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GEOTECHNICAL
CONSULTANTS INC.

GCI PROJECT No.: 15-G-18776

Subsurface Exploration and Geotechnical Engineering Report

Holder Wright Park and Pedestrian Bridge
Dublin, Ohio

Prepared for:
CT Consultants

April 30, 2015

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April 30, 2015

Mr. Matt Simpson, RLA, LEED AP
CT Consultants, Inc.
Northwoods Building 1
7965 North High Street
Suite 340
Columbus, Ohio 43235

Reference: **Subsurface Exploration and Geotechnical Engineering Report**
Holder Wright Park and Pedestrian Bridge
Dublin, Ohio
GCI Project No. 15-G-18776

Dear Mr. Simpson:

As you requested and authorized, Geotechnical Consultants, Inc. (GCI) has performed a subsurface exploration and prepared this geotechnical engineering report for the referenced project. The purpose of this exploration was to assess subsurface conditions and make recommendations for foundations for the restrooms and pedestrian bridge, recommendations for the new pavements, and site preparation recommendations. The borings encountered topsoil, overlying possible fill (3 to 8 feet deep), overlying silty sand in two borings. At depths of 3 to 9 feet below grade, we encountered sandstone. We terminated the borings with auger refusal in the sandstone, generally within 1 foot of encountering the top of rock. We provide geotechnical and foundation recommendations in this report.

After you have reviewed the report, feel free to contact GCI with any questions you may have. GCI appreciates the opportunity to provide our services for this project, and we hope to continue service through construction.

Sincerely,
Geotechnical Consultants, Inc.

4/30/15

STATE OF OHIO
CURTIS L.
MILLER
E-58404
REGISTERED
PROFESSIONAL ENGINEER

Curtis L. Miller, P.E.
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CLM for KMO

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In-House Reviewer

Distribution: Mr. Matt Simpson @ CT Consultants – 1 bound copy, pdf email
GCI File – 1 copy

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INTRODUCTION

As requested and authorized by Mr. Matt Simpson representing CT Consultants, Inc., Geotechnical Consultants, Inc. (GCI) performed a subsurface exploration and prepared this geotechnical engineering report for the proposed Holder Wright Park and Pedestrian Bridge project, to be located in Dublin, Ohio. The client provided GCI with a preliminary site plan showing the proposed layout overlying an aerial photograph of the site.

The subsurface study consisted of five standard penetration borings across the site; one at each bridge abutment, one at the proposed restroom, and two in proposed pavement areas. GCI field located the borings using the provided site plan and site landmarks; the locations should be considered approximate. Surface elevations at the boring locations were not determined for the project. A sketch showing the approximate boring locations and copies of the boring logs are attached in the appendix.

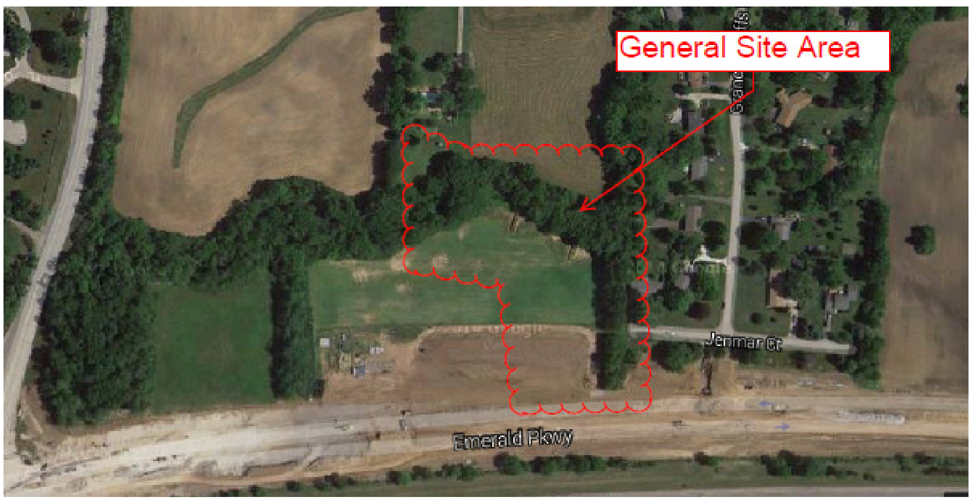
The intent of this exploration was to evaluate subsurface conditions and offer geotechnical recommendations relative to foundations, slabs, pavements, and earthwork for the new park. GCI should review final plans when available and provide additional recommendations and borings, if necessary.

