REPORT OF PRELIMINARY GEOTECHNICAL AND STORMWATER BASIN AREA INVESTIGATION

PROPOSED DAY SCHOOL AND MEDICAL OFFICE

982 Georgetown Franklin Turnpike (County Route 518)
Block 28005, Lots 57 & 58
Township of Montgomery, Somerset County, New Jersey

Prepared for:

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APPENDICES

1.0 EXECUTIVE SUMMARY

Dynamic Earth, LLC (Dynamic Earth) has completed a preliminary geotechnical investigation and stormwater basin area investigation for the proposed site redevelopment. The subsurface conditions encountered generally consisted of existing fill material underlain by natural residual soil deposits and weathered rock/rock. **The existing fill material is not suitable for direct foundation support without the risk of excessive settlement. As such, the existing fill material will need to be overexcavated and replaced below the proposed foundations.** Following overexcavation of the existing fill material (where encountered) and proper subgrade preparation, conventional shallow foundations are anticipated to be feasible for the proposed development. Due to the moisture sensitivity and plasticity of the on-site soils, limited overexcavation and replacement, subgrade stabilization, and/or re-compaction should be anticipated below proposed building and/or pavement areas.

Due to the subsurface conditions encountered, Dynamic Earth should remain involved as the design progresses to review the potential impacts to the recommendations detailed herein and/or provide supplemental recommendations for the proposed development.

2.0 PROJECT DETAILS

The subject site is located at 982 Georgetown Franklin Turnpike (County Route 518) in the Township of Montgomery, Somerset County, New Jersey and is further identified as Block 28005, Lots 57 and 58. The site is bound to the north by on-going construction of residential property, with East Hartwick Drive beyond; to the east by commercial properties with Route 206 beyond; to the south by County Route 518 (Georgetown Franklin Turnpike); with residential and agricultural property beyond; and to the west by residential property. The site of the proposed construction is shown on the attached *Test Location Plan*.

At the time of Dynamic Earth's investigation, the northern portion of the site was developed with an existing single-story residential dwelling and associated driveway and wooded/landscaped areas. Based on a September 15, 2022 *Conceptual Site Plan A* prepared by Dynamic Engineering Consultants, P.C, the proposed site redevelopment will include the demolition of the existing structure and construction of a Malvern Day School building within the southeastern portion of the site (occupying a footprint area of approximately 4,300 square feet) and a proposed medical support building within the northeastern portion of the site (occupying a footprint area of approximately 4,000 square feet). Associated items include parking areas and utilities. Stormwater management facilities are planned within the northeastern, northern, and western portions of the site. Proposed grading plans were not available at the time of this report; however, preliminarily anticipate earth fills on the order of five feet will be required within the eastern portion of the subject site.

Topographic information was provided on a September 7, 2022 *ALTA/NSPS LAND TITLE SURVEY* prepared by Dynamic Survey, LLC. Existing site elevations generally slope downwards from an approximate elevation of 146 feet within the western portion of the site to an elevation of 125 feet within the eastern portion of the site. The elevations provided in this report reference the 1988 North American Vertical Datum (NAVD 88), unless otherwise noted.

Final structural loads were not developed at this time; however, based on our experience with similar projects, the proposed buildings are expected to be a one- to two-story masonry and metal framed structures constructed with a concrete slab-on-grade and no basement. The maximum loads are assumed to be less than the following:

- wall Load – 3.0 kips per linear foot;
- column Load – 120 kips; and
- floor Slab Load – 125 pounds per square foot.

3.0 SCOPE OF SERVICES

3.1 Field Investigation

Field exploration for this preliminary investigation was conducted by means of four soil borings (identified as borings B-1 through B-4), four structural test pits (identified as TP-1 through TP-4) and seven soil profile pits (identified as SPP-1 through SPP-7). Prior to the advancement of soil borings, structural test pits, and soil profile pits, ground penetrating radar (GPR) was performed at the test locations in an attempt to avoid potential subsurface utilities. The borings were drilled using hollow stem auger drilling techniques with an ATV-mounted drill rig and the soil profile pits and structural test pits were excavated with a track-mounted excavator. Test locations are summarized in the following table and are shown on the accompanying *Test Location Plan* included within the Appendix of this report.

TEST LOCATION SUMMARY TABLE		
Number	**Proposed Location**	**Final Depth (feet)**
B-1	Medical Support: Northwest corner of building	22.0
B-2	Medical Support: Southeast corner of building	22.0
B-3	Malvern School: Northwest corner of building	14.0
B-4	Malvern School: Southeast corner of building	16.0
TP-1	Medical Support: Northeast corner of building	12.0
TP-2	Medical Support: Southwest corner of building	12.0
TP-3	Malvern School: Northeast corner of building	12.3*
TP-4	Malvern School: Southwest corner of building	12.0
SPP-1	Potential Stormwater Management Facility –	11.2

TEST LOCATION SUMMARY TABLE		
Number	**Proposed Location**	**Final Depth (feet)**
SPP-2	Northeastern Portion of the Site	12.0
SPP-3	Potential Stormwater Management Facility – Northern Portion of the Site	10.0
SPP-4		8.5
SPP-5	Potential Stormwater Management Facility – Western Portion of the Site	10.0
SPP-6		11.0
SPP-7	Potential Stormwater Management Facility – Northeastern Portion of the Site	12.0

* Refusal encountered on apparent weathered rock

The soil borings, soil profile pits, and test pits were completed in the presence of a Dynamic Earth engineer who performed field tests, recorded visual classifications, and collected samples of the various strata encountered. The test locations were located in the field using conventional taping procedures with estimated right angles, and are presumed to be accurate within several feet of the location plotted on the plans.

Soil borings and standard penetration tests (SPTs) were conducted in general accordance with ASTM D6151 (*Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling*). Standard penetration tests (SPTs) were conducted in general accordance with ASTM D1586 (*Standard Test Method for Standard Penetration Test and Split Barrel Sampling of Soils).* The SPT resistance value (N) is used in conjunction with many correlations which relate to blow count, or SPT N-value to engineering behavior of soils to develop foundation and earthwork recommendations. Unconfined compressive strength (Q_p) values were assessed with a pocket penetrometer within the fine-grained soils.

The soils encountered within the area of the proposed/anticipated stormwater management areas were classified using the United States Department of Agriculture (USDA) Classification System. Observations were made for groundwater and/or soil mottling and mineral deposits potentially indicative of zones of saturation or seasonal high groundwater. The results of our preliminary stormwater basin soils area investigation are included herein.

Groundwater level observations were recorded during and at the completion of field operations prior to backfilling the test locations. Seasonal variations, temperature, tidal influence, anthropogenic activities, seasonality, soil permeability, and precipitation will influence the actual and observed groundwater levels. Groundwater elevations derived from sources other than seasonally observed groundwater monitoring wells may not be representative of true groundwater levels.

Environmental conditions were not evaluated by Dynamic Earth at the time of this report.

3.2 Laboratory Testing Program

Physical/Textural Analysis: Each sample was visually classified in general accordance with ASTM D-2488 (visual-manual procedure). In addition, representative samples of selected strata encountered were subjected to a laboratory testing program which included moisture content determinations (ASTM D-2216), particle size distribution (ASTM D-6913), Atterberg Limits (ASTM D-4318), and washed gradation analyses (ASTM D-1140) in order to perform supplementary engineering soil classifications in general accordance with ASTM D-2487. The soil strata tested were classified by the Unified Soil Classification System (USCS) and results of the laboratory testing are summarized in the following table:

SUMMARY OF LABORATORY PHYSICAL/TEXTURAL RESULTS							
Boring No.	**Sample No.**	**Depth (feet)**	**Moisture Content (%)**	**Liquid Limit (%)**	**Plasticity Index (%)**	**Percent Passing No. 200 (%)**	**USCS Classification**
B-1	S-3	4-6	29.3	70	37	63	CH
B-2	S-2	2-4	26.2	54	24	58	MH
B-3	S-5	8-10	8.3	--	--	24	GC
B-4	S-8	14-16	20.0	--	--	38	GC

The engineering classifications are useful when considered in conjunction with the additional site data to estimate other properties of the soil types encountered and to predict the soil's behavior under construction and service loads.

Permeability Testing: Undisturbed tube permeameter tests were collected in general accordance with New Jersey Department of Environmental Protection (N.J.D.E.P.) *Stormwater Best Practices Manual – Chapter 12: Soil Testing Criteria* on representative samples obtained from anticipated stormwater management facility infiltration depths. Results of the permeability testing are included herein.

4.0 SUMMARY OF SUBSURFACE CONDITIONS

4.1 Site Geology

The subject site is located in the Piedmont Physiographic Province of New Jersey. Specifically, the site is underlain by the Lower Jurassic and Upper Triassic aged Passaic Formation. The Passaic Formation includes reddish brown to brownish-purple siltstone; silty mudstone; very fine-grained sandstone; and shale, predominantly in cyclical beds. Overburden material also includes man-made fill soils.

4.2 United States Department of Agriculture (USDA) Web Soil Survey

Based on a review of the United States Department of Agriculture – Natural Resources Conservation Services (USDA-NRCS) soil survey, the near surface soils mapped underlying the subject site are summarized below:

Birdsboro silt loam, two to six percent slopes (BhnB): The Birdsboro silt loam is mapped throughout the site. The parent material is reported as old alluvium derived from sandstone and siltstone and/or shale. The typical soil profile (as detailed in the survey) consists of silt loam to a depth of 40 inches; stratified sand to silty clay loam to a depth of 60 inches; underlain by stratified sand to fine sand to a depth of 80 inches below the natural ground surface (limit of report). The depth to the water table is reported to be more than 80 inches below the natural ground surface (limit of report).

4.3 Subsurface Soil Profile

Details of the subsurface materials encountered are presented on the *Records of Subsurface Exploration* presented in the Appendix of this report. The subsurface soil conditions encountered as part of our investigation consisted of the following generalized strata in order of increasing depth.

Surface Cover Material: Test locations were performed within existing landscaped areas and encountered approximately five to 12 inches of topsoil at the surface.

