SOIL EXPLORATION,
BROWN ROAD TRUNK WATERLINE – PHASE 2,
OREGON, LUCAS COUNTY, OHIO,

City of Oregon
Attention: Rodney Schultz, P.E.
5330 Seaman Street
Oregon, Ohio 43616-2608

BMI Report No. 172007-0216-5801

February 8, 2016

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419-691-4800

Geotechnical Laboratory Report

Report To:	City of Oregon	**Date:**	February 8, 2016
Attention:	Rodney Schultz, P.E.	**Laboratory Job No.:**	172007
	5330 Seaman Street	**BMI Report No.:**	172007-0216-5801
	Oregon, Ohio 43616-2608	**Report Consists of 24 Pages**	

Report On: SOIL EXPLORATION,
Brown Road Trunk Waterline - Phase 2,
Oregon, Lucas County, Ohio

Ladies and Gentlemen:

Bowser-Morner, Inc. has completed the authorized subsurface exploration and geotechnical engineering evaluation at the above referenced project. The following report briefly reviews our exploration procedures, describes existing site and subsurface conditions, and presents our evaluations, conclusions, and recommendations.

1.0 AUTHORIZATION

The purpose of this subsurface exploration and geotechnical engineering evaluation was to determine the subsurface conditions at the project site and to analyze these conditions as they relate to water line design and construction. All work was performed in accordance with Bowser-Morner technical proposal No. T-23357 dated August 17, 2015 and its and its A*cceptance Sheets* between the City of Oregon and Bowser-Morner, Inc. Authorization to proceed with the necessary work was given in your Purchase Order No. 91999-00 dated September 11, 2015. The scope of the exploration included subsurface drilling and sampling, limited laboratory testing, engineering evaluation of the field and laboratory data, and the preparation of this report.

2.0 WORK PERFORMED

2.1 Field Exploration

During this exploration, eleven soil test borings were drilled at the approximate locations shown on the attached *Boring Location Plan*. The borings were drilled to a depth of 10 feet each. Boring locations were established in the field by the Poggemeyer Design Group.

All soil sampling and standard penetration testing was conducted in general accordance with ASTM D 1586. The borings were advanced by an ATV-mounted drilling rig by mechanically twisting hollow-stem augers into the soil. At regular intervals, soil samples were obtained with a standard 2-inch O. D. split spoon sampler driven 18 inches into the soil with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and designated the "standard penetration resistance." The standard penetration resistance, or "N" value, when properly evaluated, is an index of the soil's strength, density, and ability to support foundations. The disturbed samples recovered by the split spoon sampler were visually classified in the field, logged, sealed in glass jars, and returned to the laboratory for testing and evaluation by a geotechnical engineer.

Boring Logs indicating soil descriptions, penetration resistances, and observed ground-water levels are attached.

2.2 Laboratory Testing

In the laboratory, each of the samples recovered from the borings was examined and visually classified by a geotechnical engineer. In addition, samples of cohesive soils from the split spoon samplers were tested to determine the soil's approximate strength using a hand-held, calibrated spring penetrometer. These values were used by the geo-technical engineer to assist in the evaluation of the relative strengths of the subsurface soils and to aid in classification of the samples.

Soil samples are normally retained in our laboratory for a period of 60 days before they are discarded. To view the samples or arrange for longer storage of samples, please contact us.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Description

The proposed site is located along the north side of Brown Road and along the Edison easement located between Brown Road and Navarre Road in Oregon, Lucas County, Ohio.

3.2 Soil Profile

Data from the soil test borings are shown on the attached *Boring Logs*. The subsurface conditions discussed in the following paragraphs and those shown on the *Boring Logs* represent an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgments. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

Geologically, the project site is situated in a glacial ground moraine consisting of till containing an unsorted, unstratified mixture of clay, silt, sand, and coarser fragments deposited discontinuously by advancing ice. Overlying the glacial till is a layer of laminated silts and clays of lacustrine origin.

Fill materials consisted of dark brown and black clay and silt with varying amounts of sand and gravel covered the ground surface of borings locations 1 through 5. The fill extended to depths between 1 and 2 feet. Topsoil covered the ground surface of boring locations 6 through 11 was recorded by the drillers as 12 inches in thickness. Underlying the topsoil and the fill materials was lacustrine soil consisted of clay and silt with varying amounts of sand which was transitioned to silt and clay. This lacustrine deposit extended to the bottom of borings 1, 2, 4, 6, 9, 10 and 11 and to depths between 6.5 and 9.5 feet in the remaining borings. Below the lacustrine deposit in the remaining boring locations was glacial till that was described as clay and silt with some sand and traces of gravel. The glacial till extended to the bottoms of these borings.

The estimated undrained shear strength of the near surface soil to a depth of 5 feet is on the order of 1,000 and 2,500 pound per square feet (psf). The glacial till has an estimated undrained shear strength on the order of 1,500 to greater than 4,500 psf.

3.3 Groundwater Observations

During the field exploration, the drilling rods and sampling equipment were continuously checked by the drillers for indications of groundwater or seepage. The *Boring Logs* list our driller's observations of groundwater or seepage. Three readings are recorded on the logs. The initial groundwater level indicates the depth(s) at which groundwater or seepage was initially noted by the drillers as the boring was being advanced and the

intensity of the seepage. The completion groundwater level represents the depth groundwater was observed in the borehole immediately after the completion of the hole. The last reading on the *Boring Logs* represents the depth groundwater was observed in the borehole after an increment of time has passed. In this case, both the depth and time are listed.

