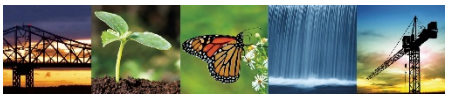

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November 2, 2020
File No. 01.0174440.01

King Devens LLC
800 Boylston Street, Suite 1570
Boston, MA 02199

Attention: Ms. Teri Ford, Associate

Re: Supplemental Geotechnical Evaluation
Proposed Biotechnical Industrial/Manufacturing Development
45 Jackson Road
Devens, Massachusetts

Dear Ms. Ford:

In accordance with our agreement executed on August 31, 2020 GZA GeoEnvironmental, Inc. (GZA) is pleased to submit this report that summarizes the results of additional subsurface explorations and geotechnical engineering evaluations made by GZA to supplement the due diligence phase geotechnical evaluation previously completed by GZA in December 2019 for the design and construction of a proposed industrial/manufacturing development located at 45 Jackson Road in Devens, Massachusetts (Site). This report supersedes our previous 2019 report.

This report is subject to the Limitations set forth in **Appendix A** and the Terms and Conditions of our agreement.

Elevations indicated in this report are in feet and are referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).

BACKGROUND

PROJECT UNDERSTANDING

GZA's understanding of the project is based on our conversations with you, site visits by GZA, our previous work at the site (including exploration programs performed in 2008, 2012, and 2019) as summarized in our preliminary geotechnical due-diligence phase report dated December 11, 2010, and our review of the following documents:

- GZA's 2008 Geotechnical Engineering Study and Phase I Environmental Site Assessment (ESA) and limited environmental subsurface investigation at the project Site (the Geotechnical Study included 21 test borings and 37 test pits);
- GZA's 2012 Geotechnical Engineering Study at the project Site (the study included 14 test borings);
- GZA's 2019 Due-Diligence-Level Geotechnical Engineering Study at the project site (the study included 6 test borings and 10 test pits);

- A PDF file of GZA's proposed Supplemental Exploration Program Sketch from June 29, 2020 with mark-up edits by HEI, entitled "45 Jackson Prop_Exs_w_Prop_Bldgs_HEI edits," received by GZA on September 11, 2020;
- An AutoCAD drawing file of the currently proposed site development prepared by Highpoint Engineering, Inc. (HEI) entitled "Concept-(07-14-20).dwg," undated and received via email on September 22, 2020;
- An AutoCAD drawing file entitled "MasterPlan_Base.dwg," transmitted by HEI on September 22, 2020; and,
- Readily available online aerial photos and geologic maps.

EXISTING CONDITIONS

The proposed development is located at 45 Jackson Road (formerly known as Lot 16) and includes an area of approximately 24 acres along the west side of the former Fort Devens Military Reserve in Devens, Massachusetts. The property is currently owned by the Massachusetts Development and Finance Agency (MassDevelopment). A site locus plan is provided as **Figure 1**.

The Site is bounded to the east by Jackson Road, to the west by undeveloped land (beyond which is a retention pond), to the north and southeast by office/educational/commercial developments and to the south/southwest by an active electrical transmission line right-of-way (ROW) and undeveloped wooded land beyond. The central and eastern portions of the Site contain multiple abandoned and degraded asphalt paved roadway and parking areas, portions of buried foundations of a former bank and previous military barracks buildings that were razed during the early-to-mid 1990's, and areas of vegetation, including grass, trees, and shrubs. In addition, there was a motor pool facility that included a gas station in the central portion of the Site along the west side of former Lake George Street. The western third of the Site is undeveloped woodlands. The Site generally slopes down from east (at Jackson Road) to west. Site grades within the area of proposed development range from about elevation (El.) 348 at the southeast corner of the Site to approximately El. 280 at the northwestern extent of the Site. Available on-line FEMA mapping indicates the Site is not within flood hazard areas.

PROPOSED DEVELOPMENT

Based on the referenced July 2020 site development plan, we understand the development will include construction of three biotechnical industrial/manufacturing buildings, as well as a 2-level parking structure. Two of the buildings (Buildings 1 and 2) are proposed within the eastern portion of the site and the third building (Building 3) and parking deck structure are proposed within the western portion of the site. We understand that Building 1, associated paved access driveways and parking areas and utilities will be constructed before the other structures. The buildings and parking structure will not have a basement level. Approximate limits of the structures are shown on **Figure 2**. Additional information regarding the proposed structures is summarized in **Table A**.

Table A – Summary of Proposed Development Areas and Structures

Proposed Features	EASTERN PORTION OF SITE		WESTERN PORTION OF SITE	
	Building No. 1	***Building No. 2***	***Building No. 3***	***Parking Structure***
No. Stories/Levels	1 to 2[1]	1 to 2[1]	1 to 2[1]	2
Approximate Footprint (square foot)	100,000	100,000	125,000	40,000
Slab-on-grade FFE[2] (ft)	339	339	316	Information not available[2]
Approx. Existing ground surface El. range (ft) near structure	328 to 343	336 to 343	307 to 326	297 to 304

Notes: 1) We understand Building Nos. 1, 2, and 3 will include a full single-story level, and a potential second-floor mezzanine level over an undetermined portion (up to ½) of the first-floor footprint.
2) The ground level of parking structure is proposed to consist of asphalt pavement.

Based on the existing site topography and the proposed building FFEs, it appears the proposed structures will generally require cuts and fills of up to about 7 feet, with occasional areas requiring up to about 12-foot cuts/fills (not including the removal and replacement of unsuitable soils below the floor slabs or foundations). Earth retaining structures are not shown on the current conceptual plan however, based on existing grades and proposed building FFEs it is anticipated that either steepened slopes or retaining walls will be required. Column spacing and building load information was not available at this early stage of design, except for Building No. 1, where we understand the column spacing in the manufacturing area of the building will be 40 to 50 feet on-center.

In addition to the structures summarized above, we understand that relatively large stormwater drainage structures will be constructed below pavement areas. The locations of these structures were not shown on the above-referenced design plan.

PREVIOUS AND CURRENT SUBSURFACE EXPLORATIONS

Subsurface explorations considered during this geotechnical evaluation included select borings and/or test pits from our previous 2008 and 2012 geotechnical and environmental studies, our 2019 due diligence phase geotechnical explorations, as well as those performed during the recent 2020 exploration program. The 2008 and 2012 explorations were performed for two previously proposed manufacturing/industrial building developments located in the east and central portions of the Site. Neither of these previously proposed developments were constructed. The locations of previous and recent subsurface explorations are shown on **Figure 2.**

Table B provides an overview of the previous and recent exploration programs. Subsurface information from the relevant previous and recent borings and test pits are summarized more in more detail in **Tables 1 and 2**, the boring and test pit logs in **Appendices B and C**, and in the next section of this report.

Table B – Subsurface Explorations Overview

Year Performed	Exploration Purpose	Exploration Type	No. of Explorations	No. of Refusals[2]	Exploration Depth Range[1] (ft)	Refusal Depth Range[2] (ft)
2008	Geotechnical	Borings	21	14	3 to 21	6 to 16
2008	Geotechnical	Test Pits	37	21	5 to 16	7.5 to 16
2008	Environmental	Borings	4	2	16 to 20	12 to 12.5
2008	Environmental	Test Pits	16	0	5 to 8	-
2012	Geotechnical	Borings	14	14	8.8 to 16.8	8.8 to 16.8
2019	Geotechnical	Borings	6	2	7 to 14	7 and 14
2019	Geotechnical	Test Pits	10	5	5 to 12	5 to 10
2020	Geotechnical	Borings	7	7 (Note 3)	10.8 to 19	10.8 to 19 (Note 3)
2020	Geotechnical	Test Pits	9	6	8 to 11.5	8 to 11

Notes:

1. Depths are referenced to existing ground surface at the time the exploration was performed.
2. Refusals are split spoon sampler and/or drilling refusals (roller bit or auger) for borings or excavator bucket refusal for test pits.
3. Number of refusals and refusal depth range includes boring GZ-304 (September 2020) where bedrock was cored from 10.8 to 16 feet below grade.

A description of the relevant previous and recent subsurface explorations is summarized in the following paragraphs.

2008 SUBSURFACE EXPLORATIONS

Geotechnical Borings and Test Pits

Twenty-one geotechnical test borings (GZ-100, GZ-101, GZ-103 through GZ-113, GZ-113A, GZ-114 through GZ-119 and GZ-119A) and 37 test pits (TP-101 through TP-137) were performed in January 2008 across the eastern and northwestern portions of the Site by New Hampshire Boring, Inc. of Brockton, Massachusetts and M.P. Crowley Company, Inc., respectively. The explorations were observed and logged by GZA personnel. The borings were performed using cased rotary wash and hollow stem auger (HSA) methods and the test pits were excavated using a steel-tracked excavator. Logs of the 2008 geotechnical borings and test pits are provided in **Appendix B**.

Environmental Borings and Test Pits

Four environmental borings (MW-1 through MW-4) with monitoring wells installed and 16 environmental test pits (TP-1 through TP-16) were performed by M.P. Crowley Company, Inc. within the eastern portion of the Site in January 2008. The borings and test pits were observed and logged by GZA personnel. These environmental explorations were performed in areas of former barracks buildings and underground storage tanks and in areas designated as an "area requiring environmental evaluation (AREE)". The borings were performed using hollow stem auger methods and the test pits were excavated using a steel-tracked excavator. The 2008 environmental explorations did not provide significant additional geotechnical information and were therefore excluded from **Tables 1 and 2** and the subsurface conditions discussion provided later in this report.

2012 SUBSURFACE EXPLORATIONS

Fourteen geotechnical borings (B-1 to B-14) were performed within the eastern portion of the Site in January 2012 by New Hampshire Boring of Derry, New Hampshire using HSA drilling methods. The borings were observed and logged by GZA personnel. Logs of the 2012 geotechnical borings are provided in **Appendix B**.

2019 DUE DILIGENCE PHASE GEOTECHNICAL SUBSURFACE EXPLORATIONS

Test Borings

Six geotechnical test borings (GZ-201 to GZ-206) were performed on November 5, 2019 by Drilex Environmental of Auburn, Massachusetts to evaluate subsurface conditions in and around the proposed building/structure areas. The borings were advanced with a drill rig mounted on a rubber-tracked all-terrain vehicle (ATV) using hollow stem auger drilling techniques. Split-spoon samples were obtained and Standard Penetration Tests (SPTs) were generally performed continuously to about 6 to 8 feet below existing ground surface (bgs) and at approximately 5-foot-intervals thereafter. A GZA representative observed the borings, obtained soil samples for laboratory testing, classified the soil samples using the Modified Burmister Soil Classification System and prepared boring logs, which are provided in **Appendix B**.

Test Pits

Ten test pits (TP-201, TP-201A and TP-202 to TP-209) were performed within and around the currently proposed building areas between November 14 and 15, 2019 by Anchor Excavating Corporation of Hanover, Massachusetts. The location and depth of the test pits were mutually agreed upon with the project civil engineer, HEI, to assess subsurface conditions and to perform in-situ permeability testing. The test pits were excavated with a Caterpillar 308E track-mounted excavator. A GZA representative observed the test pits, obtained soil samples for laboratory testing, classified the soil samples using the Modified Burmister Soil Classification System and prepared test pit logs, which are provided in **Appendix B**.

Field VOC Screening

GZA field screened soil samples collected from the borings and test pits for total volatile organic compounds (VOCs) using an Organic Vapor Meter equipped with a 10.6 eV photoionization detector (PID) lamp. Field screening results for most samples generally indicated levels below the detection limit (less than 0.1 parts per million [ppm]), with occasional isolated results up to about 5 ppm. Field PID screening results are included on the boring and test pit logs provided in **Appendix C**.

2020 GEOTECHNICAL SUBSURFACE EXPLORATIONS

Test Borings

Seven geotechnical test borings (GZ-301 to GZ-307) were performed from September 10 to 12, 2020 by Drilex Environmental of Auburn, Massachusetts to evaluate subsurface conditions in and around the currently proposed building/structure areas. The borings were advanced with a drill rig mounted on a rubber-tracked all-terrain vehicle (ATV) using hollow stem auger drilling techniques. Split-spoon samples were obtained and Standard Penetration Tests (SPTs) were generally performed continuously to about 6 to 8 feet below existing ground surface (bgs) and at approximately 5-foot-intervals thereafter. One 5-foot-long NX-sized rock core was performed in boring GZ-304 to confirm the presence, type, and quality of the bedrock. Groundwater observations wells were installed in borings GZ-301, GZ-303, GZ-304, and GZ-307, which were each finished with a 3-foot-high steel protective casing set in concrete. A GZA representative

observed the borings, obtained soil samples for laboratory testing, classified the soil samples using the Modified Burmister Soil Classification System and prepared boring logs, which are provided in **Appendix C**.

Test Pits

Nine test pits (TP-301 to TP-309) were performed within and around the currently proposed building areas between September 17 and 21, 2020 by Drilex Environmental of Auburn, Massachusetts. The location and depth of the test pits were mutually agreed upon with the project civil engineer, HEI, to assess subsurface conditions and to perform in-situ permeability testing. The test pits were excavated with a Takeuchi TB290 rubber track-mounted excavator. A GZA representative observed the test pits, obtained soil samples for laboratory testing, classified the soil samples using the Modified Burmister Soil Classification System and prepared test pit logs, which are provided in **Appendix C**.

Field VOC Screening

GZA field screened soil samples collected from the borings and test pits for total volatile organic compounds (VOCs) using an Organic Vapor Meter equipped with a 10.6 eV photoionization detector (PID) lamp. Field screening results for most samples generally indicated levels below the detection limit (less than 0.1 parts per million [ppm]), with occasional isolated results up to about 13 ppm (within an organic forest mat stratum). Field PID screening results are included on the boring and test pit logs provided in **Appendix C**.

FIELD PERMEABILITY TESTING

2008 PERMEABILITY TESTING

Falling head permeability tests were performed in 10 of the 2008 geotechnical borings: 4 within the east portion of the site (GZ- 101, GZ-104, GZ-107, and GZ-110) and 6 within the west portion of the Site (GZ-113, GZ-113A, GZ-115, GZ-117, GZ-119, and GZ-119A). Test depths at the eastern and western portions of the Site ranged from 5 to 10 feet and 2.5 to 5 feet bgs, respectively. Permeability test data and results are provided in **Appendix D**.

2019 and 2020 PERMEABILITY TESTING

Falling head permeability testing in two of the 2019 test pits (TP-201A and TP-202) and two of the 2020 test pits (TP-306 and TP-307) within the natural glacial till and sand/gravel strata in the eastern and western portions of the Site. The permeability testing was performed to estimate the vertical hydraulic conductivity (i.e. permeability) of in-situ soils above the water table to provide preliminary data to HEI for design of stormwater infiltration system(s).

The testing apparatus consisted of an approximately 12-inch-diameter by 3.4-foot-long section of solid PVC pipe. The pipe was inserted into a hand-excavated hole (approximately 1.5 feet in diameter and 1.3- to 1.4-feet-deep). The annulus between the pipe and the hand-excavated hole was backfilled with excavated soil, manually tamped in place.

The inside of the pipe was filled with water for approximately 15 minutes to presoak the underlying soils prior to recording the water level drop in the pipe during the test. **Table C** provides an overview of the previous and recent permeability testing results. Permeability test data and results are provided in **Appendix D**.

Table C – Summary of 2019-2020 Single-Ring Infiltrometer Test Results

Test Pit ID	Year Performed	Nearest Proposed Feature	Depth of Test (ft)	Stratum Test Performed in	Estimated Vertical Hydraulic Conductivity Result (cm/s)
TP-201A	2019	Pavement area east of Building No. 2	8.5	Glacial Till	5.8×10^{-3}
TP-202	2019	Pavement area south of Building No. 2	6.5	Sand/Gravel	1.4×10^{-1}
TP-306	2020	Pavement area west of Building No. 3	7.3	Glacial Till	2.6×10^{-3}
TP-307	2020	Pavement area west of Building No. 1	7.1	Glacial Till	3.5×10^{-3}

Based on our experience from other projects at the Devens base, the permeability of the natural glacial till with a similar percentage of silt as encountered is typically a few orders of magnitude lower than the permeability results estimated from this current study. It is possible that the higher permeability at this site could be due to sandy layer(s) within the glacial till stratum. A summary table of the results and calculation sheets for the field permeability tests are included in **Appendix D**.

LABORATORY ANALYSES

2008 GEOTECHNICAL LABORATORY TESTING

Eight soil samples from the geotechnical borings and test pits were submitted to GZA's geotechnical laboratory for gradation analysis to confirm field classifications and assess the potential for re-use of on-site soils as Structural Fill (i.e. Sand-Gravel Fill or Granular Fill). In addition, two of these samples were submitted to the laboratory for moisture-density relationship (Proctor) testing to obtain additional design/construction related information. Results of geotechnical laboratory testing are presented in **Appendix E**.

2012 GEOTECHNICAL LABORATORY TESTING

GZA performed four gradation analyses on samples recovered from the test borings. The purpose of the analyses was to confirm visual classifications made in the field and estimate the engineering properties of the soils. Laboratory results are included as **Appendix E**.

2019 GEOTECHNICAL LABORATORY TESTING

Laboratory grain size analyses were performed on two soil samples obtained from the 2019 borings to confirm visual field classifications and to help evaluate the potential for re-use as backfill on-site. Laboratory results are included in **Appendix E**.

2020 GEOTECHNICAL LABORATORY TESTING

Laboratory grain size analyses were performed on four soil samples obtained from the recent borings to confirm visual field classifications and to help evaluate the potential for re-use as backfill on-site. Laboratory results are included in **Appendix E**.

In addition, four composite topsoil samples were collected by GZA and submitted to the Soil Nutrient Analysis Laboratory at the University of Connecticut in Storrs, Connecticut for nutrient and textural analyses to evaluate the soils suitability as a growing medium (required for project unified permit application (UPA)). The "Standard Nutrient Analysis" provides pH, acidity, extractable nutrients, extractable heavy metals (e.g. lead and aluminum), cation exchange capacity, and percent base saturation. The "Organic Matter Content" analysis reports percent organic matter, and the "Soil Textural Analysis" provides a determination of the USDA Texture Classification by hydrometer analysis which indicates percentages of sand, silt and clay particles. Approximate topsoil sampling locations and laboratory test results are included in **Appendix F**.

SUBSURFACE CONDITIONS

Based on the relevant previous[1] and recent subsurface explorations, subsurface conditions across the currently proposed development areas generally consist of (in order of increasing depth): a thin layer of topsoil/forest mat or asphalt pavement, intermittent subsoil, granular fill, natural granular soils, glacial till, and bedrock. As noted above, a summary of subsurface conditions encountered in the explorations is presented on **Tables 1 and 2** for the proposed structures. A general description of the soil, bedrock and groundwater encountered in the proposed development areas is summarized below. Refer to the boring and test pit logs for more detailed information at each exploration location.

Note that the subsurface conditions presented below are separated into two main areas of the Site, as delineated on **Figure 2**:

- Eastern Portion of Site - Mostly previously developed, contains portions of previous building foundations, abandoned and live underground utilities, and areas of asphalt pavement. Existing grades vary from about El. 348 to El. 335. Proposed Buildings 1 and 2 are located in the eastern portion of the Site. Fifty-nine subsurface explorations, including 28 borings and 31 test pits were considered for evaluating the eastern portion of the Site.

- Western Portion of Site - Mostly undeveloped and wooded. Existing grades vary from about El. 335 to El. 280. Proposed Building 3 and the proposed parking structure are located in the western portion of the Site. Forty-five subsurface explorations, including 20 borings and 25 test pits, were considered for evaluating the western portion of the Site.

[1] Note that subsurface information from the relevant previous explorations (including ground surface elevations) included in the subsurface condition summaries assume changes to site grading from 2008 to the present are negligible.

EASTERN PORTION OF THE SITE (PROPOSED BUILDING NOS. 1 AND 2)

- ***Topsoil/Forest Mat and Pavement*** – A surficial layer of topsoil/forest mat was noted in 48 of the 59 explorations with thicknesses ranging from 0.2 to 3 feet. 2008 test pit TP-118 and boring GZ-104 were located within an existing paved area and instead of topsoil encountered a 0.2-foot-thick surficial layer of bituminous asphalt pavement. Boring GZ-301 was located proximate to a former road and encountered a 0.2-foot-thick buried asphalt pavement layer below a 0.2-foot-thick surficial topsoil layer. The topsoil/forest mat layer generally consisted of dark brown to brown silty sand with varying amounts of gravel, trace to little organic matter (roots, leaves, grass), and occasionally trace amounts of asphalt. A buried topsoil layer of up to 0.7-feet-thick was noted at test pits TP-115, TP-116, TP-118, and TP-136.

- ***Subsoil*** – A layer of subsoil was encountered directly below the topsoil in about 25 percent of the explorations. This layer was generally about 0.3- to 2.5-feet-thick and consisted of orange-brown silty sand with varying amounts of gravel and trace to little roots. Note that a buried subsoil layer up to about 1-foot-thick was encountered in five test pits (TP-115, TP-116, TP-117, TP-118, and TP-136) at a depth of up to about 2.5 feet bgs.

- ***Fill*** – Fill encountered at the site was mainly granular and was observed in about 45 percent of the explorations from existing ground surface or below the surficial topsoil/subsoil or asphalt layers. The thickness of the fill ranged from about 1 to 10.5 feet. The fill varied from very loose to dense (typically medium dense to dense), brown or dark brown, sand with about 10 to 40 percent gravel and 10 to 35 percent silt. Trace amounts of asphalt, brick and/or wood were observed in the existing fill at some locations. Miscellaneous debris (i.e., concrete, metal, pipe fragments, cinder blocks and rebar) was also observed in the existing fill in test pit TP-103. Boulders were encountered in the fill in some of the explorations. Loose to very loose blow counts (SPT N-values) were encountered within the fill in boring B-4. Also, in a stratum which was called sand and gravel in borings B-3, B-9, and GZ-303 loose blow counts were encountered within about 4 feet of ground surface and, based on the location of these borings to existing and former structures at the site, the top approximately 4 feet of these borings may have instead been fill.

  Old concrete foundations (i.e. walls, footings and/or piers) from former structures were encountered in the fill in nine of the test pits (TP-103 to TP-105, TP-108, TP-111, TP-114, TP-117, TP-136, and TP-201) at depths ranging from about 1 to 6 feet. In addition, abandoned pipes were encountered in the fill stratum in five of the test pits (TP-104, TP-105, TP-111, TP-116 and TP-201) at depths ranging from 3 to 8 feet.

  It should be noted that in some of the explorations it was difficult to differentiate between fill and the natural granular soils. This was noted particularly at locations where it appeared that on-site granular soils may have been used to backfill around foundations of previous structures and in excavations following removal of underground fuel storage tanks that were used to heat the former barracks buildings.

- ***Natural Granular Soils*** – Natural sand and gravel/gravelly sand was encountered in most of the explorations at depths ranging from 0.2 to 8 feet bgs. This stratum was approximately 0.5 to 11 feet thick in the explorations and generally consisted of medium dense to dense sand with 10 to 50 percent gravel and 5 to 15 percent silt. At some locations (particularly the 2012 borings) this deposit contained up to about 30 percent silt. In a few of the test pits approximately 5 to 10 percent cobbles and occasional boulders were encountered in this layer. Loose blow counts were encountered in the 2- to 4-foot bgs samples within what was called sand and gravel at borings B-3, B-9, and GZ-303 only and it appears the top 4 feet of these two borings may have been fill of similar appearance to the natural granular soils.

- ***Glacial Till*** – Glacial till was generally encountered below the natural granular soils layer and in about 3/4 of the explorations at depths ranging from about 3 to 14 feet bgs. The glacial till varied from medium dense to very dense (typically dense to very dense) and generally consisted of brown fine to medium sand with 30 to 40 percent silt and 10 to 35 percent gravel. The frequency of encountering boulders in the glacial till stratum varied from occasional to more frequent.

- ***Weathered Bedrock/Bedrock*** – Bedrock was generally encountered below the glacial till layer. Bedrock coring was performed in borings GZ-110 (Building 2) beginning at a depth of about 14 feet. The bedrock generally consisted of moderately hard, slightly to severely weathered, moderately fractured blue, gray mica schist. Approximately 0.1 to 7.5 feet of very severely to completely weathered bedrock was encountered immediately above more sound bedrock or apparent bedrock in 18 of the 59 explorations.

  Auger, roller bit, and/or split-spoon refusals were encountered at 24 out of 28 boring locations at depths ranging from about 9 to 17.5 feet bgs. Excavator refusal was encountered at 13 of 21 test pit locations at depths ranging from 5 to 16 feet bgs. Apparent top of bedrock was encountered at elevations ranging from about 313.5 to 336. Although it appeared that the refusals were due to bedrock, it should be noted that the refusals may be on boulders, cobbles, or gravel and not necessarily bedrock. In addition, based on our experience on nearby sites, the top of bedrock elevation is erratic and may be encountered at higher elevations across the site.

<u>WESTERN PORTION OF THE SITE (BUILDING NO. 3 AND PARKING STRUCTURE)</u>

- ***Topsoil/Forest Mat*** – A surficial layer of topsoil/forest mat was encountered in 41 of the 45 explorations. This layer was generally about 6- to 12-inches thick and consisted of dark brown silty sand with lesser amounts of gravel and trace to little roots and organic matter.

- ***Subsoil*** – A layer of subsoil was encountered directly below the topsoil in about 80 percent of the explorations. This layer was generally about 0.5 to 2.5 feet thick and consisted of orange-brown silty sand with about 10 to 30 percent gravel and trace roots.

- ***Fill*** – Existing fill was encountered in three of the explorations (borings GZ-114, GZ-304 and test pit TP-304). The fill was approximately 1- to 5.5-feet-thick and consisted of dark brown silty sand with various amounts of gravel. The fill at boring GZ-304 also contained asphalt and trace amounts of roots and metal in test pit TP-304.

- ***Natural Granular Soils*** – Natural sand/gravel and gravelly sand was encountered in all but three of the explorations (GZ-113A, GZ-118 and GZ-206, all near the west end of the site) at depths ranging from 0 to 10 feet bgs. This stratum generally consisted of medium dense to dense sand with about 10 to 50 percent gravel and trace amounts of silt. At a few locations this deposit contained up to 20 to 35 percent silt. About 5 to 10 percent cobbles were encountered in this layer in a few of the test pits. Boulders were encountered in some of the test pits. This layer was observed to be approximately 1.5 to 9 feet thick in the explorations.

- ***Glacial Till*** – Glacial till was encountered at depths ranging from 2 to 10 feet bgs. The glacial till was medium dense to very dense (typically dense to very dense) and generally consisted of brown fine to medium sand with 30 to 40 percent silt and 15 to 35 percent gravel. Cobbles and boulders were frequently encountered in the glacial till.

- ***Bedrock*** – Bedrock coring was performed in borings GZ-117 and GZ-304 (both Building 3 area) beginning at depth of about 16 and 11 feet bgs, respectively. It was not possible to recover any rock core at GZ-117, possibly indicating the presence of weathered bedrock. However, at boring GZ-304 a 5-foot-rock core was advanced and collected and

indicated the presence of medium hard to hard, slightly weathered schist, which is consistent with the type of rock recovered from the core at boring GZ-110 (eastern portion of the site) and bedrock observed at other nearby GZA project sites on the Devens campus.

Auger, roller bit and split-spoon refusal was encountered at 15 of the 20 boring locations at depths ranging from about 7 to 19 feet bgs. Excavator refusal was encountered at 19 of the 25 test pit locations at depths ranging from about 5.5 to 14 feet bgs. Apparent top of bedrock was encountered at elevations ranging from about 286.5 to 313. Although it appeared that refusals were due to bedrock, it should be noted that the refusals may be on boulders, cobbles or gravel and not necessarily bedrock. Also, there is an apparent bedrock outcrop located within about 8 feet of the west-central edge of the proposed parking structure (approximate outcrop location shown on **Figure 2**). In addition, based on our experience on nearby sites, the top of bedrock elevation is erratic and may be encountered at higher elevations across on the site.

GROUNDWATER

Depths to groundwater were estimated based on observations made during drilling of the borings and excavation of the test pits, as well as measurements made over time within five monitoring wells installed in the recent (September 2020) borings. We note that the recent exploration program was performed during relatively dry late summer conditions, and that the levels observed in explorations without a monitoring well, particularly in the borings, may not represent stabilized groundwater levels. Also, based on available information at this site, it appears that the observed groundwater level often coincides with the top of the glacial till stratum, likely due to the relatively impervious nature of the glacial till. During wet periods, it is expected that groundwater would be present at the top of the glacial till stratum or slightly higher. During dry periods, the static groundwater level may be expected to drop below the top of glacial till. Groundwater flow is expected to generally follow the topography of the site and thus flow generally from east (at Jackson Road) to the west.

- ***Eastern Portion of Site –*** Groundwater was encountered in the borings and test pits at depths ranging from approximately 6 to 14 feet bgs, corresponding to approximate groundwater elevations ranging from El. 336 east of proposed Building No. 2 and sloping down to about El. 319 feet about to the west of proposed Building No. 1.

These approximate groundwater elevations in the Building 1 and 2 area were generally confirmed by the monitoring well readings summarized in **Table D** below. **Table D – Summary of Recent and Previous Site Monitoring Well Readings (Eastern Portion of Site)**

Exploration ID	Year Monitoring Well Installed	Date Monitoring Well Installed	Date of Monitoring Well Reading	Nearest Proposed Structure	Groundwater Depth Reading[1] (ft)	Groundwater Elevation Reading (ft)
MW-2	2008	1/17/08	January 2008	Building 2	8.8	319.0
MW-4	2008	1/17/08	January 2008	Building 1	7.5	334.5
B-9	2012	1/12/12	1/16/12	Building 1	12.3	325.7
GZ-301	2020	9/10/20	10/23/20	Building 2	9.2	332.3
GZ-303	2020	9/10/20	10/23/20	Building 1	Dry (15)	< 323

Note: 1. Depths are referenced to existing ground surface at the time the exploration was performed.

- ***Western Portion of Site –*** Observations made in the borings and test pits indicated groundwater was encountered at depths ranging from approximately 3 to 11 feet bgs. Based on these depths, approximate

groundwater elevations range from about El. 300 to El. 309 in the vicinity of proposed Building No. 3, with the exception of Boring GZ-100 and TP-203 (located in proposed paved areas about 50 feet east and 100 feet south of proposed Building No. 3, respectively,) which indicate groundwater at approximately El. 315 to El. 319. Groundwater levels encountered in the explorations varied from El. 280 to El. 298 at the proposed parking structure.

Design groundwater elevations for the proposed structures at the site are provided below in the Design Recommendations section of this report. It should be noted that, in addition to precipitation, fluctuations in groundwater levels may occur due to variations in season, precipitation, site features and other factors different from those existing at the time of the explorations.

GEOTECHNICAL IMPLICATIONS OF SUBSURFACE CONDITIONS

The primary geotechnical issues for design and construction of the proposed development are:

- *Presence of unsuitable materials/debris and existing fill (Eastern Portion of Site)* – The existing buried debris (including concrete foundations) from the demolished barracks buildings and potentially from demolished buildings at the former motor pool facility, as well as existing fill and buried topsoil and subsoil are considered unsuitable bearing material for support of slabs-on-grade and foundations due to variable density and potential compressibility. Also, some of the existing fill is difficult to distinguish from the natural granular soils at the site.
- *Relatively Shallow Bedrock (Western Portion of Site)* – Subsurface explorations and observation of a bedrock outcrop indicate the depth to bedrock may be relatively shallow (within about 10 feet of ground surface) over much of the western portion of the site, particularly near the proposed Parking Structure and the southeast portion of Building No. 3. Some foundation excavations and deeper utility excavations in these areas may require bedrock removal using methods such as blasting (if allowed) and hydraulic hammering.
- *Boulders and Cobbles (Eastern and Western Portions of Site)* – The subsurface explorations across most of the Site indicate the presence of occasional and sometimes more frequent cobbles and boulders (particularly some greater than or equal to 3-feet thick) in the fill, natural granular soils, and glacial till strata. Boulders and cobbles should be accounted for during site cut/fill site balance considerations, as they will not be able to be reused as backfill within the building areas or utility trenches.
- *Reuse of On-Site Soils* – Some of the proposed excavated soils, particularly those which penetrate the glacial till stratum will have a relatively high silt content and will likely be difficult to reuse as fill, especially in wet conditions.
- *Possible temporary high groundwater table* – While recent stabilized groundwater levels (mostly obtained during a relatively dry season) indicate static groundwater level may be below proposed building and shallower utility excavation elevations, based on our experience in Devens during precipitation events, water tends to perch on top of the glacial till and bedrock strata (generally within about 5 to 15 feet of ground surface). Therefore, the presence of perched water will need to be considered in the overall site and building drainage design and during earthwork construction.
- *Unexploded Ordinance (UXO) Potential* – While not encountered in the previous or current explorations, because of the past site usage as an Army base, unexploded ordinance (UXO) may be present in the soils across the site, although encountering UXO is considered unlikely due to past site cleanup operations.

GEOTECHNICAL RECOMMENDATIONS

The geotechnical design and construction recommendations presented below are based on GZA's understanding of the currently proposed development, evaluation of the available data from our previous and recent subsurface exploration programs, and the 2015 International Building Code (IBC) and the Massachusetts Amendments to the 2015 IBC, 9th Edition (MSBC). The recommendations presented herein are subject to the limitations in **Appendix A**.

DESIGN

1. Design Considerations

Table E provides GZA's recommended design groundwater elevation for each proposed structure, as well as other critical elevations of concern for the proposed structures.

Table E – Summary of Subsurface Conditions that Impact Building Design

Proposed Features	EASTERN PORTION OF SITE		WESTERN PORTION OF SITE	
	Building No. 1	***Building No. 2***	***Building No. 3***	***Parking Structure***
Slab-on-grade FFE	339	339	316	Information not available
Range of Observed Groundwater Levels within Footprint of Structure	323 to 334	326 to 336	304 to 308	280.5 to 299
Design Groundwater Elevation	336	338	312[1]	301
Range of Observed Top of Suitable Bearing Soils	328 to 343	328 to 341.5	306 to 325	297 to 304
Range of Observed Top of Bedrock	322.5 to 331	327.5 to 334[2]	296 to 307[3]	288 to 298[4]

Note: 1) Design Groundwater Elevation at Building No. 3 takes into account depth to glacial till stratum as an influence on perched water elevation.
2) Top of observed bedrock at Building No. 1 includes boring B-3, located approximately 40 feet east of proposed Building No. 1.
3) Top of possible bedrock observed just outside the Building 3 footprint includes El. 313 at boring GZ-304 immediately south of the building, El. 316 at boring GZ-104 located about 45 feet east of the building, and El. 316 in boring GZ-104, located about 50 feet east of the building.
4) Apparent exposed bedrock outcrop observed about 10 feet east of boring GZ-206 (refer to Figure 2) at around El. 298 ft.

2. Foundations (Building Nos. 1, 2, 3 and Parking Structure)

The topsoil, subsoil, fill, buried topsoil/subsoil are unsuitable for support of the proposed structures because of their potential for compression due to organic content and variable density. Foundations, related demolition debris, and abandoned utilities from previous structures should also be removed prior to foundation or slab construction. It is anticipated that excavation to a depth of 4 to 6 feet below existing ground surface in the former barracks building areas will be required to remove remnants of foundations. Additional test pit excavations should be considered before or during the beginning of construction in the footprints of previously demolished buildings associated with the former motor pool to assess the presence and depths of potential foundation remnants.

The proposed structures may be supported on shallow foundations (e.g. spread footings) bearing on undisturbed natural granular soil, glacial till, bedrock, or on compacted Structural Fill (i.e., Sand-Gravel Fill, Granular Fill, or Crushed Stone) placed in controlled lifts over these natural materials after removing the fill, topsoil, subsoil, and buried topsoil/subsoil, foundations and debris. Removal below proposed buildings should include soils that have been

disturbed by excavations to remove existing footings from previously demolished buildings, and from test pit investigations performed for this project that extend below the bottom of proposed footings. Unsuitable soils should be removed within the zone of influence below the new foundations, defined by a 1 foot horizontal to 1-foot vertical line extending downward and outward starting at 1 foot horizontally outside the bottom edge of footing. Careful observation of footing subgrades by a qualified geotechnical engineer will be required to observe that subgrade soils are suitable for foundation support.

The gradation and compaction criteria for Structural Fill used to replace unsuitable soil are provided in **Tables 3 and 4**, respectively. Structural Fill must be placed in a controlled manner as further described in the Construction Recommendations section of this report.

Provided that foundation subgrades are prepared as described herein, recommended maximum net allowable bearing pressures in tons per square foot (tsf) for the shallow footings on the different strata are:

- Compacted Structural Fill (placed over the Natural Undisturbed Soils): 3 tsf
- Undisturbed Natural Gravelly Sand, Sand/Gravel Soils: 3 tsf
- Natural Undisturbed Glacial Till: 4 tsf
- Weathered Bedrock[2]: 4 tsf
- Bedrock: 8 tsf

Since the actual bearing material may not be known until construction, it may be more practical to design all footings for a recommended bearing pressure of 3 tsf.

Assuming that the proposed shallow foundations are constructed no more than 4 feet below the slab-on-grade elevations, it is unlikely that substantial amounts of bedrock will be encountered during footing construction, especially in the eastern portion of the Site; however, some areas (such as the southeast corner of proposed Building No. 3 and possibly the parking structure) are more likely to encounter bedrock. If bedrock is encountered at or above the bottom of footing elevation, it should be overexcavated at least 6 inches below proposed footing grade and replaced with compacted Structural Fill. Alternatively, individual footings may bear entirely on bedrock. We recommend a transition zone be provided for continuous wall footings where the subgrade changes from natural soil or Structural Fill to bedrock. The transition zone should be constructed by excavating bedrock to 12 inches below the bottom of footing at the change in bearing material. Taper this bedrock excavation to 6 inches below the footing at 10 feet from the subgrade change and backfill with compacted Structural Fill. Alternatively provide a vertical construction joint in the foundation and building wall at the location of the subgrade change to mitigate cracking due to differential settlement, or provide additional reinforcement in the footing at the change in bearing material to accommodate potential bending stresses due to the differing subgrade material stiffness.

Footings should be designed in accordance with the Massachusetts State Building Code, 9th Edition (MSBC) Amendments to the 2015 International Building Code (IBC). Exterior footings and interior footings in unheated areas should bear at least 4 feet below the final exterior grades for frost protection. Interior footings in heated areas and footings bearing entirely on bedrock should bear at least 18 inches below top of slab. In accordance with MSBC Section

[2] "Weathered Bedrock" is defined as very severely to completely weathered bedrock that can be readily excavated with standard soil excavation equipment and techniques.

1806.2, for footings less than three feet in least lateral dimension (width), the recommended allowable bearing pressure shall be 1/3 of the value indicated above, times the footing width in feet.

3. Building Slabs

Slab-on-grade construction is recommended for the proposed buildings on a base course consisting of a minimum 8-inch-thick layer of Sand-Gravel Fill in accordance with gradation and compaction criteria provided in **Tables 3** and **4**, respectively. Prior to the construction of the building slab and base course, existing unsuitable soils (e.g. topsoil, subsoil, fill, buried topsoil/subsoil) and debris should be removed in accordance with subgrade preparation/construction recommendations provided later in this report.

4. Foundation Settlement

Post-construction settlement for the proposed building and parking structure foundations is anticipated to be less than 1 inch and differential settlement (between columns) less than about ½ inch, provided that the foundations are designed and constructed as recommended herein.

5. Geotechnical Seismic Design Parameters

Based on the criteria of MSBC Section 1806.4 and Figures 1806.4b and 1806.4c, a qualitative liquefaction assessment was performed on the basis of SPT N-values, soil type and estimated fines content. The soils at the Site are not considered susceptible to liquefaction based on the criteria set forth in the MSBC.

The SPT N-values from the borings were used to evaluate seismic Site Class in accordance with Section 1613.5.5 of the MSBC, and the IBC. Based on this evaluation, we recommend Site Class C be used for seismic design. In accordance with Table 1604.11 of the MSBC, the mapped seismic design factors for the town of Shirley (nearest municipality to the 45 Jackson Road development area) are:

- S_s = 0.207, and
- S_1 = 0.071

Seismic loads on foundation walls should be calculated based on MSBC Section 1613.3.3(1) and (2), using the following parameters:

- Total Soil Unit Weight: 130 pcf
- Site Coefficient, F_a = 1.2
- Site Coefficient, F_v = 1.7

6. Permanent Groundwater Control

Based on groundwater levels measured in the borings, test pits, and a limited number of observation wells, observations of moisture in samples obtained from the borings, and our experience during design and construction for other structures within nearby sites in Devens, we recommend the design groundwater levels (same as those presented in **Table E)** and permanent groundwater control measures for the proposed structures as summarized in **Table F**:

Table F – Recommended Design Groundwater Levels and Permanent Groundwater Control Design Measures

Area	Proposed FFE	Design Groundwater El. (See Note 1) (ft)	Permanent Groundwater Control Measures
Building No. 1	339	336	Perimeter Foundation Drains
Building No. 2	339	338	Perimeter Foundation Drains
Building No. 3	316	312	Perimeter Foundation Drains
Parking Structure	Information not available	301	Perimeter Foundation Drains (Note 2)

Notes:

1. The Design Groundwater Elevations correspond to maximum anticipated groundwater levels prior to construction of building perimeter drain system. Waterproofing up to the Design Groundwater Elevation is recommended for elevator and laboratory process/equipment pits. However, assuming the perimeter drains perform as intended, the static groundwater level around each structure will be maintained below its base slab elevation, and hydrostatic uplift is not anticipated.
2. Perimeter drains for the Parking Structure are not required if the design FFE is set at El. 303 or above, or if structure consists of asphalt pavement at ground surface and isolated column foundations (i.e. no continuous wall foundations and no concrete slab).

The perimeter foundation drainage system should be placed outside the foundation wall in accordance with Section 1805.4.2 of the MSBC to provide discharge of infiltrating rain and surface water. The drain should generally consist of 4-inch-diameter perforated PVC pipe surrounded by a minimum of 6 inches of Crushed Stone (required gradation described in **Table 3**) and wrapped in a non-woven geotextile (Mirafi 140N or equal). Above the Crushed Stone, Sand-Gravel fill, as detailed in the attached **Table 3**, should be placed to within 18 inches of ground surface to provide positive drainage into the foundation drain pipe. The perimeter drain should be installed outside the foundation wall a minimum of 4 feet below finish grade, to provide discharge of infiltrating rain and surface water.

Building perimeter drains should discharge via gravity from above the design groundwater levels into the on-site stormwater discharge lines/structures. Exterior grades should be sloped away from the building areas as much as

practical. Provisions should be made to incorporate clean-out risers into the perimeter drains to facilitate periodic clean-out of the drains.

Outside grades should be sloped away from the building areas as much as practical. It is recommended that the site storm drainage systems be designed such that that perimeter drain connections at the manholes are above the existing groundwater level.

We recommend that below-grade portions of foundation walls and lowest level slabs be damp-proofed in accordance with MSBC Section 1805.2. We understand the proposed buildings will not include a basement. Should elevator pits be proposed below observed groundwater levels or areas where perched groundwater is anticipated based on soil stratigraphy, waterproofing of the pit walls and slabs in accordance with IBC Section 1805.3 should be provided.

7. Lateral Earth Pressures

Retaining walls, buried foundation walls, and other permanent retaining structures subjected to unbalanced earth-loading conditions should be designed to resist lateral earth pressures. We recommend the following design criteria:

a) For the purpose of evaluating lateral earth pressures for retaining walls or other below-grade walls with unbalanced earth loading, we recommend the following equivalent weights:

- flexible (cantilever) walls 45 pounds/cubic foot (pcf)
- rigid walls 65 pcf

These values are for horizontal backfill and assume that the walls are backfilled with free draining soils such as Granular Fill (provided it has less than 8 percent passing sieve No. 200) or Sand Gravel Fill within at least 3 feet of the walls and constructed with perimeter drains so that no water pressure develops behind the wall. Where the calculated earth pressure behind the wall is less than 250 pounds per square foot (psf), it should be increased to 250 psf to account for stresses created by compaction within 5 feet of the wall. This pressure does not account for surcharge loads from large equipment such as cranes and concrete trucks. Walls should also be designed for appropriate surcharge and seismic loads per Section 1807.2 of the MSBC.

b) The recommended coefficient of friction to resist sliding between mass concrete/formed concrete and natural soils or compacted Structural Fill is 0.4.

c) The minimum factors of safety for sliding and overturning under static loads should be 1.5. Passive pressure at the toe of the walls should not be included as a resisting force when analyzing for overturning and sliding.

On-site finished slopes should be no steeper than 2.5 horizontal to 1 vertical. If steeper slopes are required, GZA can provide recommended slope treatments and/or slope stabilizing measures upon request.

CONSTRUCTION

1. Foundation Subgrade Preparation

Remove all existing topsoil, subsoil, existing fill, and buried topsoil/subsoil within the proposed building areas and parking structure foundation areas down to undisturbed natural soils or bedrock. The limits of existing fill, topsoil, subsoil, and buried topsoil/subsoil to be removed below proposed footings is defined by a 1 horizontal to 1 vertical (1H:1V) line sloping downward and outward from 1 foot outside the bottom exterior edge of the footings and intersecting the undisturbed natural soil or bedrock subgrade.

Where practical, final excavation should be undertaken using a smooth-edged bucket to limit disturbance to the natural subgrades. Proof-roll final subgrade areas prior to placement of footings or Structural Fill with at least ten passes of a minimum 10,000 pound (minimum static weight) vibratory roller. In confined areas, proof-roll with a minimum of ten passes of a vibratory plate compactor or walk-behind vibratory drum roller. When near the water table or perched water, proof-rolling should be performed at the discretion of the Engineer and should be performed using static (non-vibratory) equipment.

Weak and unstable areas that are observed during proof-rolling should be overexcavated and replaced with compacted Structural Fill (Granular Fill, Sand-Gravel, or Crushed Stone wrapped in filter fabric).

Based on the borings and test pits, some of the soils at the bottom of the excavation, particularly those with higher silt content – such as glacial till soils, will be susceptible to disturbance during excavation in wet conditions. Excavations should be sequenced and conducted in such a way as to minimize disturbance of subgrades. Equipment (other than proof-rolling equipment) should not operate directly on the natural subgrade to limit disturbance. Where natural subgrades are silty and/or which easily disturbed when wet, they may require a mud mat or working mat of Crushed Stone. Crushed Stone placed in excess of 4-inches-thick should be wrapped in non-woven geotextile filter fabric.

Footing and slab subgrades should be protected from frost at all times during construction. We recommend that a qualified geotechnical engineer evaluate the subgrade for suitability for foundation support and to monitor proof-compaction and subsequent fill placement.

If bedrock excavation is required below footings, slabs or within utility trenches, bedrock should be overexcavated to at least 6 inches below bottom of the footing, slab or utility invert. Based on the explorations, it is anticipated that limited bedrock excavation (particularly noted in the southeast Building No. 3 and proposed parking structure areas) will be required for footing construction. Bedrock encountered in the explorations is indicated on **Tables 1 and 2**. Based on data from our exploration program, and the proposed finished floor elevations of the proposed structures, if bedrock excavation is required, we anticipate that some of the rock excavation can be accomplished with rippers or large excavation equipment. However, there may be areas where blasting is required to remove bedrock. If blasting is used, it should be performed in a controlled manner to avoid damage to existing utilities and nearby buildings.

2. Building Slab Subgrade Preparation

a. Below building slabs for proposed Building Nos. 1, 2, and 3, excavate and remove all existing topsoil, subsoil, organic fill, buried topsoil/subsoil. Also excavate inorganic fill, remnants of previous foundations, and demolition debris from previous structures to at least 3 feet below the bottom of proposed slabs. Slab excavation should extend at least 3 feet beyond the outside edge of the proposed slab. Where practical, final excavation should be undertaken using a smooth-edged bucket to limit disturbance to the soil subgrades.

b. Proof-roll the existing subgrade with a minimum of six passes of a vibratory drum roller (with a minimum static drum weight of 10,000 pounds). This operation must be observed by a qualified geotechnical engineer.

c. Place structural fill below slab base course as required. Backfill should be compacted to 95 percent of maximum dry density as determined by ASTM D-1557.

3. Pavement Subgrade Preparation

Remove topsoil, subsoil, organic fill and buried topsoil/subsoil to at least 2 ½ feet below proposed finished grades beneath paved areas (including the asphalt paved ground level of the parking structure) and remove existing inorganic fill to the minimum depth required to accommodate Finish, Binder and Sand-Gravel base course. Proof-roll the existing subgrade with a minimum of six passes of a vibratory drum roller (with a minimum static drum weight of 10,000 pounds). Any weak, unstable or soft spots identified during proof-rolling should be excavated and replaced with compacted Structural Fill.

4. Reuse of On-Site Materials

On-site materials anticipated to be excavated during construction include existing granular fill, and natural gravelly sand, sand/gravel and glacial till.

Based on visual and laboratory soil classifications, the existing on-site granular fill and the natural granular soils often contain less than approximately 15 percent fines (primarily silt) and in many cases meet the gradation requirements for Granular Fill. Some of the natural granular soils and fill contain up to 35 percent silt and generally do not meet the gradation requirements for Granular Fill. The on-site glacial till soils contain up to about 50 percent fines (primarily silt) and do not meet the gradation requirements for Granular Fill or Sand-Gravel Fill. Due to the high silt content, the on-site glacial till may be easily disturbed during wet/freezing conditions when subject to heavy earthwork equipment.

If weather conditions are favorable, the on-site natural granular soils and glacial till may be reused on site as a substitute for Granular Fill provided that the moisture content can be controlled and the material can be compacted to the required density. However, the on-site glacial till and any soil containing more than 20 percent fines should not be used as fill within 1 foot of bottom of footings or within 1 foot of the bottom of building slab base course, nor should it be used above perimeter foundation drain pipes. Where glacial till is used as fill below footings and slabs, a 12-inch-thick base course layer of Sand-Gravel Fill, Crushed Stone wrapped in non-woven filter fabric, or Granular Fill with no greater than 10 percent fines should be placed and compacted below the footings and slabs.

On-site granular fill from site excavations may be reused as a substitute for Granular Fill, provided it is free from deleterious or organic matter, topsoil/subsoil, roots, and particles greater than 6 inches in greatest dimension, its moisture content is controlled such that it can be placed in stable lifts and is placed and compacted as recommended herein.

The contract documents should include the requirement for the contractor to submit methods for acceptance by the engineer for on-site soil reuse during these difficult weather times (if proposed). Such measures could include: covering stockpiles to mitigate water intrusion, blending on-site soil with off-site gravel, using alternating layers of off-site Structural Fill and existing on-site granular fill, for example. The contractor's submittal should include demonstrated experience on other projects having similar soil conditions.

5. Fill Materials and Placement

Recommended gradations for off-site fill materials are provided in **Table 3**. Structural Fill should consist of off-site Granular Fill, Sand-Gravel, or Crushed Stone. Use of ¾-inch Crushed Stone, in lieu of soil fill, at the bottom of excavations will aid in dewatering operations. Crushed Stone greater than 4 inches in thickness should be wrapped in non-woven filter fabric (Mirafi 140N or equivalent).

Place Structural Fill in lifts and compact in accordance with the guidelines presented in **Table 4**, while meeting the recommended minimum degrees of compaction presented below. A qualified geotechnical engineer should be on site during fill placement and compaction, particularly where higher silt content on-site soils are encountered, such as glacial till, because of the sensitivity of these soils to moisture and disturbance due to construction and worker foot traffic.

The recommended minimum degree of compaction of soils, based on percentage of maximum dry density as defined by ASTM D-1557, is specified below for different areas.

Fill Area	Percent of Maximum Dry Density
Within Building Areas and Below Foundations and Slabs	95
Behind Retaining Walls	95
Pavement Base Course	95
Utility Trench Backfill	95
Below Pavement Base Course	92
Beneath Landscape Areas	90

Crushed Stone should be placed in lifts, with each lift compacted to an unyielding surface. Recommended maximum loose lift thickness and minimum number of passes of compaction equipment for structural fill materials are provided in **Table 3**.

Compaction within 5 feet of building walls and retaining walls should be performed using a hand-operated vibratory roller or plate compactor. Backfill and compact all fills at approximately similar elevations on each side of foundation walls to avoid unbalanced loading. Concrete footings and slabs, as well as footing and slab subgrades should be protected from frost at all times. Fill should not be placed over frozen soil.

6. Construction Dewatering

Groundwater measurements and observations in the previous and current explorations, generally indicated groundwater depths ranging from 6 to more than 15 feet bgs along the eastern portion of the site (Buildings 1 and 2) and 3 to 11 feet bgs along the western portion of the site (Building 3 and parking structure). Based on GZA's observations within excavations at the site and nearby sites within the former Devens Army base, groundwater tends to perch above the top of the glacial till stratum following rain events and could therefore be encountered within the top 4 feet of existing grade during construction.

Thus, construction dewatering will likely be required to conduct all below-grade construction work "in the dry". It is recommended that an interceptor trench (wrapped in filter fabric and filled with Crushed Stone) be excavated along the east side of the proposed buildings to the bottom of the deeper excavations prior to construction to help divert

groundwater away from the excavation. This is especially beneficial if excavations are performed in wet seasons. In addition, constructing small temporary earth berms and grading to allow drainage away from the excavation are recommended to control surface water runoff. We anticipate groundwater and storm water can be controlled by pumping from sump pumps. Sump pumps should be surrounded by ¾-inch Crushed Stone wrapped in filter fabric to limit migration of fines.

The site contractor should be responsible for designing and selecting construction dewatering methods based on his proposed methods and equipment used for excavation. Dewatering efforts must satisfy requirements of local, state and federal environmental and conservation authorities. Permits will be required if discharge is directed to public or site storm drains and utilities.

7. Excavation Slopes and Shoring

Where sufficient space is not available to safely lay back excavations in accordance with OSHA regulations, a temporary earth support system will be required to support the excavation and maintain existing structures and utilities that are adjacent to proposed excavations.

Temporary earth support systems, if required, should be selected by the site Contractor and designed by an experienced Professional Engineer registered in the Commonwealth of Massachusetts, and retained by the Contractor.

The Owner and the Contractor should make themselves aware of and become familiar with applicable local, state, and federal safety regulations, including the current Occupational Safety and Health Administration (OSHA) Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing this information solely as a service to our client. Under no circumstances should the information provided below be interpreted to mean that GZA is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

The Contractor should be aware that slope height, slope inclination, or excavation depths (including utility trench excavations) should in no case exceed those specified in local, state, or federal safety regulations, e.g., OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations; such regulations are strictly enforced and, if they are not followed, the Owner, Contractor, and/or earthwork and utility subcontractors could be liable for substantial penalties.

If any excavation, including a utility trench, is extended to a depth of more than 20 feet, it will be necessary to have the side slopes designed and stamped by a professional engineer registered in the Commonwealth of Massachusetts, and retained by the Contractor.

As a safety measure, it is recommended that all vehicles and soil piles be kept a lateral distance away from the top edge of the excavation at least equal to the slope height. Also, the exposed slope face of open-cut excavations should be protected against the elements.

