STORMWATER FACILITIES OPERATIONS AND MAINTENANCE MANUAL

VERONA SUNSET URBAN RENEWAL, LLC
BLOCK 303, LOT 4 – TOWNSHIP OF VERONA
BLOCK 301, LOT 5 AND BLOCK 401, LOT 1 – TOWNSHIP OF MONTCLAIR
ESSEX COUNTY, NEW JERSEY

MATRIXNEWORLD
Engineering Progress

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1.0 INTRODUCTION

The development of this project will create the following Stormwater Management Facilities (SWMF):

1. Underground Detention Basins
2. Surface Bioretention Basin
3. Pervious Pavement
4. Stormwater inlets
5. Stormwater piping

All maintenance shall be the responsibility of the property owner. The responsible party for maintenance listed herein shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed. Adjustments may include frequency of inspection, sediment removal or any other item specifically outlined below.

2.0 DEFINITIONS/ABBREVIATIONS

Underground Detention Basin: A Storm Water Management Facility (SWMF) which provides temporary storage of stormwater runoff. It has an outlet structure that detains and attenuates runoff. An underground detention basin is normally designed as a multistage facility that provides runoff storage and attenuation for stormwater quantity management. This system is designed to hold stormwater for a specific duration of time after a rainfall event and should be dry during all other times.

Surface Bioretention Basin: A Stormwater Management Facility (SWMF) which provides temporary storage of stormwater runoff as well as 80% TSS removal rate of stormwater runoff. It has an outlet structure that detains and attenuates runoff for the higher storms. The bioretention basins associated with this project are constructed with soil bed, sand and gravel layers which achieve 80% TSS removal rate. There is also an underdrain in both basins, due to poor soil conditions. These systems are designed to hold stormwater for a specific duration of time after a rainfall event and should be dry during all other times.

Pervious Pavement: A Storm Water Management Facility (SWMF) which allows stormwater to filter through voids in the pavement surface into an underlying rock reservoir where it is temporarily stored and infiltrated into the surrounding materials or conveyed by an underdrain system.

N.J.A.C.: New Jersey Administrative Code.

Responsible Party: A person or persons responsible for the maintenance and proper function of the stormwater management facility.

Stormwater Inlet: An underground structure with a grate at grade, typically located at a low point, which collects stormwater runoff.

Stormwater Piping: An underground conduit which conveys stormwater runoff from one location to another.

3.0 PURPOSE

Stormwater Management Facilities are incorporated into the design of most land development projects to mitigate any adverse impacts from the increase in stormwater runoff, created by either a decrease in the time of concentration, or an increase in impervious surfaces or both. This document is created to ensure the proper function of the systems as designed, to minimize the potential for damage to property and/or infrastructure in the event of a system failure.

4.0 RESPONSIBLE PARTY

NAME: Verona Sunset Urban Renewal, LLC

ADDRESS: 16 Microlab Road, Suite A, Livingston, NJ 07039

TELEPHONE: (973) 992-2443

5.0 FUNCTION/OPERATION

Please refer to Appendix A for location of all below mentioned items.

5.1 Underground Detention Basins

There are two underground detention basins associated with this development.

The first underground detention basin is located under the parking garage in the northwest corner of the site. This basin, Basin A utilizes the Storm Tank 36" tall chamber system and consists of 1,687 modules. This basin accepts flow from portions of the building (2.20 acres) and the overland runoff along the south side of the building. The second underground detention basin is located under the surface parking area in the northeast corner of the site. This basin, Basin B utilizes the Storm Tank 24" tall chamber system and consists of 342 modules. This basin accepts flow from portions of the building (0.39 acres), the access road, surface parking, and other overland areas.

The underground detention systems are designed to collect and attenuate runoff from the proposed improvements. Both basins utilize a 5'x5' structure that will act as an outflow control structure to regulate flow leaving the systems. Basin A has a structure with a manhole cover, as well as a type A inlet grate. Basin B has a structure only with a manhole cover. The systems tie into the existing drainage system via the outlet structures and are designed to detain percentages of the 2-year through 100-year storms so that the proposed development will not increase in runoff during those storm events when properly maintained.

