

GEOTECHNICAL EVALUATION REPORT

MARTIN RUN PUMP STATION
LORAIN, OHIO

SME Project No. 082419.00
September 11, 2019

SME

SME

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September 11, 2019

Ms. Georgia Fuerst
CT Consultants
8150 Sterling Court
Mentor, Ohio 44060

Via e-mail: GFuerst@ctconsultants.com (pdf file)

RE: Geotechnical Evaluation
Martin Run Pump Station
Lorain, Ohio
SME Project No: 082419.00

Dear Ms. Fuerst:

We have completed our geotechnical evaluation for the expansion of the Martin Run Pump Station. This report presents the results of our observations and analyses, and our geotechnical recommendations based on the boring data.

We appreciate the opportunity to be of service. If you have questions or require additional information, please contact me.

Sincerely,

SME

FOR: Alison K. Frye, PE
Project Manager

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1. INTRODUCTION

This report presents the results of a geotechnical evaluation for the expansion at Martin Run Pump Station in Lorain, Ohio. This evaluation was conducted based on SME proposal P02492.19, dated July 26, 2019. Our services for this evaluation were authorized by Ms. Georgia Fuerst with CT Consultants.

SME received the following information which was used in the evaluation and preparation of this report:

- Martin Run Pump Station RFP dated July 11, 2019
- Emails from Georgia Fuerst during the weeks of July 22, 2019, and July 29, 2019

1.1 SITE CONDITIONS

The project site is located in Lorain, Ohio, at the north end of Robinhood Drive. The proposed site currently consists of an open lawn area. The existing pump station is located northeast of the project site. The lawn area slopes downward from southwest to northeast with about 10 feet of overall grade change.

1.2 PROJECT DESCRIPTION

We understand the project will consist of a new one-story pump station with overall dimensions of 31 feet by 37 feet-10 inches. The pump station will contain a wet well with depth of approximately 33 feet below the finished floor elevation and footprint dimensions of 14 by 27 feet. A pumping test was conducted to help determine dewatering needs during excavation for the wet well. A new influent sewer with an invert depth of approximately 23 feet below the existing ground surface is also planned. The method of construction was not specified; however, we anticipate that either open cut or trenchless installation will be used.

This section's discussion represents our understanding of the proposed project and is an important part of our engineering interpretation. If this understanding is not correct, or if project plans change, we should be given the opportunity to review our recommendations.

2. EVALUATION PROCEDURES

2.1 FIELD EXPLORATION

The field exploration included two borings at locations selected by SME and CT Consultants. Boring B1, located at the new pump station, extended to a depth of 40 feet below the existing ground surface. B2, located along the sewer alignment, extended to a depth of 30 feet below the existing ground surface. Two Shelby tube samples were also obtained.

SME staked the boring locations referenced to existing site features. The approximate boring locations and estimated ground surface elevations are shown on the attached Boring Location Plan (Figure 1). Ground surface elevations were referenced to the existing condition contours shown on the existing condition plan sheet in the RFP.

The borings were drilled and sampled using an all-terrain rotary drill rig. The borings were advanced using hollow-stem augers, and included soil sampling based upon the Split-Barrel Sampling procedure. Recovered split-barrel samples were sealed in glass jars by the driller.

Groundwater level observations in the boreholes were recorded during and immediately after completion of each boring. B2 was backfilled with auger cuttings after completion and collection of groundwater readings. A 4-inch diameter PVC well was installed at B1 for a groundwater pumping test.

Soil samples recovered from the field exploration and were delivered to the SME laboratory for further evaluation and testing.

2.2 LABORATORY TESTING

Samples were visually classified in accordance with ASTM D2488. Laboratory testing included moisture contents and penetrometer tests on the cohesive split-barrel samples. Two Atterberg limits tests and two grain-size hydrometer tests were completed on split barrel samples, and a direct shear test was completed on the Shelby tube sample from boring B1.

Upon completion of the laboratory testing, boring logs were prepared that include information on materials encountered, penetration resistances, pertinent field observations made during drilling operations, and the results of the laboratory testing. The boring logs also include the existing ground surface elevations as estimated by SME. The boring logs and laboratory test results are included in Appendix A. Explanations of symbols and terms used on the boring logs are provided on the Boring Log Terminology sheet included in Appendix A. The soil descriptions included on the logs were developed from the visual classifications.

2.3 GROUNDWATER PUMPING TEST

A groundwater pumping test was conducted at B1 using a submersible, adjustable rate pump. Pumping began using the lowest rate that could be sustained with the pump. This rate varied between 0.05 gallons per minute (gpm) and 0.2 gpm; drawdown was measured in the well at these rates. After 60 minutes, we were able to stabilize the pumping rate at 0.05 gpm (3.2 gallons per hour). After approximately 90 minutes of pumping, drawdown stabilized at approximately 7.25 feet of drawdown. After 125 minutes of pumping, the pump was shut off and the recharge was measured for an additional 70 minutes. The rate of recharge was 0.01 gpm (0.6 gallons per hour). It is likely that the groundwater is present in a thin sand seam in the clay. We recommend using a pump with a sump and float system during dewatering so that if drawdown below the depth of the excavation is achieved the pump turns off. A copy of the pumping test data, rate calculations and drawdown/recharge graph are included in Appendix B.

3. ENCOUNTERED CONDITIONS

The soil profile generally consists of topsoil followed by lean clay identified as ground moraine (glacial till).

Four to five inches of topsoil was encountered at the surface. Below the topsoil, lean clay with varying amounts of sand and gravel was encountered. Above roughly 10 feet and below 25 feet, the till has a very stiff or hard consistency. Between approximately 10 and 25 feet, the till has a medium to stiff consistency. The till transitions from brown or brown and gray to gray at depth of approximately 11 and 12 feet below the existing ground surface.

Groundwater was only encountered during drilling at a depth of 23 feet below the existing ground surface at B1. Groundwater was not present immediately after drilling. Based upon the color change in the clay soil from brown to gray, it is our opinion that the long term static groundwater table is at a depth of 12 feet (elevation 578 ft.) below existing grade at the time of this exploration.

Groundwater levels should be expected to fluctuate seasonally and in response to extended periods of wet or dry weather. The groundwater conditions indicated on the borings represent conditions at the time the readings were taken. Groundwater conditions at the time of construction may vary from those reported on the boring logs.

4. ANALYSIS AND RECOMMENDATIONS

4.1 SITE PREPARATION AND EARTHWORK

4.1.1 GENERAL SITE SUBGRADE PREPARATION

The proposed construction area should be cleared of trees, vegetation, topsoil, and other deleterious materials to expose suitable underlying inorganic subgrade soils. Tree root mats should be completely removed. We recommend the clearing and stripping extend a minimum of 5 feet beyond the limits of the proposed building and pavement areas and areas to receive engineered fill. Based on the boring information, we expect stiff to very stiff lean clay will be exposed after clearing and stripping the project site.

After stripping and cutting to design grades but prior to filling, SME should review the exposed subgrade for otherwise unsuitable soils, such as those containing organics or concentrated tree mats. Undercuts recommended by SME should be backfilled with engineered fill until a uniform subgrade is established. Once a uniform subgrade is established, thoroughly compact the exposed subgrade with a large steel drum vibratory roller. Once the subgrade has been uniformly compacted, we recommend the resulting subgrade be proofrolled in the presence of a representative from SME to locate areas of unsuitably soft or disturbed subgrade. Areas of unsuitable subgrade revealed during proofrolling should be mechanically improved (compacted) in-place, if feasible. Soils that cannot be improved in-place must be removed and replaced with engineered fill. We recommend proofrolling with a fully loaded, tandem-axle dump truck or other suitable-sized pneumatic-tire equipment.

