REPORT OF PRELIMINARY GEOTECHNICAL AND STORMWATER BASIN AREA INVESTIGATION

PROPOSED RESIDENTIAL SUBDIVISION

2 & 10 Ridge Road
Block 80.03, Lots 10 and 21
Township of West Orange, Essex County, New Jersey

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1.0 EXECUTIVE SUMMARY

Dynamic Earth, LLC (Dynamic Earth) has completed a preliminary geotechnical investigation and stormwater basin area investigation for the proposed site development located at 2 and 10 Ridge Road in the Township of West Orange, Essex County, New Jersey. Based on the results of our field investigation, conventional shallow foundations and ground supported floor slabs bearing on structural fill material (where site grades are raised), natural soils and/or underlying weathered rock are expected to be feasible for the proposed site development. However, portions of the on-site soils included existing fill material. As such, project planning should include at least partial overexcavation and replacement of the existing fill material.

Relatively shallow weathered rock and rock and oversized cobbles/boulders were encountered during our subsurface exploration. **As such, depending on final site grading plans, project planning should include the need for difficult excavation to remove weathered rock/rock and oversized materials.**

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 2 and 10 Ridge Road in the Township of West Orange, Essex County, New Jersey and is further identified as Block 80.03, Lots 10 and 21. The site is bound to the north and to the east by Mount Pleasant Avenue with residential property beyond; to the south by residential property; and to the west by Ridge Road with commercial property beyond (Brookdale West Orange). The site of the proposed construction is shown on the attached *Test Location Plan*.

At the time of Dynamic Earth's investigation, the majority of the site was a heavily wooded parcel. Existing stone/brick retaining walls were located within the eastern portion of the site. The proposed site development will include the construction of a residential subdivision with approximately four to five single-family homes with associated pavements and utilities the location and size of the residential homes were not provided. Stormwater management facilities are planned throughout the subject site. Proposed site development details were provided on an April 8, 2022 *Conceptual Plan 'A'* prepared by Dynamic Engineering Consultants, PC (Dynamic). While site grading plans were not developed at this time, we preliminarily assume typical earth cuts and fills on the order of approximately five to seven feet will be required as part of the site development.

Topographic information was provided on a May 11, 2022 *ALTA/NSPS Land Title Survey* prepared by Dynamic Survey, LLC. Existing site elevations range between approximately 625.0 feet within

the central portion of the site and 507.0 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.

Structural loads were not developed at this time; however, based on our experience with similar projects, the proposed structures are expected to be masonry and wood-framed structures constructed with a concrete slab-on-grade and may include basement levels. The maximum loads are assumed to be less than the following:

- Wall – 1.0 kip per linear foot;
- Column – 50 kips; and
- Floor Slab – 50 pounds per square foot.

3.0 SCOPE OF SERVICES

3.1 Field Investigation

Field exploration for this investigation was conducted by means of two soil borings (identified as borings B-1 through B-2), ten soil profile pits (identified as SPP-1 through SPP-10), and five structural test pits (identified as TP-1 through TP-5). The borings were drilled using hollow stem auger drilling techniques with an all-terrain vehicle (ATV) mounted drill rig and the soil profile pits/test pits were excavated with a rubber-tire backhoe. 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	Northwestern Portion of Site	20.7 [1]
B-2	Central/Eastern Portion of Site	9.8 [1]
SPP-1/TP-1	Southwestern Portion of Site	6.3 [1]
TP-2	Western Portion of Site	12.0 [1]
SPP-2	Northwestern Portion of Site	11.7 [1]
SPP-3	Central/Eastern Portion of Site	9.8 [1]
SPP-4/TP-3	Southern Portion of Site	11.9 [1]
SPP-5	Central portion of Site	4.8 [1]
SPP-6		3.3 [1]
SPP-7/TP-4	Central/Northern Portion of Site	3.9 [1]
SPP-8/ TP-5	Northeastern Portion of Site	11.5 [1]
SPP-9	Eastern Portion of Site	5.9 [1]
SPP-10		4.0 [1]

[1] Refusal encountered within underlying weathered rock and/or very dense glacial deposits

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.

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 borings. Seasonal variations, temperature, 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.

A Phase I Site Assessment was also completed by Dynamic Earth and was issued under an April 18, 2022 *Phase I Environmental Site Assessment.*

3.2 Laboratory Testing Program

Physical/Textural Analysis: Each sample was visually classified in general accordance with ASTM D2488. In addition, representative samples of selected strata encountered were subjected to a laboratory testing program which included, moisture content determinations (ASTM D2216), Atterberg limits (ASTM D4318), and washed gradation analyses (ASTM D6913) in order to perform supplementary engineering soil classifications in general accordance with ASTM D2487 (Unified Soil Classification System). The 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-2	2-4	17.8	Not Plastic		33.4	GM
B-2	S-3	4-6	15.2	Not Plastic		46.1	SM
TP-1	S-1	1-2	15.1	17	Not Plastic	26.3	SC

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 a region of the Piedmont Physiographic Province of New Jersey known as the Newark Basin. The Newark Basin contains rocks of the Newark Super Group and Brunswick Group which is a stratigraphic series of Triassic to Jurassic age igneous and sedimentary rocks containing intrusive sills and dikes as well as extrusive volcanics. The primary formation beneath the site is known as the Orange Mountain Basalt which includes basalts, greenish-gray to greenish-black, massive, pillow, and columnar jointed structures separated by thick beds of red siltstone or volcaniclastic rocks. The formation beneath the eastern portion of the site is known as the Passaic Formation of the Brunswick Group which includes thin to thick bedded siltstone and sandstone. Mud cracks, ripple marks, crossbeds and burrows are common. The overburden materials include residual soils derived from the underlying bedrock.

Surficial geology at the site consists of the Rahway Till (Qwtr). The reported lithology consists of exposed clayey silt and sandy silt deposits and include pebbles and cobbles and few boulders directly desisted from glacial ice. Overburden material also include reworked on-site 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:

Yalesville-Boonton-Holyoke complex, zero to eight percent slopes (YaobBc): The Yalesville-Boonton-Holyoke complex is mapped underlying the central portion of the site. The parent material reported as loamy basaltic till deposits. The typical soil profile (as detailed in the survey) consists of decomposed plant material to one inch; loam to a depth of five inches; sandy loam to a depth of 32 inches; underlain by bedrock 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).

Yalesville-Holyoke complex, 35 to 60 percent slopes (YaohEh): The Yalesville-Holyoke complex is mapped underlying a small area within the eastern portion of the overall site and has a similar soil profile (as detailed in the survey) to YaobBc as detail above.

Haledon silt loam, zero to eight percent slopes (HanBc): The Haledon silt loam is mapped underlying the central and western portions of the site. The parent material reported as loamy basaltic till deposits. The typical soil profile (as detailed in the survey) consists of decomposed plant material to two inches; silt loam to a depth of 22 inches; loam to a depth of 30 inches; underlain by sandy loam to a depth of 80 inches below the natural ground surface (limit of report). The depth to the water table is reported to be seven to 18 inches below the natural ground surface (limit of report).

Boonton-Urban land complex, zero to eight percent slopes (BowrB): The Boonton-Urban Land complex is mapped underlying the eastern portion of the site. The parent material reported as loamy sandstone and shale till deposits. The typical soil profile (as detailed in the survey) consists of decomposed plant material to one inch; silt loam to a depth of three inches; loam to a depth of 27 inches; underlain by sandy loam to a depth of 83 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).

Boonton-loam, eight to fifteen percent slopes (BogCc): The Boonton Loam is mapped underlying the western portion of the site. The parent material reported as loamy basaltic till deposits. The typical soil profile (as detailed in the survey) consists of decomposed plant material to three inches; loam to a depth of five inches; silt loam to a depth of 30 inches; sandy loam to a depth of 47 inches; underlain by loamy sand to a depth of 72 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).

Urban land, Boonton substratum, zero to eight percent slopes (USBONB): The Urban Land Boonton substratum is mapped underlying the northern portion of the site. The parent material reported as supraglacial till. The typical soil profile (as detailed in the survey) consists of material

to 12 inches; sandy loam to a depth of 47 inches; underlain by loamy sand to a depth of 72 inches below the natural ground surface (limit of report). The depth to the water table is reported to be about 28 to 59 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: Soil borings and soil profile pits were performed within existing grass covered/wooded areas and encountered approximately seven to 17 inches of topsoil at the surface.

Existing Fill Material: Beneath the surface cover, existing fill material was encountered at one test location (SPP-8/TP-5) within the northeastern portion of the site. Where encountered, the existing fill material generally consisted of apparent reworked on-site soils that included silty clay loam with variable amounts of channers, gravel, and debris. The debris encountered included brick and concrete. This stratum extended to a depth of approximately two feet below the ground surface; corresponding to an elevation of approximately 569.1 feet.

Glacial Deposits: Beneath the surficial cover and/or existing fill material, natural glacial deposits were encountered that generally consisted of sand (USCS: SM and SP-SM), gravel (USCS: GM) and clay (USCS: CL) with varying amounts of silt. The natural glacial deposits were encountered to depths ranging between approximately two feet and ten feet below the ground surface; corresponding to elevations ranging between approximately 621.3 feet and 521.7 feet. Standard Penetration Test (SPT) N-values ranged between five blows per foot (bpf) and 33 bpf, and averaged approximately 16 bpf; generally indicating a relatively medium dense condition within this stratum.

Residual Soils: Beneath the surficial cover and/or glacial deposits material, natural residual deposits were encountered that generally consisted of silt (USCS: ML), sand (USCS: SM) and gravel (USCS: GP) with varying amounts of clay. The natural residual soils were encountered to depths ranging between approximately two feet and 15.0 feet below the ground surface; corresponding to elevations ranging between approximately 618.4 feet and 559.6 feet. Standard Penetration Test (SPT) N-values ranged between 18 bpf and 46 bpf, and averaged approximately 29 bpf; generally indicating a relatively medium dense condition within this stratum.

Weathered Rock/Top of Rock: The natural residual soils graded to weathered rock with increasing depth. The weathered rock generally consisted of coarse to fine gravel (USCS: GM and GP) with variable amounts of sand, silt, and clay. SPT N-values recorded within this stratum were generally refusal (defined herein as greater than 50 blows per six inches or less at split-spoon sampler advancement); generally indicating a very dense condition. Each test location was

terminated within this stratum due to auger and/or machine refusal at depths ranging between approximately 3.3 feet and 20.7 feet below the ground surface, corresponding to elevations ranging between 617.0 feet and 521.7 feet. The machine refusal is generally considered the top of intact rock.

