STONEFIELD

STORMWATER OPERATIONS & MAINTENANCE MANUAL

PROPOSED MIXED USE DEVELOPMENT
BLOCK 808, LOTS 5-8
NJSH ROUTE 35, WEST BANGS AVE, AND MONROE AVE
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

PREPARED FOR:

GSZ REALTY, LLC

PREPARED BY:

STONEFIELD ENGINEERING & DESIGN, LLC
15 SPRING STREET
PRINCETON, NJ 08542
MARCH 24TH, 2021

PRI-200234

PAUL D. MUTCH JR., PE
NEW JERSEY PROFESSIONAL ENGINEER LICENSE # 55094

REPORT CONTENTS

1.0 PROJECT DESCRIPTION

GSZ Realty, LLC is proposing the construction of a mixed use development on Neptune Township Block 808 Lots 5, 6, 7, and 8. The development would consist of a four (4) story building which will house a 4,250 SF commercial space on the first floor, and a total of 42 residential units. Other supporting site improvements include providing a total of 97 parking spaces, site lighting, landscaping, stormwater management facilities. The subject property is currently bound Route 35, West Bangs Ave, and Monroe Ave.

The total project area is 58,667 (1.35 acres), the total area of impervious surfaces in the proposed condition is 46,913 SF (1.07 acres), and the total area of disturbance is 66,659 SF (1.53 acres). Project Figures can be found in Appendix A of this Report.

This Stormwater Operations & Maintenance Manual has been prepared to delineate operational and maintenance responsibilities for the stormwater best management practices (BMPs) proposed to meet the requirements set forth by the Township of Neptune, Freehold Soil Conservation District, and the New Jersey Department of Transportation (NJDOT).

2.0 PROPOSED DEVELOPMENT

This project proposes a 4-story mixed use building which occupies a footprint of 17,434 SF. The first floor is a mixed of commercial space, lobby space, and amenities for the residential use. A portion of the building overhangs the row of building to the eastern portion of the site. Access to the site is provided via a proposed full movement driveway to Monroe Ave, and two proposed full movement driveways to West Bangs Ave. Other associated improvements include the remainder of the parking area, landscaping, utilities, site lighting. The stormwater management facilities for this site consists of porous pavements and one underground CulTec infiltration basin.

3.0 STORMWATER MANAGEMENT OPERATIONAL PROCEDURES

Operation and maintenance of the permanent stormwater control BMPs shall be the responsibility of the operator of the project site at the time that the applicable maintenance is required. The current owner and responsible agent of the project is:

GSZ Realty, LLC
606 West Union Ave
Bound Brook, NJ 08805
Email: SZ8855@msn.com

A copy of this report shall be kept on-site at all times both during and after construction. Upon reviewing agency approval, the title and date of the maintenance plan as well as the contact information of the current agent responsible for maintaining the stormwater management measures for the project shall be recorded on the deed of the property on which the measures are located. Any future change in this information such as change in property ownership shall also be recorded on the deed.

The current responsible agent shall evaluate the maintenance plan for effectiveness at least annually and revise the plan as necessary. A detailed, written log of all preventative and corrective maintenance performed for each stormwater management measure must be kept, including a record of all inspections and copies of maintenance-related work orders. Upon request from a public entity with jurisdiction over the project area the responsible agent shall make available the maintenance plan and associate logs and other records for review.

3.1 MAINTENANCE EQUIPMENT AND PERSONNEL

The current responsible agent shall ensure that adequate equipment and training is provided to maintenance personnel to perform the required maintenance tasks. Confined Space Entry Certification shall be required by personnel entering underground structures and pipes. The material and equipment necessary for inspection and maintenance activities shall include, but not be limited to, the following:

- *Infiltration Basins:* Instruments to perform visual inspection of underground pipes and outlet structures, equipment to pump stormwater from the basin in the event of maintenance, vacuum truck and hose for removal of sediment from basin bottom, and necessary safety equipment
- *Pervious Paving Area Equipment:* Material and equipment customary in pavement maintenance practices.
- *Landscape Areas:* Material and equipment customary in landscape maintenance practices.
- *Street Sweeping:* Litter vacuum or leaf/litter blower to collect sediment from asphalt surface, brooms, and disposal bags.

The estimated cost of routine, scheduled maintenance activities is estimated to be approximately $8,000.00 per year. Approximate breakdown of yearly routine maintenance costs are noted below:

MAINTENANCE COST BREAKDOWN

Underground Infiltration Basin	$2,500.00 per year
Pervious Pavement Maintenance	$2,000.00 per year

Landscape Areas	$1,500.00 per year
Sediment Debris and Trash Removal	$1,000.00 per year
Street Sweeping	$1,000.00 per year

3.2 MAINTENANCE ACCESS POINTS

The proposed BMP measures (infiltration basin and porous pavement areas) can be readily accessed on foot, via inlets, and manholes as seen on the Site Plans prepared by Stonefield Engineering & Design, LLC. Reduced sheets (not to scale) can be found in the Appendix of this Manual.

4.0 STORMWATER BMP INVENTORY

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

4.1 INFILTRATION BASIN(S)

One (1) stormwater infiltration basins are proposed for the proposed development:

- *Subsurface Infiltration Basin B-1*: The subsurface infiltration under the western drive aisle of the site. The onsite conveyance system is routed so the clean roof runoff immediately directed to the basin and the motor vehicle surface areas is piped to the basin after pre-treatment via the porous pavement.
    - Design Purposes:
        1. Water Quality
            - 1.25 inches in 2 hours
        2. Water Quantity
            - 2-year storm (3.38 inches)
            - 10-year storm (5.23 inches)
            - 100-year storm (8.94 inches)
    - Dimensions: 171.00 FT (Length) x 19.16 FT (Width) x 3.21 FT (Depth)

As the majority of stormwater management for this project is dependent on infiltration at least as effective as the determined design rate to achieve stormwater quantity and quality control as well groundwater recharge, maintaining the effectiveness of these basins is essential for proper site operations as well as public safety.

4.2 PERVIOUS PAVING SYSTEM(S)

Three (3) non-contiguous pervious paving areas are proposed for this project:

- *Pervious Pavement Area 1 (O-1):* This BMP spans the parking area to the rear of the proposed building, to the south of the truck loading area. Its area is greater than 1/3 of the tributary area, which includes the parking area itself and the section of the drive aisle to its immediate east. It discharges to the proposed underground infiltration stormwater basin at the rear of the site. Overflow during a larger storm event is collected in an inlet within the pervious pavement area.
    - *Design Purposes:*
        1. *Water quantity - 1.25 inches in 2 hours*
    - *Dimensions: 90.0 FT (Length) x 18.0 FT (Width) x 7.0 in (Depth of Stone Bed)*
    - *Slopes: 0.50% - 3.00%*
- *Pervious Pavement Area 2 (O-2)*: This BMP spans the parking area to the rear of the proposed building, to the south of the truck loading area. Its area is greater than 1/3 of the tributary area, which includes the parking area itself and the section of the drive aisle to its immediate east. It discharges to the proposed underground infiltration stormwater basin at the rear of the site. Overflow during a larger storm event is collected in an inlet within the pervious pavement area.
    - *Design Purposes:*
        1. *Water quantity - 1.25 inches in 2 hours*
    - *Dimensions: 153.0 FT (Length) x 18.0 FT (Width) x 7.0 in (Depth of Stone Bed)*
    - *Slope: 1.00% - 5.00%*
- *Pervious Pavement Area 3 (O-3)*: This BMP spans the parking area to the rear of the proposed building, to the south of the truck loading area. Its area is greater than 1/3 of the tributary area, which includes the parking area itself and the section of the drive aisle to its immediate east. It discharges to the proposed underground infiltration stormwater basin at the rear of the site. Overflow during a larger storm event is collected in an inlet within the pervious pavement area.
    - *Design Purposes:*
        1. *Water quantity - 1.25 inches in 2 hours*
    - *Dimensions: 270.0 FT (Length) x 18.0 FT (Width) x 7.0 in (Depth of Stone Bed)*
    - *Slope: 0.50% - 3.50%*

4.3 OTHER MAINTENANCE

In addition to the scheduled inspections for the above referenced stormwater BMPs, the following general maintenance tasks shall be performed:

1. All stormwater inlets and manholes shall be inspected for debris and sediment accumulation and structural integrity at least four (4) times annually. Debris and sediment removal shall be scheduled as required to maintain stormwater runoff conveyance efficiency and disposed of in compliance with all applicable local, state, and federal waste regulations.

2. Street sweeping shall occur at least once (1) monthly in all parking lot areas onsite. Regenerative air equipment shall be used.

3. Trash receptacles onsite shall be emptied, and their liners replaced at a minimum of three (3) times per week.

4. Landscaping within the developed portions of the site shall be trimmed/mowed twice (2) monthly during the growing season. Reforested portions of the site shall be left undisturbed to vegetate naturally.

5. Inlet hoods and sumps located within the fuel canopy area of the convenience store shall be inspected for debris and sediment accumulation and structural integrity at least four (4) times annually. Debris and sediment removal shall be scheduled as required to maintain stormwater runoff conveyance efficiency and disposed of in compliance with all applicable local, state, and federal waste regulations.

6. Inlet oil and grit interceptors shall be inspected for debris and sediment accumulation and structural integrity at least four (4) times annually. Debris and sediment removal shall be scheduled as required to maintain stormwater runoff conveyance efficiency and disposed of in compliance with all applicable local, state, and federal waste regulations.

5.0 STORMWATER BMP PREVENTATIVE MAINTENANCE ACTIONS

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.

5.1 SUBSURFACE INFILTRATION BASIN

Subsurface infiltration basin inspections shall be performed by entering the basin area via any of the associated manholes along the basin perimeter. The responsible agent shall ensure that subsurface basin inspections occur as often as surface basin inspections. The following maintenance tasks shall be performed for the infiltration basins.

5.1.1 QUARTERLY

All infiltration basin components which receive, or discharge stormwater must be checked for trapped debris and sediment accumulation at least four (4) times annually as well as after storm events exceeding one (1) inch of precipitation. These basin components include rip-rap aprons, flared end sections, outlet structures, basin bottoms (in surface basins), trash racks, and pipe storage areas (in subsurface basins). Sediment removal shall take place when the basin is completely dry. Disposal of debris and sediment shall be done in compliance with all applicable local, state, and federal waste regulations.

5.1.2 SEMIANNUALLY

Upon initial planting of vegetation around the surface basins, biweekly inspections shall be performed during the first growing season or until vegetation is established. Inspections of vegetation health, density, and diversity would be performed twice (2) annually during both growing and non-growing season; an additional inspection shall occur once (1) annually for unwanted growth, erosion, and scouring. Vegetated areas should be mowed/trimmed at least once (1) monthly during the growing season or more frequently as the discretion of the responsible agent. If vegetation is more than 50% damaged, the area should be reestablished according to the original planting and inspection specifications. Fertilizers and chemical treatments should be avoided where possible.

5.1.3 ANNUALLY

All structural components (flared end sections, outlet structures, piping etc.) shall be checked at least once (1) annually for cracking, subsidence, spalling, erosion and deterioration.

5.1.4 BASIN DRAWDOWN

The following table outlines the design drawdown time (time elapsed for basin to completely drain after the end of a storm event) for subsurface basin.

Storm Event	*Precipitation (in)*	*B-1 Drawdown (hr)*
2 Year	3.38"	28.00 HR
10 Year	5.23"	28.85 HR
100 Year	8.94"	29.75 HR

This table shall be referenced to the actual drawdown times for each infiltration basin to evaluate performance. Should significant increases in drawdown time be noted or if stormwater runoff remains in the basin more than 72 hours after the end of a storm event, the basin's bottom surface, subsoil, groundwater, and tailwater conditions must be evaluated and permeability tests shall be performed to determine appropriate measures to be taken to ensure proper basin functionality. Annual tilling may be performed by lightweight equipment at the discretion of the responsible agent as a preventative measure against decreased infiltration rates.

5.2 PERVIOUS PAVING SYSTEMS

The pervious pavement underdrains can be inspected via the inlets proposed in each pervious pavement area. The following maintenance tasks shall be performed for the infiltration basins.

5.2.1 QUARTERLY

All pervious pavement system components which receive, or discharge stormwater must be checked for trapped debris and sediment accumulation at least four (4) times annually as well as after storm events exceeding one (1) inch of precipitation. These components include the underdrain pipe and inlet within each of the two pervious pavement areas. Disposal of debris and sediment shall be done in compliance with all applicable local, state, and federal waste regulations.

5.2.2 ANNUALLY

All structural components shall be checked at least once (1) annually for cracking, subsidence, spalling, erosion and deterioration.

6.0 STORMWATER BMP CORRECTIVE MAINTENANCE ACTIONS

Depending on many factors, such as the performance of preventative maintenance actions, weather, or unexpected incidents. Corrective requirements may not be precisely anticipated; however, a list of potential corrective maintenance actions may assist the responsible party in planning and estimating costs in advance.

Potential Corrective Maintenance Actions	***Stormwater Management Measures/No.***
▪ Repair/replacement of eroded or damaged riprap apron ▪ Repair/replacement of outlet pipes or orifices ▪ Revegetation of eroded side slope, aquatic bench, marsh, basin bottom, grass swales, etc.	Infiltration Basin, Pervious Pavement Systems

The corrective maintenance actions should also be listed in the Field Manuals for the specific stormwater management measures on the site.

7.0 INSPECTION AND LOGS OF ALL PREVENTATIVE AND CORRECTIVE MEASURES

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:

- Appendix C-1: General Inspection Checklist Log
- Appendix C-2: General Preventative Maintenance Log
- Appendix C-3: General Corrective Maintenance Log
- Appendix C-4: Annual Evaluation Records
- Appendix C-5: CulTec Chamber Operations and Maintenance Manual

All inspection and maintenance activities shall be recorded to document frequency of inspection and maintenance, and implementation of corrective action. All regularly scheduled inspections, inspections following one (1) inch of precipitation, maintenance activities, and repairs shall be recorded. Refer to the Appendix of this Manual for the BMP Inspection & Maintenance Log for this facility. This log shall be considered a minimum standard for recording purposes, the Operator and Inspection/Maintenance Personnel are encouraged to supplement the Log with additional notes and photos.

8.0 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.

APPENDIX A:
PROJECT PLANS
(NOT TO SCALE)

APPENDIX A-1:
SITE PLAN

LAND USE AND ZONING

BLOCK 808, LOTS 5, 6, 7, & 8			
ROUTE 35 & WEST BANGS AVENUE REDEVELOPMENT ZONE			
PROPOSED USE			
MIXED USE (RESIDENTIAL OVER RETAIL)	CONDITIONAL USE		
ZONING REQUIREMENT	**REQUIRED**	**EXISTING**	**PROPOSED**
MINIMUM LOT AREA	15,000 SF	58,667 SF	NO CHANGE
MAXIMUM FLOOR AREA RATIO	0.60	N/A	1.04 (V)
MINIMUM LOT WIDTH	75 FT	169.5 FT	NO CHANGE
MINIMUM LOT FRONTAGE	75 FT	666.8 FT	NO CHANGE
MINIMUM LOT DEPTH	100 FT	164.6 FT	NO CHANGE
MINIMUM BUILDING SETBACK			
-FROM ROUTE 35	20 FT	N/A	20.0 FT
-FROM BANGS AVENUE	25 FT	N/A	25.0 FT
-FROM MONROE AVENUE	20 FT	N/A	24.6 FT
MINIMUM BUILDING SETBACK FROM RESIDENTIAL LOT LINE	40 FT	N/A	84.6 FT
MINIMUM DISTANCE BETWEEN BUILDINGS	28 FT	N/A	N/A
MAXIMUM PERCENT BUILDING COVER	35%	N/A	29.7% (17,434 SF)
MAXIMUM PERCENT TOTAL LOT COVER	80%	N/A	80.0% (46,913 SF)
MAXIMUM BUILDING HEIGHT	42 FT	N/A	42 FT
MINIMUM IMPROVABLE AREA	7,200 SF	23,876.2 SF	NO CHANGE
MINIMUM IMPROVABLE AREA (DIA. OF CIRCLE)	55 FT	174.30 FT	NO CHANGE

(V) VARIANCE

CONDITIONAL USE REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ 415.12 (A)	APARTMENTS MAY BE LOCATED AT THE 2ND & 3RD STORY LEVELS OF THE BUILDING, PROVIDED THE 1ST STORY LEVEL IS A PERMITTED USE.	COMPLIES
§ 415.12 (B)	PRINCIPAL ACCESS TO THE 2ND & 3RD STORY APARTMENT SHALL BE PROVIDED VIA A DEDICATED ENTRANCEWAY OR VESTIBULE AT THE BUILDING FACE	COMPLIES
§ 415.12 (C)	MINIMUM DWELLING SIZE: ONE (1) BEDROOM - 850 SF TWO (2) BEDROOM - 1,000 SF	COMPLIES 850 SF 1,070 SF

