

**Stormwater Best Management Practices
Operation and Maintenance Plan**

for:

Newport County Regional YMCA

Located at:

***792 Valley Rd.
AP 115 Lot 1
Middletown, Rhode Island***

Prepared for:

***Newport County Regional YMCA
792 Valley Rd.
Middletown, RI 02842***

Prepared by:

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**Stormwater Best Management Practices
Operation and Maintenance Plan**

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Stormwater Best Management Practices Inspection and Maintenance Plan

I. Compliance with Stormwater Best Management Practices Maintenance Requirements

All property owners are responsible for ensuring that stormwater best management practices (BMPs) or facilities installed on their property are properly maintained and that they function as designed. In some cases, this maintenance responsibility may be assigned to others through special agreements. The maintenance responsibility for a stormwater facility may be designated on the subdivision plat, the site development plan, and/or within a maintenance agreement for the property. Property owners should be aware of their responsibilities regarding stormwater facility maintenance and need to be familiar with the contents of this Operation and Maintenance Plan (O&M Plan). Maintenance agreement(s) associated with this property are provided.

II. Inspection & Maintenance – Annual Reporting

Requirements for the inspection and maintenance of stormwater facilities, as well as reporting requirements are included in this Stormwater Best Management Practices Operation and Maintenance Plan.

Verification that the stormwater BMPs have been properly inspected and maintained; submittal of the required Inspection and Maintenance Forms shall be provided to the Owner & Town on an annual basis. The annual reporting form shall be provided to the Town prior to May 31st of each year.

Copies of the Inspection and Maintenance forms for each of the stormwater BMPs are located in Appendix D and E. A standard annual reporting form is provided in Appendix F. Each form shall be reviewed and submitted by the property owner or property manager to the Town Building Official.

III. Preventative Measures to Reduce Maintenance Costs

The most effective way to maintain your water quality facility is to prevent the pollutants from entering the facility. Common pollutants include sediment, trash & debris, chemicals, pet wastes, runoff from stored materials, illicit discharges into the storm drainage system and many others. A thoughtful maintenance program will include measures to address these potential contaminants. Key points to consider in your maintenance program include:

- Educate property owners/residents to be aware of how their actions affect water quality and how they can help reduce maintenance costs.
- Keep properties, streets and gutters, and parking lots free of trash, debris, and lawn clippings.
- Ensure the proper use, storage, and disposal of hazardous wastes and chemicals. Promptly clean up and spilled materials and dispose of properly.
- Plan lawn care to minimize and properly use chemicals and pesticides.
- Sweep paved surfaces and put the sweepings back on the lawn.
- Be aware of automobiles leaking fluids. Use absorbents such as cat litter to soak up drippings – dispose of properly.
- Re-vegetate disturbed and bare areas to maintain vegetative stabilization.
- Clean any private storm drainage system components, including inlets, storm sewers, and outfalls.
- Do not store materials outdoors (including landscaping materials) unless properly protected from runoff.

IV. Access and Right to Enter

All stormwater management facilities located on the site should have both a designated access location and the Town has the right to enter for the purpose of inspecting and for maintaining BMPs where the owner has failed to do so.

V. Safety

Keep safety considerations at the forefront of inspection procedures at all times. Likely hazards should be anticipated and avoided. Never enter a confined space (outlet structure, manhole, etc) without proper training, number of personal, and equipment.

Vertical drops may be encountered in areas located within and around the facility. Avoid walking on top of retaining walls or other structures that have a significant vertical drop. If a vertical drop is greater than 48" in height, make the appropriate note/comment on the maintenance inspection form.

If any hazard is found within the facility area that poses an immediate threat to public safety, contact emergency services at 911 immediately.

VI. Field Inspection Equipment

It is imperative that the appropriate equipment is taken to the field with the inspector(s). This is to ensure the safety of the inspector and allow the inspections to be performed as efficiently as possible. Below is a list of the equipment that may be necessary to perform the inspections of all Stormwater BMPs:

- Protective clothing and boots.

- Safety equipment (vest, hard hat, confined space entry equipment [if certified to perform confined space entry]).
- Communication equipment.
- IM Plan for the site.
- Clipboard.
- Stormwater BMP Inspection Forms (See Appendix D).
- Manhole Lid Remover
- Shovel.

Some of the items identified above need not be carried by the inspector (manhole lid remover, shovel, and confined space entry equipment), but should be available in the vehicle driven to the site. Specialized equipment may require specific training related to that equipment and should only be used by trained individuals.

VII. Inspecting Stormwater BMPs

The quality of stormwater entering the waters of the state relies heavily on the proper operation and maintenance of permanent BMPs. Stormwater BMPs must be periodically inspected to ensure that they function as designed. The inspection will determine the appropriate maintenance that is required for the facility.

A. Inspection Procedures

Inspections should follow the inspection guidance for the specific type of facility. (Appendix B of this manual).

B. Inspection Report

The person(s) conducting the inspection activities shall complete the appropriate inspection report for the specific facility. Inspection reports are located in Appendix D. A copy of each inspection form shall be kept by the owner a minimum of 5 years.

C. Verification of Inspection and Form Submittal

The Stormwater BMP Inspection Form provides a record of inspection of the facility. Inspection Forms for each facility type are provided in Appendix D. Verification of the inspection of the stormwater facilities and the facility inspection form(s) shall be provided to the Town on an annual basis. The verification and the inspection form(s) shall be reviewed and submitted by the property owner or property manager on behalf of the property owner.

Refer to Section II of this Manual regarding the annual reporting of inspections.

VIII. Maintaining Stormwater BMPs

Stormwater BMPs must be properly maintained to ensure that they operate correctly and provide the water quality treatment for which they were designed.

