Stormwater Management Facilities
Operations & Maintenance Manual

Development Name: Hillcrest Farms
Address: 383 Bloomfield Avenue

Block(s) / Lot(s): 708 / 1

Township, County: Verona, Essex County

Party Responsible for Maintenance:

Molfetta Corporation

Address: 383 Bloomfield Avenue, Verona, NJ 07044

Contact Person(s): Brian Mazzei Phone: (201) 832-1675

Prepared by: Paul W. Anderson, P.E., P.P. Date: 11/18/2025

This plan is recorded in

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

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Maintenance

Appendix - Field Manuals and Maintenance Records

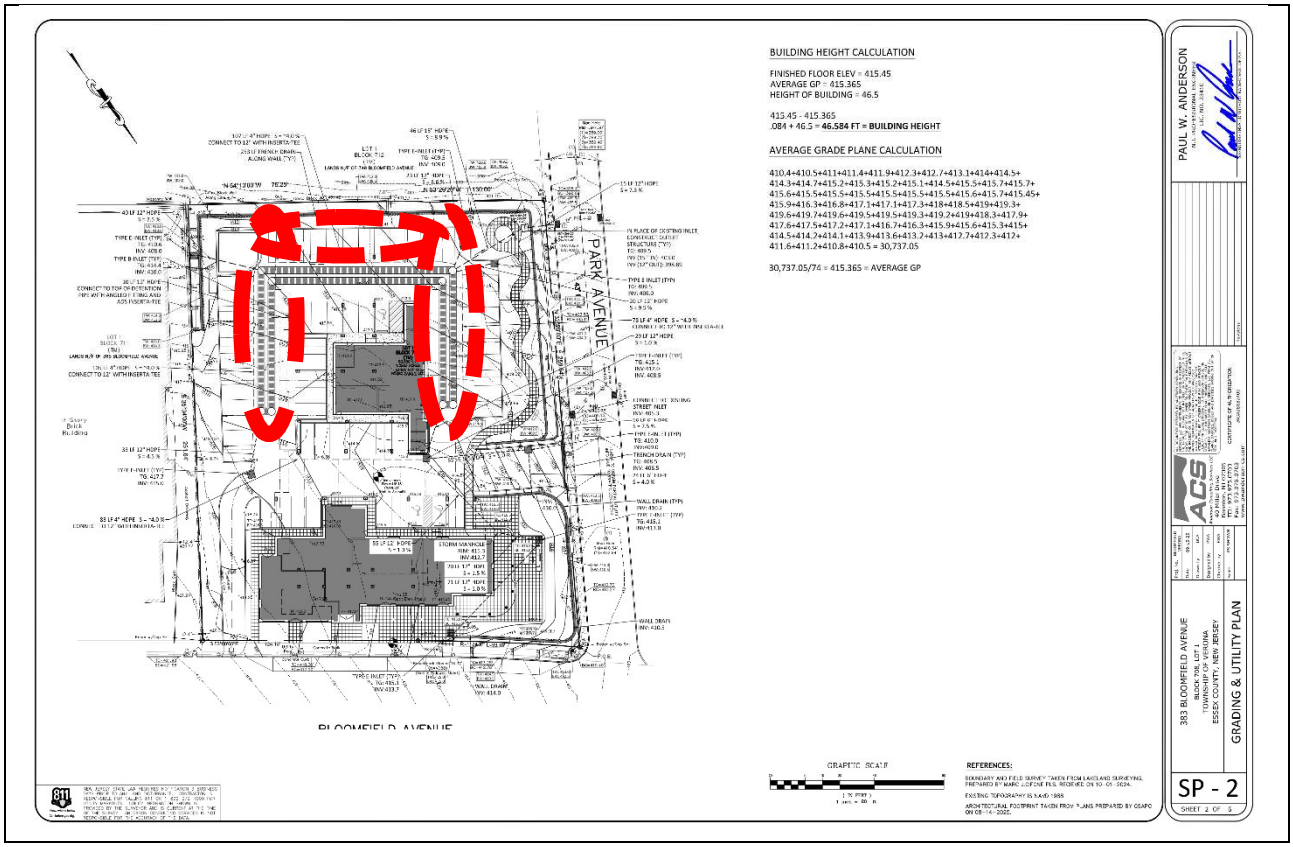
Maintenance Plan

List of Stormwater Management Measures

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

Type of Stormwater Management Measure	BMP No.	Location Description
Small Scale Detention Basin	BMP#1	On the easterly and northerly side of the building.
Pervious Pavement	BMP#2	Parking lot on-site
Outlet Structure	OCS#1	At the end of the pipe storage system.