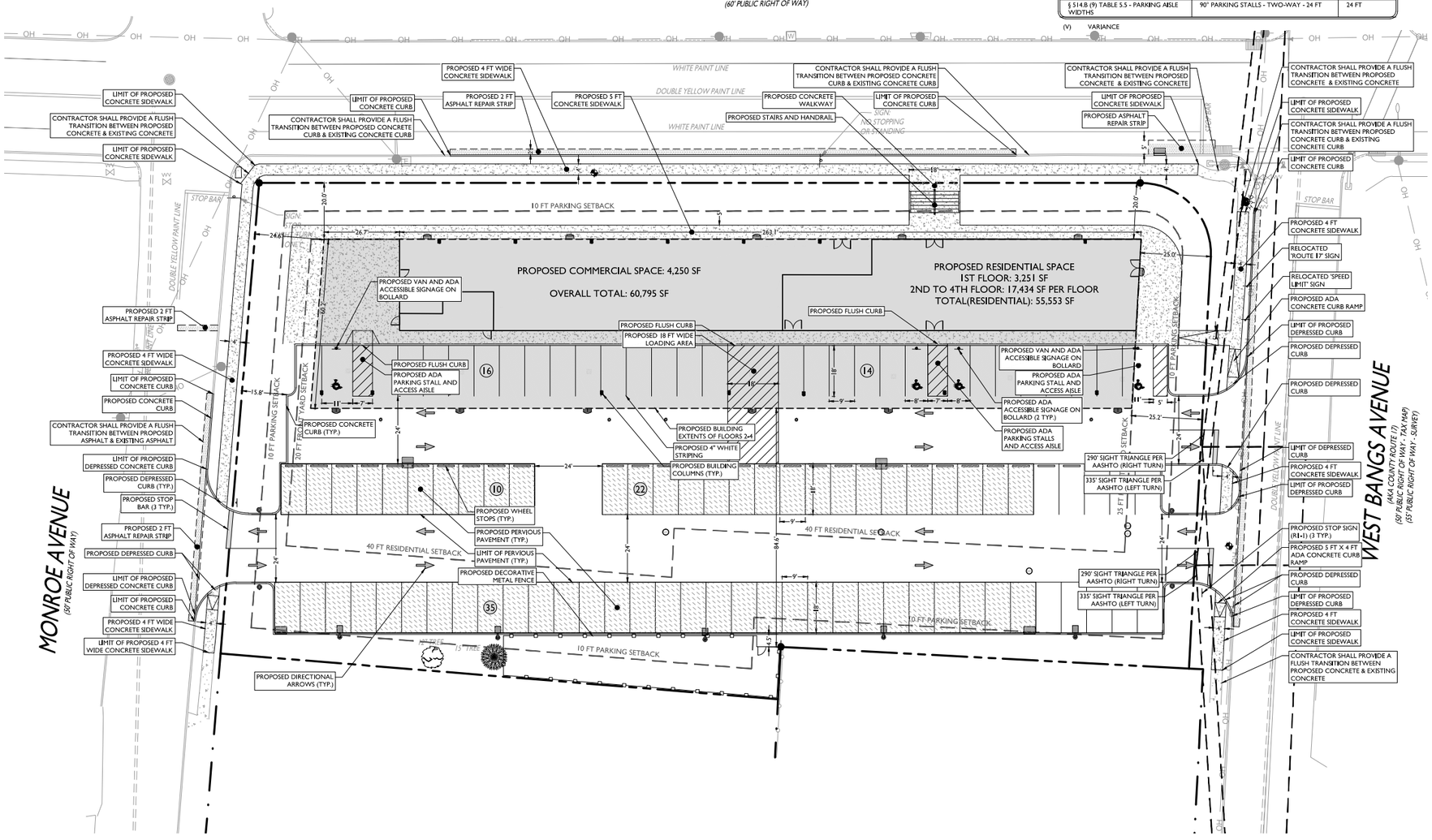
OFF-STREET PARKING REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
REDEVELOPMENT PLAN (RDV35-WB)-PARKING/CIRCULATION #1	SIDEWALKS ARE REQUIRED ALONG ROUTE 35, MONROE AVENUE, & WEST BANGS AVENUE & SHALL BE 4 FT IN WIDTH	4 FT
REDEVELOPMENT PLAN (RDV35-WB)-PARKING/CIRCULATION #3	NO PARKING SHALL BE LOCATED LESS THAN 10 FT TO ANY PROPERTY LINE	4.5 FT(V)
REDEVELOPMENT PLAN (RDV35-WB)-PARKING/CIRCULATION #4	PARKING SPACES,DRIVEWAYS, AND AISLES SHALL BE MARKED WITH DIRECTIONAL SIGNS & DOUBLE SPACE MARKINGS.	COMPLIES
RSIS PARKING STANDARDS	1 BR APT: *1 BR @ 1.8 PER UNIT* *18 X 1.8 = 32 SPACES* 2 BR APT: *2 BR @ 2 PER UNIT* *24 X 2 = 48 SPACES* *TOTAL REQUIRED SPACES = 80 SPACES*	80 SPACES
§ 412.17 TABLE 4.2 - PARKING REQUIREMENTS	PARKING REQUIREMENT - RETAIL: 1 SPACE PER 250 SF OF GFA *4,250 SF / 250 SF = 17 SPACES*	17 SPACES
§ 412.17 (G)	ALL PERMITTED & REQUIRED ACCESSORY PARKING STRUCTURE SHALL BE LOCATED ON THE SAME LOT AS THE USE TO WHICH THE SPACES ARE ACCESSORY, OR UPON AN ADJACENT LOT IN COMMON OWNERSHIP.	COMPLIES
§ 412.18	EXCEPT FOR SINGLE-DWELLINGS IN NON-HISTORIC ZONE DISTRICTS, NO INDIVIDUAL PARKING SPACES SHALL BE PERMITTED IN ANY FRONT YARD SETBACK AREA. PARKING IS PROHIBITED IN ALL DISTRICTS ON LAWN AREAS WITHIN FRONT YARD SETBACK.	DOES NOT COMPLY (V)
§ 514.B (2)	PARKING LOT LOCATION - SHALL BE LOCATED TO THE REAR OF THE BUILDING AND/OR THE INTERIOR OF THE SITE WHERE ITS VISUAL IMPACT TO ADJACENT PROPERTIES AND PUBLIC R.O.W. CAN BE MINIMIZED.	COMPLIES
§ 514.B (3)	THE MINIMUM SETBACKS FOR BUILDINGS FROM DRIVEWAYS, PARKING SPACES, AND PRIVATE STREETS WITHIN THE SITE SHALL BE 10 FT FOR NONRESIDENTIAL DEVELOPMENTS.	4.5 FT (V)
§ 514.B (9) TABLE 5.5 - PARKING AISLE WIDTHS	90° PARKING STALLS - TWO-WAY - 24 FT	24 FT

(V) VARIANCE

NEW JERSEY STATE HIGHWAY ROUTE 35

(60' PUBLIC RIGHT OF WAY)



SYMBOL	DESCRIPTION
	PROPERTY LINE
	SETBACK LINE
	SAWCUT LINE
	PROPOSED CURB
	PROPOSED DEPRESSED CURB
	PROPOSED SIGNS / BOLLARDS
	PROPOSED BUILDING
	PROPOSED PERVIOUS PAVEMENT
	PROPOSED CONCRETE
	PROPOSED AREA LIGHT
	PROPOSED BUILDING DOORS

GENERAL NOTES

1. THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. PRIOR TO THE START OF CONSTRUCTION.
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
3. ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC. AND IT'S SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
4. THE CONTRACTOR SHALL NOT DEVIATE FROM THE PROPOSED IMPROVEMENTS IDENTIFIED WITHIN THIS PLAN SET UNLESS APPROVAL IS PROVIDED IN WRITING BY STONEFIELD ENGINEERING & DESIGN, LLC.
5. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
6. THE CONTRACTOR SHALL NOT PERFORM ANY WORK OR CAUSE DISTURBANCE ON A PRIVATE PROPERTY NOT CONTROLLED BY THE PERSON OR ENTITY WHO HAS AUTHORIZED THE WORK WITHOUT PRIOR WRITTEN CONSENT FROM THE OWNER OF THE PRIVATE PROPERTY.
7. THE CONTRACTOR IS RESPONSIBLE TO RESTORE ANY DAMAGED OR UNDERMINED STRUCTURE OR SITE FEATURE THAT IS IDENTIFIED TO REMAIN ON THE PLAN SET. ALL REPAIRS SHALL USE NEW MATERIALS TO RESTORE THE FEATURE TO ITS EXISTING CONDITION AT THE CONTRACTORS EXPENSE.
8. CONTRACTOR IS RESPONSIBLE TO PROVIDE THE APPROPRIATE SHOP DRAWINGS, PRODUCT DATA, AND OTHER REQUIRED SUBMITTALS FOR REVIEW. STONEFIELD ENGINEERING & DESIGN, LLC. WILL REVIEW THE SUBMITTALS IN ACCORDANCE WITH THE DESIGN INTENT AS REFLECTED WITHIN THE PLAN SET.
9. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
10. THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
11. THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION & DEMOLITION ACTIVITIES.
12. SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC. BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.

20' 0' 20' 40'
GRAPHIC SCALE IN FEET
1" = 20'

ISSUE	DATE	BY	DESCRIPTION
0	03/24/2021	JK	FOR MUNICIPAL SUBMISSION

NOT APPROVED FOR CONSTRUCTION

STONEFIELD engineering & design
Rutherford, NJ · New York, NY · Boston, MA
Princeton, NJ · Tampa, FL · Detroit, MI
www.stonefieldeng.com
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Phone 201.340.4468 · Fax 201.340.4472

PRELIMINARY AND FINAL MAJOR SITE PLAN

GSZ REALTY, LLC

PROPOSED MIXED USE DEVELOPMENT

BLOCK 808, LOTS 5-8
NJSH ROUTE 35, WEST BANGS AVE & MONROE AVE
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

PAUL D. MUTCH Jr., P.E.
NEW JERSEY LICENSE No. 55096
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 20' | PROJECT ID: PRI-200234

TITLE: SITE PLAN

DRAWING: C-4

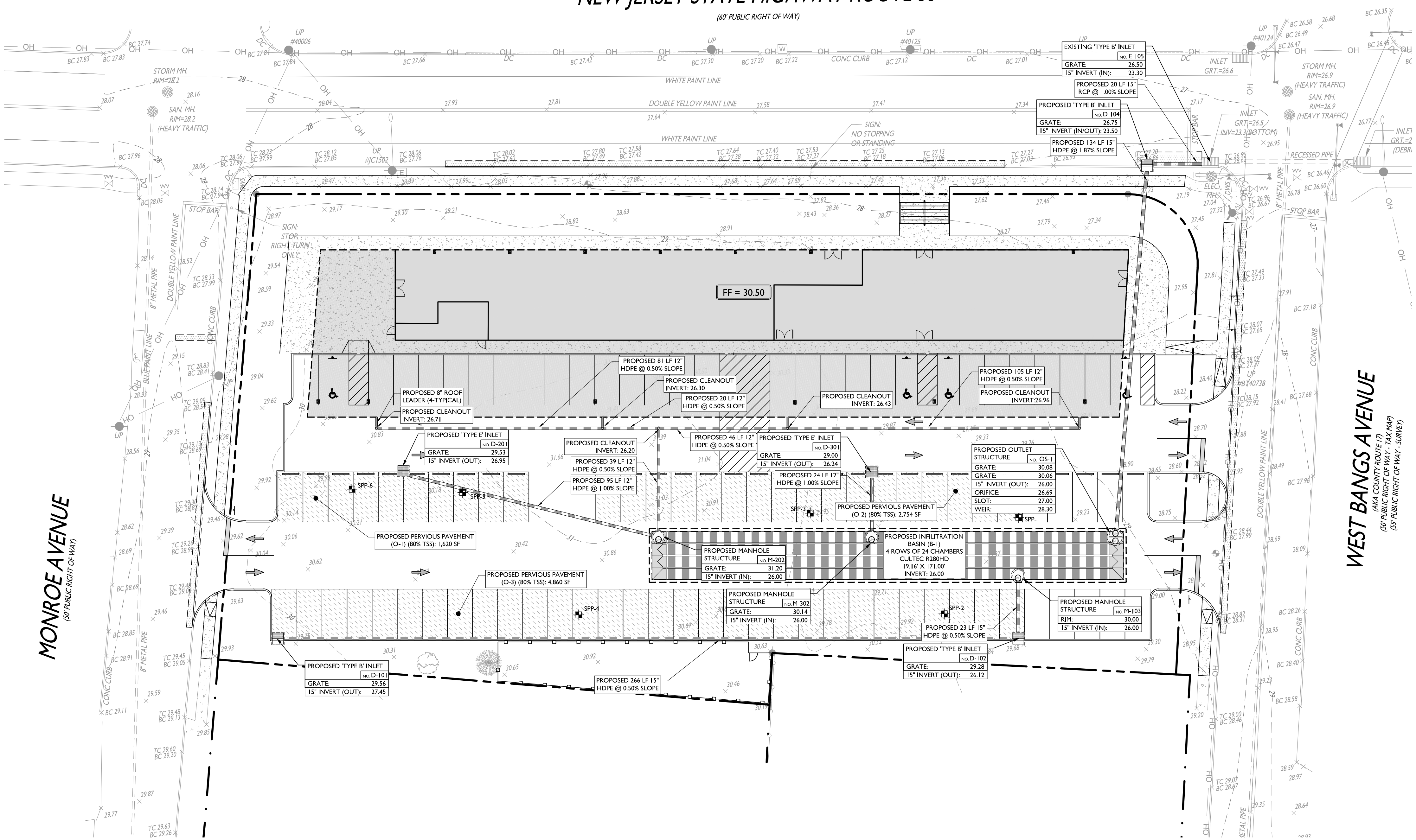
Z:\PROJECTS\PRI\2020\PRI-200234 GSZ REALTY - ROUTE 35 & WEST BANGS AVENUE, NEPTUNE, NJ\CAD\PLOTS\LDP\04-SITE.DWG

APPENDIX A-2:
DRAINAGE PLAN

INFILTRATION TEST SUMMARY					
Profile Pit #	Surface Elevation (feet above NAVD88)	ESHGW (fbgs)	USDA Classification @ Test	Infiltration/Permeability Test	
				Depth (fbgs)	Rate (in/hour)
SPP-1	29.0	6.0	Sand	4.0	> 20.0
SPP-2	29.0	6.0	Sand	4.0	12.0
SPP-3	29.0	6.0	Sand	4.0	12.0
SPP-4	30.0	6.0	Sand	4.0	> 20.0
SPP-5	30.0	6.0	Sand	4.0	> 20.0
SPP-6	30.0	6.0	Sand	4.0	12.0

NE – Not Encountered, NS – Not Surveyed

SYMBOL	DESCRIPTION
	PROPERTY LINE
100	PROPOSED GRADING CONTOUR
RIDGELINE	PROPOSED GRADING RIDGELINE
	PROPOSED STORMWATER STRUCTURES
	PROPOSED STORMWATER PIPING
	TEST PIT
	PROPOSED PERVIOUS PAVEMENT



DRAINAGE AND UTILITY NOTES

1. THE CONTRACTOR TO PERFORM A TEST PIT PRIOR TO CONSTRUCTION (RECOMMEND 30 DAYS PRIOR) AT LOCATIONS OF EXISTING UTILITY CROSSINGS FOR STORMWATER IMPROVEMENTS. SHOULD A CONFLICT EXIST, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. IN WRITING.
2. CONTRACTOR SHALL START CONSTRUCTION OF STORM LINES AT THE LOWEST INVERT AND WORK UP-GRADIENT.
3. THE CONTRACTOR IS REQUIRED TO CALL THE APPROPRIATE AUTHORITY FOR NOTICE OF CONSTRUCTION/EXCAVATION AND UTILITY MARK OUT PRIOR TO THE START OF CONSTRUCTION IN ACCORDANCE WITH STATE LAW. CONTRACTOR IS REQUIRED TO CONFIRM THE HORIZONTAL AND VERTICAL LOCATION OF UTILITIES IN THE FIELD. SHOULD A DISCREPANCY EXIST BETWEEN THE FIELD LOCATION OF A UTILITY AND THE LOCATION SHOWN ON THE PLAN SET OR SURVEY, THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. IMMEDIATELY IN WRITING.
4. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN A RECORD OF THE AS-BUILT LOCATIONS OF ALL PROPOSED UNDERGROUND INFRASTRUCTURE. THE CONTRACTOR SHALL NOTE ANY DISCREPANCIES BETWEEN THE AS-BUILT LOCATIONS AND THE LOCATIONS DEPICTED WITHIN THE PLAN SET. THIS RECORD SHALL BE PROVIDED TO THE OWNER FOLLOWING COMPLETION OF WORK.

EXCAVATION, SOIL PREPARATION, AND DEWATERING NOTES

1. THE CONTRACTOR IS REQUIRED TO REVIEW THE REFERENCED GEOTECHNICAL DOCUMENTS PRIOR TO CONSTRUCTION, THESE DOCUMENTS SHALL BE CONSIDERED A PART OF THE PLAN SET.
2. THE CONTRACTOR IS REQUIRED TO PREPARE SUBGRADE SOILS BENEATH ALL PROPOSED IMPROVEMENTS AND BACKFILL ALL EXCAVATIONS IN ACCORDANCE WITH RECOMMENDATIONS BY THE GEOTECHNICAL ENGINEER OF RECORD.
3. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING SHORING FOR ALL EXCAVATIONS AS REQUIRED. CONTRACTOR SHALL HAVE THE SHORING DESIGN PREPARED BY A QUALIFIED PROFESSIONAL. SHORING DESIGNS SHALL BE SUBMITTED TO STONEFIELD ENGINEERING & DESIGN, LLC. AND THE OWNER PRIOR TO THE START OF CONSTRUCTION.
4. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL OPEN EXCAVATIONS ARE PERFORMED AND PROTECTED IN ACCORDANCE WITH THE LATEST OSHA REGULATIONS.
5. THE CONTRACTOR IS RESPONSIBLE FOR ANY DEWATERING DESIGN AND OPERATIONS, AS REQUIRED, TO CONSTRUCT THE PROPOSED IMPROVEMENTS. THE CONTRACTOR SHALL OBTAIN ANY REQUIRED PERMITS FOR DEWATERING OPERATIONS AND GROUNDWATER DISPOSAL.

