Subsurface Exploration and Geotechnical Evaluation
Lovettsville Park
Lovettsville, VA
Specialized Engineering Project No. 125522

Prepared for:

Loudoun County
Dept of Construction & Waste Management
211 Gibson St, NW
Leesburg, VA 20176

Prepared by:

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November 7, 2012

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November 7, 2012

LOUDOUN COUNTY
Dept. of Construction & Waste Mgmt.
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Attention: Mr. Mark E. Hoffman, PE
Civil Engineer

Reference: Subsurface Exploration and Geotechnical Evaluation
Engineering Services Contract QQ-01683
PROPOSED LOVETTSVILLE PARK
12565 Milltown Road, Lovettsville, Virginia
Specialized Engineering Project No. 125522

Dear Mr. Hoffman:

Specialized Engineering is pleased to submit our final report concerning the subsurface exploration and geotechnical evaluation for the proposed Lovettsville Park in Lovettsville, Loudoun County, Virginia.

The report explains the exploration procedures, describes the general site and subsurface conditions, and presents evaluations and recommendations relevant to geotechnical considerations for the project. If project characteristics presented in this report are changed, this office should be notified so that the design recommendations may be reviewed and revised, as necessary.

If you have any questions concerning this report or require additional assistance on the project, please do not hesitate to contact us.

Respectfully submitted,
Specialized Engineering

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1.0 EXECUTIVE SUMMARY

Specialized Engineering has completed the subsurface exploration and geotechnical evaluation of the **PROPOSED LOVETTSVILLE PARK** project located in the Lovettsville, Loudoun County, Virginia. The subsurface exploration consisted of drilling a total of forty-two (42) test borings across the site, designated; B-1 through B-10, B-12 through B-25, B-27 through B-41 and B-43 through B-45, per the provided Boring Plan. The drilling was extended to depths ranging from 8.9 feet to 15 feet below existing site grades. Spoon and/or auger refusal was encountered in four (4) of the forty-two (42) borings at depths ranging from 6.5 feet to 12.1 feet below the existing ground surface grades.

This geotechnical exploration was performed in general accordance with the "*Detailed Soil/Site Investigation*" of the "*Facilities Standard Manual*" of Loudoun County.

The data developed during this study indicate that the subsoil and groundwater conditions at the site are generally adaptable for the proposed park development provided the recommendations in the report are followed.

Shallow foundations (continuous and spread footings) are considered adequate for the support of the proposed light structures planned for the park. The footings should be supported on the undisturbed, suitable-bearing natural soils of Stratum I, except moderately to highly plastic soils, or on controlled structural fill placed on suitable natural soils. The footings should not be supported on moderately to highly plastic silts or clays (LL>45 and PI>20). These plastic soils, if encountered at or below the foundation grades, should be excavated in their entirety or to a minimum depth of 6 feet below the adjacent exterior finished grades. The footings in the latter case should be embedded at least 4 feet below the adjacent exterior finished grades supported on 2 feet of controlled structural fill placed over the clay layer.

Lighting poles are usually supported on drilled pier foundation. Based on the subsurface soil and groundwater conditions encountered at the test boring locations, the proposed light poles can be supported on drilled pier foundations. Drilling difficulties should be anticipated in the drilled pier excavation within the depth explored since decomposed rock was encountered at relatively shallow depth.

The data developed during this study indicate that the subsoil, rock and groundwater conditions are generally suitable for the construction of stormwater management bioretention or infiltration facilities provided that the facilities are designed and constructed in accordance with *Chapter 5: "Water Resource Management" of Loudoun County FSM* and the most currently adopted "*Virginia Stormwater Management Handbook*". However, it should be noted that adequate infiltration rate was not achieved in one (1) of the ten (10) locations where an infiltration test was performed.

Excavations during the development of the site can generally be achieved with conventional earth-moving equipment (dozers, pans and hoes) to the anticipated shallow

excavation depths. However, ripping and/or hoe-ramming of weathered but dense rock may be required in localized areas where equipment refusal was encountered at shallow depths.

Encountering groundwater is not anticipated during the development of this site. However, perched water should be anticipated at different elevations during foundation excavations and installation of underground utilities, especially if the work is performed during wetter months or following prolonged periods of heavy precipitation. It is our opinion that conventional dewatering measures such as diversion ditches, interceptor drains and sump pumps should be adequate.

Recommendations relative to earthwork and the design and construction of foundations, pavements and SWM facilities are presented in the report.

The owner/designer should not rely solely upon the executive summary and must read and evaluate the entire contents of this report, prior to utilizing our engineering recommendations in the preparation of design and construction documents.

2.0 PROJECT INFORMATION

2.1 AUTHORIZATION

This subsurface exploration and geotechnical evaluation for **PROPOSED LOVETTSVILLE PARK** projects located in the Lovettsville, Virginia, project was planned and performed in accordance with the scope of services outlined in our proposal No. B12-9196 dated June 13, 2012. Mr. Mark E. Hoffman, PE, of Loudoun County authorized the work.

2.2 PROJECT DESCRIPTION

We understand that Loudoun County is planning to develop a 92 acre park at the area southwest of the intersection of Milltown Road and Lovettsville Road in Lovettsville, Virginia. The park project will include three large soccer playing fields and one large baseball field, both with sport lighting, three small baseball fields, access roads, trails, restroom buildings, pavilions, a stormwater management facility and paved parking lots with infiltration facilities. The County is also planning road improvements to the Milltown Road and Lovettsville Road intersection and a potential right turn lane on Loudoun Street.

If any of the noted information is incorrect or has changed, please inform Specialized Engineering so that we may review the geotechnical data and amend the recommendations presented in this report, if appropriate.

2.3 PURPOSE AND SCOPE OF WORK

The scope of services for this study included a site reconnaissance of the project area and the determination of subsurface conditions through field exploration and laboratory testing. The study included an evaluation of the site and subsurface conditions relative to the proposed construction and the preparation of a report of findings. The subsurface exploration was developed to address the following:

- Develop data relative to subsurface soil, rock and groundwater conditions to relevant depths at various locations across the site.
- An evaluation of the data as it relates to the proposed site development.
- Address problem areas, if any, with special reference to seasonal high water table conditions, shallow rock and the presence of highly plastic soils susceptible to shrinkage and swelling associated with changes in the natural moisture contents of these soils.
- Provide an evaluation of the suitability of on-site materials for use as controlled structural fill in building pad and pavement areas. Provide recommendations for site

preparation, including placement and compaction of fill soils.

- Provide an assessment of the suitability of in-situ soil formations for providing adequate support of building foundations and pavements.

- Provide geotechnical recommendations related to support the design and construction of the building foundations.

- Provide geotechnical recommendations related to support the design and construction of the BMP facilities.

- Provide geotechnical recommendations related to support the design and construction of the proposed roadways including estimates of CBR values.

- Provide IBC 2009 soil site classification and site seismic response coefficients S_s and S_1.

- Comments and recommendations relating to other observed geotechnical conditions, which could impact development.

The scope of our services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of our client.

Specialized Engineering did not provide any service to investigate or detect the presence of mold, moisture as related to mold or other biological contaminates in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same. As such, Specialized Engineering cannot and shall not be held responsible for the occurrence or recurrence of mold amplification.

2.4 SUBSURFACE EXPLORATION

The subsurface exploration consisted of drilling a total of forty-two (42) test borings across the site, designated; B-1 through B-10, B-12 through B-25, B-27 through B-41 and B-43 through B-45. The drilling was extended to depths ranging from 8.9 feet to 15 feet below existing site grades. The test borings were drilled on the site by an ATV-mounted CME 55LC drill rig utilizing 2-1/4" I.D. continuous flight hollow-stem augers at the locations shown on the Boring Plan. The drilling was extended to the planned depths or to spoon/ auger refusal depths. Spoon and/or auger refusal was encountered in four (4) of the forty-two (42) borings at depths ranging from 6.5 feet to 12.1 feet below the existing ground surface grades. The depths of individual test borings are indicated on the boring logs in the appendices of this report.

Atkins proposed the test borings and established their locations in the field utilizing a handheld GPS unit. Ground surface elevations were interpolated from the provided project site plan. The locations and elevations of the soil test borings, therefore, should be deemed accurate to the degree implied by the method used.

Drilling of the test borings and the associated soil sampling were conducted in accordance with the procedures generally recognized and accepted as standard methods of exploration of subsurface conditions related to earthwork and foundation engineering projects. Representative soil samples were obtained by employing split-spoon sampling procedures in general accordance with ASTM D1586 test method. Soil samples obtained from the borings were identified according to boring number and depths, and a representative portion of each sample was sealed in a moisture-tight glass jar to protect against moisture loss. The soil samples from the test borings were subsequently transported to the Specialized Engineering laboratory for visual classification and further evaluation.

The location of the site and the locations of the individual test borings are shown on the Vicinity Map and Test Boring Location Plans provided in **APPENDIX A**. The findings of the Specialized Engineering test borings are presented on the Test Boring Logs included in **APPENDIX B**.

2.5 FIELD INFILTRATION TESTING

In order to explore the possibility of utilizing infiltration BMP facilities within the proposed paved parking areas, Atkins proposed ten (10) locations for infiltration testing and specified the infiltration elevations relative to existing grades.

A total of ten (10) test borings, B-36 thru B-41, B-25, B-33, B-43 and B-44 were drilled within the areas proposed for infiltration facilities and extended to a minimum depth of 4 feet below the proposed infiltration subgrade elevation to determine if groundwater table or bedrock is encountered. Neither rock nor groundwater was encounter within the 4-foot zone so an infiltration test was performed at each location at depths specified by Atkins. In each case, the infiltration tests was performed in an adjacent boring that was drilled without sampling and was lined with 5-inch PVC pipe. The results of the infiltration testing program are listed in the following table:

Boring	Boring Elevation (ft)	Infiltration Elevation (ft)	Infiltration Rate Inch/Hour	Remarks
B-25	461.5	457.4	0.24	Not Suitable for Infiltration
B-33	466.4	461.0	0.60	Suitable for Infiltration
B-36	481.5	474.3	0.60	Suitable for Infiltration
B-37	464.3	464.8	1.92	Suitable for Infiltration
B-38	462.0	460.5	2.88	Suitable for Infiltration
B-39	477.3	474.3	0.96	Suitable for Infiltration

B-40	465.0	464.2	2.52	Suitable for Infiltration
B-41	462.6	460.0	3.36	Suitable for Infiltration
B-43	494.9	491.0	2.16	Suitable for Infiltration
B-44	496.2	492.9	1.92	Suitable for Infiltration

2.6 LABORATORY TESTING

Our geotechnical engineer visually classified the soil samples in the laboratory in general accordance with ASTM D 2488. Tests for natural moisture content (ASTM D 2216), Atterberg limits (ASTM D 4318), and percent finer than No. 200 sieve (ASTM D 1140) were conducted on representative jar samples. The laboratory test results are presented in **APPENDIX C.**

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 SITE LOCATION AND DESCRIPTION

The site is located on the west side of Milltown Road, south of the intersection of Milltown Road and Lovettsville road in Lovettsville, Virginia. Access to the site is from Milltown Road on the east side of the site. The site is currently mostly open fields with some wooded areas along existing fence lines. The site is bounded on the east, south, and west by undeveloped agricultural land and to the north Lovettsville Elementary School and residential property. High points of about generally EL 495 to EL 510 ft occur on the west side and east side of the site, respectively, with grades falling towards the center of the side along the existing stream a low of EL 445.

3.2 AREA GEOLOGY

According to the *Geologic Map of Loudoun County Virginia (2006)*, the subject site is located within the Blue Ridge Physiographic Province; specifically within the Mesoproterozoic aged basement rocks that form the core of the Blue Ridge anticlinorium.

Specifically, the eastern half of the site is underlain by biotite granite Gneiss and the western half of the site is underlain by a garnetiferous leucocratic Metagranite. The rocks typically weather to a variable depth of fine-grained residual soils overlying with a relatively abrupt transition to "decomposed rock" (saprolite) or competent rock.

3.3 MAPPED SOILS

Based upon a review of the Loudoun County Soils Map, the following soils are mapped at the project site: Mongle loam, 0-7% slope, Soil Mapping Unit (SMU) 10B; Middleburg silt loam, 1-7% slope, SMU 17B; Purcellville and Tankerville soils, 7-15% slope, SMU 20C; Purcellville Swampoodle Complex, 2-7% slope, SMU 22B; Purcellville silt loam, 2-

7% slope, SMU 23B; Eubank loam, 2-7% slope, SMU 28B; and Swampoodle silt loam, 1-7% slope, SMU 38B.

The Mongle loam (SMU 10B) consists of a very deep somewhat poorly drained, loamy to silty soils with seasonal water tables in concave drainage positions; developed in alluvium and colluvium from mixed acid and basic rocks. The depth to bedrock is generally greater than 5 feet and the soils are very poor in terms of percolation. The soils map shows this Class IV W soil only in along a small portion of the in the center of the site along an existing stream.

The Middleburg silt loam (SMU 17B) consists of a very deep, well drained, loamy soils in concave upland positions (swales) with seasonal perched water tables; developed in recent colluvium derived from mixed acid and basic rock. The depth to bedrock is generally greater than 5 feet and the soils are given a poor potential with problems due to short duration water tables. The soils map shows these Class III W soils present in the central and eastern portions of the site

The Purcellville and Tankerville soils (SMU 20C) consists of a complex of very deep, well drained silty Purecelleville soils and moderately deep, well drained loamy soils on convex upland positions; developed in residuum weathered from mixed granite gneiss and meatdiabase rock. The depth to bedrock is generally greater than 6 feet in Purcellville soils and 30 inches in Tankerville soils. The soils have fair potential with the depth to rock less than 60 inches in some areas. The soils map shows this Class II R soils covering areas in the central area and eastern area of the site.

The Purcellville Swampoodle Complex (SMU 22B) consists of a complex of very deep, well drained silty Purcellville soils and very deep, moderately drained silty Swampoodle soils in broad, nearly level to concave upland positions; developed in residuum weathered from mixed granite gneiss and metadiabase rock. These soils have a fair potention with problems due to shallow seasonal water tables. The soils map shows these Class II WP soils present in the western area of the site.

The Purcellville silt loam (SMU 23B) consists of a very deep, well drained silty to loamy soil on undulating and gently sloping uplands; developed in residuum weathered from mixed granite gneiss and metabiabase. These soils are classified with a good potential (Class I) and are present on the higher elevations at the site.

The Eubank loam (SMU 28B) consists of a very deep, well drained loamy soil on undulating and gently sloping uplands; developed in residuum weathered from mixed gneiss, metadiabase, and other metamorphosed granite rocks. These soils are classified with a good potential (Class I) and are present on the higher elevations at the northeast corner of the site.

The Swampoodle silt loam (SMU 38B) consists of very deep, moderately well drained silty soils with seasonal water tables in broad, nearly level to concave upland positions; developed in residuum derived from mixed acid and basic rocks. The depth to bedrock

is generally greater than 5 feet and the soils are classified with a poor potential due to a seasonal high water table and areas of shrink-swell clays. The soils map shows this Class IV WP soil in a limited area on the western portion of the site.