5.2 Surface Bioretention Basin

There is one (1) surface bioretention basin associated with this development.

Bioretention Basin 'C' is located along the southern property line adjacent to Dryer Road. Basin 'C' accepts stormwater runoff from the grass swale area that runs along the southern portion of the proposed building.

These systems are designed as normally "dry" systems. This basin is designed to convey the entire one-hundred (100) year storm event without overflow when properly maintained.

5.3 Pervious Pavement

There are two (2) sections of pervious pavement associated with this development. These two (2) sections are located in the lower parking area of the development.

These systems are designed as normally "dry" systems. These systems 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.

6.0 INSPECTION FREQUENCY

6.1 Underground Detention Basins

The underground system shall be inspected at least once monthly with additional inspections after rainfall events which generate greater than one inch of rainfall in twenty-four hours. Inspection reports as provided in Appendix A of this Manual shall be maintained and shall be made readily available to all municipal officials requesting same.

The inspection form shall be completed in its entirety by the responsible party with minimal assistance from outside sources.

6.2 Surface Bioretention Basin

The surface bioretention basin shall be inspected at least once monthly with additional inspections after rainfall events which generate greater than one inch of rainfall in twenty-four hours. Inspection reports as provided in Appendix A of this manual, shall be maintained and shall be made readily available to all municipal officials requesting same.

The inspection form shall be completed in its entirety by the responsible party with minimal assistance from outside sources.

6.3 Pervious Pavement

The pervious pavement shall be inspected at least once monthly with additional inspections after rainfall events which generate greater than one inch of rainfall in

twenty-four hours. Inspection reports as provided in Appendix A of this manual, shall be maintained and shall be made readily available to all municipal officials requesting same.

The inspection form shall be completed in its entirety by the responsible party with minimal assistance from outside sources.

6.4 Drainage Structures

The stormwater drainage structures such as inlets, manholes and outlet structures shall be inspected at least once monthly with additional inspections after rainfall events, which generate greater than one inch of rainfall in twenty-four hours.

7.0 MAINTENANCE

The maintenance procedures normally required vary in complexity, frequency, and cost. In general, SWMF maintenance procedures can be categorized as two types:

1. Functional Maintenance
2. Aesthetic Maintenance

Definitions of each type of maintenance are presented below:

Functional Maintenance: The maintenance required to keep SWMF functional or operational at all times. Functional Maintenance includes both Preventative (routine) Maintenance and Corrective (emergency) Maintenance.

Aesthetic Maintenance: The maintenance required to enhance or maintain the visual appeal of a facility. While Aesthetic Maintenance is not required for assuring the intended operation of a SWMF, it can improve the quality of life in the community and reduce the amount of required Functional Maintenance.

Functional Maintenance can be further divided into two types:

1. Preventative Maintenance
2. Corrective Maintenance

Preventative Maintenance: Functional Maintenance procedures that are required to maintain an intended operation and safe condition by preventing the occurrence of problems and malfunctions. To be effective, Preventative Maintenance should be performed on a regularly scheduled basis and includes such routine procedures as silt and debris removal. Since it is performed on a regular basis, Preventative Maintenance is simpler to schedule and budget for and is easier/less expensive to perform than Corrective Maintenance.

Corrective Maintenance: Functional Maintenance procedures that are required to correct a problem or malfunction at a SWMF and to restore the facility's intended operation and safe condition. Based upon the severity of the problem, Corrective Maintenance must be performed on an as-needed or emergency basis and includes such procedures as

structural and equipment repair and mosquito control. By its nature, Corrective Maintenance is much more difficult to schedule and budget and is more difficult/expensive to perform than Preventative Maintenance.

Presented below are detailed descriptions of typical maintenance procedures that are generally applicable to the proposed facilities as part of this project. Aesthetic Maintenance should also play a key role in any SWMF maintenance program. As shown below, Aesthetic Maintenance procedures are incorporated into the Preventative Maintenance schedule. When performed regularly, Aesthetic Maintenance can also help reduce the required amount of both Preventative and Corrective SWMF maintenance. It will help maintain the visual appeal of the SWMF and allow it to reflect positively on the maintenance staff, owner, and community.

