# Operation & Maintenance Plan

## Site & Subdivision Stormwater System

Village of Kimberly | Outagamie County, Wisconsin

DECEMBER 12, 2022

McM. No. K0001-09-22-00635

NAV:car

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McMAHON ENGINEERS ARCHITECTS

# Operation & Maintenance Plan

## I. INTRODUCTION

This Operation and Maintenance Plan is applicable to sites and subdivisions with a stormwater management system located in the Village of Kimberly, Outagamie County, Wisconsin. More specifically, this Operation and Maintenance Plan is applicable to the following site or subdivision:

| |
|---|
| Site or Subdivision Name: |
| Site Address / Location: |
| Parcel No. / Tax Key No.: |

## II. RESPONSIBLE PARTY

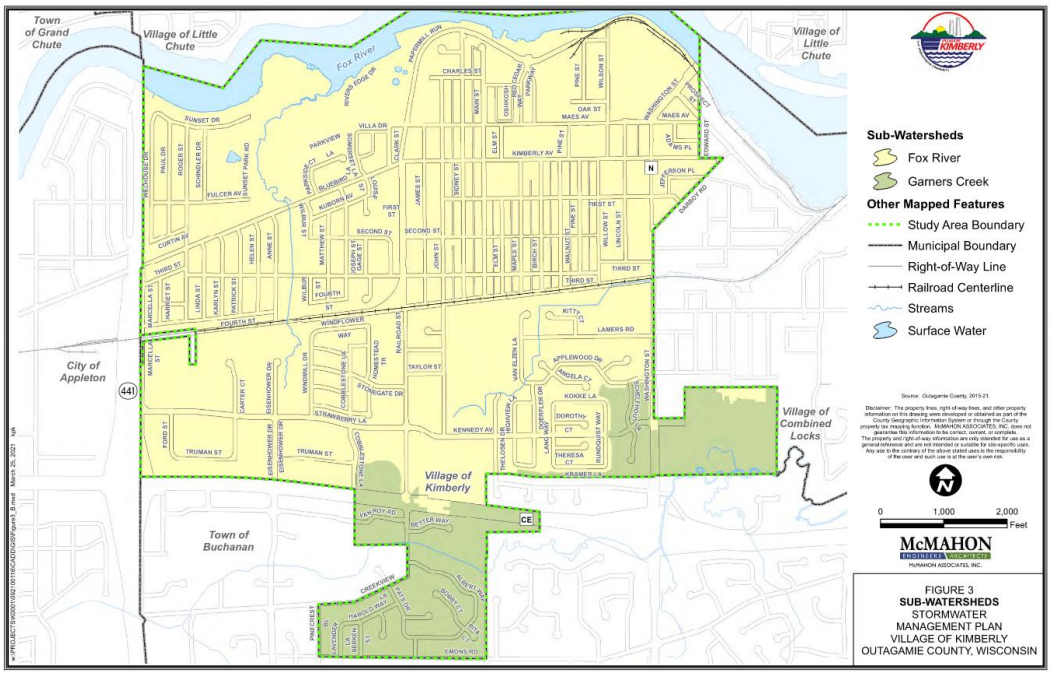
The individual or entity responsible for operation and maintenance of the stormwater management system is as follows:

| | | |
|---|---|---|
| Landowner Name: | | |
| Contact Person: | | |
| Title: | | |
| Phone: | | |
| E-mail: | | |
| Mailing Address: | | |
| City | State | Zip Code |

## III. BACKGROUND

Landowners and the Village are required by the Wisconsin Department of Natural Resources (WDNR) to reduce the amount of stormwater pollutants discharging into Garners Creek and the Fox River. Stormwater pollutants include sediment, phosphorus, heavy metals, bacteria, oil, litter, and other pollutants. The purpose of the stormwater management system is to

provide flood control, reduce pollutants, and improve water quality. To satisfy this purpose, proper inspection, operation, and maintenance of the stormwater management system is needed.




## IV. INSPECTION, OPERATION, & MAINTENANCE

Inspection, operation, and maintenance of the stormwater management system is to be in conformance with the approved plan set, drawings, Stormwater Management Plan report, Operation & Maintenance Plan report, and Operation & Maintenance Agreement. In addition, inspection, operation, and maintenance are to conform with WDNR Technical Standards and guidance in effect at the time of site or subdivision plan approval.

