STORMWATER MANAGEMENT FACILITIES OPERATIONS & MAINTENANCE MANUAL

for

Proposed Office Building

Prepared for

Heller Property Partners, LP
Block 2001, Lots 19, 20, 21, 22 & 23
176, 178 & 180 Main Street
Borough of Madison
Morris County, New Jersey

Prepared by

BOHLER

N.J. Certificate of Authorization 24GA28161700

30 Independence Blvd, Suite 200
Warren, NJ 07059
908-668-8300

Robert L. Streker, P.E.
New Jersey Professional Engineer
License No. 45344

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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.
4. "NJ Stormwater Best Management Practices Manual: Chapter 8" – provides general information to be included and considered in a maintenance plan.
5. "NJ Stormwater Best Management Practices Manual: Chapter 9.3" – provides maintenance requirements for dry wells.
6. "NJ Stormwater Best Management Practices Manual: Chapter 9.5" – provides maintenance requirements for infiltration basins.
7. "Probable Annual Costs for Inspection and Preventive & Corrective Maintenance"
8. Kraken Filter Manual
9. The Kraken Filter – Operation & Maintenance recommendations
10. Storm Trap Stormwater Management Solutions information

1.0 PROJECT DETAILS

1.1 Introduction and Description of Facilities:

The project site has frontage on Main Street (New Jersey State Highway Route 124) and is situated within Madison, New Jersey. The site is currently a two-story office building with a rear surface parking lot. The subject site is more specifically defined as Block 2001, Lots 19, 20, 21, 22 & 23;

The various design parameters established by the Borough of Madison will require the construction of an infiltration system to collect runoff from the proposed site development. The infiltration systems are proposed to control the peak rate of runoff and to enhance discharge water quality for the existing site. The site also includes a water quality unit. Note that the subject site is within Metropolitan Planning Area PA-1 and therefore, the site is exempt from the NJDEP recharge requirements. Additionally, the total limit of disturbance is under one acre and less than one-quarter of an acre of new impervious surface is proposed. Therefore, the project does not qualify as a major development and does not need to meet NJDEP water quality and quantity requirements.

Under post-development conditions, the stormwater management facilities will include a new underground infiltration basin, the two existing detention basins, a water quality unit, and associated inlets, catch basins and piping.

This manual consists of three parts. The first part includes the introduction, project description and a list of project contacts. The second part provides the operation and maintenance instructions for the facilities and equipment. The third part (Appendix) provides information regarding the inspection and maintenance activities. All maintenance procedures are to be applied to the proposed and existing stormwater facilities on-site.

Please refer to Appendix 4, Chapter 8 of the NJ Stormwater Best Management Practices, for a list of information to be included and considered in this maintenance plan.

1.2 Project Contacts:

<u>Borough of Madison Municipal Engineer:</u>
Address: 50 Kings Road, Madison, NJ 07940
Tel. (973) 593-3060
Attn: Frank Russo, Borough Engineer

<u>Borough of Madison Dept. of Public Works:</u>
Address: 34 John Avenue, Madison, NJ 07940
Tel (973) 593-3088
Attn: Ken O'Brien

<u>New Jersey Department of Transportation</u>
Address: 1035 Parkway Avenue, Ewing, NJ 08618
Tel (732) 625-4340

<u>Site Design Engineer:</u>
Bohler Engineering
Address: 35 Technology Drive, Warren, NJ 07059
Tel. (908) 668-8300
Attn: Robert L. Streker, PE

Party Responsible for Maintaining Stormwater Management Facility:

Heller Property Partners, LP
Address: 180 Main Street, Madison, NJ 07940
Tel. (973) 377-6000
Attn: Chris Hricko

2.0 INSPECTION AND MAINTENANCE:

2.1 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.

Both the proposed storm trap system and the existing underground basin system will be maintained in the same fashion as described hereinto. Below is a summary of design water elevations for each onsite basin in a given storm event.

BASIN VOLUME SUMMARY

	2-yr Storm Elevation	10-yr Storm Elevation	100-yr Storm Elevation
Proposed Basin	**222.55**	**225.31**	**226.49**
Exist. Basin #1	**221.79**	**224.52**	**224.80**
Exist. Basin #2	**217.13**	**218.01**	**218.30**

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:

2.1.1 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) *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.

b) *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.

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.

c) *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 function is removal of all obstructions to natural flow patterns before stagnant water conditions can develop.

d) *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.

e) *Parking lot maintenance:*

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

2.1.2 Corrective Maintenance Procedures:

a) Removal of Debris and Sediment:

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

b) Structural Repairs:

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

c) 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.

d) 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.

e) 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.

2.1.3 Aesthetic Maintenance Procedures:

a) Grass Trimming/Landscape Maintenance:

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

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

In the event that a shrub should experience more than 2/3 die back, it should be replaced in kind as soon as possible in either the spring or fall planting season. The replacement

shrub should be the same species as the original and installed at the size and condition as specified on the original landscape plans. If, for any reason, a substitution of species or size must be made, it shall be subject to the approval of the project Landscape Architect.

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

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

Summary of Maintenance Procedures:

Preventative Maintenance

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

Corrective Maintenance

a) Removal of Debris and Sediment
b) Structural Repairs
c) Extermination of Mosquitoes
d) Erosion Repair
e) Snow and Ice Removal

Aesthetic Maintenance

a) Grass Trimming/Landscape Maintenance

2.1.4 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)

Transportation Equipment

Debris, Trash and Sediment Removal Equipment

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

Miscellaneous Equipment

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

Standard Mechanics Tools

Tools for Maintenance of Equipment

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

2.1.5 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.

4. "NJ Stormwater Best Management Practices Manual: Chapter 8" – list of information to be included in this Maintenance Report.

5. "NJ Stormwater Best Management Practices Manual: Chapter 9.3" – provides maintenance requirements for drywells.

6. "NJ Stormwater Best Management Practices Manual: Chapter 9.5" – provides maintenance requirements for infiltration basins.

7. "Probable Annual Costs for Inspection and Preventive & Corrective Maintenance"

A P P E N D I X

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. INFILTRATION BASIN - TILING BOTTOM SAND LAYER			
9. 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. FENCE REPAIR			
9. SNOW AND ICE REMOVAL			
10. OTHER			

C. AESTHETIC MAINTENANCE

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

REMARKS (REFER TO ITEM NO. IF APPLICABLE) _____

WORK ORDER PREPARED BY: _____

MAINTENANCE LOG FOR STORMWATER MANAGEMENT FACILITIES

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. SAND LAYER REPLACEMENT					
11. 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: _____

NJ STORMWATER BEST MANAGEMENT PRACTICES CHAPTER 8

New Jersey Stormwater Best Management Practices Manual

February 2004

C H A P T E R 8

Maintenance and Retrofit of Stormwater Management Measures

Maintenance of Stormwater Management Measures

Research and experience have demonstrated that regular and thorough maintenance is necessary for stormwater management measures to perform effectively and reliably. They have also demonstrated that failure to perform such maintenance can lead to diminished performance, deterioration, and failure, in addition to a range of health and safety problems including mosquito breeding, vermin, and the potential for drowning. The potential for such problems to develop is accentuated by many of the very features and characteristics that allow stormwater management measures to do their job, including standing or slowing moving water, dense vegetation, forebays, trash racks, dams, and the need to continually function in all types of weather. As implied by their name, stormwater management measures are also expected to become the repositories for sediment, nutrients, trash, debris, and other pollutants targeted by the NJDEP Stormwater Management Rules. For this reason, stormwater management measures share maintenance requirements with more mundane items as vacuum cleaner bags, car motor filters, and floor mats, all of which require regular inspection and cleaning, sediment and debris removal, and periodic replacement.