7.1 Preventative Maintenance

Preventative Maintenance of stormwater management facilities are those tasks required to ensure that the system operates in the manner in which it is intended and minimize the need for emergency corrective measures.

Tasks associated with this include, but are not limited to the following:

1. Removal of Trash and Debris: A routine program for the removal of accumulated trash and debris from the inlet grates, trash racks and outlet structures shall be provided to ensure runoff will be able to enter the system and to minimize the accumulation of sediment and debris within the system. Disposal of all debris shall be in accordance with applicable codes.

2. Sediment Removal/Disposal: Accumulated sediment within the inlets and the detention systems shall be removed and disposed of in accordance with all applicable regulations including, but not limited to NJDEP and OSHA regulations. Sediment shall be removed when the StormTank system as discussed within the StormTank Maintenance Guidelines in Appendix D. Sediment shall be removed when the accumulated depth is less than or equal to (3) three inches within the inlet systems and within the detention systems.

7.2 Corrective Maintenance

Corrective Maintenance of stormwater management facilities are those tasks which are required on an emergency or non-routine basis to correct problems or malfunctions. These tasks may be completed by the responsible party but will more than likely require professional assistance in the form of a contractor or other source.

Tasks associated with this include, but are not limited to the following:

1. Removal of Debris and Sediment: Sediment and debris which prevents or diminishes the ability of runoff from entering the system should be removed and disposed of in a timely manner in accordance with applicable regulations.

2. Structural Repairs: Structural damage to the drainage structures or the underground conduits must be repaired promptly. Equipment, personnel, and materials must be available on short notice to complete the repair. The immediacy of the repair will depend on the on the effects to safety and operation of the facility.

3. Erosion Repair: Areas subject to erosion due to wind or water shall be repaired immediately. If some event has exposed soils to erosion, corrective steps should be initiated to prevent further loss of soil and any subsequent danger to the stability of the facility.

4. Snow and Ice Removal: In the event that snow, or ice prevents or limits the amount of runoff from entering the system, same shall be removed to ensure proper function.

5. Dewatering: standing water within the detention basins or outlet structures should be inspected immediately to determine the repair required. There is a potential for blockages at the trash rack, orifices, and downstream pipes. Any blockages should be removed immediately.

6. Control of Mosquitos: the basins are not intended to hold any water for extended times, so they are not areas for potential mosquito problems. A mosquito control program should be established if mosquitos are encountered in the areas of the basins.