Existing Fill Material: Beneath the surface cover, existing fill material was encountered that generally consisted of sand and silt with variable amounts of gravel. The existing fill material was encountered to depths ranging between approximately 3.6 feet and six feet below the ground surface; corresponding to elevations ranging between 133.3 feet and 124.5 feet. Standard penetration (SPT) N-values ranged between one blow per foot (bpf) and 19 bpf.

Residual Soils: Beneath the surficial cover and/or existing fill material (where encountered), natural residual soils were encountered that consisted variably of clay (USCS: CH), gravel (USCS: GC), sand (USCS: SM) and silt (USCS: ML and MH). The natural residual soils were encountered to depths ranging between approximately 8.5 feet and 22.0 feet below the ground surface; corresponding to elevations ranging between approximately 121.9 feet and 108.8 feet. SPT N-values ranged between five bpf and 27 bpf, and averaged approximately 16 bpf; generally indicating a relatively medium dense condition within coarse-grained portions of this stratum. Unconfined compressive strength (Q_p) values obtained from pocket penetrometer tests performed within the fine-grained portions of this stratum ranged between approximately 2.0 tons per square foot (tsf) and greater than 4.0 tsf; and averaged approximately 3.75 tsf, generally indicating relatively very stiff consistencies.

Weathered Rock: Beneath the natural residual soils, weathered rock was encountered within the northeast corner of the proposed Malvern School building (test pit TP-3). The weathered rock generally consisted of gravel (USCS: GC) with variable amounts of silt, sand, clay, and shale fragments. The weathered rock was encountered to a refusal depth of approximately 12.3 feet; corresponding to an elevation of 115.2 feet. Refusal is expected to be the top of rock.

4.4 Seasonal High Groundwater and Groundwater

Indicators of seasonal high groundwater (i.e. based on soil mottling) and groundwater were not encountered at the test locations. Groundwater levels are expected to fluctuate seasonally and following significant periods of precipitation.

5.0 PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

5.1 General

The following preliminary considerations are based on the soil conditions encountered during our limited subsurface investigation and are intended to provide general characteristics of the subsurface conditions for preliminary planning purposes and should not be utilized for final design of structural foundations, floor slabs, or pavements. Final recommendations pertaining to the geotechnical aspects of the site development will need to be developed from a supplemental subsurface investigation and engineering analyses once the final site development plans are developed.

The subsurface conditions encountered generally included existing fill material underlain by natural residual soils and weathered rock. **The existing fill material was encountered within the area of the proposed building footprints to depths ranging between approximately 3.6 feet and six feet below the ground surface. The existing fill material is not suitable for direct foundation support without the risk of excessive settlement and will need to be overexcavated and replaced below the proposed buildings.** Following overexcavation of the existing fill material (where encountered) and proper subgrade preparation, conventional shallow foundations are anticipated to be feasible for the proposed development. Due to the moisture sensitivity and plasticity of the on-site soils, limited overexcavation and replacement, subgrade stabilization, and/or re-compaction should be anticipated below the proposed building and/or pavement areas. Careful construction phase inspections with Dynamic Cone Penetrometer (DCP) testing and proofroll inspections will be critical to confirm adequate soil bearing capacity below the proposed structures.

Where site grades are raised, overexcavation and replacement should be performed prior to placing new fill material. Furthermore, the proposed building footprints/foundation locations should be located by a professional surveyor prior to performing overexcavation operations.

The majority of the on-site soils are expected to be suitable for support of proposed floor slabs and pavements, provided these materials are properly evaluated and inspected during construction. However, portions of the on-site soils include fine-grained materials that are considered extremely moisture sensitive and have relatively high plasticity characteristics. **As such, partial overexcavation and/or subgrade stabilization should be anticipated, as detailed herein.**

5.2 Preliminary Shallow Foundation Design Recommendations

Anticipated Bearing Strata: Proposed foundations are anticipated to bear partially within the existing fill material and partially within the natural residual soils. **As detailed throughout this report, the existing fill material is not suitable for direct foundation support without the risk of excessive settlement and will need to be overexcavated and replaced below the proposed building (where encountered).** Approved portions of the natural residual soils are preliminary anticipated to be suitable for foundation support without the risk of excessive settlement. However, due to the moisture sensitivity of the on-site soils, limited overexcavation and replacement, re-compaction and/or stabilization of the on-site soils should be anticipated, particularly if these materials are exposed to moisture.

Shallow Foundation Design Criteria: Following overexcavation and replacement and proper subgrade preparation, the proposed structure may be supported on conventional shallow foundations bearing within approved subgrade materials. We preliminary anticipate a maximum allowable net bearing capacity of 3,000 pounds per square foot (psf) may be achieved for foundations bearing within approved subgrade materials. Regardless of loading conditions, proposed foundations should be sized no less than minimum dimensions of 24 inches for continuous wall footings and 36 inches for isolated column footings.

Footings subject to tension loads should be designed so that the maximum toe pressure due to the combined effect of vertical loads and overturning moment does not exceed the recommended maximum allowable net bearing pressure recommended above. In addition, positive contact pressure should be maintained throughout the base of the footings such that no uplift or tension exists between the base of the footings and the supporting soil. Uplift loads should be resisted by the weight of the concrete; side friction (vertical along the footer) should be neglected.

Lateral resistance should be provided by friction on the base of the footing with a recommended coefficient of friction against sliding:

- Formed concrete on gravel subbase material – 0.40;
- Mass concrete on gravel subbase material – 0.50; and
- Mass concrete on on-site natural residual soils – 0.30.

Inspection/Overexcavation Criteria: The suitability of the bearing soils along and below the footing bottoms must be verified by Dynamic Earth's geotechnical engineer prior to placing concrete, especially to confirm that existing fill materials (if encountered) are removed and new fills are adequately placed and compacted. Any overexcavation to be restored with structural fill (on-site or imported) will need to extend at least one foot laterally beyond footing edges for each vertical foot of overexcavation. The bottom of overexcavations should be compacted with smooth drum rollers, walk-behind compactors, vibrating plates or plate tampers ("jumping jacks") to compact locally disturbed materials and densify underlying natural soil zones.

Unsuitable materials should be overexcavated prior to placing new fill materials where site grades are to be raised. The extent of overexcavation can be estimated based on an evaluation of the final site grading plans, structural loading conditions, foundation plans, and supplemental geotechnical investigation. Furthermore, the proposed building footprint/interior column foundation locations should be located by a professional surveyor prior to performing overexcavation operations.

Settlement: Once design loading conditions have been determined, settlement evaluation associated with the proposed structure will be required as part of the final evaluation.

Frost Coverage Embedment Depth: Footings subject to frost action should be placed at least 36 inches below adjacent exterior grades or as required by the local building code to provide protection from frost penetration. Interior footings not subject to frost action (including during the period of construction) may be placed at a minimum depth of 18 inches below the slab subgrade.

5.3 Preliminary Floor Slab Recommendations

Dynamic Earth anticipates that on-site soils and/or compacted structural fill material placed over approved subgrades will be suitable for support of the proposed floor slabs, provided these materials are properly evaluated, and inspected. **Due to the potential variability of the existing fill material and moisture sensitive plasticity of the on-site soils encountered, at least partial overexcavation and replacement, re-compaction, and/or subgrade stabilization should be anticipated below proposed floor slabs.** Depending on construction phase evaluation, overexcavation may be limited (to a typical depth of approximately two feet) with the use of geogrid reinforcement. Any areas that become softened or disturbed as a result of wetting and/or repeated exposure to construction traffic should be removed and replaced with compacted structural fill. The properly prepared on-site soils are expected to yield a minimum subgrade modulus (k) of 125 psi/in.

A minimum four-inch layer of stone should be installed below the floor slabs to provide a capillary break. A vapor barrier beneath the floor slab is recommended. Total and post-construction settlements of floor slabs installed in accordance with the recommendations outlined in this report are estimated to be less than one-quarter inch.

5.4 Preliminary Earthwork Considerations

Demolition and Surface Cover Stripping: Prior to the start of construction, all utilities should be identified and secured. If encountered, existing structural elements, such as concrete foundations, slabs, and remnant basement walls, should be removed entirely from below proposed foundations and slabs and excavated to at least two feet below pavement subgrades. Remnant structural elements may remain in-place below these depths below pavements provided they do not interfere with future construction. Any slabs left in-place should be thoroughly fractured to promote vertical drainage in the presence of a qualified Geotechnical Engineer and should be backfilled with structural fill in accordance with the recommendations included herein.

The surface cover materials, including pavements, vegetation, and topsoil, should be removed from within, and at least five feet beyond, the limits of the proposed building and new pavement areas as well as any other area which will require fill placement. If required, removal of any trees should include root mats and tree stumps. The contractor is responsible for restoring grades with structural fill following removal of deeper topsoil and root mat layers.

Surface Preparation/Proofrolling: Prior to placing any fill or subbase materials to raise or restore grades to the desired building pad or pavement subgrade elevations, **the existing exposed soils should be compacted to a firm and unyielding surface with several passes in two perpendicular directions with a vibratory, smooth drum roller during favorable moisture conditions. The drum roller should be operated in the static mode or a kneading "sheepsfoot" roller should be used where fine-grained soils are encountered at the subgrade elevation** and/or where water is suspected near subgrade elevations. The surface should then be proofrolled with a loaded tandem axle truck in the presence of Dynamic Earth to help identify soft or loose pockets which may require removal and replacement or further investigation. Dynamic Earth anticipates at least partial overexcavation if the subgrade is wetted or subjected to repeated construction traffic. Any fill or backfill should be placed and compacted in accordance with the recommendations included herein.

Subgrade Protection and Inspection: The on-site soils included existing fill material and increased amounts of fine-grained silt/clay that are considered to be moisture sensitive. The on-site soils will become unsuitable if exposed to moisture and/or construction traffic. If these materials become overly wetted, the on-site soils will likely require increased handling such as discing and drying during extended periods of favorable weather. In-place materials that become wet may require partial overexcavation and subgrade stabilization. Typically, a triaxial geogrid (such as Tensar TX-5 or TX-7) can be used for moderately soft or pumping conditions as directed by the geotechnical engineer. Alternatively, potential chemical stabilization (i.e. with lime or cement) may be feasible, depending on evaluation of the soil conditions by the geotechnical engineer during construction. Subgrades should be sealed daily and construction traffic should be minimized to designated non-structural areas as an attempt to minimize deterioration of otherwise suitable subgrade soils. Dynamic Earth should be retained as the Geotechnical Engineer of Record to inspect soil conditions during construction and verify the suitability of prepared foundation, floor slab and pavement subgrades for support of design loads.

