Preliminary
Geotechnical Engineering Study
St. Elizabeth's Shelter Relocation
Washington, DC
HCCS Job No. A18108

Prepared for:

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December 3, 2018

Jacobs
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Attention: Mr. Richard Staudinger

Re: Preliminary Geotechnical Engineering Study
St. Elizabeth's Shelter Relocation
Washington, DC
HCCS Job No. A18108

Dear Mr. Staudinger:

Hillis-Carnes Capitol Services (HCCS) is pleased to submit this report concerning the subsurface exploration and subsequent preliminary geotechnical evaluation for the proposed construction that is to be located in Washington, DC.

We wish to advise you that the boring samples will be stored at our offices for a period of 30 days from the date of this letter. Should you wish the samples to be stored for a longer period of time or to be delivered to you or another party, please advise us in writing prior to the end of the 30-day period. Otherwise, the samples will be discarded at the end of the 30-day storage period.

HCCS appreciates having had the opportunity to provide the geotechnical consultation for this project, and we will remain available for further consultation during the various design stages. Should you have any questions concerning the contents of this report, or require additional consultation, design, inspection, or testing services, please contact our Office.

Very truly yours,
HILLIS-CARNES CAPITOL SERVICES, PLLC

Michael P. Johnson, PE

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PRELIMINARY GEOTECHNICAL ENGINEERING STUDY
ST. ELIZABETH'S SHELTER RELOCATION
WASHINGTON, DC
HCCS JOB NO. A18108

1.0 PURPOSE AND SCOPE

The purpose of this study was to determine the general subsurface conditions at the boring locations and to preliminarily evaluate those conditions with respect to concept and design of a foundation system and floor slabs for the proposed construction.

The preliminary evaluations and recommendations presented in this report were developed from an analysis of project characteristics and an interpretation of the general subsurface conditions at the site based on the boring information. The stratification lines indicated on the Records of Soil Exploration (boring logs) represent the approximate boundaries between soil types. In-situ, however, the transitions may be gradual. Such variations can best be evaluated during construction and, if necessary, any minor design changes can be made at that time.

An evaluation of the site with respect to potential construction problems and foundation recommendations are also included. The construction inspection is considered necessary to verify the subsurface conditions and to verify that the soils-related construction phases are performed properly.

The Appendix contains a summary of the field and laboratory work on which this report is based.

2.0 PROJECT CHARACTERISTICS

The project site is located on the St. Elizabeth's East Campus in southeast Washington DC. It is our understanding the project consists of the construction of the relocation of the 801 homeless shelter.

It is our understanding the project will consist of the construction of a multi-level (five stories maximum) building with a partial basement. The planned building location includes a portion of the building that will be lying directly above the WMATA Green Line tunnel, which is approximately 90 feet below existing site grades. It is understood that changes in the design or concept may warrant additional exploration and/or testing. The proposed site plan is provided in the Appendix.

Structural loading information was not available at the time this report was being prepared. It has therefore been assumed that maximum wall loads will be on the order of 6 kips per linear foot and that maximum column loads will be on the order of 350 kips. Settlements on the order of 1-inch total and 1/2-inch differential have been assumed to be tolerable by the structure.

Additional details concerning the proposed construction were not available at the time that this report was being prepared. Should any of the project characteristics, assumed loading conditions, or required settlement criteria differ from those outlined above, then this office should be contacted for a re-evaluation of the site.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

In order to determine the general foundation soil types and to develop design parameters, seven Standard Penetration Test (SPT) soil borings (numbered B-1 through B-7) were drilled to depths of 75 ft to 145 ft below existing site grades in the vicinity of the proposed building area at the site. The deeper boring locations were generally located to avoid conflicts with the Green Line tunnels. Additionally, four borings (numbered B-8 through B-11) were drilled to depths of 10 ft in proposed stormwater management areas. The boring locations were staked in the field by the Civil Engineer who also provided boring elevations. The boring locations are shown on the Boring Location Plans in the Appendix.

The borings were advanced with hollow-stem augers and the subsurface soils were sampled at 2.5 ft and 5.0 ft intervals. Samples were taken by driving a 1-3/8 inch I.D. (2-inch O.D.) split-spoon sampler in accordance with ASTM D-1586 specifications. The sampler was first seated 6 inches to penetrate any loose cuttings and then was 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 additional foot is designated as the "Penetration Resistance" or "N" value. The penetration resistance, when properly evaluated, is an index to the soil strength and compression characteristics.

Representative portions of each soil sample were placed in glass jars and transported to HCCS's laboratory. In the laboratory, the samples were visually examined by the Geotechnical Engineer to verify the driller's field classifications. The samples were visually classified in general accordance with the Unified Soil Classification System and the field classifications were revised where necessary. The Unified Soil Classification Symbols appear on the boring logs and the system nomenclature is briefly described in the Appendix.

Laboratory testing was performed on representative samples, which consisted of Atterberg limits, sieve analysis and moisture content tests. These tests were used in general accordance with ASTM D-2487 to obtain the USCS classification of the soils tested. Additionally, organic content tests were performed on selected samples. The results of the laboratory testing are presented in the Appendix and

the USCS classifications presented on the Records of Soil Exploration were reviewed based on the laboratory testing results.

4.0 SUBSURFACE CONDITIONS

Details of the subsurface conditions encountered at the site are shown on the Records of Soil Exploration. A brief description of the subsurface conditions and pertinent engineering characteristics of the soils are given below.

Strata divisions shown on the Records of Soil Exploration and Soil Profiles have been estimated based on visual examinations of the recovered boring samples. In the field, strata changes could occur gradually and/or at slightly different levels than indicated. Also, groundwater conditions indicated on the Records of Soil Exploration are those observed during the period of the subsurface exploration. Fluctuations in groundwater levels could occur seasonally and might also be influenced by changes in grading, runoff and infiltration rates, and other influencing factors.

Generalized subsurface conditions based on the results of the widely spaced borings are discussed below:

4.1 Site Geology

According to the State Geologic Map Compilation (SGMC) geodatabase of the conterminous United States (ver. 1.1, August 2017), the project site is located in the Atlantic Coastal Plain Region, where near surface natural soils are sedimentary materials, usually consisting of interbedded layers of granular and semi-cohesive to cohesive soils. The site appears to be mapped within the Upland Deposits, which is said to contain interbedded granular, semi-cohesive and cohesive layers. The Uplands Deposits are most commonly orange-brown gravel and sand with minor components of silt and red, white or gray clay.

It is typical in the Washington, DC area to find man-placed fill materials associated with previous construction activities situated atop the above-mentioned natural soils.

4.2 Man-Placed Fill Materials

Materials specifically identified as man-placed fill materials or possible man-placed fill materials were encountered at the following locations in the borings:

Boring	Approximate Depth of Fill Material (ft)
B-1	2.5
B-2	18.5
B-3	38.5
B-4	18.5
B-5	53.5
B-6	18.5
B-7	53.5
B-8	8.5
B-9	5.0
B-10	2.5

As can be seen from these results, the deeper existing fill materials were encountered on the eastern side of the proposed building area along the existing slope.

Since the size of the samples obtained is relatively small in comparison to the areal extent of the site and since the fill materials could be of similar composition to the natural soils encountered at the site, it is often difficult to determine the presence and composition of fill materials from the SPT samples. It should be anticipated that man-placed fill materials may be encountered at other locations and to different depths across the site due to the previous construction that has occurred on and around the project site.

Materials specifically identified as fly ash were not encountered in the samples obtained at the site. It is known that fly ash was previously utilized in various areas around the St. Elizabeth's campus; therefore, it should be anticipated that such materials could be encountered in other areas around the site during construction.

4.3 Natural Materials

The subsurface soils encountered in our borings were consistent with the area geology described above. The natural soils encountered at the site were visually classified in general accordance with the Unified Soil Classification System as being sandy gravel with clay (GP-GC), silty gravel (GM), poorly-graded sand (SP), silty sand (SM), clayey sand (SC), silty or sandy clay (CL), high-plasticity clay (CH) and combinations thereof.

"N" values from the Standard Penetration Test (SPT) borings generally indicated relative densities in the loose to very dense range for the more granular materials encountered. The more fine-grained materials typically exhibited consistencies in the medium stiff to hard range.

Refer to the Records of Soil Exploration in the Appendix of this report for more detailed information regarding the specific soil conditions encountered in the individual borings.

4.4 Groundwater

Groundwater levels were monitored during drilling operations. Groundwater was encountered at depths ranging from 30± ft to 71± ft below the existing ground surface during and following drilling operations. Generally, these depths coincide with elevations ranging from El 92.6± to El 113.5±. An exception to this occurred in Boring B-1 where groundwater was encountered at completion at El 145± (the borehole was dry to a cave-in depth of 32.3±, or approximately El 131.8±, after 24 hours). The water encountered at completion appears to be water that may have been perched in the gravel layer above a clay layer in the boring.

It should also be anticipated that perched water may be encountered in pockets within the fill materials, at the fill material/natural soil interface or over denser or more fine-grained layers.

A more accurate determination of the hydrostatic water table would require the installation of perforated pipes or piezometers which could be monitored over an extended period of time. The actual level of the hydrostatic water table and the amount and level of perched water should be anticipated to fluctuate throughout the year, depending on variations in precipitation, surface run-off, infiltration, site topography, and drainage.

5.0 PRELIMINARY EVALUATIONS AND RECOMMENDATIONS

Our preliminary findings suggest that the development of the site as currently proposed would require difficult foundation design and construction and would place a significant amount of risk on the Owner. There are subsurface conditions at the site that make foundation design and installation difficult, at best. The two most problematic subsurface conditions deal with the presence of deep existing man-placed fill materials that are not suitable for foundation support and the presence of the WMATA Green Line tunnels below. The deeper fill materials encountered along the slope on the eastern side of the proposed building area (as well as being located adjacent to the Green Line tunnel) also limit the degree of reliability that would be considered present for any deep foundation alternative selected.

In installing a deep foundation system, tip elevations are limited by the presence of the existing man-placed fill materials as well as the presence of the Green Line tunnel. Along the eastern side of the structure, there is a small window of suitable natural soil that is located between the bottom of the unsuitable fill materials and a point where the installation of the piles would be located too close to the existing tunnels, potentially placing loads on the tunnels greater than allowable.

We understand that it is possible that the proposed building footprint could be rotated and/or otherwise moved. We recommend that serious consideration be given to moving the building footprint as far to the west as is possible on the site - away from the slope and deeper man-placed fill materials. It may be possible for the relocated structure to be supported on a spread footing foundation system (considering the same finished floor elevation) if it can be moved far enough to the west. If this movement of the structure could occur (additional subsurface exploration would be required to evaluate this possibility), it would possibly allow the spread footing foundations to bear on firm, natural soils or on new engineered fill. This has a multiple effect on the viability and reliability of the structure. It would reduce the unknowns of the subsurface conditions, would reduce the cost of the foundation system and would lower the impact of the structure on the Green Line tunnels that are located 84± ft to 86± ft below the proposed finished floor elevation.

The following preliminary recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions and on the discussion of foundation risks described above. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, HCCS should be consulted so that the recommendations of this report can be reviewed and revised, if necessary.

5.1 General Site Preparation

All existing structures (including all above and below ground construction) within the areas to be developed should be removed prior to the initiation of new construction. We suggest that all available information regarding the existing utilities at the site be reviewed prior to construction.

Removal should include all underground pipes, utilities, and underground structures that might interfere with the new construction. If abandoned underground utilities are to be removed prior to the initiation of construction, provisions should be made in the construction specifications and budget to restore the subgrade to stable condition. Restoration should include backfilling and compaction of the excavation areas.

Removal should also include surficial topsoil, unsuitable existing fill and deleterious materials from the areas to be developed. Stripping operations should be performed in a manner consistent with good erosion and sediment control practices.

After the initial stripping process is completed, areas of the site to receive fill, or areas of the site at-grade where structures will be located, should be proofrolled. The proofrolling operations should be performed using a 20-ton, fully-loaded dump truck or another pneumatic-tire vehicle of similar size and weight. The purpose of the proofrolling will be to locate any near-surface

pockets of soft or loose soils requiring undercutting. A Geotechnical Engineer or experienced Soils Inspector should witness the proofrolling operations and should determine which areas need further undercutting and/or stabilization.

5.2 Foundation Excavations

Maximum excavation on the order of 20± ft is anticipated to reach foundation levels; therefore, it will be necessary to either properly slope the excavation or to provide a temporary excavation support system.

The materials encountered in the borings were fill materials that are variable in nature and ranging in classification in accordance with the Unified Soil Classification System from silty gravel (GM) to clay (CL). It is recommended that such soils be considered Type C soils in accordance with OSHA guidelines. The maximum allowable slope for excavations less than 20 ft is 1.5:1 (H:V) for Type C soils.

Although design of the earth retention system is best performed by a specialty contractor, a free-draining system, consisting of soldier piles and wood lagging with the required lateral bracing, is typical in DC. The system will have to be braced internally using struts and/or rakers or externally using tiebacks. Soldier piles and lagging should be designed for an appropriate lateral earth pressure diagram. The earth pressure diagram should be reviewed by the geotechnical engineer. The temporary excavation support system should consider loading due to construction equipment, soil stockpiles, and other surcharge effects adjacent to the top of the excavation during construction.

The spacing of the soldier piles and braces should be determined by a structural analysis. The design of the retention system was beyond this scope of work.

5.3 Lateral Earth Pressures

The magnitude of lateral earth pressure against subsurface walls is dependent on the type of backfill soil, drainage provisions, and whether the walls are permitted to yield during and/or after placement of the backfill. For walls that are designed such that movement of the top of the wall is prohibited, an equivalent fluid pressure distribution considering an equivalent fluid weight of 65 lbs/ft (per foot of wall height) should be used for design purposes. If the walls are designed as free-standing walls with unrestricted rotation at the top, then an equivalent fluid pressure distribution considering an equivalent fluid weight of 45 lbs/ft can be used for design purposes. Any surcharge loadings must also be considered in the wall designs. We recommend a coefficient of 0.5 for surcharge effects,

applied to the wall using a uniform pressure distribution in addition to the design equivalent fluid pressures provided above.

Generally, backfill materials behind the walls should consist of granular soils having a Unified Soil Classification of SM or more granular. Where required, wall backfill materials should be compacted to minimum dry densities of 95 percent of the Standard Proctor maximum dry density. It may be necessary to use smaller walk-behind compaction equipment near the walls to attain the proper compaction and to avoid damaging the walls. Also, the walls should be properly braced during backfilling operations.

5.4 Fill Selection, Placement and Compaction

All material to be used as fill or backfill should be inspected, tested and approved by the Geotechnical Engineer or their authorized representative. In general, the on-site soils which are free from organic and other deleterious components can selectively be re-used as general site fill; however, the existing man-placed fill materials were noted to contain deleterious materials and there are also environmentally impacted materials on-site. Materials that are suitable for various construction purposes may be present on site and can be identified during construction by the Geotechnical Engineer or their designated representative.

We wish to point out that a Phase 2 environmental site assessment (ESA) was also performed at the site by HCCS. The results of this assessment have been previously provided under separate cover (report dated November 27, 2018). Based on the results of this assessment, there were environmental contaminants that have been identified as being present on-site. The contractor and designers should be made aware of the presence of these materials and should also be aware that the materials will require special design consideration, handling and/or disposition.

All fill should be placed in relatively horizontal 8-inch (maximum) loose lifts and should be compacted to a minimum of 95 percent of the Standard Proctor (ASTM D-698) maximum dry density. Fill materials in non-structural areas should be compacted to at least 90 percent of the Standard Proctor maximum dry density. Field moisture contents should be maintained within 2 percentage points of the optimum moisture content in order to provide adequate compaction. A sufficient number of in-place density tests should be performed by an experienced Engineering Technician on a full-time basis to verify that the proper degree of compaction is being obtained

Moisture conditioning (that is, wetting or drying) of the soils should be anticipated to achieve proper compaction. The moisture contents of the soils should be controlled properly to avoid extensive construction delays.

If imported fill material is required, those materials should have Unified Soil Classifications of SM or more granular.

The fine-grained nature of some the soils encountered on-site may make them sensitive to heavy dynamic loads and to increases in moisture content beyond their "optimum" value. The traffic of heavy equipment, including heavy construction equipment, could create pumping and a general deterioration of the on-site soils, especially if conducted in the presence of water. If exposed to water, these soils can deteriorate and become difficult to work or compact properly. The grading should therefore, if at all possible, be carried out during a dry season. This would help to minimize these potential problems. Additionally, the contractor should not permit water to pond on the site. Exposed subgrades should be sloped and sealed at all times to facilitate rainfall runoff. If such problems arise, the Geotechnical Engineer should be consulted for an evaluation of the conditions.

New fill slopes should be properly benched into existing slopes (and made with a slope of 2(H):1(V) or more flat.

5.5 Foundations

As stated previously, deep existing man-placed fill materials that are not suitable for foundation support would require the building, in its current configuration and location, to be supported on a deep foundation system. Based on the results of the borings, there is a small window of suitable natural soil that is located between the bottom of the unsuitable fill materials and a point where the installation of the piles would be located too close to the existing tunnels, particularly on the eastern side of the proposed structure. It is recommended that additional borings, including borings directly over the tunnels, be drilled to better delineate the limits of the deeper fill materials to reduce the risk of having foundations end up bearing on existing fill materials.

Additional evaluation will also be required once the proposed foundation scheme has been developed. It is not possible to thoroughly evaluate the impacts that a deep foundation system may have on the existing Green Line tunnels as required by WMATA without knowing the foundation configurations so that group effects can be analyzed.

Evaluations pertaining to the potential use of shallow, spread footing foundations for a relocated structure would also require additional borings within the new building footprint. Such evaluations are beyond the scope of this report.

Various deep foundation alternatives, including both driven and drilled foundation types, were analyzed for their potential use for the structure at its currently proposed location. Based on our analysis, we are recommending a drilled type of foundation system to avoid the possible detrimental effects of driving piles above the tunnel crowns. It is therefore recommended that the proposed structure be supported on a deep foundation system consisting of either augered, cast-in-place concrete piles, DeWaal piles or drilled shafts if the structure is to be constructed at the currently proposed location.

It should be noted that drilled elements may significantly impact the cost of the foundation system at this site due to the presence of contaminated soil materials encountered that would require special handling and/or disposition.

These options are discussed in more detail below. Again, the preliminary recommendations below are provided considering all of the risk factors previously outlined in this report.

Auger-Cast Piles

Augered, cast-in-place concrete piles are installed using a continuous flight, hollow-stem auger to drill down to the desired pile tip elevation. Then, as the auger is slowly withdrawn, the pile is formed by pumping a high-strength cement grout into the foundation soils through the base of the lead auger.

Our calculations indicate that an allowable single pile compression capacity of 40 tons should be generally available for 18-inch diameter piles installed to an estimated tip elevation of approximately El 85.

This estimated allowable pile capacity is based on a consideration of both skin friction and end bearing support and was estimated from static equations using the results of Standard Penetration resistance (N-values) and the characteristics of the soils encountered.

Since augered, cast-in-place, concrete piles are installed without the benefit of dynamic driving records, we recommend that at least two load tests be performed to verify that the design compression capacity will be appropriate for the specified pile size and installation depth. The load test program should include strain gages to assist in the evaluation of the load test results. Production piles should then be installed based on installation criteria similar to those used for successfully load-tested piles.

Various contractors have the ability and expertise to install this type of foundation system. The names of contractors can be supplied on request. The specialty contractor that installs these piles must be responsible for the

integrity of the pile construction and should be willing to guarantee the performance of the final product.

Isolated columns generally should be supported on at least three piles for lateral stability unless this is otherwise provided by lateral ties between pile caps. Walls should be supported on grade beams bearing on piles located in pairs, one on each side of the wall providing a cradle-type support. The grade beams can be supported on single rows of piles provided that the walls are otherwise laterally stabilized. Piles should be spaced at least three pile diameters center-to-center.

A comprehensive quality control inspection program should be instituted to monitor the installation of all production pile units. The quality control inspection program should be conducted under the direction of a registered Geotechnical Engineer. Inspection items that should receive special attention should include the depth of installation, the diameter of the auger, the grout-takes of individual piles, the rate of auger withdrawal, the grout head and the strength of the grout. An accurate record should be kept of all pertinent data.

DeWaal Piles

As an alternative to augered, cast-in-place concrete piles, consideration could be given to the use of DeWaal drilled displacement piles. The DeWaal system is a proprietary system that utilizes a screw-shaped tool that displaces the spoils laterally so that there are no spoils generated. Such a system could be particularly beneficial at this site since the spoils that would otherwise be created would potentially be environmentally contaminated, requiring special handling and/or disposition.

This system is proprietary in nature and would require design by the specialty contractor (that would then warrantee the design their design and work). It would be anticipated that the design capacity obtained by the DeWaal piles would be similar to or greater than the capacity for the auger-cast pile alternative.

Drilled Shafts

Drilled shafts bearing at estimated tip levels near El 85 can be designed for an allowable end bearing pressure of 4 tons/sq ft for downward loads.

It is recommended that skin friction be neglected in the upper 10 ft of the shafts. The following allowable shaft friction values can be utilized for the design of the shafts below this 10 ft depth:

Elevation (ft)	Allowable Shaft Friction (tsf)
Above El 140	0.0
El 120 to El 140	0.1
El 100 to El 120	0.15
Below El 100	0.2

The minimum diameter of the drilled shafts should be 30-inches so that adequate cleaning and inspection can be accomplished. However, the actual diameter of shaft that is required to support the design loads should be based on the design considerations outlined above. The evaluation of lateral load capacity was beyond the scope of work to be performed by HCCS at this time. Additional design information can be provided on request. Reinforcing steel and concrete strength requirements for the shafts should be determined by the Structural Engineer.

Telescoping casings may be used on site to stabilize the shaft excavations. It is anticipated that drilled shafts can be constructed utilizing "dry methods". Any water encountered during drilling should be able to be controlled by sealing off with casings or by pumping. In the event that the casings cannot seal off groundwater, the shaft should be flooded with water or polymer slurry to establish a positive head pressure.

Our experience and current research in the field indicates that the drilled shafts can be constructed by "free-fall" without hitting the sides of the casing or reinforcing. The use of a hopper or other suitable device is recommended to control concrete placement. The placement of concrete in the cased shafts should proceed until the concrete level is above the highest groundwater level encountered at the shaft location before beginning casing removal. The concrete level should be maintained above this level throughout casing removal. Slumps for free-fall concrete should be maintained in the 7-inch to 9-inch range.

Inspection of the drilled shaft construction is essential to the successful completion of drilled shafts on site. The purpose of the observation would be to verify that the exposed materials are capable of supporting the design bearing pressure. The contractor should be prepared to extend shafts to greater depth where less than suitable materials are encountered at the bearing elevation. During the installation of drilled shafts, the depth of embedment, the diameter of the shaft and appropriateness of the bearing materials should be verified.