7.3 Aesthetic Maintenance Procedures

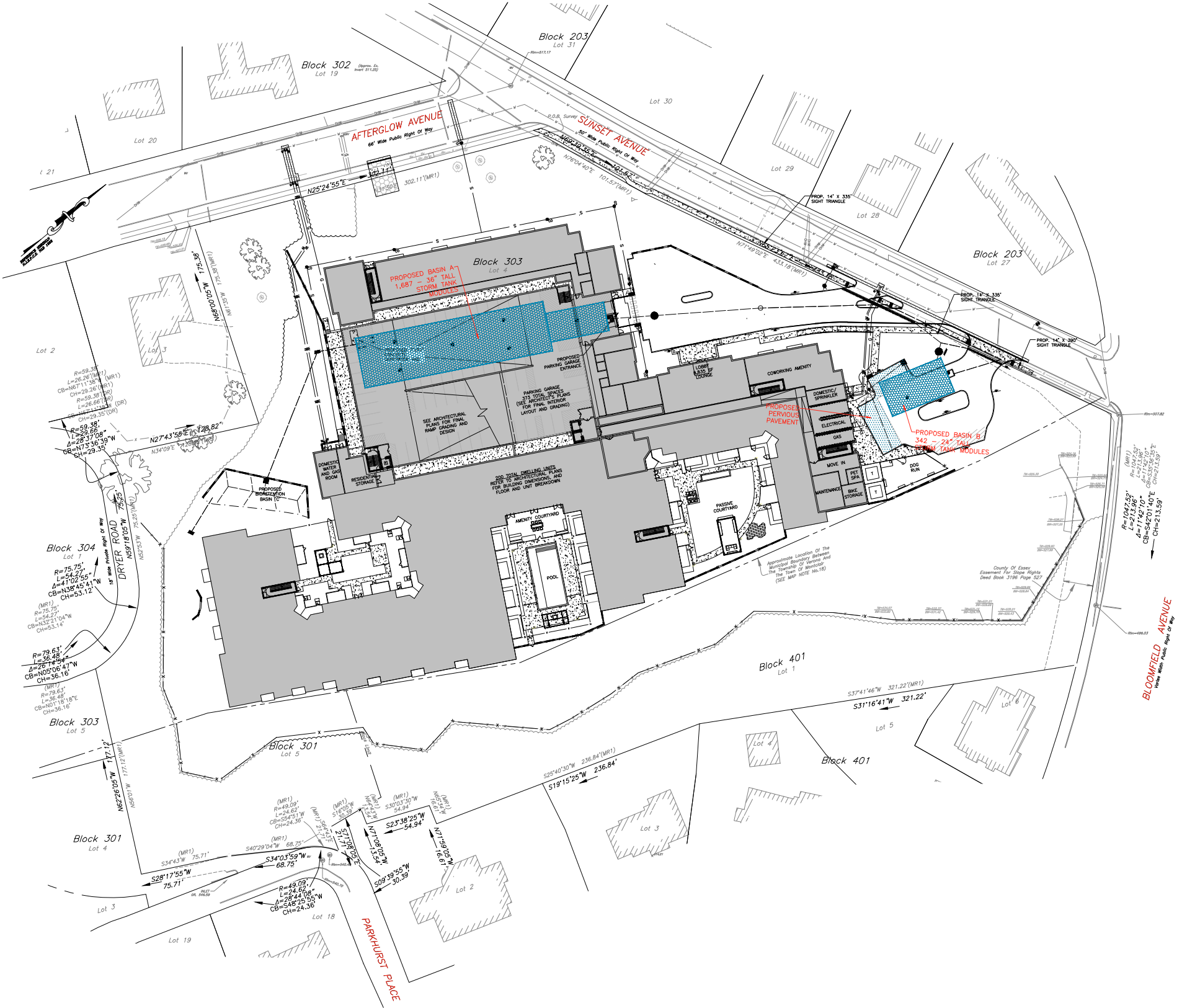
Aesthetic Maintenance, although not required to keep a SWMF operational, will maintain the visual appeal of a facility and will benefit everyone within the local community. Aesthetic Maintenance can also reduce the amount of required Preventative and Corrective Maintenance.

Aesthetic Maintenance may include the following:

1. Details: Careful, meticulous, and frequent attention to the performance of maintenance items such as painting, tree pruning, leaf collection, debris removal, and grass cutting will result in SWMF that remains both functional and attractive.