In recognition of these needs and potential problems, the NJDEP Stormwater Management Rules require that a maintenance plan be developed for all stormwater management measures incorporated into the design of a major development. This maintenance plan must contain specific preventative and corrective maintenance tasks, schedules, cost estimates, and the name, address, and telephone number of the person or persons responsible for the measures' maintenance.

In accordance with the Rules, this section of Chapter 8 has been developed to provide guidelines for the development of such maintenance plans. Specific maintenance guidance for structural stormwater management measures is presented in *Chapter 9: Structural Stormwater Management Measures*. Additional maintenance information is also provided in the NJDEP Stormwater Management Facility Maintenance Manual, including maintenance tasks and equipment, inspection procedures and schedules, ownership responsibilities, and design recommendations to minimize and facilitate inspection and maintenance tasks.

Finally, it should be noted that a stormwater management measure that includes a dam as defined in the NJDEP Dam Safety Standards at N.J.A.C. 7:20 must also have an operations and maintenance manual for the dam as described at 7:20-1.11.

Maintenance Plan Contents

According to the NJDEP Stormwater Management Rules, all maintenance plans for stormwater management measures must include the following:

1. The name, address, and telephone number of the person or persons responsible for the preventative and corrective maintenance of the stormwater management measure. If the plan identifies a party other than the owner or developer as having responsibility for maintenance, i.e., a public entity or homeowners' association, the plan must include a copy of the other party's written agreement to assume this responsibility. This agreement must include a copy of any ordinance or regulation that requires the owner or developer to dedicate the stormwater management measure and/or its maintenance to the other party.
2. 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. Detailed maintenance information for specific structural stormwater management measures is presented in Chapter 9. Maintenance needs of nonstructural measures are discussed in *Chapter 2: Low Impact Development Techniques*.
3. A schedule of regular inspections and tasks. Detailed inspection tasks and schedules for specific structural stormwater management measures are presented in Chapter 9.
4. Cost estimates of maintenance tasks, including sediment, trash, and debris removal.
5. Detailed logs of all preventative and corrective maintenance performed at the stormwater management measure, including all maintenance-related work orders.

In addition, as described in the NJDEP Stormwater Management Facility Maintenance Manual, the following items should also be included in the maintenance plan:

1. Maintenance 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.
2. Recommended corrective responses to various emergency conditions that may be encountered at the stormwater management measure. It should be noted that, if the stormwater management measure includes a Class I or II dam as defined in the NJDEP Dam Safety Standards at N.J.A.C. 7:20, an emergency action plan for the dam is also required. See N.J.A.C. 7:20-1.7(f) for more information.
3. Maintenance, repair, and replacement instructions for specialized, proprietary, and nonstandard measure components, including manufacturers' product instructions and user manuals.
4. Procedures and equipment required to protect the safety of inspection and maintenance personnel.
5. Approved disposal and recycling sites and procedures for sediment, trash, debris, and other material removed from the measure during maintenance operations.
6. Originals or copies of manufacturers' warranties on pertinent measure components.
7. As-built construction plans of the stormwater management measure and copies of pertinent construction documents such as laboratory test results, permits, and completion certificates.

Maintenance Plan Considerations

In addition to the plan contents described above, a maintenance plan should address the following important aspects of stormwater management measure maintenance.

Access

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

Training of Maintenance Personnel

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 a 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.

Aesthetics

The impacts of the aesthetics of the stormwater management measures on the surrounding community should be included in the consideration for the design and selection of the stormwater management measure.

Required Maintenance Plan Procedures

Once the maintenance plan is completed, the NJDEP Stormwater Management Rules require that the following procedures be followed:

1. Copies of the maintenance plan must be provided to the owner and operator of the stormwater management measure. Copies must also be submitted to all reviewing agencies as part of each agency's approval process. In addition, a copy should be provided to the local mosquito control or extermination commission upon request.
2. The title and date of the maintenance plan and the name, address, and telephone number of the person with stormwater management measure maintenance responsibility as specified in the plan must be recorded on the deed of the property on which the measure is located. Any change in this information due, for example to a change in property ownership, must also be recorded on the deed.
3. The person with maintenance responsibility must evaluate the maintenance plan for effectiveness at least annually and revise as necessary.
4. A detailed, written log of all preventative and corrective maintenance performed at the stormwater management measure must be kept, including a record of all inspections and copies of maintenance-related work orders.
5. 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.

NJ STORMWATER BEST MANAGEMENT PRACTICES CHAPTER 9.3

determine and evaluate the extent of the data inconsistency and whether there is a need for revised site runoff and BMP design computations. All significant inconsistencies should be discussed with the local Soil Conservation District prior to proceeding with such redesign to help ensure that the final site soil data is accurate.

Geology

The presence or absence of Karst topography is an important consideration when designing a dry well; in areas of the State with this type of geology, the bedrock is composed of highly soluble rock. If Karst topography is present, infiltration of runoff may lead to subsidence and sinkholes; therefore, careful consideration must be taken in these areas. For more information on design and remediation in areas of Karst topography, refer to the *Standards for Soil Erosion and Sediment Control in New Jersey: Investigation, Design and Remedial Measures for Areas Underlain by Cavernous Limestone.*

Maintenance

Regular and effective maintenance is crucial to ensure effective dry well performance; in addition, maintenance plans are required for all stormwater management facilities associated with a major development. There are a number of required elements in all maintenance plans, pursuant to N.J.A.C. 7:8-5.8; these are discussed in more detail in *Chapter 8: Maintenance of Stormwater Management Measures*. Furthermore, maintenance activities are required through various regulations, including the New Jersey Pollutant Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A. Specific maintenance requirements for dry wells are presented below; these requirements must be included in the maintenance plan.

General Maintenance

- All structural components must be inspected, at least once annually, for cracking, subsidence, spalling, erosion and deterioration.
- Components expected to receive and/or trap debris must be inspected for clogging at least four times annually, as well as after every storm exceeding 1 inch of rainfall.
- Disposal of debris, trash and other waste material must be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste regulations.
- Access points for maintenance are required on all dry wells; these access points must be clearly identified in the maintenance plan. In addition, any special training required for maintenance personnel to perform specific tasks, such as confined space entry, must be included in the plan.

