

STORMWATER MANAGEMENT FACILITY OPERATIONS & MAINTENANCE MANUAL

for

Proposed Multi-Family Residential with Non-Residential Event Space

Prepared for:

CBD Bloomfield Developer Urban Renewal, LLC

Block 244, Lots 10, 42 & 46
675-699 Bloomfield Avenue (C.R. 605)
14 & 34-40 State Street
Bloomfield Township
Essex County, New Jersey

Prepared by

BOHLER //

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May 2024

Stormwater Management Measures Maintenance Plan & Field Manuals

Development Name: CBD Bloomfield Developer Urban Renewal, LLC

Address: 675-699 Bloomfield Avenue (C.R. 605), 14 & 34-40 State Street

Block(s) / Lot(s): Block 244, Lots 10, 42 & 46

Township, County: Bloomfield Township, Essex County

Party Responsible for Maintenance:

CBD Bloomfield Developer Urban Renewal, LLC

Address: 75 Eisenhower Parkway, Suite 180, Roseland, New Jersey 07068

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Prepared by: Bohler Engineering NJ, LLC Date: May 2024

This plan is recorded in

Deed Book # _____ Page # _____ with _____ County Clerk on Date

Last Revised on ____/____/____

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Part I- Maintenance Plan

List of Stormwater Management Measures

The stormwater management measures incorporated into this development are listed below. The corresponding Field Manuals for the stormwater management measures are located in Part II of the Maintenance Plan.

Type of Stormwater Management Measure	BMP No.	Location Description	State Plane Coordinates
Sub-Surface Infiltration Basin	Basin #1A	Located within the understory parking area at the center of the building	715,390 Northing 575,294 Easting
Sub-Surface Infiltration Basin	Basin #1B	Located within the understory parking area at the Southeast corner of the building	715,305 Northing 575,344 Easting
Sub-Surface Infiltration Basin	Basin #1C	Located within the understory parking area at the Northeast corner of the building	715,481 Northing 575,334 Easting

Location Map

Refer to Proposed Drainage Area Map provided in the Appendix of this Report

Description of Stormwater Management Measures

Bioretention Basins

Design storm:

- Design Purposes:
 - NJDEP Water Quality storm
 - NOAA Atlas 14 Rainfall
 - o 2-year storm (3.44 inches);
 - o 10-year storm (5.22 inches);
 - o 100-year storm (8.66 inches);
 - NJDEP Current Adj. NOAA Atlas 14 Rainfall
 - o 2-year storm (3.47 inches);
 - o 10-year storm (5.38 inches);
 - o 100-year storm (9.18 inches);
 - NJDEP Future Adj. NOAA Atlas 14 Rainfall
 - o 2-year storm (4.09 inches);
 - o 10-year storm (6.37 inches);
 - o 100-year storm (11.52 inches).
- Dimensions:
 - Basin #1A
 - o 111.40' (L) x 82.72' (W) x 3.21' (H)
 - Basin #1B
 - o 102.43' (L) x 23.69' (W) x 3.21' (H)
 - Basin #1C
 - o 90.61' (L) x 22.04' (W) x 3.37' (H)

Preventative and Corrective Maintenance Action Plan

As per N.J.A.C. 7:8-5.8(b) & (e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including, but not limited to, repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings.

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include specific preventative and corrective maintenance tasks such as removal of sediment, trash, and debris; mowing, pruning, and restoration of vegetation; restoration of eroded areas; elimination of mosquito breeding habitats; control of aquatic vegetation; and repair or replacement of damaged or deteriorated components.

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include recommended corrective responses to various emergency conditions that may be encountered at the stormwater management measure. It should be noted that if the stormwater management measure includes a Class I or II dam as defined in the NJDEP Dam Safety Standards at N.J.A.C. 7:20, an emergency action plan for the dam is also required. See N.J.A.C. 7:20-1.7(f) for more information.

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), the maintenance plan should address the maintenance of access points to the stormwater management measures in accordance with the following:

- all components of the stormwater management measures must be readily accessible for inspection and maintenance;
- trees, shrubs, and underbrush must be pruned or trimmed as necessary to maintain access to the stormwater management measure via roadways, paths, and ramps, including paths through perimeter vegetation to permanent pools, aquatic benches, and safety ledges to allow for the inspection and control of mosquito breeding; and
- the exact limits of inspection and maintenance easements and rights-of-way should be specified on stormwater management measure plans and included in the maintenance plan.

As per N.J.A.C. 7:8-5.8(d), the maintenance of stormwater management facilities and any future revision to it shall be recorded upon the deed of record for the property.

Routine Inspection and Maintenance of the Stormwater Management Facilities:

All stormwater management basins have been designed to control degradation of water quality. Without proper routine inspection and maintenance, the basins may lose some or all of their capability to function to their full capacity. Lack of adequate maintenance at these facilities could lead to system failures.

Regularly scheduled maintenance inspections of the stormwater facilities should be performed at least four (4) times each year. The primary purpose of these inspections is to ascertain the operational condition and safety of the facilities, particularly the condition of embankments, outlet structures, sedimentation and other safety-related aspects. Inspections will also provide information on the effectiveness of regularly scheduled Preventative and Aesthetic Maintenance Procedures, and will help to identify where changes in the extent and scheduling of the procedures are warranted. Finally, the facility inspections should also be used to determine the need for and timing of Corrective Maintenance procedures.

Routine maintenance of these facilities should be separated into two (2) basic types: Functional Maintenance and Aesthetic Maintenance. Functional Maintenance is further broken down into two (2) categories: Preventative and Corrective. Aesthetic Maintenance, which is necessary to maintain the visual appeal and aesthetic quality of these facilities, should be incorporated on the same schedule as the preventative maintenance efforts. Listed below are the Preventative, Corrective and Aesthetic Maintenance Procedures to be performed on a routine basis:

Preventative Maintenance Procedures:

The purpose of Preventative Maintenance is to maximize the effectiveness of the stormwater management aspects of the basins so that they remain operational and safe and to minimize the need for potential emergency or extensive corrective maintenance. These procedures are as follows:

- a) **Weed Growth** – Weeds associated with detention basins typically fall into three (3) categories: submergent, floating and emergent. All three (3) are typically found, to some extent, in a stormwater management system. However, excessive growth of any of these weeds can lead to problems.

The basins should be evaluated regularly to determine whether excessive invasive plant growth is evident. If it occurs, this situation can be corrected by appropriate application of fertilizers and weed killers. Weeds which have become a problem can be cleared through manual removal by professional pond maintenance technicians.

- b) **Maintenance of Adjacent Areas** – Grass areas, trees, and shrubs throughout the site require periodic routine maintenance to include fertilizing, de-thatching and soil conditioning in order to maintain healthy growth and to provide soil stabilization. The application of fertilizers should follow manufacturer’s instructions to reduce run-off of these compounds into the basins. Additionally, provisions should be made to re-seed and re-establish grass cover in areas damaged by sediment accumulation, stormwater flow, or other causes. These tasks should be performed, or at least evaluated, on a quarterly basis. Lawn areas should be mowed at least once a month during the growing season. Vegetated areas must be inspected at least annually for erosion and scour as well as unwanted growth, which should be removed with minimum disruption to the remaining vegetation.

Note: All use of fertilizers, mechanical treatments, pesticides and other means to ensure optimum vegetation health must not compromise the intended purpose of the stormwater management facility. All vegetation deficiencies should be addressed without the use of fertilizers and pesticides whenever possible and if necessary, the minimum amount practical.

- c) **Removal and Disposal of Trash/Debris and Sediment** – All stormwater management components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation at least four times annually as well as after every storm exceeding one inch of rainfall in 24 hours. Such components should include the aboveground basins, catch basins, outlet structures, manufactured treatment devices and trash racks.

Removal of trash and debris will prevent possible damage and minimize potential mosquito breeding habitats. Debris and trash must be properly hauled off the site and transferred to an approved disposal site.

The subsurface infiltration basin should also be evaluated for excessive deposition of sediment. Accumulated sediment should be removed before it threatens the storage volume of the basin. Before de-sedimentation activities are performed, consideration should be given to evacuating all standing water from the basins. Disposal of discharged water and sediment must comply with all local, county, state and federal regulations. Only suitable disposal sites should be utilized. If stable soil conditions exist around the basin, sediment deposition should not be an excessive maintenance issue. Should a recurrent stabilization situation develop, the inspector should identify the upstream sources of sediment and recommend required stabilization measures.

- d) **Elimination of Potential Mosquito Breeding Habitats** – The most effective mosquito control program is one that eliminates potential breeding habitats. Almost any stagnant pool of water can be attractive to mosquitoes, and may become the source of a large mosquito population. A maintenance program dedicated to eliminating potential breeding areas is preferable to chemical means of controlling mosquitoes. The most important maintenance functions, is removal of all obstructions to natural flow patterns before stagnant water conditions can develop.

- e) **Parking Lot Maintenance** – This management measure involves employing pavement cleaning practices, such as parking lot sweeping on a regular basis, to minimize pollutant export to the stormwater conveyance system/ detention basins and eventually the receiving waters. These cleaning practices are designed to remove sediment, debris, and other pollutants from access drive and parking lot surfaces that are a potential source of pollution impacting urban waterways. Mechanical machines that use vacuum assisted dry sweeping to remove particulate matter shall be utilized as these have the ability to remove finer sediment particles. Parking lots and access drives shall be swept/ vacuumed at least semi-annually or more often as conditions warrant. The disposal of the swept material must be properly hauled off the site and transferred to an approved disposal site. Other parking lot maintenance features include the use of on-site trash receptacle. These receptacles are located at each residential unit where the majority of the pedestrian traffic occurs. The disposal of the solid waste must be properly hauled off the site and transferred to an approved disposal site.

Corrective Maintenance Procedures:

- a) **Removal of Debris and Sediment** – Sediment, debris and trash which threaten the discharge capacity of the basins should be removed immediately and properly disposed of. As noted previously, it is recommended that all water be evacuated from the basins before any significant amount of sediment, settled debris or trash is removed from the basins.
- b) **Structural Repairs** – Structural damage to outlet and inlet structures, trash racks, access hatches, and roadways as a result of vandalism, flood events, settlement or other causes must be repaired promptly. The urgency of the repairs will depend upon the nature of the damage and its effects on the safety and operation of the facility. The analysis of structural damage if it occurs and the design and performance of structural repairs should only be undertaken by a Professional Engineer.
- c) **Embankment and Slope Repairs** – Damage to embankments, and side slopes must be repaired promptly. This damage can be the result of unusual rain or flood events, vandalism, animals, vehicles or neglect. Typical problems can include settlement, scouring, cracking, sloughing, seepage and rutting. The urgency of the repairs will depend upon the nature of the damage and its effect on safety and operational efficiency of the facility. The analysis of the damage and the design and performance of geotechnical repairs should only be undertaken by qualified personnel and under the direction of a consulting Professional Engineer. All basin embankments should be inspected quarterly and after each significant storm greater than one (1) inch of rainfall in 24 hours. Any damage or indication of erosion shall be immediately inspected by a Professional Engineer.
- d) **Weed Harvesting** – It may be necessary to remove congested weeds from the basin. Companies specializing in manual removal of weeds should be contacted to perform these operations. Note that such work does not usually, but may in some cases require the approval of various regulatory agencies.

- e) **Extermination of Mosquitoes** – If neglected, basins can become a potential mosquito breeding area. The extermination of mosquitoes will usually require the services of the County Mosquito Commission. If mosquito control in the facility becomes necessary, the preventative maintenance program should be re-evaluated, and more emphasis should be placed on control of mosquito breeding habitats.

- f) **Erosion Repair** – Vegetative cover or other protective measures are necessary to prevent the loss of soil due to the forces of wind and water. Where a re-seeding program has not been effective in maintaining a non-erosive vegetative cover, or other factors have exposed soils to erosion, corrective steps should be initiated to prevent further loss of soil that may result in danger to the stability of the facility. Soil loss can be controlled by a variety of materials and methods, including rip-rap, gabion lining, geotextile fabrics, sod, seeding, concrete lining and re-grading.

- g) **Elimination of Trees, Brush, Roots and Animal Burrows** – The stability of embankments can be impaired by large roots and animal burrows. Additionally, burrows can present a safety hazard for maintenance personnel. Trees and brush with extensive, woody root systems should be completely removed to prevent destabilization and the creation of seepage routes. Regular mowing will prevent vegetation that can cause root problems. Roots should also be completely removed to prevent decomposition within the embankment. Root voids and burrows should be filled with material similar to the existing material, and capped just below grade with stone, concrete or other material. If the filling of the burrows does not discourage the animals from returning, further measures should be taken to either move the animal population or to make critical areas of the facility unattractive to them.

- h) **Snow and Ice Removal** – Accumulations of snow and ice can threaten the functioning of the inlets, outlets and emergency spillways. Provision of the equipment, material and personnel to monitor and remove snow and ice from critical areas will assure the function of the facility during the winter months.

Aesthetic Maintenance Procedures:

- a) **Graffiti Removal** - The timely removal of graffiti will restore the aesthetic quality of the basins. Removal can be accomplished by paint or other cover, or removal with scrapers, solvents or cleansers. Timely removal is important to discourage further graffiti and other acts of vandalism.