4.4 Seasonal High Groundwater and Groundwater

Indicators of seasonal high groundwater (i.e. based on soil mottling) were encountered within the soil profile pit excavations at depths ranging between approximately 1.4 feet and five feet below the ground surface; corresponding to elevations ranging between approximately 621.3 feet and 612.4 feet. Groundwater was encountered at depths ranging between approximately two feet and 9.6 feet below the ground surface; corresponding to elevations ranging between 621.3 feet and 562.1 feet. Groundwater levels are expected to fluctuate seasonally and following significant periods of precipitation.

5.0 PRELIMINARY DEVOLPMENT CONSIDERATIONS

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.

Based on the subsurface conditions encountered, the proposed building may be supported on a conventional shallow foundation system and ground supported floor slab bearing within approved on-site soils, underlying weathered rock/rock, and/or compacted structural fill material, provided these materials are properly inspected, placed, and compacted, as outlined herein. Due to moisture sensitivity of the onsite soils, at least partial overexcavation and replacement should be expected, particular if the material is subjected to moisture. Existing fill material was encountered within the northeastern portion of the site. If existing fill material is encountered during construction below proposed foundations, these materials will need to be overexcavated and replaced with structural fill material.

Relatively shallow weathered rock and rock and oversized cobbles/boulders were encountered during our subsurface exploration. **As such, depending on final site grading plans, project planning should include the need for difficult excavation to remove weathered rock/rock, and oversized materials.** Dynamic Earth should remain involved to review the final site grading plans as related to difficult excavation, particularly if the proposed buildings will include basement levels.

5.2 Preliminary Shallow Foundation Design Recommendations

Anticipated Bearing Strata: Proposed foundations are anticipated to bear within natural glacial soils, natural residual soils, underlying weathered rock/rock, and/or compacted structural fill. If encountered, existing fill material will need to be overexcavated and replaced below proposed foundations. Due to the moisture sensitivity of the on-site soils, partial overexcavation and replacement of the on-site soils should be included as a part of the project planning.

Shallow Foundation Design Criteria: Dynamic Earth recommends supporting the proposed structure may be supported on conventional shallow foundations bearing within approved on-site soils and/or newly placed and compacted structural fill material. Foundations bearing within approved subgrade material may be designed to exert a maximum allowable net bearing pressure of 3,000 pounds per square foot (psf). 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 soils - 0.30.

Partial Rock Support: Footings should not bear partially on rock and partially on soil due to the risk of brittle fracture at hinging points. Any foundation subgrades that would result in partially supported rock conditions should be overexcavated an additional six inches and replaced with well graded, compacted structural fill to provide a cushion against brittle fracture. Alternatively, isolated spread footings (if applicable) may be extended to bear entirely on rock.

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 unsuitable materials 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. If applicable, 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 approved structural fill placed and/or on-site soils will be suitable for support of the proposed floor slabs provided these materials are properly evaluated, compacted and proofrolled in accordance with Sections 5.2 and 5.3 of this report. **Due to the existing fill and moisture sensitive on-site soils encountered, the contractor should anticipate at least partial overexcavation and replacement and/or subgrade stabilization within the area of proposed floor slab.** Depending on construction phase evaluation, overexcavation may be limited with the use of subgrade stabilization techniques, such as geogrid stabilization, as directed by Dynamic Earth. Any areas of the slab 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 preliminarily 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 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. **As evident by the soil profile pits performed, relatively deeper root mats should be anticipated. The contractor is responsible for restoring grades with structural fill**

following removal of deeper topsoil and root mat layers.

Difficult Excavation and Rock Excavation: Weathered rock/rock was encountered at depths as shallow as approximately 2.3 feet below existing site grades. In addition, difficult excavation was encountered apparent cobbles/boulders within the test pits. As such, depending on the final site grading plans, Dynamic Earth anticipates removal of weathered rock/rock and/or oversized materials will be required within excavations for the proposed buildings and/or utility installation.

Conventional excavation equipment with rock ripping tools may be effective to remove only the uppermost weathered rock and/or rock. The speed and ease of excavation will depend on the type of grading equipment, the skill of the equipment operators, and the structure of the material itself. Planned excavation depths beyond refusal depths will likely require pneumatic hammers to remove the rock.

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 minimum 10-ton 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 groundwater is suspected near subgrade elevations. The surface then should 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 Section 5.3.

Subgrade Protection and Inspection: Portions of the on-site soils are considered to be extremely moisture sensitive and every effort should be made to minimize disturbance of the on-site soils by construction traffic and surface runoff. These materials will likely become unsuitable if exposed to moisture and/or construction traffic. If the onsite soils become overly wetted, increased handling such as discing and drying during extended periods of favorable weather and/or subgrade stabilization may be required. Common stabilization for marginally unsuitable subgrades includes installation of geogrid (such as Tensar TX-5 of TX-7), mixing with granular soils and or chemical stabilization (lime or cement mixing). If required, the subgrade stabilization should be reviewed by the geotechnical engineer during construction. 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.

Subgrade Stabilization and Inspection: The on-site soils are considered to be extremely moisture sensitive and every effort should be made to minimize disturbance of the on-site soils by construction traffic and surface runoff. The on-site soils will likely 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 and/or partial overexcavation and stabilization. A triaxle geogrid such as Tensar TX-5 of TX-7 or mixing with granular soils, may be considered where excessively soft or pumping conditions are encountered, as directed by the geotechnical engineer.

The subgrades should be sealed daily and construction traffic be minimized to designated non-structural areas and following periods of precipitation 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 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 glacial deposits, natural residual soils, and weathered rock/rock. Portions of these materials (above the zone of saturation) are preliminarily expected to be suitable for reuse as structural fill material,

provided moisture contents are within tolerable limits to achieve compaction and that oversized materials/deleterious debris (if encountered) are segregated. Portions of the on-site soils are considered moisture sensitive and will require moisture conditioning during a period of favorable weather, mixing with granular soils, and/or chemical stabilization (such as lime or cement mixing), and/or will become impractical for reuse if exposed to moisture. As such, 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 smooth drum roller or sheepsfoot roller (where fine-grained soils are encountered) to compact subgrade soils beneath larger areas such as pavements or slabs. Hand operated vibratory jumping jacks and plate compactors should be used in confined excavations for foundations or utilities. Fill material compacted with relatively light weight equipment or in the static mode may require additional passes and/or the material may need to be placed in thinner, loose lifts.

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 pavements. **Due to the reworked onsite material and moisture sensitivity of the on-site soils, at least partial overexcavation and replacement, re-compaction and/or subgrade stabilization should be expected, as detailed throughout this report.** Depending on the overall subgrade conditions and weather conditions, more extensive mitigation efforts may be required. If required, a specific pavement section can be provided based on the results of a supplemental geotechnical investigation.

5.6 Preliminary Groundwater Considerations

Indicators of seasonal high groundwater were encountered during this investigation as shallow as 1.4 feet below existing site grades. As such, groundwater control measures should be anticipated for this project, as detailed below.

Permanent Groundwater Control: The need for permanent groundwater control measures should be evaluated along with the final site grading plans by the project's structural engineer and architect as part of the building design. Waterproofing and permanent groundwater control measures are recommended along proposed foundation walls that will be located below the seasonal high groundwater level. In addition, under slab drains and sump pumps are recommended where the finished floor slab is near the groundwater elevation. Alternatively, the project's structural engineer can include considerations for resisting the buoyant pressure (such as increasing the thickness of the floor slab) for the design of the floor slab.

Temporary Groundwater Control: The contractor should anticipate the need for groundwater control within proposed excavations. Typically, excavations extending less than approximately two feet below the groundwater levels may be controlled by providing a sufficient number of sump pumps to draw down groundwater below the bottom of excavations. Deeper excavations that remain open for extended periods will require more extensive dewatering, possibly including installation of deep well points. The contractor should be responsible for providing adequate groundwater control so that proper installation of below grade structures can be accomplished.

While the means of groundwater control will need to be determined by the contractor, the use of gravity fed sump pumps are typically suitable for dewatering of surface runoff, perched and infiltrating water. Surface water runoff must be controlled and diverted away from construction areas by grading and limiting the exposure of excavations to rainfall.

5.7 Preliminary Retaining Walls and Lateral Earth Pressure Recommendations

Proposed retaining wall structures were not identified at this time; however, retaining wall structures may be proposed due to existing site topography and/or along the property lines (if necessary). Dynamic Earth presents the following preliminary design recommendations for use when designing proposed retaining walls requiring lateral earth pressure estimates.

Soil Parameters and Design Considerations: Proposed retaining walls that are free to rotate generally can be designed to resist active earth pressures. Restrained walls and retaining wall corners need to be designed to resist at-rest earth pressures. Backfill soils adjacent to these structures should consist of freely draining materials composed primarily of sand and gravel. The

soil parameters provided below apply to properly compacted granular fill and backfill placed in a well-drained, level condition and may be used for preliminary design of retaining structures.

SUMMARY OF LATERAL EARTH PRESSURE PARAMETERS					
Stratum	**Moist Density, γ_{moist}, (pcf)**	**Internal Friction Angle, Φ (degrees)**	**Coefficient of Active Earth Pressure (K_a)**	**Coefficient of Passive Earth Pressure (K_p)**	**Cohesion (psf)**
On-Site Natural Soils (Fine-Grained)	120	--	--	--	1000
On-Site Natural Soils (Coarse-Grained)	125	30	0.33	3.0	--
Imported Structural Fill	140	32	0.31	3.25	--

The effect of any surcharge loads including construction equipment, traffic, proposed structures and temporary and permanent stockpiles also will need to be included in earth pressure calculations. Dynamic Earth would be pleased to assist with the calculation of lateral earth pressures based on the soil parameters presented herein during the structural design phase.

Retaining walls should be designed so that the combined effect of vertical and horizontal resultant loads and overturning moment does not exceed the maximum allowable soil bearing capacity recommended in this report.