After the exposed subgrade is compacted, or proofrolled and improved as needed, engineered fill may be placed on the prepared subgrade to establish final design subgrade levels. See Section 4.1.3 of this report for materials and compaction requirements for engineered fill.

4.1.2 SUBGRADE PREPARATION FOR FLOOR SLABS

We anticipate the final floor slab subgrade will consist of undisturbed lean clay or engineered fill. SME should verify the suitability of the subgrade by observing a proofroll, and by testing density-in-place of fill placed in the building area. Just prior to concrete placement for floor slabs, the exposed subgrade should be observed and tested by SME to identify areas where the subgrade has been disturbed due to placement of underground utilities, precipitation events and/or construction traffic. Soils softened or disturbed during construction should be re-compacted in place or removed and replaced with lean clay engineered fill.

Provide 6 inches of an approved ODOT No. 57 or No. 8 crushed limestone to provide a leveling surface for construction of the building slab and a moisture capillary break between the slab and the underlying soils. The aggregate base should be placed and compacted as engineered fill.

Slabs should be separated by isolation joints from structural walls and columns to permit relative movement. A minimum of 6 inches of engineered fill between the bottom of the slab and the top of the shallow foundations below is recommended. Isolation joints should be sealed and slab underdrains should be provided to prevent water from accumulating in the aggregate base.

Slab-on-grade subgrade soils should be protected from freezing during winter construction. Any frozen soils must be thawed and compacted, or removed and replaced prior to slab-on-grade construction.

4.1.3 ENGINEERED FILL REQUIREMENTS

Any fill placed within structural areas, including utility trench backfill, should be an approved material free of frozen soil, organics (greater than 4 percent), over-sized materials, or other deleterious materials. Fill placed in structural areas should be spread in uniform horizontal layers with loose layer thickness appropriate to the type of equipment used to achieve compaction, but not exceeding 10 inches in loose thickness. The fill should be compacted to a minimum of 98 percent of the maximum dry density as determined in accordance with the Standard Proctor test, ASTM D698. Fill placed below the bottom of foundation elevation or within the top 12 inches of the floor slab subgrade should be compacted to a minimum of 100 percent of the maximum dry density as determined in accordance with the Standard Proctor test. The fill lift thickness should be adjusted for the specific compaction equipment used so the required compaction is achieved throughout the entire lift. The existing lean clay may be reused as engineered fill material.

4.2 SHALLOW FOUNDATIONS

Continuous strip or isolated square foundations are recommended for support of the proposed building. Foundations bearing on undisturbed stiff or better lean clay or engineered fill should be proportioned for a maximum net allowable bearing pressure of 3,000 psf.

Foundations should bear a minimum of 42 inches below final site grades in any unheated areas for protection against frost related heave. Interior foundations in heated areas can be constructed at shallower depths provided suitable undisturbed clay or engineered fill is present at that depth. Bearing soils should be protected from freezing during construction if work occurs in the winter months.

To reduce the risk of bearing surface disturbance, we recommend placing concrete as soon as possible after excavating for foundations. Disturbed soils must be removed from foundation excavations and replaced with additional concrete.

Continuous (wall) foundations should have a minimum width of 12 inches and isolated (column) foundations should have a minimum dimension of 36 inches. In cases where structural loading is light, the minimum recommended foundation size, and not the design bearing pressure, may govern the size of the foundation.

4.3 BELOW GRADE WALLS

Below-grade walls should be backfilled with clean, free-draining, coarse grained, crushed, granular material. Do not allow slag to be used in the backfill. Backfill should be spread in maximum 6 inch loose thickness lifts, and should be compacted to at least 95 percent of standard Proctor maximum dry density. Compaction equipment should be sized so the wall is not damaged during construction.

Walls restrained at the top and not free to rotate should be designed for an equivalent fluid density of 60 pcf, assuming drained, granular backfill. Surcharges, if any, would result in a uniform lateral loading on the wall equal to 0.4 times the vertical surcharge with its resultant acting at mid-height. If clay backfill is used the wall loads will be higher.

Cantilevered walls that are free to rotate and are backfilled with drained, moderately compacted granular soil can be designed for an equivalent fluid density of 40 pcf. Surcharges, if any, would result in a uniform lateral loading on the wall equal to 0.33 times the vertical surcharge with its resultant acting at mid-height.

For these equivalent fluid densities to apply, the drainage backfill zone should extend up and out from the base of the wall at 1H:2V ratio. A geotechnical separating fabric should be placed against the sides of the excavation to prevent soil fines from migrating into the aggregate backfill.

The following parameters for evaluating the stability of the retaining walls assume the base of the wall bears directly on the undisturbed soils and the wall is backfilled with a well-draining granular backfill. To evaluate the sliding of the wall, compute the sliding resistance at the base and active (driving) earth forces. The sliding resistance may be determined by using a recommended ultimate sliding coefficient of 0.35 for the soils encountered at the site, limited to an ultimate unit value of 1,000 psf. Active and at-rest earth pressure coefficients of 0.33 and 0.50, respectively, may be used for design in combination with a unit weight of 120 pcf and friction angle of 30 degrees for the granular backfill. We recommend a safety factor between 1.5 and 2.0 for the lateral sliding resistance. Ignore passive resistance in calculations for overturning and sliding. In addition to checking sliding resistance, evaluate the safety factor from overturning, and global stability.

4.4 WET WELL BUOYANCY

The bottom of the wet well is anticipated to be at least 33 feet below grade. The boring logs indicate that the long term static groundwater table is 12 feet (Elevation 578 ft.) below grade. The wet well should be designed to resist uplift due to buoyancy by widening the mat foundation beneath it. Use a soil unit weight of 135 pcf above elevation 578 feet and a buoyant unit weight of 72 pcf below 578 ft. if the wall backfill is clay and 100 pcf and 37 pcf, respectively if the backfill directly over the mat foundation is crushed 57 limestone.

4.5 EXCAVATION AND SOIL PARAMETERS

The soils on this site should be considered OSHA Type “B” for excavations. Below approximately elevation 564 feet, the soils can be considered Type "A." Excavation sidewalls should be sloped or braced in accordance with OSHA requirements. The following parameters are recommended for use in the design of trench excavations.

DESIGN PARAMETERS

PARAMETER	VALUE
Wet Unit Weight	140 pcf
Dry Unit Weight	122 pcf
Cohesion (based on the medium stiff clay layer)	1,000 psf
Cohesion (below elevation 564 feet)	4,000 psf
Liquid Limit	25
Plastic Limit	17

5. CONSTRUCTION CONSIDERATIONS

Groundwater seepage into excavations from perched groundwater or sand seams may occur but is not anticipated to be a significant factor during construction. Accumulations from precipitation events and surface run-off may also occur. Standard sump pit and pumping procedures should be adequate to control these accumulations. A working surface of either crushed aggregate or crushed concrete might be required to protect the exposed subgrade where seepage is encountered.

Cobbles and boulders are associated with glacial till deposits. Contractors should be prepared to encounter cobbles and boulders during deep excavation or trenchless construction methods.

