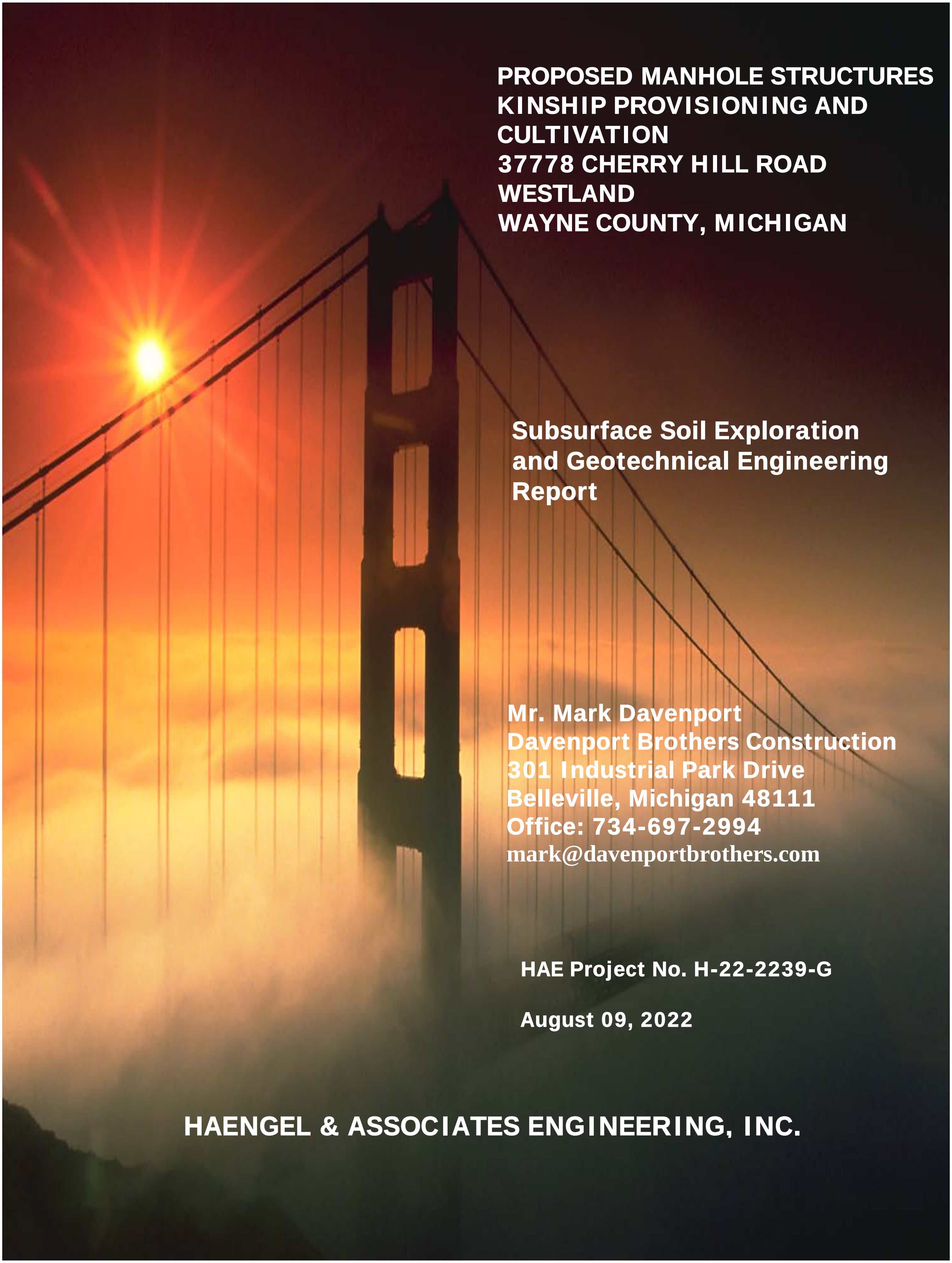

PROPOSED MANHOLE STRUCTURES
KINSHIP PROVISIONING AND CULTIVATION
37778 CHERRY HILL ROAD
WESTLAND
WAYNE COUNTY, MICHIGAN

Subsurface Soil Exploration and Geotechnical Engineering Report

Mr. Mark Davenport
Davenport Brothers Construction
301 Industrial Park Drive
Belleville, Michigan 48111
Office: 734-697-2994
mark@davenportbrothers.com

HAE Project No. H-22-2239-G

August 09, 2022

HAENGEL & ASSOCIATES ENGINEERING, INC.

HAENGEL & ASSOCIATES
ENGINEERING, INC.
Geotechnical, Environmental, Structural, Civil,
Construction QA/QC Inspection and Testing

42040 KOPPERNICK ROAD, SUITE 407
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WEBSITE: www.haengelassociates.com

August 9, 2022

Mr. Mark Davenport
Davenport Brothers Construction
301 Industrial Park Drive
Belleville, Michigan 48111
Phone: 734-697-2994

RE: Soil Exploration & Geotechnical Engineering Services
Proposed Sanitary Sewer Manhole Structures
Kinship Provisioning & Cultivation Facility
37778 Cherry Hill Road, Westland, Michigan
HAE Project No. H-22-2239-G

Dear Mr. Davenport

We have completed the subsurface soil exploration and geotechnical engineering report for the above referenced project. The purpose of this study was to obtain general subsurface soil and groundwater information from the site, and to identify and evaluate the geotechnical characteristics of the soils encountered at the boring locations at the two manhole structure locations. This report presents our understanding of the project, the results of the exploration including boring logs and boring location plan, our observations including site photos, geotechnical recommendations for the design and construction of the proposed subsurface structures.

We appreciate the opportunity to assist you and the design team on the geotechnical aspects of this project. We have over 20 years of experience in construction quality control testing, foundation inspection and laboratory services for over 15,000 projects for many satisfied and repeat clients. HAE will be happy to provide you these services for your project.

If you have any questions regarding this report, please do not hesitate to contact us. Thank you very much for your continued use of our services.

Respectfully,

HAENGEL & ASSOCIATES ENGINEERING, INC.

Gusta. N. Haengel

Gustavo N. Haengel
Principal

TABLE OF CONTENTS

EXECUTIVE SUMMARY – H-22-2239-G
Proposed Manhole Structures – Kinship Provisioning & Cultivation
37778 Cherry Hill Road, Westland, Michigan

We understand the project includes the construction of a 10-inch sanitary sewer line with two 8-feet deep manholes at the north end of the proposed Kinship Provisioning & Cultivation Facility, to be located at 37778 Cherry Hill Road in Westland, Michigan. The site appears to be an abandoned junkyard with vegetation and trees. A Summary of our observations, conclusions and recommendations presented in this report are given below.

Based on the two borings at the two proposed manhole structures, the area is covered with loose sandy silt fill with some debris and organics to approximately 5.5 feet depth. The underlying stiff to very stiff silty clay with varying amounts of sand was noted to the end of borings at 20 feet. The driller reported groundwater during drilling and upon completion of the drilling at depths ranging from 7.5 to 15.0 feet.

We recommend that during site grading, all trees, trunks, large roots, organic soil and other debris and unsuitable materials must be removed completely. The resulting voids and depressions should be backfilled and graded with engineered fill.

Trench excavation for the sanitary sewer will require vertical bank with properly installed lateral bracing, unless proper side slope is provided. Bracing systems for pipe trenches may include, where applicable, portable trench boxes, sliding trench shields or tight sheeting. In all cases, local, state, and federal regulations, including the current MI-OSHA requirements must be followed.

All excavations should safely sheeted, shored, sloped, or braced in accordance with MI-OSHA requirements. If material is stored or equipment is operated near an excavation, stronger shoring must be used to resist the extra pressure due to the superimposed loads. Care should always be exercised when excavating near existing roadways or utilities to avoid undermining. In no case should excavations extend below the level of adjacent existing utilities unless underpinning of the utility is planned.

Groundwater seepage into the utility trench excavations may take place if the excavations are carried below the prevailing ground water level. Depending on the utility invert elevation, it may be necessary to perform positive water control procedures, such as protecting the utility trench excavations from rainwater. It may also be necessary to stabilize the excavation bottom with a layer of crushed aggregate, to maintain the integrity of the bearing material. All excavations should comply with applicable local, state and federal regulations, including current MI-OSHA regulations.

After installation of the water main on a prepared granular bed at the design elevation, the trench should be backfilled with compacted granular materials as necessary to achieve a stable subgrade. Existing granular soils may be used as Engineered Fill to raise grades to design subgrade elevations. The base material shall be compacted to 98% of Modified Proctor ASTM D-1557. All fill material should be placed and compacted at or near the optimum moisture content.

Do not consider this summary separate from the entire text of this report, with all the conclusions and qualifications mentioned herein. Details of our analysis and recommendations are discussed in the following sections and in the Appendix of this report.

REPORT PREPARED BY:

ABDUL A. KHANDKER
No. 36757

A. Aziz Khandker, PhD, PE
Senior Consultant

REPORT REVIEWED BY:

Gustavo N. Haengel
Principal

1.0 THE PROJECT

1.1 Introduction

Following authorization from Mr. Mark Davenport of Davenport Brothers Construction, Haengel & Associates Engineering, Inc., has completed the subsurface soil exploration and geotechnical engineering report for the manhole structures at the site located near 37778 Cherry Hill Road in Westland, Michigan.

The purpose of this study was to obtain general subsurface soil and groundwater information from the site, and to identify and evaluate the geotechnical characteristics of the soils encountered at the boring locations at the two manhole structure locations.

This report presents our understanding of the project, the results of the exploration including boring logs and boring location plan, our observations including site photos, geotechnical recommendations for the design and construction of the proposed subsurface structures.

1.2 Project Description

We understand the project includes the construction of a 10-inch sanitary sewer line with two 8-feet deep manholes at the north end of the proposed Kinship Provisioning & Cultivation Facility, to be located near 37778 Cherry Hill Road in Westland, Michigan. The proposed 10-inch sanitary sewer line is planned to be connected to the existing sewer line along Cherry Hill Road. Two 8-feet deep manholes are proposed within the site as shown on the Site Plan Layout & Utility Plan for Kinship Provisioning & Cultivation Facility revised on 1/4/2022.

The site appears to be an abandoned junkyard with vegetation and trees. The topography of the site is characterized by a relatively flat terrain. The area is surrounded by wooded area, indicating the site may have been cleared of trees. Buried trunks and roots may be exposed during site grading.

