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July 11, 2019

Mr. Jason Francis
M/I Homes of Central Ohio, LLC
3 Easton Oval, Suite 340
Columbus, Ohio 43219

Reference: Kahler Tile Storm Sewer Project
Cubbage Road – Columbus (Franklin County), Ohio
GCI Project No. 19-G-23047

Dear Mr. Francis:

As you requested and authorized, Geotechnical Consultants, Inc. (GCI) completed borings for the proposed Kahler Tile Storm Sewer project on Cubbage Road in Columbus (Franklin County), Ohio. We performed our work in accordance with our proposal dated June 4, 2019 (GCI Proposal number 19G0328).

The purpose of this letter is to summarize the results of our boring program and to discuss the impact of the encountered soil and groundwater conditions on the proposed storm sewer project.

PROJECT DESCRIPTION

The project consists of installing a storm sewer line from Cubbage Road on the west side of the project to about 1,950 feet east of Cubbage Road. The alignment begins west of Cubbage Road, crosses Cubbage, and runs on the east side of Cubbage for about 375 feet, before turning east. EMH&T, Inc. provided a boring plan (prepared by EMH&T, Inc., dated May 2019) showing requested locations for 13 borings, and requested depths which ranged from 6 feet to 16 feet below existing grades.

EMH&T, Inc. field staked the requested boring locations. We could not perform boring B-9 (B-ST09 as staked) due to restrictions from trees.

The attached boring location plan shows the approximate boring locations.

SUBSURFACE CONDITIONS

On July 1, 2019, GCI mobilized an ATV-mounted, rotary drill rig (CME 750 with automatic sampling hammer) to complete the test borings. Boring logs, a boring location plan, and a summary table of encountered subsurface conditions are attached in the appendix. In addition, we summarize the subsurface findings below. Refer to the individual boring logs for more detailed subsurface information at specific boring locations.

Surface Cover

Borings B-1 to B-6 and B-8 to B-13 encountered surface topsoil ranging in thickness from 0.2 to 0.7 feet below grade.

At the surface of B-7, we encountered fill materials consisting of a mixture of lean clay, topsoil, sand, gravel, and pieces of brick. The fill in B-7 extended to about 3 feet below grade. The drillers also noted possible fill below the topsoil in boring B-1. The possible fill consisted of a mixture of brown and gray lean clay, sand, and gravel, and extended to about 6 feet below grade.

Natural Soils
Below the surface cover, we encountered moderately plastic, soft to medium stiff, brown lean clay with sand (classified as CL in the Unified/ASTM Soils Classification System). The drillers noted varying sand and gravel lenses and random shale and sandstone fragments in the lean clay soils.

Bedrock
At depths of 3 to 7 feet below grade in borings B-1 to B-4, we encountered brown weathered to intact shale. The shale was highly fractured to intact, with horizontal layers. We noted random sandstone fragments and layers within the shale. At depths of 2.3 to 6 feet below grade in borings B-5 to B-8 and B-10 to B-13, we encountered brown sandstone. We noted random shale layers within the sandstone.

We were able to obtain split spoon samples in the more weathered portions of the shale and sandstone, but sampling became more limited with depth. We terminated these borings within the shale or sandstone at depths of 6 feet to 16 feet below grade. We did not record auger refusal in the borings.

Groundwater Seepage
We encountered groundwater seepage in borings B-1, B-3, B-5, B-8, and B-9 at depths ranging from 5.5 to 13 feet below grade during the drilling process. By completion of drilling, the water had dissipated in the borings.

The soil samples were characterized as moist to very moist, while the rock was generally characterized as damp, with some very moist to wet samples noted. Note that groundwater levels and moisture conditions can vary with seasonal changes and in response to precipitation events.

CONSTRUCTION COMMENTS AND RECOMMENDATIONS

Based on our boring findings, it is GCI's opinion that the proposed sewer line can be constructed with some geotechnical considerations, as discussed below.

Excavations
The existing fill and natural site soils can be excavated with conventional track hoe equipment. Excavations extending through any granular layers will require layback or trench box use to prevent sidewall collapse. Groundwater seepage will exacerbate side wall instability.