The contractors should be made aware of the site history. Provide adequate contingencies in construction budgets and include unit rates for removal and replacement of softened or frozen soils, obstructions, and undercuts in contract documents. The contractor should meet applicable regulatory requirements regarding handling, transportation, and disposal of soils removed from the site.

Regarding construction contingencies, undercuts may be required during foundation, slab-on-grade, and pavement construction. We strongly recommend including contingencies in the project budget. Additionally, for project contracts and bid documents, we recommend units of cubic-yards in-place. This allows for direct measurement of undercuts in the field that are not subject to arbitrary “fluff factors” when considering other units such as loose yards or weight.

The exposed subgrade soils might be easily disturbed due to weather and construction activity. Therefore, the contractor should remove standing water and prevent surface water from reaching the foundation excavations and areas of prepared subgrade.

6. SIGNATURES

Report Prepared By:

FOR: Alison K. Frye, PE
Project Engineer

Report Reviewed By:

Alan J. Esser, PE, D.GE
Chief Consultant

APPENDIX A

BORING LOCATION PLAN
BORING LOG TERMINOLOGY
BORING LOGS (B1 TO B2)
DIRECT SHEAR TEST

LEGEND

APPROXIMATE BORING LOCATION

NORTH

NOTE:
DRAWING INFORMATION TAKEN FROM GOOGLE EARTH

No.	Revision Date		
		Date	09/04/19
		Drawn By	AKF
		Designed By	AKF
		Scale	NTS
		Project	082419.00

BORING LOCATION PLAN
MARTIN RUN PUMP STATION
LORAIN, OHIO

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Figure No. 1

BORING LOG TERMINOLOGY

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOIL
(more than 50% of material is larger than No. 200 sieve size.)

GRAVEL More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravel (Less than 5% fines)	GW	Well-graded gravel; gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravel; gravel-sand mixtures, little or no fines
	Gravel with fines (More than 12% fines)	GM	Silty gravel; gravel-sand-silt mixtures
		GC	Clayey gravel; gravel-sand-clay mixtures
SAND 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sand (Less than 5% fines)	SW	Well-graded sand; sand-gravel mixtures, little or no fines
		SP	Poorly graded sand; sand-gravel mixtures, little or no fines
	Sand with fines (More than 12% fines)	SM	Silty sand; sand-silt-gravel mixtures
		SC	Clayey sand; sand–clay-gravel mixtures

FINE-GRAINED SOIL
(50% or more of material is smaller than No. 200 sieve size)

SILT AND CLAY Liquid limit less than 50%	ML	Inorganic silt; sandy silt or gravelly silt with slight plasticity
	CL	Inorganic clay of low plasticity; lean clay, sandy clay, gravelly clay
	OL	Organic silt and organic clay of low plasticity
SILT AND CLAY Liquid limit 50% or greater	MH	Inorganic silt of high plasticity, elastic silt
	CH	Inorganic clay of high plasticity, fat clay
	OH	Organic silt and organic clay of high plasticity
HIGHLY ORGANIC SOIL	PT	Peat and other highly organic soil

OTHER MATERIAL SYMBOLS

Topsoil	Void	Sandstone
Asphalt	Glacial Till	Siltstone
Base	Coal	Limestone
Concrete	Shale	Fill

LABORATORY CLASSIFICATION CRITERIA

GW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}^{\ 2}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with PI greater than 7	
SW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{D_{30}^{\ 2}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for SW	
SM	Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
SC	Atterberg limits above "A" line with PI greater than 7	

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

Less than 5 percent……………………………..GW, GP, SW, SP
More than 12 percent…………………………..GM, GC, SM, SC
5 to 12 percent……………………Cases requiring dual symbols

- SP-SM or SW-SM (SAND with Silt or SAND with Silt and Gravel)
- SP-SC or SW-SC (SAND with Clay or SAND with Clay and Gravel)
- GP-GM or GW-GM (GRAVEL with Silt or GRAVEL with Silt and Sand)
- GP-GC or GW-GC (GRAVEL with Clay or GRAVEL with Clay and Sand)

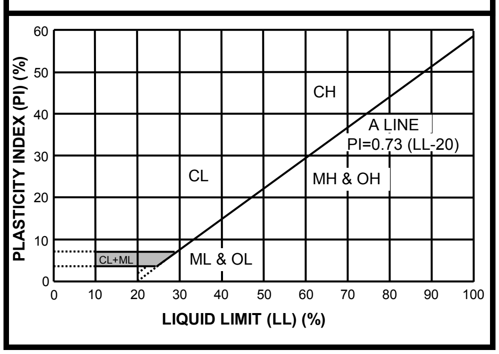
If the fines are CL-ML:

- SC-SM (SILTY CLAYEY SAND or SILTY CLAYEY SAND with Gravel)
- SM-SC (CLAYEY SILTY SAND or CLAYEY SILTY SAND with Gravel)
- GC-GM (SILTY CLAYEY GRAVEL or SILTY CLAYEY GRAVEL with Sand)
- GM-GC (CLAYEY SILTY GRAVEL or CLAYEY SILTY GRAVEL with Sand)

PARTICLE SIZES

Boulders	- Greater than 12 inches
Cobbles	- 3 inches to 12 inches
Gravel- Coarse	- 3/4 inches to 3 inches
Fine	- No. 4 to 3/4 inches
Sand- Coarse	- No. 10 to No. 4
Medium	- No. 40 to No. 10
Fine	- No. 200 to No. 40
Silt and Clay	- Less than (0.0074 mm)

PLASTICITY CHART



VISUAL MANUAL PROCEDURE

When laboratory tests are not performed to confirm the classification of soils exhibiting borderline classifications, the two possible classifications would be separated with a slash, as follows:

For soils where it is difficult to distinguish if it is a coarse or fine-grained soil:

- SC/CL (CLAYEY SAND to Sandy LEAN CLAY)
- SM/ML (SILTY SAND to SANDY SILT)
- GC/CL (CLAYEY GRAVEL to Gravelly LEAN CLAY)
- GM/ML (SILTY GRAVEL to Gravelly SILT)

For soils where it is difficult to distinguish if it is sand or gravel, poorly or well-graded sand or gravel; silt or clay; or plastic or non-plastic silt or clay:

- SP/GP or SW/GW (SAND with Gravel to GRAVEL with Sand)
- SC/GC (CLAYEY SAND with Gravel to CLAYEY GRAVEL with Sand)
- SM/GM (SILTY SAND with Gravel to SILTY GRAVEL with Sand)
- SW/SP (SAND or SAND with Gravel)
- GP/GW (GRAVEL or GRAVEL with Sand)
- SC/SM (CLAYEY to SILTY SAND)
- GM/GC (SILTY to CLAYEY GRAVEL)
- CL/ML (SILTY CLAY)
- ML/CL (CLAYEY SILT)
- CH/MH (FAT CLAY to ELASTIC SILT)
- CL/CH (LEAN to FAT CLAY)
- MH/ML (ELASTIC SILT to SILT)
- OL/OH (ORGANIC SILT or ORGANIC CLAY)

DRILLING AND SAMPLING ABBREVIATIONS

2ST	–	Shelby Tube – 2" O.D.
3ST	–	Shelby Tube – 3" O.D.
AS	–	Auger Sample
GS	–	Grab Sample
LS	–	Liner Sample
NR	–	No Recovery
PM	–	Pressure Meter
RC	–	Rock Core diamond bit. NX size, except where noted
SB	–	Split Barrel Sample 1-3/8" I.D., 2" O.D., except where noted
VS	–	Vane Shear
WS	–	Wash Sample