Drilled shaft construction should be observed and approved by a qualified geotechnical engineer or his/her representative from our office who is experienced in the construction of drilled shafts and placement of concrete in

deep foundations. Utilizing the drilled shaft design engineer to inspect the drilled shaft construction allows the confirmation of the engineer's recommendations in the field. The use of the design engineer as inspector also provides the most efficient method of making changes to the drilled shaft construction in the event that conditions in the field require a change in methodology.

5.6 Floor Slabs

Floor slabs should be supported on firm natural soils, on approved existing fill materials, or on new compacted fill. The slab subgrade should be prepared in accordance with the procedures outlined in Sections 5.1 and 5.4 of this report. In particular, the slab subgrade should be proofrolled to delineate any soft or loose areas requiring undercutting and/or stabilization.

It is recommended that the slab be directly supported on a minimum 6-inch layer of clean granular materials such as washed sand, clean sand and gravel, or screened, crushed stone. These materials will require acquisition from an off-site source. A suitable moisture/vapor barrier (that is, polyethylene sheeting) should also be provided. These procedures will provide a moisture break that will help to prevent capillary rise, dampness of the floor slabs and also help to cure the slab concrete. It is also recommended that construction joints on the slab surface and isolation joints between the slab and structural walls be provided (such that the slab would be ground-supported).

On most projects, there is a significant time lag between initial grading and a point when the contractor is ready to pour the slabs-on-grade. Environmental conditions and construction traffic often disturb the subgrade soils. Provisions should be made in the construction specifications for the restoration of the subgrade soils to a stable condition prior to the placement of the concrete for the floor slabs.

5.7 Groundwater and Drainage

As stated previously, groundwater was encountered at depths ranging from 30± ft to 71± ft below the existing ground surface during drilling operations. Generally, these depths coincide with elevations ranging from El 92.6± to El 113.5±. An exception to this occurred in Boring B-1 where groundwater was encountered at completion at El 145± (the borehole was dry to a cave-in depth of 32.3±, or approximately El 131.8±, after 24 hours. The water encountered at completion appears to be water that may have been perched in the gravel layer above a clay layer in the boring. Therefore, major groundwater-related problems are not anticipated during building construction.

Any water infiltration resulting from precipitation, surface run-off, or perched water should be able to be controlled by means of sump pits and pumps, or by gravity ditching procedures. If any conditions are encountered which cannot be handled in such a manner, this office should be consulted.

Adequate drainage should be provided at the site to minimize any increases in the moisture contents of the foundation soils. All pavement areas should be sloped away from the structure to prevent the ponding of water.

5.8 Site Seismicity

Based on the results of the borings performed, a site seismic classification of "D" based on the IBC 2009 codes should be utilized for design.

5.9 Stormwater Management by Infiltration

We have evaluated the site subsurface conditions at the boring locations drilled in the vicinities of the proposed SWM facilities (Borings B-8 through B-11) in accordance with the District Department of the Environment (DDOE) specifications. The following information is provided for planning stormwater management measures:

1. Location of seasonal high groundwater table.

Groundwater was not encountered within the depths explored in the SWM area borings at the time of our study.

An accurate determination of the hydrostatic water table would require the installation of perforated pipes or piezometers which could be monitored over an extended period of time. The actual level of the hydrostatic water table and the amount and level of perched water should be anticipated to fluctuate throughout the year, depending on variations in precipitation, surface run-off, infiltration, site topography, and drainage. Site grading operations at other parts of the site can also influence the level of the groundwater at the stormwater management area significantly. HCCS cannot be responsible for changes in groundwater conditions at the site due to seasonal variation and changes caused by other factors such as grading operations at the site.

2. Subsurface Conditions

In-situ infiltration testing was performed at locations offset from each of the four SWM boring locations. We must point out that the in-situ infiltration rates obtained have had no factor of safety applied to them. The results of the in-situ tests are as follows:

Boring No.	Approximate Depth of Test (feet)	Measured In-Situ Infiltration Rate (in/hr.)
B-8	8.0	0.0
B-9	8.0	0.0
B-10	8.0	0.75
B-11	8.0	0.0

Information pertaining to the soil and groundwater conditions encountered in the SWM area borings can be found on the Records of Soil Exploration in the Appendix.

3. Bedrock

Bedrock was not encountered within the depths explored in the SWM area borings during this exploration.

Based on the subsurface conditions encountered and on the in-situ infiltration rates measured, infiltration methods of SWM only appear to be feasible at the location tested adjacent to Boring B-10. Infiltration methods of SWM are not feasible at the remaining three locations tested.

6.0 REMARKS

This report has been prepared to aid in the preliminary evaluation of the site for the proposed construction. It is considered that adequate recommendations have been provided to serve as a basis for preliminary design and preparation of plans and specifications. Additional recommendations can be provided as needed.

These preliminary analyses and recommendations are, of necessity, based on the information made available to us at the time of the actual writing of the report and the on-site conditions, surface, and subsurface that existed at the time the exploratory borings were performed. Further assumption has been made that the limited exploratory borings, in relation both to the areal extent of the site and to depth, are representative of conditions across the site.

If subsurface conditions are encountered which differ from those reported herein, this Office should be notified immediately so that the analyses and recommendations can be reviewed and/or revised as necessary. It is also recommended that:

a. Additional subsurface exploration should be performed at the site either to better delineate the limits of the deeper fill materials if the structure is to be built in its currently proposed location or to determine the subsurface conditions in an area where the proposed structure is relocated.

b. Additional evaluation will be required once the proposed foundation scheme has been developed to evaluate the impacts that a deep foundation system may have on the existing Green Line tunnels as required by WMATA.

c. As the project proceeds, monitoring, instrumentation and contingency plans will need to be prepared and submitted in accordance with WMATA's "Adjacent Construction Project Manual". The monitoring must then be performed.

d. We should be given the opportunity to review any plans and specifications prepared subsequent to the final geotechnical study in order to comment on the interaction of the soil conditions as described herein and the design requirements.

e. A Geotechnical Engineer or experienced Soils Inspector should be present at the site during the construction phase to verify installation according to the approved plans and specifications. This is particularly important during excavation, placement, and compaction of fill materials.

Please note that successful completion of the project is dependent on your compliance with all of the recommendations provided in this report. While represented separately, the recommendations represent work that is intertwined. The successful completion of the project is specifically conditioned on your complying with all recommendations.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties either implied or expressed. Hillis-Carnes Capitol Services, PLLC assumes no responsibility for interpretations made by others based on work or recommendations made by HCCS.

APPENDIX

Boring Location Plans (2 Figures)

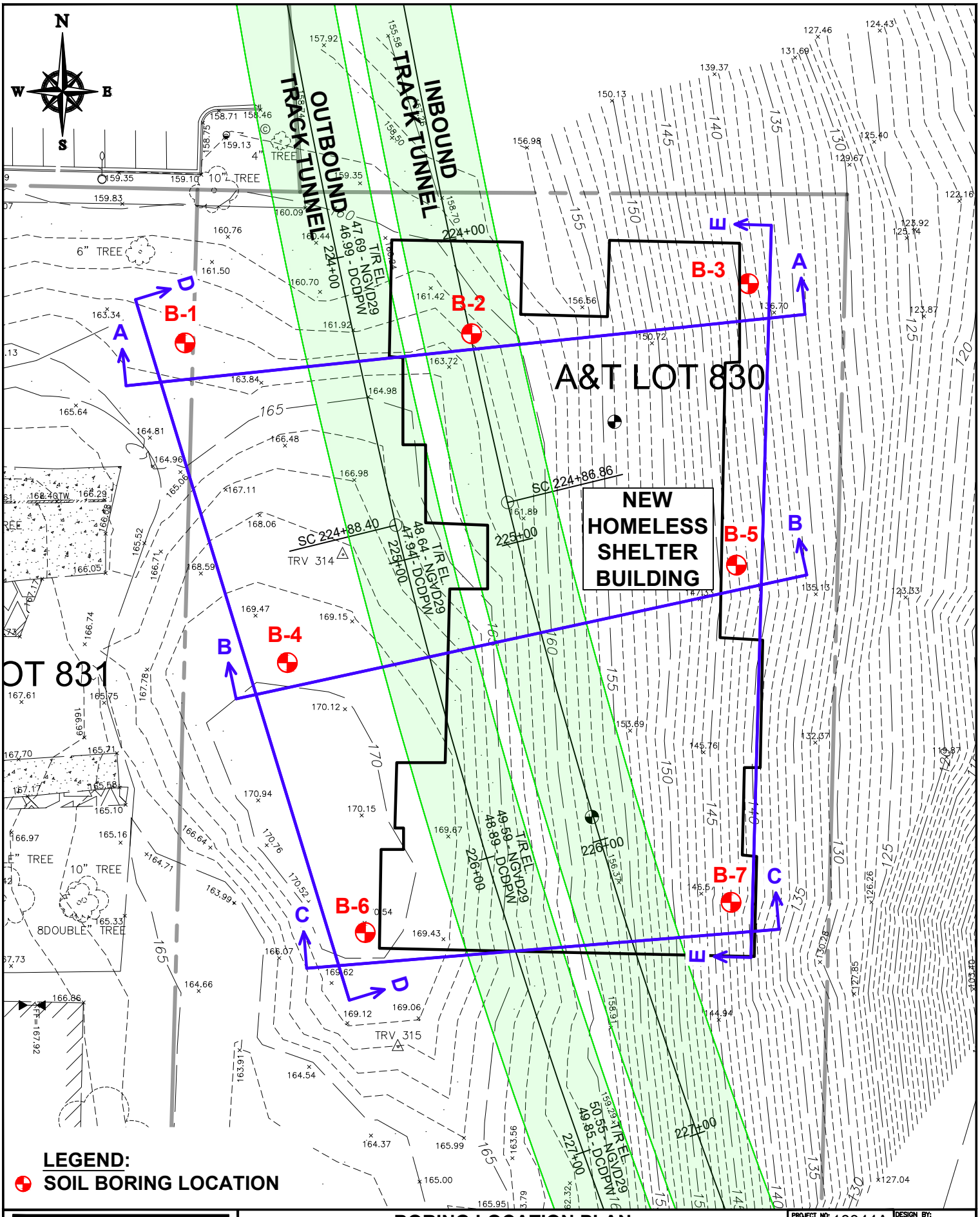
Boring Profiles (A-A through E-E)

Particle Size Distribution Test Reports

Laboratory Test Report – Organic Content

Records of Soil Exploration

Soil Description Sheet



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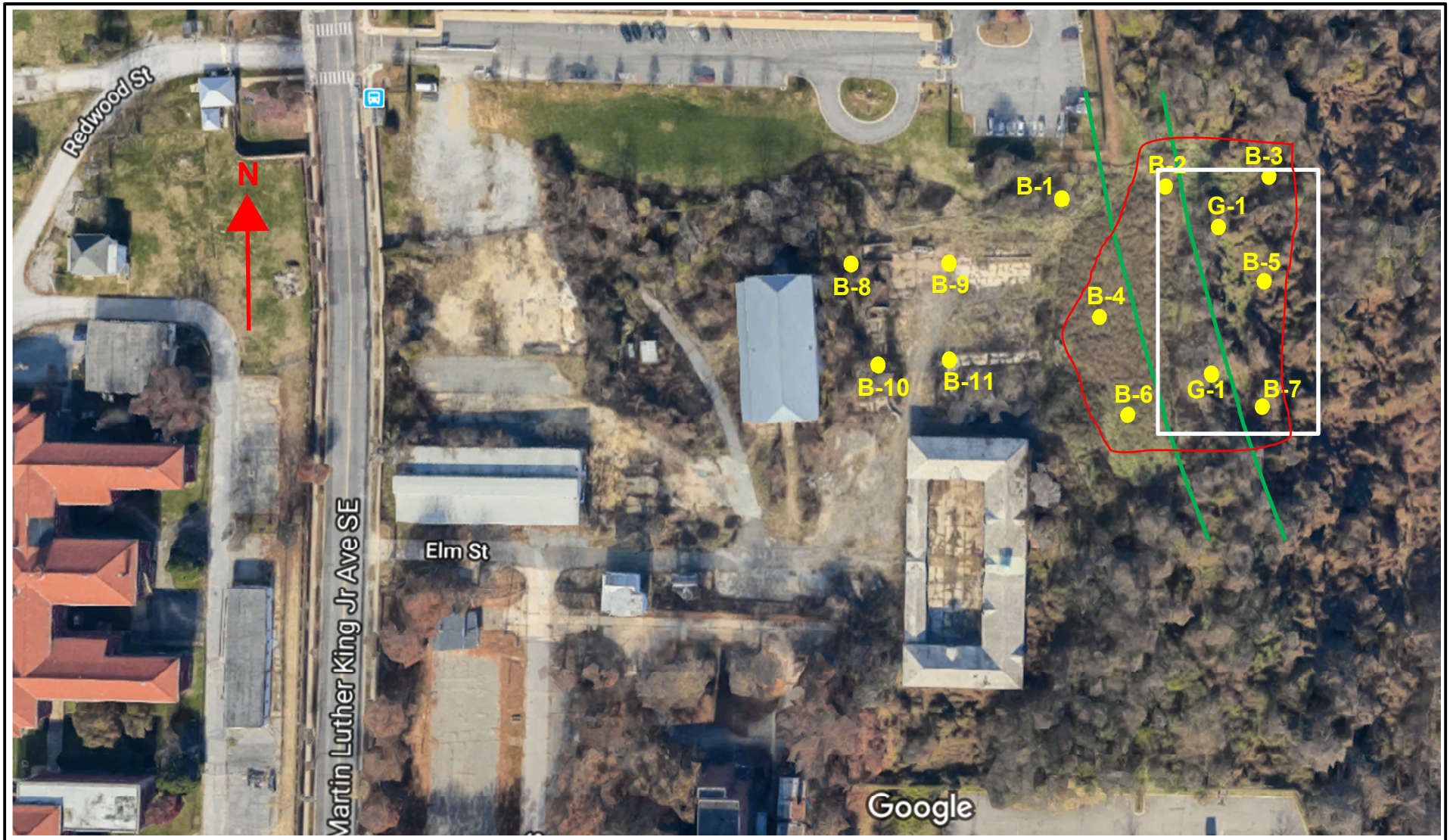
10975 Guilford Road, Suite A Annapolis Junction, Maryland
Ph: (410) 880-4788 WWW.HCEA.COM Fax: (410) 880-4098

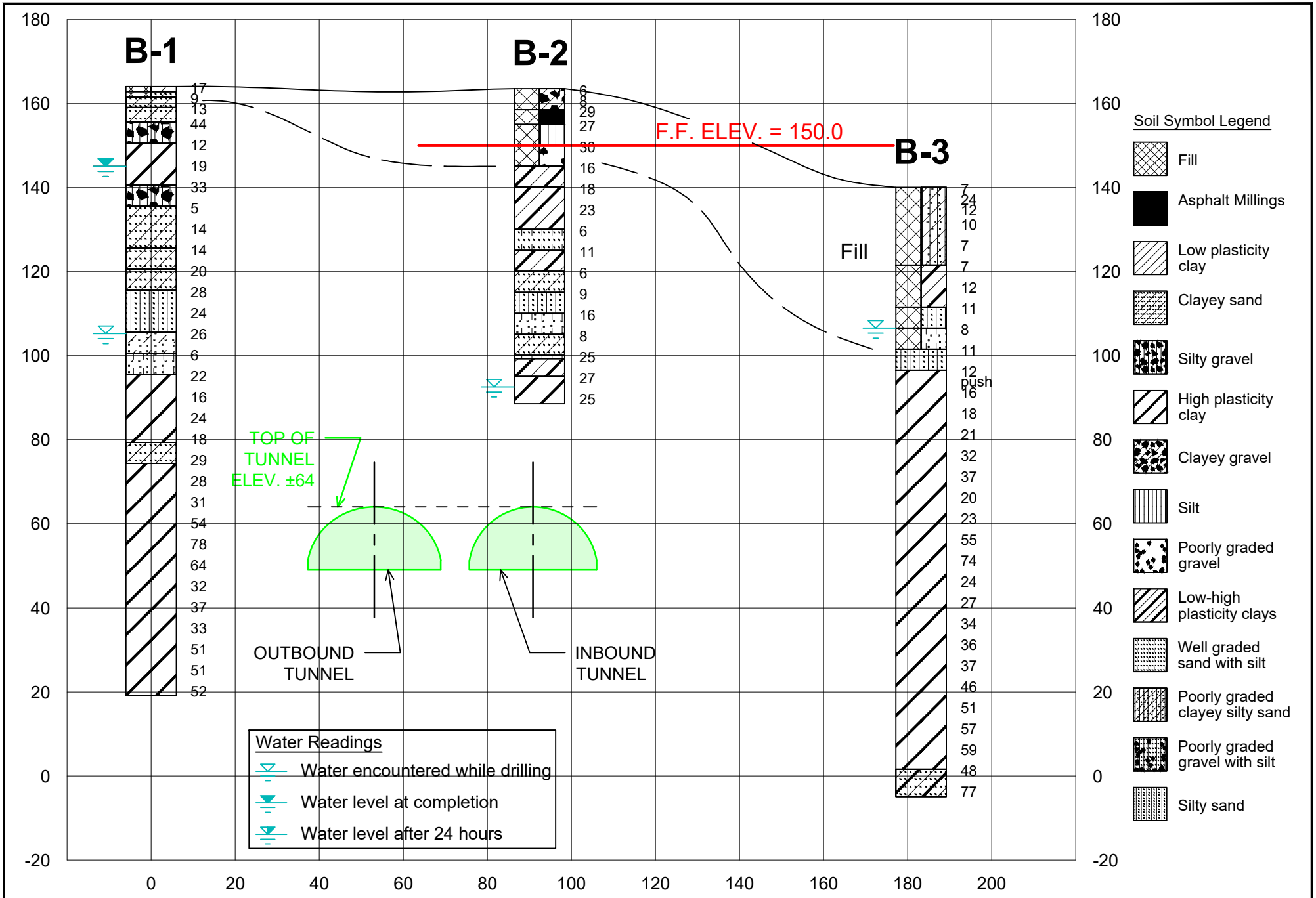
BORING LOCATION PLAN
ST. ELIZABETH'S SHELTER RELOCATION
WASHINGTON, DC

PROJECT NO:	18344A
DATE:	11/30/18
SCALE:	1" = 40'
SHEET:	1
DESIGN BY:	NP
DRAWN BY:	AM
CHECKED BY:	MPJ

\\Terra\vol1\AJ Project Files\2018\18344A St. Elizabeth's Shelter Reloca\CAD\CAD DESIGN DWGS\PRODUCTION\18344A BLP.dwg – 11/29/2018 – 11:49am



Project: St. Elizabeth's East Campus 801 Shelter Relocation **Project No.: 18344A**	**Scale: Reduced**
Map image from Google Maps© 2018	**Boring Location Plan**



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Ph: (410) 880-4788 WWW.HCEA.COM Fax: (410) 880-4098

BORING PROFILE A - A

ST. ELIZABETH'S SHELTER RELOCATION

WASHINGTON, DC

PROJECT NO:	18344A
DATE:	11/30/18
SCALE:	As Noted
SHEET:	2
DESIGN BY:	NP
DRAWN BY:	AM
CHECKED BY:	MPJ

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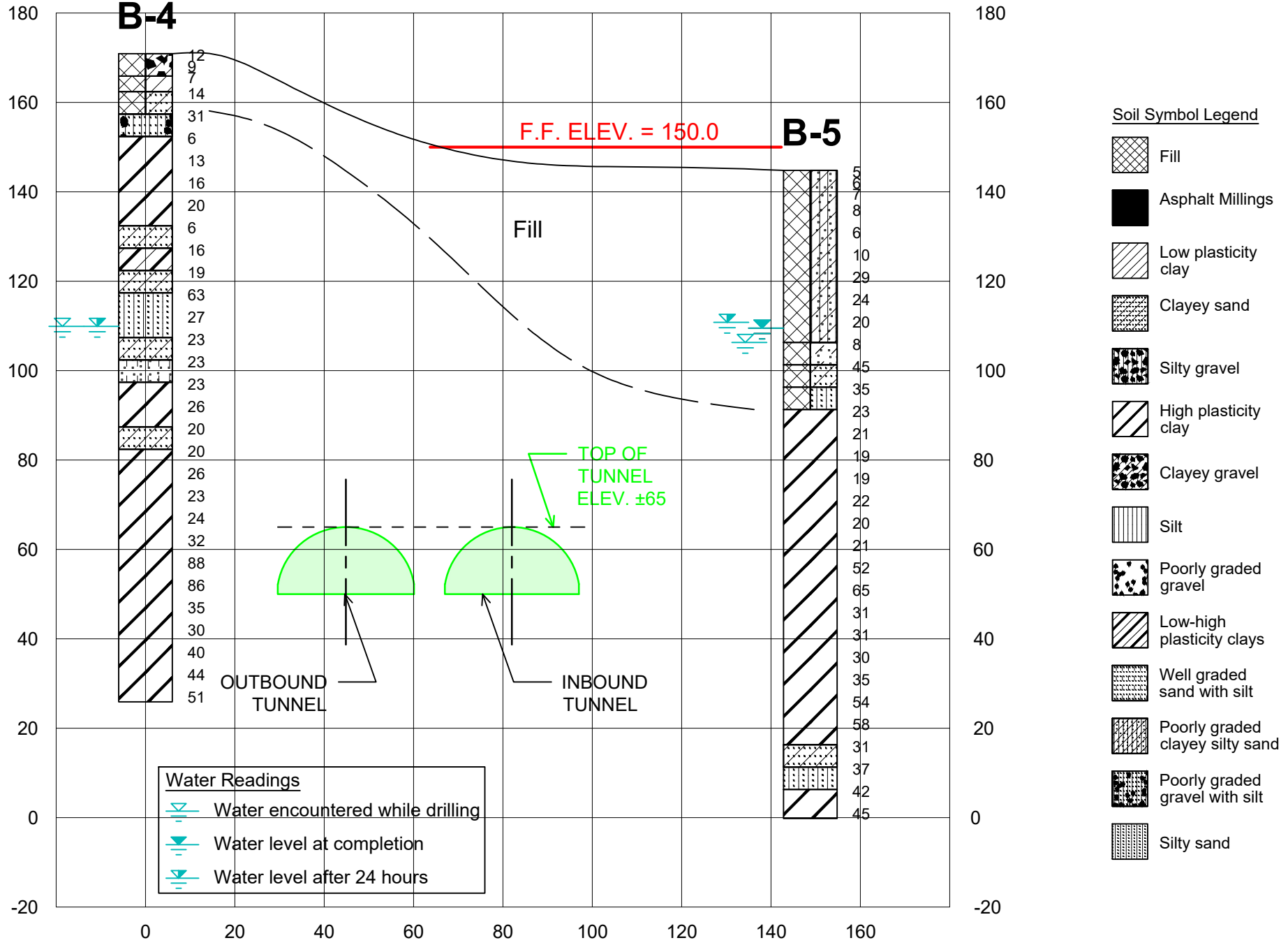