A. Maintenance Categories

Stormwater BMP maintenance programs are separated into three broad categories of work. The categories are separated based upon the magnitude and type of the maintenance activities performed. A description of each category follows:

Routine Work

The majority of this work consists of scheduled mowings and trash and debris pickups for stormwater management facilities during the growing season. This includes items such as the removal of debris/material that may be clogging the outlet structure well screens and trash racks. It also includes activities such as weed control, mosquito treatment, and algae treatment. These activities normally will be performed numerous times during the year. Inspection and maintenance forms shall be completed with the information also being reported on the annual report forms that are submitted to the owner & Town.

Restoration Work

This work consists of a variety of isolated or small-scale maintenance and work needed to address operational problems. Most of this work can be completed by a small crew, with minor tools, and small equipment. These items do not require prior correspondence with Town but do require that completed maintenance forms be submitted to the owner & Town with the annual report forms.

Rehabilitation Work

This work consists of large-scale maintenance and major improvements needed to address failures within the stormwater BMP. This work requires consultation with the Town and may require an engineering design with construction plans to be prepared for review and approval by the Town. This work may also require more specialized maintenance equipment, surveying, construction permits or assistance through private contractors and consultants. These items require prior correspondence with the Town and require that completed maintenance forms be submitted to the owner & Town with the annual report forms.

B. Maintenance Personnel

Maintenance personnel should be qualified to properly maintain stormwater BMPs, especially for restoration or rehabilitation work.

C. Maintenance Forms

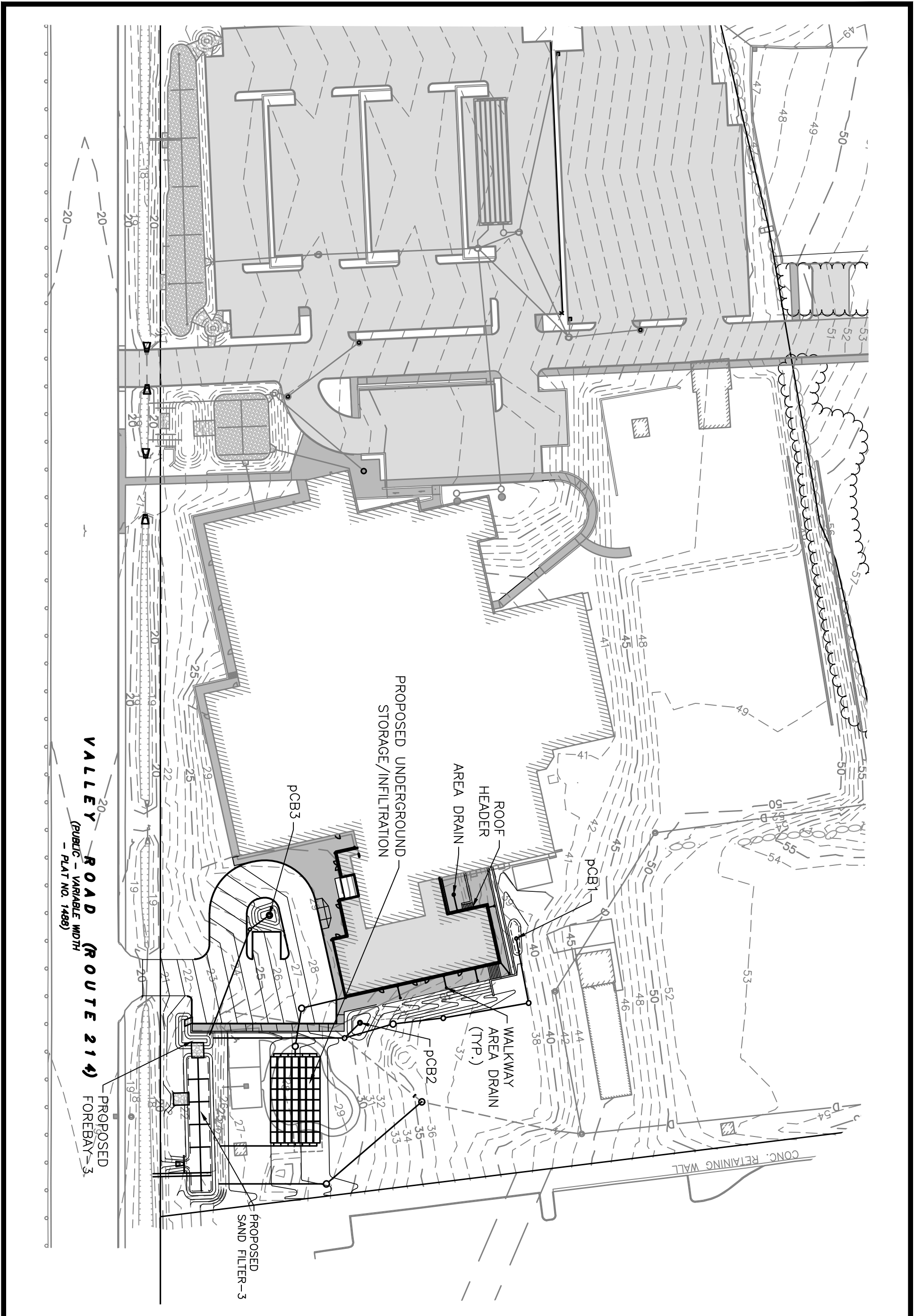
The Stormwater BMP Maintenance Form provides a record of maintenance activities to assist property owners in budgeting for future maintenance. Maintenance Forms for each facility type are provided in Appendix E. Maintenance Forms shall be completed by the property owner, management company, or contractor completing the required maintenance items. The form shall then be reviewed by the property owner or an authorized agent of the property owner and submitted on an annual basis by May 31st to the following address:

**Newport County Regional YMCA
c/o Facilities Manager
792 Valley Road
Middletown, RI 02842**

Refer to Section II of this Manual regarding the annual reporting of inspections and maintenance activities performed.