Adequate drainage of water which may collect on the backfill side of the retaining walls should be incorporated into the design and/or hydrostatic pressures should be added to the pressure calculations. A system of perforated drain pipes should be used at the base of the backfill side of the wall structure to collect and remove the water and relieve hydrostatic pressure.

Dynamic Earth recommends that granular soils be used to backfill the proposed subgrade and retaining walls. Clays and silts or soils with a fine fraction with a liquid limit exceeding 40 or a plastic index exceeding 20 should not be used as backfill. **Based on the subsurface condition encountered and laboratory test results, the portions of the on-site soils are expected to be suitable for reuse as structural fill behind proposed retaining walls provided they can be properly prepared and compacted during construction. However, portions of the on-site soils included an increased percentage of fine-grained material (silt and clay). As such, the final retaining wall design will need to be reviewed to confirm reuse of the on-site soils as structural fill.** Acceptable backfill should be placed in maximum nine-inch loose lifts and compacted to 95 percent of the maximum dry density, within two percent of the optimum moisture content, as determined

by ASTM D 1557 (Modified Proctor). A maximum density of 140 pounds per cubic foot should not be exceeded in order to avoid creating excessive lateral pressure on the walls during compaction operations.

Dynamic Earth recommends that backfill directly behind the walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within a zone measured at a 45-degree angle from the base of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

Resistance to sliding should be provided by friction resistance at the base of the retaining structure foundation, as detailed herein.

5.8 Seasonal High Groundwater and Soil Permeability

Indicators of seasonal high groundwater (i.e. based on soil mottling) were encountered within the soil profile pit excavations at depths ranging between approximately 1.4 feet and 5.0 feet below the ground surface; corresponding to elevations ranging between approximately 621.3 feet and 612.4 feet. Groundwater was encountered at depths ranging between approximately two feet and 9.6 feet; corresponding to elevations ranging between 621.3 feet and 562.1 feet during our investigation.

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)	Mottling[1]		Groundwater		Permeability Test Results		
		Depth (ft)	Elevation	Depth (ft)	Elevation	Depth (in)	Permeability (in/hr)	
							A	B
SPP-1	623.3	2.0	621.3	2.0	621.3	24	<0.2	<0.2
SPP-2	616.2	1.4	614.8	2.0	614.2	24	<0.2	<0.2
						54	Not Tested	
SPP-3	615.0	Not Encountered		9.6	605.4	20	<0.2	<0.2
						48	Not Tested	
SPP-4	621.6	5.0	616.6	5.6	616.0	26	Not Tested	
						36	<0.2	<0.2
SPP-5	616.9	4.5	612.4	Not Encountered		24	<0.2	<0.2
SPP-6	611.9	Not Encountered				24	<0.2	<0.2
SPP-7	620.4	2.6	617.8	3.7	616.7	24	Not Tested	
						36	<0.2	<0.2
SPP-8	571.1	Not Encountered		9.0	562.1	28	Not Tested	
						34		

Estimated Seasonal High Groundwater and Permeability Summary								
Location	Surface Elevation (ft)	Mottling[1]		Groundwater		Permeability Test Results		
		Depth (ft)	Elevation	Depth (ft)	Elevation	Depth (in)	Permeability (in/hr)	
							A	B
SPP-9	535.2	Not Encountered		Not Encountered		24	Not Tested	
SPP-10	525.7					24	Not Tested	

[1] Where mottling was not encountered, the depth to seasonal high groundwater can be approximated from the 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 should be performed within building areas as part of the final geotechnical investigation for the site. Dynamic recommends performing supplemental investigation throughout the proposed site once the design layout 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, soil probes, 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.

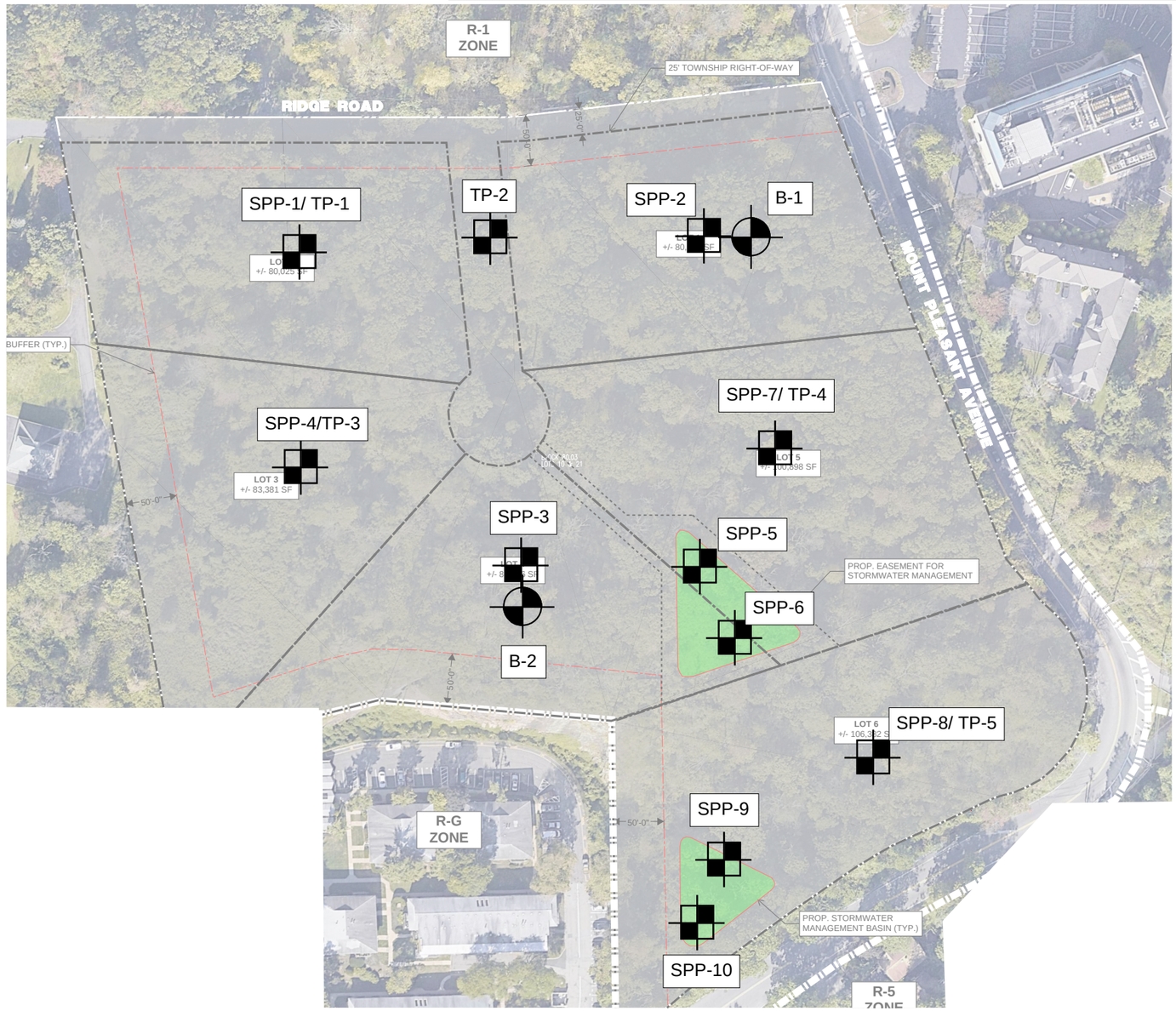
The possibility exists that conditions between test locations may differ from those at specific test pit locations, and conditions may not be as anticipated by the designers or contractors. In addition, the construction process may itself alter soil conditions. Therefore, Dynamic Earth Geotechnical Engineers 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: 4266-99-001E
SHEET No: 1 OF 1	DRAWN BY: DR
	DESIGNED BY: --
	CHECKED BY: FVC
	DATE: 05/09/22

TITLE:

TEST LOCATION PLAN

PROJECT: **SHI BUILDERS**

PROPOSED RESIDENTIAL SUBDIVISION

BLOCK 80.03, LOTS 21 & 10
2 & 10 RIDGE ROAD
TOWNSHIP OF WEST ORANGE, ESSEX COUNTY, NEW JERSEY

Rev. # 0 | DEC Client Code: 4266

LEGEND:

B-X — APPROXIMATE LOCATION OF SOIL BORING

SPP-X — APPROXIMATE LOCATION OF SOIL PROFILE PIT

TP-X — APPROXIMATE LOCATION OF STRUCTRAL 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 AN APRIL 8, 2022 CONCEPTUAL PLAN 'A' PREPARED BY DYNAMIC ENGINEERING CONSULTANTS, P.C.

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RECORDS OF SUBSURFACE EXPLORATION

DYNAMIC EARTH

BOREHOLE LOG

Boring No : B-1

Project:	Proposed Residential Subdivision	**Proj. No.:**	4266-99-001E
Location:	2-10 Ridge Road, Township of West Orange, Essex County, NJ	**Client:**	SHI Builders

Surface Elevation:	615.2 feet	**Date Started:**	05-06-2022	**Groundwater Data**	**Depth (ft)**	**El. (ft)**	**Additional Groundwater Data**	**Depth (ft)**	**El. (ft)**
Termination Depth:	20.7 feet	**Date Completed:**	05-06-2022						
Proposed Location:	Proposed Building	**Logged by:**	M. Mickley	**While Drilling:** ▽	4.0	611.2			
Drill/Test Method:	HSA/SPT	**Contractor:**	Boring Brothers	**At Completion:** ▼	4.0	611.2			
Hammer Type:	Auto	**Rig Type:**	CME 55						

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				
0.0-2.0	S-1	SS	6	--	10 / 16	17 / 9	33		Surface Cover	12 inches topsoil	
									Glacial Deposits	Reddish brown coarse to fine sand, and coarse to fine gravel, trace silt, moist, dense (SP-SM)	
2.0-4.0	S-2	SS	6	--	5 / 6	8 / 5	14			Reddish brown coarse to fine gravel, little coarse to fine sand, little silt, moist, medium dense (GM)	
4.0-6.0	S-3	SS	2	--	4 / 6	5 / 7	11	5		As above, wet (GM)	
6.0-8.0	S-4	SS	18	--	6 / 14	14 / 12	28			As above, wet (GM)	
									Residual Soils	Reddish brown coarse to fine gravel, little coarse to fine sand, little silt, wet, medium dense (GM)	Drilling mud mixed at 8'
8.0-10.0	S-5	SS	24	--	12 / 10	12 / 8	22				
10.0-12.0	S-6	SS	24	--	10 / 9	9 / 8	18	10		As above, wet (GM)	
15.0-15.7	S-7	SS	2	--	48 / --	50/2 / --	50/2	15	Weathered Rock	Gray coarse to fine gravel, trace coarse to fine sand, moist, very dense (GP)	
20.0-20.7	S-8	SS	2	--	27 / --	50/2 / --	50/2	20		As above (GP)	
										Boring B-1 encountered refusal at approximately 20.7 feet below the ground surface on apparent rock.	