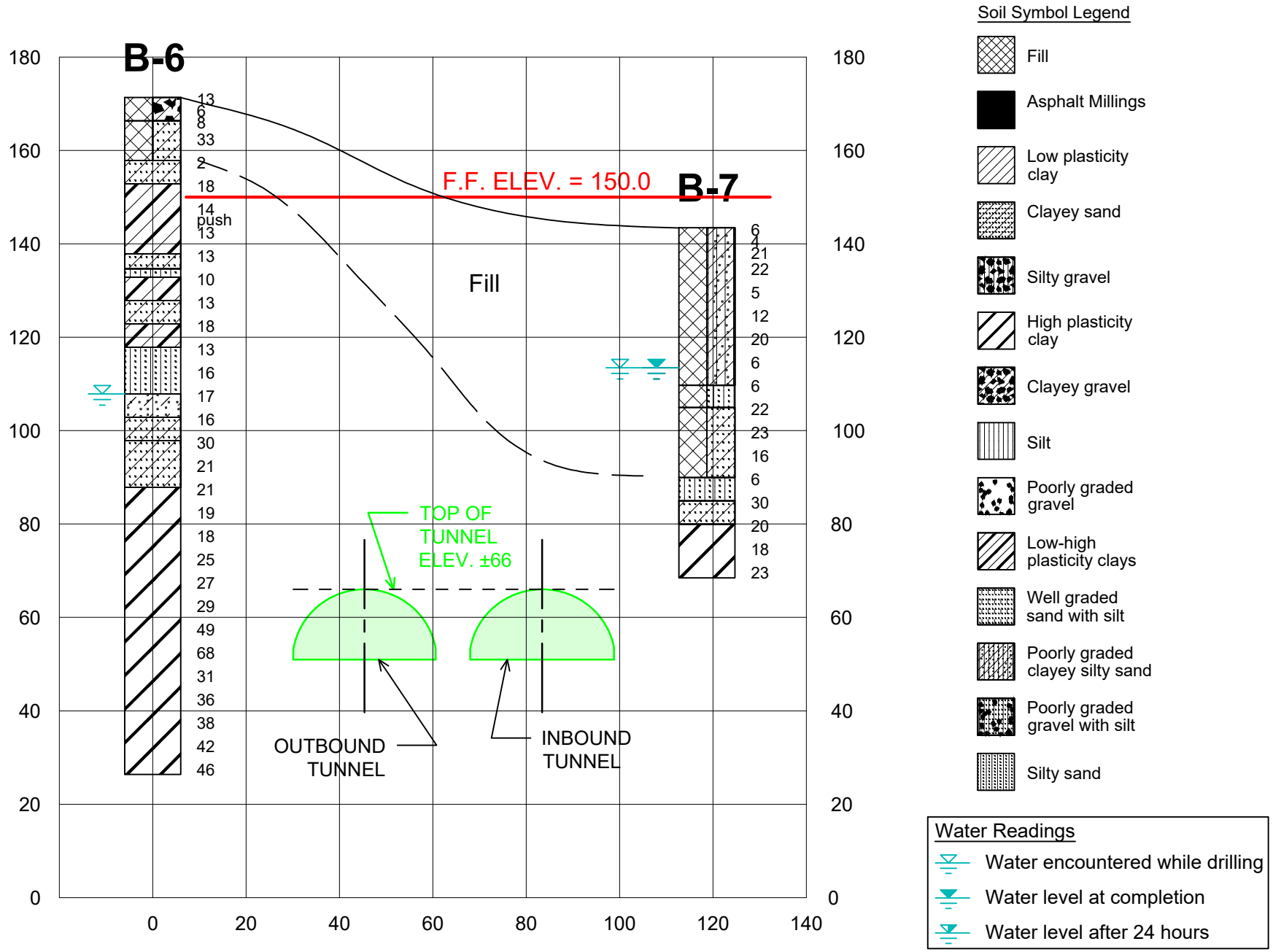
HILLIS-CARNES ENGINEERING ASSOCIATES
10975 Guilford Road, Suite A Annapolis Junction, Maryland
Ph: (410) 880-4788 WWW.HCEA.COM Fax: (410) 880-4098

BORING PROFILE B - B

ST. ELIZABETH'S SHELTER RELOCATION

WASHINGTON, DC

PROJECT NO:	18344A
DATE:	11/30/18
SCALE:	As Noted
SHEET:	3
DESIGN BY:	NP
DRAWN BY:	AM
CHECKED BY:	MPJ



Soil Symbol Legend

- Fill
- Asphalt Millings
- Low plasticity clay
- Clayey sand
- Silty gravel
- High plasticity clay
- Clayey gravel
- Silt
- Poorly graded gravel
- Low-high plasticity clays
- Well graded sand with silt
- Poorly graded clayey silty sand
- Poorly graded gravel with silt
- Silty sand

Water Readings

- Water encountered while drilling
- Water level at completion
- Water level after 24 hours

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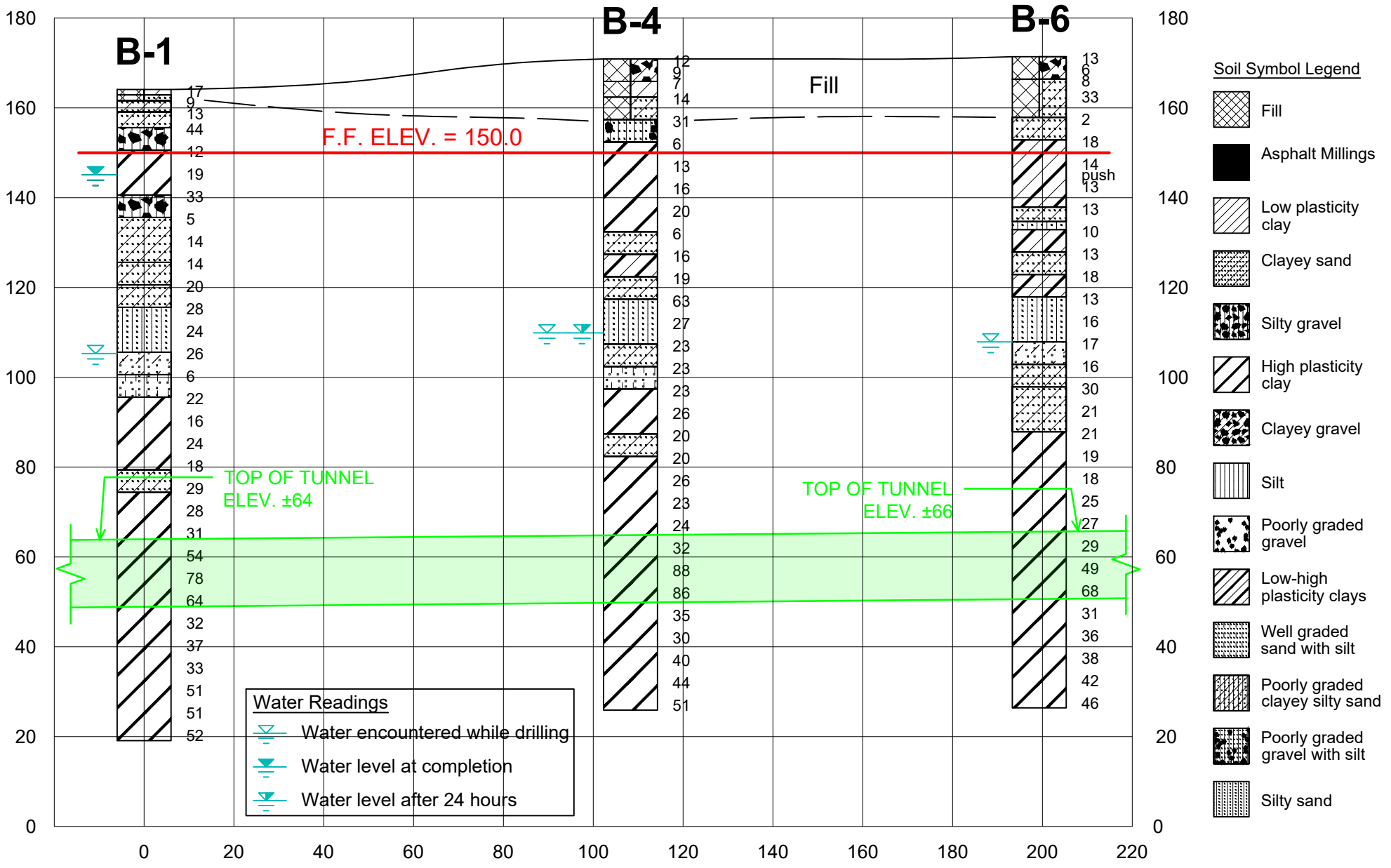
BORING PROFILE C - C

ST. ELIZABETH'S SHELTER RELOCATION

WASHINGTON, DC

PROJECT NO:	18344A
DATE:	11/30/18
SCALE:	As Noted
SHEET:	4
DESIGN BY:	NP
DRAWN BY:	AM
CHECKED BY:	MPJ

\\terra\vol1\AJ Project Files\2018\18344A St. Elizabeth's Shelter Reloca\CAD\CAD DESIGN DWGS\PRODUCTION\18344A B PROF.dwg – 12/03/2018 – 2:18pm



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BORING PROFILE D - D

ST. ELIZABETH'S SHELTER RELOCATION

WASHINGTON, DC

PROJECT NO:	18344A
DATE:	11/30/18
SCALE:	As Noted
SHEET:	5
DESIGN BY:	NP
DRAWN BY:	AM
CHECKED BY:	MPJ

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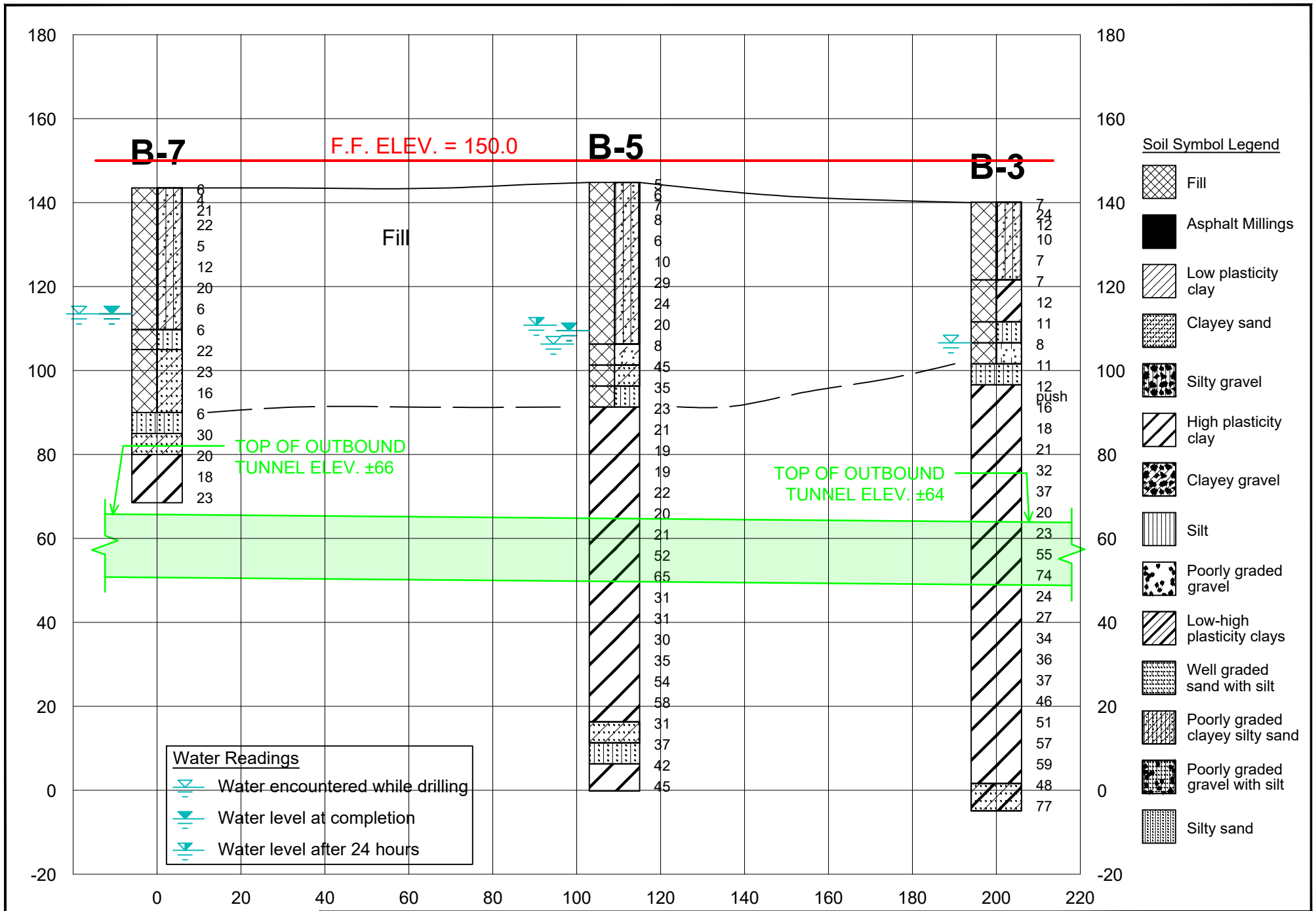


HILLIS-CARNES ENGINEERING ASSOCIATES
10975 Guilford Road, Suite A Annapolis Junction, Maryland
Ph: (410) 880-4788 WWW.HCEA.COM Fax: (410) 880-4098

BORING PROFILE E - E

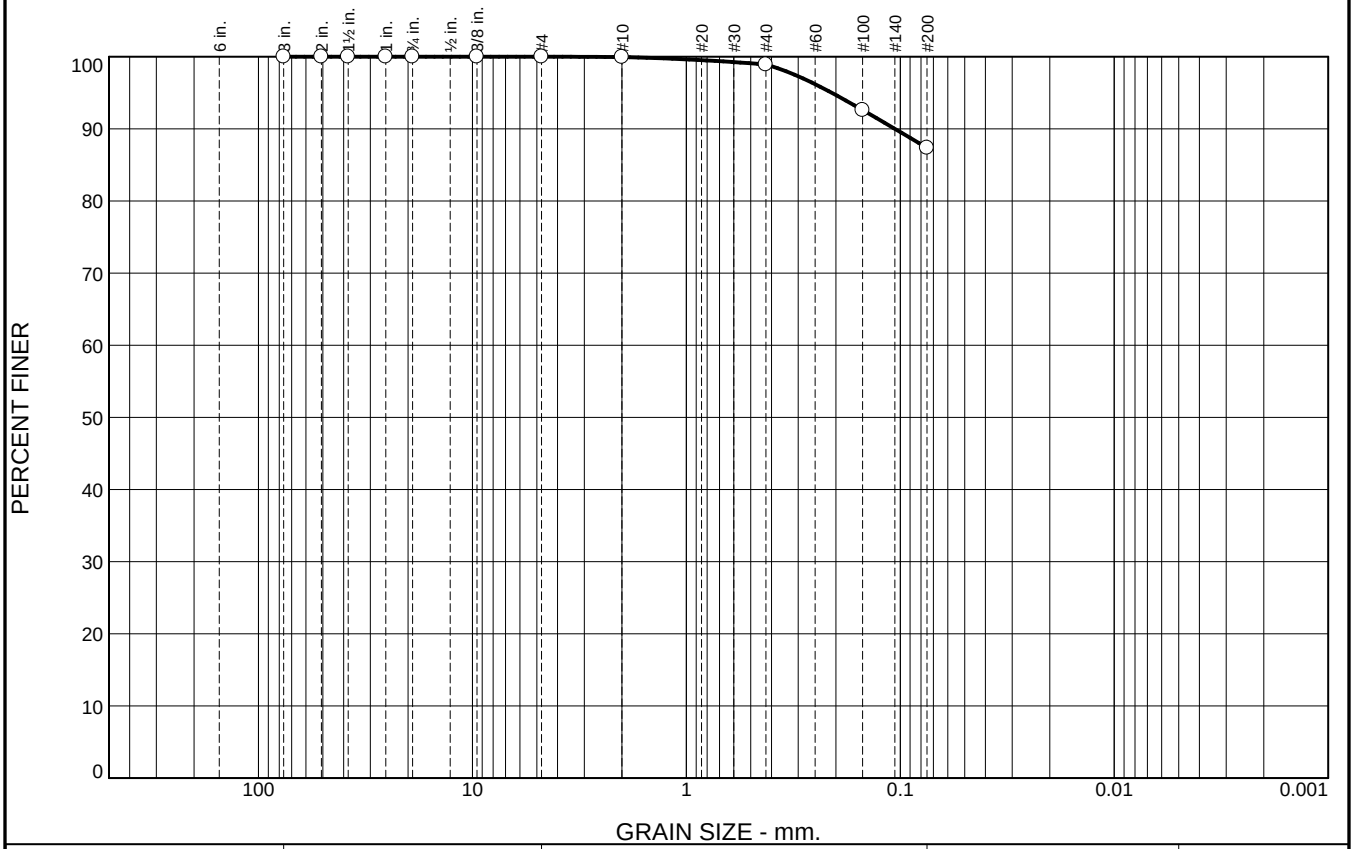
ST. ELIZABETH'S SHELTER RELOCATION

WASHINGTON, DC

PROJECT NO:	18344A
DATE:	11/30/18
SCALE:	As Noted
SHEET:	6
DESIGN BY:	NP
DRAWN BY:	AM
CHECKED BY:	MPJ

\\terra\vol1\AJ Project Files\2018\18344A St. Elizabeth's Shelter Reloca\CAD\CAD DESIGN DWGS\PRODUCTION\18344A B PROF.dwg – 12/03/2018 – 2:19pm

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	12.6	87.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.9		
#40	98.9		
#100	92.6		
#200	87.4		

* (no specification provided)

Material Description

Brown with orange fat clay

Atterberg Limits

PL= 15 LL= 54 PI= 39

Coefficients

D_{90}= 0.1061 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(35)

Remarks

Moisture content: 17.9%

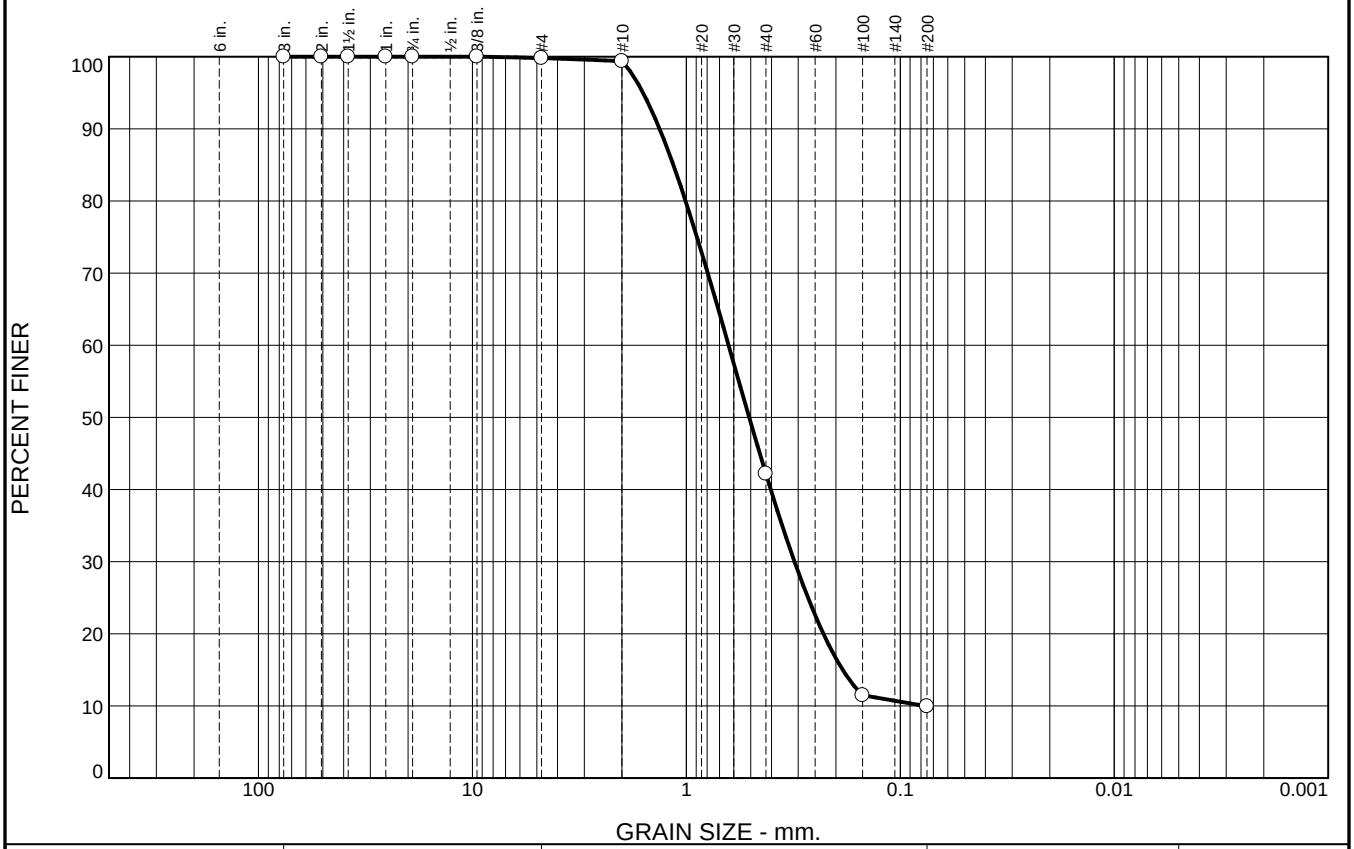
Location: B-1, S-6
Sample Number: 5 **Depth:** 18.5'-20.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca

Project No: 18344A **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.2	89.9	9.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	100.0		
#4	99.8		
#10	99.4		
#40	42.2		
#100	11.5		
#200	9.9		

* (no specification provided)

Material Description

Orange brown well-graded sand with silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 1.3338 D_{85}= 1.1509 D_{60}= 0.6348
D_{50}= 0.5084 D_{30}= 0.3122 D_{15}= 0.1860
D_{10}= 0.0768 C_u= 8.27 C_c= 2.00