Drain Time

- The water level in the inspection port is the primary means of measuring the infiltration rate and drain time; therefore, the water level associated with the design storm must be included in the maintenance plan.

- The design drain time for the maximum design storm runoff volume must be indicated in the maintenance plan.
- If the actual drain time is longer than the design drain time, the dry well must be evaluated and appropriate measures must be taken to return the dry well to the as-built condition.
- If the dry well fails to fully drain the Water Quality Design Storm within 72 hours, corrective action must be taken and the maintenance manual revised accordingly to prevent similar failures in the future.

NJ STORMWATER BEST MANAGEMENT PRACTICES CHAPTER 9.5

- When using a structural BMP for pretreatment, it must be designed in accordance with the design requirements outlined in its respective chapter. For additional information on the design requirements of each structural BMP, refer to the appropriate chapter in this manual.

Soil Characteristics

Soils are perhaps the most important consideration for site suitability. In general, County Soil Surveys may be used to obtain necessary soil data for planning and preliminary design of infiltration basins. However, as previously mentioned, for final design and construction, soil tests are required at the exact location of the proposed basin in order to confirm its ability to function properly without failure. In order to confirm reasonable data consistency, the results of soil testing should be compared with the County Soil Survey data that was used in the computation of runoff rates and volumes and the design of on-site BMPs. If significant differences exist between the soil test results and the County Soil Survey data, additional soil tests are recommended to determine and evaluate the extent of the data inconsistency and whether there is a need for revised site runoff and BMP design computations. All significant inconsistencies should be discussed with the local Soil Conservation District prior to proceeding with such a redesign to help ensure that the final site soil data is accurate.

Geology

The presence or absence of Karst topography is an important consideration when designing an infiltration basin; in areas of the State with this type of geology, the bedrock is composed of highly soluble rock. If Karst topography is present, infiltration of runoff may lead to subsidence and sinkholes; therefore, careful consideration must be taken in these areas. For more information on design and remediation in areas of Karst topography, refer to the *Standards for Soil Erosion and Sediment Control in New Jersey: Investigation, Design and Remedial Measures for Areas Underlain by Cavernous Limestone.*

Maintenance

Regular and effective maintenance is crucial to ensure effective infiltration basin performance; in addition, maintenance plans are required for all stormwater management facilities on a major development. There are a number of required elements in all maintenance plans, pursuant to N.J.A.C. 7:8-5.8; these are discussed in more detail in *Chapter 8: Maintenance of Stormwater Management Measures*. Furthermore, maintenance activities are required through various regulations, including the New Jersey Pollutant Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A. Specific maintenance requirements for infiltration basins are presented below; these requirements must be included in the basin's maintenance plan.

General Maintenance

- Proper and timely maintenance is essential to continuous, effective operation; therefore, an access route must be incorporated into the design, and it must be properly maintained.
- All structural components must be inspected, at least once annually, for cracking, subsidence, spalling, erosion and deterioration.

- Components expected to receive and/or trap debris and sediment must be inspected for clogging at least four times annually, as well as after every storm exceeding 1 inch of rainfall.
- Sediment removal should take place when all runoff has drained from the planting bed and the basin is dry.
- Disposal of debris, trash, sediment and other waste material must be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste regulations.
- Access points for maintenance are required on all enclosed areas within an infiltration basin; these access points must be clearly identified in the maintenance plan. In addition, any special training required for maintenance personnel to perform specific tasks, such as confined space entry, must be included in the plan.
- Stormwater BMPs may not be used for stockpiling of plowed snow and ice, compost, or any other material.

Drain Time

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

PROBABLE ANNUAL COSTS FOR INSPECTION AND PREVENTIVE & CORRECTIVE MAINTENANCE

PROBABLE ANNUAL COSTS FOR INSPECTION AND, PREVENTIVE & CORRECTIVE MAINTENANCE

OPERATION AND MAINTENANCE OF STORMWATER MANAGEMENT STRUCTURES

Location: Block 2001; Lots 19, 20, 21, 22 &23
176, 178 &180 Main Street
Borough of Madison in Morris County, NJ

	QUANTITY	UNIT	UNIT COST	TOTAL COST
INSPECTION				
Quarterly Inspection for clogging, damage,sedimentation	4	Visit	$250.00	$1,000.00
Inspection for clogging, ponding, sedimetation after storm event exceeding 1'	4	Visit	$250.00	$1,000.00
Annual inspection for erosion,scour & damage	1	Visit	$250.00	$250.00
Annual time-to-drain tests, condition of outlet valves	1	Visit	$250.00	$250.00
	Annual Inspection costs			**$2,500.00**
PREVENTIVE AND CORRECTIVE MAINTENANCE				
Mow/Trim grass	0.7	Acres	$50.00	$35.00
Unblock and vacuum stormwater inlets	7	No	$20.00	$140.00
Clean,unblock,and remove sediments from RCP, Manhole	1	Lumpsum	$1,500.00	$1,500.00
Clean and unblock basin inlets & outlets	7	No	$50.00	$350.00
Re-establish vegetative cover	500	SF	$1.50	$750.00

Note: Maintenance shall be carried out when and to the extent of the situation as it arises.

KRAKEN FILTER MANUAL

Bio Clean

A Forterra Company

Kraken™ Filter

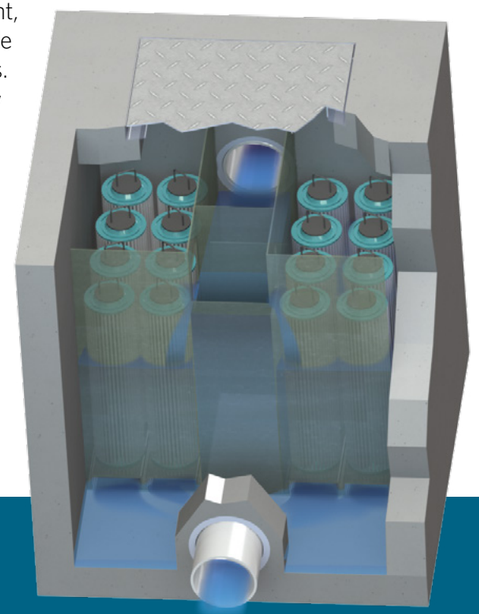
A Stormwater Filtration Solution

OVERVIEW

The Bio Clean Kraken™ Filter is a state-of-the-art system utilizing advanced membrane filtration, ensuring a high level of removal for not only TSS, but also metals, trash, nutrients, and hydrocarbons. The Kraken™ membrane filters provide high flow rates and over 170 sq. ft. of surface area. This much surface area allows it to operate at a loading rate of only 0.05 gpm/sq. ft. to ensure maximum performance and minimum maintenance. The Kraken™ Filter's low loading rate successfully overcomes high maintenance requirements and frequent clogging issues often found in other filter systems advertising high loading rates.

Each membrane filter is lightweight, washable, reusable, and more sustainable than typical granular-filled media cartridges. By eliminating the need to purchase new granular media and dispose of spent media, the Kraken™ Filter provides lower life cycle and maintenance costs.