- b) **Grass Trimming/Landscape Maintenance** – The lawn areas around the site shall be mowed on a regular basis as necessary to maintain the lawn at a height of 2 to 3-inches. These areas shall also be fertilized twice a year, once in the spring and once in the fall. Fertilizer for lawn areas shall be 10-20-10 applied at a rate of 11 lbs. per 1,000 sf. or as determined by a soil test. Any bare, dead or damaged lawn areas shall be re-seeded in accordance with the original procedures as outlined in the Soil Erosion and Sediment Control Plans using the same mix and seeding rates. Stabilization of bare or damaged areas shall be done in a timely fashion so as to avoid exposing the soil to erosion.

If season prevents the re-establishment of turf cover, exposed areas should be stabilized with straw or salt hay mulch as described in the Soil Erosion and Sediment Control Plans until permanent seeding can be done. Seeding can be done between March 15th and June 15th and between September 15th and December 1st, only if adequate water is provided.

The shrubs around the basins should also be maintained in order to promote a neat appearance and healthy, vigorous growth. All shrubs should be allowed to grow together in masses as shown on the plans and not pruned into individual plants. The planting beds should be mulched with hardwood mulch every two (2) years in order to provide a suitable growing medium for the shrubbery and to retain moisture around the root zones.

Pruning of shrubs should also be done on a regular basis to maintain the shape and appearance of the shrub masses. The height of the shrubs may vary according to the plants natural growth habits, but should not exceed 6-feet. Pruning should be done as necessary throughout the year to remove dead branches and to control new growth. Any pruning, other than the removal of dead branches, should be done

in either late winter/early spring or after the shrub has flowered in the spring.

In the event that a shrub should experience more than 2/3 die back, it should be replaced in kind as soon as possible in either the spring or fall planting season. The replacement shrub should be the same species as the original and installed at the size and condition as specified on the original landscape plans. If, for any reason, a substitution of species or size must be made, it shall be subject to the approval of the project Landscape Architect.

The trees surrounding the basin areas shall be maintained regularly to ensure good health and exhibit an attractive appearance. Their maintenance should include fertilization twice annually, with one application in the spring and another in early fall. The trees shall be pruned in the late winter or early spring. However, dead branches should be removed as soon as they are noticed. Care should be taken to avoid cutting off the central leader of a tree if one is present.

If a tree is severely damaged or experiences more than 2/3 die back, it should be replaced in either the spring or fall planting season, whichever comes first. The only exception to this is if the replacement tree has a fall transplanting hazard. Replacement trees should be planted at the same size and condition as specified on the landscape plans. Any tree or shrub maintenance, tree pruning or plant material substitution of species or size shall be subject to the approval of the project Landscape Architect.

- c) **Control of Weeds** – Although a regular grass maintenance program will minimize weed intrusion, some weeds will appear. Periodic weeding, either chemically or mechanically, will help to maintain a healthy turf, and keep grassed areas looking attractive. Application of chemicals should be minimized and monitored closely so as not to affect the ecosystems within the detention basin. Excessive growth of weeds within the basin can be controlled mechanically as discussed in the previous section.

The recording of all maintenance work and inspections provide valuable data on the facility’s condition. Review of this information will also help to establish more efficient and beneficial maintenance procedures and practices. As the owner is ultimately responsible for site maintenance, all recorded information should be directed to the owners of the basins for review and subsequent follow-up on recommendations. Data obtained from informal inspections should be retained; however, under current regulations, this data does not have to be submitted to NJDEP.

Preventative Maintenance Actions

Frequency	Preventative Maintenance Actions	Stormwater Measures/ No.
Monthly	Vegetation mowing and removal in growing season	e.g., Grass Areas Onsite
Quarterly	Quarterly inspection (Sediment removal, depending on the type of measure)	e.g., Sub-Surface Infiltration Basins, Onsite Inlets
Semiannual	Clean, sediment removal, depending on the type of measure	N/A
Annual	Basin Structural Inspection	e.g., Sub-Surface Infiltration Basins, Onsite Inlets
Unscheduled	Quick inspection after every 1” rain	All Stormwater Management Measures

Corrective Maintenance Actions

Potential Corrective Maintenance Actions	Stormwater Management Measures/No.
Repair/Replacement of Eroded or Damaged Rip-Rap	N/A
Repair/ Replacement of Missing or Damaged Trash Racks	N/A
Repair/Replacement of Outlet Pipes or Orifices	e.g., Sub-Surface Infiltration Basins, Onsite Inlets
Repair/Replace Stormwater Manufactured Treatment Devices	N/A
Re-Vegetation of Eroded Side Slope and Basin Bottoms	N/A

Inspection and Logs of All Preventative and Corrective Maintenance

As per N.J.A.C. 7:8-5.8(f), the person responsible for maintenance shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

As per NJDEP BMP Manual Ch. 8 (Feb, 2004), a maintenance plan shall include a schedule of regular inspections and tasks, and detailed logs of all preventative and corrective maintenance performed on the stormwater management measure, including all maintenance-related work orders. The person with maintenance responsibility must retain and, upon request, make available the maintenance plan and associated logs and other records for review by a public entity with administrative, health, environmental, or safety authority over the site.

Inspection Checklists in the Field Manual for the stormwater management measures on this site include:

- Sub-Surface Infiltration Basin Field Manual
- “Maintenance Work Order and Checklist” – a comprehensive form outlining both required and completed maintenance work.
- “Maintenance Log” – a summary table for recording of all maintenance work at the site.
- “Inspection Log” – a summary table for recording the results of all inspections of the basins.

The logs of all inspections, and both preventative and corrective maintenance performed should be attached in the “**Maintenance Logs and Inspection Records**” section. See Part II of the Maintenance Plan

Maintenance Personnel, Equipment, Tools, and Supplies

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include equipment, tools, and supplies necessary to perform the various preventative and corrective maintenance tasks specified in the plan. Sources of specialized, proprietary, and nonstandard equipment, tools, and supplies should also be provided.

This section applies to both maintenance tasks that are performed by in-house personnel or are outsourced. The design engineer has to list the required amount of maintenance personnel, equipment, tools, and supplies necessary to perform the various preventative and corrective maintenance tasks specified in the plan. In addition, the sources of specialized, proprietary, and nonstandard equipment, tools and supplies for specific measures, such as manufactured treatment devices should also be listed.

Maintenance Personnel/Equipment/Tools/Supplies

Personnel/Equipment/Tools Name	Quantity
General Maintenance Crew	4
General Landscape Equipment	1
Vacuum Truck	1
Power Washer	1

Specialized, proprietary or nonstandard equipment, tools and supplies, if applicable

Name of the specialized, proprietary or nonstandard equipment, tools and supplies	Source

Disposal Plan

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), the maintenance plan should include approved disposal and recycling sites and procedures for sediment, trash, debris and other material removed from stormwater management measures during maintenance operations.

Disposal Field – Offsite

Description of the Offsite Disposal:

Private hauler handles disposal, unloading and covering offsite

Cost Estimate

As per N.J.A.C.7:8-5.8(b), cost estimates of maintenance tasks, including, but not limited to, sediment, trash and debris removal must be included in the maintenance plan. Below is an illustration of a cost breakdown and estimation for maintenance of stormwater management measures. The design engineer should estimate the cost based on the expected maintenance required for each stormwater management measure. The actual costs may vary with factors such as local requirements, equipment, personnel, weather, and maintenance methods.

COST ESTIMATES

Opinion of Probable Annual Stormwater Management Maintenance Costs

Item	Description	Rate	Unit	Total Units	Frequency Per Year	Item Total
1	Mowing	\$100.00	Acre	0.1	35	\$350.00
2	Landscape Maintenance	\$400.00	Acre	0.15	2	\$120.00
3	Landscape Maintenance Materials	\$1,200.00	Acre	0.15	2	\$360.00
4	General Maintenance	\$500.00	L/S	1	2	\$1,000.00
5	Preventative Maintenance	\$2,000.00	L/S	1	1	\$2,000.00
6	Corrective Maintenance (every 5 years)	\$10,000.00	L/S	1	0.2	\$2,000.00
7	Engineering Inspection	\$500.00	L/S	1	6	\$3,000.00
8	Parking Lot Sweeping	\$50.00	Acre	0.50	12	\$300.00
9	Trash Collection	\$50.00	Day	1	52	\$2,600.00
Estimated Annual SWM Maintenance Cost						\$11,730.00
Estimated Annual Insurance Cost						\$ 500.00
Total Estimated Annual SWM Maintenance Costs						\$12,230.00

The responsible party shall review and updated this “Opinion of Probable Annual Stormwater Management Maintenance Costs” table at least once annually. The update shall reflect the task items and quantity to be performed, the cost for each task item, and the frequency.

Safety Measures and Procedures

All maintenance activities must comply with all local, state and federal regulations regarding occupational safety. These include but are not limited to the following:

1. N.J.A.C. 7:26G-1 – Hazardous Waste Regulations
2. N.J.A.C. 7:8 – Stormwater Management
3. O.S.H.A. Permit-Required Confined Spaces and all other OSHA regulations applicable to any work that is conducted on site

The stormwater inspection/maintenance company is required to follow the above referenced requirements.

Training Plan and Records

As per NJDEP BMP Manual Ch. 8 (February 2004), maintenance training begins with a basic description of the purpose and function of the overall stormwater management measure and its major components. Such understanding will enable maintenance personnel to provide more effective component maintenance and more readily detect maintenance-related problems. Depending on the size, character, location, and components of each stormwater management measure, maintenance personnel may also require training in specialized inspection and maintenance tasks and/or the operation and care of specialized maintenance equipment. Training should also be provided in the need for and use of all required safety equipment and procedures.

I. Training Plan

Types of Training

- Mandatory Stormwater Management Basic Training and Field Manual Usage Training for new maintenance crews
- Occupational Safety Training
- Subcontractor training, if applicable
- OSHA Confined Space Entry Certification

Content of Training

- **Stormwater Management Basic Training**
 - Purposes and Functions of BMPs
 - Training Material
 - NJDEP Stormwater BMP Manual, Chapter Nine: Structural Stormwater Management Measures
 - Chapter 9.6 Manufactured Treatment Devices
 - Vegetation Care
 - Training Material
 - NJDEP Stormwater BMP Manual, Chapter Seven: Landscaping
(provides information on vegetation and landscaping for stormwater management measures)
 - Field Manual Usage Training
 - Training Material
 - Field Manuals attached to this Maintenance Plan
 - Equipment and Tools Operation Training
 - Training Material
 - Equipment or tool manufacturer's Operation & Maintenance Manual
 - Occupational Safety Training
 - Training Material
 - OSHA Confined Space Entry Certification
 - Equipment or tool manufacturer's Operation & Maintenance Manual

- More training information is available at NJ Stormwater.org (<http://www.nj.gov/dep/stormwater/training.htm>)

II. Training Records

Training attendance sheets should be attached by the responsible party after each training.

Annual Evaluation of the Effectiveness of the Plan

As per N.J.A.C. 7:8-5.8(g), the person responsible for maintenance shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.

The responsible party should evaluate the effectiveness of the maintenance plan by comparing the maintenance plan with the actual performance of the maintenance. The items to evaluate may include, but not limited to,

- Whether the inspections have been performed as scheduled;
- Whether the preventive maintenance has been performed as scheduled;
- Whether the frequency of preventative maintenance needs to increase or decrease;
- Whether the planned resources were enough to perform the maintenance;
- Whether the repairs were completed on time;
- Whether the actual cost was consistent with the estimated cost;
- Whether the inspection, maintenance, and repair records have been kept.

If actual performance of those items has been deviated from the maintenance plan, the responsible party should find the causes and implement solutions in a revised maintenance plan.

Annual Evaluation Records

Evaluator(s)	Date of Evaluation	Decision
		<input type="checkbox"/> Maintain current version OR <input type="checkbox"/> Revise current version Revision date _____ (also update the last revision date on the cover page) <input type="checkbox"/> Requires a new deed recording (also update the last recording information on the cover page)
		<input type="checkbox"/> Maintain current version OR <input type="checkbox"/> Revise current version Revision date _____ (also update the last revision date on the cover page) <input type="checkbox"/> Requires a new deed recording (also update the last recording information on the cover page)
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Documents

- Drainage Area Maps, prepared by Bohler Engineering, dated May 30, 2024.
- Preliminary Geotechnical Investigation, prepared by Whitestone Associates, dated May 3, 2021
- Stormwater Management Area Evaluation, prepared by Whitestone Associates, Inc., dated March 26, 2024

Part II- Field Manuals

Attachment of Maintenance Manuals for Stormwater Management Measures on this Site

As per N.J.A.C. 7:8-5.8(b)&(e), preventative and corrective maintenance shall be performed to maintain the function of stormwater management measures, including repair or replacement of the structure; removal of sediment, debris or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; repair or replacement of non-vegetated linings, and removal of rodent/wildlife and repair/restoration to damaged affected areas caused by them.

Each Maintenance Manual attached to this Maintenance Plan is a separate document pertaining to one specific stormwater management measure and should be used by inspections and maintenance crews in order to carry out the maintenance work required by N.J.A.C. 7:8-5.8(e). Design engineers should prepare the field manuals in accordance with the design of each measure and the specific requirements of the site. See the sample field manuals for further guidance.

- Sub-Surface Infiltration Basin Field Manual
- “Maintenance Work Order and Checklist” – a comprehensive form outlining both required and completed maintenance work.
- “Maintenance Log” – a summary table for recording of all maintenance work at the site.
- “Inspection Log” – a summary table for recording the results of all inspections of the basins.

Maintenance Logs and Inspection Records

As per N.J.A.C. 7:8-5.8(e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure(s), including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings.