Import/On-site Structural Fill Material: Soils placed as structural fill material should consist of well graded sand or gravel with a maximum particle size of three inches in diameter and less than 15 percent of material passing the number 200 sieve. These materials should be free of objectionable debris (clay clumps, organic and/or deleterious material, etc.) and within moisture contents suitable for compaction. Alternative soil types with higher percentages of silt and clay may be considered, provided that the contractor is able to achieve proper compaction and maintain suitable subgrade once the material is placed. Fine-grained soils and/or granular soils with higher percentages of silt and clay are extremely moisture sensitive and will only be suitable for reuse as structural fill material under ideal weather conditions. Materials wetted beyond the optimum moisture content; that contain oversized rock or debris; or with increased amounts of objectionable debris will not be suitable for reuse as structural fill material without special handling. As such, the contractor should be responsible for importing structural fill material and/or processing on-site soils as required so that these materials are suitable for structural fill placement.

If encountered, cobbles, boulders, excavated rock, and/or oversized debris greater than three inches in diameter will need to be separated from material to be placed as structural fill. Approved material between three to 12 inches in diameter may be crushed or individually placed in fill layers deeper than two feet below proposed subgrade levels. Care must be taken to individually seat any large particles and to compact soil around large particles with hand operated equipment to minimize the risk of void formation. The larger material should not be placed near areas of the proposed utility or planned excavation. Boulders larger than approximately 12 inches are not expected to be adequate for use as fill or backfill and should be removed from the site or crushed to an adequate size.

The on-site soils encountered included existing fill material, natural residual soils, and weathered rock/rock. The granular portions of the on-site soils are preliminarily expected to be suitable for reuse as structural fill material, provided objectionable materials (if encountered) are segregated and moisture contents are within tolerable limits for compaction. The on-site soils contained increased amounts of fine-grained material and are considered moisture sensitive. As such, these materials will require moisture conditioning and/or will become impractical for reuse, particularly if exposed to moisture. Moisture conditioning methods include drying during a period of favorable weather, mixing with granular soils, and/or chemical stabilization (i.e. with lime or cement). The contractor should include a unit rate for importing structural fill material and exporting unsuitable material. Reuse of these materials will be contingent upon further evaluation during construction.

Compaction and Placement Requirements: Structural fill and backfill should be placed in maximum 12-inch loose lifts and compacted to 95 percent of the maximum dry density within a targeted two percent of the optimum moisture content as determined by ASTM D 1557 (Modified Proctor). Variations in moisture content may be acceptable subject to Dynamic Earth's on-site geotechnical engineer's approval if the contractor is able to achieve the necessary compaction. Dynamic Earth recommends using a minimum 20-ton, smooth drum, vibratory roller to compact granular subgrade soils within large areas of excavation and hand-operated vibratory jumping jacks and plate compactors within confined excavations for foundations or utilities. The drum roller should be operated in the static mode or a kneading "sheepsfoot" roller should be used where fine-grained soils are encountered at the subgrade. Fill material compacted with static or hand-operated equipment may need to be placed in thinner loose lifts and an increased number of passes may be required to achieve proper compaction.

Structural Fill Testing: Before filling operations begin, representative samples of each proposed fill material (on-site and imported) should be collected. The samples should be tested to determine the maximum dry density, optimum moisture content, natural moisture content, gradation, and plasticity of the soil. These tests are needed for quality control during compaction and also to determine if the fill material is acceptable. The placement of all fill and backfill should be monitored by Dynamic Earth's geotechnical engineer or technician to ensure that the specified material and lift thicknesses are properly installed. A sufficient number of in-place density tests should be performed during fill placement to ensure that the specified compaction is achieved throughout the height of the fill or backfill.

5.5 Preliminary Pavement Recommendations

The on-site soils are preliminarily expected to be suitable for support of proposed pavement. **Due to the moisture sensitivity of the onsite soils and areas of existing fill material encountered, at least partial overexcavation, and replacement and/or subgrade stabilization should preliminarily be expected below proposed pavements.** Depending on the overall subgrade conditions and weather conditions, more extensive mitigation efforts may be required. The specific pavement section can be provided based on the results of the supplemental geotechnical investigation.

5.6 Preliminary Groundwater Considerations

Groundwater levels are expected to be deeper than proposed excavations and the need for extensive dewatering or permanent groundwater control is not anticipated for this project.

While the contractor should be responsible to provide groundwater control means and methods, perched or infiltrating water can typically be controlled with installation of sump pumps in and/or adjacent to excavations. Deeper excavations that remain open for extended periods will require more extensive dewatering. Surface water should be diverted away from construction area as an attempt to limit exposure to rainfall/precipitation.

5.7 Preliminary Retaining Walls and Lateral Earth Pressure Recommendations

Retaining walls and other structures having lateral earth pressures were not identified at this time. Dynamic Earth should be notified if structures requiring lateral earth pressure estimates subsequently are proposed.

5.8 Seasonal High Groundwater and Soil Permeability

Indicators of seasonal high groundwater (i.e. based on soil mottling) and groundwater were not encountered at the test locations. Permeability test of the samples tested were less than 0.2 inches per hour (iph). A summary of the seasonal high groundwater levels and permeability test results is presented in the following table:

Estimated Seasonal High Groundwater and Permeability Summary

Location	Surface Elevation (ft)	Estimated Seasonal High Groundwater*		Permeability Test Results		
		Depth (ft)	Elevation	Depth (in)	Permeability (in/hr)	
					Replicate A	Replicate B
SPP-1	130.6	Not Observed *		36	<0.2	<0.2
SPP-2	127.0			48	<0.2	<0.2
SPP-3	130.9			30	--	--
SPP-4	139.2			52	<0.2	<0.2
SPP-5	140.1			40	<0.2	<0.2
SPP-6	143.4			50	<0.2	<0.2
SPP-7	133.9			36	<0.2	<0.2

*Where mottling was not observed, the depth to seasonal high groundwater can be approximated from the web soil survey and/or with direct groundwater readings during the wet season.

5.9 Temporary Excavation

The soils encountered during the investigation are consistent with Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA) which require a maximum unbraced excavation angle of 1.5:1 (horizontal: vertical). Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA) to ensure that safe excavation methods and/or shoring and bracing requirements are implemented.

5.10 Preliminary Seismic and Liquefaction Considerations

The soils are most consistent with a Site Class D defined by the *International Building Code*. Based on the seismic zone and soil profile, liquefaction considerations are preliminarily not expected to have a substantial impact on design.

5.11 Supplemental Evaluation and Investigation

Final Design/Supplemental Investigation: Since these preliminary geotechnical investigation activities have been completed during the initial design phase, many critical assumptions or preliminarily details regarding assumed structural loads, existing and proposed elevations, etc. affect the geotechnical analysis. The preliminary considerations presented herein should be considered to help develop the optimum site design and grading, and Dynamic Earth should remain involved during final design. A supplemental investigation including the advancement of additional soil borings, test pits, and laboratory testing within inaccessible areas (following demolition) should be performed as part of the final geotechnical investigation for the site. Dynamic recommends performing supplemental investigation throughout the proposed site once the design layout, structural loading, and grading becomes finalized in order to confirm the recommendations herein and/or provide additional recommendations, if required.

Construction Monitoring and Testing: The recommendations presented herein are contingent on the owner retaining Dynamic Earth to perform inspection, testing and consultation during construction as described in previous sections of this report. **Construction phase evaluation by means of proofroll inspections and/or subgrade inspections will be needed to confirm adequate support for the proposed structures.** Monitoring and testing should also be performed to verify that suitable materials are used for controlled fill, and that they are properly placed and compacted over suitable subgrade soils. Testing of fill placement will also be critical to limiting differential settlement.

6.0 GENERAL COMMENTS AND LIMITATIONS

Supplemental recommendations will be required upon finalization of conceptual site plans or if significant changes are made in the characteristics or location of the proposed structures. Dynamic Earth should be included as a consultant to the design team and should be provided final plans for review to confirm these criteria apply or to modify recommendations as necessary.

The recommendations presented herein should be utilized by a qualified engineer in preparing preliminary design concepts and site grading. The engineer should consider these recommendations as minimum physical standards that may be superseded by local and regional building codes and structural considerations. These recommendations are prepared for the use of the client for the specific project detailed and should not be used by any third party. These recommendations are relevant to the preliminary design phase and should not be substituted for construction specifications.