Groundwater was not encountered in any of the borings.

Groundwater levels fluctuate with seasonal and climatic variations and may be different at other times. More specific information regarding groundwater levels, standard penetration resistances, and soil descriptions is detailed on the attached *Boring Logs*.

4.0 PROPOSED CONSTRUCTION

It is our understanding that the proposed construction is to consist of installation of a new 16-inch waterline along the north side of Brown Road and along the Edison easement located between Brown Road and Navarre Road in Oregon, Lucas County, Ohio.

5.0 EVALUATIONS AND CONCLUSIONS

The following evaluations and conclusions are based on our interpretation of the field and laboratory data obtained during the exploration and our experience with similar subsurface conditions. Soil penetration data and laboratory data have been used to estimate allowable bearing pressures using commonly accepted geotechnical engineering practices. Subsurface conditions in uninvestigated locations between borings may vary considerably from those encountered in the borings. If structure location, loadings, or levels are changed, we request we be advised so we may re-evaluate our recommendations.

5.1 Water Line Construction

As previously described, the soil profile at this site consists of silt and clay soil of lacustrine over glacial till soil. We anticipate that excavations for the waterline will stand open and that water intrusion into the excavations will be relatively minor. In order to provide protection for workers, a trenchbox or similar device will be needed. As an alternate, the excavations could be laid back at a slope of about 1:1. The dewatering requirements during construction will depend upon the weather and groundwater conditions at the time of construction. It does not appear, however, that much

groundwater will be encountered in the soil profile. The soil materials are medium stiff clays that will provide adequate support for the waterline. In general, granular material Type 1 and 2 is recommended for bedding and should be six inches thick. Type 3 can be used, if necessary, to control water inflow into the excavation.

5.2 Slopes and Temporary Excavation

The owner and the contractor should make themselves aware of and become familiar with applicable local, state, and federal safety regulations, including current OSHA excavation and trench safety standards. Construction site safety generally is the sole responsibility of the contractor. The contractor shall also be solely responsible for the means, methods, techniques, sequences, and operations of construction operations. Bowser-Morner is providing the following information solely as a service to the client. Under no circumstances should Bowser-Morner's provision of the following information be construed to mean Bowser-Morner is assuming responsibility for construction site safety or the contractor's activities; such responsibility is not implied and should not be inferred.

The contractor should be aware that slope height, slope inclination, and excavation depths (including utility trench excavations) should in no case exceed those specified in local, state, or federal safety regulations, e.g., OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations. Such regulations are strictly enforced and, if not followed, the owner, the contractor, or earthwork or utility subcontractors could be liable for substantial penalties.

For this site, the overburden soil encountered in our exploration is mostly silty clay soil. Some fill, estimated at depths between 1 and 2 feet or more, will be encountered. We anticipate OSHA will classify the fill materials and the sandy soil as Type C. The underlying naturally occurring undisturbed clay soils would be likely classified as Type B.

Note: Soils encountered in the construction excavations may vary significantly across the site. Our preliminary soil classifications are based solely on the materials encountered in widely spaced borings. The contractor should verify similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the

time of construction, Bowser-Morner recommends we be contacted immediately to evaluate the conditions encountered.

If any excavation, including a utility trench, is extended to a depth of more than 20 feet, OSHA requires the side slopes of such excavation be designed by a professional engineer.

5.3 General Considerations

In evaluating the geotechnical engineering recommendations and soil data of this report, the following guidelines and information should be considered. Soil does not possess unique or linear stress/strain relationships and, therefore, strength parameters indicated in this report are simply estimates and idealizations based upon engineering judgment and limited laboratory tests. Most soils are sensitive to disturbance from sampling, and thus the behavior measured by laboratory tests may be unlike that of the in situ soil. As a consequence of the above items, the interpretation of the data in this report and the selection of soil parameters to be utilized for design of construction items in the field requires experience and a high degree of intuition – specifically engineering judgement. Therefore, these parameters should be used carefully and only by experienced personnel in order to determine the sizes and strength of excavation bracing and trench protection devices. Soil behavior depends on loading, time, the environment, and construction technique; therefore, a given excavation will perform differently at various times of the year as weather conditions change. As excavations are opened, more information becomes available and modifications to the preliminary plans may be required.

The subsurface conditions indicated by the borings are representative of the conditions at the specific boring locations on the dates shown and may not be representative of conditions at locations between the borings. Changes in rock level, soil conditions, and groundwater, therefore, are likely to occur and may not be uniform between the borings. Furthermore, the physical properties of soil and rock can be highly variable and can change drastically within a few feet of lateral or vertical travel.

Several other considerations are very important. Groundwater and surfacewater are major contributors to excavation instability and can cause the failure of a trench excavation. This can occur either by undermining and raveling of a wet zone beneath otherwise stable soils, or by the filling of cracks and fissures in the soil profile causing horizontal

pressures that allow the soil to slab off. Some soil types are more prone to failure than others. One that is particularly hazardous is hard, over-consolidated clays. These soils appear to be very stable upon excavation, but can allow large chunks of material to fall into an excavation without warning.

Man-made fills are the most hazardous of all soils. Man-made fills are often a random, nonuniform mixture of soils and construction debris that were placed in an uncontrolled manner. Sometimes it is not easy to identify old fill deposits, which makes them even more hazardous. Not only is old fill a particular hazard, but intersecting trenches can cause original soil materials in the surrounding area to fail unexpectedly. Thus, when excavating in or near old fill areas, extreme caution is advised.