A soil map, scale 1: 200, of the proposed site is included in **APPENDIX A**.

3.4 SUBSOIL CONDITIONS

Approximately 6 to 30 inches of topsoil (Plow zone) was encountered at the location of thirty-nine (39) of the forty-two (42) test borings drilled within the areas of the proposed development at the site. Pavement sections consisting of asphalt course, ranging in thickness from 5 to 7 inches, and a granular base course, ranging in thickness from 9 to 11 inches, was encountered at the three (3) remaining test borings. Below the topsoil or pavement section, two (2) natural soil/rock strata representative of the underlying geologic formation were encountered in the test borings. The two (2) natural soil/rock strata are briefly described hereunder:

STRATUM I – RESIDUAL SOILS

Stratum I was encountered, below the topsoil or pavement, in all forty-two (42) test borings drilled and extended to depths ranging from 5.5 feet to 15 feet below existing surface grades. The residual soils of this stratum generally consist of yellowish brown, reddish brown, dark brown, and gray silty sands and sandy silts, clayey sands, clayey silts and medium to high plasticity sandy clays (USCS Designations: ML, SM, SC, CL and CH) with rock fragments.

The Standard Penetration test (SPT) "N" values within the soils of Stratum I ranged from 6 blows per foot (bpf) to 55 bpf, with higher values likely due to the presence of rock fragments. These encountered N-values generally indicate that the relative densities of the granular soils of this stratum range from loose to very dense, with the majority being medium dense, while the consistencies of the cohesive soils ranged from medium stiff to hard, with the majority being stiff.

A summary of the results of the laboratory tests performed on representative soil samples from this stratum is presented in **APPENDIX C**.

STRATUM II – DECOMPOSED TO WEATHERED ROCK

Decomposed to weathered rock was encountered, below the soils of Stratum I in twenty-nine (29) of the forty-two (42) test borings and extended to auger and/or spoon refusal at depths of 6.5 feet to 12.1 feet or to boring termination depths varying from 8.9 feet to 14.8 feet below existing surface grades.

Decomposed rock is generally considered to be a soil like material with SPT N-values in excess of 60 bpf. When removed via the sampling apparatus they are generally given soil composition classifications; however, in situ the materials are very dense rock-like

to rock materials. The Standard Penetration tests within the decomposed to weathered rock of Stratum II resulted in (SPT) "N" values generally ranging from 61 bpf to 50 blows per 2 inches of penetration.

Weathered rock is usually denser material than the 50 blows per one inch penetration. Spoon and/or auger refusal, which generally defines rock/bedrock, was encountered in four (4) of the forty-two (42) borings at depths ranging from 6.5 feet to 12.1 feet below the existing ground surface grades.

The description of subsurface conditions presented above is of a generalized nature, provided to highlight the major soil strata encountered. The test boring logs included in the appendix should be reviewed for specific information regarding the individual test locations. The stratification lines shown on the test boring logs represent the conditions only at the actual test locations. Variations may occur and should be expected between test locations. The stratification lines represent the approximate boundary between subsurface materials and the actual transition may be gradual.

3.5 GROUNDWATER CONDITIONS

Groundwater was not encountered during the drilling operations in any of the forty-two (42) test borings drilled. Due to safety concerns, the test borings were backfilled immediately upon completion of drilling and accordingly the 24-hour groundwater level readings were not obtained. Cave-in depth in the borings ranged from 4 to 12 feet below existing grades.

The groundwater observations presented in this report were recorded at the time of our field activities. Fluctuation in groundwater levels should be anticipated. We recommend that the Contractor determine the actual groundwater levels at the time of construction to determine groundwater impact on the proposed construction procedure.

4.0 GEOTECHNICAL EVALUATION

The data developed during this study indicate that the subsoil and groundwater conditions are generally suitable for the proposed development provided the recommendations presented hereafter are followed.

Shallow foundations (continuous and spread footings) are considered adequate for the support of the proposed light structures planned for the park. The footings should be supported on the undisturbed, suitable-bearing natural soils of Stratum I, except moderately to highly plastic clays and elastic silts (LL>40 and PI>20) if encountered, or on controlled structural fill placed on suitable natural soils.

The footings should not be supported on moderately to highly plastic silts or clays (LL>45 and PI>20). These plastic soils, if encountered at or below the foundation grades, should be excavated in their entirety or to a minimum depth of 6 feet below the adjacent exterior finished grades. The footings in the latter case should be embedded at least 4 feet below

the adjacent exterior finished grades supported on 2 feet of controlled structural fill placed over the clay layer.

Lighting poles are usually supported on drilled pier foundation. Based on the subsurface soil and groundwater conditions encountered at the test boring locations, the proposed light poles can be supported on drilled pier foundations. The design of drilled pier foundation, including diameter and depth need to consider compression loads, lateral loads, and overturning moments associated with the light pole. We anticipate that the overturning moment will be the controlling factor in the foundation design.

The data developed during this study indicate that the subsoil, rock and groundwater conditions are generally suitable for the construction of stormwater management bioretention or infiltration facilities provided that the facilities are designed and constructed in accordance with *Chapter 5: "Water Resource Management" of Loudoun County FSM* and the most currently adopted "*Virginia Stormwater Management Handbook*". However, it should be noted that adequate infiltration rate was not achieved in one (1) of the ten (10) locations where an infiltration test was performed.

Excavations during the development of the site can generally be achieved with conventional earth-moving equipment (dozers, pans and hoes) to the anticipated shallow excavation depths. However, ripping and/or hoe-ramming of weathered but dense rock may be required in localized areas where the recorded N-values were 50 blows for a penetration of 6 inches or less and where equipment refusal was encountered at shallow depths. Ripping, hoe-ramming or blasting of dense rock may be needed at isolated locations during the excavations for deeper sections of utility lines.

Encountering groundwater is not anticipated during the development of this site. However, perched water should be anticipated at different elevations during foundation excavations and installation of underground utilities, especially if the work is performed during wetter months or following prolonged periods of heavy precipitation. It is our opinion that conventional dewatering measures such as diversion ditches, interceptor drains and sump pumps should be adequate.

The soils of Stratum I and Stratum II, except layers of soils with LL>40 and PI>20, may be suitable for use in engineered fills, subject to moisture adjustment and approval of the Geotechnical Engineer of Record.

Due to the moisture sensitive nature of the on-site soils, the presence of standing water and the action of heavy equipment may lead to softening and a general deterioration/weakening of the fine-grained soils. The grading should, therefore, be carried out during a dry season, if at all possible, and in such a way as to promote positive drainage of surface water runoff, and ponding of water shall not be permitted. This should minimize potential problems associated with fine-grained soils although they may not be eliminated. If such problems occur, the geotechnical engineer should be consulted for an evaluation of the conditions.

5.0 RECOMMENDATIONS

5.1 SITE PREPARATION AND EARTHWORK (BUILDING PADS, ROADWAYS, SPORT COURTS & PARKING AREAS)

The following recommendations are intended for the satisfactory performance of the earthwork that may be involved to attain the planned grades across the site.

- Areas to support the building pads, sport courts or field, pavement area and other park facilities should be stripped of any vegetation and topsoil. The depth of this excavation is expected to range from approximately 6 inches to 30 inches and may differ at the other unexplored areas of the site. The average thickness of the topsoil in this farm field is estimated to be on the order of one foot.

  Soft/loose soil, root mats and moderately to highly plastic soils with LL>40 and PI>20, wherever encountered near the planned grades, should be undercut to a suitable undisturbed subgrade as recommended by the Geotechnical Engineer of Record.

  If highly plastic soils (LL>40 and PI>20) are encountered at and below the planned subgrade elevations of the pavements for drive lanes and parking areas, the upper 2 feet of the moderately to highly plastic soils (LL>40 and PI>20), should be excavated and replaced with engineered fill consisting of approved soils.

- Following the stripping and excavation of all unsuitable materials, grading operations may proceed. Prior to fill placement, the site should be observed by the Geotechnical Engineer of Record or his qualified representative for proper stripping and preparation for receiving the fill.

- The bottom of the stripped areas should be proof rolled in the presence of the Geotechnical Engineer of Record with at least two (2) passes of a loaded dump truck that has a minimum axle load of 10 tons or similar equipment. All loose and soft areas should be excavated to suitable-bearing subgrade. The excavated materials should be replaced with soils satisfying the controlled fill requirements detailed later in this report. The excavated fills should be evaluated for suitability to be reused by the Geotechnical Engineer of Record or his qualified representative.

- Controlled structural fill placement required to achieve the planned grades within the building pad should extend laterally on all sides beyond the building footprint a minimum distance of 10 feet at the building pad subgrade elevations. The edge of the fill should be placed at a maximum slope of 1H: 1V. The building pads should be prepared by excavation or by placing controlled structural fill to

an elevation 10 inches below the floor level of slabs-on-grade. The footings should be excavated after the building areas have been properly prepared.

- Material satisfactory for controlled structural fill should include clean soil or bankrun sand and gravel (GW, GM, and SM). GC and SC materials may be used provided that the density and the liquid limit and plasticity index of the finer fraction of the material satisfy the following limitations:

Maximum Dry Density	$\geq$ 105 pcf
Liquid Limit (%)	$\leq$ 40
Plasticity Index	$\leq$ 20

CL and ML materials satisfying the above requirements and limitations may be used with approval of the Geotechnical Engineer of Record. Highly plastic clays and elastic silts (MH, CH) should not be used as controlled fill. The fill materials should be free from topsoil, organics and rock fragments having a major dimension greater than 3 inches.

- The excavated soils of Stratum I and II, except soils with LL>40 and PI>20, may be suitable for reuse in controlled structural fill, subject to the approval Geotechnical Engineer of Record and moisture adjustments and the maximum dry density requirement specified above. Moisture conditioning of on-site material should be anticipated.

- Fill placement should be in a maximum 8-inch thick, loose, horizontal lifts compacted uniformly with the proper equipment.

- Structural fill required for supporting footings and slabs-on-grade shall be compacted to at least 95 percent of the maximum dry density as determined by ASTM D698 (Standard Proctor). Moisture content of the compacted fill shall be within plus or minus two (±2) percentage points of the optimum moisture content.

- The compaction for the roadways and other paved areas will be governed by the VTM-1 Method (Standard Proctor). The requirements for the degree of compaction should conform to the current VDOT Specifications and the current Loudoun County requirements, and are summarized below:

Aggregate Subbase/Base Course	90 to 100 percent*
Subgrade	100 percent
The entire thickness of fill up to 6 inches below the subgrade elevations	95 percent

*As per Section 309.05 of the current VDOT Road and Bridge specifications.

The moisture content of the fill should be within plus or minus two (±2) percentage points of the optimum moisture content.

For proper site preparation, the earthwork should be performed under the supervision of and to the satisfaction of the Geotechnical Engineer of Record.

5.2 BUILDINGS FOUNDATIONS

As stated earlier, shallow foundations (continuous and spread footings) supported on natural soil of Stratum I or controlled structural fills, provided that the supporting subgrade soils are prepared in accordance with Section 5.1 "Site Preparation And Earthwork", are considered adequate for the support of the proposed park buildings.

The footings should not be supported on moderately to highly plastic silts or clays (LL>45 and PI>20). These plastic soils, if encountered at or below the foundation grades, should be excavated in their entirety or to a minimum depth of 6 feet below the adjacent exterior finished grades. The footings in the latter case should be embedded at least 4 feet below the adjacent exterior finished grades supported on 2 feet of controlled structural fill placed over the clay layer.

Continuous footings that are partially located in fill and partially in undisturbed soil formation, should be designed as grade beams, 5 feet on either side of the transition. The column footings, in similar circumstances, should be extended into the underlying undisturbed soils.

The footings may be sized and designed on the basis of allowable bearing pressures indicated below, subject to observation of soil conditions at the bottom of footing excavations for suitable soil bearing by the Geotechnical Engineer of Record or his qualified representative.

SOIL CONDITIONS AT SUBGRADE	ALLOWABLE BEARING PRESSURE (psf)	MINIMUM WIDTH OF FOOTINGS (INCHES)
Undisturbed Soil of Stratum I Or Controlled Structural Fill		
Isolated Footings	2,500	30
Continuous Footings	2,500	18

DEPTH OF FOOTINGS

The embedment depth of all footing subgrades is governed by the minimum depth

requirements for protection against frost heave in accordance with the 2009 International Building Code. The depth of frost in Loudoun County, Virginia, is approximately 24 to 30 inches. Therefore, we recommend that the bottom of the footings be located at least 30 inches below the lowest adjacent finished exterior grade.

FOOTING EXCAVATIONS

Because of possible variations in subsurface conditions and related bearing capacity, all footing excavations and trenches should be observed and approved by the Geotechnical Engineer of Record. Water and possibly some loose soil may collect in the footing excavations as a result of surface precipitation and near ground surface seepage. Therefore:

- Water, loose soil and soil softened by water should be removed from the bottom of the footing excavations before placing concrete.

- Footing excavations should not be left open for long periods. If the concrete can not be placed due to inclement weather conditions or any other unforeseen circumstances, the bottom of the footing excavations and trenches should be protected by undercutting 3 inches and placing a 3-inch thick lean-mix concrete (2,000 psi) workmat immediately upon approval and before reinforcing steel is placed.

Backfill around and above the footing should satisfy the controlled fill requirements described in Section 5.1 'Site Preparation and Earthwork'.

5.3 FLOOR SLABS

The following recommendations are intended for the placement of the slab-on-grade.

- Floor slab excavations should be proofrolled and prepared as described under 'Site Preparation and Earthwork'.

- A free-draining granular blanket of crushed stone or gravel should be placed under the floor slab for lateral drainage and as a capillary barrier. The thickness of this blanket should be at least 4 inches.

- A 6-mil thick impermeable plastic membrane (vapor barrier) should be placed directly under the concrete floor slab and over the granular material.

- The entire floor slab area should be reinforced as specified by the structural engineer.

- The column points and periphery walls should be isolated from the floor slab to minimize the possibility of the floor slab cracking due to relative displacement.

- The floor slab should be designed on the basis of modulus of subgrade reaction "k" of not more than 125 psi/inch.

5.4 SWM INFILTRATION FACILITIES

We understand the park designers are considering paving the parking lots in the park with pervious pavement. The infiltration rate of the subgrade, at the assigned elevation, was measured by an infiltration test that was performed at each of the proposed ten (10) locations within the proposed parking lots. The measured infiltration rates are listed in the following table:

Boring	Boring Elevation (ft)	Infiltration Elevation (ft)	Infiltration Rate Inch/Hour	Remarks
B-25	461.5	457.4	0.24	Not Suitable for Infiltration
B-33	466.4	461.0	0.60	Suitable for Infiltration
B-36	481.5	474.3	0.60	Suitable for Infiltration
B-37	464.3	464.8	1.92	Suitable for Infiltration
B-38	462.0	460.5	2.88	Suitable for Infiltration
B-39	477.3	474.3	0.96	Suitable for Infiltration
B-40	465.0	464.2	2.52	Suitable for Infiltration
B-41	462.6	460.0	3.36	Suitable for Infiltration
B-43	494.9	491.0	2.16	Suitable for Infiltration
B-44	496.2	492.9	1.92	Suitable for Infiltration

The data developed during this study indicate that the subsoil, rock and groundwater conditions are generally suitable for the construction of stormwater management infiltration facilities provided that the facilities are designed and constructed in accordance with *Chapter 5: "Water Resource Management" of Loudoun County FSM* and the most currently adopted "*Virginia Stormwater Management Handbook*". However, it should be noted that adequate infiltration rate was not achieved in one (1) of the ten (10) locations where an infiltration test was performed.