APPENDIX A

SITE PLAN



VALLEY ROAD (ROUTE 214)
 (PUBLIC - VARIABLE WIDTH - PLAT NO. 1488)
 PROPOSED FOREBAY-3

BMP SITE PLAN

792 VALLEY ROAD
 ASSESSOR'S MAP 115, LOT 1
 MIDDLETOWN, RHODE ISLAND

680 AQUIDNECK AVE.
 Middletown, RI 02842
 T: 401-354-2050
 F: 401-369-9775
 WWW.SDE-LDEC.COM



DATE: DECEMBER 30, 2022		REV. DATE:	
PROJ.#: 20014	SCALE: 1" = 60'	DRAWN BY: SJE	CHECK BY: MER
ISSUED FOR: PERMITTING			
PREPARED FOR: NEWPORT COUNTY REGIONAL YMCA			

APPENDIX B

MAINTENANCE AGREEMENT

SAMPLE

STORMWATER MANAGEMENT SYSTEM MAINTENANCE AGREEMENT

THIS AGREEMENT, made and entered into this ___ day of _____, 20___, by and between Newport County Regional YMCA hereinafter called the “Landowner”, and the Town of Middletown, hereinafter called the “Town”. WITNESSETH, that WHEREAS, the Landowner is the owner of certain real property described as Tax Map 115 Lot 1 as recorded by deed in the land evidence records of Town of Middletown, hereinafter called the “Property”.

WHEREAS, the Landowner is proceeding to build on and develop the property; and WHEREAS, the Site Plan known as Site Redevelopment Plans, hereinafter called the “Plan”, which is expressly made a part hereof, as approved or to be approved by the Town, provides for detention of stormwater within the confines of the property; and

WHEREAS, the Town and the Landowner, its successors and assigns, agree that the health, safety, and welfare of the residents of Middletown require that on-site stormwater management facilities be constructed and maintained on the Property; and

WHEREAS, the Town requires that on-site stormwater management facilities as shown on the Plan be constructed and adequately maintained by the Landowner, its successors and assigns.

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The on-site stormwater management facilities shall be constructed by the Landowner, its successors and assigns, in accordance with the plans and specifications identified in the Plan.
2. The Landowner, its successors and assigns, shall adequately maintain the stormwater management facilities in accordance with the required Operation and Maintenance Plan. This includes all pipes, channels or other conveyances built to convey stormwater to the facility, as well as all structures, improvements, and vegetation provided to control the quantity and quality of stormwater. Adequate maintenance is herein defined as good working condition so that these facilities are performing their design functions. The Stormwater Best Management Practices Operation, Maintenance and Management Checklists are to be used to establish what good working condition is acceptable to the Town.
3. The Landowner, its successors and assigns, shall inspect the stormwater management facility and submit an inspection report annually. The purpose of the inspection is to assure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, berms, outlet structures, basin areas, access roads, etc... Deficiencies shall be noted in the inspection report.
4. The Landowner, its successors and assigns, hereby grant permission to the Town, its authorized agents and employees, to enter upon the Property and to inspect the stormwater management facilities whenever the Town deems necessary. The purpose of inspection is to follow up on reported deficiencies and/or to respond to citizen complaints. The Town shall provide the Landowner, its successors and assigns, copies of the inspection findings and a directive to commence with the repairs of necessary.
5. In the event the Landowner, its successors and assigns, fails to maintain the stormwater management facilities in good working condition acceptable to the Town, the Town may enter the Property and take whatever steps necessary to correct deficiencies identified in the inspection report and to charge the costs of such repairs to the Landowner, its successors and assigns. This provision shall not be construed to allow the Town to erect any structure of permanent nature on the land of the Landowner. It is expressly understood and agreed that the Town is under no obligation to routinely maintain or repair said facilities, and in no event shall this agreement be construed to impose any such obligation on the Town.
6. The Landowner, its successors and assigns, will perform the work necessary to keep these facilities in good working order as appropriate. In the event a maintenance schedule for the stormwater management facilities (including sediment removal) is outlined on the approved plans, the schedule will be followed.

7. In the event the Town pursuant to this agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner, its successors and assigns, shall reimburse the Town upon demand, within (30) days of receipt thereof for all actual costs incurred by the Town hereunder.
8. This Agreement imposes no liability of any kind whatsoever on the Town and the Landowner agrees to hold the Town harmless from any liability in the event the stormwater management facilities fail to operate properly.
9. This Agreement shall be recorded among the land evidence records of Middletown and shall constitute a covenant running with the land, and shall be binding on the Landowner, its administrators, executors, assigns, heirs and any other successors in interests/

WITNESS the following signatures and seals:

Company/Corporation/Partnership Name (Seal)

By: _____

(Name & Title)

The foregoing Agreement was acknowledged before me this ____ day of _____, 20__ by

NOTARY PUBLIC

My Commission Expires: _____

By: _____

(Type Name and Title)

The foregoing Agreement was acknowledged before me this ____ day of _____, 20__, by

NOTARY PUBLIC

My Commission Expires: _____

Approved as to Form:

Town Solicitor

Date

APPENDIX C

BMP STANDARD O&M PROCEDURES

**STORMWATER MANAGEMENT SYSTEM
BEST MANAGEMENT PRACTICES (BMP) RECOMMENDED MAINTENANCE**

**Newport County Regional YMCA
729 Valley Rd.
Middletown, Rhode Island**

SEDIMENT FOREBAYS

Maintenance:

- Inspections shall be performed monthly or more frequently, particularly after intense rainfall events.
- All sediment, debris shall be removed from the forebay at least 4 times per year.
- After sediment removal, stabilize the floor and sidewalls of the forebay before making it operational.
- Grass shall be mowed to keep the height between 4-6 inches.
- Check for signs of rilling and gullyng and repair as necessary.
- Replace any vegetation damaged during the maintenance.