OTHER ABBREVIATIONS

WOH	–	Weight of Hammer
WOR	–	Weight of Rods
SP	–	Soil Probe
PID	–	Photo Ionization Device
FID	–	Flame Ionization Device

DEPOSITIONAL FEATURES

Parting	–	as much as 1/16 inch thick
Seam	–	1/16 inch to 1/2 inch thick
Layer	–	1/2 inch to 12 inches thick
Stratum	–	greater than 12 inches thick
Pocket	–	deposit of limited lateral extent
Lens	–	lenticular deposit
Hardpan/Till	–	an unstratified, consolidated or cemented mixture of clay, silt, sand and/or gravel, the size/shape of the constituents vary widely
Lacustrine	–	soil deposited by lake water
Mottled	–	soil irregularly marked with spots of different colors that vary in number and size
Varved	–	alternating partings or seams of silt and/or clay
Occasional	–	one or less per foot of thickness
Frequent	–	more than one per foot of thickness
Interbedded	–	strata of soil or beds of rock lying between or alternating with other strata of a different nature

CLASSIFICATION TERMINOLOGY AND CORRELATIONS

Cohesionless Soils

Relative Density	N-Value (Blows per foot)
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	50 to 80
Extremely Dense	Over 80

Cohesive Soils

Consistency	N-Value (Blows per foot)	Undrained Shear Strength (kips/ft^2)
Very Soft	0 - 2	0.25 or less
Soft	2 - 4	0.25 to 0.50
Medium	4 - 8	0.50 to 1.0
Stiff	8 - 15	1.0 to 2.0
Very Stiff	15 - 30	2.0 to 4.0
Hard	> 30	4.0 or greater

Standard Penetration 'N-Value' = Blows per foot of a 140-pound hammer falling 30 inches on a 2-inch O.D. split barrel sampler, except where noted.

BORING B1

PAGE 1 OF 1

SME

PROJECT NAME: Martin Run Pump Station - GEO
PROJECT NUMBER: 082419.00
CLIENT: CT Consultants, Inc.
PROJECT LOCATION: Lorain, Ohio
DATE STARTED: 8/14/19
COMPLETED: 8/14/19
BORING METHOD: 3-3/4" Hollow-stem Augers
DRILLER: RH/JF
RIG NO.: 293 (CME 55)
LOGGED BY: JF
CHECKED BY: AKF

SURFACE ELEVATION: 590± FT

DEPTH (FEET)	PROFILE DESCRIPTION	ELEVATION (FEET)
0.3	4 inches TOPSOIL	589.7
12.0	LEAN CLAY with Sand - Brown - Very Stiff to Stiff (CL/TILL)	578.0
26.0	Sandy LEAN CLAY - Trace Gravel - Gray - Stiff to Medium (CL/TILL)	564.0
40.0	Sandy LEAN CLAY - Trace Gravel - Gray - Very Stiff to Hard (CL/TILL)	550.0
	END OF BORING AT 40.0 FEET.	

SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE	MOISTURE (%)	HAND PENE. (KSF)	REMARKS
SB1	12	10 8 9	17	15	4.5+	
SB2	18	7 7 9	16	19	4.5+	
SB3	14	5 6 6	12	15	4.5+	
3ST4	22					
SB5	14	5 5 6	11	14	4.5+	
SB6	11	3 3 4	7	14		
3ST7	23			15		Friction angle = 29°
SB8	9	3 3 6	9	11		
SB9	16	8 12 20	32	10	4.5+	
SB10	15	14 20 30	50	9	4.5+	
SB11	18	25 30 32	62	9		

Legend: DRY DENSITY (pcf) -- ■; N-VALUE -- ○; MOISTURE & ATTERBERG LIMITS (%) PL MC LL; SHEAR STRENGTH (KSF): ▽ HAND PENE., ⊠ TORVANE SHEAR, ○ UNC.COMP., ⊡ VANE SHEAR (PK), ✕ VANE SHEAR (REM), ⊕ TRIAXIAL (UU)

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	23.0	567.0

BACKFILL METHOD: Note 2

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Four inch diameter well installed with 30 feet of screen.

BORING B2

PROJECT NAME: Martin Run Pump Station - GEO **PROJECT NUMBER:** 082419.00

CLIENT: CT Consultants, Inc. **PROJECT LOCATION:** Lorain, Ohio

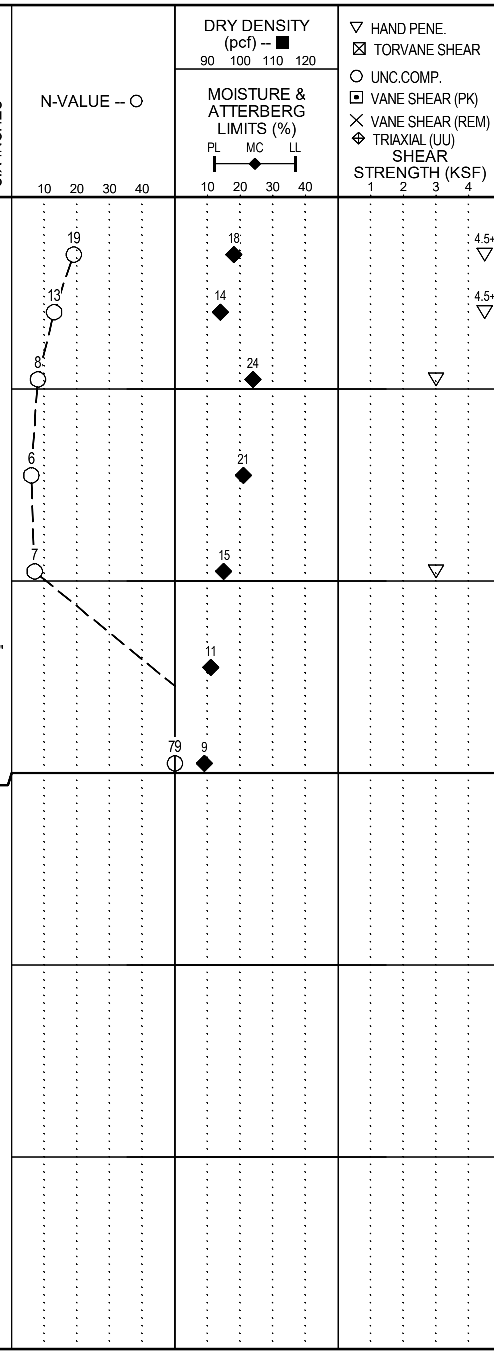
DATE STARTED: 8/14/19 **COMPLETED:** 8/14/19 **BORING METHOD:** 3-3/4" Hollow-stem Augers

DRILLER: RH/JF **RIG NO.:** 293 (CME 55) **LOGGED BY:** JF **CHECKED BY:** AKF

SURFACE ELEVATION: 587± FT

DEPTH (FEET)	PROFILE DESCRIPTION	ELEVATION (FEET)	SAMPLE TYPE/NO.	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	REMARKS
0.4	5 inches TOPSOIL	586.6				
7.5	LEAN CLAY with Sand - Brown - Very Stiff to Stiff (CL/TILL)	579.5	SB1	8	10 10 9	
			SB2	10	7 6 7	
11.0	Sandy LEAN CLAY - Trace Gravel - Brown and Gray - Medium to Stiff (CL/TILL)	576.0	SB3	15	4 4 4	
23.0	Sandy LEAN CLAY - Trace Gravel - Gray - Medium (CL/TILL)	564.0	AS4	3	2 3 3	
			SB5	13	2 3 4	
30.0	Sandy LEAN CLAY with Gravel - Gray - Hard (CL/TILL)	557.0	SB6	1	50/4"	Possible cobble encountered
			SB7	15	25 38 41	

END OF BORING AT 30.0 FEET.



GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

	DEPTH (FT)	ELEV (FT)
CAVE-IN OF BOREHOLE AT:	24.0	563.0

BACKFILL METHOD: Auger Cuttings

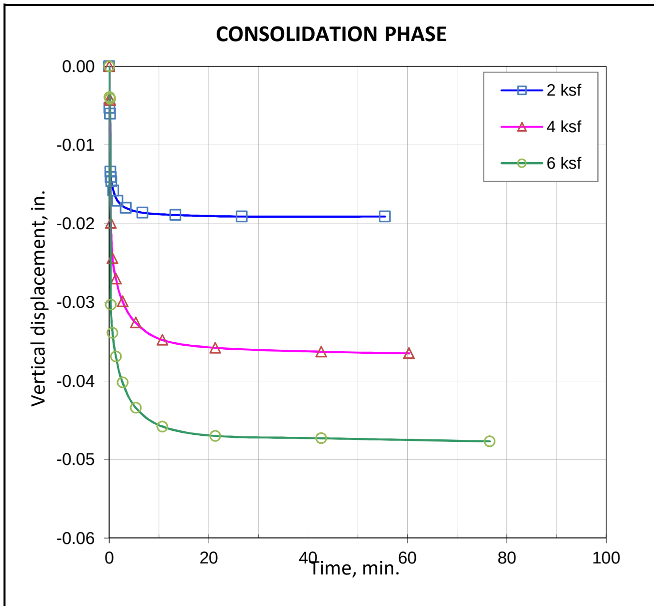
NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.

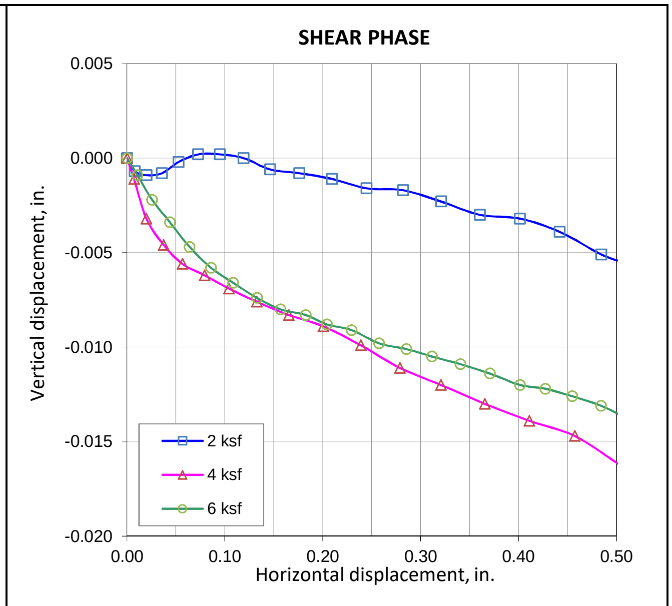
9375 Chillicothe Road, Kirtland, Ohio 44094-8501
p: 440-256-6500, f: 440-256-6500

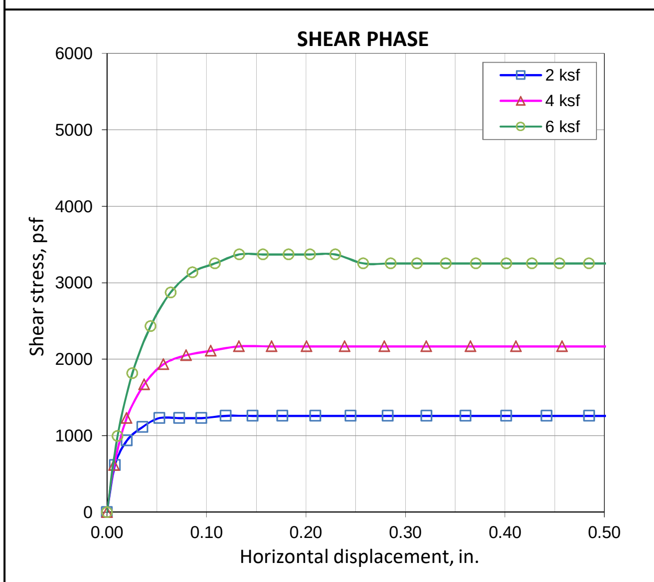
DIRECT SHEAR TEST, ASTM D3080

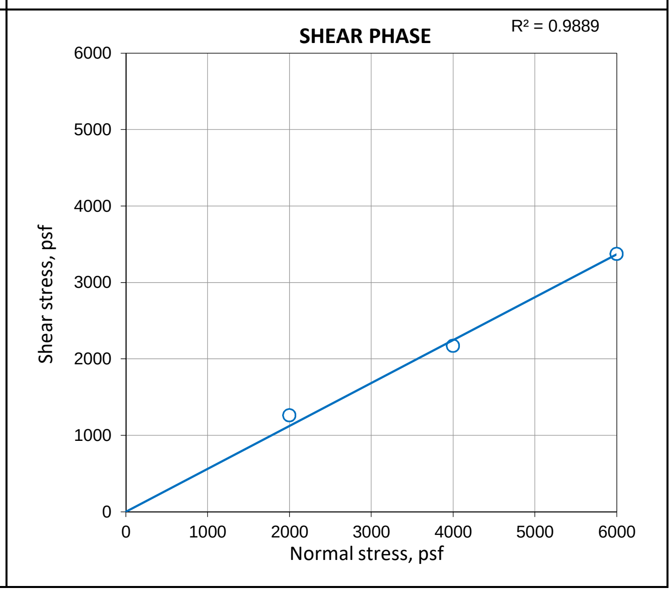
PROJECT: Martin Run Pump Station
LOCATION: Lorain, Ohio
PROJECT #: 082419.00
CLIENT: CT Consultants
TEST DATE(S): 8/23/2019

SAMPLE #: 3ST7
SAMPLE LOCATION: B-1; 21.5' - 23.5'
SAMPLE DESCRIPTION: Gray LEAN CLAY
SOIL STRUCTURE: Undisturbed
SHEAR DEVICE: Tecnotest
TEST CONDITIONS: Shear box saturated
TECHNICIAN: SM









	Sample Parameters		
Normal stress (psf):	2000	4000	6000
Thickness (in):	1.000		
Diameter (in):	2.501		
Dry mass sample (gr):	158.0	156.3	157.6
Initial moisture content (%):	13.7	14.6	14.5
Initial wet density (pcf):	138.8	138.5	139.4
Initial dry density (pcf):	122.1	120.8	121.8
Final moisture content (%):	16.1	15.3	14.1
Final wet density (pcf):	146.7	148.2	149.9
Final dry density (pcf):	126.4	128.5	131.4