STORMWATER INFILTRATION BMP CONSTRUCTION NOTES

1. PRIOR TO THE START OF CONSTRUCTION, ANY AREA DESIGNATED TO BE USED FOR AN INFILTRATION BMP (E.G. BASIN, BIORETENTION AREA, ETC.) SHALL BE FENCED OFF AND SHALL NOT BE UTILIZED AS STORAGE FOR CONSTRUCTION EQUIPMENT OR AS A STOCKPILE AREA FOR CONSTRUCTION MATERIALS. NO ACTIVITY SHALL BE PERMITTED WITHIN THE INFILTRATION BASIN AREA UNLESS RELATED TO THE CONSTRUCTION OF THE INFILTRATION BASIN. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY ALL SUBCONTRACTORS OF BASIN AREA RESTRICTIONS.
2. THE CONTRACTOR SHALL MAKE EVERY EFFORT, WHERE PRACTICAL, TO AVOID SUBGRADE SOIL COMPACTION IN THE AREAS DESIGNATED TO BE USED FOR AN INFILTRATION BMP.
3. ALL EXCAVATION WITHIN THE LIMITS OF ANY INFILTRATION BMP SHALL BE PERFORMED WITH THE LIGHTEST PRACTICAL EXCAVATION EQUIPMENT. ALL EXCAVATION EQUIPMENT SHALL BE PLACED OUTSIDE THE LIMITS OF THE BASIN WHERE FEASIBLE. THE USE OF LIGHT-WEIGHT, RUBBER-TIRED EQUIPMENT (LESS THAN 8 PSI APPLIED TO THE GROUND SURFACE) IS RECOMMENDED WITHIN THE BASIN LIMITS.
4. THE SEQUENCE OF SITE CONSTRUCTION SHALL BE COORDINATED WITH BASIN CONSTRUCTION TO ADHERE TO SEQUENCING LIMITATIONS.
5. DURING THE FINAL GRADING OF AN INFILTRATION BASIN, THE BOTTOM OF THE BASIN SHALL BE DEEPLY TILLED WITH A ROTARY TILLER OR DISC HARROW AND THEN SMOOTHED OUT WITH A LEVELING DRAW OR EQUIVALENT GRADING EQUIPMENT. ALL GRADING EQUIPMENT SHALL BE LOCATED OUTSIDE OF THE BASIN BOTTOM WHERE FEASIBLE.
6. FOLLOWING CONSTRUCTION OF AN INFILTRATION BASIN, SOIL INFILTRATION TESTING BY A LICENSED GEOTECHNICAL ENGINEER IS REQUIRED TO CERTIFY COMPLIANCE WITH THE DESIGN INFILTRATION RATES IN ACCORDANCE WITH APPENDIX E OF THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S BEST MANAGEMENT PRACTICES MANUAL, LATEST EDITION. IF THE FIELD INFILTRATION RATES ARE LOWER THAN THE RATE USED DURING DESIGN, THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. IN WRITING IMMEDIATELY TO DETERMINE THE APPROPRIATE COURSE OF ACTION.
7. THE CONTRACTOR SHALL NOTIFY THE MUNICIPALITY TO DETERMINE IF WITNESS TESTING IS REQUIRED DURING INFILTRATION BASIN EXCAVATION AND/OR SOIL INFILTRATION TESTING.

STORMWATER UNDERGROUND BMP CONSTRUCTION NOTES

1. THE CONTRACTOR SHALL INSTALL AND BACKFILL THE UNDERGROUND BMP IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.
2. UNDERGROUND BASINS SHALL UTILIZE A STONE BACKFILL WITH A MINIMUM VOID RATIO OF 40%.
3. NO CONSTRUCTION LOADING OVER UNDERGROUND BASINS IS PERMITTED UNTIL BACKFILL IS COMPLETE PER THE MANUFACTURER'S SPECIFICATIONS. NO VEHICLES SHALL BE STAGED OR OPERATE FROM A FIXED POSITION OVER THE BASIN.

20' 0' 20' 40'

GRAPHIC SCALE IN FEET
1" = 20'

ISSUE	DATE	BY	DESCRIPTION
0	03/24/2021	JK	FOR MUNICIPAL SUBMISSION

NOT APPROVED FOR CONSTRUCTION

STONEFIELD engineering & design
Rutherford, NJ · New York, NY · Boston, MA
Princeton, NJ · Tampa, FL · Detroit, MI
www.stonefieldeng.com
Headquarters: 92 Park Avenue, Rutherford, NJ 07070
Phone 201.340.4468 · Fax 201.340.4472

PRELIMINARY AND FINAL MAJOR SITE PLAN

GSZ REALTY, LLC

PROPOSED MIXED USE DEVELOPMENT

BLOCK 808, LOTS 5-8
NJSH ROUTE 35, WEST BANGS AVE & MONROE AVE
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

PAUL D. MUTCH Jr., P.E.
NEW JERSEY LICENSE No. 55094
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 20' | PROJECT ID: PRI-200234

TITLE:

STORMWATER MANAGEMENT PLAN

DRAWING:

C-6

Z:\PRINCETON\PRI\2020\PRI-200234 GSZ REALTY - ROUTE 35 & WEST BANG AVENUE, NEPTUNE, NJ\CADD\PLOT\LDP-06-STRM.DWG

APPENDIX A-3:
LANDSCAPING PLAN

PLANT SCHEDULE

DECIDUOUS TREES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	SPACING
	GIN PSG	3	GINKGO BILOBA `PRINCETON SENTRY`	PRINCETON SENTRY MAIDENHAIR TREE	3" - 3.5" CAL	B&B	AS SHOWN
	QUE RUB	8	QUERCUS RUBRA	RED OAK	3" - 3.5" CAL	B&B	AS SHOWN
EVERGREEN TREES	**CODE**	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**CONTAINER**	**SPACING**
	THU SMA	62	THUJA OCCIDENTALIS `SMARAGD`	EMERALD GREEN ARBORVITAE	6` - 7` HT	B&B	AS SHOWN
	THU GRN	5	THUJA X `GREEN GIANT`	GREEN GIANT ARBORVITAE	6` - 7` HT	B&B	AS SHOWN
SHRUBS	**CODE**	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**CONTAINER**	**SPACING**
	CEA AME	20	CEANOTHUS AMERICANUS	NEW JERSEY TEA	24" - 30"	POT	AS SHOWN
	CLE ALN	14	CLETHRA ALNIFOLIA	SUMMERSWEET CLETHRA	24" - 30"	POT	AS SHOWN
	HYD MAC	18	HYDRANGEA MACROPHYLLA `ENDLESS SUMMER`	BAILMER HYDRANGEA	24" - 30"	POT	AS SHOWN
EVERGREEN SHRUBS	**CODE**	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**CONTAINER**	**SPACING**
	ICO GLA	24	ILEX GLABRA `COMPACTA`	COMPACT INKBERRY	24" - 30"	POT	AS SHOWN
	MYR MOR	14	MYRICA PENSYLVANICA `MORTON`	SILVER SPRITE BAYBERRY	24" - 30"	B&B	AS SHOWN

NOTE: IF ANY DISCREPANCIES OCCUR BETWEEN AMOUNTS SHOWN ON THE LANDSCAPE PLAN AND WITHIN THE PLANT LIST, THE PLAN SHALL DICTATE.

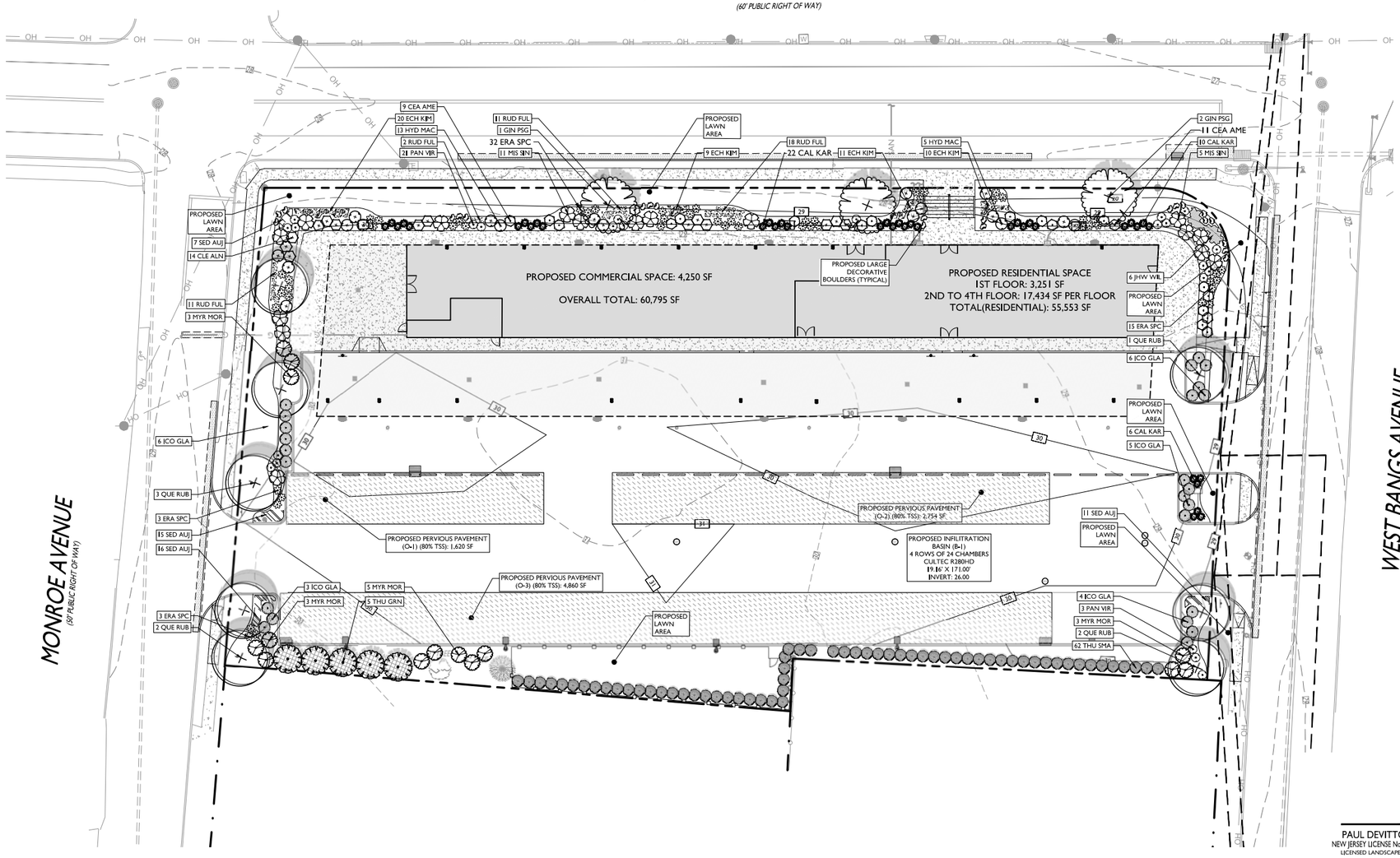
PLANT SCHEDULE CONTINUED

GRASSES	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	SPACING
	CAL KAR	38	CALAMAGROSTIS X ACUTIFLORA `KARL FOERSTER`	KARL FOERSTER FEATHER REED GRASS	1 GAL.	POT	AS SHOWN
	ERA SPC	53	ERAGROSTIS SPECTABILIS	PURPLE LOVE GRASS	1 GAL.	POT	AS SHOWN
	MIS SIN	16	MISCANTHUS SINENSIS `ADAGIO`	ADAGIO EULALIA GRASS	3 GAL.	POT	AS SHOWN
	PAN VIR	24	PANICUM VIRGATUM	SWITCH GRASS	1 GAL.	POT	AS SHOWN
SHRUB AREAS	**CODE**	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**CONTAINER**	**SPACING**
	JHW WIL	6	JUNIPERUS HORIZONTALIS `WILTONII`	BLUE RUG JUNIPER	1 GAL.	POT	36" o.c.
PERENNIALS	**CODE**	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**CONTAINER**	**SPACING**
	ECH KIM	50	ECHINACEA PURPUREA `KIM`S KNEE HIGH`	PURPLE CONEFLOWER	1 GAL.	POT	18" o.c.
	RUD FUL	42	RUDBECKIA FULGIDA	CONEFLOWER	1 GAL.	POT	18" o.c.
	SED AUJ	49	SEDUM X `AUTUMN JOY`	AUTUMN JOY SEDUM	1 GAL.	POT	18" o.c.

NOTE: IF ANY DISCREPANCIES OCCUR BETWEEN AMOUNTS SHOWN ON THE LANDSCAPE PLAN AND WITHIN THE PLANT LIST, THE PLAN SHALL DICTATE.

NEW JERSEY STATE HIGHWAY ROUTE 35

(60' PUBLIC RIGHT OF WAY)



PAUL DEVITTO, L.L.A.
NEW JERSEY LICENSE No. 21AS00123500
LICENSED LANDSCAPE ARCHITECT

LANDSCAPING AND BUFFER REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
RDP: LANDCAPE STANDARDS #1	LANDSCAPING IS TO BE PROVIDED TO DEFINE BUILDING ENTRANCES, SOFTEN EDGES, PROVIDE ATTRACTIVE STREETSCAPE, AND SCREEN STRUCTURES.	PROVIDED
RDP: LANDCAPE STANDARDS #4	FRONT AND SIDE YARDS: PLANTINGS IN IMMEDIATE PROXIMITY TO BUILDINGS SHALL RESPECT ARCHITECTURAL LINES AND SEEN AS A EXTENSION OF THE ARCHITECTURE.	PROVIDED
RDP: BUFFER	A VEGETATIVE BUFFER AND FENCING SHALL BE PROVIDED ALONG THE EASTERN BOUNDARIES OF THE REDEVELOPMENT DISTRICT.	PROVIDED
§ 503.A BUFFER	REQUIRED BUFFERS TO RESIDENTIAL USES: HEIGHT AT TIME OF PLANTING MIN 6 FT PROPOSED USE: BUFFER REQUIRED: NON-RESIDENTIAL USE 10 FT	PROVIDED 4.45 FT (W)
§ 503.B(1) BUFFER	BUFFERING SHALL CONSIST OF A MINIMUM TEN (10) FOOT WIDE AREA SURROUNDING ALL SIDES OF A PARKING LOT EXPOSED TO VIEW.	
§ 503.B(2) BUFFER	6 FT SCREENING WHERE SUCH PARKING AREA IS LOCATED ON A TRACT ADJACENT TO A RESIDENTIAL USE OR DISTRICT. 3 FT WHERE DRIVEWAYS APPROACH SIDEWALKS OR WALKWAYS.	PROPOSED
§ 509.D LANDSCAPING	SIZE OF PLANTING: DECIDUOUS TREES: 3" CALIPER EVERGREEN TREES: 6 FT HEIGHT SHRUBS: 24" HEIGHT	 PROPOSED PROPOSED PROPOSED
§ 509.H LANDSCAPING	BUILDING FOUNDATION: PLANTINGS SHALL BE A MINIMUM 24" HT AND SPACED 3 FT O.C. DOES NOT APPLY TO BUILDING SIDES ADJACENT TO THE PUBLIC-OF-WAY.	PROVIDED
§ 509.I(1) LANDSCAPING	PERIMETER PARKING LOTS: ALL PARKING LOTS SHALL BE SETBACK FROM ALL REAR AND SIDE LOT LINES BY A MINIMUM OF TEN (10) FEET.	4.45 FT (W)
§ 509.I(1)(a) LANDSCAPING	PARKING LOT SIDE AND REAR YARDS: MINIMUM HEDGE 6 FT TALL AT PLANTING	PROVIDED
§ 509.I(3) LANDSCAPING	PARKING LOTS 16 TO 99 SPACES: 5% INTERIOR AREA SHALL BE PLANTING ISLANDS CONTAINING (1) DECIDUOUS TREE FOR EVERY (5) PARKING SPACES. [67 PROPOSED OUTDOOR SPACES = 14 TREES] [19,522 INTERIOR ASPHALT AREA * 5% = 977 SF PLANTING ISLAND]	 0 TREES (W) 1,148 SF
§ 509.I(3)(b) LANDSCAPING	NO MORE THAN 8 PARKING SPACES SHALL BE PLACED IN ONE ROW.	35 SPACES (W)
§ 523.A STREET TREES	LOCATION: TREES SHALL BE PLACED 15 FT BEHIND THE CURBLINE.	PROVIDED
§ 523.B STREET TREES	SPACING: 1 LARGE STREET TREE PER 35 FT [MONROE AVENUE: 167 LF/35 = 5 TREES] [ROUTE 35: 332 LF/35 = 10 TREES] [WEST BANGS AVENUE: 166 LF/35 = 5 TREES]	(W) 5 TREES 3 TREES 3 TREES

(W) WAIVER

BEFORE YOU BREAK GROUND FOR A PROJECT AROUND YOUR YARD, SUCH AS A FENCE, IN-GROUND POOL, OR HOME ADDITION, YOU MUST CALL NEW JERSEY ONE CALL AT (800) 272-1000 TO REQUEST A MARK OUT OF THE UTILITY SERVICES THAT ARE UNDERGROUND. IT IS RECOMMENDED THAT YOU CALL 3 DAYS BEFORE YOU DIG. THE STATE OF NEW JERSEY REQUIRES THAT YOU CALL "BEFORE" YOU DIG SO THAT YOU CAN IDENTIFY WHERE THE UNDERGROUNDED UTILITIES ARE LOCATES (SUCH AS WATER, GAS, ELECTRIC, PHONE, CABLE, ETC.). ONCE THE SERVICES ARE "MARKED OUT", YOU CAN DIG WITHOUT THE RISK OF INTERRUPTING SERVICE FROM ONE OF THESE UTILITIES, DAMAGING PROPERTY OR

ONE CALL

NEW JERSEY

SUFFERING PERSONAL INJURY. IF YOU ARE HAVING A PROFESSIONAL DO THE WORK FOR YOU, THEY ARE RESPONSIBLE TO CONTACT ONE CALL. UTILITY SERVICES ARE MARKED OUT WITH PAINT OR A FLAG. THE FOLLOWING LIST WILL HELP YOU IDENTIFY WHAT UTILITY HAS PERFORMED A MARK OUT:

ELECTRIC=RED, GAS/OIL=YELLOW, COMMUNICATION TV=ORANGE, WATER=BLUE, SEWER=GREEN, TEMPORARY SURVEY MARKINGS=MAGENTA, PROPOSED EXCAVATION=WHITE

IRRIGATION NOTE:

IRRIGATION CONTRACTOR TO PROVIDE A DESIGN FOR AN IRRIGATION SYSTEM SEPARATING PLANTING BEDS FROM LAWN AREA. PRIOR TO CONSTRUCTION, DESIGN IS TO BE SUBMITTED TO THE PROJECT LANDSCAPE DESIGNER FOR REVIEW AND APPROVAL WHERE POSSIBLE, DRIP IRRIGATION AND OTHER WATER CONSERVATION TECHNIQUES SUCH AS RAIN SENSORS SHALL BE IMPLEMENTED. CONTRACTOR TO VERIFY MAXIMUM ON SITE DYNAMIC WATER PRESSURE AVAILABLE MEASURED IN PSI. PRESSURE REDUCING DEVICES OR BOOSTER PUMPS SHALL BE PROVIDED TO MEET SYSTEM PRESSURE REQUIREMENTS. DESIGN TO SHOW ALL VALVES, PIPING, HEADS, BACKFLOW PREVENTION, METERS, CONTROLLERS, AND SLEEVES WITHIN HARDSCAPE AREAS.