FINAL DESIGN AND CONSTRUCTION

We trust that the information presented herein addresses your current needs related to the geotechnical aspects of design and construction of the proposed biotechnical manufacturing/industrial development at this site.

Should the project advance and structure locations, finish floor elevations, and site grading become more defined or change (particularly of Building Nos. 2 and 3 and the Parking Structure), we recommend GZA be retained to update this supplemental geotechnical report as appropriate to reflect final structural and civil site design conditions, and to prepare technical specifications and review near-final plans as they relate to the geotechnical aspects of the project.

Due to the former structures on site, and given the amount of disturbance that the on-site soils may have been subjected to, we recommend that you retain GZA during foundation and site earthwork construction to observe subgrade conditions for consistency with our recommendations. It should also be noted that the Massachusetts State Building Code requires all foundation subgrades to be observed by a registered Professional Engineer or his/her representative. GZA's familiarity with the site and performing these services at nearby Devens sites will allow us to share lessons learned and help avoid unnecessary construction delays that may be related to earthwork and foundation construction.

We appreciate the opportunity to work with you on this design phase of the project. GZA looks forward to providing to our continued involvement. Please call Martin Rodick at 781-278-5790 or Michael Ostrowski at 781-278-5877 with any questions.

Very truly yours,
GZA GEOENVIRONMENTAL, INC.

Michael Ostrowski
Assistant Project Manager

Terese Kwiatkowski, P.E.
Consultant Reviewer

Martin Rodick, P.E.
Associate Principal

Attachments: Tables
Figures
Appendix A – Limitations
Appendix B – Relevant Previous Exploration Logs
- Appendix B.1 – 2008 Boring and Test Pit Logs
- Appendix B.2 – 2012 Boring Logs
- Appendix B.3 – 2019 Boring and Test Pit Logs

Appendix C – 2020 Test Boring Logs
Appendix D – Falling Head Borehole and Single-Ring Infiltrometer Permeability Test Results
- Appendix D.1 – 2008 Permeability Test Results
- Appendix D.2 – 2019 Permeability Test Results
- Appendix D.3 – 2020 Permeability Test Results

Appendix E – Geotechnical Laboratory Test Results
- Appendix E.1 – 2008 Geotechnical Laboratory Results
- Appendix E.2 – 2012 Geotechnical Laboratory Results
- Appendix E.3 – 2019 Geotechnical Laboratory Results
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Appendix F – Topsoil Laboratory Test Results

Tables

TABLE 1
SUMMARY OF SUBSURFACE EXPLORATIONS
EASTERN PORTION OF SITE

				DEPTH TO / ELEVATION OF FEATURE OR TOP OF STRATUM (FT)[2,3]										
Nearest Proposed Structure ID	Exploration ID	Exploration Type	Year Performed	Ground Surface	Bottom of Exploration	Refusal (Drilling, Sampler, or Excavation)	Topsoil Forest Mat/Subsoil	Fill[4]	Natural Granular Deposits[5]	Glacial Till	Weathered Bedrock	Bedrock	Ground-water Reading[5]	Notes
BUILDING NO. 1	B-5	boring	2012	0 / 344	12.8 / 331.2	12.8 / 331.2	0 / 344	- / -	0.25 / 343.75	8 / 336	12.3 / 331.7	12.8 / 331.2	- / -	ss and auger refusal at bottom of boring
	B-9	boring	2012	0 / 338	14 / 324	14 / 324	0 / 338	- / -	0.75 / 337.25	- / -	13 / 325	14 / 324	12.3 / 325.7	ss and auger refusal at bottom of boring, monitoring well installed
	B-10	boring	2012	0 / 341	11.6 / 329.4	11.6 / 329.4	0 / 341	- / -	0.25 / 340.75	- / -	11 / 330	11.6 / 329.4	- / -	ss and auger refusal at bottom of boring
	B-11	boring	2012	0 / 342	14.7 / 327.3	14.7 / 327.3	0 / 342	- / -	0.25 / 341.75	- / -	14 / 328	14.7 / 327.3	- / -	ss and auger refusal at bottom of boring
	B-12	boring	2012	0 / 342	13 / 329	13 / 329	0 / 342	- / -	0.75 / 341.25	8.25 / 333.75	12.5 / 329.5	13 / 329	- / -	ss and auger refusal at bottom of boring
	B-13	boring	2012	0 / 341	15.1 / 325.9	15.1 / 325.9	0 / 341	- / -	0.25 / 340.75	8 / 333	15 / 326	15.1 / 325.9	- / -	ss and auger refusal at bottom of boring
	B-14	boring	2012	0 / 337	10.5 / 326.5	10.5 / 326.5	0 / 337	- / -	0.25 / 336.75	8 / 329	9.75 / 327.25	10.5 / 326.5	- / -	ss and auger refusal at bottom of boring
	GZ-101	boring	2008	0 / 335	13.8 / 321.2	13.8 / 321.2	0 / 335	- / -	3 / 332	7 / 328	- / -	- / -	- / -	ss and rollerbit refusal at bottom of boring
	GZ-103	boring	2008	0 / 341	14 / 327	14 / 327	0 / 341	- / -	0.5 / 340.5	7 / 334	13 / 328	14 / 327	8 / 333	ss refusal at 13.3 ft; auger refusal at 14 ft
	GZ-106	boring	2008	0 / 342	15 / 327	15 / 327	0 / 342	- / -	0.4 / 341.6	7 / 335	13 / 329	15 / 327	8 / 334	ss refusal at 13.2 ft; auger refusal at 15 ft
	GZ-201	boring	2019	0 / 338.5	12 / 326.5	- / -	0 / 338.5	- / -	2.2 / 336.3	6.8 / 331.7	- / -	- / -	9 / 329.5	Gravel/Cobbles from 6.5 to 7.5 ft
	GZ-302	boring	2020	0 / 341	17.5 / 323.5	17.5 / 323.5	0 / 341	- / -	2.3 / 338.7	7.5 / 333.5	- / -	- / -	- / -	SS refusal at 15.1 ft, auger refusal at 17.5 ft
	GZ-303	boring	2020	0 / 338	15 / 323	15 / 323	0 / 338	- / -	0.4 / 337.6	11.3 / 326.7	- / -	- / -	>15 / <323	SS and auger refusal at 15 ft. See note #5.
	TP-107	test pit	2008	0 / 342	10.5 / 331.5	10.5 / 331.5	0 / 342	- / -	0.3 / 341.7	8.5 / 333.5	- / -	10.5 / 331.5	- / -	excavator refusal at bottom of test pit
	TP-108	test pit	2008	0 / 342	11 / 331	11 / 331	0 / 342	0.3 / 341.7	6 / 336	9 / 333	- / -	11 / 331	9 / 333	excavator refusal at bottom of test pit; encountered buried footing/pier from 3 to 6 ft
	TP-109	test pit	2008	0 / 340	13.5 / 326.5	- / -	0 / 340	- / -	0.3 / 339.7	11.5 / 328.5	- / -	- / -	11.5 / 328.5	-
	TP-111	test pit	2008	0 / 342	9 / 333	- / -	0 / 342	1.5 / 340.5	5 / 337	- / -	- / -	- / -	- / -	encountered two buried footings from 3 to 5 ft
	TP-112	test pit	2008	0 / 342	6 / 336	- / -	0 / 342	- / -	1.7 / 340.3	- / -	- / -	- / -	- / -	-
	TP-115	test pit	2008	0 / 334	11.5 / 322.5	11.5 / 322.5	- / -	0 / 334	4.5 / 329.5	11 / 323	- / -	11.5 / 322.5	11 / 323	fill thickness includes 0.5 ft topsoil, 0.7 ft buried topsoil & 1.3 ft buried subsoil; excavator refusal at bottom of test pit
	TP-116	test pit	2008	0 / 329	8.5 / 320.5	- / -	- / -	0 / 329	8 / 321	- / -	- / -	- / -	- / -	fill thickness includes 0.2 ft asphalt, 0.5 ft buried topsoil & 1 ft buried subsoil. C.I. pipe at 8 ft
	TP-135	test pit	2008	0 / 341	16 / 325	16 / 325	0 / 341	- / -	2.5 / 338.5	9.5 / 331.5	- / -	16 / 325	9.5 / 331.5	excavator refusal at bottom of test pit
	TP-136	test pit	2008	0 / 326	7.5 / 318.5	7.5 / 318.5	0 / 326	0.5 / 325.5	3.5 / 322.5	6.5 / 319.5	- / -	7.5 / 318.5	6.5 / 319.5	excavator refusal; encountered buried concrete footing from 2 to 5 ft; Fill thickness includes 0.3 ft buried topsoil and 0.7 ft buried subsoil
	TP-209	test pit	2019	0 / 328	11 / 317	5 / 323	0 / 328	1 / 327	2 / 326	5 / 323	- / -	5 / 323	- / -	Buried fill layer from 1 to 2 ft depth. Excavator refusal on sloped bedrock
	TP-307	test pit	2020	0 / 324.5	11 / 313.5	11 / 313.5	0 / 324.5	- / -	2.3 / 322.2	4.2 / 320.3	- / -	11 / 313.5	- / -	Excavator refusal on apparent bedrock at bottom of test pit. K test at 7.1 ft
	TP-308	test pit	2020	0 / 330	10 / 320	- / -	0 / 330	- / -	2.2 / 327.8	5.7 / 324.3	- / -	- / -	- / -	-
BUILDING NO. 2	B-1	boring	2012	0 / 343	16.75 / 326.25	16.75 / 326.25	0 / 343	- / -	0.25 / 342.75	8 / 335	- / -	- / -	- / -	ss and auger refusal at bottom of boring
	B-2	boring	2012	0 / 343	14.5 / 328.5	14.5 / 328.5	0 / 343	- / -	0.5 / 342.5	6 / 337	13 / 330	14.5 / 328.5	- / -	ss and auger refusal at bottom of boring
	B-3	boring	2012	0 / 343	9.1 / 333.9	9.1 / 333.9	0 / 343	- / -	0.5 / 342.5	8 / 335	8.5 / 334.5	9.1 / 333.9	- / -	ss and auger refusal at bottom of boring
	B-4	boring	2012	0 / 344	8.75 / 335.25	8.75 / 335.25	0 / 344	0.5 / 343.5	- / -	- / -	8.25 / 335.75	8.75 / 335.25	- / -	ss and auger refusal at bottom of boring, monitoring well installed
	B-6	boring	2012	0 / 343.5	10.5 / 333	10.5 / 333	0 / 343.5	- / -	0.25 / 343.25	- / -	9.5 / 334	10.5 / 333	- / -	ss and auger refusal at bottom of boring
	B-7	boring	2012	0 / 343	13.7 / 329.3	13.7 / 329.3	0 / 343	- / -	0.5 / 342.5	8 / 335	13 / 330	13.7 / 329.3	- / -	ss and auger refusal at bottom of boring
	B-8	boring	2012	0 / 341.5	13 / 328.5	13 / 328.5	0 / 341.5	- / -	0.25 / 341.25	- / -	- / -	- / -	- / -	ss and auger refusal at bottom of boring
	GZ-104	boring	2008	0 / 328	14 / 314	14 / 314	0 / 328	0.2 / 327.8	3 / 325	- / -	- / -	12 / 316	- / -	Asphalt pavement at top 0.2 ft; casing ref. at 8 ft; roller bit ref. at 14 ft
	GZ-105	boring	2008	0 / 340	14.2 / 325.8	14.2 / 325.8	0 / 340	- / -	3 / 337	12 / 328	- / -	- / -	8 / 332	ss refusal at 14.2 ft at bottom of boring
	GZ-107	boring	2008	0 / 343	13 / 330	13 / 330	0 / 343	0.3 / 342.7	3 / 340	- / -	12.5 / 330.5	13 / 330	- / -	ss and rollerbit refusal at bottom of boring
	GZ-108	boring	2008	0 / 329	15 / 314	- / -	0 / 329	- / -	3 / 326	14 / 315	- / -	- / -	8 / 321	-
	GZ-109	boring	2008	0 / 340	15 / 325	- / -	- / -	0 / 340	3 / 337	13.5 / 326.5	- / -	- / -	14 / 326	-
	GZ-110	boring	2008	0 / 341	19 / 322	13 / 328	0 / 341	0.4 / 340.6	3 / 338	9 / 332	- / -	13 / 328	- / -	top of bedrock at 13 ft+/-; cored rock 14-19 ft; k test below gw level
	GZ-111	boring	2008	0 / 343	13.1 / 329.9	13.1 / 329.9	0 / 343	- / -	0.2 / 342.8	3 / 340	- / -	- / -	8 / 335	ss refusal at bottom of boring
	GZ-301	boring	2020	0 / 341.5	15 / 326.5	15 / 326.5	- / -	0 / 341.5	4 / 337.5	- / -	7.5 / 334	- / -	9.2 / 332.3	Buried asphalt layer: 0.2 to 0.4 ft depth. SS refusal at 14.3 ft, auger refusal at 15 ft
	TP-101	test pit	2008	0 / 343	8.5 / 334.5	8.5 / 334.5	0 / 343	0.5 / 342.5	2 / 341	7 / 336	- / -	8.5 / 334.5	7 / 336	excavator refusal at bottom of test pit
	TP-102	test pit	2008	0 / 342	12 / 330	12 / 330	0 / 342	0.5 / 341.5	6 / 336	6.5 / 335.5	11.5 / 330.5	12 / 330	6.5 / 335.5	excavator refusal at bottom of test pit
	TP-103	test pit	2008	0 / 342	13 / 329	- / -	0 / 342	0.5 / 341.5	- / -	5 / 337	- / -	- / -	8 / 334	observed concrete wall from 2.5 to 5.5 ft
	TP-104	test pit	2008	0 / 342	13.5 / 328.5	- / -	0 / 342	0.5 / 341.5	- / -	11 / 331	- / -	- / -	11 / 331	encountered buried footing/pier from 1 to 3 ft and C.I. pipe at 5.5 ft
	TP-105	test pit	2008	0 / 342	11.5 / 330.5	- / -	0 / 342	0.5 / 341.5	- / -	9 / 333	- / -	- / -	9 / 333	encountered C.I. pipe at 3.5 ft and buried footing from 3 to 6 ft
	TP-106	test pit	2008	0 / 343	11.5 / 331.5	- / -	- / -	- / -	0.5 / 342.5	8 / 335	- / -	- / -	8 / 335	-
	TP-110	test pit	2008	0 / 342	5 / 337	- / -	0 / 342	- / -	2 / 340	- / -	- / -	- / -	- / -	-
	TP-113	test pit	2008	0 / 342	6 / 336	- / -	0 / 342	- / -	0.3 / 341.7	- / -	- / -	- / -	- / -	-
	TP-114	test pit	2008	0 / 342	5.5 / 336.5	- / -	0 / 342	0.5 / 341.5	5.5 / 336.5	- / -	- / -	- / -	- / -	encountered buried footing from 3 to 5.5 ft
	TP-117	test pit	2008	0 / 336	8 / 328	- / -	0 / 336	0.5 / 335.5	5.5 / 330.5	- / -	- / -	- / -	- / -	encountered buried concrete wall from 2.5 to 5.5 ft
	TP-118	test pit	2008	0 / 330	12.5 / 317.5	12.5 / 317.5	- / -	0 / 330	1.8 / 328.2	9.5 / 320.5	- / -	12.5 / 317.5	9.5 / 320.5	Fill thickness includes 2-inch asphalt pavement, 0.5 ft topsoil and 0.9 ft subsoil. Excavator
	TP-119	test pit	2008	0 / 340	12.5 / 327.5	12.5 / 327.5	- / -	0 / 340	2 / 338	10 / 330	- / -	12.5 / 327.5	- / -	excavator refusal at bottom of test pit
	TP-137	test pit	2008	0 / 336	15 / 321	15 / 321	0 / 336	- / -	2.5 / 333.5	12.5 / 323.5	- / -	15 / 321	12.5 / 323.5	excavator refusal at bottom of test pit
	TP-201	test pit	2019	0 / 343.5	5 / 338.5	- / -	- / -	0 / 343.5	- / -	- / -	- / -	- / -	- / -	D.I. pipe from 4 to 5 ft±
	TP-201A	test pit	2019	0 / 343.5	10 / 333.5	- / -	- / -	0 / 343.5	- / -	6.5 / 337	- / -	- / -	10 / 333.5	Large pieces of wood and a concrete structure from 1 to 2 ft, k test at 8.5 ft
	TP-202	test pit	2019	0 / 337.5	12 / 325.5	- / -	- / -	0 / 337.5	2.5 / 335	8.5 / 329	- / -	- / -	- / -	k test at 6.5 ft
	TP-301	test pit	2020	0 / 338	10 / 328	- / -	0 / 338	0.8 / 337.2	4.3 / 333.7	- / -	- / -	- / -	- / -	-
	TP-302	test pit	2020	0 / 332	11.5 / 320.5	- / -	- / -	0 / 332	4 / 328	9.5 / 322.5	- / -	- / -	- / -	-
	TP-309	test pit	2020	0 / 340.5	11 / 329.5	11 / 329.5	0 / 340.5	- / -	1 / 339.5	9.6 / 330.9	10.5 / 330	11 / 329.5	- / -	Excavator refusal on apparent bedrock at bottom of test pit

Notes:

1) Definitions/Acronyms/shorthand: "-" = Not observed or noted, ft = depth measurement in feet, ref. = refusal, ss = splitspoon sampler, gw = groundwater, k test = in-situ hydraulic permeability test performed within exploration, C.I. = cast iron, D.I. = ductile iron.

2) Refer to the exploration logs and text of the report for more detail, including how the ground surface elevation of an exploration was estimated. Depths are relative to existing ground surface level at the time the exploration was performed. The ground surface elevation estimate should only be considered accurate to the degree implied by the method used. Elevations are in feet and are referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).

3) The subsurface information from the relevant previous explorations from 2008, and 2012 (including ground surface elevation estimations) are included in the subsurface condition summaries below, are not altered from their original form, and information regarding subsequent changes in site conditions/grading are not known and were generally not available for this study.

4) Included within the fill layer: a 2-inch-thick surficial layer of bituminous asphalt pavement in test pit TP-118, a 2-inch-thick surficial layer of bituminous asphalt pavement in boring GZ-104, a 0.2-foot-thick buried asphalt layer at GZ-301, and buried topsoil/subsoil layer(s) observed at three test pits (TP-115, TP-116, and TP-136).

5) Groundwater observation wells were installed in 2020 borings GZ-301 and GZ-303. Groundwater level readings at the year 2020 observation wells were obtained over the course of an approximately 1.5-month-long stabilization period. The observation well at GZ-301 consistently indicated the presence of groundwater as indicated above. Observation well GZ-303 indicated water at 11.4 feet below existing ground surface after 1 day of stabilization but appeared dry for three consecutive readings thereafter and the initial water reading therefore does not appear to have been groundwater. It should be noted that fluctuations in groundwater levels may occur due to variations in season, rainfall, site features and other factors different from those existing at the time of the explorations and measurements. Also, we note that the rotary action of the drilling tools within the natural sand/silt and glacial till soils may have obscured observations of groundwater within some of the boreholes during drilling.

TABLE 2
SUMMARY OF SUBSURFACE EXPLORATIONS
WESTERN PORTION OF SITE

Nearest Proposed Structure ID	Exploration ID	Exploration Type	Year Performed	DEPTH TO / ELEVATION OF FEATURE OR TOP OF STRATUM (FT)[2,3] Ground Surface	Bottom of Exploration	Refusal (Drilling, Sampler, or Excavation)	Topsoil /Subsoil	Fill[4]	Natural Granular Deposits	Glacial Till	Weathered Bedrock	Bedrock	Ground-water Reading[4]	Notes
BUILDING NO. 3	GZ-100	boring	2008	0 / 324	14.8 / 309.2	14.8 / 309.2	0 / 324	- / -	0.5 / 323.5	9.5 / 314.5	14.5 / 309.5	14.8 / 309.2	5 / 319	ss and auger refusal at bottom of boring
	GZ-113	boring	2008	0 / 306	13.1 / 292.9	13.1 / 292.9	0 / 306	- / -	0.5 / 305.5	5.5 / 300.5	- / -	- / -	- / -	ss and roller bit refusal at bottom of boring
	GZ-113A	boring	2008	0 / 306	3 / 303	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	No soil samples obtained; k test from 2 to 3 ft
	GZ-114	boring	2008	0 / 310	11.5 / 298.5	11.5 / 298.5	- / -	0 / 310	1 / 309	3 / 307	9 / 301	11.5 / 298.5	4 / 306	auger refusal at bottom of boring
	GZ-116	boring	2008	0 / 307	11.5 / 295.5	11.5 / 295.5	0 / 307	- / -	0.5 / 306.5	3 / 304	9 / 298	11.5 / 295.5	3 / 304	ss refusal at 9.1 ft, auger refusal at 11.5 ft
	GZ-117	boring	2008	0 / 313	21 / 292	14.6 / 298.4	0 / 313	- / -	2 / 311	6 / 307	14.5 / 298.5	16 / 297	- / -	top of rock at 14.5 ft; cored rock 16 to 21 ft
	GZ-119	boring	2008	0 / 309	10.3 / 298.7	10.3 / 298.7	0 / 309	- / -	3 / 306	- / -	7.7 / 301.3	10.3 / 298.7	- / -	k test 6 to 8 ft; bit grinding from 7.7 ft; ss and rollerbit refusal at 10.3 ft
	GZ-119A	boring	2008	0 / 309	3 / 306	- / -	- / -	- / -	0 / 309	- / -	- / -	- / -	- / -	boring moved 8 ft south; k test attempted at 2 to 3 ft
	GZ-202	boring	2019	0 / 322	12 / 310	- / -	0 / 322	- / -	1 / 321	5 / 317	- / -	- / -	- / -	-
	GZ-203	boring	2019	0 / 317	12 / 305	- / -	0 / 317	- / -	2 / 315	6.5 / 310.5	- / -	- / -	- / -	-
	GZ-204	boring	2019	0 / 315	12 / 303	- / -	0 / 315	- / -	2 / 313	6 / 309	- / -	- / -	- / -	-
	GZ-205	boring	2019	0 / 313	14 / 299	14 / 299	0 / 313	- / -	2 / 311	9 / 304	11.2 / 301.8	14 / 299	- / -	ss refusal at 11.2 ft, auger refusal at bottom of boring
	GZ-304	boring	2020	0 / 324	16 / 308	10.8 / 313.2	0 / 324	0.5 / 323.5	2 / 322	8.5 / 315.5	- / -	10.8 / 313.2	- / -	Asphalt/fill from 0.5 to 2 ft. SS refusal at 10.8 ft, bedrock cored 11 to 16 ft
	GZ-305	boring	2020	0 / 311	16.5 / 294.5	16.5 / 294.5	0 / 311	- / -	0.5 / 310.5	4.3 / 306.7	8 / 303	- / -	- / -	Auger refusal at 16.5 ft
	GZ-306	boring	2020	0 / 312.5	14.5 / 298	14.5 / 298	0 / 312.5	- / -	2 / 310.5	7.5 / 305	12.5 / 300	- / -	- / -	SS refusal at 14.3 ft, auger refusal at 14.5 ft at original and offset boring
	TP-120	test pit	2008	0 / 314	10 / 304	10 / 304	0 / 314	- / -	2.5 / 311.5	7 / 307	- / -	10 / 304	7 / 307	excavator refusal at bottom of test pit
	TP-121	test pit	2008	0 / 311	9 / 302	9 / 302	0 / 311	- / -	2 / 309	6 / 305	- / -	9 / 302	- / -	excavator refusal at bottom of test pit
	TP-122	test pit	2008	0 / 307	8 / 299	8 / 299	0 / 307	- / -	1.5 / 305.5	6.5 / 300.5	- / -	8 / 299	6.5 / 300.5	excavator refusal at bottom of test pit
	TP-125	test pit	2008	0 / 311	10 / 301	10 / 301	0 / 311	- / -	2.5 / 308.5	5.5 / 305.5	- / -	10 / 301	9 / 302	excavator refusal at bottom of test pit
	TP-128	test pit	2008	0 / 308	10 / 298	10 / 298	0 / 308	- / -	2.5 / 305.5	7 / 301	- / -	10 / 298	7 / 301	excavator refusal at bottom of test pit
	TP-129	test pit	2008	0 / 315	11 / 304	11 / 304	0 / 315	- / -	2 / 313	7.5 / 307.5	- / -	11 / 304	7.5 / 307.5	excavator refusal at bottom of test pit
	TP-130	test pit	2008	0 / 314	13.5 / 300.5	13.5 / 300.5	0 / 314	- / -	2.5 / 311.5	7 / 307	- / -	13.5 / 300.5	6 / 308	excavator refusal at bottom of test pit
	TP-131	test pit	2008	0 / 310	8.5 / 301.5	- / -	0 / 310	- / -	2 / 308	4.5 / 305.5	- / -	- / -	4.5 / 305.5	-
	TP-132	test pit	2008	0 / 310	7 / 303	- / -	0 / 310	- / -	2.5 / 307.5	6 / 304	- / -	- / -	6 / 304	rapid inflow of groundwater at 6 ft
	TP-133	test pit	2008	0 / 306	8.5 / 297.5	8.5 / 297.5	0 / 306	- / -	3 / 303	6 / 300	- / -	8.5 / 297.5	6 / 300	excavator refusal at bottom of test pit
	TP-134	test pit	2008	0 / 306	9 / 297	- / -	0 / 306	- / -	2.5 / 303.5	5.5 / 300.5	- / -	- / -	- / -	-
	TP-203	test pit	2019	0 / 324	10 / 314	- / -	0 / 324	- / -	2 / 322	9.8 / 314.2	- / -	- / -	9 / 315	-
	TP-204	test pit	2019	0 / 317.5	10 / 307.5	- / -	0 / 317.5	- / -	2 / 315.5	9 / 308.5	- / -	- / -	8.7 / 308.8	-
	TP-205	test pit	2019	0 / 307	9 / 298	9 / 298	0 / 307	- / -	2 / 305	6.5 / 300.5	8.5 / 298.5	9 / 298	- / -	excavator refusal at bottom of test pit
	TP-208	test pit	2019	0 / 319	10 / 309	10 / 309	0 / 319	- / -	2 / 317	6 / 313	9.5 / 309.5	10 / 309	- / -	excavator refusal at bottom of test pit
	TP-303	test pit	2020	0 / 315.5	8.8 / 306.7	8.8 / 306.7	0 / 315.5	- / -	1 / 314.5	5.8 / 309.7	- / -	8.8 / 306.7	- / -	Excavator refusal on apparent bedrock at bottom of test pit
	TP-304	test pit	2020	0 / 322	11 / 311	11 / 311	- / -	0 / 322	6 / 316	9 / 313	10.5 / 311.5	11 / 311	- / -	Fill includes Buried Topsoil from 5.5 to 6 ft depth. Excavator refusal on apparent bedrock at bottom of test pit
PARKING STRUCTURE	GZ-112	boring	2008	0 / 306	7.5 / 298.5	7.5 / 298.5	0 / 306	- / -	3 / 303	4.5 / 301.5	- / -	- / -	4 / 302	ss and auger refusal at bottom of boring
	GZ-115	boring	2008	0 / 302	12 / 290	12 / 290	0 / 302	- / -	2 / 300	4.5 / 297.5	8 / 294	12 / 290	- / -	ss refusal at 8.2 ft; roller bit refusal at 12 ft
	GZ-118	boring	2008	0 / 303	15 / 288	15 / 288	0 / 303	- / -	- / -	3 / 300	10 / 293	15 / 288	4 / 299	ss refusal at 13 ft; auger refusal at 15 ft
	GZ-206	boring	2019	0 / 298	7 / 291	7 / 291	0 / 298	- / -	- / -	2 / 296	6.7 / 291.3	7 / 291	- / -	auger refusal at bottom of boring, bedrock outcrop observed ~10 ft to the east
	GZ-307	boring	2020	0 / 299	19 / 280	19 / 280	0 / 299	- / -	0.5 / 298.5	4 / 295	- / -	- / -	18.7 / 280.3	SS refusal at 19 ft
	TP-123	test pit	2008	0 / 303	7.5 / 295.5	7.5 / 295.5	0 / 303	- / -	2 / 301	5 / 298	- / -	7.5 / 295.5	5 / 298	excavator refusal at bottom of test pit
	TP-124	test pit	2008	0 / 299	11.5 / 287.5	- / -	0 / 299	- / -	2 / 297	5.5 / 293.5	- / -	- / -	- / -	-
	TP-126	test pit	2008	0 / 300	8.5 / 291.5	8.5 / 291.5	0 / 300	- / -	1 / 299	5 / 295	- / -	8.5 / 291.5	- / -	excavator refusal at bottom of test pit
	TP-127	test pit	2008	0 / 301	10.5 / 290.5	10.5 / 290.5	0 / 301	- / -	2 / 299	5.5 / 295.5	- / -	10.5 / 290.5	- / -	excavator refusal at bottom of test pit
	TP-206	test pit	2019	0 / 292	5.5 / 286.5	5.5 / 286.5	0 / 292	- / -	2 / 290	4 / 288	5 / 287	5.5 / 286.5	- / -	excavator refusal at bottom of test pit
	TP-207	test pit	2019	0 / 295	6 / 289	6 / 289	0 / 295	- / -	2 / 293	4 / 291	5.5 / 289.5	6 / 289	- / -	excavator refusal at bottom of test pit
	TP-305	test pit	2020	0 / 297.5	8.1 / 289.4	8.1 / 289.4	0 / 297.5	- / -	0.8 / 296.7	5.3 / 292.2	7.8 / 289.7	8.1 / 289.4	- / -	Excavator refusal on apparent bedrock at bottom of test pit
	TP-306	test pit	2020	0 / 305.5	8 / 297.5	8 / 297.5	0 / 305.5	- / -	2 / 303.5	6.5 / 299	7.7 / 297.8	8 / 297.5	- / -	Excavator refusal on apparent bedrock at bottom of test pit. K test at 7.3 ft

Notes:

1) Definitions/Acronyms/shorthand: "-" = Not observed or noted, ft = depth measurement in feet, ref. = refusal, ss = splitspoon sampler, k test = in-situ hydraulic permeability test performed within exploration.
2) Refer to the exploration logs and text of the report for more detail, including how the ground surface elevation of an exploration was estimated. Depths are relative to existing ground surface level at the time the exploration was performed. The ground surface elevation estimate should only be considered accurate to the degree implied by the method used. Elevations are in feet and are referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).
3) The subsurface information from the relevant previous explorations from 2008, and 2012 (including ground surface elevation estimations) are included in the subsurface condition summaries below, are not altered from their original form, and information regarding subsequent changes in site conditions/grading are not known and were generally not available for this study.
4) Included within the fill layer: a 6-inch-thick buried topsoil layer observed at test pit TP-304.
5) It should be noted that fluctuations in groundwater levels may occur due to variations in season, rainfall, site features and other factors different from those existing at the time of the explorations and measurements. Also, we note that the rotary action of the drilling tools within the natural silty granular and glacial till soils may have obscured observations of groundwater within some of the boreholes during drilling.

TABLE 3

RECOMMENDED USE AND GRADATION CRITERIA FOR FILL MATERIALS

Geotechnical Evaluation
Proposed Development
45 Jackson Road
Devens, Massachusetts

USE OF STRUCTURAL FILL MATERIAL

Granular Fill: Below building slab and pavement base course.

Sand-Gravel: Building slab and pavement base course and as backfill within three feet laterally of retaining walls.

Crushed Stone: For use in bottom of excavations to aid in construction dewatering, maintaining subgrade stability, and backfill behind walls in confined areas Crushed Stone shall be wrapped in non-woven geotextile fabric when placed in thicknesses greater than 4 inches.

GRADATION REQUIREMENTS

Sieve Size	Percent Finer by Weight
Granular Fill shall be free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. Structural Fill shall conform to the following gradation requirements:	
2/3 of the loose lift thickness	100
No. 10	30 - 95
No. 40	10 - 70
No. 200	0 - 15
Sand-Gravel shall consist of durable sand and gravel and shall be free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. Sand-Gravel shall conform to the following gradation requirements:	
3 inch	100
1/2 inch	50 - 85
No. 4	40 - 75
No. 40	10 - 35
No. 200	0 - 8
Crushed Stone shall consist of durable crushed rock or durable crushed gravel stone and shall be free from ice and snow, clay, loam and other deleterious material. Crushed Stone shall conform to the following gradation requirements:	
1 inch	100
3/4 inch	90 - 100
1/2 inch	10 - 50
3/8 inch	0 - 20
No. 4	0 - 5

TABLE 4

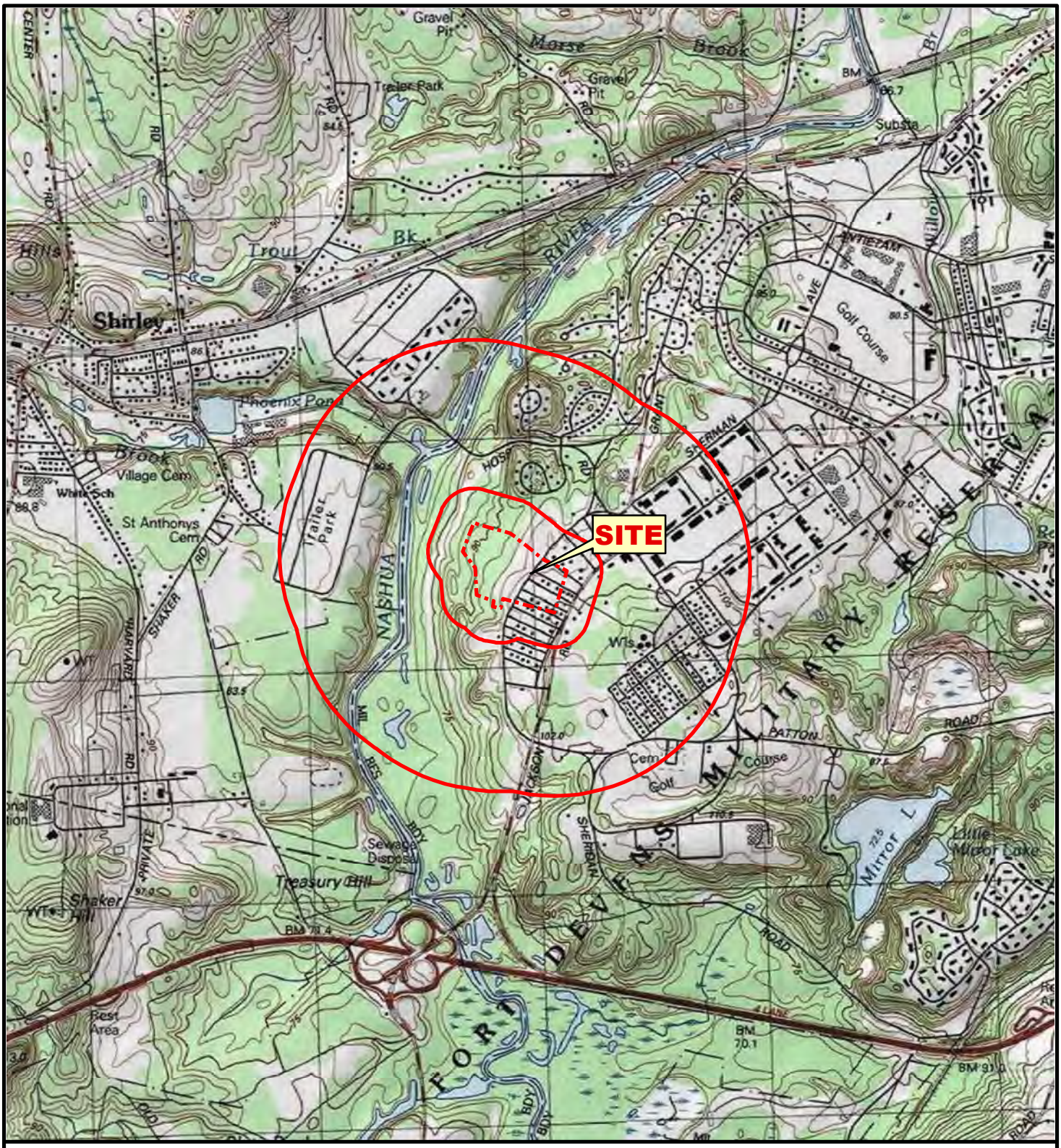
RECOMMENDED COMPACTION METHODS

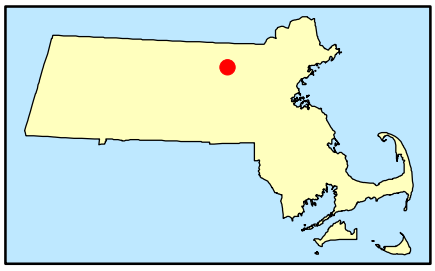
Geotechnical Evaluation
Proposed Development
45 Jackson Road
Devens, Massachusetts

Compaction Method	Maximum Stone Size*	Maximum Loose Lift Thickness		Minimum Number of Passes	
		Below Structures and Pavement	Less Critical Area	Below Structures and Pavement	Less Critical Area
GRANULAR FILL, SAND-GRAVEL, CRUSHED STONE**					
Hand-operated vibratory plate or light roller in confined areas	4"	6"	8"	4	4
Hand-operated vibratory drum rollers weighing at least 1,000# in confined areas	6"	10"	12"	4	4
Light vibratory drum roller minimum weight at drum: 3,000# minimum dynamic force: 10,000#	8"	12"	18"	4	4
Medium vibratory drum roller minimum weight at drum: 10,000# minimum dynamic force: 20,000#	8"	18"	24"	6	6

* And no more than two-thirds (2/3) loose lift thickness.
** Crushed Stone greater than 4 inches in thickness should be enveloped on all sides with non-woven filter fabric (Mirafi 140N or equivalent).

Figures





SOURCE : USGS TOPOGRAPHIC QUADRANGLES SCANNED BY THE NATIONAL GEOGRAPHIC SOCIETY & I-CUBED, COPYRIGHT 2011

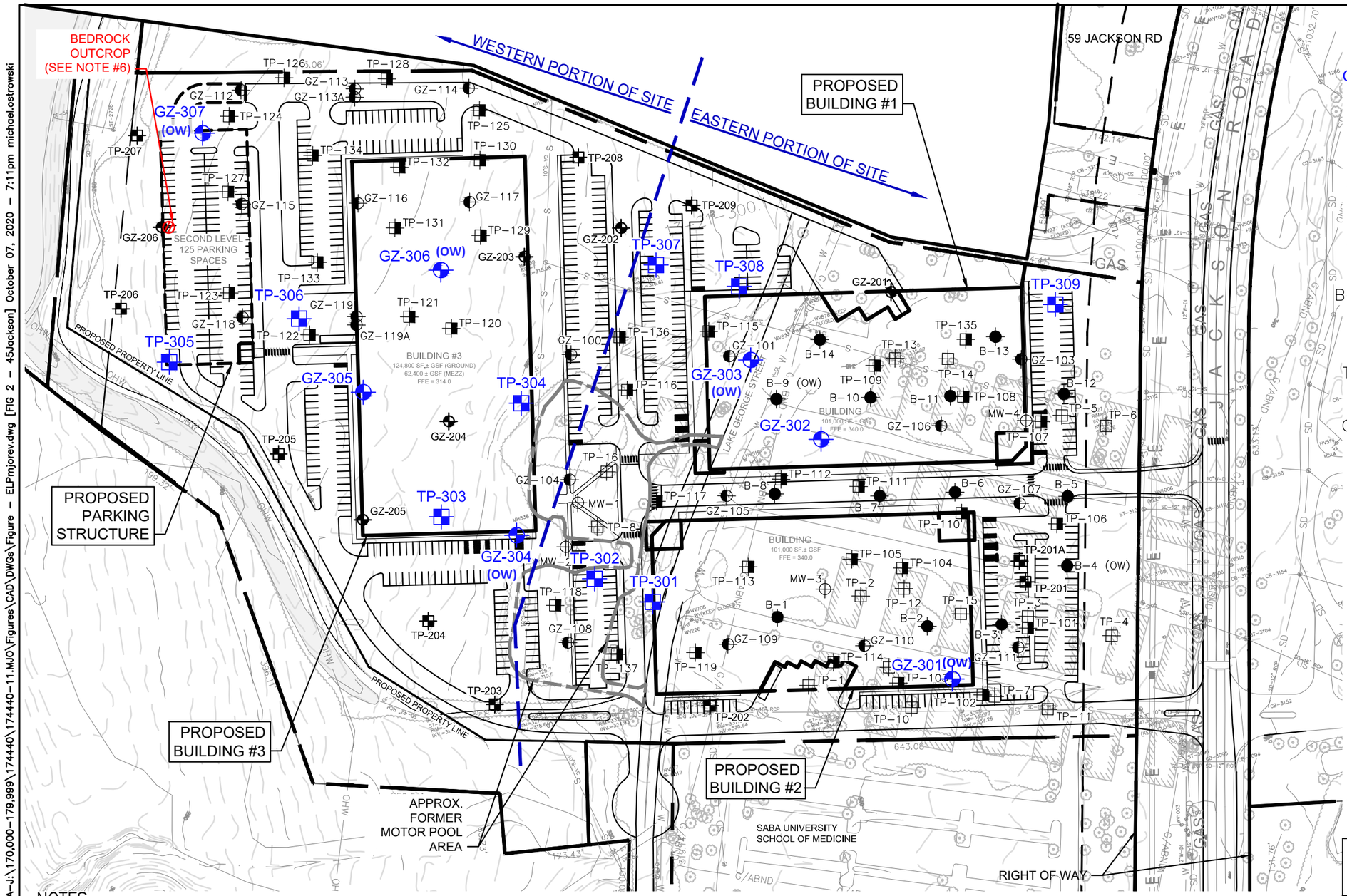
Data Supplied by : esri

0 1,000 2,000 4,000 6,000

SCALE IN FEET

N W E S

GZA	PROJ. MGR.: MJO DESIGNED BY: MJO REVIEWED BY: MAR OPERATOR: ADP DATE: 12-05-2019	LOCUS PLAN SHOWING 500 FOOT & 1/2 MILE BUFFERS	JOB NO. 01.0174440.01
		PROPOSED DEVELOPMENT 45 JACKSON RD DEVENS, MASSACHUSETTS	FIGURE NO. 1



LEGEND

- GZ-301 (OW) — INDICATES BORINGS PERFORMED BY DRILEX ENVIRONMENTAL OF AUBURN, MASSACHUSETTS FROM SEPTEMBER 10 TO 12, 2020 AND OBSERVED AND LOGGED BY GZA PERSONNEL. "(OW)" INDICATES MONITORING WELL INSTALLED IN BOREHOLE
- TP-301 — INDICATES TEST PITS PERFORMED BY DRILEX ENVIRONMENTAL OF AUBURN, MASSACHUSETTS ON SEPTEMBER 17, 18, AND 21, 2020 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- GZ-201 — INDICATES BORINGS PERFORMED BY DRILEX ENVIRONMENTAL OF AUBURN, MASSACHUSETTS ON NOVEMBER 5, 2019 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- TP-201 — INDICATES TEST PITS PERFORMED BY ANCHOR EXCAVATING CORPORATION OF HANOVER, MASSACHUSETTS ON NOVEMBER 14 AND 15, 2019 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- B-4(OW) — INDICATES BORINGS PERFORMED BY NEW HAMPSHIRE BORING, INC. OF DERRY, NEW HAMPSHIRE FROM JANUARY 12 THROUGH 16, 2012 AND OBSERVED AND LOGGED BY GZA PERSONNEL. "(OW)" INDICATES MONITORING WELL INSTALLED IN BOREHOLE.
- TP-101 — INDICATES TEST PITS PERFORMED BY CROWLEY COMPANY FROM JANUARY 7 THROUGH 10, 2008 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- GZ-101 — INDICATES BORINGS PERFORMED BY NEW HAMPSHIRE BORING OF BROCKTON, MASSACHUSETTS FROM JANUARY 15 THROUGH 23, 2008 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- TP-1 — INDICATES TEST PITS PERFORMED BY CROWLEY COMPANY ON JANUARY 15, 2008 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- MW-1 — INDICATES BORING/MONITORING WELL INSTALLED BY GEOSEARCH, INC, OF FITCHBURG, MASSACHUSETTS ON JANUARY 16 AND 17, 2008 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- INDICATES APPROXIMATE FORMER BARRACKS BUILDING LOCATION

NOTES

1. BASE MAP DEVELOPED FROM ELECTRONIC DRAWING FILE(S) PRODUCED BY HIGHPOINT ENGINEERING, INC. ENTITLED "MASTERPLAN_BASE.DWG" AND TRANSMITTED TO GZA ON OCTOBER 31, 2019. GZA DID NOT CONFIRM THE ACCURACY OF THE FEATURES SHOWN.
2. LOCATION OF PROPOSED BUILDINGS AND PARKING LOT FEATURES WERE DETERMINED BY ELECTRONIC FILE: "45 CONCEPT10A.DWG" PROVIDED BY HIGHPOINT ENGINEERING, INC., ENTITLED: "DEVENS BIOTECH CAMPUS – CONCEPT 10A", DATED: 11/26/2019.
3. LOCATION OF FORMER BARRACKS BUILDINGS WERE DETERMINED BY ELECTRONIC FILES PROVIDED BY S.J. MULLANEY ENGINEERING, INC. OF LEOMINSTER, MA, ENTITLED "CONCEPTUAL SITE PLAN OF LAND IN DEVENS, MASSACHUSETTS LOCATED AT LOT 16 – JACKSON ROAD, WITH A REVISION DATE OF JANUARY 8, 2008, AND A PLAN ENTITLED "SITE PLAN OF LAND IN DEVENS, MASSACHUSETTS LOCATED AT LOT 16A – JACKSON ROAD", PLAN NO. 80-D-5, DATED MARCH 6, 2008.
4. LOCATIONS OF THE 2020 EXPLORATIONS WERE APPROXIMATELY DETERMINED USING A TRIMBLE GEO7X GPS/GNSS DEVICE, HOWEVER TEST BORINGS GZ-302, GZ-305, AND GZ-306 WERE LOCATED USING TAPED MEASUREMENTS THE GPS-LOCATED STAKES. LOCATIONS OF THE 2019 EXPLORATIONS WERE APPROXIMATELY DETERMINED USING A TRIMBLE R1 HANDHELD WITH IPAD GPS/GNSS DEVICE. PREVIOUS EXPLORATIONS WERE LOCATED BASED ON LINE OF SIGHT AND FROM EXISTING TOPOGRAPHIC SITE FEATURES. THE EXPLORATION LOCATIONS SHOWN SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
5. PER MASSDEVELOPMENT THE ELEVATION DATUM IS REFERENCED TO NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29).
6. BEDROCK OUTCROP LOCATION APPROXIMATED BASED ON TAPED MEASUREMENT FROM BORING GZ-206 AND IS NOT DEPICTED TO SCALE.

SUPPLEMENTAL GEOTECHNICAL EVALUATION
PROPOSED DEVELOPMENT
45 JACKSON ROAD
DEVENS, MASSACHUSETTS

EXPLORATION LOCATION PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: KING DEVENS LLC	
PROJ MGR: MJO	REVIEWED BY: MAR	CHECKED BY: TMK	FIGURE NO. 2
DESIGNED BY: MJO	DRAWN BY: MJO / AJP	SCALE: AS SHOWN	
DATE: OCTOBER 2020	PROJECT NO. 01.0174440.01	REVISION NO. --	

Appendix A – Limitations

USE OF REPORT

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the contract documents, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

STANDARD OF CARE

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report,as appropriate, to reflect the unanticipated changed conditions .

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

SUBSURFACE CONDITIONS

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

7. Water level readings have been made in test holes (as described in this Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water table encountered in the course of the work may differ from that indicated in the Report.

8. GZA's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

9. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

COMPLIANCE WITH CODES AND REGULATIONS

10. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

COST ESTIMATES

11. Unless otherwise stated, our cost estimates are only for comparative and general planning purposes. These estimates may involve approximate quantity evaluations. Note that these quantity estimates are not intended to be sufficiently accurate to develop construction bids, or to predict the actual cost of work addressed in this Report. Further, since we have no control over either when the work will take place or the labor and material costs required to plan and execute the anticipated work, our cost estimates were made by relying on our experience, the experience of others, and other sources of readily available information. Actual costs may vary over time and could be significantly more, or less, than stated in the Report.

SCREENING AND ANALYTICAL TESTING

12. Our interpretation of field screening and laboratory data is presented in the Report. Unless otherwise noted, we relied upon the laboratory's QA/QC program to validate these data.

ADDITIONAL SERVICES

13. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

Appendix B – Relevant Previous Exploration Logs

BORING LOG GUIDE

BORING LOG LEGEND

GS Elev. = Ground Surface Elevation
NAVD = North American Vertical Datum
NR = No Recovery
S.S. = Split Spoon
Stab. = Stabilization Time for groundwater reading
WOH = Weight of Hammer
WOR = Weight of Rods

SOIL DESCRIPTIONS

Soil samples are described on the exploration logs by the "Modified Burmister Soil Identification System". The following provides a brief description of the Modified Burmister System.

1. Major and minor components of the soil matrix are identified as gravel, sand or fines. The relative amounts of these constituents are proportioned as:

Component	Proportional Term	Percent by Weight of Total
Major		Greater than percentage of other components
Minor	And	35-50
	Some	20-35
	Little	10-20
	Trace	1-10

2. The nature of "fines" is defined by using the following guidelines:

Degree of Plasticity	Identity	Plasticity Index
Non-plastic	SILT	0
Slight	Clayey SILT	1-5
Low	SILT & CLAY	5-10
Medium	CLAY & SILT	10-20
High	Silty CLAY	20-40
Very High	CLAY	40 and Greater

3. For boring logs, relative density or consistency is identified based on standard penetration resistance, using the following table.

