ECS SOUTHEAST, LLP
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Geotechnical • Construction Materials • Environmental • Facilities

January 10, 2022
(Revised per POND comments)

Mr. Zach Puckett, P.E., IMSA Level II
Pond & Company
3500 Parkway Lane, Suite 500
Peachtree Corners, GA 30092

Reference: Report of Limited Geotechnical Exploration
Tyrone – TO #8 – Roadway Resurfacing
Tyrone, Georgia

ECS Project Number 10:11619

Dear Mr. Puckett:

Thank you for selecting ECS Southeast, LLP (ECS) to complete a limited geotechnical exploration and pavement evaluation for the selected roadways identified under the above referenced Task Order #8. This letter report presents the results of our field exploration, our findings, and recommendations. The geotechnical exploration and report were performed in general accordance with ECS Proposal # 10:17650r1 dated August 23, 2022.

1.0 PROJECT INFORMATION

We understand the City of Tyrone is considering re-paving several streets. The purpose of this limited exploration was to determine the existing pavement section, subgrade soil, and groundwater conditions at preselected locations on the designated streets and to develop engineering recommendations to guide design and reconstruction of the proposed streets.

We accomplished the purposes of the study by:

1. Reviewing the existing condition of each street by performing a general site reconnaissance.
2. Coring the pavement and collecting asphalt core specimens to determine the current pavement section condition and record the asphalt and graded aggregate base (GAB) layer thicknesses at selected locations.
3. Drilling borings to explore the shallow subsurface soil and groundwater conditions.
4. Performing laboratory tests on selected representative soil samples from the borings to evaluate pertinent engineering properties.
5. Evaluating the field and laboratory data to develop appropriate engineering recommendations.

Pond & Company (POND) has provided a previous evaluation with a Pavement Condition Index (PCI) with results ranging from 17.0 to 65.6. These proposed paving locations and associated PCI ratings are shown in Table 1 below.

Table 1 - Pavement Condition Index (PCI)

Section ID	Street Name	From	To	Length	Width	2021(PCI)
5038	Howell Rd	Brentwood Rd	End	612.2	24	32.0
5037	Llyod Av	Handley Rd	End	636.6	24	36.9
4970	Lynnwood Av	Senoia Rd	End	1272.0	22	56.8
5053	Meadow View Cir	Valley View Dr	Meadow View Cir	977.2	24	27.7
4815	Meadow View Cir	End	Meadow View Cir	168.8	24	28.8
5051	Meadow View Cir	Meadow View Cir	End	391.8	24	32.0
5042	Northwood Rd	Arrowood Rd	End	1229.4	20	17.0
4723	Oakhurst Dr	End	Valley View Dr	405.5	24	61.9
4703	Oakhurst Dr	Valley View Dr	End	169.5	26	65.6
5046	Valley View Dr	Arrowood Rd	Valley View Cir	343.0	24	31.9
4813	Valley View Ct	End	Valley View Cir	161.0	24	34.1
5054	Valley View Dr	Valley View Cir	Meadow View Cir	350.7	24	38.2
5065	Valley View Dr	Meadow View Cir	Oakhurst Dr	1232.8	22	40.7
5045	Valley View Cir	Valley View Dr	Valley View Ct	245.5	24	43.5
4814	Valley View Ct	Valley View Cir	End	166.3	14	43.8

In general, a PCI rating of 100 represents pavement in excellent condition and a rating of 0 is considered failed. PCI rating of less than 55 are considered in poor condition and ratings less than 25 are in serious condition. Refer to ASTM D6433 for more information about the PCI rating.

A *Site Location Diagram* (Figure 1) is attached to this report. From our site reconnaissance, existing asphalt pavement was observed to have moderate to severe distress throughout each of the roads listed. Most of the pavement distress was observed in turn areas, such as the residential driveway entrances, along various streets, and in cul-de-sacs. Other distress areas observed within the study limits were along pavement joints, previously patched areas, and near utilities found in the roadway. Photographs showing representative levels of distress are included in the attached *Site Photo Log*.

2.0 FIELD EXPLORATION AND LAB TESTING

2.1 PAVEMENT CORES AND BORINGS

For this evaluation, six (6) pavement cores and soil test borings were performed at selected locations within the subject study area. The attached Test Location Diagram (Figure 2) shows the approximate test locations. The test locations were selected by ECS. At each test location, the pavement was cored, and a machine powered hollow stem auger was advanced to below the base stone and the sampling spoon was advanced continuously to depth of approximately 6 feet below the existing surface of the asphalt.

The soil test borings were performed with an ATV mounted drill rig, which utilized stem augers to advance the boreholes. No water or drilling fluid was introduced during the process. Representative soil samples were obtained by means of the split-barrel sampling procedure in general accordance with ASTM Specification D-1586 with an automatic drive hammer. In this procedure, a 2-inch O.D., split-barrel sampler is driven into the soil for an interval of 24 inches by a 140-pound hammer falling 30 inches.

The number of blows required to drive the sampler through a 12-inch interval is termed the Standard Penetration Test (SPT) N-value and is indicated for each sample on the boring logs. This value can be used as a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils.

An ECS geotechnical professional prepared a field log of the soils encountered in the borings. After recovery, each sample was removed from the sampler and visually classified by the ECS geotechnical professional. Representative portions of each sample were then sealed and brought to our laboratory in Marietta, Georgia for further visual examination and laboratory testing by ECS. In addition to the split spoon samples. Bulk samples were collected from the auger cuttings at each test location.

2.2 LABORATORY TESTING

Classification and index property tests were performed by ECS on representative soil samples obtained from the test borings to aid in classifying soils according to the Unified Soil Classification System and to quantify and correlate engineering properties. Laboratory testing included moisture content testing, Atterberg Limits, washed #200 sieve gradation analyses, standard Proctor test, and California Bearing Ratio (CBR) test. The results of the laboratory testing program are included in Attachments below.

Each sample was visually classified based on texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) and including USCS classification symbols, and ASTM D2487 Standard Practice for Classification for Engineering Purposes (Unified Soil Classification System (USCS)). After classification, the samples were grouped in the major zones noted on the boring logs. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

3.0 SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

Data from the soil test borings is attached to this report. 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. We note that the transition between different soil strata is usually less distinct than those shown on the boring logs.

Asphalt Pavement

The existing asphalt pavement at the test locations ranged from about 1 ½ inches to 4 inches in thickness. Pavement thickness variation should be expected within the project limits. At locations B-1 and B-3, asphalt cracks extended through the asphalt core as seen in the attached *Core Photo Log*. At locations B-1 through B-4 and B-6, the graded aggregate base (GAB) layer below the asphalt pavement ranged from approximately 4 inches to 8 inches in thickness. The was no GAB below the asphalt pavement at location B-5.

Fill Materials

Fill may be any material that has been transported and deposited by man. Undocumented fill is considered any man placed materials with no moisture-density records from the time it was originally placed. Materials described as undocumented fill were encountered in Boring B-1 and B-2 extending to a depth of at least 2 feet below the existing pavement surface. The composition of the fill material was variable typically consisting of sandy Silt/elastic Silt (ML/MH).

Residual Soils

Residual soil, formed by in-place weathering of the parent rock, was encountered below the fill material and/or below the pavement section in all the six borings. The residual soil was generally described as sandy Silt (ML) in borings B-1 and B-2, elastic silt (MH) in borings B-3 and B-5 and silty sand (SM) in borings B-4 and B-6.

3.2 GROUNDWATER CONDITIONS

No groundwater seepage was observed in the shallow bore holes advanced during our fieldwork activities.

3.3 LABORATORY TEST RESULTS

Laboratory testing on the selected soils obtained from borings B-1, B-3, B-5, and B-6 between the depths of just below the GAB material and 6 feet indicates that the natural moisture content of the tested soils ranged between 13.3 and 25.7 percent. Laboratory testing indicates that the moisture content of the tested soil samples range from near optimum or above optimum for proper compaction.

The site soils contain high percentages of fine-grained soils, typically about 35.6 to 57.7 percent in the samples tested. These types of soils are moisture sensitive and may be difficult to use as structural fill if the material becomes too wet. The fine-grained soils at the site could require reworking and drying for proper compaction.

Atterberg Limits testing was performed on the bulk soil samples collected at Borings B-1, B-3, and B-5. The testing indicated that the bulk soil samples had liquid limits (LL) of 60, 62, and 61 percent, and a plasticity index (PI) of 29, 27 and 18 percent, respectively.

The liquid limit of the tested soil samples was above the recommended liquid limit of less than 40 for structural fill. In addition, the plasticity index of the tested sample from Borings B-1 and B-3 were above the recommended plasticity index of less than 20 for structural fill. Based on the lab test results, the three bulk samples are classified as elastic Silt (MH) with various amount of sand. ***MH soils are considered poor-quality for pavement support.***

California Bearing Ratio (CBR) testing and Standard Proctor testing was performed in our laboratory on the bulk samples from borings B-1, B-3, B-5, and B-6. Laboratory CBR values ranged from 3.6 to 4.5. Standard Proctor Moisture-Densities tests ranged with a maximum dry density of 99.7 to 113.5 pcf at optimum moistures ranging from 13.9 to 20.8 percent. For additional information please refer to the attached boring logs, laboratory summary, and individual test reports.

3.4 SUMMARY OF PAVEMENT CONDITIONS

The approximate thickness of the asphalt pavement, thickness of graded aggregate base (GAB), and termination depth at each of the boring locations is presented in Table 2. Please refer to the attached individual hand auger logs for more detailed information. The pavement structural number (SN) was determined for each test location and compared to the required City of Tyrone pavement section structural number (SN) to determine the percent underdesigned.

Table 2 – Summary of Existing Pavement and GAB Thicknesses

Boring No.	Street Names Residential (R) Commercial (C)	Approximate Asphalt Thickness (inches)	Approximate Graded Aggregate Base – GAB Thickness (Inches)	Existing Asphalt Structural Number (SN)	Percent Under Designed (%) (1)	Estimated Age of Road (Yrs.)
B-1	Howell Rd. (C)	2	8	1.88	42	32
B-2	Lloyd Ave. (R)	2 ½	6	1.71	25	29
B-3	Lynnwood Ave. (R)	4	6	2.16	5	30+
B-4	Meadowview Dr. (R)	3 ½	6	2.01	12	30+
B-5	Valley View Dr. (R)	4	0	1.20	47	30+
B-6	Northwood Rd. (R)	1 ½	4	1.00	56	30+

Note: (1) Based on City of Tyrone pavement requirements for Residential and commercial roadways.

The following layer coefficients were used for our evaluation.

Table 3 – Layer Coefficients

Material	Layer Coefficient
Asphalt (New, up to 4.5”)	0.44
Asphalt (New, > 4.5”)	0.30
Asphalt (aged, in-place)	0.30
GAB	0.16
FDR	0.24

According to the City of Tyrone codes published by municode.com and based on the roadway classifications provided by POND, we understand the city requires the following pavement sections for residential and commercial roadways:

Table 4 – City of Tyrone Pavement Requirements

Material	Residential Streets Thickness (inches)	Commercial/Minor Collector Street Thickness (inches)
Type F” Asphaltic Concrete Topping (9.25 mm)	1	1½
Type “B” Asphaltic Concrete Binder (19.0 mm)	2	3
Compacted GAB Base	6	8
Structural Number (SN)	2.28	3.26

Based on the required pavement section structural number SN, it appears that the pavements within the subject study area and at the locations we evaluated ranged from 5 percent to 56 percent under designed and do not meet the City's pavement requirements.

4.0 PAVEMENT DISTRESS OBSERVATIONS

4.1 PAVEMENT ASSESSMENT

The common types of pavement distresses we observed included Longitudinal and transverse cracking, block cracking and load cracking. Some of the typical causes of pavement deterioration include traffic loading; environment or climate influences; drainage deficiencies; material quality problems; construction deficiencies; and external contributors such as utility cuts. These pavement distresses are defined below.

> **Load cracking:** Load cracking is sometimes called alligator cracking due to the interconnected cracks which resemble an alligator skin. Load cracking is caused by load-related deterioration resulting from a weakened base course or subgrade, too little pavement thickness, overloading, or a combination of these factors.
>
> **Block cracking:** Block cracking is a series of large (typically one foot or more), rectangular cracks on an asphalt pavement surface. This type of cracking typically covers large areas and may occur in areas where there is no traffic. Block cracking is typically caused by shrinkage of the asphalt pavement due to temperature cycles.
>
> **Longitudinal cracking**: Longitudinal cracking occurs parallel to the centerline of the pavement. These types of cracks can be caused by a poorly constructed joint; shrinkage of the asphalt layer; cracks reflecting up from an underlying layer; and longitudinal segregation due to improper paver operation. These cracks are not load-related.
>
> **Transverse cracking:** Transverse cracking occurs roughly perpendicular to the centerline of the pavement. They can be caused similarly as longitudinal cracking and are not load-related.