GCI prepared this report for the exclusive use of CT Consultants, Inc. and their consultants for specific application to the referenced project in Dublin, Ohio in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

SITE LOCATION AND PROJECT DESCRIPTION

The proposed Holder Wright Park is located north of Emerald Parkway, west of Jenmar Court in Dublin, Ohio. A computer-generated *General Site Location Map* is included in the Appendix.

The site is generally a farmfield, except where the proposed pedestrian bridge will cross the wooded creek. The aerial photograph below shows site conditions similar to what we encountered at the time of our study.



Aerial from Google.com

The park will include a paved entry drive extending from Emerald Parkway on the south side of the site, north into the property. A paved parking lot will be constructed off the northeast end of the drive, a restroom area will be construction north of the drive, and a pedestrian bridge will be constructed north of the restroom area. The pedestrian bridge will be a 10-foot wide, 96-foot long timber combination span on timber butt pilings or a prefabricated steel truss bridge on spread footings. Based on available plans, the bridge deck (finish floor) elevation will be +/- 848 feet. The existing grades at the bridge abutments are at about elevation 847 feet at the north abutment and about elevation 848 feet at the south abutment. We anticipate some cut/fill operations could be needed at the approaches to achieve finish grade. The restroom area finish floor elevation is set at about elevation 857 feet, and some cut/fill will be required.

SUBSURFACE CONDITIONS

GCI mobilized a truck-mounted, rotary drill rig (CME-45 with automatic sampling hammer) to the site on April 16, 2015 and drilled five standard penetration borings to obtain a generalized profile of existing subsurface conditions. Borings B-1 and B-2 were drilled within the proposed bridge area, boring B-3 was drilled at the restroom area, and B-4 and B-5 were drilled in proposed pavement areas.

The boring logs and a copy of the boring location plan are attached in the appendix. The subsurface findings are summarized below. Refer to the individual boring logs for more detailed subsurface information at specific boring locations.

Topsoil/Fill

The borings encountered surface topsoil cover, ranging in thickness from 0.4 to 0.8 feet. Below the topsoil, we encountered possible fill materials, extending to depths ranging from 3 feet (B-2 and B-3) to possibly 8 feet (B-5). The fill consisted of mixtures of lean clay, sand, gravel, and pieces of sandstone.

Natural Soils

Below the fill in borings B-3 and B-4, we encountered brown silty sand (classified as SM in the Unified/ASTM Classification System). The silty sand contained clayey layers and sandstone fragments. We noted the silty sand as loose to medium dense.

Bedrock

We encountered brown sandstone in the borings at depths ranging from 3 feet (B-2) to 9 feet (B-4) below existing grades. We terminated the borings with auger refusal at depths of 3.8 to 13.2 feet below grade. We were only able to penetrate the sandstone by 1 foot or less, except at B-5, where we were able to penetrate about 5 feet into the sandstone.

Groundwater

We encountered groundwater seepage at boring B-4 at 8.5 feet below grade at the time of drilling. By completion of drilling, the water had dissipated in B-4. The remaining borings were dry during drilling and at completion of the drilling operations.

We generally described the retrieved soil samples as moist to very moist. Note that groundwater levels and moisture conditions can vary with changes in season and in response to precipitation events.

ANALYSES, CONCLUSIONS, AND RECOMMENDATIONS

PEDESTRIAN BRIDGE

Foundations

Borings B-1 and B-2 encountered possible fill to depths of 3 to 5 feet below grade, although the fill did resemble natural soils. Sandstone was encountered at depths of 3 to 5 feet below grade.

We recommend footings for the bridge bear a minimum of 3 feet into the sandstone; the top of the sandstone was encountered at depths of 3 to 5 feet below grade. Foundations bearing on the sandstone can be designed for a maximum allowable bearing capacity of 6,000 psf. **We recommend that GCI be present during foundation excavation procedures to verify proper bearing conditions.**

Abutments and Wingwalls

Abutment walls restrained at the top and bottom should be designed to resist *at-rest* lateral soil pressures. Wing walls allowed to move freely at the top of the wall should be designed using *active* lateral soil pressures. Both types of wall design should also take into account hydrostatic pressures that may develop behind the wall, as well as surcharges behind the wall, including live loads and sloped fills.

The walls will support new embankment fill. While the fill is not known, conservatively it could consist of locally available clay-based soils rather than importing premium granular soils. The following table presents equivalent fluid soil pressures to be used in design based on a soil density of 130 pcf (clay) and 135 pcf (sand and gravel) and level backfill conditions for the following materials.