As per N.J.A.C. 7:8-5.8(f), the person responsible for maintenance shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

The responsible party shall maintain a record of all maintenance actions performed, including:

- Inspection checklists from each performed inspection
- Preventative maintenance logs
- Corrective maintenance logs, including work orders
- Other maintenance records

Sub-Surface Infiltration Basin Field Manual

Sub-Surface Infiltration Basin

Development Name: CBD Bloomfield Developer Urban Renewal, LLC

Township, County: Bloomfield Township, Essex County

Type of Stormwater Management Measure	BMP No.	Location Description	State Plane Coordinates
Sub-Surface Infiltration Basin	Basin #1A	Located within the understory parking area at the center of the building	715,390 Northing 575,294 Easting
Sub-Surface Infiltration Basin	Basin #1B	Located within the understory parking area at the Southeast corner of the building	715,305 Northing 575,344 Easting
Sub-Surface Infiltration Basin	Basin #1C	Located within the understory parking area at the Northeast corner of the building	715,481 Northing 575,334 Easting

Location Map: Refer to Proposed Drainage Area Map

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Sub-Surface Infiltration Basin Overview

Functionality

An infiltration basin is a stormwater management facility constructed of highly permeable soils, which provides temporary storage of stormwater runoff. Infiltration basins are used to remove pollutants and to infiltrate stormwater. In addition to pollutant removal and groundwater recharge, infiltration may help to reduce increases in both the peak rate and total runoff volume caused by land development. Pollutant removal is achieved through filtration of the runoff through the soil, as well as biological and chemical activity within the soil. The total suspended solids (TSS) removal rate attributed to infiltration basins is 80%.

Proper care and attention in the long-term maintenance of the stormwater management measure is critically important to the safety and health of the public.

Type of BMP – Dry Basin / Infiltration Only

An infiltration basin is a type of *dry* basin. Dry basins must fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of basin failure. It may also contribute to mosquito breeding and other health and safety issues. The design drain time shall be closely monitored to ensure that potential failure is recognized early.

This sub-surface infiltration basin is designed for **infiltration only** and is **not** designed for extended detention.

General Maintenance

1. Proper and timely maintenance is essential to continuous, effective operation; therefore, an access route must be incorporated into the design and it must be properly maintained.
2. All structural components must be inspected, at least once annually, for cracking, subsidence, spalling, erosion and deterioration.
3. Components expected to receive and/or trap debris and sediment must be inspected for clogging at least four times annually, as well as after every storm exceeding 1 inch of rainfall.
4. Sediment removal should take place when all runoff has drained and the basin is dry.
5. Disposal of debris, trash, sediment and other waste material must be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste regulations.
6. Access points for maintenance are required on all enclosed areas within a small-scale infiltration basin; these access points must be clearly identified in the maintenance plan. In addition, any special training required for maintenance personnel to perform specific tasks, such as confined space entry, must be included in the plan.
7. Stormwater BMPs may not be used for stockpiling of plowed snow and ice, compost, or any other material.

Drain Time

1. The basin must be inspected at least twice annually to determine if the permeability of the basin has decreased.
2. The design drain time for the maximum design storm runoff volume must be indicated in the maintenance manual.
3. If the actual drain time is longer than the design drain time, the components must be evaluated and appropriate measures taken to return the small-scale infiltration basin to the original tested as-built condition.
4. If the small-scale infiltration basin fails to drain the WQDS within 72 hours, corrective action must be taken and the maintenance manual revised accordingly to prevent similar failures in the future. Note that annual tilling of the sand layer, using lightweight equipment, may assist in maintaining the infiltration capacity of a surface type system by breaking up clogged surfaces

Basic Design Information

Hydrology Design Targets

1. The sub-surface infiltration basins are designed with the following subsoil permeability rates (pre-construction) tested on 03/11/2024.

BMP No.	Subsoil Permeability Rate (inches/hour)
Basin #1	4.3

2. The design drain times for each sub-surface infiltration basin are:

BMP No.	WQ Storm	100-Year Storm (Future Adj.)
Basin #1	2.4 hours	26.6 hours

3. The seasonal high water table for Basin #1 was not located on 03/11/2024.
4. These systems are designed to infiltrate into the subsoil.

Hydraulic Design Targets

1. Design Parameters

Sub-Surface Infiltration Basin #1 – Basin Bottom: 130.50

	Water Quality Design Storm	NOAA 2-year storm	NOAA 10-year storm	NOAA 100-year storm
Rainfall Depth (inches)	1.25 inch in 2 hours	3.44 inches in 24 hours	5.22 inches In 24 hours	8.66 inches In 24 hours
Runoff Volume (acre-feet)	0.119	0.368	0.571	0.965
Peak Flow Rate - Outflow (cfs)	0.00	0.57	1.37	4.44
Water Surface Elevation (feet)	131.25	131.79	132.27	132.88

	Water Quality Design Storm	Current Adj. 2-year storm	Current Adj. 10-year storm	Current Adj. 100-year storm
Rainfall Depth (inches)	1.25 inch in 2 hours	3.47 inches in 24 hours	5.38 inches In 24 hours	9.18 inches In 24 hours
Runoff Volume (acre-feet)	0.119	0.371	0.590	1.025
Peak Flow Rate - Outflow (cfs)	0.00	0.58	1.48	4.90
Water Surface Elevation (feet)	131.25	131.80	132.30	132.95

	Water Quality Design Storm	Future Adj. 2-year storm	Future Adj. 10-year storm	Future Adj. 100-year storm
Rainfall Depth (inches)	1.25 inch in 2 hours	4.09 inches in 24 hours	6.37 inches In 24 hours	11.52 inches In 24 hours
Runoff Volume (acre-feet)	0.119	0.442	0.703	1.293
Peak Flow Rate - Outflow (cfs)	0.00	0.73	2.26	7.28
Water Surface Elevation (feet)	131.25	131.99	132.49	133.26

Basin Configuration Targets

1. Pretreatment is not provided to the sub-surface infiltration basins.
2. Outlet Information:

Sub-Surface Infiltration Basin #1

Outlet Description	Outlet Type	Orifice Size / Weir Length	Invert Elevation
Culvert	Pipe	15" Ø Pipe	129.80
Orifice	Outlet Control Structure	6.0" (W) x 5.0" (H)	131.25
Weir	Outlet Control Structure	1.2' Wide	132.00
Weir	Weir	4.0' Wide	133.15

Reference Documents

Documents to be placed in this field manual should include the following:

- As-built Drawings with Drainage Plans
- Report of Geotechnical Investigation, includes:
 - o Soil Boring Logs
 - o Permeability Test (Pre-construction)

Inspection Checklist / Maintenance Actions Sub-Surface Infiltration Basin

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. _____

Inspection Date: _____

Date of most recent rain event: _____

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other _____

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspection items and preventative/corrective maintenance actions listed below represent general requirements. The design engineer and/or responsible party shall adjust the items and actions to better meet the conditions of the site, the specific design targets, and the requirements of regulatory authorities.

	For Inspector		For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.		Result
			Preventative / Corrective Maintenance Actions
A1 Pretreatment (Forebay)	1	Scouring or erosion is present at inlet structure and/or riprap apron	Y__ N__ Work Order # _____
	2	Clogged pipes or excessive sediment in the forebay	Y__ N__ Remove sediment or debris
	3	Damaged outlet structure (e.g., cracking, subsidence, spalling, erosion, or deterioration)	Y__ N__ Repair or replace the outlet structure Work Order # _____
A2 Pretreatment (MTD, if installed)	1	MTD inspection	Y__ N__ (If a MTD is used for pretreatment, see manufacturer's maintenance manual)
A3 Pretreatment (Structural BMP)	1	BMP inspection	Y__ N__ (See BMP No. _____ Field Manual)

Note:

	For Inspector		For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
B Infiltration Bed	1	<p>Standing water is present after the design drain time</p> <p>The observed drain time is approximately _____ hours.</p>	<p>Y__</p> <p>N__</p> <p>Recheck to determine if there is standing water after 72 hours</p> <p>If standing water is present longer than 5 days, report to mosquito commission.</p> <p>Remove any sediment buildup</p> <p>Replace the sand</p> <p>Work Order # _____</p>
	2	Excessive sediment, silt, or trash accumulation on basin bed	<p>Y__</p> <p>N__</p> <p>Clean pretreatment system</p> <p>Remove silt, sediment, and trash</p> <p>Work Order # _____</p>

Note:

	For Inspector		For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
G Miscellaneous	1	Fence: broken or eroded parts	Y__ N__ Repair or replace Work Order #_____
	2	Gate: missing gate or lock	Y__ N__ Repair or replace Work Order #_____
	3	Sign/plate: tiled, missing, or faded	Y__ N__ Repair or replace Work Order #_____
	4	Excessive or overgrown vegetation blocking access to the basin	Y__ N__ Clear, trim, or prune the vegetation to allow access for inspection and maintenance Work Order #_____
Note:			

Follow Up Items (Component No. / Inspection Item No.):

Associated Work Orders: # _____, # _____, # _____, # _____, # _____

Inspector Name

Signature

Date

Report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities, if standing water is present longer than 5 days.

File this checklist in the Maintenance Log after performing maintenance.

Preventative Maintenance Record

Corresponding Checklist No. _____
 Component No. _____, Inspection Item No. _____

Work Logs

Activities	Components	Date Completed
Sediment/debris removal Sediment removal should take place when the basin is thoroughly dry	A1/A2/A3 – Pretreatment	
	B – Infiltration Bed	

Vegetation is removed by _____ (type of equipment) with minimum disruption to the remaining vegetation.

All use of fertilizers, pesticides, mechanical treatments, and other means to ensure optimum vegetation health must not compromise the intended purpose of the stormwater management measure. The fertilizer applied is _____ (type), and _____ (quantity per usage) is applied _____ (frequency of use).

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

Crew member: _____ / _____ **Date:** _____
(name/ signature)

Supervisor: _____ / _____ **Date:** _____
(name/ signature)

File this Preventative Maintenance Record in the Maintenance Log after performing maintenance.

Corrective Maintenance Record

1. Work Order # _____ Date Issued _____

2. Issue to be resolved:

3. The issue was from Corresponding Checklist No. _____, Component No.,
Inspection Item No. _____.

4. Required Actions

Actions	Planned Date	Date Completed

5. Responsible person(s):

6. Special requirements

- Time of the season or weather condition: _____
- Tools/equipment: _____
- Subcontractor (name or specific type): _____

Approved by _____ / _____ Date _____
(name/signature)

Verification of completion by _____ / _____ Date _____
(name/signature)

File this Corrective Maintenance Record in the Maintenance Log after performing maintenance.

MAINTENANCE LOGS AND INSPECTION RECORDS

**MAINTENANCE WORK ORDER AND CHECKLIST
FOR STORMWATER MANAGEMENT FACILITIES**

NAME OF FACILITY _____
 LOCATION _____ DATE _____
 CREW _____ WORK STARTED _____
 EQUIPMENT _____ WORK COMPLETED _____
 WEATHER _____ TOTAL MANPOWER OF WORK _____

A. PREVENTATIVE MAINTENANCE

WORK ITEMS	ITEMS REQUIRED	ITEMS DONE	COMMENTS AND SPECIAL INSTRUCTIONS
1. GRASS CUTTING			
A. BOTTOMS			
B. EMBANKMENTS AND SIDE SLOPES			
C. PERIMETER AREAS			
D. ACCESS AREAS AND ROADS			
E. OTHERS			
2. GRASS MAINTENANCE			
A. FERTILIZING			
B. RE-SEEDING			
C. DE-THATCHING			
D. PEST CONTROL			
E. OTHERS			
3. VEGETATIVE COVER			
A. FERTILIZING			
B. PRUNING			
C. PEST CONTROL			
D. OTHERS			
4. TRASH AND DEBRIS REMOVAL			
A. BOTTOMS			
B. EMBANKMENTS AND SIDE SLOPES			
C. PERIMETER AREAS			
D. ACCESS AREAS AND ROADS			
E. INLETS			
F. OUTLETS AND TRASH RACKS			
G. OTHERS			
5. SEDIMENT REMOVAL			
A. INLETS			
B. OUTLETS AND TRASH RACKS			
C. BOTTOM			
D. OTHERS			
6. ELIMINATION OF POTENTIAL MOSQUITO BREEDING HABITATS			

**MAINTENANCE WORK ORDER AND CHECKLIST
FOR STORMWATER MANAGEMENT FACILITIES**

NAME OF FACILITY _____
 LOCATION _____ DATE _____
 CREW _____ WORK STARTED _____
 EQUIPMENT _____ WORK COMPLETED _____
 WEATHER _____ TOTAL MANPOWER OF WORK _____

B. CORRECTIVE MAINTENANCE

WORK ITEMS	ITEMS REQUIRED	ITEMS DONE	COMMENTS AND SPECIAL INSTRUCTIONS
1. REMOVAL OF DEBRIS AND SEDIMENT			
2. STRUCTURAL REPAIRS			
3. EMBANKMENTS AND SIDE SLOPES			
4. DEWATERING			
5. BASIN MAINTENANCE			
6. CONTROL OF MOSQUITOES			
7. EROSION REPAIR			
8. FENCE REPAIR			
9. SNOW AND ICE REMOVAL			
10. OTHER			