DEEP SUMP & HOODED CATCH BASINS

Maintenance:

- Inspections shall be performed a minimum of 2 times per year (spring/fall). Units shall be cleaned annually and whenever the depth of sediment is greater than or equal to half the sump depth.
- The inlet grate shall not be welded to the frame so that the sump can be easily inspected and maintained.
- Maintenance of structure shall be performed by qualified personnel and in accordance with OSHA regulations.
- All sediment, debris, floatables, contaminants shall be disposed of to a landfill or other permitted facility.

SAND FILTERS/ ORGANIC FILTERS/ FILTER BED

Maintenance:

- Inspect after storm events greater or equal to 1-year 24 hour event.
- Perform the following activities on a monthly basis:
 - sediment removal
 - mowing
 - litter and debris removal
 - stabilization of eroded side slopes and bottom
- Vegetation limited to 18"
- Sediment chamber cleaned if drawdowns exceed 36 hours.
- Silt/sediment removed from filter bed after it reaches 1-inch.
- If water ponds on the filter bed for greater than 48 hours, remove and replace filter media.

SUBSURFACE INFILTRATION/STORAGE CHAMBERS

Maintenance:

- Inspections shall be performed on pretreatment BMP's per above outline to ensure proper function of chamber system.
- Chamber system is equipped with inspection ports. Remove each lid and measure sediment depth at each port location. When depth of sediment exceeds 3-inches, the chamber row shall be pressure washed with water through a culvert cleaning nozzle. Back-flush may accumulate in upstream structures. Water is to be removed from structures using a vacuum truck.
- Closed Circuit Television (CCTV) inspection can be deployed as necessary to determine sediment accumulation.
- If the does not drain fully in 48hrs or less, the designer/contractor shall repair/replace the system/system components as necessary.

APPENDIX D

ANNUAL INSPECTION AND MAINTENANCE REPORTING FORMS

Forebay Operation, Maintenance, and Management Inspection Checklist

Project:

Location:

Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Annual, After Major Storms)		
Forebay and contributing areas clean of debris		
No dumping of yard wastes into practice		
Litter (branches, etc.) have been removed		
2. Vegetation (Annual, After Major Storms)		
Grass height not less than 3-4 inches		
Grass height not greater than 6 inches		
No evidence of erosion		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
3. Sediment Removal (Four times per year, after Major Storms)		
Forebay clean of sediments		
Stabilized floor and sidewalls after sediment removal		
4. Outlet/Overflow Spillway (Annual, After Major Storms)		
Good condition, no need for repair		
No evidence of erosion		
No evidence of any blockages		

Comments

Actions to be Taken

**Stormwater Basin/WVTS Operation,
Maintenance, and Management Inspection Checklist**

Project

Location:

Site Status:

Date:

Time:

Inspector:

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
1. Embankment and emergency spillway (Annual, After Major Storms)		
1. Vegetation and ground cover adequate		
2. Embankment erosion		
3. Animal burrows		
4. Unauthorized planting		
5. Cracking, bulging, or sliding of dam		
a. Upstream face		
b. Downstream face		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
c. At or beyond toe		
downstream		
upstream		
d. Emergency spillway		
6. Basin, toe & chimney drains clear and functioning		
7. Seeps/leaks on downstream face		
8. Slope protection or riprap failure		
9. Vertical/horizontal alignment of top of dam "As-Built"		
10. Emergency spillway clear of obstructions and debris		
2. Riser and principal spillway (Annual, After Major Storms)		
Type: Reinforced concrete		
Corrugated pipe		
Masonry		
1. Low-flow orifice obstructed		
2. Low-flow trash rack. a. Debris removal necessary		
b. Corrosion control		
3. Weir trash rack maintenance a. Debris removal necessary		
b. corrosion control		
4. Excessive sediment accumulation inside		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
5. Concrete/masonry condition riser and barrels a. cracks or displacement		
b. Minor spalling (<1")		
c. Major spalling (rebars exposed)		
d. Joint failures		
e. Water tightness		
6. Metal pipe condition		
7. Control valve a. Operational/exercised		
b. Chained and locked		
8. Basin drain valve a. Operational/exercised		
b. Chained and locked		
9. Outfall channels functioning		
3. Permanent Pool (WVTS/Wet Basins) (Semi-annually)		
1. Undesirable vegetative growth		
2. Floating or floatable debris removal required		
3. Visible pollution		
4. Shoreline problem		
5. Other (specify)		
4. Sediment Forebays (Semi-annually)		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
1. Sedimentation noted		
2. Sediment cleanout when depth < 50% design depth		
5. Dry Basin Areas (Annual, After Major Storms)		
1. Vegetation adequate		
2. Undesirable vegetative growth		
3. Undesirable woody vegetation		
4. Low-flow channels clear of obstructions		
5. Standing water or wet spots		
6. Sediment and/or trash accumulation		
6. Condition of Outfalls (Annual , After Major Storms)		
1. Riprap failures		
2. Slope erosion		
3. Storm drain pipes		
4. Endwalls / Headwalls		
5. Other (specify)		
7. Other (Semi-annually)		
1. Encroachment on basin, WVTS or easement area		
2. Complaints from residents		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
3. Aesthetics a. Grass growing required		
b. Graffiti removal needed		
c. Other (specify)		
4. Conditions of maintenance access routes		
5. Signs of hydrocarbon build-up		
6. Any public hazards (specify)		
8. Emergent Vegetation (Annual)		
1. Vegetation healthy and growing WVTS maintaining 50% surface area coverage of emergent plants after the second growing season. (If unsatisfactory, reinforcement plantings needed)		
2. Dominant emergent plants: Survival of desired emergent plant species Distribution according to planting plan?		
3. Evidence of invasive species		
4. Maintenance of adequate water depths for desired emergent plant species		
5. Harvesting of emergent plantings needed		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
6. Have sediment accumulations reduced pool volume significantly or are plants “choked” with sediment		
7. Eutrophication level of the WVTS		

