

**APPENDIX**

**SUBSURFACE INVESTIGATION & FOUNDATION RECOMMENDATIONS**

DAYTON NATIONAL CEMETERY  
PUBLIC RESTROOMS ADDITION

PROJECT NO. 810CM3023



***Alt & Witzig Engineering, Inc.***

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April 4, 2012

Jacobs Engineering  
180 Promenade Cr. Suite 300  
Sacramento, California 95834  
ATTN: Ms. Tammy Schlagbaum

RE: Subsurface Investigation &  
Foundation Recommendations  
Dayton National Cemetery  
New Restroom Facilities  
Dayton, Ohio  
Alt & Witzig File: 12CN0044

Gentlemen:

In compliance with your request, we have completed a foundation investigation and evaluation for the above referenced project. It is our pleasure to transmit herewith a copy of our report.

The purpose of this subsurface investigation was to determine the various soils profile components, determine the engineering characteristics of the materials encountered, and provide information to be used in preparing foundation designs for the proposed addition.

Field Services

The field investigation included reconnaissance of the project site, drilling two (2) soil borings for the new restroom facilities. At the request of the cemetery director the borings were offset approximately twenty (20) feet to the east so as to not disturb the existing landscaping and are in the area shown on the enclosed boring location plan. Additionally, our investigation included performing standard penetration tests, and obtaining soil samples retained in the standard split-spoon sampler. The apparent groundwater level at the boring location was also determined.

The soil borings were performed with a conventional drilling rig equipped with a rotary head. Conventional hollow-stem augers were used to advance the holes. Representative samples were obtained employing split-spoon sampling procedures in accordance with ASTM Procedure D-1586.

During the sampling procedure, standard penetration tests were performed at regular intervals to obtain the standard penetration value of the soil. The standard penetration value is defined as the number of blows of a 140-pound hammer, falling thirty (30) inches, required to advance the split-spoon sampler one (1) foot into the soil. The results of the standard penetration tests indicate the relative density and comparative consistency of the soils, and thereby provide a basis for estimating the relative strength and compressibility of the soil profile components.

### Laboratory Testing

The types of soils encountered in the borings were visually classified and are described in detail on the boring logs. Representative samples of the soils encountered in the field were placed in sample jars and are now stored in our laboratory. Unless notified to the contrary, all samples will be disposed of after thirty (30) days.

### Project Information

The addition will be constructed on the east side of the existing structure. Furthermore, it is assumed that the addition will consist of a lightly loaded structure constructed of either block/brick or wood frame construction. The facilities are estimated to have wall loads not exceeding 3 kips per lineal foot.

### Subsurface Condition

Our borings encountered medium stiff silty clay and silt in the area of the addition. Boring B-1 indicated a water level of eighteen (18) feet below at completion of operations. Due to the active nature of the site all holes were backfilled at completion of operations.

### Foundation Recommendations

Shallow Spread Footings. Spread footings and continuous wall footings are generally most economical when the existing soil conditions allow them to be founded at a shallow depth. A net allowable soil bearing pressure of 2500 psf is recommended to design conventional spread footings and continuous wall footings. This bearing pressure assumes that the foundations will be placed upon the medium stiff natural soils or structural fill.

Footings should not be less than twenty (20) inches wide for walls or twenty-four (24) inches square for columns. However, minimum-footing sizes must also be in compliance with the actual building loads and all local building code requirements. Thus, larger foundations could be required.

The above recommended bearing pressure is a "net allowable soil pressure". In utilizing a net allowable pressure for dimensioning footings, it is necessary to consider only those loads applied above the finished floor elevations.

If the above suggested bearing pressures are used in the design of the footings, then all interior footings could be founded at nominal depths below the finished floor slab. In order to alleviate the effects of seasonal variation in moisture content on the behavior of the footings and eliminate the effects of frost action, all exterior foundations should be founded a minimum of thirty (30) inches or greater below the final grade.