1.3 Limitations of Geotechnical Services

If our understanding of the project does not align with your intent, or if changes occur in the design, location, or concept of the project, the conclusions and recommendations contained in this report are not valid unless HAE is notified of the differences in writing. HAE will then review the changes and confirm the recommendations or make changes in writing.

2.0 PROCEDURES

The field operations, laboratory testing, and engineering report preparation are performed under the direction and supervision of a registered professional engineer. These services are performed according to generally accepted standards and procedures in the practice of geotechnical engineering.

2.1 Field Operations

The number, location and depth of the soil borings were provided by the owner's representative. The soil borings were located in the field based on physical features shown on a site plan, provided by the Architect, and by using simple tape and wheel measurements. The borings were relocated to facilitate drill rig access. Actual locations are shown on the Boring Location Plan included in the Appendix.

A truck mounted rotary drilling rig was used to perform the soil borings. Continuous flight solid-stem augers were used to advance the bore holes. Standard split spoon samplers were used to obtain the soil samples. The sampling was in general conformance with ASTM Standard D 1586. The number of blows required to drive the sampler 12 inches, after an initial seating of 6 inches, with a 140 pound hammer falling 30 inches is termed the Standard Penetration Resistance, N-value. A graphical representation of the N-values is given on the boring logs.

During the field operations, HAE Engineer maintained the log of the subsurface conditions, including changes in stratigraphy and observed groundwater levels. After completion of the drilling operations, the boreholes were backfilled with auger cuttings. The soil samples were placed in sealed containers in the field and brought to the laboratory for testing and classification.

2.2 Laboratory Testing

An experienced geotechnical engineer classified the samples in general conformance with the Unified Soil Classification System. After visual classification of the soils received in the sample jars, routine laboratory testing includes the determinations of natural moisture content of all samples and in-situ density of intact samples.

For cohesive soils, unconfined compressive strength was measured using a calibrated hand penetrometer, to a maximum of 4-1/2 tons per square foot (tsf), by measuring the resistance of the soil sample to penetration of a small calibrated spring loaded cylinder. The particle size distributions of six soil samples were also determined by sieve analysis. The gradation curve provides estimates of internal friction and permeability-related behavior of the granular soils.

The data obtained from the field and laboratory tests are indicated on the boring logs and laboratory result sheets included in the Appendix. The laboratory tests apply to the samples tested and some results may not be representative of the soil mass because of variations in composition and texture as well as imperfect samples and presence of pebbles and/or other inclusions.

HAE will keep the soil samples for 60 days before we dispose of them. If you desire HAE to retain the samples longer than 60 days, please notify us within the above referenced time frame.

3.0 RESULTS

When obtaining and testing samples and preparing this report, we followed procedures that represent reasonable and accepted practice in the geotechnical engineering profession. The engineer preparing the report reviews the field log, laboratory classifications, and test data, and then prepares the final boring log. We base our recommendations on the contents of the final log.

3.1 Soil Conditions

Based on the two borings at the two proposed manhole structures, the area is covered with loose sandy silt fill with some debris and organics to approximately 5.5 feet depth. The N-values in sandy silt ranged from 7 to 10 blows per foot indicating loose condition. Moisture contents ranged from 18.6 to 23.3 percent of the dry weight of the soil. Dry unit weight ranged from 101.7 to 107.3 pounds per cubic foot.

The underlying stiff to very stiff silty clay with varying amounts of sand was noted to the end of borings at 20 feet. The N-values in silty clay ranged from 7 to 18 blows per foot with unconfined compressive strength ranging from 1.5 to 4.0 tons per square foot. Moisture contents ranged from 13.8 to 23.1 percent of the dry weight of the soil. Dry unit weight ranged from 110.5 to 127.15 pounds per cubic foot.

The stratification depths shown on the soil boring logs represent the soil conditions at the boring locations. Variations may occur between the borings. Additionally, the stratigraphic lines represent the approximate boundary between soil types; the transition may be more gradual than what is shown. We have prepared the boring logs on the basis of laboratory classification and testing as well as field logs of the soils encountered.

The soil boring logs and boring location diagram are presented in the Appendix. The soil profiles described above are generalized descriptions of the conditions encountered at the boring location. Please consult the boring logs for more specific information.

3.2 Groundwater Conditions

The driller reported groundwater during drilling and upon completion of the drilling at depths ranging from 7.5 to 15.0 feet.

It should be noted that in cohesive soils, such as the natural clay material encountered at this site, the groundwater observations made during drilling of the test borings are not necessarily indicative of the static groundwater level. The water may be perched within the granular fill over the cohesive soils.

Groundwater or surface water can become trapped or confine within open excavations or shallow pockets of sand above the less pervious clay soils. Ground water levels can be temporarily elevated as a result of wet weather conditions. Typically, groundwater levels and volumes are expected to be higher in the winter and spring seasons as compared to the summer and fall months.

To make an accurate determination of the long term groundwater level it is necessary to install groundwater level monitoring wells (piezometer) in the boreholes and monitored for an extended time. Ground water levels can be temporarily elevated as a result of wet weather conditions. Typically, groundwater levels and volumes are expected to be higher in the winter and spring seasons as compared to the summer and fall months.

The long term hydrostatic groundwater level and perched groundwater levels will vary due to changes in precipitation, evaporation, surface run-off, and other factors. The groundwater levels, discussed herein, represent the conditions at the time of the measurements.

4.0 ANALYSIS AND RECOMMENDATIONS

We have made our analysis based on the information developed during this exploration. The resulting recommendations are given in the following sections. If our assumptions or understandings are not correct or if conditions during construction are significantly different from those found in the site exploration, contact HAE immediately. HAE may need to re-evaluate the recommendations.

4.1 Utility Trench Excavations

Trench excavations for utility lines may proceed with either sloped banks, vertical banks with properly designed and installed lateral bracing, or a combination of both. Bracing systems for pipe trenches may include, where applicable, portable trench boxes, sliding trench shields or tight sheeting. In all cases, local, state, and federal regulations, including the current MI-OSHA requirements must be followed.

All excavations should safely sheeted, shored, sloped, or braced in accordance with MI-OSHA requirements. If material is stored or equipment is operated near an excavation, stronger shoring must be used to resist the extra pressure due to the superimposed loads. Care should always be exercised when excavating near existing roadways or utilities to avoid undermining. In no case should excavations extend below the level of adjacent existing utilities unless underpinning of the utility is planned.

After installation of the sewer pipes on a prepared granular bed at the design elevation, the trench should be backfilled with compacted granular materials as necessary to achieve a stable subgrade. Existing granular soils may be used as Engineered Fill to raise grades to design subgrade elevations. The base material shall be compacted to 98% of Modified Proctor ASTM D-1557. All fill material should be placed and compacted at or near the optimum moisture content.

Groundwater seepage into the utility trench excavations may take place if the excavations are carried below the prevailing groundwater level. Depending on the utility invert elevation, it may be necessary to perform positive dewatering procedures, such as installing sump pumps closely spaced along both sides of the utility trench excavations.

It may also be necessary to stabilize the excavation bottom with a layer of crushed aggregate, to maintain the integrity of the bearing material. All excavations should comply with applicable local, state and federal regulations, including current MI-OSHA regulations.

4.2 Below-Grade Structures and Lateral Earth Pressure Considerations

In general, any below-grade walls or other retaining walls should be backfield with a clean granular material, such as MDOT Class II material, in order to facilitate drainage of water from the backfill as well as to reduce the lateral earth pressure on the below-grade wall. Weep holes and/or drain tile should be used to remove the water from the backfill where necessary.

The walls of the manhole structure are expected to be restrained and rigid so that it does not rotate sufficiently to reach the active earth pressure condition. A higher lateral earth pressure at-rest should be used for design. For rigid walls backfilled with free draining granular material and in at rest condition, an equivalent fluid earth pressure of 80 psf per foot of wall height should be used for design. If the draining cannot be guaranteed, a higher pressure of 95 psf per foot of wall height should be used.

The walls should be designed so that the resultant of all forces is within the middle one-third of the wall base. Any additional lateral wall loads resulting from adjacent surcharge loading, such as equipment, foundations or utilities, should be added to the above recommended earth pressures. Additional lateral loads, such as those resulting from surrounding surcharge or foundations or floor loads, should be added to the above recommended pressure.

The following parameters for evaluating the stability of retaining walls assume the foundation of the wall bears directly on the natural clay, the wall is backfilled with free draining granular material and the insitu soils will be in contact with the front (toe) of the wall. To evaluate the sliding of the wall, the sliding resistance at the base, and the passive (resisting) and active (driving) earth forces must be computed. Generally, the walls should have minimum factor of safety between 1.5 and 2.0 against sliding and overturning.

Coefficient of friction for sliding = 0.4
Coefficient of active earth pressure. (Ka) = 0.3
Coefficient of passive earth pressure, (Kp) = 3.0
Coefficient of at-rest earth pressure, (Ko) = 0.45
Unit weight, (psf) = 125

5.0 GENERAL COMMENTS

HAE prepared this report according to generally accepted geotechnical engineering standards and procedures. The purpose of this report is to aid in the evaluation of this property and to help the design team of this project. If changes occur in the design, location, or concept of the project, the conclusions and recommendations contained in this report are not valid. The changes must be reviewed by HAE and the recommendations either modified or affirmed in writing by HAE.

We base the analyses and recommendations submitted in this report upon the data from the soil borings performed at the approximate location shown on the boring location diagram. This report does not reflect variations that may occur between the actual boring location and the actual structure location. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.

The field log is prepared during the drilling and sampling operations to describe the field observations, sampling depths, and other information. We frequently subject the samples from the field to additional testing and reclassification in the laboratory. Differences may exist between the field log and the final log.

We recommend HAE be given the opportunity to review the final design plans and specifications as they relate to the recommendations presented in this report. The review is necessary to verify the report conclusions and recommendations have been interpreted according to our intent and are properly incorporated into the design. Further, the review will verify subsequent changes to the project have not affected our recommendations. Without this review, we can not be held responsible for misinterpretation of our data, analysis and/or our recommendations, nor how these are incorporated in the final design.

We also recommend HAE observe all geotechnical related work, including foundation construction, subgrade preparation, and engineered fill placement. HAE will perform the appropriate testing to confirm the geotechnical conditions given in the report are found during construction.