5.0 RECOMMENDATIONS

5.1 PAVEMENT REPAIR OPTIONS

Based on the results of our field observations and laboratory services as well as our experience with similar projects, the primary causes of the pavement distress within the subject study area appears to be underdesigned pavement sections (has an inadequate pavement section thickness) and age of the existing asphalt.

The existing roadway pavement is underdesigned compared to the City's requirements. As pavement ages, it becomes brittle and requires increased maintenance. We note the pavements have been in place for more than 20 years and in our opinion have reached their useful life. Subgrade soils generally consist of silts with soaked laboratory CBR results that ranged from of 3.6 to 4.5. The sample obtained from Boring B-6 was classified a silty sand and had a CBR of 6.4. The two options we recommend for the rehabilitation of the pavements are Full Depth Reclamation (FDR) and Reconstruction.

FDR is a pavement rehabilitation technique in which the asphalt and underlying aggregate and subbase soils and milled and combined with cement to create a new and stiffer base layer to support a new asphalt. FDR is a predictable process, relatively quick and generally will come with a warranty from the pavement contractor.

Reconstruction would require the removal of the existing asphalt, repair of an unknown quantity of subgrade and the addition of new asphalt. Repair of the subgrade may require stabilizing with a geogrid in some areas. The cost of reconstruction is hard to predict and where poor subgrade conditions are exposed during reconstruction costly change orders could result. Reconstruction is also generally slower to construct than FDR resulting in longer traffic diversions and inconveniences for local residents. The FDR and Reconstruction options are discussed in more detail in the following sections.

5.1.1 Full Depth Reclamation (FDR)

This option includes milling the existing pavement, GAB and subgrade soils and mixing the millings with cement and compacting the mixture to create a firm base to support the new asphalt pavement. The actual mix design for the FDR is typically the responsibility of the contractor. However, we have historically observed cement quantities in the range of 3 to 7 percent by weight used in FDR base material, with 5 to 6 percent the typical percentage used. Laboratory testing is recommended to determine the proper cement dosage for FDR mixing. We recommend performing an FDR mix design to determine the amount of cement needed to create a stable pavement base.

The FDR typically requires a fine-grained material which usually comes from extending tilling below the existing GAB. The FDR method has been used on similar projects in lieu of the traditional remove and replace method to provide an adequate pavement section at a lower cost with improved construction times and less interference of ongoing operations during the pavement rehabilitation/repair. After the FDR is installed, the FDR base is topped with a new asphalt surface course. Table 5 represents the recommendations.

Table 5 – Recommended Minimum FDR Flexible Pavement Section

Material Designation	Residential Streets Thickness (inches)	Commercial/Minor Collector Street Thickness (inches)
Asphalt Surface Course (9.5 mm Type II Superpave)	2 inches	2 inches
Full Depth Reclamation (Base Material)	8 inches (1)	10 inches
Structural Number, SN	2.80	3.28

Note: (1) Minimum recommended FDR thickness 8 inches

5.1.2 Reconstruction

This option includes the complete removal of the existing asphalt and reconstruction per the thicknesses contained in Table 6. After removal, the base surface material should be observed to identify areas of instability. The evaluation should include proofrolling with a loaded dump truck having an axle weight of at least 10 tons or other similar equipment to identify soft or yielding areas. The GAB can stay in place if found to be stable. Based on the laboratory CBR testing and the soils encountered in our test borings, a

GAB thicknesses of 8 inches are recommended for the roadways. Any unstable GAB and/or subgrade will require remediation.

The need for subgrade repair is best determined at the time of construction and could include the replacement of poor subgrade soils with new structural fill or use of a geogrid such as Tensar TriAx TX-140 to stabilize the subgrade, where determined necessary. Stable GAB with insufficient thickness will need to be increased with additional compacted GAB to meet City thickness requirements.

The thickness of a pavement section depends on many factors, including the volume and type of traffic that the proposed pavement will experience, condition of the subgrade materials, desired design life and level of serviceability. The pavement design discussed in this section is based on GDOT guidelines, assuming the subgrades are repaired (as needed) or are unyielding during proofrolling.

We understand the City of Tyrone requires a pavement section with 6 inches of GAB for residential roadways. For residential street we feel the GAB thickness required by the City is thin and should be increased to a total of 8 inches of GAB based on the laboratory CBR testing and the soils encountered in our test borings.

Based on an assumed Annual Average Daily Traffic (AADT) of 1000 vehicles per day with 2% single unit trucks we agree the City's commercial pavement section for the above referenced section of Howell Road will be sufficient for a pavement design life of 20 year with typical maintenance.

Table 5 – Recommended Minimum Flexible Pavement Section

Material Designation	Residential Street Thickness	Commercial/Minor Collector Street Thickness
Asphalt Surface Course (9.5 mm Type II Superpave)	1 inch	1 ½ inches
Asphalt Surface Course (19 mm Type II Superpave)	2 inches	3 inches
Graded Aggregate Base (GAB)	8 inches	8 inches
Structural Number, SN	2.60	3.26

Base course materials beneath pavements should be compacted to at least 98% of their standard Proctor maximum dry density (ASTM D698). The asphalt concrete and all crushed stone materials should conform to the GDOT Standard Specifications.

An important consideration with the design, construction, and performance of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrades and other problems related to weak subgrade can be expected. Furthermore, good drainage should help reduce the possibility of the subgrade materials becoming saturated during the normal service period of the pavement.

5.2 Implications of Elastic Silt (MH)

Elastic Silt (MH) soils of moderately high plasticity were noted at boring locations B-1 (Howell Road), B-3 (Lynnwood Avenue), and B-5 (Valley View Drive). This type of material can occasionally exhibit shrinking and swelling during seasonal moisture fluctuation. In our experience, moderately to highly plastic elastic silt (MH) soils typically have lower strength and result increased maintenance over the life of the pavement.

During construction, these types of materials are difficult to work with if the soil is above the optimum moisture for proper compaction. Laboratory testing performed on the samples of the sandy elastic Silt (MH) indicated moistures in the range of 20 to 26 percent. Our lab test indicates the upper portions of this range of natural moistures would be considered high and could render the subgrade soils unstable.

Some drying and reworking of the sandy elastic Silt subgrades should be anticipated by the owner and contractor for areas that require remediation. The severity of these potential problems depends to a great extent on the weather conditions during pavement repair. A concerted effort should be made to control construction traffic and surface water while subgrade soils are exposed. Depending on the rainfall conditions at the time of construction, the highly plastic soils at these locations may become difficult to dry and potentially require replacement with drier material.

If Reconstruction is selected, we would recommend providing a minimum 12-inch separation between any highly elastic and plastic soils and the bottom of pavement GAB base course. This would help mitigate the effect of the highly plastic material with high shrink/swell properties if encountered during construction. The separation material could consist of low plasticity structural fill or GAB material as discussed in this report below.

5.3 Undercutting and Fill Placement

After subgrade evaluations during Reconstruction of pavements, selective undercutting to remove unstable subgrade or poor-quality elastic silt (MH) soils, appears to be possible. A minimum undercut of 12 inches is recommended. The need for additional undercut should be determined by the onsite ECS representative at the time of construction. Once the excavation has achieved a firm subgrade, the exposed subgrade should be densified in place.

As needed for subgrade repairs, structural fill materials should consist of GAB or granular material with not more than 50 percent passing the No. 200 sieve, a Liquid Limit less than 40 and a Plasticity Index less than 20. Unacceptable fill materials include topsoil, cultivated soil, low density soils with a maximum unit weight less than 95 pcf, organic materials, and highly plastic silts and clays.

Grade control should be maintained throughout the fill placement operations. All fill operations should be observed on a full-time basis by a qualified soil technician from ECS to determine that minimum compaction requirements are being met. A minimum of one compaction test should be performed on every lift placed and per 2,500 square foot area. The elevation and location of the tests should be clearly identified and recorded at the time of fill placement.

Fill materials should be placed in lifts not exceeding 8 inches in loose thickness and moisture conditioned to within +/- 3 percentage points of the optimum moisture content to facilitate proper compaction. Controlled fill soils should be compacted to a minimum of 98% of the maximum dry density obtained in accordance with ASTM D698, Standard Proctor Method. Subgrades should be “nonyielding” as determined by proofroll inspection prior to construction. GAB base course materials should be compacted to at least 98% of their modified Proctor maximum dry density (ASTM D1557).

6.0 ADDITIONAL TESTING AND EVALUATION

As mentioned previously, two options are provided in the recommendations. If FDR is selected ECS would like to remain involved with the preliminary design of the FDR. Both recommendations will require field observation, monitoring, and quality assurance testing during earthwork and pavement installation are an extension of and integral to the geotechnical design recommendation. We recommend that Pond & Company and the City of Tyrone retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases to provide general consultation if any issues arise.

7.0 CLOSING

This letter report has been prepared in accordance with generally accepted geotechnical engineering practice. No warranty is expressed or implied. The findings presented in this letter are based on the available project information, as well as on the results of the exploration.

This report is provided for the exclusive use of Pond & Company and their project specific design team. This report is not intended to be used or relied upon in connection with other projects or by other third parties. ECS disclaims liability for any such third-party use or reliance without express written permission.

Sincerely,

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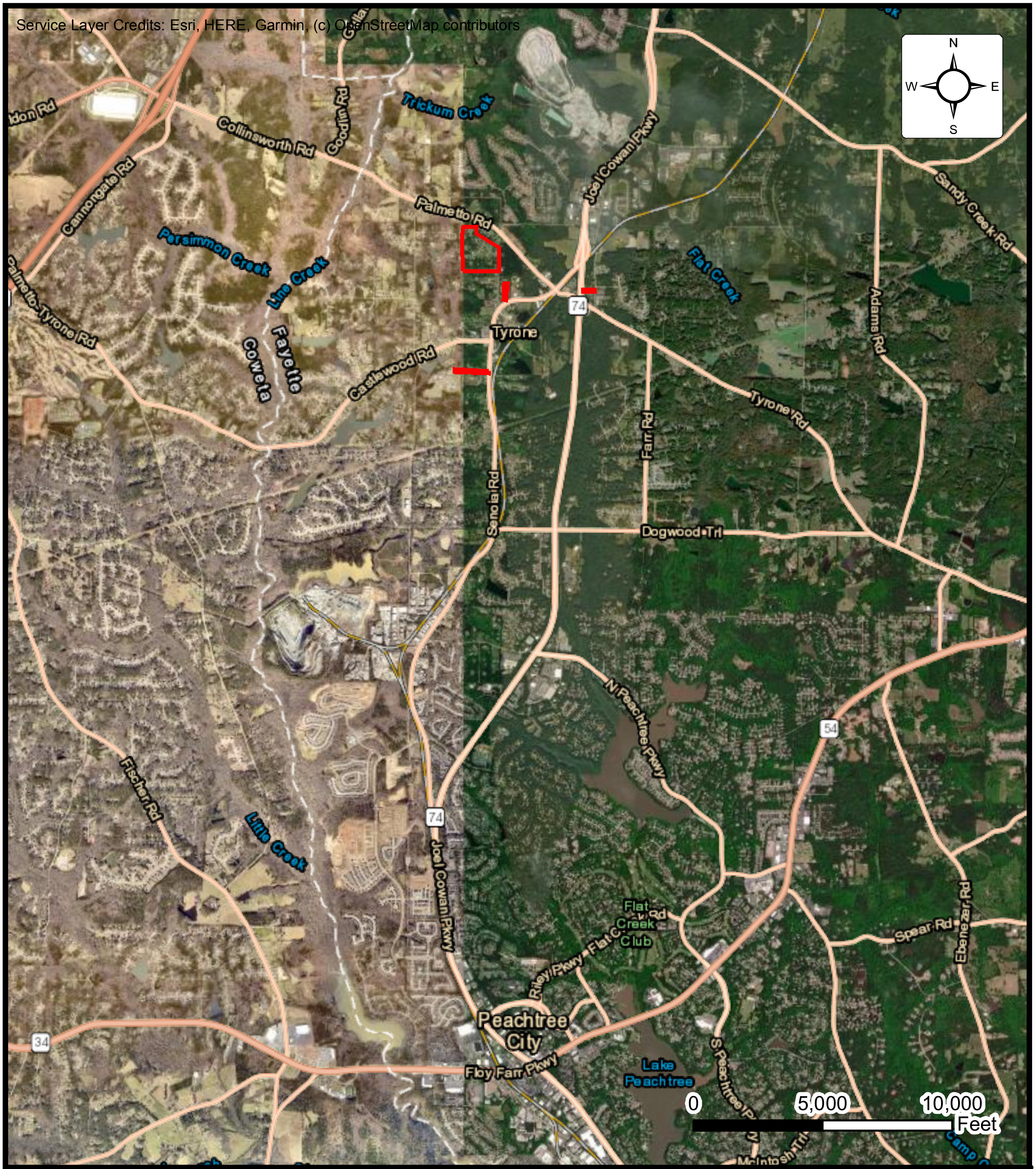
GEORGIA REGISTERED PROFESSIONAL ENGINEER
1-10-23
No. 29715
ROBERT HOLMES BARNES