Finally, it should be kept in mind that this report provides only general recommendations and guidelines to be utilized in the actual design work. None of the recommendations should be utilized out of context or without specific engineering review.

6.0 QUALIFICATIONS

The evaluations, conclusions, and recommendations in this report are based on our interpretation of the field and laboratory data obtained during the exploration, our understanding of the project, and our experience with similar sites and subsurface conditions. Data used during this exploration included, but was not necessarily limited to:

- eleven exploratory borings performed during this study;
- observations of the project site by our staff;
- results of limited laboratory soil testing;
- preliminary site plans and drawings furnished by the Poggemeyer Design Group;
- limited interaction with Ms. Denise Plummer of Poggemeyer Design Group; and
- published soil or geologic data of this area.

In the event changes in the project characteristics are planned, or if additional information or differences from the conditions anticipated in this report become apparent, Bowser-Morner, Inc. should be notified so the conclusions and recommendations contained in this report can be reviewed and, if necessary, modified or verified in writing.

The subsurface conditions discussed in this report and those shown on the *Boring Logs* represent an estimate of the subsurface conditions based on interpretation of the boring data using normally

accepted geotechnical engineering judgments. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

Regardless of the thoroughness of a subsurface exploration, there is the possibility conditions between borings will differ from those at the boring locations, conditions are not as anticipated by designers, or the construction process has altered the soil conditions. As variations in the soil profile are encountered, additional subsurface sampling and testing may be necessary to provide data required to re-evaluate the recommendations of this report. Consequently, after submission of this report, it is recommended Bowser-Morner be authorized to perform additional services to work with the designer(s) to minimize errors and/or omissions regarding the interpretation and implementation of this report.

Prior to construction, we recommend that Bowser-Morner:

- work with the designers to implement the recommended geotechnical design parameters into plans and specifications;
- consult with the design team regarding interpretation of this report;
- establish criteria for the construction observation and testing for the soil conditions encountered at this site; and
- review final plans and specifications pertaining to geotechnical aspects of design.

During construction, we recommend that Bowser-Morner:

- observe the construction, particularly site preparation, fill placement, and foundation excavation or installation;
- perform in-place density testing of all compacted fill;
- perform materials testing of soil and other materials as required; and
- consult with the design team to make design changes in the event differing sub-surface conditions are encountered.

If Bowser-Morner is not retained for these services, we shall assume no responsibility for construction compliance with the design concepts, specifications, or recommendations.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, expressed or implied, is made.

The scope of our services did not include an environmental assessment for the presence or absence of hazardous or toxic materials in the soil, surfacewater, groundwater, or air, on, within,

or beyond the site studied. Our work also did not include anything related to mold. Our scope of services also did not include an evaluation for the presence or absence of wetlands or protected species. Any statements in the report or on the *Boring Logs* regarding odors, staining of soils, or other unusual items or conditions observed are strictly for the information of our client.

To evaluate the site for possible environmental liabilities, we recommend an environmental assessment, consisting of a detailed site reconnaissance, a record review, and report of findings. Additional subsurface drilling and sampling, including groundwater sampling, may be required. The presence or absence of wetlands or protected species should be determined by a wetlands study. Bowser-Morner, Inc. can provide these services and would be pleased to provide a cost proposal to perform these studies, if requested.

This report has been prepared for the exclusive use of the City of Oregon for specific application to the proposed Brown Road Trunk Waterline - Phase 2 in Oregon, Lucas County, Ohio. Specific design and construction recommendations have been provided in the various sections of the report. The report should, therefore, be used in its entirety. This report is not a bidding document and shall not be used for that purpose. Anyone reviewing this report must interpret and draw their own conclusions regarding specific construction techniques and methods chosen. Bowser-Morner is not responsible for the independent conclusions, opinions, or recommendations made by others based on the field exploration and laboratory test data presented in this report.