Non-Plastic Soils		Plastic Soils	
Blows/ft "N"	Relative Density	Blows/ft "N"	Consistency
0-4	Very Loose	<2	Very Soft
4-10	Loose	2-4	Soft
10-30	Medium Dense	4-8	Medium Stiff
30-50	Dense	8-15	Stiff
>50	Very Dense	15-30	Very Stiff
		>30	Hard

BEDROCK DESCRIPTIONS

Rock samples described on the exploration logs are generally based on the International Society of Rock Mechanics (ISRM) System, as generally described on the following page. Each rock sample was generally described using the following guideline, in the order presented:

1. Field hardness: very hard, hard, moderately hard, medium, soft, very soft
2. Weathering: fresh, very slight, slight, moderate, moderately severe, severe, very severe, complete
3. Rock continuity (fracturing): extremely, moderately, slightly, sound
4. Texture: amorphous, fine, medium, coarse, very coarse
5. Color
6. Rock type
7. Fractures, Bedding, and Foliation, Spacing and Attitude
8. Rock Quality Designation (RQD)

Appendix B.1 – 2008 Boring and Test Pit Logs

GZA
GeoEnvironmental, Inc.
Engineers and Scientists

LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-100
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-16-08 / 1-16-08
Boring Location: See Exploration Location Plan
GS Elev.: 324' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:		Split Spoon
O.D. / I.D.:		1-3/8"/2"
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:	2.5" HSA	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
1/16/08	1050	5'	Out	15 min.
1/21/08	0800	5'	Out	5 days

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/8	0-2	5-19 20-21	ND	Dense, dark brown, fine to coarse SAND, some Silt, little Gravel	0.5' TOPSOIL SILTY, GRAVELLY SAND	1	None
4	S-2	24/10	4-6	3-8 8-6	ND	Medium dense, brown, fine to coarse SAND, some Gravel, little Silt		2	
8	S-3	24/20	8-10	12-17 11-17	ND	Top 8": Brown, fine to medium SAND, some Silt, some Gravel Middle 6": Brown, fine to coarse SAND, some Gravel, trace Silt Bottom 6": Brown, fine to medium SAND and SILT, little Gravel	9.5' GLACIAL TILL		
14	S-4	8/8	14-14.8	51-100/2"	ND	Top 6": Dense, brown, fine to coarse SAND, trace Silt Bottom 2": Dense, gray WEATHERED ROCK FRAGMENTS and SILT, some fine to medium Sand End of Exploration at 14.8'	14.5' WEATHERED BEDROCK	3	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Sample S-2 observed to be wet. Groundwater level approximately 4 feet.
3. Auger refusal at 14.8 feet. Borehole left open so groundwater level readings could be obtained after stabilization.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-100

W_B_SAMP-DEPTH_19707.GPJ GZADEPTH.GDT 3/6/08

GZA
GeoEnvironmental, Inc.
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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-101
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-18-08 / 1-21-08
Boring Location: See Exploration Location Plan
GS Elev.: 335' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:	HW	Split Spoon
O.D. / I.D.:	4.5"/4"	1-3/8"/2"
Hammer Wt.:	300 lb.	140 lb.
Hammer Fall:	18"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/3	0-2	4-16 14-12	ND	Medium dense, dark brown, fine to medium SAND, some Silt, trace Gravel, trace Roots (Topsoil)	TOPSOIL	1 2	None
3							3' SAND AND GRAVEL		
4 5	S-2	15/10	4-5.3	16-27 100/3"	ND	Very dense, brown, fine to coarse SAND and GRAVEL, some Silt		3 4	
7							7' GLACIAL TILL		
8	S-3	1/0	8-8.1	100/1"		No Recovery		5	
9 10	S-4	24/12	9-11	8-10 20-15	ND	Dense, orange/brown, fine to medium SAND, some Silt, some Gravel			
13	S-5	10/6	13-13.1	36-100/4"	ND	Very dense, gray, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt	13.8'	6	
14						End of Exploration at 13.8'		7	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Water added to borehole. Could not obtain accurate groundwater reading.
3. Driller roller bit to 7 feet to get past dense gravel. Advanced casing to 7 feet; then performed falling head test from 5 to 7 feet.
4. Performed additional falling head test from 5 to 7 feet on 1/21/08.
5. Roller bit thru boulder from 8 to 9 feet.
6. Roller bit refusal at 13.8'.
7. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

GZA
GeoEnvironmental, Inc.
Engineers and Scientists

LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-103
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-16-08 / 1-16-08
Boring Location: See Exploration Location Plan
GS Elev.: 341' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:		Split Spoon
O.D. / I.D.:		1-3/8"/2"
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:	2.5" HSA	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/16	0-2	3-14 12-8	ND	Top 6": TOPSOIL, dark brown, fine to medium SAND, some Silt, little Gravel Bottom 10": Brown, fine to coarse SAND, little Gravel, little Silt	0.5' TOPSOIL GRAVELLY SAND	1	None
4	S-2	24/18	4-6	21-20 29-23	ND	Dense, brown, fine to coarse SAND, some Gravel, trace Silt			
7							7' GLACIAL TILL		
8	S-3	24/14	8-10	12-19 13-16	ND	Dense, brown/tan, fine to medium SAND and SILT, some Gravel		2	
13	S-4	3/2	13-13.3	100/3"	ND	Very dense, gray WEATHERED ROCK FRAGMENTS	13' WEATHERED 14' BEDROCK	3	
14						End of Exploration at 14'		4	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Sample S-3 observed to be wet. Groundwater level approximately 8 feet.
3. Driller augered to 14 feet after spoon refusal at 13'3". Auger refusal at 14 feet.
4. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-103

W_B_SAMP-DEPTH_19707.GPJ_GZADEPTH.GDT 3/6/08

GZA
GeoEnvironmental, Inc.
Engineers and Scientists

LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-104
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-21-08 / 1-21-08
Boring Location: See Exploration Location Plan
GS Elev.: 328' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:	HW	Split Spoon
O.D. / I.D.:	4.5"/4"	1-3/8"/2"
Hammer Wt.:	300 lb.	140 lb.
Hammer Fall:	18"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/6	0-2	7-14 21-23	ND	Dense, dark brown, fine to coarse SAND, some Gravel, little Silt, little Roots, trace Asphalt	0.2' ASPHALT FILL	1 2	None
3							3' SAND AND GRAVEL		
4 5	S-2	24/8	4-6	14-8 11-20	ND	Medium dense, brown/orange, fine to coarse SAND, some Gravel, some Silt		3	
8 9	S-3	24/10	8-10	12-14 18-21	ND	Dense, brown, fine to coarse SAND and GRAVEL, trace Silt (wet)		4	
12							12' POSSIBLE BEDROCK	5	
14						End of Exploration at 14'	14'	6	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Water added to borehole. Could not obtain accurate groundwater reading.
3. Performed falling head perm test from 5 to 7 feet.
4. Casing refusal at 8 feet.
5. Roller bit grinding from 12 to 14 feet. Refusal at 14 feet.
6. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-104

W_B_SAMP-DEPTH_19707.GPJ GZADEPTH.GDT 3/6/08

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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-105
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-17-08 / 1-17-08
Boring Location: See Exploration Location Plan
GS Elev.: 340' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:		Split Spoon
O.D. / I.D.:		1-3/8"/2"
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:	2.5" HSA	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/12	0-2	7-7 7-7	ND	Top 6": Dark brown, fine to medium SAND, some Silt, trace Gravel, trace Roots Bottom 6": Orange/brown, fine to medium SAND, some Silt, little Gravel	0.5' TOPSOIL SUBSOIL	1	None
3							3' SAND AND GRAVEL		
4	S-2	24/20	4-6	9-20 23-35	ND	Dense, brown, fine to coarse SAND and GRAVEL, trace Silt			
8	S-3	24/4	8-10	25-34 32-30	ND	Very dense, brown, fine to coarse SAND and GRAVEL, little Silt		2	
12							12' GLACIAL TILL		
13	S-4	14/14	13-14.2	11-16 100/2"	ND	Very dense, brown, fine to medium SAND and SILT, some Gravel	14.2'		
14						End of Exploration at 14.2'		3	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Sample S-3 observed to be wet. Groundwater level approximately 8 feet.
3. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-105

W_B_SAMP-DEPTH 19707.GPJ GZADEPTH.GDT 3/6/08

GZA
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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-106
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-17-08 / 1-17-08
Boring Location: See Exploration Location Plan
GS Elev.: 342' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:		Split Spoon
O.D. / I.D.:		1-3/8"/2"
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:	2.5" HSA	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/10	0-2	25-16 5-7	ND	Top 4": TOPSOIL, dark brown, fine to medium SAND, some Silt, little Roots, trace Gravel Bottom 6": Brown, fine to coarse SAND, some Gravel, trace Silt	0.4' TOPSOIL GRAVELLY SAND	1	None
5	S-2	24/16	4-6	7-7 9-5	ND	Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt			
8	S-3	24/12	8-10	21-36 58-68	ND	Very dense, brown, fine to medium SAND and SILT, some Gravel	7' GLACIAL TILL	2	
13	S-4	2/2	13-13.5	100/2"	ND	Very dense, brown, fine to medium SAND and SILT, some Gravel (gray weathered rock at tip of spoon)	13' WEATHERED BEDROCK	3	
15						End of Exploration at 15'	15'	4	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Sample S-3 observed to be wet. Groundwater level approximately 8 feet.
3. Auger grinding from 13 to 15 feet. Auger refusal at 15 feet.
4. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-107
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-18-08 / 1-18-08
Boring Location: See Exploration Location Plan
GS Elev.: 343' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:	HW	Split Spoon
O.D. / I.D.:	4.5"/4"	1-3/8"/2"
Hammer Wt.:	300 lb.	140 lb.
Hammer Fall:	18"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/20	0-2	5-15 17-21	ND	Top 3" TOPSOIL, Dark brown, fine to medium SAND, some Silt, trace Gravel, little Roots Bottom 17" Medium dense, gray/brown, fine to coarse SAND, some Gravel, little Silt	0.3' TOPSOIL FILL	1 2	None
3							3' GRAVELLY SAND		
4	S-2	24/3	4-6	8-8 13-25	ND	Medium dense, tan/brown, fine to medium SAND, some Gravel, little Silt		3	
7							7' SAND AND GRAVEL		
8	S-3	24/18	8-10	25-31 32-18	ND	Very dense, dark brown/brown, fine to coarse SAND and GRAVEL, little Silt			
13	S-4	1/0	13-13.1	100/1"	ND	No Recovery	13'	4	
						End of Exploration at 13'		5	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Water added to borehole. Could not obtain accurate groundwater reading.
3. Falling head permeability test performed from 4 to 6 feet.
4. Roller bit grinding from 12.5 to 13 feet. Roller bit refusal at 13 feet. Possible boulder or bedrock encountered.
5. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-107

W_B_SAMP-DEPTH_19707.GPJ_GZADEPTH.GDT 3/6/08

GZA
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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-108
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-16-08 / 1-16-08
Boring Location: See Exploration Location Plan
GS Elev.: 329' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:		Split Spoon
O.D. / I.D.:		1-3/8"/2"
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:	2.5" HSA	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/20	0-2	16-9 8-10	ND	Top 6": TOPSOIL, dark brown, fine to medium SAND, some Silt, trace Gravel, little Roots Bottom 14": Brown, fine to coarse SAND, some Gravel, some Silt (Subsoil)	0.5' TOPSOIL SUBSOIL	1	None
3							3' GRAVELLY SAND		
5	S-2	24/15	4-6	6-17 18-16	ND	Dense, brown, fine to coarse SAND, little Gravel, little Silt			
9	S-3	24/20	8-10	15-21 28-29	ND	Dense, brown, fine to coarse SAND, little Gravel, trace Silt		2	
13	S-4	24/10	13-15	11-15 21-17	ND	Top 4": Dense, brown, fine to coarse SAND, little Gravel, little Silt Bottom 6": Dense, brown/tan, fine to medium SAND and SILT, little Gravel	14' GLACIAL TILL 15'		
15						End of Exploration at 15'		3	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Sample S-3 observed to be moist. Groundwater level approximately 8 feet.
3. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-108

W_B_SAMP-DEPTH 19707.GPJ GZADEPTH.GDT 3/6/08

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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-109
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-17-08 / 1-17-08
Boring Location: See Exploration Location Plan
GS Elev.: 340' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:		Split Spoon
O.D. / I.D.:		1-3/8"/2"
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:	2.5" HSA	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
1/17/08	1115	14'	13'	None

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/6	0-2	11-21 12-16	ND	Dense, brown, fine to coarse SAND and GRAVEL, little Silt	FILL	1	None
3							3' SAND AND GRAVEL		
4	S-2	24/16	4-6	20-24 23-29	ND	Dense, brown, fine to coarse SAND and GRAVEL, trace Silt			
8	S-3	24/14	8-10	20-22 18-13	ND	Dense, brown, fine to coarse SAND and GRAVEL, trace Silt			
13	S-4	24/20	13-15	21-19 16-18	ND	Top 6": Dense, brown, fine to coarse SAND and GRAVEL, trace Silt Bottom 14": Dense, tan/brown, fine to medium SAND and SILT, little Gravel	13.5' GLACIAL TILL		
15						End of Exploration at 15'	15'	2	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-110
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-17-08 / 1-17-08
Boring Location: See Exploration Location Plan
GS Elev.: 341' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:	HW	Split Spoon
O.D. / I.D.:	4.5"/4"	1-3/8"/2"
Hammer Wt.:	300 lb.	140 lb.
Hammer Fall:	18"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
1/17/08	1250	3.2'	8'	15 min.
1/17/08	1310	3.4'	8'	45 min.
See Note 5				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/10	0-2	2-8 16-11	ND	Top 4": Dark brown, fine to medium SAND, some Silt, trace Gravel, trace Roots (Topsoil) Bottom 6": Dark brown to black, fine to coarse SAND, some Silt, little Gravel, trace Roots, trace Brick (Fill)	0.4' TOPSOIL FILL 3' SAND AND GRAVEL	1	None
4	S-2	24/14	4-6	15-16 18-16	ND	Dense, brown/dark brown, fine to coarse SAND and GRAVEL, trace Silt			
8	S-3	24/16	8-10	23-18 21-18	ND	Dense, tan/brown, fine to medium SAND and SILT, little Gravel	9' GLACIAL TILL	2	
13	S-4	1/0	13-13.1	100/1" min/ft		No Recovery	13' BEDROCK	3	
14	C-1	60/49	14-19	2.5 3 4 8 9.5		Top 45": Moderately to moderately hard, slightly to severely weathered, moderately fractured, fine grained, blue, gray MICA SCHIST, very close to close, shallow to moderately dipping joints Bottom 4": Moderately hard, severely weathered, moderately fractured, fine to coarse grained, white/gray QUARTZ		4 5	
19						End of Exploration at 19'	19'	6	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Falling head permeability test performed from 9 to 11 foot depth.
3. Possible bedrock encountered at 13 feet.
4. For core sampling, numbers indicated in the Blows/6" column are rate of coring in min/ft.
5. Groundwater levels may not be representative of actual groundwater level due to adding water to borehole.
6. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-110

W_B_SAMP-DEPTH 19707.GPJ GZADEPTH.GDT 3/6/08

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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-111
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File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-16-08 / 1-16-08
Boring Location: See Exploration Location Plan
GS Elev.: 343' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:		Split Spoon
O.D. / I.D.:		1-3/8"/2"
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:	2.5" HSA	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
1/16/08	1330	8'	Out	20 min.

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/18	0-2	3-9 11-14	ND	Top 2": TOPSOIL, dark brown, fine to medium SAND, some Silt, trace Gravel Bottom 16": Brown, fine to coarse SAND, some Gravel, little Silt	0.2' TOPSOIL GRAVELLY SAND	1	None
3							3' GLACIAL TILL		
4	S-2	24/12	4-6	10-8 9-25	ND	Medium dense, brown, fine to medium SAND, some Silt, little Gravel			
8	S-3	22/20	8-9.10	24-27 25-100/4"	ND	Dense, brown, fine to medium SAND and SILT, some Gravel (wet)			
13	S-4	1/1	13-13.1	100/1"	ND	Very dense, large piece of Gravel (possible bedrock at tip of spoon) End of Exploration at 13.1'	13.1'	2	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Borehole left open so groundwater level could be measured after stabilization.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-111

W_B_SAMP-DEPTH 19707.GPJ GZADEPTH.GDT 3/6/08

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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-112
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-15-08 / 1-15-08
Boring Location: See Exploration Location Plan
GS Elev.: 299' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:		Split Spoon
O.D. / I.D.:		1-3/8"/2"
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:	2.5" HSA	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/16	0-2	1-3 4-8	ND	Top 6": TOPSOIL, dark brown, fine to medium SAND, some Silt Bottom 10": SUBSOIL, orange/brown, fine to medium SAND, some Silt, little Gravel	0.5' TOPSOIL SUBSOIL	1	None
3							3' GRAVELLY SAND		
4	S-2	24/18	4-6	8-17 18-17	ND	Top 6": Brown, fine to coarse SAND, some Gravel, trace Silt (wet) Bottom 10": Brown, fine to medium SAND and SILT, little Gravel	4.5' GLACIAL TILL	2	
7							7.5'	3	
8						End of Exploration at 7.5'		4 5	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Sample S-2 observed to be wet. Groundwater level at approximately 4 feet.
3. Auger refusal at 7 feet. Moved 4 feet north of stake.
4. Auger refusal encountered at 7.5 feet at new location.
5. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-112

W_B_SAMP-DEPTH 19707.GPJ GZADEPTH.GDT 3/6/08

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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-113
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File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-22-08 / 1-22-08
Boring Location: See Exploration Location Plan
GS Elev.: 306' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:	HW	Split Spoon
O.D. / I.D.:	4.5"/4"	1-3/8"/2"
Hammer Wt.:	300 lb.	140 lb.
Hammer Fall:	18"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/12	0-2	1-1 2-8	ND	Loose, brown, fine to medium SAND, some Silt, trace Gravel, trace Roots (Topsoil)	0.5' TOPSOIL GRAVELLY SAND	1 2	None
2 3	S-2	24/12	2-4	7-10 12-19	ND	Medium dense, orange/brown, fine to coarse SAND, some Gravel, trace Silt		3	
4 5 6 7	S-3	24/18	4-6	28-27 22-16	ND	Top 12": Brown, fine to coarse SAND and GRAVEL, little Silt Bottom 6": Tan/brown, fine to medium SAND and SILT, little Gravel	5.5' GLACIAL TILL		
8 9	S-4	21/16	8-9.9	20-19 28-100/3"	ND	Dense, tan/brown, fine to medium SAND and SILT, little Gravel			
13	S-5	1/0	13-13.1	100/1"		No Recovery End of Exploration at 13.1'	13.1'	4 5	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Water added to borehole. Could not obtain accurate groundwater reading.
3. Falling head permeability test performed from 2 to 4 feet.
4. Roller bit and split spoon refusal at 13.1 feet.
5. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-113

W_B_SAMP-DEPTH_19707.GPJ GZADEPTH.GDT 3/6/08

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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-113A
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-23-08 / 1-23-08
Boring Location: See Exploration Location Plan
GS Elev.: 306' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:	HW	Split Spoon
O.D. / I.D.:	4.5"/4"	1-3/8"/2"
Hammer Wt.:	300 lb.	140 lb.
Hammer Fall:	18"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
Not Encountered				
See Note 2				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1–3						No samples taken		1 2	None
3						End of Exploration at 3'			

REMARKS

1. Relocated boring 5 feet south of GZ-113. Driller advanced casing to 3 feet and cleaned out borehole. Falling head test was performed from 2 to 3 feet. Borehole was backfilled upon completion.
2. Water added to borehole. Could not obtain accurate groundwater reading.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-113A

W_B_SAMP-DEPTH 19707.GPJ GZADEPTH.GDT 3/6/08

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LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-114
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-15-08 / 1-15-08
Boring Location: See Exploration Location Plan
GS Elev.: 310' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:		Split Spoon
O.D. / I.D.:		1-3/8"/2"
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:	2.5" HSA	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/12	0-2	3-10 14-17	ND	Top 6": Dark brown, fine to medium SAND, some Silt, trace Gravel (Fill) Bottom 6": Brown, fine to coarse SAND, some Gravel, little Silt	FILL 1' GRAVELLY SAND 3' GLACIAL TILL	1	None
4	S-2	21/21	4-5.9	7-14 29-100/3"	ND	Dense, brown, fine coarse SAND, some Silt, some Gravel		2	
8	S-3	10/8	8-8.10	32-100/4"	ND	Very dense, tan/brown, fine to medium SAND and SILT, some Gravel (1/2" of gray weathered rock fragments at tip of spoon)	9' WEATHERED ROCK 11.5'	3	
12						End of Exploration at 11.5'		4	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Sample S-2 observed to be wet. Groundwater level at approximately 4 feet.
3. Auger grinding from 9 to 11.5 feet. Refusal at 11.5 feet.
4. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-114

W_B_SAMP-DEPTH_19707.GPJ GZADEPTH.GDT 3/6/08

GZA
GeoEnvironmental, Inc.
Engineers and Scientists

LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-115
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-20-08 / 1-20-08
Boring Location: See Exploration Location Plan
GS Elev.: 302' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:	HW	Split Spoon
O.D. / I.D.:	4.5"/4"	1-3/8"/2"
Hammer Wt.:	300 lb.	140 lb.
Hammer Fall:	18"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
0	S-1	24/8	0-2	1-2 3-6	ND	Top 4": Dark brown, fine to medium SAND, some Silt, some Roots, trace Gravel (Topsoil)	TOPSOIL	1	None
1							1'	2	
2	S-2	24/16	2-4	15-22 21-26	ND	Bottom 4": Orange/brown, fine to medium SAND, some Silt, trace Gravel (Subsoil)	SUBSOIL	3	
3							2'		
4	S-3	24/20	4-6	20-25 30-65	ND	Dense, orange/brown, fine to coarse SAND and GRAVEL, trace Silt	SAND AND GRAVEL		
5						Top 4": Very dense, orange/brown, fine to coarse SAND and GRAVEL, trace Silt	4.5'		
6						Bottom 16": Very dense, tan/brown, fine to medium SAND and SILT, some Gravel	GLACIAL TILL		
7									
8	S-4	2/2	8-8.2	100/2"	ND	Very dense, gray WEATHERED ROCK FRAGMENTS	8'	4	
9							WEATHERED BEDROCK		
10									
11									
12							12'		
12						End of Exploration at 12'		5	
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Water added to borehole. Could not obtain accurate groundwater reading.
3. Performed falling head permeability test from 2 to 4 feet.
4. Roller bit grinding from 8 to 12 feet. Roller bit refusal at 12 feet.
5. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-115

W_B_SAMP-DEPTH_19707.GPJ_GZADEPTH.GDT 3/6/08

GZA
GeoEnvironmental, Inc.
Engineers and Scientists

LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-116
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-16-08 / 1-16-08
Boring Location: See Exploration Location Plan
GS Elev.: 307' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:		Split Spoon
O.D. / I.D.:		1-3/8"/2"
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:	2.5" HSA	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
1/16/08	0930	3'	Out	15 min.

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/12	0-2	7-4 9-11	ND	Top 6": TOPSOIL Bottom 6": Brown, fine to coarse SAND and GRAVEL, little Silt	0.5' TOPSOIL SAND AND GRAVEL	1	None
3							3' GLACIAL TILL		
4	S-2	21/21	4-6	8-18 25-100/3"	ND	Dense, orange/brown, fine to medium SAND and SILT, some Gravel		2	
8	S-3	13/13	8-9.1	5-55 100/1"	ND	Very dense, orange/brown, fine to medium SAND and SILT, some Gravel (brown, fractured rock at tip of spoon)	9' WEATHERED ROCK		
11							11.5'		
12						End of Exploration at 11.5'		3 4	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Auger refusal at 6 feet. Moved hole 6 feet to east. Augered to 8 feet and sampled.
3. Auger refusal at 11.5 feet.
4. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-116

W_B_SAMP-DEPTH 19707.GPJ GZADEPTH.GDT 3/6/08

GZA
GeoEnvironmental, Inc.
Engineers and Scientists

LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-117
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-23-08 / 1-23-08
Boring Location: See Exploration Location Plan
GS Elev.: 313' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:	HW	Split Spoon
O.D. / I.D.:	4.5"/4"	1-3/8"/2"
Hammer Wt.:	300 lb.	140 lb.
Hammer Fall:	18"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
1/23/08	1300	2.2'	Out	None
See Note 6				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/8	0-2	1-1 2-4	ND	Top 4": TOPSOIL Bottom 4": Orange/brown, fine to medium SAND, some Silt, trace Gravel (Subsoil)	0.5' TOPSOIL SUBSOIL	1	None
2	S-2	24/14	2-4	10-15 16-17	ND	Dense, brown, fine to coarse SAND, some Gravel, trace Silt	2' GRAVELLY SAND		
4	S-3	24/16	4-6	13-14 13-14	ND	Top 14": Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt Bottom 2": Brown/tan, fine to medium SAND and SILT, little Gravel	6' GLACIAL TILL		
8	S-4	24/8	8-10	4-11 23-21	ND	Dense, brown/tan, fine to medium SAND and SILT, little Gravel			
13	S-5	19/16	13-14.7	16-23 55-100/1"	ND	Very dense, brown/tan, fine to medium SAND and SILT, some Gravel, (1-2" of weathered rock at tip of spoon)	14.5' WEATHERED BEDROCK	2	
16	C-1	60/0	16-21	min/ft 3 3 3 3 3		No Recovery		3 4	
21						End of Exploration at 21'	21'	5 6	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Roller bit grinding from 14.5 to 16 feet on possible weathered bedrock. Driller indicated that some water was lost during drilling from 14 to 16 feet.
3. For core sampling, numbers indicated in the Blows/6" column are rate of coring in min/ft.
4. Cored bedrock from 16 to 21 feet
5. Borehole backfilled with soil cuttings upon completion.
6. Groundwater levels may not be representative of actual groundwater level due to adding water to borehole.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-117

W_B_SAMP-DEPTH 19707.GPJ GZADEPTH.GDT 3/6/08

GZA
GeoEnvironmental, Inc.
Engineers and Scientists

LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-118
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-15-08 / 1-15-08
Boring Location: See Exploration Location Plan
GS Elev.: 303' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:		Split Spoon
O.D. / I.D.:		1-3/8"/2"
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:	2.5" HSA	

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
See Note 2				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/14	0-2	1-2 1-4	ND	Top 8": Dark brown, fine SAND, some Silt (Topsoil) Bottom 6": Orange/brown, fine to medium SAND, little Silt, trace Gravel (Subsoil)	0.8' TOPSOIL / SUBSOIL	1	None
3							3' GLACIAL TILL		
4	S-2	24/20	4-6	8-25 23-30	ND	Dense, brown/orange, fine to medium SAND and SILT, little Gravel		2	
8	S-3	24/24	8-10	22-35 45-58	ND	Very dense, orange/brown, fine to medium SAND and SILT, some Gravel (gray, fractured rock at tip of spoon)	10' WEATHERED BEDROCK		
13	S-4	4/4	13-13.4	100/4"	ND	Very dense, orange/brown, fine to medium SAND and SILT, some Gravel (brown/gray weathered rock fragments at tip of spoon)	15'		
15						End of Exploration at 15'		3 4	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Sample S-2 observed to be moist. Groundwater level may be at approximately 4 feet.
3. Auger refusal at 15 feet.
4. Borehole backfilled with soil cuttings upon completion.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-118

W_B_SAMP-DEPTH_19707.GPJ GZADEPTH.GDT 3/6/08

GZA
GeoEnvironmental, Inc.
Engineers and Scientists

LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-119
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-21-08 / 1-22-08
Boring Location: See Exploration Location Plan
GS Elev.: 309' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:	HW	Split Spoon
O.D. / I.D.:	4.5"/4"	1-3/8"/2"
Hammer Wt.:	300 lb.	140 lb.
Hammer Fall:	18"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
1/22/08	0730	3.4'	4'	15 hours
1/22/08	0900	3.5'	Out	None
See Note 5				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1	S-1	24/14	0-2	3-7 13-9	ND	Top 8": Dark brown, fine to medium SAND, some Silt, little Roots, trace Gravel (Topsoil) Bottom 6": Brown, fine to medium SAND, little Silt, little Gravel, trace Roots (Subsoil)	TOPSOIL 0.8' SUBSOIL	1	None
3							3' SAND AND GRAVEL		
5	S-2	24/18	4-6	21-34 31-28	ND	Very dense, brown, fine to coarse SAND and GRAVEL, trace Silt		2	
8							7.7' WEATHERED ROCK	3	
10	S-3	3/2	10-10.3	100/3"	ND	Rock Cuttings	10.3'		
11						End of Exploration at 10.3'		4 5	

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Falling head permeability test performed from 4 to 6 feet.
3. Roller bit grinding from 7.75 feet to 10 feet. Roller bit refusal at 10.3'.
4. Borehole backfilled with soil cuttings upon completion.
5. Groundwater level may not be representative of actual groundwater level due to adding water to borehole.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-119

W_B_SAMP-DEPTH 19707.GPJ GZADEPTH.GDT 3/6/08

GZA
GeoEnvironmental, Inc.
Engineers and Scientists

LOT 16 DEVELOPMENT
DEVENS, MASSACHUSETTS

Boring No.: GZ-119A
Page: 1 **of** 1
File No.: 19707
Check: PJM

Contractor: NHB
Foreman: Todd Penticost
Logged by: A. Michonski
Date Start/Finish: 1-22-08 / 1-22-08
Boring Location: See Exploration Location Plan
GS Elev.: 309' **Datum:** NAD 1983

	Auger/ Casing	Sampler
Type:	HW	Split Spoon
O.D. / I.D.:	4.5"/4"	1-3/8"/2"
Hammer Wt.:	300 lb.	140 lb.
Hammer Fall:	18"	30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab
Not Encountered				
See Note 4				

Depth	Sample Information: No.	Pen./ Rec. (ft.)	Depth (Ft.)	Blows (/6")	Field Test Data (ppm)	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
1–2	S-1	24/16	1-3	14-16 19-12	ND	Dense, tan/brown, fine to coarse SAND, some Gravel, trace Silt	GRAVELLY SAND	1 2	None
3							3'		
3–4						End of Exploration at 3'		3 4	
5–29									

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Mini Rae organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
2. Relocated boring 8 feet south of GZ-119. Advanced casing and cleaned borehole to 3 feet. Performed falling head test from 2 to 3 feet.
3. Borehole backfilled with soil cuttings upon completion.
4. Water added to borehole. Could not obtain accurate groundwater readings.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: GZ-119A

W_B_SAMP-DEPTH 19707.GPJ GZADEPTH.GDT 3/6/08

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Lot 16, Jackson Technology Park
Devens, Massachusetts

Boring No.: MW-02
Page: 1 of 1
File No.: 19691.00
Check:

Contractor: GeoSearch, Inc.
Foreman:
Logged by: Scott Marcinkus
Date Start/Finish: 1-16-08 / 1-17-08
Boring Location: See Exploration Location Plan
GS Elev.: Datum:

	Auger/ Casing	Sampler
Type:	HSA	S.S.
O.D. / I.D.:	4-1/4"	2" O.D.
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab

Depth	Casing Blows	Sample Information No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Field Test Data	Sample Description & Classification	Stratum Desc.	Remarks	Equipment Installed
		S-1	24/16	0-2	10-17 23-22	ND	4" ASPHALT. Top 4": Brown, fine to medium SAND, little Gravel, trace Silt. Middle 2": Concrete pieces/dust. Bottom 6": Brown, fine to medium SAND, little Gravel, trace Silt.	0.3' ASPHALT	1	FLUSH
5		S-2	24/20	5-7	12-12 13-13	ND	Brown, fine to medium SAND, trace Gravel.	SAND with GRAVEL		Backfill 0-5' Bentonite 5-6' Filter Sand 6-17'
10		S-3	21/18	10-11.7	9-15 14-60	ND	Top 4": Saturated, brown, fine to medium SAND, trace Silt, little Gravel. Bottom 14": Saturated, brown, fine to medium SAND, little (+) Silt, little -some Gravel. Refusal at 11.75 feet.	10.5' SILTY 12' SAND with GRAVEL BEDROCK 17'		Wellscreen 7-17'
15							Bottom of Boring at 17 feet.			
20										
25										

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using an organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1ppmv).

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: MW-02

WELL_BOR_CB GZADEPTH.GDT.GPJ GZA_CORP.GDT 2/14/08

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Lot 16, Jackson Technology Park
Devens, Massachusetts

Boring No.: MW-04
Page: 1 of 1
File No.: 19691.00
Check:

Contractor: GeoSearch, Inc.
Foreman:
Logged by: Scott Marcinkus
Date Start/Finish: 1-16-08 / 1-17-08
Boring Location: See Exploration Location Plan
GS Elev.: Datum:

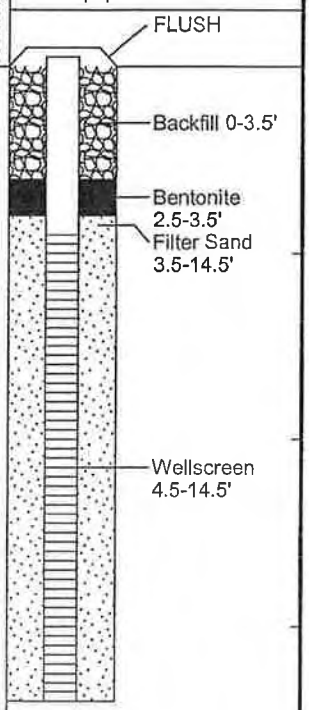
	Auger/ Casing	Sampler
Type:	HSA	S.S.
O.D. / I.D.:	4-1/4"	2" O.D.
Hammer Wt.:		140 lb.
Hammer Fall:		30"
Other:		

GROUNDWATER READINGS

Date	Time	Depth	Casing	Stab

Depth	Casing Blows	Sample Information No.	Pen./ Rec. (in.)	Depth (Ft.)	Blows (/6")	Field Test Data	Sample Description & Classification	Stratum Desc.	Remarks
		S-1	24/15	0-2	8-7 12-9	ND	Brown, fine to medium SAND, trace-little Silt, trace (+) Gravel.		1
5		S-2	24/16	5-7	9-13 14-17	ND	Brown, fine to coarse SAND, trace (-) Silt, trace (+) Gravel.	SAND with GRAVEL	
10		S-3	24/16	10-12	13-45 43-40	ND	Top 4": Brown SAND, little Silt, trace Gravel. 4-5": Gray SAND. 5-8": Brown SAND, trace Silt, trace (+) Gravel. Bottom 8": Brown, fine to medium SAND, little Silt, little (+) Gravel.	10' SILTY SAND and GRAVEL	
15		S-4	24/20	15-17	11-35 19-41	ND	Brown SAND, little-some Silt, little-some Gravel.	17'	
							Bottom of Boring at 17 feet.		
20									
25									

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using an organic vapor meter equipped with a photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1ppmv).

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring No.: MW-04

WELL_BOR_CB GZADEPTH.GDT.GPJ GZA_CORP.GDT 2/14/09

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-101
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

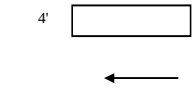
Date 1/7/2008
Ground Elev. 343'±
Time Started 9:00
Time Completed 10:00

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.5'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)					
	1.2'± Dark brown, fine to coarse SAND and GRAVEL, little Silt. (FILL)			E	0	
1'	Light brown, fine to medium SAND, some Gravel, some Silt, trace Brick. (FILL)					
2'	2'±			E	1A,1C	
		S-1 (3')		E	0	
3'						
	Light brown-orange, fine to coarse SAND and GRAVEL, little Silt.			E	0	
4'						
				E	0	
5'						
	6'±			E	0	
6'	Brown, fine to coarse SAND, little Gravel, trace Silt.					
	7'±			E	0	
7'	Tan, fine to coarse SAND and SILT, some Gravel. (GLACIAL TILL)					
				D	0	1
8'						
	Refusal at 8.5 feet.			D	0	2,3
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1 . Slight water seepage at approximately 7 feet.
2. Excavator bucket refusal at approximately 8.5 feet. Possible bedrock encountered.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	7'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-102
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

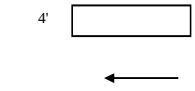
Date 1/7/2008
Ground Elev. 342'±
Time Started 10:15
Time Completed 10:45

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.5'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL/FILL)			E	0	
1'	Brown, fine to medium SAND, some Silt, little Gravel. (SUBSOIL/FILL)			E	0	
2'	2.5'±					
	3'± Tan, fine to medium SAND, some Silt, little Gravel. (FILL)			E	0	
3'				E	3A,2B	
4'	Orange-brown, fine to coarse SAND and GRAVEL, little Silt, trace Wood. (FILL)			E	↓	
5'						
6'	6'±			E		
	6.5'± Tan, fine to medium SAND, trace Silt.			E		1
7'				M	1C	
8'				M	0	
9'	Tan-brown, fine to coarse SAND and SILT, some Gravel. (GLACIAL TILL)			D	0	
10'				D	0	
11'						
	11.5'±					
12'	Gray, weathered ROCK			D	0	2,3
	Refusal at 12 feet.					
13'						
14'						
15'						
16'						

Notes:

1 . Groundwater seepage at approximately 6.5 feet. Excavation side walls began caving in at approximately 8 feet.
2. Gray weathered rock encountered at 11.5 feet. Excavator bucket refusal at 12 feet.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	6.5'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.		Test Pit No.	TP-103
Engineers/Scientists	Lot 16 Development	Page No.	1 of 1
	Devens, Massachusetts	File No.	19707.00
One Edgewater Drive		Checked By:	PJM
Norwood, Massachusetts 02062			

Excavation Equipment

GZA Rep.	Adam Michonski	Contractor	M.P. Crowley Corp			Date	1/7/2008
		Operator	Chris Crowley			Ground Elev.	342'±
Weather	Cool, cloudy, 50's	Make	CAT	Model	315CL	Time Started	11:00
		Capacity	3 cu.yd	Reach	14 ft.	Time Completed	11:30

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.5'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'				M	15-20A	
2'	Brown, fine to coarse SAND and GRAVEL, little Silt, (comingled Concrete, Metal			M	↓	1
3'	Pipe, Cinder Blocks, Rebar). (FILL)			M		
4'	Concrete Wall (see Note 1) →	S-1 (4')		M	↓	
5'	5'±			M	0	
6'				M	0	
7'				M	0	2
8'				M	0	
9'	Light brown, fine to coarse SAND, some Silt, little Gravel. (GLACIAL TILL)			M	0	
10'		S-2 (10')		M	0	
11'				D	0	
12'				D	0	3
13'	Bottom of Test Pit at 13 feet.					
14'						
15'						
16'						

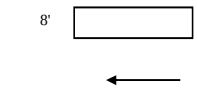
Notes:

1 . Concrete foundation wall encountered from 2.5 to 5.5 feet on south and east sides of test pit excavation.

2. Groundwater seepage at approximately 8 feet.

3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

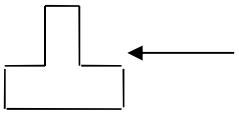
Elapsed Time to Reading (Hours)	Depth to Ground-water
	8'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.		Test Pit No.	TP-104
Engineers/Scientists	Lot 16 Development	Page No.	1 of 1
	Devens, Massachusetts	File No.	19707.00
One Edgewater Drive		Checked By:	PJM
Norwood, Massachusetts 02062			

Excavation Equipment

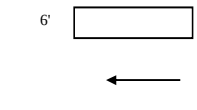
GZA Rep.	Adam Michonski	Contractor	M.P. Crowley Corp			Date	1/7/2008
		Operator	Chris Crowley			Ground Elev.	342'±
Weather	Cool, cloudy, 50's	Make	CAT	Model	315CL	Time Started	11:30
		Capacity	3 cu.yd	Reach	14 ft.	Time Completed	12:00

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.5'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	1
1'				E	0	
2'	 (see Note 1.)			E	0	
3'				E	0	
4'		S-1 (4')		E	0	
5'				E	0	
6'	Brown-orange, fine to coarse SAND and GRAVEL, trace to little Silt.			E	0	2
7'	7 ft long 6" I.D. cast iron pipe at 5.5 ft.			E	0	
8'				E	0	
9'				E	0	
10'				E	0	
11'	11'±			E	0	
12'	Tan, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			M	0	3
13'				M	0	
14'	Bottom of Test Pit at 13.5 feet.			M		4
15'						
16'						

Notes:

1. 16"x16" concrete footing with 8"x8" pier encountered from 1 to 3 feet. No noticable difference between existing backfilled soil directly adjacent to this structure and the surrounding soils.
2. 6" (ID) cast iron pipe encountered at 5.5 feet parallel to north side of test pit (one 7'± length of pipe removed). No noticable difference between existing backfilled soil directly adjacent to this structure and the surrounding soils.
3. Groundwater seepage at approximately 11 feet.
4. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	11'

GZA GeoEnvironmental, Inc.

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Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-105
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

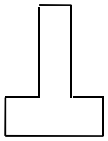
Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

Date 1/7/2008
Ground Elev. 342'±
Time Started 12:10
Time Completed 12:50

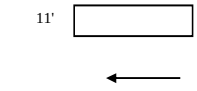
Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.5'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'				E	0	
2'				E	0	1,2
3'	6" I.D. cast iron pipe at 3.5 ft.			E	0	
4'				M	0	
5'	Brown-orange, GRAVEL and fine to coarse SAND, trace Silt.			M	0	
6'	(see Note 1.)			M	0	
7'				M	0	
8'				M	0	3
9'	9'±			M	0	
10'	Tan, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			M	0	
11'				M	0	4
12'	Bottom of Test Pit at 11.5 feet.					
13'						
14'						
15'						
16'						



Notes:

1. 16"x16" concrete footing with 8"x8" pier encountered from 3 to 6 feet. No noticable difference between existing backfilled soil directly adjacent to this structure and the surrounding soils.
2. 6" (ID) cast iron pipe encountered at 3.5 feet on north side of test pit. Pipe was not removed. No noticable difference between existing backfilled soil directly adjacent to this structure and the surrounding soils.
3. Groundwater seepage encountered at 9 feet.
4. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	9'

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GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-106
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

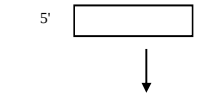
Date 1/7/2008
Ground Elev. 343'±
Time Started 13:15
Time Completed 14:20

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.5'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'				E	0	
2'				E	0	
3'				E	0	
4'	Brown-orange, fine to coarse SAND, some Gravel, little Silt.			E	0	
5'				E	0	
6'				E	0	
7'				E	0	
8'	8'±			E	0	1
9'				M	0	
10'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			M	0	
11'				D	0	
12'	Bottom of Test Pit at 11.5 feet.			D	0	2
13'						
14'						
15'						
16'						

Notes:

1. Groundwater seepage encountered at 8 feet.
2. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	8'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.		Test Pit No.	TP-107
Engineers/Scientists	Lot 16 Development	Page No.	1 of 1
	Devens, Massachusetts	File No.	19707.00
One Edgewater Drive		Checked By:	PJM
Norwood, Massachusetts 02062			

Excavation Equipment

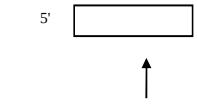
GZA Rep.	Adam Michonski	Contractor	M.P. Crowley Corp			Date	1/7/2008
		Operator	Chris Crowley			Ground Elev.	342'±
Weather	Cool, cloudy, 50's	Make	CAT	Model	315CL	Time Started	2:30
		Capacity	3 cu.yd	Reach	14 ft.	Time Completed	3:00

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.3'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'				M	0	
2'				M	0	
3'				M	0	
4'	Brown-orange, GRAVEL and SAND, trace Silt.			M	0	
5'				M	0	
6'				M	0	
7'				M	0	
8'	8.5'±			M/D	0	
9'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			D	0	
10'				D	0	1,2
11'	Refusal at 10.5 feet.					
12'						
13'						
14'						
15'						
16'						

Notes:

1. Excavator refusal at 10.5 feet. Possible bedrock encountered.
2. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-108
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

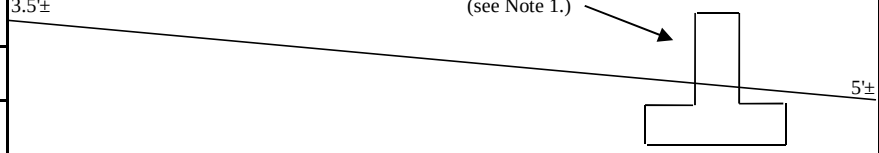
Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

Date 1/7/2008
Ground Elev. 342'±
Time Started 15:05
Time Completed 15:20

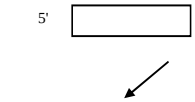
Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.3'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'				E	0	
2'	Brown-orange, fine to coarse SAND and GRAVEL, trace Silt.			M	0	1
3'	3.5'± (see Note 1.)			M	0	
4'				M	0	
5'	5'±			M	2A	
6'				M	0	
7'	Brown, fine to coarse SAND, some Gravel, trace Silt.			M	0	
8'				M	0	
9'	9'±			M	0	2
10'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			D	0	3,4
11'	Refusal at 11 feet.					
12'						
13'						
14'						
15'						
16'						



Notes:

1. 16"x16" concrete footing with 8"x8" pier encountered from 3 to 6 feet. No noticable difference between existing backfilled soil directly adjacent to this structure and the surrounding soils.
2. Groundwater seepage at 9 feet.
3. Bucket refusal at approximately 11 feet. Possible bedrock encountered.
4. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	9'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-109
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

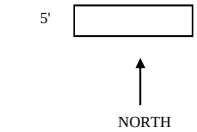
Date 1/7/2008
Ground Elev. 340'±
Time Started 15:25
Time Completed 16:00

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.3'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'				E	0	
2'	Orange-brown, fine to coarse SAND and GRAVEL, trace (+) Silt. Approximately 10% Cobbles.			E	0	
3'				E	0	
4'				E	0	
5'	5'±			E	0	
6'				E	0	
7'				E	0	
8'	Gray-brown, fine to coarse SAND, little Gravel, trace (-) Silt.			E	0	
9'				E	0	
10'				E	0	
11'	11.5'±			M	0	1
12'	Tan, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			M	0	2
13'						
14'	Bottom of Test Pit at 13.5 feet.					
15'						
16'						

Notes:

1. Groundwater seepage encountered at 11.5 feet.
2. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	11.5'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-110
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, partly cloudy, 60's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

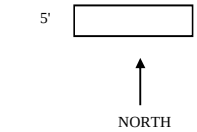
Date 1/8/2008
Ground Elev. 342'±
Time Started 8:10
Time Completed 8:25

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1.2'±	Dark brown, fine to coarse SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'						
2'±	Orange-brown, fine to medium SAND, some Silt, little Gravel, little Roots. (SUBSOIL)			E	0	
2'				M	0	
3'	Orange-brown, GRAVEL and fine to coarse SAND, trace Silt. Approximately 5% Cobbles.			M	0	
4'				M	0	1
5'	Bottom of Test Pit at 5 feet.					
6'						
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-111
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, partly cloudy, 60's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

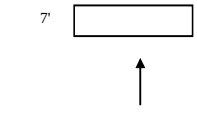
Date 1/8/2008
Ground Elev. 342'±
Time Started 8:25
Time Completed 8:35

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.5'± Dark brown, fine to coarse SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'				E	0	
2'				E	0	
3'	Brown, fine to coarse SAND and GRAVEL, trace Silt.			E	0	1
4'				E	0	
5'				E	0	2
6'				E	0	
7'	(see Note 2.)			M	0	
8'				M	0	
9'				M	0	3
10'	Bottom of Test Pit at 9 feet.					
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Piece of cast iron pipe encountered at 3 feet. No noticable difference between existing backfilled soil directly adjacent to this structure and the surrounding soils.
2. Two concrete footings/ piers encountered from 3 to 5 feet (16"x16" footing, 8"x8" pier). No noticable difference between existing backfilled soil directly adjacent to there structures and the surrounding soils.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-112
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, partly cloudy, 60's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

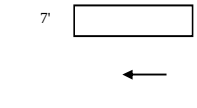
Date 1/8/2008
Ground Elev. 342'±
Time Started 8:40
Time Completed 8:55

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
	1.5'± Dark brown, fine to coarse SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'	1.7'± Orange-brown, fine to medium SAND, some Silt, little Roots, trace Gravel. (SUBSOIL)					
2'				E	0	
3'				E	0	
4'	Orange-brown, fine to coarse SAND and GRAVEL, trace Silt.			E	0	
5'				E	0	
6'				E	0	1
7'	Bottom of Test Pit at 6 feet.					
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-113
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, partly cloudy, 60's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

Date 1/8/2008
Ground Elev. 342'±
Time Started 9:00
Time Completed 9:15

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.3'± Dark brown, fine to coarse SAND, some Silt, little Gravel. (TOPSOIL)					
	1'± Brown, fine to coarse SAND, little Gravel, trace (-) Silt.			E	0	
1'						
2'				E	0	
3'				E	0	
4'	Brown, fine to coarse SAND, some Gravel, trace Silt. Approximately 5% Cobbles.	S-1 (4')		E	0	
5'				M	0	
6'				M	0	1
	Bottom of Test Pit at 6 feet.					
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan

9'
4'

NORTH

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-114
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, partly cloudy, 60's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

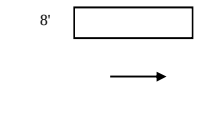
Date 1/8/2008
Ground Elev. 342'±
Time Started 9:00
Time Completed 9:30

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.5'± Dark brown, fine to coarse SAND, some Silt, little Gravel. (TOPSOIL)			M	0	
1'	Brown, fine to coarse SAND, some Silt, some Gravel.			M	0	
2'	2'±			M	0	1
3'	Orange-brown, fine to coarse SAND and GRAVEL, little Silt.			M	0	
4'	(see Note 1.)			M	0	
5'				M	0	2
6'	Bottom of Test Pit at 5.5 feet.					
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. 4" wide concrete foundation wall encountered from 3 to 5.5 feet in the middle of the test pit going north to south. No noticable difference between existing backfilled soil directly adjacent to this structure and the surrounding soils.
2. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-115
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, partly cloudy, 60's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

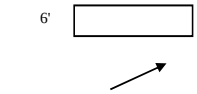
Date 1/8/2008
Ground Elev. 334'±
Time Started 10:30
Time Completed 11:00

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.5'± Dark brown, fine to coarse SAND, some Silt, little Gravel. (TOPSOIL)			E	2C	
1'	Brown, fine to coarse SAND, some Gravel, some Silt. (FILL)			E	↓	
2'	2.5'±					
	3.2'± Brown, fine to medium SAND, some Silt, little Gravel, little Roots. (BURIED TOPSOIL)			E		
3'	Orange-brown, fine to coarse SAND, some Gravel, some Silt, trace Roots.			E	0	
4'	4.5'± (BURIED SUBSOIL)			M	0	
5'				M	0	
6'				M	0	
7'				M	0	
8'	Brown, GRAVEL and fine to coarse SAND, trace Silt.			M	0	
9'				M	0	
10'				M	0	
11'	11'±			M	0	
	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)					
12'	Refusal at 11.5 feet.			D	0	1,2
13'						
14'						
15'						
16'						

Notes:

1. Bucket refusal encountered at 11.5 feet. Possible bedrock encountered.
2. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	11'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.		Test Pit No.	TP-116
Engineers/Scientists	Lot 16 Development	Page No.	1 of 1
	Devens, Massachusetts	File No.	19707.00
One Edgewater Drive		Checked By:	PJM
Norwood, Massachusetts 02062			

Excavation Equipment

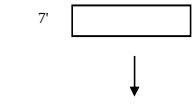
GZA Rep.	Adam Michonski	Contractor	M.P. Crowley Corp			Date	1/8/2008
		Operator	Chris Crowley			Ground Elev.	329'±
Weather	Cool, partly cloudy, 60's	Make	CAT	Model	315CL	Time Started	11:30
		Capacity	3 cu.yd	Reach	14 ft.	Time Completed	11:43

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.2'± ASPHALT			E	0	
1'	Brown, fine to coarse SAND and GRAVEL, trace Silt. (FILL)			E	0	
2'				E	0	
3'				E	0	
4'	4.5'±			E	0	
5'	5'± Brown, fine to medium SAND, some Silt, little Gravel. (BURIED TOPSOIL)			E	0	
6'	Brown, fine to coarse SAND, some Silt, little Gravel. (BURIED SUBSOIL) 6'±			E	0	
7'	Brown, fine to coarse SAND and GRAVEL, trace Silt. (see Note 1.)			E	0	
8'				E	0	
9'	Bottom of Test Pit at 8.5 feet.			D	0	1,2
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. 6" Cast iron pipe encountered at 8 feet. Stopped test pit excavation. No noticable difference between existing backfilled soil directly adjacent to this structure and the surrounding soils.
2. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-117
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, partly cloudy, 60's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

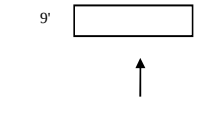
Date 1/8/2008
Ground Elev. 336'±
Time Started 12:00
Time Completed 12:30

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.5'± Dark brown, fine to coarse SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'	Brown, fine to coarse SAND and GRAVEL, little Silt.			E	0	1
2'	6" Concrete Wall			E	0	
3'	Orange-brown, fine to meidum SAND, some Silt, little Gravel. (BURIED SUBSOIL)			E	0	
4'				M	0	
5'	Brown, fine to coarse SAND, some Gravel, trace Silt. 5.5'±			M	0	
6'				M	0	
7'	Brown, fine to coarse SAND.			M	0	2
8'	Bottom of Test Pit at 8 feet.					
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. 6" concrete foundation wall encountered from 2.5 to 5.5 feet. No noticable difference between existing backfilled soil directly adjacent to west side of this structure and the surrounding soils.
2. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.		Test Pit No.	TP-118
Engineers/Scientists	Lot 16 Development	Page No.	1 of 1
	Devens, Massachusetts	File No.	19707.00
One Edgewater Drive		Checked By:	PJM
Norwood, Massachusetts 02062			

Excavation Equipment

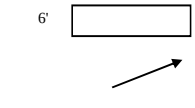
GZA Rep.	Adam Michonski	Contractor	M.P. Crowley Corp			Date	1/8/2008
		Operator	Chris Crowley			Ground Elev.	330'±
Weather	Cool, partly cloudy, 60's	Make	CAT	Model	315CL	Time Started	13:30
		Capacity	3 cu.yd	Reach	14 ft.	Time Completed	14:00

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.2'± ASPHALT	S-1				
	0.7'± Brown, fine to medium SAND, some Silt, some Gravel, trace Roots. (TOPSOIL)	(0.5')		M	0	
1'	Orange-brown, fine to medium SAND, some Silt, some Gravel, trace Roots. (SUBSOIL)					
	1.8'±			M	0	
2'	Brown, fine to coarse SAND, some Gravel, trace Silt.			M	0	
3'				M	0	
4'				M	0	
5'				M	0	
6'		S-2 (6')		M	0	
7'				M	0	
8'				M	0	
9'				M	0	
	9.5'±			M	0	1
10'	Tan-brown, fine to medium SAND and SILT, little Gravel. (GLACIAL TILL)			M	0	
11'				M	0	
12'				D	0	2,3
	Refusal at 12.5 feet.					
13'						
14'						
15'						
16'						

Notes:

1. Groundwater encountered at 9.5 feet.
2. Excavator bucket refusal at 12.5 feet. Possible bedrock encountered.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	9.5'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-119
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, light rain, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

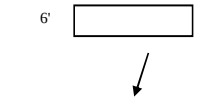
Date 1/9/2008
Ground Elev. 340'±
Time Started 8:25
Time Completed 8:45

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	Brown, fine to medium SAND, some Silt, some Gravel. (FILL)			E	0	
2'	2'±			M	0	
3'				M	0	
4'				M	0	
5'				M	0	
6'	Brown, fine to coarse SAND and GRAVEL, trace (-) Silt. (6" brown, fine to coarse SAND, some Gravel, trace (-) Silt layer at 3 and 9.5± feet.)			M	0	
7'				M	0	
8'				M	1B	
9'				M	0	
10'	10'±			M	0	
11'				M	1C	
12'	Tan-brown, fine to medium SAND and SILT, little Gravel. (GLACIAL TILL)			M	0	
13'	Refusal at 12.5 feet.			M	0	1,2
14'						
15'						
16'						

Notes:

1. Excavator bucket refusal at 12.5 feet. Bedrock encountered.
2. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-120
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, light rain, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

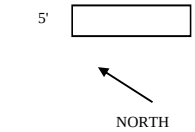
Date 1/9/2008
Ground Elev. 314'±
Time Started 9:00
Time Completed 9:15

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'±	Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'						
2'	Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
2.5'±						
3'				E	0	
	Orange-brown, fine to coarse SAND and GRAVEL, trace Silt.					
4'				E	0	
4.5'±						
5'				E	0	
	Tan, fine to coarse SAND, little Gravel, trace Silt.					
6'				E	0	
7'±				E	0	1
7'				M	0	
8'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)					
9'				M	0	
				D	0	2,3
10'	Refusal at 10 feet.					
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Groundwater encountered at 7 feet.
2. Excavator bucket refusal at 10 feet. Bedrock encountered.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	7'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-121
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, light rain, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

Date 1/9/2008
Ground Elev. 311'±
Time Started 9:20
Time Completed 9:35

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.7'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'	Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
2'	2'±			E	0	
3'	Brown, fine to coarse SAND and GRAVEL, trace Silt.			E	0	
4'				E	2B,4A	
5'				E	↓	
6'	6'±			M	↓	
7'	Tan-brown, fine SAND and SILT, little Gravel. Approximately 5 to 10% Cobbles. (GLACIAL TILL)			M	↓	
8'				D	↓	1,2
9'	Refusal at 9 feet.					
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Excavator bucket refusal at 9 feet. Bedrock encountered.
2. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan
12'
5'
NORTH
Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-122
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, light rain, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

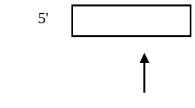
Date 1/9/2008
Ground Elev. 307'±
Time Started 9:45
Time Completed 10:00

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
	1'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'	1.5'± Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
2'				E	0	
3'				E	0	
4'	Brown, fine to coarse SAND and GRAVEL, trace Silt.			E	0	
5'				E	0	
6'	6.5'±			M	0	1
7'	Tan-brown, fine SAND and SILT, little Gravel. (GLACIAL TILL)			D	0	2,3
8'	Refusal at 8 feet.					
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Groundwater seepage encountered at 6.5 feet.
2. Excavator bucket refusal at 8 feet. Bedrock encountered.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	6.5'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-123
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, partly cloudy, light rain, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

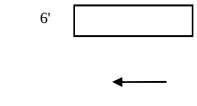
Date 1/9/2008
Ground Elev. 303'±
Time Started 10:10
Time Completed 10:30

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'±	Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	1C	
2'±	Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
3'	Brown, fine to coarse SAND and GRAVEL, trace Silt.			E	0	
4'				E	0	
5'±				E	0	1
6'	Tan, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			M	0	
7'				M	0	
8'	Refusal at 7.5 feet.			D	0	2,3
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Groundwater seepage encountered at 5 feet.
2. Excavator bucket refusal at 7.5 feet. Bedrock encountered.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	5'

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Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-124
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, light rain, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

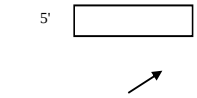
Date 1/9/2008
Ground Elev. 299'±
Time Started 11:15
Time Completed 11:30

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	1'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
2'	2'± Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	3B,1C	
3'	Brown, fine to coarse SAND, some Gravel, trace Silt. Approximately 5 to 10% Cobbles.			E		
4'				E		
5'	5.5'±			M		
6'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			M	2B,2C	
7'				M		
8'				M		
9'		S-1 (9')		M		
10'				M		
11'				M		
12'	Bottom of Test Pit at 11.5 feet.			M		1
13'						
14'						
15'						
16'						

Notes:

1. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-125
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, light rain, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

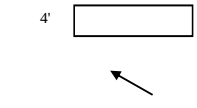
Date 1/9/2008
Ground Elev. 311'±
Time Started 12:00
Time Completed 12:15

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'±	Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
2'±	Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
2.5'±				E	0	
3'	Brown, fine to coarse SAND and GRAVEL, trace Silt.			E	3C	
4'				E	↓	
5'				M		
5.5'±				M		
6'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			M		
7'				M		1
8'				D		2,3
9'						
10'	Refusal at 10 feet.					
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Groundwater seepage encountered at 9 feet.
2. Excavator bucket refusal at 10 feet. Bedrock encountered.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	9'

GZA GeoEnvironmental, Inc.