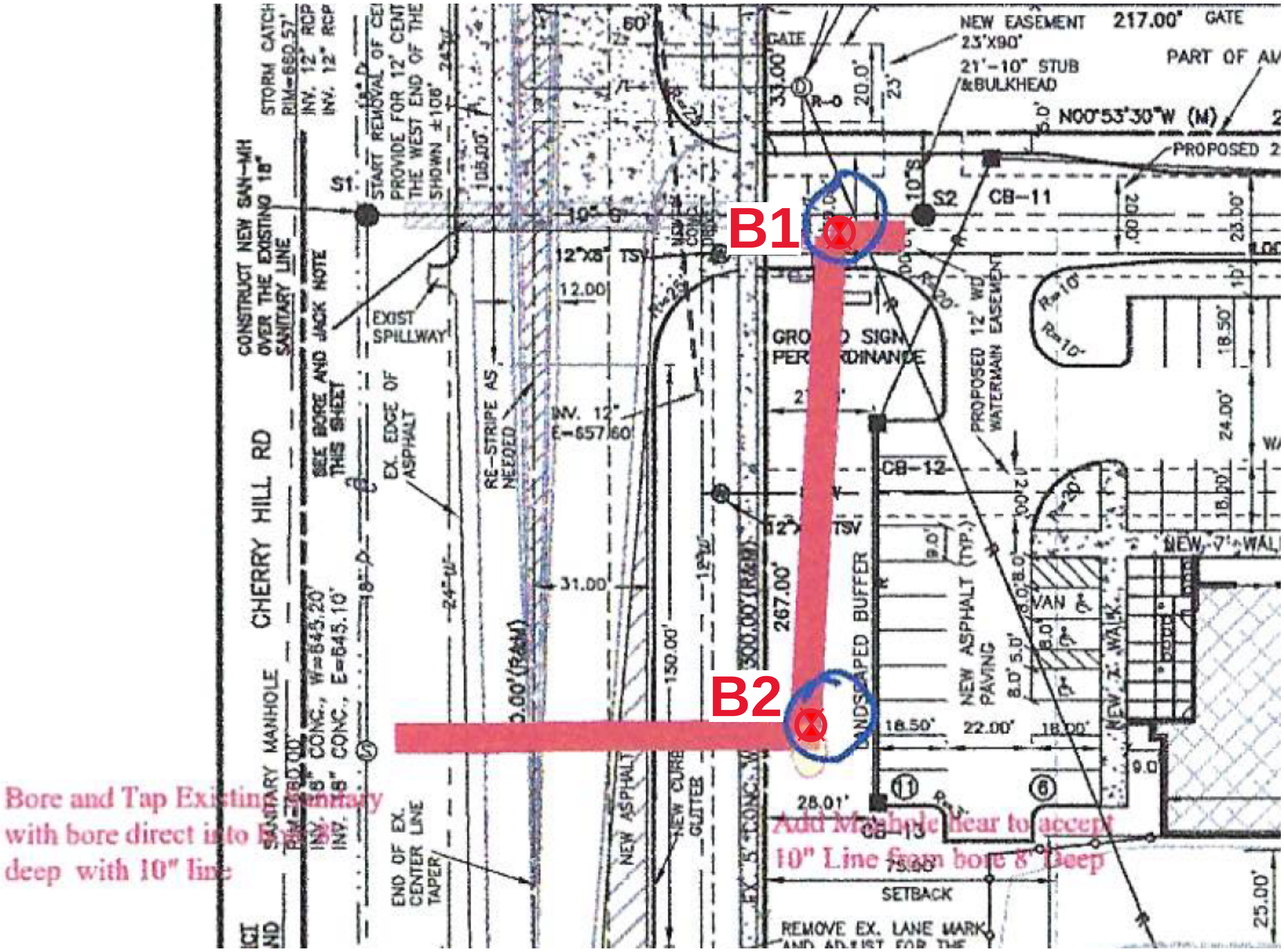
We have enjoyed working with you, and look forward to being of further assistance during the design and construction phases. If you have any questions please do not hesitate to call us at (734) 455-9771.

APPENDIX

1

BORING LOCATIONS DIAGRAM

APPROXIMATE LOCATION OF BORING HOLES



Bore and Tap Existing Sanitary with bore direct into RM 18" deep with 10" line

Add Manhole near to accept 10" Line from bore 8' Deep

LEGEND:

🅧 Approx. Soil Boring B1 - B2

7/29/2022 by HAE / GEOSERV DRILLING

N.T.S.

42040 KOPPERNICK ROAD. SUITE 407
CANTON, MICHIGAN 48187
(734) 455-9771/ Fax (734) 455-9774

SOIL BORING LOCATION PLAN

Manhole Structures-Kinship Provisioning & Cultivation

Project No.: H-22-2239-G	PLATE No.: 1A

2

GENERAL NOTES

GENERAL NOTES

TERMINOLOGY AND CLASSIFICATION

Unless otherwise noted, terms used refer to Standard Definitions in ASTM D 653. The major soil constituent is the principal noun (i.e. **CLAY, SILT, SAND, GRAVEL**). The 2nd major constituent and minor constituents are reported as follows:

Particle Sizes	
Boulders	- Greater than 12 inches (305 mm)
Cobbles	- 3 inches (76.2 mm) to 12 inches (305 mm)
Coarse Gravel	- 3/4 inches (19.05 mm) to 3 inches (76.2 mm)
Fine Gravel	- No. 4 sieve (4.75 mm) to 3/4 inches (19.02 mm)
Coarse Sand	- No. 10 sieve (2.0 mm) to No. 4 sieve (4.75 mm)
Medium Sand	- No. 40 sieve (0.425 mm) to No. 10 sieve (2.00 mm)
Fine Sand	- No. 200 sieve (0.074 mm) to No.40 sieve (0.425 mm)
Silt	- 0.005 mm to 0.074 mm
Clay	- Less than 0.005 mm

2nd Major Constituent (Percent by weight)	
trace:	1 – 12
clayey, etc.:	13 – 35
and:	> 35
(e.g. CLAY AND SILT)	

Minor Constituents (Percent by weight)	
trace:	1 – 12
little:	13 – 23
some:	24 – 33

COHESIVE SOILS

If clay content is sufficient so that cohesion dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier (i.e. **SILTY CLAY**). Other minor soil constituents may be included in accordance with the classification breakdown for cohesion less soils (i.e. **SILTY CLAY**, trace of sand, little gravel). Consistency of cohesive soils is based on an evaluation of the observed resistance to deformation under load and not upon the Penetration Test (**SPT**) Resistance (**N**). The **N-Values** shown below are general indicators of the relative soil consistency.

Soil Consistency	Unconfined Compressive Strength (psf)	Undrained Shear Strength (psf)	Approximate Range of (N)
Very Soft	< 500	< 250	0 – 2
Soft	501 – 1000	250 – 500	3 – 4
Medium	1001 – 2000	500 – 1000	5 – 8
Stiff	2001 – 4000	1000 – 2000	9 – 15
Very Stiff	4001 – 8000	2000 – 4000	16 – 30
Hard	8001 – 16000	4000 – 8000	31 – 50
Very Hard	> 16000	> 8000	> 50

COHESIONLESS SOILS

Relative Density of Cohesion less Soils is based on the **N-Values**, modified as required for depth effects, sampling effects, etc.

Density Classification	Relative Density (Percent)	Approximate Range of (N)
Very Loose	0 – 15	0 – 4
Loose	16 – 35	5 – 10
Medium Dense	36 – 65	11 – 30
Dense	66 – 85	31 – 50
Very Dense	86 – 100	> 50

SAMPLE DESIGNATIONS

AS	-Auger Sample: Directly from auger flight.
BS	-Miscellaneous Samples: Bottle or Bag.
S	-Split Spoon Sample with Liner Insert: ASTM D 1586
LS	-Liner Sample S with liner insert 3 inches in length
ST	-Shelby Tube Sample: 3-inch diameter unless noted.
PS	-Piston Sample: 3-inch diameter unless noted.
RC	-Rock Core: NX core unless otherwise noted.

STANDARD PENETRATION TEST (SPT) ASTM D 1586: A 2-in. OD, 1.375-in ID split spoon sampler is driven into undisturbed soil by means of a 140-lb. Weight falling freely a vertical distance of 30 inches. The sampler is normally driven three successive 6-in. increments. The number of bellows required for the final 12 inches of penetration is the **SPT** Resistance (**N**).

PLATE NO. 2

3

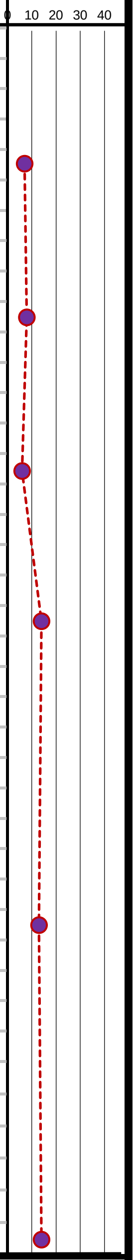
BORING LOGS

HAE Haengel & Associates Engineering, Inc.
Geotechnical, Environmental, QA/QC

LOG OF GEOTECHNICAL SOIL BORING B1

Project: Manhole Structures - Kinship Provisioning & Cultivation
Project No.: H-22-2239-G
Location: 37778 Cherry Hill Road, Westland, Michigan
Prepared/Checked by: AAK / GH

SUBSURFACE PROFILE				SOIL SAMPLE DATA							
ELEV. (FT)	STRATA PROFILE	MATERIAL DESCRIPTION	LAYER DEPTH (FT)	SAMPLE DEPTH (FT)	SAMPLE TYPE-NO.	BLOWS PER 6-IN.	N-SPT BLOWS PER FT	MOIST. CONT. (%)	DRY UNIT WT (PCF)	UNCONF. COMP. STR. (TSF)	SPT N-VALUE Blows/Feet
100.0			0								
				1.0							
		FILL - Sandy Silt (ML)				4					
		trace gravel & organics				4					
		black, wet, loose		2.5	S-1	3	7	18.6	103.6		
97.0			3.0								
				3.5							
		FILL - Sandy Silt (ML)				2					
		trace gravel & organics				3					
		gray, wet, loose		5.0	S-2	5	8	23.3	105.0		
94.5			5.5								
				6.0							
		Silty CLAY (CL)				6					
		little sand, trace gravel				4					
		gray, wet, stiff		7.5	S-3	2	6	23.1	120.0	1.5	
92.0			8.0								
				8.5							
		Silty CLAY (CL)				2					
		little sand, trace gravel				5					
		gray, wet, very stiff		10.0	S-4	9	14	17.0	121.9	4.0	
88.0			12.0								
				13.5							
		Silty CLAY (CL)				4					
		little sand, trace gravel				6					
		gray, wet, very stiff		15.0	S-5	7	13	20.3	110.5	3.5	
83.0			17.0								
				18.5							
		Silty CLAY (CL)				5					
		little sand, trace gravel				7					
80.0		gray, wet, very stiff	20.0	20.0	S-6	7	14	16.8	121.7	3.5	
		End of Boring									