DYNAMIC EARTH

BOREHOLE LOG

Boring No : B-2

Project:	Proposed Residential Subdivision	**Proj. No.:**	4266-99-001E
Location:	2-10 Ridge Road, Township of West Orange, Essex County, NJ	**Client:**	SHI Builders

Surface Elevation:	617.6 feet	**Date Started:**	05-06-2022	**Groundwater Data**	**Depth (ft)**	**El. (ft)**	**Additional Groundwater Data**	**Depth (ft)**	**El. (ft)**
Termination Depth:	9.8 feet	**Date Completed:**	05-06-2022						
Proposed Location:	Proposed Building	**Logged by:**	M. Mickley	**While Drilling:** ▽	NE	-			
Drill/Test Method:	HSA/SPT	**Contractor:**	Boring Brothers	**At Completion:** ▼	NE	-			
Hammer Type:	Auto	**Rig Type:**	CME 55						

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
0.0-2.0	S-1	SS	10	--	1	2	5		Surface Cover	12 inches topsoil	
					3	3			Glacial Deposits	Reddish brown coarse to fine sand, and silt, some coarse to fine gravel, moist, loose (SM)	
2.0-4.0	S-2	SS	16	--	3	4	9			As above (SM)	
					5	5					
4.0-6.0	S-3	SS	4	--	9	10	22	5		As above, medium dense (SM)	
					12	13					
6.0-8.0	S-4	SS	14	--	21	23	46		Residual Soils	Reddish brown coarse to fine sand, and silt, wet, some coarse to fine gravel, moist, medium dense (SM)	Drilling mud mixed at 8'
					23	24					
8.0-9.8	S-5	SS	4	--	12	12	35		Weathered Rock	Gray coarse to fine gravel, trace coarse to fine sand, moist, dense (GP)	
					23	50/4				As Above (GP)	
								10		Boring B-2 encountered refusal at approximately 9.8 feet below the ground surface on apparent rock.	
								15			
								20			

TEST PIT

Test Pit : TP-1

Project:	Proposed Residential Subdivision	**Proj. No.:**	4266-99-001E
Location:	2-10 Ridge Road, Township of West Orange, Essex County, NJ	**Client:**	SHI Builders

Surface Elevation:	623.3 feet	**Date Started:**	05-09-2022	**Groundwater Data**	**Depth (ft)**	**El. (ft)**	**Additional Groundwater Data**	**Depth (ft)**	**El. (ft)**
Termination Depth:	6.3 feet	**Date Completed:**	05-09-2022						
Proposed Location:	Proposed Building	**Logged by:**	J. Gomez	**First Encountered:** ▽	2.0	621.3			
		Contractor:	Carroccia Company	**At Completion:** ▼	2.0	621.3			
		Rig Type:	CX1606						

Sample Information Depth (Feet)	Number	Type	Depth (FT)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
0.0 - 1.2		BAG		Surface Cover	14 inches - Topsoil	
1.2 - 2.0	S-1	BAG	▽ 2.0 ▼	Glacial Till	Brown coarse to fine sand, some clay, little coarse to fine gravel, trace fine roots, moist (SC)	
2.0 - 4.0	S-2	BAG	4.0		Yellow red, gray, and red sand, some silt, little coarse to fine gravel, wet (SM)	
4.0 - 6.3	S-3	BAG	6.0			
			8.0		Test Pit TP-1 encountered refusal at approximately 6.3 feet below the ground surface.	Refusal on apparent boulders within glacial deposits
			10.0			

DYNAMIC EARTH

TEST PIT

Test Pit : TP-2

Project:	Proposed Residential Subdivision	**Proj. No.:**	4266-99-001E
Location:	2-10 Ridge Road, Township of West Orange, Essex County, NJ	**Client:**	SHI Builders

Surface Elevation:	620.4 feet	**Date Started:**	05-09-2022	**Groundwater Data**	**Depth (ft)**	**El. (ft)**	**Additional Groundwater Data**	**Depth (ft)**	**El. (ft)**
Termination Depth:	12.0 feet	**Date Completed:**	05-09-2022						
Proposed Location:	Proposed Building	**Logged by:**	J. Gomez	**First Encountered:** ▽	NE	--			
		Contractor:	Carroccia Company	**At Completion:** ▼	NE	--			
		Rig Type:	CX1606						

Sample Information Depth (Feet)	Number	Type	Depth (FT)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
0.0 - 1.0		BAG		Surface Cover	12 inches - Topsoil	
1.0 - 2.0	S-1	BAG	2.0	Glacial Till	Brown clay, some coarse to fine gravel, trace fine roots, moist (CL)	
2.0 - 4.0	S-2	BAG	4.0		Yellow red, gray, and red coarse to fine sand, some clay, some coarse to fine gravel, moist (SC)	
4.0 - 6.0	S-3	BAG	6.0		Red clay, little silt, little coarse to fine gravel, moist (CL)	
6.0 - 10.0		BAG	8.0		As above (CL)	
10.0 - 12.0	S-4	BAG	10.0	Residual Soils	Red clay, little silt, little coarse to fine gravel, moist (CL)	
					Test Pit TP-2 encountered refusal at approximately 12.0 feet below the ground surface on apparent rock.	

DYNAMIC EARTH

TEST PIT

Test Pit : TP-3

Project:	Proposed Residential Subdivision	**Proj. No.:**	4266-99-001E
Location:	2-10 Ridge Road, Township of West Orange, Essex County, NJ	**Client:**	SHI Builders

Surface Elevation:	621.6 feet	**Date Started:**	05-09-2022	**Groundwater Data**	**Depth (ft)**	**El. (ft)**	**Additional Groundwater Data**	**Depth (ft)**	**El. (ft)**
Termination Depth:	11.9 feet	**Date Completed:**	05-09-2022						
Proposed Location:	Proposed Building	**Logged by:**	J. Gomez	**First Encountered:** ▽	5.6	616.0			
		Contractor:	Carroccia Company	**At Completion:** ▼	NE	-			
		Rig Type:	CX1606						

Sample Information Depth (Feet)	Number	Type	Depth (FT)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
0.0 - 2.0	S-1	BAG		Surface Cover	7 inches - Topsoil	
				Glacial Till	Red silt, little clay, little coarse to fine gravel, moist (ML)	
			2.0			
2.0 - 4.0	S-2	BAG			Red clay, trace silt, little coarse to fine gravel, moist (CL)	
			4.0			
4.0 - 8.0		BAG	▽ 6.0		Red clay, trace silt, some coarse to fine gravel, moist (CL)	
			8.0			
8.0 - 11.9	S-3	BAG	10.0	Residual Soils	Red clay, little silt, little coarse to fine gravel, moist (CL)	
					Test Pit TP-3 encountered refusal at approximately 11.9 feet below the ground surface.	Refusal on apparent weathered rock

DYNAMIC EARTH

TEST PIT

Test Pit : TP-4

Project:	Proposed Residential Subdivision	**Proj. No.:**	4266-99-001E
Location:	2-10 Ridge Road, Township of West Orange, Essex County, NJ	**Client:**	SHI Builders

Surface Elevation:	620.4 feet	**Date Started:**	05-05-2022	**Groundwater Data**	**Depth**	**El.**	**Additional Groundwater Data**	**Depth**	**El.**
Termination Depth:	3.9 feet	**Date Completed:**	05-05-2022		**(ft)**	**(ft)**		**(ft)**	**(ft)**
Proposed Location:	Proposed Building	**Logged by:**	J. Gomez	**First Encountered:** ▽	3.9	616.5			
		Contractor:	Carroccia Company	**At Completion:** ▼	3.9	616.5			
		Rig Type:	CX1606						

Sample Information			Depth	Strata		DESCRIPTION OF MATERIALS (Classification)	Remarks
Depth (Feet)	Number	Type	(FT)				
0.0 - 2.0	S-1	BAG		Surface Cover		9 inches - Topsoil	
				Residual Soils		Red clay, trace silt, little coarse to fine gravel, moist (CL)	
			2.0				
2.0 - 3.9	S-2	BAG		Weathered Rock		Yellow red, red, and gray clay, little clay, trace silt, moist (CL)	
			4.0			Test Pit TP-4 encountered refusal at approximately 3.9 feet below the ground surface due to apparent rock	
			6.0				
			8.0				
			10.0				

DYNAMIC EARTH

TEST PIT

Test Pit : TP-5

Project:	Proposed Residential Subdivision	**Proj. No.:**	4266-99-001E
Location:	2-10 Ridge Road, Township of West Orange, Essex County, NJ	**Client:**	SHI Builders

Surface Elevation:	571.1 feet	**Date Started:**	05-09-2022	**Groundwater Data**	**Depth**	**El.**	**Additional Groundwater Data**	**Depth**	**El.**
Termination Depth:	11.5 feet	**Date Completed:**	05-09-2022		**(ft)**	**(ft)**		**(ft)**	**(ft)**
Proposed Location:	Proposed Building	**Logged by:**	J. Gomez	**First Encountered:** ▽	6.0	565.1			
		Contractor:	Carroccia Company	**At Completion:** ▼	NE	-			
		Rig Type:	CX1606						

Sample Information Depth (Feet)	Number	Type	Depth (FT)	Strata	DESCRIPTION OF MATERIALS (Classification)	Remarks
0.0 - 2.0		BAG		Surface Cover	7 inches - Topsoil, Brick, Concrete	One half of pit on abandoned man-made brick path, other half of topsoil surface cover
				FILL	Reddish brown and brown channers, flagstones, and coarse to fine gravel, some coarse to fine sand, trace silt, moist (FILL)	Possibly reworked on-site material
			2.0			
2.0 - 3.0	S-1	BAG		Glacial Till	Red silt, some fine sand, little clay, moist (ML)	
3.0 - 4.0	S-2	BAG			Red silt, trace fine sand, some coarse to fine gravel, moist (ML)	
			4.0			
4.0 - 6.0	S-3	BAG		Residual Soils	Yellow red, red, and gray silt, little clay, little coarse to fine sand, some channers, some flagstones, moist (ML)	
			▽ 6.0			
6.0 - 8.5		BAG			As above (ML)	
			8.0			
8.5 - 11.5	S-4	BAG	10.0		As above (ML)	
					Test Pit TP-5 encountered refusal at approximately 11.5 feet below the ground surface on apparent rock.	