Backfill Material Type	Equivalent *Active* Fluid Weight (pcf)	*Active* Lateral Pressure Coefficient (K_a)[2]	Equivalent *At-Rest* Fluid Weight (pcf)	*At-Rest* Lateral Pressure Coefficient (K_0)
Sand and Gravel[3]	40	0.31	65	0.47
Silt/Clay Soils	55[1]	0.40	80	0.62

1. It should be assumed that lean clay type soils will be used to construct the Embankments.
2. We suggest using K_a = 0.65 (active case) for sloping backfill conditions of 2H: 1V or flatter.
3. Granular fill should be placed in a wedge shaped area extending from the base of the wall upward at an angle of 35° from the vertical to utilize the lower equivalent fluid weight design values stated above for "sand and gravel".

For effective drainage, we recommend free draining gravel (such as No. 57 stone) with filter fabric be used directly behind the abutments and wing walls for a minimum thickness of 2 feet extending behind the wall and along the entire length and height of the wall. The No. 57 stone should provide positive drainage to weep holes and/or a perforated pipe at the base of the walls to alleviate hydrostatic pressures that may develop behind the wall. **Cohesive soil backfill directly behind the walls is not recommended** because of its poor drainage characteristics and tendencies to creep, resulting in high lateral pressures with time. Where possible, wall drainage should be designed in accordance with the ODOT Bridge Design Manual section for Abutment Drainage of the latest ODOT Bridge Design Manual. Heavy equipment should not be operated behind walls unless the walls are properly designed for this case.

The type of fill placed beyond the No. 57 stone drain material will govern the magnitude of the forces to be used for wall design; refer to the table above for design values. The wall backfill should be placed and compacted in accordance with ODOT Construction and Materials Specifications section for Embankment Compaction.

Scour

We do not know if scour would be an issue for this structure. According to ODOT, footings exposed to action of stream currents should have the bottom of the footing placed below the depth of contraction scour. A scour analysis was beyond the scope of this study. As a minimum, GCI recommends the foundations/abutments be protected with properly designed rip-rap (Type C material). The rip-rap shall be placed along the entire length of the footing and abutments. Inspect and repair rip-rap after major storm events.

Approach Embankments

We anticipate some fill may be needed to create properly supported approach embankments. Existing vegetation and associated topsoil are not suitable for embankment support and should be removed from below the proposed embankment areas in accordance with ODOT Construction and Materials Specifications Item 201 – Clearing and Grubbing. GCI anticipates the resultant exposed subgrades will consist of lean clay (fill or natural). Exposed subgrades should be carefully proof-rolled to delineate soft/unstable conditions and prepared in accordance with ODOT Construction and Materials Specifications Item 204 – Subgrade Compaction and Proof Rolling.

Soft/unstable areas encountered during proof-rolling operations should be brought to a firm and stable condition prior to fill placement. Under favorable drying conditions (late spring, summer and early fall), a subgrade stabilization program consisting of disking of the soils to enhance air drying followed by recommended compaction is expected to be sufficient. Deeper soft soil conditions may require undercuts or more extensive means of stabilization, and should be reviewed by GCI in the field prior to remediation. During wet seasons (late fall, winter and early spring) air-drying may not be practical, and undercuts backfilled with structural fill (which may include stone and geogrid) or the use of lime or lime-fly ash is expected to be required to complete subgrade stabilization. The use of lime/fly-ash or other means of stabilization beyond air-drying should be reviewed by our office prior to use. Careful routing of construction traffic is advised to help minimize pumping of the near-surface very moist, clayey soils. Once the subgrade is stable, place and compact required fill to create approach subgrades.

Structural fill should be properly benched into existing stable slopes to permit compaction of new fill in accordance with ODOT. A keyway should be constructed at the base of embankments that are in excess of 10 feet high. The steepest recommended slope without geogrid reinforcement is 2H: 1V. Slopes of 3H: 1V are recommended in areas that will be mowed.

New embankment fill should be free of organics, cobbles, boulders, and miscellaneous debris. The fill should be placed in loose lifts not exceeding 8 inches thick and compacted in accordance with ODOT Item 203 – Roadway Excavation and Embankment". It is recommended that GCI review potential borrow sources prior to use.

Excavations and Groundwater

Typical track-hoe equipment will be able to excavate the site soils down to the sandstone. We anticipate that rock excavation tools (such as pneumatic hammer and ripper bars) will be needed for excavations that extend more than a couple feet into the sandstone. Excavations should be completed in accordance with current OSHA regulations governing excavation

and trench safety standards (29 CFR Part 1926). Also, all excavations should comply with local, state, and federal safety regulations.

Groundwater seepage was not encountered in the bridge borings. As such, we do not anticipate that groundwater seepage will be a significant consideration for bridge foundation construction. GCI feels that strategically placed local sump pumps combined with crushed stone working mats should be sufficient to control groundwater.

