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GEOTECHNICAL LABORATORIES, INC.
ENGINEERS • GEOLOGISTS • CONSULTANTS

December 29, 2016

Mr. David Yensan
Director of Structural Engineering
Pond & Company
3500 Parkway Lane, Suite 600
Norcross, Georgia 30092

Re: Addendum to Report of Subsurface Exploration and Geotechnical Engineering Analysis
DC ANG Munitions Loading Crew and Corrosion Control Hangers
Joint Base Andrews
Prince George's County, Maryland
Project No. 113-020

Dear Mr. Yensan:

This report is to serve as an addendum to the report entitled "Report of Subsurface Exploration and Geotechnical Engineering Analysis, DC ANG Munitions Loading Crew and Corrosion Control Hangers" that was dated July 23, 2013. Geotechnical Laboratories, Inc. performed an additional test boring to supply the seismic recommendations as required in UFC 3-220-01 "Geotechnical Engineering." This test boring was drilled to a depth of 100 feet and was located within the foot print of the proposed hanger.

For purposes of seismic building design, the soils encountered in the test borings for this addendum were classified according to the International Building Code (IBC) 2012. Based on an evaluation of the field and laboratory test data, this site is considered to be site Class E (soft soils). This facility is considered to be SUG Class II. The foundations should be designed using Maximum Considered Earthquake (MCEr) spectral response accelerations S_s of 18 and S_1 of 6. This site has a moderate potential for liquefaction.

We have appreciated this opportunity to be of service to you. Should you have any questions regarding the content of this report, please feel free to contact our office.

Very truly yours,
Geotechnical Laboratories, Inc.

Brian J. Luoma, E.I.T
Staff Engineer

G. Matthew Norris, P.E.
Principal

GMN/BJL
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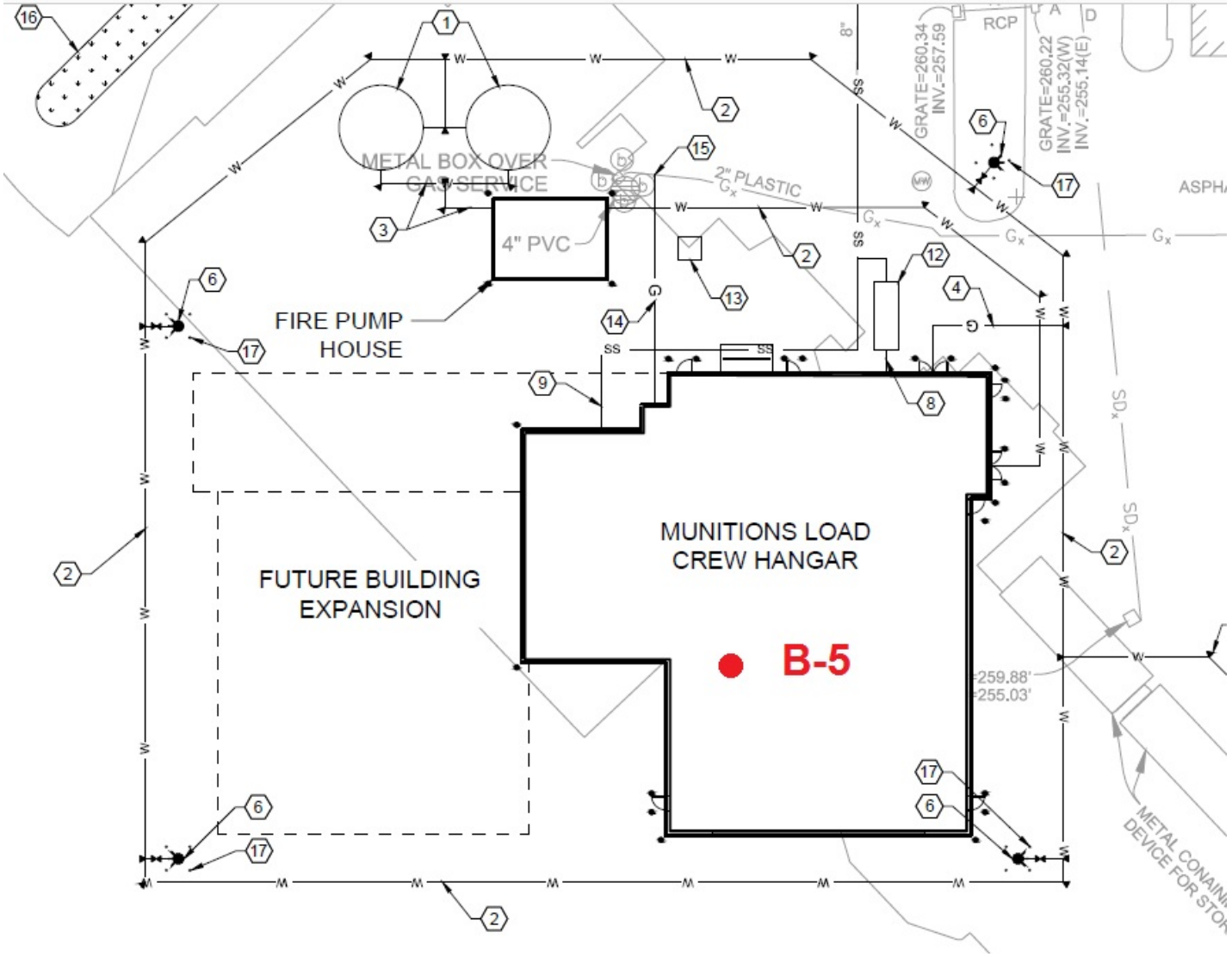
8980 State Route 108, Suite D, Columbia, Maryland 21045
410-772-2220 1-888-4geolab Fax: 410-772-2221 geolab@verizon.net



Boring Location Plan	**DC ANG Munitions Loading Crew and Corrosion Control Hanger**
	Joint Base Andrews, Prince Georges County, MD
	Project No. 113-020
	December 2016

BORING LOG

GEOLAB, INC.

Report No.: Date: **12/29/2016**

Client: **Pond and Company**

Project: **DCANG** Project No. **113-020**

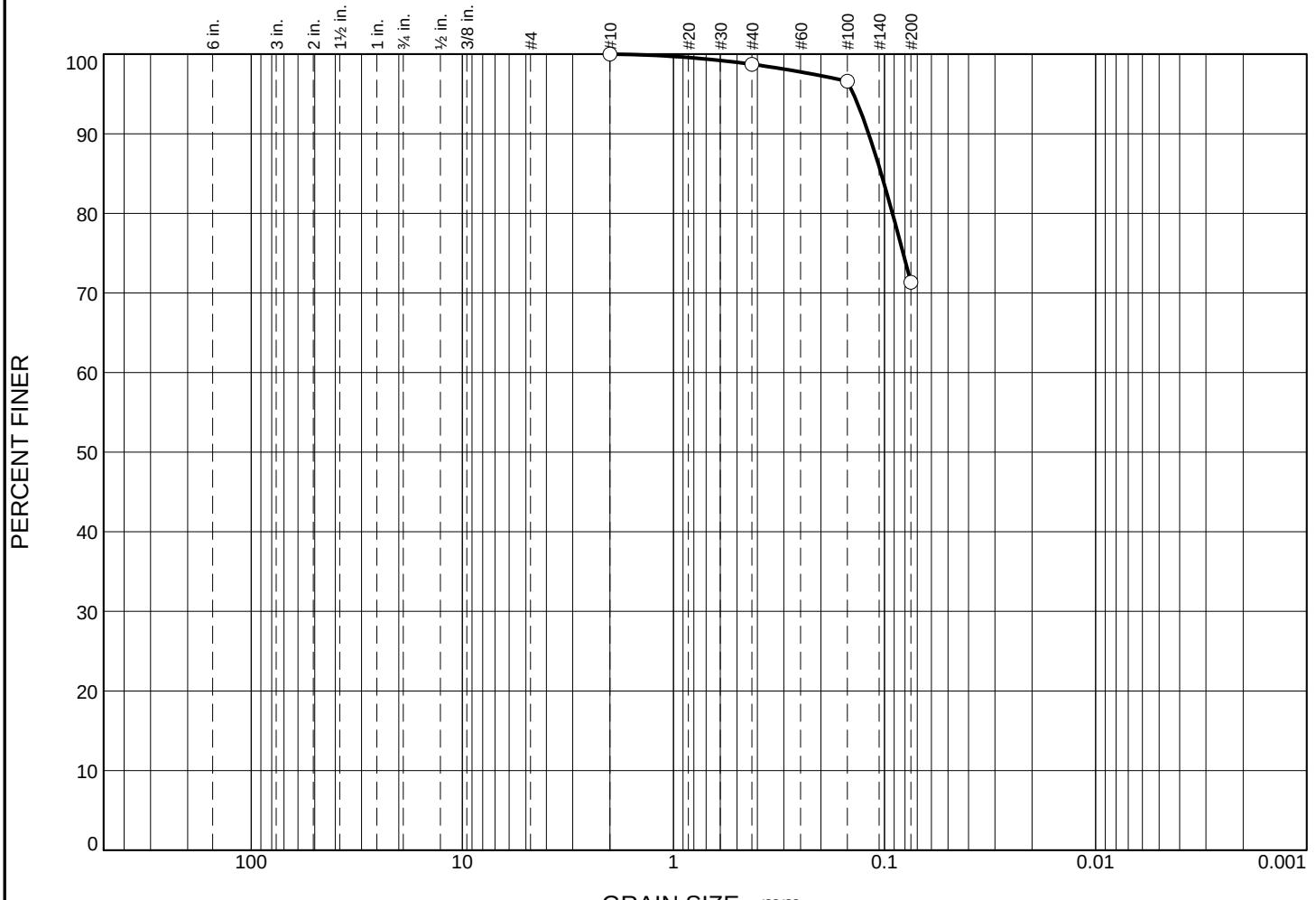
Boring No.: **B-5** **(1 of 1)** Total Depth **100** Elev: **261.0 +/-** Location: **See Boring Location Plan**

Type of Boring: **Hollow Stem Auger** Started: **6/20/2013** Completed: **6/20/2013** Driller: **Free State Drilling, Inc.**