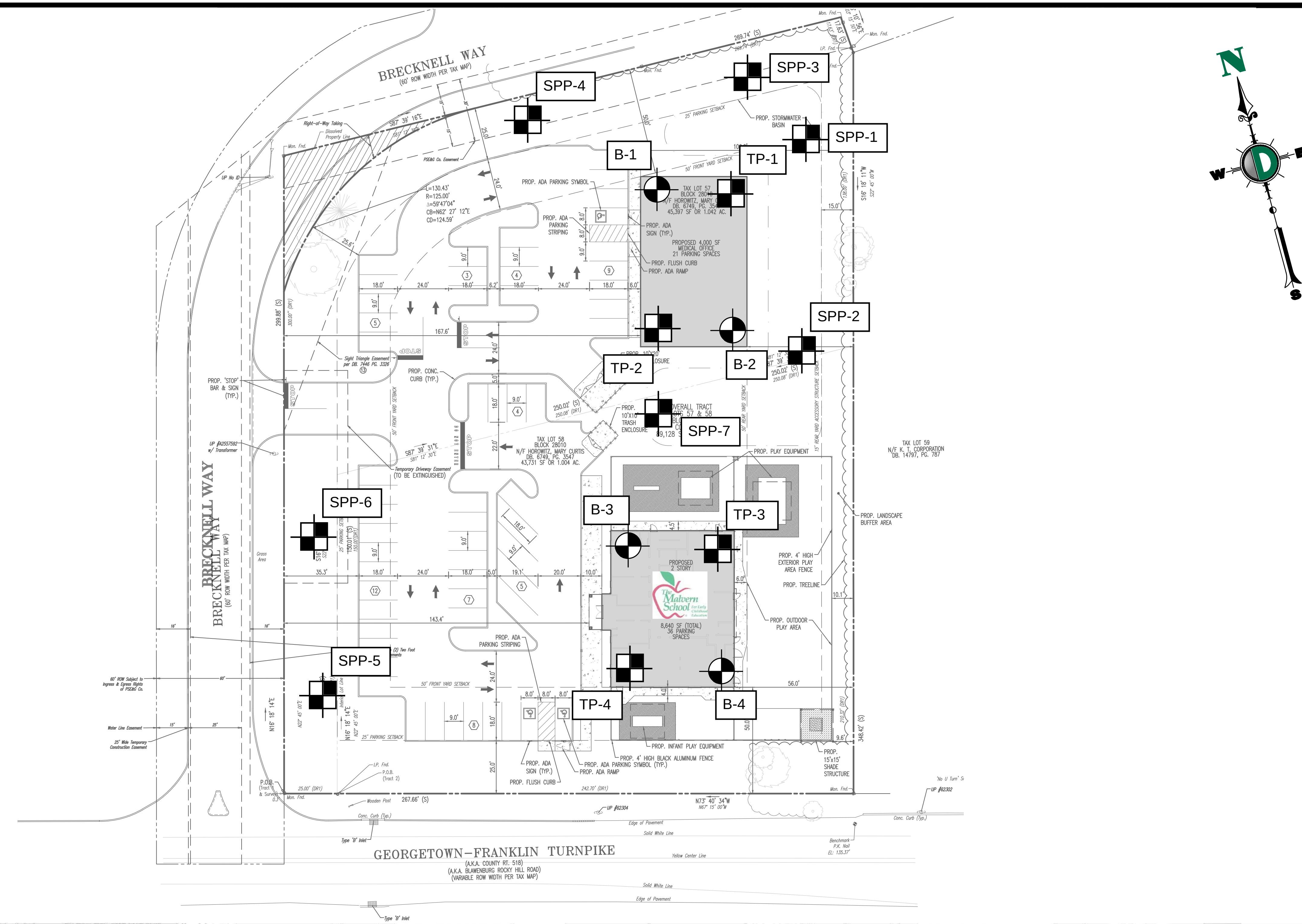
The possibility exists that conditions between test locations may differ from those at specific test pit locations, and conditions may not be as anticipated by the designers or contractors. In addition, the construction process may itself alter soil conditions. Therefore, Dynamic Earth Geotechnical Engineers or their representatives should observe and document the final construction procedures used and the conditions encountered, as well as conduct testing and inspection to ensure the design criteria are met or recommendations to address deviations are implemented.

Dynamic Earth assumes that a qualified contractor will be employed to perform the construction work, and that the contractor will be required to exercise care to ensure all excavations are performed in accordance with applicable regulations and good practice. Particular attention should be paid to avoiding damaging or undermining adjacent properties and maintaining slope stability.

The exploration and analysis of the foundation conditions reported herein are presented to form a reasonable basis for preliminary site evaluation. The recommendations submitted for the proposed construction are based on the available soil information and the preliminary design details furnished or assumed. Deviations from the noted subsurface conditions encountered during construction should be brought to the attention of the geotechnical engineer.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been promulgated after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology. No other warranties are implied or expressed.

Test Location Plan



SCALE: N.T.S.

JOB No: 4447-22-01615

SHEET No: **1** OF 1

DRAWN BY: LS

DESIGNED BY: --

CHECKED BY: FVC

DATE: 8/15/2022

TITLE: **TEST LOCATION PLAN**

PROJECT: **THE MALVERN SCHOOL**
PROPOSED DAY SCHOOL AND MEDICAL OFFICE
982 Route 518 Georgetown-Franklin Turnpike (County Route 518)
Block 28005, Lots 57 & 58
Township of Montgomery, Somerset County, New Jersey

Rev. # 0

DEC Client Code: 4447

LEGEND:

- B-X: APPROXIMATE LOCATION OF BORING
- SPP-X: APPROXIMATE LOCATION OF SOIL PROFILE PIT
- TP-X: APPROXIMATE LOCATION OF TEST PIT

NOTES:

1. THIS PLAN IS NOT FOR CONSTRUCTION AND WAS PREPARED TO ILLUSTRATE TEST LOCATIONS ONLY AND MAY NOT REFLECT THE MOST CURRENT REVISION OF THE BASE PLAN.
2. BASE PLAN OBTAINED FROM A SEPTEMBER 15, 2022 CONCEPTUAL SITE PLAN 'A' PREPARED BY DYNAMIC ENGINEERING CONSULTANTS, PC.

DYNAMIC EARTH, LLC
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Records of Subsurface Exploration

DYNAMIC EARTH

BOREHOLE LOG

Boring No : B-1

Project:	Proposed Day School & Medical Office	**Proj. No.:**	4447-22-01615
Location:	982 Georgetown-Frankling Turnpike (Route 518) Township of Montgomery, Somerset County, New Jersey	**Client:**	The Malvern School

Surface Elevation:	137.3 feet	**Date Started:**	08-10-2022
Termination Depth:	22.0 feet	**Date Completed:**	08-10-2022
Proposed Location:	Proposed Medical Office	**Logged by:**	M. Mickley
Drill/Test Method:	HSA/SPT	**Contractor:**	GPI
Hammer Type:	Auto	**Rig Type:**	Geoprobe 7822DT

Groundwater Data	Depth (ft)	El. (ft)	Additional Groundwater Data	Depth (ft)	El. (ft)
While Drilling: ▽	NE	-			
At Completion: ▼	NE	-			

Sample Information											
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)	N	Depth (ft)	Strata		DESCRIPTION OF MATERIALS (Classification)	Remarks
								Surface Cover		8 inches of topsoil	
0.0-2.0	S-1	SS	12	--	1, 4, 8, 9	12		FILL		Brown coarse to fine sand, some silt, little coarse to fine gravel, moist (FILL)	
2.0-4.0	S-2	SS	12	--	3, 8, 8, 9	16		FILL		Reddish brown silt, some coarse to fine sand, little coarse to fine gravel, moist, (FILL)	
4.0-6.0	S-3	SS	16	--	5, 8, 10, 16	18	5	Residual Soils		Reddish brown clay, little coarse to fine sand, trace fine gravel, moist, hard (CH)	Qp = 4.5 tsf
6.0-8.0	S-4	SS	12	--	5, 10, 10, 11	20		Residual Soils		As above (CH)	Qp = 4.5 tsf
8.0-10.0	S-5	SS	18	--	9, 8, 10, 8	18		Residual Soils		As above (CH)	Qp = 4.5 tsf
10.0-12.0	S-6	SS	14	--	6, 4, 3, 3	7	10	Residual Soils		As above (CH)	Qp = 4.5 tsf
12.0-14.0	S-7	SS	20	--	3, 3, 2, 3	5		Residual Soils		As above, very stiff (CH)	Qp = 3.5 tsf
14.0-16.0	S-8	SS	18	--	5, 6, 5, 6	11	15	Residual Soils		As above (CH)	Qp = 3.5 tsf
								Residual Soils			
18.0-20.0	S-9	SS	18	--	5, 5, 2, 3	7		Residual Soils		As above, stiff (CH)	Qp = 2.0 tsf
20.0-22.0	S-10	SS	18	--	8, 9, 10, 13	19	20	Residual Soils		As above (CH)	Qp = 3.5 tsf
										Boring B-1 was terminated at approximately 22 feet below the ground surface.	

DYNAMIC EARTH

BOREHOLE LOG

Project: Proposed Day School & Medical Office **Proj. No.:** 4447-22-01615

Location: 982 Georgetown-Frankling Turnpike (Route 518) Township of Montgomery, Somerset County, New Jersey **Client:** The Malvern School

Surface Elevation:	130.8 feet	**Date Started:**	08-10-2022	**Groundwater Data**	**Depth (ft)**	**El. (ft)**	**Additional Groundwater Data**	**Depth (ft)**	**El. (ft)**
Termination Depth:	22.0 feet	**Date Completed:**	08-10-2022						
Proposed Location:	Proposed Medical Office	**Logged by:**	M. Mickley	**While Drilling:** ∇	NE	-			
Drill/Test Method:	HSA/SPT	**Contractor:**	GPI	**At Completion:** ▼	NE	-			
Hammer Type:	Auto	**Rig Type:**	Geoprobe 7822DT						

Sample Information								Depth (ft)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)		N				
								0	Surface Cover	8 inches of topsoil	
0.0-2.0	S-1	SS	3	--	3 / 3	5 / 6	8		Residual Soils	Reddish brown silt, little coarse to fine sand, moist, stiff (MH)	Qp = 3.0 tsf
2.0-4.0	S-2	SS	12	--	7 / 3	5 / 2	8			Reddish brown silt, little coarse to fine sand, moist, stiff (MH)	Qp = 4.0 tsf
4.0-6.0	S-3	SS	18	--	5 / 8	7 / 5	15	5		Reddish brown silt, little coarse to fine sand, moist, very stiff (ML)	Qp = 4.0 tsf
6.0-8.0	S-4	SS	22	--	9 / 11	8 / 11	19			As above (ML)	Qp = 4.5 tsf
8.0-10.0	S-5	SS	18	--	10 / 10	10 / 11	20			As above (ML)	Qp = 4.5 tsf
10.0-12.0	S-6	SS	20	--	8 / 9	8 / 9	17	10		As above (ML)	Qp = 3.0 tsf
15.0-17.0	S-7	SS	24	--	6 / 6	6 / 9	12	15		As above (ML)	Qp = 3.0 tsf
20.0-22.0	S-8	SS	20	--	4 / 17	10 / 25	27	20		As above (ML)	Qp = 3.5 tsf
										Boring B-2 was terminated at approximately 22 feet below the ground surface.	