* Indicates results from calibrated penetrometer

DRILLING INFORMATION

GROUNDWATER LEVEL OBSERVATIONS

Date Drilled: 7/29/2022
Total Depth: 20 feet
Driller: Steve - GeoServ
Inspector: Tarun
Drilling Method: Truck-mounted, solid-stem auger.
BH Backfill Procedure: Borings backfilled with soil cuttings.
Refusal:
Relocate:

During Drilling: 9.0'
At Completion: 15
... Hours after completion:
Cave-in:
Notes:

FIGURE NO. 1

HAE Haengel & Associates Engineering, Inc.
Geotechnical, Environmental, QA/QC

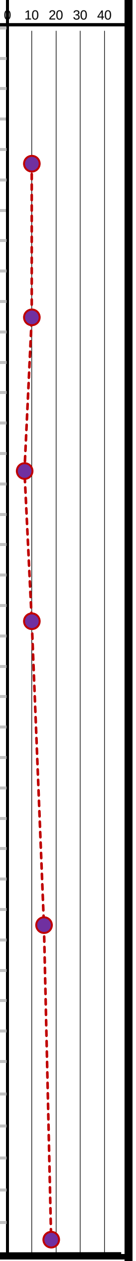
LOG OF GEOTECHNICAL SOIL BORING B2

Project: Manhole Structures - Kinship Provisioning & Cultivation
Project No.: H-22-2239-G
Location: 37778 Cherry Hill Road, Westland, Michigan
Prepared/Checked by: AAK / GH

SUBSURFACE PROFILE / SOIL SAMPLE DATA

ELEV. (FT)	STRATA PROFILE	MATERIAL DESCRIPTION	LAYER DEPTH (FT)	SAMPLE DEPTH (FT)	SAMPLE TYPE-NO.	BLOWS PER 6-IN.	N-SPT BLOWS PER FT	MOIST. CONT. (%)	DRY UNIT WT (PCF)	UNCONF. COMP. STR. (TSF)
100.0			0							
				1.0						
		FILL - Sandy Silt (ML)				9				
		trace gravel, brick & organics				5				
		black, wet, loose		2.5	S-1	5	10	18.9	107.3	
97.0			3.0							
				3.5						
		FILL - Sandy Silt (ML)				3				
		trace gravel				4				
		gray, wet, loose		5.0	S-2	6	10	20.2	101.7	
94.5			5.5							
				6.0						
		Silty CLAY (CL)				6				
		little sand, trace gravel				4				
		gray, wet, stiff		7.5	S-3	3	7	19.0	117.9	3.0
92.0			8.0							
				8.5						
		Silty CLAY (CL)				3				
		little sand, trace gravel				6				
		gray, wet, very stiff		10.0	S-4	4	10	13.8	127.2	4.0
88.0			12.0							
				13.5						
		Silty CLAY (CL)				4				
		some sand, trace gravel				6				
		gray, wet, very stiff		15.0	S-5	9	15	16.7	125.4	4.0
83.0			17.0							
				18.5						
		Silty CLAY (CL)				6				
		some sand, trace gravel				9				
80.0		gray, wet, very stiff	20.0	20.0	S-6	9	18	18.4	124.6	3.0

SPT
N-VALUE
Blows/Feet



End of Boring

* Indicates results from calibrated penetrometer

DRILLING INFORMATION

GROUNDWATER LEVEL OBSERVATIONS

Date Drilled: 7/29/2022
Total Depth: 20 feet
Driller: Steve - GeoServ
Inspector: Tarun
Drilling Method: Truck-mounted, solid-stem auger.
BH Backfill Procedure: Borings backfilled with soil cuttings.
Refusal:
Relocate:

∇ During Drilling: 7.5
▼ At Completion: 8
... Hours after completion:
Cave-in:
Notes:

FIGURE NO. 2

4

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION

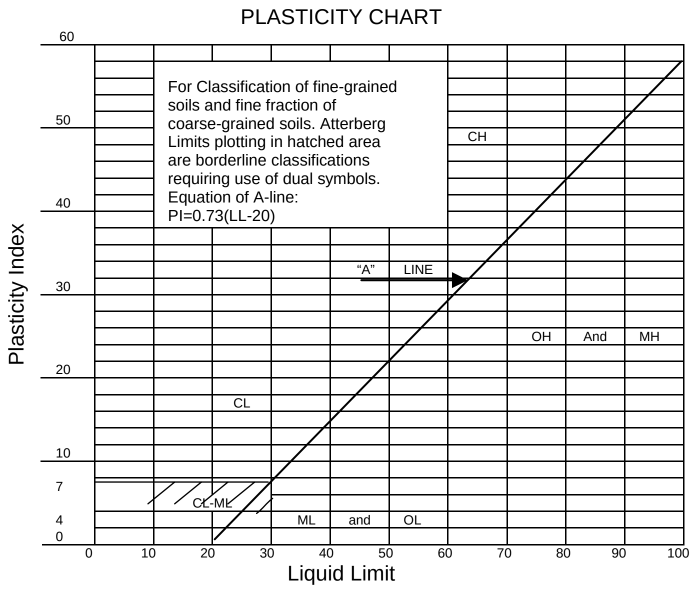
Major Division			Group Symbols		Typical Names	Laboratory Classification Criteria		
Coarse Grained Soils (More than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean Gravels (Little or no fines)	GW		Well graded gravels, gravel-sand mixtures, little or no fines	Determine percentage 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% ------------- GW, GP, SW, SP More than 12% ------------- GM, GC, SM, SC 5 to 12% ------------ Borderline cases requiring dual symbols	$Cu=D_{60}/D_{10}$ greater than 4; $Cc=(D_{30})^2/(D_{10} \times D_{60})$ between 1 and 3	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM	d u	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or PI less than 4	Above " A" lime with PI between 4 and 7 are borderline cases requiring use of dual symbols
			GC		Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with PI greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean Sands (Little or no fines)	SW		Well graded sands, gravelly sands, little or no fines		$Cu=D_{60}/D_{10}$ greater than 6; $Cc=(D_{30})^2/(D_{10} \times D_{60})$ Between 1 and 3	
			SP		Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM	d u	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or PI less than 4	Limits plotting hatched zone with P1 between 4 and 7 are borderline cases requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures		Atterberg limits above "A" line or PI less than 7	
Fine Grained Soils (More than half of material is smaller than No. 200 sieve size)	Silt and Clays (liquid limit less than 50)		ML		Inorganic silt with low plasticity	 For Classification of fine-grained soils and fine fraction of coarse-grained soils. Atterberg Limits plotting in hatched area are borderline classifications requiring use of dual symbols. Equation of A-line: PI=0.73(LL-20) 		
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL		Organic silt, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
	Silts and Clays (Liquid limit greater than 50)		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			

PLATE NO. 3

5

LAB

SIEVE ANALYSIS OF SOILS

ASTM D - 422

Project:	Manhole Structures - Kinship Provisioning and Cultivation			**Project #:**	**H-22-2239-G**
Location:	37778 Cherry Hill Rd, Westland, MI			**Source:**	**Boring B1**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S1**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/02/22**	**Sample Depth (ft):**	**1-2.5**
Soil Description:	Sandy SILT	trace gravel & organics		**Soil Classification:**	**ML**

			Wt soil+tare	Dry wt of soil
Tare No.;	11	Before Wash:	179.4	97.7
Wt of Tare (gm):	81.7	After Wash:	134.7	53

Washed Gradation

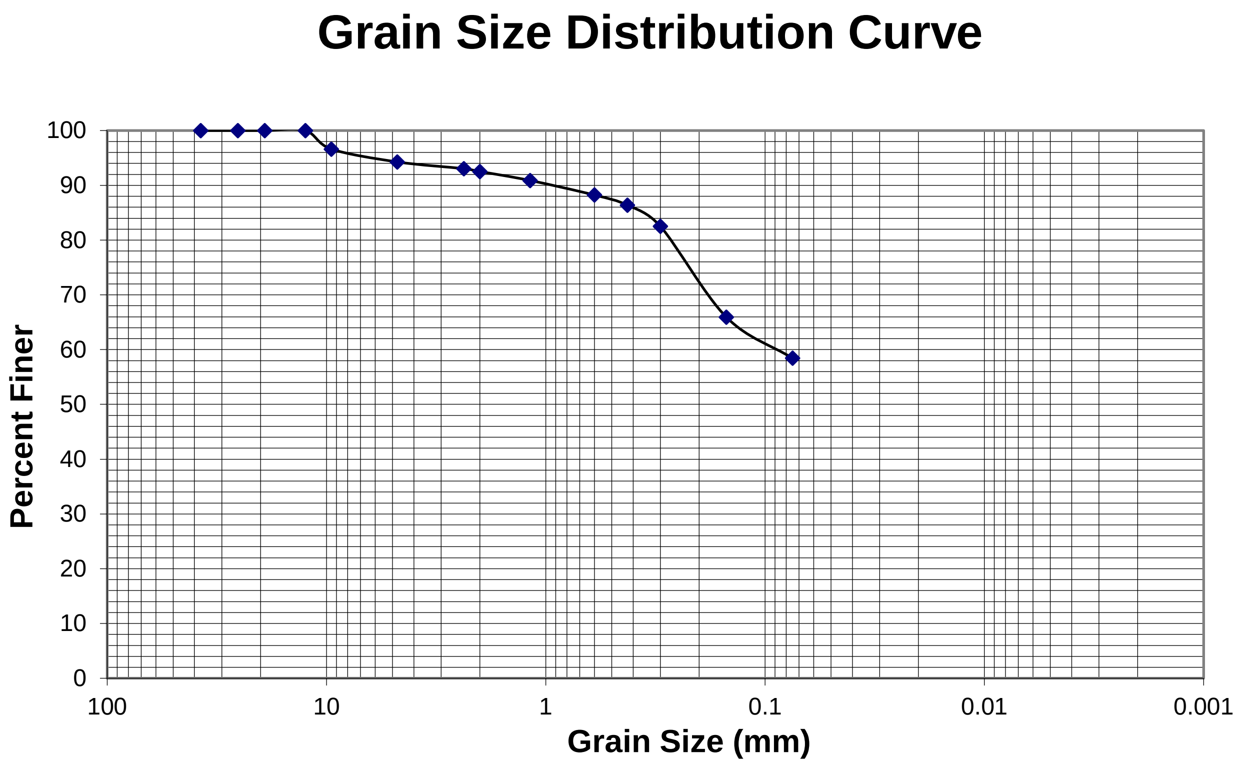
Sieve size (in. or #)	Sieve size (mm)	Cum. Weight Retained (g)	Percent (%) Retained	Percent % Passing	Specification
1.5"	37.5	0.0	0.0	100.0	
1"	25.4	0.0	0.0	100.0	
.75"	19.1	0.0	0.0	100.0	
.5"	12.5	0.0	0.0	100.0	
.375"	9.5	3.3	3.4	96.6	
#4	4.75	5.6	5.7	94.3	
#8	2.36	6.8	7.0	93.0	
#10	2.00	7.3	7.5	92.5	
#16	1.18	8.9	9.1	90.9	
#30	0.600	11.5	11.8	88.2	
#40	0.425	13.3	13.6	86.4	
#60	0.300	17.1	17.5	82.5	
#100	0.150	33.3	34.1	65.9	
#200	0.075	40.6	41.6	58.4	
Pan	0	52.5	53.7		
	Total Dry Weight:	97.7	Loss by Wash:	58.4	