Elevation	Depth	DESCRIPTION OF MATERIALS (classification)	*Sample Blows	Sample Depth (Feet)	Moisture Content	REMARKS
261	0.0	Concrete slab				**Groundwater was encountered at a depth of 7.0 feet.**
260.1	0.9	Orange-brown and gray fine sandy CLAY, moist, stiff (CL)	4,7,10	1.0 2.5		
260	3.0		6,7,12	3.5	14.8	
258				5	7.3	
257.5	5.5	Light gray to pink orange silty fine SAND with little clay, moist, medium dense (SM)	20,14,13	6.0	10.2	**Cave-in occured at a depth of 10.0 feet.**
255.5				7.5		
255	8.0	Gray to brown silty fine to medium SAND with little clay and little gravel, moist, medium dense (SM)	5,6,9	8.5		
253				10		
252.5				13.5		
248.5	12.5	Tan to orange-tan silty fine to medium SAND with trace gravel and trave clay, wet, medium dense (SM)	5,7,8	15	14.2	
247.5				18.5		
242.5			5,6,7	20	18.3	
239	22.0	Tan silty fine to coarse SAND, saturated, medium dense (SM)	1,2,2	23.5 25	33.3	
237.5						
233.5	27.5	Yellow and brown silty fine SAND with little clay, saturated, very loose (SM)	0,0,0	28.5 30	52.3	
232.5						
230	31.0	Dark gray fine sandy SILT, wet to moist, very loose (ML)	2,1,2	33.5 35	50.0	
227.5						
222.5		Dark gray CLAY with little fine sand, wet to moist, soft to stiff (CH)	4,4,5	38.5 40		
217			8,8,12	44.0 45.5	50.7	
214	47.0	Dark gray SILT with some fine sand, moist, medium dense (ML)				
212			6,6,8	49.0 50.5	43.3	
207			6,5,7	54.0 55.5	44.5	
202			6,7,10	59.0 60.5	38.0	
199	62.0	Dark gray fine sandy SILT, moist, medium dense to very dense (ML)				
197			7,7,10	64.0 65.5	39.4	
192			9,9,10	69.0 70.5	45.5	
187			10,10,13	74.0 75.5	50.6	
182			11,19,23	79.0 80.5	42.3	
177			11,18,22	84.0 85.5	43.0	
172			32,50+	89.0 90.5	56.5	
167			19,28,32	94.0 95.5	54.9	
162			29,50+	99.0 100.5	61.0	
161	100.0	End of Boring				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the last two increments of penetration is termed the standard penetration resistance, N.

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.3	27.4	71.3	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.1037							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ Gray SILT with some fine sand		ML	44.5

Project No. 113-020 **Client:** Pond and Company

Project: DCANG

○ **Source of Sample:** B-5 **Depth:** 54.0'-55.5' **Sample Number:** S-13

Remarks:

○ SpG Assumed

Date Received: 12/7/2016

Nat. M/C - 44.5%

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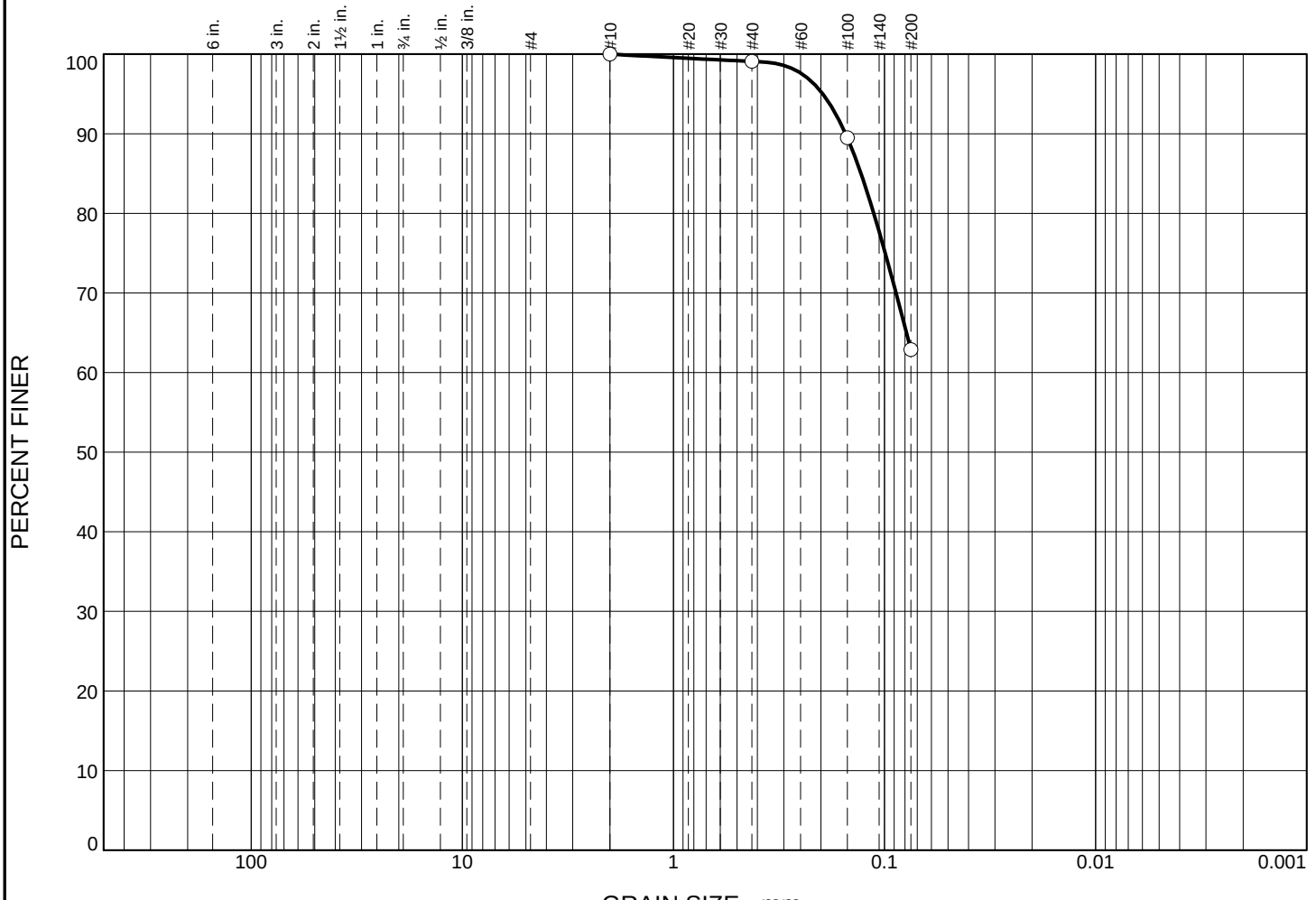
Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.9	36.2	62.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.1292							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ Dark gray fine sandy SILT		ML	50.6

Project No. 113-020 **Client:** Pond and Company

Project: DCANG

○ **Source of Sample:** B-5 **Depth:** 74.0'-75.5' **Sample Number:** S-17

Remarks:

○ SpG Assumed

Date Received: 12/7/2016

Nat. M/C - 50.6%

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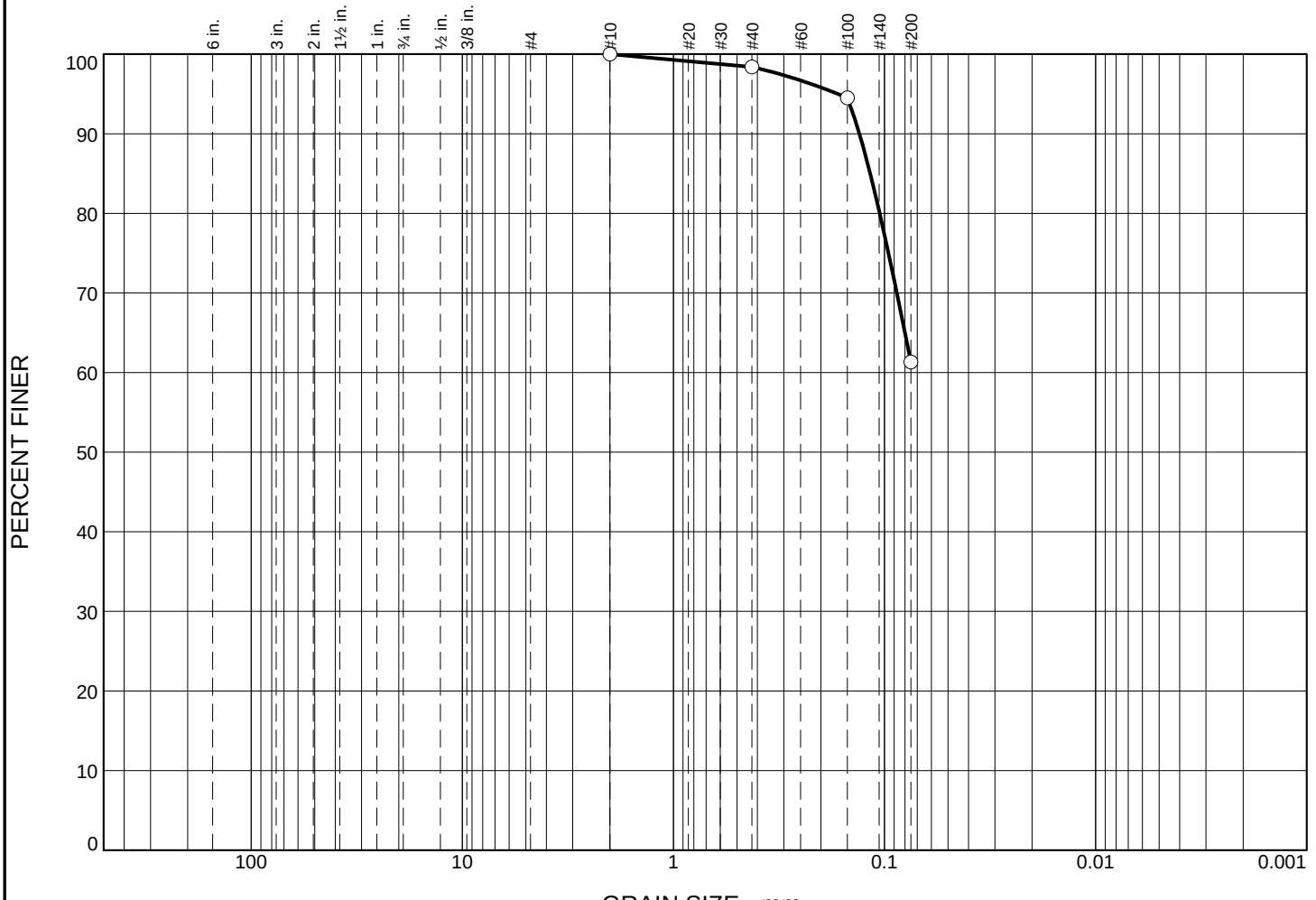
Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.6	37.1	61.3	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.1169							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ Dark gray fine sandy SILT		ML	54.9

Project No. 113-020 **Client:** Pond and Company

Project: DCANG

○ **Source of Sample:** B-5 **Depth:** 94.0'-95.5' **Sample Number:** S-21

Remarks:

○ SpG Assumed

Date Revceived: 12/7/2016

Nat. M/C - 54.9%

Geolab, Inc.