BOREHOLE LOG

Project:	Proposed Day School & Medical Office	**Proj. No.:**	4447-22-01615
Location:	982 Georgetown-Frankling Turnpike (Route 518) Township of Montgomery, Somerset County, New Jersey	**Client:**	The Malvern School

Surface Elevation:	130.4 feet	**Date Started:**	08-10-2022
Termination Depth:	14.0 feet	**Date Completed:**	08-10-2022
Proposed Location:	Proposed Day School	**Logged by:**	M. Mickley
Drill/Test Method:	HSA/SPT	**Contractor:**	GPI
Hammer Type:	Auto	**Rig Type:**	Geoprobe 7822DT

Groundwater Data	Depth (ft)	El. (ft)	Additional Groundwater Data	Depth (ft)	El. (ft)
While Drilling: ∇	NE	-			
At Completion: ▼	NE	-			

Sample Information								Depth (ft)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)		N				
									Surface Cover	8 inches of topsoil	
0.0-2.0	S-1	SS	8	--	3	4	8		FILL	Reddish brown silt, little coarse to fine sand, moist (FILL)	
					4	4					
2.0-4.0	S-2	SS	16	--	2	2	4			As above (FILL)	
					2	1					
4.0-6.0	S-3	SS	0	--	1	1	1	5		No recovery	
					WOH	WOH					
6.0-8.0	S-4	SS	22	--	4	4	10		Residual Soils	Reddish brown silt, little coarse to fine sand, moist, very stiff (ML)	Qp=3.0 tsf
					6	7					
8.0-10.0	S-5	SS	14	--	8	12	25		Residual Soils	Reddish brown coarse to fine gravel, some coarse to fine sand, some silty clay, moist medium dense (GC)	
					13	13		10			
10.0-12.0	S-6	SS	14	--	10	13	26			As above (GC)	Cave-in at 10.5 feet
					13	7					
12.0-14.0	S-7	SS		--	4	8	16			Reddish brown to purple silt, trace fine sand, moist very stiff (ML)	Qp = 3.0 tsf
					8	9					
								15		Boring B-3 was terminated at approximately 14 feet below the ground surface.	
								20			

DYNAMIC EARTH

BOREHOLE LOG

Boring No : B-4

Project:	Proposed Day School & Medical Office	**Proj. No.:**	4447-22-01615
Location:	982 Georgetown-Frankling Turnpike (Route 518) Township of Montgomery, Somerset County, New Jersey	**Client:**	The Malvern School

Surface Elevation:	130.1 feet	**Date Started:**	08-10-2022
Termination Depth:	16.0 feet	**Date Completed:**	08-10-2022
Proposed Location:	Proposed Day School	**Logged by:**	M. Mickley
Drill/Test Method:	HSA/SPT	**Contractor:**	GPI
Hammer Type:	Auto	**Rig Type:**	Geoprobe 7822DT

Groundwater Data	**Depth (ft)**	**El. (ft)**	**Additional Groundwater Data**	**Depth (ft)**	**El. (ft)**
While Drilling: ▽	NE	-			
At Completion: ▼	NE	-			

Sample Information											
Depth (Feet)	Number	Type	Rec (in)	RQD %	Blows per 6" or drill time (mm:ss)	N	Depth (ft)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
								Surface Cover	8 inches of topsoil	
0.0-2.0	S-1	SS	6	--	5, 5, 6, 8	11		FILL	Brown coarse to fine sand, some silt, trace coarse to fine gravel, moist, (FILL)	
2.0-4.0	S-2	SS	4	--	7, 9, 10, 10	19		FILL	As above (FILL)	
4.0-6.0	S-3	SS	14	--	7, 7, 9, 10	16	5	Residual Soils	Reddish brown silt, little coarse to fine sand, moist, very stiff (ML)	Qp = 3.0 tsf
6.0-8.0	S-4	SS	22	--	8, 9, 9, 10	18		Residual Soils	As above (ML)	Qp = 3.0 tsf
8.0-10.0	S-5	SS	24	--	6, 7, 6, 8	13		Residual Soils	As above, hard (ML)	Qp = 4.0 tsf
10.0-12.0	S-6	SS	14	--	8, 11, 11, 12	22	10	Residual Soils	As above (ML)	Qp = 4.0 tsf
12.0-14.0	S-7	SS	16	--	9, 9, 9, 9	18		Residual Soils	Reddish brown coarse to fine gravel, little clay, moist, medium dense (GC)	Qp = 4.0 tsf
14.0-16.0	S-8	SS	18	--	10, 11, 11, 8	22	15	Residual Soils	As above (GC)	Qp = 4.0 tsf
							20		Boring B-4 was terminated at approximately 16 feet below the ground surface.	

TEST PIT

Test Pit : TP-1

Project: Proposed Day School & Medical Office		**Proj. No.:**	4447-22-01615
Location: 982 Georgetown-Frankling Turnpike (Route 518) Township of Montgomery, Somerset County, New Jersey		**Client:**	The Malvern School

					Depth (ft)	El. (ft)	Additional Groundwater Data	Depth (ft)	El. (ft)
Surface Elevation:	133.9 feet	**Date Started:**	08-10-2022	**Groundwater Data**					
Termination Depth:	12.0 feet	**Date Completed:**	08-10-2022						
Proposed Location:	Proposed Medical Office	**Logged by:**	M. Mickley	**First Encountered:** ∇	NE	-			
		Contractor:	GPI	**At Completion:** ▼	NE	-			
		Rig Type:	Bobcat E-60						

Sample Information Depth (Feet)	Number	Type	Depth (FT)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
0.0 - 0.7				Surface Cover	8 inches of topsoil	
0.7 - 12.0	S-1	BAG	2.0 4.0 6.0 8.0 10.0	Residual Soils	Reddish brown silt, little coarse to fine sand, trace fine gravel, moist (ML)	
					Test Pit TP-1 was terminated at approximately 12 feet below the ground surface.	

DYNAMIC EARTH

TEST PIT

Test Pit : TP-2

Project:	Proposed Day School & Medical Office	**Proj. No.:**	4447-22-01615
Location:	982 Georgetown-Frankling Turnpike (Route 518) Township of Montgomery, Somerset County, New Jersey	**Client:**	The Malvern School

Surface Elevation:	136.5 feet	**Date Started:**	08-10-2022	**Groundwater Data**	**Depth (ft)**	**El. (ft)**	**Additional Groundwater Data**	**Depth (ft)**	**El. (ft)**
Termination Depth:	12.0 feet	**Date Completed:**	08-10-2022						
Proposed Location:	Proposed Medical Office	**Logged by:**	M. Mickley	**First Encountered:** ▽	NE	-			
		Contractor:	GPI	**At Completion:** ▼	NE	-			
		Rig Type:	Bobcat E-60						

Sample Information Depth (Feet)	Number	Type	Depth (FT)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
0.0 - 0.7				Surface Cover	8 inches of topsoil	
0.7 - 1.5	S-1	BAG		FILL	Brown coarse to fine sand, some silt, little coarse to fine gravel, moist (FILL)	
1.5 - 3.6	S-2	BAG	2.0	FILL	Reddish brown silt, little coarse to fine sand, little coarse to fine gravel, moist (FILL)	
3.6 - 12.0	S-3	BAG	4.0, 6.0, 8.0, 10.0	Residual Soils	Reddish brown silt, little coarse to fine sand, trace fine gravel, moist (ML)	
					Test Pit TP-2 was terminated at approximately 12 feet below the ground surface.	

TEST PIT

Test Pit : TP-3

Project:	Proposed Day School & Medical Office	**Proj. No.:**	4447-22-01615
Location:	982 Georgetown-Frankling Turnpike (Route 518) Township of Montgomery, Somerset County, New Jersey	**Client:**	The Malvern School

				Groundwater Data	Depth (ft)	El. (ft)	Additional Groundwater Data	Depth (ft)	El. (ft)
Surface Elevation:	127.5 feet	**Date Started:**	08-10-2022						
Termination Depth:	12.3 feet	**Date Completed:**	08-10-2022						
Proposed Location:	Proposed Day School	**Logged by:**	M. Mickley	**First Encountered:** ▽	NE	-			
		Contractor:	GPI	**At Completion:** ▼	NE	-			
		Rig Type:	Bobcat E-60						

Sample Information Depth (Feet)	Number	Type	Depth (FT)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
0.0 - 0.7				Surface Cover	8 inches of topsoil	
0.7 - 3.0	S-1		2.0	Residual Soils	Brown coarse to fine sand, some silt, trace coarse to fine gravel, moist (SM)	
3.0 - 11.3	S-2		4.0 6.0 8.0 10.0	Residual Soils	Reddish brown silt, little coarse to fine sand, moist (ML)	
11.3 - 12.3				Weathered Rock	Reddish Brown coarse to fine gravel, some clay, some weathered rock (shale) fragments, moist (GC)	
					Test Pit TP-3 encountered refusal at approximately 12.3 feet below the ground surface.	

DYNAMIC EARTH

TEST PIT

Project:	Proposed Day School & Medical Office	**Proj. No.:**	4447-22-01615
Location:	982 Georgetown-Frankling Turnpike (Route 518) Township of Montgomery, Somerset County, New Jersey	**Client:**	The Malvern School

				Groundwater Data	Depth (ft)	El. (ft)	Additional Groundwater Data	Depth (ft)	El. (ft)
Surface Elevation:	131.8 feet	**Date Started:**	08-10-2022						
Termination Depth:	12.0 feet	**Date Completed:**	08-10-2022						
Proposed Location:	Proposed Day School	**Logged by:**	M. Mickley	**First Encountered:** ▽	NE	-			
		Contractor:	GPI	**At Completion:** ▼	NE	-			
		Rig Type:	Bobcat E-60						

Sample Information Depth (Feet)	Number	Type	Depth (FT)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
0.0 - 0.7				Surface Cover	8 inches of topsoil	
0.7 - 1.4	S-1	BAG		Residual Soils	Brown coarse to fine sand, some silt, little coarse to fine gravel, moist (SM)	
1.4 - 4.5	S-2	BAG	2.0		Reddish brown silt, little coarse to fine sand, moist (ML)	
4.5 - 6.0	S-3	BAG	4.0		Dark reddish silt, little coarse to fine sand, moist (ML)	
6.0 - 12.0	S-4	BAG	6.0 8.0 10.0		Reddish brown to purple silt and coarse to fine sand, trace fine gravel, moist (ML)	
					Test Pit TP-4 was terminated at approximately 12 feet below the ground surface.	