Each membrane filter is equipped with easy-to-grab handles and is pressure fitted, allowing it to be quickly removed, cleaned, and reattached without the use of tools.



MEMBRANE FILTERS

PERFORMANCE

85-89% REMOVAL OF TOTAL SUSPENDED SOLIDS (TSS)

72% REMOVAL OF PHOSPHORUS

ADVANTAGES

- NO GRANULAR MEDIA TO REPLACE
- HIGH FLOW RATES AND MAXIMUM SURFACE AREA
- LOADING RATE OF 0.05 GPM / SQ. FT. FOR MINIMAL MAINTENANCE
- FILTERS ARE EASILY REMOVED AND CLEANED BY HAND
- BUILT-IN PRETREATMENT CHAMBER CAPTURES TRASH, SEDIMENTS, DEBRIS, AND HYDROCARBONS
- FILTERS DRY OUT BETWEEN STORM EVENTS TO PREVENT BIOFILM GROWTH WHICH CAN CAUSE CLOGGING AND OTHER PERFORMANCE ISSUES
- NJDEP ONLINE INSTALLATION APPROVED

APPROVALS

The Kraken™ Filter has received NJCAT Verification for 89% TSS removal and NJDEP Certification at an 80% TSS removal rate. In addition, the Kraken™ Filter NJCAT Verification is also for online installations.

NJCAT Verified

NJDEP Certified

TAPE PERFORMANCE

State of Washington TAPE GULD Basic Phosphorus

The Kraken Membrane Filter received distinguished performance recognition and certification from the Washington State Department of Ecology. Washington Ecology's Technology Acceptance Protocol – Ecology (TAPE) has granted General Use Level Designation (GULD) treatment approvals for Basic (Total Suspended Solids - TSS), and Total Phosphorous (TP).

POLLUTANT	AVERAGE INFLUENT CONCENTRATION (mg/L)	AVERAGE EFFLUENT CONCENTRATION (mg/L)	REMOVAL EFFICIENCY
Total Suspended Solids	73.1	7.0	89%
Total Phosphorus	0.151	0.034	72%
Suspended Solids Conc.	151.3	6.9	89%
Nitrogen (TKN)	1.5	1.0	31%
Fecal Coliform	692	355	60%
Motor Oil	4.6	0.7	81%
Total Zinc	0.158	0.054	54.3%
Total Copper	0.042	0.017	52%
Diesel Range Organics	1.2	0.4	65%

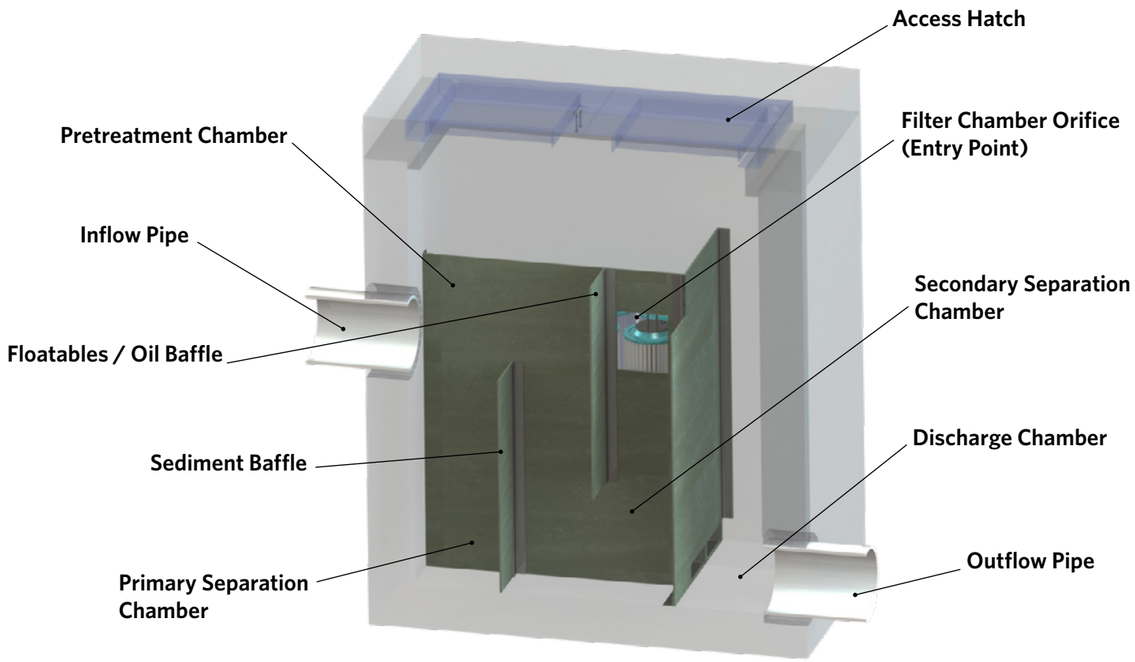
SPECIFICATIONS

Based on Max Cartridge Capacity

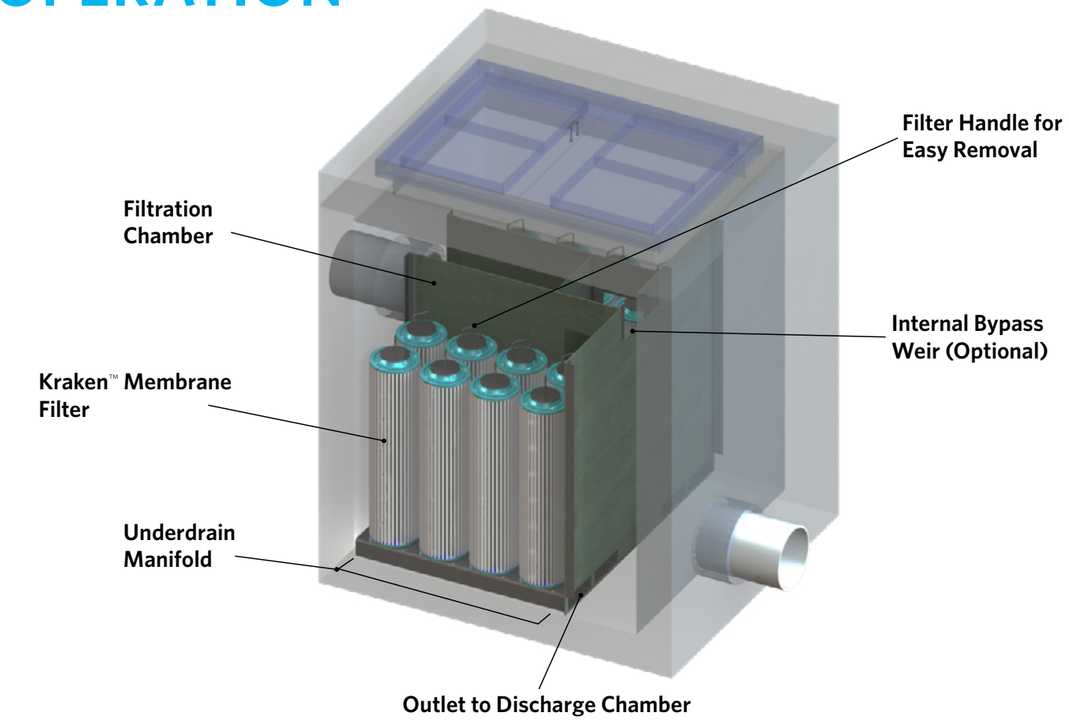
MODEL #	STRUCTURE SIZE (ft. x ft.)	CARTRIDGE CAPACITY	MAX MEDIA SURFACE AREA (sq. ft.)	TREATMENT FLOW CAPACITY (cfs)
KF-4-4	4′ x 4′	9 to 16	2720	0.30
KF-4-6	4′ x 6′	17 to 24	4080	0.46
KF-4-8	4′ x 8′	25 to 32	5440	0.61
KF-8-8	8′ x 8′	33 to 48	8160	0.91
KF-8-10	8′ x 10′	49 to 65	11220	1.25
KF-8-12	8′ x 12′	66 to 78	13260	1.48
KF-8-14	8′ x 14′	79 to 96	16320	1.82
KF-8-16	8′ x 16′	97 to 114	19380	2.16
KF-10-16	10′ x 16′	115 to 152	25840	2.88