Attachments:

- Figure 1 – Site Location Diagram
- Figure 2 – Boring Location Plan
- Core Photo Log
- Site Photo Log
- Reference Notes for Boring Logs
- Boring Logs
- Laboratory Testing Summary
- Liquid and Plastic Limits Test Report
- Moisture-Density Relationship Curves
- CBR Test Results
- GBA Important Information About This Geotechnical-Engineering Report



Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors

SITE LOCATION DIAGRAM

TYRONE - TO #8 - ROADWAY
TYRONE, GEORGIA

POND & COMPANY

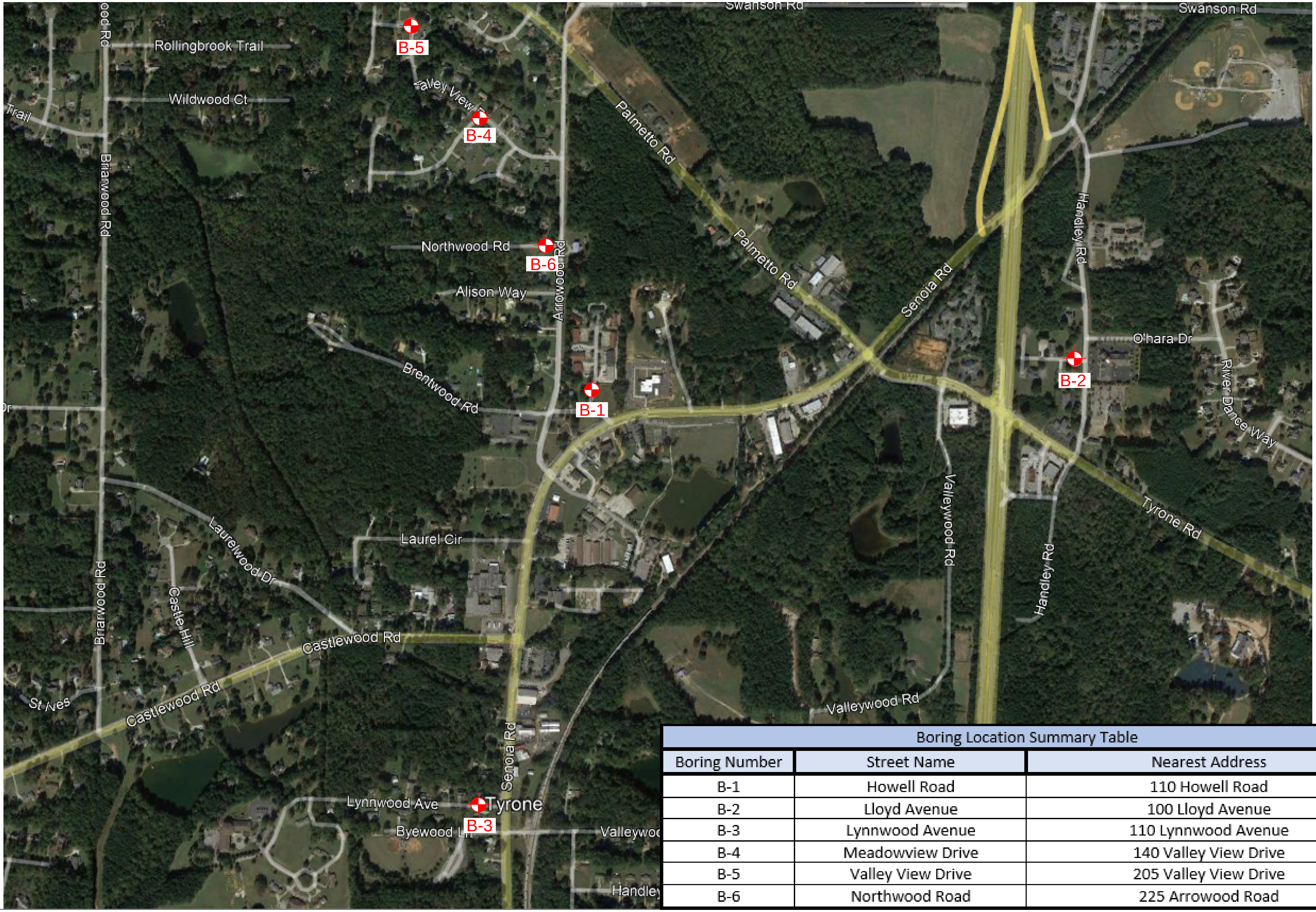
ENGINEER
RHB

SCALE
AS NOTED

PROJECT NO.
10:11619

FIGURE
1

DATE
9/30/2022



Boring Location Summary Table		
Boring Number	Street Name	Nearest Address
B-1	Howell Road	110 Howell Road
B-2	Lloyd Avenue	100 Lloyd Avenue
B-3	Lynnwood Avenue	110 Lynnwood Avenue
B-4	Meadowview Drive	140 Valley View Drive
B-5	Valley View Drive	205 Valley View Drive
B-6	Northwood Road	225 Arrowood Road

LEGEND

⌖	Approximate Boring Location
B-#	Boring Designation

NORTH

PROJECT:
TYRONE - TO #8 - ROADWAY

PREPARED FOR:
POND & COMPANY

FIGURE NAME:
TEST LOCATION DIAGRAM

REFERENCE:
GOOGLE EARTH

REVISIONS

JOB NO.	10:11619	
SCALE	NOT TO SCALE	
DRAWN	TKS	11/2022
APPR.	TKS	11/2022

Figure No.:
2

ECS Southeast, LLP
1281 Kennestone Circle
Suite 200
Marietta, GA 30066
Phone: 770-590-1971

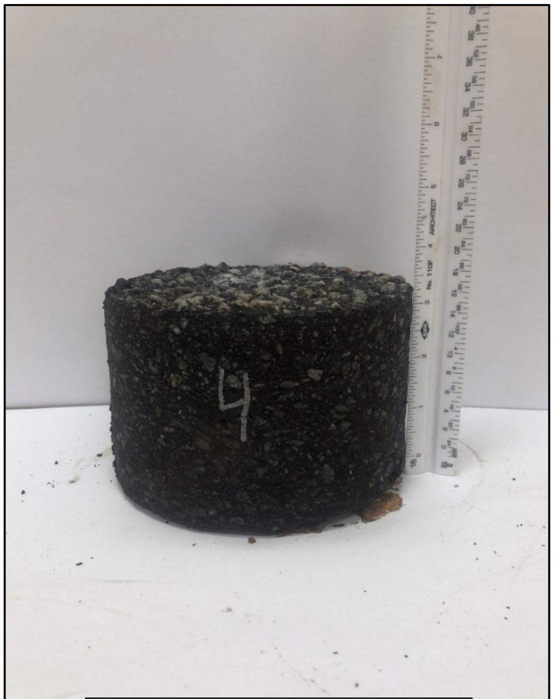
CORE PHOTO LOG

Project Name: Tyrone - TO #8 - Roadway Resurfacing	Project Number: 10:11619
Project Location: Tyrone, GA	Date: 11/6/2022

B-1 Asphalt Core

B-2 Asphalt Core

B-3 Asphalt Core



B-4 Asphalt Core

ECS Southeast, LLP
1281 Kennestone Circle
Suite 200
Marietta, GA 30066
Phone: 770-590-1971

CORE PHOTO LOG

Project Name: Tyrone - TO #8 - Roadway Resurfacing	Project Number: 10:11619
Project Location: Tyrone, GA	Date: 11/6/2022

B-5 Asphalt Core

B-6 Asphalt Core

ECS Southeast, LLP
1281 Kennestone Circle
Suite 200
Marietta, GA 30066
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SITE PHOTO LOG

Project Name: Tyrone - TO #8 - Roadway Resurfacing	Project Number: 10:11619
Project Location: Tyrone, GA	Date: 11/6/2022

B-1 Looking North

B-2 Looking West

SITE PHOTO LOG

Project Name: Tyrone - TO #8 - Roadway Resurfacing	Project Number: 10:11619
Project Location: Tyrone, GA	Date: 11/6/2022

B-3 Looking East

B-4 Looking Northeast

SITE PHOTO LOG

Project Name: Tyrone - TO #8 - Roadway Resurfacing	Project Number: 10:11619
Project Location: Tyrone, GA	Date: 11/6/2022

B-5 Looking South

B-6 Looking South

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]

	ASPHALT	
	CONCRETE	
	GRAVEL	
	TOPSOIL	
	VOID	
	BRICK	
	AGGREGATE BASE COURSE	
GW	WELL-GRADED GRAVEL	gravel-sand mixtures, little or no fines
GP	POORLY-GRADED GRAVEL	gravel-sand mixtures, little or no fines
GM	SILTY GRAVEL	gravel-sand-silt mixtures
GC	CLAYEY GRAVEL	gravel-sand-clay mixtures
SW	WELL-GRADED SAND	gravelly sand, little or no fines
SP	POORLY-GRADED SAND	gravelly sand, little or no fines
SM	SILTY SAND	sand-silt mixtures
SC	CLAYEY SAND	sand-clay mixtures
ML	SILT	non-plastic to medium plasticity
MH	ELASTIC SILT	high plasticity
CL	LEAN CLAY	low to medium plasticity
CH	FAT CLAY	high plasticity
OL	ORGANIC SILT or CLAY	non-plastic to low plasticity
OH	ORGANIC SILT or CLAY	high plasticity
PT	PEAT	highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, QP[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS[6]

▽	WL (First Encountered)
▼	WL (Completion)
▼	WL (Seasonal High Water)
▽	WL (Stabilized)

FILL AND ROCK

🟥	🟪	□	🟩
FILL	POSSIBLE FILL	PROBABLE FILL	ROCK

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[1] Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2] To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3] Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4] Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5] Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

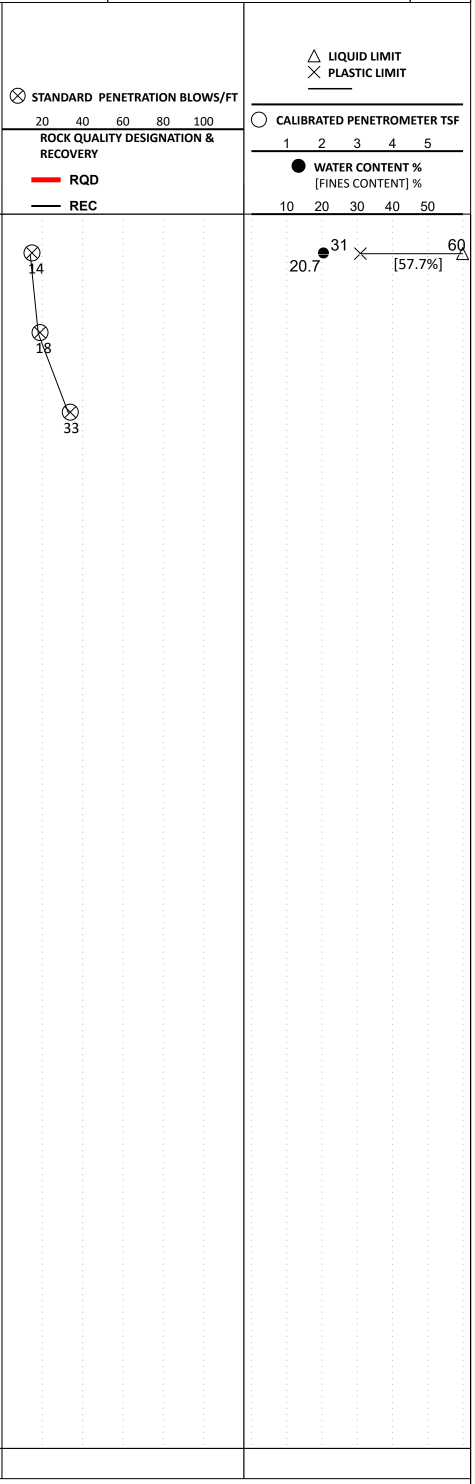
[6] The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7] Minor deviation from ASTM D 2488-17 Note 14.

[8] Percentages are estimated to the nearest 5% per ASTM D 2488-17.