LANDSCAPING NOTES

1. THE CONTRACTOR SHALL RESTORE ALL DISTURBED GRASS AND LANDSCAPED AREAS TO MATCH EXISTING CONDITIONS UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
2. THE CONTRACTOR SHALL RESTORE ALL DISTURBED LAWN AREAS WITH A MINIMUM 4 INCH LAYER OF TOPSOIL AND SEED.
3. THE CONTRACTOR SHALL RESTORE MULCH AREAS WITH A MINIMUM 3 INCH LAYER OF MULCH .
4. THE MAXIMUM SLOPE ALLOWABLE IN LANDSCAPE RESTORATION AREAS SHALL BE 3 FEET HORIZONTAL TO 1 FOOT VERTICAL (3:1 SLOPE) UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
5. THE CONTRACTOR IS REQUIRED TO LOCATE ALL SPRINKLER HEADS IN AREA OF LANDSCAPING DISTURBANCE PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL RELOCATE SPRINKLER HEADS AND LINES IN ACCORDANCE WITH OWNER'S DIRECTION WITHIN AREAS OF DISTURBANCE.
6. THE CONTRACTOR SHALL ENSURE THAT ALL DISTURBED LANDSCAPED AREAS ARE GRADED TO MEET FLUSH AT THE ELEVATION OF WALKWAYS AND TOP OF CURB ELEVATIONS EXCEPT UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET. NO ABRUPT CHANGES IN GRADE ARE PERMITTED IN DISTURBED LANDSCAPING AREAS.

20' 0' 20' 40'

GRAPHIC SCALE IN FEET

1" = 20'

ISSUE	DATE	BY	DESCRIPTION
0	03/24/2021	JK	FOR MUNICIPAL SUBMISSION

NOT APPROVED FOR CONSTRUCTION

STONEFIELD engineering & design
Rutherford, NJ · New York, NY · Boston, MA
Princeton, NJ · Tampa, FL · Detroit, MI
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Phone 201.340.4468 · Fax 201.340.4472

PRELIMINARY AND FINAL MAJOR SITE PLAN

GSZ REALTY, LLC

PROPOSED MIXED USE DEVELOPMENT

BLOCK 808, LOTS 5-8
NJSH ROUTE 35, WEST BANGS AVE & MONROE AVE
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

PAUL D. MUTCH Jr., P.E.
NEW JERSEY LICENSE No. 55094
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 20' PROJECT ID: PRI-200234

TITLE: LANDSCAPING PLAN

DRAWING: C-12

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APPENDIX B:
GEOTECHNICAL INVESTIGATION REPORT

APPENDIX C:
INSPECTION CHECKLISTS

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants

2430 HIGHWAY 34
BUILDING B, SUITE 101
MANASQUAN, NJ 08736
732.592.2101
whitestoneassoc.com

REPORT OF GEOTECHNICAL INVESTIGATION

PROPOSED MIXED-USE DEVELOPMENT
505 U.S. ROUTE 35
BLOCK 808, LOTS 5 - 8
NEPTUNE, MONMOUTH COUNTY, NEW JERSEY

Prepared for:

STONEFIELD ENGINEERING & DESIGN, LLC
15 Spring Street
Princeton, New Jersey 08542

Prepared by:

WHITESTONE ASSOCIATES, INC.
2430 Highway 34
Building B, Suite 101
Manasquan, New Jersey 08736

Kyle J. Kopacz, P.E.
Project Manager

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

Whitestone Project No.: GS2117697.000
February 24, 2021

WHITESTONE
ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants

2430 HIGHWAY 34
BUILDING B, SUITE 101
MANASQUAN, NJ 08736
732.592.2101
whitestoneassoc.com

February 24, 2021

via email

STONEFIELD ENGINEERING & DESIGN, LLC
15 Spring Street
Princeton, New Jersey 08542

Attention: Mr. Aaron Chan
Civil Engineer

Regarding: REPORT OF GEOTECHNICAL INVESTIGATION & SWM AREA EVALUATION
PROPOSED MIXED-USE DEVELOPMENT
505 U.S. ROUTE 35
BLOCK 808, LOTS 5 - 8
NEPTUNE, MONMOUTH COUNTY, NEW JERSEY
WHITESTONE PROJECT NO.: GS2117697.000

Dear Mr. Chan:

Whitestone Associates, Inc. is pleased to submit the attached *Report of Geotechnical Investigation & Stormwater Management Area Evaluation* for the above-referenced project. The attached report presents the results of Whitestone's soils exploration efforts and presents recommendations for design of the proposed structural foundations, floor slab, pavement areas, related earthwork and preliminary recommendations for design of proposed stormwater management facilities.

Whitestone's Geotechnical Division appreciates the opportunity to be of continued service Stonefield Engineering & Design, LLC (Stonefield). Please note that Whitestone has the capability to perform the additional geotechnical engineering services recommended herein. Please contact us with any questions regarding the enclosed report.

Sincerely,

WHITESTONE ASSOCIATES, INC.

Kyle J. Kopacz, P.E.
Project Manager

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

KK/ri L:\Job Folders\2021\2117697GS\Reports and Submittals\17697 ROGI.docx
Enclosures
Copy: Paul Mutch, P.E. Stonefield Engineering & Design, LLC

REPORT OF GEOTECHNICAL INVESTIGATION
PROPOSED MIXED-USE DEVELOPMENT
505 U.S. Route 35
Block 808, Lots 5 - 8
Neptune, Monmouth County, New Jersey

TABLE OF CONTENTS

REPORT OF GEOTECHNICAL INVESTIGATION
PROPOSED MIXED-USE DEVELOPMENT
505 U.S. Route 35
Block 808, Lots 5 - 8
Neptune, Monmouth County, New Jersey

TABLE OF CONTENTS
(Continued)

FIGURES

APPENDICES

SECTION 1.0
Summary of Findings and Recommendations

An exploration and evaluation of the subsurface conditions has been performed on the site of the proposed mixed-use development located at 505 U.S. Route 35 in Neptune, Monmouth County, New Jersey. The site of the proposed construction is shown on the *Testing Location Plan* included as Figure 1.

At the time of Whitestone's investigation, the subject site was a vacant parcel with partially paved areas. Based on the December 28, 2020 *Proposed Drainage Area Map* provided by Stonefield, the subject site is generally flat-lying with grade changes on the order of four feet.

Based on the aforementioned *Proposed Drainage Area Map* prepared by Stonefield, the proposed redevelopment includes clearing the subject site and constructing an approximately 21,051-square feet mixed-use development with associated utilities and pavements. Proposed site grading was not completed at the time of this report; however, Whitestone anticipates maximum cuts and fills on the order of two feet are required to attain design subgrade elevations. A proposed SWM facility also is anticipated, however, detailed information regarding the proposed SWM facility was not available at the time of this report. The bottom of the proposed SWM facility is anticipated to be situated approximately four feet below existing site grades.

The geotechnical investigation included performing a reconnaissance of the project site, drilling eight soil borings, excavating six soil profile pits, conducting in-situ infiltration testing and collecting soil samples for laboratory analysis. The data from this exploration were analyzed by Whitestone in light of the project information provided by Stonefield. A summary of Whitestone's findings is presented in the following table and detailed descriptions of the subsurface conditions encountered are presented in Section 4.0.

Subsurface Profile	Description	Bottom of Stratum (fbgs)
Surface Cover Materials	Two inches of topsoil or two inches asphaltic concrete at the surface.	0.2
Existing Fill	Consisting of silty sand, poorly graded sand, and poorly graded gravel with variable amounts of debris. Debris encountered consisted of brick and asphalt. Generally identified as reworked natural materials.	2.0 to 6.0
Coastal Plain Deposits	Consisting of a combination of poorly graded sand (USCS: SP and SP-SM) with variable amounts of silt, silty and clayey sand (USCS: SM and SC), Silt (USCS: ML), and clay (USCS: CL) with variable amounts of sand, extending to termination depth of 25 fbgs.	+25.0
Groundwater	Static groundwater was encountered in all test locations at approximately six to seven fbgs	+7.0

fbgs: feet below ground surface.

Recommendations developed upon consideration of these findings are summarized in the table below and presented in greater detail in the indicated sections of the report.

Geotechnical Consideration	Recommendation	Report Section
Foundation System	The proposed mixed-use building may be supported on shallow spread and continuous footings bearing on compacted natural soils, approved existing fill (if encountered at or below foundation bearing elevations), and/or approved structural fill.	5.5
Floor Slab System	Ground-supported floor slab bearing on approved existing fill materials, natural soils, and/or imported structural fill following compaction and proofroll inspection.	5.6
On-Site Soil Reuse	The site soils are suitable for selective reuse as structural fill and/or backfill provided that moisture levels are maintained within two percent of optimum moisture content and deleterious debris is segregated. Earthwork should only be performed during favorable weather conditions as portions of the on-site soils with appreciable fine-grained materials will require significant drying prior to reuse.	5.3
Groundwater	Groundwater conditions are anticipated to be below proposed foundation elevations, however, may be encountered during deeper utility installation. As such, temporary construction phase dewatering including the use of multiple sump pumps should be anticipated for the proposed development.	5.4
Preliminary SWM	Results obtained from in-situ infiltration testing indicated that the granular site soils are suitable for SWM infiltration design.	5.12

SECTION 2.0
Introduction

2.1 AUTHORIZATION

Mr. Aaron Chan of Stonefield issued authorization to Whitestone to perform a geotechnical investigation on this site relevant to the construction of the proposed mixed-use development. The geotechnical investigation was performed in general accordance with Whitestone's January 22, 2021 proposal to Stonefield.

2.2 PURPOSE

The purpose of this subsurface exploration and analysis was to:

- ascertain the various soil profile components at test locations;
- estimate the engineering characteristics of the proposed foundation bearing and subgrade materials;
- provide geotechnical criteria for use by the design engineers in preparing the foundation, slab, and pavement, and preliminary SWM design;
- provide recommendations for required earthwork and subgrade preparation;
- record groundwater and/or bedrock levels (if encountered) at the time of the investigation and discuss the potential impact on the proposed construction; and
- recommend additional investigation and/or analysis (if warranted).

2.3 SCOPE

The scope of the exploration and analysis included the subsurface exploration; field testing and sampling; laboratory analysis; and an engineering analysis and evaluation of the foundation materials. This *Report of Geotechnical Investigation* is limited to addressing the site conditions related to the physical support of the proposed construction. Any references to suspicious odors, materials, or conditions are provided strictly for the client's information.

2.3.1 Field Exploration

Field exploration of the project site was conducted by means of eight soil borings (identified as B-1 through B-8) and six soil profile pits (identified as SPP-1 through SPP-6). The borings were advanced with a truck-mounted drill rig equipped with hollow-stem augers and six soil profile pits performed with a rubber-tire backhoe. The locations of the soil borings are shown on the *Testing 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 borings 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 test locations. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

2.3.2 Laboratory Program

In addition to the field investigation, a laboratory program was conducted to determine additional, pertinent engineering characteristics of representative samples of on-site soils. The laboratory program was performed in general accordance with applicable ASTM standard test methods and included physical testing of proposed building foundation bearing and pavement subgrade stratum.

Physical/Textural Analyses: Representative samples of selected strata encountered were subjected to a laboratory program that included Atterberg limits determinations (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 strata tested were 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 No.	**Sample**	**Depth (fbgs)**	**% Passing No. 200 Sieve**	**Moisture Content (%)**	**Liquid Limit**	**Plastic Index**	**USCS Classification**
B-1	S-3	4.0 - 6.0	4.1	3.9	NP	NP	SP
B-7	S-5	8.0 - 10.0	72.3	42.8	40	4	ML

fbgs: feet below ground surface
NP: Non-Plastic

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

SECTION 3.0
Site Description

3.1 LOCATION AND DESCRIPTION

The subject site is located at 505 Route 35 in Neptune, Monmouth County, New Jersey and is a vacant parcel with partially paved areas. The site is bordered to the north by Monroe Avenue followed by residential buildings, to the south by West Bangs Avenue followed by commercial and residential buildings, to the east by Route 35 followed by commercial building, and to the west by residential buildings. The subject site is shown on the *Test Location Plan* included as Figure 1.

3.2 EXISTING CONDITIONS

Surface Cover/Development: At the time of Whitestone's investigation, the subject was a vacant parcel with partially paved areas.

Previous Site Development: Based on available historic aerial imagery, the subject site has remained in its current state dating back to at least 2008. From 1931 to 2008, the site consisted of multiple residential developments with associated pavement. Aerial photography prior to 1931 was not available.

Topography: Based on the aforementioned *Proposed Drainage Area Map* provided by Stonefield, the subject site is generally flat-lying with grade changes on the order of four feet

Utilities: The subject site is serviced by overhead utilities along the existing roadway. The utility information contained in this report is presented for general discussion only and is not intended for construction purposes.

Site Drainage: Surface runoff generally consists of sheet flow across the existing ground surface and generally appears to flow towards inlets located in the adjacent right-of-way. The termini of these inlets are unknown.

3.3 GEOLOGY

The subject site is situated within the Atlantic Coastal Plain Physiographic Province of New Jersey. Specifically, the site is underlain by the Tertiary Aged, Lower member of the Kirkwood Formation. Specifically, the Lower member of the Kirkwood Formation consists of light yellow to white, massive to thick bedded, fine to medium grained sands interbedded with clay. Locally, areas encountered in near-surface beds are very micaceous and extensively stained by iron oxides. The thick bedded strata commonly consists of interbedded fine grained, micaceous sand and gravelly, coarse to fine grained sand.

3.4 PROPOSED CONSTRUCTION

Based on the aforementioned *Proposed Drainage Area Map* prepared by Stonefield, the proposed development will include clearing the subject site and constructing a 21,051 square feet four-story mixed-use building and associated pavements and utilities. Proposed site grading was not completed at the time of this report, however, Whitestone anticipates maximum cuts and fills on the order of two feet are required to attain design subgrade elevations. A proposed SWM facility also is anticipated, however, detailed information regarding the proposed SWM facility was not available at the time of this report. The bottom of the proposed SWM facility is anticipated to be situated approximately four feet below existing site grades.

The mixed-use building is expected to consist of a combination masonry- and metal-framed structure constructed with a ground-supported concrete floor slab with no subsurface level. The anticipated maximum loads are expected to be less than the following:

- column loads - 225 kips
- wall loads - 3.0 kips per lineal foot; and
- floor slab loads - 125 pounds per square foot (live load).

The scope of Whitestone's investigation and the professional advice contained in this report were generated based on the project details and loading noted herein. Any revisions or additions to the design details enumerated in this report should be brought to the attention of Whitestone for additional evaluation as warranted.

SECTION 4.0
Subsurface Conditions

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

4.1 SUBSURFACE CONDITIONS

Surface Cover Materials: Subsurface tests were performed within existing landscaped areas or paved areas and encountered two inches of topsoil or two inches of asphalt at the surface.

Existing Fill: Underlying the surface cover, the subsurface tests encountered sporadic existing fill generally identified as reworked natural site soils, consisting of silty sand, poorly graded sand, and poorly graded gravel with variable amounts of debris. Debris encountered consisted of brick and asphalt. The existing fill extended to depths ranging between two fbgs and six fbgs. SPT N-values within this stratum ranged from four blows per foot (bpf) to refusal (defined as more than 50 blows per six inches of split spoon sampler penetration) and averaged approximately 18 bpf.

Coastal Plain Deposits: Underlying the existing fill, the subsurface tests encountered natural coastal plain deposits that consisted of poorly graded sand (USCS: SP and SP-SM) with variable amounts of silt, silty and clayey sands (USCS: SM and SC), silt (USCS: ML), and lean clay (USCS: CL) with variable amounts of sand. The coastal plain soils extended to the maximum boring termination depth of approximately 25.0 fbgs. SPT N-values recorded within the granular coastal plain soils ranged between eight bpf and refusal (defined as more than 50 blows per six inches of split spoon sampler penetration), indicating loose to very dense relative densities, and averaging 20 bpf. Pocket penetrometer testing performed on the cohesive natural soils indicated unconfined compressive strength values ranging from 0.75 tons per square foot (tsf) to 2.5 tsf.

4.2 GROUNDWATER

Static groundwater was encountered within all subsurface tests at a depth of approximately six fbgs to seven fbgs. Static groundwater and perched/trapped water conditions are expected to fluctuate seasonally and following periods of precipitation.

SECTION 5.0
Conclusions and Recommendations

5.1 GENERAL

The results of the subsurface investigation and analysis indicated that, following construction phase evaluation, the existing site soils are suitable for support of proposed foundations, floor slab, and pavements provided that these materials are properly inspected, compacted, and proofrolled as recommended herein. Limited areas of overexcavation should be anticipated due to the inherent variability of existing fill.

5.2 SITE PREPARATION AND EARTHWORK

Surface Cover Stripping and Demolition: Whitestone understands that demolition of the previous site structures has taken place, however, any former structural elements, such as foundation walls, or any concrete foundations, walls or slabs encountered during excavations, should be removed entirely from below proposed foundations and their zones of influence (as determined by lines extending at least one foot laterally beyond footing edges for each vertical foot of depth) and excavated to at least two feet below proposed construction subgrade levels elsewhere. Foundations and slabs may remain in place below these depths below proposed ground-supported slabs, pavements, and landscaped areas provided there is interference with future construction. Any existing slab to remain should be thoroughly broken such that maximum particle size is 12 inches to allow vertical drainage of water. The demolition contractor should be required to perform all earthwork in accordance with the recommendations in this report including backfilling any excavation, utility, etc. with structural fill. All fill or backfill placed in structural areas during any demolition operations should be placed as structural fill in accordance with Section 5.2, 5.3, and 5.11 of this report.