It is recommended that all foundation excavations be inspected by a representative of the soil engineer to assure that adequate bearing soils exist in the base of all footings. If uncontrolled fills are encountered they should be undercut to suitable natural soils as determined by a representative

of AWEI. After excavation to an adequate bearing material, the footing areas should then be re-established to the proposed bottom of footing elevation by placing lean concrete.

Floor Slab Recommendations The ground floor for the proposed building can be constructed as a slab-on-grade supported by approved existing soils and/or well-compacted fill materials. Once final subgrade elevation has been established, four (4) to six (6) inches of granular material should be placed beneath the slab. This compacted granular fill will provide a uniform surface for construction of the slab and minimize capillary rise from the subgrade into the slab.

Before any fill is placed, it is recommended that the exposed subgrade be proofrolled with equipment approved by the soil engineer. This proofrolling will expose any soft, compressible soil. Soft areas should be undercut to a depth determined at the time of the proofroll inspection and replaced with a well-compacted fill.

Seismic Requirements Seismic design consideration based on the information obtained in our subsurface investigation and the Ohio Building Code guidelines indicates that the site will be classified with a site class C.

Corrosion Potential Soil sulfate testing and pH testing were performed on representative samples of the shallow soils in the area of the addition. PH tests performed indicated that the soils ranged from 7.7 to 8.0 with an average pH of 7.8. The results of the pH tests indicate that the soils are slightly basic to neutral. Sulfate testing indicated values of 7 ppm to 47 ppm with an average of 22 ppm. Based on the results of these tests and the moisture content, the soils across this site have a low corrosion potential.

If we can give further service in these matters, please contact us at your convenience.

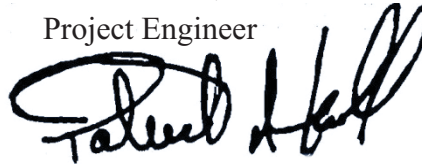
Respectfully Submitted,

ALT & WITZIG ENGINEERING, INC.



Robert Smith, P.E.

Project Engineer



Patrick A. Knoll, P.E.