CLIENT: **Pond & Company**	PROJECT NO.: **10:11619**	BORING NO.: **B-1**	SHEET: **1 of 1**
PROJECT NAME: **Tyrone - TO #8 - Roadway Resurfacing**	DRILLER/CONTRACTOR: **Sunrise Drilling Inc.**		
SITE LOCATION: **Northwood Road, Tyrone, Georgia, 30290**		LOSS OF CIRCULATION	⟩100%⟩
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **983+/-**
		BOTTOM OF CASING	▶

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
	S-1	SS	24	24	Asphalt Thickness[2"] Gravel Thickness[8"]			6-6-8-9 (14)
	S-2	SS	24	24	(MH FILL) SANDY ELASTIC SILT, contains slight roots and rock fragments, reddish brown to orangish brown, moist, very stiff			8-9-9-9 (18)
5	S-3	SS	24	24	(ML) SANDY SILT, reddish brown to tannish brown, moist, very stiff to hard		978	14-18-15-25 (33)
					END OF BORING AT 6 FT			
10							973	
15							968	
20							963	
25							958	
30							953	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)		BORING STARTED: **Nov 02 2022**		CAVE IN DEPTH:
▼ WL (Completion)	**Not Encountered**	BORING COMPLETED: **Nov 02 2022**		HAMMER TYPE: **Manual**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV**	LOGGED BY: **TKS3**	DRILLING METHOD: **Auger**
▽ WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Pond & Company	**10:11619**	**B-2**	**1 of 1**

PROJECT NAME: **Tyrone - TO #8 - Roadway Resurfacing**

DRILLER/CONTRACTOR: **Sunrise Drilling Inc.**

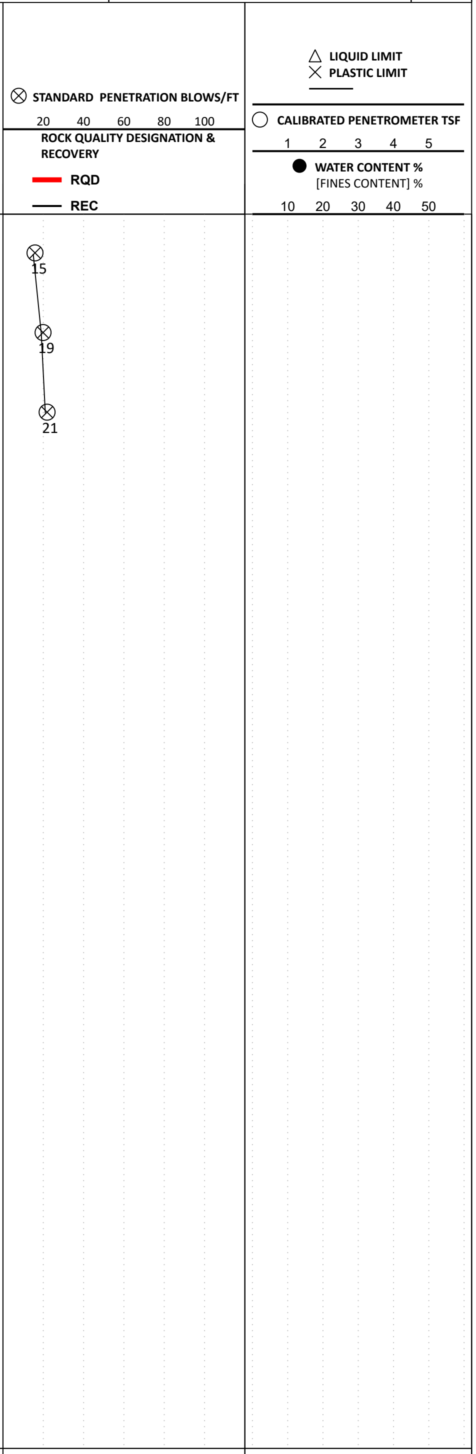
SITE LOCATION: **Northwood Road, Tyrone, Georgia, 30290**

LOSS OF CIRCULATION

BOTTOM OF CASING

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
			992+/-

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
	S-1	SS	24	24	Asphalt Thickness[2 1/2"] Gravel Thickness[6"]			6-6-9-10 (15)
	S-2	SS	24	24	(ML FILL) SANDY SILT, contains slight rock fragments, reddish brown, moist, very stiff			8-9-10-12 (19)
5	S-3	SS	24	24	(ML) SANDY SILT, contains mica, reddish brown, moist, very stiff		987	8-10-11-13 (21)
					END OF BORING AT 6 FT			
10							982	
15							977	
20							972	
25							967	
30							962	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)		BORING STARTED: **Nov 02 2022**	CAVE IN DEPTH:
▼ WL (Completion)	**Not Encountered**	BORING COMPLETED: **Nov 02 2022**	HAMMER TYPE: **Manual**
▼ WL (Seasonal High Water)		EQUIPMENT: **ATV** / LOGGED BY: **TKS3**	DRILLING METHOD: **Auger**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Pond & Company	**10:11619**	**B-3**	**1 of 1**

PROJECT NAME: **Tyrone - TO #8 - Roadway Resurfacing**

DRILLER/CONTRACTOR: **Sunrise Drilling Inc.**

SITE LOCATION: **Northwood Road, Tyrone, Georgia, 30290**

LOSS OF CIRCULATION

BOTTOM OF CASING

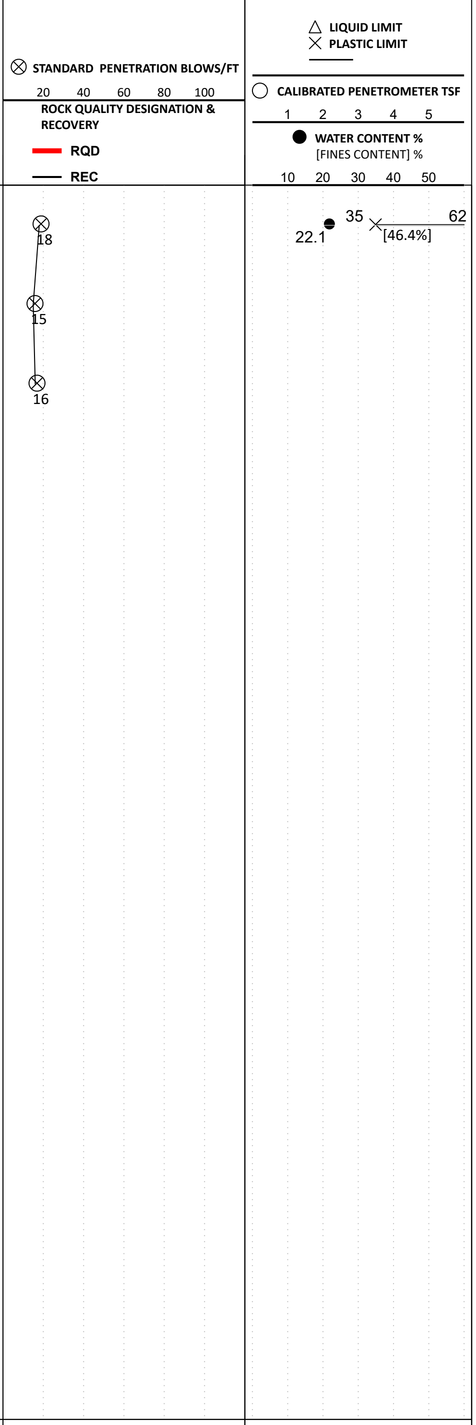
NORTHING:

EASTING:

STATION:

SURFACE ELEVATION: **983+/-**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
	S-1	SS	24	24	Asphalt Thickness[4"] Gravel Thickness[6"]			7-8-10-13 (18)
	S-2	SS	24	24	(MH) SANDY ELASTIC SILT, reddish brown to tannish brown, moist, very stiff			7-8-7-9 (15)
5	S-3	SS	24	24	(SM) SILTY SAND, contains mica, reddish brown to tannish brown, moist, medium dense		978	6-7-9-13 (16)
					END OF BORING AT 6 FT			
10							973	
15							968	
20							963	
25							958	
30							953	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)

▼ WL (Completion) **Not Encountered**

▼ WL (Seasonal High Water)

▽ WL (Stabilized)

BORING STARTED: **Nov 02 2022**

BORING COMPLETED: **Nov 02 2022**

EQUIPMENT: **ATV**

LOGGED BY: **TKS3**

CAVE IN DEPTH:

HAMMER TYPE: **Manual**

DRILLING METHOD: **Auger**

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Pond & Company**

PROJECT NO.: **10:11619**

BORING NO.: **B-4**

SHEET: **1 of 1**

PROJECT NAME: **Tyrone - TO #8 - Roadway Resurfacing**

DRILLER/CONTRACTOR: **Sunrise Drilling Inc.**

SITE LOCATION: **Northwood Road, Tyrone, Georgia, 30290**

LOSS OF CIRCULATION 100%

BOTTOM OF CASING

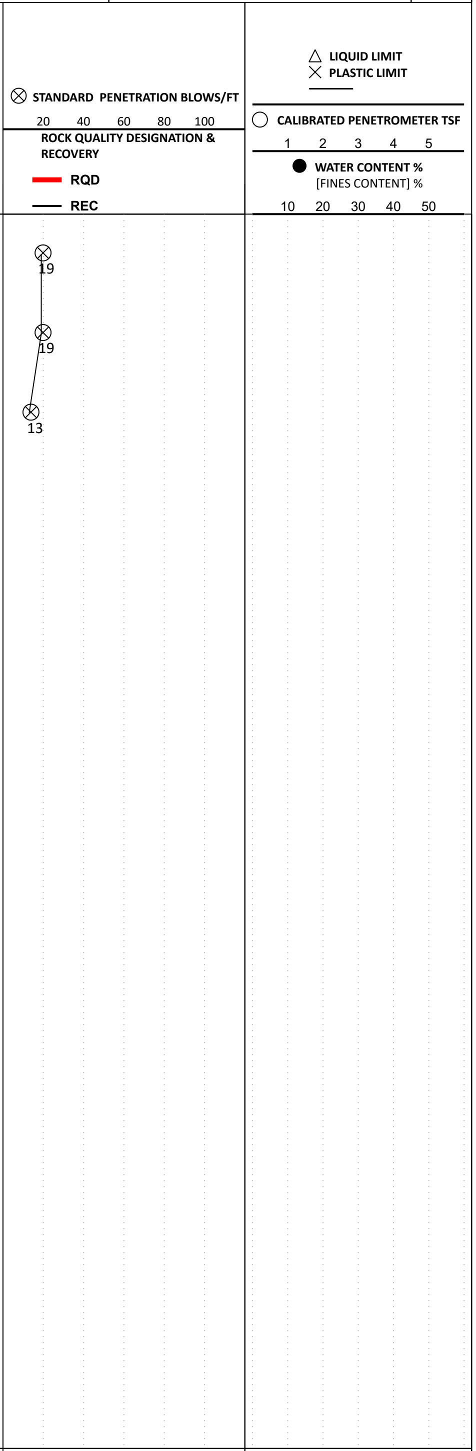
NORTHING:

EASTING:

STATION:

SURFACE ELEVATION: **958+/-**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
	S-1	SS	24	24	Asphalt Thickness[3 1/2"] Gravel Thickness[6"]			6-8-11-13 (19)
	S-2	SS	24	24	(SM) SILTY SAND, contains slight mica, reddish brown to tannish brown, moist, medium dense			6-8-11-13 (19)
5	S-3	SS	24	24			953	6-6-7-9 (13)
					END OF BORING AT 6 FT			
10							948	
15							943	
20							938	
25							933	
30							928	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered)

WL (Completion) **Not Encountered**

WL (Seasonal High Water)

WL (Stabilized)

BORING STARTED: **Nov 02 2022**

BORING COMPLETED: **Nov 02 2022**

EQUIPMENT: **ATV**

LOGGED BY: **TKS3**

CAVE IN DEPTH:

HAMMER TYPE: **Manual**

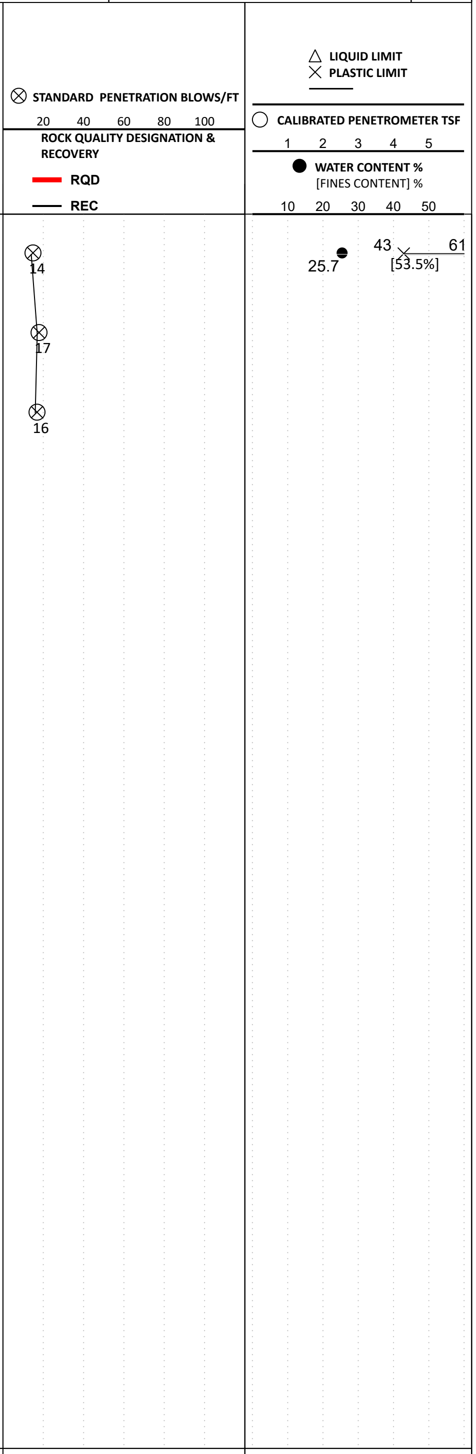
DRILLING METHOD: **Auger**

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Pond & Company**
PROJECT NO.: **10:11619**
BORING NO.: **B-5**
SHEET: **1 of 1**
PROJECT NAME: **Tyrone - TO #8 - Roadway Resurfacing**
DRILLER/CONTRACTOR: **Sunrise Drilling Inc.**
SITE LOCATION: **Northwood Road, Tyrone, Georgia, 30290**
NORTHING:
EASTING:
STATION:
SURFACE ELEVATION: **942+/-**

LOSS OF CIRCULATION ⟩100%⟩
BOTTOM OF CASING ▶

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Asphalt Thickness[4"]			
	S-1	SS	24	24	(MH) SANDY ELASTIC SILT, contains slight mica, reddish brown to tannish brown, moist, stiff to very stiff			6-6-8-11 (14)
	S-2	SS	24	24				8-8-9-10 (17)
5	S-3	SS	24	24			937	6-8-8-9 (16)
					END OF BORING AT 6 FT			
10							932	
15							927	
20							922	
25							917	
30							912	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

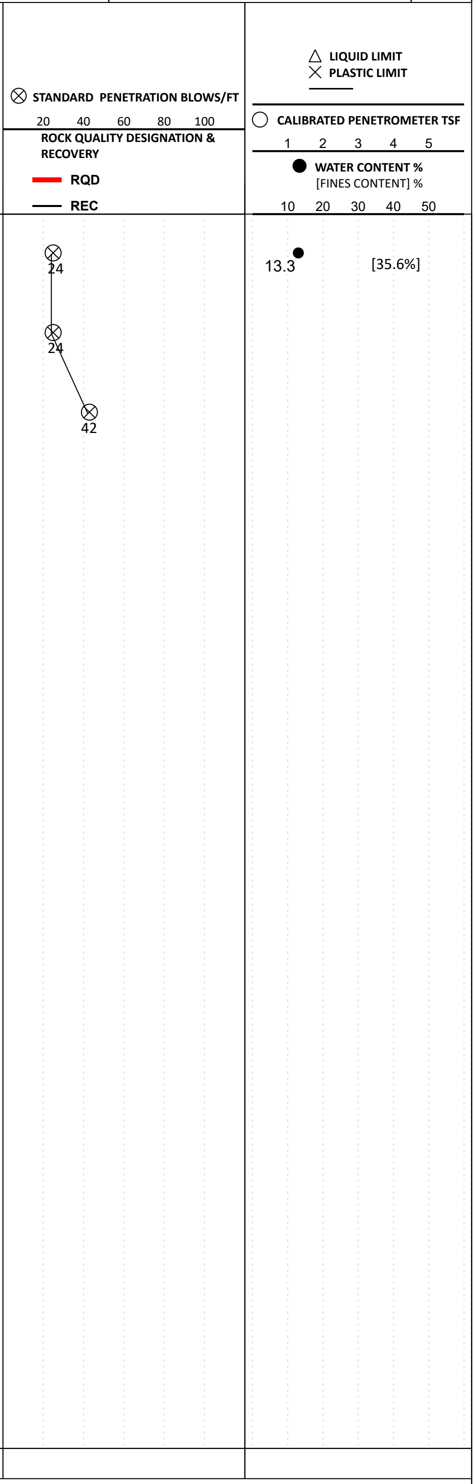
▽ WL (First Encountered)
▼ WL (Completion) **Not Encountered**
▼ WL (Seasonal High Water)
▽ WL (Stabilized)

BORING STARTED: **Nov 02 2022**
BORING COMPLETED: **Nov 02 2022**
EQUIPMENT: **ATV**
LOGGED BY: **TKS3**
CAVE IN DEPTH:
HAMMER TYPE: **Manual**
DRILLING METHOD: **Auger**

GEOTECHNICAL BOREHOLE LOG

CLIENT: **Pond & Company**	PROJECT NO.: **10:11619**	BORING NO.: **B-6**	SHEET: **1 of 1**
PROJECT NAME: **Tyrone - TO #8 - Roadway Resurfacing**	DRILLER/CONTRACTOR: **Sunrise Drilling Inc.**		
SITE LOCATION: **Northwood Road, Tyrone, Georgia, 30290**		LOSS OF CIRCULATION	
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION: **966+/-**
		BOTTOM OF CASING	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Asphalt Thickness[1 1/2"]			
	S-1	SS	24	24	Gravel Thickness[4"]			12-12-12-18 (24)
	S-2	SS	24	24	(SM) SILTY SAND, contains rock fragments, reddish brown, moist, medium dense to dense			11-11-13-18 (24)
5	S-3	SS	24	24			961	20-20-22-22 (42)
					END OF BORING AT 6 FT			
10							956	
15							951	
20							946	
25							941	
30							936	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)		BORING STARTED: **Nov 02 2022**	CAVE IN DEPTH:
▼ WL (Completion)	**Not Encountered**	BORING COMPLETED: **Nov 02 2022**	HAMMER TYPE: **Manual**
WL (Seasonal High Water)		EQUIPMENT: **ATV** / LOGGED BY: **TKS3**	DRILLING METHOD: **Auger**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-1	S-1	0-2	20.7	MH	60	31	29	57.7	102.7	20.2	4.1	3.9	
B-3	S-1	0-2	22.1	MH	62	35	27	46.4	100.1	20.6	4.1	3.6	
B-5	S-1	0-2	25.7	MH	61	43	18	53.5	99.7	20.8	4.3	4.5	
B-6	S-1	0-2	13.3	SM				35.6	113.5	13.9	6.1	6.4	

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

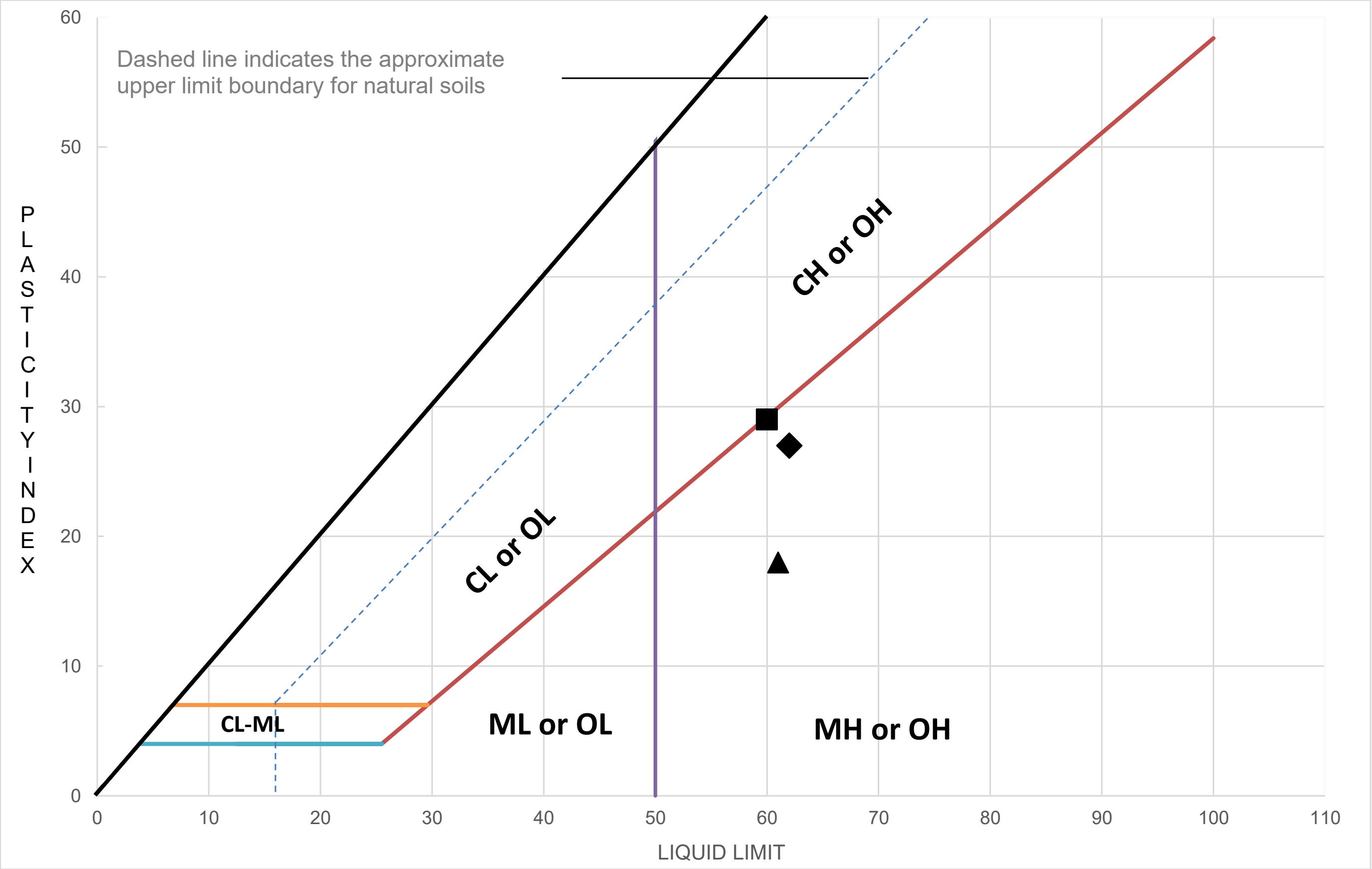
Project: Tyrone - TO #8 - Roadway Resurfacing
Client: Pond & Company

Project No.: 10:11619
Date Reported: 11/15/2022

Office / Lab	Address	Office Number
ECS Southeast LLP - Marietta	1281 Kennestone Circle NE Suite 200 Marietta, GA 30066	(770)590-1971

Tested by	Checked by	Approved by	Date Received
KShah	KShah	KShah	11/4/2022

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (SINGLE POINT TEST))

	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	USCS	Material Description
■	B-1	S-1	0-2	60	31	29		57.7		MH	Bulk
◆	B-3	S-1	0-2	62	35	27		46.4		MH	Bulk
▲	B-5	S-1	0-2	61	43	18		53.5		MH	Bulk