See design manual for list of all models. Many other models and structure sizes are available for higher flows. Please contact us for more details.

OPERATION

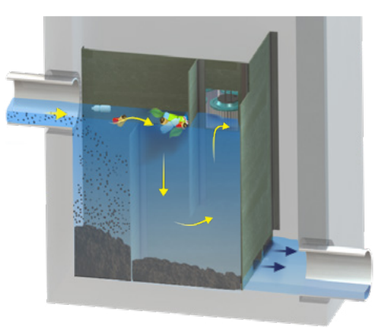


OPERATION



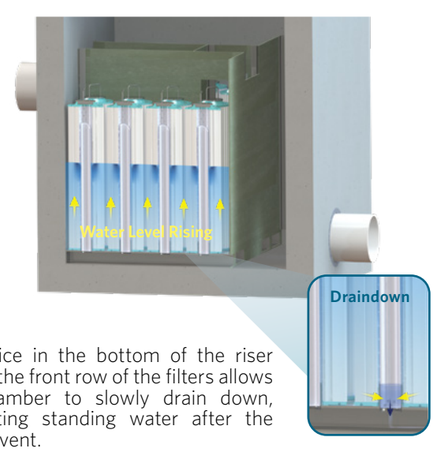
1 PRETREATMENT

To reduce loading on the membrane filter, runoff is initially passed through the pretreatment chamber to capture trash, hydrcarbons, and sediments. Once runoff is pretreated, it is directed to the filter chambers for primary treatment.



2 MEMBRANE FILTRATION FILL-UP

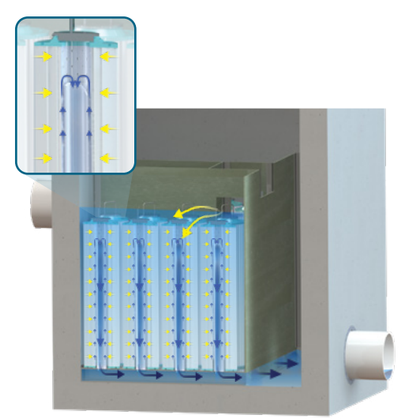
During the fill-up process, a riser tube prevents flow through the membrane filter until the water level nears the top of the filter. This ensures loading is evenly distributed over the vertical height, maximizing efficiency.



An orifice in the bottom of the riser tube in the front row of the filters allows the chamber to slowly drain down, eliminating standing water after the storm event.

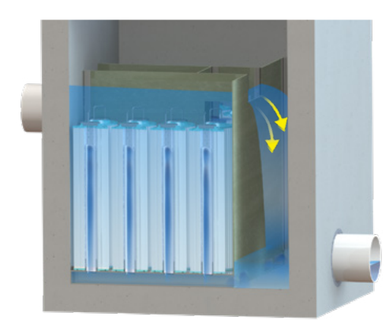
3 MEMBRANE FILTRATION PEAK CAPACITY

As the water level reaches the top of the membrane filters, flow through will begin. The riser tube creates an upward flow path within each filter to increase performance. Treated water then passes down the riser tube and collects in the underdrain manifold and flows to the discharge chamber.



4 BYPASS

An optional internal bypass is available with most system configurations. When flows exceed the treatment capacity of the system, the water level rises and goes into bypass. High flows are conveyed from the pretreatment chamber directly to the discharge chamber to prevent scouring of fine sediments captured within the filtration chamber.



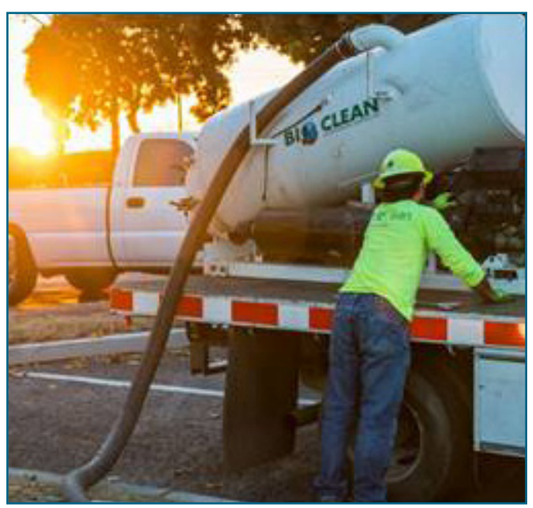
INSTALLATION

Small footprint reduces installation and shipping costs.

No deep sump chamber (as found with tentacle-type systems) and reduces excavation costs.

MAINTENANCE

Lowest lifecycle cost of any media filter with fast and simple maintenance procedures.



Easily cleaned with a standard vacuum truck, and reusable filter can be cleaned with a standard garden hose.