Comments:

Actions to be Taken:

Infiltration System Operation, Maintenance, and Management Inspection Checklist

Project:

Location:

Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Annual)		
Trench/chamber or basin surface clear of debris		
Inflow pipes clear of debris		
Overflow spillway clear of debris		
Inlet area clear of debris		
2. Sediment Traps or Forebays (Annual)		
Obviously trapping sediment		
Greater than 50% of storage volume remaining		
3. Dewatering (Annual)		
Trench/chamber or basin dewateres between storms		
4. Sediment Cleanout of Trench/Chamber or Basin (Annual)		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
No evidence of sedimentation in trench/chamber or basin		
Sediment accumulation doesn't yet require cleanout		
5. Inlets (Annual)		
Good condition		
No evidence of erosion		
6. Outlet/Overflow Spillway (Annual)		
Good condition, no need for repair		
No evidence of erosion		
7. Aggregate Repairs (Annual)		
Surface of aggregate clean		
Top layer of stone does not need replacement		
Trench/Chamber or basin does not need rehabilitation		

Comments:

Actions to be Taken:

Sand Filter Operation, Maintenance, and Management Inspection Checklist

Project:

Location:

Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Annual, After Major Storms)		
Sand filter and contributing areas clean of debris		
No dumping of yard wastes into practice		
Litter (branches, etc.) have been removed		
2. Vegetation (Annual, After Major Storms)		
Fertilized per specifications		
Plant composition according to approved plans		
No placement of inappropriate plants		
Grass height not greater than 10 inches		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
No evidence of erosion		
3. Check Dams/Energy Dissipaters/Sumps (Annual, After Major Storms)		
No evidence of sediment buildup		
Sumps should not be more than 50% full of sediment		
No evidence of erosion at downstream toe of drop structure		
4. Dewatering (Semi-annually)		
Dewaters between storms		
No evidence of standing water		
5. Sediment Deposition (Annual, after Major Storms)		
Silt/Sediment to be removed if accumulation reaches 1"		
6. Outlet/Overflow Spillway (Annual, After Major Storms)		
Good condition, no need for repair		
No evidence of erosion		
No evidence of any blockages		
7. Integrity of Filter Bed (Annual, After Major Storms)		
Filter bed has not been blocked or filled inappropriately		

Comments:

Actions to be Taken:

APPENDIX E

POLLUTION PREVENTION AND SOURCE CONTROLS

APPENDIX G: POLLUTION PREVENTION AND SOURCE CONTROLS

G.1 OVERVIEW

Pollution prevention techniques must, to the extent practicable, be incorporated into all site designs, especially at commercial and light industrial sites, to minimize the potential impact those activities may have on stormwater runoff quality. Preventative source controls must also be applied in residential development, particularly in preventing floatables (trash and debris) from entering storm sewer drainage systems.

G.2 GENERAL POLLUTION PREVENTION DESIGN FEATURES

Inlets to stormwater management systems should incorporate trash racks wherever practicable. Storm drain marking (e.g., stenciling) to discourage dumping must also be provided at each inlet. Maintenance plans must include a schedule for regular maintenance and inspection of trash racks.

G.3 SOLID WASTE CONTAINMENT

Proper containment of solid waste will prevent it from entering drainage systems and polluting waterways. At a minimum, apply the following pollution prevention practices:

- Trash and recycling receptacles must be provided with regular collection at all sites;
- Industrial and commercial sites must include regular street sweeping (at least annually) in their maintenance plans; and
- Pet waste stations that provide bags and waste containers are recommended at all residential developments and must be provided at multiunit dwellings, such as apartments, town houses, and condominiums.

G.4 ROADS AND PARKING AREA MANAGEMENT

Roads and parking areas constitute a large portion of Rhode Island's impervious surfaces and are often directly connected to storm drain systems. These impervious areas contribute relatively high concentrations of a wide variety of pollutants, including sediment, nutrients, metals, and volatile organic compounds (VOCs), among other constituents. The discussion below addresses guidance requirements related to road and parking area management:

G.4.1 Street and Parking Lot Sweeping

Street sweeping helps to remove sediment and debris from paved surfaces, reducing potential pollutant transport to waterbodies. Street and parking lot sweeping may also reduce the need for maintenance of pretreatment devices, such catch basins and forebays that precede WVTSS or bioretention areas.

Street sweeping is a requirement for municipalities pursuant to Phase II of the RIPDES Stormwater Regulations and is also recommended for private entities. Currently, available street sweeping technology is not considered to meet the water quality treatment standard and should not be relied on for TSS removal, but does help as a pretreatment practice.

Debris collected from some streets and parking lots (e.g., LUHPPLs) may be regulated as a hazardous waste. For these cases, debris must be disposed of in accordance with appropriate practice and applicable regulatory standards. Appendix A of the *Rules and Regulations for Composting Facilities and Solid Waste Management Facilities*, which is entitled "Management of Street Sweepings in Rhode Island," should be reviewed. For further information, contact the DEM Office of Waste Management.

G.4.2 Deicing and Salt Storage

Deicing and sanding operations are often necessary for safety during winter storms; however, the materials used create water quality problems. Use deicing chemicals and sand judiciously. Consider the information in Table G-1 when selecting a deicer.

