TIME OF EXCAVATION ---None
LOGGED BY Nick Burgess **CHECKED BY** Nick Burgess
AT END OF EXCAVATION ---
NOTES Test pit took place with a compact excavator with a 24" wide bucket.

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			5" TOPSOIL
0.4			Damp to moist, loose, brown, fine to coarse SAND.
1.1			Moist, medium dense, brown, clayey SILT.
1.5			Moist, dense, gray, SILT, trace of sand and gravel.
2.5			
3.5			Moist, loose to medium dense, brown, very fine to medium SAND and SILT.
5.0			
			Test pit terminated at 7.0 feet

Test Pit Number: TP-6

CLIENT Enviroscience
PROJECT NAME Summit Metro Parks Valleyview Phase 2
PROJECT NUMBER 2017381.01
PROJECT LOCATION 1070 Cuyahoga St, Akron, OH 44313
DATE STARTED May 9, 2019 **COMPLETED** May 9, 2019
GROUND ELEVATION _____ **TEST PIT SIZE** 24 in
EXCAVATION CONTRACTOR River Reach Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Excavator
AT TIME OF EXCAVATION ---None
LOGGED BY Nick Burgess **CHECKED BY** Nick Burgess
AT END OF EXCAVATION ---
NOTES Test pit took place with a compact excavator with a 24" wide bucket.

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			5" TOPSOIL
0.4			Damp to moist, loose, brown, medium to coarse SAND & GRAVEL, trace of cobbles and bricks. (FILL)
2.5			Moist, medium dense, brown, medium to coarse SAND & GRAVEl, trace of cobbles and brick. (FILL)
5.0			
			Test pit terminated at 7.0 feet

Test Pit Number: TP-7

CLIENT Enviroscience
PROJECT NAME Summit Metro Parks Valleyview Phase 2
PROJECT NUMBER 2017381.01
PROJECT LOCATION 1070 Cuyahoga St, Akron, OH 44313
DATE STARTED May 9, 2019 **COMPLETED** May 9, 2019
GROUND ELEVATION _____ **TEST PIT SIZE** 24 in
EXCAVATION CONTRACTOR River Reach Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Excavator
AT TIME OF EXCAVATION ---None
LOGGED BY Nick Burgess **CHECKED BY** Nick Burgess
AT END OF EXCAVATION ---
NOTES Test pit took place with a compact excavator with a 24" wide bucket.

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			6" TOPSOIL
0.5			Damp to moist, loose, brown, medium to coarse SAND & GRAVEL, trace of cobbles and brick. (FILL)
2.5			Moist, medium dense, brown, medium to coarse SAND & GRAVEL, trace of cobbles and bricks. (FILL)
5.0			Moist, medium dense, gray, medium to coarse SAND & GRAVEL, trace of debris and clay. (FILL)
			Test pit terminated at 7.0 feet

Test Pit Number: TP-8

CLIENT Enviroscience
PROJECT NAME Summit Metro Parks Valleyview Phase 2
PROJECT NUMBER 2017381.01
PROJECT LOCATION 1070 Cuyahoga St, Akron, OH 44313
DATE STARTED May 9, 2019 **COMPLETED** May 9, 2019
GROUND ELEVATION _____ **TEST PIT SIZE** 24 in
EXCAVATION CONTRACTOR River Reach Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Excavator
AT TIME OF EXCAVATION ---None
LOGGED BY Nick Burgess **CHECKED BY** Nick Burgess
AT END OF EXCAVATION ---
NOTES Test pit took place with a compact excavator with a 24" wide bucket.

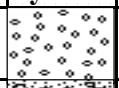
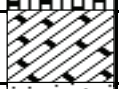
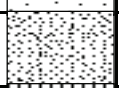
DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			6" TOPSOIL
0.5			Damp, loost, brown, clayey SILT.
			Damp, medium dense, brown, clayey SILT.
2.2			Moist, stiff to very stiff, gray, silty CLAY.
2.5			
3.5			Moist to wet, medium dense, brown, fine to coarse SAND & GRAVEL, trace of cobbles.
5.0			
			Test pit terminated at 7.0 feet

Test Pit Number: TP-9

CLIENT Enviroscience
PROJECT NAME Summit Metro Parks Valleyview Phase 2
PROJECT NUMBER 2017381.01
PROJECT LOCATION 1070 Cuyahoga St, Akron, OH 44313
DATE STARTED May 9, 2019 **COMPLETED** May 9, 2019
GROUND ELEVATION _____ **TEST PIT SIZE** 24 in
EXCAVATION CONTRACTOR River Reach Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Excavator
AT TIME OF EXCAVATION ---None
LOGGED BY Nick Burgess **CHECKED BY** Nick Burgess
AT END OF EXCAVATION ---
NOTES Test pit took place with a compact excavator with a 24" wide bucket.

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			9" TOPSOIL
0.8			Damp to moist, loose to medium dense, brown, SILT.
1.8			Moist, medium stiff, brown, silty CLAY.
2.5			Moist, stiff, brown/gray, silty CLAY.
5.0			Moist, very stiff, gray, silty CLAY.
			Test pit terminated at 7.0 feet

Unified Soil Classification System

Major Divisions			Letter	Symbol	Description
Coarse-grained Soils More than ½ retained on the No. 200 Sieve	**Gravels** More than ½ coarse fraction retained on the No. 4 sieve	Clean Gravels	GW		Well-graded gravels and gravel-sand mixtures, little or no fines.
			GP		Poorly-graded gravels and gravel-sand mixtures, little or no fines.
		Gravels With Fines	GM		Silty gravels, gravel-sand-silt mixtures.
			GC		Clayey gravels, gravel-sand-clay mixtures.
	Sands More than ½ passing through the No. 200 sieve	Clean Sands	SW		Well-graded sands and gravelly sands, little or no fines.
			SP		Poorly-graded sands and gravelly sands, little or no fines.
		Sands With Fines	SM		Silty sands, sand-silt mixtures
			SC		Clayey sands, sandy-clay mixtures.
Fine-grained Soils More than ½ passing through the No. 200 Sieve	**Silts and Clays** Liquid Limit less than 50%		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL		Organic clays of medium to high plasticity.
	Silts and Clays Liquid Limit greater than 50%		MH		Inorganic silts, micaceous or diatomaceous fines sands or silts, elastic silts.
			CH		Inorganic clays of high plasticity, fat clays.
			OH		Organic clays of medium to high plasticity.
Highly Organic Soils			PT		Peat, muck, and other highly organic soils.

Consistency Classification

Granular Soils			*Cohesive Soils*		
Description - Blows Per Foot (Corrected)			Description - Blows Per Foot (Corrected)		
	MCS	SPT		MCS	SPT
Very loose	<5	<4	Very soft	<3	<2
Loose	5 - 15	4 - 10	Soft	3 - 5	2 - 4
Medium dense	16 - 40	11 - 30	Firm	6 - 10	5 - 8
Dense	41 - 65	31 - 50	Stiff	11 - 20	9 - 15
Very dense	>65	>50	Very Stiff	21 - 40	16 - 30
			Hard	>40	>30

MCS = Modified California Sampler SPT = Standard Penetration Test Sampler

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,▼ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

Slightly Weathered: Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.

Weathered: Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.

Highly Weathered: Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.