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-1

Project: Proposed Residential Subdivision — **Project No.:** 4266-99-001E

Location: 2 & 10 Ridge Road, Township of West Orange, Essex County, New Jersey — **Client:** SHI Builders

Surface Elevation (ft):	623.3	**Date Started:**	5/6/22
Termination Depth (ft):	6.3	**Date Completed:**	5/6/22
Proposed Location:	SWM	**Logged by:**	J. Gomez
Excavation / Test Method:	Visual Observation	**Contractor:**	Carroccia
		Rig Type:	CX16 OC

Groundwater Data	Depth (ft)	EL (ft)
Seepage	2.0	621.3
Groundwater	2.0	621.3
Seasonal High Groundwater	2.0	621.3

Groundwater Comments: (10YR 5/3) Brown iron depletions approximately 24 inches below the ground surface

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.	
0-14	TOPSOIL Brown (7.5YR 4/2)	LOAM	0	0	0	0	GRANNULAR/ SPHERIODAL	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	NONPLASTIC	ABRUPT <1"	SMOOTH	CMN (20% MAX)	MEDIUM	NONE						
14-24	Brown (7.5YR 4/4)	SILTY CLAY LOAM	25	20	15	5	PLATY	MODERATE	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC	CLEAR <2.5"	WAVY	MNY (>20% MAX)	VERY FINE TO MEDIUM	NONE			BAG TUBE	24	S-1 T-1	A < 0.2 iph B < 0.2 iph
24-75	Brown (7.5YR 4/4)	EXTREMELY GRAVELLY SILTY CLAY LOAM	35	15	5	5	PLATY	MODERATE	FINE	WET	FRIABLE	SLIGHTLY STICKY	SLIGHTLY PLASTIC			NONE		CMN 2%-20%	MEDIUM 5MM-15MM	DISTINCT	BAG	48	S-2	

Additional Remarks: Soil profile pit SPP-1 encountered refusal at approximately 6.3 feet below the ground surface on apparent boulders.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-2

Project: Proposed Residential Subdivision
Project No.: 4266-99-001E
Location: 2 & 10 Ridge Road, Township of West Orange, Essex County, New Jersey
Client: SHI Builders

Surface Elevation (ft):	616.2	**Date Started:**	5/5/22
Termination Depth (ft):	11.7	**Date Completed:**	5/5/22
Proposed Location:	SWM	**Logged by:**	J. Gomez
Excavation / Test Method:	Visual Observation	**Contractor:**	Carroccia
		Rig Type:	CX16 OC

Groundwater Data	Depth (ft)	El. (ft)
Seepage	2.0	614.2
Groundwater	2.0	614.2
Seasonal High Groundwater	1.4	614.8

Groundwater Comments
(10YR 5/3) Brown iron depletions approximately 17 inches below the ground surface

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.	
0-17	TOPSOIL Brown (7.5YR 4/2)	LOAM	0	0	0	0	GRANNULAR/ SPHERIODAL	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	NONPLASTIC	ABRUPT <1"	SMOOTH	CMN (20% MAX)	MEDIUM	NONE						
17-24	Dark Brown (7.5YR 3/4)	CLAY	0	0	0	0	PLATY	MODERATE	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	VERY PLASTIC	CLEAR <2.5"	WAVY	CMN (20% MAX)	VERY FINE TO MEDIUM	MNY >20%	COARSE >15MM	PROMINENT				
24 - 32	Dark Brown (7.5YR 3/4)	CLAY	0	0	0	0	PLATY	MODERATE	FINE	WET	FRIABLE	SLIGHTLY STICKY	VERY PLASTIC	CLEAR <2.5"	WAVY	CMN (20% MAX)	VERY FINE TO MEDIUM	MNY >20%	COARSE >15MM	PROMINENT	BAG TUBE	24	S-1 T-1	A < 0.2 iph B < 0.2 iph
32-87	Dark Brown (7.5YR 3/4)	GRAVELLY AND CHANNERY SILTY CLAY LOAM	15	15	5	0	PLATY	MODERATE	FINE	WET	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC	CLEAR <2.5"	WAVY	FEW (5% MAX)	VERY FINE TO FINE	MNY >20%	COARSE >15MM	PROMINENT	BAG TUBE	38 54	S-2 T-2 S-3	
87-140	Dark Brown (7.5YR 3/4)	VERY GRAVELLY AND CHANNERY SILTY CLAY LOAM	20	20	15	0	PLATY	WEAK	FINE	WET	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC					MNY >20%	COARSE >15MM	PROMINENT	BAG	120	S-4	

Additional Remarks: Soil profile pit SPP-2 encountered refusal at approximately 11.7 feet below the ground surface on apparent weathered rock.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-3

Project: Proposed Residential Subdivision — **Project No.:** 4266-99-001E

Location: 2 & 10 Ridge Road, Township of West Orange, Essex County, New Jersey — **Client:** SHI Builders

Surface Elevation (ft):	615.0	**Date Started:**	5/5/22
Termination Depth (ft):	9.8	**Date Completed:**	5/5/22
Proposed Location:	SWM	**Logged by:**	J. Gomez
Excavation / Test Method:	Visual Observation	**Contractor:**	Carroccia
		Rig Type:	CX16 OC

Groundwater Data	Depth (ft)	EL (ft)	Groundwater Comments
Seepage	9.6	605.4	
Groundwater	9.6	605.4	

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.	
0-16	TOPSOIL Brown (7.5YR 4/2)	LOAM	0	0	0	0	GRANNULAR/ SPHERIODAL	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	NONPLASTIC	ABRUPT <1"	SMOOTH	CMN (20% MAX)	MEDIUM	NONE						
16-34	Dark Reddish Brown (5YR 3/4)	SILTY CLAY	5	0	0	0	SUBANGULAR BLOCKY	STRONG	VERY FINE	MOIST	FRIABLE	SLIGHTLY STICKY	VERY PLASTIC	CLEAR <2.5"	WAVY	MNY (>20% MAX)	VERY FINE TO MEDIUM	NONE			BAG TUBE	20	S-1 T-1	A < 0.2 iph B < 0.2 iph
34-92	Reddish Brown (5YR 4/4)	VERY GRAVELLY AND CHANNERY SILT LOAM	30	20	5	0	PLATY	MODERATE	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	SLIGHTLY PLASTIC	CLEAR <2.5"	WAVY	CMN (20% MAX)	VERY FINE TO FINE	NONE			BAG TUBE	48	S-2 T-2	
92-115	Dark Reddish Brown (5YR 3/4)	VERY CHANNERY SILTY CLAY LOAM	30	25	10	0	PLATY	MODERATE	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC	CLEAR <2.5"	WAVY	NONE		NONE			BAG	115	S-4	
115-118	Dark Reddish Brown (5YR 3/4)	VERY CHANNERY SILTY CLAY LOAM	30	25	10	0	PLATY	MODERATE	FINE	WET	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC	CLEAR <2.5"	WAVY	NONE		NONE						

Additional Remarks: Soil profile pit SPP-3 encountered refusal on at approximately 9.8 feet below the ground surface on apparent weathered rock

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-4

Project: Proposed Residential Subdivision
Project No.: 4266-99-001E
Location: 2 & 10 Ridge Road, Township of West Orange, Essex County, New Jersey
Client: SHI Builders

Surface Elevation (ft):	621.6	**Date Started:**	5/6/22
Termination Depth (ft):	11.9	**Date Completed:**	5/6/22
Proposed Location:	SWM	**Logged by:**	J. Gomez
Excavation / Test Method:	Visual Observation	**Contractor:**	Carroccia
		Rig Type:	CX16 OC

Groundwater Data	Depth (ft)	El. (ft)
Seepage	5.6	616.0
Groundwater	5.6	616.0
Seasonal High Groundwater	5.0	616.6

Groundwater Comments
(10YR 5/3) Brown iron depletions approximately 60 inches below the ground surface

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.	
0-7	TOPSOIL Brown (7.5YR 4/2)	LOAM	0	0	0	0	GRANNULAR/ SPHERIODAL	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	NONPLASTIC	ABRUPT <1"	SMOOTH	CMN (20% MAX)	MEDIUM	NONE						
7-29	Dark Brown (7.5YR 3/4)	GRAVELLY, COBBLY, STONY SILT LOAM	25	20	15	5	PLATY	MODERATE	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC	CLEAR <2.5"	WAVY	MNY (>20% MAX)	VERY FINE TO MEDIUM	NONE			BAG TUBE	26	S-1 T-1	
29-60	Brown (7.5YR 4/4)	VERY GRAVELLY SILTY CLAY LOAM	30	20	15	0	PLATY	MODERATE	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	VERY PLASTIC	CLEAR <2.5"	WAVY	NONE		NONE			BAG TUBE	36	S-2 T-2	A < 0.2 iph B < 0.2 iph
60 - 78	Brown (7.5YR 4/4)	VERY GRAVELLY SILTY CLAY LOAM	30	20	15	0	PLATY	MODERATE	FINE	WET	FRIABLE	SLIGHTLY STICKY	VERY PLASTIC	CLEAR <2.5"	WAVY	NONE		CMN 2%-20%	MEDIUM 5MM-15MM	DISTINCT				
78-196	Brown (7.5YR 4/4)	VERY GRAVELLY SILTY CLAY LOAM	30	20	15	0	PLATY	MODERATE	FINE	WET	FRIABLE	SLIGHTLY STICKY	VERY PLASTIC	CLEAR <2.5"	WAVY	NONE		CMN 2%-20%	MEDIUM 5MM-15MM	DISTINCT				
96-143	Dark Brown (7.5YR 3/4)	EXTREMELY GRAVELLY SILTY CLAY LOAM	35	15	10	5	PLATY	MODERATE	FINE	WET	FRIABLE	SLIGHTLY STICKY	VERY PLASTIC			NONE		MNY >20%	MEDIUM 5MM-15MM	DISTINCT	BAG	120	S-3	