APPENDIX A

SITE LOCATION MAP


AFTERGLOW AVENUE
60' Wide Public Right Of Way
SUNSET AVENUE
50' Wide Public Right Of Way
DRYER ROAD
18' Wide Private Right Of Way
PARKHURST PLACE
BLOOMFIELD AVENUE
Varies Width Public Right Of Way
Block 203
Lot 31
Block 302
Lot 19
Lot 30
Lot 20
Lot 21
Lot 29
Lot 28
Block 203
Lot 27
Block 303
Lot 4
PROPOSED BASIN A
1,687 ± 36" TALL
STORM TANK
MODULES
PROPOSED BASIN B
342 ± 24" TALL
STORM TANK MODULES
PROPOSED
PERVIOUS
PAVEMENT
PROP. 14' X 335'
SIGHT TRIANGLE
PROP. 14' X 390'
SIGHT TRIANGLE
PROPOSED
PARKING GARAGE
ENTRANCE
PARKING GARAGE
373 TOTAL SPACES
(SEE ARCHITECTS PLANS
FOR FINAL INTERIOR
LAYOUT AND GRADING)
SEE ARCHITECTURAL
PLANS FOR FINAL
RAMP GRADING AND
DESIGN
LOBBY
6,835 SF
LOUNGE
COWORKING AMENITY
DOMESTIC/
SPRINKLER
ELECTRICAL
GAS
MOVE IN
MAINTENANCE
BIKE
STORAGE
PET
SPA
DOG
RUN
DOMESTIC
WATER
AND GAS
ROOM
RESIDENTIAL
STORAGE
200 TOTAL DWELLING UNITS
REFER TO ARCHITECTURAL PLANS
FOR BUILDING DIMENSIONS, AND
FLOOR AND UNIT BREAKDOWN
AMENITY COURTYARD
POOL
PASSIVE
COURTYARD
PROPOSED
BIORETENTION
BASIN 'C'
Block 304
Lot 1
Block 303
Lot 5
Block 301
Lot 5
Block 301
Lot 4
Block 401
Lot 1
Block 401
Lot 5
Lot 6
Lot 4
Lot 3
Lot 2
Lot 3
Lot 18
Lot 19
Lot 2
Lot 3
Approximate Location Of The
Municipal Boundary Between
The Township Of Verona And
The Town Of Montclair
(SEE MAP NOTE No.16)
County Of Essex
Easement For Slope Rights
Deed Book 3196 Page 527
N68°00'05"W 175.38'
N25°24'55"E 302.11'
N71°40'02"E 432.18'(MR1)
N71°40'02"E 101.52'(MR1)
N27°43'58"E 128.82"
S19°15'25"W 236.84'
S37°41'46"W 321.22'(MR1)
S31°16'41"W 321.22'
N61°26'05"W 177.12'
S28°17'55"W 75.71'
S34°03'59"W 68.75'
S23°38'25"W 54.94'
N71°08'05"W 13.54'
S09°39'55"W 30.39'
N71°59'05"W 16.67'
R=75.75'
L=54.27'
Δ=41°02'55"
CB=N38°45'41"W
CH=53.12'
R=79.63'
L=36.48'
Δ=26°14'54"
CB=N05°06'47"W
CH=36.16'
R=59.38'
L=29.66'
Δ=28°37'08"
CB=N73°36'39"W
CH=29.35'
R=49.09'
L=24.62'
Δ=28°44'08"
CB=S48°25'55"W
CH=24.36'
R=194.52'
L=213.86'
Δ=11°42'10"
CB=S42°01'40"E
CH=213.59'

APPENDIX B

INSPECTION CHECKLIST FOR STORMWATER MANAGEMENT FACILITIES

Inspection Checklist for Stormwater Management Facilities

Name of Facility: One Sunset
Location: 1 Sunset Ave., Verona Township, New Jersey Date: _____
Weather: _____

Facility Item	O.K.[1]	Routine[2]	Urgent[3]	Comments[4]
1. Bottoms (Below Ground Detention)				
A. Vegetation				
B. Erosion				
C. Standing Water				
D. Settlement				
E. Trash and Debris				
F. Sediment				
G. Aesthetics				
H. Other:				
2. Inlet Structure				
A. Condition of Structure				
B. Erosion				
C. Trash & Debris				
D. Sediment				
E. Aesthetics				
F. Other:				
3. Outlet Structure				
A. Condition of Structure				
B. Erosion				
C. Trash & Debris				
D. Sediment				
E. Mechanical Components				
F. Aesthetics				
G. Other:				
4. Perimeter				
A. Vegetation				
B. Erosion				
C. Trash & Debris				
D. Fences & Gates				
E. Aesthetics				
F. Other:				

Facility Item	O.K.[1]	Routine[2]	Urgent[3]	Comments[4]

5. Access Roads

A. Vegetation				
B. Road Surface				
C. Fence & Gates				
D. Erosion				
E. Aesthetics				
F. Other:				

6. Miscellaneous

A. Effectiveness of Existing Maintenance Program				
B. Dam Inspections				
C. Potential Mosquito Habitats				
D. Mosquitoes				
E. Mechanical Treament Devices				
F. Other				

[1] The item checked is in good condition and the maintenance program is adequate

[2] The item checked required attention, but does not present an immediate threat

[3] The item checked requires immediate attention

[4] Provide explanation and details if column 2 or 3 are checked.