5.5 LIGHTING POLES FOR ATHLETIC FACILITIES

We understand that some of the planned athletic courts or fields will be provided with lighting. Such lighting poles are usually supported on drilled pier foundation. Based on the subsurface soil and groundwater conditions encountered at the test boring locations, the proposed light poles can be supported on drilled pier foundations. The design of drilled pier foundation, including diameter and depth need to consider compression loads, lateral

loads, and overturning moments associated with the light pole. We anticipate that the overturning moment will be the controlling factor in the foundation design.

The table below provides recommendations and parameters for the drilled pier foundation at the proposed pole location. A minimum factor of safety of 2 and 3 has been used in design considerations for skin resistance and end bearing, respectively.

Depth Range (feet)	Total Unit Weight (pcf)	Allowable Skin Resistance (ksf)	Lateral Modulus of Reaction (pci)	Allowable End Bearing (ksf)
0 – 5	120	Neglect	50	N/A
5 – 10	125	0.50	90	3.0
10 - 15	130	1.0	250	8.0

Drilling difficulties should be anticipated in the drilled pier excavation within the depth explored since decomposed rock was encountered at relatively shallow depth. The drilled pier excavation should be observed by Specialized Engineering to verify that the foundation will bear at the specified depth. This should be accomplished by observation and testing of the auger cuttings being removed from the pier excavation. Surface runoff or seepage water should be drained away from the drilled pier excavation and not be allowed to collect in the excavation.

The use of casing and possibly drilling fluid may be necessary to minimize sloughing and groundwater infiltration. Prior to the placement of the reinforcement cage or concrete, the bottom of the drilled pier excavation should be thoroughly cleaned and free of all loose or soft materials. It is essential that the bottom of the excavation be clean from loose or soft materials. If necessary to reach a competent bearing material, the pier excavation should be extended below the specified minimum depth.

During the placement of concrete, we recommend that the slump of the concrete be no less than 5 inches and no more than 8 inches. This will allow for proper distribution of the concrete and limit the amount of air voids. In addition, we recommend that the concrete be tremied into the excavation to limit segregation of the aggregate from the concrete. When temporary casing is utilized, extreme care should be given as to minimize the amount of disturbance along the sides of the drilled pier. The contractor must place the concrete in contact with undisturbed natural soil. The contractor must fill any voids or enlargements in the shaft excavation with concrete at the time of concrete placement.

When removing the casing a head of concrete should be maintained above the bottom of the casing at all times. The head of the concrete should be at least 5 feet higher than the bottom of the casing. This will allow the excavation to remain open, minimize

groundwater infiltration and prevent loose soils from falling into the wet concrete. The volume of concrete placed in the excavation should be checked to confirm that no substantial air pocket or voids were created upon removal of the casing. If any discrepancies are noted, the geotechnical engineer should be notified immediately.

Prior to the placement of concrete for the drilled pier foundation, the bases of the pier excavation should be observed and tested to evaluate that it will bear on suitable subgrade materials. Where reinforcing steel is to be placed in the foundation excavation, observations should also be made to verify that the reinforcing steel is properly positioned. Appropriate laboratory testing of concrete to be used in the construction of the drilled pier should also be conducted.

5.6 PAVEMENT

The pavement areas should be prepared as recommended in Section 5.1 of this report, "Site Preparation and Earthwork".

Any loose/soft areas should be undercut to suitable bearing subgrade and replaced with approved fill. If highly plastic soils (LL>40 and PI>20) are encountered at and below the planned subgrade elevations of the pavements for drive lanes and parking areas, the upper 2 feet of the moderately to highly plastic soils (LL>40 and PI>20), should be excavated and replaced with engineered fill consisting of approved soils.

The soil subgrade in the paved areas, including the sidewalk, curb and gutter, and driveway aprons, is recommended to be compacted to at least ninety-five percent (95%) of the maximum dry density as determined by VTM-1 test method up to 6 inches below the planned subgrade elevations for controlled fills. The top 6 inches of the subgrade for natural soils as well as engineered fills should be compacted to one hundred percent (100%) of these values. The moisture content of the subgrade should be within plus or minus two (±2) percentage points of the optimum moisture content.

6.1 NEW ROAD

Three (3) CBR tests were performed on three (3) representative soil samples from the park site. The three tests indicated CBR values of 4.4, 5.1 and 6.8, with an average of 5.5. The results of the CBR test and their associated Proctors are presented in **APPENDIX C**.

A CBR value of 5 may be assigned to the on-site soils for preliminary pavement design. It is recommended that the preliminary design CBR value be confirmed through laboratory testing following completion of grading operations when subgrade conditions can be better evaluated. Any necessary adjustments to pavement designs can be made at that time. It is possible that the additional testing may result in CBR values that are higher than those estimated in this report. In that case, the final pavement section may be reduced in thickness, thereby resulting in cost savings during construction.

Based on the estimated traffic loading, the preliminary pavement sections presented below should be considered the minimum recommended thickness for the parking area and drive aisle. Prior to placement of the base course, the Geotechnical Engineer of Record or his qualified representative should observe the subgrade preparation.

Pavement Layer	Thickness (Inch)
Asphaltic Concrete Surface Course (SM-9.5A)	2.0
Asphaltic Concrete Base Course (BM-25.0A)	4.0
Aggregate Base Stone (21A or equivalent)	8.0

All material and methods of placement should conform to the current Virginia Department of Transportation (VDOT) requirements.

The pavement sections are designed for the post construction traffic conditions and on the basis of actual CBR values. Partial construction of the pavement section, a common practice in the industry, is likely to result in pavement and subgrade failure, due to inadequate support capability of an incomplete pavement, heavier than design traffic loads and maneuvering of construction traffic.

6.2 Right-Turn Lane & Intersection Improvement

We understand, the County is planning road improvements to the intersection of Milltown Road and Lovettsville Road and a potential right turn lane on Loudoun Street.

The findings of Borings B-1, B-24 and B-35 indicate that the average thickness of the asphalt course is 6 inches, while the average thickness of aggregate base is 12 inches.

We recommend that the proposed right-turn lane on Loudoun Street and any pavement expansion at the intersection of Milltown Road and Lovettsville Road should have the same pavement section as the existing one. It should be noted that the pavement section is based on a CBR of 10 or higher. The actual CBR value of the subgrade should be tested, and if the CBR value is less that 10, then the pavement section should be revised. All material and methods of placement should conform to the current Virginia Department of Transportation (VDOT) requirements.

5.8 UTILITY TRENCHES AND MANHOLES

The backfill in the utility trenches should conform to the requirements of the Town of Lovettsville and the Facilities Standards Manual of Loudoun County. The existing fill soils excavated from the utility trenches should be observed by the Geotechnical Engineer of Record or his qualified representative for their suitability for use in the trench backfill.

The backfill against the manhole structures should conform to the requirements stated under Section 5.1 'Site Preparation and Earthwork'. The fill material should not have rock fragments larger than 3 inches and each lift should be compacted as specified.

Excavations for utility trenches shall be in accordance with applicable OSHA excavation standards detailed in 29 CFR, Part 1926 and should be adequately protected against sudden cave-in or sloughing by using steel trench boxes.

5.9 SEISMIC CONSIDERATIONS

Based on the subsurface conditions encountered at the site, structural design shall use the following site coefficients for seismic design based on Section 1615 of the International Building Code (2009):

Seismic Site Class	D
Spectral response acceleration at short periods, S_s	0.16
Spectral response acceleration at 1-second period, S_1	0.051
Site coefficient, F_a	1.6
Site coefficient, F_v	2.4

Based on information obtained from our soil test borings and our review and knowledge of local geology, it is our opinion that the potential for liquefaction of the soils at the site due to earthquake activity is relatively low.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 CONSTRUCTION QUALITY CONTROL

To assess that the in-situ soil conditions or those developed during the construction are as anticipated during the design stage, construction control, continuous observation and testing are recommended as follows:

- Potential areas of cut to be used as fill should be sampled and compared to the Standard Proctor, to determine, what if any moisture conditioning is required.

- Controlled fill placement for building pads and pavements should be monitored by the soils technician under the overall supervision of the Geotechnical Engineer of Record.

- All footing and floor slab excavations, preparation of subgrade, placement of aggregate base course, etc., should be carried out under the observation of the Geotechnical Engineer of Record or his qualified representative.

6.2 DEMOLITION OF OLD STRUCTURES

Existing structures, including footings, slabs, basement walls, pavement, etc., if encountered, should be removed from the building pad area including at least 5 feet off-set from the building. In addition, the existing pavement should be removed in its entirety. Within the building footprint, all existing uncontrolled fill should be undercut a minimum of 2 feet and any deleterious fills encountered should be removed in their entirety. All soils undercut below the planned grades should be replaced with engineered fill. It is our experience that debris-laden fills are usually encountered in the vicinity of existing structures.

Any demolition of existing building(s) and other structures should be carried out under the observation of the Geotechnical Engineer of Record or his qualified representative.

6.3 RESPONSIBILITY OF DEVELOPER

Review and approval of plans, specifications, and reports by Loudoun County and the Town of Lovettsville with or without recommendations, should in no way relieve the developer of the responsibility for the design, construction and performance of the structures and pavements on the project and damage to surrounding properties.

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P". This document was issued to better allow for the safety of workers entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the Contractor could be liable for substantial penalties.

The Contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The Contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the Contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in all local, state, and federal safety regulations.

We are providing this information solely as a service to our client. Specialized Engineering does not assume responsibility for construction site safety or the Contractor's or other parties' compliance with local, state, and federal safety or other regulations.

6.4 CONSTRUCTION OBSERVATIONS

All development and construction work should be performed under the observation of the Geotechnical Engineer or his qualified representative or the Town or County staff.

7.0 REPORT LIMITATIONS

The recommendations submitted are based on the available subsurface information obtained by Specialized Engineering and preliminary project information furnished by ATKINS for the proposed project. The sole purpose of this exploration is to determine an appropriate foundation design recommendation. Recommendations contained in this report are based on findings from the relatively limited number of test borings performed. Specialized Engineering's Professional staff may have adjusted the scope of work proposed based on field conditions, equipment capabilities', client schedule, or any other factor during the course of design. The work adjustments may have been relocation of borings or probes, adjustments in depth of borings or probes, addition or deletion of scope items as deemed prudent at the time of the exploration. Variations in soil conditions between the borings may not become evident until construction. If deviations from the subsurface conditions noted in this report are encountered during construction, that may change the geotechnical foundation recommendation, Specialized Engineering should be notified immediately to determine if changes in the foundation recommendations are required. If Specialized Engineering is not retained to perform these functions, we will not be responsible for the impact of those conditions on the geotechnical recommendations for the project.

Specialized Engineering's findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No warranties are implied or expressed.

After the plans and specifications are more complete, Specialized Engineering should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations, or perform additional exploration.

The opinions, conclusions and recommendations expressed in this report are based upon the subsurface conditions revealed by our field exploration, laboratory testing, and the result of analyses and studies performed for this project, based on our professional engineer's interpretation. We are not responsible for interpretations of our findings, or data contained within the report, by others. We recommend the project specification contain a statement indicating that this report is for informational purposes only and should not be considered part of the contract documents. The data contained in this report may not be adequate for the contractor's purposes, the contractor should make his own tests and analyses prior to bidding. The contractor may not rely on this report to

assess field conditions other than the proposed design recommendation. Field conditions may be much more difficult that the contractor anticipates.

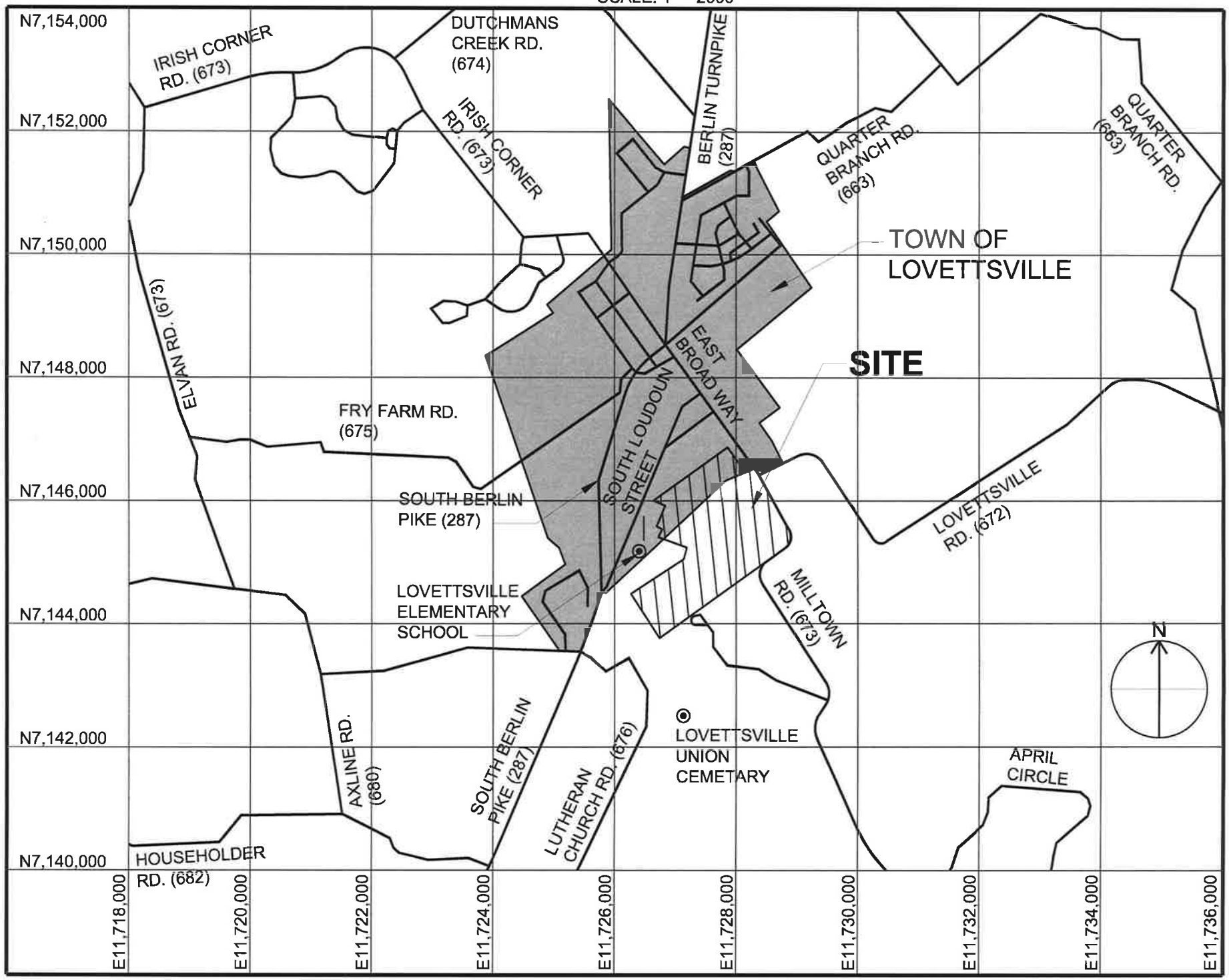
This report has been prepared for the exclusive use of Loudoun County and their associated engineering consultants to aid in the evaluation of this site and to assist in the design of the **PROPOSED LOVETTSVILLE PARK** project located at 12565 Milltown Road in Lovettsville, Loudoun County, Virginia.