Location Map



No.	Type of Stormwater Management Measure
BMP# 1	Small scale detention basin
BMP# 2	Porous pavement; green tech for quality only
OCS# 1	Outlet Structure

Preventative and Corrective Maintenance Action Plan

Routine Inspection and Maintenance of the Stormwater Management Facilities:

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

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

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

Preventative Maintenance Procedures:

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

a) Weed Growth:

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

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

b) Maintenance of Adjacent Areas:

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

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

c) Removal and Disposal of Trash/Debris and Sediment:

All stormwater management components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation at least four times annually as well as after every storm exceeding one inch of rainfall in 24 hours. Such components should include basin and swale bottoms and low flow channels, trash racks and inflow (headwall) points.

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

Accumulated sediment should be removed before it threatens the conveyance of the swale. Before de-sedimentation activities are performed, consideration should be given to evacuating all standing water from the grass swales. Disposal of discharged water and sediment must comply with all local, county, state and federal regulations. Only suitable disposal sites should be utilized. If stable soil conditions exist around the basin, sediment deposition should not be

an excessive maintenance issue. Should a recurrent stabilization situation develop, the inspector should identify the upstream sources of sediment and recommend required stabilization measures.

d) Elimination of Potential Mosquito Breeding Habitats:

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

e) Specific Maintenance of Underground Detention Basin Pipes& Chambers:

The basin pipes and chambers are to be evaluated for excessive deposition of sediment and debris in pipe and chamber inverts. The ground and paved parking lots above and adjacent to the underground detention basins shall be evaluated for excessive settlement.

f) Parking lot maintenance:

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

Corrective Maintenance Procedures:

g) Removal of Debris and Sediment:

Sediment, debris and trash which threaten the discharge capacity of the swales should be removed immediately and properly disposed of. As noted previously, it is recommended that all water be evacuated from the swales before any significant amount of sediment, settled debris or trash is removed from the basins.

h) Structural Repairs:

Structural damage to outlet and inlet structures, trash racks, access hatches, roadways and headwalls as a result of vandalism, flood events, settlement or other causes must be repaired promptly. The urgency of the repairs will depend upon the nature of the damage and its effects on the safety and operation of the facility. The analysis of structural damage if it occurs and the design and performance of structural repairs should only be undertaken by a Professional Engineer.

i) Embankment and Slope Repairs:

Damage to embankments, and side slopes must be repaired promptly. This damage can be the result of unusual rain or flood events, vandalism, animals, vehicles or neglect. Typical problems can include settlement, scouring, cracking, sloughing, seepage and rutting. The urgency of the repairs will depend upon the nature of the damage and its effect on safety and operational efficiency of the facility. The analysis of the damage and the design and performance of geotechnical repairs should only be undertaken by qualified personnel and under the direction of a consulting Professional Engineer. All swale embankments should be inspected quarterly and after each significant storm greater than one (1) inch of rainfall in 24 hours. Any damage or indication of erosion shall be immediately inspected by a Professional Engineer.

j) Weed Harvesting:

It may be necessary to remove congested weeds from the swale. Companies specializing in manual removal of weeds should be contacted to perform these operations. Note that such work does not usually, but may in some cases require the approval of various regulatory agencies.

k) Extermination of Mosquitoes:

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

l) Erosion Repair:

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

m) Elimination of Trees, Brush, Roots and Animal Burrows:

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

n) Snow and Ice Removal:

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

Aesthetic Maintenance Procedures:

o) Graffiti Removal:

The timely removal of graffiti will restore the aesthetic quality of the drainage structures and swales. Removal can be accomplished by paint or other cover, or removal with scrapers, solvents or cleansers. Timely removal is important to discourage further graffiti and other acts of vandalism.

p) Grass Trimming/Landscape Maintenance:

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

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

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

Pruning of shrubs should also be done on a regular basis to maintain the shape and appearance of the shrub masses. The height of the shrubs may vary according to the plant's natural growth habits, but should not exceed 6-feet. Pruning should be done as necessary throughout the year to remove dead branches and to control new growth. Any pruning, other than the removal of dead branches, should be done in either late winter/early spring or after the shrub has flowered in the spring.
In the event that a shrub should experience more than 2/3 die back, it should

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

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

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

q) Control of Weeds:

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

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

Summary of Maintenance Procedures:

Preventative Maintenance

a) Weed Growth
b) Maintenance of Adjacent Areas
c) Removal and Disposal of Trash/Debris and Sediment
d) Elimination of Potential Mosquito Breeding Habitats
e) Specific Maintenance of Underground Detention Basin Pipes & Chambers
f) Parking Lot Maintenance

Corrective Maintenance

a) Removal of Debris and Sediment
b) Structural Repairs
c) Embankment and Slope Repairs
d) Weed Harvesting
e) Extermination of Mosquitoes
f) Erosion Repair
g) Elimination of Trees, Brush, Roots and Animal Burrows
h) Snow and Ice Removal

Aesthetic Maintenance

a) Graffiti Removal
b) Grass Trimming/Landscape Maintenance
c) Control of Weeds

Inspection and Logs of All Preventative and Corrective Maintenance

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

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

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

- Pervious Paving System Field Manual

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

Maintenance Personnel, Equipment, Tools, and Supplies

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

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

Maintenance Equipment and Materials

Note: Only light equipment is allowed to be used within open basins to prevent compaction.

Grass Maintenance Equipment

a) Riding Mowers
b) Hand Mowers
c) Gas Powered Trimmers
d) Gas Powered Edgers
e) Seed Spreaders
f) Fertilizer Spreaders
g) De-Thatching Equipment
h) Pesticide and Herbicide Application Equipment
i) Grass Clipping and Leaf Collection Equipment

Vegetative Maintenance Equipment

a) Saws
b) Pruning Shears
c) Hedge Trimmers
d) Aquatic Weed Harvester (owned/operated by subcontractor)

Debris, Trash and Sediment Removal Equipment

a) Loader (not to be used in the bottom of swales)
b) Backhoe (not to be used in the bottom of the swales)
c) Grader (not to be used in the bottom of the swales)
d) Dredging Equipment (not to be used in the bottom of the swales)
e) Portable Pump for Dewatering
f) Jet Vac Equipment for removal of sediment in pipes

Miscellaneous Equipment

a) Shovels
b) Wheel Barrows
c) Gloves
d) Hand Pushed Tilling Machine
e) Brooms

Materials

a) Topsoil
b) Fill
c) Seed
d) Soil Amenities (Fertilizer, Lime, etc.)
e) Chemicals (Pesticides, Herbicides, etc.)
f) Mulch
g) Paint Removers
h) Spare Parts for Equipment

Parking Maintenance Equipment

a) Sweeping/Vacuuming Equipment
b) Trash Receptacles
c) Snow Plowing Equipment
d) Snow Shovels

Disposal Plan

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

Disposal Field – Offsite

Description of the Offsite Disposal:

Private hauler handles disposal, unloading and covering offsite.

Cost Estimate

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

COST ESTIMATES

Cost Overview

Opinion of Probable Annual Stormwater Management Maintenance Cost

Item	Description	Rate	Unit	Total Units	Frequency Per Year	Item Total
1	Mowing	$100.00	Acre	0.29	35	$1,015.00
2	Landscape Maintenance	$400.00	Acre	0.29	2	$232.00
3	Landscape Maintenance Materials	$1,200.00	Acre	0.29	2	$696.00
4	General Maintenance	$500.00	L/S	1	2	$1,000.00
5	Preventative Maintenance	$2,000.00	L/S	1	1	$2,000.00
6	Corrective Maintenance (every 5 years)	$10,000.00	L/S	1	0.2	$2,000.00
7	Engineering Inspection	$500.00	L/S	1	6	$3,000.00
9	Trash Collection	$50.00	Day	1	52	$2,600.00
	Estimated Annual SWM Maintenance Cost					$12,543.00
	Estimated Annual Insurance Cost					$3,000.00
	Total Estimated Annual SWM Maintenance Costs					$15,543.00

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

Safety Measures and Procedures

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

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

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

Emergency Procedures

Emergency – 911
Verona Police – (973) 239-5000
Verona Fire Department – (973) 857-1078
Verona OEM – (973) 857-4817

Training Plan and Records

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

I. Training Plan

Types of Training

- Mandatory Stormwater Management Basic Training and Field Manual Usage Training for new maintenance crews
- Occupational Safety Training
- Subcontractor training, if applicable
- OSHA confined space entry certification

Content of Training

- **Stormwater Management Basic Training**
    - Purposes and Functions of BMPs
      Training Material
        - NJDEP Stormwater BMP Manual, Chapter Nine: Structural Stormwater Management Measures
            - Chapter 9.6 Manufactured Treatment Devices