We would classify the site as having OSHA Type C soils; therefore the maximum/steepest slope allowable per OSHA is 1.5H: 1V without excavation support. **All site excavations should comply with current OSHA regulations with regards to layback geometry and benching.**

We encountered bedrock in the borings at depths of 2.3 to 7 feet below grade. As such, rock excavation will be required to complete the project. We found the upper part of the

bedrock to be highly weathered, and as such we are of the opinion that the upper part of the rock should be able to be excavated with a large track hoe. The rock becomes harder with depth and specialty rock excavation methods such as a hoe-ram/pneumatic hammer may be needed to remove more intact rock to achieve design subgrades.

Groundwater

We encountered groundwater seepage in 5 of the 12 borings at depths varying from 5.5 feet to 13 feet below existing grade. By the completion of drilling, the water had dissipated in the borings. *Note that seepage and moisture conditions may change from those encountered during drilling, in response to seasonal changes, and in response to precipitation events.*

The bottoms of some of the excavations will be below the noted seepage depths in areas. Therefore, the contractor should expect to encounter groundwater during sewer construction.

Excavations should be dewatered to allow utility construction and trench backfilling in dry conditions. We expect the anticipated groundwater seepage flows in the shallow portions of the excavations can be handled with portable sump pumps and working mats of crushed stone. The purpose of the working mat is to protect soil subgrades from disturbance during construction and to act as a drainage layer to help control groundwater seepage. The granular bedding layer can be thickened to help control seepage, as needed.

More sophisticated dewatering methods may be needed (e.g., well points or deep sumps) for the deepest excavations if increased water flow is encountered.

Trench Backfill Compaction

Properly placing and compacting trench backfill will be critical where pavement will be placed over utility lines. Settlement of trench backfill, due to improper compaction or substandard backfill materials, will likely result in pavement problems and the need for pavement repairs at a future date. Note that wet soils that prevent proper compaction are often the cause of many backfill related problems; this will be the case with some of the excavated trench materials. For this reason, excavated trench spoils are usually discarded and replaced with imported aggregate fill where the sewer is below or near roads and pavements.

We recommend that the contractor place trench backfill materials in maximum 8-inch thick loose lifts and compact each lift to a minimum of 98% Standard Proctor dry densities. Backfill outside the influence of pavement and structures should be compacted to a minimum of 95% Standard Proctor dry densities. We expect that the contractor will need to use remotely operated compaction equipment or track hoe compactor attachments within the lower depths of the excavations.

Utility trench backfill should be properly keyed into the sidewalls of the excavations to tie the new fill mass into the adjacent natural soils. The ‘keying’ process will also eliminate the potential for a vertical seam (shear plane) of loose, un-compacted soil between the trench backfill and the adjacent natural soils.

Trench Backfill Materials
Within the influence of roadways and/or if required by municipal regulations, use imported, granular materials, such as AASHTO #57 stone, ODOT Item 304 stone, or ODOT Item 411 stone to backfill the trench. These granular materials would compact best using vibratory compactive effort, such as a vibratory smooth drum roller or vibratory hoe-pack attached to a track hoe.

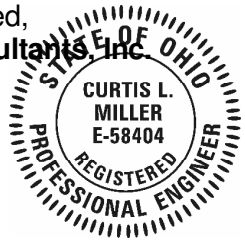
In green areas, the backfill can consist of excavation spoils, provided these materials are placed at suitable moisture contents and properly compacted. Based on our borings, generated trench spoils will primarily consist of clay-based soils and mixtures of shale and sandstone. Some drying of these materials could be needed to be able to achieve compaction.

FINAL
The recommendations contained in this report are the opinion of GCI based on the subsurface conditions found in the borings and available development information. It should be noted that the nature and extent of variations between borings might not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

This report has been prepared for design purposes only and may not be sufficient to prepare an accurate bid document. If you have any questions or need for any additional information, please contact our office. It has been a pleasure to be of service to you on this project, and we hope to continue our services through construction.

Respectfully submitted,
Geotechnical Consultants, Inc.