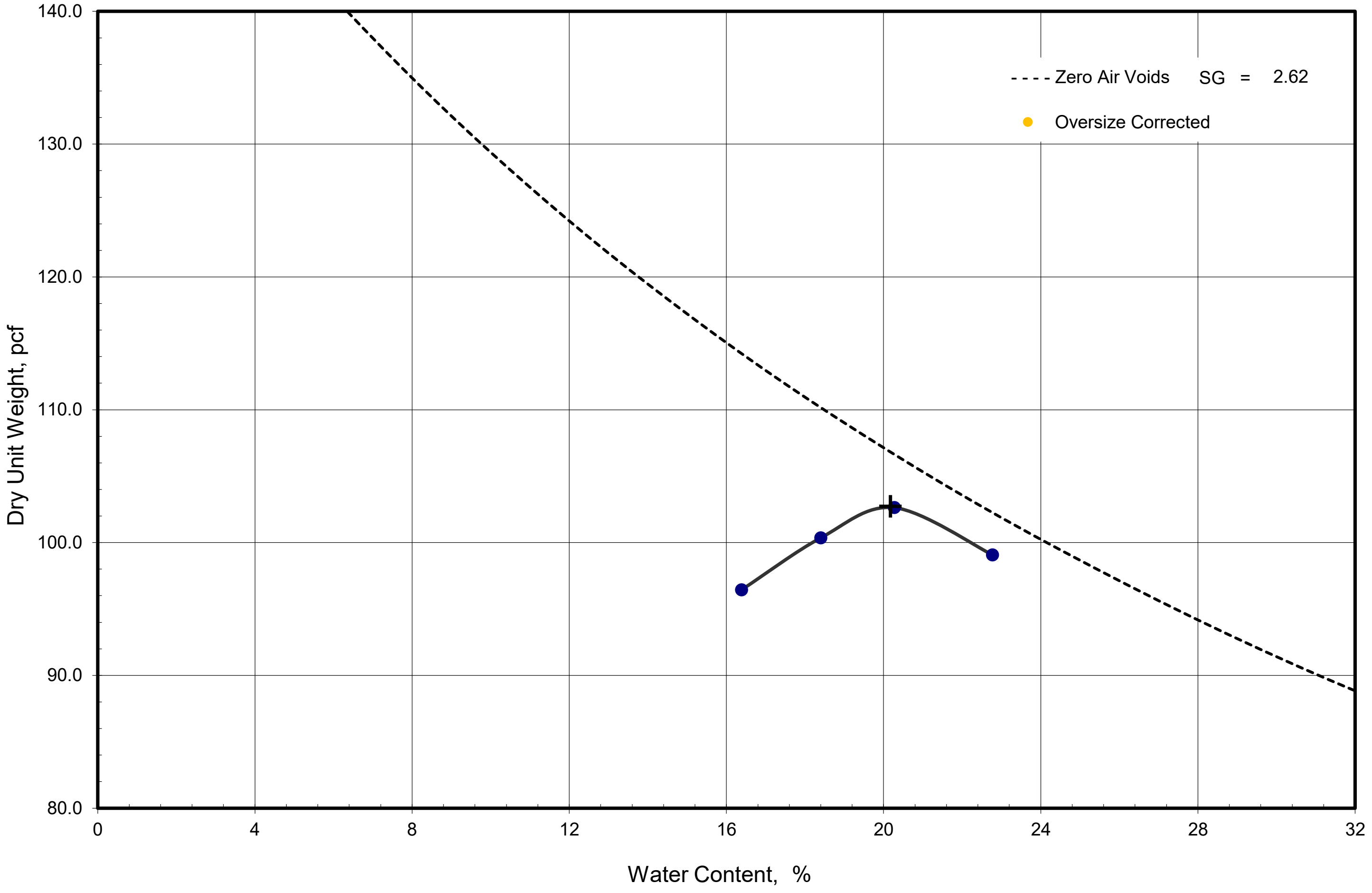
Project: Tyrone - TO #8 - Roadway Resurfacing
Client: Pond & Company

Project No.: 10:11619
Date Reported: 11/15/2022

Office / Lab	Address	Office Number
ECS Southeast LLP - Marietta	1281 Kennestone Circle NE Suite 200 Marietta, GA 30066	(770)590-1971

Tested by	Checked by	Approved by	Date Received
KShah	KShah	KShah	11/4/2022

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content	**20.2**	%
Maximum Dry Unit Weight	**102.7**	pcf

Cumulative material retained on:

3/4 in. sieve	0.0	%
3/8 in. sieve		%
#4 sieve		%

Preparation	ASTM dry preparation method	
Type of rammer	Manual - 5.5lbf (24.5N)	
Test Specfication / Method	ASTM D698-12e2-method A	
Specific gravity - D854 water pycnometer	2.62	Historical
Coarse Aggregate Specific Gravity -		

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
BULK	20.7	60	29	57.7	MH	

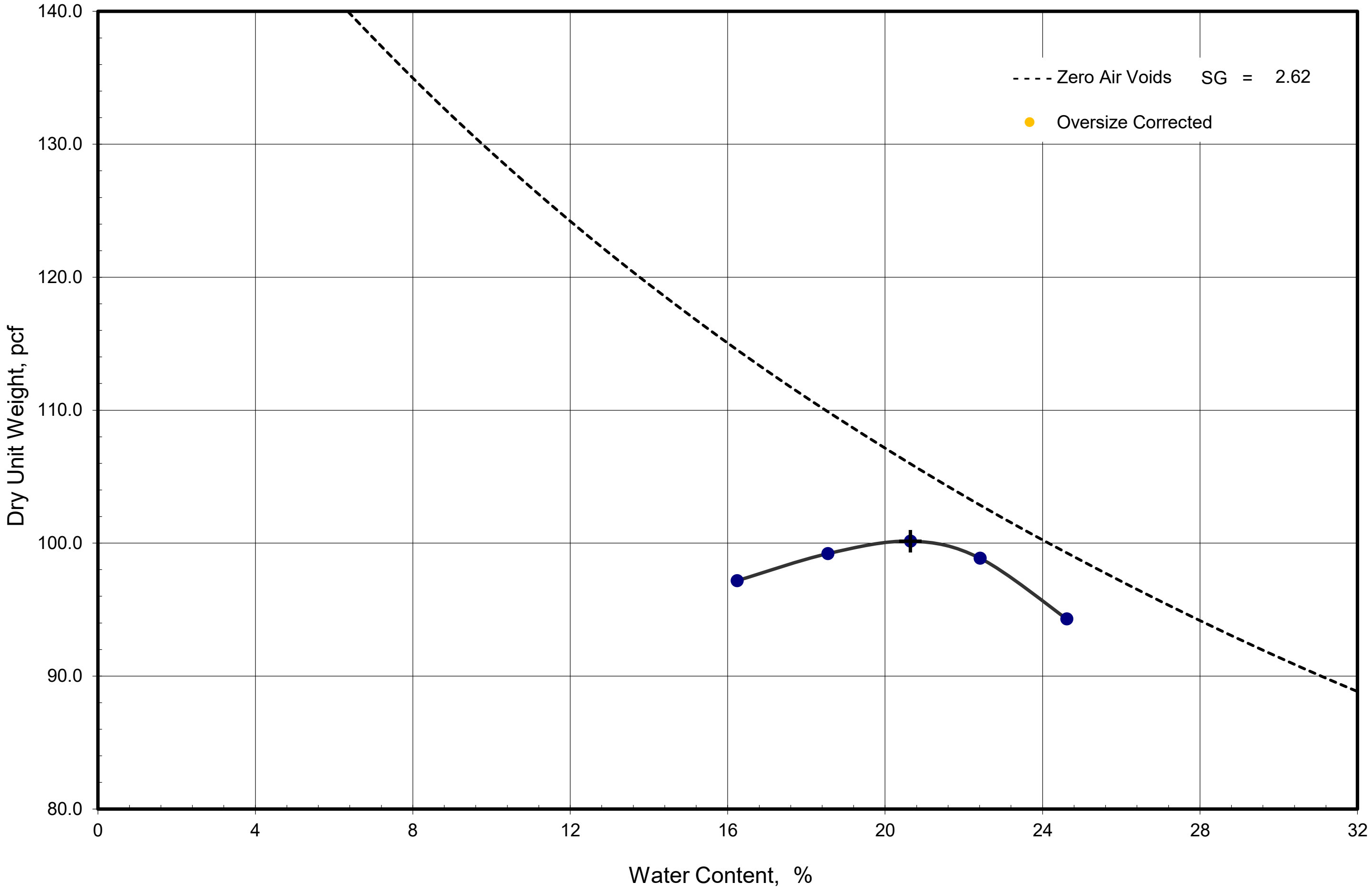
Project: Tyrone - TO #8 - Roadway Resurfacing
Client: Pond & Company
Sample / Source B-1
Test Reference/No.:

Project No.: 10:11619
Depth (ft.): 0 - 5
Sample No.: Bulk
Date Reported: 11/15/2022

Office / Lab	Address	Office Number
ECS Southeast LLP - Marietta	1281 Kennestone Circle NE Suite 200 Marietta, GA 30066	(770)590-1971

Tested by	Checked by	Approved by	Date Received	Remarks
KShah	KShah	KShah	11/4/2022	

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content	**20.6**	%
Maximum Dry Unit Weight	**100.1**	pcf

Cumulative material retained on:	3/4 in. sieve	0.0	%
	3/8 in. sieve		%
	#4 sieve		%

Preparation	ASTM dry preparation method	
Type of rammer	Manual - 5.5lbf (24.5N)	
Test Specfication / Method	ASTM D698-12e2-method A	
Specific gravity - D854 water pycnometer	2.62	Historical
Coarse Aggregate Specific Gravity -		

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Bulk	22.1	62	27	46.4	MH	

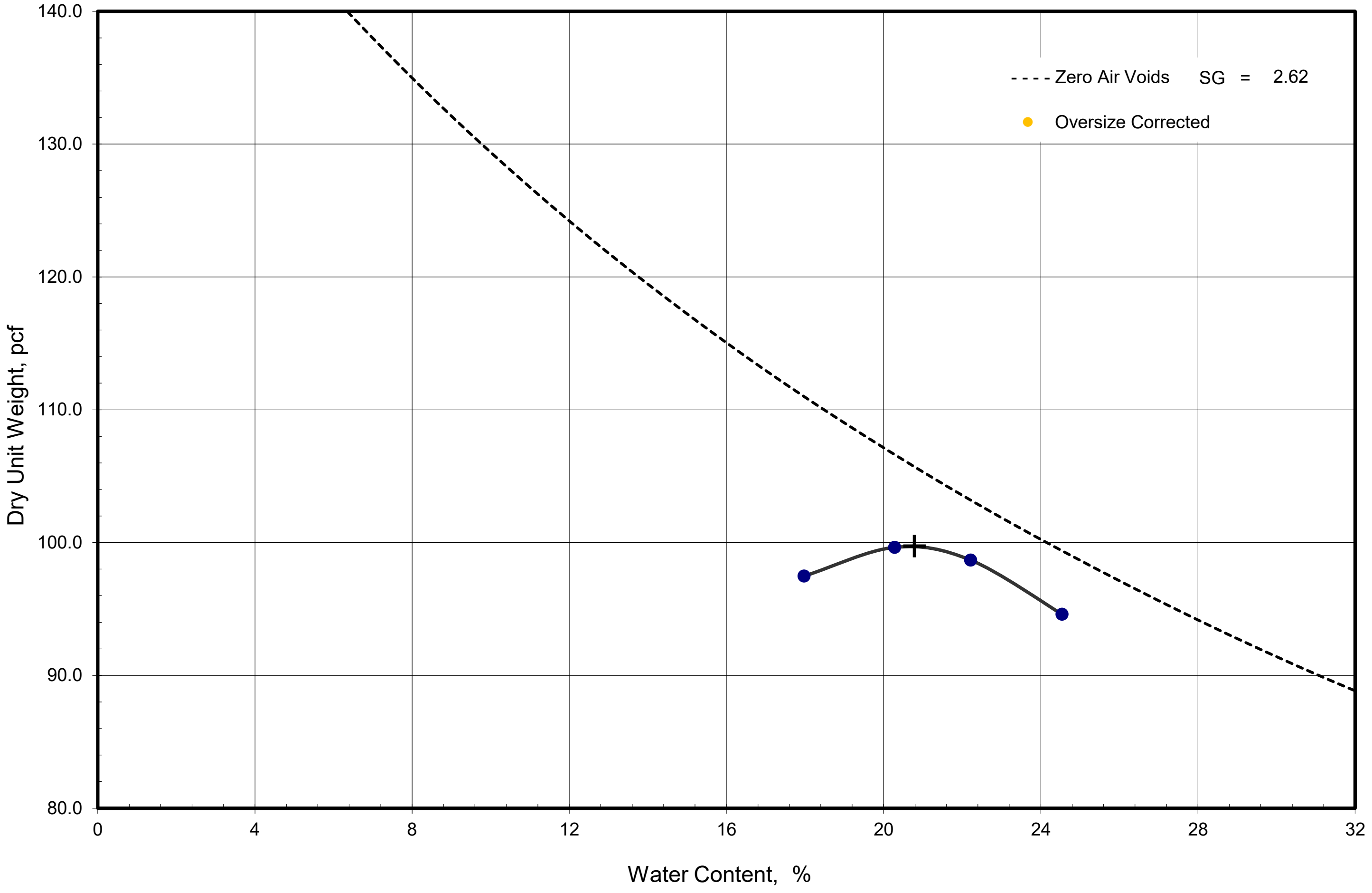
Project: Tyrone - TO #8 - Roadway Resurfacing
Client: Pond & Company
Sample / Source B-3
Test Reference/No.:

Project No.: 10:11619
Depth (ft.): 0 - 5
Sample No.: Bulk
Date Reported: 11/15/2022

Office / Lab	Address	Office Number
ECS Southeast LLP - Marietta	1281 Kennestone Circle NE Suite 200 Marietta, GA 30066	(770)590-1971

Tested by	Checked by	Approved by	Date Received	Remarks
KShah	KShah	KShah	11/4/2022	

Laboratory Compaction Characteristics of Soil
Using Standard Effort



Optimum Moisture Content	**20.8**	%
Maximum Dry Unit Weight	**99.7**	pcf

Cumulative material retained on:	3/4 in. sieve	0.0	%
	3/8 in. sieve		%
	#4 sieve		%

Preparation	ASTM dry preparation method	
Type of rammer	Manual - 5.5lbf (24.5N)	
Test Specfication / Method	ASTM D698-12e2-method A	
Specific gravity - D854 water pycnometer	2.62	Historical
Coarse Aggregate Specific Gravity -		