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Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-126
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, light rain, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

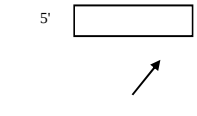
Date 1/9/2008
Ground Elev. 300'±
Time Started 15:00
Time Completed 15:15

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'±	Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'				E	0	
2'	Brown, fine to coarse SAND and GRAVEL, trace Silt, trace Roots.			E	0	
3'				E	0	
4'				E	0	
5'±				M	0	
5'				M	0	
6'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			M	0	
7'				M	0	
8'				M	0	1,2
9'	Refusal at 8.5 feet.					
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Excavator bucket refusal at 8.5 feet. Bedrock encountered.
2. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-127
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, light rain, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

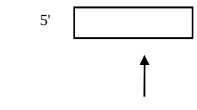
Date 1/9/2008
Ground Elev. 301'±
Time Started 15:30
Time Completed 15:45

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	1'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
2'	2'± Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
3'				E	0	
4'	Orange-brown, fine to coarse SAND and GRAVEL, trace Silt.			E	1C	
5'				E	0	
6'	5.5'±			M	0	
7'				M	0	
8'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			M	1C	
9'				M	↓	
10'				D		
11'	Refusal at 10.5 feet.			D		1,2
12'						
13'						
14'						
15'						
16'						

Notes:

1. Excavator bucket refusal at 10.5 feet. Bedrock encountered.
2. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-128
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, light rain, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

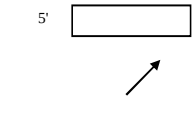
Date 1/9/2008
Ground Elev. 308'±
Time Started 16:00
Time Completed 16:15

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	1'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
2'	Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
3'	2.5'±			E	0	
4'				E	0	
5'	Brown-tan, fine to coarse SAND and GRAVEL, trace Silt.			M	0	
6'				M	0	
7'	7'±			M	0	1
8'				M	0	
9'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			D	0	2,3
10'	Refusal at 10 feet.					
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Groundwater seepage at 7 feet.
2. Excavator bucket refusal at 10 feet. Bedrock encountered.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	7'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.		Test Pit No.	TP-129
Engineers/Scientists	Lot 16 Development	Page No.	1 of 1
	Devens, Massachusetts	File No.	19707.00
One Edgewater Drive		Checked By:	PJM
Norwood, Massachusetts 02062			

Excavation Equipment

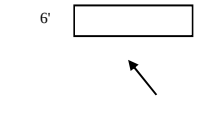
GZA Rep.	Adam Michonski	Contractor	M.P. Crowley Corp			Date	1/10/2008
		Operator	Chris Crowley			Ground Elev.	315'±
Weather	Cool, cloudy, 50's	Make	CAT	Model	315CL	Time Started	8:30
		Capacity	3 cu.yd	Reach	14 ft.	Time Completed	8:45

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	1'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
2'	2'± Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
3'	Orange-brown, fine to coarse SAND and GRAVEL, trace Silt. Approximately 10 to 15%			E	0	
4'	3.5'± Cobbles.			M	0	
5'	4.5'± Tan, fine to coarse SAND, trace Silt.			M	1B,3C	
6'				M	↓	
7'	Brown, fine to meidum SAND and GRAVEL, trace Silt. Approximately 5% Cobbles.			M	↓	
8'	7.5'±			M	3C	1
9'				M	↓	
10'	Brown, fine to medium SAND and SILT, some Gravel. Approximately 5 to 10% Cobbles.			M	↓	
11'	(GLACIAL TILL)			D	↓	2,3
12'	Refusal at 11 feet.					
13'						
14'						
15'						
16'						

Notes:

1. Rapid groundwater seepage at 7.5 feet. Approximately 5 gallons seeped into bottom of test pit in 5 minutes.
2. Excavator bucket refusal at 11 feet. Bedrock encountered.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	7.5'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-130
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

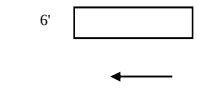
Date 1/10/2008
Ground Elev. 314'±
Time Started 9:00
Time Completed 9:25

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL) 1'±			E	0	
2'	Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL) 2.5'±			E	0	
3'				E	0	
4'				E	0	
5'	Orange-brown, fine to coarse SAND and GRAVEL, trace Silt. Approximately 5 to 10% Cobbles.			E	3B,3A	
6'	6'±			E	↓	1
7'	7'±			E	↓	
8'				M	4A,3B	
9'				M	↓	
10'	Tan-brown, fine to medium SAND and SILT, some Gravel. Approximately 10 to 15% Cobbles and Boulders. (GLACIAL TILL)			M	5A,2B	
11'				D	↓	
12'				D		
13'				D	↓	
14'	Refusal at 13.5 feet.					2,3
15'						
16'						

Notes:

1. Groundwater seepage at 6 feet. Slight seepage, walls started caving in from 11 to 13 feet.
2. Excavator bucket refusal at 13.5 feet. Bedrock encountered.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	6'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-131
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Cool, cloudy, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

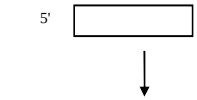
Date 1/10/2008
Ground Elev. 310'±
Time Started 9:40
Time Completed 10:00

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'±	Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
2'±	Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
3'	Brown, fine to coarse SAND and GRAVEL, trace Silt.			E	0	
4'				E	0	
4.5'±				M	1C,2B	1
5'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			M	↓	
6'				M	2B	
7'				M	1B	
8'				M	0	2
9'	Bottom of Test Pit at 8.5 feet.					
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Slight groundwater seepage at 4.5 feet.
2. Test pit backfilled in 1 to 2 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	4.5'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-132
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File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Sunny, cool, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

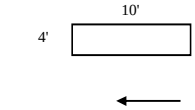
Date 1/10/2008
Ground Elev. 310'±
Time Started 10:15
Time Completed 10:35

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'±	Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'						
2'	Orange-brown, fine to medium SAND, some Silt, little Gravel. (SUBSOIL)			E	0	
2.5'±						
3'				E	0	
4'	Tan-brown, fine to coarse SAND and GRAVEL, trace Silt.			M	0	
5'						
6'±				M	0	1
6'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)			M	0	2
7'	Bottom of Test Pit at 7 feet.					
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Rapid groundwater seepage at 6 feet±. 6" of water at bottom of test pit in 5 minutes.
2. Test pit backfilled in 1 to 2 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	6'±

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-133
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Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Sunny, cool, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

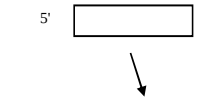
Date 1/10/2008
Ground Elev. 306'±
Time Started 11:10
Time Completed 11:50

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'±	Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'						
2'	Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
3'±				E	0	
3'				E	0	
4'	Brown, fine to coarse SAND and GRAVEL, trace Silt. Approximately 5 to 10% Cobbles.			E	0	
5'				M	0	
6'±				M	0	1
6'	Tan-brown, fine to medium SAND and SILT, some Gravel. (GLACIAL TILL)	S-1 (8.5')		D	0	2,3
7'						
8'	Refusal at 8.5 feet.					
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Groundwater seepage at 6 feet±.
2. Excavator bucket refusal at 8.5 feet. Highly fractured bedrock encountered.
3. Test pit backfilled in 1 to 2 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	6'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.		Test Pit No.	TP-134
Engineers/Scientists	Lot 16 Development	Page No.	1 of 1
	Devens, Massachusetts	File No.	19707.00
One Edgewater Drive		Checked By:	PJM
Norwood, Massachusetts 02062			

Excavation Equipment

GZA Rep.	Adam Michonski	Contractor	M.P. Crowley Corp			Date	1/10/2008
		Operator	Chris Crowley			Ground Elev.	306'±
Weather	Sunny, cool, 50's	Make	CAT	Model	315CL	Time Started	11:30
		Capacity	3 cu.yd	Reach	14 ft.	Time Completed	12:00

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'±	Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'						
2'	Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
2.5'±						
3'				E	0	
4'	Tan-brown, fine to coarse SAND, little Gravel, trace Silt.			E	0	
5'				E	1C	
5.5'±				M/D	0	
6'				M/D	2B,1C	
7'	Tan-brown, fine to medium SAND and SILT, some Gravel. Approximately 10 to 15% Cobbles and Boulders. (GLACIAL TILL)			D	3A,1B	
8'				D	↓	1
9'	Bottom of Test Pit at 9 feet.					
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Test pit backfilled in 1 to 2 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan

10'

5'

NORTH

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(x) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.		Test Pit No.	TP-135
Engineers/Scientists	Lot 16 Development	Page No.	1 of 1
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One Edgewater Drive		Checked By:	PJM
Norwood, Massachusetts 02062			

Excavation Equipment

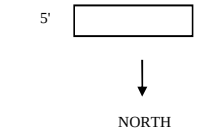
GZA Rep.	Adam Michonski	Contractor	M.P. Crowley Corp			Date	1/10/2008
		Operator	Chris Crowley			Ground Elev.	341'±
Weather	Sunny, cool, 50's	Make	CAT	Model	315CL	Time Started	13:20
		Capacity	3 cu.yd	Reach	14 ft.	Time Completed	13:55

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	1'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
2'	Orange-brown, fine to medium SAND, some Gravel, some Silt. (SUBSOIL)			E	0	
3'	2.5'±			E	0	
4'	Tan, fine to coarse SAND, little Gravel, trace Silt.			E	0	
5'	4'±			M	0	
6'	Brown, fine to coarse SAND and GRAVEL, trace Silt.			M	0	
7'				M	0	
8'	7'±			E	0	
9'	Tan, fine to coarse SAND, little Gravel, trace Silt.			E	0	
10'	9.5'±			M	0	1
11'				M	0	
12'				M	0	
13'				M	0	
14'	Tan-brown, fine to medium SAND and SILT, little Gravel. (GLACIAL TILL)			D	0	
15'				D	0	
16'				D	0	2,3
	Refusal at 16 feet.					

Notes:

1. Slight groundwater sweepage at 9.5 feet. Sidewalls began caving in at 11 feet.
2. Excavator bucket refusal at 16 feet. Bedrock encountered.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	9.5'

GZA GeoEnvironmental, Inc.

GZA GeoEnvironmental, Inc.		Test Pit No.	TP-136
Engineers/Scientists	Lot 16 Development	Page No.	1 of 1
	Devens, Massachusetts	File No.	19707.00
One Edgewater Drive		Checked By:	PJM
Norwood, Massachusetts 02062			

Excavation Equipment

GZA Rep.	Adam Michonski	Contractor	Mp Crowley Corp			Date	1/10/2008
		Operator	Chris Crowley			Ground Elev.	326'±
Weather	Sunny, cool, 50's	Make	CAT	Model	315CL	Time Started	14:15
		Capacity	3 cu.yd	Reach	14 ft.	Time Completed	14:35

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	0.5'± Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL)			E	0	
1'	Orange-brown, fine to medium SAND, some Gravel, some Silt, trace Roots. (FILL)			E	0	1
2'	2.5'± (see Note 1.)			E	0	
3'	2.8'± BURIED TOPSOIL			E	0	
4'	3.5'± BURIED SUBSOIL			M	0	
5'	Orange-brown, fine to coarse SAND and GRAVEL, trace Silt.			M	0	
6'	6.5'±			M/D	0	2
7'	Tan-brown, fine to medium SAND and SILT, little Gravel. (GLACIAL TILL)			D	0	3,4
8'	Refusal at 7.5 feet.					
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. 1.5' x 1.5' concrete footing approximately 1 foot high encountered at 2 feet. No noticable difference between existing backfilled soil directly adjacent to this structure and the surrounding soils.
2. Slight groundwater seepage at 6.5 feet.
3. Excavator bucket refusal at 7.5 feet. Bedrock encountered.
4. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan

10'

5'

NORTH

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	6.5'

GZA GeoEnvironmental, Inc.
Engineers/Scientists

One Edgewater Drive
Norwood, Massachusetts 02062

Lot 16 Development
Devens, Massachusetts

Test Pit No. TP-137
Page No. 1 of 1
File No. 19707.00
Checked By: PJM

Excavation Equipment

GZA Rep. Adam Michonski
Weather Sunny, cool, 50's

Contractor M.P. Crowley Corp
Operator Chris Crowley
Make CAT Model 315CL
Capacity 3 cu.yd Reach 14 ft.

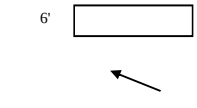
Date 1/10/2008
Ground Elev. 336'±
Time Started 14:50
Time Completed 15:20

Depth	Soil Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	Dark brown, fine to medium SAND, some Silt, little Gravel. (TOPSOIL) 1'±			E	0	
2'	Orange-brown, fine to medium SAND, some Silt, little Gravel. (SUBSOIL) 2'			E	0	
3'	2.5'±			E	0	
4'	Tan-brown, fine to coarse SAND, little Gravel, trace Silt.			E	0	
5'	5'±			M	0	
6'				M	0	
7'				M	0	
8'	Brown, fine to coarse SAND and GRAVEL, trace Silt. Approximately 5 to 10% Cobbles.			M	0	
9'				M	0	
10'				M	0	
11'				M	0	
12'				M	0	
13'	12.5'±			M	0	1
14'	Tan-brown, fine to medium SAND and SILT, little Gravel. Approximately 5 to 10% Cobbles. (GLACIAL TILL)			D	0	
15'				D	0	2,3
16'	Refusal at 15 feet.					

Notes:

1. Slight groundwater sweepage at 12.5 feet.
2. Excavator bucket refusal at 15 feet. Bedrock encountered.
3. Test pit backfilled in 2 to 3 foot lifts and tamped with excavator bucket upon completion.

Test Pit Plan



Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	12.5'

GZA GeoEnvironmental, Inc.

Appendix B.2 – 2012 Boring Logs

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-1
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 343
Final Boring Depth (ft.): 16.75
Date Start - Finish: 1/16/2012 - 1/16/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/16/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0-2	24	11	5 6 9 8	15	S-1 : Medium dense, brown, fine to coarse SAND, some Silt, little Gravel.			0.25	TOPSOIL	342.8
		S-2	2-4	24	16	7 12 19 15	31	S-2 : Dense, brown, fine to coarse SAND and Gravel, little Silt.					
5		S-3	4-6	24	13	17 18 21 17	39	S-3 : Dense, brown, fine to coarse SAND and Gravel, little Silt.				SAND AND GRAVEL	
		S-4	6-8	24	18	15 15 17 17	32	S-4 : Dense, brown, fine to coarse SAND and Gravel, little Silt.			8		335.0
10		S-5	8-10	24	15	22 24 30 30	54	S-5 : Very dense, brown, fine to coarse SAND and Silt, trace Gravel. Wet.				GLACIAL TILL	
15		S-6	15-16.75	21	18	5 7 19 100/3"	26	S-6 : Medium dense, brown, fine to coarse SAND and Silt, little Gravel. Wet.			16.75		326.3
								End of exploration at 16.75 feet.	1				
20													
25													
30													

REMARKS

1 - Auger and split spoon refusal on boulder or bedrock at 16.75 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-1

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:42 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-2
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 343
Final Boring Depth (ft.): 14.5
Date Start - Finish: 1/12/2012 - 1/12/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/12/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0-2	24	15	4 6 6 5	12	S-1 : Medium dense, dark brown, fine to coarse SAND, some Silt, little Gravel.			0.5	TOPSOIL	342.5
		S-2	2-4	24	16	12 11 15 14	26	S-2 : Medium dense, dark brown, fine to coarse SAND, some Silt, little Gravel.				SAND AND GRAVEL	
5		S-3	4-6	24	18	10 10 16 22	26	S-3 : Medium dense, dark brown, fine to coarse SAND, some Silt, little Gravel.			6		337.0
		S-4	6-8	24	20	22 13 15 18	28	S-4 : Medium dense, brown, fine to medium SAND and Silt, little Gravel.					
		S-5	8-10	24	14	11 69 28 15	97	S-5 : Very dense, brown, fine to medium SAND and Silt, little Gravel.				GLACIAL TILL	
10											13		330.0
									1		14.5	WEATHERED BEDROCK	328.5
15		S-6	14.4-14.4	0	0	50/0"	R	S-6 : No recovery. End of exploration at 14.5 feet.	2				
20													
25													
30													

REMARKS

1 - Weathered bedrock at 13 feet based on drill action and drill cuttings.
2 - Auger and split spoon refusal in weathered bedrock at 14.5 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-2

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:47 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-3
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 343
Final Boring Depth (ft.): 9.1
Date Start - Finish: 1/12/2012 - 1/12/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/12/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0-2	24	15	3 6 8 8	14	S-1 : Medium dense, dark brown, fine to coarse SAND, some Silt, little Gravel.			0.5	TOPSOIL	342.5
		S-2	2-4	24	17	5 4 4 3	8	S-2 : Loose, dark brown, fine to medium SAND and Silt, trace Gravel.					
5		S-3	4-6	24	16	3 4 6 9	10	S-3 : Loose, brown to gray, fine to coarse SAND, some Silt, trace Gravel.				SAND AND GRAVEL	
		S-4	6-8	24	18	4 9 12 16	21	S-4 : Medium dense, brown to gray, fine to medium SAND, some Silt, trace Gravel. Wet.			8		335.0
		S-5	8-9.1	13	13	16 30 50/1"	R	S-5 : Top 6 inches: Very dense, brown, fine to medium SAND and Silt, little Gravel. Wet.			8.5	GLACIAL TILL	334.5
10								Bottom 7 inches: Very dense, gray, weathered rock fragments, some fine to medium Sand. Wet.	1		9.1	WEATHERED BEDROCK	333.9
								End of exploration at 9.1 feet.					
15													
20													
25													
30													

REMARKS

1 - Auger and split spoon refusal in weathered bedrock at 9.1 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-3

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:47 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-4 (OW)
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: DGL

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 344
Final Boring Depth (ft.): 8.75
Date Start - Finish: 1/12/2012 - 1/12/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/12/12	1530	Not encountered	15 min.
1/13/12	0731	Not encountered	16 hours
1/16/12	0725	Not encountered	88 hours

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
0		S-1	0-2	24	8	7 11 12 19	23	S-1: Medium dense, dark brown, fine to coarse SAND, some Silt, with root fibers.	1	
		S-2	2-4	24	13	14 13 9 7	22	S-2: Medium dense, dark brown, fine to coarse SAND, some Gravel, little Silt.		
5		S-3	4-6	24	16	3 3 5 4	8	S-3: Loose, brown to gray, fine to coarse SAND, some Silt, little Gravel.		
		S-4	6-8	24	9	6 1 1 1	2	S-4: Loose, brown to gray, fine to coarse SAND, some Silt, little Gravel.	2	
		S-5	8-8.75	9	8	6 100/3"	R	S-5: Top 3 inches: Very dense, dark brown to gray, fine to coarse SAND, some Silt, some Gravel, trace rock fragments. Bottom 5 inches: Very dense, gray, weathered rock fragments.	3	
10										
15								End of exploration at 8.75 feet.		
20										
25										
30										

Depth (ft.)	Stratum Description	Elev. (ft.)
0.5	TOPSOIL	343.5
	SAND AND GRAVEL (FILL)	
8.25		335.8
8.75	WEATHERED BEDROCK	335.3

Equipment Installed:
- Drill cuttings
- 2' Bentonite Seal
- 3' 2" ID Solid Sch 40 PVC Well Riser
- 3.5' Filter Sand
- 2" ID Slotted Sch 40 PVC Well Screen (0.01" Slot)
- 8.5'
- 8.75'

REMARKS

1 - Top of PVC at 2.75 feet above ground surface; standpipe 3.0 feet above ground surface.
2 - Pieces of clay pipe observed in split spoon in Sample S-4.
3 - Auger and split spoon refusal in weathered bedrock at 8.75 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-4 (OW)

GZA TEMPLATE TEST BORING W/ EQUIP.; 2/1/2012; 11:50:01 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-5
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 344
Final Boring Depth (ft.): 12.8
Date Start - Finish: 1/13/2012 - 1/13/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/13/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0-2	24	14	6 11 17 9	28	S-1 : Medium dense, gray, fine to coarse SAND, some Silt, little Gravel.			0.25	TOPSOIL	343.8
		S-2	2-4	24	1	7 8 8 8	16	S-2 : No recovery.					
5		S-3	4-6	24	15	8 8 15 19	23	S-3 : Medium dense, gray, fine to coarse SAND, little Gravel, little Silt.				SAND AND GRAVEL	
		S-4	6-8	24	21	20 32 32 28	64	S-4 : Very dense, gray, fine to coarse SAND, some Silt, little Gravel.			8		336.0
		S-5	8-10	24	20	10 9 9 9	18	S-5 : Medium dense, brown, fine to coarse SAND and Silt, little Gravel.				GLACIAL TILL	
10											12.3		331.7
		S-6	12.7-12.7	0	0	50/0"	R	S-6 : No recovery.	1 2		12.8	WEATHERED BEDROCK	331.2
								End of exploration at 12.8 feet.					
15													
20													
25													
30													

REMARKS

1 - Weathered bedrock at 12.3 feet based on drill action and drill cuttings.
2 - Auger and split spoon refusal in weathered bedrock at 12.8 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-5

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:48 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-6
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 343.5
Final Boring Depth (ft.): 10.5
Date Start - Finish: 1/13/2012 - 1/13/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/13/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0-2	24	16	5 10 10 10	20	S-1 : Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel.			0.25	TOPSOIL	343.3
		S-2	2-4	24	15	9 12 15 14	27	S-2 : Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel.					
5		S-3	4-6	24	16	12 17 24 18	41	S-3 : Dense, brown, fine to coarse SAND, some Silt, little Gravel.				SAND AND GRAVEL	
		S-4	6-8	24	18	17 18 23 20	41	S-4 : Dense, brown, fine to coarse SAND, some Silt, little Gravel.					
		S-5	8-10	24	14	13 19 30 4	49	S-5 : Top 9 inches: Dense, brown, fine to coarse SAND, some Gravel, little Silt. Bottom 5 inches: Dense, brown, weathered bedrock.			9.5	WEATHERED	334.0
10		S-6	10.4-10.4	0	0	50/0"	R	S-6 : No recovery. End of exploration at 10.5 feet.	1		10.5	BEDROCK	333.0
15													
20													
25													
30													

REMARKS

1 - Auger and split spoon refusal in weathered bedrock at 10.5 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-6

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:49 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-7
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 343
Final Boring Depth (ft.): 13.7
Date Start - Finish: 1/16/2012 - 1/16/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/16/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0-2	24	10	6 8 14 16	22	S-1 : Medium dense, gray, fine to coarse SAND, some Silt, trace Gravel.			0.5	TOPSOIL	342.5
		S-2	2-4	24	15	16 18 17 17	35	S-2 : Dense, gray, fine to coarse SAND and Gravel, little Silt.					
5		S-3	4-6	24	17	20 25 20 25	45	S-3 : Dense, gray, fine to coarse SAND and Gravel, little Silt.				SAND AND GRAVEL	
		S-4	6-8	24	18	22 24 19 14	43	S-4 : Dense, gray, fine to coarse SAND and Gravel, little Silt.			8		335.0
		S-5	8-10	24	14	10 6 12 10	18	S-5 : Medium dense, brown, fine to coarse SAND and Silt, trace Gravel. Wet.				GLACIAL TILL	
10											13		330.0
		S-6	13.6-13.6	0	0	50/0"	R	S-6 : No recovery.	1		13.7	WEATHERED BEDROCK	329.3
15								End of exploration at 13.7 feet.	2				
20													
25													
30													

REMARKS

1 - Weathered bedrock at 13 feet based on drill action and drill cuttings.
2 - Auger and split spoon refusal in weathered bedrock at 13.7 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-7

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:49 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-8
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 341.5
Final Boring Depth (ft.): 13
Date Start - Finish: 1/16/2012 - 1/16/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/16/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0-2	24	19	14 7 8 12	15	S-1 : Medium dense, gray, fine to coarse SAND, some Silt, little Gravel.			0.25	TOPSOIL	341.3
		S-2	2-4	24	4	14 10 8 8	18	S-2 : Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel.					
5		S-3	4-6	24	11	4 4 22 22	26	S-3 : Medium dense, brown, fine to coarse SAND, little Silt, little Gravel.					
		S-4	6-8	24	18	7 18 16 11	34	S-4 : Medium dense, brown, fine to coarse SAND, little Silt, little Gravel.				SAND AND GRAVEL	
		S-5	8-10	24	20	5 5 7 8	12	S-5 : Medium dense, brown, fine to coarse SAND, little Silt, little Gravel.					
10													
		S-6	12.9-12.9	0	0	50/0"	R	S-6 : No recovery.	1		13		328.5
15								End of exploration at 13 feet.					
20													
25													
30													

REMARKS

1 - Auger and split spoon refusal on boulder or bedrock at 13.0 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-8

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:50 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-9 (OW)
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: DGL

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 338
Final Boring Depth (ft.): 14
Date Start - Finish: 1/12/2012 - 1/12/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/12/12	1604	12.01	15 min.
1/13/12	1528	12.17	23 hours
1/16/12	1046	12.32	91 hours

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)	Equipment Installed
		S-1	0-2	24	20	5 5 6 2	11	S-1: Top 8 inches: Topsoil. Bottom 12 inches: Medium dense, brown, fine to coarse SAND, some Silt, trace Gravel.	1		0.75	TOPSOIL	337.3	Drill cuttings 1' Bentonite Seal 2'
		S-2	2-4	24	8	1 2 5 4	7	S-2: Loose, brown, fine to coarse SAND, some Silt, trace Gravel.						2" ID Solid Sch 40 PVC Well Riser 3.75' Filter Sand
5		S-3	4-6	24	3	13 17 18 21	35	S-3: Dense, brown, fine to coarse SAND, some Silt, some Gravel.						
		S-4	6-8	24	22	15 16 25 28	41	S-4: Dense, brown, fine to coarse SAND, some Silt, little Gravel, trace Rock fragments.				SAND AND GRAVEL		
		S-5	8-10	24	14	20 17 14 13	31	S-5: Dense, brown, fine to coarse SAND, some Silt, little Gravel, trace Rock fragments.						2" ID Slotted Sch 40 PVC Well Screen (0.01" Slot)
10														
									2		13		325.0	
		S-6	13.9-13.9	0	0	50/0"	R	S-6: No recovery.	3		14	WEATHERED BEDROCK	324.0	14'
15								End of exploration at 14 feet.						
20														
25														
30														

REMARKS

1 - Top of PVC at 2.75 feet above ground surface; standpipe 3.0 feet above ground surface.
2 - Weathered bedrock at 13 feet based on drill action and drill cuttings.
3 - Auger and split spoon refusal in weathered bedrock at 14.0 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-9 (OW)

GZA TEMPLATE TEST BORING W/ EQUIP.; 2/1/2012; 11:50:02 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-10
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 341
Final Boring Depth (ft.): 11.6
Date Start - Finish: 1/16/2012 - 1/16/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/16/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0-2	24	14	13 10 9 9	19	S-1 : Medium dense, gray to brown, fine to coarse SAND, some Silt, little Gravel.			0.25	TOPSOIL	340.8
		S-2	2-4	24	20	13 12 17 15	29	S-2 : Medium dense, gray to brown, fine to coarse SAND, some Gravel, little Silt.					
5		S-3	4-6	24	18	17 21 19 14	40	S-3 : Dense, gray, fine to coarse SAND, little Silt, little Gravel.				SAND AND GRAVEL	
		S-4	6-8	24	19	14 17 16 15	33	S-4 : Dense, gray, fine to coarse SAND, some Gravel, some Silt.					
		S-5	8-10	24	17	13 13 15 17	28	S-5 : Medium dense, gray, fine to coarse SAND, some Silt, little Gravel.					
10											11		330.0
		S-6	11.5- 11.5	0	0	50/0"	R	S-6 : No recovery. End of exploration at 11.6 feet.	1 2		11.6	WEATHERED BEDROCK	329.4
15													
20													
25													
30													

REMARKS

1 - Weathered bedrock at 11 feet based on drill action and drill cuttings.
2 - Auger and split spoon refusal in weathered bedrock at 11.6 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-10

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:44 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-11
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 342
Final Boring Depth (ft.): 14.7
Date Start - Finish: 1/13/2012 - 1/13/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/13/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0-2	24	20	5 6 6 6	12	S-1 : Medium dense, gray to brown, fine to coarse SAND, some Silt, little Gravel.			0.25	TOPSOIL	341.8
		S-2	2-4	24	14	12 10 18 18	28	S-2 : Medium dense, gray to brown, medium to coarse SAND, some Gravel, little Silt.					
5		S-3	4-6	24	15	15 16 16 18	32	S-3 : Dense, gray, medium to coarse SAND, some Gravel, little Silt.					
		S-4	6-8	24	18	21 23 25 17	48	S-4 : Dense, gray, medium to coarse SAND, some Gravel, little Silt.				SAND AND GRAVEL	
		S-5	8-10	24	16	11 12 11 11	23	S-5 : Medium dense, gray, medium to coarse SAND, some Gravel, little Silt.					
10													
											14		328.0
15		S-6	14.6-14.6	0	0	50/0"	R	S-6 : No recovery. End of exploration at 14.7 feet.	1 2		14.7	WEATHERED BEDROCK	327.3
20													
25													
30													

REMARKS

1 - Weathered bedrock at 14 feet based on drill action and drill cuttings.
2 - Auger and split spoon refusal in weathered bedrock at 14.7 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-11

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:44 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-12
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 342
Final Boring Depth (ft.): 13
Date Start - Finish: 1/13/2012 - 1/13/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/13/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0-2	24	9	3 14 30 19	44	S-1 : Dense, black, fine to coarse SAND and Silt, with root fibers.			0.75	TOPSOIL	341.3
		S-2	2-4	24	0	12 9 9 9	18	S-2 : No recovery.					
5		S-3	4-6	24	14	10 15 23 23	38	S-3 : Dense, gray, fine to coarse SAND, some Gravel, some Silt.				SAND AND GRAVEL	
		S-4	6-8	24	17	29 25 22 28	47	S-4 : Dense, gray, fine to coarse SAND, some Gravel, some Silt.					
		S-5	8-10	24	22	18 15 15 15	30	S-5 : Top 11 inches: Dense, gray, fine to coarse SAND, some Gravel, some Silt. Wet.			8.25		333.8
10								Bottom 9 inches: Dense, brown, fine to coarse SAND and Silt, little Gravel. Wet.				GLACIAL TILL	
		S-6	12.9-12.9	0	0	50/0"	R	S-6 : No recovery.	1		12.5		329.5
								End of exploration at 13 feet.	2		13	WEATHERED BEDROCK	329.0
15													
20													
25													
30													

REMARKS

1 - Weathered bedrock at 12.5 feet based on drill action and drill cuttings.
2 - Auger and split spoon refusal in weathered bedrock at 13.0 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-12

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:45 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-13
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 341
Final Boring Depth (ft.): 15.1
Date Start - Finish: 1/16/2012 - 1/16/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/16/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0-2	24	18	11 19 23 18	42	S-1 : Dense, brown, fine to coarse SAND, some Silt, trace Gravel.			0.25	TOPSOIL	340.8
		S-2	2-4	24	13	17 15 19 19	34	S-2 : Dense, brown, fine to coarse SAND, some Silt, little Gravel.					
5		S-3	4-6	24	13	9 12 14 11	26	S-3 : Medium dense, brown, fine to coarse SAND, some Silt, little Gravel.				SAND AND GRAVEL	
		S-4	6-8	24	15	15 15 16 15	31	S-4 : Dense, brown, fine to coarse SAND, little Silt, little Gravel.			8		333.0
		S-5	8-10	24	13	14 13 13 8	26	S-5 : Medium dense, brown, fine to coarse SAND and Silt, little Gravel. Wet.					
10												GLACIAL TILL	
15											15		326.0
		S-6	15-15.1	2	2	50/2"	R	S-6 : Very dense, gray, weathered Bedrock. Wet. End of exploration at 15.1 feet.	1		15.1	WEATHERED BEDROCK	325.9
20													
25													
30													

REMARKS

1 - Auger and split spoon refusal in weathered bedrock at 15.1 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-13

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:46 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Geis Construction Company
Lot 16, Jackson Road
Devens, Massachusetts

EXPLORATION NO.: B-14
SHEET: 1 of 1
PROJECT NO: 04.0029496.00
REVIEWED BY: D. Lamothe

Logged By: Mirsad Alihodzic
Drilling Co.: New Hampshire Boring, Inc.
Foreman: Mike Misiaszek

Type of Rig: CME 45 Truck
Rig Model: 550
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 337
Final Boring Depth (ft.): 10.5
Date Start - Finish: 1/16/2012 - 1/16/2012

H. Datum:
V. Datum: NGVD29

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 3.25 I.D.

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/16/12		Not encountered	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0-2	24	18	7 10 7 6	17	S-1 : Medium dense, gray, fine to coarse SAND, some Silt, trace Gravel.			0.25	TOPSOIL	336.8
		S-2	2-4	24	10	4 4 10 15	14	S-2 : Medium dense, brown, fine to coarse SAND, some Silt, trace Gravel.					
5		S-3	4-6	24	14	8 11 13 10	24	S-3 : Medium dense, brown, fine to coarse SAND, some Silt, little Gravel.				SAND AND GRAVEL	
		S-4	6-8	24	15	13 9 8 7	17	S-4 : Medium dense, brown, fine to coarse SAND, some Silt, little Gravel.			8		329.0
		S-5	8-10	24	17	10 12 15 30	27	S-5 : Top 14 inches: Medium dense, brown, fine to coarse SAND and Silt, little Gravel. Wet.				GLACIAL TILL	
10								Bottom 3 inches: Medium dense, gray, weathered			9.75		327.3
		S-6	10.4-10.4	0	0	50/0"	R	Bedrock. Wet. S-6 : No recovery.	1		10.5	WEATHERED BEDROCK	326.5
								End of exploration at 10.5 feet.					
15													
20													
25													
30													

REMARKS

1 - Auger and split spoon refusal in weathered bedrock at 10.5 feet.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: B-14

GZA TEMPLATE TEST BORING; 2/1/2012; 11:39:46 AM

Appendix B.3 – 2019 Boring Logs

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens, LLC
Due Diligence Geotechnical Evaluation
Proposed Development
45 Jackson Road Devens, MA

BORING NO.: GZ-201
SHEET: 1 of 1
PROJECT NO: 01.0174440.00
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental	**Type of Rig:** ATV	**Boring Location:** See Plan	**H. Datum:** See Plan
Foreman: James Hastings	**Rig Model:** CME 55LC	**Ground Surface Elev. (ft.):** 338.5	
Logged By: Glenn Larose	**Drilling Method:** HSA	**Final Boring Depth (ft.):** 12	**V. Datum:** See Plan
		Date Start - Finish: 11/5/2029 - 11/5/2019	

Auger/Casing Type: Hollow Stem Auger	**Sampler Type:** Split Spoon	
I.D/O.D.(in): 3.25/6.25	**I.D./O.D. (in.):** 1.375/2	
Hammer Weight (lb.):	**Sampler Hmr Wt (lb):** 140 lbs	
Hammer Fall (in.):	**Sampler Hmr Fall (in):** 30"	
Other:	**Other:** Autohammer	

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
11/5/19	08:00	9	10	10 Mins.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0-2	24	12	6 5 5 6	10	S-1: Top 10" - Dry, dark brown, fine to coarse SAND, some Silt, little Gravel, trace Roots/Grass/Leaves.	1	0.8	0.8	TOPSOIL	337.7'
								Bottom 2" - Dry, brown/orange, fine to coarse SAND, some Silt, little Gravel.		5.2	2.2	SUBSOIL	336.3'
		S-2	2-4	24	18	8 6 7 9	13	S-2: Top 3" - Dry, brown/orange, fine to coarse SAND, some Silt, trace Gravel.	2				
								Bottom 15" - Medium dense, dry, brown, fine to coarse SAND, little Gravel, trace Silt.	3	0.1		SAND	
5		S-3	4-6	24	16	10 8 13 19	21	S-3: Medium dense, dry, brown, fine to coarse SAND, little Gravel, trace Silt.		0.3			
		S-4	6-8	24	12	28 20 31 18	51	S-4: Top 10" - Dry, brown, fine to coarse SAND, little Gravel, little Silt.	4		6.8		331.7'
								Bottom 2" - Dry, brown with occasional orange, fine to coarse SAND, some Silt, little Gravel.				GLACIAL TILL	
10		S-5	10-12	24	14	11 11 19 40	30	S-5: Dense, wet, brown/gray with occasional orange, fine to coarse SAND, some Silt, some Gravel.	5	ND	12		326.5'
								Bottom of boring at 12 feet.	6				
15													
20													
25													
30													

REMARKS

1. Ground surface elevation estimated from topographic contours in an autoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Advanced borehole using hollow stem auger (HSA) method from ground surface to approximately 10 feet below existing ground surface.
3. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
4. Driller noted possible gravel/cobbles during drilling from 6.5 to 7.5 feet.
5. Observed gravel in tip of split spoon Sample S-5.
6. Upon completion, borehole backfilled with cuttings to existing grade.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-201

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens, LLC
Due Diligence Geotechnical Evaluation
Proposed Development
45 Jackson Road Devens, MA

BORING NO.: GZ-202
SHEET: 1 of 1
PROJECT NO: 01.0174440.00
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental	**Type of Rig:** ATV	**Boring Location:** See Plan	**H. Datum:** See Plan
Foreman: James Hastings	**Rig Model:** CME 55LC	**Ground Surface Elev. (ft.):** 322	
Logged By: Glenn Larose	**Drilling Method:** HSA	**Final Boring Depth (ft.):** 12	**V. Datum:** See Plan
		Date Start - Finish: 11/5/2029 - 11/5/2019	

Auger/Casing Type: Hollow Stem Auger	**Sampler Type:** Split Spoon	
I.D/O.D.(in): 3.25/6.25	**I.D./O.D. (in.):** 1.375/2	
Hammer Weight (lb.):	**Sampler Hmr Wt (lb):** 140 lbs	
Hammer Fall (in.):	**Sampler Hmr Fall (in):** 30"	
Other:	**Other:** Autohammer	

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
Not Observed				

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0-2	24	12	4 5 10 18	15	S-1: Top 6" - Dark brown, fine to coarse SAND, some Silt, trace Roots/Leaves. Bottom 6" - Dry, brown, fine to coarse SAND and GRAVEL, some Silt.	1	ND	0.5 1	TOPSOIL SUBSOIL	321.5' 321.0'
		S-2	2-4	24	18	20 19 16 12	35	S-2: Dense, dry, brown with orange, fine to coarse SAND and GRAVEL, little Silt.	2 3	ND		SAND/GRAVEL	
5		S-3	4-6	24	16	15 15 16 12	31	S-3: Top 12" - Dry, brown, fine to coarse SAND, some Gravel, little Silt. Bottom 4" - Dry, brown, fine to coarse SAND, some Silt, little Gravel.		ND	5		317.0'
		S-4	6-8	24	16	13 9 12 11	21	S-4: Medium dense, moist, brown with occasional orange, fine to coarse SAND and Clayey SILT, little (+) Gravel.		ND		GLACIAL TILL	
10		S-5	10-12	24	14	14 21 25 23	46	S-5: Dense, moist, brown/gray, fine to coarse SAND, some Silt, some Gravel.	4	ND	12		310.0'
								Bottom of boring at 12 feet.					
15													
20													
25													
30													

REMARKS

1. Ground surface elevation estimated from topographic contours in an autoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Advanced borehole using hollow stem auger (HSA) method from ground surface to approximately 10 feet below existing ground surface.
3. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
4. Upon completion, borehole backfilled with cuttings to existing grade.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-202

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens, LLC
Due Diligence Geotechnical Evaluation
Proposed Development
45 Jackson Road Devens, MA

BORING NO.: GZ-203
SHEET: 1 of 1
PROJECT NO: 01.0174440.00
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental
Foreman: James Hastings
Logged By: Glenn Larose

Type of Rig: ATV
Rig Model: CME 55LC
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 317
Final Boring Depth (ft.): 12
Date Start - Finish: 11/5/2029 - 11/5/2019

H. Datum: See Plan
V. Datum: See Plan

Auger/Casing Type: Hollow Stem Auger
I.D/O.D.(in): 3.25/6.25
Hammer Weight (lb.):
Hammer Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D. (in.): 1.375/2
Sampler Hmr Wt (lb): 140 lbs
Sampler Hmr Fall (in): 30"
Other: Autohammer

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
Not Observed				

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0-2	24	6	1 1 2 2	3	S-1: Top 5" - Dry, dark brown, fine to coarse SAND, some Silt, trace Leaves, Roots. Bottom 1" - Dry, brown, fine to coarse SAND, some Silt, trace Roots.	1	ND	0.4	TOPSOIL	316.6'
		S-2	2-4	24	18	7 7 7 8	14	S-2: Medium dense, dry, brown, fine to coarse SAND, little (+) Gravel, little Silt.	2	ND	2	SUBSOIL	315.0'
5		S-3	4-6	24	20	10 11 21 24	32	S-3: Dense, dry, brown, fine to coarse SAND, some Gravel, little Silt.	3	ND		GRAVELLY SAND	
		S-4	6-8	24	24	28 20 24 19	44	S-4: Top 6" - Dry, brown, fine to coarse SAND, little Gravel, little Silt. Bottom 18" - Dense, moist, brown/gray with occasional orange, SILT and fine to coarse SAND, little Gravel.	4	ND	6.5		310.5'
10		S-5	10-12	24	16	12 21 21 32	42	S-5: Dense, moist, brown/gray, SILT and fine to coarse SAND, little (+) Gravel.		ND		GLACIAL TILL	
								Bottom of boring at 12 feet.	5		12		305.0'
15													
20													
25													
30													

REMARKS

1. Ground surface elevation estimated from topographic contours in an autoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Advanced borehole using hollow stem auger (HSA) method from ground surface to approximately 10 feet below existing ground surface.
3. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
4. Borehole location offset approximately 30 feet west due to apparent utility conflict.
5. Upon completion, borehole backfilled with cuttings to existing grade.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-203

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens, LLC
Due Diligence Geotechnical Evaluation
Proposed Development
45 Jackson Road Devens, MA

BORING NO.: GZ-204
SHEET: 1 of 1
PROJECT NO: 01.0174440.00
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental	**Type of Rig:** ATV	**Boring Location:** See Plan	**H. Datum:** See Plan
Foreman: James Hastings	**Rig Model:** CME 55LC	**Ground Surface Elev. (ft.):** 315	
Logged By: Glenn Larose	**Drilling Method:** HSA	**Final Boring Depth (ft.):** 12	**V. Datum:** See Plan
		Date Start - Finish: 11/5/2029 - 11/5/2019	

Auger/Casing Type: Hollow Stem Auger	**Sampler Type:** Split Spoon	
I.D/O.D.(in): 3.25/6.25	**I.D./O.D. (in.):** 1.375/2	
Hammer Weight (lb.):	**Sampler Hmr Wt (lb):** 140 lbs	
Hammer Fall (in.):	**Sampler Hmr Fall (in):** 30"	
Other:	**Other:** Autohammer	

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
Not Observed				

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0-2	24	16	2 2 4 8	6	S-1: Top 6" - Dark Brown, fine to coarse SAND, some Silt, trace Gravel, Roots, Leaves, Wood.	1	ND	0.5	TOPSOIL	314.5'
								Bottom 18" - Dry, brown, fine to coarse SAND, some Silt, little Gravel, trace Roots.	2	ND	2	SUBSOIL	313.0'
		S-2	2-4	24	18	8 12 16 13	28	S-2: Medium dense, dry, brown, fine to coarse SAND, some Silt, some Gravel.	3	ND		SAND	
5		S-3	4-6	24	18	20 17 17 20	34	S-3: Top 12" - Dry, brown, fine to coarse SAND, some Gravel, little Silt.		ND	6		309.0'
		S-4	6-8	24	20	31 25 29 36	54	Bottom 6" - Dry, brown, fine to medium SAND, trace Silt, trace Gravel.					
								S-4: Very dense, dry, brown, SILT and fine to coarse SAND, little Gravel.				GLACIAL TILL	
10		S-5	10-12	24	18	23 41 29 39	70	S-5: Very dense, dry, olive-brown, fine to coarse SAND, some Silt, some gravel.		ND			
											12		303.0'
								Bottom of boring at 12 feet.	4				
15													
20													
25													
30													

REMARKS

1. Ground surface elevation estimated from topographic contours in an autoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Advanced borehole using hollow stem auger (HSA) method from ground surface to approximately 10 feet below existing ground surface.
3. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
4. Upon completion, borehole backfilled with cuttings to existing grade.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-204

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens, LLC
Due Diligence Geotechnical Evaluation
Proposed Development
45 Jackson Road Devens, MA

BORING NO.: GZ-205
SHEET: 1 of 1
PROJECT NO: 01.0174440.00
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental	**Type of Rig:** ATV	**Boring Location:** See Plan	**H. Datum:** See Plan
Foreman: James Hastings	**Rig Model:** CME 55LC	**Ground Surface Elev. (ft.):** 313	
Logged By: Glenn Larose	**Drilling Method:** HSA	**Final Boring Depth (ft.):** 14	**V. Datum:** See Plan
		Date Start - Finish: 11/5/2029 - 11/5/2019	

Auger/Casing Type: Hollow Stem Auger	**Sampler Type:** Split Spoon	
I.D/O.D.(in): 3.25/6.25	**I.D./O.D. (in.):** 1.375/2	
Hammer Weight (lb.):	**Sampler Hmr Wt (lb):** 140 lbs	
Hammer Fall (in.):	**Sampler Hmr Fall (in):** 30"	
Other:	**Other:** Autohammer	

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
Not Observed				

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0-2	24	12	3 5 6 7	11	S-1: Medium dense, dry, dark brown, fine to coarse SAND, some Silt, trace Roots/Leaves/Sticks.	1	0.4		TOPSOIL/SUBSOIL	
		S-2	2-4	24	8	7 8 10 14	18	S-2: Medium dense, dry, brown, fine to coarse SAND and GRAVEL, little Silt.	2 3	0.1	2		311.0'
5		S-3	4-6	24	12	16 18 23 20	41	S-3: Dense, dry, brown, fine to coarse SAND, some Gravel, little Silt.		ND		SAND/GRAVEL	
		S-4	6-8	24	20	24 22 26 27	48	S-4: Dense, dry, brown, fine to coarse SAND, some Gravel, little Silt.		ND			
											9		304.0'
10		S-5	10-11.2	14	0	9 45 100/2"	R	S-5: No Recovery	4			POSSIBLE GLACIAL TILL	
											11.2		301.8'
									5			WEATHERED BEDROCK	
											14		299.0'
15								Bottom of boring at 14 feet.	6				
20													
25													
30													

REMARKS

1. Ground surface elevation estimated from topographic contours in an autoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Advanced borehole using hollow stem auger (HSA) method from ground surface to approximately 14 feet below existing ground surface.
3. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
4. Driller noted increased HSA drill effort at approximately 9 feet.
5. Split spoon refusal at 11.2 feet. Advanced HSA from 11.2 to 14 feet with approximately 1000 psi down pressure with auger refusal at 14 feet.
6. Upon completion, borehole backfilled with cuttings to existing grade.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-205

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens, LLC
Due Diligence Geotechnical Evaluation
Proposed Development
45 Jackson Road Devens, MA

BORING NO.: GZ-206
SHEET: 1 of 1
PROJECT NO: 01.0174440.00
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental	**Type of Rig:** ATV	**Boring Location:** See Plan	**H. Datum:** See Plan
Foreman: James Hastings	**Rig Model:** CME 55LC	**Ground Surface Elev. (ft.):** 298	
Logged By: Glenn Larose	**Drilling Method:** HSA	**Final Boring Depth (ft.):** 7	**V. Datum:** See Plan
		Date Start - Finish: 11/5/2029 - 11/5/2019	

Auger/Casing Type: Hollow Stem Auger	**Sampler Type:** Split Spoon	
I.D/O.D.(in): 3.25/6.25	**I.D./O.D. (in.):** 1.375/2	
Hammer Weight (lb.):	**Sampler Hmr Wt (lb):** 140 lbs	
Hammer Fall (in.):	**Sampler Hmr Fall (in):** 30"	
Other:	**Other:** Autohammer	

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
Not observed				

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0-2	24	12	1 2 1 3	3	S-1: Top 6" - Dry, dark brown, fine to coarse SAND, some Silt, trace Leaves, Roots, Wood. Bottom 18" - Loose, moist, brown, fine to coarse SAND, some Silt, little Gravel.	1	ND	0.5	TOPSOIL	297.5'
		S-2	2-4	24	18	11 24 29 40	53	S-2: Very dense, dry, brown with orange/gray, fine to coarse SAND, some Silt, some Gravel.	2 3	ND	2	SUBSOIL	296.0'
5		S-3	4-6	24	20	18 21 24 23	45	S-3: Dense, dry, brown/gray with orange, fine to coarse SAND and SILT, little (+) Gravel.	4	ND		GLACIAL TILL	
									5		6.7 7	WEATHERED BEDROCK	291.3' 291.0'
								Bottom of boring at 7 feet.	6				
10													
									7				
15													
20													
25													
30													

REMARKS

1. Ground surface elevation estimated from topographic contours in an autoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Advanced borehole using hollow stem auger (HSA) method from ground surface to approximately 10 feet below existing ground surface.
3. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
4. Observed apparent exposed bedrock outcrop approximately 10 feet east of borehole.
5. Driller noted increased drill effort at 6.7 feet and HSA refusal at 7 feet. Driller noted probable weathered bedrock over bedrock at 6.7 and 7 feet, respectively.
6. Boring offset approximately 5 feet south and HSA advanced to refusal at 6.7 feet.
7. Upon completion, borehole backfilled with cuttings to existing grade.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

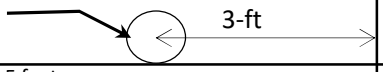
Boring No.: GZ-206

GZA
GeoEnvironmental, Inc.
Engineers/Scientists
249 Vanderbilt Ave
Norwood, MA 02062

Due Diligence Geotechnical Study
Proposed Development
45 Jackson Road
Devens, Massachusetts 01434

Test Pit No.	TP-201
Page No.	1 of 1
File No.	01.0174440.0
Checked By:	MJO

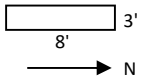
GZA Rep.	Glenn Larose	Contractor	Anchor Excavating Corporation			Date	11/15/2019
		Operator	Mark Stodard			Ground Elev.	343.5
Weather	P. Sunny 20-30s	Make	CAT	Model	308E	Time Started	0830
		Capacity	0.75 CY	Reach	~15 FT	Time Completed	0900

Depth	Soil Description	Sample No.	PID (PPM)	Excav. Effort	Boulders: Count/ Class	Note No.
0				E	0	1
1'				E	0	
2'	Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt, trace Brick/ Roots/ Wood/ Concrete.		ND	E	0	
3'	(FILL)			E	0	
4'	Apparent 12-inch-diameter ductile iron pipe 			E	0	2
5'	5'					3
	Bottom of excavation at 5 feet					
6'						
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from topography shown on an electronic drawing .dwg file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base."
2. Field testing results represent total organic vapor levels, refrenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Observed top of existing 12-inch-diameter ductile iron pipe located at the north side of the test pit approximately 4 to 5 feet. Test pit terminated at approximately 5 feet. Operator backfilled test pit location in ~ 12-inch thick lifts and each lift was tamped with the excavator bucket back to existing grade. Topsoil-like fill was used as the top lift of backfill and was reseeded.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Observed
(x) Not Observed

Elapsed Time to Reading (Hours)	Depth to Ground-water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA
GeoEnvironmental, Inc.
Engineers/Scientists
249 Vanderbilt Ave
Norwood, MA 02062

Due Diligence Geotechnical Study
Proposed Development
45 Jackson Road
Devens, Massachusetts 01434

Test Pit No. TP-201A
Page No. 1 of 1
File No. 01.0174440.0
Checked By: MJO

GZA Rep. Glenn Larose
Weather P. Sunny 20-30s

Contractor Anchor Excavating Corporation
Operator Mark Stodard
Make CAT Model 308E
Capacity 0.75 CY Reach ~15 FT

Date 11/15/2019
Ground Elev. 343.5
Time Started 0830
Time Completed 0900

Depth	Soil Description (Approx. East Side ← → Approx. West Side)	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0				E	0	1,2,3
1'	1' Wood & Concrete			E	0	4
2'				E	0	
3'	Dry, brown, fine to coarse, SAND and fine to coarse GRAVEL, little Silt, trace Brick/Roots/Wood/Concrete. (FILL)			E	0	
4'			ND	E	0	
5'				D	0	
6'				D	0	
7'	6.5' Damp, olive-brown with red staining, fine to coarse SAND, some Silt, some fine to coarse Gravel. (GLACIAL TILL)	S-1		D	0	
8'				D	0	
9'			ND	D	1A	
10'	10' Bottom of excavation at 10 feet			D	1A 1A	5,6,7
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from topography shown on an electronic drawing .dwg file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base."
2. Field testing results represent total organic vapor levels, refrenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Offset test pit approximately 30 feet north of test pit TP-201 staked location due to asphalt pavement and buried pipe at staked location.
4. Observed some large pieces of wood and a concrete structure from approximately 1 to 2 feet within the East sidewall.
5. Observed ground water at approximately 10 feet pooling at bottom of test pit.
6. Infiltration test performed adjacent to test pit location at a depth of approximately 8.5 feet.
7. Upon completion, test pit backfilled in 12-inch-thick lifts of excavated soil each tamped with the excavator bucket back to existing grade. Topsoil-like fill was used as the top lift of backfill and was reseeded.