Additional Remarks: Soil profile pit SPP-4 encountered refusal at approximately 11.9 feet below the ground surface on apparent weathered rock.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-5

Project: Proposed Residential Subdivision
Project No.: 4266-99-001E
Location: 2 & 10 Ridge Road, Township of West Orange, Essex County, New Jersey
Client: SHI Builders

Surface Elevation (ft):	616.9	**Date Started:**	5/5/22	**Groundwater Data**	**Depth (ft)** / **EL (ft)**
Termination Depth (ft):	4.8	**Date Completed:**	5/5/22	**Seepage**	NE / -
Proposed Location:	SWM	**Logged by:**	J. Gomez	**Groundwater**	NE / -
Excavation / Test Method:	Visual Observation	**Contractor:**	Carroccia	**Seasonal High Groundwater**	4.5 / 612.4
		Rig Type:	CX16 OC		

Groundwater Comments
(10YR 5/3) Brown iron depletions approximately 54 inches below the ground surface

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)	LOAM	0	0	0	0	GRANNULAR/ SPHERIODAL	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	NONPLASTIC	ABRUPT <1"	SMOOTH	CMN (20% MAX)	MEDIUM	NONE						
8-28	Dark Reddish Brown (5YR 3/4)	SILTY CLAY LOAM	20	20	10	0	SUBANGULAR BLOCKY	MODERATE	FINE	MOIST	FRIABLE	MODERATELY STICKY	SLIGHTLY PLASTIC	CLEAR <2.5"	WAVY	MNY (>20% MAX)	VERY FINE TO MEDIUM	NONE			BAG TUBE	24	S-1 T-1	A < 0.2 iph B < 0.2 iph
28-54	Reddish Brown (5YR 4/4)	SILTY CLAY LOAM	15	25	20	20	PLATY	MODERATE	FINE	MOIST	FRIABLE	MODERATELY STICKY	SLIGHTLY PLASTIC	CLEAR <2.5"	WAVY	NONE		NONE			BAG	50	S-2	
54- 58	Reddish Brown (5YR 4/4)	SILTY CLAY LOAM	15	25	20	20	PLATY	MODERATE	FINE	MOIST	FRIABLE	MODERATELY STICKY	SLIGHTLY PLASTIC			NONE		CMN 2%-20%	COARSE >15MM	DISTINCT	BAG	50	S-2	

Additional Remarks: Soil profile pit SPP-5 encountered refusal at approximately 4.8 feet below the ground surface on apparent weathered rock.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-6

Project: Proposed Residential Subdivision
Project No.: 4266-99-001E
Location: 2 & 10 Ridge Road, Township of West Orange, Essex County, New Jersey
Client: SHI Builders

Surface Elevation (ft):	611.9	**Date Started:**	5/6/22
Termination Depth (ft):	3.3	**Date Completed:**	5/6/22
Proposed Location:	SWM	**Logged by:**	J. Gomez
Excavation / Test Method:	Visual Observation	**Contractor:**	Carroccia
		Rig Type:	CX16 OC

Groundwater Data	Depth (ft)	El. (ft)	Groundwater Comments
Seepage	NE	-	
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)	LOAM	0	0	0	0	GRANNULAR/ SPHERIODAL	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	NONPLASTIC	ABRUPT <1"	SMOOTH	CMN (20% MAX)	MEDIUM	NONE						
10-39	Dark Brown (7.5YR 3/3)	VERY CHANNERY AND FLAGGY SILTY CLAY	20	35	25	0	PLATY	MODERATE	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC			CMN (20% MAX)	VERY FINE TO MEDIUM	NONE			BAG TUBE	24	S-1 T-1	A < 0.2 iph B < 0.2 iph

Additional Remarks: Soil profile pit SPP-6 encountered refusal at approximately 3.3 feet below the ground surface on apparent weathered rock.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-7

Project: Proposed Residential Subdivision — **Project No.:** 4266-99-001E

Location: 2 & 10 Ridge Road, Township of West Orange, Essex County, New Jersey — **Client:** SHI Builders

Surface Elevation (ft):	620.4	**Date Started:**	5/5/22
Termination Depth (ft):	3.9	**Date Completed:**	5/5/22
Proposed Location:	SWM	**Logged by:**	J. Gomez
Excavation / Test Method:	Visual Observation	**Contractor:**	Carroccia
		Rig Type:	CX16 OC

Groundwater Data	Depth (ft)	El. (ft)
Seepage	3.7	616.7
Groundwater	3.7	616.7
Seasonal High Groundwater	2.6	617.8

Groundwater Comments: (10YR 5/3) Brown iron depletions approximately 31 inches below the ground surface

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.	
0-9	TOPSOIL Brown (7.5YR 4/2)	LOAM	0	0	0	0	GRANNULAR/ SPHERIODAL	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	NONPLASTIC	ABRUPT <1"	SMOOTH	CMN (20% MAX)	MEDIUM	NONE						
9-31	Brown (7.5YR 4/4)	FLAGGY CLAY	15	35	20	0	PLATY	MODERATE	VERY FINE	MOIST	FRIABLE	SLIGHTLY STICKY	VERY PLASTIC	CLEAR <2.5"	WAVY	MNY (>20% MAX)	VERY FINE TO MEDIUM	NONE			BAG TUBE	24	S-1 T-1	
31-44	Reddish Yellow (7.5YR 6/8)	CHANNERY AND FLAGGY CLAY	15	35	20	0	PLATY	MODERATE	VERY FINE	MOIST	FRIABLE	SLIGHTLY STICKY	VERY PLASTIC	CLEAR <2.5"	WAVY	CMN (20% MAX)	VERY FINE TO FINE	FEW 2%	MEDIUM 5MM-15MM	DISTINCT	BAG TUBE	36	S-2 T-2	A < 0.2 iph B < 0.2 iph
44 - 47	Reddish Yellow (7.5YR 6/8)	CHANNERY AND FLAGGY CLAY	15	35	20	0	PLATY	MODERATE	VERY FINE	WET	FRIABLE	SLIGHTLY STICKY	VERY PLASTIC			CMN (20% MAX)	VERY FINE TO FINE	FEW 2%	MEDIUM 5MM-15MM	DISTINCT				

Additional Remarks: Weathered rock and refusal encountered at 47 inches. Possible groundwater/seepage encountered at approximately 47 inches. Soil profile pit SPP-7 was terminated at approximately 3.9 feet below the ground surface on apparent weathered rock.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-8

Project: Proposed Residential Subdivision — **Project No.:** 4266-99-001E

Location: 2 & 10 Ridge Road, Township of West Orange, Essex County, New Jersey — **Client:** SHI Builders

Surface Elevation (ft):	571.1	**Date Started:**	5/5/22
Termination Depth (ft):	11.5	**Date Completed:**	5/5/22
Proposed Location:	SWM	**Logged by:**	J. Gomez
Excavation / Test Method:	Visual Observation	**Contractor:**	Carroccia
		Rig Type:	CX16 OC

Groundwater Data	Depth (ft)	EL (ft)	Groundwater Comments
Seepage	9.0	562.1	
Groundwater	9.0	562.1	

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)	LOAM	0	0	0	0	GRANNULAR/ SPHERIODAL	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	NONPLASTIC	ABRUPT <1"	SMOOTH	CMN (20% MAX)	MEDIUM	NONE						
12-24	FILL Strong Brown (7.5YR 5/8)	SILTY CLAY LOAM	35	50	15	0	PLATY	MODERATE	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC	CLEAR <2.5"	WAVY	MNY (>20% MAX)	FINE	NONE			BAG TUBE	28	S-1 T-1	
24-36	Reddish Brown (5YR 4/4)	CHANNERY SILT LOAM	25	15	5	0	PLATY	MODERATE	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	SLIGHTLY PLASTIC	CLEAR <2.5"	WAVY	CMN (20% MAX)	VERY FINE TO MEDIUM	NONE			BAG TUBE	34	S-2 T-2	
36-56	Strong Brown (7.5YR 4/6)	CHANNERY SILTY CLAY LOAM	30	20	5	0	PLATY	MODERATE	VERY FINE	MOIST	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC	CLEAR <2.5"	WAVY	FEW (5% MAX)	VERY FINE	NONE			BAG	54	S-3	
56-108	Strong Brown (7.5YR 5/6)	CHANNERY AND FLAGGY SILT LOAM	25	30	25	0	PLATY	MODERATE	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC	CLEAR <2.5"	WAVY	NONE		NONE						
108 - 138	Strong Brown (7.5YR 5/6)	CHANNERY AND FLAGGY SILT LOAM	25	30	25	0	PLATY	MODERATE	FINE	WET	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC			NONE		NONE			BAG	132	S-4	

Additional Remarks: Half of pit was man-made brick (5 inches of brick, 7 inches of concrete fill) Soil profile pit SPP-8 encountered refusal at approximately 11.5 feet below the ground surface on apparent rock.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-9

Project: Proposed Residential Subdivision — **Project No.:** 4266-99-001E

Location: 2 & 10 Ridge Road, Township of West Orange, Essex County, New Jersey — **Client:** SHI Builders

Surface Elevation (ft):	535.2	**Date Started:**	5/6/22	**Groundwater Data**	**Depth (ft)**	**El. (ft)**
Termination Depth (ft):	5.9	**Date Completed:**	5/6/22	**Seepage**	NE	-
Proposed Location:	SWM	**Logged by:**	J. Gomez	**Groundwater**	NE	-
Excavation / Test Method:	Visual Observation	**Contractor:**	Carroccia			
		Rig Type:	CX16 OC			

Groundwater Comments

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)	LOAM	0	0	0	0	GRANNULAR/ SPHERIODAL	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	NONPLASTIC	ABRUPT <1"	SMOOTH	CMN (20% MAX)	MEDIUM	NONE						
12-28	Very Dark Brown (7.5YR 2.5/2)	VERY COBBLY SILTY CLAY LOAM	20	25	25	5	SUBANGULAR BLOCKY	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	MODERATELY PLASTIC	CLEAR <2.5"	WAVY	CMN (20% MAX)	VERY FINE TO MEDIUM	NONE			BAG TUBE	24	S-1 T-1	
28-71	Dark Brown (7.5YR 3/4)	VERY COBBLY SILT LOAM	20	25	35	10	SUBANGULAR BLOCKY	WEAK	MEDIUM	MOIST	FRIABLE	SLIGHTLY STICKY	SLIGHTLY PLASTIC			NONE		NONE			BAG	48	S-2	

Additional Remarks: Soil profile pit SPP-9 encountered refusal at approximately 5.9 feet below the ground surface on apparent cobbles/boulders.