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Bulk	25.7	61	18	53.5	MH	

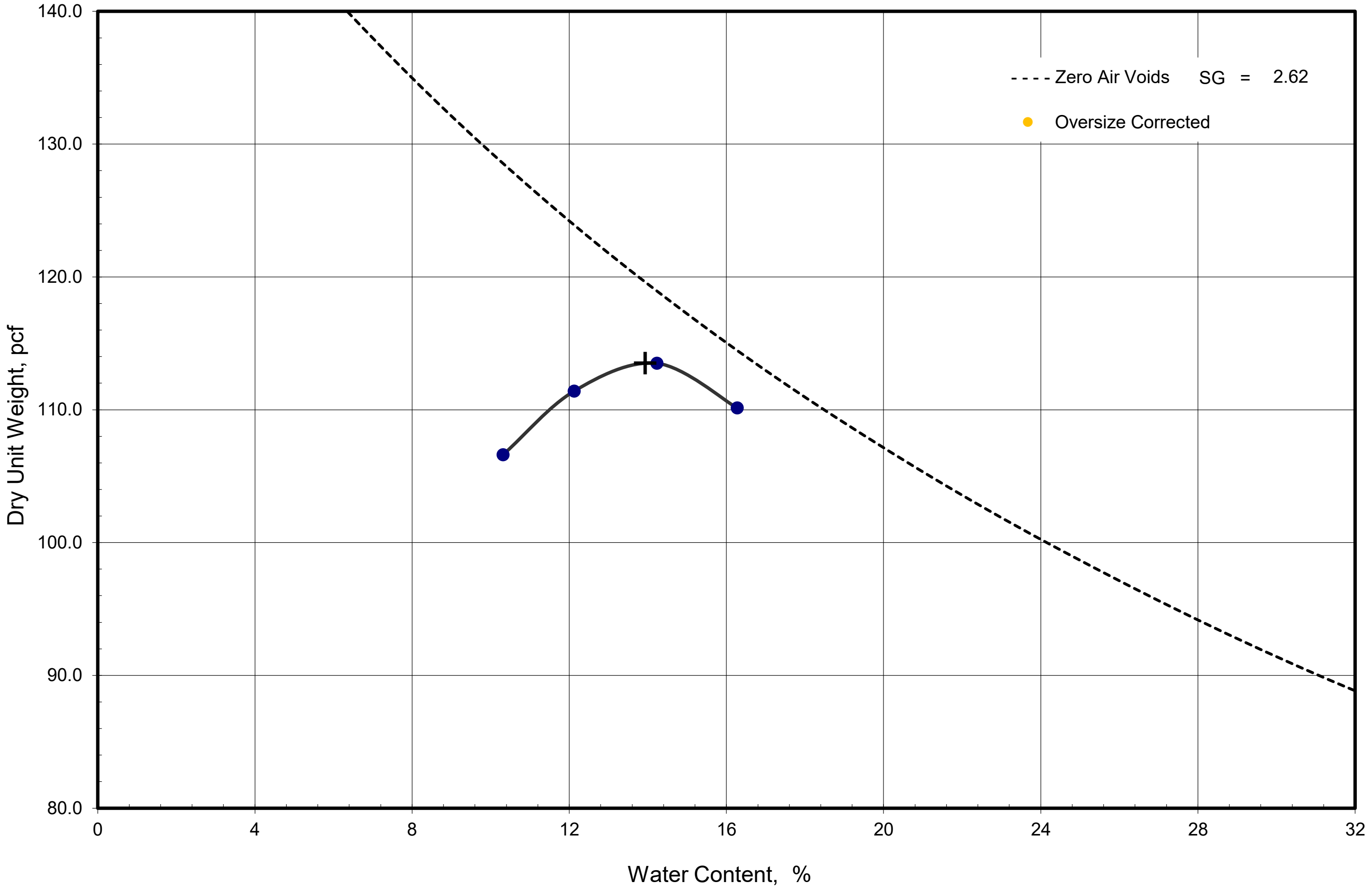
Project: Tyrone - TO #8 - Roadway Resurfacing
Client: Pond & Company
Sample / Source B-5
Test Reference/No.:

Project No.: 10:11619
Depth (ft.): 0 - 5
Sample No.: Bulk
Date Reported: 11/15/2022

Office / Lab	Address	Office Number
ECS Southeast LLP - Marietta	1281 Kennestone Circle NE Suite 200 Marietta, GA 30066	(770)590-1971

Tested by	Checked by	Approved by	Date Received	Remarks
KShah	KShah	KShah	11/4/2022	

Laboratory Compaction Characteristics of Soil Using Standard Effort



Optimum Moisture Content **13.9** %

Maximum Dry Unit Weight **113.5** pcf

Preparation	ASTM dry preparation method
Type of rammer	Manual - 5.5lbf (24.5N)
Test Specfication / Method	ASTM D698-12e2-method A
Specific gravity - D854 water pycnometer	2.62 Historical
Coarse Aggregate Specific Gravity -	

Cumulative material retained on:

3/4 in. sieve	0.0	%
3/8 in. sieve		%
#4 sieve		%

Soil Description	Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Bulk	13.3			35.6	SM	

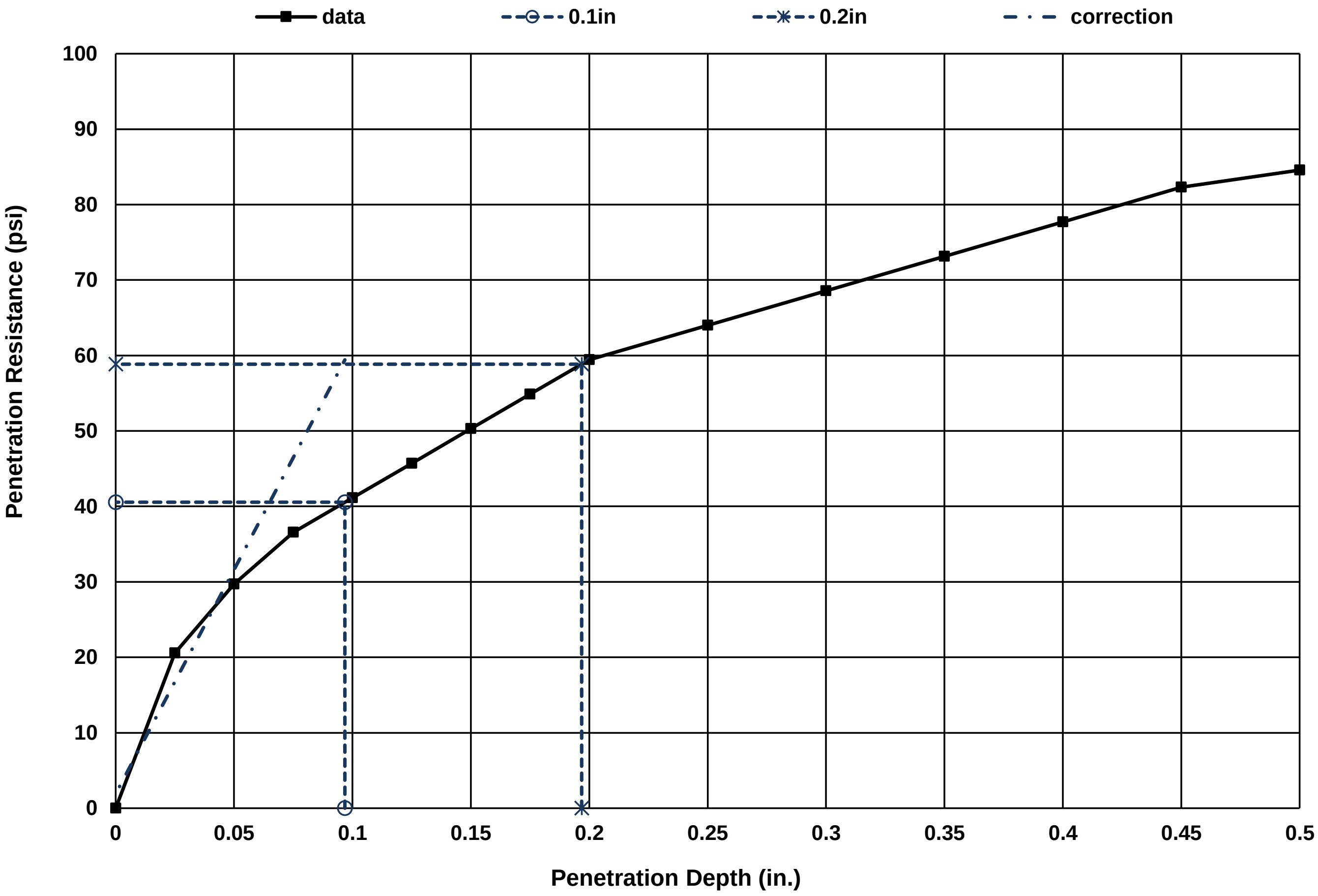
Project: Tyrone - TO #8 - Roadway Resurfacing
Client: Pond & Company
Sample / Source B-6
Test Reference/No.:

Project No.: 10:11619
Depth (ft.): 0 - 5
Sample No.: Bulk
Date Reported: 11/15/2022

Office / Lab	Address	Office Number
ECS Southeast LLP - Marietta	1281 Kennestone Circle NE Suite 200 Marietta, GA 30066	(770)590-1971

Tested by	Checked by	Approved by	Date Received	Remarks
KShah	KShah	KShah	11/4/2022	

California Bearing Ratios (CBR) of Laboratory-Compacted Soils



TEST RESULTS (ASTM D1883-16)

Molded			Soaked			CBR (%)		Linearty Correction (in.)	Surcharge (lbs.)	Swell (%)
Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.1 in.	0.2 in.			
97.9	95.3	19.7	92.6	90.2	26.0	4.1	3.9	0.00	10	0.46

Material Description	AASHTO	USCS	MAX. Dens. (pcf)	Optimum Moisture (%)	LL	PI	% Fines	% Gravel
BULK		MH	102.7	20.2	60	29	57.7	

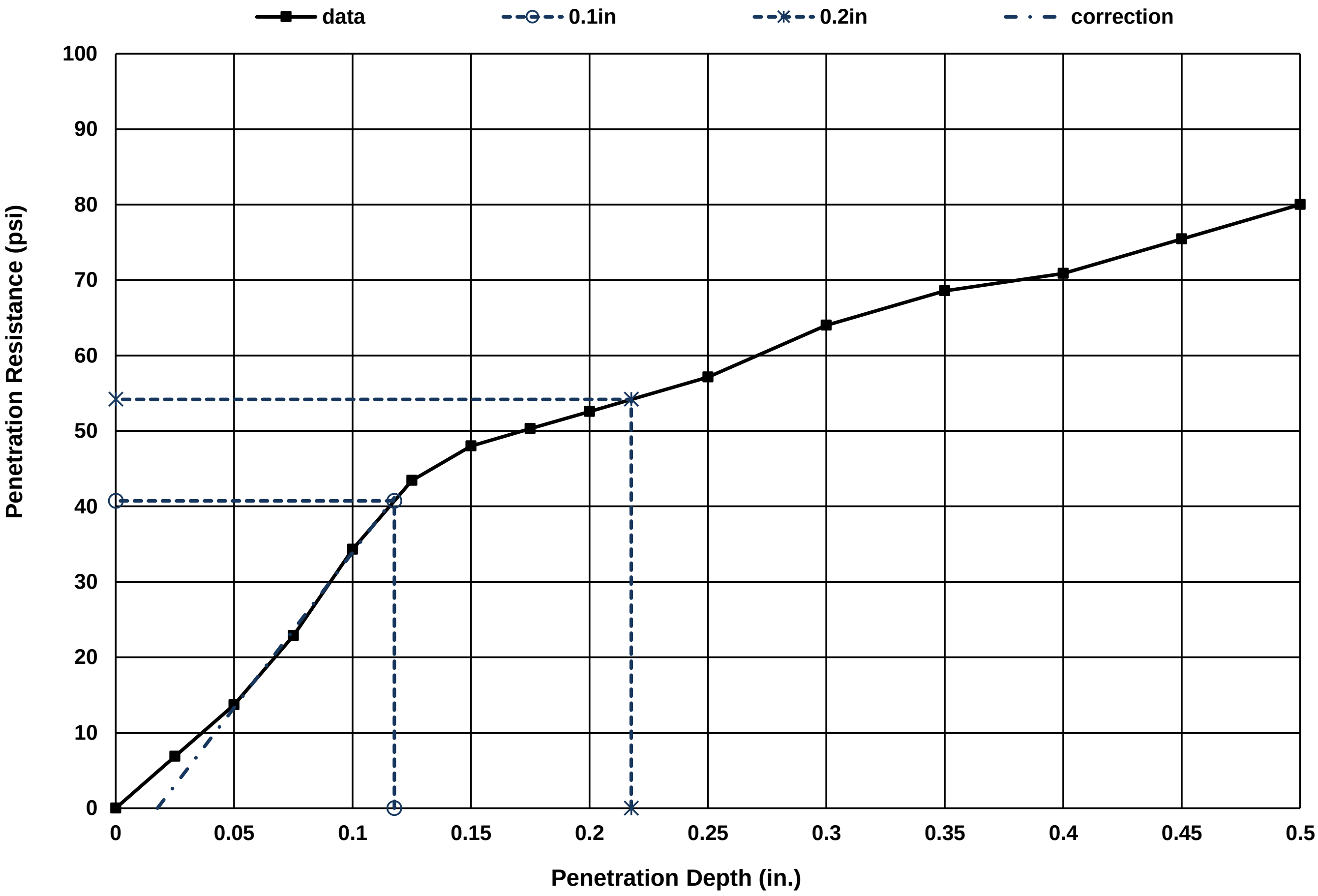
Project: Tyrone - TO #8 - Roadway Resurfacing
Client: Pond & Company
Sample / Source B-1
Test Reference/No.: 1