GENERAL

Foundations and Floor Slab

Borings B-3 (restroom), B-4 (pavement), and B-5 encountered possible fill to depths of 3 to 8 feet. B-3 and B-4 encountered natural silty sand below the fill. We encountered rock at depths of 5.5 to 9 feet below grade.

In GCI's opinion, conventional spread footings and continuous wall foundations are feasible for general structures on the site. In our opinion, the footings can bear in the natural silty sand or underlying sandstone bedrock; **footings should not bear in the fill**. Foundations bearing on firm and stable natural soils or new fill placed directly on stable natural soils can be designed using a maximum allowable bearing capacity not to exceed 3,000 pounds per square foot. Footings bearing on the sandstone can be designed for a bearing capacity of 6,000 psf.

Regardless of the calculated values, GCI recommends minimum dimensions of 16 inches wide for wall footings and 30 inches square for isolated column pads to eliminate a potential punching effect. Exterior footings should be placed with a minimum soil cover of 36 inches, extended to local frost code depth, or to stable soils, whichever is deepest. Interior footings in heated areas may be placed as shallow as feasible if bearing in acceptable soils.

If soft or unstable areas are encountered within footing excavations, undercut to stable soils. Undercut areas can be backfilled to bottom-of-footing elevation using a controlled density fill (CDF). Alternatively, the foundations can be constructed on firm, stable natural soils at the bottom of the undercut. Granular bearing soils should be compacted with several passes of a vibratory plate compactor prior to placement of stone or concrete. **GCI should be retained to observe soft or unstable bearing soils prior to undercuts.**

After stripping surface topsoil, the exposed fill subgrade should be thoroughly proof rolled and soft areas stabilized (refer to above discussion of abutment embankments). Once the building pad has been prepared, a conventional concrete slab-on-grade is feasible for the proposed building.

GCI recommends placing a minimum of 4 inches of granular fill (ODOT Item 304) under lightly loaded floor slabs to serve as a capillary cut-off and to provide a uniform, firm sub-base. Place a vapor barrier below the slab in areas where moisture could cause problems with floor finishes or where slabs extend below grade.

Excavations and Groundwater

The site soils can be excavated with conventional track hoe equipment. In borings B-3 to B-5, sandstone bedrock was encountered at depths of 5.5 to 9 feet below grade. Any excavations into the sandstone will be difficult and will require pneumatic hammer or ripper bar use to penetrate 1 to 2 feet. Deeper excavations may require more advanced rock excavation techniques. Sidewall stability will be an issue where excavations extend into the silty sand, particularly if those soils are wet. As such, laybacks or trench box construction techniques may be required. **All site excavations should comply with current OSHA regulations.**

Groundwater seepage was encountered at 8.5 feet in boring B-4. Based on the borings, GCI is of the opinion that groundwater will not have a significant impact on shallow foundations, slab-on-grade, and shallow utility trench excavations. If water is encountered in site excavations, the excavations should be dewatered to allow footing construction and utility trench backfilling in dry conditions. GCI expects groundwater seepage flows can be handled with portable sump pumps and working mats of crushed stone during construction, as needed. Contact GCI for additional recommendations if excessive groundwater conditions are encountered.

Seismic Considerations

The borings revealed a subsurface profile generally consisting of clay-based fill, silty sand, with sandstone bedrock at depths of 3 to 9 feet. In accordance with the Ohio Building Code – Site Class Definitions, GCI estimates the site as a Site Class C – “very stiff soil/soft rock” profile.

Pavements

Provided the site is properly prepared, conventional aggregate base and flexible asphalt wearing course pavements can be used. Prior to pavement construction, the subgrade should be carefully proof-rolled, and stabilized as necessary. A specific pavement design is beyond the scope of work of this report; GCI can provide one if requested. A site-specific pavement design would require additional laboratory testing and pavement use criteria.

We assume that traffic will consist of automobiles and occasional trucks. Properly compacted, we feel that the site soils would have a CBR value of at least 3. Based on our experience with similar projects and soils, and assuming properly prepared subgrades, we recommend a minimum light-duty pavement section consisting of 3 inches of asphalt over 8 inches of aggregate base. For heavy-duty traffic areas, including the main traffic aisles and areas subjected to refuse truck traffic, we suggest a pavement section consisting of a minimum of 4 inches of asphalt over 10 inches of aggregate base. We recommend a minimum of 8 inches of air-entrained, Portland cement concrete for dumpster pad and the dumpster pad approach area.

Providing adequate subbase drainage is important to future pavement performance. Finger drains connecting to weep-holes in inlets, proper grading of pavement subgrades and surfaces to shed run-off, and underdrains in pavement swales are suggested subbase drainage methods and should be designed by the site civil engineer.