DYNAMIC EARTH

SOIL PROFILE PIT LOG

Soil Profile Pit: SPP-10

Project: Proposed Residential Subdivision — **Project No.:** 4266-99-001E

Location: 2 & 10 Ridge Road, Township of West Orange, Essex County, New Jersey — **Client:** SHI Builders

Surface Elevation (ft):	525.7	**Date Started:**	5/6/22	**Groundwater Data**	**Depth (ft)**	**El. (ft)**
Termination Depth (ft):	4.0	**Date Completed:**	5/6/22	**Seepage**	NE	-
Proposed Location:	SWM	**Logged by:**	J. Gomez	**Groundwater**	NE	-
Excavation / Test Method:	Visual Observation	**Contractor:**	Carroccia			
		Rig Type:	CX16 OC			

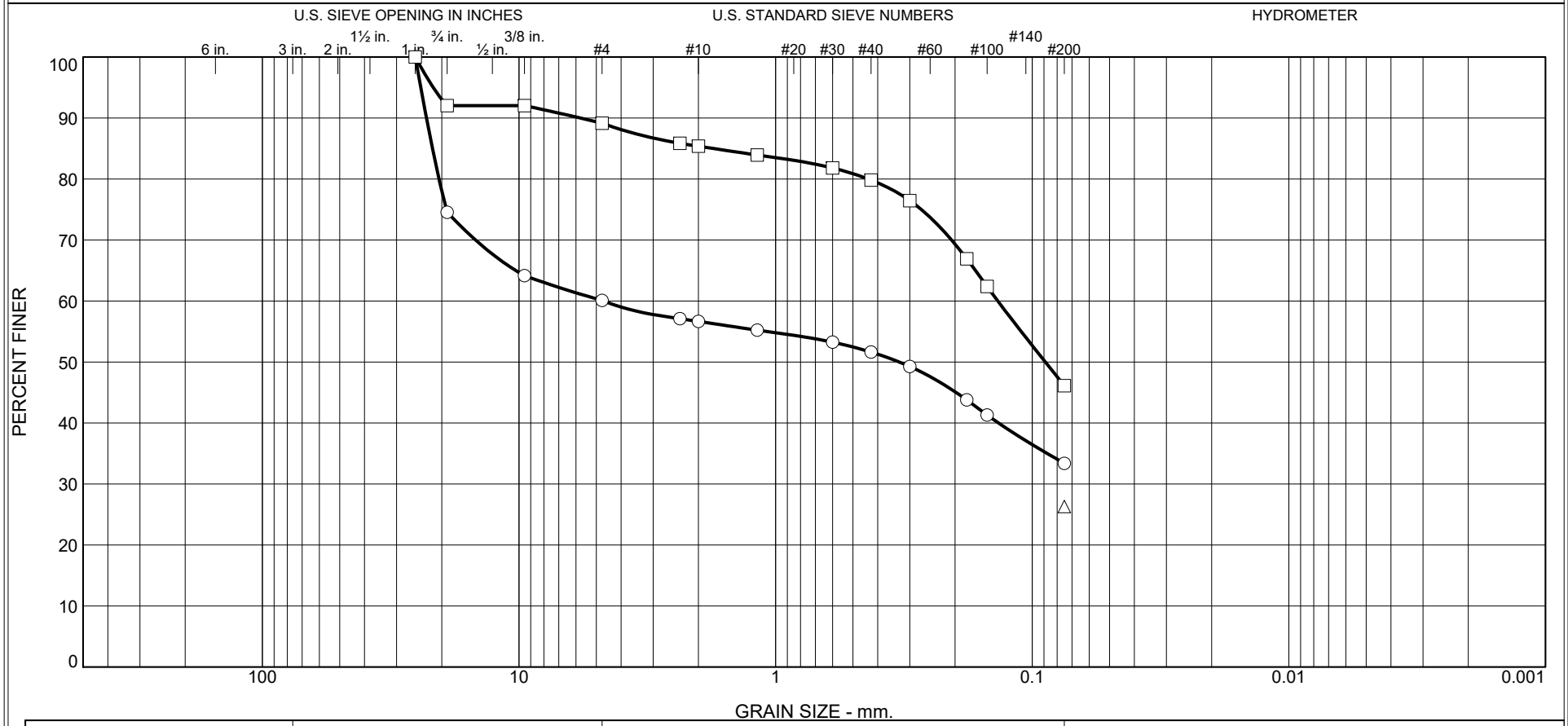
Groundwater Comments

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.	
0-13	TOPSOIL Brown (7.5YR 4/2)	LOAM	5	0	0	0	GRANNULAR/ SPHERIODAL	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	NONPLASTIC	ABRUPT <1"	SMOOTH	CMN (20% MAX)	MEDIUM	NONE						
13-48	Dark Brown (7.5YR 3/4)	EXTREMELY COBBLY SILTY CLAY LOAM	20	25	35	10	SUBANGULAR BLOCKY	WEAK	FINE	MOIST	FRIABLE	SLIGHTLY STICKY	SLIGHTLY PLASTIC			CMN (20% MAX)	VERY FINE TO MEDIUM	NONE			BAG TUBE	24	S-1 T-1	

Additional Remarks: Soil profile pit SPP-10 encountered refusal at approximately four feet below the ground surface due to bedrock.

LABORATORY TEST RESULTS

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	25.4	14.5	3.4	5.1	18.2	33.4	
□	0.0	8.0	2.8	3.8	5.6	33.7	46.1	
△							26.3	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	B-1	S-2	2-4	05/06/2022	GM	Reddish brown c-f gravel, and silt, some c-f sand	17.8	--	--
□	B-2	S-3	4-6	05/06/2022	SM	Reddish brown silt, and c-f sand, little c-f gravel	15.2	--	--
△	TP-1	S-1	1-2	05/09/2022	SC	Brown c-f sand, some clay	15.1	17	19

Client SHI Builders

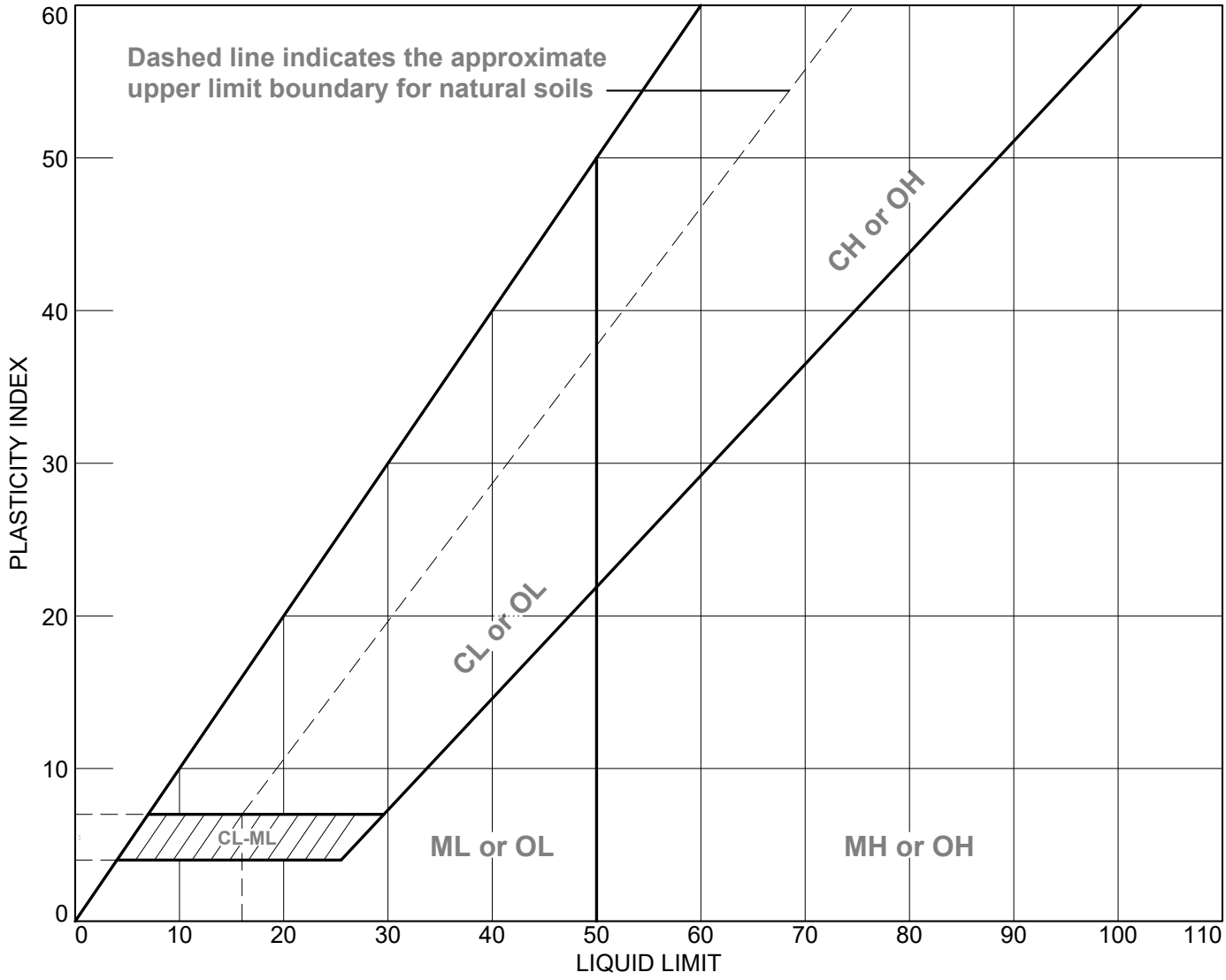
Project Proposed Residential Subdivision