Columbia, MD

Figure

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GEOTECHNICAL LABORATORIES, INC.
ENGINEERS • GEOLOGISTS • CONSULTANTS

July 23, 2013

Mr. David Yensan
Director of Structural Engineering
Pond & Company
3500 Parkway Lane, Suite 600
Norcross, Georgia 30092

Re: Report of Subsurface Exploration
and Geotechnical Engineering Analysis
DC ANG Munitions Loading Crew and
Corrosion Control Hangers
Joint Base Andrews
Prince George's County, Maryland
Project No. 113-020

Dear Mr. Yensan:

Geotechnical Laboratories, Inc. (Geolab) has completed the authorized subsurface exploration and geotechnical engineering analysis for the above referenced project. This study was conducted in accordance with the terms of our proposal dated February 28, 2013, and subsequently authorized by Mr. David Yensan of Pond & Company.

Our report describes the exploration methods employed, exhibits the data obtained and presents our evaluation and recommendations. The results of our exploration and evaluation indicate that conventional spread footings bearing on native soils represent the most feasible foundation type for the planned building based upon the engineering characteristics of the subsurface materials and the anticipated structural loads. The subsurface conditions at the proposed hanger location will support the planned construction. However, it appears that infiltration is not feasible at the proposed stormwater management location. This condition is addressed in detail later in this report.

In addition to our foundation recommendations, we have presented recommendations for site preparation, backfill placement and compaction, floor slab construction, pavement subgrade preparation, and flexible and rigid pavement design.

We have appreciated this opportunity to be of service to you. Should you have any questions regarding the content of this report, please feel free to contact our office.

Very truly yours,
Geotechnical Laboratories, Inc.

Brian J. Luoma, E.I.T
Staff Engineer

G. Matthew Norris, P.E.
Principal

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geotechnical laboratories, inc.

REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING ANALYSIS

DC ANG MUNITIONS LOADING CREW AND CORROSION CONTROL HANGERS
JOINT BASE ANDREWS
PRINCE GEORGE'S COUNTY, MARYLAND

PREPARED FOR:

Mr. David Yensan
Pond & Company
3500 Parkway Lane, Suite 600
Norcross, Georgia 30092

July 2013
Project No. 113-020

8980 State Route 108, Suite D, Columbia, Maryland 21045

TABLE OF CONTENTS

PURPOSE AND SCOPE

This report presents our engineering evaluation of the subsurface exploration program for the Proposed Munitions Loading Crew and Corrosion Control Hanger at Joint Base Andrews in Prince George's County, Maryland.

The purpose of this subsurface exploration and analysis was to determine the various soil profile components and the engineering characteristics of the foundation materials, and to provide geotechnical criteria for use by the design engineers and architects in preparing the foundation and site designs.

The scope of services included the performance of four standard penetration test borings, laboratory testing and professional engineering analysis of the resulting data to develop:

1. Estimated subsoil conditions and groundwater levels within the areas explored.

2. Identification of the engineering characteristics of the subsurface materials.

3. Foundation recommendations for support of the proposed structure including allowable bearing pressures.

4. Evaluate the strength of the existing pavement in the taxiway.

5. Construction recommendations and descriptions of unusual soil conditions, if encountered.

The assessment of site environmental conditions or the presence of environmentally-related contaminants in the soil or groundwater of the site was beyond the scope of this exploration.

EXISTING SITE CONDITIONS

The project site is located in the western portion of Prince George's County, Maryland, in the town of Camp Springs. More specifically, it is situated at the east-central section of Joint Base Andrews. The site is located adjacent to the runway within the boundary of the airfield. See the Vicinity Map in the Appendix at the end of this report.

The surface of the project area is covered with asphalt and concrete pavement and grassy areas. Short grasses are located adjacent to a taxi way and the proposed hanger location. Large concrete slabs are located were several hangers once stood. The remaining areas are asphalt pavement of various thickness.

Several utilities were observed or noted on plan drawings. These consist of electrical, communication, stormdrain, water, and gas lines spanning through the planned project area. For the most part, these are positioned throughout the site with the communication, sewer, gas, and electric lines located to the east of the site.

The topography of the subject site is relatively flat and uniform. The overall relief varies only about 3.0 foot in elevation. Surface drainage appears to be poor. At the time of drilling the grassy areas were moist and soft. It was also observed at the time of drilling that the asphalt area was occupied by personal vehicles.

PROPOSED CONSTRUCTION

Details concerning the current project planning were provided by representatives of Pond & Company (civil engineers). These indicate that the project will consist of relocating two existing hanger structures from their current positioned 1400 feet to the southeast. These structures will then be converted to house the munitions loading crew and corrosion control equipment. The existing hangers will be moved in one piece and positioned on top of newly constructed footings. The taxi way will be used to transport the structures to the new location.

Details regarding the structural loads for the planned building were not available for this study; however, it is assumed that the structural loads will likely be applied primarily to exterior columns.

The finished floor elevation for the slab-on-grade is reported to be approximately 6 inches lower than the existing grade at the proposed hanger locations.

FIELD EXPLORATION AND LABORATORY TESTING

The field exploration to determine the engineering characteristics of the foundation materials included a reconnaissance of the project site, making the borings, performing standard penetration tests and recovering disturbed split-spoon samples.

A total of four test borings, Nos. B-1 through B-4, were drilled with an ATV (all-terrain vehicle)-mounted mechanical drill rig for this study. The number and locations of the test borings were selected by personnel of Pond & Company. Field horizontal and vertical control for the test boring locations was provided by field personnel of Geolab. Test Boring No. B-1 was located in the taxiway adjacent to the runway and was drilled to a depth of 10 feet. Test Boring No. B-2 was located within the grass area at the proposed SWM location and was drilled to a depth of 15 feet. Test Boring Nos. B-3 and B-4 were located at the proposed hanger locations and were drilled to a depth of 60 feet and 20 feet, respectively. See the Boring Location Plan in the Appendix for the approximate locations of the test borings.

The test drilling and sampling operations were conducted in accordance with ASTM Specification D-1586. A brief description of our field procedures is included in the Appendix. Each test boring was checked for the presence of groundwater during and at the completion of drilling. The results of all boring and sampling operations are shown on the Boring Logs, which are also included in the Appendix.

In addition to the field exploration, a supplemental laboratory testing program was conducted to determine additional pertinent engineering characteristics of the foundation materials necessary in analyzing the behavior of the proposed structure. The laboratory testing program included a visual classification on all the samples by a geotechnical engineer in accordance with ASTM D-2488. In addition, selected representative samples were subjected to moisture content determinations, Atterberg Limits and Grain Size tests (ASTM D-2487). The results of these tests were used to classify the soils according to the Unified Soils Classification System (USCS).

All phases of the soil laboratory testing program were conducted in general accordance with applicable ASTM Specifications. The results of these tests are to be found on the accompanying Boring Logs and Grain Size Distribution Test Reports located in the Appendix.

SUBSURFACE CONDITIONS

Area Geology

The project site is located in the Atlantic Coastal Plain Physiographic Province, a region characterized by deep alluvial deposits of layered and mixed sediments formed by the transgression and regression of the sea and adjacent river tributaries.

Based on the visual characteristics of the samples obtained during the field exploration and available published geologic information on the area, the site is directly underlain by Tertiary Geologic Age Upland Deposits. This unit is composed of coarse to fine gravel or sand and gravel which grades upward to a silt/silty clay loam cap. It is also referred to as the Brandywine Formation and has historically been a source of select granular material for borrowing or mining purposes.

General

The types of subsurface materials encountered have been visually classified and are described in detail on the boring logs. Representative samples of the soils were placed in sample jars and are now stored in the laboratory for further analysis if desired. Unless notified to the contrary, all samples will be disposed of after three months.

The stratification of the soils. as shown on the boring logs, represents the soil conditions in the actual test boring locations. Other variations may occur between the test borings. Lines of demarcation represent the approximate boundary between the soil types, but the transition may be gradual.

It is to be noted that, whereas the test borings are drilled and sampled by experienced drillers, it is sometimes difficult to record changes in stratification within narrow limits, especially at moderate depths. In the absence of foreign substances, it is also difficult to distinguish between discolored natural soils and clean soil fill.

Description of Foundation Materials

The surface of the areas explored consists of asphalt pavement, concrete pavement or sod with root (organic) matter and organic soil, approximately 0.5 to 1.1 feet in thickness. Directly beneath the surface cover material, the soils encountered in the test borings consist of fill soils underlain by native soils. Fill soils were encountered in Test Boring No. B-1 extending to a depth of about 5.5 feet. This material could have been placed during the construction of the taxi way. Texturally, the fill soils are composed of tan silty fine SAND (SM). Results of field penetration tests and a laboratory moisture content test indicated that this material was, at the time of drilling, dense and "moist."A bulk sample representative of this fill material was collected from Test Boring No. B-1. Laboratory tests indicates that this soil has a maximum dry density of 126.6 pcf with an optimum moisture content of 9.8%.

The remaining soils are composed of native soils. These appear to be representative of the geologic unit described above. Overall, three layers or strata were encountered in the test borings. A description of each of these native soil strata follows:

Stratum A: The shallowest approximate 3.0 to 5.5 feet observed in each of the test borings (except No. B-1) consists of brown to tan or reddish/orangish/yellowish-tan silty CLAY with small percentages of fine to medium/coarse sand and gravel (CL) and tan clayey SILT with some fine sand (ML). Results of laboratory testing on a selected representative sample of this stratum indicates that it has low to moderate plasticity. This stratum can be considered as a representation of the cap or cover materials of this unit.

The natural moisture content of the Stratum A soils ranged, at the time of drilling, from 14.5 to 14.7 percent (considered "moist" on a continuum of dry, damp, moist, wet and saturated). Standard penetration (N) values ranged from 6 to 17 blows per foot, indicating medium to very stiff consistency. Typically, these N values increased with depth, especially below a depth of about 2.0 to 3.0 feet.

Stratum B: This second stratum was encountered in all four of the test borings between depths of about 3.0/5.5 and 27.5 feet. The soils of Stratum B are composed of light-colored well-graded SAND with small percentages of gravel and silt. These materials are typical of the granular materials which have been historically mined and used as select fill in this region. Test Boring Nos. B-1, B-2 and B-4 were terminated in this stratum.

The moisture content of Stratum B ranged, at the time of drilling, from 6.1 to 33.3 percent (considered "damp" to "saturated"). "Wet" or "saturated" soils of this stratum were observed at depths of about 7.0-35.0 feet in the test borings. N values ranged from 4 to 39 blows per foot (very loose to dense relative density). The values for penetration resistance were especially high in the more gravelly shallower materials of this stratum and decreased somewhat with depth.

Stratum C: The soils of this third stratum comprise the remainder of the subsurface materials encountered in Test Boring No. B-3. They consist of dark gray fine sandy silt and CLAY with little fine sand. Results of laboratory testing on a selected representative sample of this stratum indicates that it has moderate to high plasticity (Liquid Limit of 40 to 65 and Plasticity Index of 25 and 32).

The moisture content of the Stratum C soils ranged, at the time of drilling, from 50.0 to 52.3 percent (considered "wet"). N values ranged from 0 to 16 blows per foot (very soft to very stiff consistency).