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-1

Project:	Proposed Day School and Medical Office	Project No.:	4447-22-01615
Location:	982 Georgetown-Franklin Turnpike (Route 518) Township of Montgomery, New Jersey	Client:	The Malvern School

				Groundwater Data	Depth (ft)	El. (ft)	Groundwater Comments
Surface Elevation (ft):	130.6	Date Started:	8/11/22				
Termination Depth (ft):	11.2	Date Completed:	8/11/22				
Proposed Location:	SWM	Logged by:	M. Mickley	Seepage	NE	-	
Excavation / Test Method:	Visual Observation	Contractor:	GPI	Groundwater	NE	-	
		Rig Type:	Bobcat E-60	Seasonal High Groundwater	NE	-	

DEPTH (IN)	COLOR	SOIL TEXTURE	COARSE FRAGMENTS (%) GRAVEL	COBBLES	STONES	BOULDERS	STRUCTURE Shape	Grade	Size	WATER CONTENT	CONSISTENCY Resistance to Rupture	Stickiness	Plasticity	BOUNDARY Distinctness	Topography	ROOTS	MOTTLING Quantity	Size	Contrast	SAMPLING Type	Depth (in)	No.	LAB RESULTS
0-12	TOPSOIL Brown (7.5YR 4/2)	LOAMY SAND	<5	0	0	0	SUBANGULAR BLOCKY	WEAK	FINE	MOIST	FRIABLE	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX) FINE	NONE						
12-134	Dark Olive Brown (2.5Y 3/4)	SILT LOAM	15	<5	<5	0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FIRM	NONSTICKY	NONPLASTIC				NONE			BAG TUBE	36	S-1 T-1	A < 0.2 iph B < 0.2 iph

Additional Remarks: Soil Profile Pit SPP-1 was terminated at approximately 11.2 feet below the ground surface.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-2

Project: Proposed Day School and Medical Office
Project No.: 4447-22-01615
Location: 982 Georgetown-Franklin Turnpike (Route 518) Township of Montgomery, New Jersey
Client: The Malvern School

Surface Elevation (ft):	127.0	**Date Started:**	8/11/22
Termination Depth (ft):	12.0	**Date Completed:**	8/11/22
Proposed Location:	SWM	**Logged by:**	M. Mickley
Excavation / Test Method:	Visual Observation	**Contractor:**	GPI
		Rig Type:	Bobcat E-60

Groundwater Data	Depth (ft)	El. (ft)	Groundwater Comments
Seepage	NE	-	
Groundwater	NE	-	
Seasonal High Groundwater	NE	-	

DEPTH (IN)	COLOR	SOIL TEXTURE	COARSE FRAGMENTS (%)				STRUCTURE			WATER CONTENT	CONSISTENCY			BOUNDARY		ROOTS	MOTTLING			SAMPLING			LAB RESULTS
							Shape	Grade	Size		Resistance to Rupture	Stickiness	Plasticity	Distinctness	Topography		Quantity	Size	Contrast	Type	Depth (in)	No.	
0-5	TOPSOIL Brown (7.5YR 4/2)	LOAMY SAND	GRAVEL <5	COBBLES 0	STONES 0	BOULDERS 0	SUBANGULAR BLOCKY	WEAK	FINE	MOIST	FRIABLE	NONSTICKY	NONPLASTIC	CLEAR <2.5"	BROKEN	FEW (5% MAX) FINE	NONE						
5-32	Yellowish Red (5YR 4/6)	SILT LOAM	GRAVEL 15	COBBLES <5	STONES <5	BOULDERS 0	SUBANGULAR BLOCKY	WEAK	MEDIUM	MOIST	FIRM	NONSTICKY	NONPLASTIC	CLEAR <2.5"	WAVY	FEW (5% MAX) MEDIUM	NONE			BAG	20	S-1	
32-140	Dusky Red (10R 3/2)	SANDY CLAY LOAM	GRAVEL 15	COBBLES <5	STONES <5	BOULDERS 0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FIRM	SLIGHTLY STICKY	SLIGHTLY PLASTIC	CLEAR <2.5"	WAVY	NONE	NONE			BAG TUBE	48	S-2 T-1	A < 0.2 iph B < 0.2 iph
140-144	Dark Reddish Gray (2.5YR 4/1)	FLAGGY SILT LOAM	CHANNERS 15	FLAGSTONES <5	STONES 10	BOULDERS 0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FIRM	NONSTICKY	NONPLASTIC			NONE	NONE						

Additional Remarks: Soil Profile Pit SPP-2 was terminated at approximately 12 feet below the ground surface.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-3

Project:	Proposed Day School and Medical Office	Project No.:	4447-22-01615
Location:	982 Georgetown-Franklin Turnpike (Route 518) Township of Montgomery, New Jersey	Client:	The Malvern School

Surface Elevation (ft):	130.9	Date Started:	8/11/22
Termination Depth (ft):	10.0	Date Completed:	8/11/22
Proposed Location:	SWM	Logged by:	M. Mickley
Excavation / Test Method:	Visual Observation	Contractor:	GPI
		Rig Type:	Bobcat E-60

Groundwater Data	Depth (ft)	El. (ft)	Groundwater Comments
Seepage	NE	-	
Groundwater	NE	-	
Seasonal High Groundwater	NE	-	

DEPTH (IN)	COLOR	SOIL TEXTURE	COARSE FRAGMENTS (%)				STRUCTURE			WATER CONTENT	CONSISTENCY			BOUNDARY		ROOTS		MOTTLING			SAMPLING			LAB RESULTS
			GRAVEL	COBBLES	STONES	BOULDERS	Shape	Grade	Size		Resistance to Rupture	Stickiness	Plasticity	Distinctness	Topography			Quantity	Size	Contrast	Type	Depth (in)	No.	
0-6	TOPSOIL Brown (7.5YR 4/2)	SANDY LOAM	<5	0	0	0	SUBANGULAR BLOCKY	WEAK	FINE	MOIST	FRIABLE	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX)	FINE	NONE						
6-20	Yellowish Red (5YR 4/6)	SANDY LOAM	15	<5	<5	0	SUBANGULAR BLOCKY	MODERATE	FINE	MOIST	FIRM	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX)	FINE	NONE			BAG	10	S-1	
20-120	Dark Reddish Gray (2.5YR 3/1)	SANDY CLAY LOAM	15	<5	<5	0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FIRM	NONSTICKY	NONPLASTIC			NONE		NONE			BAG TUBE	30	S-2 T-1	

Additional Remarks: Soil Profile Pit SPP-3 was terminated at approximately 10 feet below the ground surface.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-4

Project: Proposed Day School and Medical Office | **Project No.:** 4447-22-01615

Location: 982 Georgetown-Franklin Turnpike (Route 518) Township of Montgomery, New Jersey | **Client:** The Malvern School

Surface Elevation (ft):	139.2	Date Started:	8/11/22	Groundwater Data	Depth (ft)	El. (ft)	Groundwater Comments
Termination Depth (ft):	8.5	Date Completed:	8/11/22				
Proposed Location:	SWM	Logged by:	M. Mickley	Seepage	NE	-	
Excavation / Test Method:	Visual Observation	Contractor:	GPI	Groundwater	NE	-	
		Rig Type:	Bobcat E-60	Seasonal High Groundwater	NE	-	

DEPTH (IN)	COLOR	SOIL TEXTURE	COARSE FRAGMENTS (%)				STRUCTURE			WATER CONTENT	CONSISTENCY			BOUNDARY		ROOTS	MOTTLING			SAMPLING			LAB RESULTS
			GRAVEL	COBBLES	STONES	BOULDERS	Shape	Grade	Size		Resistance to Rupture	Stickiness	Plasticity	Distinctness	Topography		Quantity	Size	Contrast	Type	Depth (in)	No.	
0-8	TOPSOIL Brown (7.5YR 4/2)	LOAMY SAND	<5	0	0	0	SUBANGULAR BLOCKY	WEAK	MEDIUM	MOIST	FRIABLE	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX) FINE	NONE						
8-48	Yellowish Red (5YR 4/6)	SANDY LOAM	15	<5	<5	0	SUBANGULAR BLOCKY	MODERATE	FINE	MOIST	FIRM	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX) FINE	NONE			BAG	32	S-1	
48-102	Dark Reddish Brown (2.5YR 3/4)	SILT LOAM	15	<5	<5	0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FIRM	SLIGHTLY STICKY	NONPLASTIC			NONE	NONE			BAG TUBE	52	S-2 T-1	A < 0.2 iph B < 0.2 iph

Additional Remarks: Soil Profile Pit SPP-4 was terminated at approximately 8.5 feet below the ground surface.

SOIL PROFILE PIT LOG

DYNAMIC EARTH

Soil Profile Pit: SPP-5

Project:	Proposed Day School and Medical Office	**Project No.:**	4447-22-01615
Location:	982 Georgetown-Franklin Turnpike (Route 518) Township of Montgomery, New Jersey	**Client:**	The Malvern School

Surface Elevation (ft):	140.1	**Date Started:**	8/11/22
Termination Depth (ft):	10.0	**Date Completed:**	8/11/22
Proposed Location:	SWM	**Logged by:**	M. Mickley
Excavation / Test Method:	Visual Observation	**Contractor:**	GPI
		Rig Type:	Bobcat E-60

Groundwater Data	Depth (ft)	El. (ft)	Groundwater Comments
Seepage	NE	-	
Groundwater	NE	-	
Seasonal High Groundwater	NE	-	

DEPTH (IN)	COLOR	SOIL TEXTURE	COARSE FRAGMENTS (%)				STRUCTURE			WATER CONTENT	CONSISTENCY			BOUNDARY		ROOTS	MOTTLING			SAMPLING			LAB RESULTS
			GRAVEL	COBBLES	STONES	BOULDERS	Shape	Grade	Size		Resistance to Rupture	Stickiness	Plasticity	Distinctness	Topography		Quantity	Size	Contrast	Type	Depth (in)	No.	
0-10	TOPSOIL Brown (7.5YR 4/2)	LOAMY SAND	<5	0	0	0	SUBANGULAR BLOCKY	WEAK	FINE	MOIST	FRIABLE	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX) FINE	NONE						
10-34	Fill Yellowish Red (5YR 4/6)	SANDY LOAM	15	<5	<5	0	SUBANGULAR BLOCKY	MODERATE	FINE	MOIST	FIRM	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX) FINE	NONE			BAG	18	S-1	
34-120	Dark Reddish Brown (2.5YR 3/4)	SILT LOAM	15	<5	<5	0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FIRM	NONSTICKY	NONPLASTIC			NONE	NONE			BAG TUBE	40	S-2 T-1	A < 0.2 iph B < 0.2 iph