Test Pit Plan
3' × 8'
N

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Observed
( ) Not Observed

Elapsed Time to Reading (Hours)	Depth to Ground-water
5 min	10'
	(see Note 5)

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA
GeoEnvironmental, Inc.
Engineers/Scientists
249 Vanderbilt Ave
Norwood, MA 02062

Due Diligence Geotechnical Study
Proposed Development
45 Jackson Road
Devens, Massachusetts 01434

Test Pit No. TP-202
Page No. 1 of 1
File No. 01.0174440.0
Checked By: MJO

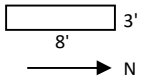
GZA Rep.	Glenn Larose	Contractor	Anchor Excavating Corporation			Date	11/15/2019
		Operator	Mark Stodard			Ground Elev.	337.5
Weather	P. Sunny 20-30s	Make	CAT	Model	308E	Time Started	0730
		Capacity	0.75 CY	Reach	~15 FT	Time Completed	0815

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt, trace Brick/Roots/Wood/Concrete. (FILL)			E	0	1,2
1'			ND	E	0	
2'				E	0	
2.5'	Dry, tan, fine SAND, some Silt. (silty SAND)	S-1	ND	E	0	
3'				E	0	
4'				E	0	3
5'	Dry, brown, fine to medium SAND, trace Silt. (SAND)		ND	E	0	
6'				E	0	4
7'	Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, trace (-) Silt. (SAND/GRAVEL)	S-2	ND	E	0	
8'				D	0	
8.5'	Damp, olive-brown with red staining, fine to coarse SAND, some Silt, some fine to coarse Gravel. (GLACIAL TILL)			D	1A 1A	
9'		S-3	ND	D	0	
10'				D	1A	5,6
11'						
12'	Bottom of excavation at 12 feet					
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from topography shown on an electronic drawing .dwg file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base."
2. Field testing results represent total organic vapor levels, refrenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Observed red/orange staining at approximately 4 feet and at 8.5 feet.
4. Infiltration test performed adjacent to test pit location at a depth of approximately 6.5 feet.
5. Test pit terminated in glacial till due to collapsing sand sidewall above.
6. Upon completion, test pit backfilled in 12-inch-thick lifts of excavated soil each tamped with the excavator bucket back to existing grade. Topsoil-like fill was used as the top lift of backfill and was reseeded.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Observed
(x) Not Observed

Elapsed Time to Reading (Hours)	Depth to Ground-water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA
GeoEnvironmental, Inc.
Engineers/Scientists
249 Vanderbilt Ave
Norwood, MA 02062

Due Diligence Geotechnical Study
Proposed Development
45 Jackson Road
Devens, Massachusetts 01434

Test Pit No. TP-203
Page No. 1 of 1
File No. 01.0174440.0
Checked By: MJO

GZA Rep. Glenn Larose
Weather P. Sunny 20-30s

Contractor Anchor Excavating Corporation
Operator Mark Stodard
Make CAT Model 308E
Capacity 0.75 CY Reach ~15 FT

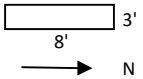
Date 11/14/2019
Ground Elev. 324
Time Started 1015
Time Completed 1045

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, dark brown, fine to coarse SAND, some Silt, trace fine Gravel, trace Roots/Leaves/Wood. (TOPSOIL)		ND	E	0	1,2
1'	Dry, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel, trace Roots. (SUBSOIL)		ND	E	0	
2'	Dry, brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt. (Gravelly SAND)			E	0	
3'			ND	E	0	
4'	Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt. (SAND/GRAVEL)			M	0	
5'				M	0	
6'			ND	M	0	
7'		S-1		M	0	
8'				D	0	
9'	9.8'		ND	D D	0	3,4 5,6
10'	Bottom of excavation at 10 feet					
11'						
12'	Wet, olive-brown with red, fine to coarse SAND, some Silt, little fine to coarse Gravel. (GLACIAL TILL)					
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from topography shown on an electronic drawing .dwg file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base."
2. Field testing results represent total organic vapor levels, refrenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Observed groundwater or perched water infiltrating into excavation from sidewalls at 9 to 9.8 feet.
4. Observed orange/red staining of soil at approximately 9.8 feet.
5. Test pit terminated in glacial till due to sidewall collapse from water infiltration at 10 feet.
6. Upon completion, test pit backfilled in 12-inch-thick lifts of excavated soil each tamped with the excavator bucket back to existing grade. Topsoil was used as the top lift of backfill and was reseeded.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(x) Observed
( ) Not Observed

Elapsed Time to Reading (Hours)	Depth to Ground-water
10 mins	9'
see Note 3	

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

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Due Diligence Geotechnical Study	
Proposed Development	
45 Jackson Road	
Devens, Massachusetts 01434	

Test Pit No.	TP-204
Page No.	1 of 1
File No.	01.0174440.0
Checked By:	MJO

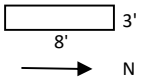
GZA Rep.	Glenn Larose	Contractor	Anchor Excavating Corporation			Date	11/14/2019
		Operator	Mark Stodard			Ground Elev.	317.5
Weather	P. Sunny 20-30s	Make	CAT	Model	308E	Time Started	0945
		Capacity	0.75 CY	Reach	~15 FT	Time Completed	1000

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, dark brown, fine to coarse SAND, some Silt, trace fine Gravel, trace Roots/Leaves/Wood. (TOPSOIL)		ND	E	0	1,2
1'						
1'	Dry, brown, fine to coarse SAND, some Silt, little Gravel, trace Roots. (SUBSOIL)		ND	E	0	
2'						
2'	Dry, brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt. (Gravelly SAND)		ND	E	0	
3'						
3'	Damp, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt. (SAND/GRAVEL)	S-1		E	0	
4'						
4'				E	0	
5'						
5'				M	0	
6'			ND			
6'				M	0	
7'						
7'				M	0	
8'						
8'				D	0	3
9'						4
9'				D	1B	
10'			ND			5,6
10'	Bottom of excavation at 10 feet					
11'						
12'	Wet, olive-brown with red, fine to coarse SAND, some Silt, little fine to coarse Gravel. (GLACIAL TILL)					
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from topography shown on an electronic drawing .dwg file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base."
2. Field testing results represent total organic vapor levels, refrenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Observed water or perched water seeping into excavation from sidewalls at about 8.7 feet.
4. Observed orange/red staining of soil at approximately 9 feet.
5. Test pit terminated in glacial till at 10 feet due to sidewall collapse from water infiltration.
6. Upon completion, test pit backfilled in 12-inch-thick lifts of excavated soil each tamped with the excavator bucket back to existing grade. Topsoil was used as the top lift of backfill.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow
ft = feet

GROUNDWATER
(x) Observed
( ) Not Observed

Elapsed Time to Reading (Hours)	Depth to Ground-water
20 mins	8.7'
see Note 3	

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

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Due Diligence Geotechnical Study
Proposed Development
45 Jackson Road
Devens, Massachusetts 01434

Test Pit No.	TP-205
Page No.	1 of 1
File No.	01.0174440.0
Checked By:	MJO

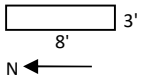
GZA Rep.	Glenn Larose	Contractor	Anchor Excavating Corporation			Date	11/14/2019
		Operator	Mark Stodard			Ground Elev.	307
Weather	P. Sunny 20-30s	Make	CAT	Model	308E	Time Started	0900
		Capacity	0.75 CY	Reach	~15 FT	Time Completed	0930

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, dark brown, fine to coarse SAND, some Silt, trace fine Gravel, trace Roots/Leaves/Wood. (TOPSOIL)		ND	E	0	1,2
1'						
2'	Dry, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel, trace Roots. (SUBSOIL)		ND	E	0	
3'				E	0	
4'	Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt. (SAND/GRAVEL)			E	1A	
5'			ND	E	1A	
6'				D	0	
6.5'				D	0	
7'	Damp, olive-brown with red staining, fine to coarse SAND, some Silt, little fine to coarse Gravel. (GLACIAL TILL)		ND	D	0	
8'				D	1A	3 4
8.5'		S-1				
9'	Bottom of excavation at 9 feet (Refusal on apparent Bedrock)					
10'						
11'	Damp, fine to coarse plate-like GRAVEL, little fine to coarse Sand, trace Silt. (Weathered BEDROCK)					
12'						
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from topography shown on an electronic drawing .dwg file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base."
2. Field testing results represent total organic vapor levels, refrenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Observed orange/red staining of soil from approximately 8 to 8.5 feet.
4. Upon completion, test pit backfilled in 12-inch-thick lifts of excavated soil each tamped with the excavator bucket back to existing grade. Topsoil was used as the top lift of backfill.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Observed
(x) Not Observed

Elapsed Time to Reading (Hours)	Depth to Ground-water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

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Due Diligence Geotechnical Study
Proposed Development
45 Jackson Road
Devens, Massachusetts 01434

Test Pit No. TP-206
Page No. 1 of 1
File No. 01.0174440.0
Checked By: MJO

GZA Rep. Glenn Larose
Weather P. Sunny 20-30s

Contractor Anchor Excavating Corporation
Operator Mark Stodard
Make CAT Model 308E
Capacity 0.75 CY Reach ~15 FT

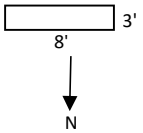
Date 11/14/2019
Ground Elev. 292
Time Started 0745
Time Completed 0800

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	Dry, dark brown, fine to coarse SAND, some Silt, trace fine Gravel, trace Roots/Leaves/Wood. (TOPSOIL)	S-1	ND	E	0	1,2
2'	Dry, brown, fine to coarse SAND, some Silt, little Gravel, trace Roots. (SUBSOIL)		ND	E	0	
3'	Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt. (SAND/GRAVEL)		ND	E	0	
4'				E/M	0	3
5'	Damp, olive-brown with red staining, fine to coarse SAND, some Silt, little fine to coarse Gravel. (GLACIAL TILL)		ND	D	1A	
5.5'	Bottom of excavation at 5.5 feet (Refusal on apparent Bedrock)			D	1A	4
6'	Damp, fine to coarse plate-like GRAVEL, little fine to coarse Sand, trace Silt. (Weathered BEDROCK)					
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from topography shown on an electronic drawing .dwg file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base."
2. Field testing results represent total organic vapor levels, refrenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Observed orange/red staining of soil at approximately 3.4 feet.
4. Upon completion, test pit backfilled in 12-inch-thick lifts of excavated soil each tamped with the excavator bucket back to existing grade. Topsoil was used as the top lift of backfill.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Observed
(x) Not Observed

Elapsed Time to Reading (Hours)	Depth to Ground-water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

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Due Diligence Geotechnical Study	
Proposed Development	
45 Jackson Road	
Devens, Massachusetts 01434	

Test Pit No.	TP-207
Page No.	1 of 1
File No.	01.0174440.0
Checked By:	MJO

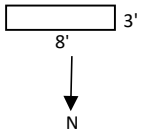
GZA Rep.	Glenn Larose	Contractor	Anchor Excavating Corporation			Date	11/14/2019
		Operator	Mark Stodard			Ground Elev.	295
Weather	P. Sunny 20-30s	Make	CAT	Model	308E	Time Started	0830
		Capacity	0.75 CY	Reach	~15 FT	Time Completed	0850

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	Dry, dark brown, fine to coarse SAND, some Silt, trace fine Gravel, trace Roots/Leaves/Wood. (TOPSOIL)	S-1	ND	E	0	1,2
2'	Dry, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel, trace Roots. (SUBSOIL)		ND	E	1C	
3'	Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt. (SAND/GRAVEL)			E	0	
4'			ND	E/M	0	3
5'	Dry, olive-brown with red staining, fine to coarse SAND, some Silt, little fine to coarse Gravel. (GLACIAL TILL)		ND	D	0	
5.5'					1A	
6'			ND	D	1A	4
6'	Bottom of excavation at 6 feet (Refusal on apparent Bedrock)					
7'						
8'	Damp, fine to coarse plate-like GRAVEL, little fine to coarse Sand, trace Silt. (Weathered BEDROCK)					
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from topography shown on an electronic drawing .dwg file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base."
2. Field testing results represent total organic vapor levels, refrenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Observed orange/red staining of soil at approximately 4 feet.
4. Upon completion, test pit backfilled in 12-inch-thick lifts of excavated soil each tamped with the excavator bucket back to existing grade. Topsoil was used as the top lift of backfill and was reseeded.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Observed
(x) Not Observed

Elapsed Time to Reading (Hours)	Depth to Ground-water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

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Due Diligence Geotechnical Study
Proposed Development
45 Jackson Road
Devens, Massachusetts 01434

Test Pit No. TP-208
Page No. 1 of 1
File No. 01.0174440.0
Checked By: MJO

GZA Rep. Glenn Larose
Weather P. Sunny 20-30s

Contractor Anchor Excavating Corporation
Operator Mark Stodard
Make CAT Model 308E
Capacity 0.75 CY Reach ~15 FT

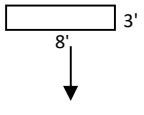
Date 11/14/2019
Ground Elev. 319
Time Started 1300
Time Completed 1345

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	Dry, dark brown, fine to coarse SAND, some Silt, trace fine Gravel, trace Roots/Leaves/Wood. (TOPSOIL)		ND	E	0	1,2
2'	Dry, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel, trace Roots. (SUBSOIL)		ND	E	0	
3'	Dry, brown, fine to coarse SAND, some fine to coarse Gravel, trace Silt. (Gravelly SAND)		ND	E	0	
4'				E	0	
5'	Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt. (SAND/GRAVEL)		ND	M	0	
6'				M	1A	
7'				D	1C	3
8'	Damp, olive-brown with red staining, fine to coarse SAND, some Silt, little fine to coarse Gravel. (GLACIAL TILL)			D	0	4
9'		S-1	ND	D	1C	
9.5'				D	2C	
10'						5
	Bottom of excavation at 10 feet (Refusal on apparent Bedrock)					
11'						
12'	Damp, fine to coarse plate-like GRAVEL, little fine to coarse Sand, trace Silt. (Weathered BEDROCK)					
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from topography shown on an electronic drawing .dwg file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base."
2. Field testing results represent total organic vapor levels, refrenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Observed orange/red staining of soil at approximately 6 feet.
4. Observed red/gray staining throughout glacial till layer.
5. Upon completion, test pit backfilled in 12-inch-thick lifts of excavated soil each tamped with the excavator bucket back to existing grade. Topsoil was used as the top lift of backfill.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Observed
(x) Not Observed

Elapsed Time to Reading (Hours)	Depth to Ground-water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

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Due Diligence Geotechnical Study
Proposed Development
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Test Pit No. TP-209
Page No. 1 of 1
File No. 01.0174440.0
Checked By: MJO

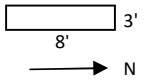
GZA Rep.	Glenn Larose	Contractor	Anchor Excavating Corporation			Date	11/14/2019
		Operator	Mark Stodard			Ground Elev.	328
Weather	P. Sunny 20-30s	Make	CAT	Model	308E	Time Started	1145
		Capacity	0.75 CY	Reach	~15 FT	Time Completed	1215

Depth	Approx. South Side ← Soil Description → Approx. North Side	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, dark brown, fine to coarse SAND, some Silt, trace fine Gravel, trace Roots/Leaves/Wood. (TOPSOIL)		ND	E	0	1,2
1'						
2'	Dry, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel, trace Asphalt/Brick/Roots. (FILL)		ND	E	0	
3'				E	0	
4'	Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt. (SAND/GRAVEL)		ND	M	1C	
5'				M	0	3,4
6'				M/D	1A	
7'	Damp, olive-brown with red staining, fine to coarse SAND, some Silt, little fine to coarse Gravel. (GLACIAL TILL)			D	0	
8'				D	2B	
9'	BEDROCK			D	1C	
10'		S-1	ND	D	0	
10.5'				D	1A	5,6
11'	Bottom of excavation at 11 feet					
12'						
13'	Damp, fine to coarse plate-like GRAVEL, little fine to coarse Sand, trace Silt. (Weathered BEDROCK)					
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from topography shown on an electronic drawing .dwg file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base."
2. Field testing results represent total organic vapor levels, refrenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Phocheck Tiger organic vapor meter (OVM) equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Observed orange/red staining of soil at approximately 5 feet.
4. Observed top of bedrock ranged from approximately 4 to 5 feet below ground surface on north side of excavation.
5. Test pit terminated in apparent bedrock at 11 feet due to excavator bucket refusal.
6. Upon completion, test pit backfilled in 12-inch-thick lifts of excavated soil each tamped with the excavator bucket back to existing grade. Topsoil was used as the top lift of backfill.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Observed
(x) Not Observed

Elapsed Time to Reading (Hours)	Depth to Ground-water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Appendix C – 2020 Test Boring and Test Pit Logs

BORING LOG GUIDE

BORING LOG LEGEND

GS Elev. = Ground Surface Elevation
NAVD = North American Vertical Datum
NR = No Recovery
S.S. = Split Spoon
Stab. = Stabilization Time for groundwater reading
WOH = Weight of Hammer
WOR = Weight of Rods

SOIL DESCRIPTIONS

Soil samples are described on the exploration logs by the "Modified Burmister Soil Identification System". The following provides a brief description of the Modified Burmister System.

1. Major and minor components of the soil matrix are identified as gravel, sand or fines. The relative amounts of these constituents are proportioned as:

Component	Proportional Term	Percent by Weight of Total
Major		Greater than percentage of other components
Minor	And	35-50
	Some	20-35
	Little	10-20
	Trace	1-10

2. The nature of "fines" is defined by using the following guidelines:

Degree of Plasticity	Identity	Plasticity Index
Non-plastic	SILT	0
Slight	Clayey SILT	1-5
Low	SILT & CLAY	5-10
Medium	CLAY & SILT	10-20
High	Silty CLAY	20-40
Very High	CLAY	40 and Greater

3. For boring logs, relative density or consistency is identified based on standard penetration resistance, using the following table.

Non-Plastic Soils		Plastic Soils	
Blows/ft "N"	Relative Density	Blows/ft "N"	Consistency
0-4	Very Loose	<2	Very Soft
4-10	Loose	2-4	Soft
10-30	Medium Dense	4-8	Medium Stiff
30-50	Dense	8-15	Stiff
>50	Very Dense	15-30	Very Stiff
		>30	Hard

BEDROCK DESCRIPTIONS

Rock samples described on the exploration logs are generally based on the International Society of Rock Mechanics (ISRM) System, as generally described on the following page. Each rock sample was generally described using the following guideline, in the order presented:

1. Field hardness: very hard, hard, moderately hard, medium, soft, very soft
2. Weathering: fresh, very slight, slight, moderate, moderately severe, severe, very severe, complete
3. Rock continuity (fracturing): extremely, moderately, slightly, sound
4. Texture: amorphous, fine, medium, coarse, very coarse
5. Color
6. Rock type
7. Fractures, Bedding, and Foliation, Spacing and Attitude
8. Rock Quality Designation (RQD)

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens LLC
Supplemental Explorations - Devens Biotech Development
45 Jackson Road
Devens, Massachusetts

BORING NO.: GZ-301
SHEET: 1 of 1
PROJECT NO: 01.0174440.01
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental, Inc.
Foreman: Joe Gruga
Logged By: Luke Prohaske

Type of Rig: Truck
Rig Model: Mobile B-57
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 341.5
Final Boring Depth (ft.): 15
Date Start - Finish: 9/10/2020 - 9/10/2020

H. Datum: See Plan
V. Datum: See Plan

Auger/Casing Type: HSA
I.D./O.D.: 4.25"/8"
Hmr Weight (lb.): -
Hmr Fall (in.): -
Other: -

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375"/2"
Sampler Hmr Wt: 140
Sampler Hmr Fall: 30
Other: Auto Hammer

Groundwater Depth (ft.)

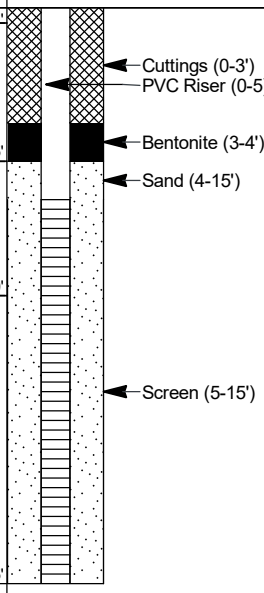
Date	Time	Water Depth	Casing	Stab. Time
9/11/20	1555	7	WELL	1 day
9/22/20	0800	9.5	WELL	12 days
10/23/20	1320	9.2	WELL	1.5 months

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
		S-1	0-2	24	5	4 14 13 16	27	S-1: Medium dense, dry, dark brown to brown, fine to coarse SAND and SILT, little Asphalt, trace Gravel.	1 2	ND
		S-2	2-4	24	4	20 15 17 13	32	S-2: Dense, dry, brown, fine to coarse SAND and GRAVEL, little Silt.	3	ND
5		S-3	4-6	24	14	4 4 8 6	12	S-3: Medium dense, moist, brown to gray with occasional orange, fine to coarse SAND, some Silt, some Gravel.	4	ND
10		S-4	9-10	12	10	23 60/6"	R	S-4: Very dense, moist, gray with orange/red staining, GRAVEL and fine to coarse SAND, trace Silt. (Weathered BEDROCK)	5 6	0.2
15		S-5	14-14.3	3	1	25/3"	R	S-5: (Tip of spoon) Very dense, damp, brown, fine to coarse SAND and GRAVEL, some Silt. (Apparent Weathered BEDROCK)	7 8	ND
20								Bottom of boring at 15 feet.		
25										
30										

Stratum Description

Depth (ft)	Description	Elev. (ft)
0.4'	ASPHALT/FILL	341.1'
4'	FILL	337.5'
7.5'	SILTY SAND/GRAVEL	334.0'
15'	WEATHERED BEDROCK	326.5'

Equipment Installed



REMARKS

1. Ground surface elevation estimated from topographic contours in an AutoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Driller noted that split spoon began to veer from vertical while sampling from 1.5 to 2 feet (possible cobble or boulder).
4. Slight orange-stained soil observed in bottom 4 inches of sample S-3.
5. Moisture observed on outside of split spoon at sample S-4.
6. Two small fragments of red ceramic observed in auger cutting at approximately 10 feet.
7. Driller noted auger refusal at approximately 15 feet on probable bedrock.
8. Upon completion, observation well with steel standpipe installed as shown.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-301

TEST BORING LOG

GZA
GeoEnvironmental, Inc.
Engineers and Scientists

King Devens LLC
Supplemental Explorations - Devens Biotech Development
45 Jackson Road
Devens, Massachusetts

BORING NO.: GZ-302
SHEET: 1 of 1
PROJECT NO: 01.0174440.01
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental, Inc.
Foreman: Joe Gruga
Logged By: Luke Prohaske

Type of Rig: Truck
Rig Model: Mobile B-57
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 341
Final Boring Depth (ft.): 17.5
Date Start - Finish: 9/10/2020 - 9/10/2020

H. Datum: See Plan
V. Datum: See Plan

Auger/Casing Type: HSA
I.D./O.D.: 4.25"/8"
Hmr Weight (lb.): -
Hmr Fall (in.): -
Other: -

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375"/2"
Sampler Hmr Wt: 140
Sampler Hmr Fall: 30
Other: Auto Hammer

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
9/10/20	1310 hrs	DRY (17.5')	17.5	10 min.

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description (Depth (ft) / Elev. (ft))	Equipment Installed
		S-1	0-2	24	13	5 7 5 3	12	S-1: Medium dense, dry, brown to dark brown, fine to coarse SAND, little Gravel, little Silt, trace Roots.	1 2	ND	TOPSOIL 2' / 339.0'	No Equipment Installed
		S-2	2-4	24	9	4 4 4 4	8	S-2: (Top 4") Loose, dry, brown, fine to coarse SAND, some Gravel, some Silt, trace Roots.	3	ND	2.3' / 338.7' SUBSOIL	
5		S-3	4-6	24	14	7 10 17 15	27	S-2: (Bottom 5") Loose, dry, brown, fine to coarse SAND, little Gravel, little (-) Silt.		ND	SAND/GRAVEL	
								S-3: Medium dense, dry, brown, fine to coarse SAND, some Gravel, little (-) Silt.			7.5' / 333.5'	
10		S-4	9-11	24	21	5 11 16 16	27	S-4: Medium dense, damp, brown, fine to coarse SAND and GRAVEL, some Clayey Silt.		ND	GLACIAL TILL	
15		S-5	14-15.1	13	11	21 27 25/1"	R	S-5: Very dense, damp, brown, fine to coarse SAND, some Gravel, some (-) Silt.	4	ND	17.5' / 323.5'	
								Bottom of boring at 17.5 feet.	5 6			
20												
25												
30												

REMARKS

1. Ground surface elevation estimated from topographic contours in an AutoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Offset borehole approximately 12 feet northwest of marked location due to apparent conflict with marked underground utilities.
4. Probable boulder noted and passed around 15.1 feet based on samping and drill effort changes.
5. Driller noted auger refusal at 17.5 feet on possible bedrock or boulder.
6. Upon completion, borehole backfilled with drill cuttings to approximately ground surface level.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-302

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens LLC
Supplemental Explorations - Devens Biotech Development
45 Jackson Road
Devens, Massachusetts

BORING NO.: GZ-303
SHEET: 1 of 1
PROJECT NO: 01.0174440.01
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental, Inc.
Foreman: Joe Gruga
Logged By: Luke Prohaske

Type of Rig: Truck
Rig Model: Mobile B-57
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 338
Final Boring Depth (ft.): 15
Date Start - Finish: 9/10/2020 - 9/10/2020

H. Datum: See Plan
V. Datum: See Plan

Auger/Casing Type: HSA
I.D./O.D.: 4.25"/8"
Hmr Weight (lb.): -
Hmr Fall (in.): -
Other: -

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375"/2"
Sampler Hmr Wt: 140
Sampler Hmr Fall: 30
Other: Auto Hammer

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
9/11/20	1600	11.4	WELL	1 day
9/22/20	0755	DRY (15')	WELL	12 days
10/23/20	1310	DRY(15')	WELL	1.5 months

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
0		S-1	0-2	24	16	8 8 6 7	14	S-1: (Top 4") Medium dense, dry, dark brown, fine to coarse SAND, some Silt, trace Roots.	1 2	ND
		S-2	2-4	24	11	9 7 8 8	15	S-1: (Bottom 12") Medium dense, dry, brown, fine to coarse SAND, little Gravel, little Silt.		ND
5		S-3	4-6	24	12	9 9 9 13	18	S-2: Medium dense, dry, brown/orange, fine to coarse SAND and GRAVEL, little Silt. S-3: Medium dense, dry, brown, GRAVEL and fine to coarse SAND, trace (+) Silt.		ND
10		S-4	9-11	24	0	15 22 22 20	44	S-4: No recovery.	3	
		S-5	11-11.8	9	7	22 50/3"	R	S-5: (Top 3") Dry, brown, fine to coarse SAND and GRAVEL, trace Silt. S-5: (Bottom 4") Very dense, dry, brown with gray and occasional orange, fine to coarse SAND, some Silt, some Gravel.	4	ND
15		S-6	15-15	0	0	50/0"	R	S-6: No penetration. Bottom of boring at 15 feet.	5 6	
20										
25										
30										

Stratum Description

Depth (ft)	Description	Elev. (ft)
0.4'	TOPSOIL	337.6'
11.3'	SAND/GRAVEL	326.7'
15'	GLACIAL TILL	323.0'

Equipment Installed

Cuttings (0-3')
PVC Riser (0-5)
Bentonite (3-4')
Sand (4-15')
Screen (5-15')

REMARKS

1. Ground surface elevation estimated from topographic contours in an AutoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Gravel observed in tip of spoon on sample S-4.
4. Driller noted boulder/cobble from about 14 to 14.5 feet based on drill effort changes.
5. Driller noted auger refusal at approximately 15 feet on possible boulder or bedrock.
6. Upon completion, observation well with steel standpipe installed as shown.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-303

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens LLC
Supplemental Explorations - Devens Biotech Development
45 Jackson Road
Devens, Massachusetts

BORING NO.: GZ-304
SHEET: 1 of 1
PROJECT NO: 01.0174440.01
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental, Inc.
Foreman: Jamie Hastings
Logged By: Luke Prohaske

Type of Rig: Truck
Rig Model: Mobile B-57
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 324
Final Boring Depth (ft.): 16
Date Start - Finish: 9/11/2020 - 9/11/2020

H. Datum: See Plan
V. Datum: See Plan

Auger/Casing Type: HSA
I.D./O.D.: 4.25"/8"
Hmr Weight (lb.): -
Hmr Fall (in.): -
Other: -

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375"/2"
Sampler Hmr Wt: 140
Sampler Hmr Fall: 30
Other: Auto Hammer

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
9/17/20	1525	DRY(16')	WELL	6 days
9/22/20	0805	DRY(16')	WELL	11 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
0		S-1	0-2	24	16	8 16 15 12	31	S-1: (Top 5") Dry, brown, fine to coarse SAND, some Gravel, some Silt, trace Roots.	1 2	12.8
		S-2	2-4	24	8	10 8 6 5	14	S-1: (Bottom 11") Dry, brown, GRAVEL, some fine to coarse Sand, some Asphalt, little Silt.	3	ND
5		S-3	4-6	24	7	7 8 9 12	17	S-2: Medium dense, dry, brown, fine to coarse SAND and GRAVEL, trace (+) Silt.		ND
		S-4	6-8	24	15	15 16 18 22	34	S-3: Medium dense, dry, brown, fine to coarse SAND and GRAVEL, trace Silt.	4	ND
10		S-5	9-10.8	21	12	13 22 33 50/3"	55	S-4: Dense, dry, brown, fine to coarse SAND and GRAVEL, tr (+) Silt. S-5: Dense, moist, brown with gray and occasional orange, fine to coarse SAND and GRAVEL, some Silt.		ND
	4:00	C-1	11-16	60	56			C-1: Medium hard to hard, slightly weathered, gray, fine grained to amorphous, SCHIST, subhorizontal to moderately dipping bedding, with close to very close subhorizontal to vertical joints/fractures.	5 6	
	2:00									
	2:30									
15	2:00									
	2:30							RQD=0%	7	
20								Bottom of boring at 16 feet.		
25										
30										

Stratum Description

Depth (ft)	Description	Elev. (ft)
0.5'	FOREST MAT	323.5'
2'	ASPHALT/FILL	322.0'
8.5'	SAND/GRAVEL	315.5'
10.8'	GLACIAL TILL	313.2'
16'	BEDROCK	308.0'

Equipment Installed

- Cuttings (0-4')
- PVC Riser (0-6)
- Bentonite (4-5')
- Screen (6-16')
- Sand (5-16')

REMARKS

1. Ground surface elevation estimated from topographic contours in an AutoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Groundwater level measured after introducing water for rock core.
4. Slight orange stained soil observed in sample S-5.
5. Driller noted auger refusal at 11 feet.
6. Driller worked the core barrel up and down slightly while advancing core barrel from 11 to 12 feet, resulting in an increased core time.
7. Upon completion, observation well with steel standpipe installed as shown.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-304

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens LLC
Supplemental Explorations - Devens Biotech Development
45 Jackson Road
Devens, Massachusetts

BORING NO.: GZ-305
SHEET: 1 of 1
PROJECT NO: 01.0174440.01
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental, Inc.
Foreman: Jamie Hastings
Logged By: Luke Prohaske

Type of Rig: Truck
Rig Model: Mobile B-57
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 311
Final Boring Depth (ft.): 16.5
Date Start - Finish: 9/11/2020 - 9/11/2020

H. Datum: See Plan
V. Datum: See Plan

Auger/Casing Type: HSA
I.D./O.D.: 4.25"/8"
Hmr Weight (lb.): -
Hmr Fall (in.): -
Other: -

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375"/2"
Sampler Hmr Wt: 140
Sampler Hmr Fall: 30
Other: Auto Hammer

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
		Not Measured		

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description (Depth (ft) / Elev. (ft))	Equipment Installed
		S-1	0-2	24	14	3 2 7 7	9	S-1: (Top 5") Dry, dark brown, fine to medium SAND, some Silt, little Roots, trace Leaves.	1 2	4.0	0.5' FOREST MAT 310.5'	No Equipment Installed
		S-2	2-4	24	11	10 12 12 15	24	S-1: (Bottom 9") Loose, dry, brown, fine to coarse SAND, little Silt, little Gravel.	3	ND	SAND/GRAVEL	
5		S-3	4-6	24	17	7 24 33 38	57	S-2: Medium dense, dry, brown, fine to coarse SAND and GRAVEL, little (-) Silt.		ND	4.3' 306.7'	
		S-4	6-6.8	9	6	44 50/3"	R	S-3: (Top 8") Dry, brown, fine to coarse SAND and GRAVEL, trace Silt.		ND	GLACIAL TILL	
10		S-5	9-11	24	14	25 34 37 35	71	S-3: (Bottom 9") Very dense, dry, brown with occasional orange staining, fine to coarse SAND and GRAVEL, some Clayey Silt.		ND	8' 303.0'	
15		S-6	14-14.5	6	6	75/6"	R	S-4: Very dense, brown, fine to coarse SAND, some Gravel, some Clayey Silt. S-5: Very dense, dry, gray with red staining, GRAVEL and fine to coarse SAND, little Silt. (Weathered BEDROCK) S-6: Very dense, moist, gray with brown and red staining, GRAVEL and fine to coarse SAND, some Silt. (Weathered BEDROCK)		ND	WEATHERED BEDROCK 16.5' 294.5'	
									4 5			
20								Bottom of boring at 16.5 feet.				
25												
30												

REMARKS

1. Ground surface elevation estimated from topographic contours in an AutoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Offset boring 9 feet southeast of marked location to avoid access restriction from nearby trees.
4. Driller noted auger refusal at approximately 16.5 feet on probable bedrock.
5. Upon completion, borehole backfilled with soil cuttings to approximate ground surface level.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-305

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens LLC
Supplemental Explorations - Devens Biotech Development
45 Jackson Road
Devens, Massachusetts

BORING NO.: GZ-306
SHEET: 1 of 1
PROJECT NO: 01.0174440.01
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental, Inc.
Foreman: Jamie Hastings
Logged By: Luke Prohaske

Type of Rig: Truck
Rig Model: Mobile B-57
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 312.5
Final Boring Depth (ft.): 14.5
Date Start - Finish: 9/10/2020 - 9/12/2020

H. Datum: See Plan
V. Datum: See Plan

Auger/Casing Type: HSA
I.D./O.D.: 4.25"/8"
Hmr Weight (lb.): -
Hmr Fall (in.): -
Other: -

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375"/2"
Sampler Hmr Wt: 140
Sampler Hmr Fall: 30
Other: Auto Hammer

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
9/17/20	1530	DRY(14.5')	WELL	5 days
9/22/20	0810	DRY(14.5')	WELL	10 days
10/23/20	1330	DRY(14.5')	WELL	1.5 months

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
0		S-1	0-2	24	9	3 4 4 8	8	S-1: (Top 5") Loose, dry, dark brown, fine to medium SAND and SILT, little Roots, trace Leaves. S-1: (Bottom 4") Dry, brown, fine to coarse SAND, some Silt, little Gravel.	1 2	ND
		S-2	2-4	24	13	9 11 14 16	25	S-2: Medium dense, dry, light brown, fine to coarse SAND and GRAVEL, little Silt.		ND
5		S-3	4-5.7	20	8	8 17 47 60/2"	64	S-3: Very dense, dry, brown, fine to coarse SAND and GRAVEL, little Silt.		ND
10		S-4	9-11	24	18	12 17 18 17	35	S-4: Dense, moist, brown, fine to coarse SAND and GRAVEL, some Silt.		ND
15		S-5	14-14.3	4	4	60/4"	R	S-5: Very dense, moist, gray with red/orange staining, fine to coarse SAND and GRAVEL, little (-) Silt. (Weathered BEDROCK)	3 4 5	ND
20								Bottom of boring at 14.5 feet.		
25										
30										

Depth (ft)	Stratum Description	Elev. (ft)
0.4'	FOREST MAT	312.1'
	SUBSOIL	
2'		310.5'
	SAND/GRAVEL	
7.5'		305.0'
	GLACIAL TILL	
12.5'		300.0'
	WEATHERED BEDROCK	
14.5'		298.0'

Equipment Installed
- PVC Riser (0-6.5)
- Cuttings (0-4')
- Bentonite (4-6')
- Sand (5.5-14.5')
- Screen (6.5-14.5')

REMARKS

1. Ground surface elevation estimated from topographic contours in an AutoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Driller noted auger refusal at approximately 14.5 feet on probable bedrock.
4. Offset 4.5 feet south of original borehole location and advanced auger to refusal at approximately 14.5 feet on probable bedrock.
5. Upon completion, observation well with steel standpipe installed as shown.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-306

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

King Devens LLC
Supplemental Explorations - Devens Biotech Development
45 Jackson Road
Devens, Massachusetts

BORING NO.: GZ-307
SHEET: 1 of 1
PROJECT NO: 01.0174440.01
REVIEWED BY: MJO

Drilling Co.: Drilex Environmental, Inc.
Foreman: Jamie Hastings
Logged By: Luke Prohaske

Type of Rig: Truck
Rig Model: Mobile B-57
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 299
Final Boring Depth (ft.): 19
Date Start - Finish: 9/10/2020 - 9/10/2020

H. Datum: See Plan
V. Datum: See Plan

Auger/Casing Type: HSA
I.D./O.D.: 4.25"/8"
Hmr Weight (lb.): -
Hmr Fall (in.): -
Other: -

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375"/2"
Sampler Hmr Wt: 140
Sampler Hmr Fall: 30
Other: Auto Hammer

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
9/11/20	1550	18	WELL	1 day
9/22/20	0815	18.7	WELL	12 days
10/23/20	1335	DRY(19')	WELL	1.5 months

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
0		S-1	0-2	24	12	3 3 7 11	10	S-1: (Top 5") Dry, dark brown, SILT, some fine to medium Sand, little Roots, trace Wood.	1 2	ND
		S-2	2-4	24	23	27 58 62 32	R	S-1: (Bottom 7") Medium dense, dry, brown, fine to coarse SAND and GRAVEL, little Silt.		ND
5		S-3	4-6	24	21	19 33 37 58	70	S-2: Very dense, dry, brown to light brown, GRAVEL and fine to coarse SAND, trace Silt.	3	ND
								S-3: Very dense, moist, brown with gray and orange staining, fine to coarse SAND and GRAVEL, some Silt.		
10		S-4	9-11	24	16	21 22 26 23	48	S-4: Dense, moist, brown, fine to coarse SAND, some Gravel, some Silt.		ND
		S-5	13-14.1	13	13	41 62 60/1"	R	S-5: Very dense, moist, brown, fine to coarse SAND, some Gravel, some Silt.	4 5	ND
20		S-6	19-19	0	0	40/0"	R	S-6: No penetration. Bottom of boring at 19 feet.	6	
25										
30										

Stratum Description

Depth (ft)	Elev. (ft)	Description
0.5'	298.5'	FOREST MAT
		SAND/GRAVEL
4'	295.0'	
		GLACIAL TILL
19'	280.0'	

Equipment Installed

Cuttings (0-7')
PVC Riser (0-9')
Bentonite (7-8')
Screen (9-19')
Sand (8-19')

REMARKS

1. Ground surface elevation estimated from topographic contours in an AutoCAD existing conditions drawing file prepared by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg," no date indicated.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppmv).
3. Slight orange-stained soil observed in bottom 12 inches of sample S-3.
4. Probable boulder noted and passed around 14.1 feet based on samping and drill effort changes.
5. Split spoon sampler and auger refusal noted at about 19 feet indicating probable bedrock.
6. Upon completion, observation well with steel standpipe installed as shown.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: GZ-307

GZA
GeoEnvironmental, Inc.
Engineers/Scientists
249 Vanderbilt Avenue
Norwood, MA 02062

Supplemental Geotechnical Study
King Devens, LLC
45 Jackson Road
Devens, Massachusetts

Test Pit No. TP-301
Page No. 1 of 1
File No. 01.0174440.01
Checked By: MJO

GZA Rep. L. Prohaske
Weather Cloudy, 50-70s
Contractor Drilex
Operator Joe Gruda
Make Takeuchi Model TB290
Capacity ~0.25 CY Reach ~12 FT
Date 9/17/2020
Ground Elev. 338
Time Started 1440
Time Completed 1515

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0						
0.8'	Dry, dark brown, fine to coarse SAND, some Silt, little Gravel, trace Roots (TOPSOIL)	S-1	ND	E	0	1, 2
1'						
2'	Dry, brown , fine to coarse SAND and GRAVEL, little Silt, trace Cobbles (FILL)	S-2	ND	E/M	0	
3'	Moist, light brown with orange, fine to coarse SAND and GRAVEL, some Silt, trace Cobbles (FILL)	S-3	ND	E/M	0	
4'				E/M	0	
4.3'				E	0	
5'	Moist, brown, fine to coarse SAND, some Gravel, trace Cobbles, trace Silt (SAND/GRAVEL)			E	0	
6'				E	0	
7'		S-4	ND	E	0	
8'				E	0	
9'				E	0	
10'				E	0	3
10'	Bottom of Test Pit 10 feet					
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from plan entitled "MasterPlan_Base.dwg", prepared by Highpoint Engineering, Inc.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Test pit terminated at approximately 10 feet below ground surface due to multiple test pit sidewall collapses. Upon completion, test pit was backfilled with excavated material in lifts and tamped with the heel of the excavator bucket. Topsoil and grass seed were spread over the disturbed ground surface.

Test Pit Plan
12'
3.5'
NORTH

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(X) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA
GeoEnvironmental, Inc.
Engineers/Scientists
249 Vanderbilt Avenue
Norwood, MA 02062

Supplemental Geotechnical Study
King Devens, LLC
45 Jackson Road
Devens, Massachusetts

Test Pit No. TP-302
Page No. 1 of 1
File No. 01.0174440.01
Checked By: MJO

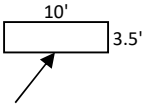
GZA Rep.	L. Prohaske	Contractor	Drilex			Date	9/18/2020
		Operator	Joe Gruda			Ground Elev.	332
Weather	Cloudy, 50-60s	Make	Takeuchi	Model	TB290	Time Started	0920
		Capacity	~0.25 CY	Reach	~12 FT	Time Completed	1045

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, brown, fine to coarse SAND and GRAVEL, little Silt, trace Aslphalt, trace Roots (FILL)	S-1	ND	M	0	1, 2
1.2'				M	0	
2'	Dry, light brown with orange, fine to coarse SAND, some Gravel, some Silt, trace Cobbles (FILL)	S-2	ND	E/M	0	
3'				E/M	0	
4'				E/M	0	
4'	Dry, brown, fine to coarse SAND and GRAVEL, little Cobbles, trace Silt (SAND/GRAVEL)			E/M	0	
6'		S-3	ND	E/M	0	
7'				E/M	2A	
8'				E/M	4A	
9'				M	2A	
9.5'	Moist, brown, fine to coarse SAND, some Gravel, some Clayey Silt, trace Cobbles (GLACIAL TILL)	S-4	ND	M/D	1A, 2B	
10'				M/D		3
11'						
11.5'	Bottom of Test Pit 11.5 feet					
12'						
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from plan entitled "MasterPlan_Base.dwg", prepared by Highpoint Engineering, Inc.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Test pit terminated at approximately 11.5 feet below ground surface due to multiple test pit sidewall collapses. Upon completion, test pit was backfilled with excavated material in lifts and tamped with the heel of the excavator bucket.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(X) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA
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Supplemental Geotechnical Study
King Devens, LLC
45 Jackson Road
Devens, Massachusetts

Test Pit No. TP-303
Page No. 1 of 1
File No. 01.0174440.01
Checked By: MJO

GZA Rep.	L. Prohaske	Contractor	Drilex			Date	9/18/2020
		Operator	Joe Gruda			Ground Elev.	315.5
Weather	Cloudy, 50-60s	Make	Takeuchi	Model	TB290	Time Started	0830
		Capacity	~0.25 CY	Reach	~12 FT	Time Completed	0910

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, dark brown, fine to medium SAND and SILT, little Gravel, trace Roots (FOREST MAT)	S-1	ND	E/M	0	1, 2
1'						
2'	Dry, light brown, fine to coarse SAND and GRAVEL, trace (+) Silt, trace Cobbles (SAND/GRAVEL)	S-2	ND	E	0	
3'				E	0	
4'	Dry, brown, fine to coarse SAND and GRAVEL, trace Cobbles, trace Silt (SAND/GRAVEL)	S-3	ND	E	0	
5'				E	0	
6'				E/M	0	
7'	Moist, brown with gray and occasional orange, fine to coarse SAND, some Gravel, some Silt, trace Cobbles (GLACIAL TILL)	S-4	ND	M	0	
8'				M/D	2A	
9'				D	3A	3
10'	Bottom of Test Pit 8.8 feet (Refusal on apparent BEDROCK)					
11'						
12'						
13'						
14'						
15'						
16'						

5.8'
8.8'

Notes:

1. Ground surface elevation estimated from plan entitled "MasterPlan_Base.dwg", prepared by Highpoint Engineering, Inc.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Test pit terminated at approximately 8.8 feet due to excavator refusal on apparent bedrock. Upon completion, test pit was backfilled with excavated material in lifts and tamped with the heel of the excavator bucket.

Test Pit Plan
10' × 3'
NORTH

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(X) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA
GeoEnvironmental, Inc.
Engineers/Scientists
249 Vanderbilt Avenue
Norwood, MA 02062

Supplemental Geotechnical Study
King Devens, LLC
45 Jackson Road
Devens, Massachusetts

Test Pit No.	TP-304
Page No.	1 of 1
File No.	01.0174440.01
Checked By:	MJO

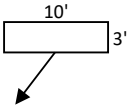
GZA Rep.	L. Prohaske	Contractor	Drilex			Date	9/18/2020
		Operator	Joe Gruda			Ground Elev.	322
Weather	Cloudy, 50-60s	Make	Takeuchi	Model	TB290	Time Started	1125
		Capacity	~0.25 CY	Reach	~12 FT	Time Completed	1215

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, brown, fine to coarse SAND, little Gravel, little Silt, trace (-) Roots, trace (-) Metal, trace (-)Asphalt (FILL)			M	3A	1, 2
1'				M	2A	
2'		S-1	ND	M	3A	
3'				M	1A	
4'				M	2A	
5'						
5.5'						
6'	Dry, brown, fine to medium SAND, some Silt, trace Gravel, trace Roots (BURIED TOPSOIL)	S-2	ND	E/M	0	
7'				E/M	0	
8'	Light brown, fine to coarse SAND, little Silt, little Gravel, trace Cobbles (Silty SAND)	S-3	ND	E/M	1A	
9'				M	0	
9'	Dry, brown, fine to coarse SAND, some Clayey Silt, little Gravel, trace Cobbles (GLACIAL TILL)	S-4	ND	D	1A	
10'						
10.5'						
11'		S-5	ND	D	0	3
11'	Bottom of Test Pit 11 feet (Refusal on apparent BEDROCK)					
12'						
13'	Dry, gray/orange/brown, plate-like GRAVEL, little Cobbles, little fine to coarse Sand, trace Silt (weathered BEDROCK)					
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from plan entitled "MasterPlan_Base.dwg", prepared by Highpoint Engineering, Inc.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Test pit terminated at approximately 11 feet due to excavator refusal on apparent bedrock. Upon completion, test pit was backfilled with excavated material in lifts and tamped with the heel of the excavator bucket.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
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GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(X) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA
GeoEnvironmental, Inc.
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249 Vanderbilt Avenue
Norwood, MA 02062

Supplemental Geotechnical Study	
King Devens, LLC	
45 Jackson Road	
Devens, Massachusetts	

Test Pit No.	TP-305
Page No.	1 of 1
File No.	01.0174440.01
Checked By:	MJO

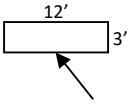
GZA Rep.	L. Prohaske	Contractor	Drilex			Date	9/21/2020
		Operator	Jamie Hastings			Ground Elev.	297.5
Weather	Clear, 30-60s	Make	Takeuchi	Model	TB290	Time Started	1120
		Capacity	~0.25 CY	Reach	~12 FT	Time Completed	1150

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0		S-1				
1'	Dry, dark brown, fine to medium SAND and SILT, trace Roots (TOPSOIL) 0.8'		1.8	E	0	1, 2
2'	Dry, light brown, fine to coarse SAND, some Gravel, little (-) Silt, trace (-) Roots (SAND/GRAVEL) 2.2'	S-2	ND	E	0	
3'				E	0	
4'	Dry, brown, fine to coarse SAND, some Gravel, little Silt, trace Cobbles (SAND/GRAVEL)	S-3	ND	E	0	
5'	5.3'			E	0	
6'				M/D	1A	
7'	Dry, brown/gray with orange/red, fine to coarse SAND, some Gravel, some Clayey Silt, trace Cobbles (GLACIAL TILL) 7.8'	S-4	ND	D	2A	
8'	8.1'			D	0	
9'	Bottom of Test Pit 8.1 feet (Refusal on apparent BEDROCK)	S-5	ND	D	1A	3
10'						
11'						
12'						
13'	Dry, gray/orange with brown, plate-like GRAVEL, little fine to coarse Sand, trace Cobbles, trace Silt (weathered BEDROCK)					
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from plan entitled "MasterPlan_Base.dwg", prepared by Highpoint Engineering, Inc.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Test pit terminated at approximately 8.1 feet below ground surface due to excavator refusal on apparent bedrock. Upon completion, test pit was backfilled with excavated material in lifts and tamped with the heel of the excavator bucket.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
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M = Medium
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F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(X) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA
GeoEnvironmental, Inc.
Engineers/Scientists
249 Vanderbilt Avenue
Norwood, MA 02062

Supplemental Geotechnical Study
King Devens, LLC
45 Jackson Road
Devens, Massachusetts

Test Pit No. TP-306
Page No. 1 of 1
File No. 01.0174440.01
Checked By: MJO

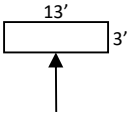
GZA Rep.	L. Prohaske	Contractor	Drilex			Date	9/21/2020
		Operator	Jamie Hastings			Ground Elev.	305.5
Weather	Clear, 30-60s	Make	Takeuchi	Model	TB290	Time Started	0816
		Capacity	~0.25 CY	Reach	~12 FT	Time Completed	0900

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0						
0.8'	Dry, dark brown, fine to medium SAND and SILT, trace Roots (FOREST MAT)	S-1	ND	E	0	1, 2
1'		S-2	ND	E	0	
2'	Dry, brown/orange, fine to coarse SAND, some (-) Silt, little Gravel, trace Roots (SUBSOIL)			E	0	
3'				E	0	
4'	Dry, brown, fine to coarse SAND and GRAVEL, trace Cobbles, trace Silt (SAND/GRAVEL)	S-3	ND	E/M	0	
5'				E/M	0	
6'				M	1A	
6.5'	Moist, brown with gray, Clayey SILT, some fine to coarse Sand, some Gravel, trace Cobbles (GLACIAL TILL)	S-4	ND	M/D	2A	3
7.7'						
8'	Bottom of Test Pit at 8 feet (Refusal on apparent BEDROCK)	S-5	ND			
9'						
10'	Dry, gray/red/orange, plate-like GRAVEL, little fine to coarse Sand, trace Cobbles, trace Silt (weathered BEDROCK)					
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from plan entitled "MasterPlan_Base.dwg", prepared by Highpoint Engineering, Inc.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Test pit terminated at approximately 8 feet below ground surface due to excavator refusal on apparent bedrock. Upon completion, test pit was backfilled with excavated material in lifts and tamped with the heel of the excavator bucket.

Test Pit Plan



Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(X) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

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Supplemental Geotechnical Study
King Devens, LLC
45 Jackson Road
Devens, Massachusetts

Test Pit No. TP-307
Page No. 1 of 1
File No. 01.0174440.01
Checked By: MJO

GZA Rep.	L. Prohaske	Contractor	Drilex			Date	9/17/2020
		Operator	Jamie Hastings			Ground Elev.	324.5
Weather	Cloudy, 50-70s	Make	Takeuchi	Model	TB290	Time Started	1305
		Capacity	~0.25 CY	Reach	~12 FT	Time Completed	1400

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0						
1'	Dry, dark brown, fine to coarse SAND, some Gravel, some Silt, trace Roots (FOREST MAT)	S-1	ND	E	0	1, 2
2'	Dry, light brown, fine to coarse SAND, some Silt, some Gravel, trace Roots (SUBSOIL)	S-2	ND	E	0	
2.3'				E/M	0	
3'	Dry, brown, GRAVEL and fine to coarse SAND, trace Silt, trace Cobbles (SAND/GRAVEL)	S-3	ND	M	1A	
4.2'				M	0	
5'				M/D	1A	
6'				D	1A	
7'	Dry, brown with gray and occasional orange, fine to coarse SAND, some Gravel, some Clayey Silt, trace Cobbles (GLACIAL TILL)	S-4	ND	D	1A	
8'				D	1A, 1B	
9'				D	3A	
10'				D	3A	3, 4
11'	Bottom of Test Pit 11 feet (Refusal on apparent BEDROCK)					
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from plan entitled "MasterPlan_Base.dwg", prepared by Highpoint Engineering, Inc.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Fragments of decomposed rock observed at about 10.5 to 11 feet below ground surface (bgs) within the Till strata.
4. Test pit terminated at approximately 11 feet below ground surface due to excavator refusal on apparent bedrock. Upon completion, test pit was backfilled with excavated material in lifts and tamped with the heel of the excavator bucket.

Test Pit Plan
9'
3'
NORTH

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(X) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

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Supplemental Geotechnical Study
King Devens, LLC
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Devens, Massachusetts

Test Pit No. TP-308
Page No. 1 of 1
File No. 01.0174440.01
Checked By: MJO

GZA Rep.	L. Prohaske	Contractor	Drilex			Date	9/17/2020
		Operator	Jamie Hastings			Ground Elev.	330
Weather	Cloudy, 50-70s	Make	Takeuchi	Model	TB290	Time Started	1140
		Capacity	~0.25 CY	Reach	~12 FT	Time Completed	1230

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, brown, fine to coarse SAND, some Silt, little Gravel, trace Roots (FOREST MAT)	S-1	ND	E	0	1, 2
1'						
1' 2.2'	Dry, light brown/orange, fine to coarse SAND, some Silt, some Gravel (SUBSOIL)	S-2	ND	E/M	0	
2'				E/M	0	
3'	Dry, brown, fine to coarse SAND and GRAVEL, trace Silt, trace Cobbles (SAND/GRAVEL)	S-3	ND	M	0	
4'				M	0	
5'				M	0	
6' 5.7'				M	0	
7'	Moist, brown with gray/orange, fine to coarse SAND, some Gravel, some Silt and Clay, trace Cobbles (GLACIAL TILL)	S-4	ND	M	1A	
8'				M/D	2A	
9'				M/D	1A	
10' 10'				M/D	2A	3
11'	Bottom of Test Pit 10 feet below ground surface					
12'						
13'						
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from plan entitled "MasterPlan_Base.dwg", prepared by Highpoint Engineering, Inc.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Test pit terminated at approximately 10 feet below ground surface. Upon completion, test pit was backfilled with excavated material in lifts and tamped with the heel of the excavator bucket.

Test Pit Plan
11'
3'
NORTH

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(X) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

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Supplemental Geotechnical Study
King Devens, LLC
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Devens, Massachusetts

Test Pit No. TP-309
Page No. 1 of 1
File No. 01.0174440.01
Checked By: MJO

GZA Rep.	L. Prohaske	Contractor	Drilex			Date	9/18/2020
		Operator	Jamie Hastings			Ground Elev.	340.5
Weather	Cloudy, 50-60s	Make	Takeuchi	Model	TB290	Time Started	1240
		Capacity	~0.25 CY	Reach	~12 FT	Time Completed	1335

Depth	Soil Description	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, dark brown, fine to coarse SAND and SILT, some Gravel, trace Cobbles, trace Roots	S-1	ND	E/M	1A	1, 2
1'	1' (TOPSOIL)			E/M	0	
2'				E	0	
3'				E	0	
4'				E	1A	
5'	Dry, brown, fine to coarse SAND, some Gravel, trace Cobbles, trace Silt (SAND/GRAVEL)	S-2	ND	E	0	
6'				E	0	3
7'				E	2A	
8'				E/M	5A	
9'	9.6'					
10'	Damp, brown with gray, fine to coarse SAND, some Clayey Silt, some Gravel, trace Cobbles	S-3	ND	M	3A	
	10.5' (GLACIAL TILL)					
11'	11'	S-4	ND	M/D	0	4
12'	Bottom of Test Pit 11 feet below ground surface (Refusal on apparent BEDROCK)					
13'	Damp, gray/brown with orange, plate-like GRAVEL, some fine to coarse SAND, trace Cobbles, trace Silt (weathered BEDROCK)					
14'						
15'						
16'						

Notes:

1. Ground surface elevation estimated from plan entitled "MasterPlan_Base.dwg", prepared by Highpoint Engineering, Inc.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Slight increase in Cobbles observed with depth between approximately 1 and 9.6 feet below ground surface (bgs).
4. Test pit terminated at approximately 11 feet due to excavator refusal on apparent bedrock. Upon completion, test pit was backfilled with excavated material in lifts and tamped with the heel of the excavator bucket. Topsoil and grass seed were spread over the disturbed area.