Surface Preparation/Proofrolling: Prior to placing any fill, backfill or subbase materials to raise or restore grades to the desired building or pavement subgrade elevations, the exposed soils should be compacted to a firm and unyielding surface with a minimum of two passes in two perpendicular directions of a minimum 10-ton, smooth drum roller. The surface should be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets that may require removal and replacement or further investigation. Any fill or backfill should be placed and compacted in accordance with Section 5.3.

Weather Performance Criteria: Every effort must be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations and prepared subgrades to rainfall. Accordingly, excavation and fill placement procedures should be performed during favorable weather conditions. Overexcavation of saturated or unsuitable soils and replacement with controlled structural fill per Section 5.3 of this report may be required prior to resuming work on disturbed subgrade soils.

On-Site Soil Protection and Maintenance: The site soils will degrade if exposed to inclement weather, freeze-thaw cycles, or repeated construction traffic. However, if properly protected and maintained as recommended herein, the site soils will provide adequate support for the proposed construction. The site contractors should employ appropriate means and methods to protect the subgrade including, but not limited to the following:

- leaving the existing pavement in place as long as practical to protect the subgrade from freeze-thaw cycles and exposure to inclement weather;
- sealing exposed subgrade soils on a daily basis with a smooth drum roller operated in static mode;
- regrading the site as needed to maintain positive drainage away from open earthwork construction areas and to prevent standing water;
- removing wet surficial soils and ruts immediately; and
- limiting exposure to construction traffic and precipitation especially following inclement weather and subgrade thawing.

5.3 STRUCTURAL FILL AND BACKFILL

Imported Fill Material: Any imported material placed as structural fill or backfill to raise elevations or restore design grades should consist of clean, relatively well-graded sand or gravel with a maximum particle size of two inches and five percent to 15 percent of material finer than a #200 sieve. Silts, clays, and silty or clayey sands and gravels with higher percentage of fines and with a liquid limit less than 40 and a plasticity index less than 20 may be considered subject to the owner's approval, provided that the required moisture content and compaction controls are met during favorable weather conditions. The material should be free of clay lumps, organics, and deleterious material. Imported structural fill material should be approved by a qualified geotechnical engineer prior to delivery to the site.

On-Site Materials: Based on the conditions disclosed by the soil borings, Whitestone anticipates that majority of the existing fill and natural soils will be suitable for selective reuse as structural fill/backfill material provided that soil moisture contents are controlled within two percent of optimum moisture level. Reuse of the existing fill will be contingent on careful inspection in the field by the owner's geotechnical engineer by visual observation and/or test pit excavations either prior to or during construction in accordance with Section 5.11 of this report.

The reuse of fine-grained or materials with more than 12 per cent fines materials (USCS: SC, CL, and ML) typically is possible only during ideal weather conditions. Reuse of these soils is expected to require mixing with a granular material, extensive moisture conditioning, and/or drying to facilitate their reuse, workability, and compaction in fill areas. The on-site soils may become increasingly difficult to reuse and compact where wetted beyond the optimum moisture content. Surficial topsoil and/or stripped asphalt should not be reused as structural fill or backfill materials.

Demolition Material: Demolition material, free of environmental restrictions, may be used as fill material provided the material is properly segregated and processed as recommended herein. Concrete and masonry materials should be crushed to a well graded blend with a maximum size of three inches in diameter. Stripped asphalt and deleterious building materials such as wood, insulation, metal, shingles etc. should not be used as structural fill material. Milled or recycled asphalt pavement (RAP) may be re-used as granular base for proposed pavements provided that the RAP particle size meets New Jersey Department of Transportation (NJDOT) standard specifications for granular base and no more than 50% of the pavement granular base contains RAP.

Compaction and Placement Requirements: On-site soils used as fill or backfill should be placed in maximum nine-inch loose lifts and compacted using a 10-ton smooth drum vibratory roller during mass grading activities or a small walk-behind roller or hand-held vibratory compactor within excavations. All structural fill and backfill, including five feet outside exterior walls, should be compacted to at least 95 percent of the maximum dry density within two percent of the optimum moisture content as determined by ASTM D 1557 (Modified Proctor). Structural fill and backfill placed within non-structural areas may be compacted to 92 percent of the maximum dry density within three percent of optimum moisture content as determined by ASTM D 1557 (Modified Proctor).

Structural Fill Testing: A sample of the imported fill material or any on-site material proposed for reuse as structural fill or backfill should be submitted to the geotechnical engineer for analysis and approval at least one week prior to its use. The placement of all fill and backfill should be monitored by a qualified engineering technician to ensure that the specified material and lift thicknesses are properly installed. A sufficient number of in-place density tests should be performed to ensure that the specified compaction is achieved throughout the height of the fill or backfill.

5.4 GROUNDWATER CONTROL

Static groundwater was encountered within the borings and profile pits at a depth of six fbgs. Based on groundwater levels recorded during this investigation, static groundwater conditions are anticipated to be below proposed foundation elevations, however, may be encountered during deeper utility installation. As such, temporary construction phase dewatering including the use of multiple sump pumps should be anticipated for the proposed development.

Because the subsurface soils will soften when exposed to water, every effort must be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations to rainfall. Overexcavation of saturated soils and replacement with controlled structural fill may be required prior to resuming work on disturbed subgrade soils.

5.5 FOUNDATIONS

Shallow Foundation Design Criteria: Contingent upon construction phase evaluation, Whitestone recommends supporting the proposed building on shallow spread and continuous footings designed to bear

within the improved and approved existing fill, natural site soils, and/or structural fill material provided these materials are properly evaluated, placed, and compacted in accordance with Sections 5.2, 5.3, and 5.11 of this report. Foundations bearing within these materials may be designed using a maximum allowable net bearing pressure of 3,000 pounds per square foot.

All footing bottoms should be improved by in-trench compaction in the presence of the geotechnical engineer. Regardless of loading conditions, proposed foundations should be sized no less than minimum dimensions of 24 inches for continuous wall footings and 36 inches for isolated column footings.

Footings should be designed so that the maximum toe pressure due to the combined effect of vertical loads and overturning moment does not exceed the recommended maximum allowable net bearing pressure. In addition, positive contact pressure should be maintained throughout the base of the footings such that no uplift or tension exists between the base of the footings and the supporting soil. Uplift loads should be resisted by the weight of the concrete. Side friction should be neglected when proportioning the footings so that lateral resistance should be provided by friction resistance at the base of the footings. An allowable coefficient of friction against sliding of 0.35 is recommended for use in the design of the foundations bearing within the on-site soils or imported structural backfill.

Inspection Criteria: Whitestone recommends that the suitability of the bearing soils along the footing bottoms be verified by a geotechnical engineer prior to placing concrete for the footings. Special attention should be given to areas underlain by existing fill materials. In the event that isolated areas of unsuitable materials are encountered during subgrade proofrolling activities as described herein or during footing excavations, overexcavation and replacement of the materials or deeper foundation embedment may be necessary to provide a suitable footing subgrade. Any overexcavation to be restored with structural fill will need to extend at least one foot laterally beyond footing edges for each vertical foot of overexcavation. Lateral overexcavation may be eliminated if grade is restored with lean concrete. The bottoms of overexcavated areas should be compacted with vibrating walk-behind compactors, vibrating plates or plate tampers ("jumping jacks") to compact locally disturbed materials and densify any underlying loose zones. Any standing water within the footing excavation should be removed with a mechanical pump prior to concrete placement.

Settlement: Whitestone estimates post construction settlements of new building foundations will be on the order of less than one inch if the recommendations outlined in this report are properly implemented. Differential settlement between individual footings should be less than one-half inch.

Frost Coverage: Footings subject to frost action should be placed at least 36 inches below adjacent exterior grades or the depth required by local building codes to provide protection from frost penetration. Interior footings not subject to frost action may be placed at a minimum depth of 18 inches below the slab subgrade.

5.6 FLOOR SLAB

Whitestone anticipates that the improved and approved existing fill, natural site soils, and properly placed and compacted fill materials will provide suitable support for the floor slab. The exposed subgrade should be compacted and inspected in accordance with Sections 5.2, 5.3, and 5.11 of this report. Any areas that become softened or disturbed as a result of wetting and/or repeated exposure to construction traffic or areas of unsuitable existing fill materials should be removed and replaced with compacted structural fill. The properly prepared site soils and structural backfill materials are expected to yield a minimum subgrade modulus (k) of 150 psi/in. A minimum four-inch layer of three-quarter inch crushed stone (AASHTO No. 57 stone or similar) should be installed below the floor slab to provide a uniform subgrade and capillary break. A moisture vapor barrier should be implemented beneath the floor slab where recommended by the flooring manufacturer.

5.7 PAVEMENT DESIGN CRITERIA

General: The majority of the existing fill materials, natural site soils, and/or compacted structural fill/backfill placed to raise or restore design elevations will be suitable for support of the proposed new pavements provided these materials are properly evaluated, compacted, and proofrolled in accordance with Sections 5.2, 5.3, and 5.11 of this report during favorable weather conditions. Subgrade stabilization with a triaxial geogrid, approved by the owner's geotechnical engineer, may be used to minimize depths of overexcavation (if necessary).

Design Criteria: A California Bearing Ratio value of 5.0 has been estimated to the properly prepared subgrade soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to prepare flexible and rigid pavement designs per the AASHTO *Guide for the Design of Pavement Structures*. Design traffic loads were estimated based on Whitestone's past experience with similar projects and correlated with 18-kip equivalent single axle loads (ESAL) for a 20-year life. An estimated maximum pavement load of 25,000 ESALs was used for the pavement areas which accounts for passenger vehicle traffic with limited heavier truck traffic.

Pavement Section: The recommended flexible pavement section is presented in the following table:

FLEXIBLE PAVEMENT SECTION DESIGN		
Layer	**Material**	**Standard Duty Thickness (Inches)**
Asphalt Surface	NJDOT I-5 Surface	1.5
Asphalt Base	NJDOT I-2 Base	2.5
Granular Subbase	NJDOT DGA Base Course	6.0

A rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns (such as ingress/egress areas and garbage dumpster aprons). The recommended rigid pavement section is presented below in tabular format:

RIGID PAVEMENT SECTION DESIGN		
Layer	**Material**	**Standard Duty Thickness (Inches)**
Surface	4000 psi air-entrained concrete	6.0
Base	NJDOT Dense-Graded Aggregate	6.0

Additional Design Considerations: The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper construction, inspection, and maintenance. Additional pavement thickness may be required by local code. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, all subgrade soil and supporting fill or backfill must be properly evaluated, placed, and prepared as detailed in Sections 5.2, 5.3, and 5.11 of this report. Proper drainage must be provided for the pavement structure including appropriate grading and surface water control, as well as measures to drain water from the subgrade. The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that NJDOT standards for materials, workmanship, and maintenance be applied to this site.

Project specifications should include verifying that the installed asphaltic concrete material composition is within tolerance for the specified materials and that the percentage of air voids of the installed pavement is within specified ranges for the respective materials. All rigid concrete pavements should be suitably air-entrained, jointed, and reinforced.

5.8 RETAINING WALL/LATERAL EARTH PRESSURES

No site retaining walls or below-grade structures are anticipated at the time of this report. Whitestone should be notified in the event that they are required for the proposed site development.

5.9 SEISMIC AND LIQUEFACTION CONSIDERATIONS

The subsurface conditions are most consistent with a Site Class D as defined by the 2018 *International Building Code - New Jersey Edition*. Based on the seismic zone and soil profile, liquefaction considerations are not expected to have a substantial impact on design. Based on the seismic zone and soil profile, liquefaction considerations are considered unlikely and not expected to have a substantial impact on design.

5.10 EXCAVATIONS

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

5.11 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Phase Evaluation of Existing Fill: Based on the conditions disclosed by the soil borings, Whitestone anticipates that the existing fill encountered to a maximum depth of six feet preliminarily will be suitable for foundation, floor slab, and pavement support in its present condition contingent upon construction phase evaluation and some anticipated overexcavation, due to the possible variability within existing fill. Increased risk of future maintenance within proposed pavement areas where marginal unimproved existing fill remains is expected. Reuse of the existing fill will be contingent on careful inspection in the field by the owner's geotechnical engineer by visual observation and/or test pit excavations during construction as recommended herein. Due to the inherent variability that exists within existing fill, Whitestone recommends confirming further the condition of the existing fill for foundation, floor slab, and pavement support and/or re-use as structural fill by means of supplemental evaluation either prior to or during the early stages of construction, as discussed further herein, to identify areas requiring removal and possible uncontrolled conditions or deleterious materials not disclosed by the soil borings conducted during this exploration.

Construction Inspection and Monitoring: The owner's geotechnical engineer with specific knowledge of the subsurface conditions and design intent should perform inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be performed to verify that unsuitable existing fill is overexcavated, the existing surface cover materials are properly removed, and suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. The proofrolling of all subgrades prior to foundation, floor slab, and pavement support should be witnessed and documented by the owner's geotechnical engineer.

5.12 STORMWATER MANAGEMENT AREA EVALUATION

General: Soil profile pits SPP-1 through SPP-6 were performed within accessible areas of the SWM facility location as provided by Stonefield. The profile pits were terminated at a depth of approximately 12 fbgs.

Estimated Seasonal High Groundwater Levels: The methods used in determining the seasonal high groundwater level include 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 as well as infiltration test results are included in the following table.

INFILTRATION TEST SUMMARY					
Profile Pit #	Surface Elevation (feet above NAVD88)	ESHGW (fbgs)	USDA Classification @ Test	Infiltration/Permeability Test	
				Depth (fbgs)	Rate (in/hour)
SPP-1	29.0	6.0	Sand	4.0	> 20.0
SPP-2	29.0	6.0	Sand	4.0	12.0
SPP-3	29.0	6.0	Sand	4.0	12.0
SPP-4	30.0	6.0	Sand	4.0	> 20.0
SPP-5	30.0	6.0	Sand	4.0	> 20.0
SPP-6	30.0	6.0	Sand	4.0	12.0

NE – Not Encountered, NS – Not Surveyed

Soil Infiltration Rates: Falling head infiltration tests were performed within the proposed SWM areas provided by Stonefield. The test resulted in field infiltration rates ranging from approximately 12 inches per hour (iph) to greater than 20 iph. Infiltration test results are provided in Appendix B and soil profile pit logs are included in Appendix A.

SECTION 6.0
General Comments

Supplemental recommendations may be required upon finalization of construction plans or if significant changes are made in the characteristics or location of the proposed structure. Soil bearing conditions should be checked at the appropriate time for consistency with those conditions encountered during Whitestone's geotechnical investigation.

The recommendations presented herein should be utilized by a qualified engineer in preparing the project plans and specifications. The engineer should consider these recommendations as minimum physical standards which may be superseded by local and regional building codes and structural considerations. These recommendations are prepared for the sole use of Stonefield Engineering & Design, LLC. for the specific project detailed and should not be used by any third party. These recommendations are relevant to the design phase and should not be substituted for construction specifications.

The possibility exists that conditions between borings may differ from those at specific boring locations, and conditions may not be as anticipated by the designers or contractors. In addition, the construction process may alter soil and rock conditions. Therefore, experienced geotechnical personnel should observe and document the construction procedures used and the conditions encountered.

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

Whitestone recommends that the services of the geotechnical engineer be engaged to test and evaluate the soils in the footing excavations prior to concreting in order to determine that the soils will support the bearing capacities. Monitoring and testing also should be performed to verify that suitable materials are used for controlled fills and that they are properly placed and compacted over suitable subgrade soils.

The exploration and analysis of the foundation conditions reported herein are considered sufficient in detail and scope to form a reasonable basis for the foundation design. The recommendations submitted for the proposed construction are based on the available soil information and the design details furnished by Stonefield Engineering & Design, LLC. Deviations from the noted subsurface conditions encountered during construction should be brought to the attention of the geotechnical engineer.

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

WHITESTONE ASSOCIATES, INC.

FIGURE 1
Test Location Plan

(60' PUBLIC RIGHT OF WAY)

N.J.S.H. ROUTE 35

POINT OF INTEREST 1 (POI-1)

WEST BANGS AVENUE

B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8

PROPOSED COMMERCIAL SPACE

TOTAL: 4,560 SF

PROPOSED RESIDENTIAL SPACE
1ST FLOOR: 2,694 SF
2ND FLOOR: 21,051 SF
3RD FLOOR: 21,051 SF
4TH FLOOR: 21,051 SF
TOTAL: 65,857 SF

SPP-1
SPP-2
SPP-3
SPP-4
SPP-5
SPP-6

ASPHALT PAVEMENT

CHAIN LINK FENCE

12" TREE
15" TREE
10" TREE

STOP BAR

CONC CURB

EDGE OF ASPHALT

DOUBLE YELLOW PAINT LINE

WHITE PAINT LINE

SIGN: STOP, RIGHT TURN ONLY

SIGN: NO STOPPING OR STANDING

STORM MH. RIM=28.2

SAN. MH. RIM=28.2 (HEAVY TRAFFIC)

SAN. MH. RIM=30.0 INV=19.6

INLET GRT.=26.6

RECESSED PIPE

8" METAL PIPE

0 40

1 inch = 40 ft.

LEGEND

SPP-1 — SOIL PROFILE PIT LOCATION

B-1 — BORING LOCATION

SUBJECT PROPERTY BOUNDARY

REFERENCE

THIS PLAN IS BASED ON A DECEMBER 28, 2020 PROPOSED DRAINAGE AREA MAP PREPARED BY STONEFIELD ENGINEERING & DESIGN, LLC & ALL ITEM LOCATIONS NOTED ARE APPROXIMATE.

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants
2430 HIGHWAY 34 BUILDING B, SUITE 101 MANASQUAN, NJ 08736
908.668.7777 WHITESTONEASSOC.COM

DRAWING TITLE: **TEST LOCATION PLAN**

CLIENT: **STONEFIELD ENGINEERING & DESIGN, LLC**

PROJECT: PROPOSED MIXED-USE DEVELOPMENT
505 ROUTE 35
NEPTUNE, MONMOUTH COUNTY, NJ

PROJECT #: GS2117697.000	
DESIGNED BY: GR	PROJ. MGR.: KK
DATE: 2/22/21	FIGURE: 1
SCALE: 1" = 40'	

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WHITESTONE ASSOCIATES, INC.