    - Vegetation Care

      Training Material
        - NJDEP Stormwater BMP Manual, Chapter Seven: Landscaping
          (provides information on vegetation and landscaping for stormwater management measures)

    - Field Manual Usage Training

      Training Material
        - Field Manuals attached to this Maintenance Plan

- Equipment and Tools Operation Training

  Training Material
  - Equipment or tool manufacturer's Operation & Maintenance Manual

- Occupational Safety Training

  Training Material
  - OSHA Training
  - Equipment or tool manufacturer's Operation & Maintenance Manual

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

II. Training Records

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

Annual Evaluation of the Effectiveness of the Plan

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

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

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

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

Annual Evaluation Records

Evaluator(s)	Date of Evaluation	Decision
		__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)

Checklists and Logs

Appendix of this report contains sample checklists and logs regarding various aspects of the basin maintenance and inspection. A brief description of the use of each form is listed below:

1. "Maintenance Work Order and Checklist" – a comprehensive form outlining both required and completed maintenance work.

2. "Maintenance Log" – a summary table for recording of all maintenance work at the site.

3. "Inspection Log" – a summary table for recording the results of all inspections of the basins.

A P P E N D I X

PERVIOUS PAVING SYSTEM
FIELD MANUAL

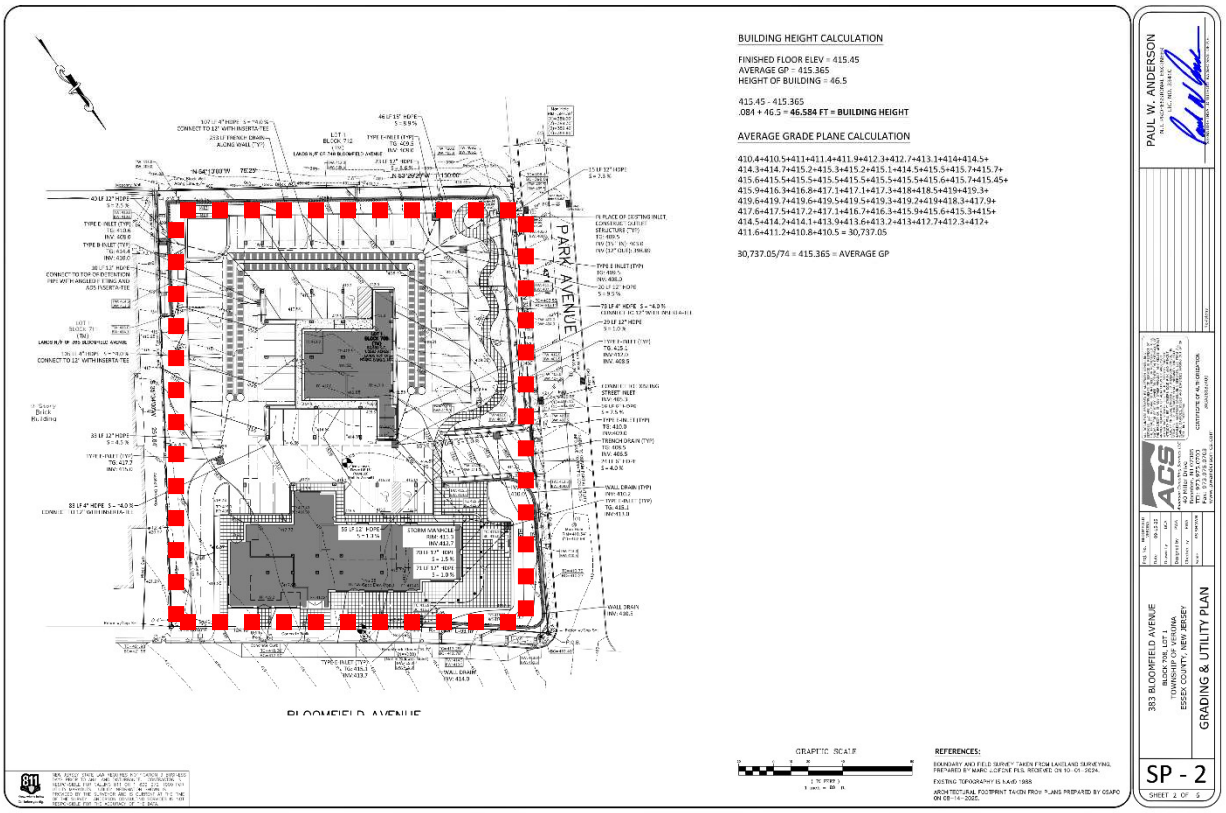
Pervious Paving System

Development Name: Hillcrest Farms

Township, County: Verona Orange, Essex County

Location Description: Parking lot on-site

Location Map



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Pervious Pavement System Overview

Functionality

Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. This reduction is achieved primarily through the infiltration of a greater portion of the rain falling on the area than would occur with conventional paving. This increased infiltration occurs either through the paving material itself or through void spaces between individual paving blocks known as pavers.