Curtis L. Miller, P.E.
Principal



Todd R. Meek, P.E., LEED AP
In-House Reviewer

Distribution: Mr. Jason Francis @ M/I Homes of Central Ohio – pdf via email
GCI Project File 19-G-23047

Attachments: General Notes for Soil Sampling and Classifications
General Site Location Map
Boring Location Plan
Summary of Encountered Subsurface Conditions
Test Boring Logs (B-1 to B-8 and B-10 to B-13)

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ATTACHMENTS

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GENERAL NOTES FOR SOIL SAMPLING AND CLASSIFICATIONS

BORINGS, SAMPLING AND GROUNDWATER OBSERVATIONS:

Drilling and sampling were conducted in accordance with procedures generally recognized and accepted as standard methods of exploration of subsurface conditions. The borings were drilled using a truck-mounted drill rig using auger boring methods with standard penetration testing performed in each boring at intervals ranging from 1.5 to 5.0 feet. The stratification lines on the logs represent the approximate boundary between soil types at that specific location and the transition may be gradual.

Water levels were measured at drill locations under conditions stated on the logs. This data has been reviewed and interpretations made in the text of the report. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time the measurements were made.

The Standard Penetration Test (ASTM-D-1586) is performed by driving a 2.0 inch O.D. split barrel sampler a distance of 18 inches utilizing a 140 pound hammer free falling 30 inches. The number of blows required to drive the sampler each 6 inches of penetration are recorded. The summation of the blows required to drive the sampler for the final 12 inches of penetration is termed the Standard Penetration Resistance (N). Soil density/consistency in terms of the N-value is as follows:

COHESIONLESS DENSITY		COHESIVE CONSISTENCY	
0-10	Loose	0-4	Soft
10-30	Medium Dense	4-8	Medium Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	Very Stiff
		30 +	Hard

SOIL MOISTURE TERMS

Soil Samples obtained during the drilling process are visually characterized for moisture content as follows:

MOISTURE CONTENT	DESCRIPTION
Damp	Soil moisture is much drier than the Atterberg plastic limit (where soils are cohesive) and generally more than 3% below Standard Proctor “optimum” moisture conditions. Soils of this moisture generally require added moisture to achieve proper compaction.
Moist	Soil moisture is near the Atterberg plastic limit (cohesive soils) and generally within ±3% of the Standard Proctor “optimum” moisture content. Little to no moisture conditioning is anticipated to be required to achieve proper compaction and stable subgrades.
Very Moist	Soil moisture conditions are above the Atterberg plastic limit (cohesive soils) and generally greater than 3% above Standard Proctor “optimum” moisture conditions. Drying of the soils to near “optimum” conditions is anticipated to achieve proper compaction and stable subgrades.
Wet	Soils are saturated. Significant drying of soils is anticipated to achieve proper compaction and stable subgrades.

SOIL CLASSIFICATION PROCEDURE:

Soil samples obtained during the drilling process are preserved in plastic bags and visually classified in the laboratory. Select soil samples may be subjected to laboratory testing to determine natural moisture content, gradation, Atterberg limits and unit weight. Soil classifications on logs may be adjusted based on results of laboratory testing.

Soils are classified in accordance with the ASTM version of the Unified Soil Classification System. ASTM D-2487 “Classification of Soils for Engineering Purposes (Unified Soil Classification System) describes a system for classifying soils based on laboratory testing. ASTM D-2488 “Description and Identification of Soil (Visual-Manual Procedure) describes a system for classifying soils based on visual examination and manual tests.

Soil classifications are based on the following tables (see reverse side):