C. AESTHETIC MAINTENANCE

WORK ITEMS	ITEMS REQUIRED (X)	ITEMS DONE (X)	LOCATION AND COMMENTS
1. GRAFFITI REMOVAL			
2. GRASS TRIMMING			
3. WEEDING			
4. OTHERS			

REMARKS (REFER TO ITEM NO. IF APPLICABLE) _____

WORK ORDER PREPARED BY: _____

**MAINTENANCE LOG
FOR STORMWATER MANAGEMENT FACILITIES**

NAME OF FACILITY _____
 LOCATION _____ DATE _____
 CREW _____ WORK STARTED _____
 EQUIPMENT _____ WORK COMPLETED _____
 WEATHER _____ TOTAL MANPOWER OF WORK _____

A. PREVENTATIVE MAINTENANCE

WORK ITEMS	ITEMS REQUIRED	DATE REQUIRED	ITEMS DONE	DATE DONE	COMMENTS AND SPECIAL INSTRUCTIONS
1. GRASS CUTTING					
A. BOTTOMS					
B. EMBANKMENTS AND SIDE SLOPES					
C. PERIMETER AREAS					
D. ACCESS AREAS AND ROADS					
E. OTHERS					
2. GRASS MAINTENANCE					
A. FERTILIZING					
B. RE-SEEDING					
C. DE-THATCHING					
D. PEST CONTROL					
E. OTHERS					
3. VEGETATIVE COVER					
A. FERTILIZING					
B. PRUNING					
C. PEST CONTROL					
D. OTHERS					
4. TRASH AND DEBRIS REMOVAL					
A. BOTTOMS					
B. EMBANKMENTS AND SIDE SLOPES					
C. PERIMETER AREAS					
D. ACCESS AREAS AND ROADS					
E. INLETS					
F. OUTLETS AND TRASH RACKS					
G. OTHERS					
5. SEDIMENT REMOVAL					
A. INLETS					
B. OUTLETS AND TRASH RACKS					
C. BOTTOM					
D. OTHERS					
6. ELIMINATION OF POTENTIAL MOSQUITO BREEDING HABITATS					
7. OTHER PREVENTIVE MAINTENANCE					
A. PARKING LOT SWEEPING					
B. EMPTYING TRASH RECEPTACLES					

**MAINTENANCE LOG
FOR STORMWATER MANAGEMENT FACILITIES**

NAME OF FACILITY _____
 LOCATION _____ DATE _____
 CREW _____ WORK STARTED _____
 EQUIPMENT _____ WORK COMPLETED _____
 WEATHER _____ TOTAL MANPOWER OF WORK _____

B. CORRECTIVE MAINTENANCE

WORK ITEMS	ITEMS REQUIRED	DATE REQUIRED	ITEMS DONE	DATE DONE	COMMENTS AND SPECIAL INSTRUCTIONS
1. REMOVAL OF DEBRIS AND SEDIMENT					
2. STRUCTURAL REPAIRS					
3. EMBANKMENTS AND SIDE SLOPES					
4. DEWATERING					
5. BASIN MAINTENANCE					
6. CONTROL OF MOSQUITOES					
7. EROSION REPAIR					
8. FENCE REPAIR					
9. SNOW AND ICE REMOVAL					
10. OTHER					

C. AESTHETIC MAINTENANCE

WORK ITEMS	ITEMS REQUIRED	DATE REQUIRED	ITEMS DONE	DATE DONE	COMMENTS AND SPECIAL INSTRUCTIONS
1. GRAFFITI REMOVAL					
2. GRASS TRIMMING					
3. WEEDING					
4. OTHERS					

REMARKS (REFER TO ITEM NO. IF APPLICABLE) _____

WORK PERFORMED BY: _____

**INSPECTION LOG
FOR STORMWATER MANAGEMENT FACILITIES**

NAME OF FACILITY _____
 LOCATION _____
 DATE _____
 WEATHER _____

A. PREVENTIVE MAINTENANCE

FACILITY ITEM	ITEMS REQUIRED	ITEMS DONE	COMMENTS AND SPECIAL INSTRUCTION
1. GRASS CUTTING			
A. BOTTOMS			
B. EMBANKMENTS AND SIDE SLOPES			
C. PERIMETER AREAS			
D. ACCESS AREAS AND ROADS			
E. OTHERS			
2. GRASS MAINTENANCE			
A. FERTILIZING			
B. RE-SEEDING			
C. DE-THATCHING			
D. PEST CONTROL			
E. OTHERS			
3. VEGETATIVE COVER			
A. FERTILIZING			
B. PRUNING			
C. PEST CONTROL			
D. OTHERS			
4. TRASH AND DEBRIS REMOVAL			
A. BOTTOMS			
B. EMBANKMENTS AND SIDE SLOPES			
C. PERIMETER AREAS			
D. ACCESS AREAS AND ROADS			
E. INLETS			
F. OUTLETS AND TRASH RACKS			
G. OTHERS			
5. SEDIMENT REMOVAL			
A. INLETS			
B. OUTLETS AND TRASH RACKS			
C. BOTTOM			
D. VORTECHNIC UNITS			
E. OTHERS			
6. ELIMINATION OF POTENTIAL MOSQUITO			
7. OTHER PREVENTIVE MAINTENANCE			
A. PARKING LOT SWEEPING			
B. EMPTYING TRASH RECEPTACLES			

**INSPECTION LOG
FOR STORMWATER MANAGEMENT FACILITIES**

NAME OF FACILITY _____
 LOCATION _____
 DATE _____
 WEATHER _____

B. CORRECTIVE MAINTENANCE

FACILITY ITEM	ITEMS REQUIRED	ITEMS DONE	COMMENTS AND SPECIAL INSTRUCTION
1. REMOVAL OF DEBRIS AND SEDIMENT			
2. STRUCTURAL REPAIRS			
3. EMBANKMENTS AND SIDE SLOPES			
4. BASIN MAINTENANCE			
5. CONTROL OF MOSQUITOES			
6. EROSION REPAIR			
7. FENCE REPAIR			
8. SNOW AND ICE REMOVAL			
9. BASIN DRAIN TIME			
10. OTHER			

C. AESTHETIC MAINTENANCE

FACILITY ITEM	ITEMS REQUIRED	ITEMS DONE	COMMENTS AND SPECIAL INSTRUCTION
1. GRASS TRIMMING			
2. WEEDING			
3. OTHERS			

REMARKS (REFER TO ITEM NO. IF APPLICABLE) _____

- (1) ITEMS CHECKED ARE IN GOOD CONDITION, AND THE MAINTENANCE PROGRAM IS ADEQUATE.
 - (2) ITEMS CHECKED REQUIRE ATTENTION, BUT DOES NOT PRESENT AN IMMEDIATE THREAT TO THE FACILITY FUNCTION OR OTHER FACILITY COMPONENTS.
 - (3) THE ITEMS CHECKED REQUIRES IMMEDIATE ATTENTION TO KEEP THE FACILITY OPERATIONAL OR TO PREVENT DAMAGE TO OTHER FACILITY COMPONENTS.
 - (4) PROVIDE EXPLANATION AND DETAILS IF COLUMNS 2 OR 3 ARE CHECKED.
- REMARKS (REFER TO ITEM NO. IF APPLICABLE)

INSPECTOR: _____

Geotechnical Report



30 INDEPENDENCE BOULEVARD
SUITE 250
WARREN, NJ 07059
908.668.7777
whitestoneassoc.com

May 3, 2021

via email

BOHLER ENGINEERING NJ, LLC

30 Independence Boulevard
Suite 200
Warren, New Jersey 07059

Attention: Bradford A. Bohler, P.E., CRE
Principal

**Regarding: PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED MIXED-USE DEVELOPMENT
BLOOMFIELD AVENUE & PARK STREET
BLOOMFIELD, ESSEX COUNTY, NEW JERSEY
WHITESTONE PROJECT NO.: GJ2117908.000**

Dear Mr. Bohler:

Whitestone Associates, Inc. (Whitestone) has completed a preliminary geotechnical investigation at the above referenced site. The results of the limited evaluation and preliminary recommendations presented below are based on the soil conditions disclosed from a limited number of soil borings performed during Whitestone's field investigation. Recommendations for further investigation also are included herein.

The purpose of the preliminary subsurface soils investigation was to assess anticipated geologic features, shallow groundwater and/or rock, refusal depths, existing fill, and the potential feasibility of shallow foundations and/or expected earthwork requirements. While the scope of this preliminary investigation will not be sufficient to formulate detailed design recommendations and a more comprehensive geotechnical investigation ultimately will be required, this preliminary investigation may be used to assess potentially development impactive geotechnical issues to support preliminary studies regarding the feasibility of developing the property.

1.0 SUMMARY OF FINDINGS

In general, the subsurface conditions preliminarily indicate conditions suitable for shallow foundation design. The exploration indicated the presence of moisture-sensitive soils throughout the site that will impact the planned construction. Based on past experience with similar soils, earthwork activities will require stringent soil moisture control efforts. Depending on the time of year of construction, site work should anticipate overexcavation of moisture sensitive soils in structural areas, using mechanical and/or chemical subgrade stabilization techniques, and exercising detailed attention to construction methods while maintaining strict moisture control. In addition, existing fill was encountered to a depth of up to four feet below ground surface (fbgs) that will require overexcavation below proposed foundations, if encountered at or below proposed foundation bearing elevations. Limited overexcavation of existing fill may also be anticipated for proposed floor slab and pavement areas as well. In addition, weathered rock was encountered at variable depths that will present excavation difficulties.

Other Office Locations:

CHALFONT, PA
215.712.2700

SOUTHBOROUGH, MA
508.485.0755

ROCKY HILL, CT
860.726.7889

WALL, NJ
732.592.2101

PHILADELPHIA, PA
215.848.2323

2.0 PROJECT DESCRIPTION

2.1 Site Location and Existing Conditions

The subject site is located southeast of the intersection of Bloomfield Avenue and Park Avenue in Bloomfield, Essex County, New Jersey. At the time of Whitestone's exploration, the existing site housed a multi-story learning center/church with associated pavements and utilities. The existing structures were observed to be in relatively fair structural condition with no observed areas of significant cracking. The existing pavements were observed to be in fair to poor structural condition with multiple areas of variable cracking.

2.2 Site Geology

The site is located within the Piedmont Physiographic Providence of New Jersey. Specifically, the subject site is underlain by the Lower Jurassic-aged and Upper Triassic-aged Sandstone and Siltstone members of the Passaic Formation, which is part of the Brunswick Group. These members generally consist of reddish-brown to brownish-purple and grayish-red sandstone and siltstone. The overburden materials at the site include late Wisconsinan glaciofluvial deposits including sand, gravel, and silt as well as residual soils associated with the underlying weathered rock/bedrock. Overburden materials also include man-made fill associated with past and present development of the subject site.

2.3 Proposed Construction

Based on the July 13, 2018 *Conceptual Study* prepared by Lessard Design, Inc., the proposed redevelopment is anticipated to include demolition of existing site structures and construction of an approximately 51,431-square feet (maximum footprint), four-story mixed-use building with at-grade parking and utilities. The proposed building is not anticipated to include a basement/cellar or below-grade level. No new retaining walls or stormwater management areas are anticipated for redevelopment.

Detailed grading or structural loading information have not been finalized at this time. Whitestone anticipates that the site will be redeveloped at or near existing site grades with maximum cut and fill on the order of one foot to three feet. Based on Whitestone's experience with similar structures, the maximum design loads are anticipated to be less than the following: column load - 300 kips, wall load - 4.0 kips/foot, and floor load - 125 pounds per square foot.

3.0 FIELD EXPLORATION & LABORATORY TESTING

3.1 Field Exploration

Field exploration at the project site was conducted by means of five soil borings (identified as B-1 through B-4 and offset B-1A) performed with a truck-mounted drill rig using hollow stem augers and split-spoon sampling techniques. The soil borings were performed within accessible portions of the proposed building footprint to depths ranging from approximately 6.9 fbs to 17.5 fbs. Soil borings were backfilled to the surface with excavated soils from the investigation and were surficially restored with asphaltic pavement cold patch, as necessary. The locations of the soil borings are shown on the *Boring Location Plan* included as Figure 1. *Records of Subsurface Exploration* are provided in Appendix A.

The subsurface tests were conducted in the presence of a Whitestone engineer who performed field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Soil borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D 1586. The SPT resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the borings. Seasonal variations, temperature effects, man-made effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

3.2 *Laboratory Program*

Representative samples of a selected strata encountered were subjected to a laboratory program that included Atterberg limits determination (ASTM D-4318), moisture content determinations (ASTM D-2216), and washed gradation analyses (ASTM D-422) in order to perform supplementary engineering soil classifications in general accordance with ASTM D-2487. The soil stratum tested was classified by the Unified Soil Classification System (USCS) and results of the laboratory testing are summarized in the following table. Quantitative test results are provided in Appendix B.

PHYSICAL/TEXTURAL ANALYSES SUMMARY							
Boring	Sample	Depth (fbgs)	% Passing No. 200 Sieve	Moisture Content (%)	Liquid Limit (%)	Plastic Index (%)	USCS Classification
B-1	S-4	6.0 - 6.9	22.8	7.9	Non-Plastic		GM
B-3	S-3	4.0 - 6.0	57.2	19.3	25	4	CL-ML

4.0 *SUBSURFACE CONDITIONS*

The subsurface soil conditions encountered within the soil borings performed consisted of the following generalized strata in order of increasing depth. *Records of Subsurface Exploration* are provided in Appendix A.