Test Pit Plan
11'
3'
NORTH

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(X) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

Appendix D – Falling Head Borehole and Single-Ring Infiltrometer Permeability Test Results

Updated:
10/29/2020

Geotechnical Exploration - Wick Test and Single-Ring Infiltrometer Summary

Boring No.	Exploration Type	Year Performed	Approximate Ground Surface Elevation (ft)	Approximate Falling Head Test Elevation (ft)	Estimated Hydraulic Conductivity k		Comments
					(cm/sec)	(ft/day)	
GZ-101	boring	2008	335	329	2E-03	6E+00	test #1
GZ-101	boring	2008	335	329	3E-03	7E+00	test #2
GZ-104	boring	2008	328	322	2E-03	7E+00	
GZ-107	boring	2008	343	338	1E-04	4E-01	
GZ-110	boring	2008	341	331	1E-04	3E-01	
GZ-113	boring	2008	306	303	8E-05	2E-01	
GZ-113A	boring	2008	306	303.5	9E-05	3E-01	
GZ-115	boring	2008	302	299	3E-03	8E+00	
GZ-117	boring	2008	313	310	5E-04	1E+00	
GZ-119	boring	2008	309	304	1E-04	4E-01	
GZ-119A	boring	2008	309	306.5	6E-05	2E-01	
TP-201A	test pit	2019	343.5	335	5.8E-03	1.6E+01	
TP-202	test pit	2019	337.5	331	1.4E-01	4.0E+02	
TP-306	test pit	2020	305.5	298.2	2.6E-03	7.4E+00	
TP-307	test pit	2020	324.5	317.4	3.5E-03	9.8E+00	

Notes:

1. Ground surface elevations for the 2008 borings interpreted from existing site contour plan prepared by S.J. Mullaney Companies, Inc. dated 1/8/08 and ground surface elevations for the 2019 and 2020 test pits were estimated from an existing conditions electronic drawing file entitled "MasterPlan_Base.dwg" transmitted by Highpoint Engineering, Inc. on October 31, 2019. Actual ground surface elevations may vary.
2. Approximate falling head wick test and single ring infiltrometer test elevation referenced to center of test zone.
3. For all 2008 borings (except boring GZ-110), for the two 2019 test pits (TP-201A and TP-202), and for the two 2020 test pits (TP-306 and TP-307) permeability test results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area estimated to be similar to the exposed surface area of the wick.

J:\170,000-179,999\174440\174440-01.MJO\WORK\Calcs\[2020 to 2008 k_test-summary.xls]Summary Table

Appendix D.1 – 2008 Falling Head Borehole Permeability Test Results

GZ-101 INFILTRATION TEST DATA

Test # 1 from 5 to 7 feet

Casing Outside Diameter, D (cm) =	11.43	
Casing Inside Diameter (cm) =	10.16	
Depth to Bottom of Casing (feet) =	5.0	(measured from ground surface)
Depth to Bottom of Borehole (feet) =	7.0	(measured from ground surface)
Casing Stickup (feet) =	5.17	
Zone tested, L (cm) =	60.96	
L/D =	5.33	
Ground Surface Elevation (feet) =	335	
Depth to Water from Top of Casing (Before filling water into the casing in feet) =		NA
Depth to Approximate Ground Water Level (feet beg) =		11

Date	Time Elasped (minute)	Time Elasped (second)	Depth of Water from Top of Casing (ft)	
1/18/2008				
	0.0	0	5.50	
	0.3	15	5.60	
	0.4	25	5.70	
	0.8	45	5.80	
	1.0	60	5.90	
	1.5	90	6.00	
	2.0	120	6.50	
	2.8	165	7.00	
	3.5	210	7.50	
	5.0	300	8.00	
	6.3	380	8.50	
	9.5	570	9.00	
	20.0	1200	9.50	
	40.0	2400	10.00	

Length of Test Interval (cm)	Exposed Surface Area, A (cm^2)	Drop in Water Level (ft)	Time Interval (sec)	Volume of Water (cm^3)	Flow Rate, Q (cm^3/sec)	**Estimated Hydraulic conductivity, k (cm/sec)**	**Estimated Hydraulic conductivity, k (ft/day)**
60.96	2292	4.50	2400	11120	4.6	**2E-03**	**6E+00**

Notes:

(1) Data presented represents falling head testing conducted by New Hampshire Boring and GZA.

(2) Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area estimated to be similar to the exposed surface area of the wick.

(3) Depth to groundwater from ground surface estimated based on nearby test pits TP-120 and TP-122.

(4) Could not fill casing to top with water - water level dropping too quickly.

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GZ-101 INFILTRATION TEST DATA

Test # 2 from 5 to 7 feet

Casing Outside Diameter, D (cm) =	11.43	
Casing Inside Diameter (cm) =	10.16	
Depth to Bottom of Casing (feet) =	5.0	(measured from ground surface)
Depth to Bottom of Borehole (feet) =	7.0	(measured from ground surface)
Casing Stickup (feet) =	5.17	
Zone tested, L (cm) =	60.96	
L/D =	5.33	
Ground Surface Elevation (feet) =	335	
Depth to Water from Top of Casing (Before filling water into the casing in feet) =		NA
Depth to Approximate Ground Water Level (feet beg) =		11.0

Date	Time Elasped (minute)	Time Elasped (second)	Depth of Water from Top of Casing (ft)	
1/21/2008				
	0.0	0	5.60	
	0.3	15	5.80	
	0.6	35	6.00	
	0.8	50	6.20	
	1.0	60	6.30	
	1.4	85	6.40	
	1.6	96	6.50	
	1.8	109	6.70	
	2.0	120	6.80	
	2.1	128	6.90	
	2.3	140	7.00	
	2.6	155	7.10	
	3.0	180	7.40	
	4.0	240	7.80	
	4.5	270	8.00	
	4.8	289	8.10	
	5.1	306	8.20	
	5.4	325	8.30	
	5.7	344	8.40	
	6.1	365	8.50	
	8.0	480	9.00	
	9.7	580	9.20	
	11.6	696	9.40	
	16.7	1000	9.60	
	23.0	1380	9.80	
	30.5	1830	10.00	

Length of Test Interval (cm)	Exposed Surface Area, A (cm^2)	Drop in Water Level (ft)	Time Interval (sec)	Volume of Water (cm^3)	Flow Rate, Q (cm^3/sec)	**Estimated Hydraulic conductivity, k (cm/sec)**	**Estimated Hydraulic conductivity, k (ft/day)**
60.96	2292	4.40	1830	10873	5.9	**3E-03**	**7E+00**

Notes:

(1) Data presented represents falling head testing conducted by New Hampshire Boring and GZA.

(2) Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area estimated to be similar to the exposed surface area of the wick.

(3) Depth to groundwater from ground surface estimated based on nearby test pits TP-120 and TP-122.

(4) Could not fill casing to top with water - water level dropping too quickly.

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GZ-104 INFILTRATION TEST DATA

Test # 1 from 5 to 7 feet

Casing Outside Diameter, D (cm) =	11.43	
Casing Inside Diameter (cm) =	10.16	
Depth to Bottom of Casing (feet) =	5.0	(measured from ground surface)
Depth to Bottom of Borehole (feet) =	7.0	(measured from ground surface)
Casing Stickup (feet) =	3.0	
Zone tested, L (cm) =	60.96	
L/D =	5.33	
Ground Surface Elevation (feet) =	328	
Depth to Water from Top of Casing (Before filling water into the casing in feet) =		NA
Depth to Approximate Ground Water Level (feet beg) =		8

Date	Time Elasped (minute)	Time Elasped (second)	Depth of Water from Top of Casing (ft)	
1/21/2008				
	0.0	0	0.00	
	0.3	15	0.08	
	0.5	30	0.17	
	0.8	50	0.25	
	1.2	70	0.33	
	1.5	90	0.42	
	1.8	110	0.50	
	2.3	135	0.60	
	2.8	165	0.70	
	3.0	180	0.80	
	3.3	200	0.90	
	3.7	220	1.00	
	4.1	245	1.10	
	4.5	270	1.20	
	4.8	290	1.30	
	5.3	320	1.40	
	5.8	350	1.50	
	6.2	370	1.60	
	6.6	395	1.70	
	7.0	420	1.80	
	7.5	450	1.90	
	8.0	480	2.00	
	10.0	600	2.40	
	12.3	735	2.80	
	13.5	810	3.00	
	17.2	1030	3.50	
	21.0	1260	4.00	
	25.5	1530	4.50	
	30.8	1845	5.00	
	49.5	2970	6.70	

Length of Test Interval (cm)	Exposed Surface Area, A (cm^2)	Drop in Water Level (ft)	Time Interval (sec)	Volume of Water (cm^3)	Flow Rate, Q (cm^3/sec)	**Estimated Hydraulic conductivity, k (cm/sec)**	**Estimated Hydraulic conductivity, k (ft/day)**
60.96	2292	6.7	2970	16556	5.6	**2E-03**	**7E+00**

Notes:

(1) Data presented represents falling head testing conducted by New Hampshire Boring and GZA.

(2) Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area estimated to be similar to the exposed surface area of the wick.

(3) Depth to groundwater from ground surface estimated based on closest adjacent test pits TP-118 and TP-136.

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GZ-107 INFILTRATION TEST DATA

Test # 1 from 4 to 6 feet

Casing Outside Diameter, D (cm) =	11.43	
Casing Inside Diameter (cm) =	10.16	
Depth to Bottom of Casing (feet) =	4.0	(measured from ground surface)
Depth to Bottom of Borehole (feet) =	6.0	(measured from ground surface)
Casing Stickup (feet) =	3.0	
Zone tested, L (cm) =	60.96	
L/D =	5.33	
Ground Surface Elevation (feet) =	343	
Depth to Water from Top of Casing (Before filling water into the casing in feet) =		NA
Depth to Approximate Ground Water Level (feet beg) =		8

Date	Time Elasped (minute)	Time Elasped (second)	Depth of Water from Top of Casing (ft)	
1/18/2008				
	0.0	0	0.00	
	0.0	1	0.17	
	0.1	3	0.42	
	0.1	5	0.67	
	0.1	7	0.75	
	0.2	12	0.83	
	0.2	14	1.00	
	0.3	17	1.08	
	0.3	19	1.17	
	0.4	21	1.25	
	0.8	50	1.33	
	1.0	60	1.42	
	1.8	105	1.50	
	6.0	360	1.58	
	10.0	600	1.67	
	20.0	1200	1.75	
	30.0	1800	1.83	

Length of Test Interval (cm)	Exposed Surface Area, A (cm^2)	Drop in Water Level (ft)	Time Interval (sec)	Volume of Water (cm^3)	Flow Rate, Q (cm^3/sec)	**Estimated Hydraulic conductivity, k (cm/sec)**	**Estimated Hydraulic conductivity, k (ft/day)**
60.96	2292	0.08	600	206	0.3	**1E-04**	**4E-01**

Notes:

(1) Data presented represents falling head testing conducted by New Hampshire Boring and GZA.

(2) Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area estimated to be similar to the exposed surface area of the wick.

(3) Depth to groundwater from ground surface estimated based on nearby test pit TP-106.

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GZ-110 FALLING HEAD PERMEABILITY TEST DATA

Test # 1 from 9 to 11 ft

Casing Outside Diameter, D (cm) =	11.43
Casing Inside Diameter (cm) =	10.16
Depth to Bottom of Casing (feet) =	9.0
Depth to Bottom of Borehole (feet) =	11.0
Casing Stickup (feet) =	1.0
Zone tested, L (cm) =	60.96
L/D =	5.33
Ground Surface Elevation (feet) =	341.0
Depth to Water from Top of Casing (Before filling water into the casing in feet) =	NA
Depth to Approximate Ground Water Level (feet beg) =	8

Date	Time Elasped (minute)	Time Elasped (second)	Depth of Water from Top of Casing (ft)	Piezometric Head "H" (ft)
1/17/2008				
	0.0	0	0.00	9.00
	0.5	30	0.08	8.92
	1.0	60	0.17	8.83
	1.3	75	0.25	8.75
	1.8	110	0.33	8.67
	2.7	160	0.42	8.58
	3.5	210	0.50	8.50
	5.0	300	0.67	8.33
	5.7	340	0.75	8.25
	6.5	390	0.83	8.17
	7.5	450	0.92	8.08
	8.2	490	1.00	8.00
	9.0	540	1.08	7.92
	9.7	580	1.17	7.83
	10.5	630	1.25	7.75
	11.5	690	1.33	7.67
	12.3	740	1.42	7.58
	13.0	780	1.50	7.50
	14.0	840	1.58	7.42
	14.8	890	1.67	7.33
	15.5	930	1.75	7.25
	16.8	1010	1.83	7.17
	17.6	1055	1.92	7.08
	18.7	1120	2.00	7.00
	19.5	1170	2.08	6.92
	20.8	1245	2.17	6.83
	22.0	1320	2.25	6.75

Based on the data, the average permeability estimated to be:

H1 (ft) =	8.75		T1 (second) =	75
H2 (ft) =	7.08		T2 (second) =	1055
Ave. Permeability, k =	1E-04	cm/s		
k =	3E-01	ft/day		

Notes:

(1) Data presented represents falling head testing conducted by New Hampshire Boring and GZA.

(2) Permeability tests were conducted in general accordance with procedures outlined by Hvorslev (1951).

(3) Assume that transformation ratio, m = 1, since vertical permeability = horizontal permeability.

(4) Depth to groundwater from ground surface estimated based on nearby test pits TP-103 through TP-105.

J:\19,000-20,999\19707\19707-00.PJM\Calcs\[k_test-GZ110.XLS]GZ110-T1 WICK

GZ-113 INFILTRATION TEST DATA

Test # 1 from 2 to 4 feet

Casing Outside Diameter, D (cm) =	11.43	
Casing Inside Diameter (cm) =	10.16	
Depth to Bottom of Casing (feet) =	2.0	(measured from ground surface)
Depth to Bottom of Borehole (feet) =	4.0	(measured from ground surface)
Casing Stickup (feet) =	3.0	
Zone tested, L (cm) =	60.96	
L/D =	5.3	
Ground Surface Elevation (feet) =	306	
Depth to Water from Top of Casing (Before filling water into the casing in feet) =		NA
Depth to Approximate Ground Water Level (feet beg) =		7

Date	Time Elasped (minute)	Time Elasped (second)	Depth of Water from Top of Casing (ft)	
1/22/2008				
	0.0	0	0.00	
	1.0	60	0.05	
	10.0	600	0.10	
	35.0	2100	0.15	

Length of Test Interval (cm)	Exposed Surface Area, A (cm^2)	Drop in Water Level (ft)	Time Interval (sec)	Volume of Water (cm^3)	Flow Rate, Q (cm^3/sec)	**Estimated Hydraulic conductivity, k (cm/sec)**	**Estimated Hydraulic conductivity, k (ft/day)**
60.96	2292	0.15	2100	371	0.18	**8E-05**	**2E-01**

Notes:

(1) Data presented represents falling head testing conducted by New Hampshire Boring and GZA.

(2) Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area estimated to be similar to the exposed surface area of the wick.

(3) Depth to groundwater from ground surface estimated based on nearby test pit TP-128.

J:\19,000-20,999\19707\19707-00.PJM\Calcs\[k_test-GZ113.XLS]GZ113-T1 WICK

GZ-113A INFILTRATION TEST DATA

Test # 1 from 3 to 4 feet

Casing Outside Diameter, D (cm) =	11.43	
Casing Inside Diameter (cm) =	10.16	
Depth to Bottom of Casing (feet) =	3.0	(measured from ground surface)
Depth to Bottom of Borehole (feet) =	4.0	(measured from ground surface)
Casing Stickup (feet) =	2.3	
Zone tested, L (cm) =	30.48	
L/D =	2.7	
Ground Surface Elevation (feet) =	306	
Depth to Water from Top of Casing (Before filling water into the casing in feet) =		NA
Depth to Approximate Ground Water Level (feet beg) =		7

Date	Time Elasped (minute)	Time Elasped (second)	Depth of Water from Top of Casing (ft)	
1/23/2008				
	0.0	0	0.00	
	4.0	240	0.04	
	15.0	900	0.08	
	30.0	1800	0.08	

Length of Test Interval (cm)	Exposed Surface Area, A (cm^2)	Drop in Water Level (ft)	Time Interval (sec)	Volume of Water (cm^3)	Flow Rate, Q (cm^3/sec)	**Estimated Hydraulic conductivity, k (cm/sec)**	**Estimated Hydraulic conductivity, k (ft/day)**
30.48	1197	0.08	1800	198	0.11	**9E-05**	**3E-01**

Notes:

(1) Data presented represents falling head testing conducted by New Hampshire Boring and GZA.

(2) Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area estimated to be similar to the exposed surface area of the wick.

(3) Depth to groundwater from ground surface estimated based on nearby test pit TP-128.

J:\19,000-20,999\19707\19707-00.PJM\Calcs\[k_test-GZ113A.XLS]GZ113A-T1 WICK

GZ-115 INFILTRATION TEST DATA

Test # 1 from 2 to 4 feet

Casing Outside Diameter, D (cm) =	11.43	
Casing Inside Diameter (cm) =	10.16	
Depth to Bottom of Casing (feet) =	2.0	(measured from ground surface)
Depth to Bottom of Borehole (feet) =	4.0	(measured from ground surface)
Casing Stickup (feet) =	3.0	
Zone tested, L (cm) =	60.96	
L/D =	5.3	
Ground Surface Elevation (feet) =	302	
Depth to Water from Top of Casing (Before filling water into the casing in feet) =		NA
Depth to Approximate Ground Water Level (feet beg) =		4

Date	Time Elasped (minute)	Time Elasped (second)	Depth of Water from Top of Casing (ft)	
1/22/2008				
	0.0	0	0.00	
	1.0	60	3.00	
	1.3	75	3.10	
	1.7	100	3.20	
	2.1	125	3.30	
	2.4	145	3.40	
	2.9	171	3.50	
	3.3	195	3.60	
	3.8	225	3.70	
	4.3	255	3.80	
	4.8	290	3.90	
	5.3	320	4.00	
	6.0	360	4.10	
	6.8	410	4.20	
	7.3	440	4.30	
	7.9	475	4.40	
	8.5	510	4.50	
	9.7	580	4.60	
	10.7	640	4.70	
	11.8	710	4.80	
	12.5	750	4.90	
	14.3	860	5.00	
	17.0	1020	5.20	
	21.0	1260	5.40	
	35.0	2100	5.60	

Length of Test Interval (cm)	Exposed Surface Area, A (cm^2)	Drop in Water Level (ft)	Time Interval (sec)	Volume of Water (cm^3)	Flow Rate, Q (cm^3/sec)	**Estimated Hydraulic conductivity, k (cm/sec)**	**Estimated Hydraulic conductivity, k (ft/day)**
60.96	2292	5.6	2100	13838	6.6	**3E-03**	**8E+00**

Notes:

(1) Data presented represents falling head testing conducted by New Hampshire Boring and GZA.

(2) Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area estimated to be similar to the exposed surface area of the wick.

(3) Depth to groundwater from ground surface estimated based on nearby test pit TP-123.

(4) Water level dropping too quickly top 3 feet of casing to obtain accurate reading.

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GZ-117 INFILTRATION TEST DATA

Test # 1 from 2 to 4 feet

Casing Outside Diameter, D (cm) =	11.43	
Casing Inside Diameter (cm) =	10.16	
Depth to Bottom of Casing (feet) =	2.0	(measured from ground surface)
Depth to Bottom of Borehole (feet) =	4.0	(measured from ground surface)
Casing Stickup (feet) =	3.0	
Zone tested, L (cm) =	60.96	
L/D =	5.3	
Ground Surface Elevation (feet) =	313	
Depth to Water from Top of Casing (Before filling water into the casing in feet) =		NA
Depth to Approximate Ground Water Level (feet beg) =		5

Date	Time Elasped (minute)	Time Elasped (second)	Depth of Water from Top of Casing (ft)	
1/23/2008				
	0.0	0	0.00	
	0.8	45	0.10	
	2.0	120	0.20	
	2.5	150	0.30	
	7.0	420	0.40	
	8.3	495	0.50	
	14.3	858	0.60	
	19.0	1140	0.65	
	22.0	1320	0.70	
	24.5	1470	0.75	
	30.0	1800	0.80	

Length of Test Interval (cm)	Exposed Surface Area, A (cm^2)	Drop in Water Level (ft)	Time Interval (sec)	Volume of Water (cm^3)	Flow Rate, Q (cm^3/sec)	**Estimated Hydraulic conductivity, k (cm/sec)**	**Estimated Hydraulic conductivity, k (ft/day)**
60.96	2292	0.8	1800	1977	1.1	**5E-04**	**1E+00**

Notes:

(1) Data presented represents falling head testing conducted by New Hampshire Boring and GZA.

(2) Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area estimated to be similar to the exposed surface area of the wick.

(3) Depth to groundwater from ground surface estimated based on nearby test pis TP-129 and TP-130.

J:\19,000-20,999\19707\19707-00.PJM\Calcs\[k_test-GZ117.XLS]GZ117-T1 WICK

GZ-119 INFILTRATION TEST DATA

Test # 1 from 4 to 6 feet

Casing Outside Diameter, D (cm) =	11.43	
Casing Inside Diameter (cm) =	10.16	
Depth to Bottom of Casing (feet) =	4.0	(measured from ground surface)
Depth to Bottom of Borehole (feet) =	6.0	(measured from ground surface)
Casing Stickup (feet) =	3.0	
Zone tested, L (cm) =	60.96	
L/D =	5.33	
Ground Surface Elevation (feet) =	309	
Depth to Water from Top of Casing (Before filling water into the casing in feet) =		NA
Depth to Approximate Ground Water Level (feet beg) =		7

Date	Time Elasped (minute)	Time Elasped (second)	Depth of Water from Top of Casing (ft)	
1/21/2008				
	1.0	60	0.10	
	5.0	300	0.20	
	10.5	630	0.30	
	11.4	683	0.31	
	16.5	990	0.37	
	18.5	1110	0.40	
	25.0	1500	0.45	

Length of Test Interval (cm)	Exposed Surface Area, A (cm^2)	Drop in Water Level (ft)	Time Interval (sec)	Volume of Water (cm^3)	Flow Rate, Q (cm^3/sec)	**Estimated Hydraulic conductivity, k (cm/sec)**	**Estimated Hydraulic conductivity, k (ft/day)**
60.96	2292	0.05	390	124	0.3	**1E-04**	**4E-01**

Notes:

(1) Data presented represents falling head testing conducted by New Hampshire Boring and GZA.

(2) Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area estimated to be similar to the exposed surface area of the wick.

(3) Depth to groundwater from ground surface estimated based on nearby test pits TP-120 and TP-122.

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GZ-119A INFILTRATION TEST DATA

Test # 2 from 2 to 3 feet

Casing Outside Diameter, D (cm) =	11.43	
Casing Inside Diameter (cm) =	10.16	
Depth to Bottom of Casing (feet) =	2.0	(measured from ground surface)
Depth to Bottom of Borehole (feet) =	3.0	(measured from ground surface)
Casing Stickup (feet) =	3.0	
Zone tested, L (cm) =	30.48	
L/D =	2.67	
Ground Surface Elevation (feet) =	309	
Depth to Water from Top of Casing (Before filling water into the casing in feet) =		NA
Depth to Approximate Ground Water Level (feet beg) =		7

Date	Time Elasped (minute)	Time Elasped (second)	Depth of Water from Top of Casing (ft)	
1/22/2008				
	0.5	30	0.04	
	1.3	75	0.13	
	2.5	150	0.15	
	3.5	210	0.17	
	5.0	300	0.19	
	6.5	390	0.21	
	15.0	900	0.23	
	30.0	1800	0.25	

Length of Test Interval (cm)	Exposed Surface Area, A (cm^2)	Drop in Water Level (ft)	Time Interval (sec)	Volume of Water (cm^3)	Flow Rate, Q (cm^3/sec)	**Estimated Hydraulic conductivity, k (cm/sec)**	**Estimated Hydraulic conductivity, k (ft/day)**
30.48	1197	0.04	1410	103	0.07	**6E-05**	**2E-01**

Notes:

(1) Data presented represents falling head testing conducted by New Hampshire Boring and GZA.

(2) Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area estimated to be similar to the exposed surface area of the wick.

(3) Depth to groundwater from ground surface estimated based on nearby test pits TP-120 and TP-122.

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Appendix D.2 –
2019 Single-Ring Infiltrometer Permeability Test Results

PERMEABILITY TEST NO. 1

Location: TP-201A

Test Data

Date of Test	11/15/2019	
Casing Inside Diameter (in)	11.8	
Depth to Bottom of Casing (feet)	8.5	(measured from ground surface)
Casing Stickup (feet)	2.2	(measured from bottom of test pit)
Ground Surface Elevation (feet)	343.5	
Approx. Test surface Elevation (feet)	335.0	
Approx. Groundwater Level Depth (feet)	10	(measured from ground surface)

Time Elasped		Depth of Water from Top of Casing	
(minute)	(second)	(ft)	(in)
0.0	0	0.17	2.0
2.0	120	0.22	2.6
4.0	240	0.26	3.1
6.0	360	0.28	3.4
8.0	480	0.31	3.7
10.0	600	0.33	4.0
15.0	900	0.40	4.8
20.0	1200	0.47	5.6
30.0	1800	0.59	7.1
60.0	3600	0.91	10.9
90.0	5400	1.24	14.9
120.0	7200	1.54	18.5

Calculations

Exposed Surface Area, A (in^2)	109.59
Drop in Water Level (in)	16.4
Time Interval (sec)	7200
Volume of Water (in^3)	1801.7
Flow Rate, Q (in^3/sec)	0.25
Estimated Hydraulic conductivity, k (in/sec)	2.3E-03
k (cm/sec)	**5.8E-03**

Notes

1. Data presented represents falling head permeameter testing conducted by GZA. Test hole pre-soaked for approx. 15 min. prior to recording water level drop.
2. Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area at the exposed surface area at the bottom of the casing.
3. Ground surface elevation estimated based on topography shown on an electronic drawing file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg" received on 10/31/2019.
4. PVC pipe used for testing is approximately 3.4-feet-long.

PERMEABILITY TEST NO. 1

Location: TP-202

Test Data

Date of Test	11/15/2019	
Casing Inside Diameter (in)	11.8	
Depth to Bottom of Casing (feet)	6.5	(measured from ground surface)
Casing Stickup (feet)	2.1	(measured from bottom of test pit)
Ground Surface Elevation (feet)	337.5	
Approx. Test surface Elevation (feet)	331.0	
Approx. Groundwater Level Depth (feet)	Not observed	(measured from ground surface)

Time Elasped		Depth of Water from Top of Casing	
(minute)	(second)	(ft)	(in)
0.0	0	2.70	32.4
0.3	15	2.83	34.0
0.5	30	2.95	35.4
1.0	60	3.13	37.6
1.5	90	3.22	38.6
2.0	120	3.28	39.4
2.2	129	3.30	39.6

Calculations

Exposed Surface Area, A (in^2)	109.59
Drop in Water Level (in)	7.2
Time Interval (sec)	129
Volume of Water (in^3)	789.1
Flow Rate, Q (in^3/sec)	6.12
Estimated Hydraulic conductivity, k (in/sec)	5.6E-02
k (cm/sec)	**1.4E-01**

Notes

1. Data presented represents falling head permeameter testing conducted by GZA. Test hole pre-soaked for approx. 15 min. prior to recording water level drop.
2. Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area at the exposed surface area at the bottom of the casing.
3. Ground surface elevation estimated based on topography shown on an electronic drawing file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg" received on 10/31/2019.
4. PVC pipe used for testing is approximately 3.4-feet-long.

Appendix D.3 –
2020 Single-Ring Infiltrometer Permeability Test Results

PERMEABILITY TEST NO. 1

Location: TP-306

Test Data

Date of Test	9/21/2020	
Casing Inside Diameter (in)	11.8	
Depth to Bottom of Casing (feet)	7.3	(measured from ground surface)
Casing Stickup (feet)	2.2	(measured from bottom of test pit)
Ground Surface Elevation (feet)	305.5	
Approx. Test surface Elevation (feet)	298.2	
Approx. Groundwater Level Depth (feet)	N/A	(measured from ground surface)

Time Elasped		Depth of Water from Top of Casing	
(minute)	(second)	(ft)	(in)
0.0	0	0.46	5.5
2.0	120	0.48	5.8
5.0	300	0.49	5.9
10.0	600	0.52	6.3
15.0	900	0.55	6.6
20.0	1200	0.58	6.9
25.0	1500	0.60	7.3
30.0	1800	0.63	7.6
35.0	2100	0.65	7.8
40.0	2400	0.69	8.3
71.0	4260	0.83	9.9

Calculations

Exposed Surface Area, A (in^2)	109.59
Drop in Water Level (in)	4.4
Time Interval (sec)	4260
Volume of Water (in^3)	482.2
Flow Rate, Q (in^3/sec)	0.11
Estimated Hydraulic conductivity, k (in/sec)	1.0E-03
k (cm/sec)	**2.6E-03**

Notes

1. Data presented represents falling head permeameter testing conducted by GZA. Test hole pre-soaked for approx. 15 min. prior to recording water level drop.
2. Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area at the exposed surface area at the bottom of the casing.
3. Ground surface elevation estimated based on topography shown on an electronic drawing file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg" no date indicated.
4. PVC pipe used for testing was approximately 3.3-feet-long.

PERMEABILITY TEST NO. 1

Location: TP-307

Test Data

Date of Test	9/18/2020	
Casing Inside Diameter (in)	11.8	
Depth to Bottom of Casing (feet)	7.1	(measured from ground surface)
Casing Stickup (feet)	2.5	(measured from bottom of test pit)
Ground Surface Elevation (feet)	324.5	
Approx. Test surface Elevation (feet)	317.4	
Approx. Groundwater Level Depth (feet)	N/A	(measured from ground surface)

Time Elasped		Depth of Water from Top of Casing	
(minute)	(second)	(ft)	(in)
0.0	0	0.50	6.0
3.8	225	0.52	6.3
6.5	390	0.54	6.5
12.0	720	0.58	7.0
15.0	900	0.60	7.3
20.0	1200	0.64	7.7
25.0	1500	0.67	8.0
30.0	1800	0.71	8.5
35.0	2100	0.73	8.8
40.0	2400	0.77	9.3
45.0	2700	0.80	9.7
50.0	3000	0.83	10.0
55.0	3300	0.88	10.5

Calculations

Exposed Surface Area, A (in^2)	109.59
Drop in Water Level (in)	4.5
Time Interval (sec)	3300
Volume of Water (in^3)	493.2
Flow Rate, Q (in^3/sec)	0.15
Estimated Hydraulic conductivity, k (in/sec)	1.4E-03
k (cm/sec)	**3.5E-03**

Notes

1. Data presented represents falling head permeameter testing conducted by GZA. Test hole pre-soaked for approx. 15 min. prior to recording water level drop.
2. Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area at the exposed surface area at the bottom of the casing.
3. Ground surface elevation estimated based on topography shown on an electronic drawing file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg" no date indicated.
4. PVC pipe used for testing was approximately 3.3-feet-long.

PERMEABILITY TEST NO. 1

Location: TP-307

Test Data

Date of Test	9/18/2020	
Casing Inside Diameter (in)	11.8	
Depth to Bottom of Casing (feet)	7.1	(measured from ground surface)
Casing Stickup (feet)	2.5	(measured from bottom of test pit)
Ground Surface Elevation (feet)	324.5	
Approx. Test surface Elevation (feet)	317.4	
Approx. Groundwater Level Depth (feet)	N/A	(measured from ground surface)

Time Elasped		Depth of Water from Top of Casing	
(minute)	(second)	(ft)	(in)
0.0	0	0.50	6.0
3.8	225	0.52	6.3
6.5	390	0.54	6.5
12.0	720	0.58	7.0
15.0	900	0.60	7.3
20.0	1200	0.64	7.7
25.0	1500	0.67	8.0
30.0	1800	0.71	8.5
35.0	2100	0.73	8.8
40.0	2400	0.77	9.3
45.0	2700	0.80	9.7
50.0	3000	0.83	10.0
55.0	3300	0.88	10.5

Calculations

Exposed Surface Area, A (in^2)	109.59
Drop in Water Level (in)	4.5
Time Interval (sec)	3300
Volume of Water (in^3)	493.2
Flow Rate, Q (in^3/sec)	0.15
Estimated Hydraulic conductivity, k (in/sec)	1.4E-03
k (cm/sec)	**3.5E-03**

Notes

1. Data presented represents falling head permeameter testing conducted by GZA. Test hole pre-soaked for approx. 15 min. prior to recording water level drop.
2. Permeability results were approximated using the formula Q=kiA where, Q is the flow rate, k is the permeability, i=1.0 (gravity drainage above the water table), and A is the area at the exposed surface area at the bottom of the casing.
3. Ground surface elevation estimated based on topography shown on an electronic drawing file produced by Highpoint Engineering, Inc. entitled "MasterPlan_Base.dwg" no date indicated.
4. PVC pipe used for testing was approximately 3.3-feet-long.

Appendix E – Geotechnical Laboratory Results

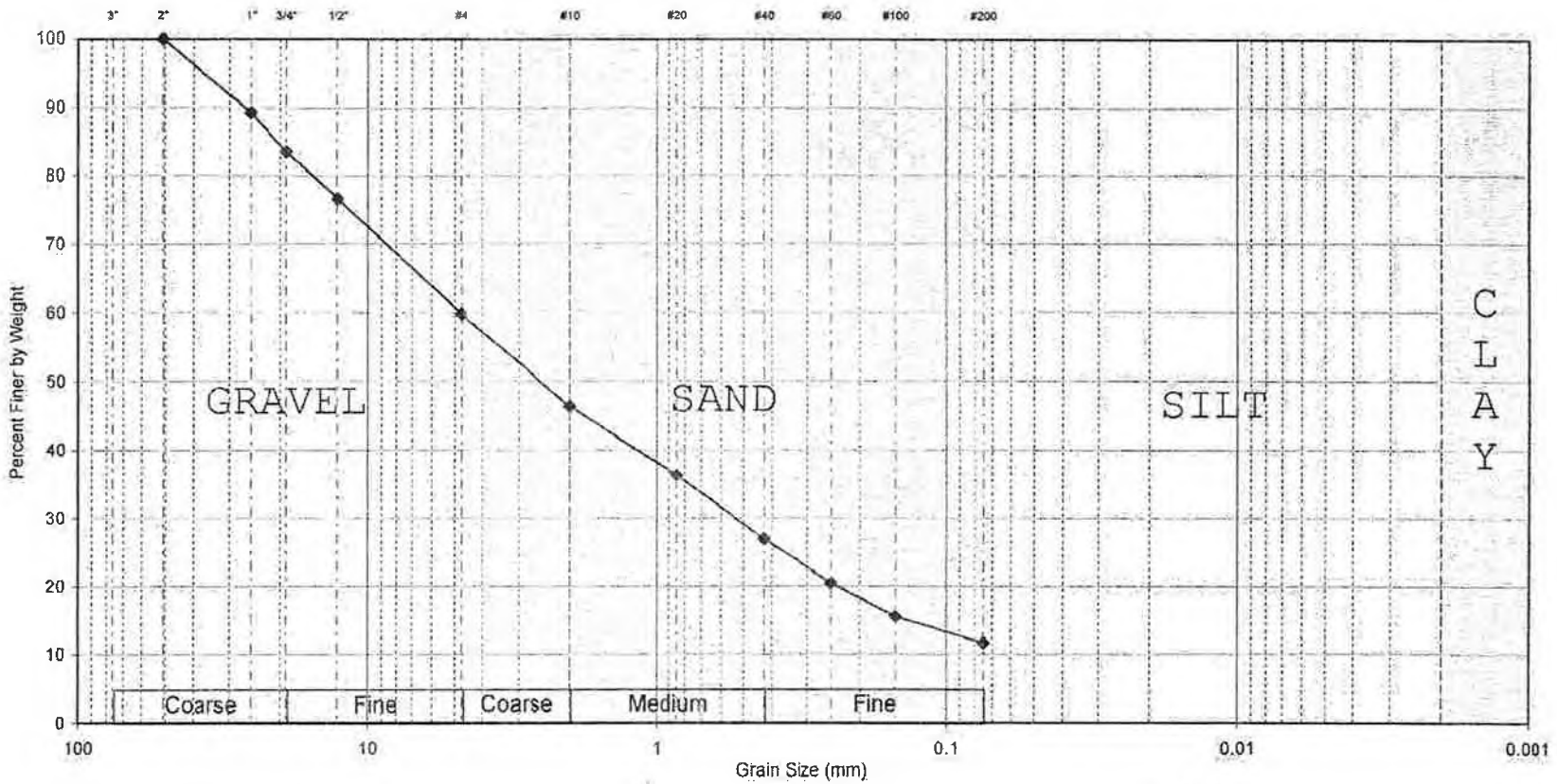
TABLE E-1
SUMMARY OF GEOTECHNICAL LABORATORY TESTING
Proposed Development
45 Jackson Road
Devens, MA

Exploration ID	Exploration Type	Year Performed	Sample No.	Sample Depth (ft)	Laboratory Test	Classification[1]	Notes
TP-101 & TP-104	test pit	2008	composite	3-4	Gradation and Proctor	Brown, f-c SAND and f-c GRAVEL, little Silt	2,5,6
TP-113 & TP-118	test pit	2008	composite	4-6	Gradation and Proctor	Brown, f-c SAND, some f-c Gravel, trace Silt	2,5,6
TP-103	test pit	2008	S-1	4	Gradation	Brown, f-c SAND and f-c GRAVEL, little Silt, trace Concrete	2,5
TP-103	test pit	2008	S-2	10	Gradation	Brown f-c SAND, some Silt, little f-c Gravel	2,5
GZ-103	boring	2008	S-2	4-6	Gradation	Brown, f-c SAND, some f-c Gravel, trace Silt	2,5
GZ-114	boring	2008	S-2	4-5.8	Gradation	Brown, f-c SAND, some Silt, some fine Gravel	2,5
GZ-116	boring	2008	S-1	0.5-2	Gradation	Brown f-c SAND and f-c GRAVEL, little Silt	2,5
GZ-117	boring	2008	S-2	4-6	Gradation	Brown f-c SAND, little f-c Gravel, trace Silt	2,5
B-1	boring	2012	S-2	2-4	Gradation	Brown, fine to coarse SAND and Gravel, little Silt	3,5
B-3	boring	2012	S-2	2-4	Gradation	Dark brown, fine to medium SAND and Silt, trace Gravel	3,5
B-7	boring	2012	S-2	2-4	Gradation	Gray, fine to coarse SAND and Gravel, little Silt	3,5
B-11	boring	2012	S-2	2-4	Gradation	Gray to brown, medium to coarse SAND, some Gravel, little Silt	3,5
TP-202	test pit	2019	S-2	6.5	Gradation	Brown f-c SAND and f-c Gravel, trace Silt	4,5
GZ-202	boring	2019	S-4	6-8	Gradation	Brown f-c SAND and Clayey SILT, little fine Gravel	4,5
GZ-301	boring	2020	S-3	4-6	Gradation	Brown f-c SAND, some Silt, some fine Gravel	4,5
GZ-302	boring	2020	S-3	4-6	Gradation	Brown f-c SAND, some f-c Gravel, little Silt	4,5
GZ-304	boring	2020	S-4	6-8	Gradation	Brown f-c SAND and f-c GRAVEL, trace Silt	4,5
GZ-307	boring	2020	S-2	2-4	Gradation	Brown fine GRAVEL and f-c SAND, trace Silt	4,5

Notes:
1. Classification is based on the Modified Burmister System.
2. Testing performed by GZA's Geotechnical Laboratory, Hopkinton, MA.
3. Testing performed by GZA's Geotechnical Laboratory, Manchester, NH.
4. Testing performed by Thielsch Engineering of Cranston, Rhode Island.
5. Laboratory gradation testing performed in accordance with ASTM D422.
6. Laboratory Proctor testing performed in accordance with ASTM D1557.

Appendix E.1 – 2008 Geotechnical Laboratory Results

U.S. STANDARD SIEVE AND HYDROMETER



Gravel	Sand	Fines
40.2%	48.2%	11.6%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
1	TP-101 & 104	Composite	3-4'	Brown f-c SAND and f-c GRAVEL, little Silt				

Lot 16 Development
Devens, MA
GZA File # 19707

Tested by: PEC Date: 1/23/08
Reviewed by: MBP Date: 1/24/08

ASTM D-1557 MODIFIED COMPACTION TEST

Project: Lot 16 Development
Location: Devens, MA

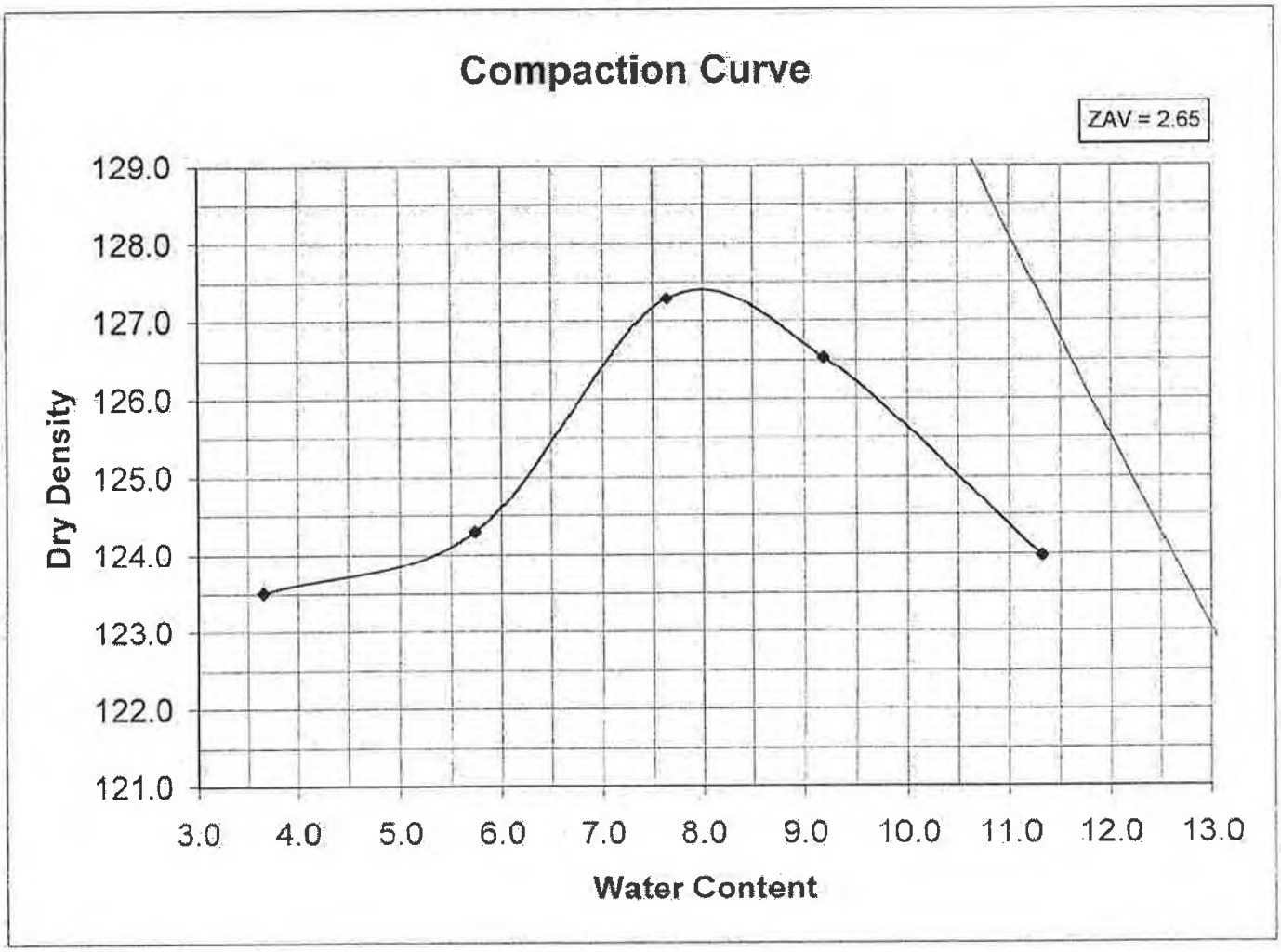
File Number: 19707.00
Test Number: MC 1.1
Depth: 3-4'
Material: Composite

Date: 1/24/08
Technician: PEC
Reviewer: MBP
Source: TP-101 & TP-104

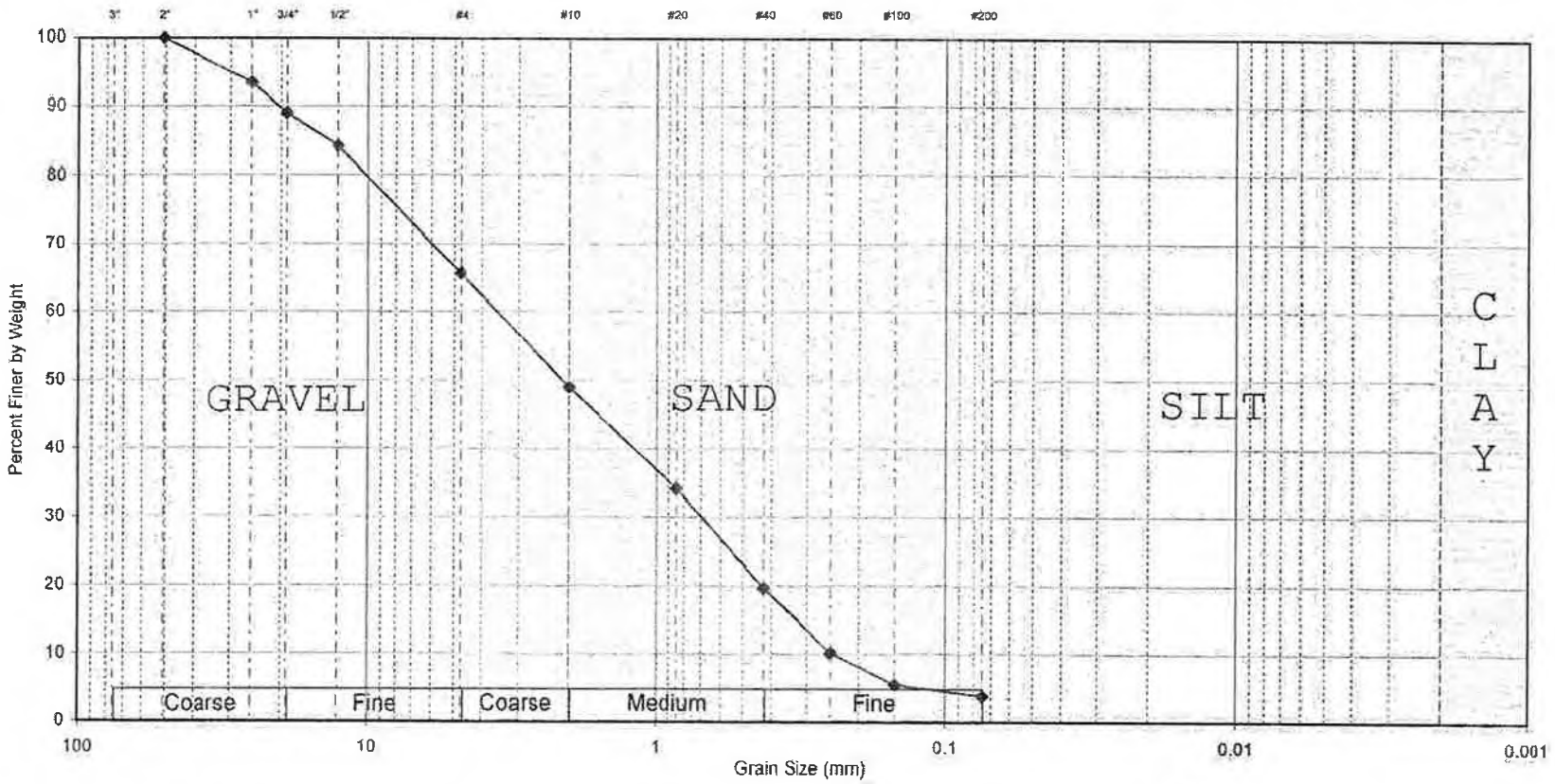
Soil Description: Brown f-c SAND and f-c GRAVEL, little Silt

Optimum Water Content % 8.0 **Maximum Dry Unit Weight (pcf)** 127.5

Method C



U.S. STANDARD SIEVE AND HYDROMETER



Gravel	Sand	Fines
34.4%	62.0%	3.7%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
2	TP-113 & 118	Composite	4-6'	Brown f-c SAND, some f-c Gravel, trace Silt				

Lot 16 Development
Devens, MA
GZA File # 19707

Tested by: PEC Date: 1/23/08
Reviewed by: MBP Date: 1/24/08

ASTM D-1557 MODIFIED COMPACTION TEST

Project: Lot 16 Development
Location: Devens, MA

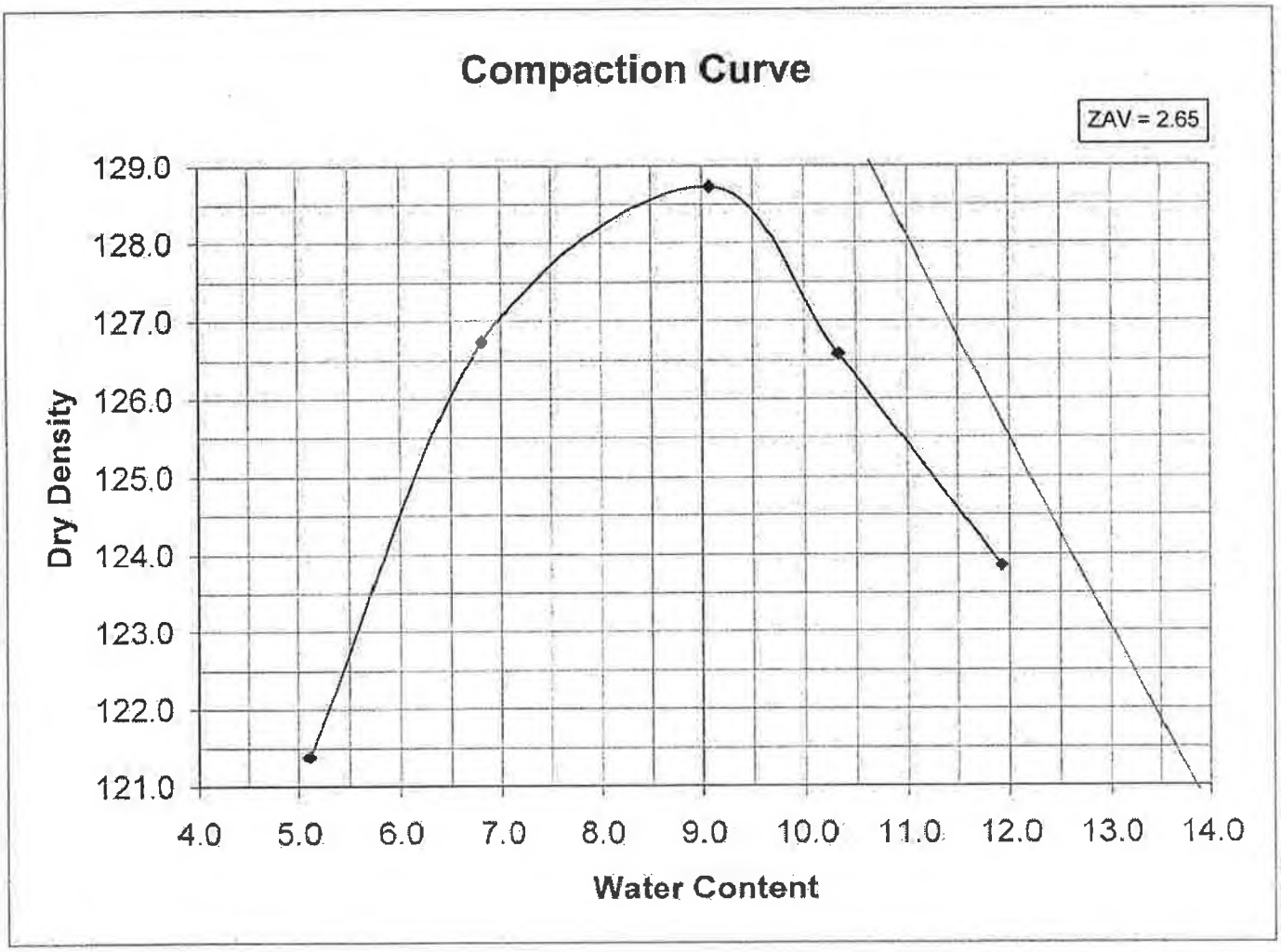
File Number: 19707.00
Test Number: MC 2.1
Depth: 4-6'
Material: Composite

Date: 1/24/08
Technician: PEC
Reviewer: MBP
Source: TP-113 & TP-118

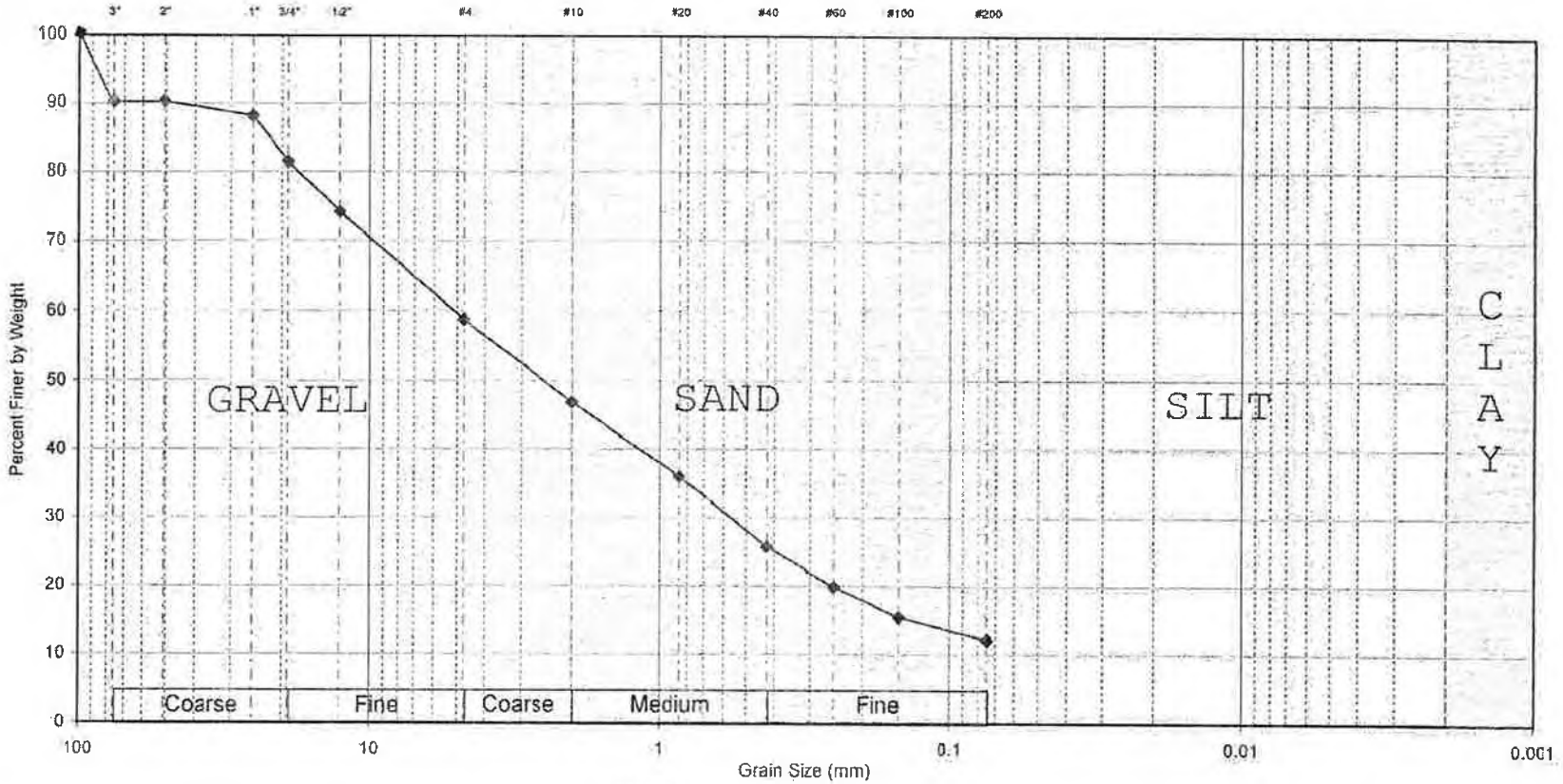
Soil Description: Brown f-c SAND, some f-c Gravel, trace Silt