Pavement areas should be thoroughly proof-rolled and steel-wheel rolled to a smooth surface prior to placement of base aggregate. Subgrade preparation during wet seasons may require the use of engineering fabrics or geogrids.

SITE PREPARATION AND EARTHWORK

GCI provides below general guidelines for site preparation and earthwork operations.

1. Remove surface vegetation, topsoil, stumps from removed trees, and other unsuitable materials from beneath proposed construction areas plus 5 feet laterally. Topsoil can be stockpiled for later use in site landscaping or used to fill borrow pits.

2. Carefully and thoroughly proof-roll the exposed soil subgrades with a fully-loaded, tandem-axle dump truck (or equivalent) to identify potential soft subgrade areas. Undercut soft areas or otherwise stabilize soft spots identified during the proof-roll prior to placing controlled fills, slab construction, or paving. GCI should review unstable subgrades prior to remediation to assess appropriate stabilization/undercutting procedures.

3. With stable subgrades, place controlled fills to design grade within proposed construction areas, as required. Non-organic site soils are suitable for reuse in controlled fills. **Off-site borrow materials should be reviewed by GCI prior to use.**

4. Place controlled fills in maximum 8-inch thick loose lifts and compact each lift to a minimum of 98% of the maximum Standard Proctor dry density (ASTM D-698). The moisture in the fill soils should be controlled to within ±3% of the optimum Standard Proctor moisture content. **Depending on the time of year of earthwork, moisture adjustment of the site soils may be required to achieve proper compaction.** Cohesive soils will compact best with a sheepsfoot roller, while granular soils will compact best with a vibratory, smooth-drum roller.

5. Install foundations for the bridge and restroom areas after the fill has been placed to grade. Refer to the *Foundations* section of this report for specific foundation design parameters.

6. The slab and pavement areas should be steel-wheel rolled to a smooth surface prior to placement of underslab or base course aggregate. Subgrade preparation during wet seasons may require the use of engineering fabric or geogrid. Refer to the *Pavements* section of this report for further details.

7. If work is performed during the winter (e.g., when freezing temperatures occur), special protective measures will be required during filling and footing construction procedures. Contact GCI for additional recommendations on cold-weather earthwork operations, if applicable.

CONSTRUCTION MATERIALS ENGINEERING AND TESTING

GCI provides construction materials engineering and testing services. For project continuity throughout construction, it is recommended that GCI be retained to observe, test, and document:

- earthwork procedures (stripping, cut and fill earthwork, etc.),
- foundation and subgrade preparation (proof-rolling, excavations, undercuts, etc.),
- concrete placement (footings, structural concrete, etc.) and compressive strength testing, and
- structural steel (welds, bolts, etc.).

The purpose of this work is to assess that the intent of the recommendations provided in this report is being followed and to make timely changes to the recommendations (as needed) in the event site conditions vary from those encountered in the borings. Please contact GCI's field department to initiate these services.

FINAL

In the event that any changes to the nature, design, or location of the proposed structures are planned, the conclusions and recommendations contained in this report shall not be considered valid, unless the changes are reviewed and conclusions of this report are modified or verified by Geotechnical Consultants, Inc. This report has been prepared for design purposes only and should not be considered sufficient to prepare an accurate bid document.

It is recommended that GCI review the final design plans and specifications to establish that our recommendations have been properly interpreted and integrated into contract plans and specifications.

If you have any questions or need for any additional information, please contact our office. GCI appreciates the opportunity to work with you on this project and hopes to continue our services through construction.

GEOTECHNICAL
CONSULTANTS INC.

APPENDIX – Holder Wright Park and Pedestrian Bridge

General Notes for Soil Sampling and Classifications
General Site Location Map (DeLorme Street Atlas USA – 2014)
Summary of Encountered Subsurface Conditions
Boring Location Plan
Boring Logs (5 pages)

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GENERAL NOTES FOR SOIL SAMPLING AND CLASSIFICATIONS

BORINGS, SAMPLING AND GROUNDWATER OBSERVATIONS:

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

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

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

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

SOIL MOISTURE TERMS

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

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

SOIL CLASSIFICATION PROCEDURE:

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

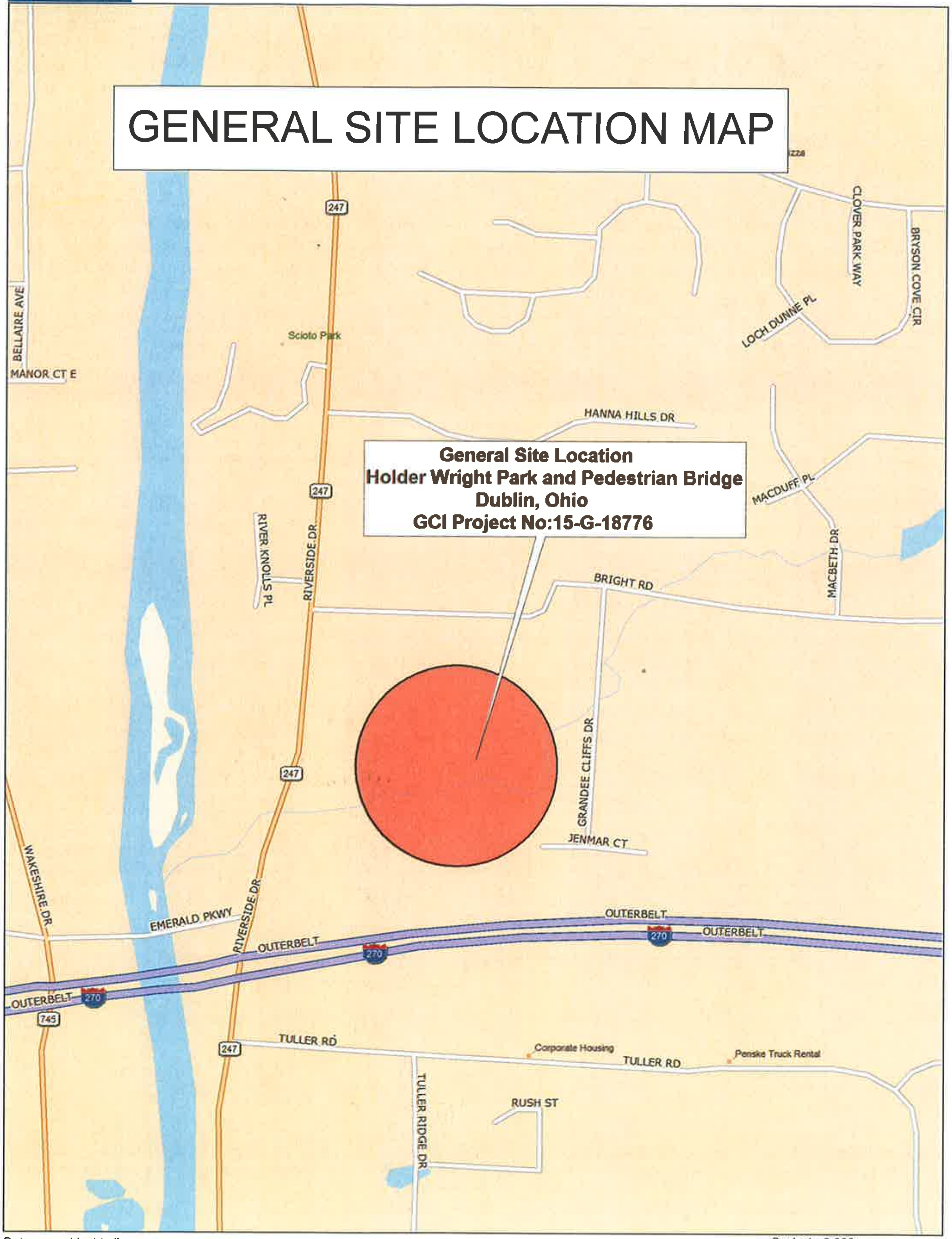
Soils are classified in accordance with the ASTM version of the Unified Soil Classification System. ASTM D-2487 “Classification of Soils for Engineering Purposes (Unified Soil Classification System) describes a system for classifying soils based on laboratory testing. ASTM D-2488 “Description and Identification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

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

GENERAL NOTES FOR SOIL SAMPLING AND CLASSIFICATIONS

PARTICLE SIZE DEFINITION			CONSTITUENT MODIFIERS	
Boulders:		>12”		
Cobbles:		3” to 12”	Trace	Less than 5%
Gravel:	Coarse:	3/4” to 3”	Few	5-10%
	Fine:	No. 4 (3/16”) to 3/4”	Little	15-25%
Sand:	Coarse	No. 10 (2.0mm) to No. 4 (4.75mm)	Some	30-45%
	Medium	No. 40 (0.425mm) to No. 10 (2.0mm)	Mostly	50-100%
	Fine	No. 200 (0.074mm) to No. 40 (0.425mm)		
Silt & Clay		<0.074mm; classification based on overall plasticity; in general clay particles <0.005mm.		