Surface Materials: The soil borings were performed within existing paved areas and encountered approximately three inches to five inches of asphaltic concrete pavement at the surface underlain by approximately two inches to four inches of gravel subbase materials.

Existing Fill: Beneath the surface cover, the borings encountered existing fill that generally consisted of silty sand with variable amounts of gravel, sandy silt with variable amounts of gravel, and/or silty gravel. The existing fill extended to a depth of approximately four fbgs. SPT N-values within the existing fill

ranged between four blows per foot (bpf) and refusal (refusal defined as greater than 50 blows per six inches of split-spoon sampler advancement) and averaged approximately 15 bpf.

Residual Soils: Underlying the existing fill, the soil borings encountered natural residual soils generally consisting of sandy silt (USCS: ML) with variable amounts of gravel-sized weathered rock fragments and/or sandy silty clay (USCS: CL-ML). The residual soils extended to depths ranging from approximately six fbgs to 16 fbgs. Pocket penetrometer tests performed within fine-grained portions of this stratum resulted in unconfined compressive strengths ranging between approximately one ton per square foot (tsf) and two tsf, generally indicating stiff to very stiff consistency.

Weathered Rock/Bedrock: Beneath the residual soils, the borings encountered weathered rock materials. The top of weathered rock was encountered at depths ranging from approximately six fbgs to 16 fbgs. The borings were terminated within the weathered rock materials or weathered rock/bedrock interface at depths ranging from approximately 6.9 fbgs to 17.5 fbgs. SPT N-values within this stratum consistently were in the refusal range.

Groundwater: Static groundwater was not encountered within the borings performed with the deepest depth explored of approximately 17.5 fbgs. However, apparent perched/trapped groundwater was encountered within boring B-2 at a depth of 0.5 fbgs. Seasonal variations, temperature effects, and recent rainfall conditions may influence the levels of the groundwater. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater level.

5.0 CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS

The following discussion is based on the subsurface conditions encountered during Whitestone's limited subsurface investigation for the proposed redevelopment and is intended to provide general characteristics of the subsurface conditions for preliminary planning purposes and should not be utilized for final design of structural foundations, floor slabs, or pavements. These preliminary considerations and site development options should be confirmed or revised upon development of the final project design concept and completion of a site-specific subsurface investigation and engineering analyses.

Foundations: Whitestone preliminarily anticipates that the structures may be supported on conventional spread and continuous wall footings designed to bear either within the underlying natural materials and/or controlled structural fill materials that are properly evaluated, placed, compacted, and prepared in order to control their moisture content. Existing fill should be overexcavated where encountered at or below proposed foundation bearing elevations and the resulting excavation should be restored with controlled structural backfill. Foundations bearing within the above materials may be preliminarily designed to impart a bearing pressure in the range of 2,000 pounds per square foot (psf) to 4,000 psf, depending on final design column and wall loading, column spacing, settlement tolerances, and the final geotechnical investigation. Reuse of the existing fill for foundation support will be contingent upon supplemental evaluation, as recommended herein.

Floor Slabs and Pavements: Whitestone preliminarily anticipates that the properly evaluated, prepared and approved existing fill, natural site subgrade soils, and/or controlled structural imported fill will be suitable for support of the proposed floor slabs and pavements. At least limited overexcavation of existing fill may be required due to the variability that exists within existing fill. Subgrade stabilization and protection may also be necessary during wet conditions to obtain a stable surface. Subgrade stabilization may be achieved through the use of separation geotextiles, geogrids, and/or the addition of lime-cement to the subgrade.

On-Site Soil Reusability: Whitestone preliminarily anticipates that the majority of the existing fill and natural site soils will be suitable for selective reuse as structural fill and/or backfill where free of objectionable debris and moisture contents are controlled within two percent of the optimum and the soils are placed during favorable weather conditions. Based on the conditions disclosed by the subsurface exploration and the results of the laboratory test results, the majority of the on-site natural soils contain an appreciable amount of fines and are not anticipated to be immediately suitable for reuse as structural fill and/or backfill due to high moisture content characteristics. Disturbance of these soils should be minimized. The on-site moisture sensitive soils, while stable and often hard when in a dry natural state, will degrade when wetted or disturbed. Whitestone anticipates that the sandy and/or less plastic site soils, where encountered, may be suitable for reuse as structural fill and/or backfill provided moisture contents are controlled within two percent of the optimum only during favorable weather conditions. Due to moisture sensitivity, use of portions of the on-site soils should expect mixing with a granular material, extensive moisture conditioning, and/or drying to facilitate their reuse, workability, and compaction in fill areas. These materials will become increasingly difficult to reuse and compact where wetted beyond the optimum moisture content. Materials that become exceedingly wet likely will require discing and aerating and extended time to dry during favorable weather.

Cobble- and boulder-sized weathered rock/bedrock materials or similarly sized materials greater than three inches in diameter will need to be separated from on-site soils to be placed as structural fill or backfill. Cobble-sized materials between three inches to 12 inches may be crushed or individually placed in structural fill or backfill layers deeper than two feet below proposed foundation and pavement subgraded levels. Care must be taken to individually seat any large particles and to compact soil around large particles with hand operated equipment to minimize risk of void formation. Boulder-sized greater than 12 inches in diameter need to be crushed prior to replacement as structural fill materials. Materials greater than three inches in size should be placed a minimum of three feet from utilities.

Excavation Difficulties: Weathered rock and bedrock were encountered across the subject property at variable depths that can present difficult excavation. Removal of weathered rock may be required within deeper site utilities and foundation excavations, depending on final grading. Bedrock removal is not anticipated to be required. Heavy excavating equipment with ripping tools will typically be effective in removing dense/hard weathered soils, transition materials, and cobble/boulder-sized rock fragments during site mass grading. The speed and ease of excavation will depend on the type of grading equipment, the skill of the equipment operators, and the geologic structure of the material itself, such as the direction of planes of weakness and spacing between discontinuities. Planned excavation in confined excavations, such as for footing and utility trenches, may require ripping tools, pneumatic hammers, pre-spitting and/or expansive grout.

Groundwater Control: Static groundwater was not encountered within the borings performed and therefore, Whitestone anticipates that static groundwater will be deeper than site excavations. However, perched/trapped groundwater was encountered as shallow as 0.5 fbs and may be encountered within the existing fill, at the existing fill/natural soil interface, within fine-grained portions of the natural materials, and at the natural soil/weathered rock interface, especially following precipitation events. As such, construction phase dewatering of perched/trapped groundwater through the use of gravity fed sump pumps should be anticipated during excavation activities for this site.

Supplemental Borings: A supplemental subsurface investigation designed to address site-specific conditions for proposed construction should be performed following demolition of the existing site structures and the finalization of the design concept, grading, and general site layout. The final subsurface investigation and geotechnical evaluation should be performed to obtain subsurface information across the site at more closely spaced intervals within the proposed building, pavements, and

utility alignments, etc. Additional borings should be completed in accordance with the New Jersey Building Code requirements as the proposed building is anticipated to be four stories.

6.0 CLOSING

Whitestone appreciates the opportunity to be of continued service to Bohler Engineering NJ, LLC. Please note that Whitestone has the capability to perform the additional geotechnical engineering services recommended herein. Please contact us at (908) 668-7777 with any questions or comments regarding this report.

Sincerely,

WHITESTONE ASSOCIATES, INC.



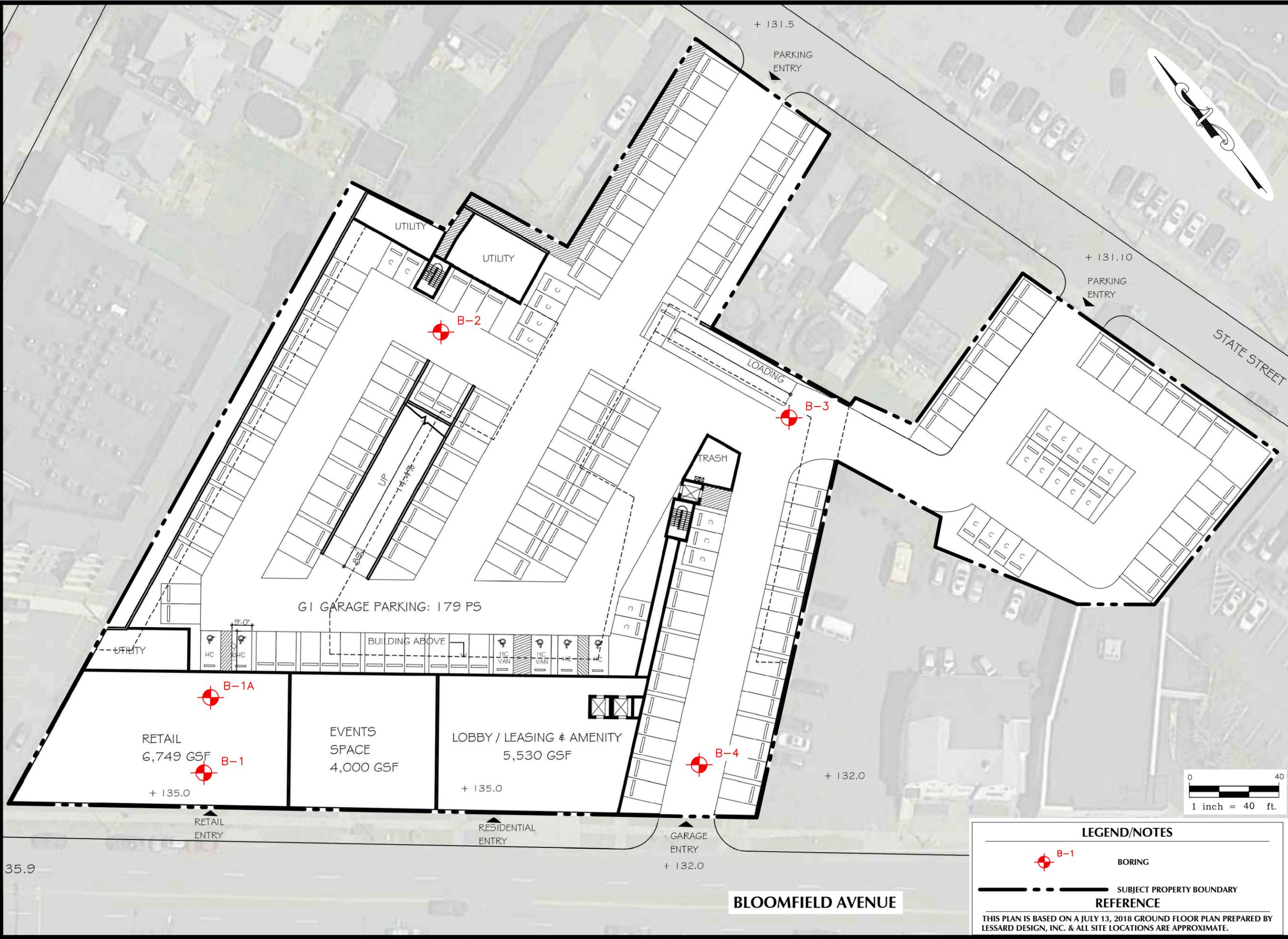
Mudar Khantamr, P.E.
Project Manager



Laurence W. Keller, P.E.
Principal, Geotechnical Services

FIGURE 1
Boring Location Plan

L:\Job_Folders\2021\2117908G\Drawings and Plans\GJ2017908.000_BLP.dwg



WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants

30 INDEPENDENCE BOULEVARD, SUITE 250, WARREN, NJ 07059
 908.668.7777 WHITESTONEASSOC.COM

DRAWING TITLE: BORING LOCATION PLAN

CLIENT: BOHLER ENGINEERING NJ, LLC

PROJECT: PROPOSED MIXED-USE DEVELOPMENT
 BLOOMFIELD AVENUE & PARK STREET
 BLOOMFIELD, ESSEX COUNTY, NJ

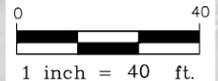
PROJECT #: GJ2117908.000	
DESIGNED BY: GR	PROJ. MGR.: MK
DATE: 4/30/21	FIGURE: 1
SCALE: 1" = 40'	

LEGEND/NOTES

B-1 BORING

SUBJECT PROPERTY BOUNDARY REFERENCE

THIS PLAN IS BASED ON A JULY 13, 2018 GROUND FLOOR PLAN PREPARED BY LESSARD DESIGN, INC. & ALL SITE LOCATIONS ARE APPROXIMATE.