SIEVE ANALYSIS OF SOILS
ASTM D - 422

Project:	**Manhole Structures - Kinship Provisioning and Cultivation**			**Project #:**	**H-22-2239-G**
Location:	**37778 Cherry Hill Rd, Westland, MI**			**Source:**	**Boring B1**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S1**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/02/22**	**Sample Depth:**	**1-2.5**
Soil Description:	**Sandy SILT**	**trace gravel & organics**		**Soil Classification:**	**ML**

Soil Gradation Information **Soil Classification**

% >1.5 in.=	**0.0**		Plastic Limit, PL =		**USCS:**	**ML**
% Gravel=	**5.7**		Liquid Limit, LL=		**Description:**	**Sandy SILT**
% Sand=	**35.8**		Plasticity Index PI =		trace gravel & organics	
	Coarse	**1.7%**	D_{10}=			
	Medium	**6.1%**	D_{30}=			
	Fine	**27.9%**	D_{60}=		**AASHTO:**	
% Fines=	**58.4**	> 50%	Cu=		**Description:**	
	Silt		Cc=			
	Clay					



SIEVE ANALYSIS OF SOILS

ASTM D - 422

Project:	Manhole Structures - Kinship Provisioning and Cultivation			**Project #:**	**H-22-2239-G**
Location:	37778 Cherry Hill Rd, Westland, MI			**Source:**	**Boring B1**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S2**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/02/22**	**Sample Depth (ft):**	**3.5-5**
Soil Description:	**Sandy SILT**	0		**Soil Classification:**	**ML**

			Wt soil+tare	Dry wt of soil
Tare No.;	30	Before Wash:	199.4	113.2
Wt of Tare (gm):	86.2	After Wash:	155.7	69.5

Washed Gradation

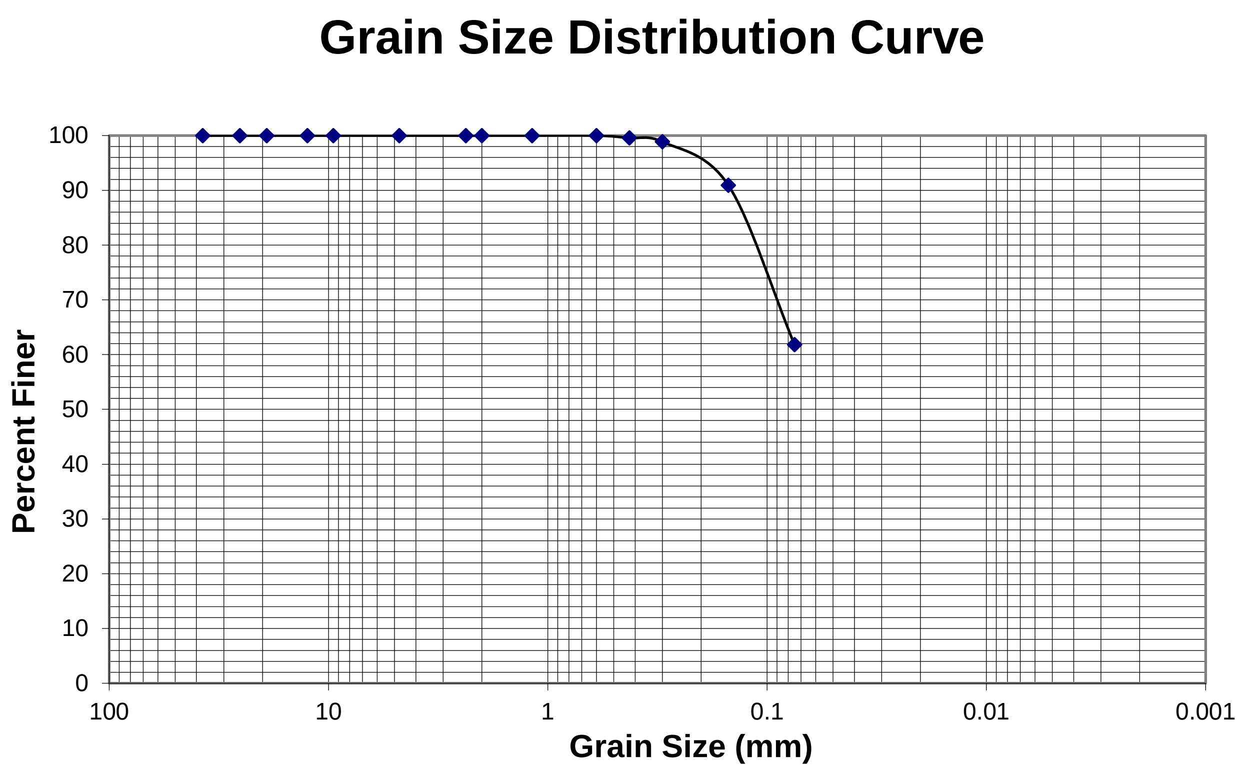
Sieve size (in. or #)	Sieve size (mm)	Cum. Weight Retained (g)	Percent (%) Retained	Percent % Passing	Specification
1.5"	37.5	0.0	0.0	100.0	
1"	25.4	0.0	0.0	100.0	
.75"	19.1	0.0	0.0	100.0	
.5"	12.5	0.0	0.0	100.0	
.375"	9.5	0.0	0.0	100.0	
#4	4.75	0.0	0.0	100.0	
#8	2.36	0.0	0.0	100.0	
#10	2.00	0.0	0.0	100.0	
#16	1.18	0.0	0.0	100.0	
#30	0.600	0.0	0.0	100.0	
#40	0.425	0.5	0.4	99.6	
#60	0.300	1.3	1.1	98.9	
#100	0.150	10.3	9.1	90.9	
#200	0.075	43.2	38.2	61.8	
Pan	0	69.1	61.0		
	Total Dry Weight:	113.2	Loss by Wash:	61.8	

SIEVE ANALYSIS OF SOILS
ASTM D - 422

Project:	**Manhole Structures - Kinship Provisioning and Cultivation**			**Project #:**	**H-22-2239-G**
Location:	**37778 Cherry Hill Rd, Westland, MI**			**Source:**	**Boring B1**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S2**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/02/22**	**Sample Depth:**	**3.5-5**
Soil Description:	**Sandy SILT**	**0**		**Soil Classification:**	**ML**

Soil Gradation Information **Soil Classification**

% >1.5 in.=	**0.0**		Plastic Limit, PL =		**USCS:**	**ML**
% Gravel=	**0.0**		Liquid Limit, LL=		**Description:**	**Sandy SILT**
% Sand=	**38.2**		Plasticity Index PI =			
	Coarse	**0.0%**	D_{10}=			
	Medium	**0.4%**	D_{30}=			
	Fine	**37.7%**	D_{60}=		**AASHTO:**	
% Fines=	**61.8**	> 50%	Cu=		**Description:**	
	Silt		Cc=			
	Clay					



HAENGEL & ASSOCIATES
ENGINEERING, INC.

SIEVE ANALYSIS OF SOILS

ASTM D - 422

Project:	Manhole Structures - Kinship Provisioning and Cultivation			**Project #:**	**H-22-2239-G**
Location:	37778 Cherry Hill Rd, Westland, MI			**Source:**	**Boring B1**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S4**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/02/22**	**Sample Depth (ft):**	**8.5-10**
Soil Description:	Silty Clay	little sand, trace gravel		**Soil Classification:**	**CL**

			Wt soil+tare	Dry wt of soil
Tare No.;	7	Before Wash:	172.8	87.8
Wt of Tare (gm):	85	After Wash:	104.1	19.1