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



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TN
MN (7.0°W)

Scale 1 : 8,000

1" = 666.7 ft

Data Zoom 14-6

Approximate Boring Location

BORING LOCATION PLAN

Holder Wright Park and Pedestrian Bridge

Dublin, Ohio

Base map provided by client	
Project No.: 15-G-18776	
Date: 4/24/15	Drawn By: clm
Scale: 1"=100' 9approximate)	

Summary of Encountered Subsurface Conditions

New Park and Pedestrian Bridge
Holder Wright Park - Dublin, Ohio
GCI Job Number: 15-G-18776

Borehole	Surface Layer	Topsoil Thickness (ft.)	Bottom of Fill Cover (feet)	Groundwater: Level Encountered (ft)	Groundwater: Level at Completion (ft)	Depth to Top of Sandstone (ft)	Bottom of Boring Depth (ft)
				Depth	Depth		
B- 1	Topsoil	0.7	5.0	--	--	5.0	6.0
B- 2	Topsoil	0.6	3.0	--	--	3.0	3.8
B- 3	Topsoil	0.6	3.0	--	--	5.5	6.2
B- 4	Topsoil	0.8	4.5	8.5	--	9.0	10.0
B- 5	Topsoil	0.4	8.0	--	--	8.0	13.2

All Borings Terminated with Auger Refusal

TEST BORING LOG

PROJECT NAME **New Park and Pedestrian Bridge - Holder Wright Park - Dublin, Ohio**
BORING NO. **B- 1**
SURF. ELEV.
CLIENT **CT Consultants, Inc.**
PROJ. NO. **15-G-18776**
DATE DRILLED **4/16/2015**

GROUND WATER OBSERVATION	**Proportions Used**		**140 lb Wt. x 30" fall on 2" O.D. Sampler**			
			Cohesionless Density		**Cohesive Consistency**	
	Trace	Less than 5%				
None FEET BELOW SURFACE AT COMPLETION	Few	5 to 10%	0 - 10	Loose	0 - 4	Soft
______ FEET BELOW SURFACE AT 24 HOURS	Little	15 to 25%	10 - 30	Medium Dense	4 - 8	Medium Stiff
	Some	30 to 45%	30 - 50	Dense	8 - 15	Stiff
______ FEET BELOW SURFACE AT ____ HOURS	Mostly	50 to 100%	50 +	Very Dense	15 - 30	Very Stiff
					30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	3	0.0-1.5	SS	4	5	5	Moist	0.7	Topsoil
									Possible Fill consisting of a mixture of lean clay, sand, and gravel; random sandstone fragments noted
	1.5-2.0	2.0-3.5	SS	7	9	7	Moist		
	3	4.0-5.5	SS	4	9	17	Moist	5.0	
5								6.0	Brown Sandstone
									AUGER REFUSAL AND BOTTOM OF BORING 6'
10									
15									

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

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TEST BORING LOG

PROJECT NAME **New Park and Pedestrian Bridge - Holder Wright Park - Dublin, Ohio** BORING NO. **B- 2**

PROJ. SURF. ELEV.

CLIENT **CT Consultants, Inc.** NO. **15-G-18776** DATE DRILLED **4/16/2015**

GROUND WATER OBSERVATION	Proportions Used		140 lb Wt. x 30" fall on 2" O.D. Sampler			
			Cohesionless Density		Cohesive Consistency	
None FEET BELOW SURFACE AT COMPLETION	Trace	Less than 5%	0 - 10	Loose	0 - 4	Soft
______ FEET BELOW SURFACE AT 24 HOURS	Few	5 to 10%	10 - 30	Medium Dense	4 - 8	Medium Stiff
______ FEET BELOW SURFACE AT ____ HOURS	Little	15 to 25%	30 - 50	Dense	8 - 15	Stiff
	Some	30 to 45%	50 +	Very Dense	15 - 30	Very Stiff
	Mostly	50 to 100%			30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	--	0.0-1.5	SS	2	3	4	Moist	0.6	Topsoil
	2.0-2.5	2.0-3.0	SS	12	50		Moist	3.0	Possible Fill consisting of a mixture of lean clay, sand, and gravel; random sandstone fragments noted
								3.8	Brown Sandstone
5									AUGER REFUSAL AND BOTTOM OF BORING 3.8'
10									
15									

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

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TEST BORING LOG

PROJECT NAME New Park and Pedestrian Bridge - Holder Wright Park - Dublin, Ohio BORING NO. B- 3