Additional Remarks: Fill encountered to 34 inches. Soil Profile Pit SPP-5 was terminated at approximately 10 feet below the ground surface.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-6

Project:	Proposed Day School and Medical Office	Project No.:	4447-22-01615
Location:	982 Georgetown-Franklin Turnpike (Route 518) Township of Montgomery, New Jersey	Client:	The Malvern School

Surface Elevation (ft):	143.4	Date Started:	8/11/22
Termination Depth (ft):	11.0	Date Completed:	8/11/22
Proposed Location:	SWM	Logged by:	M. Mickley
Excavation / Test Method:	Visual Observation	Contractor:	GPI
		Rig Type:	Bobcat E-60

Groundwater Data	Depth (ft)	El. (ft)	Groundwater Comments
Seepage	NE	-	
Groundwater	NE	-	
Seasonal High Groundwater	NE	-	

DEPTH (IN)	COLOR	SOIL TEXTURE	COARSE FRAGMENTS (%)				STRUCTURE			WATER CONTENT	CONSISTENCY			BOUNDARY		ROOTS	MOTTLING			SAMPLING			LAB RESULTS
			GRAVEL	COBBLES	STONES	BOULDERS	Shape	Grade	Size		Resistance to Rupture	Stickiness	Plasticity	Distinctness	Topography		Quantity	Size	Contrast	Type	Depth (in)	No.	
0-12	TOPSOIL Brown (7.5YR 4/2)	LOAMY SAND	<5	0	0	0	SUBANGULAR BLOCKY	WEAK	FINE	MOIST	FRIABLE	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX) FINE	NONE						
12-46	Fill Yellowish Red (5YR 4/6)	SANDY LOAM	15	<5	<5	0	ANGULAR BLOCKY	MODERATE	FINE	MOIST	FIRM	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX) FINE	NONE			BAG	24	S-1	
46-132	Dark Reddish Brown (2.5YR 3/4)	SILT LOAM	15	<5	<5	0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FIRM	NONSTICKY	NONPLASTIC			NONE	NONE			BAG TUBE	50	S-2 T-1	A < 0.2 iph B < 0.2 iph

Additional Remarks: Soil Profile Pit SPP-6 was terminated at approximately 11 feet below the ground surface.

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-7

Page 1 of 1

Project:	Proposed Day School and Medical Office	**Project No.:**	4447-22-01615
Location:	982 Georgetown-Franklin Turnpike (Route 518) Township of Montgomery, New Jersey	**Client:**	The Malvern School

Surface Elevation (ft):	133.9	**Date Started:**	8/11/22
Termination Depth (ft):	12.0	**Date Completed:**	8/11/22
Proposed Location:	SWM	**Logged by:**	M. Mickley
Excavation / Test Method:	Visual Observation	**Contractor:**	GPI
		Rig Type:	Bobcat E-60

Groundwater Data	Depth (ft)	El. (ft)	Groundwater Comments
Seepage	NE	-	
Groundwater	NE	-	
Seasonal High Groundwater	NE	-	

DEPTH (IN)	COLOR	SOIL TEXTURE	COARSE FRAGMENTS (%) GRAVEL	COBBLES	STONES	BOULDERS	STRUCTURE Shape	Grade	Size	WATER CONTENT	CONSISTENCY Resistance to Rupture	Stickiness	Plasticity	BOUNDARY Distinctness	Topography	ROOTS	MOTTLING Quantity	Size	Contrast	SAMPLING Type	Depth (in)	No.	LAB RESULTS
0-8	TOPSOIL Brown (7.5YR 4/2)	LOAMY SAND	<5	0	0	0	SUBANGULAR BLOCKY	WEAK	FINE	MOIST	FRIABLE	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX) FINE	NONE						
8-26	Fill Yellowish Red (5YR 4/6)	SANDY LOAM	15	<5	<5	0	SUBANGULAR BLOCKY	MODERATE	FINE	MOIST	FIRM	NONSTICKY	NONPLASTIC	CLEAR <2.5"	SMOOTH	FEW (5% MAX) FINE	NONE			BAG	12	S-1	
26-144	Dark Reddish Brown (2.5YR 3/4)	SILT LOAM	15	<5	<5	0	SUBANGULAR BLOCKY	MODERATE	MEDIUM	MOIST	FIRM	NONSTICKY	NONPLASTIC			NONE	NONE			BAG TUBE	36	S-2 T-1	A < 0.2 iph B < 0.2 iph

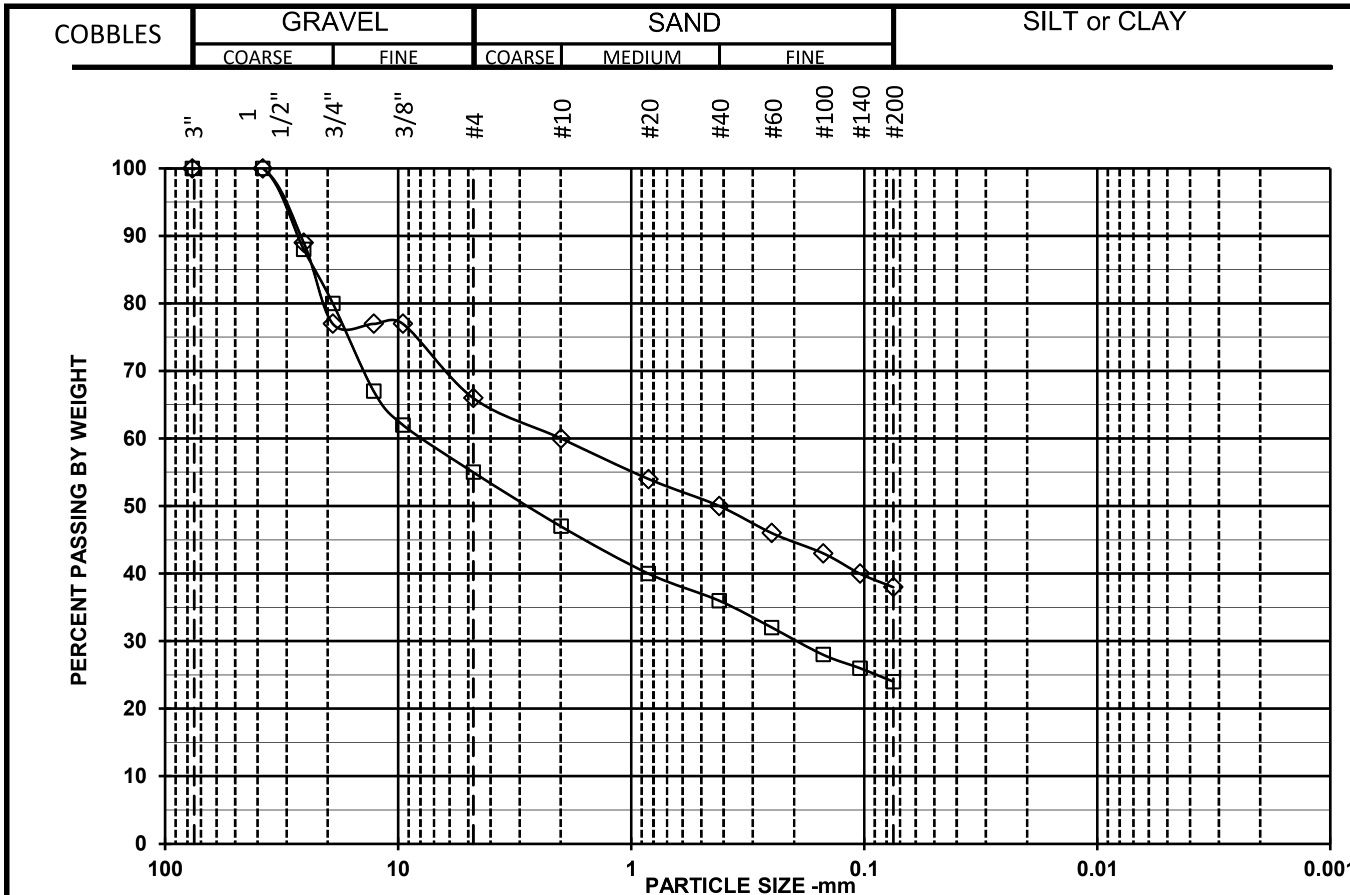
Additional Remarks: Soil Profile Pit SPP-7 was terminated at approximately 12 feet below the ground surface.