The results of the laboratory testing and U.S. Department of Agriculture (U.S.D.A.) textural classifications indicate that, in the proposed stormwater management areas, the natural soils classify as LOAM, LOAMY SAND and SAND. See the Boring Logs for the appropriate U.S.D.A. textural classifications at Test Boring No. B-2.

Groundwater Observations

Subsurface water was encountered during drilling in each of the three test borings at depths ranging from 7.0 to 9.0 feet below the ground surface. The following provides a tabular summary of this data:

Boring No.	Groundwater Encountered (feet)	Cave-in Depth (feet)
B-1	9.0	-
B-2	8.0 (5.5 at end of day)	9.0
B-3	7.0	10.0
B-4	8.0	9.7

The ground water levels observed in the test borings appear to be representative of the normal ground water table. It should also be noted that groundwater levels on this site may vary due to seasonal conditions.

Field Percolation Test Results

The percolation (supplemental) hole was, after 24 hours, initially restored to a level of 2.0 feet of water at the start of this testing procedure. The water level was thereafter maintained for a period of 4 hours and checked hourly for fall. At the completion, the average hourly infiltration/percolation rate was calculated based on the recorded data. The average infiltration rate was as follows:

Test Boring No.	Infiltration Rate (inches per hour)	Depth of Pipe
B-2	12.0	4.0

PROJECT DISCUSSION

The results of this study reveal that the site is, for the most part, suitable for the planned construction. It should be treated in the typical manner of construction and grading, that is, the removal of sod and the organic matter cover, and existing asphalt and concrete pavement, proofroll the exposed subgrade, identify any locally soft pockets, to design grade and to construct the planned development.

Based on the proposed scope of construction and the subsurface conditions encountered in the test borings, a foundation system of conventional shallow footings is considered feasible. Also included in the scope of this study was to evaluate the taxiway and to evaluate the site for the planned stormwater management area. The results of our geotechnical analysis borings indicate that it appears that the taxiway will support the hanger in transit. However, it appears that infiltration is not feasible at the planned SWM location. These topics are discussed in more detail later in this report.

RECOMMENDATIONS

The following recommendations are based on our understanding of the proposed construction, the data obtained from the test borings, and our previous experience with similar subsurface conditions and projects. If there are any significant changes to the building location, floor elevation, etc., we request that this office be advised so the recommendations of this report can be re-evaluated.

Existing Taxiway Pavement

Test Boring No. B-1 was positioned in the taxi way to determine if the pavement section would support the hangers during transport. The asphalt at Test Boring No. B-1 was recorded to be 13 inches in thickness with 4 inches of graded aggregate base. The test boring also indicates that approximately 5 feet of fill was placed to construct the taxi way. As described earlier, this fill material consisted of silty fine SAND (SM). Laboratory test results indicate that this fill material has an California Bearing Value of 16.0. Based on the existing pavement section, it is calculated that the existing paving section can support more then 3,000 daily 18,000 pound equivalent single axle loads (ESAL).

Foundation Design

The strengths of the natural soils at and below the anticipated footing elevations indicate that conventional shallow spread footings may be feasible, using a maximum allowable bearing pressure of 4000 psf (pounds per square foot).

Settlement analyses were accordingly performed at one of the representative test boring locations using this allowable bearing pressure, on residual soils, and representative soil parameters based on the test boring results and laboratory test data. These calculations also assumed a column load of 100 Kips. The analysis yielded the following results:

Boring No.	Column Footing Size (feet)	Calculated Settlement (inches)
B-3	5.0 x 5.0	0.6

Actual settlement could be more or less, but it is our experience that actual total settlement will typically be about one-half to two-thirds of the calculated magnitude. In any event, considering the anticipated footing sizes (dependent on the magnitude of the column loads) and the above-detailed data regarding both anticipated total and differential settlement, use of conventional footings bearing directly on the native soils appears to be feasible as a foundation for the proposed building. Judging by the results of the settlement analyses and our experience, the total settlement will likely be less than 1.0 inch with differential settlement between adjacent columns being less then 0.5 inches. Most, if not all, of the actual settlement would be expected to occur during and within several days of construction.

Minimum dimensions of 36 inches for square footings and 18 inches for continuous or rectangular footings should be used in foundation design to minimize the possibility of local shear failure.

Localized soft/loose pockets may be encountered in the foundation excavations. If found, they should be densified in-place or the footings extended to bear on underlying higher strength soils. Accordingly then, the footings may be stepped down or raised, depending upon the existing subsoil conditions and presence of weak fill soils. This should be determined by the geotechnical engineer at the time of construction. Alternatively, these localized soft/loose pockets may be undercut to their full depth and lateral extent and replaced with select (granular/clean crushed stone or gravel) fill.

All conventional foundation excavations should be inspected by the geotechnical engineer prior to the placement of concrete. The purpose of the inspection would be to verify that the exposed bearing materials are suitable for the design soil bearing pressure and that loose, wet, frozen or compressible soils are not present.

Exterior footings and footings in unheated areas should be located at a depth of at least 2.5 feet below the final exterior grade to provide adequate frost cover protection. If foundation construction is performed during winter months, or, if the footing elements will be subjected to freezing temperatures after construction, then all footings should be adequately protected during freezing periods. Otherwise, interior footings can be located at nominal depths below the finished floor level.

Soils exposed at the bases of all satisfactory foundation excavations should be protected against any detrimental change in condition such as disturbance from rain or frost. Surface runoff should be drained away from the excavations and not be allowed to pond. If possible, concrete should be placed in the footings the same day the excavations are made. Otherwise, footing excavations should be adequately protected from rainfall or freezing conditions.

CONSTRUCTION RECOMMENDATIONS

Site Preparation and Excavation

Prior to any site grading and construction of the planned development, the existing paving (if being replaced) should be removed and/or demolished and all vegetation, organic matter and organic soil removed.

The thickness of the surficial organic matter to be stripped (over the rest of the site) is dependent upon weather conditions. If the stripping operations are performed during a wet or seasonally inclement period, the thickness of the organic zone and unsuitable (wet) materials will likely further increase.

Therafter, the site may be graded. The exposed soil subgrade in the building floor slab and the pavement areas and any designated fill areas should be inspected by the geotechnical engineer. The inspector should require the exposed materials be proofrolled utilizing a tandem axle fully-loaded dump truck. The purpose of the proofrolling would be to provide surficial densification (for slab-on-grade or pavement support) and to locate any potential isolated areas of soft or loose soils requiring undercutting. Any unsuitable/weak pockets in the building footprint detected during the proofrolling operation should be undercut to the dimensions and depth directed by the geotechnical engineer. For the proposed pavement area we recommend a minimum undercut of 18 inches.

Care should be exercised during this stage of construction. This is because the shallow soils are sensitive to moisture change and loss of strength in the presence of excessive moisture. If these soils are permitted to acquire high moisture contents during construction, traffic of heavy compaction equipment may create a general deterioration of these soils. A significant increase in moisture (which could occur if construction is performed during the winter or early spring) and/or deterioration of the soils during construction will likely require their removal and replacement with imported, drier material. Therefore, if at all possible, this stage of construction should be carried out during a dry period. Minimally, the contractor should implement steps to insure that the shallow soils are protected from the elements during this phase of construction.

If problems concerning the moisture conditions of the on-site soils should arise, the geotechnical engineer should be consulted for an evaluation of the conditions. Any over-excavated areas resulting from the removal of unsuitable materials should be backfilled with properly compacted materials in accordance with the procedures provided in the following section.

Ground-Supported Slab

The ground-supported slab (if required) may be supported on approved existing fill soils and/or controlled fill. The finished subgrade should be prepared in accordance with the procedures described in the earlier sections entitled “Site Preparation and Excavation” and “Fill Placement”. Additional over-excavation will be required if soft or unsuitable materials are found in the shallow fill soils within the building limits.

It is also recommended that a four-inch clean granular leveling and load distributing material such as washed sand, washed sand and gravel or screened crushed stone be used beneath the floor slab. This material may require acquisition from off-site source. For purposes of slab design, the supporting soils are anticipated to provide a subgrade modulus (k) of 200 pounds per cubic inch (pci).

Prior to placing stone, the slab subgrade should be free of standing water or mud. A suitable moisture barrier should also be provided. These procedures will help to prevent capillary rise and damp floor slab conditions.

Groundwater and Drainage

Considering the anticipated finished floor elevation and the results of the test borings, no significant groundwater-related construction problems are anticipated for the new footing elements of the relocated hangers. Additionally, seasonal variations may introduce moisture to the subgrades and, following a prolonged rainy period, water levels may affect footings and utility excavations. In the likelihood of such an occurrence, then gravity ditching and/or use of a sump pit and pump may be required.

Additional water infiltration may occur as a result of surface runoff. Efforts should be made to deep exposed subgrade areas dry during construction, primarily because the fine-grained soils of this region are susceptible to rapid deterioration and loss of strength in the presence of excessive moisture. Adequate drainage should be provided at the site to minimize any increase in moisture content of the foundation soils. All surrounding areas should be sloped away from the structure to prevent ponding of water around the building. Site drainage should also be such that runoff onto adjacent areas is properly controlled.

Stormwater Management System

The following U.S.D.A. Textural Infiltration Classifications have been assigned to the on-site native soils encountered in the proposed infiltration stormwater management areas (Test Boring No. B-2).

Texture Class	Effective Water Capacity (inch per inch)	Minimum Infiltration Rate (inches per hour)	Hydrologic Soil Group
LOAM	0.19	0.52	B
LOAMY SAND	0.31	2.41	A
SAND	0.35	8.27	A

A comparison of the above infiltration rates and soil permeabilities with the State of Maryland infiltration criteria indicates that only the soils which classify as LOAM, LOAMY SAND and SAND are suitable for utilization of an infiltration system. This applies to the soils below depths of about 2.0 feet at the location of Test Boring No. B-2.

As discussed above, “saturated” soils indicative of groundwater were encountered in this test boring at a depth of about 8.0 feet and, at the end of the day, the water level was recorded at a depth of 5.5 feet. This is a limiting condition in that regulatory criteria require a 2 to 4 foot distance between the bottom of an infiltration structure and the seasonally high groundwater table. In view of this restriction, it appears that infiltration is not feasible at this location.

Soil Resistivity

Soil resistivity was measured using the driven rod (3-pin method) at three locations in the grassy area near Test Boring Nos. B-2 and B-3. Soil resistivity ranged from 2000 to 2500 Ohm-cm, considered highly corrosive.

IBC Soil Classification

For purposes of seismic building design, the soils encountered in the test borings (and especially Boring No. B-3) for this study were classified according to the International Building Code (IBC) 2009. Based on an evaluation of the field and laboratory test data, these soils were viewed as being site Class E (soft soils). The foundations should be designed using a S_s of 15 and a S_1 of 5.5.

ADDITIONAL SERVICES RECOMMENDED

Additional engineering, testing and consulting services recommended for this project are summarized below.