PROJ. NO. 15-G-18776 SURF. ELEV. ______

CLIENT CT Consultants, Inc. DATE DRILLED 4/16/2015

GROUND WATER OBSERVATION	Proportions Used		140 lb Wt. x 30" fall on 2" O.D. Sampler	
			Cohesionless Density	Cohesive Consistency
None FEET BELOW SURFACE AT COMPLETION	Trace	Less than 5%	0 - 10 Loose	0 - 4 Soft
______ FEET BELOW SURFACE AT 24 HOURS	Few	5 to 10%	10 - 30 Medium Dense	4 - 8 Medium Stiff
______ FEET BELOW SURFACE AT ____ HOURS	Little	15 to 25%	30 - 50 Dense	8 - 15 Stiff
	Some	30 to 45%	50 + Very Dense	15 - 30 Very Stiff
	Mostly	50 to 100%		30 + Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2.5	0.0-1.5	SS	2	2	2	Moist	0.6	Topsoil
								3.0	Possible Fill consisting of a mixture of lean clay, sand, and gravel; random sandstone fragments noted
	2	2.0-3.5	SS	2	2	2	Moist to Very Moist		
								5.5	Brown Silty Sand (SM) - clayey layers and sandstone fragments noted
	--	4.0-5.5	SS	5	6	9	Moist		
5								6.2	Brown Sandstone
									AUGER REFUSAL AND BOTTOM OF BORING 6.2'
10									
15									

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

TEST BORING LOG

PROJECT NAME **New Park and Pedestrian Bridge - Holder Wright Park - Dublin, Ohio** BORING NO. **B- 4**

PROJ. SURF. ELEV.

CLIENT **CT Consultants, Inc.** NO. **15-G-18776** DATE DRILLED **4/16/2015**

GROUND WATER OBSERVATION	Proportions Used		140 lb Wt. x 30" fall on 2" O.D. Sampler	
			Cohesionless Density	**Cohesive Consistency**
	Trace	Less than 5%		
None FEET BELOW SURFACE AT COMPLETION	Few	5 to 10%	0 - 10 Loose	0 - 4 Soft
____ FEET BELOW SURFACE AT 24 HOURS	Little	15 to 25%	10 - 30 Medium Dense	4 - 8 Medium Stiff
	Some	30 to 45%	30 - 50 Dense	8 - 15 Stiff
____ FEET BELOW SURFACE AT ____ HOURS	Mostly	50 to 100%	50 + Very Dense	15 - 30 Very Stiff
				30 + Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2	0.0-1.5	SS	3	3	3	Moist	0.8	Topsoil
									Possible Fill consisting of a mixture of lean clay, sand, and gravel; random sandstone fragments noted
	3	2.0-3.5	SS	3	3	4	Very Moist to Moist		
	--	4.0-5.5	SS	1	2	3	Moist	4.5	
5									Brown Silty Sand (SM) - clayey layers and sandstone fragments noted
	--	8.5-9.4	SS	7	50/4"		Very Moist	9.0	Water Seepage at 8.5'
								10.0	Brown Sandstone
10									
									AUGER REFUSAL AND BOTTOM OF BORING 10'
15									

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

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TEST BORING LOG

PROJECT NAME New Park and Pedestrian Bridge - Holder Wright Park - Dublin, Ohio | BORING NO. B- 5

PROJ. SURF. ELEV.

CLIENT CT Consultants, Inc. | NO. 15-G-18776 | DATE DRILLED 4/16/2015

GROUND WATER OBSERVATION	Proportions Used		140 lb Wt. x 30" fall on 2" O.D. Sampler			
			Cohesionless Density		Cohesive Consistency	
None FEET BELOW SURFACE AT COMPLETION	Trace	Less than 5%	0 - 10	Loose	0 - 4	Soft
___ FEET BELOW SURFACE AT 24 HOURS	Few	5 to 10%	10 - 30	Medium Dense	4 - 8	Medium Stiff
___ FEET BELOW SURFACE AT ___ HOURS	Little	15 to 25%	30 - 50	Dense	8 - 15	Stiff
	Some	30 to 45%	50 +	Very Dense	15 - 30	Very Stiff
	Mostly	50 to 100%			30 +	Hard

LOCATION OF BORING **See Boring Location Plan**

DEPTH	Pocket Penetrometer (tsf)	Sample Depths From To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	Moisture Density or Consist.	Strata Change Depth*	SOIL IDENTIFICATION Remarks include color, type of soil, etc. Rock-color, type, condition, hardness
	2	0.0-1.5	SS	2	3	3	Moist	0.4	Topsoil
									Possible Fill consisting of a mixture of lean clay, sand, and gravel; random sandstone fragments noted
	4	2.0-3.5	SS	4	5	6	Moist		
	3.5-4.0	4.0-5.5	SS	5	5	6	Moist		
5									
								8.0	
	NR	8.5-8.6	SS	50/1"					Brown Sandstone
10									
								13.2	
15									AUGER REFUSAL AND BOTTOM OF BORING 13.2'

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