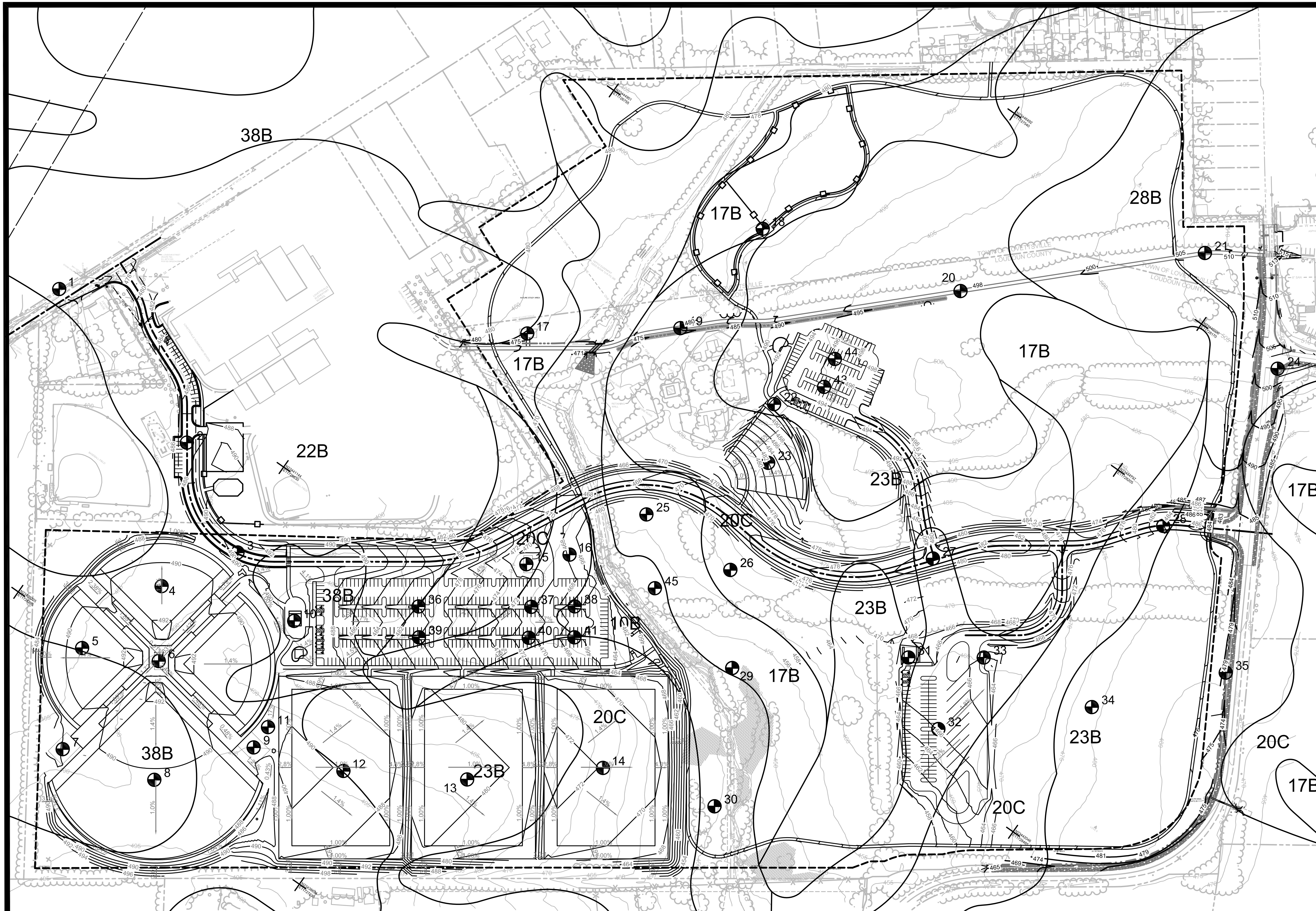
APPENDIX A

VICINITY MAP & TEST BORING LOCATION PLAN


672
12565 Milltown Rd, Lovett
S Loudoun St
673
Image © 2012 Commonwealth of Virginia

VICINITY MAP
SCALE: 1" = 2000'





LOVETTSVILLE PARK SOILS MAP

DRAWN BY: RJB

CHECKED BY: GEC

DATE: 11/05/2012

SCALE: 1"=200'

ATKINS
ATKINS NORTH AMERICA, INC.
3859 CENTERVIEW DRIVE, SUITE 160
CHANTILLY, VA 20151

APPENDIX B

TEST BORING LOGS

SPECIALIZED ENGINEERING
Construction Quality Control • Environmental Consulting
Geotechnical & Forensic Engineering

BORING NUMBER B-01

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/24/12 **COMPLETED** 7/24/12
GROUND ELEVATION 476.5 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
475			**ASPHALT**	SS S-1	0.0 1.5	100	1-3-4 (7)		
			GRAVEL BASE: (12")						
			SILT: olive yellow, trace roots, moist, medium stiff, (ML)						
			SILTY SAND: yellowish brown and pale yellow, fine to coarse grained, moist, dense, (SM)	SS S-2	2.5 4.0	100	6-12-22 (34)		
	5			SS S-3	5.0 6.5	100	26-32-50/6"		
470			**DECOMPOSED ROCK**: dark brown very dense, (5")						
			End of Boring at 8.9 feet.	SS S-4	8.5 8.9	100	50/5"		

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/20/12

SPECIALIZED ENGINEERING
Construction Quality Control • Environmental Consulting
Geotechnical & Forensic Engineering

BORING NUMBER B-02

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/24/12 **COMPLETED** 7/24/12
GROUND ELEVATION 486.6 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (10")	SS S-1	0.0 1.5	100	1-4-5 (9)		
485			**LEAN SANDY CLAY**: olive yellow, trace roots, moist, medium stiff, (CL)						
			CLAYEY SAND: brownish yellow with pale yellow, fine to coarse grained, trace quartz fragments, moist, medium dense, (SC)	SS S-2	2.5 4.0	100	5-5-6 (11)		
	5			SS S-3	5.0 6.5	100	5-6-7 (13)		
480									
				SS S-4	8.5 10.0	100	18-50/6"		
	10		**DECOMPOSED ROCK**: dark brownish gray very dense						
			End of Boring at 10.0 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

SPECIALIZED ENGINEERING
Construction Quality Control • Environmental Consulting
Geotechnical & Forensic Engineering

BORING NUMBER B-03

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/24/12 **COMPLETED** 7/24/12
GROUND ELEVATION 489.3 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (12"0	SS S-1	0.0 1.5	100	1-3-4 (7)		
			SILT: olive yellow, trace roots, moist, medium stiff, (ML)						
485	5		**SANDY SILT**: olive yellow to yellowish brown, moist, very stiff to hard, (ML)	SS S-2	2.5 4.0	100	7-9-13 (22)		
				SS S-3	5.0 6.5	100	12-19-26 (45)		
			DECOMPOSED ROCK: brown very dense	SS S-4	8.5 8.9	100	50/5"		
			End of Boring at 8.9 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80
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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

7504 Connelley Drive, Suite G, Hanover, Maryland 21076 (410) 768-4800 / (410) 768-4803 fax

SPECIALIZED ENGINEERING
Construction Quality Control • Environmental Consulting
Geotechnical & Forensic Engineering

BORING NUMBER B-04

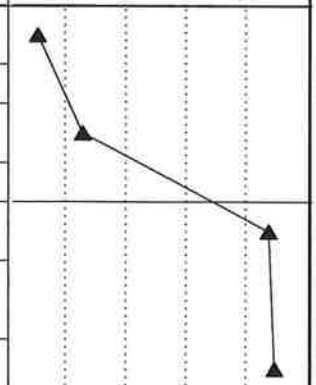
CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/24/12 **COMPLETED** 7/24/12
GROUND ELEVATION 487.2 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (12")	SS S-1	0.0 1.5	100	3-5-5 (10)		
485			**SANDY SILT**: olive yellow, trace gravel, trace roots, moist, medium stiff, (ML)						
	5		**SANDY SILT**: olive yellow with yellowish brown, moist, medium dense to very dense, (ML)	SS S-2	2.5 4.0	100	7-11-14 (25)		
			DECOMPOSED ROCK: dark gray very dense	SS S-3	5.0 6.5	100	18-39-48 (87)		
480									
	10			SS S-4	8.5 10.0	100	13-34-55 (89)		
475									
				SS S-5	13.5 14.3	100	50/5"		
			End of Boring at 14.3 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80



GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

SPECIALIZED ENGINEERING
Construction Quality Control•Environmental Consulting
Geotechnical & Forensic Engineering

BORING NUMBER B-05

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/24/12 **COMPLETED** 7/24/12
GROUND ELEVATION 485 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (9")	SS S-1	0.0 1.5	100	2-3-5 (8)		
			CLAYEY SILT: olive yellow, trace roots, moist, medium stiff, (ML)						
480	5		**LEAN SANDY CLAY**: light yellowish brown, moist, stiff to very stiff, (CL)	SS S-2	2.5 4.0	100	6-7-8 (15)		
				SS S-3	5.0 6.5	100	4-10-20 (30)		
475	10		**DECOMPOSED ROCK**: grayish brown very dense	SS S-4	8.5 10.0	89	27-50/6"		
			End of Boring at 14.0 feet.	SS S-5	13.5 14.0	100	50/6"		

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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SPECIALIZED ENGINEERING
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Geotechnical & Forensic Engineering

BORING NUMBER B-06

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/24/12 **COMPLETED** 7/24/12
GROUND ELEVATION 490.7 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
490			**TOPSOIL**: (11")	SS S-1	0.0 1.5	100	1-2-3 (5)		
			SANDY SILT: light yellowish brown, trace roots, moist, soft, (ML)						
			SANDY SILT: grayish brown, moist, medium stiff, (ML)	SS S-2	2.5 4.0	100	3-4-5 (9)		
	5								
485			**SILTY SAND**: light yellowish brown, moist, stiff, (SM)	SS S-3	5.0 6.5	100	7-7-7 (14)		
	10		**DECOMPOSED ROCK**: brownish gray dense to very dense	SS S-4	8.5 10.0	100	18-38-50 (88)		
480									
			End of Boring at 13.9 feet.	SS S-5	13.5 13.9	100	50/5"		

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80

GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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SPECIALIZED ENGINEERING
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BORING NUMBER B-07

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/24/12 **COMPLETED** 7/24/12
GROUND ELEVATION 488.3 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (12")	SS S-1	0.0 1.5	100	2-4-8 (12)		
			SILT: pale brown, some rock fragments, trace roots, moist, medium dense, (ML)						
485			**SILTY SAND**: light brownish gray, fine to medium grained, with rock fragments, moist, medium dense to dense, (SM)	SS S-2	2.5 4.0	100	7-8-12 (20)		
	5			SS S-3	5.0 6.5	100	14-16-24 (40)		
480									
	10		**DECOMPOSED ROCK**: brownish gray very dense	SS S-4	8.5 9.8	100	10-78-100/4"		
475									
			End of Boring at 14.3 feet.	SS S-5	13.5 14.3	100	50/2"		

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-08

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/23/12 **COMPLETED** 7/23/12
GROUND ELEVATION 491.6 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
490			**TOPSOIL**: (14")	SS S-1	0.0 1.5	100	2-3-6 (9)		
			SANDY SILT: brownish yellow, trace roots, moist, loose to medium dense, (ML)	SS S-2	2.5 4.0	100	4-5-12 (17)		
	5			SS S-3	5.0 6.5	100	12-33-63 (96)		
485			**DECOMPOSED ROCK**: grayish brown dense	SS S-4	8.5 9.4	91	32-50/5"		
	10								
480				SS S-5	13.5 14.3	100	50/4"		
			End of Boring at 14.3 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80
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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-09

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/23/12 **COMPLETED** 7/23/12
GROUND ELEVATION 495 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (8")	SS S-1	0.0 1.5	100	2-3-6 (9)		
			CLAYEY SILT: yellowish brown, trace roots, moist, medium stiff, (ML)						
			LEAN SANDY CLAY: brown to yellowish brown, moist, stiff to very stiff, (CL)	SS S-2	2.5 4.0	100	8-9-11 (20)		
490	5			SS S-3	5.0 6.5	100	4-5-9 (14)		
			DECOMPOSED ROCK: gray dense	SS S-4	8.5 9.5	50	43-50/6"		
485	10			SS S-5	13.5 14.8	88	18-50/5"		
			End of Boring at 14.8 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-10

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/24/12 **COMPLETED** 7/24/12
GROUND ELEVATION 486.1 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
485			**TOPSOIL**: (7")	SS S-1	0.0 1.5	100	2-3-4 (7)		
			SANDY SILT: brownish yellow, trace roots, moist, medium stiff, (ML)						
			SILTY SAND: pale yellow, fine to coarse grained, moist, medium dense to dense, (SM)	SS S-2	2.5 4.0	100	5-9-13 (22)	99.6	47.9
	5		With gravel at 5 feet	SS S-3	5.0 6.5	100	7-14-18 (32)		
480									
			DECOMPOSED ROCK: pale yellow very dense	SS S-4	8.5 9.4	91	50/6"		
	10								
475									
			End of Boring at 13.8 feet.	SS S-5	13.5 13.8	50	50/4"		

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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BORING NUMBER B-12

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/23/12 **COMPLETED** 7/23/12
GROUND ELEVATION 492.9 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (11")	SS S-1	0.0 1.5	100	2-4-6 (10)		
			SANDY SILT: red, trace roots, moist, medium stiff, (ML)						
490			**SANDY SILT**: reddish yellow to yellowish red, trace sand, moist, stiff, (ML)	SS S-2	2.5 4.0	100	4-6-8 (14)		
	5			SS S-3	5.0 6.5	100	3-5-6 (11)		
485									
	10		**DECOMPOSED ROCK**: pale brown to pale yellow silty sand, fine to medium grained, with rock fragments, moist, very dense	SS S-4	8.5 10.0	100	5-23-38 (61)		
480									
			Black and reddish	SS S-5	13.5 14.2	100	46-50/2"		
			End of Boring at 14.2 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80
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BORING NUMBER B-13