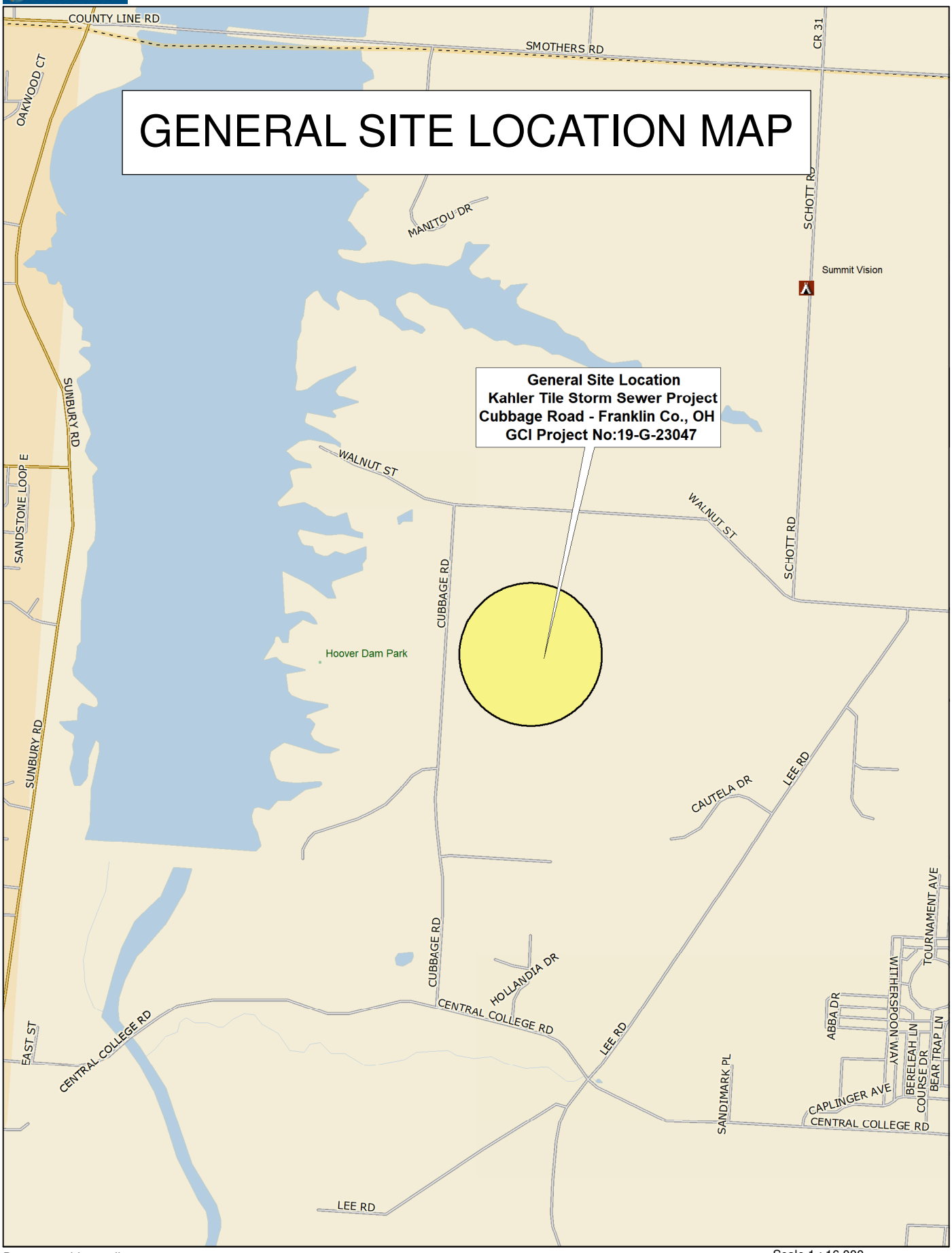
GENERAL NOTES FOR SOIL SAMPLING AND CLASSIFICATIONS

PARTICLE SIZE DEFINITION		
Boulders:		>12"
Cobbles:		3" to 12"
Gravel:	Coarse:	3/4" to 3"
	Fine:	No. 4 (3/16") to 3/4"
Sand:	Coarse	No. 10 (2.0mm) to No. 4 (4.75mm)
	Medium	No. 40 (0.425mm) to No. 10 (2.0mm)
	Fine	No. 200 (0.074mm) to No. 40 (0.425mm)
Silt & Clay		<0.074mm; classification based on overall plasticity; in general clay particles <0.005mm.

CONSTITUENT MODIFIERS	
Trace	Less than 5%
Few	5-10%
Little	15-25%
Some	30-45%
Mostly	50-100%