The most current version of Technical Standards developed by the WDNR can be downloaded at https://dnr.wisconsin.gov/topic/Stormwater/standards/postconst_standards.html. The site or subdivision's stormwater management system includes the following devices or components (check all that apply), which are depicted on the plan set or drawings:

- ☐ Wet Detention Pond (1001)
- ☐ Infiltration Basin (1003)
- ☐ Bioretention (1004)
- ☐ Vegetated Swale (1005)
- ☐ Proprietary Sediment Device (1006)
- ☐ Infiltration Trench (1007)
- ☐ Permeable Pavement (1008)
- ☐ Rain Garden (1009)
- ☐ Proprietary Filter Device (1010)
- ☐ Dry Detention Pond
- ☐ Enhanced Phosphorus Treatment
- ☐ Underground Detention
- ☐ Hydro Dynamic Separator (HDS)
- ☐ Catch Basin Cleaning
- ☐ Other: _____
- ☐ Other: _____

Inspection, operation, and maintenance of the stormwater management system is to be performed by the responsible party, or a designated representative trained in stormwater management system inspection, operation, and maintenance.

Limited experience and knowledge are typically required to perform routine inspection and maintenance activities after a 0.5-inch rainfall event or greater. Moderate experience and knowledge are typically required to perform annual inspection and maintenance activities. Extensive experience and professional knowledge are typically required to perform inspection and maintenance activities that are required once every five (5) years.

Written records are to be kept which document inspection, operation, and maintenance activities. To assist with record keeping, a sample Operation & Maintenance Form is provided in Appendix A. Records and test results are to be kept for at least seven (7) years.

## A. Debris & Litter

After each 0.5-inch rainfall event or greater, inlet and outlet locations are to be inspected for debris, litter, obstructions, and clogging. Debris, litter, obstructions, and clogging are to be removed or repaired as soon as practicable after the rainfall event. At a minimum, the following inlet and outlet locations are to be inspected and maintained: trash racks, grates, orifices, weirs, standpipes, backflow preventors, flap gates, pumps, pipes, spillways, channels, level spreaders, dewatering pipes, filter surfaces, and infiltration surfaces.

Annually, other device locations are to be inspected for debris, litter, obstructions, and clogging. Debris, litter, obstructions, and clogging in these other locations are to be removed annually.

## B. Vegetation

About monthly, vegetation is to be visually inspected and maintained during the growing season. Vegetation is to conform with the approved plan set and drawings, unless prior approval to modify vegetation is obtained from the municipality. Consult with and follow the recommendations of a qualified professional that is familiar with the approved plan set, Technical Standards, and stormwater system's purpose.

### Turf Grass

Refer to the approved plan set and drawings for site areas planted with turf grass. Maintain a turf grass density of at least 70% to reduce soil erosion and encourage stormwater infiltration. Apply fertilizers, herbicides, and water if needed to maintain the turf grass's health and density. Replant or overseed, if needed. Select salt, shade, and wet tolerant species where appropriate. Turf grasses are typically mowed to a +/-

2-to-3-inch height. However, if a Vegetated Swale (1005) is depicted on the plan set, the mowing height needs to conform with the height listed in the following table.

| |
|---|
| Vegetated Swale (1005) Mowing Height: _____ inches |
| Vegetated Swale (1005) Density / Mowing Length: _____ feet |

Native Prairie Grass (Larger Area)

Refer to the approved plan set for the location of larger site areas planted with native prairie. For larger prairie grass areas (e.g. wet or dry detention pond, infiltration basin, vegetated swale), maintain a native prairie grass and wildflower density of at least 70% to reduce soil erosion potential and encourage stormwater infiltration.

Larger prairie areas are typically established by seeding, reseeding, or overseeding, as needed. Temporary erosion mat is typically used to improve seed germination and reduce the need for watering during establishment. Hardwood mulch is not typically used for a larger prairie area. Use salt, shade, and wet tolerant species where appropriate. A larger prairie area does not typically need fertilizer, herbicide, and water applications. A larger prairie area is not frequently mowed. However, if a Vegetated Swale (1005) is depicted on the plan set, the mowing height needs to conform with the height listed in the following table. A larger prairie area is typically burned every few years after the initial establishment period. Consult with a qualified professional.

| |
|---|
| Vegetated Swale (1005) Mowing Height: _____ inches |
| Vegetated Swale (1005) Density / Mowing Length: _____ feet |

Native Prairie Grass (Smaller Area)

Refer to the approved plan set for smaller site areas planted with native prairie. For smaller prairie grass areas (e.g. bioretention, infiltration trench, rain garden), maintain a native prairie grass and wildflower density of about one plant for every 1 to 3 square feet, depending on plant canopy and whether a hardwood mulch layer is utilized. Native prairies consist of deep-rooted plants, which enhance stormwater infiltration and reduce potential for clogging in filtration and infiltration devices.