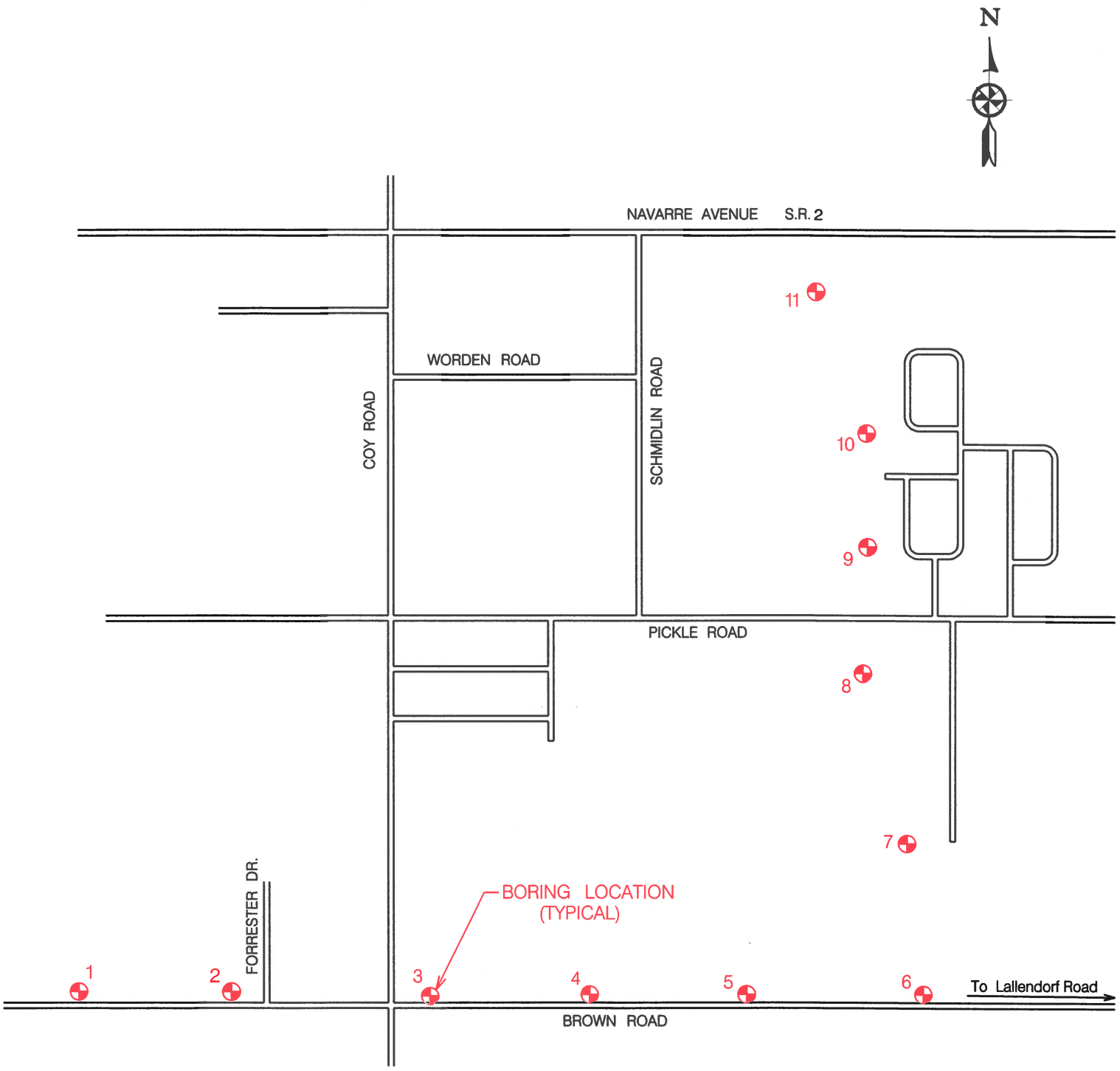
Respectfully submitted,

BOWSER-MORNER, INC.

This document was originally issued by Ahmad K. Rashid, on February 8, 2016. This document is not considered a sealed document. This document has been produced from material that was stored and/or transmitted electronically and may have been inadvertently altered. Rely only on final hard-copy materials bearing the consultant's original signature.

Ahmad K. Rashid, P.E.
Senior Geotechnical Engineer

AKR: sgr
Attachments: *Boring Location Plan*
Boring Log Terminology
Boring Logs
2- Client (via email to rshultz@ci.oregon.oh.us and proman@ci.oregon.oh.us)
1- Poggemeyer Design Group (via email to plummerd@poggemeyer.com)



SCALE: NONE

DATE: 1–20–16
JOB NO. 172007

BORING LOCATION PLAN
BROWN ROAD TRUNK WATER LINE – PHASE 2
OREGON, LUCAS COUNTY, OHIO

BOWSER MORNER.

BORING LOG TERMINOLOGY

Stratum Depth:

Distance in feet and/or inches below ground surface.

Description of Materials:

When the color of the soil is uniform throughout, the color recorded will be such as brown, gray, or black and may be modified by adjectives such as light and dark. If the soil's predominant color is shaded by a secondary color, the secondary color precedes the primary color, such as gray and brown, yellow and brown. If two major and distinct colors are swirled throughout the soil, the colors will be modified by the term mottled, such as mottled brown and gray.

There are two types of visual classification methods currently used by Bowser-Morner, Inc. The first is ASTM D2488. This method results in classifications such as "lean clay". The second method is the ASEE system or Burmister system. This system results in classifications such as "silt and clay, with traces of sand" and is described below.

Particle Size		Visual
Boulders		Larger than 8"
Cobbles		8" to 3"
Gravel:	Coarse	3" to 3/4"
	Fine	3/4" to 2 mm
Sand:	Coarse	2 mm to 0.6 mm (pencil size)
	Medium	0.6 mm to 0.2 mm (table sugar & salt size)
	Fine	0.2 mm to 0.06 mm (powdered sugar size)
Silt		0.06 mm to 0.002 mm
Clay		0.002 mm and smaller (particles of silt and clay size are not visible to the naked eye)

Soil Components	
Major Components	**Minor Component Term**
Gravel Sand Silt Clay	Trace.....1 - 10% Some.....11 - 35% And.....36 - 50%

Moisture Content	
Term	**Relative Moisture**
Dry	Powdery
Damp	Moisture content below plastic limit
Moist	Moisture content above plastic limit, but below liquid limit
Wet	Moisture content above liquid limit

Condition of Soil Relative to Compactness (Granular Material)	
Condition	**N**
Very Loose	5 blows/ft or less
Loose	6 to 10 blows/ft
Medium Dense	11 to 30 blows/ft
Dense	31 to 50 blows/ft
Very Dense	51 blows/ft of more

Condition of Soil Relative to Consistency (Cohesive Material)	
Condition	**Approximate Undrained Shear Strength**
Very Soft	Less than 250 psf
Soft	250 to 500 psf
Medium Stiff	500 to 1,000 psf
Stiff	1,000 to 2,000 psf
Very Stiff	2,000 to 4,000 psf
Hard	Greater than 4,000 psf

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Sample Number:

Sample numbers are designated consecutively, increasing with depth for each boring.