Laboratory Test Results

Dynamic Earth #4447-22-01615
Montgomery, NJ
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS						REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	
B-1	S-3	4-6	29.3	70	33	37	CH	63	
B-2	S-2	2-4	26.2	54	30	24	MH	58	
B-3	S-5	8-10	8.3				GC	24	
B-4	S-8	14-16	20.0				GC	38	

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



Open Symbols: Sieve analysis by ASTM D6913
Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	8.3				GC		Brown, Clayey gravel with sand, Insufficient sample size	08/22/22
◇	20.0				GC		Reddish brown, Clayey gravel with sand, Insufficient sample size	08/22/22
○								

Symbol	□	◇	○
Boring	B-3	B-4	
Sample	S-5	S-8	
Depth	8-10	14-16	
% +3"	0	0	
% Gravel	45	34	
% SAND	31	28	
%C SAND	8	6	
%M SAND	11	10	
%F SAND	12	12	
% FINES	24	38	
D_{100} (mm)	38.1	38.1	
D_{60} (mm)	7.81	2	
D_{30} (mm)	0.19		
D_{10} (mm)			
Cc			
Cu			

Sieve Size/ID #	Percent Finer Data		
6"	100	100	
4"	100	100	
3"	100	100	
1 1/2"	100	100	
1"	88	89	
3/4"	80	77	
1/2"	67	77	
3/8"	62	77	
#4	55	66	
#10	47	60	
#20	40	54	
#40	36	50	
#60	32	46	
#100	28	43	
#140	26	40	
#200	24	38	
5µ m			
2µ m			
1µ m			

Dynamic Earth #4447-22-01615

TerraSense #22010405A

Montgomery, NJ

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

TerraSense Analysis File: GrainSizeTSLV2

Siev1a.xlsx 8/31/2022

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-1 **Sample No.:** T-1 **Depth:** 36"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) A Date Collected 8/11/2022

2. Material Tested: ____ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
   Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 347.3238

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

    K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

    x NONE

    ____ Soil/Tube Contact ____ Large Gravel ____ Large Roots

    ____ Dry Soil ____ Smearing ____ Compaction

    ____ Other - Specify ____

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-1 **Sample No.:** T-1 **Depth:** 36"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) B Date Collected 8/11/2022

2. Material Tested: ____ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
   Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 347.3238

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

x NONE

____ Soil/Tube Contact ____ Large Gravel ____ Large Roots

____ Dry Soil ____ Smearing ____ Compaction

____ Other - Specify ____

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-2 **Sample No.:** T-1 **Depth:** 48"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) A Date Collected 8/11/2022

2. Material Tested: ____ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
Length of Sample, L, in inches 3.25

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 376.2675

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

x NONE

____ Soil/Tube Contact ____ Large Gravel ____ Large Roots

____ Dry Soil ____ Smearing ____ Compaction

____ Other - Specify ____

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-2 **Sample No.:** T-1 **Depth:** 48"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) B Date Collected 8/11/2022

2. Material Tested: ______ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ______ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
   Length of Sample, L, in inches 3.25

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 376.2675

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ______ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

    K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

    x NONE

    ________ Soil/Tube Contact ________Large Gravel _____________ Large Roots

    ________ Dry Soil ___________Smearing ____________ Compaction

    ________ Other - Specify ____

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-4 **Sample No.:** T-1 **Depth:** 52"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) A Date Collected 8/11/2022

2. Material Tested: ____ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
   Length of Sample, L, in inches 2.25

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 260.4929

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

    K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

    x NONE

    ____ Soil/Tube Contact ____ Large Gravel ____ Large Roots

    ____ Dry Soil ____ Smearing ____ Compaction

    ____ Other - Specify ____

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-4 **Sample No.:** T-1 **Depth:** 52"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) B Date Collected 8/11/2022

2. Material Tested: ____ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
   Length of Sample, L, in inches 2.50

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 289.4365

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

    K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

    x NONE

    ____ Soil/Tube Contact ____ Large Gravel ____ Large Roots

    ____ Dry Soil ____ Smearing ____ Compaction

    ____ Other - Specify ____

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-5 **Sample No.:** T-1 **Depth:** 40"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) A Date Collected 8/11/2022

2. Material Tested: ____ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
   Length of Sample, L, in inches 3.50

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 405.2111

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

    K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

    x NONE

    ____ Soil/Tube Contact ____ Large Gravel ____ Large Roots

    ____ Dry Soil ____ Smearing ____ Compaction

    ____ Other - Specify ____

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-5 **Sample No.:** T-1 **Depth:** 40"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) B Date Collected 8/11/2022

2. Material Tested: ____ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
   Length of Sample, L, in inches 3.50

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 405.2111

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

    K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

    x NONE

    ____ Soil/Tube Contact ____ Large Gravel ____ Large Roots

    ____ Dry Soil ____ Smearing ____ Compaction

    ____ Other - Specify ____

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-6 **Sample No.:** T-1 **Depth:** 50"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) A Date Collected 8/11/2022

2. Material Tested: ____ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
   Length of Sample, L, in inches 3.50

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 405.2111

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

    K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

    x NONE

    ____ Soil/Tube Contact ____ Large Gravel ____ Large Roots

    ____ Dry Soil ____ Smearing ____ Compaction

    ____ Other - Specify ____

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-6 **Sample No.:** T-1 **Depth:** 50"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) B Date Collected 8/11/2022

2. Material Tested: ____ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
   Length of Sample, L, in inches 3.50

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 405.2111

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

    K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

    x NONE

    ________ Soil/Tube Contact ________Large Gravel ____________ Large Roots

    ________ Dry Soil ___________Smearing ____________ Compaction

    ________ Other - Specify ____

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-7 **Sample No.:** T-1 **Depth:** 36"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) A Date Collected 8/11/2022

2. Material Tested: ______ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ______ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
   Length of Sample, L, in inches 2.50

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 289.4365

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ______ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

    K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

    x NONE

    ______ Soil/Tube Contact ______ Large Gravel ______ Large Roots

    ______ Dry Soil ______ Smearing ______ Compaction

    ______ Other - Specify ______________________

Tube Permeameter Test Data

Job Number: 4447-22-01615
Project: Proposed School Redevelopment
Client: The Malvern School
Lab Tech: M. Shaw

Sample ID: **Boring/Test Pit No.:** SPP-7 **Sample No.:** T-1 **Depth:** 36"

MUNICIPALITY Montgomery Township BLOCK 28005 LOT 57 & 58

1. Test Number T-1 Replicate (letter) B Date Collected 8/11/2022

2. Material Tested: ______ Fill x Test in Native Soil-Indicate Depth

3. Type of Sample: x Undisturbed ______ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 3.81
   Length of Sample, L, in inches 2.75

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams N/A

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 318.3802

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. N/A > 1.2

9. Standpipe Used: x No ______ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		>240
		>240
		>240

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= >240

    K = <0.2 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

    x NONE

    ________ Soil/Tube Contact ________Large Gravel ______________ Large Roots

    ________ Dry Soil ___________Smearing ____________ Compaction

    ________ Other - Specify ____

NRCS-USDA Custom Soil Resource Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Somerset County, New Jersey

August 22, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:968 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 10, 20, 40, 60

Feet: 0, 45, 90, 180, 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Somerset County, New Jersey
Survey Area Data: Version 19, Aug 31, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 13, 2021—Sep 14, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BhnB	Birdsboro silt loam, 2 to 6 percent slopes	2.4	100.0%
Totals for Area of Interest		**2.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Somerset County, New Jersey

BhnB—Birdsboro silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1j514
Elevation: 200 to 1,000 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Birdsboro and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Birdsboro

Setting

Landform: Stream terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old alluvium derived from sandstone and siltstone and/or shale

Typical profile

Ap - 0 to 8 inches: silt loam
BA - 8 to 13 inches: silt loam
Bt - 13 to 29 inches: silt loam
BC - 29 to 40 inches: silt loam
C - 40 to 60 inches: stratified sand to silty clay loam
2C - 60 to 80 inches: stratified sand to fine sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Raritan, rarely flooded

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Bucks

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Duffield

Percent of map unit: 5 percent
Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

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Geotechnical Terms and Symbols

245 Main Street; Suite 110
Chester, NJ 07930
908-879-9229: Fax 908-879-0222

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

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

SOIL PROPERTY SYMBOLS

N:	Standard Penetration Value: Blows per ft. or a 140 lb. hammer falling 30” on a 2” O.D. split-spoon.
Qu:	Unconfined compressive strength, TSF.
Qp:	Penetrometer value, unconfined compressive strength, TSF.
Mc:	Moisture content, %
LL:	Liquid limit, %
PI:	Plasiticity index, %
δd:	Natural dry density, PCF.
▼: =	Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE:	Not Encountered (Groundwater was not encountered)
SS:	Split-Spoon – 1⅜” I.D., 2” O.D., except where noted
ST:	Shelby Tube – 3” O.D., except where noted
AU:	Auger Sample
OB:	Diamond Bit
CB:	Carbide Bit
WS:	Washed Sample

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	Qu (TSF)
Very Soft	0-0.25
Soft	0.25-0.50
Firm (Medium)	0.50-1.00
Stiff	1.00-2.00
Very Stiff	2.00-4.00
Hard	4.00 +

PARTICLE SIZE

Boulders	8 in. +	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in. – 3 in.	Medium Sand	0.6mm-0.2mm	Clay	- 0.005mm
Gravel	3 in. – 5mm	Fine Sand	0.2mm – 0.074mm		

USCS Standard Classification System

UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2488

MAJOR DIVISION			GROUP SYMBOL	LETTER SYMBOL	GROUP NAME
COARSE GRAINED SOILS CONTAINS MORE THAN 50% FINES	**GRAVEL AND GRAVELLY SOILS** MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVEL WITH * 5% FINES		GW	Well-graded GRAVEL
				GP	Poorly graded GRAVEL
		GRAVEL WITH BETWEEN 5% AND 15% FINES		GW-GM	Well-graded GRAVEL with silt
				GW-GC	Well-graded GRAVEL with clay
				GP-GM	Poorly graded GRAVEL with silt
				GP-GC	Poorly graded GRAVEL with clay
		GRAVEL WITH ≥ 15% FINES		GM	Silty GRAVEL
				GC	Clayey GRAVEL
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SAND WITH * 5% FINES		SW	Well-graded SAND
				SP	Poorly graded SAND
		SAND WITH BETWEEN 5% AND 15% FINES		SW-SM	Well-graded SAND with silt
				SW-SC	Well-graded SAND with clay
				SP-SM	Poorly graded SAND with silt
				SP-SC	Poorly graded SAND with clay
		SAND WITH ≥ 15% FINES		SM	Silty SAND
				SC	Clayey SAND
FINE GRAINED SOILS CONTAINS MORE THAN 50% FINES	SILT AND CLAY	LIQUID LIMIT LESS THAN 50		ML	Inorganic SILT with low plasticity
				CL	Lean inorganic CLAY with low plasticity
				OL	Organic SILT with low plasticity
		LIQUID LIMIT GREATER THAN 50		MH	Elastic inorganic SILT with moderate to high plasticity
				CH	Fat inorganic CLAY with moderate to high plasticity
				OH	Organic SILT or CLAY with moderate to high plasticity
HIGHLY ORGANIC SOILS				PT	PEAT soils with high organic contents

NOTES:

1) Sample descriptions are based on visual field and laboratory observations using classification methods of ASTM D2488. Where laboratory data are available, classifications are in accordance with ASTM D2487.

2) Solid lines between soil descriptions indicate change in interpreted geologic unit. Dashed lines indicate stratigraphic change within the unit.

3) Fines are material passing the U.S. Std. #200 Sieve.