Smaller prairie areas are typically established using individual bare root or potted plants, as needed. Hardwood mulch or erosion mat is typically used to reduce weed growth between individual plants and reduce the need for watering during the establishment period. Use salt, shade, and wet tolerant species where appropriate. Apply fertilizers, herbicides, and water only if needed to maintain individual plant health and density. Prairie plants rarely need fertilizer, herbicide, and water applications. A smaller prairie area is not typically mowed or burned. Rather, individual weeds are pulled by hand. Consult with a qualified professional.

Wetland

Refer to the approved plan set for site areas planted with wetland plants. Wetland plants are typically planted or grow naturally within a wet detention pond's safety shelf or shallow water. Wetland plants shade water, hide litter, hide algae, reduce shoreline erosion, reduce accessibility to deep water, provide habitat for mosquito predators, discourage Canadian Geese, and improve water quality.

Plant spacing depends on the species. Each species has a different density or spacing recommendation for adequate shoreline protection. Wetland plants may need weed control on occasion, but typically not fertilizer or water applications. Replant if needed to manage plant density. Consult with a qualified professional.

Trees & Shrubs

Refer to the approved plan set for site areas planted with trees and shrubs. Trees and shrubs consist of deep-rooted plants, which enhance water infiltration and reduce potential for clogging within filtration and infiltration devices. Use salt, shade, and wet tolerant species where appropriate.

Trees and shrubs are typically trimmed every year or every few years. Trimming frequency depends on the species and desired aesthetics. Trees and shrubs may also need occasional fertilizer, herbicide, insecticide, and water applications. Replant diseased or dead trees and shrubs. Consult with a qualified professional.

Noxious Weed Growth

Annually, noxious weeds and undesirable vegetation are to be cut, sprayed, stunted, and/or removed. Refer to the list of noxious weeds published by the WDNR. Consult with a qualified professional, such as an ecologist or landscaper, to identify and eradicate noxious weeds and other undesirable vegetation.

Unauthorized Tree & Shrub Growth

Annually, unauthorized trees and shrubs will likely grow within stormwater management devices (e.g. willow, cottonwood, buckthorn, etc.). Unauthorized trees and shrubs growth along a stormwater management device's embankment or within a liner have the potential to cause root damage, embankment failure, liner failure, etc. Unauthorized and undesirable woody vegetation is to be eradicated. Unauthorized and undesirable woody vegetation can be cut to a height of 6 inches and then apply a herbicide to the freshly cut stump to stunt growth.

## C. Wildlife

Annually, wildlife damage to stormwater management devices is to be visually inspected and maintained. Consult with and follow the recommendations of a qualified professional that is familiar with the approved plan set, Technical Standards, stormwater system's purpose, and public safety risks.

Animal Burrow Holes

Animal burrow holes can cause a fill embankment, dam, liner, or filter to fail. Animal burrow holes are to be repaired immediately, if public safety is at risk. Animal burrow holes are to be repaired as soon as practicable, if public safety is not at risk.

Fish

Fish are not recommended within wet detention ponds. Bottom feeding fish, such as carp, can uproot wetland vegetation and decrease water quality by re-suspending sediment. If adjacent to a water body, backflow preventers or flap gates on outlets can reduce the potential for fish to enter a pond. Fish can be eradicated by spearing or other methods.

Mosquitoes

Mosquitoes are attracted to open water, wetland vegetation, tall grass, and trees. Mosquito populations should be monitored to control vector-borne diseases, such as the West Nile Virus. Although mosquitoes cannot be permanently eliminated, natural predators can be used to reduce populations. Dragonflies, aquatic insects, bats, and birds are effective natural predators. If biological controls are ineffective, other measures may be utilized, such as harvesting wetland vegetation, burning / mowing tall grass, or artificially fluctuating pond water surface elevations to disrupt breeding. If these measures fail, more aggressive measures such as biological larvicides, larvicidal oils, and chemical adulticides may be necessary. Contact the WDNR before using a biological larvicide, larvicidal oil, or chemical adulticide within or near water.