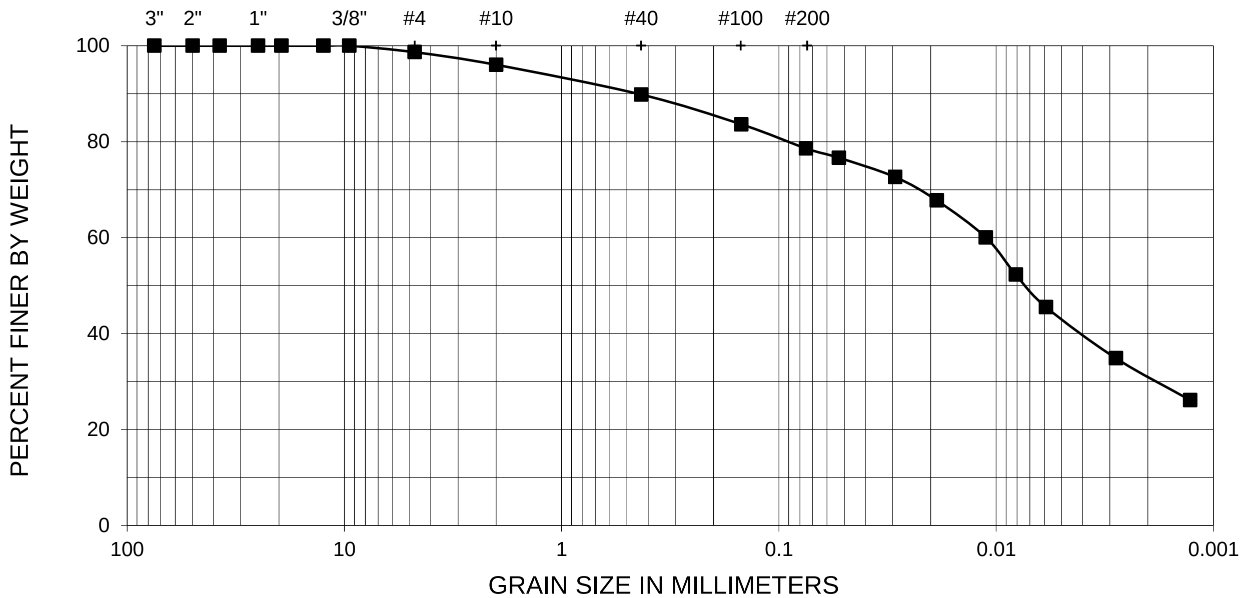
	Test Results		
Normal stress (psf):	2000	4000	6000
	CONSOLIDATION PHASE		
Final vertical displacement (in):	-0.019	-0.037	-0.048
Duration consolidation (min):	55.5	60.3	76.6
	SHEAR PHASE		
Peak shear stress (psf):	1261	2170	3372
Horizontal displacement (in):	0.119	0.133	0.133
Shear rate (mm/min):	0.014	0.016	0.016
Duration of test (min):	525	480	705
ϕ (deg):	29.3		
Cohesion (psf):	0		

PARTICLE SIZE ANALYSIS
WITH HYDROMETER
ASTM D422

9375 CHILLICOTHE ROAD, KIRTLAND, OH 44094
PHONE: 440-256-6500 FAX: 440-256-6507

PROJECT INFORMATION	
Project:	Martin Run Pump Station
Location:	Lorain, Ohio
Project #:	082419.00
Test Date:	August 23, 2019
Sample #:	SB2

SAMPLE INFORMATION		
ASTM Description	LEAN CLAY with sand	CL
OHIO Modified AASHTO	SILT and CLAY	A-6a (9)
Sample Location	B-1; 5' - 6.5'	



SIEVE ANALYSIS

Sieve #	Sieve size, mm	Percent Passing
3"	75	100.0
2"	50	100.0
1-1/2"	37.5	100.0
1"	25	100.0
3/4"	19	100.0
3/8"	9.5	100.0
#4	4.75	98.7
#10	2	96.0
#40	0.43	89.8
#100	0.15	83.6
#200	0.074	78.6
#270	0.053	76.7

DISPERSION

Device	ASTM D422, Type A
Agent	Sodium Hexametaphosphate
Time in Agent	16 Hours

HYDROMETER ANALYSIS

Particle Size	Percent Passing
0.074 mm	78.6
0.053 mm	76.7
0.005 mm	42.9
0.0013 mm	26.1

ATTERBERG LIMITS

LIQUID LIMIT	33
PLASTIC LIMIT	20
PLASTICITY INDEX	13

PARTICLE DISTRIBUTION

D_{10}	NA	mm
D_{30}	0.002	mm
D_{60}	0.011	mm
C_c	NA	
C_u	NA	

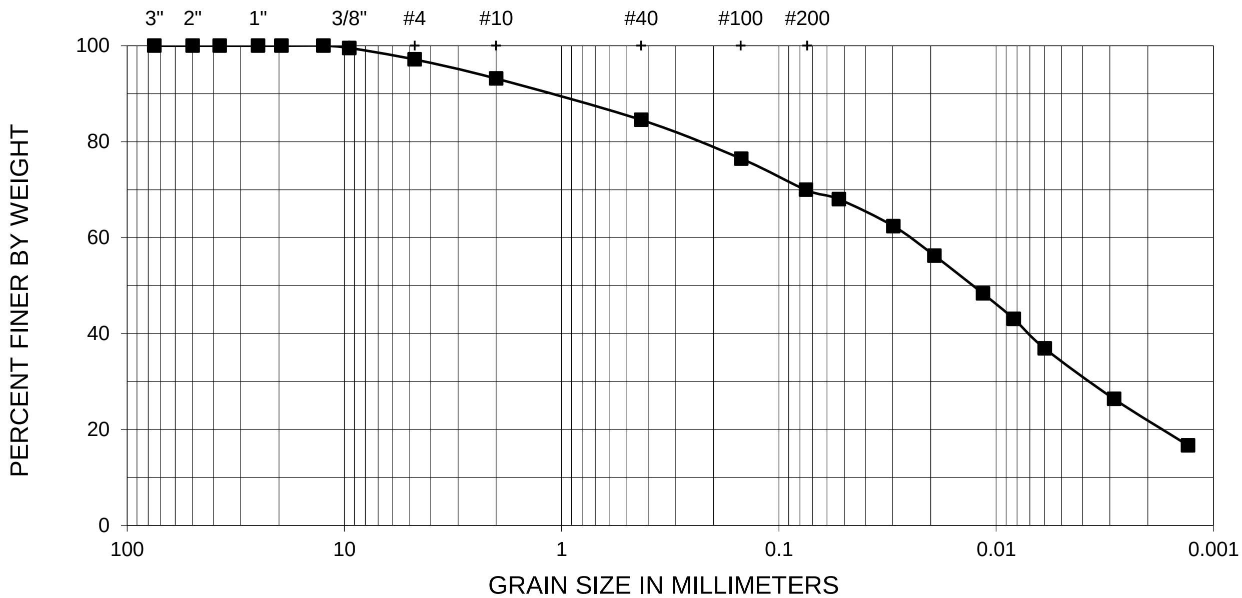
SAND AND GRAVEL DESCRIPTION

SHAPE	Angular
HARDNESS	Hard and durable

9375 CHILLICOTHE ROAD, KIRTLAND, OH 44094
PHONE: 440-256-6500 FAX: 440-256-6507

PARTICLE SIZE ANALYSIS WITH HYDROMETER ASTM D422

PROJECT INFORMATION		SAMPLE INFORMATION		
Project:	Martin Run Pump Station	***ASTM Description***	Sandy LEAN CLAY	CL
Location:	Lorain, Ohio			
Project #:	082419.00	***OHIO Modified AASHTO***	Sandy SILT	A-4a (7)
Test Date:	August 23, 2019			
Sample #:	3ST7	***Sample Location***	B-1; 21.5' - 23.5'	