35.9

APPENDIX A
Records of Subsurface Exploration

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Mixed-Use Development		WAI Project No.: GJ2117908.000	
Location: Bloomfield Avenue & Park Street; Bloomfield, Essex County, NJ		Client: Bohler Engineering NJ, LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>4/16/2021</u>	Water Depth Elevation (feet bgs) (feet)	
Termination Depth: <u>6.9</u> feet bgs	Date Completed: <u>4/16/2021</u>	Cave-In Depth Elevation (feet bgs) (feet)	
Proposed Location: <u>Building</u>	Logged By: <u>CN</u>	During: <u>NE</u> --- ▼	At Completion: <u>4.0</u> --- ▼
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>AD</u>	At Completion: --- --- ▼	
	Equipment: <u>CME</u>	24 Hours: --- --- ▼	24 Hours: --- --- ▼

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	PAVEMENT	5" Asphalt, 2" Gravel Subbase	
0.5 - 2	S-1	X	2 - 2 - 2	8	4	0.6	FILL	Reddish-Brown Silty Sand with Gravel, Moist (FILL)	
2 - 3.4	S-2	X	4 - 5 - 50/5"	6	55/11"			As Above (FILL)	
						4.0			
4 - 6	S-3	X	11 - 17 - 46 - 28	18	63	5.0	RESIDUAL	Reddish-Brown Sandy Silt with Gravel, Slightly Moist, Very Stiff (ML)	Qu = 2.0 tsf Subangular WR Fragments
6 - 6.9	S-4	X	33 - 50/5"	12	50/5"	6.0	WR	Reddish-Brown Weathered Rock, Moist, Very Dense (WR)	
						6.9			
						10.0			
						15.0			
						20.0			
						25.0			
								Boring Log B-1 Terminated at a Depth of 6.9 Feet Below Ground Surface Due to Spoon/Auger Refusal; Offset to B-1A	

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Mixed-Use Development		WAI Project No.: GJ2117908.000	
Location: Bloomfield Avenue & Park Street; Bloomfield, Essex County, NJ		Client: Bohler Engineering NJ, LLC	
Surface Elevation: ± NS feet	Date Started: 4/16/2021	Water Depth Elevation (feet bgs) (feet)	
Termination Depth: 16.0 feet bgs	Date Completed: 4/16/2021	Cave-In Depth Elevation (feet bgs) (feet)	
Proposed Location: Building	Logged By: CN	During: NE --- ▼	At Completion: 11.0 --- ▼
Drill / Test Method: HSA / SPT	Contractor: AD	At Completion: --- --- ▼	
	Equipment: CME	24 Hours: --- --- ▼	24 Hours: --- --- ▼

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0		Augered to 7.0 fbgs Offset from B-1 20' East	
7 - 8.9	S-1	X	39 - 40 - 45 - 50/5"	12	85	7.0	WEATHERED ROCK	Dark Reddish-Brown Weathered Rock, Moist, Very Dense (WR)	
13 - 14.3	S-2	X	23 - 50 - 50/3"	12	100/9"	10.0		As Above (WR)	
16 - 16	S-3	X	50/0"	NR	50/0"	16.0			Hard Augering @ 13.0 fbgs
						20.0			
						25.0			
Boring Log B-1A Terminated at a Depth of 16.0 Feet Below Ground Surface Due to Spoon/Auger Refusal									

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Mixed-Use Development		WAI Project No.: GJ2117908.000	
Location: Bloomfield Avenue & Park Street; Bloomfield, Essex County, NJ		Client: Bohler Engineering NJ, LLC	
Surface Elevation: ± NS feet	Date Started: 4/16/2021	Water Depth Elevation (feet bgs) (feet)	
Termination Depth: 16.0 feet bgs	Date Completed: 4/16/2021	Cave-In Depth Elevation (feet bgs) (feet)	
Proposed Location: Building	Logged By: CN	During: 0.5(P) --- ▼	At Completion: 12.5 --- ▼
Drill / Test Method: HSA / SPT	Contractor: AD	At Completion: --- --- ▼	
	Equipment: CME	24 Hours: --- --- ▼	24 Hours: --- --- ▼

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0			
						0.5	PAVEMENT	4" Asphalt, 2" Gravel Subbase	
0.5 - 2	S-1	X	8 - 4 - 4	NR	12		FILL	No Recovery, Presumed As Below (FILL)	Perched Water Visible in Borehole @ 0.5 fbs
2 - 4	S-2	X	2 - 5 - 7 - 11	8	12			Dark Reddish-Brown Silty Sand with Gravel, Wet to Moist (FILL)	
4 - 6	S-3	X	9 - 14 - 11 - 10	12	25		RESIDUAL	Dark Reddish-Brown Sandy Silt with Gravel, Moist, Very Stiff (ML)	Qu = 2.0 tsf
6 - 8	S-4	X	12 - 13 - 17 - 28	12	30			As Above, Stiff (ML)	Qu = 1.5 tsf
8 - 10	S-5	X	19 - 27 - 38 - 40	18	65			As Above (ML)	Qu = 1.5 tsf Subangular Weathered Rock Fragments
13 - 15	S-6	X	19 - 12 - 13 - 27	18	25			As Above (ML)	Qu = 1.0 tsf
16 - 16	S-7	X	50/0"	NR	50/0"	16.0		Boring Log B-2 Terminated at a Depth of 16.0 Feet Below Ground Surface Due to Spoon/Auger Refusal	Hard Augering @ 15.0 fbs
						20.0			
						25.0			

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Mixed-Use Development		WAI Project No.: GJ2117908.000	
Location: Bloomfield Avenue & Park Street; Bloomfield, Essex County, NJ		Client: Bohler Engineering NJ, LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>4/16/2021</u>	Water Depth Elevation (feet bgs) (feet)	
Termination Depth: <u>12.0</u> feet bgs	Date Completed: <u>4/16/2021</u>	Cave-In Depth Elevation (feet bgs) (feet)	
Proposed Location: <u>Building</u>	Logged By: <u>CN</u>	During: <u>NE</u> --- ▼	At Completion: <u>12.0</u> --- ▼
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>AD</u>	At Completion: --- --- ▼	
	Equipment: <u>CME</u>	24 Hours: --- --- ▼	24 Hours: --- --- ▼

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	PAVEMENT	3" Asphalt, 2" Gravel Subbase	
						0.4	FILL		
0.5 - 2	S-1	X	11 - 11 - 10	6	21			Dark Reddish-Brown Sandy Silt, Very Moist (FILL)	
2 - 4	S-2	X	4 - 4 - 6 - 7	12	10			As Above, with Gravel, Moist (FILL)	
4 - 6	S-3	X	12 - 16 - 11 - 17	12	27		RESIDUAL	Dark Reddish-Brown Sandy Silty Clay, Moist, Stiff (CL-ML)	LL = 25, PI = 4 Qu = 1.5 tsf
6 - 8	S-4	X	29 - 21 - 22 - 20	12	43			As Above (CL-ML)	Hard Augering @ 6.0 fbgs Qu = 1.5 tsf
8 - 10	S-5	X	37 - 44 - 21 - 14	18	65			As Above, Very Stiff (CL-ML)	Qu = 2.0 tsf
						10.0			Hard Augering @ 10.0 fbgs
						12.0			
12 - 12	S-6	X	50/0"	NR	50/0"			Boring Log B-3 Terminated at a Depth of 12.0 Feet Below Ground Surface Due to Spoon/Auger Refusal	
						15.0			
						20.0			
						25.0			

RECORD OF SUBSURFACE EXPLORATION

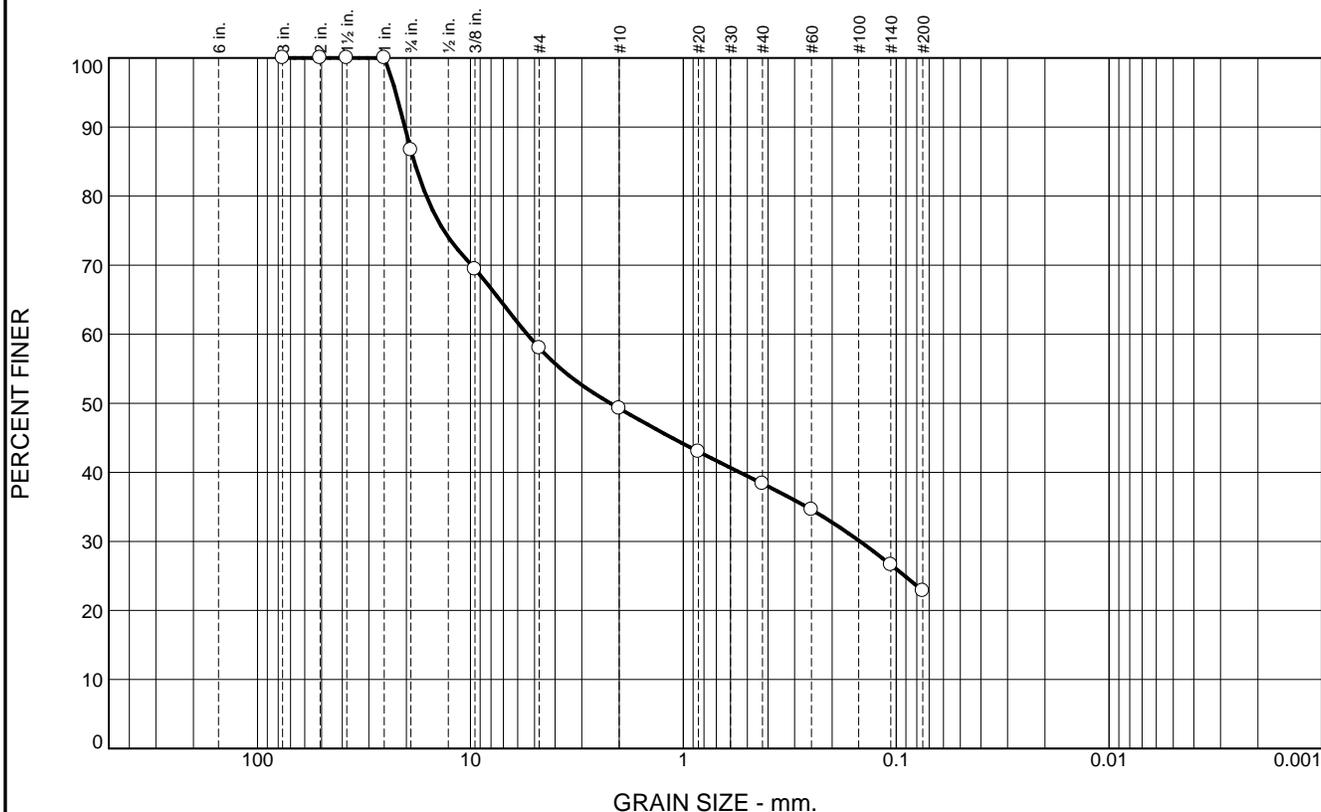
Project: Proposed Mixed-Use Development		WAI Project No.: GJ2117908.000	
Location: Bloomfield Avenue & Park Street; Bloomfield, Essex County, NJ		Client: Bohler Engineering NJ, LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>4/16/2021</u>	Water Depth Elevation (feet bgs) (feet)	
Termination Depth: <u>17.5</u> feet bgs	Date Completed: <u>4/16/2021</u>	Cave-In Depth Elevation (feet bgs) (feet)	
Proposed Location: <u>Building</u>	Logged By: <u>CN</u>	During: <u>NE</u> --- ▼	At Completion: <u>13.5</u> --- ▼
Drill / Test Method: <u>HSA / SPT</u>	Contractor: <u>AD</u>	At Completion: --- --- ▼	
	Equipment: <u>CME</u>	24 Hours: --- --- ▼	24 Hours: --- --- ▼

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	PAVEMENT	3" Asphalt, 4" Gravel Subbase	
0.5 - 2	S-1	X	2 - 3 - 2	4	5	0.6	FILL	Grayish-Black Silty Gravel, Slightly Moist (FILL)	
2 - 4	S-2	X	2 - 3 - 2 - 5	4	5	2.0		Dark Reddish-Brown Sandy Silt with Gravel, Moist (FILL)	
4 - 6	S-3	X	9 - 8 - 14 - 6	6	22	4.0	RESIDUAL	Dark Reddish-Brown Sandy Silt with Gravel, Slightly Moist (ML)	
6 - 8	S-4	X	14 - 22 - 19 - 15	12	41	5.0		As Above (ML)	
8 - 9.3	S-5	X	22 - 31 - 50/4"	12	81/10"	8.0	WEATHERED ROCK	Reddish-Brown Weathered Rock, Moist, Very Dense (WR)	
13 - 14.3	S-6	X	14 - 47 - 50/4"	18	97/10"	10.0		As Above (WR)	
						15.0			Hard Augering @ 15.0 fbgs
17.5 - 17.5	S-7	X	50/0"	NR	50/0"	17.5		Boring Log B-4 Terminated at a Depth of 17.5 Feet Below Ground Surface Due to Spoon/Auger Refusal	
						20.0			
						25.0			

APPENDIX B

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.3	28.7	8.7	10.9	15.6	22.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	86.7		
.375	69.4		
#4	58.0		
#10	49.3		
#20	43.0		
#40	38.4		
#60	34.6		
#140	26.6		
#200	22.8		

Material Description

Silty Gravel with Sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 20.3467 D₈₅= 18.3696 D₆₀= 5.4159
 D₅₀= 2.1993 D₃₀= 0.1480 D₁₅=
 D₁₀= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

W_n = 7.9 %

* (no specification provided)