## D. Erosion

Annually, erosion is to be inspected and repaired as soon as practicable. A more immediate repair is required if needed to protect public safety, structural integrity, slope stability, or stormwater device performance. A description of the different types of erosion is provided below, including typical maintenance activities.

1. Channel erosion (concentrated flow) may occur along steep slopes, bends, high velocity areas, or continuous flows. For minor erosion, the damaged segment is typically repaired with topsoil, seed, and channel erosion mat. For

moderate to severe erosion, the damaged segment is typically repaired with turf reinforcement mat, riprap with geotextile fabric, or concrete.

2. Rill erosion may occur along moderate to steep slopes. For minor to moderate rill erosion, the damaged area is typically repaired with topsoil, seed, and slope erosion mat. For moderate to severe rill erosion, the damaged area is typically repaired with turf reinforcement mat or riprap with geotextile fabric.

3. Scour erosion may occur at inlet or outlet structures. For minor scour erosion, no action may be needed. For moderate to severe scour erosion, the damaged area is typically repaired with turf reinforcement mat, riprap with geotextile fabric, or concrete.

4. Shoreline erosion may occur at the perimeter of open water areas. Shoreline erosion is more common within wet detention ponds, as compared to other devices. The damaged area is typically repaired with topsoil, dense wetland plantings, turf reinforcement mat, and/or riprap with geotextile fabric.

**E. Algae & Aesthetics**

Annually, inspect the stormwater management devices for algae concerns or other aesthetic concerns such as graffiti. Algae typically grows within wet detention ponds. If problematic, algae can be removed with a skimmer, hidden with wetland plants, or dispersed with aerators or fountains. Contact the municipality and WDNR prior to adding aerators, fountains, or chemicals. Approvals or permits may be required. Graffiti and other aesthetic concerns can be addressed as needed.

**F. Pollutants & Illicit Discharges**

Annually, inspect the stormwater management devices for potential pollutants from illegal dumping, illicit discharges, and petroleum sheen. Remove and properly dispose of materials illegally dumped. Contact the municipality if an illicit discharge or petroleum sheen is observed within the stormwater device, site, or subdivision.

**G. Structural (Inlets & Outlets)**

Annually, inspect inlet and outlet structures for cracking, spalling, corrosion, joint separation, leaks, instability, damage, deterioration, and failure. At a minimum, the following components are to be inspected and maintained: trash racks, grates, orifices, weirs, standpipes, structures, pumps, pipes, backflow preventers, flap gates, spillways, channels, level spreaders, and dewatering pipes. Debris and obstructions are to be removed as soon as practicable. Erosion, scour, seepage, instability, damage, deterioration, failures, and other undesirable conditions are be repaired as soon as

practicable, if detrimental to device performance or a public safety hazard. Please contact a professional engineer or the municipality with concerns.

About once every five (5) years, the annual inspection should be performed by a professional engineer or individual with extensive experience and knowledge.

**H. Structural (Embankments, Dam Structures, & Emergency Spillways)**

After each 0.5-inch rainfall event or greater, embankments, dam structures, and emergency spillways are to be quickly inspected for bulging, cracking, seepage, sliding, slumping, instability, erosion, and other failure risks. Complete the repair immediately if deemed a public safety hazard. Schedule the repair if not an immediate public safety risk. Please contact a professional engineer or the municipality with concerns.

Annually, embankments, dam structures, and emergency spillways are to be more thoroughly inspected for bulging, cracking, seepage, leakage, sliding, slumping, instability, erosion, burrow holes, tree roots, settlement, erosion, scour, damage, deterioration, failures, and other failure risks. Complete the repair immediately if deemed a public safety hazard. Schedule the repair if not an immediate public safety risk. Please contact a professional engineer or the municipality with concerns.

About once every five (5) years, the annual inspection should be performed by a professional engineer or individual with extensive experience and knowledge.