SIEVE ANALYSIS

Sieve #	Sieve size, mm	Percent Passing
3"	75	100.0
2"	50	100.0
1-1/2"	37.5	100.0
1"	25	100.0
3/4"	19	100.0
3/8"	9.5	99.5
#4	4.75	97.1
#10	2	93.1
#40	0.43	84.5
#100	0.15	76.5
#200	0.074	69.9
#270	0.053	68.0

DISPERSION

Device	ASTM D422, Type A
Agent	Sodium Hexametaphosphate
Time in Agent	16 Hours

HYDROMETER ANALYSIS

Particle Size	Percent Passing
0.074 mm	69.9
0.053 mm	68.0
0.005 mm	34.1
0.0013 mm	16.7

ATTERBERG LIMITS

LIQUID LIMIT	25
PLASTIC LIMIT	17
PLASTICITY INDEX	8

PARTICLE DISTRIBUTION

D_{10}	NA	mm
D_{30}	0.004	mm
D_{60}	0.025	mm
C_c	NA	
C_u	NA	

SAND AND GRAVEL DESCRIPTION

SHAPE	Angular
HARDNESS	Hard and durable

LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX
ASTM D4318 - A

SME
9375 CHILLICOTHE ROAD, KIRTLAND, OH 44094
PHONE: 440-256-6500 FAX: 440-256-6507

PROJECT: Martin Run Pump Station
LOCATION: Lorain, Ohio
PROJECT#: 082419.00
DATE: August 22, 2019

DATE OBTAINED: August 14, 2019
SAMPLE NUMBER: SB2
SAMPLE LOCATION: B-1; 5' - 6.5'
SAMPLE DESCRIPTION: LEAN CLAY
TECHNICIAN: SM

TEST METHOD: ASTM D4318
METHOD - A

TEST DATA:

LIQUID LIMIT

Point #:	1	2	3
Wet Wt + Tare, g:	43.37	47.89	43.10
Dry Wt + Tare, g:	40.87	45.08	40.90
Tare Wt.:	33.63	36.57	33.92
Water Content:	34.53	33.02	31.52
Number of Blows:	18	25	32

Water Content corrected for method B:	33

PLASTIC LIMIT TEST

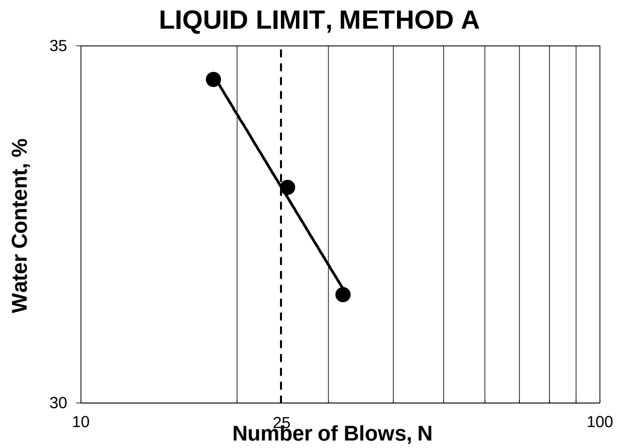
Wet Wt + Tare, g:	43.45	40.01
Dry Wt + Tare, g:	42.30	38.95
Tare Wt, g:	36.52	33.55
Water Content:	19.90	19.63

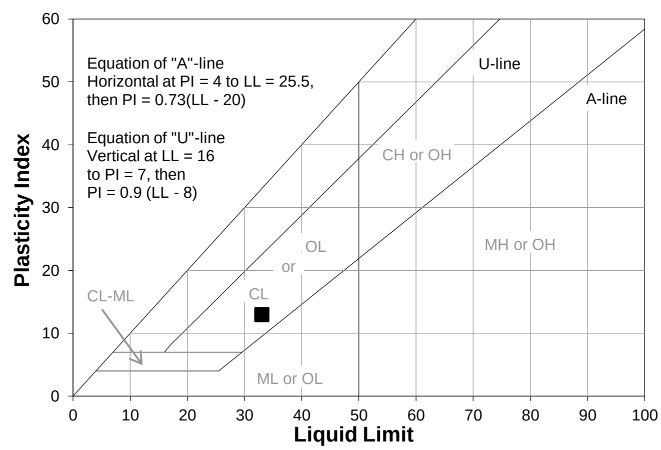
PLASTICITY INDEX

LIQUID LIMIT:	33
PLASTIC LIMIT:	20
PLASTICITY INDEX:	13

CLASSIFICATION: CL

REMARKS: Sample air dried prior to testing





LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX
ASTM D4318 - A

9375 CHILLICOTHE ROAD, KIRTLAND, OH 44094
PHONE: 440-256-6500 FAX: 440-256-6507

PROJECT: Martin Run Pump Station
LOCATION: Lorain, Ohio
PROJECT#: 082419.00
DATE: August 23, 2019

DATE OBTAINED: August 14, 2019
SAMPLE NUMBER: 3ST7
SAMPLE LOCATION: B-1; 21.5' - 23.5'
SAMPLE DESCRIPTION: LEAN CLAY
TECHNICIAN: SM

TEST METHOD: ASTM D4318
METHOD - A

TEST DATA:

LIQUID LIMIT

Point #:	1	2	3
Wet Wt + Tare, g:	47.05	45.12	46.40
Dry Wt + Tare, g:	44.41	42.80	43.96
Tare Wt.:	34.14	33.37	33.69
Water Content:	25.71	24.60	23.76
Number of Blows:	18	28	35

Water Content corrected for method B:	25

PLASTIC LIMIT TEST

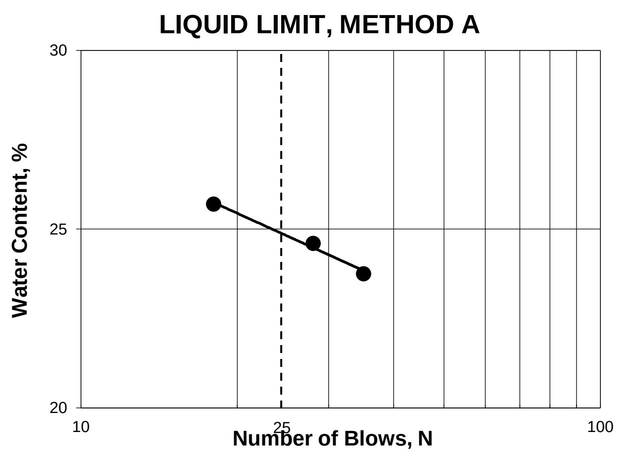
Wet Wt + Tare, g:	40.99	40.51
Dry Wt + Tare, g:	39.87	39.52
Tare Wt, g:	33.15	33.67
Water Content:	16.67	16.92