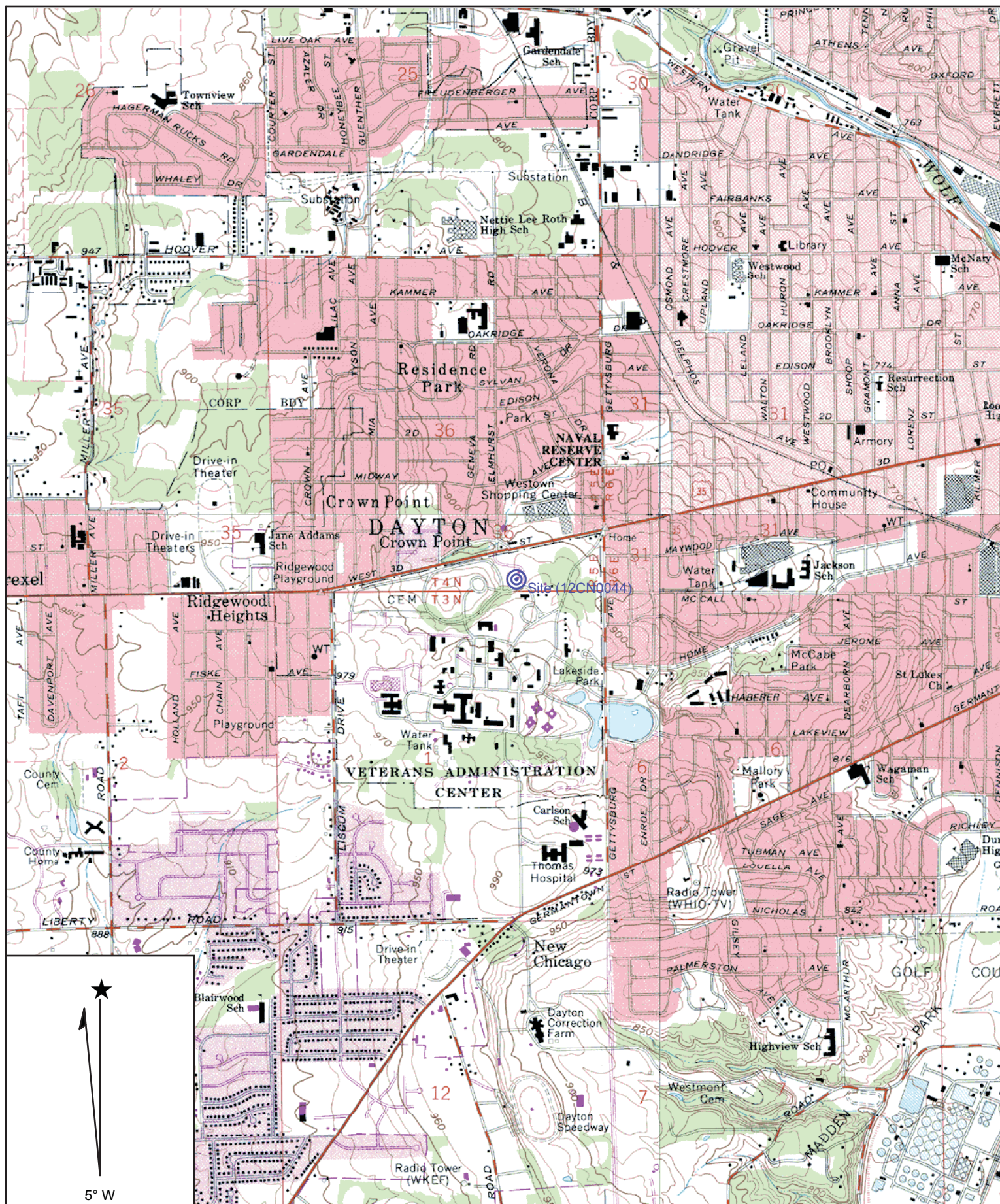




## **APPENDIX**







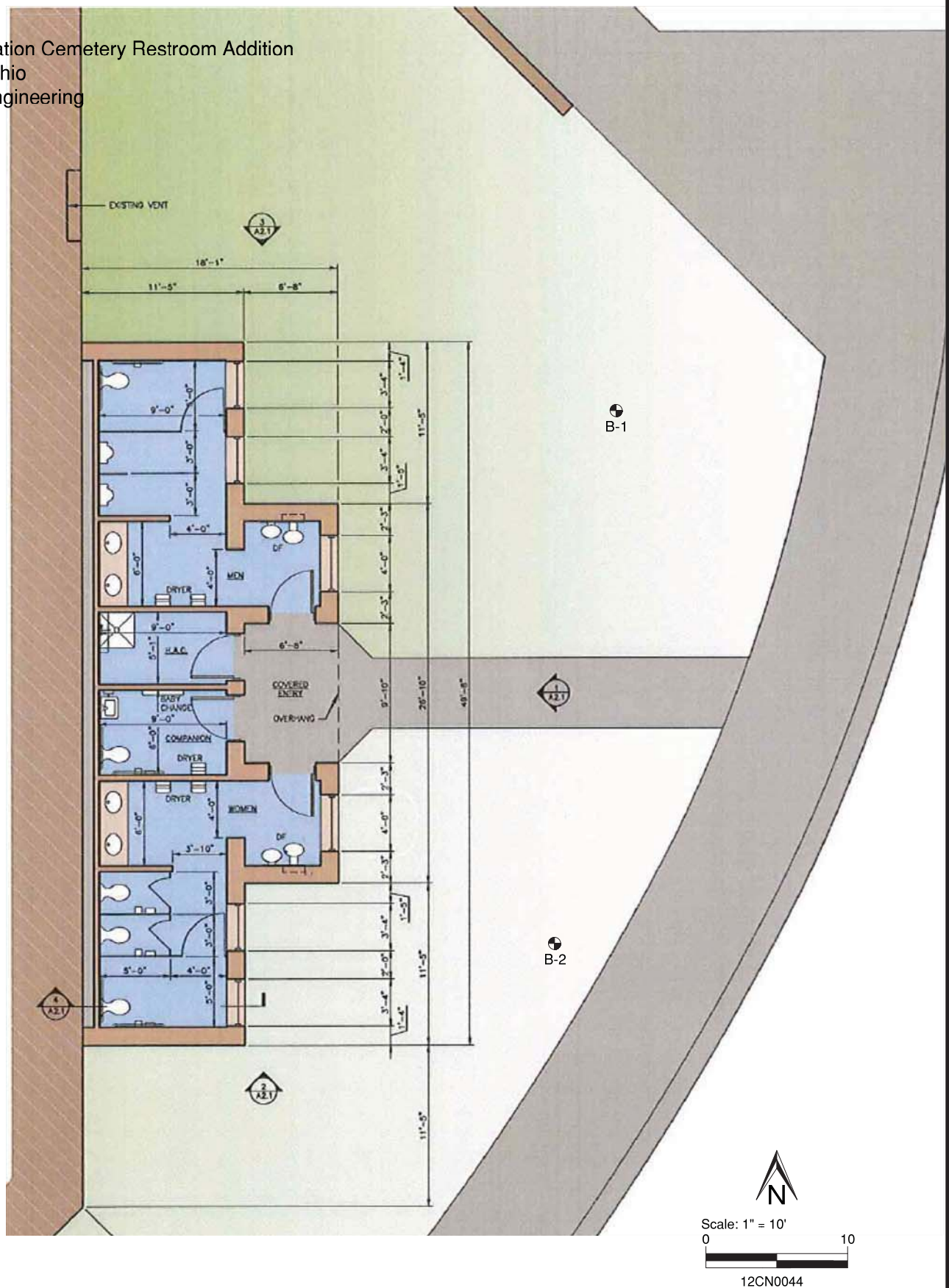
Name: MIAMISBURG  
 Date: 3/29/2012  
 Scale: 1 inch equals 2000 feet

Location: 039° 44' 45.2" N 084° 15' 31.6" W  
 Caption: Site Location Map 12CN0044  
 Dayton National Cemetery Restroom Addition  
 Dayton, Ohio





Dayton Nation Cemetery Restroom Addition  
Dayton, Ohio  
Jacobs Engineering







# RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Jacobs Engineering  
PROJECT NAME Dayton National Cemetery Public Restroom  
PROJECT LOCATION Dayton, OH

BORING # B-1  
Alt & Witzig File No. 12CN0044

## DRILLING and SAMPLING INFORMATION

Date Started 3/28/12 Hammer Wt. 140 lbs.  
Date Completed 3/28/12 Hammer Drop 30 in.  
Boring Method HSA Spoon Sampler OD 2 in.  
Driller J.Roark Rig Type D-50 Truck

## TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsif Unconfined Compressive Strength	PP-tsif Pocket Penetrometer	Moisture Content % Unit Weight (pcf)	Remarks
	TOPSOIL	0.5										
	Brown Silty CLAY	4.0		1	SS			15		2.5	15.9	pH = 8.02 Sulfate = 7 ppm
	Brown Mottled Gray Silty CLAY Trace Gravel	7.0	5	2	SS			16		4.5	12.3	pH = 7.73 Sulfate = 47 ppm
	Brown Silty CLAY Trace Sand and Gravel	9.0		3	SS			11		2.5	12.4	
	Gray Silty CLAY Trace Sand and Gravel	14.0	10	4	SS			10		1.3	11.1	
				5	SS			16		2.5		
	Gray, Moist SILT	18.0	15	6	SS			26		4.5		
	Gray Silty CLAY Trace Gravel	26.0	20	7	SS			11		1.0		
			25	8	SS			20		4.5		
	End of Boring at 26 feet											

### Sample Type

SS - Driven Split Spoon  
ST - Pressed Shelby Tube  
CA - Continuous Flight Auger  
RC - Rock Core  
CU - Cuttings  
CT - Continuous Tube

### Groundwater

○ During Drilling Dry ft.  
▽ At Completion 18 ft.  
☒ Caved At Completion 21 ft.