Table G-1 Comparison of Environmental Effects of Common Roadway Deicers

Media	Sodium Chloride (NaCl)	Calcium Chloride (CaCl ₂)	Calcium magnesium acetate (CMA) (CaMgC ₂ H ₃ O ₂)	Sand (SiO ₂)
Soils	Cl complexes release heavy metals; Na can breakdown soil structure and reduce permeability	Ca can exchange with heavy metals, increase soil aeration and permeability.	Ca and Mg can exchange with heavy metals.	Gradually will accumulate on soil.
Vegetation	Salt spray/splash can cause leaf scorch and browning or dieback of new plant growth up to 50 feet from road; osmotic stress can result from salt uptake; grass is more tolerant than trees and woody plants.		Little effect.	Accumulates on and around low vegetation.
Groundwater	Mobile Na and Cl ions readily reach groundwater, and concentration levels can temporarily increase in areas of low flow during spring thaws. Ca and Mg can release heavy metals from soil.			No known effect.
Surface Water	Can cause density stratification in small lakes having closed basins, potentially leading to anoxia in lake bottoms; often contain nitrogen, phosphorus, and trace metals as impurities, often in concentrations greater than 5 ppm.		Depletes dissolved oxygen in small lakes and streams when degrading.	Accumulated sand alters stream geometry and habitat

Media	Sodium Chloride (NaCl)	Calcium Chloride (CaCl ₂)	Calcium magnesium acetate (CMA) (CaMgC ₂ H ₃ O ₂)	Sand (SiO ₂)
Aquatic Biota	Little effect in large or flowing bodies at current road salting amounts; small streams that are end points for runoff can receive harmful concentrations of Cl; Cl from NaCl generally not toxic until it reaches levels of 1,000-36,000 ppm.		Can cause oxygen depletion.	Accumulation of particles to stream bottoms degrades habitat, clogs gills.

Source: Adapted from Ohrel, 2000

Sand and deicing chemicals should be stored under cover so as to prevent their exposure to stormwater; the DEM Groundwater Quality Rules require that deicer materials be covered in areas where the groundwater is classified GAA or GA. Table G-2 provides recommendations appropriate for storage and use of deicers. Storage of these materials may be regulated as an industrial activity. Contact DEM's Stormwater Program in the Office of Water Resources for further information.

Table G-2 Recommendations to Reduce Deicer Impacts

Activity	Recommendation
Storage	<ul style="list-style-type: none"> Salt storage piles should be completely covered, ideally by a roof, and at a minimum, by a weighted tarp, and stored on impervious surfaces. The DEM Groundwater Quality Rules require that deicer materials be covered in areas where the groundwater is classified GAA or GA. Runoff should be contained in appropriate areas. Spills should be cleaned up after loading operations. The material may be directed to a sand pile or returned to salt piles. Avoid storage in drinking water supply areas, water supply aquifer recharge areas, and public wellhead protection areas.
Application	<ul style="list-style-type: none"> Application rate of deicing materials should be tailored to road conditions (i.e., high versus low volume roads). Trucks should be equipped with sensors that automatically control the deicer spread rate. Drivers and handlers of salt and other deicers should receive training to improve efficiency, reduce losses, and raise awareness of environmental impacts.

Activity	Recommendation
Other	<ul style="list-style-type: none"> • Identify ecosystems such as wetlands that may be sensitive to salt. • Use calcium chloride and CMA in sensitive ecosystem areas. • To avoid over-application and excessive expense, choose deicing agents that perform most efficiently according to pavement temperature. • Monitor the deicer market for new products and technology.

Source: Adapted from Ohrel, 2000.

G.4.3 Snow Disposal

Improper snow disposal can be a threat to public health and the environment. Disposal should consider site selection, site preparation and maintenance, and emergency snow disposal locations and procedures. Refer to DEM's Snow Disposal Policy for more details on these topics, which are summarized below.

G.4.3.1 Site Selection

The key to selecting effective snow disposal sites is to locate them adjacent to or on pervious surfaces in upland areas away from water resources and wells. At these locations, snow meltwater can filter in to the soil, leaving behind sand and debris, which can be removed in the springtime. When selecting a site for snow disposal, adhere to the following guidelines:

- Avoid dumping snow into any waterbody, including rivers, reservoirs, ponds, lakes, wetlands, bays, or the ocean. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes.
- Do not dump snow within a Wellhead Protection Area (WHPA) of a public water supply well, or within 200 feet of a private well, where road salt may contaminate water supplies.
- Avoid dumping snow in sanitary landfills and gravel pits. Snow meltwater will create more contaminated leachate in landfills posing a greater risk to groundwater. In gravel pits, there is little opportunity for pollutants to be filtered out of the meltwater because groundwater is close to the land surface.
- Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. Snow combined with sand and debris may block a storm drainage system, causing localized flooding. In addition, a high volume of sand, sediment, and litter released from melting snow may be quickly transported through the drainage system into surface water.

G.4.3.2 Site Selection Procedures

It is important that the municipal Department of Public Works or Highway Department, and other appropriate municipal offices work together to select appropriate snow disposal sites. The following steps should be taken:

- Estimate how much snow disposal capacity is needed for the season so that an adequate number of disposal sites can be selected and prepared;
- Identify sites that could potentially be used for snow disposal such as municipal open space (e.g., parking lots or parks);
- Sites located in upland locations that are not likely to impact sensitive environmental resources should be selected first; and
- If more storage space is needed, prioritize the sites with the least environmental impact (using the site selection criteria and the online Environmental Resource Map as a guide).

Environmental Resource Map

An interactive map containing a wide variety of GIS data layers of interest to local planning or zoning board members, consultants, or anyone else needing a general mapping of soils, wetlands, land use patterns, regulatory overlay districts and other environmental information can be accessed via the internet at the following address:

<http://www.state.ri.us/dem/maps/index.htm>.

This interactive map can be used to identify publicly owned open spaces and approximate locations of sensitive environmental resources (locations should be field verified where possible).