Washed Gradation

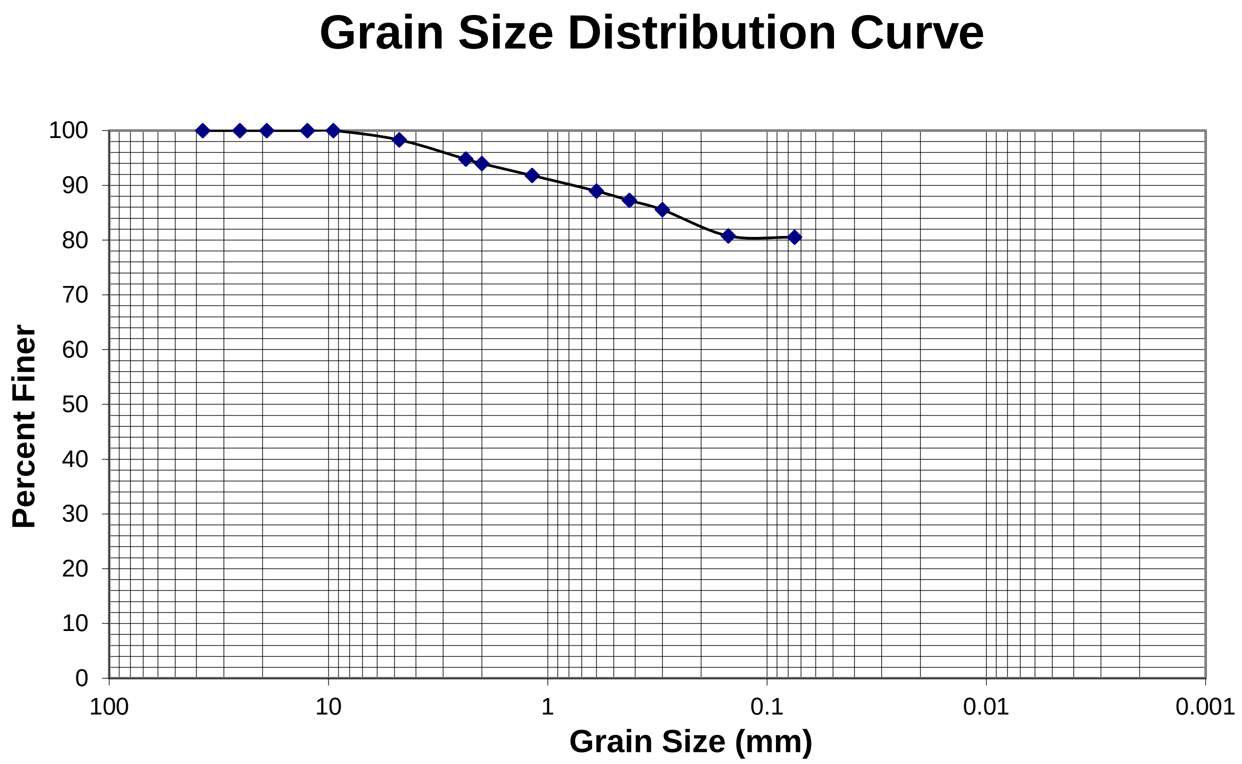
Sieve size (in. or #)	Sieve size (mm)	Cum. Weight Retained (g)	Percent (%) Retained	Percent % Passing	Specification
1.5"	37.5	0.0	0.0	100.0	
1"	25.4	0.0	0.0	100.0	
.75"	19.1	0.0	0.0	100.0	
.5"	12.5	0.0	0.0	100.0	
.375"	9.5	0.0	0.0	100.0	
#4	4.75	1.5	1.7	98.3	
#8	2.36	4.6	5.2	94.8	
#10	2.00	5.3	6.0	94.0	
#16	1.18	7.2	8.2	91.8	
#30	0.600	9.7	11.0	89.0	
#40	0.425	11.2	12.8	87.2	
#60	0.300	12.7	14.5	85.5	
#100	0.150	16.9	19.2	80.8	
#200	0.075	17.1	19.5	80.5	
Pan	0	18.7	21.3		
	Total Dry Weight:	87.8	Loss by Wash:	80.5	

SIEVE ANALYSIS OF SOILS
ASTM D - 422

Project:	Manhole Structures - Kinship Provisioning and Cultivation			Project #:	H-22-2239-G
Location:	37778 Cherry Hill Rd, Westland, MI			Source:	Boring B1
Sampled by:	VT&SA	Tested By:	VT&SA	Sample No.	S4
Date Sampled:	07/29/22	Date Tested:	08/02/22	Sample Depth:	8.5-10
Soil Description:	Silty Clay	little sand, trace gravel		Soil Classification:	CL

Soil Gradation Information **Soil Classification**

% >1.5 in.=	0.0		Plastic Limit, PL =		USCS:	CL
% Gravel=	1.7		Liquid Limit, LL=		Description:	Silty Clay
% Sand=	17.8		Plasticity Index PI =		little sand, trace gravel	
	Coarse	4.3%	D_{10}=			
	Medium	6.7%	D_{30}=			
	Fine	6.7%	D_{60}=		AASHTO:	
% Fines=	80.5	> 50%	Cu=		Description:	
	Silt		Cc=			
	Clay					



SIEVE ANALYSIS OF SOILS

ASTM D - 422

Project:	Manhole Structures - Kinship Provisioning and Cultivation			**Project #:**	**H-22-2239-G**
Location:	37778 Cherry Hill Rd, Westland, MI			**Source:**	**Boring B1**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S5**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/02/22**	**Sample Depth (ft):**	**13.5-15**
Soil Description:	Silty Clay	little sand, trace gravel		**Soil Classification:**	**CL**

			Wt soil+tare	Dry wt of soil
Tare No.;	1	Before Wash:	145.3	59
Wt of Tare (gm):	86.3	After Wash:	96.9	10.6

Washed Gradation

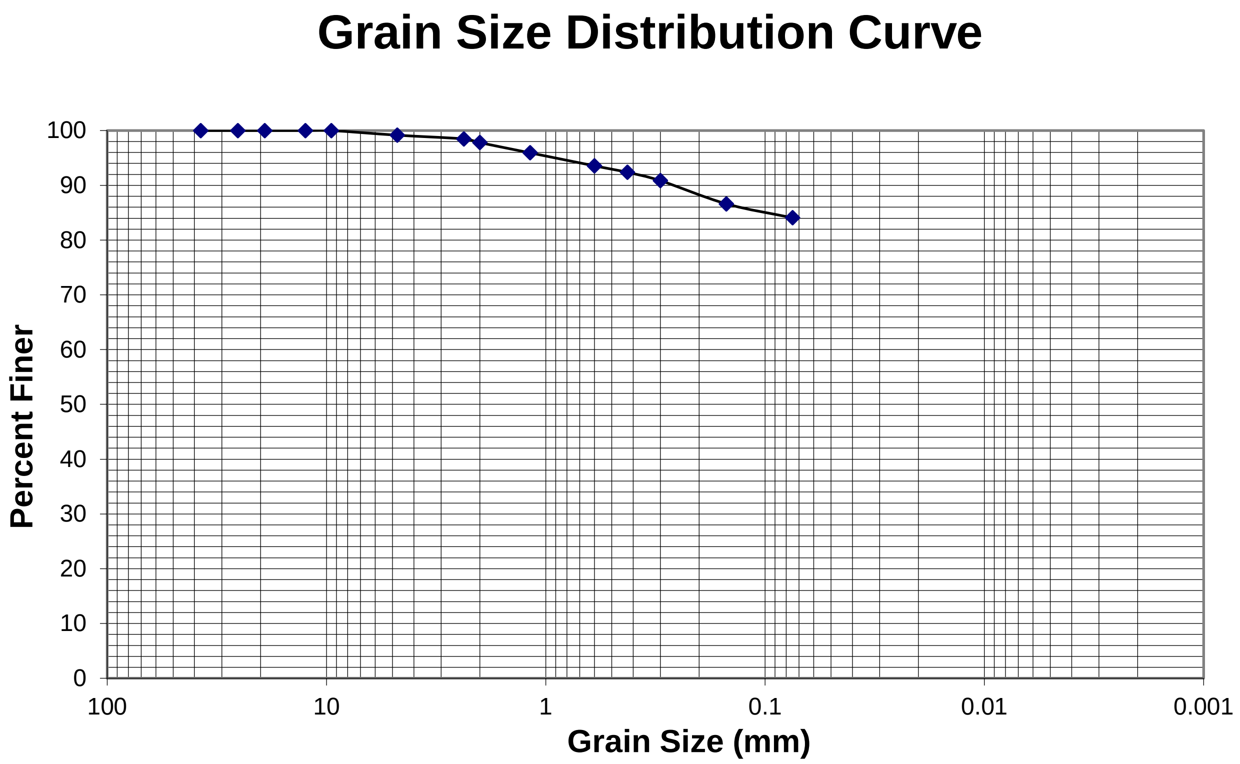
Sieve size (in. or #)	Sieve size (mm)	Cum. Weight Retained (g)	Percent (%) Retained	Percent % Passing	Specification
1.5"	37.5	0.0	0.0	100.0	
1"	25.4	0.0	0.0	100.0	
.75"	19.1	0.0	0.0	100.0	
.5"	12.5	0.0	0.0	100.0	
.375"	9.5	0.0	0.0	100.0	
#4	4.75	0.5	0.8	99.2	
#8	2.36	0.9	1.5	98.5	
#10	2.00	1.3	2.2	97.8	
#16	1.18	2.4	4.1	95.9	
#30	0.600	3.8	6.4	93.6	
#40	0.425	4.5	7.6	92.4	
#60	0.300	5.4	9.2	90.8	
#100	0.150	7.9	13.4	86.6	
#200	0.075	9.4	15.9	84.1	
Pan	0	9.6	16.3		
	Total Dry Weight:	59.0	Loss by Wash:	84.1	

SIEVE ANALYSIS OF SOILS
ASTM D - 422

Project:	**Manhole Structures - Kinship Provisioning and Cultivation**			**Project #:**	**H-22-2239-G**
Location:	**37778 Cherry Hill Rd, Westland, MI**			**Source:**	**Boring B1**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S5**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/02/22**	**Sample Depth:**	**13.5-15**
Soil Description:	**Silty Clay**	**little sand, trace gravel**		**Soil Classification:**	**CL**

Soil Gradation Information | **Soil Classification**

% >1.5 in.=	**0.0**		Plastic Limit, PL =		**USCS:**	**CL**
% Gravel=	**0.8**		Liquid Limit, LL=		**Description:**	**Silty Clay**
% Sand=	**15.1**		Plasticity Index PI =		little sand, trace gravel	
	Coarse	**1.4%**	D_{10}=			
	Medium	**5.4%**	D_{30}=			
	Fine	**8.3%**	D_{60}=		**AASHTO:**	
% Fines=	**84.1**	> 50%	Cu=		**Description:**	
	Silt		Cc=			
	Clay					



SIEVE ANALYSIS OF SOILS

ASTM D - 422

Project:	Manhole Structures - Kinship Provisioning and Cultivation			**Project #:**	**H-22-2239-G**
Location:	37778 Cherry Hill Rd, Westland, MI			**Source:**	**Boring B1**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S6**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/02/22**	**Sample Depth (ft):**	**18.5-20**
Soil Description:	Silty Clay	little sand, trace gravel		**Soil Classification:**	**CL**

			Wt soil+tare	Dry wt of soil
Tare No.;	8	Before Wash:	155.7	68.8
Wt of Tare (gm):	86.9	After Wash:	102.3	15.4