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

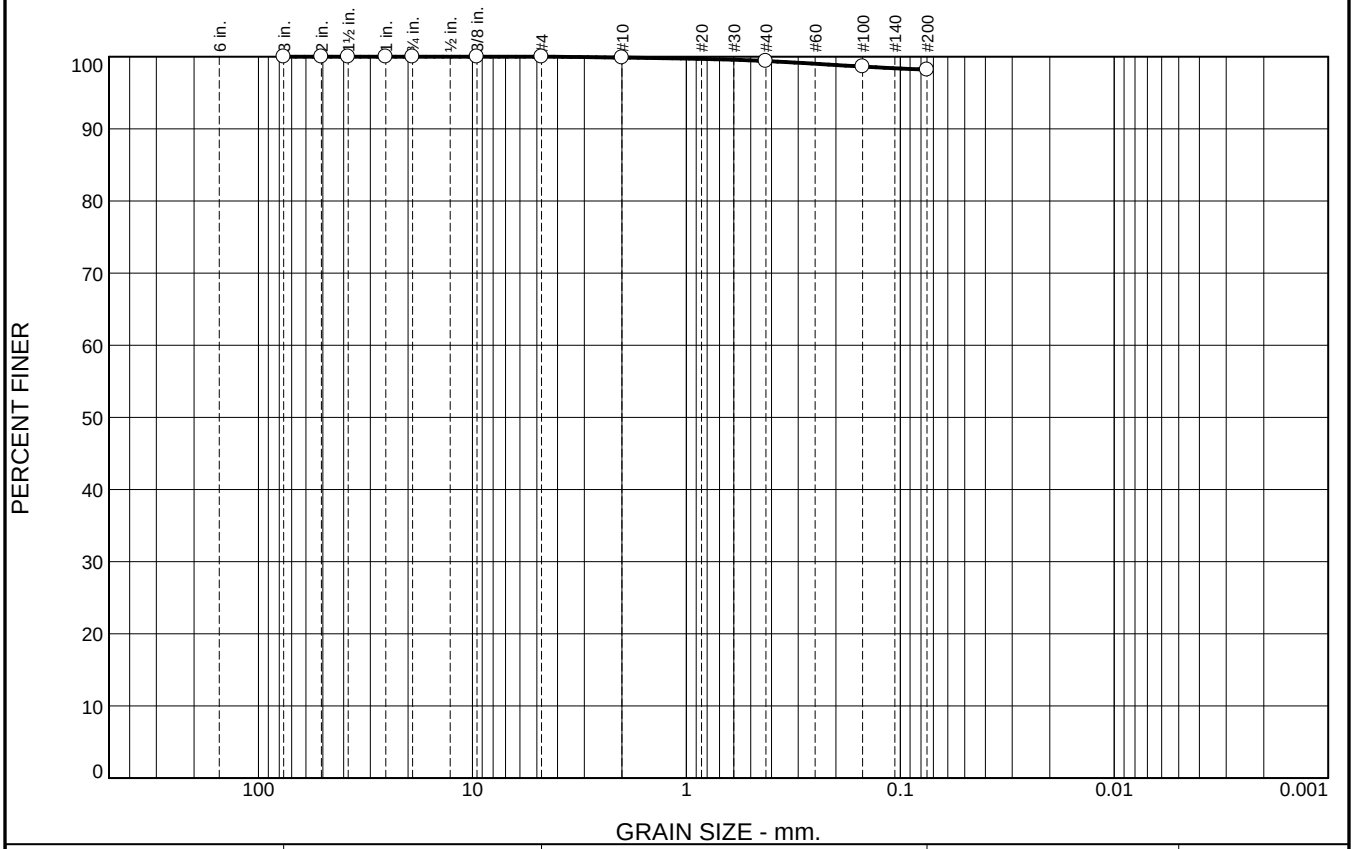
Moisture content: 8.6%

Location: B-2, S-9
Sample Number: 6 **Depth:** 33.5'-35.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca
Project No: 18344A **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	1.8	98.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.9		
#40	99.4		
#100	98.6		
#200	98.2		

* (no specification provided)

Material Description

Dark red brown fat clay

Atterberg Limits

PL= 22 LL= 103 PI= 81

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(91)

Remarks

Moisture content: 24.8%

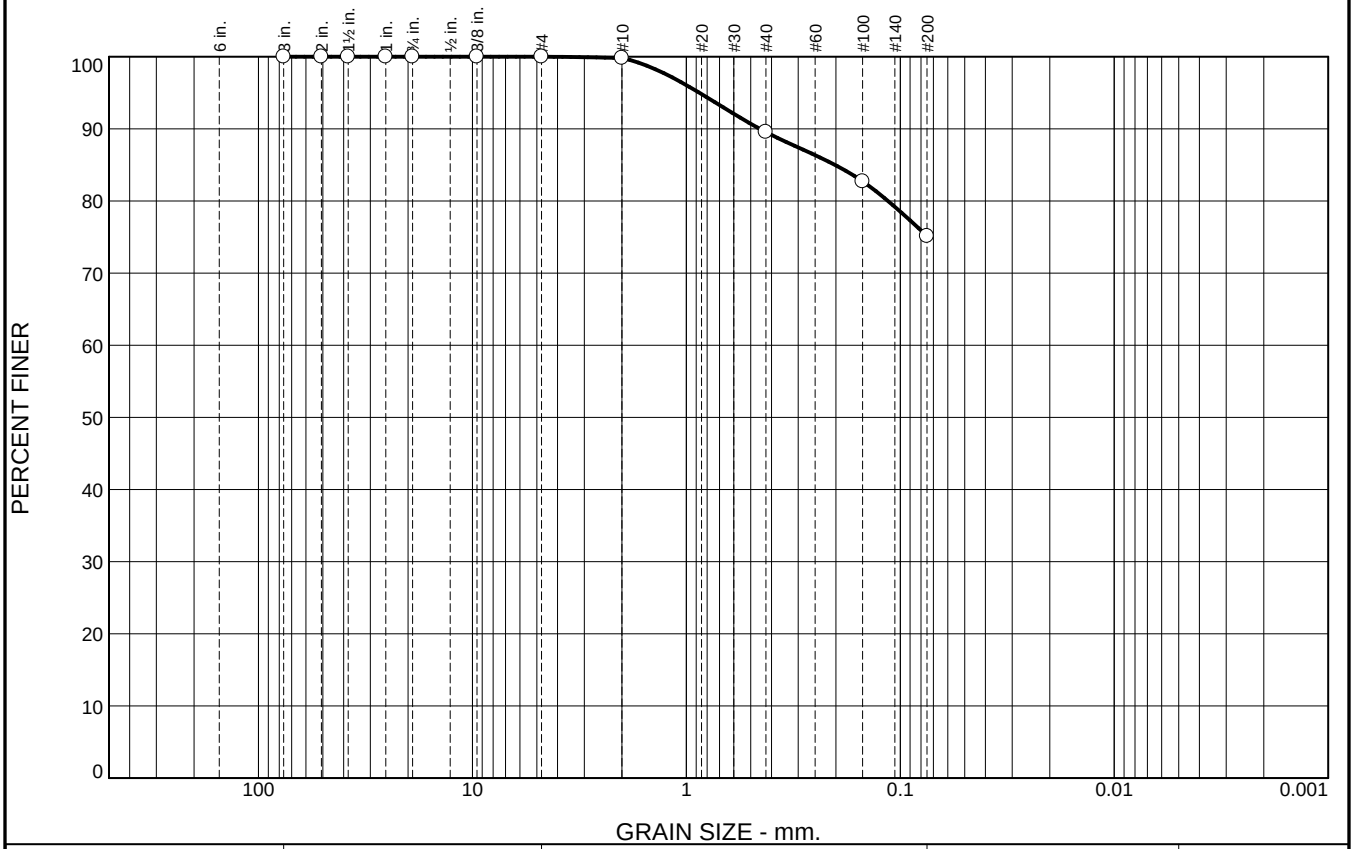
Location: B-2, S-16
Sample Number: 7 **Depth:** 68.5'-70.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca

Project No: 18344A **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	24.9	75.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.8		
#40	89.6		
#100	82.7		
#200	75.1		

* (no specification provided)

Material Description

Orange with red fat clay with sand

Atterberg Limits

PL= 19 LL= 78 PI= 59

Coefficients

D_{90}= 0.4534 D_{85}= 0.2019 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(45)

Remarks

Moisture content: 24.4%

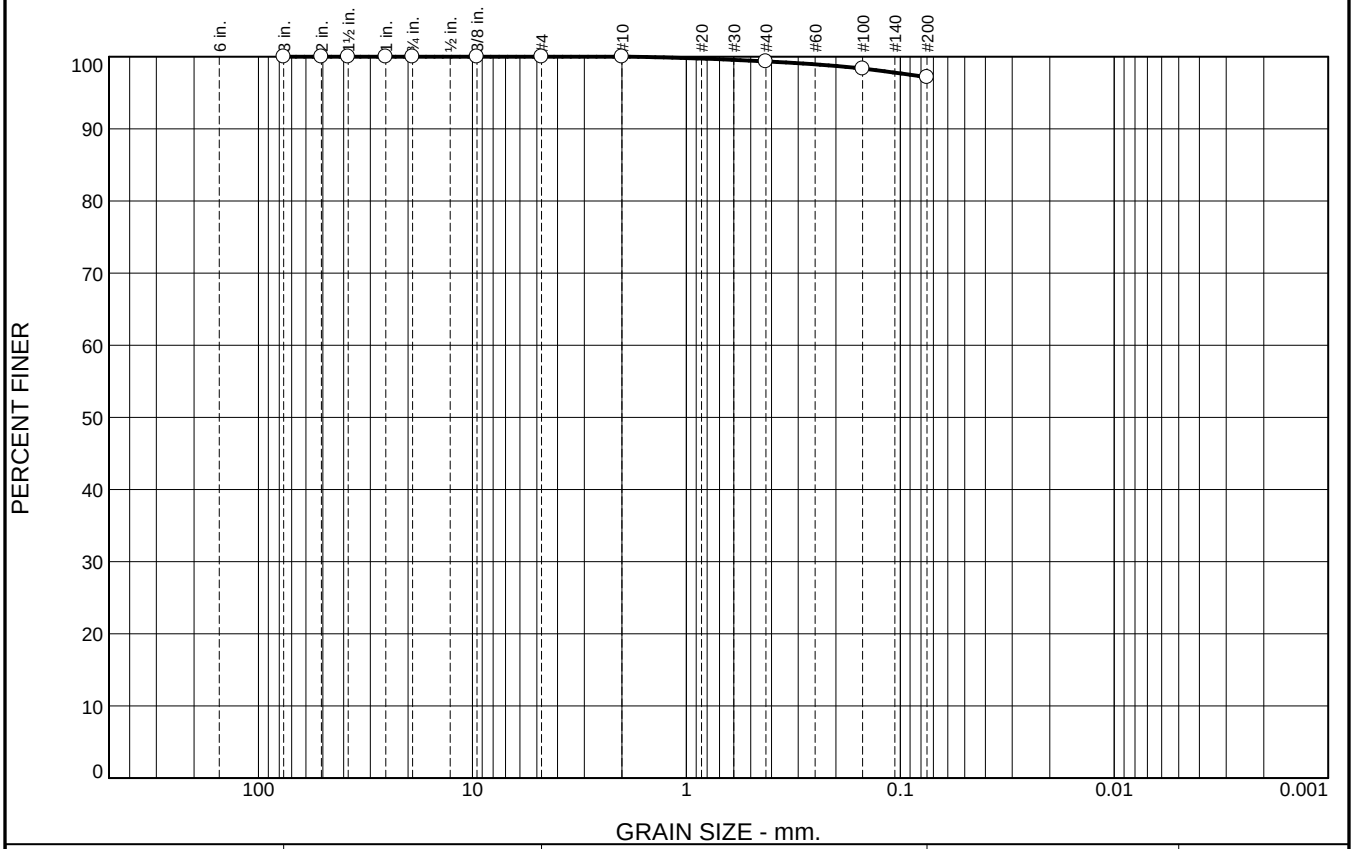
Location: B-4, S-6
Sample Number: 8 **Depth:** 18.5'-20.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca

Project No: 18344A **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	2.8	97.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	100.0		
#40	99.3		
#100	98.3		
#200	97.2		

* (no specification provided)

Material Description

Gray & brown with reddish brown

Atterberg Limits

PL= 22 LL= 148 PI= 126

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(141)

Remarks

Moisture content: 30.4%

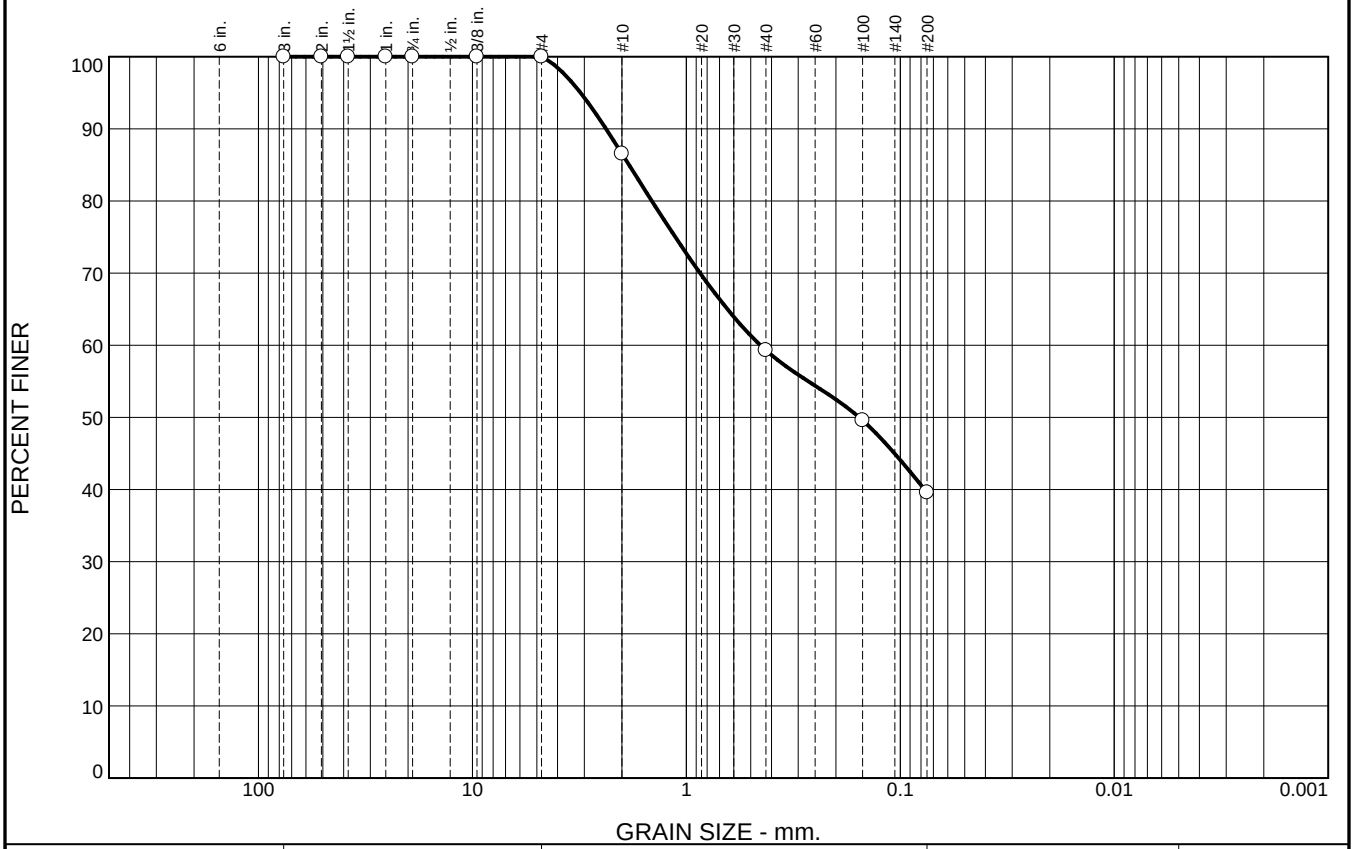
Location: B-5, S-16
Sample Number: 12 **Depth:** 68.5'-70.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca

Project No: 18344A **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	60.4	39.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	86.5		
#40	59.3		
#100	49.6		
#200	39.6		

* (no specification provided)

Material Description

Gray with green & brown clayey sand

Atterberg Limits

PL= 14 LL= 30 PI= 16

Coefficients

D_{90}= 2.3749 D_{85}= 1.8537 D_{60}= 0.4504
D_{50}= 0.1556 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(2)

Remarks

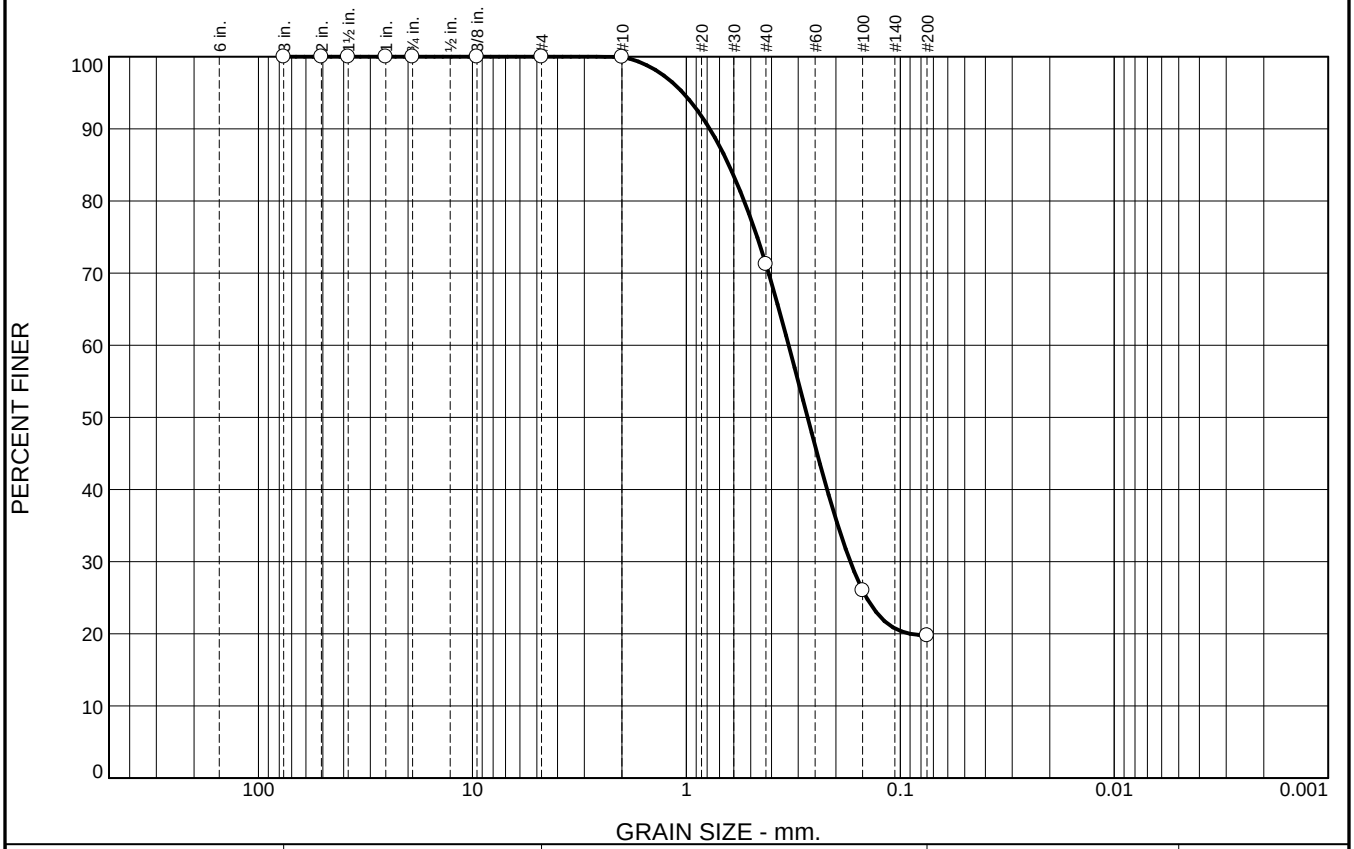
Moisture content: 14.9%

Location: B-6, S-9
Sample Number: 9 **Depth:** 33.5'-35.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca
Project No: 18344A **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	80.2	19.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	100.0		
#40	71.2		
#100	26.0		
#200	19.8		

* (no specification provided)

Material Description

Brown silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.7777 D_{85}= 0.6332 D_{60}= 0.3325
D_{50}= 0.2713 D_{30}= 0.1713 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

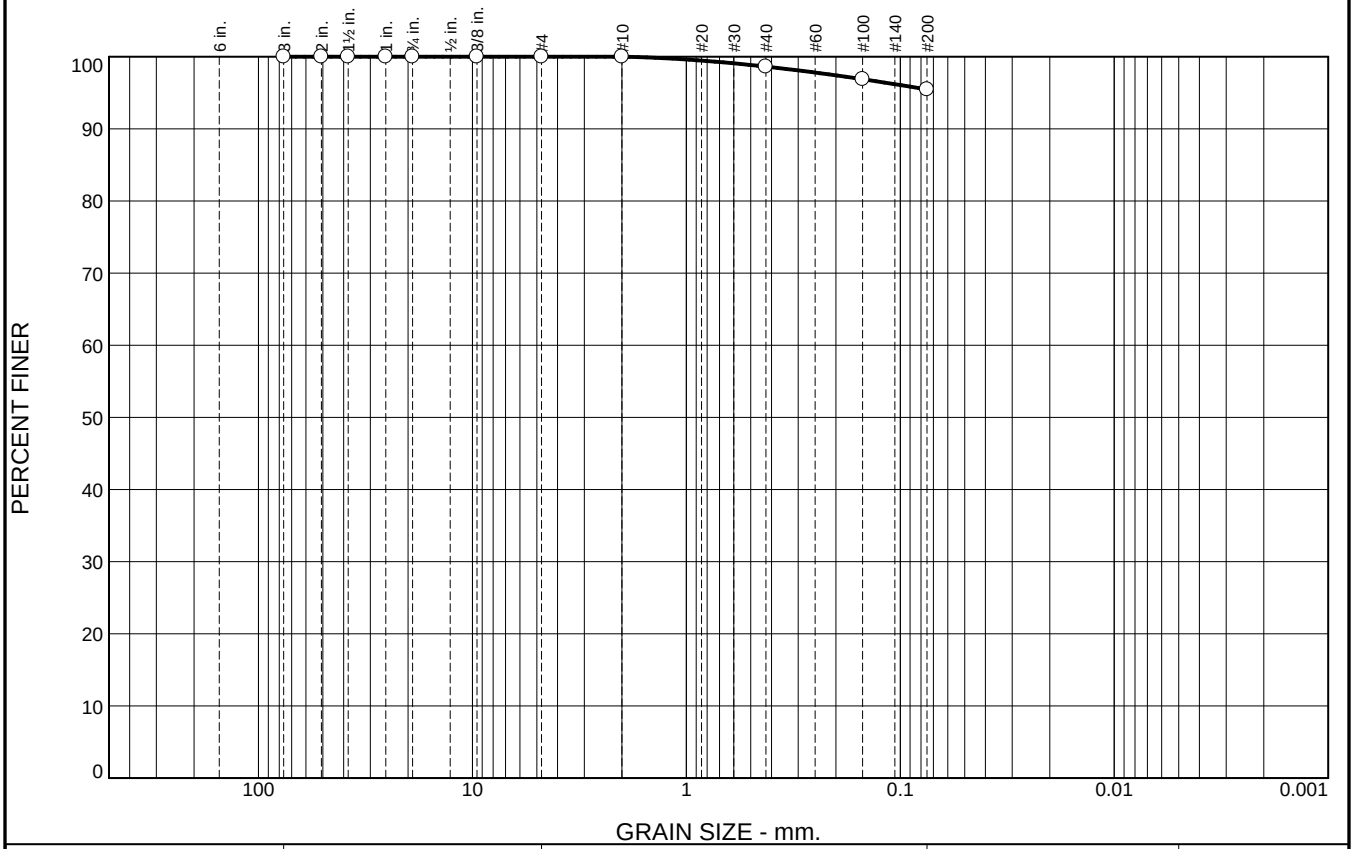
Moisture content: 20.4%

Location: B-7, S-13
Sample Number: 10 **Depth:** 53.5'-55.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca
Project No: 18344A **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	4.5	95.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	100.0		
#40	98.6		
#100	96.9		
#200	95.5		