Site Preparation and Proofrolling

The geotechnical engineer or experienced soils technician should inspect the site after it has been stripped and excavated. The inspector should determine the extent of undercutting or in-place densification necessary to prepare a subgrade for fill placement or slab and pavement support.

Fill Placement and Compaction

A geotechnical engineer or experienced soils technician should monitor all fill operations and take sufficient in-place density tests to verify that the specified degree of fill compaction is achieved. The inspector should observe and approve borrow materials used and should determine if their existing moisture contents are suitable.

Foundation Installation Inspection

The Geolab geotechnical engineer or experienced soils technician should monitor the installation of the foundation system. Where applicable, he should verify that the design bearing pressure is available and that no loose or soft areas exist beneath the bearing surfaces of the footing excavations. He should also keep detailed records of the installation of the foundation elements.

LIMITATIONS

This report has been prepared for the exclusive use of Mr. David Yensan or his agents for specific application to the DC ANG Munitions Loading Crew and Corrosion Control Hanger at Joint Base Andrews in Prince George's County, Maryland in accordance with generally accepted soils and foundation engineering practices. No other warranty, expressed or implied, is made. Our conclusions and recommendations are based on design information furnished to us, the data obtained from the previously described subsurface exploration program and our previous experience. The conclusions and recommendations do not reflect variations in subsurface conditions which could exist intermediate of the boring locations or unexplored areas of the site. Should such variations become apparent during construction, it will be necessary to re-evaluate our conclusions and recommendations based upon an on-site observation of the conditions.

In the event that changes are made in the design or location of the proposed building or pavements, the recommendations presented in this report shall not be considered valid unless the changes are reviewed by our firm and conclusions of this report modified or verified in writing. We would appreciate the opportunity to review foundation plans and project specifications as the design progresses, so that we may provide any needed geotechnical input.

We recommend that this report, in its entirety, be made available to the prospective Contractors for information purposes. The boring logs should not be separated from this report.

APPENDIX

1.Boring Location Plan

2.Boring Logs

3.Investigative Procedures

4.Field Classification Sheet

5.Grain Size Distribution Test Reports

APPENDIX 1
BORING LOCATION PLAN

Boring Location Plan	**DC AND Munitions Loading Crew and Corrosion Control Hangers**
	Joint Base Andrews
	Project No. 113-020
	July 2013

APPENDIX 2
BORING LOGS

BORING LOG

GEOLAB, INC.

Report No.:

Date: **7/23/2013**

Client: **Pond and Company**

Project: **DCANG**

Project No. **113-020**

Boring No.: **B-1** **(1 of 1)** Total Depth **10** Elev: **259.0 +/-** Location: **See Boring Location Plan**

Type of Boring: **Hollow Stem Auger** Started: **6/20/2013** Completed: **6/20/2013** Driller: **Free State Drilling, Inc.**

Elevation	Depth	DESCRIPTION OF MATERIALS (classification)	*Sample Blows	Sample Depth (Feet)	Moisture Content	REMARKS
259	0.0	Asphalt pavement				**Groundwater was encountered at a depth of 9.0 feet.**
257.9	1.1	Fill: Graded aggregate base	15,13, 15	1.0	12.5	
257.5	1.5	Fill: Tan and brown silty fine SAND, moist (SM)		2.5		
			7,7,5	3.5	18.5	
				5		
253	6.0	Tan silty fine to coarse SAND with medium gravel, moist (SM)	8,10,7	6.0	6.1	
				7.5		
			2,1,2	8.5		
249	10.0	End of Boring		10		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the last two increments of penetration is termed the standard penetration resistance, N.

BORING LOG

GEOLAB, INC.

Report No.:

Date: **7/23/2013**

Client: **Pond and Company**

Project: **DCANG**

Project No. **113-020**

Boring No.: **B-2** **(1 of 1)** Total Depth **15** Elev: **258.0 +/-** Location: **See Boring Location Plan**

Type of Boring: **Hollow Stem Auger** Started: **6/20/2013** Completed: **6/20/2013** Driller: **Free State Drilling, Inc.**

Elevation	Depth	DESCRIPTION OF MATERIALS (classification)	*Sample Blows	Sample Depth (Feet)	Moisture Content	REMARKS
258	0.0	Sod with root (organic) matter and organic soil				**Groundwater was encountered at a depth of 8.0 feet.**
257.5	0.5	Tan, yellow and gray fine sandy clayey SILT, moist, medium stiff (ML/Loam)	1,3,6	1.0 2.5		
			2,3,3	3.5 5	14.7	**At the end of the day, the water level was at a depth of 5.25 feet.**
252.5	5.5	Orange to gray gravelly fine to coarse SAND with trace silt, moist (SP-SM, SAND)	17,18, 18	6.0 7.5	8.5	
			9,8,9	8.5 10	24.4	
246.5	11.5	Orange tan silty fine SAND, wet (SM, Loamy SAND)				
			3,3,4	13.5 15		
243	15.0	End of Boring				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the last two increments of penetration is termed the standard penetration resistance, N.

BORING LOG

GEOLAB, INC.

Report No.:

Date: **7/23/2013**

Client: **Pond and Company**

Project: **DCANG**

Project No. **113-020**

Boring No.: **B-3** **(1 of 2)** Total Depth **60** Elev: **261.0 +/-** Location: **See Boring Location Plan**

Type of Boring: **Hollow Stem Auger** Started: **6/20/2013** Completed: **6/20/2013** Driller: **Free State Drilling, Inc.**

Elevation	Depth	DESCRIPTION OF MATERIALS (classification)	*Sample Blows	Sample Depth (Feet)	Moisture Content	REMARKS
261	0.0	Concrete slab				**Groundwater was encountered at a depth of 7.0 feet.**
260.1	0.9	Orange-brown and gray fine sandy CLAY, moist, (CL)	4,7,10	1.0 2.5		
258	3.0	Light gray to pink orange silty fine SAND with little clay, moist (SM)	6,7,12	3.5 5	14.8	**Cave-in occured at a depth of 10.0 feet.**
255.5	5.5	Gray to brown silty fine to medium SAND with little clay and little gravel, moist (SM)	20,14,13	6.0 7.5	7.3	
253	8.0	Tan to orange-tan silty fine to medium SAND with trace gravel and trave clay, wet (SM)	5,6,9	8.5 10	10.2	
248.5	12.5	Tan silty fine to coarse SAND, saturated (SM)	5,7,8	13.5 15	14.2	
245	16.0	a;hfsd aj owae pj gaweoijg ewj	5,6,7	18.5 20	18.3	
239	22.0	Yellow and brown silty fine SAND with little clay, saturated (SM)	1,2,2	23.5 25	33.3	
233.5	27.5	Dark gray fine sandy SILT, wet to moist (ML)	0,0,0	28.5 30	52.3	
230	31.0	Dark gray CLAY with little fine sand, wet to moist, (CH)	2,1,2	33.5 35	50.0	
			4,4,5	38.5 40		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the last two increments of penetration is termed the standard penetration resistance, N.

BORING LOG

GEOLAB, INC.

Report No.:

Date: **7/23/2013**

Client: **Pond and Company**

Project: **DCANG**

Project No. **113-020**

Boring No.: **B-3** **(2 of 2)**

Total Depth **60**

Elev: **261.0 +/-**

Location: **See Boring Location Plan**

Type of Boring: **Hollow Stem Auger**

Started: **6/20/2013**

Completed: **6/20/2013**

Driller: **Free State Drilling, Inc.**

Elevation	Depth	DESCRIPTION OF MATERIALS (classification)	*Sample Blows	Sample Depth (Feet)	Moisture Content	REMARKS
			6,8,8	48.5 50		
208	53.0	Dark gray fine sandy SILT, moist (ML)				
			4,4,4	58.5 60		
201	60.0	End of Boring				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the last two increments of penetration is termed the standard penetration resistance, N.

BORING LOG

GEOLAB, INC.

Report No.:

Date: **7/23/2013**

Client: **Pond and Company**

Project: **DCANG**

Project No. **113-020**

Boring No.: **B-4** **(1 of 1)** Total Depth **20** Elev: **261.0 +/-** Location: **See Boring Location Plan**

Type of Boring: **Hollow Stem Auger** Started: **6/20/2013** Completed: **6/20/2013** Driller: **Free State Drilling, Inc.**

Elevation	Depth	DESCRIPTION OF MATERIALS (classification)	*Sample Blows	Sample Depth (Feet)	Moisture Content	REMARKS
261	0.0	Asphalt pavement				**Groundwater was encountered at a depth of 10.0 feet.**
260.2	0.8	Gray-tan to orange-tan sitly CLAY with trace fine sand, moist (CL)	6,7,8	1.0 2.5		
258	3.0	Gray to orange clayey fine SAND, moist (SC)	7,8,7	3.5 5	14.5	
255.5	5.5	Red-orange to olive-gray clayey fine to medium SAND with little gravel, moist (SM)	11,21, 18	6.0 7.5	14.6	
253	8.0	Yellow-tan cleyey fine to coarse SAND, moist to saturated (SC)	10,10, 10	8.5 10	10.1	
248.5	12.5	Yellow-orange silty fine to coarse SAND iwth some gravel, saturated (SM)	4,5,6	13.5 15		
244	17.0	yellow-orange silty fine SAND with little clay, saturated (SM)	2,2,2	18.5 20		
241	20.0	End of Boring				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the last two increments of penetration is termed the standard penetration resistance, N.

APPENDIX 3
INVESTIGATIVE PROCEDURES

INVESTIGATIVE PROCEDURES

Soil Boring Tests

Soil drilling and sampling operations were conducted in accordance with ASTM Specification D1586-67. The borings were advanced by mechanically turning continuous hollow stem auger flights into the ground. At regular intervals, samples were obtained with a standard 1.4 inch I.D., 2.0 inch O.D. splitspoon sampler. The sample was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140 pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is the "standard penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil's strength, density and behavior under applied loads. The soil descriptions and penetration resistances for each boring are presented on the Test Boring Records in the Appendix.

The evaluation and recommendations presented in this report were developed from a consideration of the project characteristics and an interpretation of test boring data. Our description of subsurface conditions was based on interpretation of the boring data using normally accepted geotechnical engineering practices and reasonable engineering judgement. Although individual test borings are considered to be representative of the subsurface conditions at the precise boring location on the date the boring was taken, they are not necessarily indicative of the subsurface conditions at other locations or at other times of the year. Actual soils variations can best be evaluated during conditions, and, if necessary, minor changes can be made at this time.

Soil Classification

Soil classification provides a general guide to the engineering properties of various soils types and enable the engineer to apply his past experience to the current problems. In our investigation, jar samples obtained during drilling operations are examined in our laboratory and visually classified by the Geotechnical Engineer in accordance with ASTM Specification D-2488. The soils are classified according to the AASHTO or Unified Classification Systems (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provide an index for estimating the soils behavior.