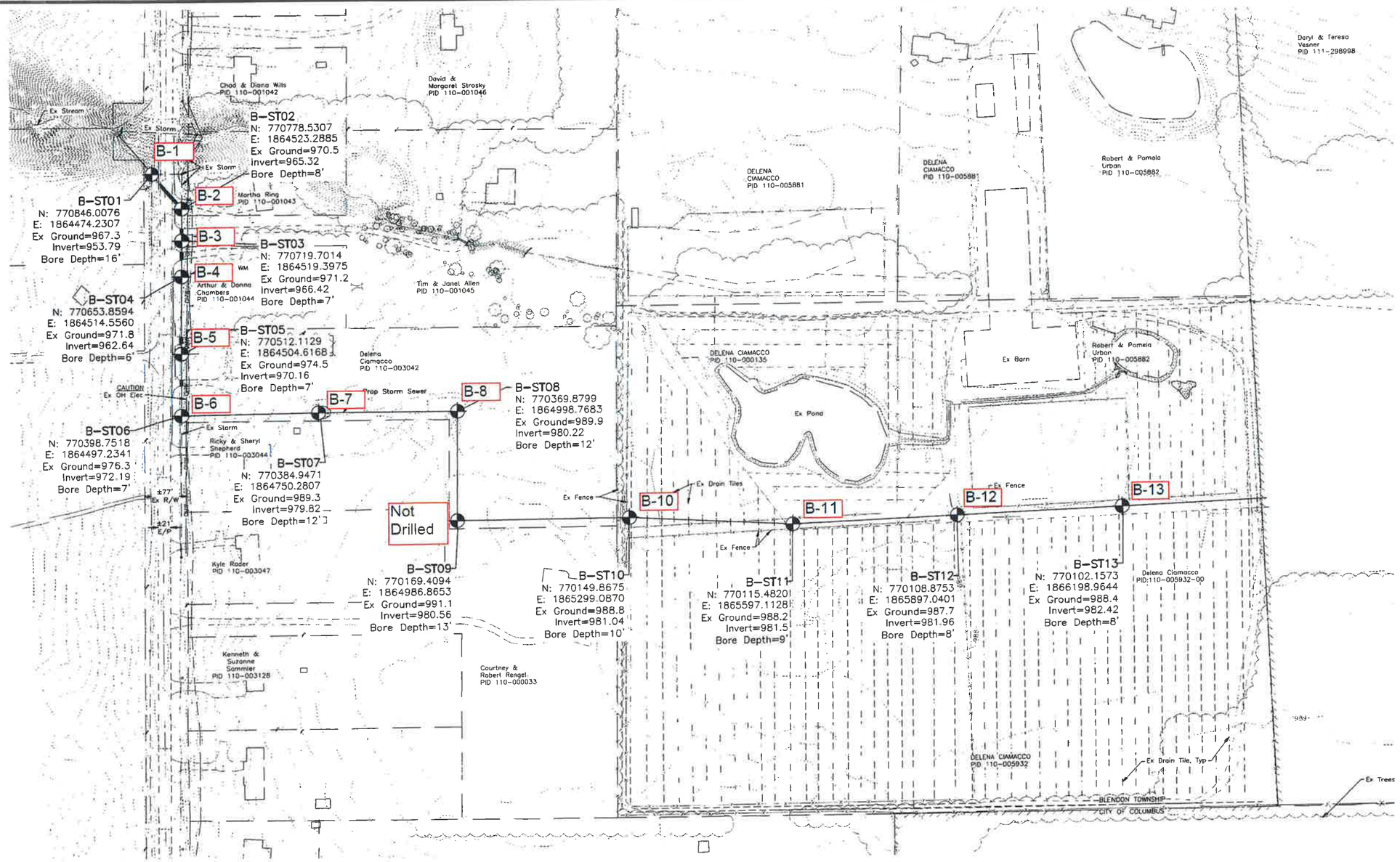
ASTM/UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART		
COARSE-GRAINED SOILS (more than 50% of materials is larger than No. 200 sieve size)		
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	*Clean Gravel (less than 5% fines)*	
	GW	Well-graded gravel, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravels, gravel sand mixtures, little or no fines
	Gravels with fines (more than 12% fines)	
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
SANDS More than 50% of coarse fraction smaller than No. 4 sieve size	*Clean Sands (Less than 5% fines)*	
	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly-graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
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 Greater than 12 percent ……GM, GC, SM, SC 5 to 12 percent ……Borderline cases requiring dual symbols: SP-SM, GP-GM, etc.		
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size)		
SILTS AND CLAYS Liquid Limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays or low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	CL-ML	Inorganic silty clay of slight plasticity, P.I. between 4 and 7
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid Limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays or medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

GENERAL SITE LOCATION MAP



TN
MN (7.4°W)