Bio Clean
A Forterra Company

5796 Armada Drive Suite 250
Carlsbad, CA 92008
855.566.3938
stormwater@forterrabp.com
biocleanenvironmental.com

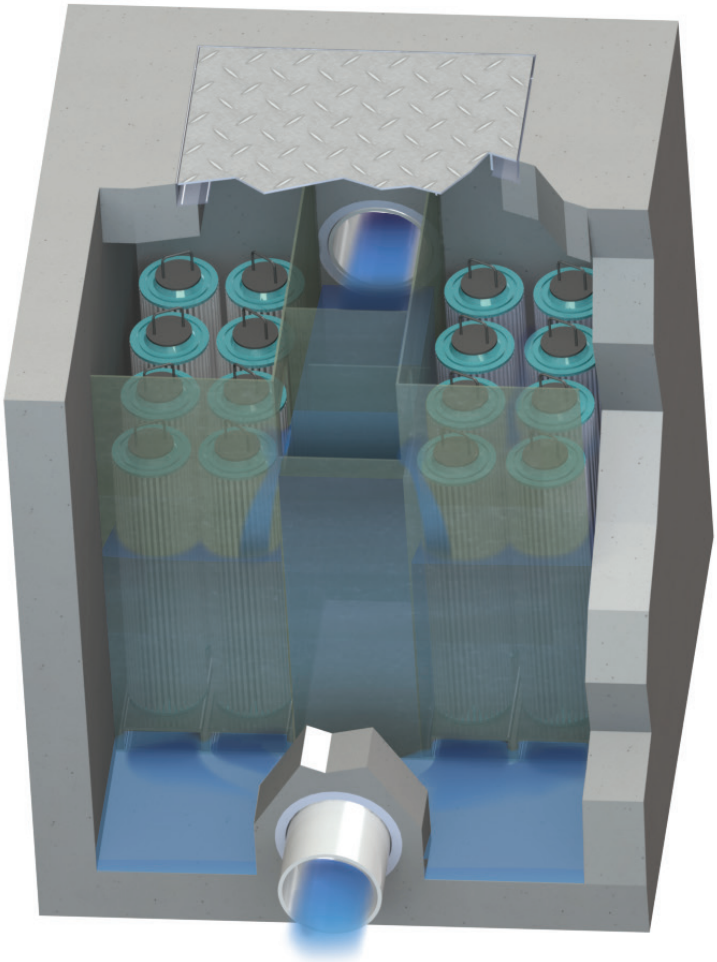
012220

THE KRAKEN FILTER – OPERATION & MAINTENANCE RECOMMENDATIONS

THE KRAKEN FILTER™

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



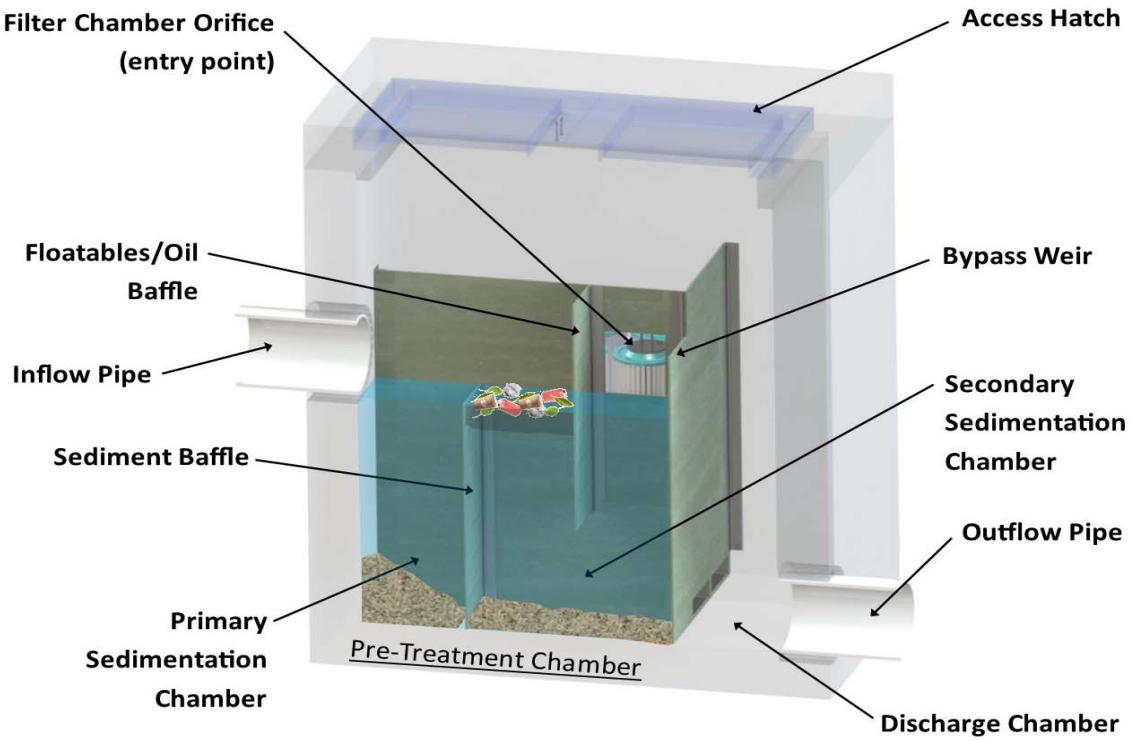
Bio Clean Environmental Services, Inc.
2972 San Luis Rey Road
Oceanside, CA 92054