Optimum Water Content % 9.0 **Maximum Dry Unit Weight (pcf)** 128.5

Method C



U.S. STANDARD SIEVE AND HYDROMETER



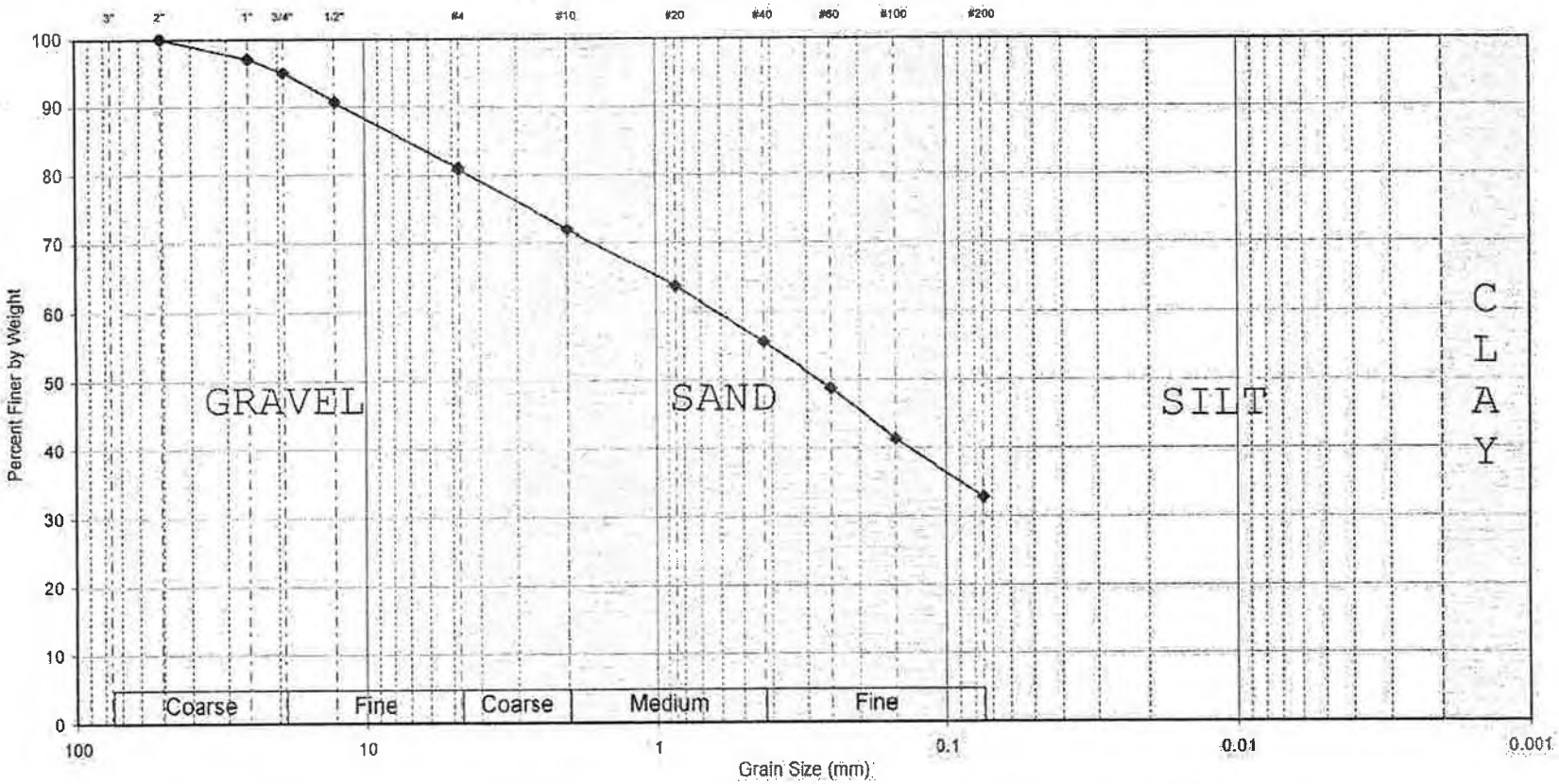
Gravel	Sand	Fines
41.2%	46.7%	12.1%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
3	TP-103	S-1	4'	Brown f-c SAND and f-c GRAVEL, little Silt (trace Concrete)				

Lot 16 Development
Devens, MA
GZA File # 19707

Tested by: PEC Date: 1/23/08
Reviewed by: MBP Date: 1/24/08

U.S. STANDARD SIEVE AND HYDROMETER



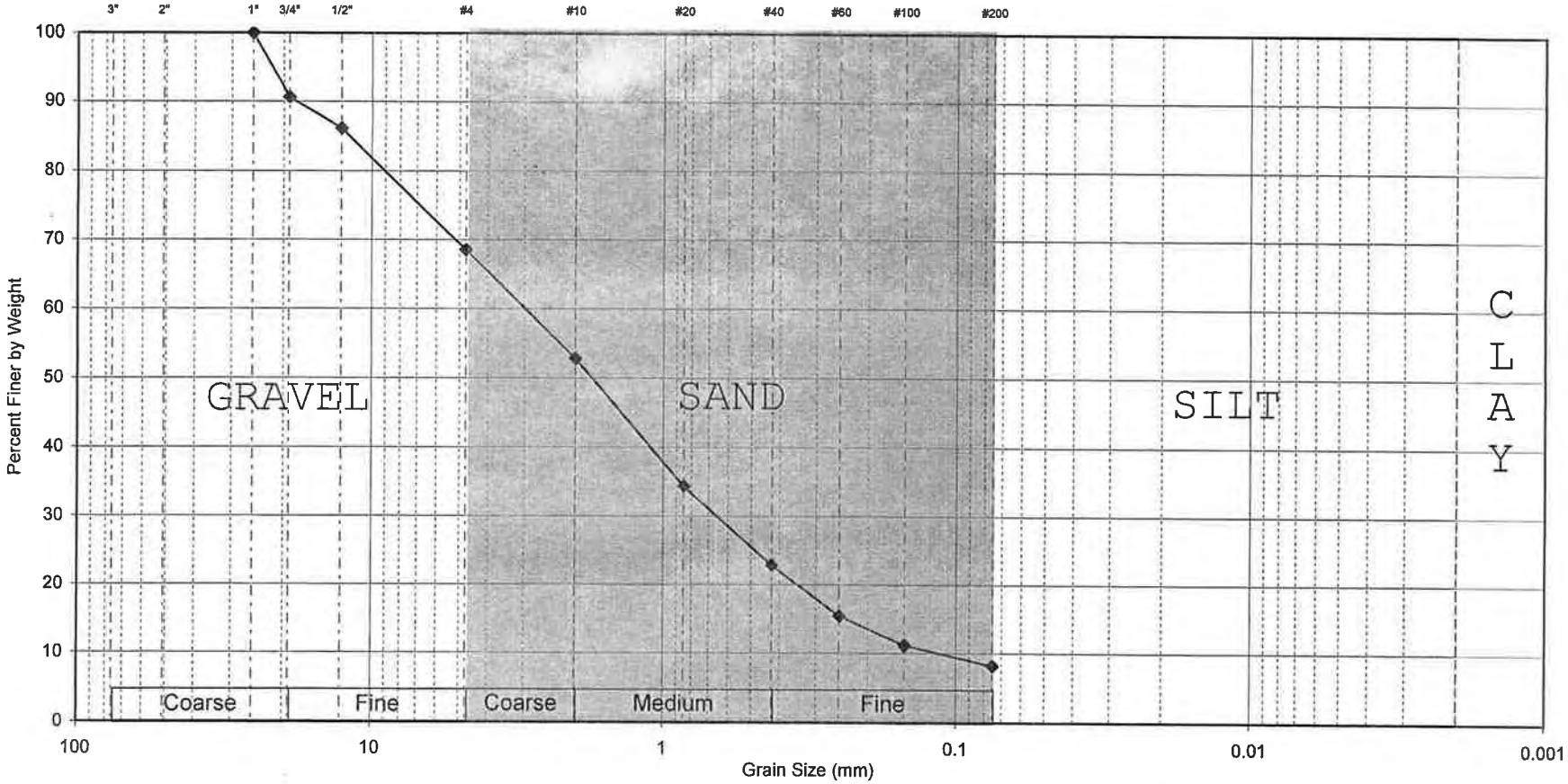
Gravel	Sand	Fines
19.1%	48.2%	32.7%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
4	TP-103	S-2	10'	Brown f-c SAND, some Silt, little f-c Gravel				

Lot 16 Development
Devens, MA
GZA File # 19707

Tested by: PEC Date: 1/23/08
Reviewed by: MBP Date: 1/24/08

U.S. STANDARD SIEVE AND HYDROMETER



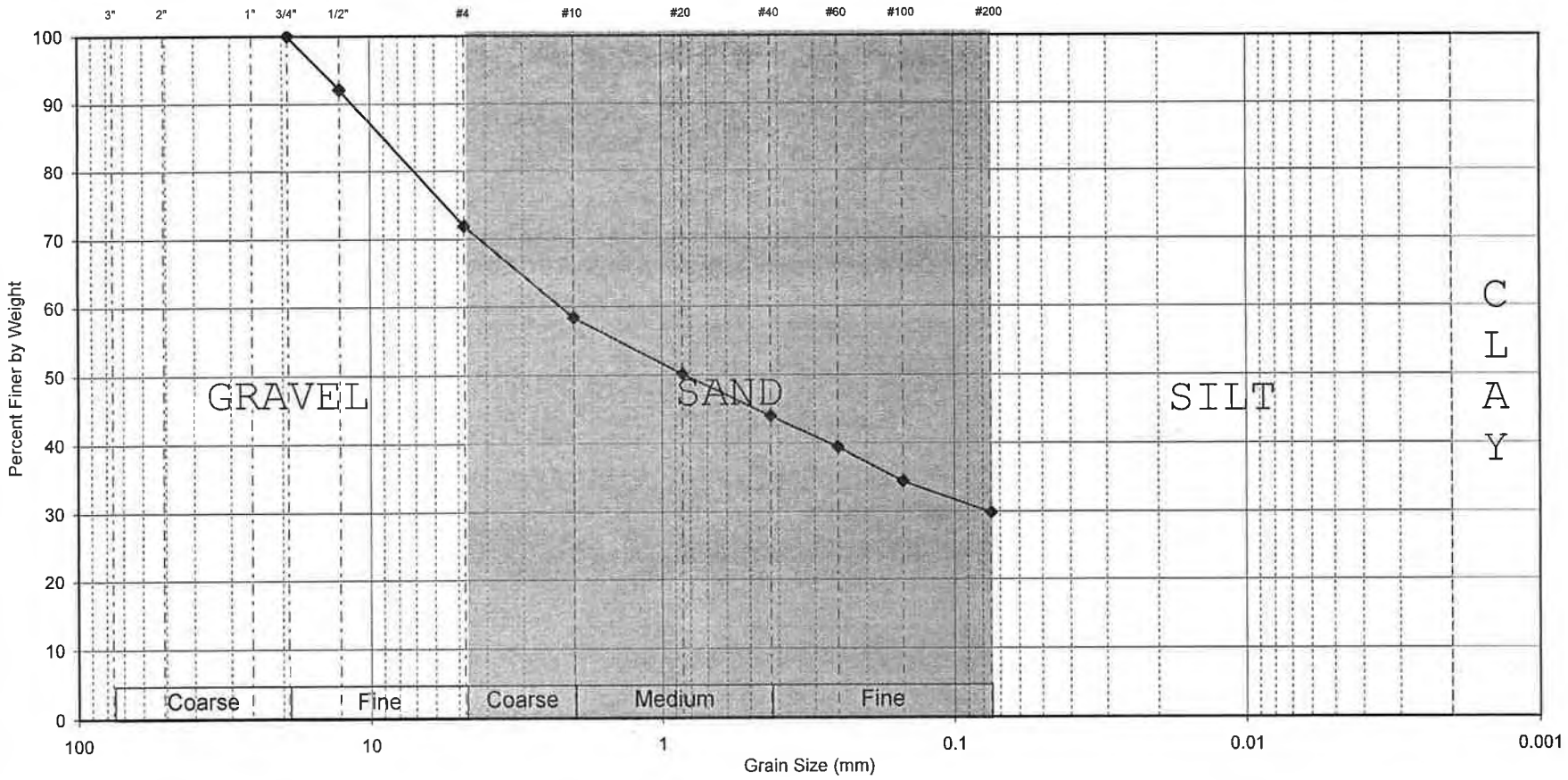
Gravel	Sand	Fines
31.5%	60.3%	8.2%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
5	GZ-103	S-2	4-6'	Brown f-c SAND, some f-c Gravel, trace Silt				

Lot 16
Devens, MA
GZA File # 19707

Tested by: BB Date: 2/5/08
Reviewed by: MBP Date: 2/6/08

U.S. STANDARD SIEVE AND HYDROMETER



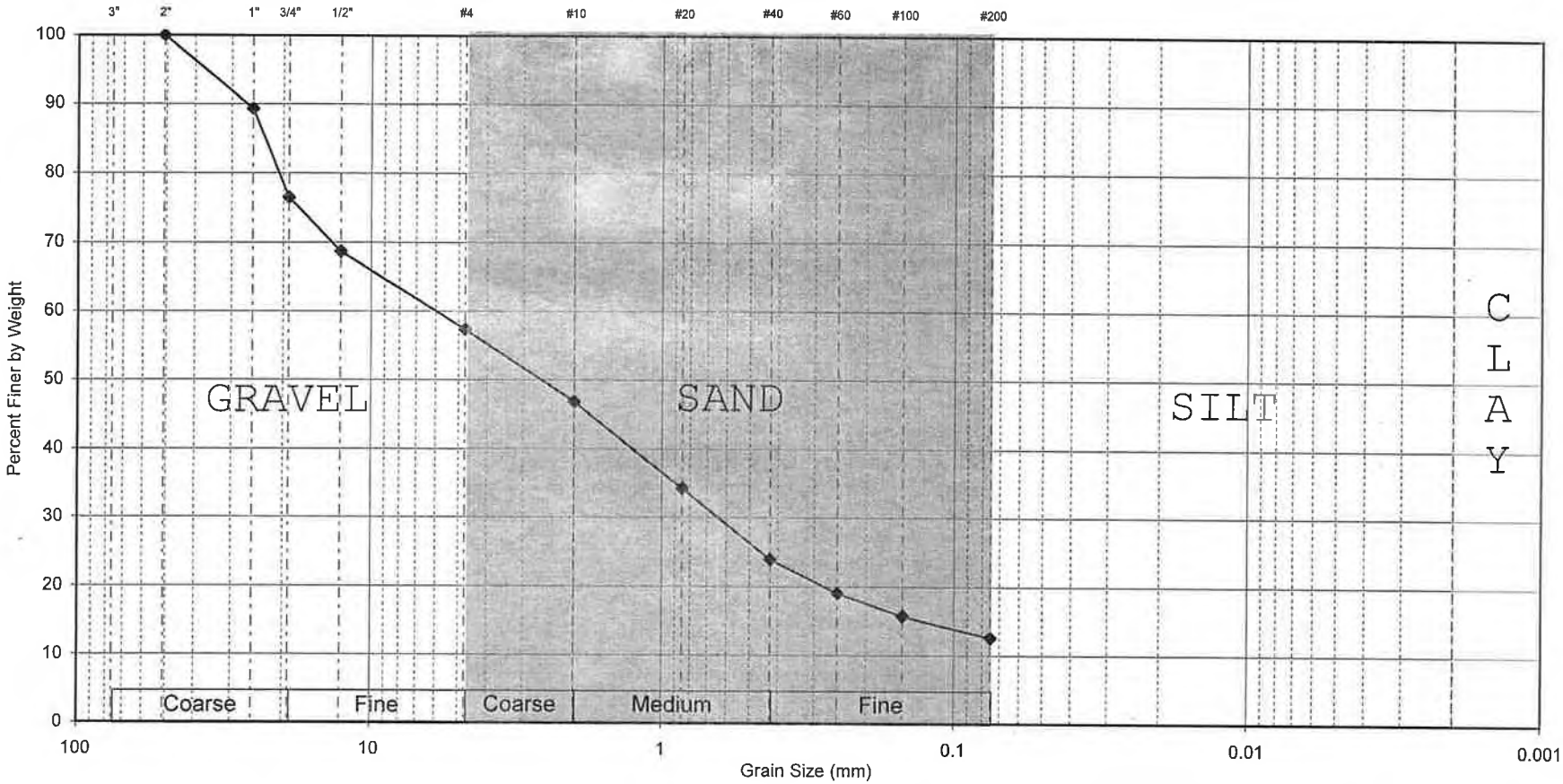
Gravel	Sand	Fines
28.1%	42.1%	29.8%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
6	GZ-114	S-2	4-5.8'	Brown f-c SAND, some Silt, some fine Gravel				

Lot 16
Devens, MA
GZA File # 19707

Tested by: BB Date: 2/5/08
Reviewed by: MBP Date: 2/6/08

U.S. STANDARD SIEVE AND HYDROMETER



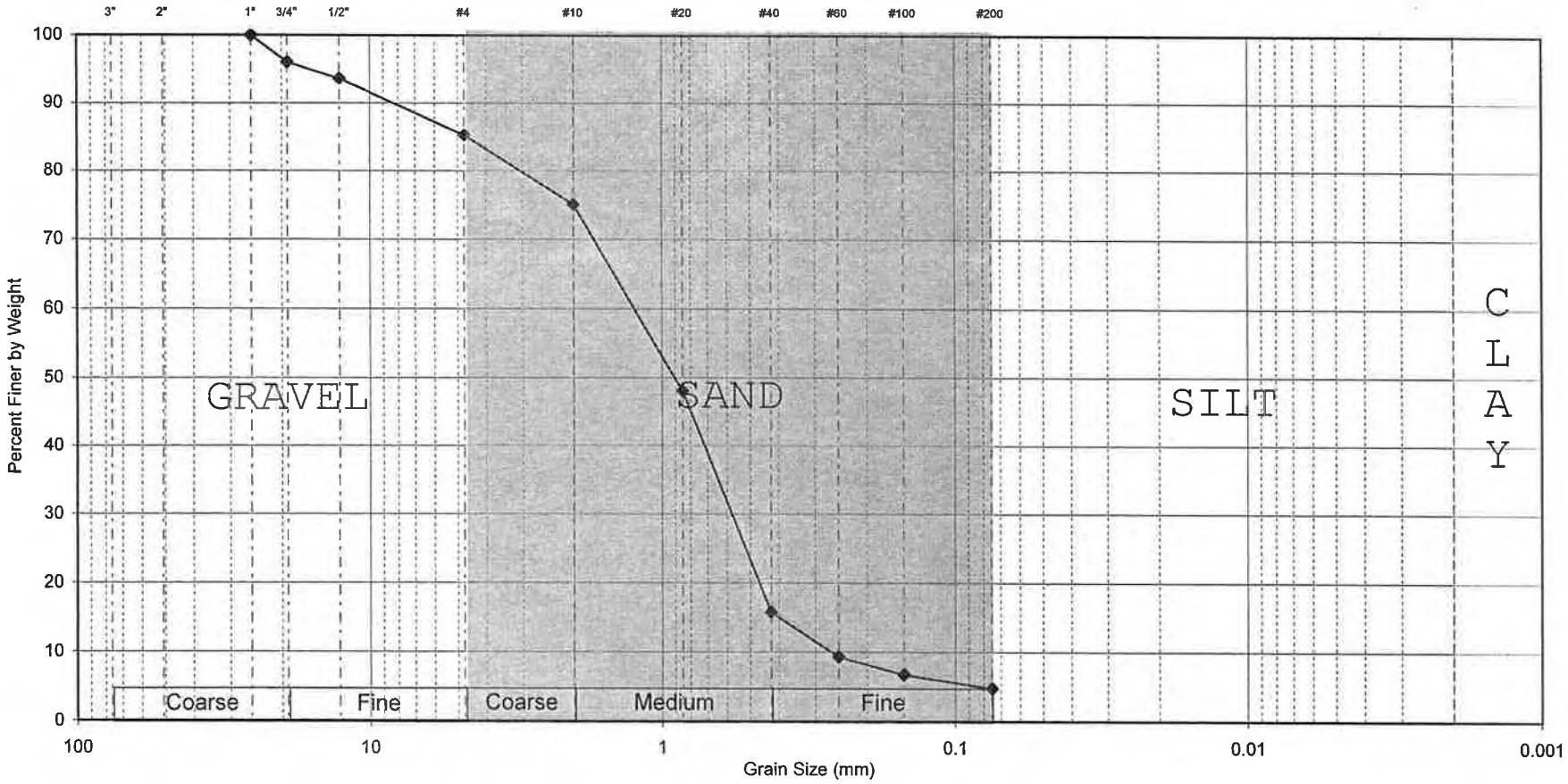
Gravel	Sand	Fines
42.7%	44.8%	12.5%

Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
7	GZ-116	S-1	0.5-2.0'	Brown f-c SAND and f-c GRAVEL, little Silt				

Lot 16
Devens, MA
GZA File # 19707

Tested by: BB Date: 2/5/08
Reviewed by: MBP Date: 2/6/08

U.S. STANDARD SIEVE AND HYDROMETER



Gravel	Sand	Fines
14.8%	80.5%	4.7%

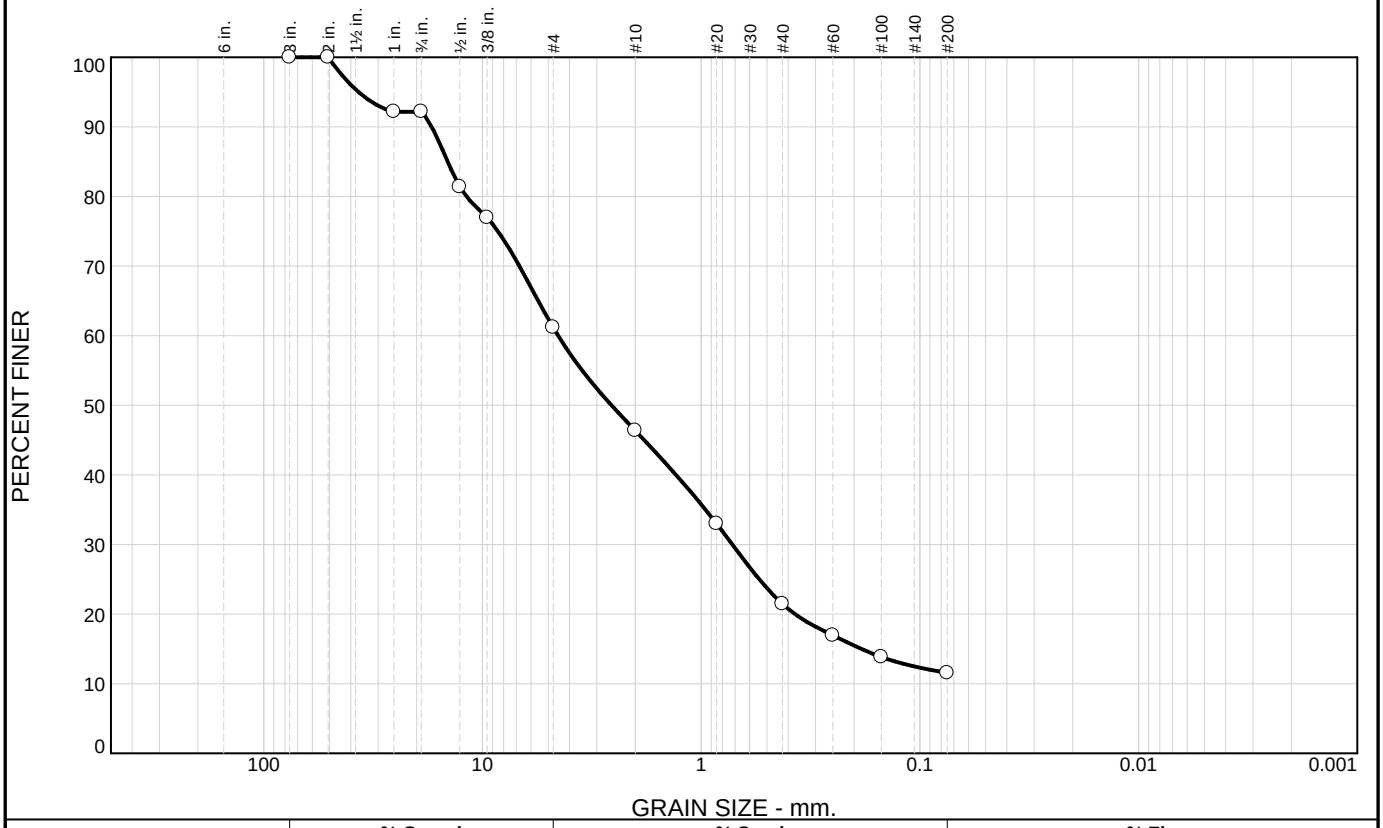
Lab #	Exploration	Sample	Depth (ft)	Description	WC	LL	PL	PI
8	GZ-117	S-2	4-6'	Brown f-c SAND, little f-c Gravel, trace Silt				

Lot 16
Devens, MA
GZA File # 19707

Tested by: BB Date: 2/5/08
Reviewed by: MBP Date: 2/6/08

Appendix E.2 – 2012 Geotechnical Laboratory Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.8	31.0	14.8	24.9	10.0	11.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1	92.2		
3/4	92.2		
1/2	81.4		
3/8	77.0		
#4	61.2		
#10	46.4		
#20	33.0		
#40	21.5		
#60	17.0		
#100	13.8		
#200	11.5		

* (no specification provided)

Material Description

Brown, fine to coarse SAND and Gravel, little Silt.

Atterberg Limits

PL= NP LL= PI=

Coefficients

D_{90}= 17.0402 D_{85}= 14.4298 D_{60}= 4.5064
D_{50}= 2.5696 D_{30}= 0.7201 D_{15}= 0.1846
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

Location: B-1
Sample Number: S-2 **Depth:** 2'-4' **Date:** 1/18/12

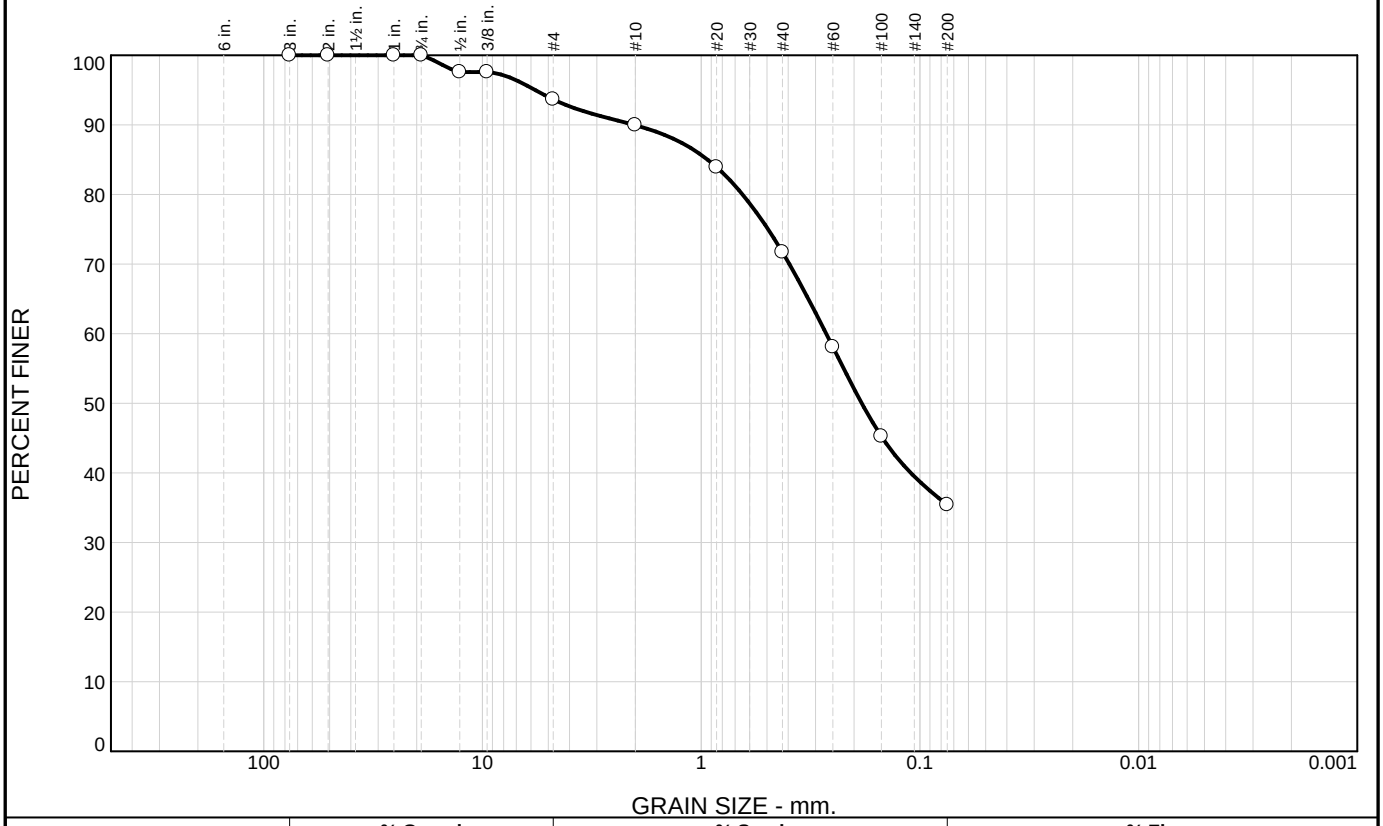
GZA GeoEnvironmental, Inc.

Manchester, NH

Client: Geis Construction Company
Project: Lot 16, Jackson Road, Devens, Massachusetts

Project No: 04.0029496.00

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.3	3.7	18.3	36.3	35.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1	100.0		
3/4	100.0		
1/2	97.6		
3/8	97.6		
#4	93.7		
#10	90.0		
#20	83.9		
#40	71.7		
#60	58.1		
#100	45.3		
#200	35.4		

* (no specification provided)

Material Description

Dark brown, fine to medium SAND and Silt, trace Gravel.

Atterberg Limits

PL= NP LL= PI=

Coefficients

D_{90}= 2.0238 D_{85}= 0.9341 D_{60}= 0.2681
D_{50}= 0.1844 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Location: B-3
Sample Number: S-2 **Depth:** 2'-4' **Date:** 1/18/11

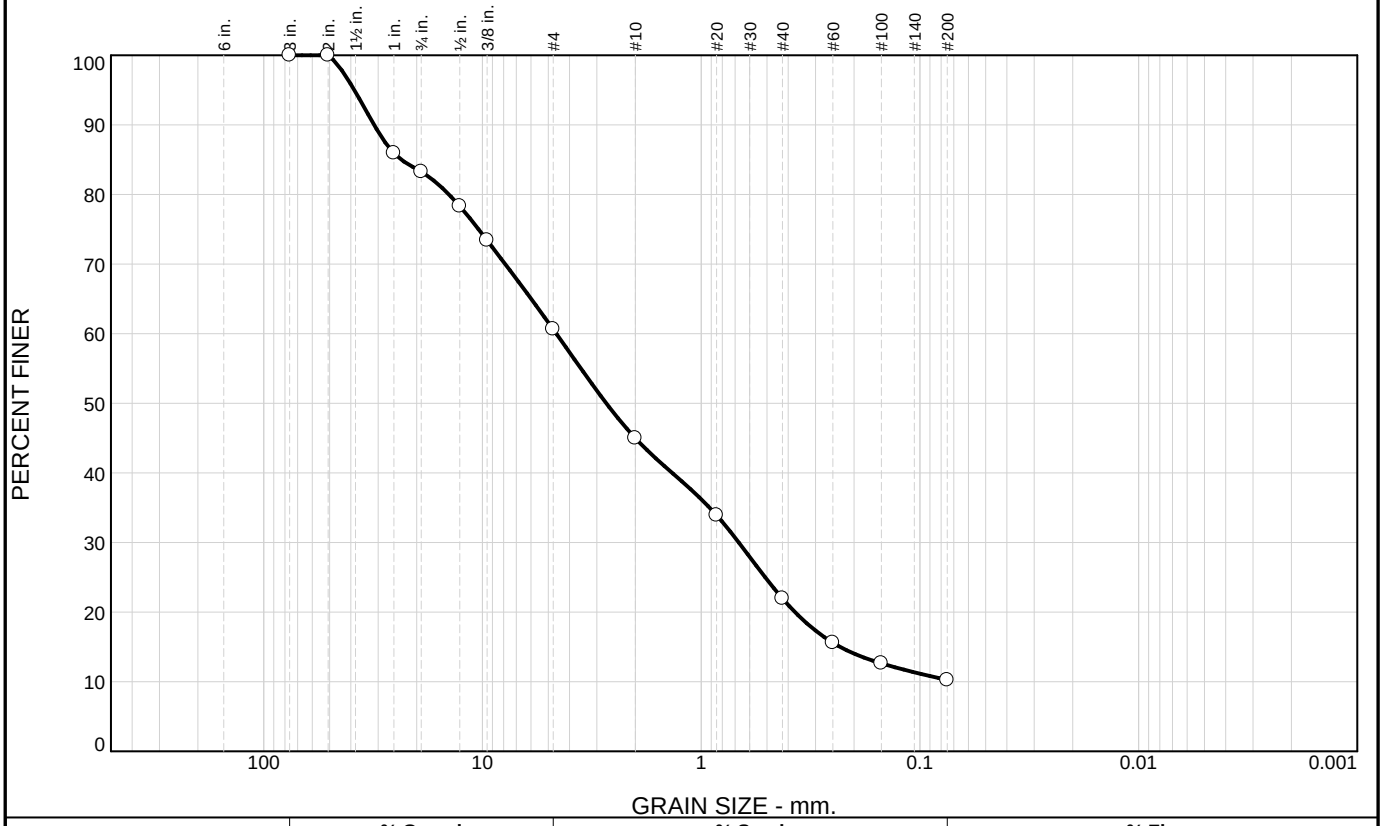
GZA GeoEnvironmental, Inc.

Manchester, NH

Client: Geis Construction Company
Project: Lot 16, Jackson Road, Devens, Massachusetts

Project No: 04.0029496.00

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	16.7	22.7	15.6	23.0	11.7	10.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1	85.9		
3/4	83.3		
1/2	78.3		
3/8	73.4		
#4	60.6		
#10	45.0		
#20	33.9		
#40	22.0		
#60	15.6		
#100	12.6		
#200	10.3		

* (no specification provided)

Material Description

Gray, fine to coarse SAND and Gravel, little Silt.

Atterberg Limits

PL= NP LL= PI=

Coefficients

D_{90}= 31.3037 D_{85}= 23.5302 D_{60}= 4.5941
D_{50}= 2.7150 D_{30}= 0.6729 D_{15}= 0.2315
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

Location: B-7
Sample Number: S-2 **Depth:** 2'-4' **Date:** 1/18/2012

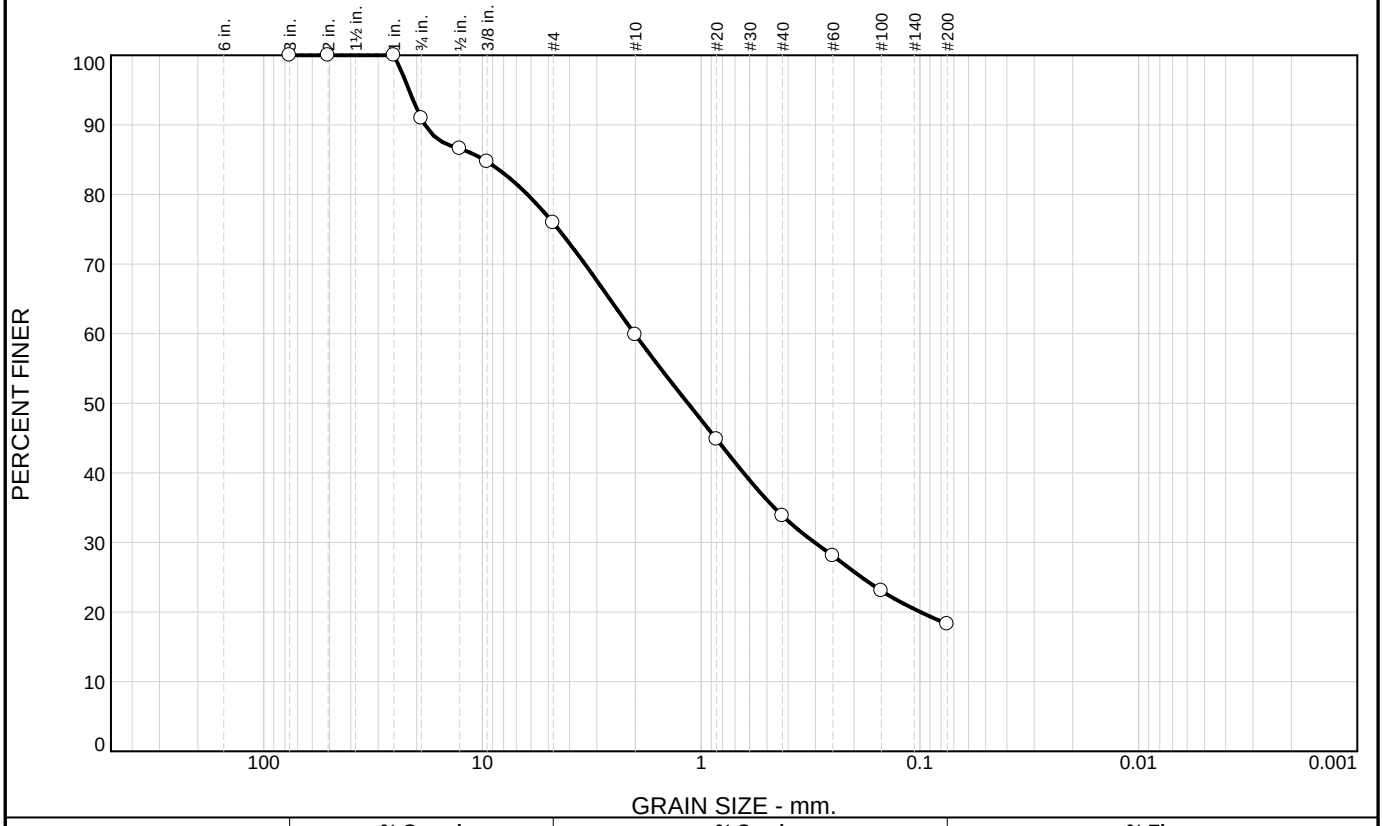
GZA GeoEnvironmental, Inc.

Manchester, NH

Client: Geis Construction Company
Project: Lot 16, Jackson Road, Devens, Massachusetts

Project No: 04.0029496.00

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.1	15.0	16.1	26.0	15.5	18.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1	100.0		
3/4	90.9		
1/2	86.6		
3/8	84.7		
#4	75.9		
#10	59.8		
#20	44.8		
#40	33.8		
#60	28.1		
#100	23.1		
#200	18.3		

* (no specification provided)

Material Description

Gray to brown, medium to coarse SAND, some Gravel, little Silt.

Atterberg Limits

PL= NP LL= PI=

Coefficients

D_{90}= 18.3048 D_{85}= 9.8594 D_{60}= 2.0164
D_{50}= 1.1493 D_{30}= 0.3023 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Location: B-11
Sample Number: S-2 **Depth:** 2'-4' **Date:** 1/18/12

GZA GeoEnvironmental, Inc.

Manchester, NH

Client: Geis Construction Company
Project: Lot 16, Jackson Road, Devens, Massachusetts

Project No: 04.0029496.00

Appendix E.3 – 2019 Geotechnical Laboratory Results

THIELSCH ENGINEERING
195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
thielsch.com
Let's Build a Solid Foundation

Client Information:
GZA GeoEnvironmental
Norwood, MA
PM: M. Ostrowski
Assigned By: M. Ostrowski
Collected By: G. Larose

Project Information:
45 Jackson Rd DD GT Study
Devens, MA
GZA Project Number: 01.0174440.00
Summary Page: 1 of 1
Report Date: 11.22.19

LABORATORY TESTING DATA SHEET, Report No.: 7419-L-163

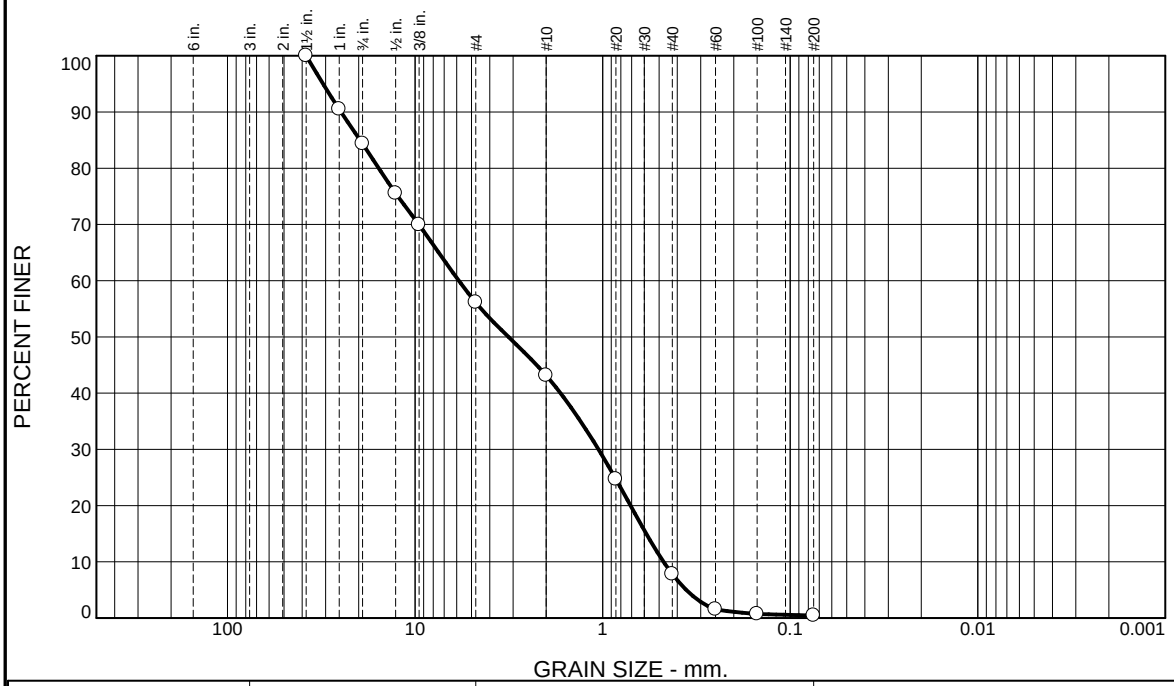
Boring ID	Sample No.	Depth (Ft)	Laboratory No.	Identification Tests								Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Received Water Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	G_s	Dry unit wt. pcf	Test Water Content %	γ_d MAX (pcf) / W_{opt} (%)	γ_d MAX (pcf) / W_{opt} (%) (Corr.)	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318		D6913			D2974	D854			D1557						
TP-202	S-2	6.5	19-S-2658				43.9	55.6	0.5											Brown f-c SAND and f-c GRAVEL, trace Silt
GZ-202	S-4	6-8	19-S-2659				20.0	44.0	36.0											Brown f-c SAND and CLAYEY SILT, little fine Gravel

Date Received: *11.20.19*

Reviewed By:

Date Reviewed: *11.26.19*

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	15.7	28.2	13.0	35.3	7.3	0.5	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100.0		
1"	90.5		
3/4"	84.3		
1/2"	75.6		
3/8"	69.9		
#4	56.1		
#10	43.1		
#20	24.7		
#40	7.8		
#60	1.5		
#100	0.7		
#200	0.5		

* (no specification provided)

Material Description

Brown f-c SAND and f-c GRAVEL, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 24.8256 D_{85}= 19.6446 D_{60}= 5.8466
D_{50}= 3.1792 D_{30}= 1.0527 D_{15}= 0.5855
D_{10}= 0.4734 C_u= 12.35 C_c= 0.40

Remarks

Date Received: 11.20.19 **Date Tested:** 11.22.19

Tested By: MN

Checked By: Steven Accetta

Title: Laboratory Coordinator

Source of Sample: Test Pit **Depth:** 6.5' **Date Sampled:**

Sample Number: TP-202 / S-2

Thielsch Engineering Inc.

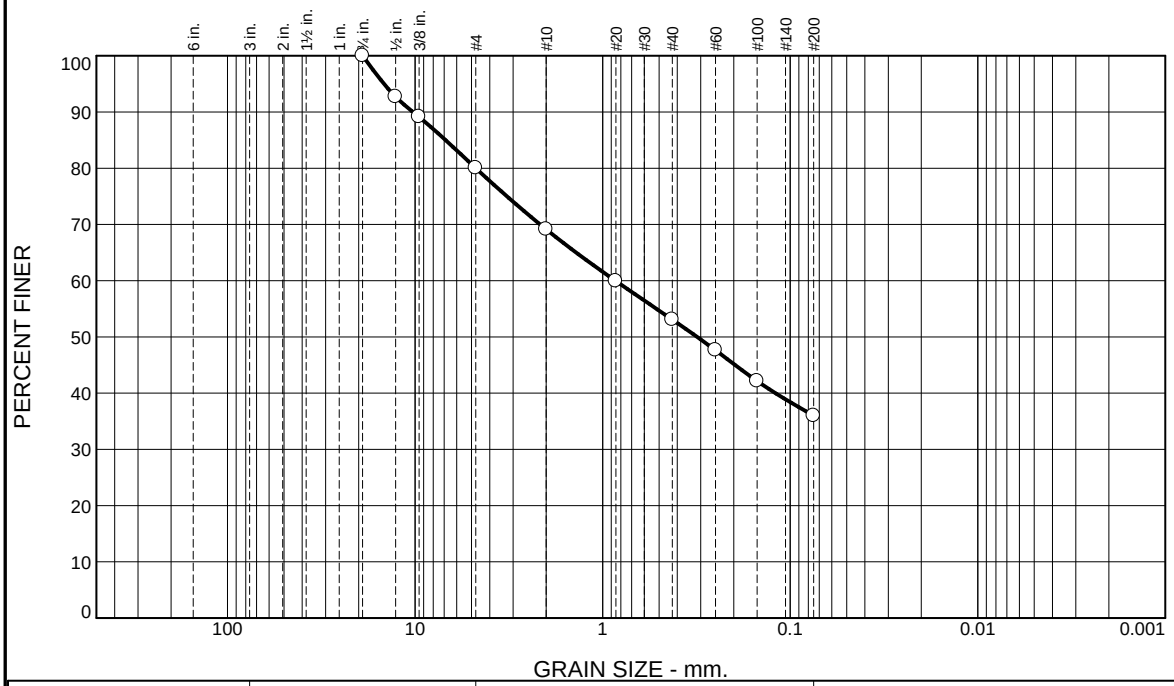
Cranston, RI

Client: GZA GeoEnvironmental

Project: 45 Jackson Rd. DD GT study
Devens, MA

Project No: 01.0174440.00 **Figure** 19-S-2658

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	20.0	10.9	16.0	17.1	36.0	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
0.5"	92.7		
0.375"	89.1		
#4	80.0		
#10	69.1		
#20	59.9		
#40	53.1		
#60	47.6		
#100	42.1		
#200	36.0		

* (no specification provided)

Material Description

Brown f-c SAND and CLAYEY SILT, little fine Gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 10.2630 D_{85}= 6.8715 D_{60}= 0.8557
D_{50}= 0.3132 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample visually classified as plastic. Sample rolled to 1/4".

Date Received: 11.20.19 **Date Tested:** 11.22.19

Tested By: IA

Checked By: Steven Accetta

Title: Laboratory Coordinator

Source of Sample: Boring **Depth:** 6-8' **Date Sampled:**
Sample Number: GZ-202 / S-4

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental
Project: 45 Jackson Rd. DD GT study
Devens, MA
Project No: 01.0174440.00 **Figure** 19-S-2659

Appendix E.4 – 2020 Geotechnical Laboratory Test Results

THIELSCH ENGINEERING

195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
thielsch.com
Let's Build a Solid Foundation

Client Information:
GZA GeoEnvironmental
Norwood, MA
PM: Michael Ostrowski
Assigned By: Michael Ostrowski
Collected By: L. Prohaske

Project Information:
45 Jackson Road
Devens, MA
GZA Project Number: 01.017444.01
Summary Page: 1 of 1
Report Date: 09.28.2020

LABORATORY TESTING DATA SHEET, Report No.: 7420-J-175

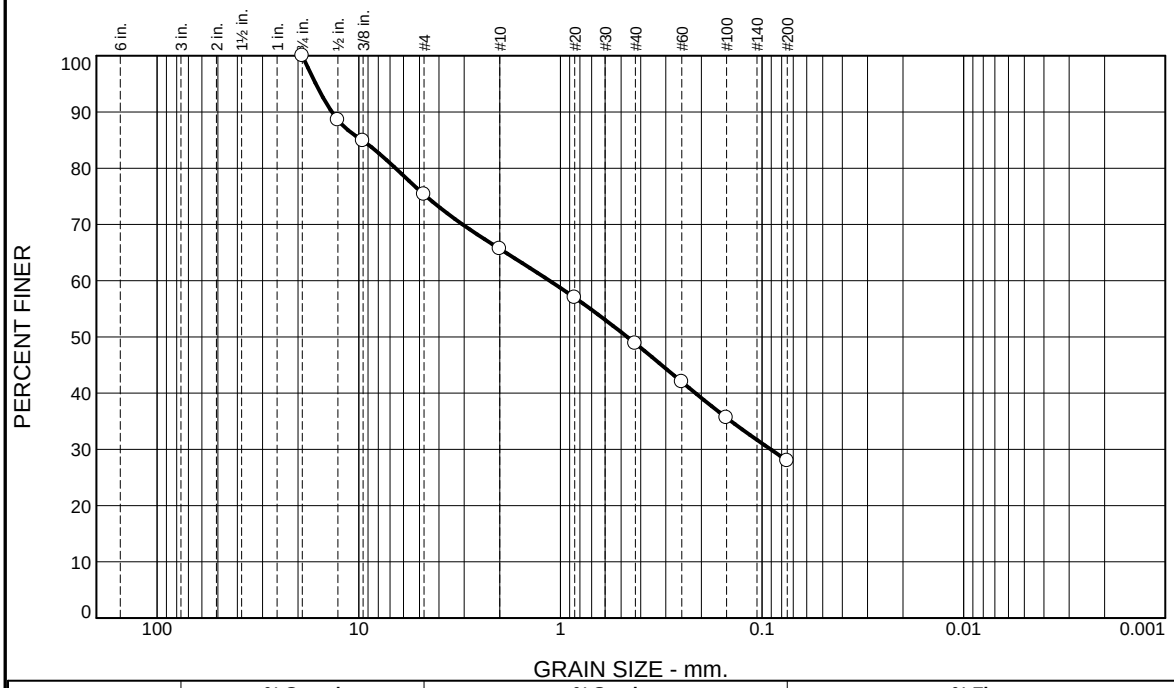
Boring	Sample No.	Depth (Ft)	Laboratory No.	Identification Tests								Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Received Water Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	G_s	Dry unit wt. pcf	Test Water Content %	γ_d MAX (pcf) W_{opt} (%)	γ_d MAX (pcf) W_{opt} (%) (Corr.)	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318		D6913			D2974	D854			D1557						
GZ-301	S-3	4-6	20-S-2804				24.7	47.3	28.0											Brown f-c SAND, some Silt, some fine Gravel
GZ-302	S-3	4-6	20-S-2805				29.3	58.6	12.1											Brown f-c SAND, some f-c Gravel, little Silt
GZ-304	S-4	6-8	20-S-2806				39.2	51.7	9.1											Brown f-c SAND and f-c GRAVEL, trace Silt
GZ-307	S-2	2-4	20-S-2807				55.4	36.9	7.7											Brown fine GRAVEL and f-c SAND, trace Silt

Date Received: *09.23.2020*

Reviewed By:

Date Reviewed: *09.29.2020*

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	24.7	9.6	16.9	20.8	28.0	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
0.5"	88.6		
0.375"	84.9		
#4	75.3		
#10	65.7		
#20	57.0		
#40	48.8		
#60	42.0		
#100	35.6		
#200	28.0		

* (no specification provided)

Material Description

Brown f-c SAND, some Silt, some fine Gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 13.5982 D_{85}= 9.6285 D_{60}= 1.1305
D_{50}= 0.4665 D_{30}= 0.0906 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 09.23.2020 **Date Tested:** 09.25.2020

Tested By: JM / AV

Checked By: Steven Accetta

Title: Laboratory Coordinator

Source of Sample: Boring **Depth:** 4-6' **Date Sampled:**
Sample Number: GZ-301 / S-3

Thielsch Engineering Inc.