Scale 1 : 16,000
1" = 1,333.3 ft
Data Zoom 13-6



Approximate Boring Location

BORING LOCATION PLAN

Kahler Tile Storm Sewer Project

Cubbage Road - Columbus (Franklin Co.), Ohio

Base map by EMH&T, Inc.	
Project No.: 19-G-23047	
Date: 7/11/19	Drawn By: CLM
Scale: 1"=200' (approximate)	

Summary of Encountered Subsurface Conditions

Kahler Tile Storm Sewer Project
Cubbage Road - Franklin County, Ohio
GCI Job Number: 19-G-23047

Borehole	Surface Layer	Topsoil Thickness (ft.)	Bottom of Fill Cover (feet)	Groundwater: Level Encountered (ft)	Groundwater: Level at Completion (ft)	Depth to Lean Clay (ft)	Depth to Bedrock (ft)	Bottom of Boring Depth (ft)
				Depth	Depth			
B- 1	Topsoil	0.2	6.0	13	--	6.0	7 SH	16.0
B- 2	Topsoil	0.4	--	--	--	0.4	3 SH	8.0
B- 3	Topsoil	0.6	--	6	--	0.6	3 SH	7.0
B- 4	Topsoil	0.4	--	--	--	0.4	4 SH	6.0
B- 5	Topsoil	0.7	--	5.5	--	0.7	2.3 SS	7.0
B- 6	Topsoil	0.5	--	--	--	0.5	3 SS	7.0
B- 7	Fill	--	3.0	--	--	3.0	3.5 SS	12.0
B- 8	Topsoil	0.3	--	10	--	0.3	4 SS	12.0
B-10	Topsoil	0.2	--	9	--	0.2	3 SS	10.0
B-11	Topsoil	0.3	--	--	--	0.3	5 SS	9.0
B-12	Topsoil	0.5	--	--	--	0.5	3.7 SS	8.0
B-13	Topsoil	0.7	--	--	--	0.7	6 SS	8.0

SS - Sandstone
SH - Shale

TEST BORING LOG

PROJECT NAME **Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio** BORING NO. **B- 1**

PROJ. SURF. ELEV.

CLIENT **M/I Homes of Central Ohio** NO. **19-G-23047** DATE DRILLED **7/1/2019**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	3	0.0-1.5	SS	1	2	1	Moist	0.2	Topsoil
									Possible Fill consisting of a mixture of brown and gray lean clay, sand, gravel, and stone
	3	2.0-3.5	SS	2	2	3	Moist		
	2	4.0-5.5	SS	3	4	4	Moist		
5								6.0	
								7.0	Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random shale fragments noted
	--	8.5-10.0	SS	19	27	50/5"	Damp		Brown Weathered to Intact Shale - highly fractured zones noted, horizontally bedded, random sandstone fragments noted
10									
	--	13.5-14.1	SS	43	50/1"		Damp		Water Seepage at 13'
15	--	15.0-15.1	SS	50/1"			Damp		
								16.0	BOTTOM OF BORING: 16'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio** BORING NO. **B- 2**

PROJ. SURF. ELEV.

CLIENT **M/I Homes of Central Ohio** NO. **19-G-23047** DATE DRILLED **7/1/2019**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0 - 10	Loose	0 - 4	Soft
10 - 30	Medium Dense	4 - 8	Medium Stiff
30 - 50	Dense	8 - 15	Stiff
50 +	Very Dense	15 - 30	Very Stiff
		30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	--	0.0-1.5	SS	2	2	2	Moist	0.4	Topsoil and Lean Clay Mixture
									Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random shale fragments noted
	4	2.0-3.5	SS	5	11	23	Moist	3.0	
									Brown Weathered to Intact Shale - highly fractured zones noted, horizontally bedded, random sandstone fragments noted
	--	4.0-5.5	SS	30	28	32	Damp		
5									
							Damp		
	--	6.5-7.8	SS	38	40	50/3"			
								8.0	
10									BOTTOM OF BORING: 8'
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio** BORING NO. **B- 3**

PROJ. SURF. ELEV.