www.BioCleanEnvironmental.com
P 760-433-7640
F 760-433-3176

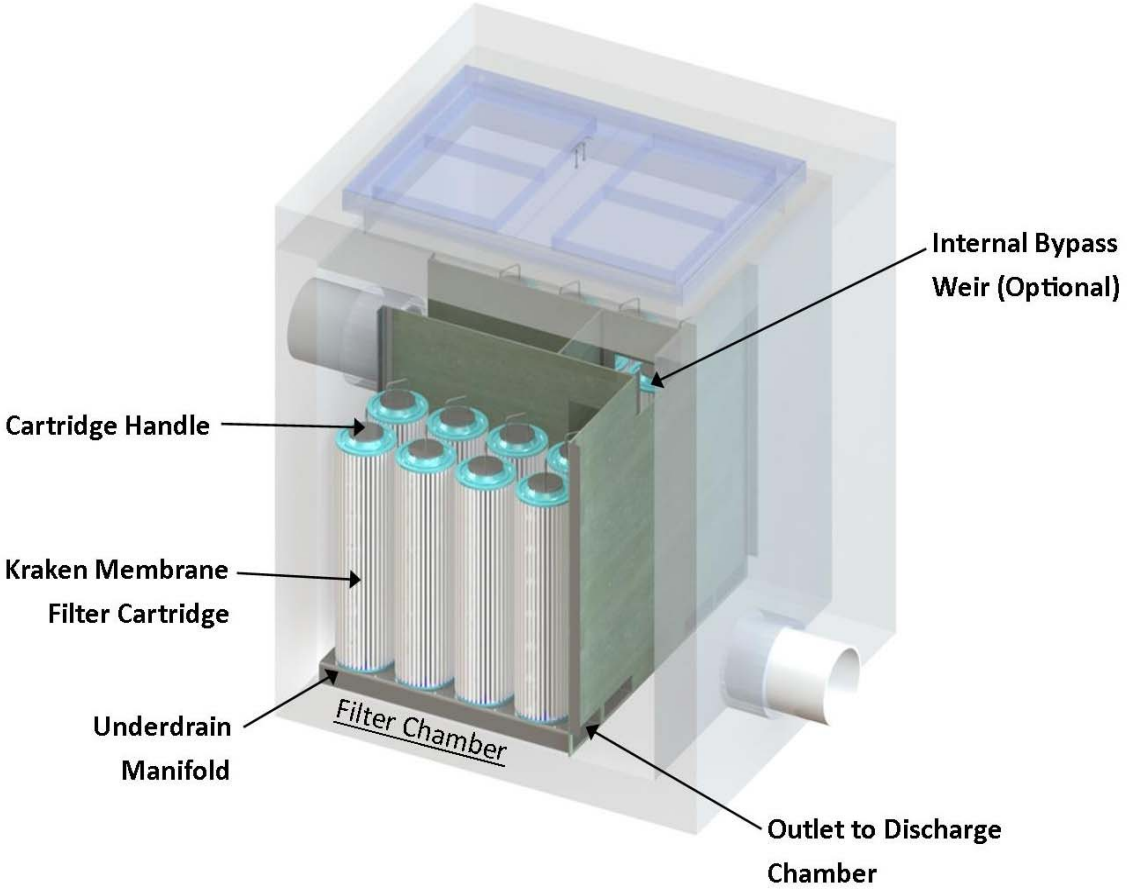
OPERATION & MAINTENANCE

The Kraken® Filter is designed at a minimal loading rate of only 0.05 gpm/sq ft of media surface to maximize longevity and minimize maintenance requirements. This is lower than any other system available. Passive backwash and pretreatment also help to minimize system maintenance requirements. The Kraken® Filter has proven to be able to handle up to at least 18 months sediment loading with no maintenance or loss of treatment capacity assuming 600 pounds of sediment per acre of impervious surface annually.

Yet, as with all stormwater BMPs inspection and maintenance on the Kraken® Filter is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess the site specific loading conditions. This is recommended because pollutant loading and pollutant characteristics can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding on roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided. Without appropriate maintenance a BMP will exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



Pre-Treatment Chamber Diagram:



Filter Chamber Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Kraken® Filter:

- Bio Clean Environmental Inspection Form.
- Flashlight.
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate traffic control signage and procedures.
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Kraken® Filter are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long term inspection and maintenance interval requirements.

The Kraken® Filter can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the system and all of its chambers.
- Look for any out of the ordinary obstructions in the inflow pipe, pre-treatment chamber, filter chambers, discharge chamber or outflow pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of floatable debris accumulated in the pre-treatment chamber. Record this information on the inspection form. Next utilizing a tape measure or measuring stick estimate the amount of sediment accumulated in the primary and secondary sedimentation chambers. Record this depth on the inspection form. Through visual observation inspect the condition of the filter cartridges. Look for excessive build-up of sediments on the surface and any build-up on the top of the cartridges. Record this information on the inspection form.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components or cartridges.
- Obstructions in the system or its inlet or outlet.

- Excessive accumulation of floatables in the pre-treatment chambers in which the length and width of the chamber behind oil/floatables skimmer is fully impacted.
- Excessive accumulation of sediment in the primary sedimentation chamber of more than 18” in depth.
- Excessive accumulation of sediment in the secondary sedimentation chamber of more than 6” in depth.
- Excessive accumulation of sediment in the filter chambers of more than 3” on average.
- Substantial build-up of sediments on the filter membrane of the filter cartridges which will have a very dark appearance indicating the membrane may be fully saturated with sediment.

Maintenance Equipment

While maintenance can be done fully by hand it is recommended that a vacuum truck be utilized to minimize time requirements required to maintain the Kraken® Filter:

- Bio Clean Environmental Maintenance Form.
- Flashlight.
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate traffic control signage and procedures.
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system. Entry into the system will be required if it is determine the cartridge filters need washing/cleaning.
- Vacuum truck.
- Trash can.
- Pressure washer.

Maintenance Procedures

It is recommended that maintenance occurs at least three days after the most recent rain even to allow for drain down of the system and any upstream detention systems designed to drain down over an extended period of time. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the pre-treatment chamber can be performed from finish surface without entry into the vault utilizing a vacuum truck. Once all safety measures have been set up cleaning of the pre-treatment chamber can proceed as followed:

- Using an extension on a boom on the vacuum truck position the hose over the opened access hatch and lower into the center of the primary sedimentation chamber. Remove all floating debris, standing water and sediment from the chamber. A power washer can be used to assist if sediments have become hardened and stuck to the walls or the flow of the chamber. Repeat the same procedure for the secondary sedimentation chamber. This completes the maintenance procedure required on the pre-treatment chamber.

If maintenance is required on the filter cartridges the following procedure can be followed after maintenance on the pre-treatment chamber is performed:

- Following rules for confined space entry use a gas meter to detect the presence of any hazardous gases. If hazardous gases are present do not enter the vault. Following appropriate confined space procedures takes steps, such as utilizing venting system, to address the hazard. Once it is determined to be safe enter utilizing appropriate entry equipment such as a ladder and tripod with harness.
- Once entry into the system has been established the maintenance technician should position themselves to stand in the pre-treatment chamber. From here the removal of the cartridges can commence.
- Each cartridge is pressure fitted in place and includes a handle for easy removal. To remove a cartridge simply grab the handle and pull straight up. It may be required to gently shift pressure from side to side while pulling up to break the pressure seal. Removal of the cartridge should be done by hand with minimal effort and requires no tools.
- Once the cartridges are removed they should be lifted out from the vault and brought up to finish surface for cleaning. Using a large garbage can and a standard garden hose (low pressure nozzle) each cartridge should be rinsed off from the outside to remove accumulated sediments and debris. Once each cartridge is rinsed it should be placed to the side for re-installation.
- Each filter chamber should be power washed and vacuumed clean before re-inserting the cleaned cartridges.
- After all cartridges have been washed they can be replaced back into the vault. To replace each cartridge simply slide cartridge over each pressure fitted coupler. Push down on the handle to ensure the cartridge has been fully seated and the bottom of the cartridge is making contact with the floor.
- The last step is to close up and replace all access hatch lids and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.

Maintenance Sequence

Remove Access Hatches Set Up Vacuum Truck to Clean The Pretreatment Chamber.

Insert Vacuum Hose in the Sedimentation Chamber and Vacuum Out All Trash, Sediment and Standing Water.

Assess the Condition of the Filter Cartridges and Determine If Cleaning is Required.

To Wash Cartridges Remove from Vault. Place Over Trash Can and Use a Garden Hose to Spray Clean.

Once Cleaned Install Back Into the Vault. This Completes Maintenance. Ensure Access Lids are Properly Replaced.

For Maintenance Services or Replacement Media Please Contact Us At:
760-433-7640
info@biocleanenvironmental.com

Bio Clean
A Forterra Company

THE KRAKEN FILTER

Inspection and Maintenance Report
Bio Clean Kraken Filter

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Inspector Name _____ Date ____/____/_____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Site Map #	GPS Coordinates of Vault	Model #	Sediment Accumulation Sedimentation Chambers (lbs) & Filter Chambers (lbs)	Condition of Filter Cartridges & Were Filter Cartridges Cleaned	Structural Notes	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:					
	Lat: Long:					
	Lat: Long:					

Comments:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

STORM TRAP STORMWATER MANAGEMENT SOLUTIONS INFORMATION

StormTrap®

MODULAR CONCRETE STORMWATER MANAGEMENT

STORMWATER MANAGEMENT SOLUTIONS

StormTrap offers the industry's best solutions for managing runoff, protecting waterways and improving the use of your property. Whether you are concerned about detention, retention, water quality or water harvesting, StormTrap has a design that will reduce your footprint, accommodate any site constraints, lower overall costs and meet your specific project needs.