APPENDIX 4
FIELD CLASSIFICATION SHEET

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

Non-Cohesive Soils (Silt, and, Gravel and Combinations)

Density		Particle Size Identification		Relative Proportions	
Very Loose	5 blows/foot or less	Boulders	8" or more diameter	Term	Percent
Loose	6-10 blows/foot	Cobbles	3-8" diameter	Trace	01 to 10 percent
Medium Dense	11-30 blows/foot	Gravel	Coarse: 1 - 3 inches Medium: 1/2 - 1 inch Fine: 1/4 - 1/2 inch	Little	11 to 20 percent
Dense	31-50 blows/foot	Sand	Coarse: .6mm-1/4 inches (dia. pencil lead) Medium: .2-.6mm (dia. broom straw) Fine: .05-.2mm (dia. human hair)	Some	21 to 35 percent
Very Dense	51 blows/foot or more	Silt	.6-002 mm (not visible)	And	36 to 50 percent

Cohesive Soils (Clay, Silt and Combinations)

Consistency		Plasticity	
Very Soft	3 blows/foot or less	None to Slight	0 to 4
Soft	4-5 blows/foot	Slight	5 to 7
Medium Stiff	6-10 blows/foot	Medium	8 to 22
Stiff	11-15 blows/foot	High to Very High	over 22
Very Stiff	16-30 blows/foot		
Hard	31 blows/ft or more		

Classifications on logs are made by visual inspection of samples.

Standard Penetration Test

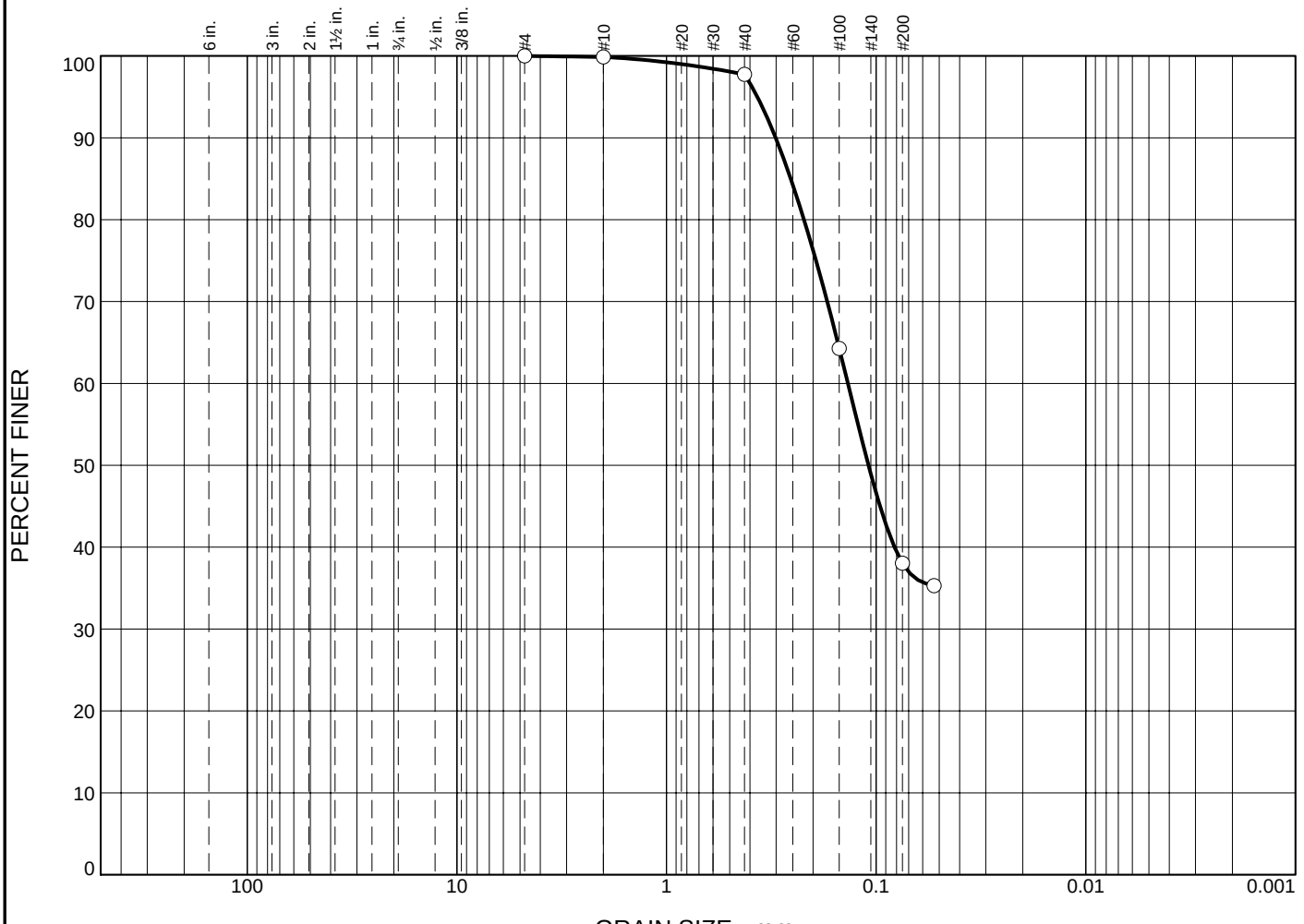
This consists of driving a 2.0" O.D., 1-3/8" L.D. sampler a distance of one (1) foot into undisturbed soil with a 140 pound hammer, free falling a distance of 30.0 inches. It is customary to drive the spoon six (6) inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded on each six (6) inches of penetration on the boring log (example: 6/8/9). The standard penetration test can be obtained by adding the last two figures (i.e. 8+9=17 blows per foot) as per ASTM D1586-67.

Groundwater

Observations were made at the time indicated. Porosity of soil strata, weather conditions, site topography, etc. may cause changes in the water level.

APPENDIX 5
GRAIN SIZE DISTRIBUTION TEST REPORTS

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.1	2.1	59.8	38.0	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NV	NP	0.2557	0.1364	0.1088					

Material Description	USCS	AASHTO
○ Tan silty fine SAND	SM	A-4(0)

Project No. 113-020 **Client:** Pond and Company

Project: DCANG

○ **Source of Sample:** B-1 **Depth:** 1.0'-2.5' **Sample Number:** S-1

Date: ○

Geolab, Inc.

Columbia, MD

Remarks:

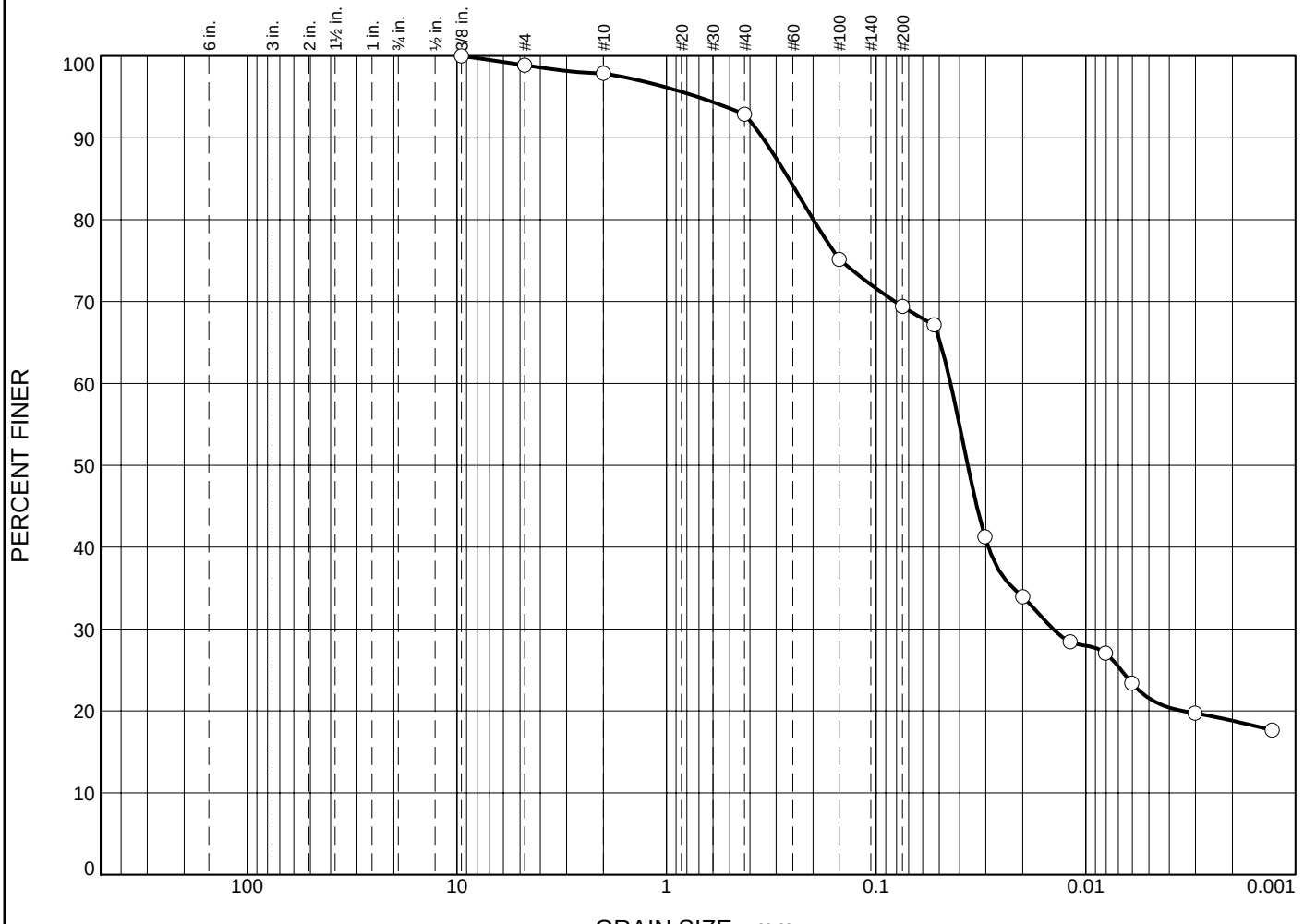
○ SpG Assumed

Date Received: 6/20/2013

Nat. M/C - 12.5%

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.1	1.0	5.0	23.5	47.9	21.5

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○				0.2613	0.0442	0.0366	0.0143				

Material Description	USCS	AASHTO
○ Tan clayey SILT with some fine sand		

Project No. 113-020 **Client:** Pond and Company

Project: DCANG

○ **Source of Sample:** B-2 **Depth:** 3.5'-5.0' **Sample Number:** S-2

Date: ○

Geolab, Inc.