### Boring Method

HSA - Hollow Stem Augers  
CFA - Continuous Flight Augers  
DC - Driving Casing  
MD - Mud Drilling



# RECORD OF SUBSURFACE EXPLORATION

*Alt & Witzig Engineering, Inc.*

CLIENT Jacobs Engineering  
 PROJECT NAME Dayton National Cemetery Public Restroom  
 PROJECT LOCATION Dayton, OH

BORING # B-2  
 Alt & Witzig File No. 12CN0044

## DRILLING and SAMPLING INFORMATION

Date Started 3/28/12 Hammer Wt. 140 lbs.  
 Date Completed 3/28/12 Hammer Drop 30 in.  
 Boring Method HSA Spoon Sampler OD 2 in.  
 Driller J.Roark Rig Type D-50 Truck

## TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Unit Weight (pcf)	Remarks
	TOPSOIL	0.4										
	Brown Silty CLAY with Gravel	4.0		1	SS			8		4.5	19.6	pH = 7.78 Sulfate = 13 ppm
	Brown Mottled Gray Silty CLAY Trace Gravel	7.0	5	2	SS			13	2.6	4.5	11.2	
	Brown Silty CLAY with Gravel Possible Wet Sand Seams	9.0		3	SS			9		0.5	14.2	
	Gray Silty CLAY with Gravel	14.0	10	4	SS			11		1.0	13.5	
				5	SS			22		4.5		
	Brownish Gray, Moist SILT Trace Gravel	22.0	15	6	SS			19		4.5		
				7	SS			17		4.5		
	Gray Silty CLAY with Gravel	26.0	20	8	SS			18		4.5		
	End of Boring at 26 feet		25									

### Sample Type

SS - Driven Split Spoon  
 ST - Pressed Shelby Tube  
 CA - Continuous Flight Auger  
 RC - Rock Core  
 CU - Cuttings  
 CT - Continuous Tube

### Groundwater

○ During Drilling Dry ft.  
 ∇ At Completion Dry ft.  
 ☒ Caved At Completion 26 ft.

### Boring Method

HSA - Hollow Stem Augers  
 CFA - Continuous Flight Augers  
 DC - Driving Casing  
 MD - Mud Drilling

## GENERAL NOTES

### SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

### SOIL PROPERTY SYMBOLS

- N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split-spoon.
- Qu: Unconfined compressive strength, TSF
- Qp: Penetrometer value, unconfined compressive strength, TSF
- Mc: Water content, %
- LL: Liquid limit, %
- PL: Plastic limit, %
- Dd: Natural dry density, PCF
- : Apparent groundwater level at time noted after completion

### DRILLING AND SAMPLING SYMBOLS

- SS: Split-spoon - 1 3/8" I.D., 2" O.D., except where noted
- ST: Shelby tube - 3" O.D., except where noted
- AU: Auger sample
- DB: Diamond bit
- CB: Carbide bit
- WS: Washed sample

### RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

<u>TERM (NON-COHESIVE SOILS)</u>	<u>BLOWS PER FOOT</u>
Very loose	0 - 4
Loose	5 - 10
Firm	11 - 30
Dense	31 - 50
Very Dense	Over 50

<u>TERM (COHESIVE SOILS)</u>	<u>Qu (TSF)</u>
Very soft	0 - 0.25
Soft	0.25 - 0.50
Medium	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

### PARTICLE SIZE

Boulders	8 in.(+)	Coarse Sand	5 mm-0.6 mm	Silt	0.075 mm - 0.005 mm
Cobbles	8 in. - 3 in.	Medium Sand	0.6mm-0.2 mm	Clay	0.005mm(-)
Gravel	3 in. - 5 mm	Fine Sand	0.2mm-0.075 mm		