APPENDIX C

MAINTENANCE LOG FOR STORMWATER MANAGEMENT FACILITIES

Maintenance Log for
Stormwater Management Facilities

Name of Facility: One Sunset
Location: 1 Sunset Ave., Verona Township, New Jersey

Preventative Maintenance

	Date								
Work Item	(√) Completed								
1. 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. Other:									
2. Sediment Removal									
A. Inlets									
B. Outlets and Trash Racks									
C. Bottoms									
D. Other:									
3. Mechanical Components									
A. Checkmate Valves									
B. Sluice Gates									
C. Access Hatches									
D. Other:									
4. Elimination of Potential Mosquito Breeding Habitats									
A.									
5. Other Preventative Maintence									
A.									
B.									

Maintenance Log for
Stormwater Management Facilities

Name of Facility: One Sunset

Location: 1 Sunset Ave., Verona Township, New Jersey

Corrective Maintenance

Date									

	Work Item	(√) Completed								
1	Removal of Debris & Sediment									
2	Structural Repairs									
3	Dam, Embankment & Slope Repairs									
4	Dewatering									
5	Pond Maintenance									
6	Control of Mosquitoes									
7	Erosion Repair									
8	Fence Repair									
9	Elimination of Trees, Brush, Roots & Animal Burrows									
10	Snow & Ice Removal									
11	Pumping System									
12	Other:									

Maintenance Log for
Stormwater Management Facilities

Name of Facility: One Sunset

Location: 1 Sunset Ave., Verona Township, New Jersey

Aesthetic Maintenance

Date									

Work Item	(√) Completed								
1 Trash/Sediment Removal									
2 Grass Trimming									
3 Weeding									
4 Other:									

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APPENDIX D

BRENTWOOD STORM TANK MAINTENANCE GUIDELINES AND INSPECTION & MAINTENANCE

STORMTANK®

Maintenance Guidelines

General:

The StormTank™ Stormwater Storage Module is a component in a stormwater collection system, providing storage for the detention or infiltration of runoff. No two systems are the same; with varying shapes, sizes and configurations. Some include pre-treatment to remove sediment and/or contaminants prior to entering the storage area and some do not. Systems without pre-treatment require greater attention to system functionality and may require additional maintenance.

In order to sustain system functionality Brentwood offers the following general maintenance guidelines.

Precautions:

1. Prior to & During Construction - Siltation prevention of the stormwater system.
   a. Conform to all local, state and federal regulations for sediment and erosion control during construction.
   b. Install site erosion and sediment BMP's (Best Management Practices) required to prevent siltation of the stormwater system.
   c. Inspect and maintain erosion and sediment BMP's during construction.
2. Post Construction - Prior to commissioning the StormTank™ system.
   a. Remove and properly dispose of construction erosion and sediment BMP's per all local, state and federal regulations. Care should be taken during removal of the BMP's as not to allow collected sediment or debris into the stormwater system.
   b. Flush the StormTank™ system to remove any sediment or construction debris immediately after the BMP's removal. Follow the maintenance procedure outlined.

Inspections:

Follow all local, state, and federal regulations regarding stormwater BMP inspection requirements.

Brentwood Industries makes the following recommendations:

1. Frequency
   a. During the first service year a visual inspection should be completed during and after each major rainfall event, in addition to semi-annually, to establish a pattern of sediment and debris buildup.
      i. Each stormwater system is unique and multiple criteria can affect maintenance frequency such as:

a) System Design: pre-treatment/no-pretreatment, inlet protection, stand alone device.
b) Surface Area Collecting From: hardscape, gravel, soil.
c) Adjacent Area: soil runoff, gravel, trash.
d) Seasonal Changes: fall-leaves, winter-salt/cinders.

b. Second year plus; establish an annual inspection frequency based on the information collected during the first year. At a minimum an inspection should be perform semi-annually.
c. Seasonal change; regional areas affected by seasonal change (spring, summer, fall, winter) may require additional inspections at the change of seasons in addition to semi-annually.