APPENDIX A
Records of Subsurface Exploration

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2117697.000
Location:	505 Route 35; Neptune, Monmouth County, New Jersey	**Client:**	Stonefield Engineering & Design, LLC
Surface Elevation:	± 29.5 feet	**Date Started:**	2/5/2021
Termination Depth:	25.0 feet bgs	**Date Completed:**	2/5/2021
Proposed Location:	Building Pad	**Logged By:**	RL
Drill / Test Method:	HSA / SPT	**Contractor:**	AWD
		Equipment:	CME-45

Water Depth | Elevation (feet bgs) | (feet)			Cave-In Depth | Elevation (feet bgs) | (feet)	
During:	6.0	23.5		
At Completion:	6.0	23.5	**At Completion:**	7.0 | 22.5
24 Hours:	---	---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
						0.2	TOPSOIL		2" Topsoil	
0 - 2	S-1	X	1 - 3 - 3 - 4	12	6		FILL		Brown Silty Sand, Moist (FILL)	Trace Brick
						2.0				
2 - 4	S-2	X	3 - 5 - 8 - 8	18	13		COASTAL PLAIN DEPOSITS		Brown Clayey Sand, Moist, Medium Dense (SC)	
						4.0				
4 - 6	S-3	X	6 - 12 - 10 - 15	18	22	5.0			Brown Poorly Graded Sand, Moist, Medium Dense (SP)	
6 - 8	S-4	X	8 - 13 - 15 - 13	24	28				As Above, Wet (SP)	
8 - 10	S-5	X	7 - 5 - 5 - 6	24	10	9.0			As Above (SP)	
						10.0			Black Lean Clay, Wet, Very Stiff (CL)	Qu = 2.5 tsf
13 - 15	S-6	X	4 - 7 - 9 - 14	18	16				As Above with Sand (CL)	Qu = 2.25 tsf
						15.0				
18 - 20	S-7	X	4 - 7 - 9 - 9	24	16				As Above, Stiff (CL)	Qu = 1.25 tsf
						20.0				
23 - 25	S-8	X	5 - 8 - 7 - 8	24	15				As Above (CL)	Qu = 1.0 tsf
						25.0			Boring Log B-1 Terminated at a Depth of 25.0 Feet Below Ground Surface	

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Page 1 of 1

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2117697.000
Location:	505 Route 35; Neptune, Monmouth County, New Jersey	**Client:**	Stonefield Engineering & Design, LLC
Surface Elevation:	± 29.5 feet	**Date Started:**	2/5/2021
Termination Depth:	25.0 feet bgs	**Date Completed:**	2/5/2021
Proposed Location:	Building Pad	**Logged By:**	RL
Drill / Test Method:	HSA / SPT	**Contractor:**	AWD
		Equipment:	CME-45

Water Depth | Elevation (feet bgs) | (feet)		Cave-In Depth | Elevation (feet bgs) | (feet)	
During:	6.0 | 23.5		
At Completion:	6.5 | 23.0	**At Completion:**	8.0 | 21.5
24 Hours:	--- | ---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
						0.2	TOPSOIL		2" Topsoil	
0 - 2	S-1		3 - 2 - 2 - 2	8	4		FILL		Brown Poorly Graded Sand with Gravel, Moist (FILL)	Track Brick and Gravel
2 - 4	S-2		2 - 3 - 5 - 20	NR	8				No Recovery, Presumed As Above (FILL)	
						4.0				
4 - 4.25	S-3		50/3"	3	50/3"				Reddish-Brown Poorly Graded Gravel with Sand, Dry (FILL)	Spoon Bouncing @ 4.0 fbgs
						5.0				Hard Augering 4.0 fbgs to 6.0 fbgs
						6.0				Heavy Brick Debris
6 - 8	S-4		6 - 11 - 15 - 13	4	26		COASTAL PLAIN DEPOSITS		Brown Poorly Graded Sand, Wet, Medium Dense (SP)	
8 - 10	S-5		7 - 5 - 5 - 7	18	10	9.0			As Above (SP)	
						10.0			Black Lean Clay, Wet, Stiff (CL)	Qu = 1.5 tsf
						13.0				
13 - 15	S-6		6 - 9 - 11 - 14	24	20				Black Sandy Lean Clay, Wet (CL)	Qu = 1.5 tsf
						15.0				
18 - 20	S-7		8 - 7 - 8 - 12	24	15				As Above, Medium Stiff (CL)	Qu = 0.75 tsf
						20.0				
23 - 25	S-8		7 - 8 - 11 - 11	24	19				As Above (CL)	Qu = 0.75 tsf
						25.0			Boring Log B-2 Terminated at a Depth of 25.0 Feet Below Ground Surface	

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

Page 1 of 1

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2117697.000
Location:	505 Route 35; Neptune, Monmouth County, New Jersey	**Client:**	Stonefield Engineering & Design, LLC
Surface Elevation:	± 29.0 feet	**Date Started:**	2/5/2021
Termination Depth:	25.0 feet bgs	**Date Completed:**	2/5/2021
Proposed Location:	Building Pad	**Logged By:**	RL
Drill / Test Method:	HSA / SPT	**Contractor:**	AWD
		Equipment:	CME-45

Water Depth | Elevation (feet bgs) | (feet)			Cave-In Depth | Elevation (feet bgs) | (feet)	
During:	6.0	23.0		
At Completion:	6.0	23.0	**At Completion:**	6.5 | 22.5
24 Hours:	---	---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
						0.2	TOPSOIL		2" Topsoil	
0 - 2	S-1	X	6 - 6 - 6 - 5	12	12		COASTAL PLAIN DEPOSITS		Brown Silty Sand, Moist, Medium Dense (SM)	
						2.0				
2 - 4	S-2	X	3 - 5 - 10 - 16	12	15				Orangish-Brown Clayey Sand, Moist, Medium Dense (SC)	
						4.0				
4 - 6	S-3	X	7 - 15 - 17 - 16	18	32	5.0			Orangish-Brown Poorly Graded Sand, Moist, Dense (SP)	
6 - 8	S-4	X	14 - 15 - 22 - 16	18	37				As Above, Wet (SP)	
						8.0				
8 - 10	S-5	X	5 - 14 - 21 - 34	21	35				Black Silt, Wet, Very Stiff (ML)	Qu = 3.0 tsf
						10.0				
						13.0				
13 - 15	S-6	X	3 - 7 - 5 - 8	12	12				Black Lean Clay with Sand, Wet, Stiff (CL)	Qu = 1.0 tsf
						15.0				
18 - 20	S-7	X	5 - 6 - 7 - 8	24	13				As Above (CL)	Qu = 1.0 tsf
						20.0				
23 - 25	S-8	X	4 - 7 - 9 - 9	24	16				As Above (CL)	Qu = 1.5 tsf
						25.0				
									Boring Log B-3 Terminated at a Depth of 25.0 Feet Below Ground Surface	

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2117697.000
Location:	505 Route 35; Neptune, Monmouth County, New Jersey	**Client:**	Stonefield Engineering & Design, LLC
Surface Elevation:	± 27.5 feet	**Date Started:**	2/4/2021
Termination Depth:	25.0 feet bgs	**Date Completed:**	2/4/2021
Proposed Location:	Building Pad	**Logged By:**	RL
Drill / Test Method:	HSA / SPT	**Contractor:**	AWD
		Equipment:	CME-45

Water Depth | Elevation (feet bgs) | (feet)			Cave-In Depth | Elevation (feet bgs) | (feet)	
During:	6.0	21.5		
At Completion:	5.5	22.0	**At Completion:**	6.0 | 21.5
24 Hours:	---	---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
						0.2	TOPSOIL		2" Topsoil	
0 - 2	S-1	X	4 - 5 - 5 - 8	8	10		COASTAL PLAIN DEPOSITS		Brown Poorly Graded Sand, Moist, Medium Dense (SP)	
2 - 4	S-2	X	5 - 18 - 19 - 23	12	37				As Above, Dense (SP)	
4 - 6	S-3	X	35 - 38 - 30 - 32	12	68	5.0			As Above, Orangish-Brown, Very Dense (SP)	
6 - 8	S-4	X	16 - 21 - 21 - 15	12	42				As Above, Wet (SP)	
						8.0				
8 - 10	S-5	X	6 - 10 - 15 - 18	18	25				Black Sandy Lean Clay, Wet, Stiff (CL)	Qu = 1.5 tsf
						10.0				
13 - 15	S-6	X	4 - 10 - 9 - 11	18	19				As Above (CL)	Qu = 1.25 tsf
						15.0				
18 - 20	S-7	X	8 - 7 - 8 - 10	18	15				As Above (CL)	Qu = 1.25 tsf
						20.0				
						23.0				
23 - 25	S-8	X	3 - 4 - 7 - 8	18	11				Black Silt, Wet, Stiff (ML)	Qu = 1.0 tsf
						25.0				
									Boring Log B-4 Terminated at a Depth of 25.0 Feet Below Ground Surface	

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-5

Page 1 of 1

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2117697.000
Location:	505 Route 35; Neptune, Monmouth County, New Jersey	**Client:**	Stonefield Engineering & Design, LLC
Surface Elevation:	± 30.0 feet	**Date Started:**	2/4/2021
Termination Depth:	25.0 feet bgs	**Date Completed:**	2/4/2021
Proposed Location:	Building Pad	**Logged By:**	RL
Drill / Test Method:	HSA / SPT	**Contractor:**	AWD
		Equipment:	CME-45

Water Depth | Elevation (feet bgs) | (feet)			Cave-In Depth | Elevation (feet bgs) | (feet)	
During:	6.0	24.0		
At Completion:	6.0	24.0	**At Completion:**	7.0 | 23.0
24 Hours:	---	---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)			
						0.0			
						0.2	TOPSOIL	2" Topsoil	
0 - 2	S-1	X	2 - 4 - 8 - 11	12	12		COASTAL PLAIN DEPOSITS	Brown to Dark Brown Poorly Graded Sand with Silt, Moist, Medium Dense (SP-SM)	
2 - 4	S-2	X	5 - 5 - 5 - 9	18	10			As Above, with Gravel, Moist (SP-SM)	
4 - 6	S-3	X	7 - 6 - 5 - 8	12	11	5.0		As Above (SP-SM)	
						6.0 ▽			
6 - 8	S-4	X	7 - 11 - 13 - 14	18	24			Brown Poorly Graded Sand, Wet, Medium Dense (SP)	
8 - 10	S-5	X	13 - 7 - 9 - 11	18	16			As Above (SP)	
						9.75		Black Lean Clay, Wet, Stiff (CL)	Qu = 1.75 tsf
						13.0			
13 - 15	S-6	X	6 - 10 - 18 - 18	24	28			Black Silt with Clay, Wet, Stiff (ML)	Qu = 1.0 tsf
						15.0			
						18.0			
18 - 20	S-7	X	7 - 8 - 9 - 14	24	17			Black Lean Clay with Silt and Sand, Wet, Stiff (CL)	Qu = 1.25 tsf
						20.0			
23 - 25	S-8	X	7 - 9 - 10 - 13	24	19			As Above, Very Stiff (CL)	
						25.0			
								Boring Log B-5 Terminated at a Depth of 25.0 Feet Below Ground Surface	

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-6

Page 1 of 1

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2117697.000
Location:	505 Route 35; Neptune, Monmouth County, New Jersey	**Client:**	Stonefield Engineering & Design, LLC
Surface Elevation:	± 31.5 feet	**Date Started:**	2/4/2021
Termination Depth:	25.0 feet bgs	**Date Completed:**	2/4/2021
Proposed Location:	Building Pad	**Logged By:**	RL
Drill / Test Method:	HSA / SPT	**Contractor:**	AWD
		Equipment:	CME-45

Water Depth | Elevation (feet bgs) | (feet)			Cave-In Depth | Elevation (feet bgs) | (feet)	
During:	6.0	25.5		
At Completion:	6.0	25.5	**At Completion:**	6.5 | 25.0
24 Hours:	---	---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
						0.2	TOPSOIL		2" Topsoil	
0 - 2	S-1		10 - 9 - 6 - 8	8	15		COASTAL PLAIN DEPOSITS		Brown Poorly Graded Sand with Silt, Moist, Medium Dense (SP-SM)	
						2.0				
2 - 4	S-2		4 - 4 - 7 - 8	18	11				Light Brown Clayey Sand, Moist, Medium Dense (SC)	
						4.0				
4 - 6	S-3		3 - 6 - 21 - 41	6	27	5.0			Orangish-Brown Poorly Graded Sand, Moist, Medium Dense (SP)	
6 - 8	S-4		36 - 41 - 40 - 44	6	81				As Above, Very Dense (SP)	
						8.0				
8 - 10	S-5		5 - 3 - 6 - 14	18	9				Black Lean Clay with Silt, Wet, Very Stiff (CL)	Qu = 2.5 tsf
						10.0				
13 - 15	S-6		11 - 6 - 8 - 9	18	14				As Above, with Silt and Sand, Stiff (CL)	Qu = 1.5 tsf
						15.0				
						18.0				
18 - 20	S-7		7 - 9 - 13 - 24	24	22				Gray to Black Clayey Sand, Wet, Medium Stiff (SC)	
						20.0				
23 - 25	S-8		8 - 10 - 12 - 13	24	22				As Above (SC)	
						25.0				
									Boring Log B-6 Terminated at a Depth of 25.0 Feet Below Ground Surface	

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-7

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2117697.000
Location:	505 Route 35; Neptune, Monmouth County, New Jersey	**Client:**	Stonefield Engineering & Design, LLC
Surface Elevation:	± 30.0 feet	**Date Started:**	2/4/2021
Termination Depth:	25.0 feet bgs	**Date Completed:**	2/4/2021
Proposed Location:	Building Pad	**Logged By:**	RL
Drill / Test Method:	HSA / SPT	**Contractor:**	AWD
		Equipment:	CME-45

Water Depth | Elevation (feet bgs) | (feet)			Cave-In Depth | Elevation (feet bgs) | (feet)	
During:	6.0	24.0		
At Completion:	6.0	24.0	**At Completion:**	14.0 | 16.0
24 Hours:	---	---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)			
						0.0			
						0.2	PAVEMENT	2" Top Course Asphalt, No Apparent Subbase	
0 - 2	S-1	X	9 - 11 - 14 - 20	8	25		COASTAL PLAIN DEPOSITS	Brown Poorly Graded Sand with Gravel, Moist, Medium Dense (SP)	
2 - 4	S-2	X	14 - 9 - 9 - 10	12	18			As Above, Grayish-Brown (SP)	
4 - 6	S-3	X	4 - 5 - 20 - 40	8	25	5.0		As Above, Orangish-Brown (SP)	
6 - 8	S-4	X	25 - 35 - 41 - 47	12	76			As Above, Wet, Very Dense (SP)	
						8.0			
8 - 10	S-5	X	5 - 3 - 5 - 12	12	8			Black Silt, Wet, Stiff (ML)	Qu = 1.5 tsf
						10.0			
13 - 15	S-6	X	16 - 5 - 5 - 9	12	10			As Above (ML)	Qu = 1.75 tsf
						15.0			
						18.0			
18 - 20	S-7	X	5 - 9 - 9 - 15	12	18			Black Sandy Lean Clay, Wet, Medium Stiff (CL)	Qu = 0.75 tsf
						20.0			
23 - 25	S-8	X	4 - 7 - 13 - 10	12	20			As Above (CL)	Qu = 0.75 tsf
						25.0			
								Boring Log B-7 Terminated at a Depth of 25.0 Feet Below Ground Surface	

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-8

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2117697.000
Location:	505 Route 35; Neptune, Monmouth County, New Jersey	**Client:**	Stonefield Engineering & Design, LLC
Surface Elevation:	± 28.5 feet	**Date Started:**	2/4/2021
Termination Depth:	25.0 feet bgs	**Date Completed:**	2/4/2021
Proposed Location:	Building Pad	**Logged By:**	RL
Drill / Test Method:	HSA / SPT	**Contractor:**	AWD
		Equipment:	CME-45

Water Depth | Elevation (feet bgs) | (feet)		Cave-In Depth | Elevation (feet bgs) | (feet)	
During:	6.0 | 22.5		
At Completion:	6.0 | 22.5	**At Completion:**	9.0 | 19.5
24 Hours:	--- | ---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							PAVEMENT		2" Top Course Asphalt, No Apparent Subbase	
						0.2	FILL			
0 - 2	S-1	X	5 - 6 - 7 - 5	12	13				Brown to Black Poorly Graded Sand with Gravel, Moist (FILL)	Track Brick
						2.0				
2 - 4	S-2	X	3 - 4 - 6 - 7	12	10		COASTAL PLAIN DEPOSITS		Grayish-Brown Poorly Graded Sand, Moist, Medium Dense (SP)	
4 - 6	S-3	X	4 - 9 - 9 - 13	12	18	5.0			As Above (AP)	
6 - 8	S-4	X	9 - 10 - 7 - 4	12	17				As Above, Wet (SP)	
8 - 10	S-5	X	10 - 11 - 13 - 15	24	24				As Above (SP)	
						9.5				
						10.0			Black Lean Clay, Wet, Stiff (CL)	Qu = 1.75 tsf
						13.0				
13 - 15	S-6	X	5 - 6 - 10 - 11	12	16				Gray to Black Clayey Sand, Wet, Medium Dense (SC)	
						15.0				
						18.0				
18 - 20	S-7	X	5 - 6 - 11 - 12	12	17				Gray to Black Sandy Lean Clay, Wet, Stiff (CL)	Qu = 1.5 tsf
						20.0				
23 - 25	S-8	X	6 - 7 - 10 - 13	18	17				As Above, Very Stiff (CL)	2.25 tsf
						25.0				
									Boring Log B-8 Terminated at a Depth of 25.0 Feet Below Ground Surface	

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-1

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2017697.000
Location:	505 Route 35, Neptune, Monmouth County, NJ	**Client:**	Stonefield Engineering & Design, LLC