G.4.3.3 Site Preparation and Maintenance

In addition to carefully selecting disposal sites before the winter begins, it is important to prepare and maintain these sites to maximize their effectiveness. The following maintenance measures should be undertaken for all snow disposal sites:

- A silt fence or equivalent barrier should be placed securely on the down-gradient side of the snow disposal site;
- To filter pollutants out of the meltwater, a 50-foot vegetative buffer strip should be maintained during the growth season between the disposal site and adjacent waterbodies;
- Debris should be cleared from the site prior to using the site for snow disposal; and
- Debris should be cleared from the site and properly disposed of at the end of the snow season.

G.4.3.4 Emergency Snow Disposal

Under normal winter conditions, storage, and disposal of snow should be done

exclusively in upland areas, not in or adjacent to waterbodies or wetlands. However, under extraordinary conditions when upland snow storage options are exhausted, it may be necessary to dispose of snow near or in certain waterbodies. The following guidance does not constitute a Clean Water Act permit for such disposal. However, in an emergency situation, DEM is unlikely to pursue an enforcement action for snow disposal by governmental entities into or near certain waters if conducted in accordance with the conditions identified below.

As mentioned earlier, it is important to estimate the amount of snow disposal capacity you will need so that an adequate number of upland disposal sites can be selected and prepared. If despite your planning, designated upland disposal sites have been exhausted, snow may be disposed of at other locations that meet the criteria in Section G.4.3.2.

Under extraordinary conditions, when all upland snow disposal options are exhausted, disposal of snow that is not obviously contaminated with road salt, sand, and other pollutants may be allowed near (within 50 feet of) or in certain waterbodies under certain conditions. In these dire situations, notify the DEM – Office of Water Resources, RIPDES Program at 222-4700 (or 222-3070 after normal business hours) before disposing of snow in a waterbody. If upland disposal is not available, and snow needs to be removed/relocated for safety reasons, then as a last resort waterways may be used in accordance with the following conditions:

- Dispose of snow in open water with adequate flow and mixing to prevent ice dams from forming;
- Do not dispose of snow in coastal or freshwater wetlands, eelgrass beds, vegetated shallows, vernal pools, shellfish beds, mudflats, outstanding resource waters, drinking water reservoirs and their tributaries, Wellhead Protection Areas (WHPAs), or other areas designated by the State as being environmentally sensitive;
- In coastal communities, preference should be given to disposal in salt water if it is available;
- Do not dispose of snow where trucks may cause shoreline damage or streambank damage or erosion; and
- Consult with appropriate municipal officials to ensure that snow disposal in water complies with local ordinances and bylaws.

G.4.4 Driveway and Parking Lot Sealants

Driveway and parking lot sealants are a major source of polycyclic aromatic hydrocarbons (PAHs) in our environment. There are two types of sealant: asphalt based and coal-tar based. Both types of sealant contain PAHs, but the coal-tar based sealants have a far higher concentration of PAHs (as much as 70 times higher than asphalt based). As the sealants wear down, small particles of sealant are washed off by stormwater into surface waters. PAHs have been found to be toxic to aquatic life, with bottom dwelling organisms most at risk since PAHs tend to attach to sediment

rather than dissolve in water. Also, in recognition of the human health effects of PAHs, DEM has adopted the US EPA water column human health criteria for PAHs in the DEM Water Quality Regulations. Because of the high concentrations of PAHs in coal-tar based sealants, DEM recommends that coal-tar based sealants not be used. For more information, see: US Geological Survey Fact Sheet 2005-3147, "Parking Lot Sealcoat: A Major Source of Polycyclic Aromatic Hydrocarbons (PAHs) in Urban and Suburban Environments."

G.5 HAZARDOUS MATERIALS CONTAINMENT

As applicable, project proponents must provide a completed Stormwater Pollution Prevention Plan in accordance with the Rhode Island Pollution Discharge Elimination System Regulations. At a minimum, the following practices should be incorporated as part of site design:

- Site designs must incorporate adequate indoor storage of hazardous materials as the primary method for preventing problems related to stormwater;
- Diversion through devices such as curbing and berms should be incorporated wherever stormwater has the potential to runoff into hazardous materials storage areas; and
- Secondary containment must be included wherever spills might occur (e.g., fueling and hazardous materials transfer and loading areas). Oil/grit separators and other manufactured treatment devices may temporarily contain certain spills and contaminated stormwater. However, these devices should be used as backup for tighter containment practices.

G.6 SEPTIC SYSTEM MANAGEMENT

Approximately one-third of Rhode Islanders use some form of onsite wastewater treatment system (i.e., septic system, cesspool, etc.). When septic systems fail, they may become a major source of pollution to surface and groundwater. Discharge from failed systems is often carried to surface water via stormwater runoff. Stormwater management plans must discuss appropriate operation and management for all onsite wastewater treatment systems (OWTSs) on the project site. Use of regular inspections in accordance with the procedures of *Septic System Checkup: The Rhode Island Manual for Inspections* is recommended.

G.7 LAWN, GARDEN, AND LANDSCAPE MANAGEMENT

Lawns are a significant feature of urban landscapes. Estimates of turf and lawn coverage in the United States are as high as 30 million acres, which, if lawns were classified as a crop, would rank as the fifth largest in the country after corn, soybeans, wheat, and hay (Swann and Schueler, 2000). This large area of managed landscape has the potential to contribute to urban runoff pollution due to overfertilization, overwatering, overapplication of pesticides, and direct disposal of lawn clippings, leaves, and trimmings. Also, erosion from bare patches of poorly managed lawns

contribute sediment to watercourses, and disposal of lawn clippings in landfills can reduce the capacity of these facilities to handle other types of waste.

The following standards for grounds management must be incorporated into stormwater management plans:

Lawn conversion - Grasses require more water and attention than alternative groundcovers, flowers, shrubs, or trees. Alternatives to turf are especially recommended for problem areas such as lawn edges, frost pockets, shady spots, steep slopes, and soggy areas. Vegetation that is best suited to the local conditions should be selected.