Washed Gradation

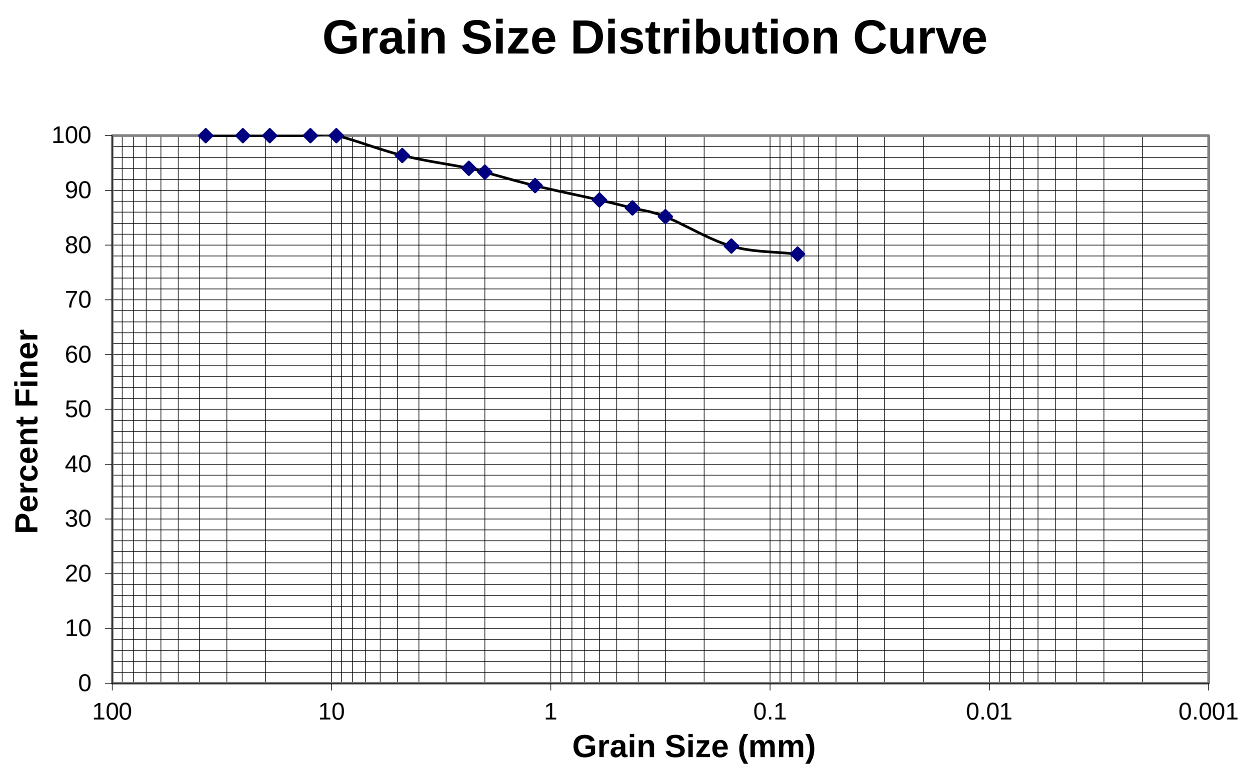
Sieve size (in. or #)	Sieve size (mm)	Cum. Weight Retained (g)	Percent (%) Retained	Percent % Passing	Specification
1.5"	37.5	0.0	0.0	100.0	
1"	25.4	0.0	0.0	100.0	
.75"	19.1	0.0	0.0	100.0	
.5"	12.5	0.0	0.0	100.0	
.375"	9.5	0.0	0.0	100.0	
#4	4.75	2.5	3.6	96.4	
#8	2.36	4.1	6.0	94.0	
#10	2.00	4.6	6.7	93.3	
#16	1.18	6.3	9.2	90.8	
#30	0.600	8.1	11.8	88.2	
#40	0.425	9.1	13.2	86.8	
#60	0.300	10.2	14.8	85.2	
#100	0.150	13.9	20.2	79.8	
#200	0.075	14.9	21.7	78.3	
Pan	0	15.3	22.2		
	Total Dry Weight:	68.8	Loss by Wash:	78.3	

SIEVE ANALYSIS OF SOILS
ASTM D - 422

Project:	Manhole Structures - Kinship Provisioning and Cultivation			Project #:	H-22-2239-G
Location:	37778 Cherry Hill Rd, Westland, MI			Source:	Boring B1
Sampled by:	VT&SA	Tested By:	VT&SA	Sample No.	S6
Date Sampled:	07/29/22	Date Tested:	08/02/22	Sample Depth:	18.5-20
Soil Description:	Silty Clay	little sand, trace gravel		Soil Classification:	CL

Soil Gradation Information **Soil Classification**

% >1.5 in.=	0.0		Plastic Limit, PL =		USCS:	CL
% Gravel=	3.6		Liquid Limit, LL=		Description:	Silty Clay
% Sand=	18.0		Plasticity Index PI =		little sand, trace gravel	
	Coarse	3.1%	D_{10}=			
	Medium	6.5%	D_{30}=			
	Fine	8.4%	D_{60}=		AASHTO:	
% Fines=	78.3	> 50%	Cu=		Description:	
	Silt		Cc=			
	Clay					



SIEVE ANALYSIS OF SOILS

ASTM D - 422

Project:	Manhole Structures - Kinship Provisioning and Cultivation			**Project #:**	**H-22-2239-G**
Location:	37778 Cherry Hill Rd, Westland, MI			**Source:**	**Boring B2**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S5**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/03/22**	**Sample Depth (ft):**	**13.5-15**
Soil Description:	**Silty Clay**	**some sand, trace gravel**		**Soil Classification:**	**CL**

			Wt soil+tare	Dry wt of soil
Tare No.;	30	Before Wash:	150.1	63.8
Wt of Tare (gm):	86.3	After Wash:	112.3	26

Washed Gradation

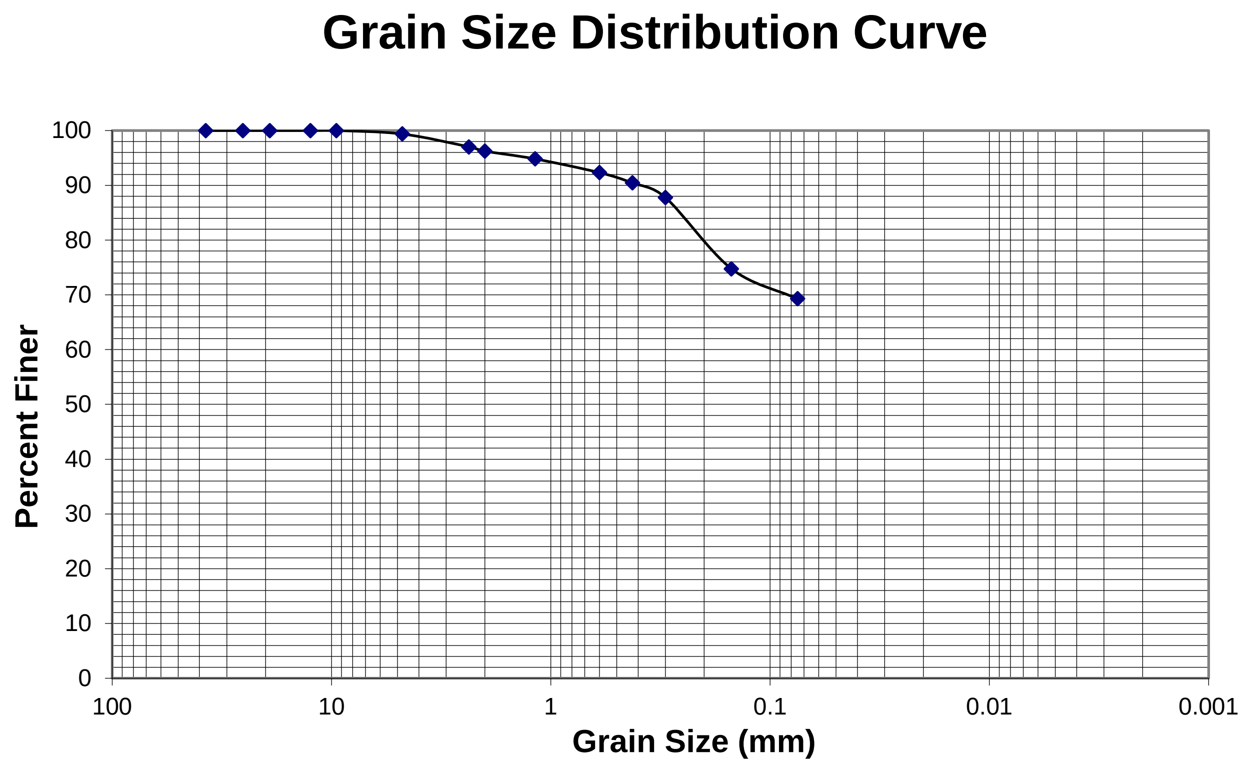
Sieve size (in. or #)	Sieve size (mm)	Cum. Weight Retained (g)	Percent (%) Retained	Percent % Passing	Specification
1.5"	37.5	0.0	0.0	100.0	
1"	25.4	0.0	0.0	100.0	
.75"	19.1	0.0	0.0	100.0	
.5"	12.5	0.0	0.0	100.0	
.375"	9.5	0.0	0.0	100.0	
#4	4.75	0.4	0.6	99.4	
#8	2.36	1.9	3.0	97.0	
#10	2.00	2.4	3.8	96.2	
#16	1.18	3.3	5.2	94.8	
#30	0.600	4.9	7.7	92.3	
#40	0.425	6.1	9.6	90.4	
#60	0.300	7.8	12.2	87.8	
#100	0.150	16.1	25.2	74.8	
#200	0.075	19.6	30.7	69.3	
Pan	0	25.1	39.3		
	Total Dry Weight:	63.8	Loss by Wash:	69.3	

SIEVE ANALYSIS OF SOILS
ASTM D - 422

Project:	**Manhole Structures - Kinship Provisioning and Cultivation**			**Project #:**	**H-22-2239-G**
Location:	**37778 Cherry Hill Rd, Westland, MI**			**Source:**	**Boring B2**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S5**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/03/22**	**Sample Depth:**	**13.5-15**
Soil Description:	**Silty Clay**	**some sand, trace gravel**		**Soil Classification:**	**CL**

Soil Gradation Information — **Soil Classification**

% >1.5 in.=	**0.0**		Plastic Limit, PL =		**USCS:**	**CL**
% Gravel=	**0.6**		Liquid Limit, LL=		**Description:**	**Silty Clay**
% Sand=	**30.1**		Plasticity Index PI =		some sand, trace gravel	
	Coarse	**3.1%**	D_{10}=			
	Medium	**5.8%**	D_{30}=			
	Fine	**21.2%**	D_{60}=		**AASHTO:**	
% Fines=	**69.3**	> 50%	Cu=		**Description:**	
	Silt		Cc=			
	Clay					