**I. Structural (Liners)**

Annually, clay and synthetic liners are to be inspected for potential leaks, animal burrow holes, tree or shrub root penetration, shoreline erosion, and other potential failures. Liners are often used for wet ponds and dry ponds. Liners, if any, are typically depicted on the approved plan set or drawings for the stormwater device.

About once every five (5) years, the annual inspection should be performed by a professional engineer or individual with extensive experience and knowledge.

Repair liners using the materials on the approved plan set unless prior approval is obtained from the municipality for a different material. Three liner types are typically used: clay liners, high density polyethylene liners, or geosynthetic clay liners. To repair a clay liner, the damaged area is typically excavated or tilled, and then recompacted to meet liner detail and specifications identified on the approved plan set. To repair HDPE or geosynthetic liners, a qualified contractor is typically required. If the liner repair is located beneath a surface water, dewatering is typically required. Dewatering

is to be performed in conformance with WDNR Technical Standards and permits. Dewatering of both surface water and groundwater may be required.

## J. Sediment Accumulation

Annually, sediment accumulation is to be visually inspected for undesirable conditions. Sediments accumulate most rapidly at inlets. Sediment is to be removed when detrimental to stormwater device performance, which is generally defined in Table 1 and WDNR Technical Standards.

About once every five (5) years, sediment accumulation is to be measured. The measurement is typically performed by a professional engineer, surveyor, or individual with extensive experience and knowledge. If recommended by a professional engineer and approved by the municipality, the time elapsed between detailed sediment measurements can be decreased or increased using trend data.

| Stormwater Device | Required Sediment Removal |
|---|---|
| Wet Detention Pond | < 3.5 feet of average water above sediment |
| Infiltration Basin | Active storage volume reduced by > 10% |
| Bioretention | Active storage volume reduced by > 10% |
| Vegetated Swale | Active storage volume reduced by > 10% |
| Proprietary Sediment Device | _____ time(s) per _____ |
| Infiltration Trench | Active storage volume reduced by > 10% |
| Permeable Pavement | _____ |
| Rain Garden | Active storage volume reduced by > 10% |
| Proprietary Filter Device | _____ time(s) per _____ |
| Dry Detention Pond | Active storage volume reduced by > 10% |
| Underground Detention | Active storage volume reduced by > 10% |
| Hydro Dynamic Separator | _____ time(s) per _____ |
| Catch Basin Cleaning | _____ time(s) per _____ |

Sediment removal is to be in accordance with Wisconsin Administrative Code NR 528 and associated guidance documents. Sediment sampling may be required prior to removal and disposal to determine if accumulated sediment is contaminated. The responsible party or sediment manager typically hires a professional to conduct sediment sampling, analysis, and evaluations if deemed appropriate or necessary. Permits may be required for the sediment removal activity.

Sediment removal is typically performed using dredging or excavating techniques. Liners are to be protected during sediment removal. Refer to the approved plan set and record drawing for liner locations and elevations. Confirm liner elevations prior to and during dredging or excavating operations. To prevent a liner failure during sediment removal, monitor and control groundwater elevations beneath the liner.

## K. Aerators & Fountains

After each 0.5-inch rainfall event or greater, aerators and fountains are to be inspected. Aerators and fountains are to be inspected for conformance with approved elevation, float, and timer operational requirements. Aerators and fountains are typically depicted on the approved plan set or drawings for the stormwater device.

Aerators and fountains are required to be operated and maintained in conformance with Wet Detention Pond (1001). Aerators and fountains require local approval prior to the initial installation and/or future modification. Aerators and fountains may or may not need to include an automatic shut-off as the pond's water begins to rise during a rainfall event. For this site or subdivision, the following aerator or fountain information is provided:

| | | | |
|---|---|---|---|
| Pond Location: | | | |
| Type (select one): | ☐ None ☐ Aerator ☐ Fountain | | |
| Water Surface Area: | Increased? ☐ Yes or ☐ No | Influence Area _____ acres | |
| Water Intake: | ☐ Vertical or ☐ Horizontal | Influence Depth _____ feet | |
| Manufacturer: | | | |
| Model Number: | | | |
| Motor / Pump: | _____ HP | _____ Volts | _____ Hertz |
| Float & Timer: | ☐ Yes ☐ No ☐ N/A<br>Motor and pump are to remain off for at least _____ hours after pond's water surface returns to its normal elevation. | | |

## L. Enhanced Phosphorus Removal

Enhanced phosphorus removal systems are used in some wet detention ponds. Enhanced phosphorus removal systems are to be inspected, operated, and maintained in conformance with the approved plan set, drawings, and Technical Standards. After each 0.5-inch rainfall event or greater, enhanced phosphorus removal systems are to be inspected and maintained.