Soil building - Grounds operation and maintenance should incorporate soil evaluation every 1 to 3 years to determine suitability for supporting a lawn, and to determine how to optimize growing conditions. Consider testing soil characteristics such as pH, fertility, compaction, texture, and earthworm content.

Grass selection - Grass seed is available in a wide range of cultivated varieties, so homeowners, landscapers, and grounds managers are able to choose the grass type that grows well in their particular climate, matches site conditions, and is consistent with the property owner's desired level of maintenance. When choosing ground cover, consideration should be given to seasonal variations in rainfall and temperature. Table G-3 lists turfgrass types and their level of tolerance to drought:

Table G-3 Drought Tolerance of Turfgrass Types

Turfgrass Type	Drought Tolerance
Fine-leaved Fescues Tall Fescue Kentucky Bluegrass Perennial Ryegrass Bentgrasses	High ↓ Low

Mowing and thatch management - To prevent insects and weed problems, property owners should mow high, mow frequently, and keep mower blades sharp. Lawns should not be cut shorter than 2 to 3 inches, because weeds can grow more easily in short grasses. Grass can be cut lower in the spring and fall to stimulate root growth, but not shorter than 1 ½ inches.

Fertilization - If fertilizing is desired, consider the following points:

- Most lawns require little or no fertilizer to remain healthy. Fertilize no more than twice a year - once in May-June, and once in September-October;
- Fertilizers are rated on their labeling by three numbers (e.g., 10-10-10 or

12-4-8), which refer to their Nitrogen (N) – Phosphorus (P) – Potassium (K) concentrations. Fertilize at a rate of no more than ½ pound of nitrogen per 1000 square feet, which can be determined by dividing 50 by the percentage of nitrogen in the fertilizer;

- Apply fertilizer carefully to avoid spreading on impervious surfaces such as paved walkways, patios, driveways, etc., where the nutrient can be easily washed into stormdrains or directly into surface waters;
- To encourage more complete uptake, use slow-release fertilizers that is those that contain 50 percent or more water-insoluble nitrogen (WIN);
- Grass blades retain 30-40 percent of nutrients applied in fertilizers. Reduce fertilizer applications by 30 percent, or eliminate the spring application of fertilizer and leave clippings on the lawn where they will degrade and release stored nutrients back to the soil; and
- Fertilizer should not be applied when rain is expected. Not only does the rain decrease fertilizer effectiveness, it also increases the risk of surface and ground water contamination.

Weed management - A property owner must decide how many weeds can be tolerated before action is taken to eradicate them. To the extent practicable, weeds should be dug or pulled out. If patches of weeds are present, they can be covered for a few days with a black plastic sheet; a technique called solarization. Solarization kills the weeds while leaving the grass intact. If weeds blanket a large enough area, the patch can be covered with clear plastic for several weeks, effectively “cooking” the weeds and their seeds. The bare area left behind after weeding should be reseeded to prevent weeds from growing back. As a last resort, homeowners can use chemical herbicides to spot-treat weeds.

Pest management - Effective pest management begins with maintenance of a healthy, vigorous lawn that is naturally disease resistant. Property owners should monitor plants for obvious damage and check for the presence of pest organisms. Learn to distinguish beneficial insects and arachnids, such as green lacewings, ladybugs, and most spiders, from ones that will damage plants.

When damage is detected or when harmful organisms are present, property owners should determine the level of damage the plant is able to tolerate. No action should be taken if the plant can maintain growth and fertility. If controls are needed, there are a variety of low-impact pest management controls and practices to choose from, including the following:

- Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off a plant with water, or in some cases vacuumed off of larger plants;
- Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used;

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- Sprinkling the ground surface with abrasive diatomaceous earth can prevent infestations by soft-bodied insects and slugs. Slugs can also be trapped by falling or crawling into small cups set in the ground flush with the surface and filled with beer;
 - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of. (Pruning equipment should be disinfected with bleach to prevent spreading the disease organism);
 - Small mammals and birds can be excluded using fences, netting, tree trunk guards, and, as a last resort, trapping. (In some areas trapping is illegal. Property owners should check local codes if this type of action is desired); and
 - Property owners can encourage/attract beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seedhead weevils, and spiders that prey on detrimental pest species. These desirable organisms can be introduced directly or can be attracted to the area by providing food and/or habitat.

If chemical pesticides are used, property owners should try to select the least toxic, water soluble, and volatile pesticides possible. All selected pesticides should be screened for their potential to harm water resources. Although organophosphate pesticides, such as diazinon and chlorpyrifos, are popular because they target a broad range of pests and are less expensive than newer, less toxic pesticides, they rank among the worst killers of wildlife, and often pose the greatest health risk. Synthetic pyrethroids are more selective, and typically much less toxic than organophosphates, yet they can harm beneficial insects. When possible, pesticides that pose the least risk to human health and the environment should be chosen. A list of popular pesticides, along with their uses, their toxicity to humans and wildlife, EPA's toxicity rating, and alternatives to the listed chemicals, is available from *The Audubon Guide to Home Pesticides*, (<http://www.audubon.org/bird/pesticides/>).

Sensible irrigation - Most New England lawns will survive without irrigation. Grasses will normally go dormant in warm, dry periods (June-September) and resume growth when moisture is more plentiful. However, if watering is desired, consider the following points:

Established lawns need no more than one inch of water per week (including precipitation) to prevent dormancy in dry periods. Watering at this rate should wet soil to approximately 4-6 inches and will encourage analogous root growth. If possible, use timers to water before 9:00 a.m., preferably in the early morning to avoid evaporative loss. Use drought-resistant grasses (see "grass selection" above) and cut grass at 2-3 inches to encourage deeper rooting and heartier lawns.