SIEVE ANALYSIS OF SOILS

ASTM D - 422

Project:	Manhole Structures - Kinship Provisioning and Cultivation			**Project #:**	**H-22-2239-G**
Location:	37778 Cherry Hill Rd, Westland, MI			**Source:**	**Boring B2**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S6**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/03/22**	**Sample Depth (ft):**	**18.5-20**
Soil Description:	Silty Clay	some sand, trace gravel		**Soil Classification:**	**CL**

			Wt soil+tare	Dry wt of soil
Tare No.;	8	Before Wash:	147.4	60.6
Wt of Tare (gm):	86.8	After Wash:	109.1	22.3

Washed Gradation

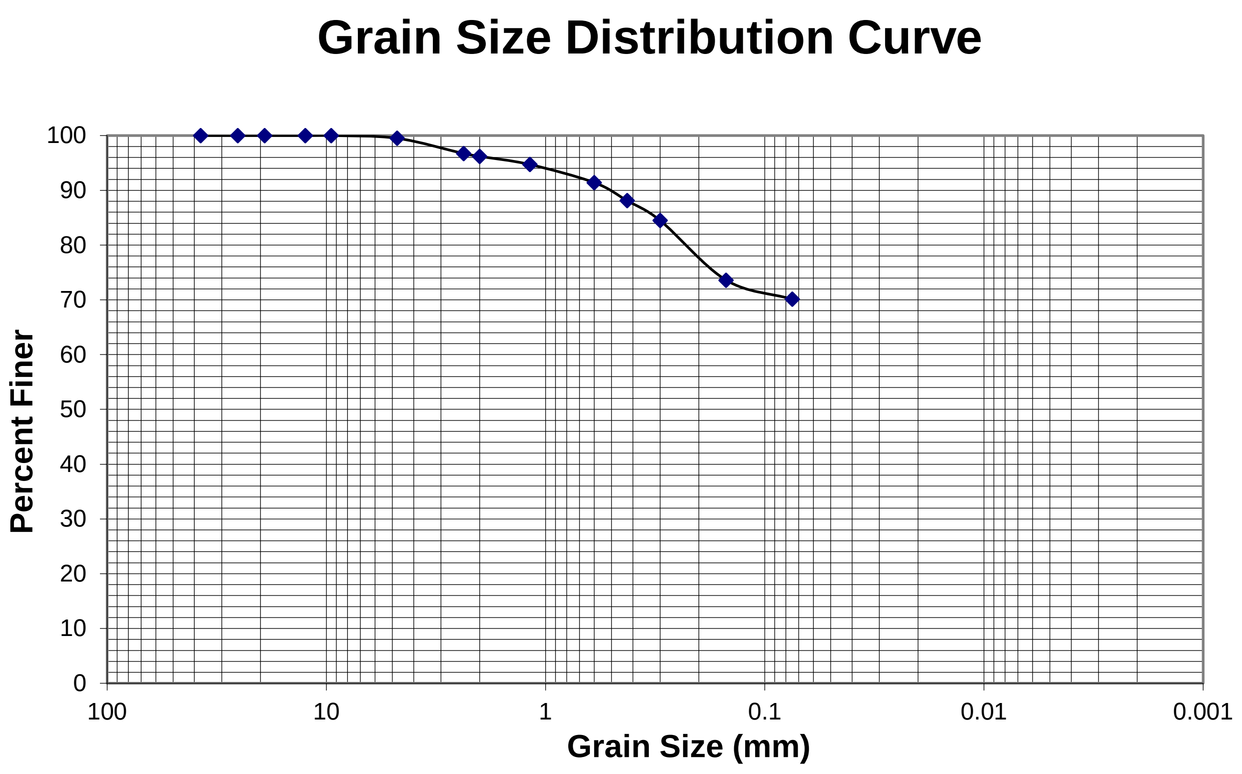
Sieve size (in. or #)	Sieve size (mm)	Cum. Weight Retained (g)	Percent (%) Retained	Percent % Passing	Specification
1.5"	37.5	0.0	0.0	100.0	
1"	25.4	0.0	0.0	100.0	
.75"	19.1	0.0	0.0	100.0	
.5"	12.5	0.0	0.0	100.0	
.375"	9.5	0.0	0.0	100.0	
#4	4.75	0.3	0.5	99.5	
#8	2.36	2.0	3.3	96.7	
#10	2.00	2.3	3.8	96.2	
#16	1.18	3.2	5.3	94.7	
#30	0.600	5.2	8.6	91.4	
#40	0.425	7.2	11.9	88.1	
#60	0.300	9.4	15.5	84.5	
#100	0.150	16.0	26.4	73.6	
#200	0.075	18.1	29.9	70.1	
Pan	0	21.5	35.5		
	Total Dry Weight:	60.6	Loss by Wash:	70.1	

SIEVE ANALYSIS OF SOILS
ASTM D - 422

Project:	**Manhole Structures - Kinship Provisioning and Cultivation**			**Project #:**	**H-22-2239-G**
Location:	**37778 Cherry Hill Rd, Westland, MI**			**Source:**	**Boring B2**
Sampled by:	**VT&SA**	**Tested By:**	**VT&SA**	**Sample No.**	**S6**
Date Sampled:	**07/29/22**	**Date Tested:**	**08/03/22**	**Sample Depth:**	**18.5-20**
Soil Description:	**Silty Clay**	**some sand, trace gravel**		**Soil Classification:**	**CL**

Soil Gradation Information **Soil Classification**

% >1.5 in.=	**0.0**		Plastic Limit, PL =		**USCS:**	**CL**
% Gravel=	**0.5**		Liquid Limit, LL=		**Description:**	**Silty Clay**
% Sand=	**29.4**		Plasticity Index PI =		some sand, trace gravel	
	Coarse	**3.3%**	D_{10}=			
	Medium	**8.1%**	D_{30}=			
	Fine	**18.0%**	D_{60}=		**AASHTO:**	
% Fines=	**70.1**	> 50%	Cu=		**Description:**	
	Silt		Cc=			
	Clay					



HAENGEL & ASSOCIATES
ENGINEERING, INC.

DETERMINATION OF MOISTURE CONTENT & UNIT WEIGHT OF SOIL

Project Name: Manhole Structures - Kinship Provisional and Cultivation Project Number: **H-22-2239-G**

Project Location: Westland, MI

Sample Identification	**Boring B1**						**Boring B2**					
Boring Number	B1	B1	B1	B1	B1	B1	B2	B2	B2	B2	B2	B2
Sample Number	SS1	SS2	SS3	SS4	SS5	SS6	SS1	SS2	SS3	SS4	SS5	SS6
Sample Depth (ft)	1.0-2.5	3.5-5.0	6.0-7.5	8.5-10.0	13.5-15	18.5-20	1.0-2.5	3.5-5.0	6.0-7.5	8.5-10.0	13.5-15	18.5-20
Basic Soil Type (visual)	Silty Sand	Silty Sand	Silty Clay	Silty Clay	Silty Clay	Silty Clay	Sand	Silty Sand	Silty Clay	Silty Clay	Silty Clay	Silty Clay
Moisture Measurements												
Tare Number	1	2	3	4	5	6	7	8	9	10	11	12
Wt of Tare (gm)	9.5	9.6	9.6	9.4	9.3	9.5	9.4	9.6	9.4	9.5	9.6	9.6
Wt of Tare + wet soil (gm)	24.8	23.9	24.5	21.1	17.6	22	22.6	25.7	23.2	23.5	21.5	23.1
Wt of Tare + dry soil (gm)	22.4	21.2	21.7	19.4	16.2	20.2	20.5	23	21	21.8	19.8	21
Wt of Water (gm)	2.4	2.7	2.8	1.7	1.4	1.8	2.1	2.7	2.2	1.7	1.7	2.1
Wt of Dry soil (gm)	12.9	11.6	12.1	10	6.9	10.7	11.1	13.4	11.6	12.3	10.2	11.4
Moisture Content (%)	18.60	23.28	23.14	17.00	20.29	16.82	18.92	20.15	18.97	13.82	16.67	18.42
Volume Measurements												
Mold Number												
Diameter of sample (cm)	3.5	3.5	3.4	3.6	3.5	3.5	3.5	3.5	3.5	3.4	3.4	3.3
Length of sample (cm)	7.6	7.6	10.3	9.7	10.6	9.0	7.6	7.6	9.2	10	8.8	10.1
Volume of sample (cm3)	73.121	73.121	93.516	98.734	101.984	86.590	73.121	73.121	88.514	90.792	79.897	86.385
Weight Measurements												
Weight of mold (gm)	116.6	116.7					117	117.4				
Wt of mold+Wet soil (gm)	260.5	268.3					266.4	260.4				
Wt of Wet soil (gm)	143.90	151.60	221.30	225.50	217.00	197.20	149.40	143.00	198.80	210.40	187.20	204.10
Unit Weight of Soil												
Wet Unit weight (kN/m3)	19.31	20.34	23.21	22.41	20.87	22.34	20.04	19.19	22.03	22.73	22.99	23.18
Wet Unit weight (pcf)	122.90	129.48	147.78	142.63	132.88	142.22	127.60	122.13	140.26	144.72	146.32	147.55
Dry Unit weight (kN/m3)	19.49	20.57	23.45	22.58	21.08	22.51	20.23	19.39	22.22	22.87	23.15	23.36
Dry Unit weight (pcf)	103.62	105.03	120.01	121.91	110.47	121.74	107.30	101.65	117.90	127.15	125.42	124.60
Strength of Soil												
Penetrometer Qu (tsf)			1.5	4	3.5	3.5			3	4	4	3
SPT (N) Values (bpf)	7	8	6	14	13	14	10	10	7	15	15	18

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BORING LOG PHOTOS

Geotechnical

Environmental

Construction

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Project Name: **Manhole Structures - Kinship Provisioning & Cultivation**
Westland, MI
Project No.: H-Job # H-22-2239-G

B-1

07-29-2022

Geotechnical
Environmental
Construction

42040 Koppernick Rd., Suite 407
Canton, Michigan 48187
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B-2

07-29-2022

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IMPORTANT INFORMATION ABOUT GEOTECHNICAL REPORT

IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/ The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used:*

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage,* to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*