Columbia, MD

Remarks:

○ SpG Assumed

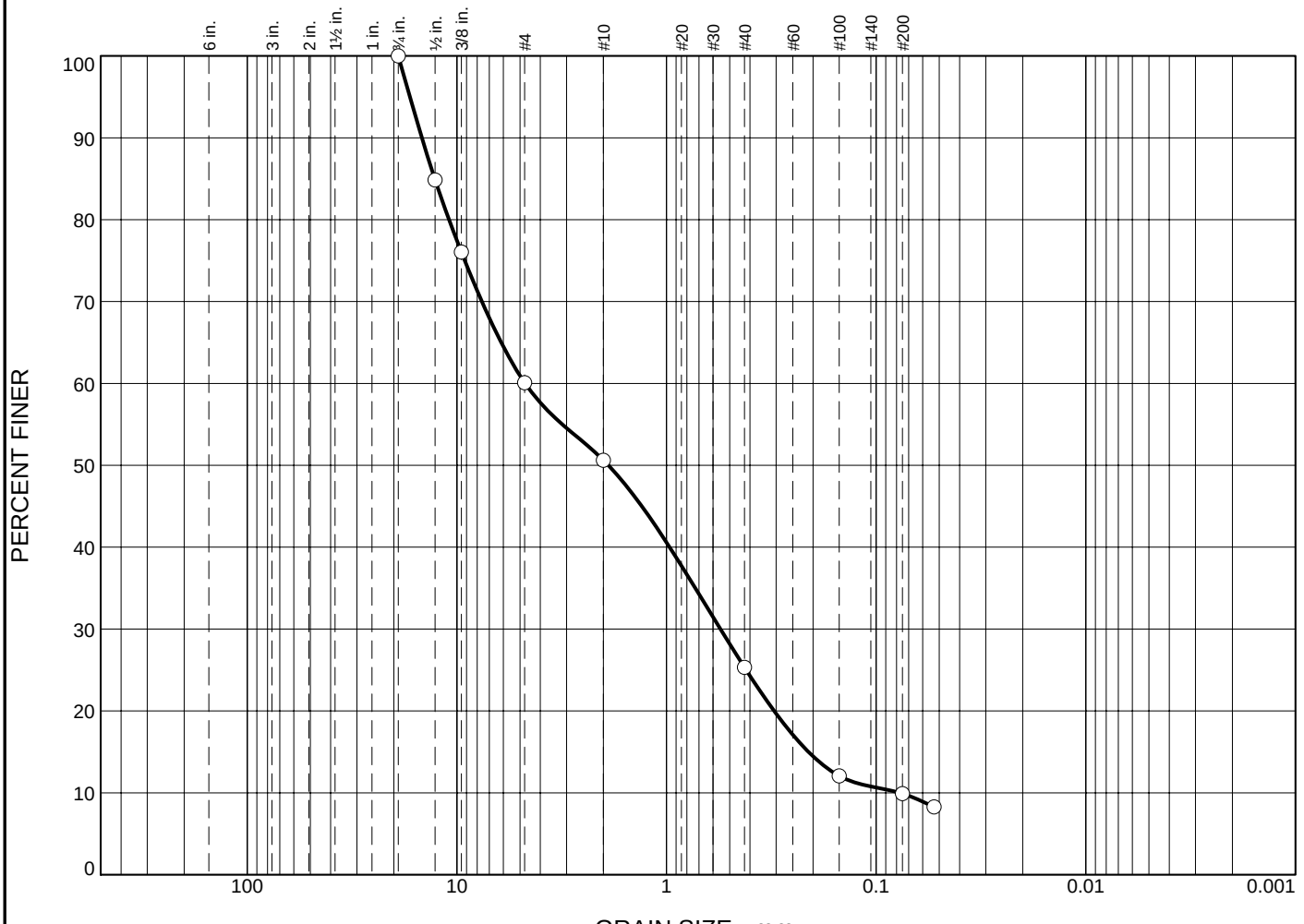
Date Received: 6/20/2013

Silt Loam

Nat. M/C - 14.7%

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	39.9	9.5	25.3	15.4	9.9	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NV	NP	12.7571	4.7228	1.8937	0.5533	0.2106	0.0772	0.84	61.16

Material Description	USCS	AASHTO
○ Orange to gray gravelly fine to coarse SAND with trace silt	SP-SM	A-1-b

Project No. 113-020 **Client:** Pond and Company

Project: DCANG

○ **Source of Sample:** B-2 **Depth:** 6.0'-7.5' **Sample Number:** S-3

Date: ○

Geolab, Inc.

Columbia, MD

Remarks:

○ SpG Assumed

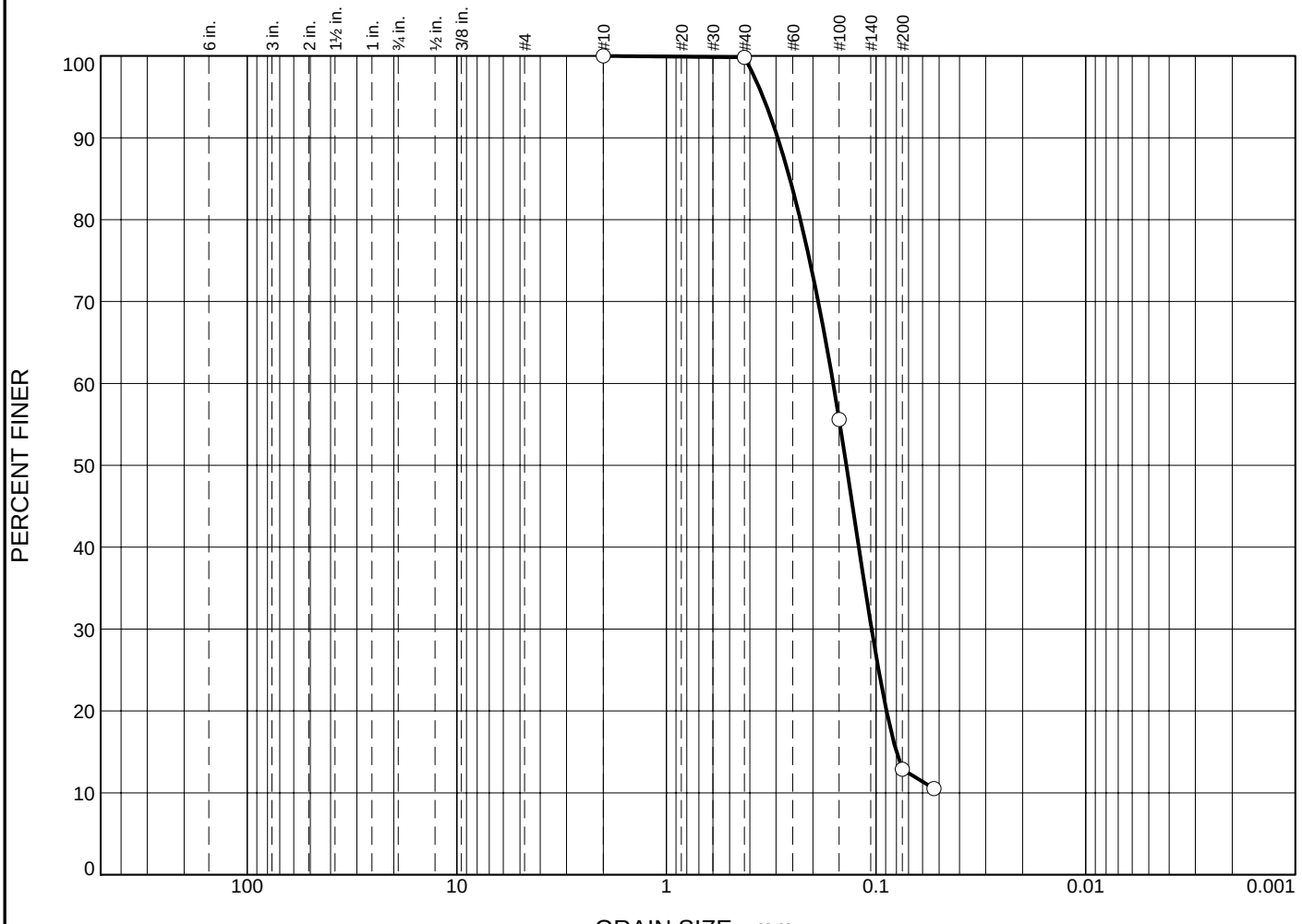
Date Received: 6/20/2013

Loamy Sand

Nat. M/C - 8.5%

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.2	86.9	12.9	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		NV	NP	0.2578	0.1602	0.1386	0.1051	0.0800			

Material Description	USCS	AASHTO
○ Orange fine SAND with little silt	SM	A-2-4(0)

Project No. 113-020 **Client:** Pond and Company

Project: DCANG

○ **Source of Sample:** B-2 **Depth:** 8.5'-10.0' **Sample Number:** S-4

Date: ○

Remarks:

○ SpG Assumed

Date Received: 6/20/2013

Sand

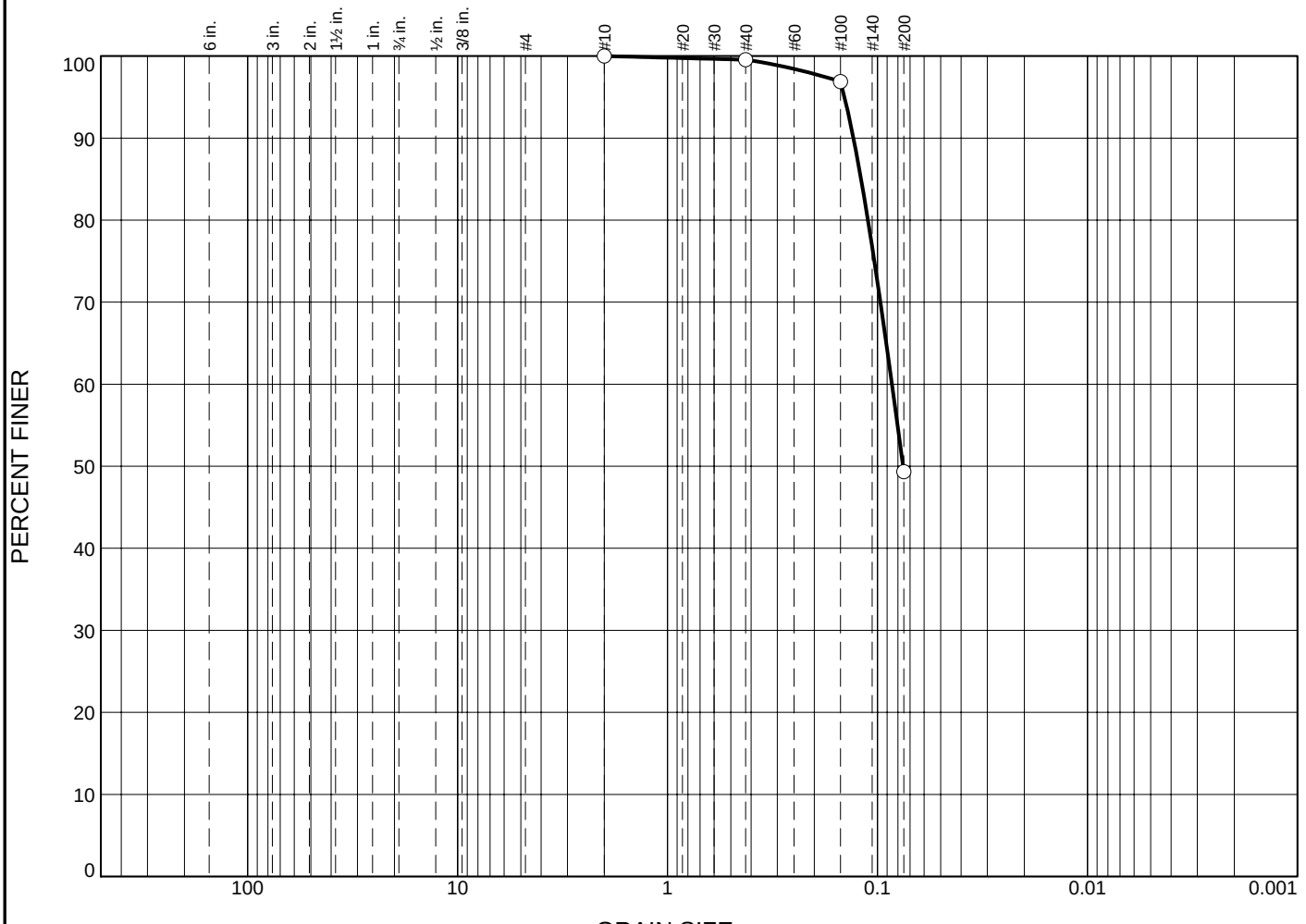
Nat. M/C - 24.4%

Geolab, Inc.

Columbia, MD

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.4	50.3	49.3	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		40.4	31.5	0.1198	0.0854	0.0756					

Material Description	USCS	AASHTO
○ Tan silty fine SAND	SM	A-4(2)

Project No. 113-020 **Client:** Pond and Company

Project: DCANG

○ **Source of Sample:** B-3 **Depth:** 23.5'-25.0' **Sample Number:** S-7

Date: ○

Remarks:

○ SpG Assumed

Date Received: 6/20/2013

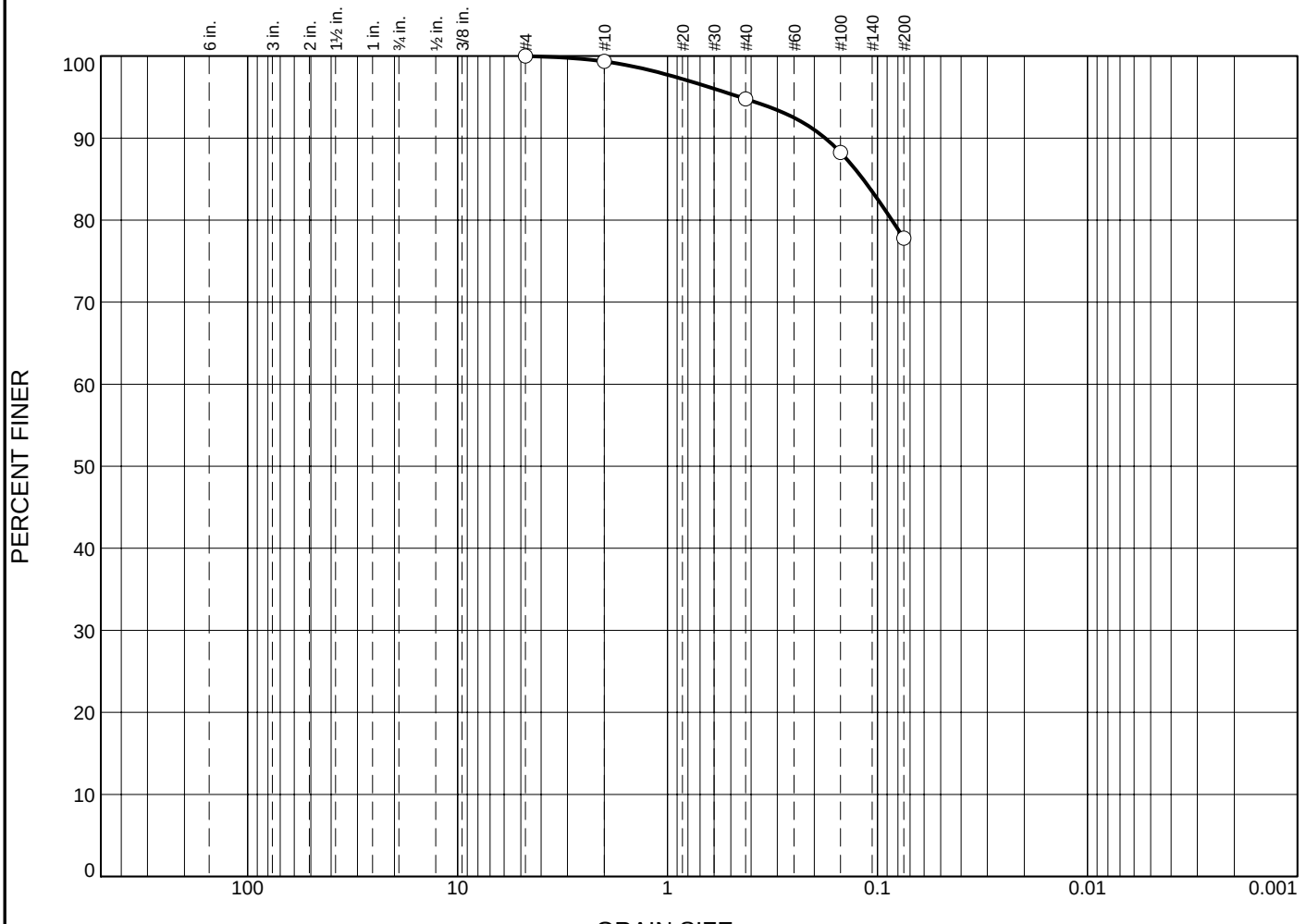
Nat M/C - 33.3%

Geolab, Inc.

Columbia, MD

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.7	4.5	17.0	77.8	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○		64.6	24.9	0.1173							

Material Description	USCS	AASHTO
○ Dark gray CLAY with little fine sand	CH	A-7-6(33)

Project No. 113-020 **Client:** Pond and Company

Project: DCANG

○ **Source of Sample:** B-3 **Depth:** 33.5'-35.0' **Sample Number:** S-9

Date: ○

Geolab, Inc.

Columbia, MD

Remarks:

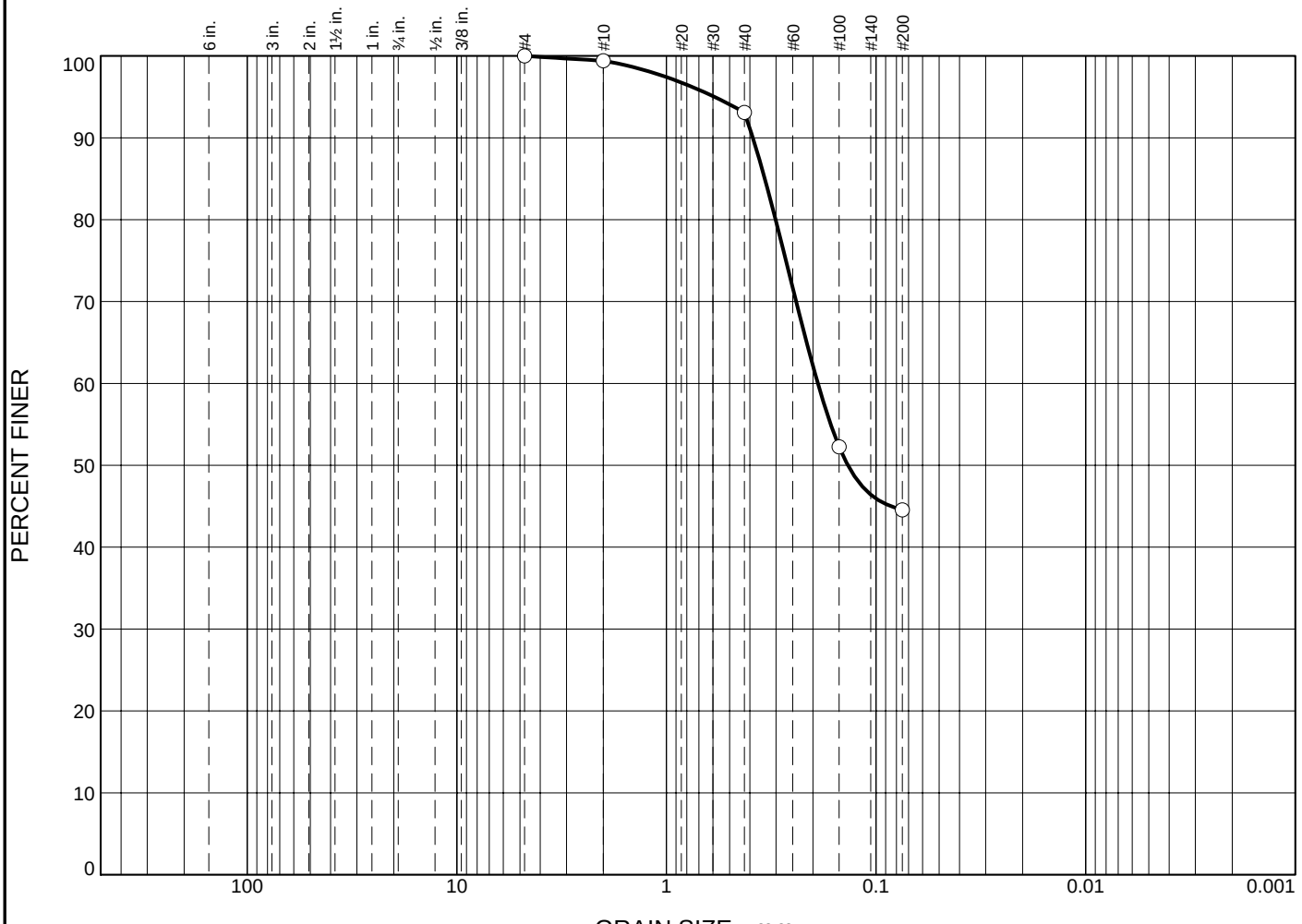
○ SpG Assumed

Date Received: 6/20/2013

Nat. M/C - 50.0%

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.6	6.3	48.5	44.6	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○				0.3394	0.1897	0.1362					

Material Description	USCS	AASHTO
○ Gray and orange clayey fine SAND	SC	

Project No. 113-020 **Client:** Pond and Company

Project: DCANG

○ **Source of Sample:** B-4 **Depth:** 3.5'-5.0' **Sample Number:** S-2

Date: ○

Geolab, Inc.

Columbia, MD

Remarks:

○ SpG Assumed

Date Received: 6/20/2013

Nat. M/C - 14.5%

Figure