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/23/12 **COMPLETED** 7/23/12
GROUND ELEVATION 487.5 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (12")	SS S-1	0.0 1.5	100	2-3-5 (8)		
485			**SANDY SILT**: red, trace roots, moist, medium stiff, (ML)						
			Brown to yellowish red	SS S-2	2.5 4.0	100	3-5-5 (10)		
	5								
			Light brown to brown	SS S-3	5.0 6.5	100	3-4-4 (8)		
480									
			Dark yellowish brown	SS S-4	8.5 10.0	100	5-13-18 (31)		
	10								
475									
				SS S-5	13.5 15.0	100	7-4-13 (17)		
	15		End of Boring at 15.0 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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BORING NUMBER B-14

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/23/12 **COMPLETED** 7/23/12
GROUND ELEVATION 471.9 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (14")	SS S-1	0.0 1.5	78	2-4-5 (9)		
470			**SANDY SILT**: reddish yellow, trace roots, moist, medium stiff, (ML)						
			SANDY SILT: light olive brown, trace quartz fragments, moist, stiff to very stiff, (ML)	SS S-2	2.5 4.0	100	3-4-9 (13)		
	5			SS S-3	5.0 6.5	100	8-9-6 (15)		
465									
				SS S-4	8.5 10.0	100	8-12-9 (21)		
	10								
460									
				SS S-5	13.5 15.0	100	16-18-23 (41)		
	15		End of Boring at 15.0 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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BORING NUMBER B-15

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/25/12 **COMPLETED** 7/25/12
GROUND ELEVATION 468.2 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (6")	SS S-1	0.0 1.5	100	2-3-5 (8)		
			SANDY SILT: brownish yellow, trace roots, moist, medium stiff, (ML)						
465			**SILTY SAND**: very pale brown, fine to coarse grained, with rock fragments, moist, medium dense, (SM)	SS S-2	2.5 4.0	100	6-12-16 (28)		
	5			SS S-3	5.0 6.5	100	11-16-19 (35)		
460									
	10			SS S-4	8.5 10.0	100	13-36-50 (86)		
			DECOMPOSED ROCK: pale brown very dense						
			End of Boring at 11.4 feet.	SS S-5	11.0 11.4	60	50/5"		

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80
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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-16

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/25/12 **COMPLETED** 7/25/12
GROUND ELEVATION 463.6 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (2.5')	SS S-1	0.0 1.5	100	3-4-4 (8)		
460	5		**SILTY SAND**: yellowish brown, fine to coarse grained, with quartz fragments, moist, loose, (SM)	SS S-2	2.5 4.0	100	6-8-12 (20)		
			SILTY SAND: light yellowish brown, fine to medium grained, with rock fragments, moist, medium dense, (SM)	SS S-3	5.0 6.5	100	7-11-13 (24)		
455	10		**DECOMPOSED ROCK**: dark grayish brown very dense	SS S-4	8.5 8.9	100	50/5"		
			End of Boring at 10.7 feet.	SS S-5	10.5 10.7	100	50/2"		

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80
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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-17

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/25/12 **COMPLETED** 7/25/12
GROUND ELEVATION 475.7 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
475			**TOPSOIL**: (14")	SS S-1	0.0 1.5	100	2-4-6 (10)		
			SILT: olive yellow, trace roots, moist, medium stiff, (ML)						
			SILTY SAND: yellowish brown, fine to medium grained, with clay lenses, moist, medium dense, (SM)	SS S-2	2.5 4.0	100	5-11-12 (23)		
	5								
470			**SILTY SAND**: dark grayish brown, fine to coarse grained, with rock fragments, moist, dense, (SM)	SS S-3	5.0 6.5	100	11-18-24 (42)		
			DECOMPOSED ROCK: light brownish gray dense to very dense	SS S-4	8.5 10.0	100	12-50/6"		
	10								
465			End of Boring at 12.7 feet.	SS S-5	12.5 12.7	100	50/2"		

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80
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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-18

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/25/12 **COMPLETED** 7/25/12
GROUND ELEVATION 481.4 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
480			**TOPSOIL**: (12")	SS S-1	0.0 1.5	100	4-7-8 (15)		
			SANDY SILT: olive yellow, trace roots, dry, stiff, (ML)						
	5		**SILTY SAND**: dark yellowish brown, fine to coarse grained, moist, medium dense, (SM)	SS S-2	2.5 4.0	67	6-9-12 (21)		
475			**CLAYEY SAND**: dark yellowish brown, fine to coarse grained, moist, medium dense, (SC)	SS S-3	5.0 6.5	83	4-8-8 (16)		
	10		**DECOMPOSED ROCK**: brownish gray dense	SS S-4	8.5 9.5	100	31-50/5"		
			End of Boring at 10.2 feet.	SS S-5	10.0 10.2	100	50/2"		

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80

GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-19

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/25/12 **COMPLETED** 7/25/12
GROUND ELEVATION 479.4 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE	▲ SPT N VALUE ▲ PL MC LL 20 40 60 80
			TOPSOIL: (7")							
			SANDY SILT: yellowish brown, trace gravel, trace roots, moist, medium stiff, (ML)	SS S-1	0.0 1.5	100	3-4-5 (9)			
				SS S-2	2.5 4.0	100	4-7-10 (17)			
475	5		Reddish yellow, moist, very stiff	SS S-3	5.0 6.5	100	4-6-8 (14)			
470	10		**DECOMPOSED ROCK**: pale brown and gray very dense	SS S-4	8.5 9.8	100	33-42-50/4"			>>
			End of Boring at 11.2 feet.	SS S-5	11.0 11.2	100	50/2"			>>

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BORING NUMBER B-20

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/26/12 **COMPLETED** 7/26/12
GROUND ELEVATION 496.8 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
495			**TOPSOIL**: (8") **SILT**: brownish red, trace roots, moist, medium stiff, (ML)	SS S-1	0.0 1.5	100	1-3-5 (8)		
				SS S-2	2.5 4.0	100	4-6-7 (13)		
	5								
490			Very stiff	SS S-3	5.0 6.5	56	8-10-7 (17)		
			DECOMPOSED ROCK: light brownish gray very dense	SS S-4	8.5 9.0	100	50/6"		
	10								
			Auger and Spoon Refusal at 11.1 feet.	SS S-5	11.0 11.1	100	50/1"		

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80
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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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SPECIALIZED ENGINEERING
Construction Quality Control • Environmental Consulting
Geotechnical & Forensic Engineering

BORING NUMBER B-21

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/26/12 **COMPLETED** 7/26/12
GROUND ELEVATION 507.4 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (12")	SS S-1	0.0 1.5	100	1-3-4 (7)		
505			**SANDY SILT**: yellowish brown, trace roots, moist, medium stiff, (ML)						
	5		**SILT**: yellowish red to yellowish brown, trace sand, moist, medium stiff to stiff, (ML)	SS S-2	2.5 4.0	100	3-5-6 (11)		
				SS S-3	5.0 6.5	100	4-4-4 (8)		
500									
	10			SS S-4	8.5 10.0	100	3-4-5 (9)		
495									
			SANDY LEAN CLAY: pale yellow with reddish yellow, moist, medium stiff, (CL)	SS S-5	13.5 15.0	100	3-3-3 (6)		
			End of Boring at 13.0 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-22

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/26/12 **COMPLETED** 7/26/12
GROUND ELEVATION 491.3 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
490			**TOPSOIL**: (12")	SS S-1	0.0 1.5	100	2-3-4 (7)		
			LEAN CLAY WITH SAND: dark yellowish brown, trace roots, moist, medium stiff, (CL)						
			SILT WITH SAND: dark yellowish brown, trace fine gravel, moist, stiff to very stiff, (ML)	SS S-2	2.5 4.0	100	6-9-9 (18)		
	5								
485				SS S-3	5.0 6.5	100	6-7-8 (15)		
			Trace rock fragments						
	10			SS S-4	8.5 10.0	100	5-8-12 (20)		
480									
			DECOMPOSED ROCK: gray very dense	SS S-5	13.5 14.0	100	50/6"		
			End of Boring at 14.0 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/20/12

SPECIALIZED ENGINEERING
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BORING NUMBER B-23

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/26/12 **COMPLETED** 7/26/12
GROUND ELEVATION 481 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
480			**TOPSOIL**: (6")	SS S-1	0.0 1.5	100	1-4-5 (9)		
			SANDY SILT: yellowish brown, trace roots, moist, medium stiff, (ML)						
			SANDY SILT: dark yellowish brown, moist, medium dense, (ML)	SS S-2	2.5 4.0	100	5-9-9 (18)		
	5								
475			**SILTY SAND**: reddish yellow, fine to coarse grained, moist, dense, (SM)	SS S-3	5.0 6.5	100	4-12-20 (32)		
			SANDY SILT: dark yellowish brown, moist, (ML)	SS S-4	8.5 10.0	89	3-4-5 (9)		
	10								
470									
				SS S-5	13.5 15.0	89	3-5-5 (10)		
	15		End of Boring at 15.0 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80

GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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SPECIALIZED ENGINEERING
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BORING NUMBER B-24

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/26/12 **COMPLETED** 7/26/12
GROUND ELEVATION 507.5 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			ASPHALT: (6")	SS S-1	0.0 1.5	100	2-2-5 (7)		
			GRAVEL BASE: (12")						
505			**FILL**: grayish brown silty sand, fine to coarse grained, with gravel, moist, loose						
			SILTY SAND: reddish brown, fine to medium grained, little rock fragments, moist, medium dense, (SM)	SS S-2	2.5 4.0	100	4-4-6 (10)		
	5								
			DECOMPOSED ROCK	SS S-3	5.0 6.5	44	16-24-38 (62)	89.5	40
			Auger Refusal at 6.5 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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BORING NUMBER B-25

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/25/12 **COMPLETED** 7/25/12
GROUND ELEVATION 461.5 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
460			**TOPSOIL**: (11")	SS S-1	0.0 1.5	100	2-2-4 (6)		
			SANDY SILT: light yellowish brown, trace fine sand, trace roots, moist, medium stiff, (ML)						
			SANDY LEAN CLAY: reddish brown with brownish gray, trace rock fragments, moist, very stiff, (CL)	SS S-2	2.5 4.0	100	4-7-9 (16)		
	5								
455			**SANDY SILT**: dark grayish brown with brownish red, with mica, trace rock fragments, moist, stiff, (ML)	SS S-3	5.0 6.5	100	4-7-5 (12)		
				SS S-4	8.5 10.0	100	6-19-36 (55)		
	10		End of Boring at 10.0 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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BORING NUMBER B-27

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/20/12 **COMPLETED** 7/20/12
GROUND ELEVATION 477 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE	▲ SPT N VALUE ▲ PL MC LL 20 40 60 80
			TOPSOIL: (12")	SS S-1	0.0 1.5	100	3-5-5 (10)			
475			**SANDY SILT**: reddish brown, trace roots, moist, medium stiff to stiff, (ML)							
				SS S-2	2.5 4.0	100	8-6-8 (14)			
	5									
			CLAYEY SAND: brownish red with brownish yellow, fine to coarse grained, with rock fragments, moist, medium dense, (SC)	SS S-3	5.0 6.5	100	5-5-8 (13)			
470										
			SANDY SILT: yellowish red, with mica, moist, medium dense, (ML)	SS S-4	8.5 10.0	100	7-5-7 (12)			
	10		End of Boring at 10.0 feet.							

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BORING NUMBER B-28

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/20/12 **COMPLETED** 7/20/12
GROUND ELEVATION 483.3 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (12")	SS S-1	0.0 1.5	89	3-3-4 (7)		
			SILT WITH FINE SAND: reddish brown, trace roots, moist, medium stiff, (ML)						
480			**LEAN SANDY CLAY**: red, moist, medium stiff, (CL)	SS S-2	2.5 4.0	83	3-4-5 (9)		
	5								
			CLAYEY SILT: brownish yellow, moist, very stiff, (ML)	SS S-3	5.0 6.5	100	4-6-13 (19)		
475									
	10		**CLAYEY SAND WITH GRAVEL**: reddish brown, fine to coarse grained, moist, medium dense, (SM)	SS S-4	8.5 10.0	100	5-6-11 (17)		
			End of Boring at 10.0 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80

GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-29

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/23/12 **COMPLETED** 7/23/12
GROUND ELEVATION 452 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (10")	SS S-1	0.0 1.5	89	1-3-4 (7)		
450			**SANDY SILT**: olive yellow, trace roots, moist, medium stiff, (ML)						
			SILTY SAND: brownish yellow, fine to coarse grained, with rock fragments, with gray clay lenses, moist, medium dense, (SM)	SS S-2	2.5 4.0	100	7-8-8 (16)		
	5		**LEAN CLAY**: light brownish gray, with rock fragments, moist, stiff, (CL)	SS S-3	5.0 6.5	100	4-6-9 (15)		
445									
				SS S-4	8.5 10.0	100	11-28-50/6"		
	10		**DECOMPOSED ROCK**: light brownish yellow very dense						
440									
			Auger and Spoon Refusal at 12.1 feet.	SS S-5	12.0 12.1	100	50/1"		

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/20/12

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BORING NUMBER B-30

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/23/12 **COMPLETED** 7/23/12
GROUND ELEVATION 450.4 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (7")	SS S-1	0.0 1.5	78	1-3-5 (8)		
			SANDY SILT: olive yellow, trace roots, moist, medium stiff, (ML)						
			SANDY SILT: grayish brown with red, trace quartz fragments, moist, stiff, (ML)	SS S-2	2.5 4.0	89	5-5-8 (13)		
445	5		**LEAN CLAY**: grayish brown, moist, very stiff, (CL)	SS S-3	5.0 6.5	33	10-13-8 (21)		
440	10		**SILTY SAND WITH FINE GRAVEL**: yellowish brown, fine to coarse grained, moist, medium dense, (SM)	SS S-4	8.5 10.0	100	7-6-7 (13)	76.6	31.1
			DECOMPOSED ROCK: brownish gray very dense	SS S-5	13.5 14.3	89	50/6"		
			End of Boring at 14.3 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80

GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-31

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/23/12 **COMPLETED** 7/23/12
GROUND ELEVATION 468.2 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (8")	SS S-1	0.0 1.5	100	2-3-4 (7)		
			SANDY SILT: red and olive yellow, trace roots, moist, loose, (ML)						
465			**LEAN CLAY**: red, moist, stiff, (CL)	SS S-2	2.5 4.0	100	4-8-10 (18)		
	5								
			SANDY SILT: light grayish brown, moist, very stiff, (ML)	SS S-3	5.0 6.5	100	5-11-11 (22)		
460									
	10		**SILTY SAND**: olive yellow, fine to medium grained, with rock fragments, moist, dense, (SM)	SS S-4	8.5 10.0	100	9-15-16 (31)		
455									
	15			SS S-5	13.5 15.0	100	14-16-15 (31)		
			End of Boring at 15.0 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80

GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-32

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/23/12 **COMPLETED** 7/23/12
GROUND ELEVATION 461.6 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (12")	SS S-1	0.0 1.5	89	2-4-5 (9)		
460			**SANDY SILT**: olive brown, moist, medium stiff, (ML)						
			FAT CLAY: brownish yellow and reddish brown, moist, stiff, (CH)	SS S-2	2.5 4.0	100	4-7-7 (14)		
	5			SS S-3	5.0 6.5	100	5-7-9 (16)		
455									
			DECOMPOSED ROCK: grayish brown very dense	SS S-4	8.5 8.9	100	100/5"		
	10								
450									
				SS S-5	13.5 14.3	100	50/4"		
			End of Boring at 14.3 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80
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GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

SPECIALIZED ENGINEERING
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BORING NUMBER B-33

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/20/12 **COMPLETED** 7/20/12
GROUND ELEVATION 466.4 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE	▲ SPT N VALUE ▲ PL MC LL 20 40 60 80
			TOPSOIL: (12")	SS S-1	0.0 1.5	83	2-4-5 (9)			
465			**SANDY SILT WITH FINE SAND**: reddish yellow, trace roots, moist, medium stiff, (ML)							
			SANDY SILT: reddish yellow with black, moist, stiff to very stiff, (ML)	SS S-2	2.5 4.0	100	9-10-10 (20)			
	5									
460				SS S-3	5.0 6.5	100	5-6-7 (13)			
			DECOMPOSED ROCK: brownish yellow sandy silt, moist, hard	SS S-4	8.5 9.4	91	26-50/5"			>>
			End of Boring at 9.4 feet.							

GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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SPECIALIZED ENGINEERING
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BORING NUMBER B-34

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/20/12 **COMPLETED** 7/20/12
GROUND ELEVATION 478.2 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (12")	SS S-1	0.0 1.5	67	3-5-7 (12)		
			SANDY SILT WITH FINE SAND: light reddish yellow, with quartz fragments, moist, stiff, (ML)						
475				SS S-2	2.5 4.0	39	14-11-12 (23)		
	5		**SANDY SILT**: reddish yellow, moist, very stiff, (ML)						
			CLAYEY SAND: pale yellow and reddish brown, with quartz fragments, moist, medium dense to dense, (SC)	SS S-3	5.0 6.5	100	11-13-12 (25)		
470									
	10			SS S-4	8.5 10.0	78	10-16-31 (47)		
465									
	15			SS S-5	13.5 15.0	100	16-14-18 (32)		
			End of Boring at 15.0 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80

GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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BORING NUMBER B-35

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/20/12 **COMPLETED** 1/9/00
GROUND ELEVATION 478.5 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			ASPHALT: (7")	SS S-1	0.0 1.5	100	3-4-5 (9)		
			GRAVEL BASE: (11")						
			SANDY SILT: brownish red, moist, medium stiff						
475				SS S-2	2.5 4.0	100	5-6-7 (13)		
	5								
			Yellowish brown with black, with rock fragments, moist, very stiff	SS S-3	5.0 6.5	100	18-9-17 (26)		
470									
	10			SS S-4	8.5 10.0	100	9-10-10 (20)		
			End of Boring at 10.0 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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BORING NUMBER B-36

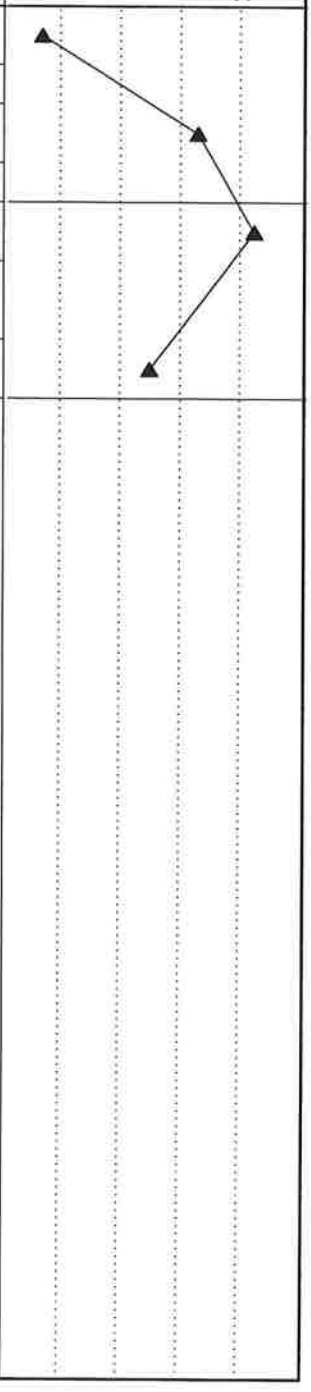
CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/24/12 **COMPLETED** 7/24/12
GROUND ELEVATION 481.5 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
480	0		**TOPSOIL**: (11")	SS S-1	0.0 1.5	100	2-4-9 (13)		
			SANDY SILT: olive yellow, trace roots, moist, stiff, (ML)						
			SANDY SILT: olive yellow, with rock fragments, moist, hard, (ML)	SS S-2	2.5 4.0	100	25-31-34 (65)		
	5			SS S-3	5.0 6.5	100	22-32-50/6"		
475			**DECOMPOSED ROCK**: dark grayish brown dense						
				SS S-4	8.5 10.0	100	14-21-28 (49)		
	10		End of Boring at 10.0 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80



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BORING NUMBER B-37

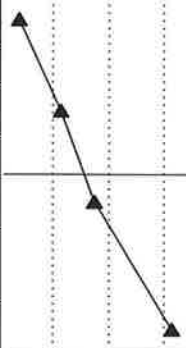
CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/25/12 **COMPLETED** 7/25/12
GROUND ELEVATION 464.3 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (12")	SS S-1	0.0 1.5	100	2-3-4 (7)		
			SANDY SILT: yellowish brown, trace roots, moist, medium stiff, (ML)						
460	5		**CLAYEY SAND**: yellowish brown and pale yellow, trace rock fragments, moist, medium dense, (SC)	SS S-2	2.5 4.0	100	4-8-14 (22)		
			SILTY SAND: very pale brown to pale brown, fine to coarse grained, trace rock fragments, moist, dense, (SM)	SS S-3	5.0 6.5	100	11-16-18 (34)		
455	10		**DECOMPOSED ROCK**: pale brown sand with silt, with quartz fragments, moist, very dense	SS S-4	8.5 10.0	100	16-27-35 (62)		
			End of Boring at 10.0 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80



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BORING NUMBER B-38

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/25/12 **COMPLETED** 7/25/12
GROUND ELEVATION 462 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (10")	SS S-1	0.0 1.5	100	1-2-4 (6)		
460			**SANDY SILT**: yellowish brown, trace roots, moist, medium stiff, (ML)						
	5		**SILTY SAND**: yellowish brown, fine to coarse grained, moist, medium dense, (SM)	SS S-2	2.5 4.0	100	2-4-6 (10)		
455			**SANDY SILT**: yellowish brown, moist, very stiff, (ML)	SS S-3	5.0 6.5	100	3-6-13 (19)		
	10		**DECOMPOSED ROCK**: grayish brown silty sand, fine to medium grained, moist, very dense	SS S-4	8.5 10.0	100	24-36-28 (64)		
			End of Boring at 10.0 feet.						

▲ SPT N VALUE ▲

PL MC LL

20 40 60 80

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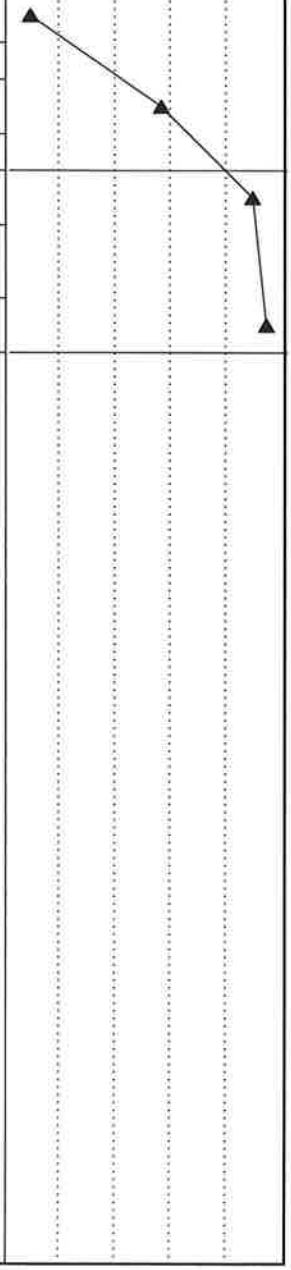
BORING NUMBER B-39

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED _____ **COMPLETED** _____
GROUND ELEVATION 477.3 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES _____
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
475			**TOPSOIL**: (10")	SS S-1	0.0 1.5	100	1-3-6 (9)		
			SANDY CLAY: red, trace roots, moist, medium stiff, (CL)						
	5		**SANDY SILT**: olive yellow, trace rock fragments, moist, very dense, (ML)	SS S-2	2.5 4.0	100	14-20-36 (56)		
470			**DECOMPOSED ROCK**: brown dense	SS S-3	5.0 6.5	100	25-25-64 (89)		
	10			SS S-4	8.5 10.0	100	31-49-45 (94)		
			End of Boring at 10.0 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80



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BORING NUMBER B-39

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED _____ COMPLETED _____
GROUND ELEVATION 477.3 ft CAVE IN ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES _____
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (10")	SS S-1	0.0 1.5	100	1-3-6 (9)		
475			**SANDY CLAY**: red, trace roots, moist, medium stiff, (CL)						
	5		**SANDY SILT**: olive yellow, trace rock fragments, moist, very dense, (ML)	SS S-2	2.5 4.0	100	14-20-36 (56)		
				SS S-3	5.0 6.5	100	25-25-64 (89)		
470			**DECOMPOSED ROCK**: brown dense						
	10			SS S-4	8.5 10.0	100	31-49-45 (94)		
			End of Boring at 10.0 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80

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BORING NUMBER B-40

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/25/12 COMPLETED 7/25/12
GROUND ELEVATION 465 ft CAVE IN ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (12")	SS S-1	0.0 1.5	100	2-4-5 (9)		
			SANDY SILT: yellowish brown, trace roots, moist, medium stiff, (ML)	SS S-2	2.5 4.0	100	4-4-5 (9)		
460	5		**CLAYEY SAND**: dark yellowish brown, fine to coarse grained, moist, medium dense, (SM)	SS S-3	5.0 6.5	100	6-7-10 (17)		
455	10		**SANDY SILT**: light olive brown, little rock fragments, moist, dense, (ML)	SS S-4	8.5 10.0	100	10-20-25 (45)	95.3	54.5
			End of Boring at 10.0 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80

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BORING NUMBER B-41

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/25/12 **COMPLETED** 7/25/12
GROUND ELEVATION 462.6 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (9")	SS S-1	0.0 1.5	100	2-3-4 (7)		
460			**SANDY SILT**: yellowish brown, trace roots, moist, medium stiff, (ML)						
	5		**SANDY SILT**: yellowish brown, moist, stiff, (ML)	SS S-2	2.5 4.0	100	4-6-8 (14)		
455			**SILTY SAND**: yellowish brown, fine to coarse grained, moist, dense, (SM)	SS S-3	5.0 6.5	100	7-13-18 (31)		
	10		**DECOMPOSED ROCK**: brownish gray dense	SS S-4	8.5 10.0	100	25-50/6"		
			End of Boring at 10.0 feet.						

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80

GEOTECH BH PLOTS REVISED 125522 LOVETTSVILLE PARK LOGS-FRED.GPJ BORINGS_CURRENT_12_7_06.GDT 8/16/12

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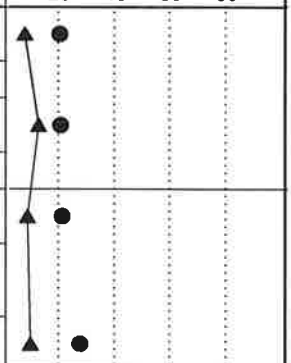
BORING NUMBER B-43

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/26/12 **COMPLETED** 7/26/12
GROUND ELEVATION 494.9 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (8")	SS S-1	0.0 1.5	100	1-3-4 (7)		
			LEAN SANDY CLAY: yellowish red, trace roots, moist, medium stiff, (CL)						
			CLAYEY SAND: reddish yellow, moist, medium dense, (SC)	SS S-2	2.5 4.0	100	3-5-7 (12)		
490	5		**SANDY SILT**: very pale brown, trace sand, with mica, moist, medium stiff, (ML)	SS S-3	5.0 6.5	100	3-4-4 (8)		
			Sandier with depth						
485	10			SS S-4	8.5 10.0	100	3-4-5 (9)	100.0	57.5
			End of Boring at 10.0 feet.						



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BORING NUMBER B-44

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/26/12 **COMPLETED** 7/26/12
GROUND ELEVATION 496.2 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE	▲ SPT N VALUE ▲ PL MC LL 20 40 60 80
495			**TOPSOIL**: (12")	SS S-1	0.0 1.5	100	1-2-4 (6)			
			SANDY SILT: reddish yellow, moist, medium stiff to stiff, (ML)	SS S-2	2.5 4.0	100	3-5-7 (12)			
	5									
490				SS S-3	5.0 6.5	100	3-3-5 (8)			
	10		**CLAYEY SAND**: pale brown and yellowish brown, fine to medium grained, moist, loose, (SC)	SS S-4	8.5 10.0	100	3-4-5 (9)			
			End of Boring at 10.0 feet.							