Pervious paving systems are divided into two general types. Each type depends primarily upon the nature of the pervious paving surface course and the presence or absence of a runoff storage bed beneath the surface course. Porous paving and permeable paver with storage bed systems treat the stormwater quality design storm runoff through storage and infiltration. Therefore, these systems have adopted TSS removal rates similar to infiltration structures. The adopted TSS removal rate for each type of pervious paving system is from 80%.

Pervious paving systems are used to reduce runoff rates and volumes from paved, on-grade surfaces such as patios, walkways, driveways, fire lanes, and parking spaces. Pervious paving systems with runoff storage beds achieve these reductions through storage of runoff and eventual infiltration into the subgrade soils. Through this infiltration process, these types of pervious paving systems also achieve stormwater quality requirements.

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

Type of BMP – Dry Stormwater Management Measure

The pervious pavement system shall fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of the porous pavement failure. It may also contribute to mosquito breeding and other health and safety issues. At no time shall there be ponding on the surface of the pavement.

Basic Design Information

Detention System

Hydrology Design Targets

1. The system is porous pavement with pipe storage.
2. The system is designed to capture runoff throughout the underdrains and convey it to the 48-inch Solid HDPE storage pipe and discharge at the outlet structure which will reduce peak flow rates.
3. The TSS removal rate is __80__%.

Hydraulic Design Targets

1. This system is designed to infiltrate the runoff from the (stormwater runoff quantity control), which generates ___43,032_____ cubic feet of runoff. The peak flow entering the system is __13.15___ cubic feet per second during the 100 yr - 2050 storm event.
2. The invert elevation of the 8" circular overflow outlet is at EL. ___403.0___ feet, EL. ___404.5___ feet for the 3"x36" rectangular overflow and EL. ___406.35___ feet for the 100yr emergency overflow.

System Configuration Targets

1. The system has pretreatment.
2. The depth of uniformly graded coarse aggregate over the pipe storage is ____42___ inches.
3. The top of the system is not vegetated.

Critical Maintenance Features

1. Avoid sand or silt onto the porous pavement area.
2. Sweep and vacuum the porous pavement area often to prevent clog.
3. Do not apply sealant to cracks or entire surface.

Visual Aid for Pervious Paving System Inspection

Currently, no photos are available. Photos will be updated upon availability.

Reference Documents

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

- As-built Drawings with Drainage Plans
- Manufacturer's Operation and Maintenance Manual

Inspection Checklist / Maintenance Actions
Pervious Pavement System

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

Checklist No. _____ **Inspection Date:** _____

Date of most recent rain event: _____

Rain Condition (circle one):
Drizzle / Shower / Downpour / Other _____

Ground Condition (circle one):
Dry / Moist / Ponding / Submerged / Snow accumulation

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

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
A Pretreatment (Vegetative Filter Strip)	1	Poor quality vegetation, erosion, sedimentation, or debris	Y__ N__	(See Vegetative Filter Strip Field Manual)
B1 Pavement Surface (Porous Pavement)	1	Standing water is present after the design drain time The observed drain time is approximately _____ hours. Excessive sediment or mud accumulation on top of the pavement	Y__ N__	Recheck to determine if there is standing water after 72 hours If standing water is present longer than 5 days, report to mosquito commission. If excessive sediment is present, the system may be clogged - Sweep the surface - Power wash (at 45 degree angle to the top) - Vacuum the surface - Excavate to inspect the storage bed for clogging, replace the storage bed material if it is severely clogged - Check the permeability rate of the subsoil Work Order # _____
B 1 Pavement Surface (Porous Pavement)	2	Cracking, subsidence, spalling, or other damage to the pavement	Y__ N__	Repair according to the manufacturer's procedures and material. See Reference Documents section. Work Order # _____
	3	Weeds or other vegetation on the porous pavement	Y__ N__	Remove the vegetation
Note:				