* (no specification provided)

Material Description

Red with brown fat clay

Atterberg Limits

PL= 26 LL= 124 PI= 98

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(109)

Remarks

Moisture content: 26.2%

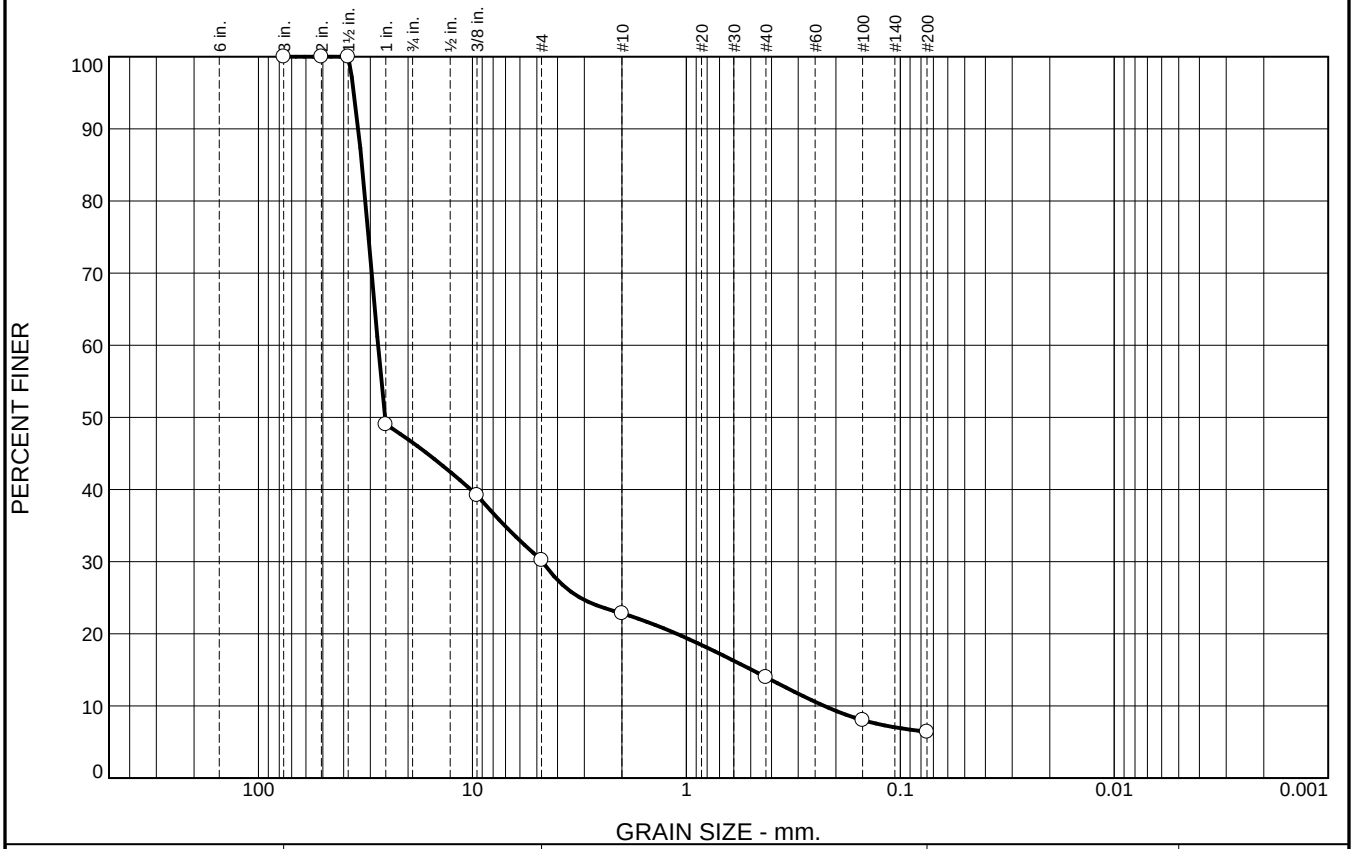
Location: B-7, S-17
Sample Number: 11 **Depth:** 73.5'-75.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca

Project No: 18344A **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	69.8	23.8	6.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	49.0		
3/8"	39.2		
#4	30.2		
#10	22.8		
#40	14.0		
#100	8.0		
#200	6.4		

* (no specification provided)

Material Description

Brown poorly graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 34.1600 D_{85}= 32.8289 D_{60}= 27.5985
D_{50}= 25.6040 D_{30}= 4.6984 D_{15}= 0.4943
D_{10}= 0.2266 C_u= 121.80 C_c= 3.53

Classification

USCS= AASHTO=

Remarks

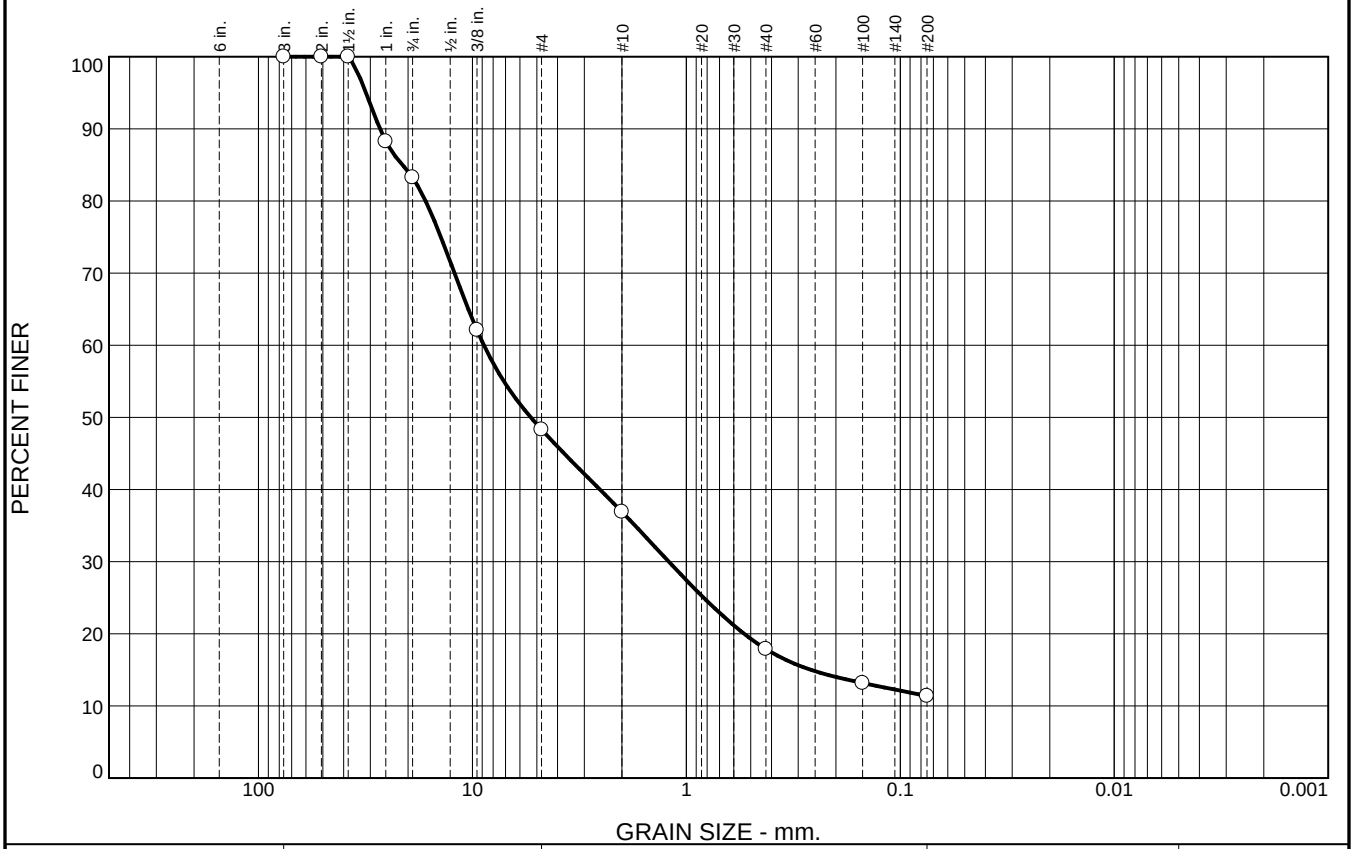
Moisture content: 3.7%

Location: B-8, S-4
Sample Number: 1 **Depth:** 8.5'-10.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca
Project No: 18344A **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	51.7	36.9	11.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	88.2		
3/4"	83.2		
3/8"	62.1		
#4	48.3		
#10	36.9		
#40	17.9		
#100	13.2		
#200	11.4		

* (no specification provided)

Material Description

Brown poorly graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 27.0424 D_{85}= 21.2321 D_{60}= 8.8368
D_{50}= 5.3336 D_{30}= 1.2082 D_{15}= 0.2615
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture content: 7.2%

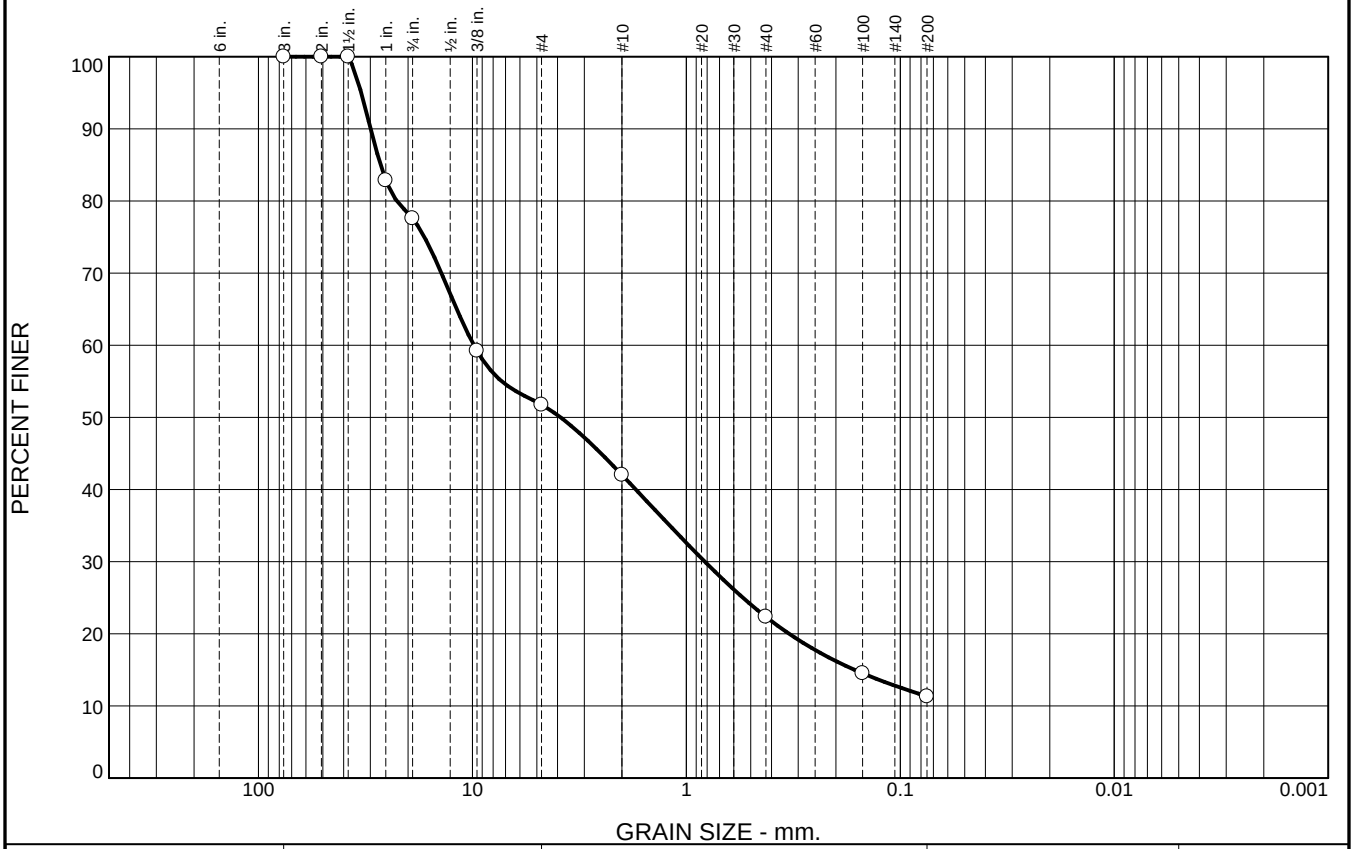
Location: B-9, S-4
Sample Number: 2 **Depth:** 8.5'-10.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca

Project No: 18344A **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	48.2	40.5	11.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	82.8		
3/4"	77.6		
3/8"	59.2		
#4	51.8		
#10	42.0		
#40	22.4		
#100	14.5		
#200	11.3		

* (no specification provided)

Material Description

Brown poorly graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 29.8798 D_{85}= 26.8786 D_{60}= 9.8474
D_{50}= 3.8715 D_{30}= 0.8199 D_{15}= 0.1634
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Mositure content: 5.9%

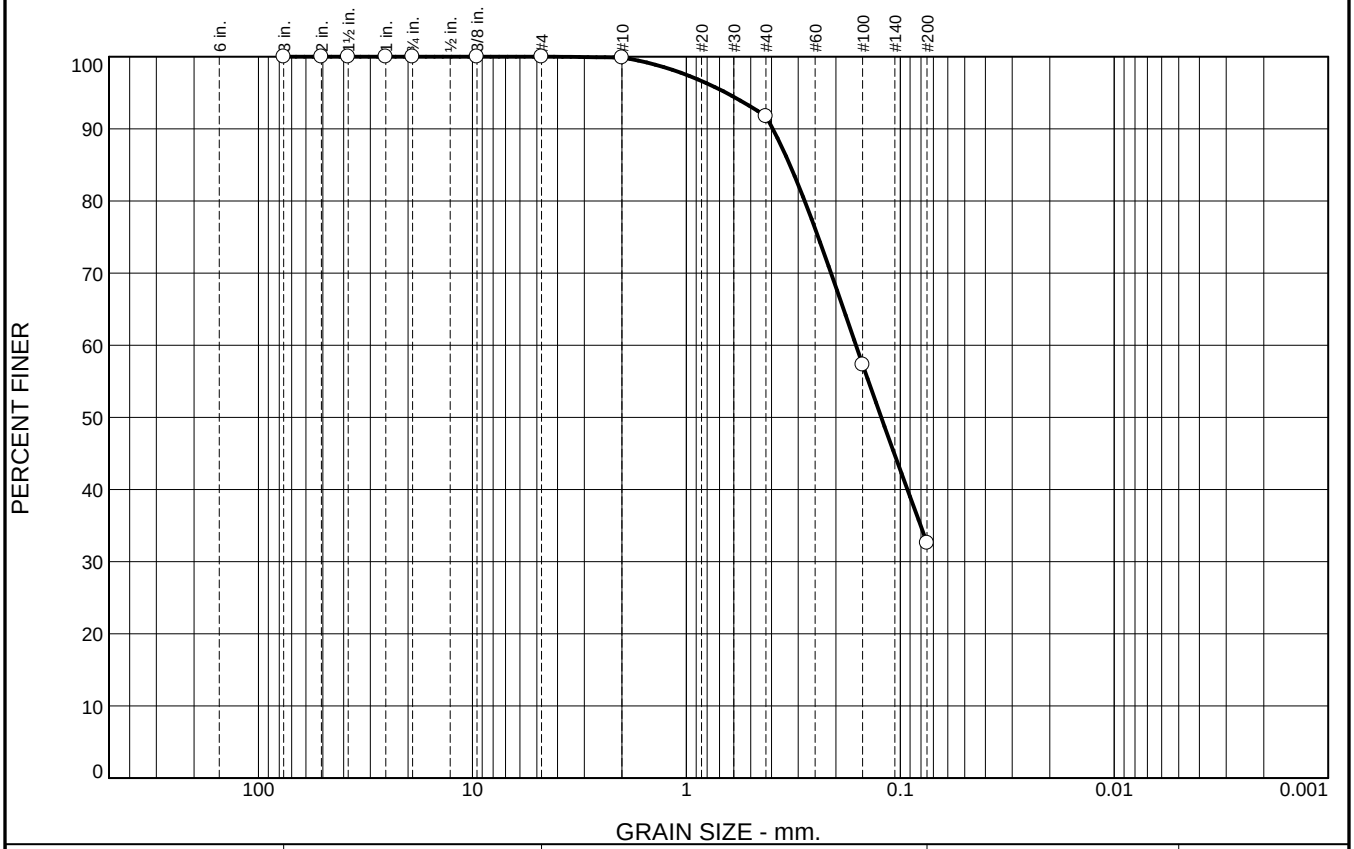
Location: B-10, S-4
Sample Number: 3 **Depth:** 8.5'-10.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca

Project No: 18344A **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	67.4	32.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100.0		
2"	100.0		
1 - 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.9		
#40	91.7		
#100	57.3		
#200	32.6		

* (no specification provided)

Material Description

Orange brown silty sand

Atterberg Limits

PL= 21 LL= 23 PI= 2

Coefficients

D_{90}= 0.3943 D_{85}= 0.3281 D_{60}= 0.1612
D_{50}= 0.1228 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 15.1%

Location: B-11, S-4
Sample Number: 4 **Depth:** 8.5'-10.0' **Date:** 11/09/18

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Client: CH2M
Project: St. Elizabeth's Shelter Reloca
Project No: 18344A **Figure**

HILLIS-CARNES

ENGINEERING ASSOCIATES, INC.

10975 Guilford Road, Suite A
Post Office Box 241
Annapolis Junction, MD 20701
Baltimore 410-880-4788
DC Metro 301-470-4239
Fax 410-880-4098
www.hcea.com

Laboratory Test Report

Date: November 09, 2018
Project: St. Elizabeth's Shelter Reloca
Job #: 18334A

Soil Test Results

Sample ID	Organic Content ASTM D2974 Method C
B-5, S-2 2.5'-4.0'	5.3%
B-5, S-3 5.0'-6.5'	9.8%
B-5, S-5 13.5'-15.0'	7.5%
B-5, S-8 28.5'-30.0'	7.9%
B-7, S-3 5.0'-6.5'	10.4%
B-7, S-5 13.5'-15.0'	9.8%
B-7, S-7 23.5'-25.0'	5.2%

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-1

Location: Elm St, SE, Washington, DC Job #: 18344A

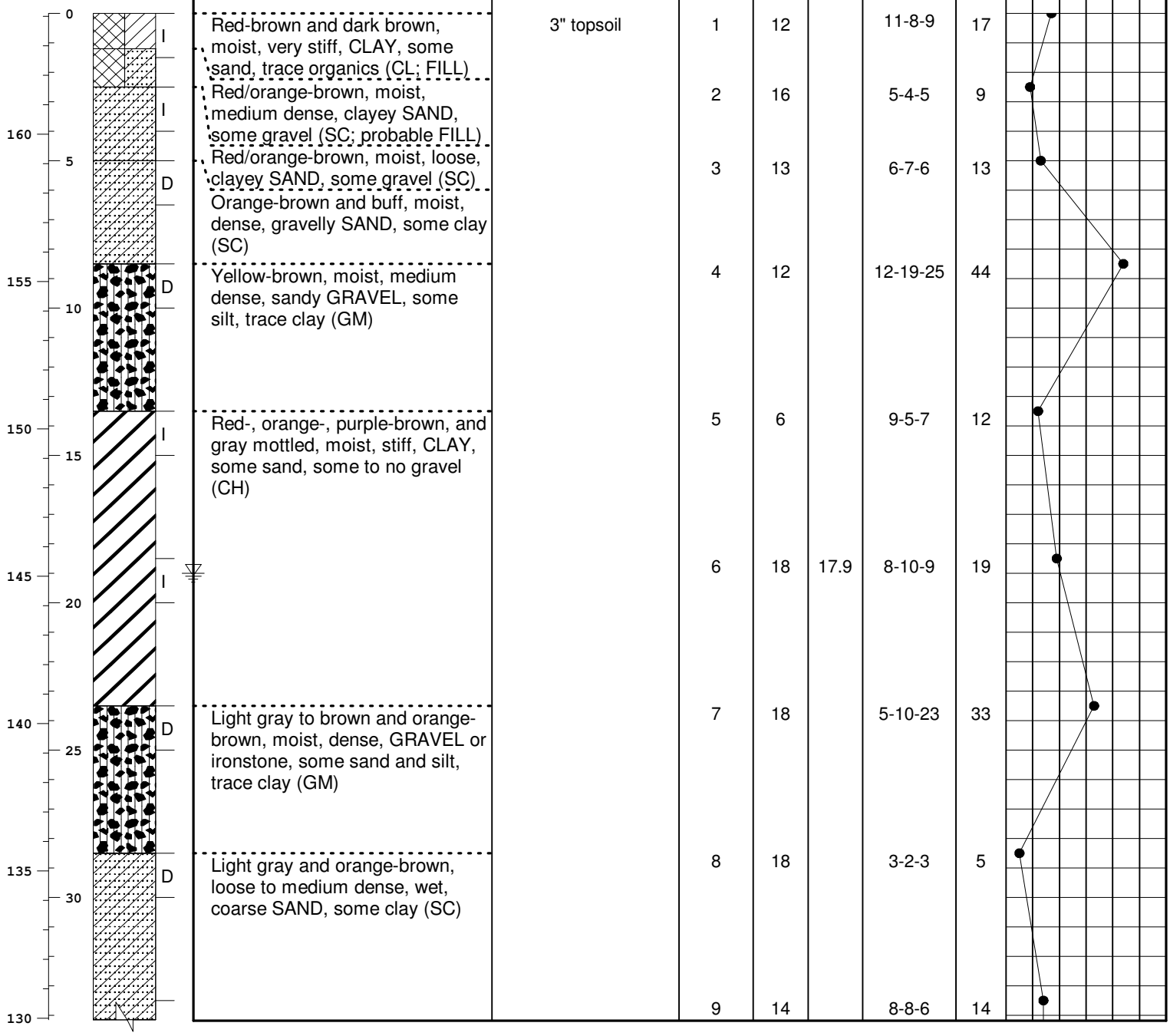
SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 164.1 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/19/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/23/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
164 / 0	I	Red-brown and dark brown, moist, very stiff, CLAY, some sand, trace organics (CL; FILL)	3" topsoil	1	12		11-8-9	17
	I	Red/orange-brown, moist, medium dense, clayey SAND, some gravel (SC; probable FILL)		2	16		5-4-5	9
160 / 5	D	Red/orange-brown, moist, loose, clayey SAND, some gravel (SC)		3	13		6-7-6	13
		Orange-brown and buff, moist, dense, gravelly SAND, some clay (SC)						
155 / 10	D	Yellow-brown, moist, medium dense, sandy GRAVEL, some silt, trace clay (GM)		4	12		12-19-25	44
150 / 15	I	Red-, orange-, purple-brown, and gray mottled, moist, stiff, CLAY, some sand, some to no gravel (CH)		5	6		9-5-7	12
145 / 20	I			6	18	17.9	8-10-9	19
140 / 25	D	Light gray to brown and orange-brown, moist, dense, GRAVEL or ironstone, some sand and silt, trace clay (GM)		7	18		5-10-23	33
135 / 30	D	Light gray and orange-brown, loose to medium dense, wet, coarse SAND, some clay (SC)		8	18		3-2-3	5
130				9	14		8-8-6	14



SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	19.0 ft.	36.0 ft.
AFTER 24 HRS.	DRY ft.	32.3 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-1

Location: Elm St, SE, Washington, DC Job #: 18344A

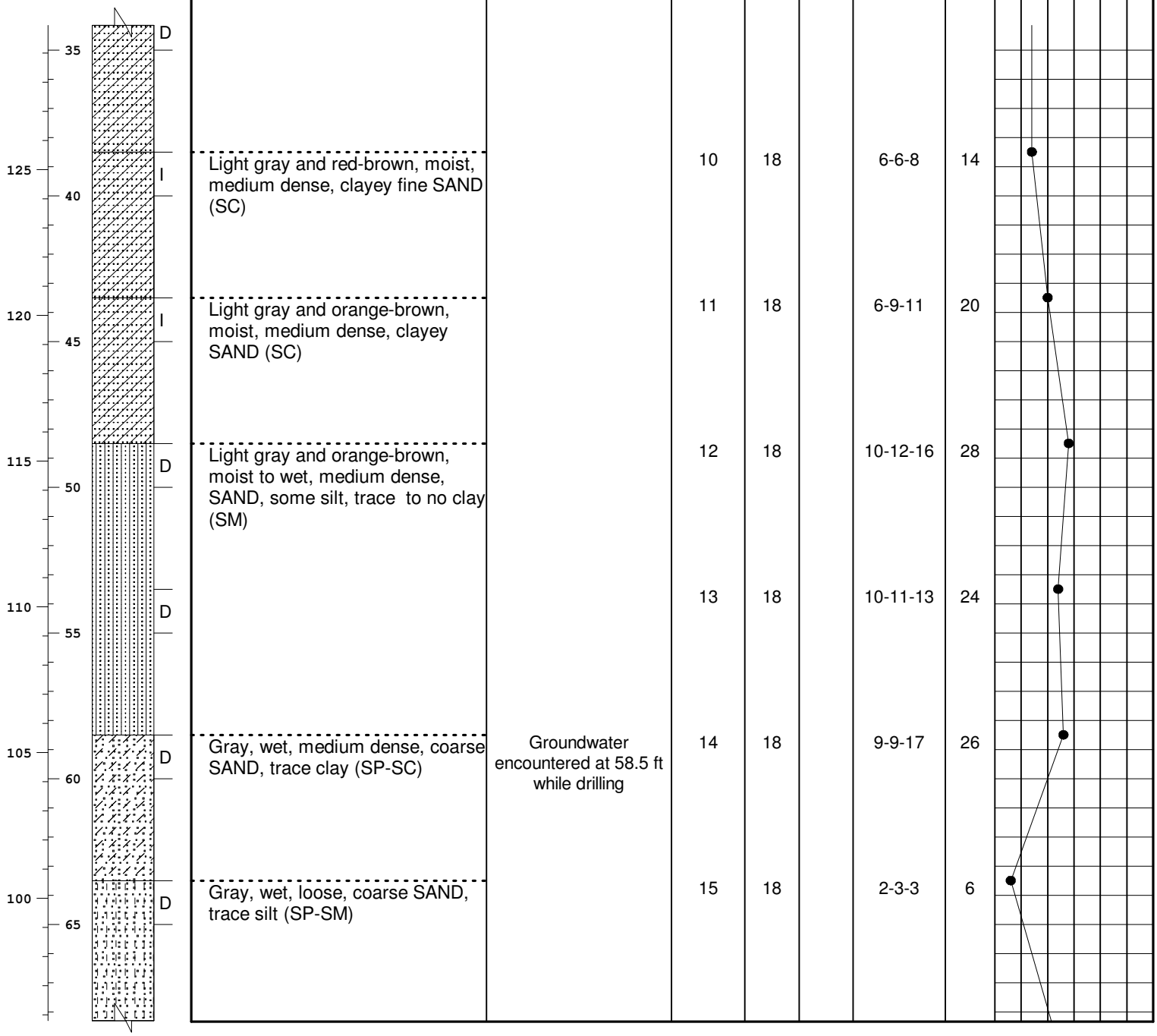
SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 164.1 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/19/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/23/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
35	D							
125 / 40	I	Light gray and red-brown, moist, medium dense, clayey fine SAND (SC)		10	18		6-6-8	14
120 / 45	I	Light gray and orange-brown, moist, medium dense, clayey SAND (SC)		11	18		6-9-11	20
115 / 50	D	Light gray and orange-brown, moist to wet, medium dense, SAND, some silt, trace to no clay (SM)		12	18		10-12-16	28
110 / 55	D			13	18		10-11-13	24
105 / 60	D	Gray, wet, medium dense, coarse SAND, trace clay (SP-SC)	Groundwater encountered at 58.5 ft while drilling	14	18		9-9-17	26
100 / 65	D	Gray, wet, loose, coarse SAND, trace silt (SP-SM)		15	18		2-3-3	6



SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	19.0	ft.	36.0	ft.
AFTER 24 HRS.	DRY	ft.	32.3	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
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STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-1

Location: Elm St, SE, Washington, DC Job #: 18344A

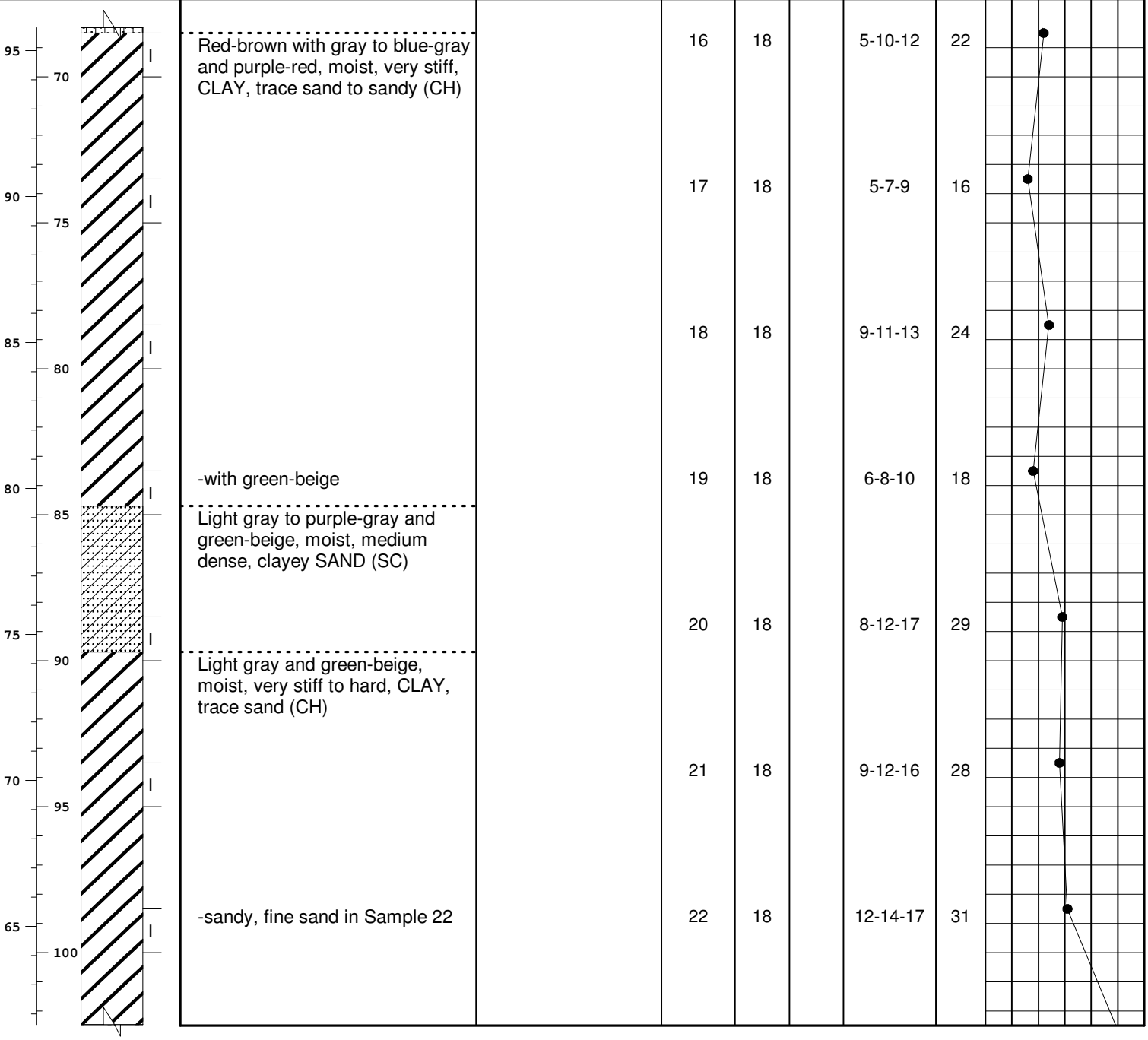
SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 164.1 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/19/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/23/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
95 / 70	I	Red-brown with gray to blue-gray and purple-red, moist, very stiff, CLAY, trace sand to sandy (CH)		16	18		5-10-12	22
90 / 75	I			17	18		5-7-9	16
85 / 80	I			18	18		9-11-13	24
80 / 85	I	-with green-beige		19	18		6-8-10	18
		Light gray to purple-gray and green-beige, moist, medium dense, clayey SAND (SC)						
75 / 90	I			20	18		8-12-17	29
		Light gray and green-beige, moist, very stiff to hard, CLAY, trace sand (CH)						
70 / 95	I			21	18		9-12-16	28
65 / 100	I	-sandy, fine sand in Sample 22		22	18		12-14-17	31



SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	19.0 ft.	36.0 ft.
AFTER 24 HRS.	DRY ft.	32.3 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
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STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-1

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 164.1 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/19/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/23/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
60 / 105	I	-some sand		23	18		10-26-28	54	
55 / 110	I			24	18		30-36-42	78	78 →
50 / 115	I	-trace sand		25	18		28-31-33	64	64 →
45 / 120	I			26	18		11-13-19	32	
40 / 125	I			27	18		11-15-22	37	
35 / 130	I	-some sand, with gravel		28	18		9-15-18	33	
30 / 135	I			29	18		19-24-27	51	

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	19.0 ft.	36.0 ft.
AFTER 24 HRS.	DRY ft.	32.3 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-1

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 164.1 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/19/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/23/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
25 / 140	I			30	18		20-24-27	51	
20 / 145	I	Boring terminated at 145 ft	Boring backfilled after 24 hrs	31	18		20-22-30	52	
15 / 150									
10 / 155									
5 / 160									
0 / 165									
−5 / 170									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	19.0	ft.	36.0	ft.
AFTER 24 HRS.	DRY	ft.	32.3	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-2

Location: Elm St, SE, Washington, DC Job #: 18344A

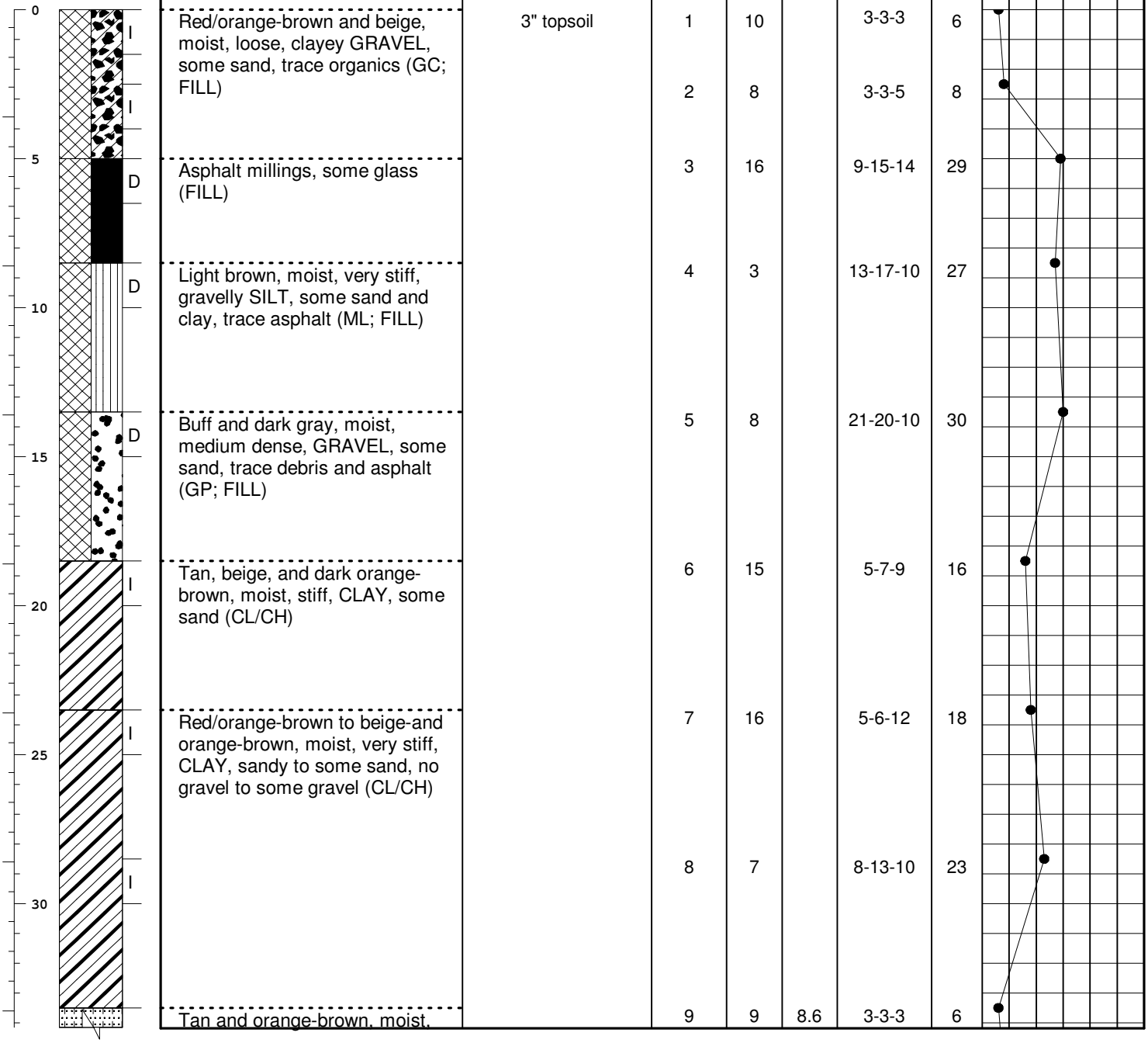
SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 163.6 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/18/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/19/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
163.6 / 0	I	Red/orange-brown and beige, moist, loose, clayey GRAVEL, some sand, trace organics (GC; FILL)	3" topsoil	1	10		3-3-3	6
	I			2	8		3-3-5	8
160 / 5	D	Asphalt millings, some glass (FILL)		3	16		9-15-14	29
155 / 10	D	Light brown, moist, very stiff, gravelly SILT, some sand and clay, trace asphalt (ML; FILL)		4	3		13-17-10	27
150 / 15	D	Buff and dark gray, moist, medium dense, GRAVEL, some sand, trace debris and asphalt (GP; FILL)		5	8		21-20-10	30
145 / 20	I	Tan, beige, and dark orange-brown, moist, stiff, CLAY, some sand (CL/CH)		6	15		5-7-9	16
140 / 25	I	Red/orange-brown to beige-and orange-brown, moist, very stiff, CLAY, sandy to some sand, no gravel to some gravel (CL/CH)		7	16		5-6-12	18
135 / 30	I			8	7		8-13-10	23
130		Tan and orange-brown, moist,		9	9	8.6	3-3-3	6



SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	DRY ft.	53.0 ft.
AFTER 24 HRS.	DRY ft.	51.0 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-2

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 163.6 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/18/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/19/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
35	D	loose, coarse SAND, trace silt (SW-SM)						
125 / 40	I	Beige and brown with light gray, moist, stiff, CLAY, some sand (CL/CH)		10	15		3-4-7	11
120 / 45	I	Brown, beige, red-brown, and light gray mottled, moist, loose, clayey, coarse SAND, trace gravel (SC)		11	14		2-3-3	6
115 / 50	D	Light gray and orange-brown, moist, loose, SAND, some silt, trace clay (SM)		12	15		4-4-5	9
110 / 55	D	Light gray with orange-brown, very moist, medium dense, coarse SAND, trace clay and silt (SP-SM)		13	16		4-8-8	16
105 / 60	I	Tan-gray with orange-brown, very moist, loose, coarse SAND, some clay and silt (SC)		14	16		3-3-5	8
100 / 65	D	Tan with orange-brown, wet, medium dense, coarse SAND, trace silt (SP-SM)		15	18		10-12-13	25
		Light gray and orange-brown to red-brown, moist, very stiff, CLAY, some silt, trace sand and						

SPT N (blows/ft) scale: 10 30 50

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	53.0	ft.
AFTER 24 HRS.	DRY	ft.	51.0	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-2

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 163.6 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/18/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/19/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
95 / 70	I	gravel (CL/CH)							
		Red-brown with light gray mottled, moist, very stiff, CLAY, trace sand (CH)	Groundwater encountered at 71 ft while drilling	16	18	24.8	10-12-15	27	
90 / 75	I		Boring backfilled after 24 hrs	17	18		9-11-14	25	
		Boring terminated at 75 ft							
85 / 80									
80 / 85									
75 / 90									
70 / 95									
65 / 100									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	53.0	ft.
AFTER 24 HRS.	DRY	ft.	51.0	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-3

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 140.1 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 11/7/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 11/8/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
140 / 0	D	Dark gray-black and dark brown with beige, moist, loose to medium dense, SAND, trace to some clay, silt, asphalt millings, gravel, organics and debris, trace glass (SM/SC; FILL)	4" topsoil	1	10		1-3-4	7
	D			2	12		6-11-13	24
135 / 5	D			3	12		7-8-4	12
	D	-some wood		4	8		3-4-6	10
130 / 10	D			5	3		6-4-3	7
125 / 15	I	Yellow-brown with light red-brown, moist, medium stiff to stiff, CLAY, trace wood and sand (CL/CH; FILL)		6	12		3-3-4	7
120 / 20	I			7	14		5-6-6	12
115 / 25	I	Yellow-brown, very moist, medium dense, SAND, some silt, trace clay (SM; probable FILL)	Groundwater encountered at 33.5 ft	8	16		6-6-5	11
110 / 30		Beige-gray, wet, loose, SAND.		9	18		3-3-5	8

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	DRY ft.	29.0 ft.
AFTER 24 HRS.	DRY ft.	28.0 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-3

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 140.1 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 11/7/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 11/8/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
105 — 35	D	trace silt (SP-SM; probable FILL)							
100 — 40	D	Light gray with tan, very moist, medium dense, SAND, some silt, trace clay (SM)		10	14		4-5-6	11	
95 — 45	I U	Red-brown with light gray to purple/red-brown, moist, stiff to hard, CLAY, trace sand (CH)		11 tube	18 18		5-6-6	12 push	
90 — 50	I			12	18		6-7-9	16	
85 — 55	I			13	18		5-8-10	18	
80 — 60	I	-some sand to sandy		14	18		6-9-12	21	
75 — 65	I			15	18		9-12-20	32	

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	29.0	ft.
AFTER 24 HRS.	DRY	ft.	28.0	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-3

Location: Elm St, SE, Washington, DC Job #: 18344A

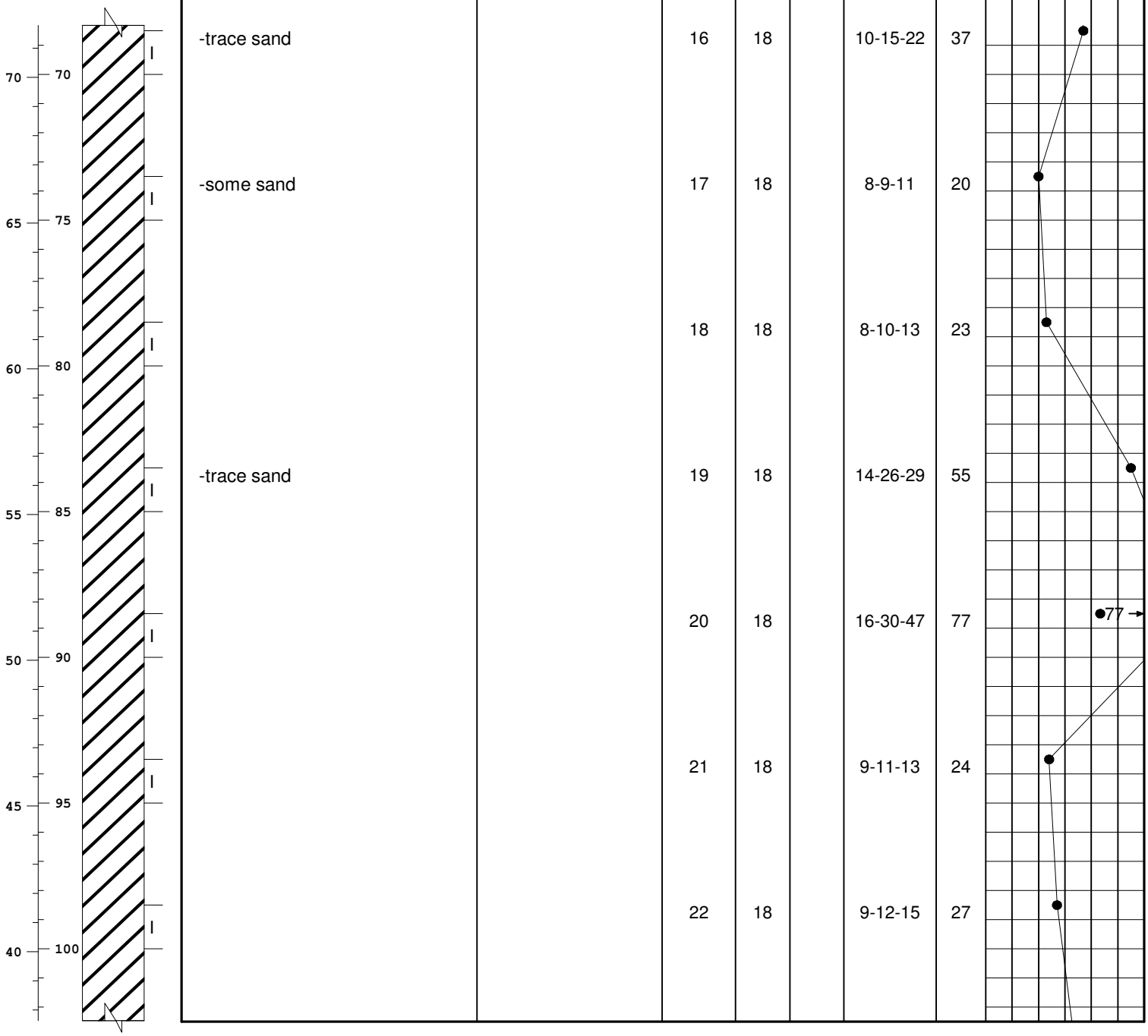
SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 140.1 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 11/7/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 11/8/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
70 — 70	I	-trace sand		16	18		10-15-22	37
65 — 75	I	-some sand		17	18		8-9-11	20
60 — 80	I			18	18		8-10-13	23
55 — 85	I	-trace sand		19	18		14-26-29	55
50 — 90	I			20	18		16-30-47	77
45 — 95	I			21	18		9-11-13	24
40 — 100	I			22	18		9-12-15	27



SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	29.0	ft.
AFTER 24 HRS.	DRY	ft.	28.0	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-3

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 140.1 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 11/7/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 11/8/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
35 — 105	I	Sample 23: some sand, some gravel		23	18		7-14-20	34	
30 — 110	I			24	18		7-14-22	36	
25 — 115	I	-sandy to some sand		25	18		9-16-21	37	
20 — 120	I			26	18		12-19-27	46	
15 — 125	I	-trace sand		27	18		15-19-32	51	
10 — 130	I			28	18		16-21-36	57	
5 — 135	I	Sample 29: blue-green and green-beige, sandy		29	18		21-27-32	59	

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	29.0	ft.
AFTER 24 HRS.	DRY	ft.	28.0	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-3

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 140.1 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 11/7/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 11/8/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
0 140	I	Blue-green and purple-red, moist, very dense, clayey SAND and hard, CLAY, some sand, alternating layers of less than 1 ft (SC/CH)		30	18		20-26-31	57	
-5 145	I		Boring backfilled after 24 hrs	31	18		20-30-47	77	77 →
		Boring terminated at 145 ft							
-10 150									
-15 155									
-20 160									
-25 165									
-30 170									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	29.0	ft.
AFTER 24 HRS.	DRY	ft.	28.0	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** | Boring No.: B-4

Location: Elm St, SE, Washington, DC | Job #: 18344A

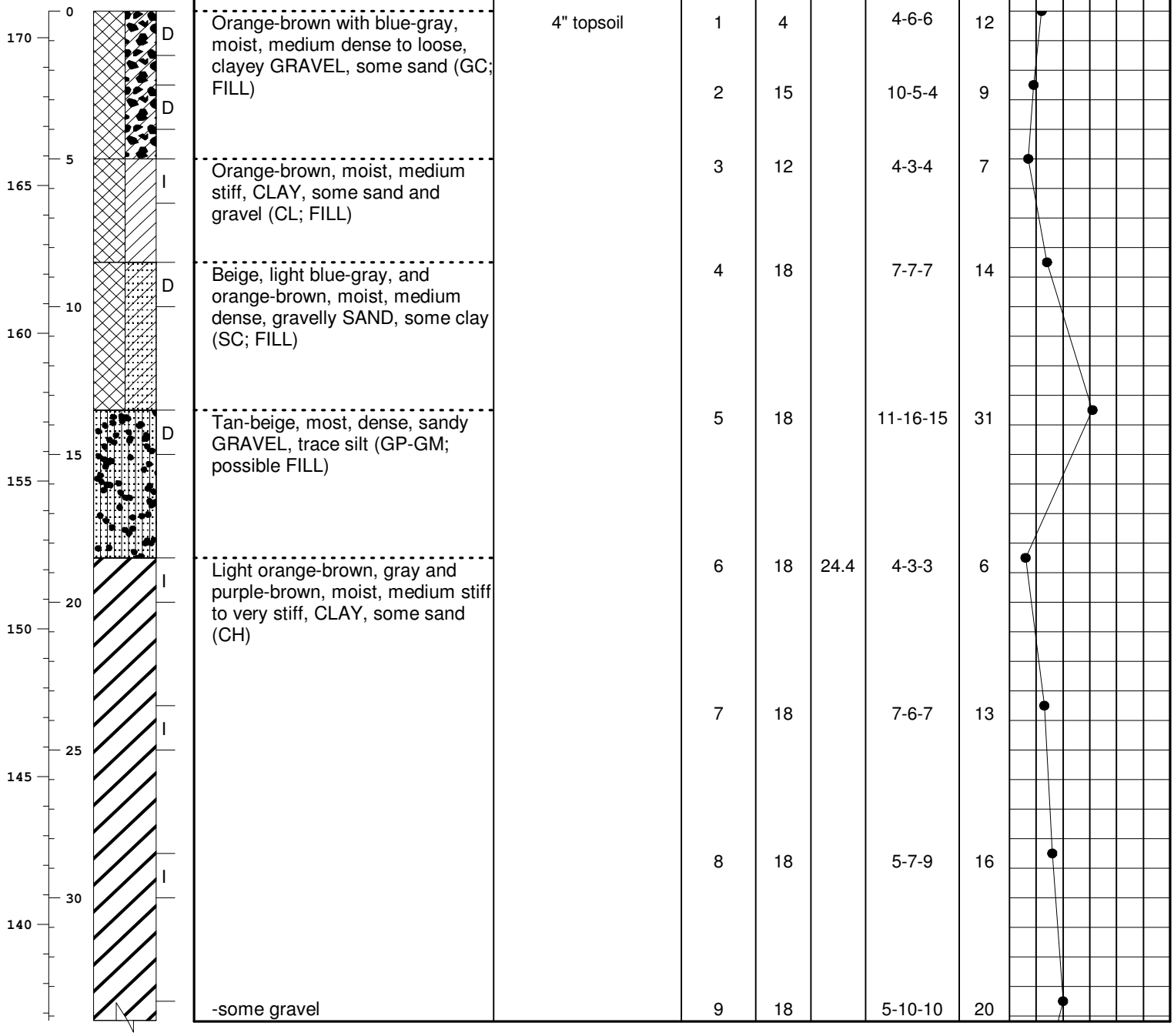
SAMPLER

Datum: | Hammer Wt.: 140 lbs. | Hole Diameter: 6 in. | Foreman: V. Velasquez

Surf. Elev.: 170.9 ft | Hammer Drop: 30 in. | Rock Core Diameter: NA | Inspector:

Date Started: 10/24/2018 | Pipe Size (O.D.): 2.0 in. | Boring Method: HSA | Date Completed: 10/25/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
170 / 0	D	Orange-brown with blue-gray, moist, medium dense to loose, clayey GRAVEL, some sand (GC; FILL)	4" topsoil	1	4		4-6-6	12
	D			2	15		10-5-4	9
165 / 5	I	Orange-brown, moist, medium stiff, CLAY, some sand and gravel (CL; FILL)		3	12		4-3-4	7
	D	Beige, light blue-gray, and orange-brown, moist, medium dense, gravelly SAND, some clay (SC; FILL)		4	18		7-7-7	14
160 / 10	D	Tan-beige, most, dense, sandy GRAVEL, trace silt (GP-GM; possible FILL)		5	18		11-16-15	31
155 / 15	I	Light orange-brown, gray and purple-brown, moist, medium stiff to very stiff, CLAY, some sand (CH)		6	18	24.4	4-3-3	6
150 / 20	I			7	18		7-6-7	13
145 / 25	I			8	18		5-7-9	16
140 / 30		-some gravel		9	18		5-10-10	20



SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	DRY ft.	61.3 ft.
AFTER 24 HRS.	61.0 ft.	67.6 ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-4

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 170.9 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/24/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/25/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
135 / 35	I							
130 / 40	I	Tan, orange-brown, and light gray, moist, loose, clayey SAND, some gravel (SC)		10	18		4-2-4	6
125 / 45	I	Orange/gray-brown, moist, very stiff, sandy CLAY (CL/CH)		11	18		10-6-10	16
120 / 50	I	Gray, red-brown and orange-brown, moist, medium dense, clayey SAND (SC)		12	18		7-9-10	19
115 / 55	D	Dark orange-brown and light gray, moist to very moist, very dense to medium dense, SAND, silty to some silt (SM)		13	18		34-36-27	63
110 / 60	D		Groundwater encountered at 61 ft while drilling	14	18		4-14-13	27
105 / 65	D	Brown-gray, wet, medium dense, coarse SAND, with some orange-tan clay (SC)		15	18		4-10-13	23

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	61.3	ft.
AFTER 24 HRS.	61.0	ft.	67.6	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-4

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 170.9 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/24/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/25/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
70 / 100	D	Tan-gray with orange-brown, very moist, medium dense, coarse SAND, trace silt (SP-SM)		16	18		6-9-14	23	
75 / 95	I	Brown-red, and gray to purple-red, beige, and orange, moist, very stiff, CLAY, trace to some sand (CH)		17	18		10-11-12	23	
80 / 90	I			18	18		10-12-14	26	
85 / 85	I	Green-beige with gray and red-brown, very moist, medium dense, clayey SAND (SC)		19	18		7-10-10	20	
90 / 80	I	Green-beige and blue-gray to purple-red, moist, very stiff to hard, CLAY, trace sand		20	18		6-8-12	20	
95 / 75	I			21	18		8-12-14	26	
100 / 70	I			22	18		6-10-13	23	

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	61.3	ft.
AFTER 24 HRS.	61.0	ft.	67.6	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-4

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 170.9 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/24/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/25/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
105 / 65	I	-sandy		23	18		10-11-13	24	
110 / 60	I	-some sand		24	18		9-15-17	32	
115 / 55	I			25	18		13-40-48	88	88 →
120 / 50	I			26	18		28-39-47	86	86 →
125 / 45	I			27	18		11-15-20	35	
130 / 40	I			28	18		10-14-16	30	
135 / 35	I			29	18		12-15-25	40	

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	DRY ft.	61.3 ft.
AFTER 24 HRS.	61.0 ft.	67.6 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-4

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 170.9 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/24/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/25/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
140 / 30	I			30	18		18-19-25	44	
145 / 25	I		Boring backfilled after 24 hrs	31	18		19-24-27	51	
		Boring terminated at 145 ft							
150 / 20									
155 / 15									
160 / 10									
165 / 5									
170									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	DRY ft.	61.3 ft.
AFTER 24 HRS.	61.0 ft.	67.6 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-5

Location: Elm St, SE, Washington, DC Job #: 18344A

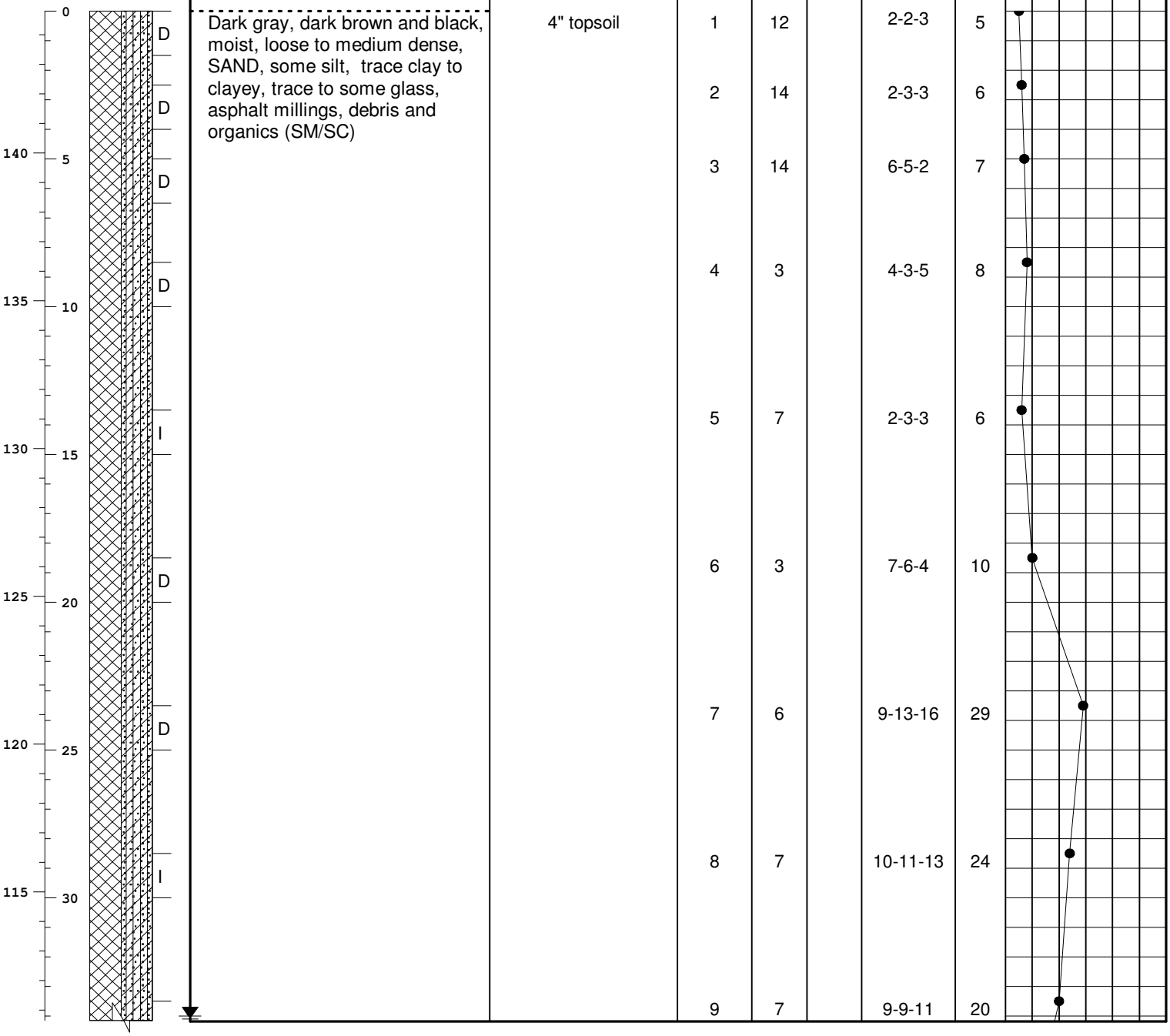
SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 144.8 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/31/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 11/2/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
0 / 144.8	D	Dark gray, dark brown and black, moist, loose to medium dense, SAND, some silt, trace clay to clayey, trace to some glass, asphalt millings, debris and organics (SM/SC)	4" topsoil	1	12		2-2-3	5
	D			2	14		2-3-3	6
5 / 140	D			3	14		6-5-2	7
	D			4	3		4-3-5	8
10 / 135	I			5	7		2-3-3	6
15 / 130	D			6	3		7-6-4	10
20 / 125	D			7	6		9-13-16	29
25 / 120	I			8	7		10-11-13	24
30 / 115				9	7		9-9-11	20



SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	35.3 ft.	63.0 ft.
AFTER 24 HRS.	34.0 ft.	54.0 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** | Boring No.: B-5

Location: Elm St, SE, Washington, DC | Job #: 18344A

SAMPLER

Datum: | Hammer Wt.: 140 lbs. | Hole Diameter: 6 in. | Foreman: V. Velasquez

Surf. Elev.: 144.8 ft | Hammer Drop: 30 in. | Rock Core Diameter: NA | Inspector:

Date Started: 10/31/2018 | Pipe Size (O.D.): 2.0 in. | Boring Method: HSA | Date Completed: 11/2/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
110 — 35	I							
105 — 40	D	Tan, brown and gray, wet, loose, coarse SAND, trace clay and gravel (SP-SC; FILL)	Groundwater encountered at 38.5 ft while drilling	10	2		8-4-4	8
100 — 45	D	Tan, beige, and gray, wet, dense, coarse SAND, some clay, trace gravel and debris (SC; FILL)		11	18		19-21-24	45
95 — 50	D	Beige-gray, wet, dense, coarse SAND, trace silt, trace debris (SP-SM; FILL)		12	18		14-17-18	35
90 — 55	I	Brown-red to purple/red-brown and green-beige, moist, very stiff to hard, CLAY, trace sand (CH)		13	18		7-11-12	23
85 — 60	I			14	18		5-10-11	21
80 — 65	I	Sample 15: some sand		15	18		6-8-11	19

SPT N (blows/ft) scale: 10, 30, 50

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	35.3 ft.	63.0 ft.
AFTER 24 HRS.	34.0 ft.	54.0 ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-5

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: ____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 144.8 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: ____

Date Started: 10/31/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 11/2/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
75 — 70	I			16	18	30.4	8-9-10	19	
70 — 75	I			17	18		8-10-12	22	
65 — 80	I	Sample 18: red-brown and blue-green, some sand		18	18		6-8-10	18	
60 — 85	I			19	18		7-9-12	21	
55 — 90	I			20	18		10-21-31	52	
50 — 95	I			21	18		12-26-39	65	65 →
45 — 100	I			22	18		11-12-19	31	

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	35.3 ft.	63.0 ft.
AFTER 24 HRS.	34.0 ft.	54.0 ft.
AFTER ___ HRS.	____ ft.	____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-5

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 144.8 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/31/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 11/2/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
40 / 105	I			23	18		13-14-17	31	
35 / 110	I			24	18		12-14-16	30	
30 / 115	I			25	18		15-16-19	35	
25 / 120	I	-blue-green and beige-green with red-brown -sandy		26	18		20-24-30	54	
20 / 125	I			27	18		20-26-32	58	
15 / 130	I	Blue-green and beige-green, moist, dense, clayey SAND, trace mica (SC)		28	18		13-14-17	31	
10 / 135	I	Blue-green and beige-green, moist, dense, SAND, some silt, trace clay (SM)		29	18		15-17-20	37	

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	35.3 ft.	63.0 ft.
AFTER 24 HRS.	34.0 ft.	54.0 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-5

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 144.8 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/31/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 11/2/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
5 — 140	I	Purple-brown and beige-green, moist, hard, sandy CLAY (CH)		30	18		20-20-22	42	
0 — 145	I			31	18		20-22-23	45	
		Boring terminated at 145 ft							
-5 — 150									
-10 — 155									
-15 — 160									
-20 — 165									
-25 — 170									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	35.3	ft.	63.0	ft.
AFTER 24 HRS.	34.0	ft.	54.0	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-6

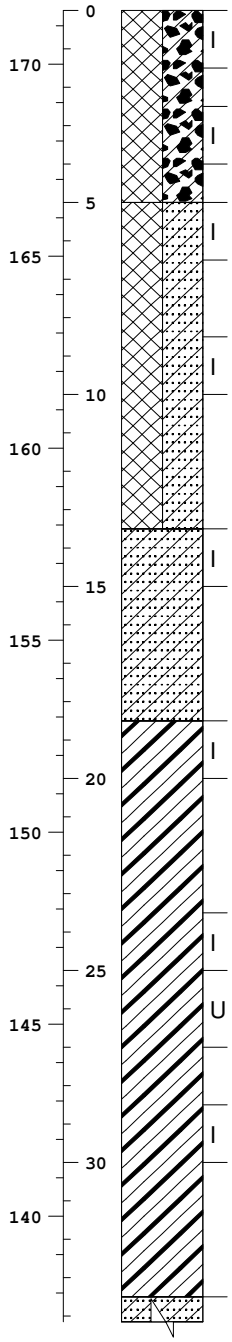
Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 171.4 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/26/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/29/2018



Elevation/ Depth (ft)	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
0	Beige/orange-gray with blue-green, moist, medium dense to loose, clayey GRAVEL, some sand (GC; FILL)	6" topsoil	1	12		4-5-8	13
			2	5		2-2-4	6
5	Beige-brown to dark gray, beige and red-brown, moist, loose to dense, clayey SAND, some gravel (SC; FILL)		3	7		6-6-2	8
			4	6		12-21-12	33
15	Beige, moist, very loose, SAND, some gravel, clay and silt (SC; possible FILL)		5	8		3-1-1	2
20	Light orange-brown with red-brown, moist, very stiff to stiff, CLAY, some sand (CL/CH)		6	15		6-7-11	18
			7	18		3-6-8	14
25			tube	24			push
			8	18		4-6-7	13
	Dark gray-beige and blue-gray.		9	18	14.9	3-6-7	13

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	DRY ft.	43.0 ft.
AFTER 24 HRS.	DRY ft.	27.0 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-6

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 171.4 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/26/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/29/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
135 / 35	I	moist, medium dense, clayey SAND (SC)							
		Gray, moist, loose, SAND, some silt (SM)							
130 / 40	I	Gray, moist, stiff, CLAY, some sand (CL/CH)		10	18		3-5-5	10	
125 / 45	I	Tan-gray with brown and orange-brown, moist, medium dense, SAND, some clay to clayey, some silt, trace to some gravel (SC)		11	18		5-6-7	13	
120 / 50	I	Brown-red and light gray, moist, stiff, sandy CLAY (CL/ CH)		12	18		5-8-10	18	
115 / 55	I	Light gray with orange-brown, very moist, medium dense, SAND, silty to some silt (SM)		13	18		3-5-8	13	
110 / 60	D	-coarse sand		14	18		5-7-9	16	
105 / 65	D	Light gray-tan with orange-brown, wet, medium dense, coarse SAND, trace clay (SP-SC)	Groundwater encountered at 63.5 ft while drilling	15	18		6-8-9	17	

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	43.0	ft.
AFTER 24 HRS.	DRY	ft.	27.0	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-6