Sample Type:

"A" Split spoon, 2-inch O.D., 1-3/8-inch I.D., 18 inches in length.
"B" One of the following:
Power Auger Sample
Piston Sample
Liner Sample
Denison Sample
Sonic Sample
"C" Shelby Tube 3-inch O.D., except where noted.

Sample Depth:

The depth below top of ground at which the sample was taken.

Blows per 6 inches on Sampler:

The number of blows required to drive a 2-inch O.D., 1-3/8-inch I.D., split spoon sampler, using a 140-pound hammer with a 30-inch free fall, is recorded for 6 inch drive increments. (Example: 3/8/9)

"N" Blows/Feet:

Standard penetration resistance. This value is based on the total number of blows required for the last 12 inches of penetration. (Example: 3/8/9 : N = 8 + 9 = 17)

Water Observations:

The depth of water recorded in the test boring is measured from the top of ground to the top of the water level. Initial depth indicates the water level during boring, completion depth indicates the water level immediately after boring, and depth after "X" number of hours indicates the water level after letting the water rise or fall over a time period. Water observations in pervious (sand and gravel) soils are considered reliable ground water levels for that date, Water observations in impervious (silt and clay) soils cannot be considered accurate unless records are made over a time period of several days to a month. Factors such as weather, soil porosity, etc. will cause the ground water level to fluctuate for both pervious and impervious soils.

CLIENT
City of Oregon

PROJECT
Soil Exploration, Brown Road Trunk Waterline - Phase 2, Oregon, Lucas County, Ohio

JOB NO. **172007**

BORING STARTED **1/14/16** | BORING COMPLETED **1/14/16**

DRILLER **JW JB** | METHOD **3 1/4" HSA**

TYPED BY **sgr**

1 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
1.0				(FILL) Medium stiff black and brown clay and silt some sand trace of gravel, moist			
2.0							
3.0				Medium stiff brown silt, some clay, trace of sand, moist			
4.0	1A				2 2 3	◇5	
5.0							
6.0							
7.0							
8.0							
9.0	2A				3 3 3	◇6	
10.0				Bottom of boring at 10.0 feet			
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

COMMENTS

REMARKS

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	None	1/14/2016
AT COMPLETION	None	1/14/2016
OTHER		

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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DRILLER **JW JB** | METHOD **3 1/4" HSA**

TYPED BY **sgr**

2 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
0.0				(FILL) Medium stiff brown clay and silt, trace of sand, moist			
1.0				Medium stiff, brown silt and sand, some clay, moist			
4.0	1A				2, 2, 2	4	
9.0	2A				3, 4, 5	9	
10.0				Bottom of boring at 10.0 feet			

COMMENTS

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	None	1/14/2016
AT COMPLETION	None	1/14/2016
OTHER		

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
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JOB NO. **172007**

BORING STARTED **1/14/16** | BORING COMPLETED **1/14/16**

DRILLER **JW JB** | METHOD **3 1/4" HSA**

TYPED BY **sgr**

3 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
1.0				(FILL) Medium stiff clay and silt, some sand, trace of gravel, moist			
2.0							
3.0				Medium stiff brown and gray clay and silt, trace of sand, moist			
4.0	1A				3 4 6	◇ 10	
5.0							
6.0							
7.0				Medium stiff brown and gray silt, some clay, trace of sand, moist			▽
8.0							
9.0	2A				4 5 7	◇ 12	
10.0				Bottom of boring at 10.0 feet			
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

COMMENTS

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	8.5 ▽	1/14/2016
AT COMPLETION	None ▽	1/14/2016
OTHER	▽	

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
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DRILLER **JW JB** | METHOD **3 1/4" HSA**

TYPED BY **sgr**

4 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	COMMENTS / REMARKS
1.0				(FILL) Medium stiff black sand some silt, trace of gravel, moist			
2.0				Medium stiff brown and gray clay and silt, trace of sand, moist			
3.0							
4.0	1A				5 6 6	◇ 12	
5.0							
6.0							
7.0							
8.0							
9.0	2A				5 5 7	◇ 12	
10.0				Bottom of boring at 10.0 feet			
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	None	1/14/2016
AT COMPLETION	None	1/14/2016
OTHER		

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
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5 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

DEPTH	SAMPLE NO.	SAMPLER TYPE	RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	COMMENTS / REMARKS
0.0					(FILL) Medium stiff black silt and sand, trace of gravel, moist			
1.0					Stiff brown and gray clay and silt, trace of sand, moist			
4.0	1A					3 3 5	◇ 8	
9.0	2A				Very stiff brown and gray clay and silt, some sand, trace of gravel, moist	5 6 6	◇ 12	
10.0					Bottom of boring at 10.0 feet			

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	None	1/14/2016
AT COMPLETION	None	1/14/2016
OTHER		

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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CLIENT
City of Oregon

PROJECT
Soil Exploration, Brown Road Trunk Waterline - Phase 2, Oregon, Lucas County, Ohio

JOB NO. **172007**

BORING STARTED **1/13/16** | BORING COMPLETED **1/13/16**

DRILLER **JW JB** | METHOD **3 1/4" HSA**

TYPED BY **sgr**

6 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

DEPTH	SAMPLE NO.	SAMPLER TYPE	RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
					Topsoil			
1.0					Stiff brown and gray clay and silt, trace of sand, moist			
2.0								
3.0								
4.0	1A					4 5 6	◇ 11	
5.0								
6.0								
7.0								
8.0								
9.0	2A					3 3 3	◇ 6	
10.0					Bottom of boring at 10.0 feet			
11.0								
12.0								
13.0								
14.0								
15.0								
16.0								
17.0								
18.0								
19.0								
20.0								
21.0								
22.0								