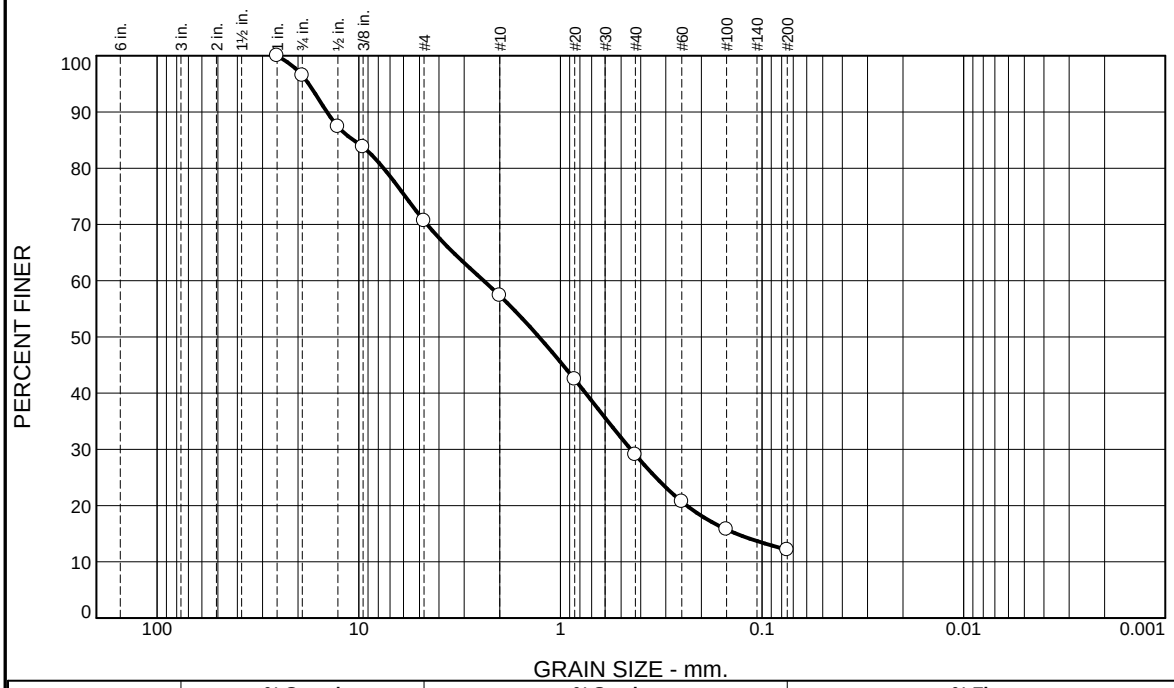
Cranston, RI

Client: GZA GeoEnvironmental

Project: 45 Jackson Road
Deven, MA

Project No: 01.0174440.01 **Figure** 20-S-2804

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.5	25.8	13.4	28.2	17.0	12.1	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	96.5		
0.5"	87.4		
0.375"	83.8		
#4	70.7		
#10	57.3		
#20	42.5		
#40	29.1		
#60	20.7		
#100	15.8		
#200	12.1		

* (no specification provided)

Material Description

Brown f-c SAND, some f-c Gravel, little Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 14.3874 D_{85}= 10.6064 D_{60}= 2.4003
D_{50}= 1.2766 D_{30}= 0.4476 D_{15}= 0.1338
D_{10}= C_u= C_c=

Remarks

Date Received: 09.23.2020 **Date Tested:** 09.25.2020

Tested By: JM / AV

Checked By: Steven Accetta

Title: Laboratory Coordinator

Source of Sample: Boring **Depth:** 4-6' **Date Sampled:**
Sample Number: GZ-302 / S-3

Thielsch Engineering Inc.

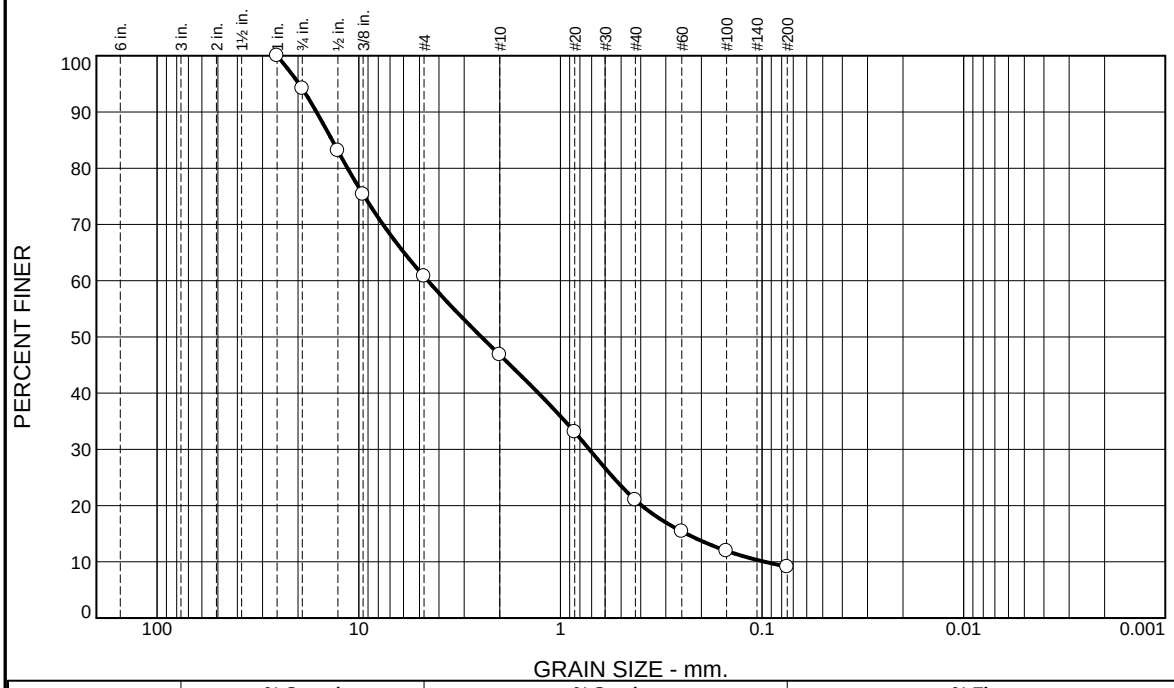
Cranston, RI

Client: GZA GeoEnvironmental

Project: 45 Jackson Road
Deven, MA

Project No: 01.0174440.01 **Figure** 20-S-2805

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.8	33.4	14.0	25.8	11.9	9.1	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	94.2		
0.5"	83.1		
0.375"	75.4		
#4	60.8		
#10	46.8		
#20	33.1		
#40	21.0		
#60	15.4		
#100	11.9		
#200	9.1		

* (no specification provided)

Material Description

Brown f-c SAND and f-c GRAVEL, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SW-SM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 16.1896 D_{85}= 13.5628 D_{60}= 4.5458
D_{50}= 2.4634 D_{30}= 0.7183 D_{15}= 0.2374
D_{10}= 0.0968 C_u= 46.95 C_c= 1.17

Remarks

Date Received: 09.23.2020 **Date Tested:** 09.25.2020

Tested By: JM / AV

Checked By: Steven Accetta

Title: Laboratory Coordinator

Source of Sample: Boring **Depth:** 6-8' **Date Sampled:**
Sample Number: GZ-304 / S-4

Thielsch Engineering Inc.

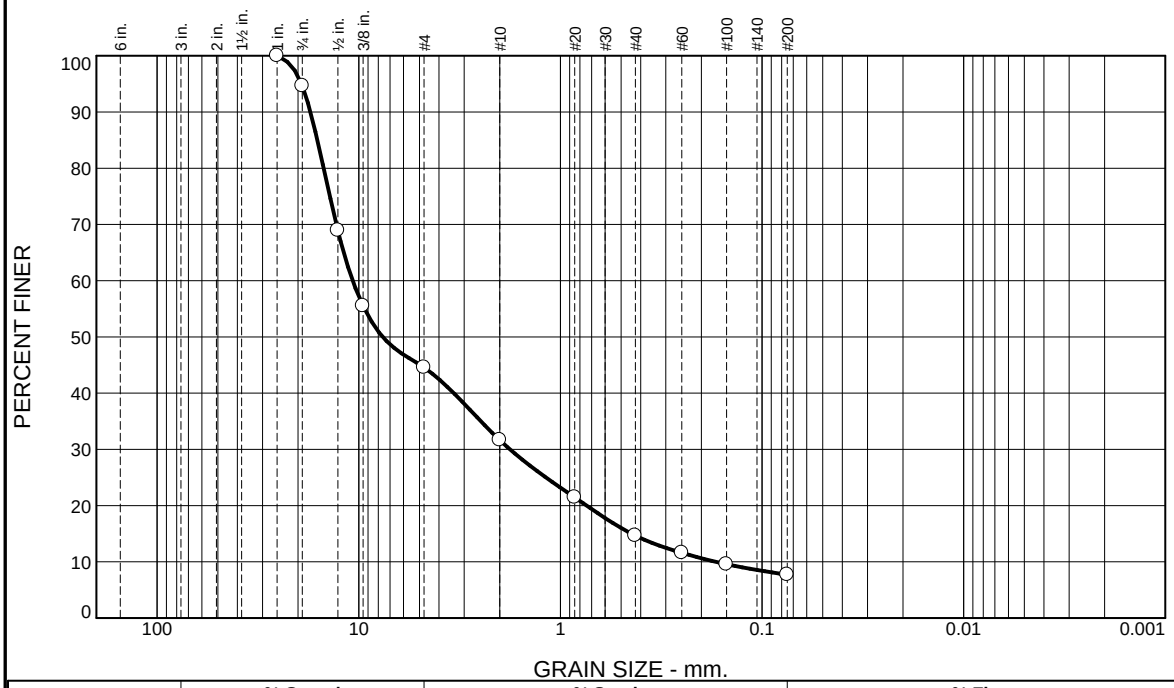
Cranston, RI

Client: GZA GeoEnvironmental

Project: 45 Jackson Road
Deven, MA

Project No: 01.0174440.01 **Figure** 20-S-2806

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.3	50.1	12.9	17.0	7.0	7.7	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	94.7		
0.5"	68.9		
0.375"	55.5		
#4	44.6		
#10	31.7		
#20	21.5		
#40	14.7		
#60	11.6		
#100	9.6		
#200	7.7		

* (no specification provided)

Material Description

Brown fine GRAVEL and f-c SAND, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= GW-GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 17.3576 D_{85}= 16.0399 D_{60}= 10.7166
D_{50}= 7.6058 D_{30}= 1.7791 D_{15}= 0.4438
D_{10}= 0.1693 C_u= 63.29 C_c= 1.74

Remarks

Date Received: 09.23.2020 **Date Tested:** 09.25.2020

Tested By: JM / AV

Checked By: Steven Accetta

Title: Laboratory Coordinator

Source of Sample: Boring **Depth:** 2-4' **Date Sampled:**

Sample Number: GZ-307 / S-2

Thielsch Engineering Inc.

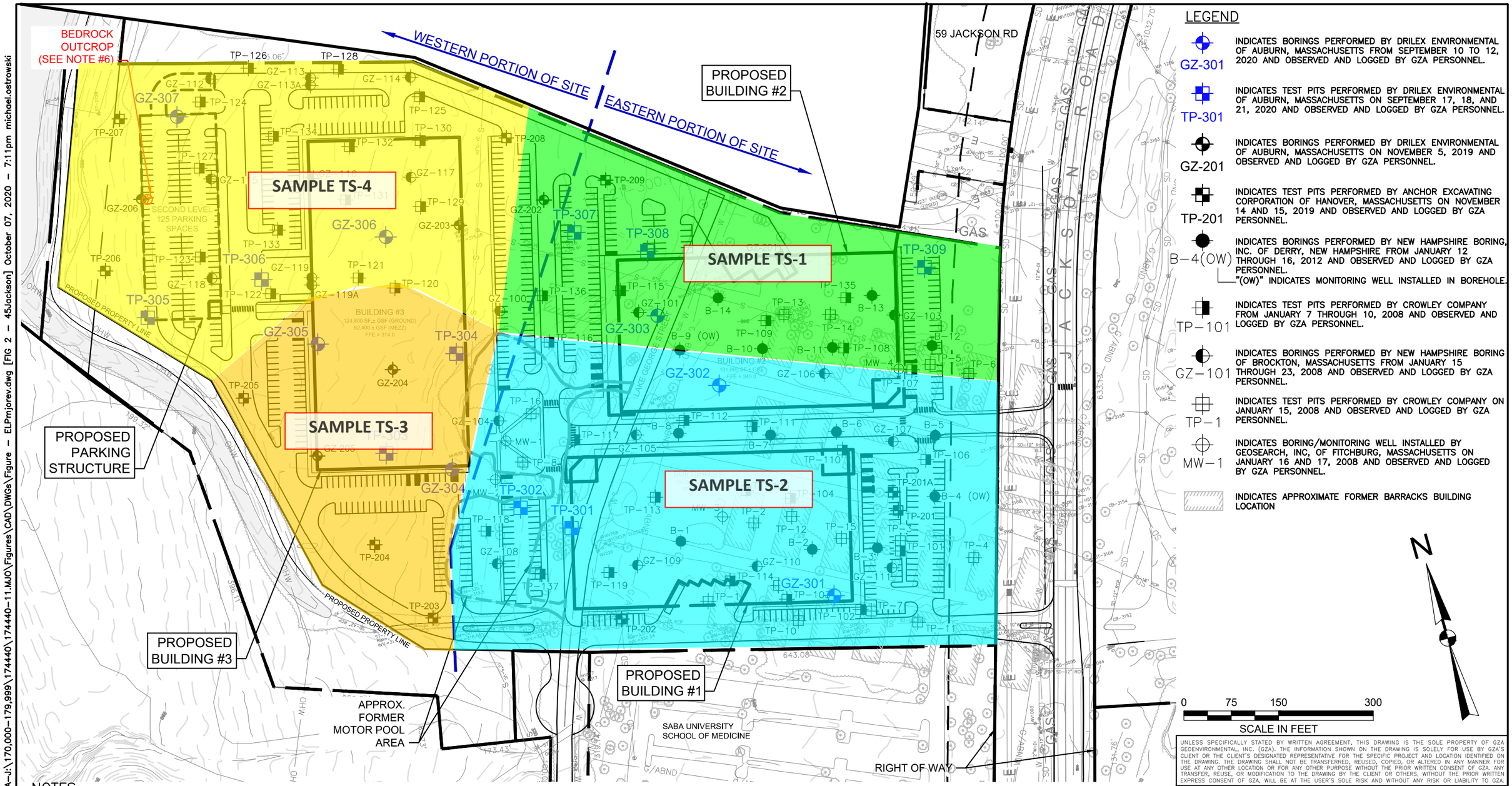
Cranston, RI

Client: GZA GeoEnvironmental

Project: 45 Jackson Road
Deven, MA

Project No: 01.0174440.01 **Figure** 20-S-2807

Appendix F – Topsoil Laboratory Test Results



LEGEND

- GZ-301 — INDICATES BORINGS PERFORMED BY DRILEX ENVIRONMENTAL OF AUBURN, MASSACHUSETTS FROM SEPTEMBER 10 TO 12, 2020 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- TP-301 — INDICATES TEST PITS PERFORMED BY DRILEX ENVIRONMENTAL OF AUBURN, MASSACHUSETTS ON SEPTEMBER 17, 18, AND 21, 2020 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- GZ-201 — INDICATES BORINGS PERFORMED BY DRILEX ENVIRONMENTAL OF AUBURN, MASSACHUSETTS ON NOVEMBER 5, 2019 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- TP-201 — INDICATES TEST PITS PERFORMED BY ANCHOR EXCAVATING CORPORATION OF HANOVER, MASSACHUSETTS ON NOVEMBER 14 AND 15, 2019 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- B-4(OW) — INDICATES BORINGS PERFORMED BY NEW HAMPSHIRE BORING, INC. OF DERRY, NEW HAMPSHIRE FROM JANUARY 12 THROUGH 16, 2012 AND OBSERVED AND LOGGED BY GZA PERSONNEL. "(OW)" INDICATES MONITORING WELL INSTALLED IN BOREHOLE.
- TP-101 — INDICATES TEST PITS PERFORMED BY CROWLEY COMPANY FROM JANUARY 7 THROUGH 10, 2008 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- GZ-101 — INDICATES BORINGS PERFORMED BY NEW HAMPSHIRE BORING OF BROCKTON, MASSACHUSETTS FROM JANUARY 15 THROUGH 23, 2008 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- TP-1 — INDICATES TEST PITS PERFORMED BY CROWLEY COMPANY ON JANUARY 15, 2008 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- MW-1 — INDICATES BORING/MONITORING WELL INSTALLED BY GEOSEARCH, INC, OF FITCHBURG, MASSACHUSETTS ON JANUARY 16 AND 17, 2008 AND OBSERVED AND LOGGED BY GZA PERSONNEL.
- INDICATES APPROXIMATE FORMER BARRACKS BUILDING LOCATION

NOTES

1. BASE MAP DEVELOPED FROM ELECTRONIC DRAWING FILE(S) PRODUCED BY HIGHPOINT ENGINEERING, INC. ENTITLED "MASTERPLAN_BASE.DWG" AND TRANSMITTED TO GZA ON OCTOBER 31, 2019. GZA DID NOT CONFIRM THE ACCURACY OF THE FEATURES SHOWN.
2. LOCATION OF PROPOSED BUILDINGS AND PARKING LOT FEATURES WERE DETERMINED BY ELECTRONIC FILE: "45 CONCEPT10A.DWG" PROVIDED BY HIGHPOINT ENGINEERING, INC., ENTITLED: "DEVENS BIOTECH CAMPUS – CONCEPT 10A", DATED: 11/26/2019.
3. LOCATION OF FORMER BARRACKS BUILDINGS WERE DETERMINED BY ELECTRONIC FILES PROVIDED BY S.J. MULLANEY ENGINEERING, INC. OF LEOMINSTER, MA, ENTITLED "CONCEPTUAL SITE PLAN OF LAND IN DEVENS, MASSACHUSETTS LOCATED AT LOT 16 – JACKSON ROAD, WITH A REVISION DATE OF JANUARY 8, 2008, AND A PLAN ENTITLED "SITE PLAN OF LAND IN DEVENS, MASSACHUSETTS LOCATED AT LOT 16A – JACKSON ROAD", PLAN NO. 80-D-5, DATED MARCH 6, 2008.
4. LOCATIONS OF THE 2020 EXPLORATIONS WERE APPROXIMATELY DETERMINED USING A TRIMBLE GEO7X GPS/GNSS DEVICE, HOWEVER TEST BORINGS GZ-302, GZ-305, AND GZ-306 WERE LOCATED USING TAPED MEASUREMENTS THE GPS-LOCATED STAKES. LOCATIONS OF THE 2019 EXPLORATIONS WERE APPROXIMATELY DETERMINED USING A TRIMBLE R1 HANDHELD WITH IPAD GPS/GNSS DEVICE. PREVIOUS EXPLORATIONS WERE LOCATED BASED ON LINE OF SIGHT AND FROM EXISTING TOPOGRAPHIC SITE FEATURES. THE EXPLORATION LOCATIONS SHOWN SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
5. PER MASSDEVELOPMENT THE ELEVATION DATUM IS REFERENCED TO NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29).
6. BEDROCK OUTCROP LOCATION APPROXIMATED BASED ON TAPED MEASUREMENT FROM BORING GZ-206 AND IS NOT DEPICTED TO SCALE.

SUPPLEMENTAL GEOTECHNICAL EVALUATION
PROPOSED DEVELOPMENT
45 JACKSON ROAD
DEVENS, MASSACHUSETTS

TOPSOIL SAMPLE SKETCH

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: KING DEVENS LLC	
PROJ MGR: MJO	REVIEWED BY: MAR	CHECKED BY: TMK	FIGURE NO. F1
DESIGNED BY: MJO	DRAWN BY: MJO / AJP	SCALE: AS SHOWN	
DATE: OCTOBER 2020	PROJECT NO. 01.0174440.01	REVISION NO. --	

UCONN | COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES

PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

RESULTS REPORT

October 7th , 2020

Name: Michael Ostrowski
GZA GeoEnvironmental, Inc
249 Vanderbilt Avenue
Norwood, MA 02062

Order Number: **13256**

Lab Number: MA20-426

Sample Name: TS-1

Textural Analysis

Percentages are based on the Fine Earth Fraction (Less than 2mm)

Sand:	96.4 %
Silt:	1.8 %
Clay:	1.8 %

According to USDA criteria, this sample classifies as a **SAND**. Classification is based on particles that are sand size or finer (i.e. Less than 2 millimeters in diameter.)

Organic Matter

The organic matter as determined by loss on ignition is 2.3 %

University of Connecticut Soil Nutrient Analysis Laboratory

6 Sherman Place Unit 5102 Storrs, CT 06269-5102

Tel: (860) 486-4274 Fax: (860) 486-4562 Web: www.soiltest.uconn.edu

UCONN | COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES

PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

RESULTS REPORT

October 7th , 2020

Name: Michael Ostrowski
GZA GeoEnvironmental, Inc
249 Vanderbilt Avenue
Norwood, MA 02062

Order Number: **13256**

Lab Number: MA20-427

Sample Name: TS-2

Textural Analysis

Percentages are based on the Fine Earth Fraction (Less than 2mm)

Sand:	86.4 %
Silt:	12.0 %
Clay:	1.6 %

According to USDA criteria, this sample classifies as a **SAND**. Classification is based on particles that are sand size or finer (i.e. Less than 2 millimeters in diameter.)

Organic Matter

The organic matter as determined by loss on ignition is 1.5 %

University of Connecticut Soil Nutrient Analysis Laboratory

6 Sherman Place Unit 5102 Storrs, CT 06269-5102

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PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

RESULTS REPORT

October 7th , 2020

Name: Michael Ostrowski
GZA GeoEnvironmental, Inc
249 Vanderbilt Avenue
Norwood, MA 02062

Order Number: **13256**

Lab Number: MA20-428

Sample Name: TS-3

Textural Analysis

Percentages are based on the Fine Earth Fraction (Less than 2mm)

Sand:	84.7 %
Silt:	15.0 %
Clay:	0.3 %

According to USDA criteria, this sample classifies as a **LOAMY SAND**. Classification is based on particles that are sand size or finer (i.e. Less than 2 millimeters in diameter.)

Organic Matter

The organic matter as determined by loss on ignition is 4.4 %

University of Connecticut Soil Nutrient Analysis Laboratory

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UCONN | COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES

PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

RESULTS REPORT

October 7th , 2020

Name: Michael Ostrowski
GZA GeoEnvironmental, Inc
249 Vanderbilt Avenue
Norwood, MA 02062

Order Number: **13256**

Lab Number: MA20-429

Sample Name: TS-4

Textural Analysis

Percentages are based on the Fine Earth Fraction (Less than 2mm)

Sand:	71.7 %
Silt:	27.9 %
Clay:	0.4 %

According to USDA criteria, this sample classifies as a **LOAMY SAND**. Classification is based on particles that are sand size or finer (i.e. Less than 2 millimeters in diameter.)

Organic Matter

The organic matter as determined by loss on ignition is 6.0 %

University of Connecticut Soil Nutrient Analysis Laboratory

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UConn Soil Nutrient Analysis Laboratory
6 Sherman Place, Unit 5102, Union Cottage
Storrs, CT 06269-5102
860-486-4274
www.soiltest.uconn.edu

UCONN
COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES
PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

Soil Test Report

Order Number: 13256

Prepared For:

Michael Ostrowski
GZA Environmental Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

michael.ostrowski@gza.com
781.603.5934

Sample Information:

Sample Name: TS-1
Lab Number: 7976
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**744 lbs/acre**				
Magnesium	**82 lbs/acre**				
Phosphorus	**4 lbs/acre**				
Potassium	**72 lbs/acre**				

**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	5.2
Est. Cation Exch. Capacity (cmole+/100g)	8.0
Buffered pH (Mod. Mehlich)	6.1

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	4	10 - 30
Calcium	23	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.1	0.1 - 2.0
Copper (Cu)	0.2	0.3 - 0.8
Iron (Fe)	8.2	1.0 - 40.0
Manganese (Mn)	3.1	3.0 - 20.0
Zinc (Zn)	2.5	0.1 - 70.0
Sulfur (S)	11.7	10 - 100
Aluminum (Al)	46.5	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for Needleleaf Trees & Shrubs

Limestone (Target pH of 6.0)

5 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 1 pound of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES TREES, SHRUBS, VINES AND GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

If you have questions about this report or fertilizer recommendations, contact the UConn Soil Nutrient Analysis Lab at (860) 486-4274 or email soiltest@uconn.edu.

If you have questions about any other plant, pest or disease problems, contact the UConn HOME and GARDEN EDUCATION CENTER, Dept. of Plant Science and Landscape Architecture. Phone: (877) 486-6271; email:ladybug@uconn.edu; website:www.ladybug.uconn.edu.

Limestone & Fertilizer Recommendations for Deciduous Trees & Shrubs

Limestone (Target pH of 6.3)

10 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 2 pounds (4 cups) of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES FOR TREES, SHRUBS, VINES and GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

If you have questions about this report or fertilizer recommendations, contact the UConn Soil Nutrient Analysis Lab at (860) 486-4274 or email soiltest@uconn.edu.

If you have questions about any other plant, pest or disease problems, contact the UConn HOME and GARDEN EDUCATION CENTER, Dept. of Plant Science and Landscape Architecture. Phone: (877) 486-6271; email:ladybug@uconn.edu; website:www.ladybug.uconn.edu.

References (Crop Related):

Soil Test Interpretation and Recommendations	http://www.soiltest.uconn.edu/documents/interpretationofsoiltestresults6-2016.pdf
Fertilizer Practices for Lawns	http://www.soiltest.uconn.edu/documents/suggfertpraclawn6-16.pdf
Suggested Fertilizer Practices for Trees, Shrubs, Groundcovers & Vines	http://www.soiltest.uconn.edu/documents/SuggFertPracttreesshrubsvinesgroundcovers5-2016.pdf
Fertilizer Conversions & Garden Measurements	http://www.soiltest.uconn.edu/documents/fertilizerandgardenmeasurements2-5-15.pdf

Soil Test Report

Order Number: 13256

Prepared For:

Michael Ostrowski
GZA Environmental Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

michael.ostrowski@gza.com
781.603.5934

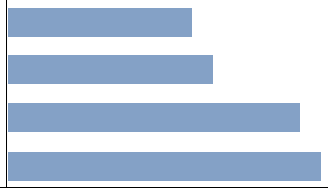
Sample Information:

Sample Name: TS-1
Lab Number: 7976
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**744 lbs/acre**				
Magnesium	**82 lbs/acre**				
Phosphorus	**4 lbs/acre**				
Potassium	**72 lbs/acre**				



**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	5.2
Est. Cation Exch. Capacity (cmole+/100g)	8.0
Buffered pH (Mod. Mehlich)	6.1

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	4	10 - 30
Calcium	23	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.1	0.1 - 2.0
Copper (Cu)	0.2	0.3 - 0.8
Iron (Fe)	8.2	1.0 - 40.0
Manganese (Mn)	3.1	3.0 - 20.0
Zinc (Zn)	2.5	0.1 - 70.0
Sulfur (S)	11.7	10 - 100
Aluminum (Al)	46.5	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for New Lawn Construction

Limestone (Target pH of 6.6)

100 lbs / 1000 sq ft

Comments:

LIMESTONE:
Incorporate any recommended ground limestone thoroughly into the top 6 inches of soil before seeding or sodding.
Your magnesium level is low. Dolomitic limestone is recommended.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM. Apply prior to seeding or sodding and before final grading, 10 lbs of 0-46-0 (triple superphosphate) or 20 lbs of 0-20-0 (superphosphate) or 134 lbs of 0-3-0 (rock phosphate) per 1000 sq ft and 5 lbs of 0-0-60 (potash) or 15 lbs 0-0-22 (sul-po-mag) per 1000 sq ft. Incorporate the fertilizers into the top 4 to 6 inches of soil.

After final grading, if seeding, apply 20 lbs of 5-10-10 or 10 lbs of 10-20-20 or 25 lbs of 4-3-4 per 1000 sq ft. Mix into the soil surface with the seed. If sodding, apply to the soil surface 10 lbs of 10-10-10, 25 lbs of 4-3-4 or 20 lbs of 5-4-3 per 1000 sq ft after final grading and before sod placement.

In future years, follow the fertilizer suggestions on the SUGESTED FERTILIZER PRACTICES FOR LAWNS fact sheet or retest the soil (at least three months after an application of fertilizer) for current recommendations.

If you have questions about this report or fertilizer recommendations, contact the UConn Soil Nutrient Analysis Lab at (860) 486-4274 or email soiltest@uconn.edu.

If you have questions about any other plant, pest or disease problems, contact the UConn HOME and GARDEN EDUCATION CENTER, Dept. of Plant Science and Landscape Architecture. Phone: (877) 486-6271; email:ladybug@uconn.edu; website:www.ladybug.uconn.edu.

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Suggested Fertilizer Practices for Trees, Shrubs, Groundcovers & Vines	http://www.soiltest.uconn.edu/documents/SuggFertPracttreesshrubsvinesgroundcovers5-2016.pdf
Fertilizer Conversions & Garden Measurements	http://www.soiltest.uconn.edu/documents/fertilizerandgardenmeasurements2-5-15.pdf

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UCONN
COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES
PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

Soil Test Report

Order Number: 13256

Prepared For:

Michael Ostrowski
GZA Environmental Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

michael.ostrowski@gza.com
781.603.5934

Sample Information:

Sample Name: TS-2
Lab Number: 7977
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**283 lbs/acre**				
Magnesium	**30 lbs/acre**				
Phosphorus	**7 lbs/acre**				
Potassium	**49 lbs/acre**				

**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	4.9
Est. Cation Exch. Capacity (cmole+/100g)	7.4
Buffered pH (Mod. Mehlich)	6.0

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	2	10 - 30
Calcium	10	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.0	0.1 - 2.0
Copper (Cu)	0.3	0.3 - 0.8
Iron (Fe)	19.5	1.0 - 40.0
Manganese (Mn)	3.1	3.0 - 20.0
Zinc (Zn)	2.0	0.1 - 70.0
Sulfur (S)	9.1	10 - 100
Aluminum (Al)	82.9	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for Needleleaf Trees & Shrubs

Limestone (Target pH of 6.0)

8 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 1 pound of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES TREES, SHRUBS, VINES AND GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

If you have questions about this report or fertilizer recommendations, contact the UConn Soil Nutrient Analysis Lab at (860) 486-4274 or email soiltest@uconn.edu.

If you have questions about any other plant, pest or disease problems, contact the UConn HOME and GARDEN EDUCATION CENTER, Dept. of Plant Science and Landscape Architecture. Phone: (877) 486-6271; email:ladybug@uconn.edu; website:www.ladybug.uconn.edu.

Limestone & Fertilizer Recommendations for Deciduous Trees & Shrubs

Limestone (Target pH of 6.3)

13 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 2 pounds (4 cups) of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES FOR TREES, SHRUBS, VINES and GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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References (Crop Related):

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Fertilizer Conversions & Garden Measurements	http://www.soiltest.uconn.edu/documents/fertilizerandgardenmeasurements2-5-15.pdf

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Area Sampled:
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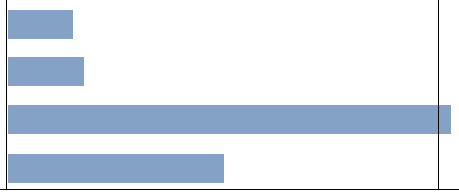
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**283 lbs/acre**				
Magnesium	**30 lbs/acre**				
Phosphorus	**7 lbs/acre**				
Potassium	**49 lbs/acre**				



**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	4.9
Est. Cation Exch. Capacity (cmole+/100g)	7.4
Buffered pH (Mod. Mehlich)	6.0

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	2	10 - 30
Calcium	10	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.0	0.1 - 2.0
Copper (Cu)	0.3	0.3 - 0.8
Iron (Fe)	19.5	1.0 - 40.0
Manganese (Mn)	3.1	3.0 - 20.0
Zinc (Zn)	2.0	0.1 - 70.0
Sulfur (S)	9.1	10 - 100
Aluminum (Al)	82.9	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for New Lawn Construction

Limestone (Target pH of 6.6)

125 lbs / 1000 sq ft

Comments:

LIMESTONE:
Incorporate any recommended ground limestone thoroughly into the top 6 inches of soil before seeding or sodding.
Your magnesium level is low. Dolomitic limestone is recommended.
FERTILIZER:
Soil test POTASSIUM values are BELOW OPTIMUM. Apply prior to seeding or sodding and before final grading, 5 lbs of 0-0-60 (potash) or 15 lbs 0-0-22 (sul-po-mag) per 1000 sq ft. Incorporate the potassium fertilizer into the top 4 to 6 inches of soil.

After final grading, if seeding apply 20 lbs of 5-10-10 or 10 lbs of 10-20-20 or 25 lbs of 4-1-4 or 4-3-4 per 1000 sq ft, or the equivalent, and mix into the soil surface with the seed. If sodding, apply to the soil surface 10 lbs of 10-10-10 or 25 lbs of 4-3-4 or 20 lbs of 5-4-3 per 1000 sq ft after final grading but before sod placement.

In future years, follow the fertilizer suggestions on the SUGGESTED FERTILIZER PRACTICES FOR LAWNS fact sheet or retest the soil (at least three months after an application of fertilizer) for current recommendations.

If you have questions about this report or fertilizer recommendations, contact the UConn Soil Nutrient Analysis Lab at (860) 486-4274 or email soiltest@uconn.edu.

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GZA Environmental Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

michael.ostrowski@gza.com
781.603.5934

Sample Information:

Sample Name: TS-3
Lab Number: 7978
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**514 lbs/acre**				
Magnesium	**66 lbs/acre**				
Phosphorus	**4 lbs/acre**				
Potassium	**87 lbs/acre**				

**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	4.7
Est. Cation Exch. Capacity (cmole+/100g)	13.2
Buffered pH (Mod. Mehlich)	5.6

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	2	10 - 30
Calcium	10	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.1	0.1 - 2.0
Copper (Cu)	0.2	0.3 - 0.8
Iron (Fe)	14.3	1.0 - 40.0
Manganese (Mn)	5.9	3.0 - 20.0
Zinc (Zn)	3.1	0.1 - 70.0
Sulfur (S)	13.3	10 - 100
Aluminum (Al)	117.9	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for Needleleaf Trees & Shrubs

Limestone (Target pH of 6.0)

18 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 1 pound of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES TREES, SHRUBS, VINES AND GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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Limestone & Fertilizer Recommendations for Deciduous Trees & Shrubs

Limestone (Target pH of 6.3)

23 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 2 pounds (4 cups) of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES FOR TREES, SHRUBS, VINES and GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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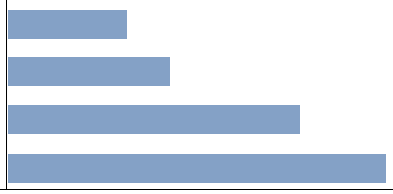
Lab Number: 7978
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**514 lbs/acre**				
Magnesium	**66 lbs/acre**				
Phosphorus	**4 lbs/acre**				
Potassium	**87 lbs/acre**				



**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	4.7
Est. Cation Exch. Capacity (cmole+/100g)	13.2
Buffered pH (Mod. Mehlich)	5.6

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	2	10 - 30
Calcium	10	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.1	0.1 - 2.0
Copper (Cu)	0.2	0.3 - 0.8
Iron (Fe)	14.3	1.0 - 40.0
Manganese (Mn)	5.9	3.0 - 20.0
Zinc (Zn)	3.1	0.1 - 70.0
Sulfur (S)	13.3	10 - 100
Aluminum (Al)	117.9	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for New Lawn Construction

Limestone (Target pH of 6.6)

225 lbs / 1000 sq ft

Comments:

LIMESTONE:
Incorporate any recommended ground limestone thoroughly into the top 6 inches of soil before seeding or sodding.
Your magnesium level is low. Dolomitic limestone is recommended.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM. Apply prior to seeding or sodding and before final grading, 10 lbs of 0-46-0 (triple superphosphate) or 20 lbs of 0-20-0 (superphosphate) or 134 lbs of 0-3-0 (rock phosphate) per 1000 sq ft and 5 lbs of 0-0-60 (potash) or 15 lbs 0-0-22 (sul-po-mag) per 1000 sq ft. Incorporate the fertilizers into the top 4 to 6 inches of soil.

After final grading, if seeding, apply 20 lbs of 5-10-10 or 10 lbs of 10-20-20 or 25 lbs of 4-3-4 per 1000 sq ft. Mix into the soil surface with the seed. If sodding, apply to the soil surface 10 lbs of 10-10-10, 25 lbs of 4-3-4 or 20 lbs of 5-4-3 per 1000 sq ft after final grading and before sod placement.

In future years, follow the fertilizer suggestions on the SUGESTED FERTILIZER PRACTICES FOR LAWNS fact sheet or retest the soil (at least three months after an application of fertilizer) for current recommendations.

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Sample Information:

Sample Name: TS-4
Lab Number: 7979
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**207 lbs/acre**				
Magnesium	**56 lbs/acre**				
Phosphorus	**4 lbs/acre**				
Potassium	**82 lbs/acre**				

**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	4.3
Est. Cation Exch. Capacity (cmole+/100g)	15.7
Buffered pH (Mod. Mehlich)	5.4

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	1	10 - 30
Calcium	3	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.0	0.1 - 2.0
Copper (Cu)	0.1	0.3 - 0.8
Iron (Fe)	43.7	1.0 - 40.0
Manganese (Mn)	9.1	3.0 - 20.0
Zinc (Zn)	2.1	0.1 - 70.0
Sulfur (S)	22.6	10 - 100
Aluminum (Al)	239.1	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for Needleleaf Trees & Shrubs

Limestone (Target pH of 6.0)

25 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.

Your soil pH is very low! Select plants adapted to very acid soils or apply limestone as directed.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 1 pound of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES TREES, SHRUBS, VINES AND GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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Limestone & Fertilizer Recommendations for Deciduous Trees & Shrubs

Limestone (Target pH of 6.3)

30 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.

Your soil pH is very low! Select plants adapted to very acid soils or apply limestone as directed.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 2 pounds (4 cups) of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES FOR TREES, SHRUBS, VINES and GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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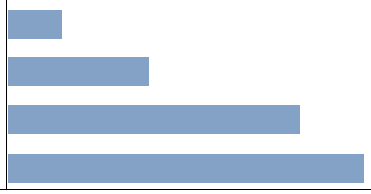
Potassium	**82 lbs/acre**				



**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	4.3
Est. Cation Exch. Capacity (cmole+/100g)	15.7
Buffered pH (Mod. Mehlich)	5.4

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	1	10 - 30
Calcium	3	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.0	0.1 - 2.0
Copper (Cu)	0.1	0.3 - 0.8
Iron (Fe)	43.7	1.0 - 40.0
Manganese (Mn)	9.1	3.0 - 20.0
Zinc (Zn)	2.1	0.1 - 70.0
Sulfur (S)	22.6	10 - 100
Aluminum (Al)	239.1	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for New Lawn Construction

Limestone (Target pH of 6.6)

300 lbs / 1000 sq ft

Comments:

LIMESTONE:
Incorporate any recommended ground limestone thoroughly into the top 6 inches of soil before seeding or sodding.
Your magnesium level is low. Dolomitic limestone is recommended.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM. Apply prior to seeding or sodding and before final grading, 10 lbs of 0-46-0 (triple superphosphate) or 20 lbs of 0-20-0 (superphosphate) or 134 lbs of 0-3-0 (rock phosphate) per 1000 sq ft and 5 lbs of 0-0-60 (potash) or 15 lbs 0-0-22 (sul-po-mag) per 1000 sq ft. Incorporate the fertilizers into the top 4 to 6 inches of soil.

After final grading, if seeding, apply 20 lbs of 5-10-10 or 10 lbs of 10-20-20 or 25 lbs of 4-3-4 per 1000 sq ft. Mix into the soil surface with the seed. If sodding, apply to the soil surface 10 lbs of 10-10-10, 25 lbs of 4-3-4 or 20 lbs of 5-4-3 per 1000 sq ft after final grading and before sod placement.

In future years, follow the fertilizer suggestions on the SUGESTED FERTILIZER PRACTICES FOR LAWNS fact sheet or retest the soil (at least three months after an application of fertilizer) for current recommendations.

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Storrs, CT 06269-5102
860-486-4274
www.soiltest.uconn.edu

UCONN
COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES
PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

Soil Test Report

Order Number: 13256

Prepared For:

Michael Ostrowski
GZA Environmental Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

michael.ostrowski@gza.com
781.603.5934

Sample Information:

Sample Name: TS75-1
Lab Number: 7980
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**1194 lbs/acre**				
Magnesium	**88 lbs/acre**				
Phosphorus	**4 lbs/acre**				
Potassium	**96 lbs/acre**				

**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	4.9
Est. Cation Exch. Capacity (cmole+/100g)	13.2
Buffered pH (Mod. Mehlich)	5.8

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	3	10 - 30
Calcium	23	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.1	0.1 - 2.0
Copper (Cu)	0.2	0.3 - 0.8
Iron (Fe)	9.7	1.0 - 40.0
Manganese (Mn)	5.1	3.0 - 20.0
Zinc (Zn)	4.7	0.1 - 70.0
Sulfur (S)	18.7	10 - 100
Aluminum (Al)	116.1	10 - 300
Est. Total Lead (Pb)	107.3	

Limestone & Fertilizer Recommendations for Needleleaf Trees & Shrubs

Limestone (Target pH of 6.0)

15 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 1 pound of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES TREES, SHRUBS, VINES AND GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

The lead level in this soil is elevated. See Soil Lead Interpretation Sheet for more information:
http://soiltest.uconn.edu/factsheets/SoilLead_new.pdf

If you have questions about this report or fertilizer recommendations, contact the UConn Soil Nutrient Analysis Lab at (860) 486-4274 or email soiltest@uconn.edu.

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Limestone & Fertilizer Recommendations for Deciduous Trees & Shrubs

Limestone (Target pH of 6.3)

20 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 2 pounds (4 cups) of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES FOR TREES, SHRUBS, VINES and GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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Fertilizer Conversions & Garden Measurements	http://www.soiltest.uconn.edu/documents/fertilizerandgardenmeasurements2-5-15.pdf

Soil Test Report

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Sample Information:

Sample Name: TS75-1
Lab Number: 7980
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**1194 lbs/acre**				
Magnesium	**88 lbs/acre**				
Phosphorus	**4 lbs/acre**				
Potassium	**96 lbs/acre**				

**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	4.9
Est. Cation Exch. Capacity (cmole+/100g)	13.2
Buffered pH (Mod. Mehlich)	5.8

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	3	10 - 30
Calcium	23	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.1	0.1 - 2.0
Copper (Cu)	0.2	0.3 - 0.8
Iron (Fe)	9.7	1.0 - 40.0
Manganese (Mn)	5.1	3.0 - 20.0
Zinc (Zn)	4.7	0.1 - 70.0
Sulfur (S)	18.7	10 - 100
Aluminum (Al)	116.1	10 - 300
Est. Total Lead (Pb)	107.3	

Limestone & Fertilizer Recommendations for New Lawn Construction

Limestone (Target pH of 6.6)

200 lbs / 1000 sq ft

Comments:

LIMESTONE:
Incorporate any recommended ground limestone thoroughly into the top 6 inches of soil before seeding or sodding.
Your magnesium level is low. Dolomitic limestone is recommended.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM. Apply prior to seeding or sodding and before final grading, 10 lbs of 0-46-0 (triple superphosphate) or 20 lbs of 0-20-0 (superphosphate) or 134 lbs of 0-3-0 (rock phosphate) per 1000 sq ft and 5 lbs of 0-0-60 (potash) or 15 lbs 0-0-22 (sul-po-mag) per 1000 sq ft. Incorporate the fertilizers into the top 4 to 6 inches of soil.

After final grading, if seeding, apply 20 lbs of 5-10-10 or 10 lbs of 10-20-20 or 25 lbs of 4-3-4 per 1000 sq ft. Mix into the soil surface with the seed. If sodding, apply to the soil surface 10 lbs of 10-10-10, 25 lbs of 4-3-4 or 20 lbs of 5-4-3 per 1000 sq ft after final grading and before sod placement.

In future years, follow the fertilizer suggestions on the SUGESTED FERTILIZER PRACTICES FOR LAWNS fact sheet or retest the soil (at least three months after an application of fertilizer) for current recommendations.

The lead level in this soil is elevated. See Soil Lead Interpretation Sheet for more information:
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Soil Test Report

Order Number: 13256

Prepared For:

Michael Ostrowski
GZA Environmental Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

michael.ostrowski@gza.com
781.603.5934

Sample Information:

Sample Name: TS75-2
Lab Number: 7981
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**858 lbs/acre**				
Magnesium	**77 lbs/acre**				
Phosphorus	**2 lbs/acre**				
Potassium	**97 lbs/acre**				

**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	5.3
Est. Cation Exch. Capacity (cmole+/100g)	7.8
Buffered pH (Mod. Mehlich)	6.1

Base Saturation	***%***	***Suggested***
Potassium	2	2.0 - 7.0
Magnesium	4	10 - 30
Calcium	28	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.1	0.1 - 2.0
Copper (Cu)	0.2	0.3 - 0.8
Iron (Fe)	5.5	1.0 - 40.0
Manganese (Mn)	1.7	3.0 - 20.0
Zinc (Zn)	3.0	0.1 - 70.0
Sulfur (S)	11.8	10 - 100
Aluminum (Al)	60.1	10 - 300
Est. Total Lead (Pb)	118.4	

Limestone & Fertilizer Recommendations for Needleleaf Trees & Shrubs

Limestone (Target pH of 6.0)

5 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 1 pound of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES TREES, SHRUBS, VINES AND GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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Limestone & Fertilizer Recommendations for Deciduous Trees & Shrubs

Limestone (Target pH of 6.3)

10 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 2 pounds (4 cups) of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES FOR TREES, SHRUBS, VINES and GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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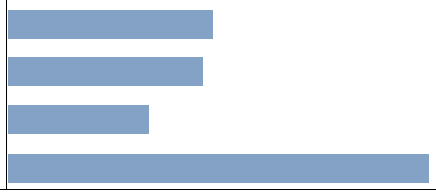
Sample Information:

Sample Name: TS75-2
Lab Number: 7981
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**858 lbs/acre**				
Magnesium	**77 lbs/acre**				
Phosphorus	**2 lbs/acre**				
Potassium	**97 lbs/acre**				



**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	5.3
Est. Cation Exch. Capacity (cmole+/100g)	7.8
Buffered pH (Mod. Mehlich)	6.1

Base Saturation	***%***	***Suggested***
Potassium	2	2.0 - 7.0
Magnesium	4	10 - 30
Calcium	28	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.1	0.1 - 2.0
Copper (Cu)	0.2	0.3 - 0.8
Iron (Fe)	5.5	1.0 - 40.0
Manganese (Mn)	1.7	3.0 - 20.0
Zinc (Zn)	3.0	0.1 - 70.0
Sulfur (S)	11.8	10 - 100
Aluminum (Al)	60.1	10 - 300
Est. Total Lead (Pb)	118.4	

Limestone & Fertilizer Recommendations for New Lawn Construction

Limestone (Target pH of 6.6)

100 lbs / 1000 sq ft

Comments:

LIMESTONE:
Incorporate any recommended ground limestone thoroughly into the top 6 inches of soil before seeding or sodding.
Your magnesium level is low. Dolomitic limestone is recommended.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM. Apply prior to seeding or sodding and before final grading, 10 lbs of 0-46-0 (triple superphosphate) or 20 lbs of 0-20-0 (superphosphate) or 134 lbs of 0-3-0 (rock phosphate) per 1000 sq ft and 5 lbs of 0-0-60 (potash) or 15 lbs 0-0-22 (sul-po-mag) per 1000 sq ft. Incorporate the fertilizers into the top 4 to 6 inches of soil.

After final grading, if seeding, apply 20 lbs of 5-10-10 or 10 lbs of 10-20-20 or 25 lbs of 4-3-4 per 1000 sq ft. Mix into the soil surface with the seed. If sodding, apply to the soil surface 10 lbs of 10-10-10, 25 lbs of 4-3-4 or 20 lbs of 5-4-3 per 1000 sq ft after final grading and before sod placement.

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Norwood, MA 02062

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781.603.5934

Sample Information:

Sample Name: TS75-3
Lab Number: 7982
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**939 lbs/acre**				
Magnesium	**81 lbs/acre**				
Phosphorus	**2 lbs/acre**				
Potassium	**67 lbs/acre**				

**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	5.8
Est. Cation Exch. Capacity (cmole+/100g)	7.2
Buffered pH (Mod. Mehlich)	6.2

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	5	10 - 30
Calcium	33	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.1	0.1 - 2.0
Copper (Cu)	0.2	0.3 - 0.8
Iron (Fe)	4.5	1.0 - 40.0
Manganese (Mn)	1.0	3.0 - 20.0
Zinc (Zn)	1.4	0.1 - 70.0
Sulfur (S)	11.5	10 - 100
Aluminum (Al)	38.8	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for Needleleaf Trees & Shrubs

Limestone (Target pH of 6.0)

5 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 1 pound of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES TREES, SHRUBS, VINES AND GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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Limestone & Fertilizer Recommendations for Deciduous Trees & Shrubs

Limestone (Target pH of 6.3)

8 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 2 pounds (4 cups) of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES FOR TREES, SHRUBS, VINES and GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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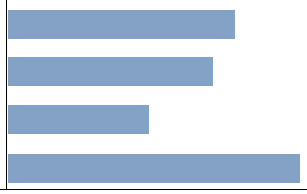
Potassium	**67 lbs/acre**				



**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	5.8
Est. Cation Exch. Capacity (cmole+/100g)	7.2
Buffered pH (Mod. Mehlich)	6.2

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	5	10 - 30
Calcium	33	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.1	0.1 - 2.0
Copper (Cu)	0.2	0.3 - 0.8
Iron (Fe)	4.5	1.0 - 40.0
Manganese (Mn)	1.0	3.0 - 20.0
Zinc (Zn)	1.4	0.1 - 70.0
Sulfur (S)	11.5	10 - 100
Aluminum (Al)	38.8	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for New Lawn Construction

Limestone (Target pH of 6.6)

75 lbs / 1000 sq ft

Comments:

LIMESTONE:
Incorporate any recommended ground limestone thoroughly into the top 6 inches of soil before seeding or sodding.
Your magnesium level is low. Dolomitic limestone is recommended.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM. Apply prior to seeding or sodding and before final grading, 10 lbs of 0-46-0 (triple superphosphate) or 20 lbs of 0-20-0 (superphosphate) or 134 lbs of 0-3-0 (rock phosphate) per 1000 sq ft and 5 lbs of 0-0-60 (potash) or 15 lbs 0-0-22 (sul-po-mag) per 1000 sq ft. Incorporate the fertilizers into the top 4 to 6 inches of soil.

After final grading, if seeding, apply 20 lbs of 5-10-10 or 10 lbs of 10-20-20 or 25 lbs of 4-3-4 per 1000 sq ft. Mix into the soil surface with the seed. If sodding, apply to the soil surface 10 lbs of 10-10-10, 25 lbs of 4-3-4 or 20 lbs of 5-4-3 per 1000 sq ft after final grading and before sod placement.

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Soil Test Interpretation and Recommendations	http://www.soiltest.uconn.edu/documents/interpretationofsoiltestresults6-2016.pdf
Fertilizer Practices for Lawns	http://www.soiltest.uconn.edu/documents/suggfertpraclawn6-16.pdf
Suggested Fertilizer Practices for Trees, Shrubs, Groundcovers & Vines	http://www.soiltest.uconn.edu/documents/SuggFertPracttreesshrubsvinesgroundcovers5-2016.pdf
Fertilizer Conversions & Garden Measurements	http://www.soiltest.uconn.edu/documents/fertilizerandgardenmeasurements2-5-15.pdf

UConn Soil Nutrient Analysis Laboratory
6 Sherman Place, Unit 5102, Union Cottage
Storrs, CT 06269-5102
860-486-4274
www.soiltest.uconn.edu

UCONN
COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES
PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

Soil Test Report

Order Number: 13256

Prepared For:

Michael Ostrowski
GZA Environmental Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

michael.ostrowski@gza.com
781.603.5934

Sample Information:

Sample Name: TS75-4
Lab Number: 7983
Area Sampled:
Received: 9/30/2020
Reported: 10/7/2020

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**1324 lbs/acre**				
Magnesium	**105 lbs/acre**				
Phosphorus	**2 lbs/acre**				
Potassium	**87 lbs/acre**				

**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	5.6
Est. Cation Exch. Capacity (cmole+/100g)	8.9
Buffered pH (Mod. Mehlich)	6.1

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	5	10 - 30
Calcium	37	40 - 50

Element	***ppm***	***Soil Range in CT***
Boron (B)	0.1	0.1 - 2.0
Copper (Cu)	0.2	0.3 - 0.8
Iron (Fe)	4.1	1.0 - 40.0
Manganese (Mn)	1.8	3.0 - 20.0
Zinc (Zn)	1.6	0.1 - 70.0
Sulfur (S)	16.7	10 - 100
Aluminum (Al)	49.6	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for Needleleaf Trees & Shrubs

Limestone (Target pH of 6.0)

5 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 1 pound of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES TREES, SHRUBS, VINES AND GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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Limestone & Fertilizer Recommendations for Deciduous Trees & Shrubs

Limestone (Target pH of 6.3)

8 lbs / 100 sq ft

Comments:

LIMESTONE:
Apply ground limestone as recommended to raise the soil pH. For new plantings, work the entire amount into the top 6 to 8 inches of soil before planting. For established beds, gently scratch in limestone into soil around plants. If more than 10 lbs of limestone per 100 sq. ft. is recommended, put one-half down now and the other half in a month or more.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM.

Apply 2 pounds (4 cups) of 5-10-10 or the equivalent from other sources per 100 square feet. See the SUGGESTED FERTILIZER PRACTICES FOR TREES, SHRUBS, VINES and GROUNDCOVERS fact sheet for instructions on how and when to add fertilizer.

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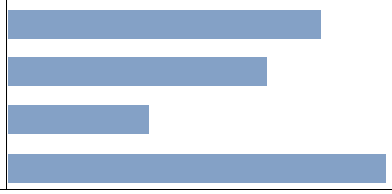

**** Excessive only defined for Phosphorus (>40 lbs/acre)***

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Zinc (Zn)	1.6	0.1 - 70.0
Sulfur (S)	16.7	10 - 100
Aluminum (Al)	49.6	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for New Lawn Construction

Limestone (Target pH of 6.6)

75 lbs / 1000 sq ft

Comments:

LIMESTONE:
Incorporate any recommended ground limestone thoroughly into the top 6 inches of soil before seeding or sodding.
FERTILIZER:
Soil test values for both PHOSPHORUS and POTASSIUM are BELOW OPTIMUM. Apply prior to seeding or sodding and before final grading, 10 lbs of 0-46-0 (triple superphosphate) or 20 lbs of 0-20-0 (superphosphate) or 134 lbs of 0-3-0 (rock phosphate) per 1000 sq ft and 5 lbs of 0-0-60 (potash) or 15 lbs 0-0-22 (sul-po-mag) per 1000 sq ft. Incorporate the fertilizers into the top 4 to 6 inches of soil.

After final grading, if seeding, apply 20 lbs of 5-10-10 or 10 lbs of 10-20-20 or 25 lbs of 4-3-4 per 1000 sq ft. Mix into the soil surface with the seed. If sodding, apply to the soil surface 10 lbs of 10-10-10, 25 lbs of 4-3-4 or 20 lbs of 5-4-3 per 1000 sq ft after final grading and before sod placement.

In future years, follow the fertilizer suggestions on the SUGESTED FERTILIZER PRACTICES FOR LAWNS fact sheet or retest the soil (at least three months after an application of fertilizer) for current recommendations.

If you have questions about this report or fertilizer recommendations, contact the UConn Soil Nutrient Analysis Lab at (860) 486-4274 or email soiltest@uconn.edu.

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