2-10 Ridge Road, Twp West Orange, Essex County, NJ

Project No. 4266-99-001E Figure 1

DYNAMIC EARTH

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	TP-1	S-1	1-2	15.1	19	17	NP	SC

DYNAMIC EARTH

Client: SHI Builders

Project: Proposed Residential Subdivision
2-10 Ridge Road, Twp West Orange, Essex County, NJ

Project No.: 4266-99-001E **Figure** 2

Tube Permeameter Test Data

Job Number: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-1 **Sample No.:** T-1 **Depth:** 24"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) A Date Collected 5/5/2022

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 2.00

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

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

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 231.5492

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-1 **Sample No.:** T-1 **Depth:** 24"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) B Date Collected 5/5/2022

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 2.00

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

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

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 231.5492

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-2 **Sample No.:** T-1 **Depth:** 24"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) A Date Collected 5/5/2022

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 --

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

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-2 **Sample No.:** T-1 **Depth:** 24"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) B Date Collected 5/5/2022

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 --

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

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-3 **Sample No.:** T-1 **Depth:** 20"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) A Date Collected 5/5/2022

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 --

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

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-3 **Sample No.:** T-1 **Depth:** 20"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) B Date Collected 5/5/2022

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 --

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

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-4 **Sample No.:** T-2 **Depth:** 36"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-2 Replicate (letter) A Date Collected 5/5/2022

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 --

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

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-4 **Sample No.:** T-2 **Depth:** 36"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) B Date Collected 5/5/2022

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 --

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

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-5 **Sample No.:** T-1 **Depth:** 24"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) A Date Collected 5/5/2022

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 --

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

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-5 **Sample No.:** T-1 **Depth:** 24"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) B Date Collected 5/5/2022

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 2.00

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

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

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 231.5492

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-6 **Sample No.:** T-1 **Depth:** 24"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) A Date Collected 5/5/2022

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 2.00

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

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

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 231.5492

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

Sample ID: **Boring/Test Pit No.:** SPP-6 **Sample No.:** T-1 **Depth:** 24"

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) B Date Collected 5/5/2022

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 --

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

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. -- > 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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

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

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) A Date Collected 5/5/2022

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: 4266-99-001E
Project: Proposed Residential Subdivision
Client: SHI Builders
Lab Tech: J. Leloia

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

MUNICIPALITY Township of West Orange BLOCK 80.03 LOT 10 & 21

1. Test Number T-1 Replicate (letter) B Date Collected 5/5/2022

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 _____

USDA-NRCS CUSTOM SOIL RESOURCE REPORT

United States Department of Agriculture

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 Essex County, New Jersey

May 4, 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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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.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,280 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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 1:12,000.

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: Essex County, New Jersey
Survey Area Data: Version 17, Aug 30, 2021

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

Date(s) aerial images were photographed: May 9, 2020—Oct 15, 2020

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
BogCc	Boonton loam, 8 to 15 percent slopes, extremely stony	0.6	4.3%
BowrB	Boonton - Urban land, Boonton substratum complex, red sandstone lowland, 0 to 8 percent slopes	0.8	5.8%
HanBc	Haledon silt loam, 0 to 8 percent slopes, extremely stony	3.2	23.7%
USBONB	Urban land, Boonton substratum - Boonton complex, 0 to 8 percent slopes	0.4	2.6%
YaobBc	Yalesville - Boonton - Holyoke complex, 0 to 8 percent slopes, extremely stony	7.3	54.0%
YaohEh	Yalesville - Holyoke complex, 35 to 60 percent slopes, very rocky	1.3	9.6%
Totals for Area of Interest		**13.5**	**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.

Essex County, New Jersey

BogCc—Boonton loam, 8 to 15 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: b120
Elevation: 50 to 500 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: Not prime farmland

Map Unit Composition

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

Description of Boonton, Extremely Stony

Setting

Landform: Ground moraines
Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy basal till derived from basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oa - 1 to 3 inches: highly decomposed plant material
A - 3 to 5 inches: loam
BA - 5 to 8 inches: silt loam
BE - 8 to 17 inches: silt loam
Bt - 17 to 30 inches: silt loam
Btx1 - 30 to 40 inches: gravelly fine sandy loam
Btx2 - 40 to 47 inches: fine sandy loam
CBt1 - 47 to 58 inches: loamy sand
CBt2 - 58 to 72 inches: loamy sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 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: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Boonton, moderately well drained, extremely stony

Percent of map unit: 10 percent
Landform: Ground moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Haledon, extremely stony

Percent of map unit: 5 percent
Landform: Ground moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

BowrB—Boonton - Urban land, Boonton substratum complex, red sandstone lowland, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: w8p8
Elevation: 20 to 560 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: Not prime farmland

Map Unit Composition

Boonton, red sandstone lowland, and similar soils: 50 percent
Urban land, boonton red sandstone lowland substratum: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boonton, Red Sandstone Lowland

Setting

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy till derived from sandstone and shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

A - 1 to 3 inches: silt loam
BE - 3 to 10 inches: loam
Bw - 10 to 27 inches: gravelly loam
Bx1 - 27 to 40 inches: gravelly fine sandy loam
Bx2 - 40 to 67 inches: gravelly fine sandy loam
BCx - 67 to 83 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 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: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Description of Urban Land, Boonton Red Sandstone Lowland Substratum

Setting

Landform: Ground moraines
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Typical profile

H1 - 0 to 12 inches: material
H2 - 12 to 67 inches: gravelly loam
2CB - 67 to 83 inches: gravelly sandy loam

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Udorthents, boonton red sandstone lowland substratum

Percent of map unit: 10 percent
Landform: Ground moraines
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

HanBc—Haledon silt loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: b12k
Elevation: 50 to 500 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: Not prime farmland

Map Unit Composition

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

Description of Haledon, Extremely Stony

Setting

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Coarse-loamy basal till derived from basalt

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
Ap - 2 to 8 inches: silt loam
Bt - 8 to 15 inches: silt loam
Btg - 15 to 22 inches: silt loam
2Bt1 - 22 to 27 inches: loam
2Bt2 - 27 to 30 inches: loam
BCtx - 30 to 60 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 24 to 36 inches to fragipan
Drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 7 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C

Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Boonton, moderately well drained, extremely stony
Percent of map unit: 10 percent
Landform: Ground moraines
Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Hasbrouck, extremely stony
Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

USBONB—Urban land, Boonton substratum - Boonton complex, 0 to 8 percent slopes

Map Unit Setting
National map unit symbol: w9c1
Elevation: 0 to 520 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 213 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land, boonton substratum: 60 percent
Boonton and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land, Boonton Substratum

Setting
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Asphalt over supraglacial meltout till

Typical profile
M - 0 to 12 inches: material

2^C - 12 to 47 inches: gravelly sandy loam
3CBt1 - 47 to 58 inches: loamy sand
3CBt2 - 58 to 72 inches: loamy sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Description of Boonton

Setting

Landform: Ground moraines
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Red coarse-loamy till derived from sedimentary rock

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: loam
Bt - 4 to 28 inches: sandy loam
Btx - 28 to 51 inches: sandy loam
BC - 51 to 72 inches: sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 39 inches to fragipan
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: About 28 to 59 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Udorthents, boonton substratum

Percent of map unit: 10 percent
Landform: Ground moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank, upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

YaobBc—Yalesville - Boonton - Holyoke complex, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: w9dx
Elevation: 50 to 690 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: Not prime farmland

Map Unit Composition

Yalesville, extremely stony, and similar soils: 40 percent
Boonton, extremely stony, and similar soils: 35 percent
Holyoke, extremely stony, and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yalesville, Extremely Stony

Setting

Landform: Ground moraines
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy till derived from basalt

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 5 inches: loam
Bw1 - 5 to 19 inches: fine sandy loam
Bw2 - 19 to 31 inches: fine sandy loam
BC - 31 to 32 inches: fine sandy loam
R - 32 to 80 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent

Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 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: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F145XY013CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Boonton, Extremely Stony

Setting

Landform: Ground moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy basal till derived from basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oa - 1 to 3 inches: highly decomposed plant material
A - 3 to 5 inches: loam
BA - 5 to 8 inches: gravelly loam
BE - 8 to 17 inches: silt loam
Bt - 17 to 30 inches: silt loam
Btx1 - 30 to 40 inches: gravelly fine sandy loam
Btx2 - 40 to 47 inches: fine sandy loam
CBt1 - 47 to 58 inches: loamy sand
CBt2 - 58 to 72 inches: loamy sand

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 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: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Description of Holyoke, Extremely Stony

Setting

Landform: Ground moraines, hills, ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Loamy till derived from basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oa - 1 to 3 inches: highly decomposed plant material
A - 3 to 5 inches: loam
Bw1 - 5 to 14 inches: loam
Bw2 - 14 to 18 inches: loam
R - 18 to 80 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 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: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F145XY011CT - Well Drained Shallow Till Uplands
Hydric soil rating: No

YaohEh—Yalesville - Holyoke complex, 35 to 60 percent slopes, very rocky

Map Unit Setting

National map unit symbol: w9g0
Elevation: 50 to 660 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: Not prime farmland

Map Unit Composition

Yalesville, very rocky, and similar soils: 50 percent
Holyoke, very rocky, and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yalesville, Very Rocky

Setting

Landform: Ground moraines
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy till derived from basalt

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 5 inches: loam
Bw1 - 5 to 19 inches: fine sandy loam
Bw2 - 19 to 31 inches: fine sandy loam
BC - 31 to 32 inches: fine sandy loam
R - 32 to 80 inches: bedrock

Properties and qualities

Slope: 35 to 60 percent
Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 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: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F145XY013CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Holyoke, Very Rocky

Setting

Landform: Ground moraines, hills, ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Loamy till derived from basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oa - 1 to 3 inches: highly decomposed plant material
A - 3 to 5 inches: loam
Bw1 - 5 to 14 inches: loam
Bw2 - 14 to 18 inches: loam
R - 18 to 80 inches: bedrock

Properties and qualities

Slope: 35 to 60 percent
Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 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: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F145XY011CT - Well Drained Shallow Till Uplands
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: Unranked

Boonton, very rocky

Percent of map unit: 10 percent
Landform: Ground moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Upper third of mountainflank, center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

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Geotechnical Terms and Symbols

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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.