COMMENTS

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	None	1/13/2016
AT COMPLETION	None	1/13/2016
OTHER		

A — SPLIT SPOON
B — ROCK CORE
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D — SOIL PROBE
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BORING STARTED **1/13/16** | BORING COMPLETED **1/13/16**

DRILLER **JW JB** | METHOD **3 1/4" HSA**

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7 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				Topsoil			
1.0				Medium stiff brown and gray clay and silt, trace of sand, moist			
2.0							
3.0							
4.0	1A				3 3 3	◇ 6	
5.0							
6.0							
7.0							
8.0							
9.0	2A			Stiff gray clay and silt, some sand, trace of gravel, moist	5 6 7	◇ 13	
10.0				Bottom of boring at 10.0 feet			
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

COMMENTS

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	None	1/13/2016
AT COMPLETION	None	1/13/2016
OTHER		

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
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GINT Report Used: NEWLOGIN Report No.: 172007-XXXX-XXXX.GPJ GINT Template Used: NEWLOGIN.GDT Date Printed: 1/26/16

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JOB NO. **172007**

BORING STARTED **1/13/16** | BORING COMPLETED **1/13/16**

DRILLER **JW JB** | METHOD **3 1/4" HSA**

TYPED BY **sgr**

8 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				Topsoil			
1.0				Stiff brown and gray clay and silt, trace of sand, moist			
2.0							
3.0							
4.0	1A				4 4 4	◇ 8	
5.0							
6.0							
7.0							
8.0							
9.0	2A				4 5	◇ 9	
10.0				Very stiff brown clay and silt, some sand, trace of gravel, moist	4	◇	
				Bottom of boring at 10.0 feet			
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

COMMENTS

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	None	1/13/2016
AT COMPLETION	None	1/13/2016
OTHER		

A — SPLIT SPOON
B — ROCK CORE
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JOB NO. **172007**

BORING STARTED **1/13/16** | BORING COMPLETED **1/13/16**

DRILLER **JW JB** | METHOD **3 1/4" HSA**

TYPED BY **sgr**

9 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	COMMENTS / REMARKS
0.0				Topsoil			
1.0				Medium stiff brown and gray silt and clay, trace of sand, moist			
2.0							
3.0							
4.0	1A				4 4 4	◇ 8	
5.0							
6.0							
7.0							
8.0							
9.0	2A			(Becomes gray at 9.5')	4 3 3	◇ 6	
10.0				Bottom of boring at 10.0 feet			
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	None	1/13/2016
AT COMPLETION	None	1/13/2016
OTHER		

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
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JOB NO. **172007**

BORING STARTED **1/13/16** | BORING COMPLETED **1/13/16**

DRILLER **JW JB** | METHOD **3 1/4" HSA**

TYPED BY **sgr**

10 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

COMMENTS

N VALUE, blows/ft.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE	REMARKS
				Topsoil			
1.0				Medium stiff brown and gray clay and silt, trace of sand, moist			
4.0	1A				3 4 3	7	
9.0	2A				2 3 3	6	▽
10.0				Bottom of boring at 10.0 feet			

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	9.0	▽ 1/13/2016
AT COMPLETION	None	▼ 1/13/2016
OTHER		▼

A — SPLIT SPOON
B — ROCK CORE
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Soil Exploration, Brown Road Trunk Waterline - Phase 2, Oregon, Lucas County, Ohio

JOB NO. **172007**

BORING STARTED **1/13/16** | BORING COMPLETED **1/13/16**

DRILLER **JW JB** | METHOD **3 1/4" HSA**

TYPED BY **sgr**

11 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)
0.0				Topsoil		
1.0				Medium stiff brown and gray clay and silt, trace of sand, moist		
4.0	1A				4 4 4	8
9.0	2A			(Become gray at 9.0')	4 3 2	5
10.0				Bottom of boring at 10.0 feet		

COMMENTS

REMARKS

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	None	1/13/2016
AT COMPLETION	None	1/13/2016
OTHER		

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
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Telephone:
Fax:
BOWSER MORNER®

1915 North 12th Street
Toledo, OH 43604-5305
T 419-324-2222
F 419-241-1808
www.ttlassoc.com

October 13, 2021 **TTL Project No. 2117401**

Mr. Anthony D. Yacobucci, P.E.
Ohio Turnpike & Infrastructure Commission (OTIC)
682 Prospect Street
Berea, Ohio 44017

Geotechnical Laboratory Testing
OTIC 70-21-01 Eastbound and Westbound Slope Repair
Milepost 73.80 to Milepost 74.00
Wood County, Ohio

Dear Mr. Yacobucci:

TTL Associates, Inc. (TTL) has completed the requested testing for the one (1) soil sample (identified as 3831 Pickle Road Stockpile) picked up by TTL and delivered to the TTL laboratory in Toledo, Ohio on October 4, 2021, identified by TTL Receiving Report No. 36232.

The following laboratory tests were performed on the sample.

- ASTM D 698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 [600 kN-m/m3],
- ASTM D 2216 – Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass,
- ASTM D 4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils,
- ASTM D 6913 – Standard Test methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis, and
- ASTM D 7928 – Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis.

The test results are summarized on the attached Tabulation of Test Data sheet. Graphical representation of the particle size analysis is attached.