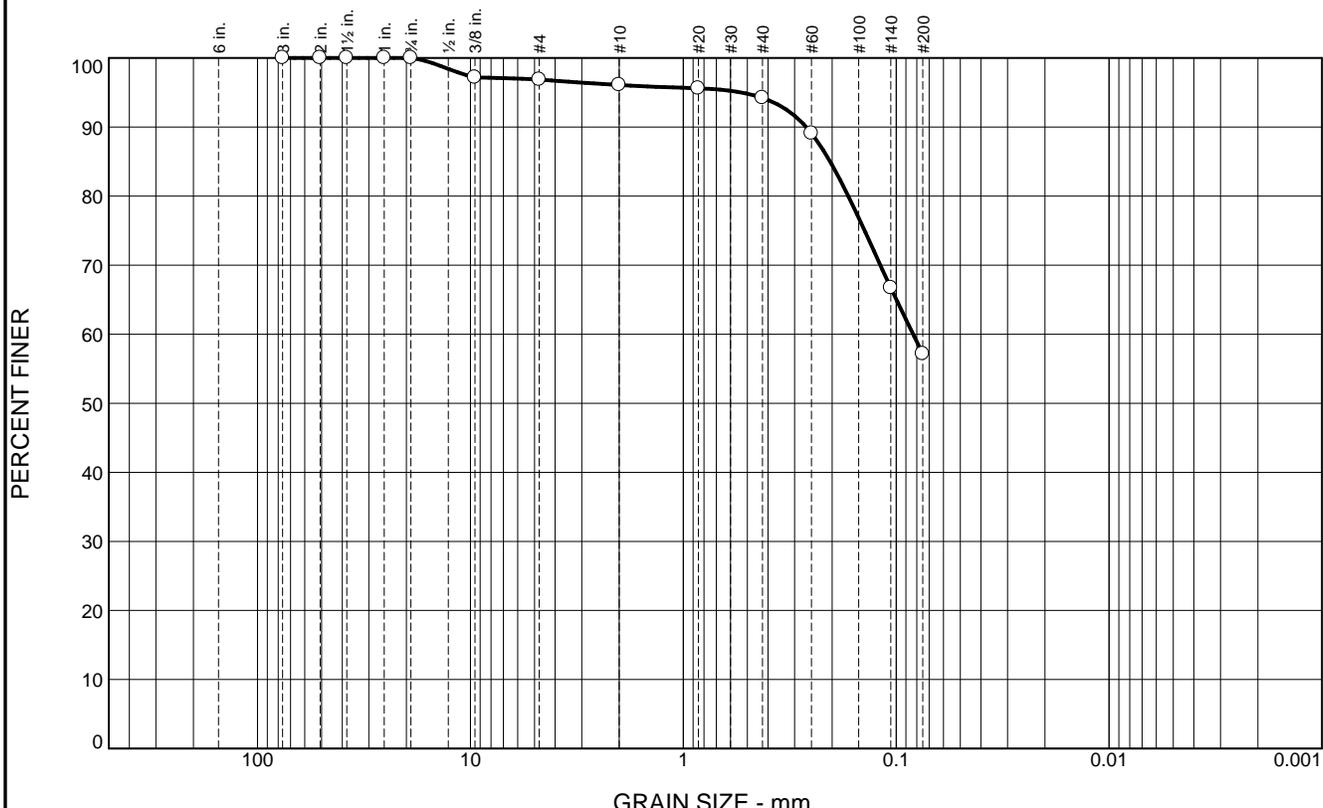
Source of Sample: B-1 Depth: 6.0' - 6.9'
 Sample Number: S-4

Date: 04/26/2021

**WHITESTONE
 ASSOCIATES, INC.
 Warren, New Jersey**

Client: Bohler Engineering NJ, LLC
Project: Proposed Mixed-Use Development
 Bloomfield Ave & Park St, Bloomfield, Essex County, NJ
Project No: GJ2117908.000 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.1	0.8	1.9	37.0	57.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.375	97.2		
#4	96.9		
#10	96.1		
#20	95.6		
#40	94.2		
#60	89.1		
#140	66.7		
#200	57.2		

Material Description

Sandy Silty Clay

Atterberg Limits
 PL= 21 LL= 25 PI= 4

Coefficients
 D₉₀= 0.2649 D₈₅= 0.2045 D₆₀= 0.0833
 D₅₀= D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Classification
 USCS= CL-ML AASHTO= A-4(0)

Remarks
 W_n = 19.3 %

* (no specification provided)

Source of Sample: B-3 Depth: 4.0' - 6.0'
 Sample Number: S-3

Date: 04/26/2021

WHITESTONE ASSOCIATES, INC. Warren, New Jersey	Client: Bohler Engineering NJ, LLC Project: Proposed Mixed-Use Development Bloomfield Ave & Park St, Bloomfield, Essex County, NJ Project No: GJ2117908.000
Figure	

APPENDIX C
Supplemental Information
(USCS, Terms and Symbols)



UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION <u>RETAINED</u> ON NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS <u>LESS</u> THAN 50	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS <u>SMALLER</u> THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS <u>GREATER</u> THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
HIGHLY ORGANIC SOILS	SILTS AND CLAYS	LIQUID LIMITS <u>GREATER</u> THAN 50	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
HIGHLY ORGANIC SOILS	SILTS AND CLAYS	LIQUID LIMITS <u>GREATER</u> THAN 50	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY

LOOSE..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

* VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM NJ.docx

Other Office Locations:

CHALFONT, PA
215.712.2700

SOUTHBOROUGH, MA
508.485.0755

ROCKY HILL, CT
860.726.7889

WALL, NJ
732.592.2101

PHILADELPHIA, PA
215.848.2323

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

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

SOIL PROPERTY SYMBOLS

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

DRILLING AND SAMPLING SYMBOLS

- NE: Not Encountered (Groundwater was not encountered).
 SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
 ST: Shelby Tube - 3" O.D., except where noted.
 AU: Auger Sample.
 OB: Diamond Bit.
 CB: Carbide Bit
 WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

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

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

PARTICLE SIZE

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

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Other Office Locations:

CHALFONT, PA
215.712.2700

SOUTHBOROUGH, MA
508.485.0755

ROCKY HILL, CT
860.726.7889

WALL, NJ
732.592.2101

PHILADELPHIA, PA
215.848.2323

March 26, 2024

via email

BOHLER ENGINEERING NJ, LLC

30 Independence Avenue
Suite 200
Warren, New Jersey 07059

Attention: Bradford A. Bohler, PE, CRE
Principal

**Regarding: STORMWATER MANAGEMENT AREA EVALUATION
PROPOSED MIXED-USE DEVELOPMENT
BLOOMFIELD AVENUE & PARK STREET
BLOOMFIELD, ESSEX COUNTY, NEW JERSEY
WHITESTONE PROJECT NO.: GJ2117908.001**

Dear Mr. Bohler:

Whitestone Associates, Inc. (Whitestone) is pleased to submit this *Stormwater Management (SWM) Area Evaluation* in support of the proposed redevelopment referenced above. This report is based on information provided by Bohler Engineering NJ, LLC (Bohler) including the December 12, 2022 *Concept Plan 'A'* prepared by Bohler and correspondence with Bohler.

1.0 PROJECT DESCRIPTION

The subject property located southeast of the Bloomfield Avenue and Park Street intersection in Bloomfield, Essex County, New Jersey currently houses a multi-story learning center/church, pavements, and utilities.

The proposed redevelopment is anticipated to include demolishing the existing site structure and constructing an approximately 51,431-square feet (maximum footprint), four-story, mixed-use building with new SWM facilities, at-grade parking, and utilities. The proposed building is not anticipated to include a basement/cellar or below-grade level.

2.0 FIELD EXPLORATION

Field exploration of the project site was conducted by means of six soil profile pits (identified as SPP-1 through SPP-6) excavated using a track-mounted excavator conducted within accessible portions of the proposed SWM facilities identified by Bohler. The locations of the subsurface tests are shown on the *Test Location Plan* included as Figure 1. *Records of Subsurface Exploration* are provided in Appendix A.

Office Locations:

The subsurface tests were conducted in the presence of a Whitestone engineer who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The subsurface tests were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Groundwater level observations, although not encountered, were recorded during and immediately after the completion of field operations prior to backfilling the test locations. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

3.0 SUMMARY OF FINDINGS

General: Soil profile pits (SPP-1 through SPP-6) were conducted within accessible portions of the proposed SWM facilities. The subsurface tests were terminated at depths ranging from approximately 4.6 feet below ground surface (fbgs) to 12 fbgs.

Estimated Seasonal High Groundwater Levels: The methods used in determining the estimated seasonal high groundwater level (ESHGWL) included evaluating the soil morphology within a test excavation and identifying irregular spots or blotches of different colors or minerals unlike that of the surrounding soil (mottles). A summary of the estimated seasonal high groundwater observations, although not encountered, and infiltration test results associated with this investigation are included in the following table.

INFILTRATION TEST SUMMARY				
Test Location	ESHGWL (fbgs)	USDA Classification @ Test Depth	Infiltration Test Results	
			Depth (fbgs)	Rate (in/hour)
SPP-1	Not Encountered	Loamy Sand	3.0	4.3
SPP-2	Not Encountered	Loamy Sand	3.0	4.0
SPP-3	Not Encountered	NT	NT	NT
SPP-4	Not Encountered	Loamy Sand	3.0	5.0
SPP-5	Not Encountered	Loamy Sand	3.5	3.3
SPP-6	Not Encountered	Loamy Sand	6.0	4.0

USDA - United States Department of Agriculture; NT - Not Tested

Soil Infiltration Rates: In-situ infiltration tests were conducted within the proposed SWM areas at the soil profile pits. In-situ infiltration testing was conducted using the single ring infiltration test methodology in general accordance with standards presented in the *New Jersey Stormwater Best Management Practices Manual* (BMP Manual). The tests resulted in field infiltration rates ranging from approximately 3.3 inches per hour (iph) to five iph. In-situ infiltration testing was not conducted at SPP-3 due to the presence of a below-grade slab underlying existing fill. In-situ infiltration test results associated with the investigation are provided in Appendix B, *Soil Profile Pit Logs* are included in Appendix A.



4.0 CLOSING

Whitestone appreciates the opportunity to be of continued service to Bohler Engineering NJ, LLC. Please contact us with any questions or comments regarding the information herein.

Sincerely,

WHITESTONE ASSOCIATES, INC.

A blue ink signature of Mudar Khantamr, consisting of a stylized first name and a long, sweeping horizontal line.

Mudar Khantamr, P.E.
Senior Associate

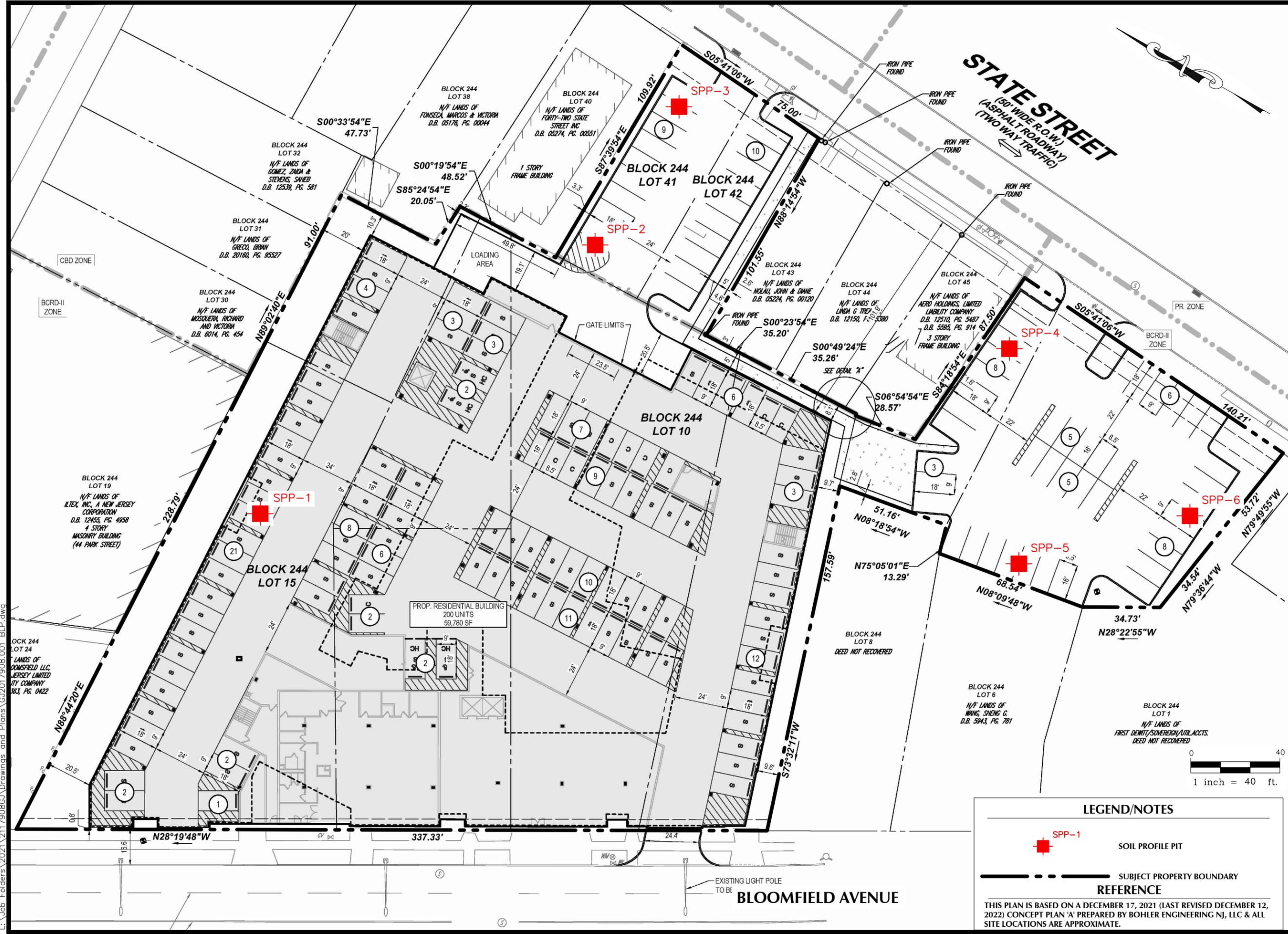
A blue ink signature of Laurence W. Keller, featuring a stylized first name and a long, sweeping horizontal line.