				Water Depth (feet bgs)	Elevation (feet)	Estimated Seasonal High Groundwater Depth (feet bgs)	Elevation (feet)
Surface Elevation:	± 29.0 feet	**Date Started:**	2/8/2021				
Termination Depth:	9.0 feet bgs	**Date Completed:**	2/8/2021				
Proposed Location:	SWM Basin	**Logged By:**	RL	**During:**	6.0 | 23.0		
Excavating Method:	Test Pit Excavation	**Contractor:**	PW	**At Completion:**	6.0 | 23.0	**At Completion:**	6.0 | 23.0
Test Method:	Visual Observation	**Rig Type:**	Deere	**24 Hours:**	|		

SAMPLE INFORMATION			DEPTH		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet	inches			
			0.0				
				0 - 0.5	TOPSOIL	6" Topsoil	
			1.0	0.5 - 2	FILL	(10 YR 6/3) Pale Brown LOAMY SAND; Moist; Friable; Fine, Moderate, Granular Structure; Few Fibrous Root; No Mottling; Clear Boundary	Reworked Natural
			2.0	2 - 6	COASTAL PLAIN DEPOSITS	(10 YR 4/4) Dark Yellowish Brown Sand; Moist; Firm; Granular Structure; No Roots; No Mottling; Clear Boundary	
			3.0				
			4.0				Infiltration Test @ 4.0 fbgs
			5.0				
			6.0				
				6 - 9		(10 YR 4/4) Dark Yellowish Brown SILT; Wet; Firm; Subangular Blocky Structure; No Roots; Mottling @ 6.0 fbgs	
			7.0				
			8.0				
			9.0				
						Soil Profile Pit SPP-1 Terminated at a Depth of 9.0 fbgs Due to Cave-In	
			10.0				
			11.0				
			12.0				
			13.0				
			14.0				
			15.0				

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-2

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2017697.000
Location:	505 Route 35, Neptune, Monmouth County, NJ	**Client:**	Stonefield Engineering & Design, LLC

Surface Elevation:	± 29.0 feet	**Date Started:**	2/8/2021	**Water Depth (feet bgs) | Elevation (feet)**		**Estimated Seasonal High Groundwater Depth (feet bgs) | Elevation (feet)**
Termination Depth:	9.0 feet bgs	**Date Completed:**	2/8/2021			
Proposed Location:	SWM Basin	**Logged By:**	RL	**During:**	6.0 | 23.0	
Excavating Method:	Test Pit Excavation	**Contractor:**	PW	**At Completion:**	6.0 | 23.0	**At Completion:** 6.0 | 23.0
Test Method:	Visual Observation	**Rig Type:**	Deere	**24 Hours:**	|	

SAMPLE INFORMATION			DEPTH		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet	inches			
			0.0				
				0 - 0.5	TOPSOIL	6" Topsoil	
			1.0	0.5 - 2	FILL	(10 YR 6/3) Pale Brown LOAMY SAND; Moist; Friable; Fine, Moderate, Granular Structure; Few Fibrous Root; No Mottling; Clear Boundary	Reworked Natural
			2.0	2 - 6	COASTAL PLAIN DEPOSITS	(10 YR 4/4) Dark Yellowish Brown Sand; Moist; Firm; Granular Structure; No Roots; No Mottling; Clear Boundary	
			3.0				
			4.0				Infiltration Test @ 4.0 fbgs
			5.0				
			6.0	6 - 9		(10 YR 4/4) Dark Yellowish Brown SILT; Wet; Firm; Subangular Blocky Structure; No Roots; Mottling @ 6.0 fbgs	
			7.0				
			8.0				
			9.0				
						Soil Profile Pit SPP-2 Terminated at a Depth of 9.0 fbgs Due to Cave-In	
			10.0				
			11.0				
			12.0				
			13.0				
			14.0				
			15.0				

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-3

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2017697.000
Location:	505 Route 35, Neptune, Monmouth County, NJ	**Client:**	Stonefield Engineering & Design, LLC

				Water Depth (feet bgs)	Elevation (feet)	Estimated Seasonal High Groundwater Depth (feet bgs)	Elevation (feet)
Surface Elevation:	± 29.0 feet	**Date Started:**	2/8/2021				
Termination Depth:	9.0 feet bgs	**Date Completed:**	2/8/2021				
Proposed Location:	SWM Basin	**Logged By:**	RL	**During:** 6.0	23.0		
Excavating Method:	Test Pit Excavation	**Contractor:**	PW	**At Completion:** 6.0	23.0	**At Completion:** 6.0	23.0
Test Method:	Visual Observation	**Rig Type:**	Deere	**24 Hours:**			

SAMPLE INFORMATION			DEPTH		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet	inches			
			0.0				
				0 - 0.5	TOPSOIL	6" Topsoil	
				0.5 - 6	COASTAL PLAIN DEPOSITS	(10 YR 4/4) Dark Yellowish Brown Sand; Moist; Firm; Granular Structure; No Roots; No Mottling; Clear Boundary	Reworked Natural
			1.0				
			2.0				
			3.0				
			4.0				Infiltration Test @ 4.0 fbgs
			5.0				
			6.0				
				6 - 9		(10 YR 4/4) Dark Yellowish Brown SILT; Wet; Firm; Subangular Blocky Structure; No Roots; Mottling @ 6.0 fbgs	
			7.0				
			8.0				
			9.0				
						Soil Profile Pit SPP-3 Terminated at a Depth of 9.0 fbgs Due to Cave-In	
			10.0				
			11.0				
			12.0				
			13.0				
			14.0				
			15.0				

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-4

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2017697.000
Location:	505 Route 35, Neptune, Monmouth County, NJ	**Client:**	Stonefield Engineering & Design, LLC

				Water Depth (feet bgs)	Elevation (feet)	Estimated Seasonal High Groundwater Depth (feet bgs)	Elevation (feet)
Surface Elevation:	± 30.0 feet	**Date Started:**	2/8/2021				
Termination Depth:	9.0 feet bgs	**Date Completed:**	2/8/2021				
Proposed Location:	SWM Basin	**Logged By:**	RL	**During:** 7.0	23.0		
Excavating Method:	Test Pit Excavation	**Contractor:**	PW	**At Completion:** 7.0	23.0	**At Completion:** 6.0	24.0
Test Method:	Visual Observation	**Rig Type:**	Deere	**24 Hours:**			

SAMPLE INFORMATION			DEPTH		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet	inches			
			0.0				
				0 - 0.5	TOPSOIL	6" Topsoil	
				0.5 - 6	COASTAL PLAIN DEPOSITS	(10 YR 4/4) Dark Yellowish Brown Sand; Moist; Firm; Granular Structure; No Roots; No Mottling; Clear Boundary	
			1.0				
			2.0				
			3.0				
			4.0				Infiltration Test @ 4.0 fbgs
			5.0				
			6.0				
				6 - 9		(10 YR 4/4) Dark Yellowish Brown SILT; Wet; Firm; Subangular Blocky Structure; No Roots; Mottling @ 6.0 fbgs	
			7.0				
			8.0				
			9.0				
						Soil Profile Pit SPP-4 Terminated at a Depth of 9.0 fbgs Due to Cave-In	
			10.0				
			11.0				
			12.0				
			13.0				
			14.0				
			15.0				

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-5

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2017697.000
Location:	505 Route 35, Neptune, Monmouth County, NJ	**Client:**	Stonefield Engineering & Design, LLC

				Water Depth (feet bgs)	Elevation (feet)	Estimated Seasonal High Groundwater Depth (feet bgs)	Elevation (feet)
Surface Elevation:	± 30.0 feet	**Date Started:**	2/8/2021				
Termination Depth:	9.0 feet bgs	**Date Completed:**	2/8/2021				
Proposed Location:	SWM Basin	**Logged By:**	RL	**During:** 7.0	23.0		
Excavating Method:	Test Pit Excavation	**Contractor:**	PW	**At Completion:** 7.0	23.0	**At Completion:** 6.0	24.0
Test Method:	Visual Observation	**Rig Type:**	Deere	**24 Hours:**			

SAMPLE INFORMATION			DEPTH		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet	inches			
			0.0				
				0 - 0.5	TOPSOIL	6" Topsoil	
				0.5 - 6	COASTAL PLAIN DEPOSITS	(10 YR 4/4) Dark Yellowish Brown Sand; Moist; Firm; Granular Structure; No Roots; No Mottling; Clear Boundary	
			1.0				
			2.0				
			3.0				
			4.0				Infiltration Test @ 4.0 fbgs
			5.0				
			6.0				
				6 - 9		(10 YR 4/4) Dark Yellowish Brown SILT; Wet; Firm; Subangular Blocky Structure; No Roots; Mottling @ 6.0 fbgs	
			7.0				
			8.0				
			9.0				
						Soil Profile Pit SPP-5 Terminated at a Depth of 9.0 fbgs Due to Cave-In	
			10.0				
			11.0				
			12.0				
			13.0				
			14.0				
			15.0				

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

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-6

Project:	Proposed Mixed-Use Development	**WAI Project No.:**	GS2017697.000
Location:	505 Route 35, Neptune, Monmouth County, NJ	**Client:**	Stonefield Engineering & Design, LLC

				Water Depth (feet bgs)	Elevation (feet)	Estimated Seasonal High Groundwater Depth (feet bgs)	Elevation (feet)
Surface Elevation:	± 30.0 feet	**Date Started:**	2/8/2021				
Termination Depth:	9.0 feet bgs	**Date Completed:**	2/8/2021				
Proposed Location:	SWM Basin	**Logged By:**	RL	**During:** 7.0	23.0		
Excavating Method:	Test Pit Excavation	**Contractor:**	PW	**At Completion:** 7.0	23.0	**At Completion:** 6.0	24.0
Test Method:	Visual Observation	**Rig Type:**	Deere	**24 Hours:**			

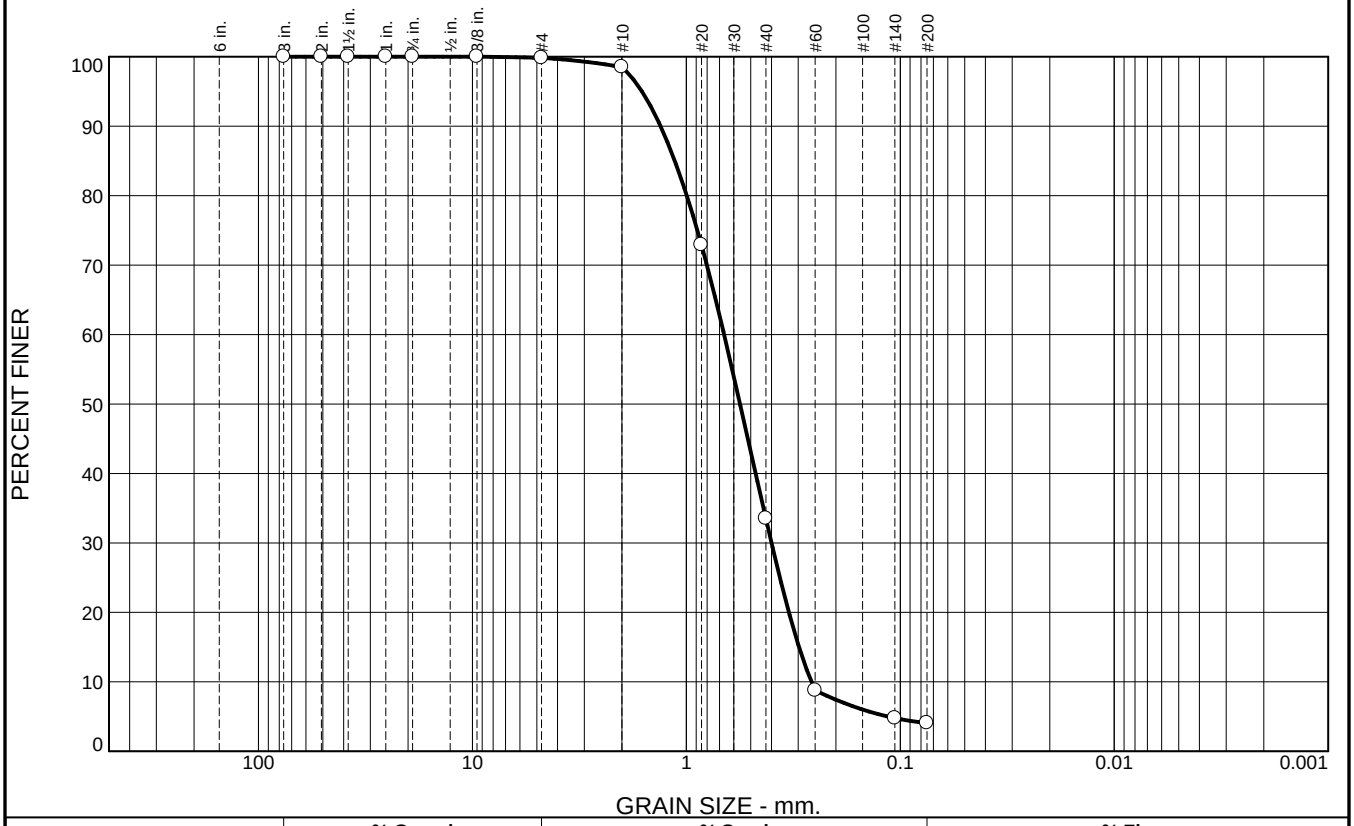
SAMPLE INFORMATION			DEPTH		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet	inches			
			0.0				
				0 - 0.5	TOPSOIL	6" Topsoil	
				0.5 - 6	COASTAL PLAIN DEPOSITS	(10 YR 4/4) Dark Yellowish Brown Sand; Moist; Firm; Granular Structure; No Roots; No Mottling; Clear Boundary	
			1.0				
			2.0				
			3.0				
			4.0				Infiltration Test @ 4.0 fbgs
			5.0				
			6.0				
				6 - 9		(10 YR 4/4) Dark Yellowish Brown SILT; Wet; Firm; Subangular Blocky Structure; No Roots; Mottling @ 6.0 fbgs	
			7.0				
			8.0				
			9.0				
						Soil Profile Pit SPP-6 Terminated at a Depth of 9.0 fbgs Due to Cave-In	
			10.0				
			11.0				
			12.0				
			13.0				
			14.0				
			15.0				

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

WHITESTONE ASSOCIATES, INC.

APPENDIX B
Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	1.3	65.0	29.4	4.1	

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	100.0		
#4	99.8		
#10	98.5		
#20	72.9		
#40	33.5		
#60	8.8		
#140	4.8		
#200	4.1		

* (no specification provided)

Material Description

Poorly Graded Sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 1.3208 D_{85}= 1.1327 D_{60}= 0.6664
D_{50}= 0.5613 D_{30}= 0.3998 D_{15}= 0.2976
D_{10}= 0.2604 C_u= 2.56 C_c= 0.92

Classification

USCS= SP AASHTO= A-1-b

Remarks

W_n = 3.9 %

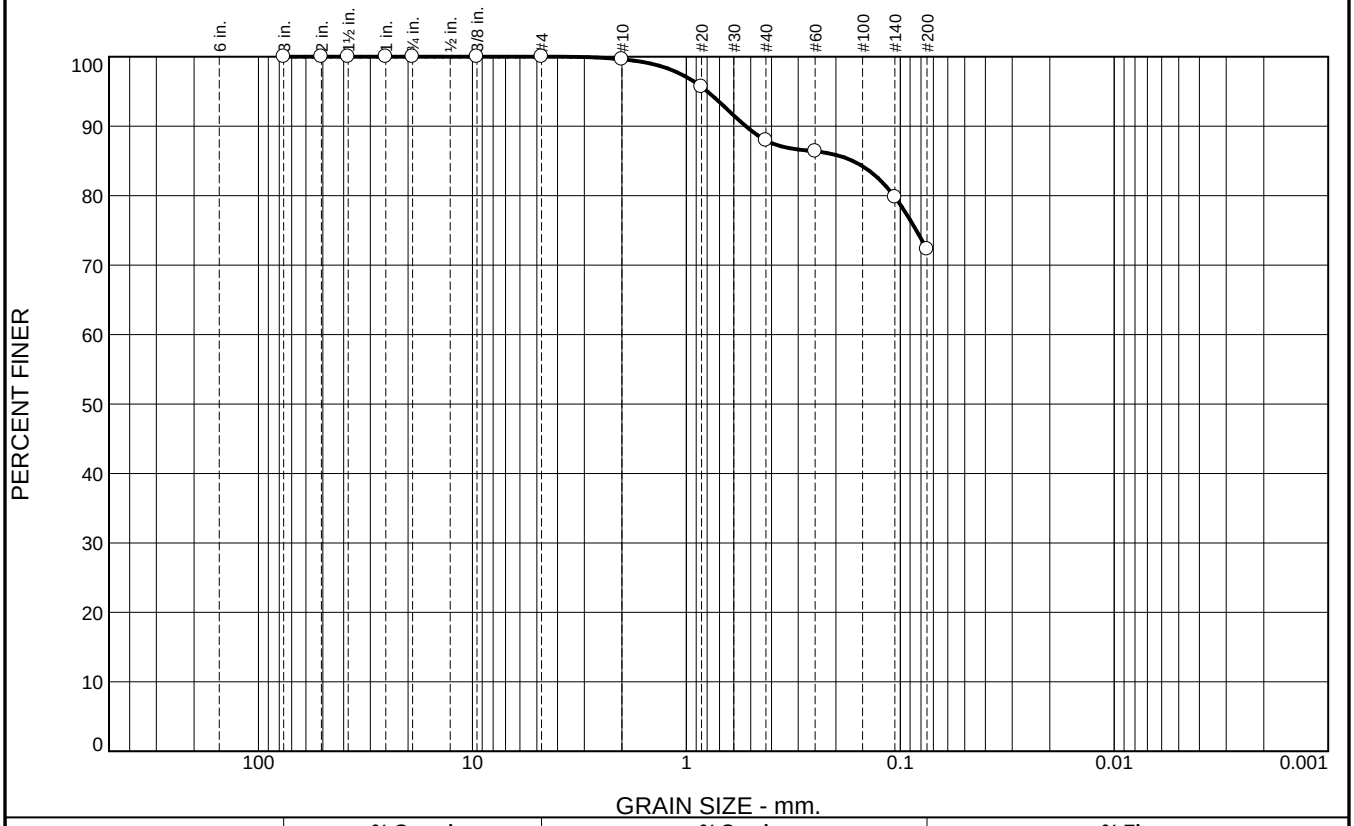
Source of Sample: B-1 **Depth:** 4.0' - 6.0'
Sample Number: S-3

Date: 02/15/2021

WHITESTONE ASSOCIATES, INC.
Warren, New Jersey

Client: Stonefield Engineering & Design, LLC
Project: Proposed Mixed-Use Development
505 Route 35, Neptune, Monmouth County, New Jersey
Project No: GS2117697.000 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	11.6	15.7	72.3	

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	100.0		
#4	100.0		
#10	99.6		
#20	95.7		
#40	88.0		
#60	86.4		
#140	79.8		
#200	72.3		

* (no specification provided)

Material Description

Silt with Sand

Atterberg Limits

PL= 36 LL= 40 PI= 4

Coefficients

D_{90}= 0.5274 D_{85}= 0.1669 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(4)

Remarks

W_n = 42.8 %

Source of Sample: B-7 **Depth:** 8.0' - 10.0'
Sample Number: S-5

Date: 02/15/2021

WHITESTONE ASSOCIATES, INC.
Warren, New Jersey

Client: Stonefield Engineering & Design, LLC
Project: Proposed Mixed-Use Development
505 Route 35, Neptune, Monmouth County, New Jersey
Project No: GS2117697.000 **Figure**

WHITESTONE ASSOCIATES, INC.