The project requirement for a maximum dry density of at least 110 pounds per cubic foot (pcf) as determined by ASTM D 698 (Standard Proctor) was met. However, the tested sample was classified as A-7-6 “clay”. This soil type was not included in the list of acceptable material per the project specification. Therefore, the sample does not meet the project specification and the planned direct shear test was not performed.

Should you have any questions or need further information, please feel free to contact us.

Sincerely,
TTL Associates, Inc.

Frank Kinor, Jr.
Construction Manager

Attachments: Tabulation of Test Data Sheet
Grain Size Distribution Sheet
Standard Proctor Sheet

T:\Projects\2117401 - 70-21-01.. MP 73 8 to MP 74 0 - Wood County - OTIC\Reports and Other Deliverables\2117401 rpt06 OTIC 70-21-01 Eastbound and Westbound Slope Repair.doc

PROJECT: OTIC 70-21-01 Eastbound & Westbound Slope Repairs, Wood Co., OH	**TTL Associates, Inc.**	PROJECT NO: 2117401

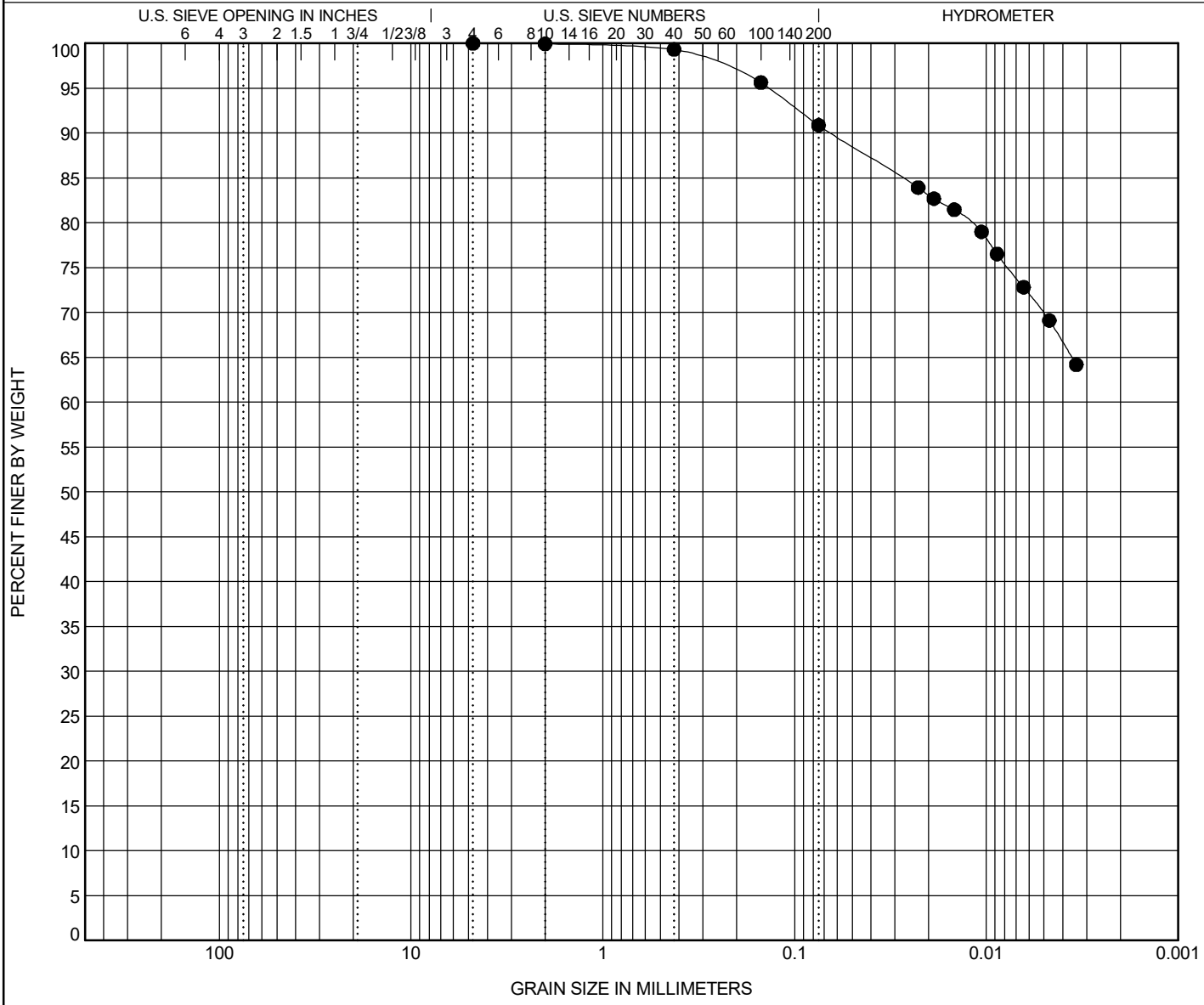
TABULATION OF TEST DATA

Sample Identification			As-Received Natural Moisture Content (% of Dry Weight)	Maximum Dry Density (Pounds per Cubic Foot)	Optimum Moisture Content (Percent)			Particle Size Distribution (%)					Atterberg Limits (%)			ODOT Soil Classification
								Gravel	Coarse Sand	Fine Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
3831 Pickle Road Stockpile			12.7	113.5	15.7			0	1	8	21	70	42	22	20	A-7-6 (12)

TTL Associates, Inc.
1915 N 12th Street
Toledo, Ohio 43624
Telephone: 419-324-2222
Fax: 419-241-1808