CLIENT **M/I Homes of Central Ohio** NO. **19-G-23047** DATE DRILLED **7/1/2019**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

____ FEET BELOW SURFACE AT 24 HOURS

____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	3	0.0-1.5	SS	1	1	3	Moist	0.6	Topsoil
	--	2.0-3.5	SS	18	23	23	Moist to Damp	3.0	Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random shale and sandstone fragments noted
	--	4.0-5.3	SS	23	38	50/3"	Damp		Brown and Gray Weathered to Intact Shale - highly fractured zones noted, horizontally bedded, random sandstone fragments noted
5	--	5.5-6.6	SS	21	33	50/1"	Damp	7.0	Water Seepage at 6'
									BOTTOM OF BORING: 7'
10									
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio** BORING NO. **B- 4**

PROJ. SURF. ELEV.

CLIENT **M/I Homes of Central Ohio** NO. **19-G-23047** DATE DRILLED **7/1/2019**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

____ FEET BELOW SURFACE AT 24 HOURS

____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	--	0.0-1.5	SS	1	1	2	Moist	0.4	Topsoil
									Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random shale fragments noted
	3	2.0-3.5	SS	4	6	12	Moist		
								4.0	
	--	4.0-5.5	SS	12	24	50	Damp		Brown and Gray Weathered to Intact Shale - highly fractured zones noted, horizontally bedded, random sandstone fragments noted
5									
	--	5.5-6.0	SS	38			Damp	6.0	
									BOTTOM OF BORING: 6'
10									
15									

* **The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio** BORING NO. **B- 5**

PROJ. SURF. ELEV.

CLIENT **M/I Homes of Central Ohio** NO. **19-G-23047** DATE DRILLED **7/1/2019**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

____ FEET BELOW SURFACE AT 24 HOURS

____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	4	0.0-1.5	SS	1	2	2	Moist	0.7	Topsoil
	--	2.0-2.7	SS	16	50/2"		Moist to Damp	2.3	Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random shale and sandstone fragments noted
	--	4.0-5.5	SS	31	24	31	Damp		Brown Sandstone - random shale layers noted
5	--	5.5-5.8	SS	50/3"			Damp		Water Seepage at 5.5'
								7.0	
									BOTTOM OF BORING: 7'
10									
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio** BORING NO. **B- 6**

PROJ. SURF. ELEV.

CLIENT **M/I Homes of Central Ohio** NO. **19-G-23047** DATE DRILLED **7/1/2019**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	3	0.0-1.5	SS	1	2	2	Moist	0.5	Topsoil
									Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random sandstone fragments noted
	3	2.0-2.7	SS	8	50/2"		Moist to Damp	3.0	
									Brown Sandstone - random shale layers noted
	--	4.0-4.2	SS	50/2"			Damp		
5									
	--	5.5-5.6	SS	50/1"			Damp		
								7.0	
									BOTTOM OF BORING: 7'
10									
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio | BORING NO. B- 7

PROJ. | SURF. ELEV.

CLIENT M/I Homes of Central Ohio | NO. 19-G-23047 | DATE DRILLED 7/1/2019

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	4	0.0-1.5	SS	2	2	3	Moist		Fill consisting of a mixture of lean clay, topsoil, brick pieces, sand, and gravel
	4	2.0-2.6	SS	12	50/1"		Moist	3.0	
								3.5	Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random shale fragments noted
	--	4.0	SS	50/0"			Damp		Brown Sandstone - random shale layers noted
5									
	--	8.5-8.9	SS	50/4"			Damp		
10									
	--	10.5-10.7	SS	50/2"			Damp		
								12.0	
									BOTTOM OF BORING: 12'
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio** BORING NO. **B- 8**

PROJ. SURF. ELEV.

CLIENT **M/I Homes of Central Ohio** NO. **19-G-23047** DATE DRILLED **7/1/2019**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

____ FEET BELOW SURFACE AT 24 HOURS

____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	3	0.0-1.5	SS	2	3	3	Moist	0.3	Topsoil
									Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random shale fragments noted
	4.5	2.0-3.4	SS	8	9	50/4"	Moist		
								4.0	
	4	4.0-4.4	SS	50/4"			Damp		Brown Sandstone - random shale layers noted
5									
	--	8.5-8.6	SS	50/1"			Damp		
10							Wet		Water Seepage at 10'
	--	10.5-10.9	SS	50/4"					
								12.0	
15									BOTTOM OF BORING: 12'

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio** BORING NO. **B-10**

PROJ. SURF. ELEV.