INFILTRATION TEST

Client:	Stonefield Engineering & Design, LLC	**Test Hole No.:**	SPP-1
Project:	Proposed Mixed-Use Development	**Date:**	2/8/2021
Location:	505 Route 35, Neptune, New Jersey	**Weather:**	Sunny
File No.	GS2017697.000	**Field Engineer:**	RL
Surf. Elev.	29.00	**Test Depth Ft. | Elev.:**	4.00 | 25.00

Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	9:30 AM	10:00 AM	12.0	0.0	12.0	0.5	> 20.0
1	10:00 AM	10:15 AM	7.0	0.0	7.0	0.25	> 20.0
2	10:15 AM	10:30 AM	7.0	0.0	7.0	0.25	> 20.0
3	10:30 AM	10:45 AM	7.0	0.0	7.0	0.25	> 20.0

Field i = > 20.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE ASSOCIATES, INC.

INFILTRATION TEST

Client:	Stonefield Engineering & Design, LLC	**Test Hole No.:**	SPP-2
Project:	Proposed Mixed-Use Development	**Date:**	2/8/2021
Location:	505 Route 35, Neptune, New Jersey	**Weather:**	Sunny
File No.	GS2017697.000	**Field Engineer:**	RL
Surf. Elev.	29.00	**Test Depth Ft. | Elev.:**	4.00 | 25.00

Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	10:00 AM	10:30 AM	12.0	0.0	12.0	0.5	> 20.0
1	10:30 AM	10:45 AM	7.0	4.0	3.0	0.25	12.0
2	10:45 AM	11:00 AM	7.0	4.0	3.0	0.25	12.0
3	11:00 AM	11:15 AM	7.0	4.0	3.0	0.25	12.0

Field i = 12.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE ASSOCIATES, INC.

INFILTRATION TEST

Client:	Stonefield Engineering & Design, LLC	**Test Hole No.:**	SPP-3
Project:	Proposed Mixed-Use Development	**Date:**	2/8/2021
Location:	505 Route 35, Neptune, New Jersey	**Weather:**	Sunny
File No.	GS2017697.000	**Field Engineer:**	RL
Surf. Elev.	29.00	**Test Depth Ft. | Elev.:**	4.00 | 25.00

Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	10:15 AM	10:45 AM	12.0	0.0	12.0	0.5	> 20.0
1	10:45 AM	11:00 AM	7.0	4.0	3.0	0.25	12.0
2	11:00 AM	11:15 AM	7.0	4.0	3.0	0.25	12.0
3	11:15 AM	11:30 AM	7.0	4.0	3.0	0.25	12.0

Field i = 12.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE ASSOCIATES, INC.

INFILTRATION TEST

Client:	Stonefield Engineering & Design, LLC	**Test Hole No.:**	SPP-4
Project:	Proposed Mixed-Use Development	**Date:**	2/8/2021
Location:	505 Route 35, Neptune, New Jersey	**Weather:**	Sunny
File No.	GS2017697.000	**Field Engineer:**	RL
Surf. Elev.	30.00	**Test Depth Ft. | Elev.:**	4.00 | 26.00

Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	11:30 AM	12:00 PM	12.0	0.0	12.0	0.5	> 20.0
1	12:00 PM	12:15 PM	7.0	0.0	7.0	0.25	> 20.0
2	12:15 PM	12:30 PM	7.0	0.0	7.0	0.25	> 20.0
3	12:30 PM	12:45 PM	7.0	0.0	7.0	0.25	> 20.0

Field i = > 20.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE ASSOCIATES, INC.

INFILTRATION TEST

Client:	Stonefield Engineering & Design, LLC	**Test Hole No.:**	SPP-5
Project:	Proposed Mixed-Use Development	**Date:**	2/8/2021
Location:	505 Route 35, Neptune, New Jersey	**Weather:**	Sunny
File No.	GS2017697.000	**Field Engineer:**	RL
Surf. Elev.	30.00	**Test Depth Ft. | Elev.:**	4.00 | 26.00

Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	11:45 AM	12:15 PM	12.0	0.0	12.0	0.5	> 20.0
1	12:15 PM	12:30 PM	7.0	0.0	7.0	0.25	> 20.0
2	12:30 PM	12:45 PM	7.0	0.0	7.0	0.25	> 20.0
3	12:45 PM	1:00 PM	7.0	0.0	7.0	0.25	> 20.0

Field i = > 20.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE ASSOCIATES, INC.

INFILTRATION TEST

Client:	Stonefield Engineering & Design, LLC	**Test Hole No.:**	SPP-6
Project:	Proposed Mixed-Use Development	**Date:**	2/8/2021
Location:	505 Route 35, Neptune, New Jersey	**Weather:**	Sunny
File No.	GS2017697.000	**Field Engineer:**	RL
Surf. Elev.	30.00	**Test Depth Ft. | Elev.:**	4.00 | 26.00

Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	10:145 AM	11:00 AM	12.0	0.0	12.0	0.5	> 20.0
1	11:00 AM	11:15 AM	7.0	4.0	3.0	0.25	12.0
2	11:15 AM	11:30 AM	7.0	4.0	3.0	0.25	12.0
3	11:30 AM	11:45 AM	7.0	4.0	3.0	0.25	12.0

Field i = 12.0 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE ASSOCIATES, INC.

APPENDIX C
Supplemental Information (USCS, Terms and Symbols)

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants

2430 HIGHWAY 34
BUILDING B, SUITE 101
MANASQUAN, NJ 08736
732.592.2101
whitestoneassoc.com

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
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS 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
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	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
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-Wall.docx

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants

2430 HIGHWAY 34
BUILDING B, SUITE 101
MANASQUAN, NJ 08736
732.592.2101
whitestoneassoc.com

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 ⅜" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
AU: Auger Sample.
OB: Diamond Bit.
CB: Carbide Bit
WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

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

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

PARTICLE SIZE

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

Other Office Locations:

WARREN, NJ 908.668.7777 | CHALFONT, PA 215.712.2700 | SOUTHBOROUGH, MA 508.485.0755 | ROCKY HILL, CT 860.726.7889 | PHILADELPHIA, PA 215.848.2323

APPENDIX C-1:
GENERAL INSPECTION CHECKLIST LOG

INSPECTION CHECKLIST LOG

1. **The responsible party shall report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities.**
2. **The maintenance crew should fill out the checklist in the field manual when performing each inspection/maintenance task.**
3. **After the maintenance task is performed, the checklist should be filed in the Maintenance Plan and recorded in the log below.**

Cycle of Inspection	***Stormwater Management Measure No.***	***Checklist No.***	***Date(s) of Inspection***
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4^{th} Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			

Cycle of Inspection	***Stormwater Management Measure No.***	***Checklist No.***	***Date(s) of Inspection***
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			

APPENDIX C-2:
GENERAL PREVENTATIVE MAINTENANCE LOG

PREVENTATIVE MAINTENANCE LOG

MAINTENANCE SCHEDULE	STORMWATER MANAGEMENT MEASURE NO.	PREVENTATIVE MAINTENANCE RECORD NO.	DATE(S) OF MAINTENANCE
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Maintenance work; e.g., after 1" rain)			
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			

APPENDIX C-3: GENERAL CORRECTIVE MAINTENANCE LOG

CORRECTIVE MAINTENANCE LOG

Maintenance Schedule	*Stormwater Management Measure No.*	*Corrective Maintenance Record No.*	*Date(s) of Maintenance*
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Maintenance work; e.g., after 1" rain)			
(1st Quarter)			
(2nd Quarter)			
(3rd Quarter)			
(4th Quarter)			
(Unscheduled Inspection; e.g., after 1" rain)			

APPENDIX C-4: *ANNUAL EVALUATION RECORD*

ANNUAL EVALUATION RECORD

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.

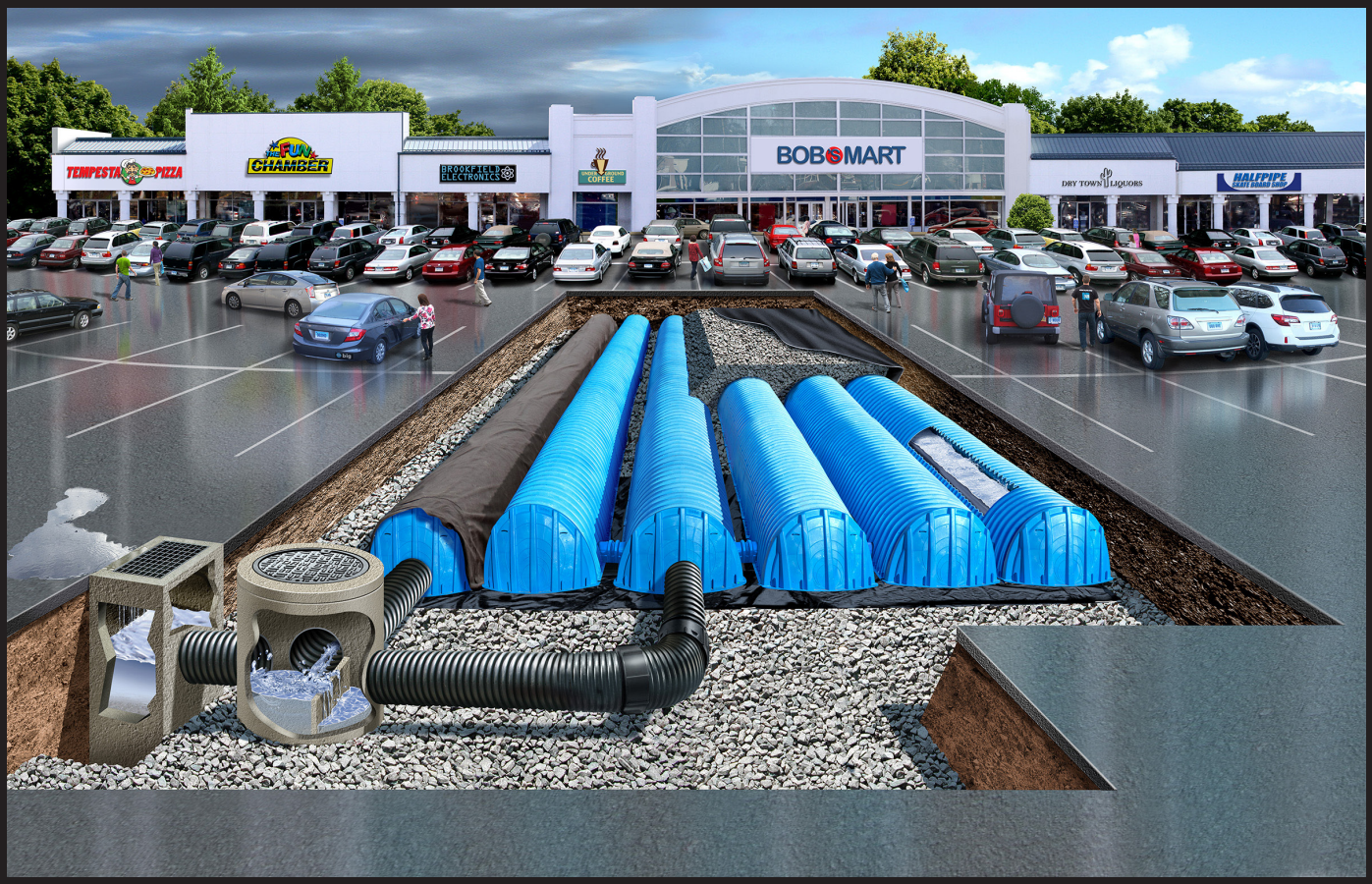
If actual performance of those items has been deviated from the maintenance plan, the responsible party should find the causes and implement solutions in a revised maintenance plan.

Evaluator(s)	***Date of Evaluation***	***Decision***
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)

APPENDIX C-5: *CULTEC CHAMBER OPERATION AND MAINTENANCE MANUAL*

CONTACTOR® & RECHARGER®

STORMWATER MANAGEMENT SOLUTIONS



OPERATION & MAINTENANCE GUIDELINES

FOR CULTEC STORMWATER MANAGEMENT SYSTEMS

CULTEC®

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Contact Information:
For general information on our other products and services, please contact our offices within the United States at (800)428-5832, (203)775-4416 ext. 202, or e-mail us at custservice@cultec.com.

For technical support, please call (203)775-4416 ext. 203 or e-mail tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

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January 2020

These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC.
All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings.
Actual designs may vary.

This manual contains guidelines recommended by CULTEC, Inc. and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pretreatment device). CCTV inspection of this row can be deployed through this access port to deter mine if any sediment has accumulated in the inlet row.

B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.

1. Manhole Access
This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

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2. StormFilter Access
Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.

B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.

C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.

D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. Minor Maintenance
The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. Major Maintenance
The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

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	Frequency	Action
Inlets and Outlets	Every 3 years	• Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	• Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	• Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	• Clean stormwater management chambers and feed connectors of any debris. • Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	• Clean stormwater management chambers and feed connectors of any debris. • Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. • Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. • Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. • Attain the appropriate approvals as required. • Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1st year	• Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	• Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	• Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC, Inc. at 1-800-428-5832.

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WQMP
Operation & Maintenance (O&M) Plan

Project Name:_____

Prepared for:

Project Name: _____

Address:_____

City, State Zip:_____

Prepared on:

Date:_____

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This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer's maintenance requirements, permits, etc.

8.1.1 Project Information

Project name	
Address	
City, State Zip	
Site size	
List of structural BMPs, number of each	
Other notes	

8.1.2 Responsible Party

The responsible party for implementation of this WQMP is:

Name of Person or HOA Property Manager	
Address	
City, State Zip	
Phone number	
24-Hour Emergency Contact number	
Email	

8.1.3 Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in this document.

8.1.4 Electronic Data Submittal

This document along with the Site Plan and Attachments shall be provided in PDF format. AutoCAD files and/or GIS coordinates of BMPs shall also be submitted to the City.

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Appendix ____

BMP SITE PLAN

Site plan is preferred on minimum 11” by 17” colored sheets, as long as legible.

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BMP OPERATION & MAINTENANCE LOG

Project Name: _____

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

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Minor Maintenance

Frequency		Action
Monthly in first year		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Month 1	Date:	
□ Month 2	Date:	
□ Month 3	Date:	
□ Month 4	Date	
□ Month 5	Date:	
□ Month 6	Date:	
□ Month 7	Date:	
□ Month 8	Date:	
□ Month 9	Date:	
□ Month 10	Date:	
□ Month 11	Date:	
□ Month 12	Date:	
Spring and Fall		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
One year after commissioning and every third year following		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Year 1	Date:	
□ Year 4	Date:	
□ Year 7	Date:	
□ Year 10	Date:	
□ Year 13	Date:	
□ Year 16	Date:	
□ Year 19	Date:	
□ Year 22	Date:	

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Major Maintenance

	Frequency		Action
Inlets and Outlets	**Every 3 years**		Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
			Notes
	□ Year 1	Date:	
	□ Year 4	Date:	
	□ Year 7	Date:	
	□ Year 10	Date:	
	□ Year 13	Date:	
	□ Year 16	Date:	
	□ Year 19	Date:	
	□ Year 22	Date:	
	Spring and Fall		Check inlet and outlets for clogging and remove any debris, as required.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
CULTEC Stormwater Chambers	**2 years after commissioning**		□ Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
			Notes
	□ Year 2	Date:	

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Major Maintenance

	Frequency		Action
CULTEC Stormwater Chambers	**9 years after commissioning every 9 years following**		□ Clean stormwater management chambers and feed connectors of any debris. □ Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
			Notes
	□ Year 9	Date:	
	□ Year 18	Date:	
	□ Year 27	Date:	
	□ Year 36	Date:	
	45 years after commissioning		□ Clean stormwater management chambers and feed connectors of any debris. □ Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. □ Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. □ Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. □ Attain the appropriate approvals as required. □ Establish a new operation and maintenance schedule.
			Notes
	□ Year 45	Date:	

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Major Maintenance

	Frequency		Action
Surrounding Site	**Monthly in 1st year**		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Month 1	Date:	
	□ Month 2	Date:	
	□ Month 3	Date:	
	□ Month 4	Date:	
	□ Month 5	Date:	
	□ Month 6	Date:	
	□ Month 7	Date:	
	□ Month 8	Date:	
	□ Month 9	Date:	
	□ Month 10	Date:	
	□ Month 11	Date:	
	□ Month 12	Date:	
	Spring and Fall		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	Yearly		□ Confirm that no unauthorized modifications have been performed to the site.
			Notes
	□ Year 1	Date:	
	□ Year 2	Date:	
	□ Year 3	Date:	
	□ Year 4	Date:	
	□ Year 5	Date:	
	□ Year 6	Date:	
	□ Year 7	Date:	

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