Laurence W. Keller, P.E.
Vice President

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Enclosures
Copy: Alexander Lomei, P.E., Bohler Engineering NJ, LLC
Allison Kopacz, Bohler Engineering NJ, LLC



FIGURE 1
Test Location Plan



WHITESTONE
 An Employee-Owned Company

30 INDEPENDENCE BOULEVARD, SUITE 250, WARREN, NJ 07059
 908.668.7777 WHITESTONEASSOC.COM

DRAWING TITLE: TEST LOCATION PLAN	
CLIENT: BOHLER ENGINEERING NJ, LLC	
PROJECT: PROPOSED MIXED-USE DEVELOPMENT BLOOMFIELD AVENUE & PARK STREET BLOOMFIELD, ESSEX COUNTY, NJ	
PROJECT #: GJ2117908.001	DESIGNED BY: GR
PROJ. MGR.: MK	DATE: 3/25/24
FIGURE: 1	SCALE: 1" = 40'

LEGEND/NOTES

SPP-1
SOIL PROFILE PIT

SUBJECT PROPERTY BOUNDARY

REFERENCE

THIS PLAN IS BASED ON A DECEMBER 17, 2021 (LAST REVISED DECEMBER 12, 2022) CONCEPT PLAN 'A' PREPARED BY BOHLER ENGINEERING NJ, LLC & ALL SITE LOCATIONS ARE APPROXIMATE.

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APPENDIX A
Records of Subsurface Exploration

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Mixed-Use Development		WAI Project No.: GJ2117908.001	
Location: Bloomfield Avenue & Park Street, Bloomfield, Essex County, New Jersey		Client: Bohler Engineering NJ, LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>3/11/2024</u>	Water Depth Elevation (feet bgs) (feet)	Estimated Seasonal High Groundwater Depth Elevation (feet bgs) (feet)
Termination Depth: <u>11.0</u> feet bgs	Date Completed: <u>3/11/2024</u>		
Proposed Location: <u>Porous Pavement</u>	Logged By: <u>AM</u>	During: <u>NE</u> <u>---</u> ▼	At Completion: <u>NE</u> <u>---</u>
Excavating Method: <u>Test Pit Excavation</u>	Contractor: <u>MC</u>	At Completion: <u>NE</u> <u>---</u> ▼	
Test Method: <u>Visual Observation</u>	Rig Type: <u>Deere</u>	24 Hours: <u>---</u> <u>---</u> ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.5	PAVEMENT	3" Asphalt, 3" Gravel Subbase	
			0.5 - 1.5	FILL	Dark Reddish-Brown (2.5 YR 3/4) LOAM, 10% Gravel, Moist, Moderate, Fine, Crumb, Friable, No Roots, Trace Debris	Brick Debris
			1.5 - 10	RESIDUAL	Reddish-Brown (2.5 YR 4/4) LOAMY SAND, 15% Gravel, 20% Cobbles, Moist, Moderate, Medium, Granular, Friable, No Roots	
			10 - 11	WEATHERED ROCK	Reddish-Brown (2.5 YR 4/4) WEATHERED ROCK, Dry, Coarse, Strong, Platy, Hard	
			11.0		Soil Profile Pit SPP-1 Terminated at a Depth of 11.0 Feet Below Ground Surface due to Bucket Refusal	
			12.0			
			13.0			
			14.0			
			15.0			



RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: **SPP-2**

Page 1 of 1

Project: Proposed Mixed-Use Development		WAI Project No.: GJ2117908.001	
Location: Bloomfield Avenue & Park Street, Bloomfield, Essex County, New Jersey		Client: Bohler Engineering NJ, LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>3/11/2024</u>	Water Depth Elevation (feet bgs) (feet)	Estimated Seasonal High Groundwater Depth Elevation (feet bgs) (feet)
Termination Depth: <u>12.0</u> feet bgs	Date Completed: <u>3/11/2024</u>		
Proposed Location: <u>Porous Pavement</u>	Logged By: <u>AM</u>	During: <u>NE</u> <u>---</u> ▼	At Completion: <u>NE</u> <u>---</u>
Excavating Method: <u>Test Pit Excavation</u>	Contractor: <u>MC</u>	At Completion: <u>NE</u> <u>---</u> ▼	
Test Method: <u>Visual Observation</u>	Rig Type: <u>Deere</u>	24 Hours: <u>---</u> <u>---</u> ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.5	PAVEMENT	2" Gravel, 4" Gravel Subbase	Wood Debris
			0.5 - 2	FILL	Dark Reddish-Brown (2.5 YR 3/4) LOAM, 10% Gravel, Moist, Moderate, Fine, Crumb, Friable, No Roots, Trace Debris	
			2 - 12	RESIDUAL	Reddish- Brown (2.5 YR 4/4) LOAMY SAND, 15% Gravel, 20% Cobbles, Moderate, Medium, Granular, Friable No Roots	
			12.0		Soil Profile Pit SPP-2 Terminated at a Depth of 12.0 Feet Below Ground Surface	
			13.0			
			14.0			
			15.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

Project: Proposed Mixed-Use Development		WAI Project No.: GJ2117908.001	
Location: Bloomfield Avenue & Park Street, Bloomfield, Essex County, New Jersey		Client: Bohler Engineering NJ, LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>3/11/2024</u>	Water Depth Elevation (feet bgs) (feet)	Estimated Seasonal High Groundwater Depth Elevation (feet bgs) (feet)
Termination Depth: <u>4.6</u> feet bgs	Date Completed: <u>3/11/2024</u>		
Proposed Location: <u>Porous Pavement</u>	Logged By: <u>AM</u>	During: <u>NE</u> <u>---</u> ▼	At Completion: <u>NE</u> <u>---</u>
Excavating Method: <u>Test Pit Excavation</u>	Contractor: <u>MC</u>	At Completion: <u>NE</u> <u>---</u> ▼	
Test Method: <u>Visual Observation</u>	Rig Type: <u>Deere</u>	24 Hours: <u>---</u> <u>---</u> ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.5	PAVEMENT	2" Gravel, 4" Gravel Subbase	
			0.5 - 4.6	FILL	Reddish-Brown (2.5 YR 4/4) LOAMY SAND, 10% Gravel, 10% Cobbles, Moist, Moderate, Medium, Granular, Friable, No Roots, Heavy Amounts of Debris	Apparent Existing Cinderblock Wall
			1.0			
			2.0			
			3.0			
			4.0			
			4.6			
			5.0		Soil Profile Pit SPP-3 Terminated at a Depth of 4.6 Feet Below Ground Surface due to Bucket Refusal on Apparent Concrete Slab	
			6.0			
			7.0			
			8.0			
			9.0			
			10.0			
			11.0			
			12.0			
			13.0			
			14.0			
			15.0			

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Mixed-Use Development		WAI Project No.: GJ2117908.001	
Location: Bloomfield Avenue & Park Street, Bloomfield, Essex County, New Jersey		Client: Bohler Engineering NJ, LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>3/11/2024</u>	Water Depth Elevation (feet bgs) (feet)	Estimated Seasonal High Groundwater Depth Elevation (feet bgs) (feet)
Termination Depth: <u>12.0</u> feet bgs	Date Completed: <u>3/11/2024</u>		
Proposed Location: <u>Porous Pavement</u>	Logged By: <u>AM</u>	During: <u>NE</u> <u>---</u> ▼	At Completion: <u>NE</u> <u>---</u>
Excavating Method: <u>Test Pit Excavation</u>	Contractor: <u>MC</u>	At Completion: <u>NE</u> <u>---</u> ▼	
Test Method: <u>Visual Observation</u>	Rig Type: <u>Deere</u>	24 Hours: <u>---</u> <u>---</u> ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.7	PAVEMENT	3" Asphalt, No Gravel Subbase 5" Concrete Slab	
			1.0	FILL	Dark Reddish-Brown (2.5YR 3/4) SANDY LOAM, 10% Gravel, 10% Cobbles, Moist, Moderate, Medium, Granular, Loose, No Roots, Some Debris	Brick
			2.5 - 12	RESIDUAL	Reddish-Brown (2.5 YR 4/4) LOAMY SAND, 15% Gravel, 20% Cobbles, Moist, Moderate, Medium, Granular, Friable, No Roots	
			12.0		Soil Profile Pit SPP-4 Terminated at a Depth of 12.0 Feet Below Ground Surface	
			13.0			
			14.0			
			15.0			



RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: **SPP-5**

Page 1 of 1

Project: Proposed Mixed-Use Development		WAI Project No.: GJ2117908.001	
Location: Bloomfield Avenue & Park Street, Bloomfield, Essex County, New Jersey		Client: Bohler Engineering NJ, LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>3/11/2024</u>	Water Depth Elevation (feet bgs) (feet)	Estimated Seasonal High Groundwater Depth Elevation (feet bgs) (feet)
Termination Depth: <u>12.0</u> feet bgs	Date Completed: <u>3/11/2024</u>		
Proposed Location: <u>Porous Pavement</u>	Logged By: <u>AM</u>	During: <u>NE</u> <u>---</u> ▼	At Completion: <u>NE</u> <u>---</u>
Excavating Method: <u>Test Pit Excavation</u>	Contractor: <u>MC</u>	At Completion: <u>NE</u> <u>---</u> ▼	
Test Method: <u>Visual Observation</u>	Rig Type: <u>Deere</u>	24 Hours: <u>---</u> <u>---</u> ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.5	PAVEMENT	4" Asphalt, 2" Gravel Subbase	
			0.5 - 3	FILL	Dark Reddish-Brown (2.5 YR 3/4) SANDY LOAM, 10% Gravel, 10% Cobbles, Moist, Moderate, Medium, Granular, Loose, No Roots, Some Debris	Brick
			3 - 12	RESIDUAL	Reddish-Brown (2.5 YR 4/4) LOAMY SAND, 15% Gravel, 20% Cobbles, Moist, Moderate, Medium, Granular, Friable, No Roots	
			12.0			
			13.0			
			14.0			
			15.0			
Soil Profile Pit SPP-5 Terminated at a Depth of 12.0 Feet Below Ground Surface						

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched



RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: **SPP-6**

Page 1 of 1

Project: Proposed Mixed-Use Development		WAI Project No.: GJ2117908.001	
Location: Bloomfield Avenue & Park Street, Bloomfield, Essex County, New Jersey		Client: Bohler Engineering NJ, LLC	
Surface Elevation: ± <u>NS</u> feet	Date Started: <u>3/11/2024</u>	Water Depth Elevation (feet bgs) (feet)	Estimated Seasonal High Groundwater Depth Elevation (feet bgs) (feet)
Termination Depth: <u>12.0</u> feet bgs	Date Completed: <u>3/11/2024</u>		
Proposed Location: <u>Porous Pavement</u>	Logged By: <u>AM</u>	During: <u>NE</u> <u>---</u> ▼	At Completion: <u>NE</u> <u>---</u>
Excavating Method: <u>Test Pit Excavation</u>	Contractor: <u>MC</u>	At Completion: <u>NE</u> <u>---</u> ▼	
Test Method: <u>Visual Observation</u>	Rig Type: <u>Deere</u>	24 Hours: <u>---</u> <u>---</u> ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.5	PAVEMENT	3" Asphalt, 3" Gravel Subbase	
			0.5 - 5.5	FILL	Dark Reddish-Brown (2.5 YR 3/4) SANDY LOAM, 10% Gravel, 10% Cobbles, Moist, Moderate, Medium, Granular, Loose, No Roots, Heavy Amounts of Debris	Brick & Concrete
			5.5 - 12	RESIDUAL	Reddish-Brown (2.5 YR 4/4) LOAMY SAND, 15% Gravel, 20% Cobbles, Moist, Moderate, Medium, Granular, Friable, No Roots	
			12.0		Soil Profile Pit SPP-6 Terminated at a Depth of 12.0 Feet Below Ground Surface	
			13.0			
			14.0			
			15.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched



APPENDIX B

Infiltration Test Results

APPENDIX C
Supplemental Information
(USCS, Terms & Symbols)

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
	MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION <u>RETAINED</u> ON NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS <u>LESS</u> THAN 50	SM	SILTY SANDS, SAND-SILT MIXTURES	
		LIQUID LIMITS <u>GREATER</u> THAN 50	SC	CLAYEY SANDS, SAND-CLAY MIXTURES	
MORE THAN 50% OF MATERIAL IS <u>SMALLER</u> THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS <u>LESS</u> THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
		LIQUID LIMITS <u>GREATER</u> THAN 50	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
HIGHLY ORGANIC SOILS			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*

Sand and/or Gravel

RELATIVE DENSITY

LOOSE..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*

Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

* VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.

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Office Locations:

NEW JERSEY

PENNSYLVANIA

MASSACHUSETTS

CONNECTICUT

FLORIDA

NEW HAMPSHIRE

NEW YORK

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

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

SOIL PROPERTY SYMBOLS

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

DRILLING AND SAMPLING SYMBOLS

- NE: Not Encountered (Groundwater was not encountered).
- SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
- ST: Shelby Tube - 3" O.D., except where noted.
- AU: Auger Sample.
- OB: Diamond Bit.
- CB: Carbide Bit
- WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

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

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

PARTICLE SIZE

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

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM NJ.docx

Office Locations:

Drainage Area Maps