CLIENT **M/I Homes of Central Ohio** NO. **19-G-23047** DATE DRILLED **7/1/2019**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

____ FEET BELOW SURFACE AT 24 HOURS

____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0 - 10	Loose	0 - 4	Soft
10 - 30	Medium Dense	4 - 8	Medium Stiff
30 - 50	Dense	8 - 15	Stiff
50 +	Very Dense	15 - 30	Very Stiff
		30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	3	0.0-1.5	SS	3	4	2	Moist	0.2	Topsoil
									Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random shale fragments noted
	4	2.0-3.5	SS	8	27	24	Moist	3.0	
									Brown Sandstone - random shale layers noted
	--	4.0-4.8	SS	38	50/4"		Damp		
5									
	--	8.5	SS	50/0"			Damp		
									Water Seepage at 9'
10								10.0	
									BOTTOM OF BORING: 10'
15									

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TEST BORING LOG

PROJECT NAME **Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio** BORING NO. **B-11**

PROJ. SURF. ELEV.

CLIENT **M/I Homes of Central Ohio** NO. **19-G-23047** DATE DRILLED **7/1/2019**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

____ FEET BELOW SURFACE AT 24 HOURS

____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0 - 10	Loose	0 - 4	Soft
10 - 30	Medium Dense	4 - 8	Medium Stiff
30 - 50	Dense	8 - 15	Stiff
50 +	Very Dense	15 - 30	Very Stiff
		30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	3	0.0-1.5	SS	1	1	2	Moist	0.3	Topsoil
									Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random shale fragments noted
	4	2.0-3.5	SS	4	5	5	Moist		
	3.5	4.0-5.5	SS	4	5	26	Moist to Damp	5.0	
5									Brown Sandstone - random shale layers noted
	--	7.5-7.9	SS	50/4"			Damp		
								9.0	
10									BOTTOM OF BORING: 9'
15									

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TEST BORING LOG

PROJECT NAME **Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio** BORING NO. **B-12**

PROJ. SURF. ELEV.

CLIENT **M/I Homes of Central Ohio** NO. **19-G-23047** DATE DRILLED **7/1/2019**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

____ FEET BELOW SURFACE AT 24 HOURS

____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used

Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density

0 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
50 +	Very Dense

Cohesive Consistency

0 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very Stiff
30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2	0.0-1.5	SS	1	1	2	Moist	0.5	Topsoil
									Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random shale fragments noted
	4	2.0-2.6	SS	4	6	8	Moist		
								3.7	
	--	4.0-4.1	SS	50/1"			Damp		Brown Sandstone - random shale layers noted
5									
	--	6.0	SS	50/0"			Damp		
								8.0	
10									BOTTOM OF BORING: 8'
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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TEST BORING LOG

PROJECT NAME **Kahler Tile Storm Sewer Project - Cubbage Road - Franklin County, Ohio** BORING NO. **B-13**

PROJ. SURF. ELEV. _____

CLIENT **M/I Homes of Central Ohio** NO. **19-G-23047** DATE DRILLED **7/1/2019**

GROUND WATER OBSERVATION

None FEET BELOW SURFACE AT COMPLETION

_____ FEET BELOW SURFACE AT 24 HOURS

_____ FEET BELOW SURFACE AT ____ HOURS

Proportions Used	
Trace	Less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0 - 10	Loose	0 - 4	Soft
10 - 30	Medium Dense	4 - 8	Medium Stiff
30 - 50	Dense	8 - 15	Stiff
50 +	Very Dense	15 - 30	Very Stiff
		30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.5	0.0-1.5	SS	1	1	1	Moist	0.7	Topsoil
	4	2.0-3.5	SS	3	4	6	Moist		Brown Lean Clay with Sand (CL) - moderately plastic, little fine to coarse sand (Glacial Till); random shale fragments noted
	3.5	4.0-5.5	SS	2	3	4	Moist		
5								6.0	
	--	6.0-6.1	SS	50/1"			Damp		Brown Sandstone - random shale layers noted
								8.0	
10									BOTTOM OF BORING: 8'
15									

*** The stratification lines represent the approximate boundary between soil types and the transition may be gradual.**

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