Location: Elm St, SE, Washington, DC Job #: 18344A

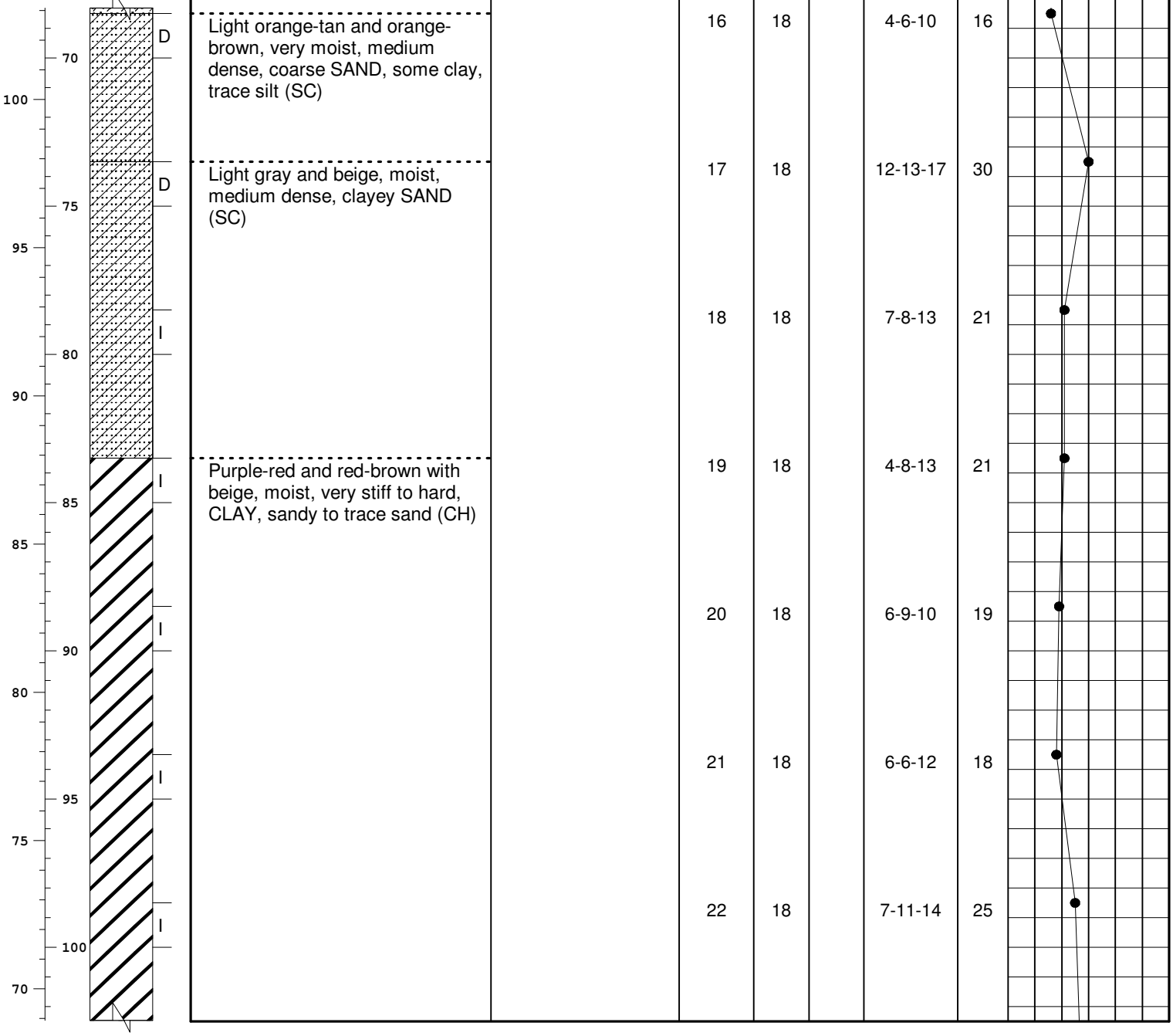
SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 171.4 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/26/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/29/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
70 / 100	D	Light orange-tan and orange-brown, very moist, medium dense, coarse SAND, some clay, trace silt (SC)		16	18		4-6-10	16
75 / 95	D	Light gray and beige, moist, medium dense, clayey SAND (SC)		17	18		12-13-17	30
80 / 90	I			18	18		7-8-13	21
85 / 85	I	Purple-red and red-brown with beige, moist, very stiff to hard, CLAY, sandy to trace sand (CH)		19	18		4-8-13	21
90 / 80	I			20	18		6-9-10	19
95 / 75	I			21	18		6-6-12	18
100 / 70	I			22	18		7-11-14	25



SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	43.0	ft.
AFTER 24 HRS.	DRY	ft.	27.0	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-6

Location: Elm St, SE, Washington, DC Job #: 18344A

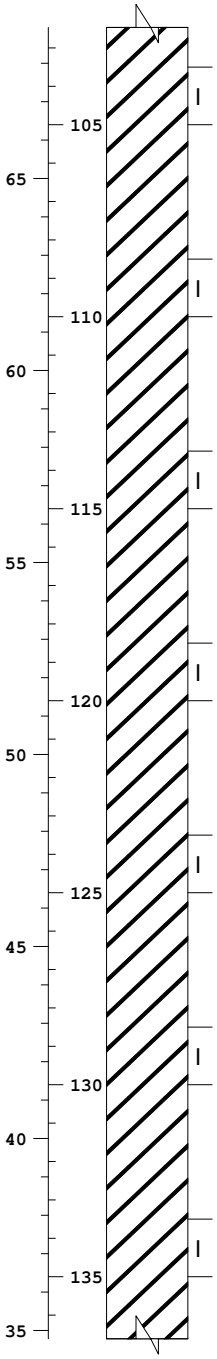
SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 171.4 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/26/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/29/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
				23	18		9-11-16	27	
				24	18		12-12-17	29	
				25	18		15-20-29	49	
				26	18		18-26-42	68	68 →
				27	18		10-12-19	31	
				28	18		11-14-22	36	
				29	18		11-17-21	38	



SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	43.0	ft.
AFTER 24 HRS.	DRY	ft.	27.0	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-6

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 171.4 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/26/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/29/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
140 / 30	I			30	18		12-19-23	42	
145 / 25	I		Boring backfilled after 24 hrs	31	18		16-20-26	46	
		Boring terminated at 145 ft							
150 / 20									
155 / 15									
160 / 10									
165 / 5									
170									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	DRY ft.	43.0 ft.
AFTER 24 HRS.	DRY ft.	27.0 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-7

Location: Elm St, SE, Washington, DC Job #: 18344A

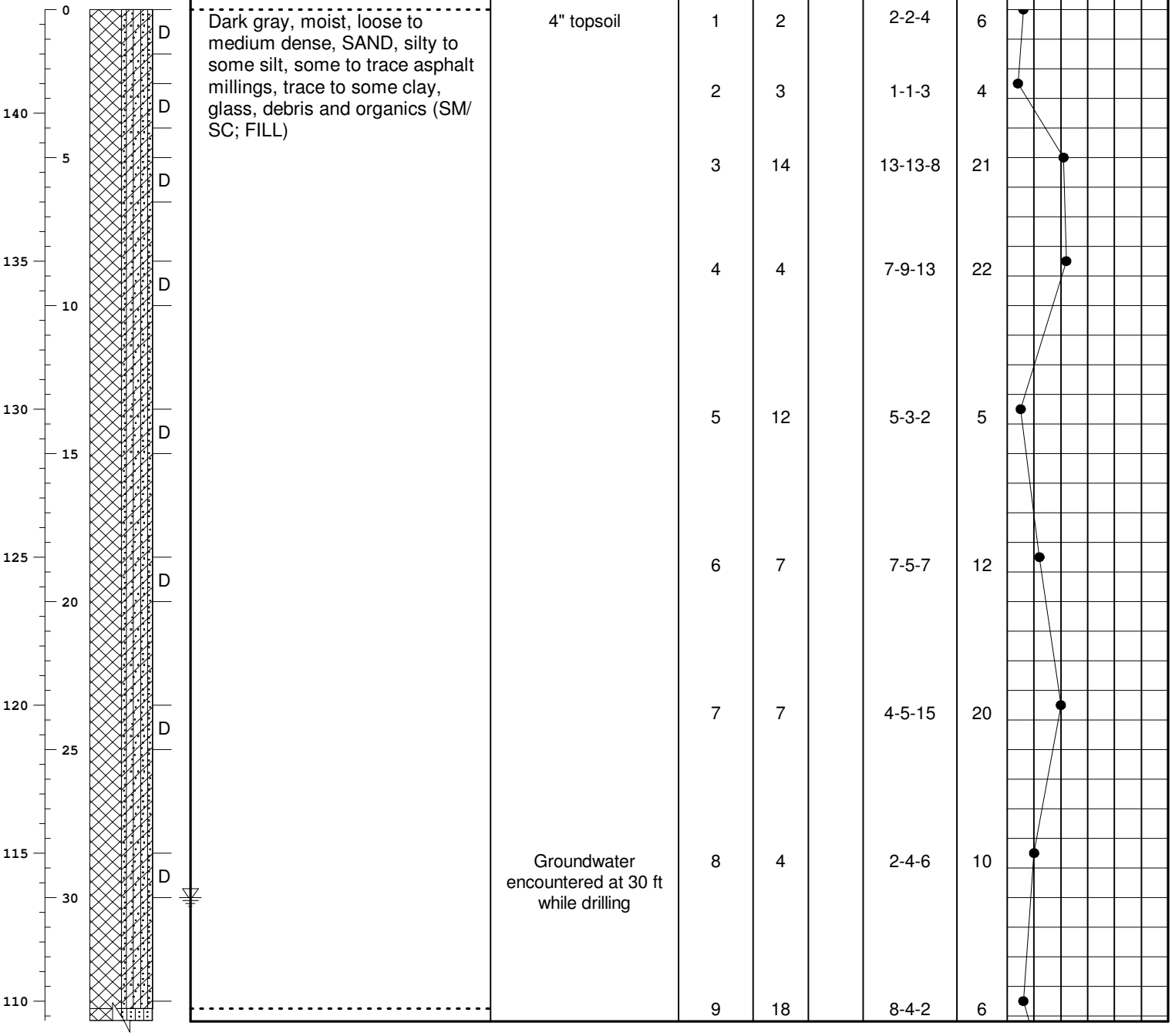
SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 143.5 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/30/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/30/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
0 / 140	D	Dark gray, moist, loose to medium dense, SAND, silty to some silt, some to trace asphalt millings, trace to some clay, glass, debris and organics (SM/ SC; FILL)	4" topsoil	1	2		2-2-4	6
	D			2	3		1-1-3	4
5	D			3	14		13-13-8	21
135	D			4	4		7-9-13	22
10 / 130	D			5	12		5-3-2	5
15 / 125	D			6	7		7-5-7	12
20 / 120	D			7	7		4-5-15	20
25 / 115	D		Groundwater encountered at 30 ft while drilling	8	4		2-4-6	10
30 / 110				9	18		8-4-2	6



SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	30.0 ft.	32.8 ft.
AFTER 24 HRS.	DRY ft.	42.0 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-7

Location: Elm St, SE, Washington, DC Job #: 18344A

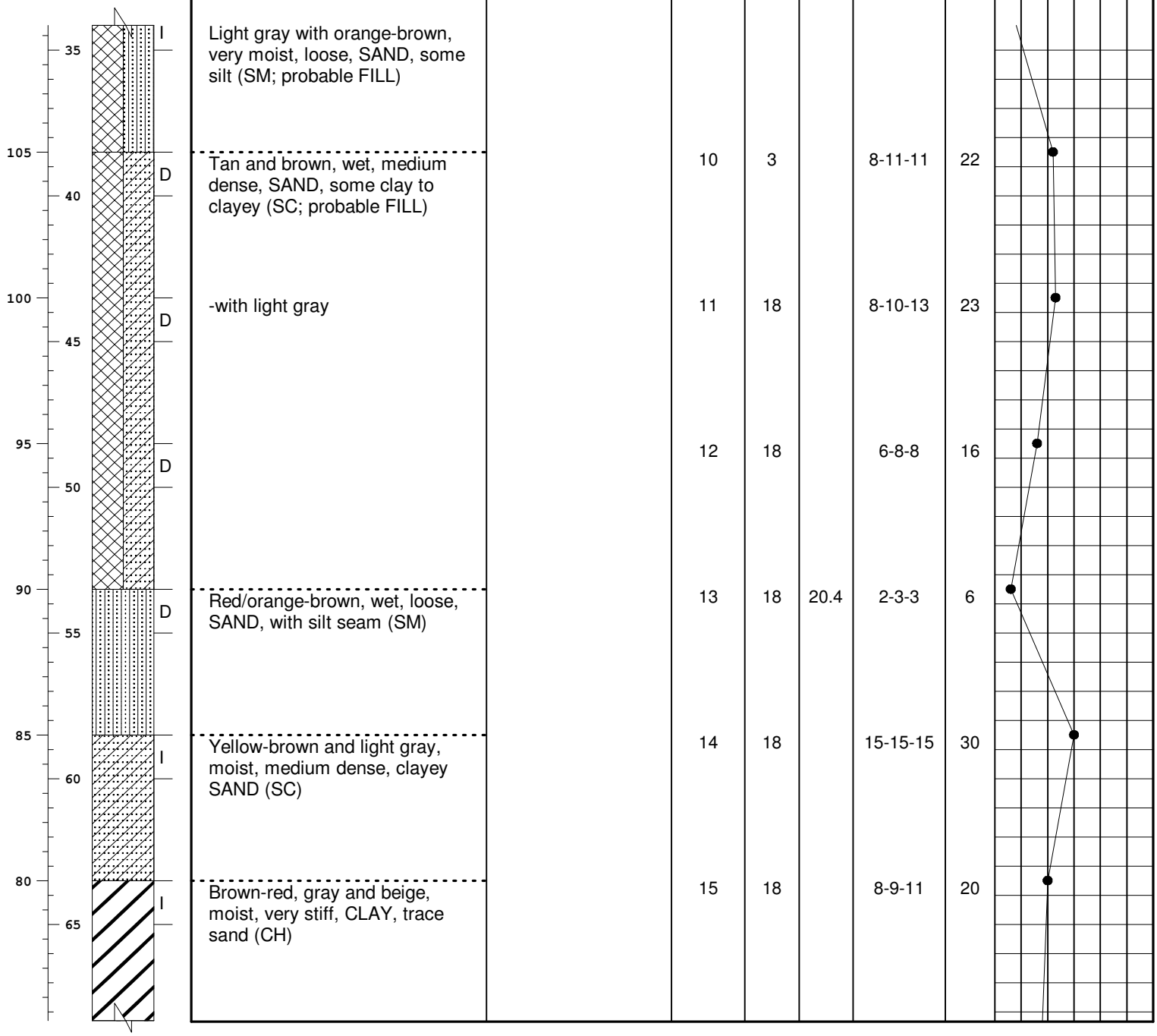
SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 143.5 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/30/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/30/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
143.5 / 0	I	Light gray with orange-brown, very moist, loose, SAND, some silt (SM; probable FILL)						
105 / 40	D	Tan and brown, wet, medium dense, SAND, some clay to clayey (SC; probable FILL)		10	3		8-11-11	22
100 / 45	D	-with light gray		11	18		8-10-13	23
95 / 50	D			12	18		6-8-8	16
90 / 55	D	Red/orange-brown, wet, loose, SAND, with silt seam (SM)		13	18	20.4	2-3-3	6
85 / 60	I	Yellow-brown and light gray, moist, medium dense, clayey SAND (SC)		14	18		15-15-15	30
80 / 65	I	Brown-red, gray and beige, moist, very stiff, CLAY, trace sand (CH)		15	18		8-9-11	20



SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	30.0 ft.	32.8 ft.
AFTER 24 HRS.	DRY ft.	42.0 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-7

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 143.5 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/30/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/30/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
75 / 70	I			16	18		5-8-10	18	
70 / 75	I			17	18	26.2	5-10-13	23	
		Boring terminated at 75 ft							

65 / 80
60 / 85
55 / 90
50 / 95
45 / 100

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
AT COMPLETION	30.0 ft.	32.8 ft.
AFTER 24 HRS.	DRY ft.	42.0 ft.
AFTER ___ HRS.	_____ ft.	_____ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-8

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 165.8 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/18/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/18/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N
165 / 0	I	Orange-brown, moist, soft, CLAY, some gravel and sand, trace organics (CL; FILL)	3" topsoil	1	12		1-2-1	3
	I	Orange-brown to red-brown, moist, loose to medium dense, clayey, coarse SAND, trace organics (SC; possible FILL)	Groundwater not encountered while drilling	2	18		3-3-3	6
160 / 5	I			3	16		7-9-11	20
	D	Buff with orange-brown and purple-brown, moist, dense, GRAVEL, some sand, trace clay (GP-GC)	Boring backfilled after 24 hrs	4	14	3.7	13-19-21	40
155 / 10		Boring terminated at 10 ft						
150 / 15								
145 / 20								
140 / 25								
135 / 30								

SPT N (blows/ft) scale: 10, 30, 50

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	8.1	ft.
AFTER 24 HRS.	DRY	ft.	7.9	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-9

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 167.4 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/17/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/17/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
0 / 167	I	5" concrete 4" gravel base							
165	I	Red/orange-brown, moist, stiff, CLAY, some sand, trace to some gravel (CL; possible FILL)		1	18		3-4-6	10	
				2	16		5-6-7	13	
			Groundwater not encountered while drilling						
5 / 162	D	Orange-brown, moist, medium dense, gravelly SAND, some clay (SC)		3	18		12-14-16	30	
160	I	Orange-brown, moist, medium dense, sandy GRAVEL, trace clay (GP-GC)	Boring backfilled after 24 hrs	4	18	7.2	10-12-14	26	
10 / 157		Boring terminated at 10 ft							
155									
15									
150									
20									
145									
25									
140									
30									
135									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	7.9	ft.
AFTER 24 HRS.	DRY	ft.	7.7	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-10

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 168.8 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/18/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/18/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
0 / 168.8		4" concrete	4" gravel base						
	I	Red/orange-brown and tan, moist, medium stiff, sandy CLAY, fine sand, trace organics (CL; FILL)		1	14		4-4-4	8	
	I			2	14		5-5-8	13	
165 / 5		Red/orange-brown, moist, stiff, CLAY, some sand, trace gravel and organics (CL)	Groundwater not encountered while drilling						
	D	Orange-brown, moist, dense, gravelly SAND, trace clay and silt (SC)		3	15		5-17-17	34	
160 / 10	D	Orange-brown, moist, dense, sandy GRAVEL, trace clay (GP-GC)	Boring backfilled after 24 hrs	4	9	5.9	11-15-18	33	
		Boring terminated at 10 ft							
155 / 15									
150 / 20									
145 / 25									
140 / 30									
135									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	7.9	ft.
AFTER 24 HRS.	DRY	ft.	7.9	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name: **St. Elizabeth's Shelter Relocation** Boring No.: B-11

Location: Elm St, SE, Washington, DC Job #: 18344A

SAMPLER

Datum: _____ Hammer Wt.: 140 lbs. Hole Diameter: 6 in. Foreman: V. Velasquez

Surf. Elev.: 170.0 ft Hammer Drop: 30 in. Rock Core Diameter: NA Inspector: _____

Date Started: 10/17/2018 Pipe Size (O.D.): 2.0 in. Boring Method: HSA Date Completed: 10/17/2018

Elevation/ Depth (ft)	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Sample No.	Rec. (in)	NM (%)	SPT Blows	SPT N (blows/ft) N	SPT N (blows/ft) 10 30 50
170 — 0	I	Orange-brown, moist, medium stiff to stiff, CLAY, some sand (CL)	2" concrete 4" gravel base	1	18		6-4-4	8	
	I		Groundwater not encountered while drilling	2	12		4-4-6	10	
165 — 5	I			3	6		4-5-6	11	
	D	Orange-brown, moist, medium dense, fine SAND, some silt, trace mica (SM)	Boring backfilled after 24 hrs	4	15	15.1	4-9-12	21	
160 — 10		Boring terminated at 10 ft							
155 — 15									
150 — 20									
145 — 25									
140 — 30									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
AT COMPLETION	DRY	ft.	8.0	ft.
AFTER 24 HRS.	DRY	ft.	8.0	ft.
AFTER ___ HRS.	_____	ft.	_____	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS-CARNES ENGINEERING ASSOCIATES, Inc.

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Description of Soils – per ASTM D2487

Major Component	Component Type	Component Description	Symbol	Group Name
Coarse-Grained Soils, More than 50% is retained on the No. 200 sieve	**Gravels** – More than 50% of the coarse fraction is retained on the No. 4 sieve. Coarse = 1" to 3" Medium = ½" to 1" Fine = ¼" to ½"	Clean Gravels <5% Passing No. 200 sieve	**GW**	Well Graded Gravel
			GP	Poorly Graded Gravel
		Gravels with fines, >12% Passing the No. 200 sieve	**GM**	Silty Gravel
			GC	Clayey Gravel
	Sands – More than 50% of the coarse fraction passes the No. 4 sieve. Coarse = No.10 to No.4 Medium = No. 10 to No. 40 Fine = No. 40 to No. 200	Clean Sands <5% Passing No. 200 sieve	**SW**	Well Graded Sand
			SP	Poorly Graded Sand
		Sands with fines, >12% Passing the No. 200 sieve	**SM**	Silty Sand
			SC	Clayey Sand
Fine Grained Soils, More than 50% passes the No. 200 sieve	Silts and Clays Liquid Limit is less than 50 Low to medium plasticity	Inorganic	**ML**	Silt
			CL	Lean Clay
		Organic	**OL**	Organic silt
				Organic Clay
	Silts and Clays Liquid Limit of 50 or greater Medium to high plasticity	Inorganic	**MH**	Elastic Silt
			CH	Fat Clay
		Organic	**OH**	Organic Silt
				Organic Clay
Highly Organic Soils	Primarily Organic matter, dark color, organic odor		**PT**	Peat

Proportions of Soil Components

Component Form	Description	Approximate percent by weight
Noun	Sand, Gravel, Silt, Clay, etc.	50% or more
Adjective	Sandy, silty, clayey, etc.	35% to 49%
Some	Some sand, some silt, etc.	12% to 34%
Trace	Trace sand, trace mica, etc.	1% to 11%
With	With sand, with mica, etc.	Presence only

Particle Size Identification

Particle Size	Particle dimension
Boulder	12" diameter or more
Cobble	3" to 12" diameter
Gravel	¼" to 3" diameter
Sand	0.005" to ¼" diameter
Silt/Clay (fines)	Cannot see particle

Cohesive Soils

Field Description	No. of SPT Blows/ft	Consistency
Easily Molded in Hands	Less than 2	Very Soft
Easily penetrated several inches by thumb	2 – 4	Soft
Penetrated by thumb with moderate effort	4 – 8	Medium Stiff
Penetrated by thumb with great effort	8 – 15	Stiff
Indented by thumb only with moderate effort	15 – 30	Very Stiff
Indented by thumb only with great effort	Greater than 30	Hard

Granular Soils

No. of SPT Blows/ft	Relative Density
Less than 5	Very Loose
5 – 10	Loose
10 – 30	Medium Dense
30 – 50	Dense
Greater than 50	Very Dense

Other Definitions:

- **Fill:** Encountered soils that were placed by man. Fill soils may be controlled (engineered structural fill) or uncontrolled fills that may contain rubble and/or debris.
- **Saprolite**: Soil material derived from the in-place chemical and physical weathering of the parent rock material. May contain relic structure. Also called residual soils. Occurs in Piedmont soils, found west of the fall line.
- **Disintegrated Roc**k: Residual soil material with rock-like properties, very dense, N = 60 to 51/0".
- **Karst:** Descriptive term which denotes the potential for solutioning of the limestone rock and the development of sinkholes.
- **Alluvium:** Recently deposited soils placed by water action, typically stream or river floodplain soils.
- **Groundwater Level**: Depth within borehole where water is encountered either during drilling, or after a set period of time to allow groundwater conditions to reach equilibrium.
- **Caved Depth:** Depth at which borehole collapsed after removal of augers/casing. Indicative of loose soils and/or groundwater conditions.