GRAIN SIZE DISTRIBUTION

CLIENT Ohio Turnpike & Infrastructure Commission
PROJECT NAME OTIC 70-21-01 Eastbound and Westbound Slope Repair
PROJECT NUMBER 2117401
PROJECT LOCATION Milepost 73.80 to Milepost 74.00, Wood County, Ohio



COBBLES	GRAVEL		SAND		SILT	CLAY
	coarse	fine	coarse	fine		

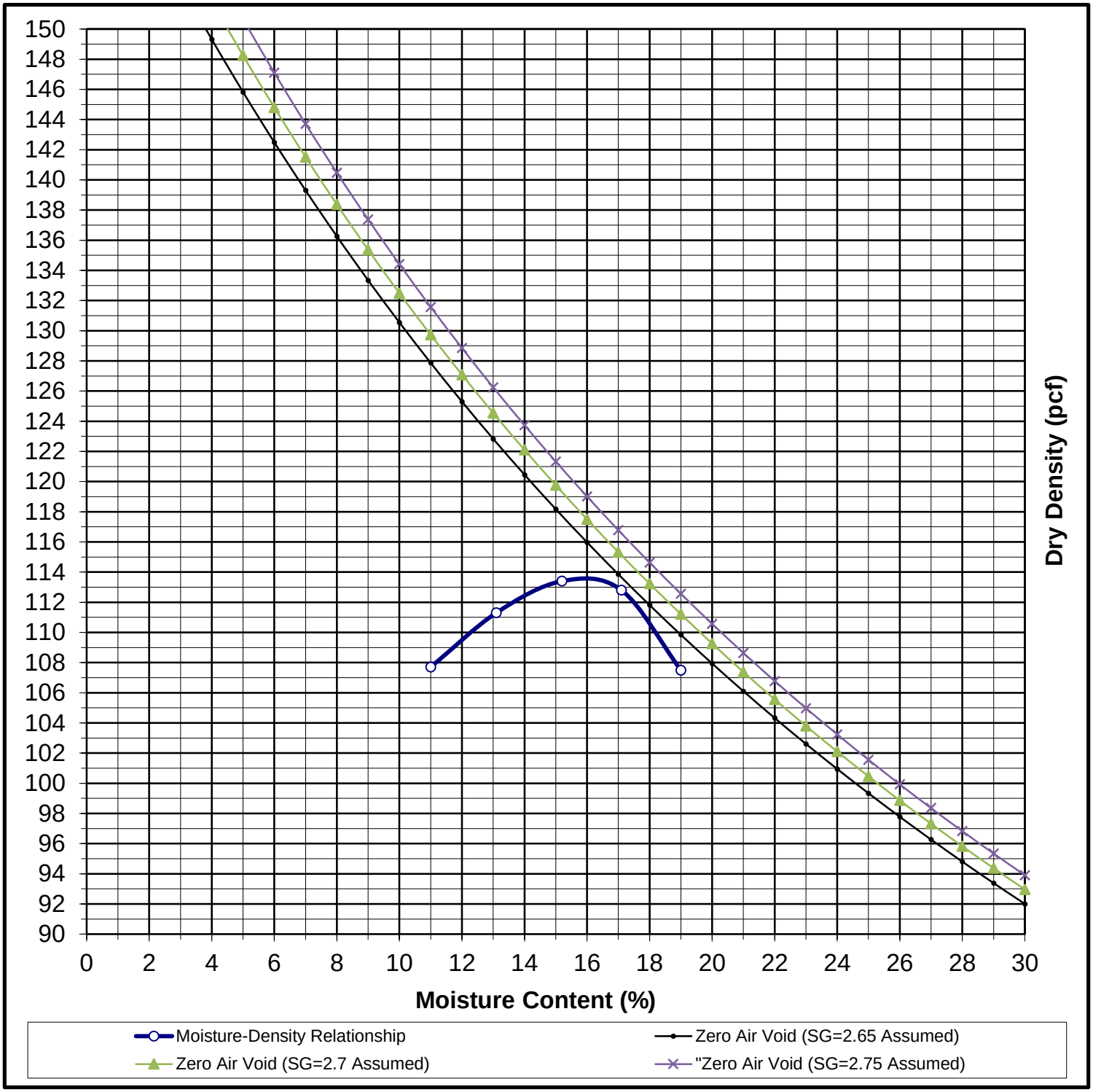
	Specimen Identification	OHDOT Classification	LL	PL	PI	Cc	Cu
●	**Pickle Road 0.0**	**CLAY, Some Silt, Trace Sand A-7-6 (12)**	**42**	**22**	**20**		

	Specimen Identification	D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**Pickle Road 0.0**	**4.75**				**0.0**	**9.1**	**21.0**	**69.9**

SILT-CLAY BOUNDARY = 0.005 MILLIMETERS

GRAIN SIZE ODOT 2117401.GPJ GINT US LAB.GDT 10/12/21

MOISTURE-DENSITY RELATIONSHIP DATA



Project Number:	2117401	Receiving Report No.	36232	Date: 10/6/2021
Project Name:	OTIC 70-21-01 Eastbound and Westbound Slope Repair Eastbound and Westbound Roadways Milepost 73.80 to Milepost 74,00, Wood County, Ohio		**As Received MC**	
Type of Test:	ASTM D 698 Method "A" (Standard Proctor)		**12.7%**	
Soil Description:	Brown CLAY w/Some Silt and Trace Sand A-7-6 (12)			
Source:	Borrow Site - 3831 Pickle Road Stockpile			

Maximum Dry Density	**Optimum Moisture Content**
113.5 pcf	**15.7 %**