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
B 2 Pavement Surface (Permeable Paver)	1	Standing water is present after the design drain time The observed drain time is approximately _____ hours..	Y__ N__	Recheck to determine if there is standing water after 72 hours If standing water is present longer than 5 days, report to mosquito commission. If excessive sediment is present, the system may be clogged - Sweep the surface - Vacuum the surface - Excavate to inspect the storage bed for clogging, replace the storage bed material if it is severely clogged - Check the permeability rate of the subsoil Work Order # _____ (Note: Do not power wash a permeable paver system)
	2	Excessive sediment or mud accumulation on the system	Y__ N__	Sweep and/or vacuum surface Replenish aggregate in joints Work Order # _____
	3	Cracking, subsidence, spalling, deformation, uneven settlement, broken unit(s), or other damage to the pavers	Y__ N__	Repair according to the manufacturer's procedures and material. See Reference Documents section. Work Order # _____
	4	Loss of aggregate between joints	Y__ N__	Replenish aggregate in joint Work Order # _____
Note:				

	For Inspector			For Maintenance Crew
Component No. Component Name	**Inspection Item and Inspection Item No.**		**Result**	**Preventative / Corrective Maintenance Actions**
C Vegetation (for permeable pavers with vegetation)	1	Vegetation is overgrown	Y__ N__	Remove the vegetation according to the permeable paver manufacturer's instruction Work Order # _____
D Outlet	1	Clogged overflow outlet	Y__ N__	Clear and remove sediment
	2	Discharge pipe apron is eroded or scoured	Y__ N__	Restabilize the discharge riprap apron Work Order #_____
Note:				

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

_____

Associated Work Orders: # _____, # _____, # _____, # ____ __, # _____

_____ _____ _____

Inspector Name **Signature** **Date**

Report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities.

File this checklist in the Maintenance Log after performing maintenance.

Preventative Maintenance Record

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

Work Logs

Activities	Components	Date Completed
Sediment/debris removal	A – Pretreament	
	B1 – Pavement Surface (Porous Pavement)	
	B2 – Pavement Surface (Permeable Paver)	
	D – Outlet	
Vegetation removal	A – Pretreament	
	B2 – Pavement Surface (Permeable Paver)	
	C – Vegetation	

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

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

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

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

Corrective Maintenance Record

1. **Work Order #** _____ **Date Issued** _____

2. **Issue to be resolved** :

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

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**
   _____

6. **Special requirements**
   - Time of the season or weather condition:_____
   - Tools/equipment:_____
   - Subcontractor (name or specific type):_____

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

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

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

MAINTENANCE WORK ORDER
&
CHECKLIST FOR STORMWATER MANAGEMENT FACILITIES

MAINTENANCE WORK ORDER AND CHECKLIST
FOR STORMWATER MANAGEMENT FACILITIES

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

A. PREVENTATIVE MAINTENANCE

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

MAINTENANCE WORK ORDER AND CHECKLIST

FOR STORMWATER MANAGEMENT FACILITIES

NAME OF FACILITY _____

LOCATION _____ DATE _____

CREW _____ WORK STARTED _____

EQUIPMENT _____ WORK COMPLETED _____

WEATHER _____ TOTAL MANPOWER OF WORK _____

B. CORRECTIVE MAINTENANCE

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

C. AESTHETIC MAINTENANCE

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

REMARKS (REFER TO ITEM NO. IF APPLICABLE) _____

WORK ORDER PREPARED BY: _____

MAINTENANCE LOG FOR STORMWATER MANAGEMENT FACILITIES

MAINTENANCE LOG
FOR STORMWATER MANAGEMENT FACILITIES

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

A. PREVENTATIVE MAINTENANCE

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

MAINTENANCE LOG
FOR STORMWATER MANAGEMENT FACILITIES

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

B. CORRECTIVE MAINTENANCE

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

C.AESTHETIC MAINTENANCE

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

REMARKS (REFER TO ITEM NO. IF APPLICABLE) _____

WORK PERFORMED BY: _____

INSPECTION LOG FOR STORMWATER MANAGEMENT FACILITIES

INSPECTION LOG
FOR STORMWATER MANAGEMENT FACILITIES

NAME OF FACILITY _____
LOCATION _____ DATE _____
WEATHER _____

A. PREVENTIVE MAINTENANCE

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

INSPECTION LOG
FOR STORMWATER MANAGEMENT FACILITIES

NAME OF FACILITY _____ LOCATION _____

DATE _____ WEATHER _____

B. CORRECTIVE MAINTENANCE

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

C. AESTHETIC MAINTENANCE

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

REMARKS (REFER TO ITEM NO. IF APPLICABLE) _____

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

INSPECTOR: _____