2. Inspect:
   a. Inspection ports.
   b. Inflow and outflow points including the inlet/manhole and pipes.
   c. Discharge area.
3. Identify and Report maintenance required:
   a. Sediment and debris accumulation.
   b. System backing up.
   c. Flow rate change.

Maintenance Procedures:

1. Conform to all local, state and federal regulations.
2. Determine if maintenance is required. If a pre-treatment device is installed, follow manufacturer recommendations.
3. Using a vacuum pump truck evacuate debris from the inflow and outflow points.
4. Flush the system with clean water forcing debris from the system. Take care to avoid extreme direct water pressure when flushing the system.
5. Repeat steps 3 and 4 until no debris is evident.

These maintenance guidelines were written by Brentwood Industries, Inc. with the express purpose of providing helpful hints. These guidelines are no to be construed as the only Brentwood approved methods for StormTank™ system maintenance or the final authority in system maintenance. Check with the stormwater system owner/project engineer for their contract/specification requirements and or recommendations. Contact your local StormTank™ distributor or Brentwood Industries for additional technical support if required.

10.0 INSPECTION & MAINTENANCE

Description

Proper inspection and maintenance of a subsurface stormwater storage system are vital to ensuring proper product functioning and system longevity. It is recommended that during construction the contractor takes the necessary steps to prevent sediment from entering the subsurface system. This may include the installation of a bypass pipe around the system until the site is stabilized. The contractor should install and maintain all site erosion and sediment per Best Management Practices (BMP) and local, state, and federal regulations.

Once the site is stabilized, the contractor should remove and properly dispose of erosion and sediment per BMP and all local, state, and federal regulations. Care should be taken during removal to prevent collected sediment or debris from entering the stormwater system. Once the controls are removed, the system should be flushed to remove any sediment or construction debris by following the maintenance procedure outlined below.

During the first service year, a visual inspection should be completed during and after each major rainfall event, in addition to semi-annual inspections, to establish a pattern of sediment and debris buildup. Each stormwater system is unique, and multiple criteria can affect maintenance frequency. For example, whether or not a system design includes inlet protection or a pretreatment device has a substantial effect on the system's need for maintenance. Other factors include where the runoff is coming from (hardscape, gravel, soil, etc.) and seasonal changes like autumn leaves and winter salt.

During and after the second year of service, an established annual inspection frequency, based on the information collected during the first year, should be followed. At a minimum, an inspection should be performed semi-annually. Additional inspections may be required at the change of seasons for regions that experience adverse conditions (leaves, cinders, salt, sand, etc).

Maintenance Procedures

Inspection:

1. Inspect all observation ports, inflow and outflow connections, and the discharge area.
2. Identify and log any sediment and debris accumulation, system backup, or discharge rate changes.
3. If there is a sufficient need for cleanout, contact a local cleaning company for assistance.

Cleaning:

1. If a pretreatment device is installed, follow manufacturer recommendations.
2. Using a vacuum pump truck, evacuate debris from the inflow and outflow points.
3. Flush the system with clean water, forcing debris from the system.
4. Repeat steps 2 and 3 until no debris is evident.

APPENDIX E

MAINTENANCE COSTS

MAINTENANCE COSTS

Routine preventative maintenance of the systems consists of removal of sediment. The range of cost for this task is as follows:

Sediment Removal	$1,000.00 each occurrence	to	$5,000 each occurrence

Corrective maintenance costs associated with the systems are as follows:

Inlet Repair	$50.00 each	to	$750.00 each
Control Structure Repair	$500 each	to	$5,000 each
Underground Detention System Module Replacement	$250 each	to	$1,000 each