SingleTrap®

A durable stormwater management system customized to your site's exact requirements, ideal for working in an extremely limited space while preserving land above for parks, buildings or parking lots.

DoubleTrap®

The stormwater management solution you need to control runoff volume and discharge timing. Its modular design maximizes storage volume while minimizing footprint and installation cost.

STORMWATER APPLICATIONS

Detention

StormTrap underground stormwater detention systems temporarily store runoff in large underground chambers before releasing it at a controlled rate. This mitigates erosion, flooding and many of the other harmful effects of high volumes of stormwater runoff.

Infiltration

The StormTrap infiltration system provides a large infiltrative surface area that allows water to recharge into the native soil. The system can also help meet low impact development (LID) goals by reducing the volume of stormwater runoff discharged from a site.

Treatment

StormTrap is committed to improving stormwater quality by deploying our range of treatment products that target your pollutant issues with integrated or stand-alone solutions.

- **Filtration:** Sandfilters use various media to remove pollutants such as nutrients and heavy metals
- **Sedimentation:** Remove suspended solids with systems customized for your particle size and flow rate
- **Oil/Water Separation:** Baffle chambers eliminate hydrocarbons from runoff
- **Litter, Trash and Debris Removal:** Disposable mesh nets efficiently capture and remove trash and floatables from Stormwater and CSO discharges

Reuse and Harvesting

StormTrap offers rainwater harvesting applications that collect stormwater on site for use in irrigation or as greywater inside buildings.

These sustainable stormwater management practices adhere to low impact development (LID) principles for runoff reduction and also contribute to LEED (Leadership in Energy and Environmental Design) design credits for Sustainable Sites and Water Efficiency.

SIGNIFICANT ADVANTAGES

Increase Options

Sizes ranging from 1'1" to 15'0"

Designed to exceed HS-20 loading with minimum of 6" cover

Locally manufactured in a NPCA (National Precast Concrete Association) certified facility

Modular design maximizes storage volume while minimizes footprint and cost

Lower Costs

Installed savings compared to traditional systems

Innovative design allows quick and efficient installation

Reduced labor and excavation costs

Meets water quantity requirements without compromising land use

Minimize Maintenance

Total accessible void storage for easy maintenance

Reclaim 100% of original storage volume

High-strength precast concrete provides up to 100 years of service life

Streamline Design and Installation

Structural stamp on each project

Budget estimate for system and installation

Complete set of drawings

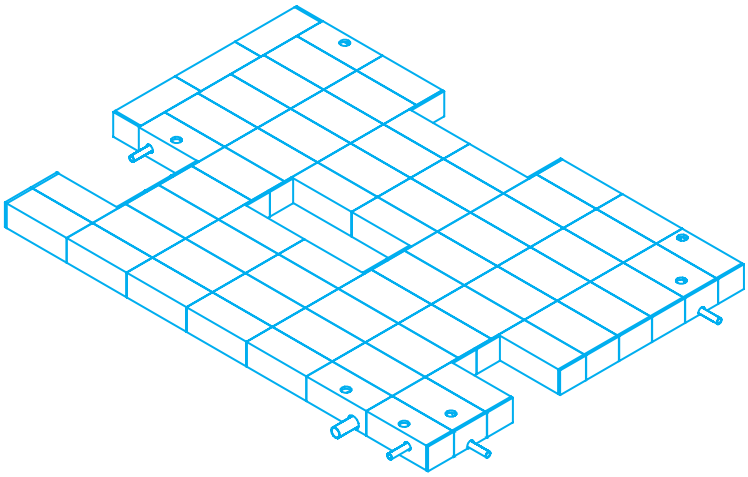
Pre-construction meeting

Representative on site during installation

FLEXIBLE AND ADAPTABLE DESIGNS

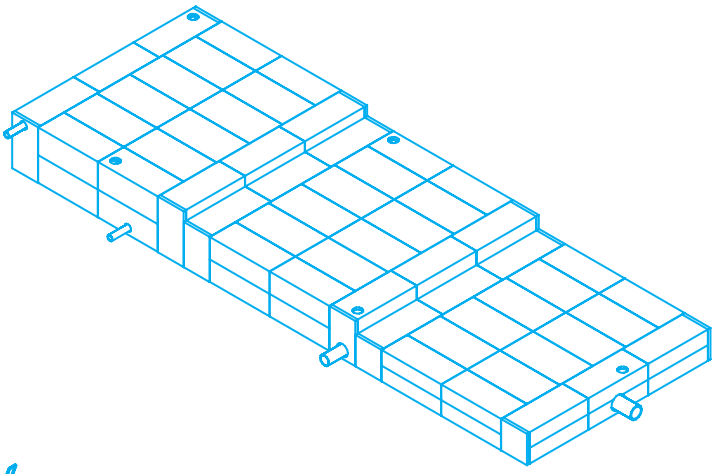
Unique Configurations

Flexible, modular design easily accommodates existing utilities, light pole foundations, trees and other job site constraints



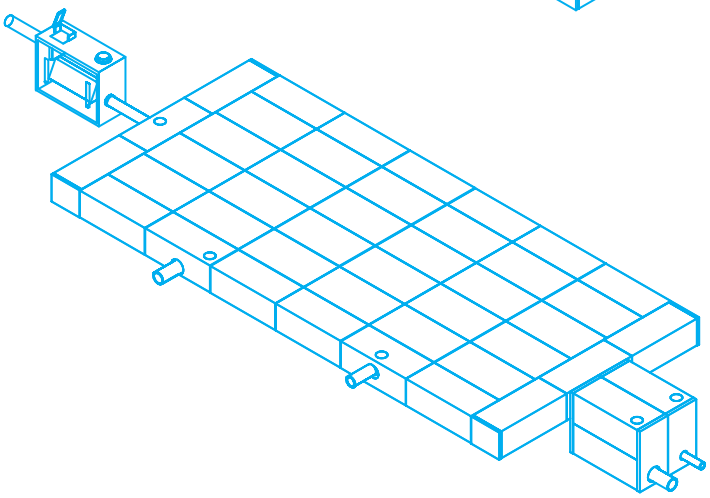
Varying Heights

Made of reinforced, high strength concrete available in sizes ranging from 1'1" to 15'0"



Integrated Applications

Integrated solutions, such as the SiteSaver water quality device or outlet control structures



PHONE 877 867 6872
WEB stormtrap.com

Schedule a lunch and learn, download product specifications, or request a free Design & Budget estimate to get your project started!