Project No.: 10:11619
Depth (ft.): 0 - 5
Sample No.: Bulk
Date Reported: 11/15/2022

Office / Lab	Address	Office Number
ECS Southeast LLP - Marietta	1281 Kennestone Circle NE Suite 200 Marietta, GA 30066	(770)590-1971

Tested by	Checked by	Approved by	Date Received	Remarks
KShah	KShah	KShah	11/4/2022	

California Bearing Ratios (CBR) of Laboratory-Compacted Soils



TEST RESULTS (ASTM D1883-16)

Molded			Soaked			CBR (%)		Linearty Correction (in.)	Surcharge (lbs.)	Swell (%)
Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.1 in.	0.2 in.			
95.3	95.2	20.5	85.8	85.7	31.5	4.1	3.6	0.02	10	1.79

Material Description	AASHTO	USCS	MAX. Dens. (pcf)	Optimum Moisture (%)	LL	PI	% Fines	% Gravel
Bulk		MH	100.1	20.6	62	27	46.4	

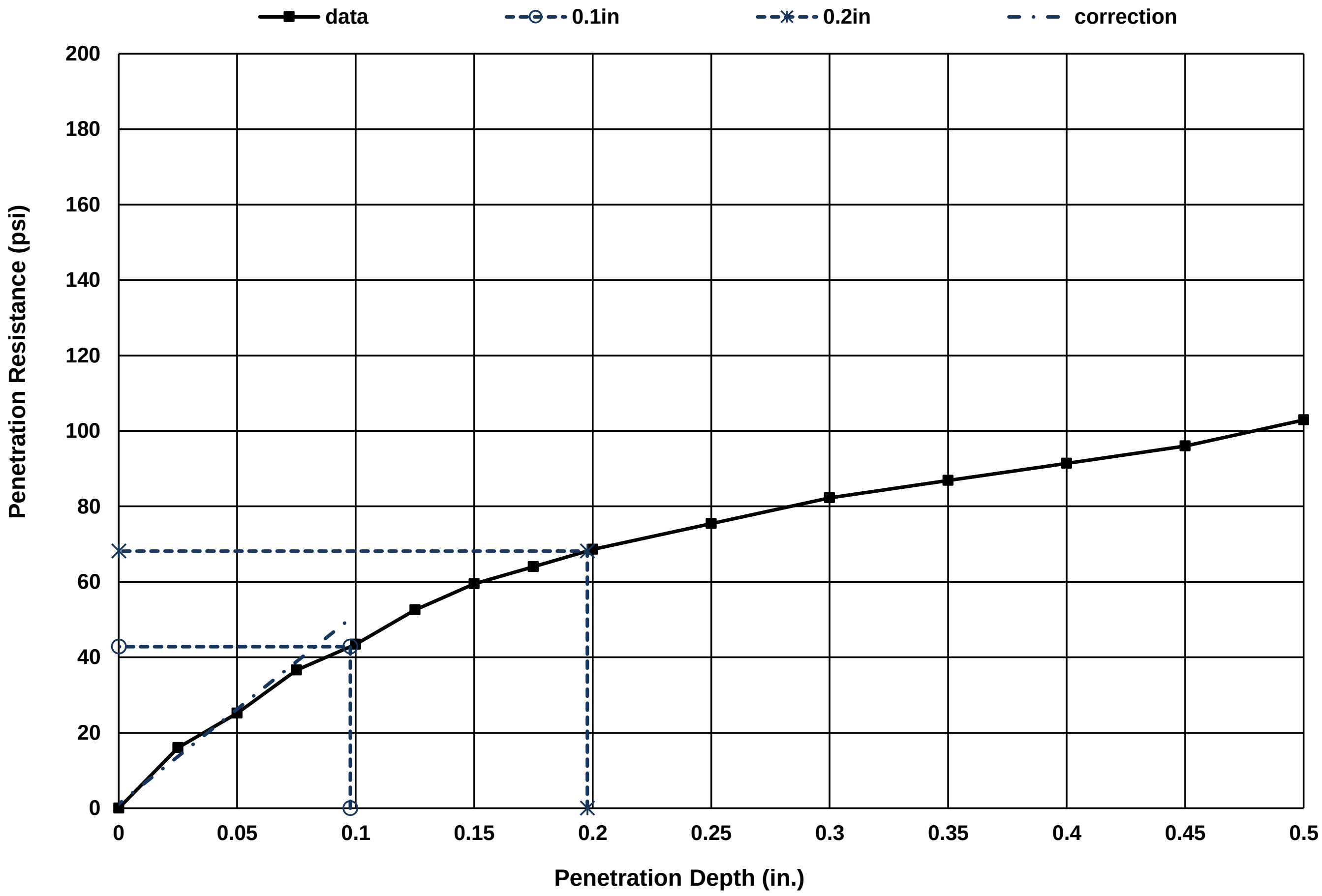
Project: Tyrone - TO #8 - Roadway Resurfacing
Client: Pond & Company
Sample / Source B-3
Test Reference/No.: 1

Project No.: 10:11619
Depth (ft.): 0 - 5
Sample No.: Bulk
Date Reported: 11/15/2022

Office / Lab	Address	Office Number
ECS Southeast LLP - Marietta	1281 Kennestone Circle NE Suite 200 Marietta, GA 30066	(770)590-1971

Tested by	Checked by	Approved by	Date Received	Remarks
KShah	KShah	KShah	11/4/2022	

California Bearing Ratios (CBR) of Laboratory-Compacted Soils



TEST RESULTS (ASTM D1883-16)

Molded			Soaked			CBR (%)		Linearty Correction (in.)	Surcharge (lbs.)		Swell (%)	
Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.1 in.	0.2 in.					
94.9	95.2	20.7	84.9	85.2	34.3	4.3	4.5	0.00	10		0.50	
Material Description					AASHTO	USCS	MAX. Dens. (pcf)	Optimum Moisture (%)	LL	PI	% Fines	% Gravel
Bulk						MH	99.7	20.8	61	18	53.5	

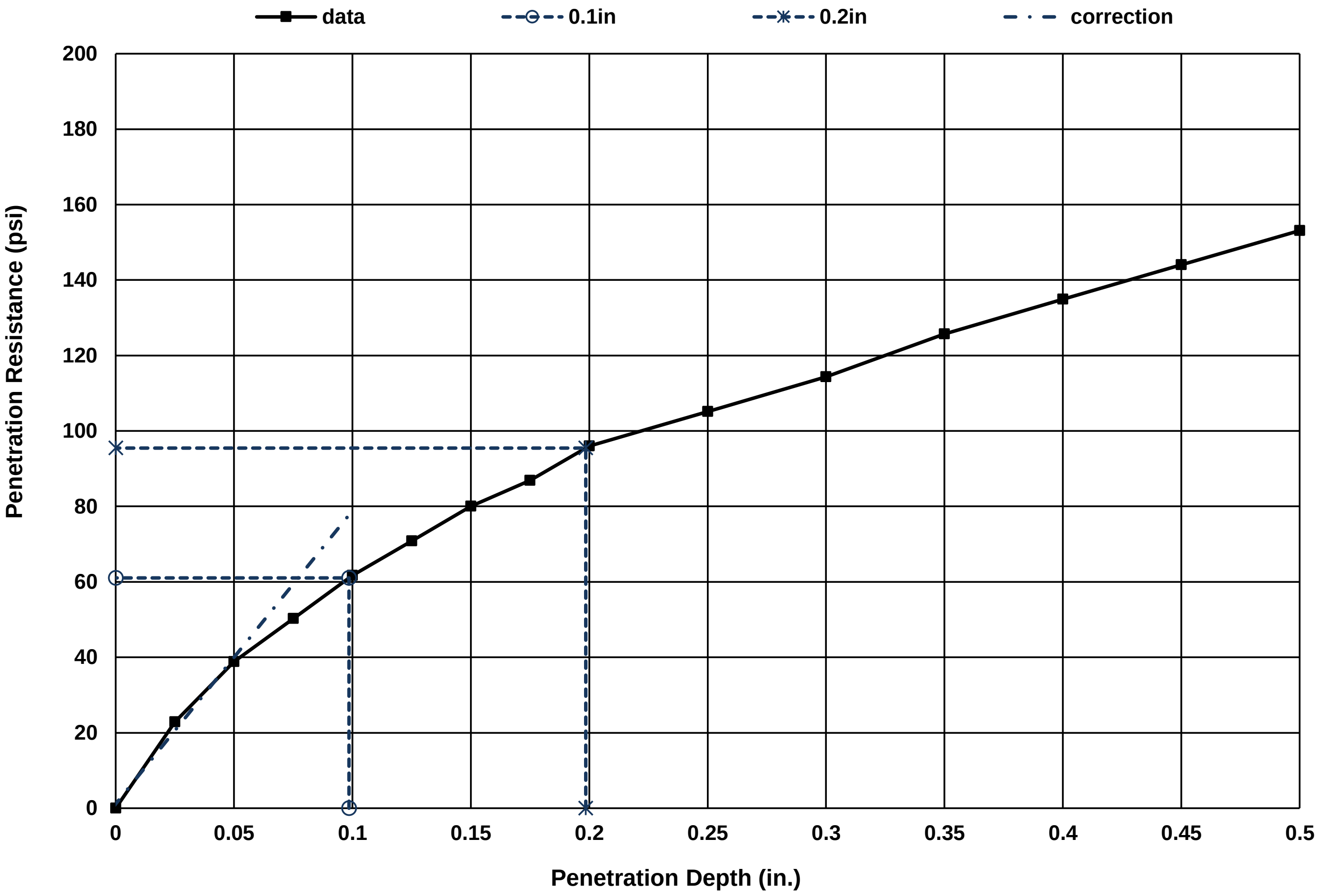
Project: Tyrone - TO #8 - Roadway Resurfacing
Client: Pond & Company
Sample / Source B-5
Test Reference/No.: 1

Project No.: 10:11619
Depth (ft.): 0 - 5
Sample No.: Bulk
Date Reported: 11/15/2022

Office / Lab	Address	Office Number
ECS Southeast LLP - Marietta	1281 Kennestone Circle NE Suite 200 Marietta, GA 30066	(770)590-1971

Tested by	Checked by	Approved by	Date Received	Remarks
KShah	KShah	KShah	11/4/2022	

California Bearing Ratios (CBR) of Laboratory-Compacted Soils



TEST RESULTS ()

Molded			Soaked			CBR (%)		Linearty Correction (in.)	Surcharge (lbs.)	Swell (%)
Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.1 in.	0.2 in.			
107.9	95.1	13.8	100.9	88.9	19.8	6.1	6.4	0.00	10	1.64

Material Description	AASHTO	USCS	MAX. Dens. (pcf)	Optimum Moisture (%)	LL	PI	% Fines	% Gravel
Bulk		SM	113.5	13.9			35.6	

Project: Tyrone - TO #8 - Roadway Resurfacing
Client: Pond & Company
Sample / Source B-6
Test Reference/No.: 1

Project No.: 10:11619
Depth (ft.): 0 - 5
Sample No.: Bulk
Date Reported: 11/15/2022

Office / Lab	Address	Office Number
ECS Southeast LLP - Marietta	1281 Kennestone Circle NE Suite 200 Marietta, GA 30066	(770)590-1971

Tested by	Checked by	Approved by	Date Received	Remarks
KShah	KShah	KShah	11/4/2022	

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, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them 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 herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences 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.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

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

- for a different client;
- for a different project or purpose;
- 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, the reliability of a geotechnical-engineering report can be 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 you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site 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.*

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

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement 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 through project completion to obtain 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 judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed 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 continuing 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 available 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-phase observations.

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 information 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. 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. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. 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 provide 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 obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

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, the engineer's services were not designed, conducted, or intended to prevent 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

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