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BORING NUMBER B-45

CLIENT Loudon Co. Department of Construction & Waste Management
PROJECT NAME Lovettesville Park
PROJECT NUMBER 125522
PROJECT LOCATION Lovettesville, Virginia
DATE STARTED 7/25/12 **COMPLETED** 7/25/12
GROUND ELEVATION 457.1 ft **CAVE IN** ft.
DRILLING CONTRACTOR Connelly and Associates, Inc.
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING None
DRILLED BY J. Powell
AT END OF DRILLING None
NOTES
AFTER DRILLING Backfilled upon completion

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft)	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Su (ksf)	% < #200 SIEVE
			TOPSOIL: (12")	SS S-1	0.0 1.5	100	2-3-6 (9)		
455			**SILT WITH FINE GRAVEL**: pale brown, trace roots, moist, loose, (ML)						
	5		**SANDY CLAY**: light brownish gray, moist, medium stiff, (CL)	SS S-2	2.5 4.0	100	3-4-5 (9)		
450			**CLAYEY SAND**: yellowish brown, fine to coarse grained, moist, loose to very dense, (SC)	SS S-3	5.0 6.5	100	3-3-5 (8)		
	10		**DECOMPOSED ROCK**: brownish gray dense	SS S-4	8.5 10.0	100	18-26-48 (74)		
			Auger and Spoon Refusal at 11.6 feet.	SS S-5	11.5 11.6	0	50/1"		

▲ SPT N VALUE ▲
PL MC LL
20 40 60 80
>>

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APPENDIX C

LABORATORY TEST RESULTS

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SUMMARY OF TEST RESULTS

CLIENT Loudon Co. Department of Construction & Waste Management **PROJECT NAME** Lovettesville Park

PROJECT NUMBER 125522 **PROJECT LOCATION** Lovettesville, Virginia

Borehole	Depth (ft)	Classification	Liquid Limit	Plastic Limit	Plasticity Index	Moisture Content (%)	%<#4 Sieve	%<#200 Sieve	N Value	Other Tests
B-06	0	ML (V)				16.1			**(5)**	
B-06	2.5	ML (V)				9.5			**(9)**	
B-06	5	ML	39	26	13	20.6			(14)	
B-10	0	ML (V)				13.2			(7)	
B-10	2.5	SM				10.9	99.6	47.9	(22)	
B-10	5	SM (V)				8.9			(32)	
B-24	0	FILL				6.4			(7)	
B-24	2.5	SM (V)				12.6			(10)	
B-24	5	SM				12.2	89.5	40	(62)	
B-30	8.5	SM				12.9	76.6	31.1	(13)	
B-32	2.5	CH	55	28	27	26.9			(14)	
B-34	2.5	ML	39	29	10	24			(23)	
B-38	0	ML (V)				16.6			(6)	
B-38	2.5	SM	42	26	16	18.6			(10)	
B-38	5	ML (V)				18			(19)	
B-38	8.5	SM (V)				7			(64)	
B-40	0	ML (V)				13.2			(9)	
B-40	2.5	ML (V)				18.2			(9)	
B-40	5	SC (V)				14.6			(17)	
B-40	8.5	ML				13.3	95.3	54.5	(45)	
B-43	0	CL (V)				19.7			(7)	
B-43	2.5	SC (V)				20			(12)	
B-43	5	ML (V)				20.4			(8)	
B-43	8.5	ML				26.8	100	57.5	(9)	
B-44	0	ML (V)				18.6			(6)	
B-44	2.5	ML	38	27	11	20.3			(12)	
B-44	5	ML (V)				21.7			(8)	
B-44	8.5	SC (V)				19.6			(9)	

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Engineers • Geologists • Inspectors

CALIFORNIA BEARING RATIO TEST

Project:	Lovettsville Park	**Project No.**	125522
Client:	Loudoun County	**Lab No.**	6121
Locations:	B-38	**Sample Date:**	7/31/2012
Test Methods:	D2488, D2216, D4318	**Proctor Type:**	AASHTO T-99

Classifications:

Soil Description: Tan Sandy Lean Clay

Classifications: USCS: CL

AASHTO: A-4

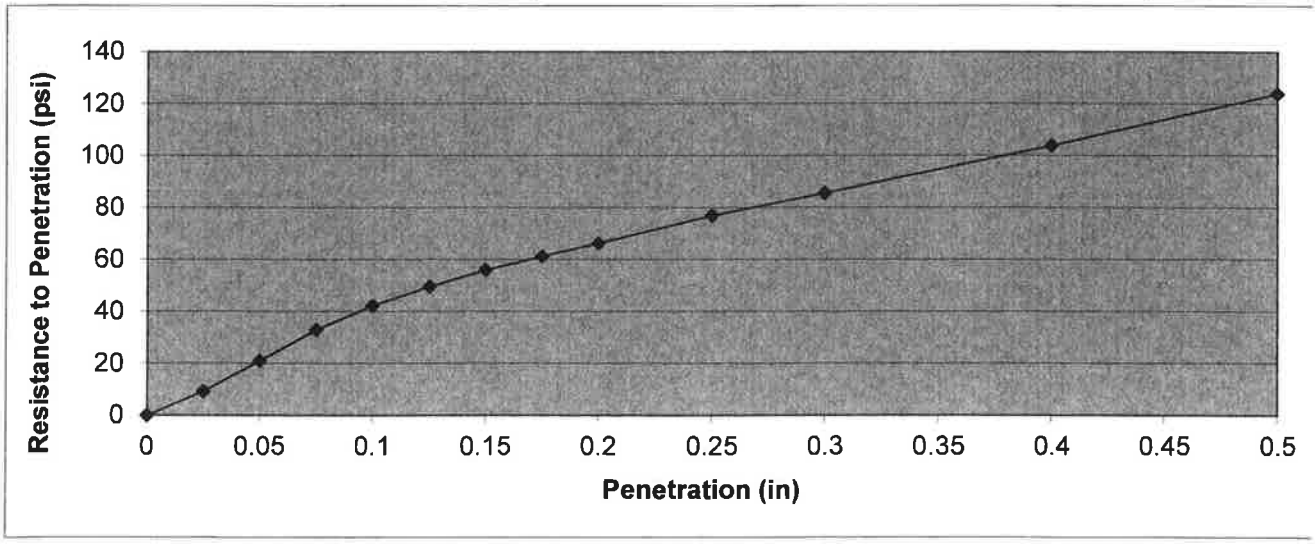
Liquid Limit: 34

Plasticity Index 10

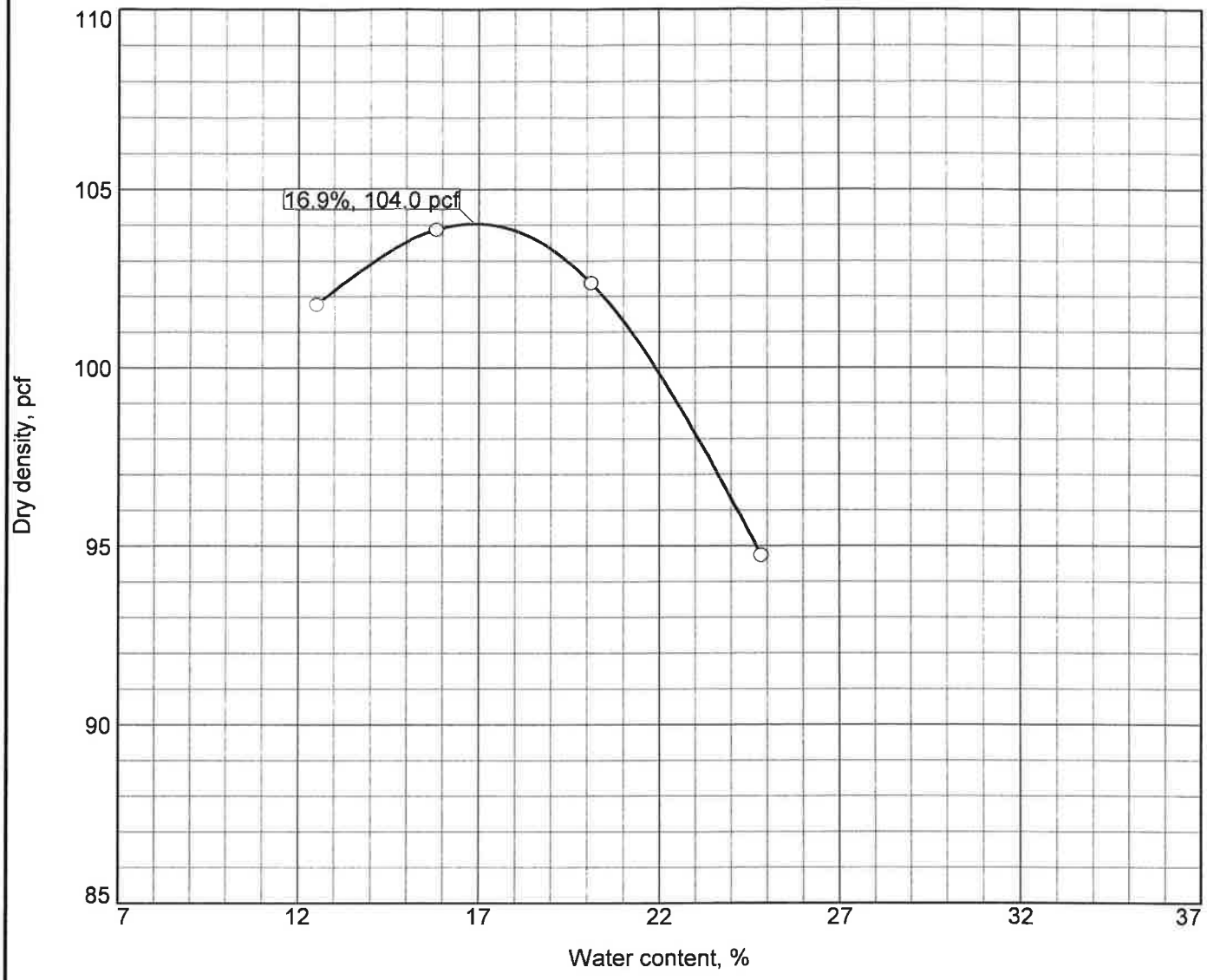
Sieve Size	Percent Passing
3/4"	100
3/8"	100
#4	100
#10	100
#40	89
#200	70
Mica	None

Proctor and CBR Test Results

Maximum Density - pcf	104.0
% Optimum Moisture	16.9
% Compaction	95%
% Moisture (before soak)	17.2%
% Moisture (after soak)	26.4%
% Swell	1.7%
CBR	4.4
Resiliency Factor	2.0



COMPACTION TEST REPORT



Test specification: AASHTO T 99-01 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	CL	A-4(6)	17.0		34	10	0	70

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 104.0 pcf Optimum moisture = 16.9 %	Tan Sandy Lean Clay

Project No. 125522 **Client:** Loudoun County
Project: Lovettsville Park

○ **Location:** B-38 **Sample Number:** 6121

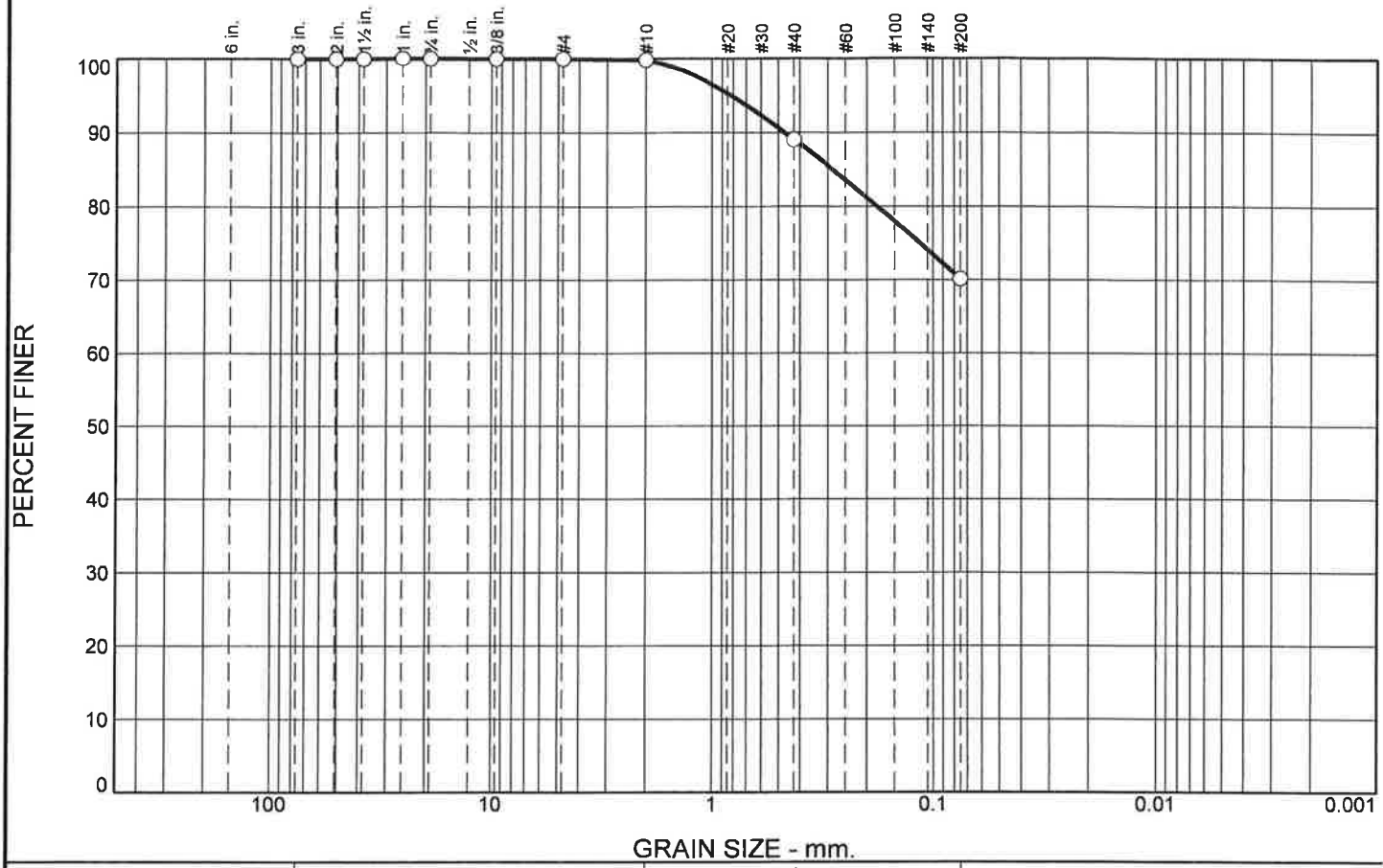
Remarks:

SPECIALIZED ENGINEERING

Frederick, Maryland

Figure

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	0	11	19	70	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100		
2 in.	100		
1 1/2 in.	100		
1 in.	100		
3/4 in.	100		
3/8 in.	100		
# 4	100		
# 10	100		
# 40	89		
#200	70		

* (no specification provided)

Soil Description

Tan Sandy Lean Clay

Atterberg Limits

PL= 24 LL= 34 PI= 10

Coefficients

D_{90}= 0.4692 D_{85}= 0.2870 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(6)

Remarks

NM = 17.0%

Location: B-38
Sample Number: 6121

Date: 7-31-12

SPECIALIZED ENGINEERING
Frederick, Maryland

Client: Loudoun County
Project: Lovettsville Park

Project No: 125522 **Figure**

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Engineers • Geologists • Inspectors

CALIFORNIA BEARING RATIO TEST

Project:	Lovettsville Park	**Project No.**	125522
Client:	Loudoun County	**Lab No.**	6122
Locations:	B-27	**Sample Date:**	7/31/2012
Test Methods:	D2488, D2216, D4318	**Proctor Type:**	AASHTO T-99

Classifications:

Soil Description: Brown Elastic Silt with Sand

Classifications: USCS: MH

AASHTO: A-7-5

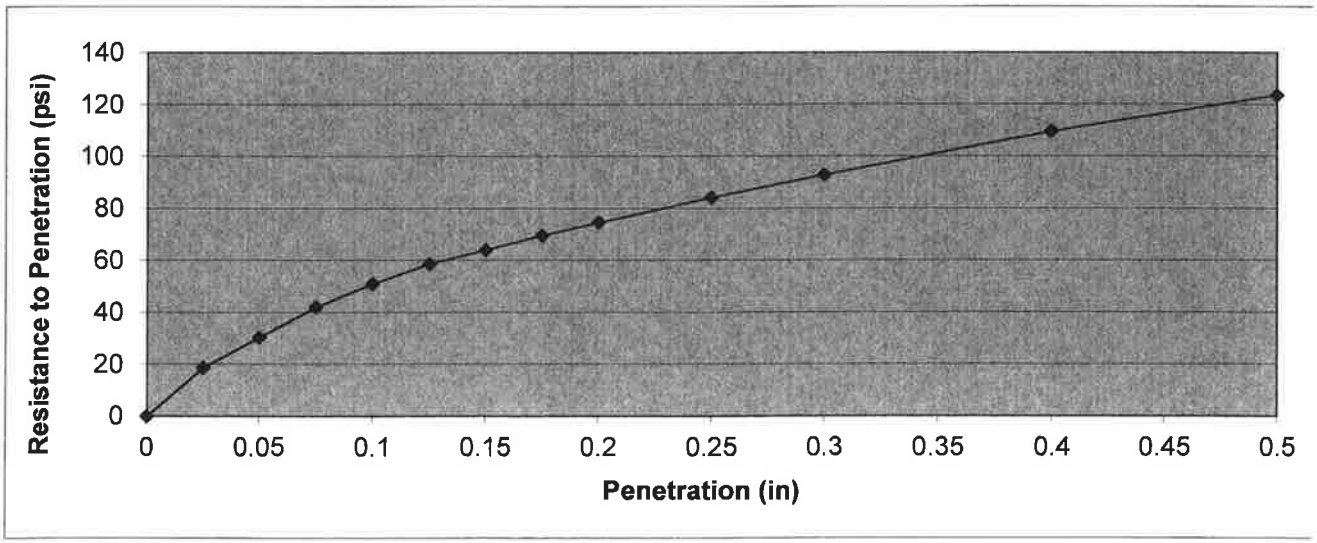
Liquid Limit: 58

Plasticity Index 27

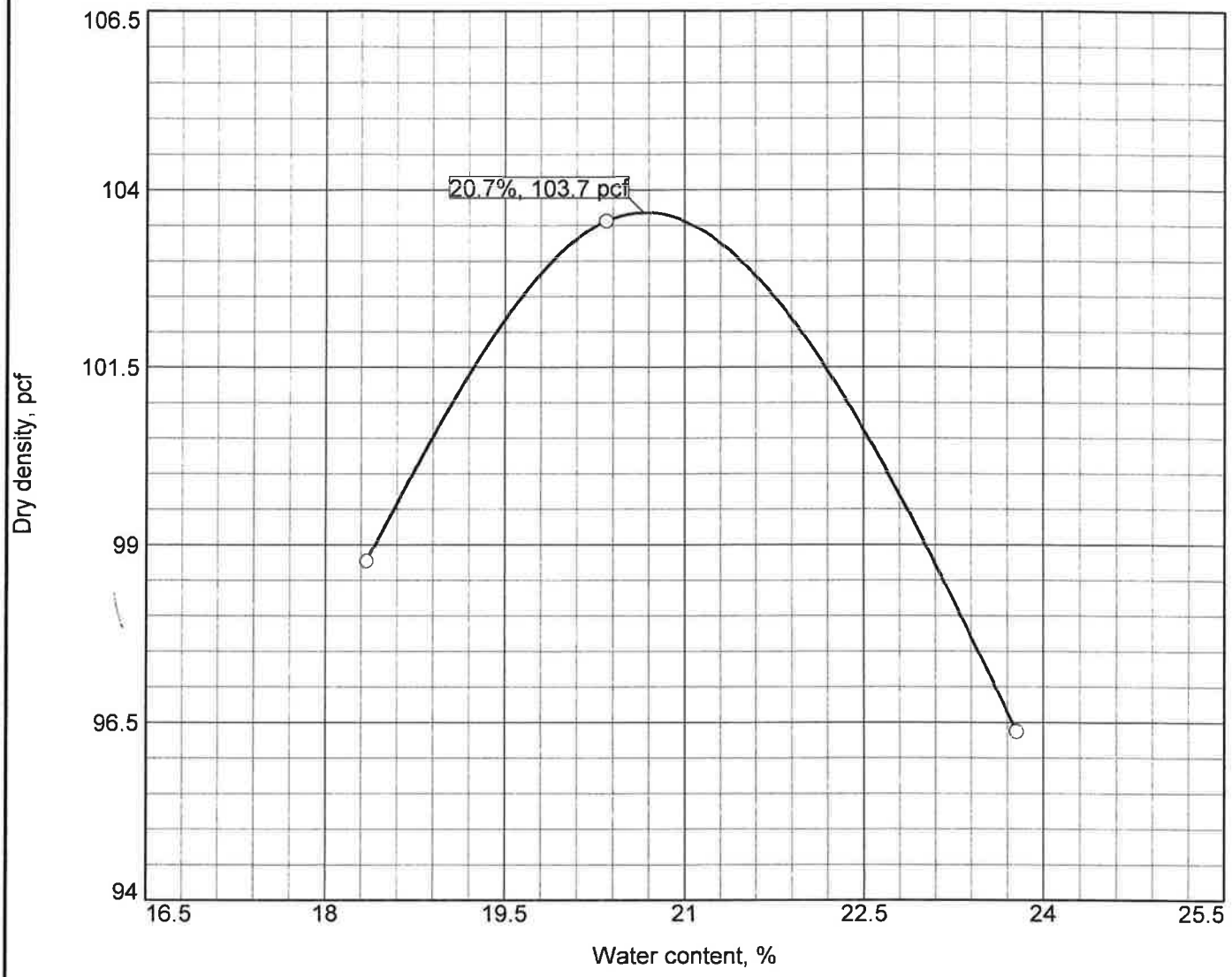
Sieve Size	Percent Passing
3/4"	100
3/8"	100
#4	100
#10	100
#40	80
#200	75
Mica	None

Proctor and CBR Test Results

Maximum Density - pcf	103.7
% Optimum Moisture	20.7
% Compaction	96%
% Moisture (before soak)	21.4%
% Moisture (after soak)	27.7%
% Swell	2.5%
CBR	5.1
Resiliency Factor	2.0



COMPACTION TEST REPORT



Test specification: AASHTO T 99-01 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	MH	A-7-5(22)	19.6		58	27	0	75

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 103.7 pcf Optimum moisture = 20.7 %	Brown Elastic Silt with Sand

Project No. 125522 **Client:** Loudoun County
Project: Lovettsville Park

○ **Location:** B-27 **Sample Number:** 6122

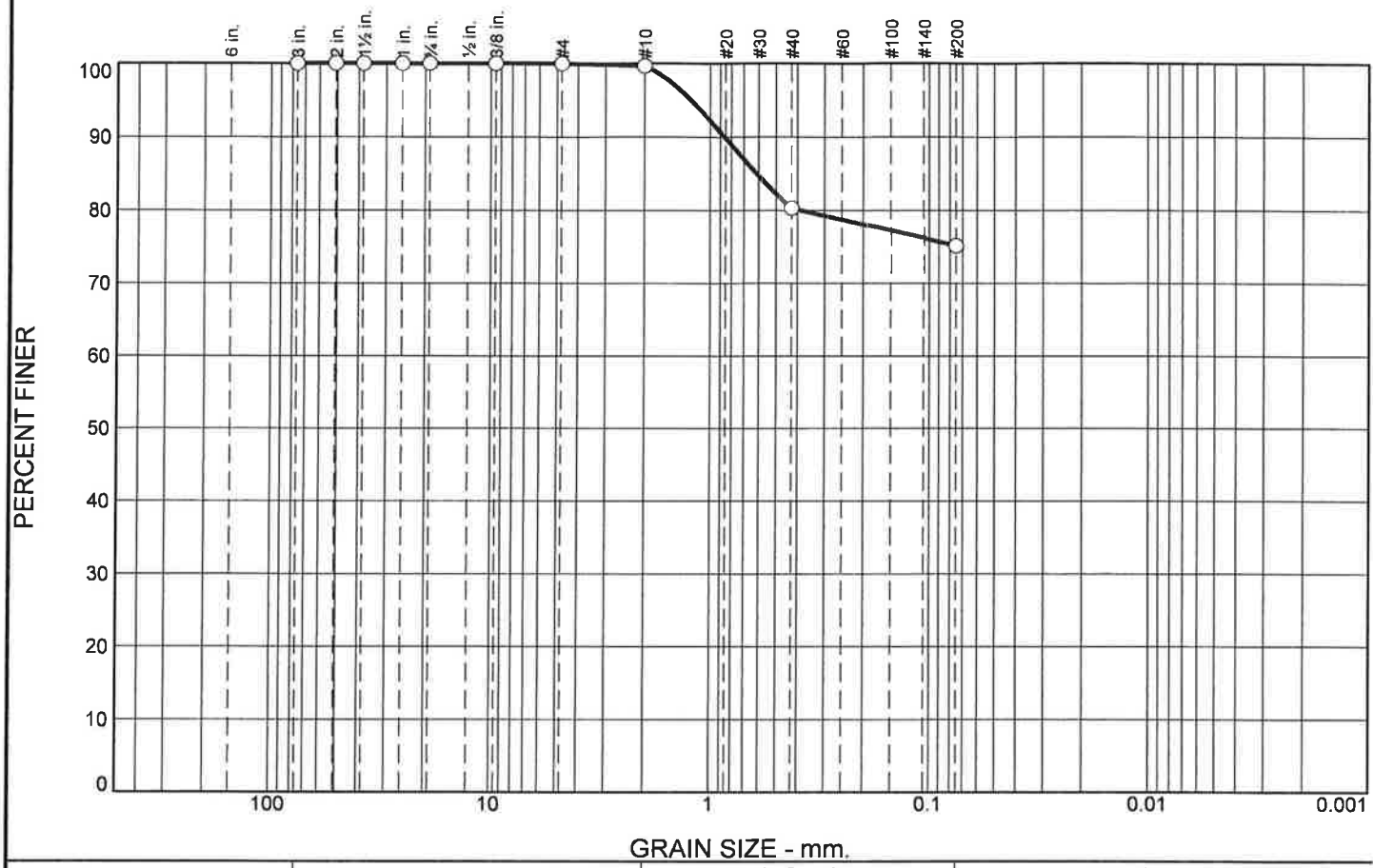
Remarks:

SPECIALIZED ENGINEERING

Frederick, Maryland

Figure

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	0	20	5	75	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100		
2 in.	100		
1 1/2 in.	100		
1 in.	100		
3/4 in.	100		
3/8 in.	100		
# 4	100		
# 10	100		
# 40	80		
#200	75		

* (no specification provided)

Soil Description

Brown Elastic Silt with Sand

Atterberg Limits

PL= 31 LL= 58 PI= 27

Coefficients

D_{90}= 0.8615 D_{85}= 0.6143 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(22)

Remarks

NM = 19.6%

Location: B-27
Sample Number: 6122

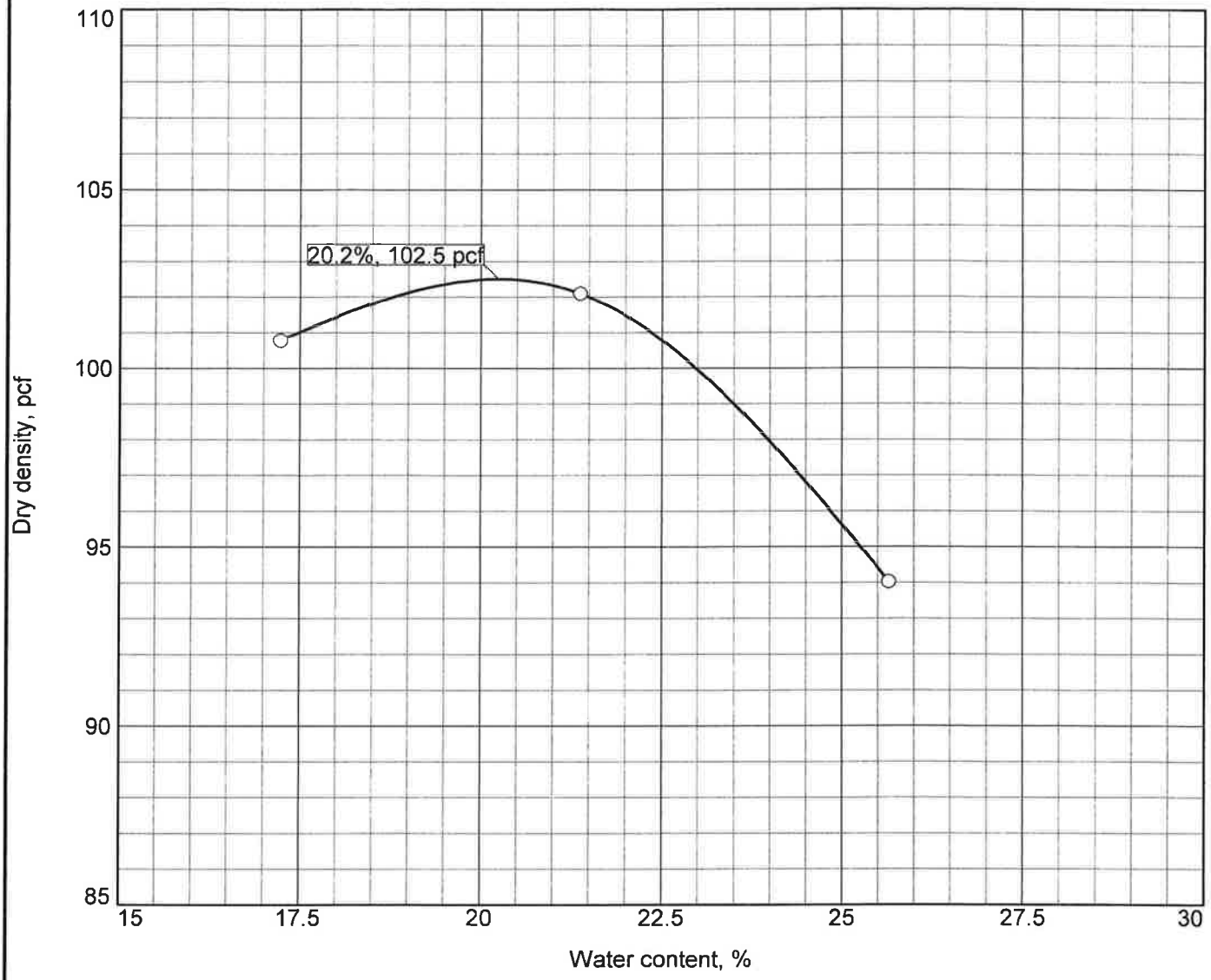
Date: 7-31-12

SPECIALIZED ENGINEERING
Frederick, Maryland

Client: Loudoun County
Project: Lovettsville Park

Project No: 125522 **Figure**

COMPACTION TEST REPORT



Test specification: AASHTO T 99-01 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	CH	A-7-6(21)	17.9		53	24	0	79

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 102.5 pcf Optimum moisture = 20.2 %	Tan Fat Clay with Sand

Project No. 125522 **Client:** Loudoun County

Project: Lovettsville Park

○ **Location:** B-3 **Sample Number:** 6123

Remarks:

SPECIALIZED ENGINEERING

Frederick, Maryland

Figure

APPENDIX D

ASFE BULLETIN

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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