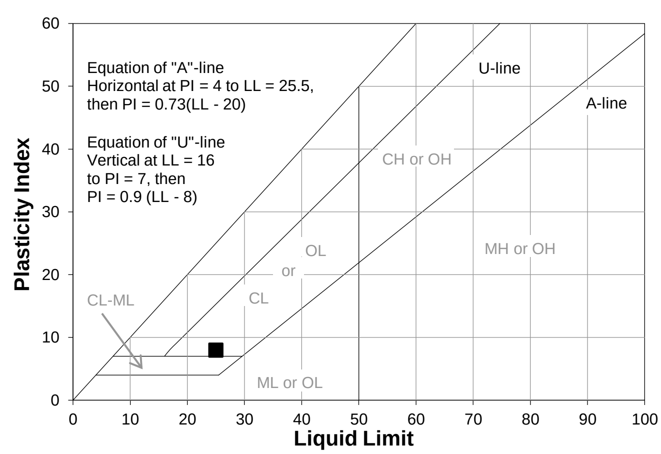
PLASTICITY INDEX

LIQUID LIMIT:	25
PLASTIC LIMIT:	17
PLASTICITY INDEX:	8

CLASSIFICATION: CL

REMARKS: Sample air dried prior to testing





APPENDIX B

PUMPING TEST DATA, CALCULATIONS, AND GRAPH

Pumping Test Data
Martin Run Pump Station
Lorain, Ohio
SME Project No. 082419.00

Pumping	
Minutes	Drawdown (ft)
0	0
1.10	0.061
2.30	0.543
3.60	0.992
4.90	1.419
6.30	1.382
7.80	1.622
9.40	1.814
11.00	1.916
12.80	1.993
14.70	2.221
16.70	2.45
18.80	2.636
21.00	2.662
23.40	2.647
25.90	3.005
28.50	3.324
31.30	3.596
34.30	3.681
37.40	4.233
40.80	4.473
44.30	4.594
48.00	4.856
52.00	5.202
56.20	5.347
60.60	5.529
65.30	5.693
70.30	5.89
75.30	6.274
80.30	6.551
85.30	7.008
90.30	7.275
95.30	7.247
100.30	7.251
105.30	7.25
110.30	7.25
115.30	7.252
120.30	7.251
125.30	7.253

Recharge	
Minutes	Recharge (ft)
0.0	7.178
5.0	6.751
10.0	6.762
15.0	6.754
20.0	6.761
25.0	6.75
30.0	6.747
35.0	6.744
40.0	6.736
45.0	6.729
50.0	6.725
55.0	6.717
60.0	6.714
65.0	6.708
70.0	6.703

Recharge Rate

Recharge = 7.178 ft - 6.703 ft = 0.475 ft

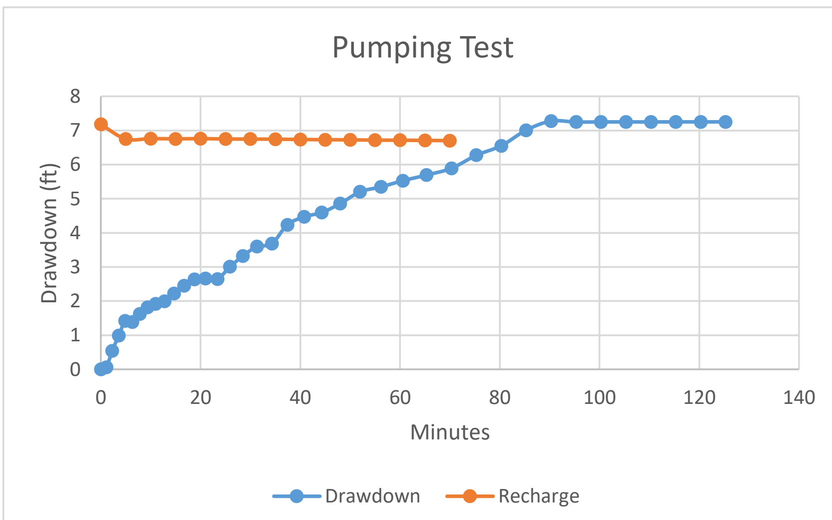
Volume of Recharge
= 0.475 ft / (0.66 gallons/ft) = 0.71 gallons

Recharge rate = 0.71 gallons / 70 minutes
= 0.01 gpm = 0.6 gallons per hour

Pumping Rates

200 mL/minute = 0.053 gpm
= 3.18 gallons per hour

800 mL/minute = 0.21 gpm
= 12.6 gallons per hour



APPENDIX C

IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL ENGINEERING REPORT

GENERAL COMMENTS

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

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

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

GENERAL COMMENTS

BASIS OF GEOTECHNICAL REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practices to assist in the design and/or evaluation of this project. If the project plans, design criteria, and other project information referenced in this report and utilized by SME to prepare our recommendations are changed, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed, and the conclusions and recommendations of this report are modified or approved in writing by our office.

The discussions and recommendations submitted in this report are based on the available project information, described in this report, and the geotechnical data obtained from the field exploration at the locations indicated in the report. Variations in the soil and groundwater conditions commonly occur between or away from sampling locations. The nature and extent of the variations may not become evident until the time of construction. If significant variations are observed during construction, SME should be contacted to reevaluate the recommendations of this report. SME should be retained to continue our services through construction to observe and evaluate the actual subsurface conditions relative to the recommendations made in this report.

In the process of obtaining and testing samples and preparing this report, procedures are followed that represent reasonable and accepted practice in the field of soil and foundation engineering. Specifically, field logs are prepared during the field exploration that describe field occurrences, sampling locations, and other information. Samples obtained in the field are frequently subjected to additional testing and reclassification in the laboratory and differences may exist between the field logs and the report logs. The engineer preparing the report reviews the field logs, laboratory classifications, and test data and then prepares the report logs. Our recommendations are based on the contents of the report logs and the information contained therein.

REVIEW OF DESIGN DETAILS, PLANS, AND SPECIFICATIONS

SME should be retained to review the design details, project plans, and specifications to verify those documents are consistent with the recommendations contained in this report.

REVIEW OF REPORT INFORMATION WITH PROJECT TEAM

Implementation of our recommendations may affect the design, construction, and performance of the proposed improvements, along with the potential inherent risks involved with the proposed construction. The client and key members of the design team, including SME, should discuss the issues covered in this report so that the issues are understood and applied in a manner consistent with the owner’s budget, tolerance of risk, and expectations for performance and maintenance.

FIELD VERIFICATION OF GEOTECHNICAL CONDITIONS

SME should be retained to verify the recommendations of this report are properly implemented during construction. This may avoid misinterpretation of our recommendations by other parties and will allow us to review and modify our recommendations if variations in the site subsurface conditions are encountered.

PROJECT INFORMATION FOR CONTRACTOR

This report and any future addenda or other reports regarding this site should be made available to prospective contractors prior to submitting their proposals for their information only and to supply them with facts relative to the subsurface evaluation and laboratory test results. If the selected contractor encounters subsurface conditions during construction, which differ from those presented in this report, the contractor should promptly describe the nature and extent of the differing conditions in writing and SME should be notified so that we can verify those conditions. The construction contract should include provisions for dealing with differing conditions and contingency funds should be reserved for potential problems during earthwork and foundation construction. We would be pleased to assist you in developing the contract provisions based on our experience.

The contractor should be prepared to handle environmental conditions encountered at this site, which may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers. Any Environmental Assessment reports prepared for this site should be made available for review by bidders and the successful contractor.

THIRD PARTY RELIANCE/REUSE OF THIS REPORT

This report has been prepared solely for the use of our Client for the project specifically described in this report. This report cannot be relied upon by other parties not involved in the project, unless specifically allowed by SME in writing. SME also is not responsible for the interpretation by other parties of the geotechnical data and the recommendations provided herein.

Passionate People Building
and Revitalizing our World

SME