## M. Filtration & Infiltration Surfaces

Filtration and infiltration surfaces are used in some stormwater management devices, including Infiltration Basins (1003), Bioretention & Biofiltration (1004), Vegetated Swales (1005), Infiltration Trenches (1007), Permeable Pavements (1008), and Rain Gardens (1009), and Proprietary Filtration (1010). Filtration and infiltration surfaces are to be protected from clogging and compaction by restricting unnecessary weight, such as snow piles and vehicles.

After each 0.5-inch rainfall event or greater, filtration and infiltration surfaces are to be visually inspected for debris, obstructions, damage, clogging, and compaction. Debris and obstructions are to be removed as soon as practicable. Damage is to be repaired as soon as practicable, if detrimental to system performance or a safety hazard. Clogging and compaction are to be mitigated as soon as practicable, and ideally before the next rainfall event. Refer to the operation and maintenance form for acceptable draining times for surface water and subsurface water.

Annually, filtration and infiltration surfaces are to be visually inspected for debris, obstructions, damage, animal burrow holes, erosion, mulch thickness (if any), clogging, and compaction. In addition, water levels below the ground surface are to be measured at observation wells, clean outs, and standpipes. Debris and obstructions are to be removed as soon as practicable. Damage, erosion, and mulch thickness (if any) are to be repaired as soon as practicable, if detrimental to system performance or a safety hazard. Clogging and compaction are to be mitigated as soon as practicable. Refer to the operation and maintenance form for acceptable draining times for surface and subsurface water.

About once every five (5) years, the annual inspection should be performed by a professional engineer or individual with extensive experience and knowledge.

Clogging & Compaction Mitigation

Clogging and compaction typically reduce the movement of stormwater through a filtration or infiltration surface. For design purposes, the maximum design drawdown time for surface water ponding is typically 24 hours after a rainfall event ends. Similarly, for design purposes, the maximum drawdown time for each layer is typically an additional 24-hours per layer. Refer to the operation and maintenance form and the applicable Technical Standards for acceptable draining times for each device.

For maintenance purposes, the filtration or infiltration surface is typically clogged if standing water is observed over 50% of the device's surface or within one or more observation wells. Refer to the operation and maintenance form and the applicable Technical Standards for acceptable draining times for each device.

The following techniques can be used to mitigate the effects of clogging or compaction: deep tilling, chisel plowing, scarifying, replacing upper soil surface, replacing entire soil layer, amending soils, etc. In addition, deep rooted plants, such as native prairie, trees, and shrubs can be used to reduce clogging potential. Refer to the vegetation section for a vegetation discussion.

Hardwood Mulch Surface Layer

Hardwood mulch is sometimes used at the surface of a filtering or infiltrating device to reduce potential weed growth and plant watering. For example, a hardwood mulch layer is often used in bioretention, biofiltration, and rain garden devices. Add hardwood mulch when needed to maintain the desired mulch thickness. Use erosion mat if needed to prevent floating of hardwood mulch. Use care so the hardwood mulch thickness does not impact the device's surface storage volume, draining time, and consequently the device's performance.

Stone Surface Layer

Stone is sometimes used at the surface of a filtering or infiltrating device to reduce potential weed growth and plant watering. For example, a stone layer is often used within infiltration trench devices. Add or replace stone when needed to maintain the desired stone thickness and device performance. Use care so the stone thickness does not impact the device's surface storage volume, draining time, and consequently the device's performance.

Infiltration Basins

During early spring, an infiltration basin's bypass and dewatering pipes are to be closed, such that stormwater flows are not bypassed away from the infiltration surface during spring, summer, and fall operation. Infiltration basins are required to have a bypass or dewatering pipe which directs stormwater away from the infiltrating surface during winter months due to concerns with deicers entering groundwater.

During late fall, an infiltration basin's bypass and dewatering pipe is to be opened, such that stormwater flows are bypassed away from the infiltration surface during winter.

**APPENDIX A**

INSPECTION, OPERATION, & MAINTENANCE FORM

**APPENDIX B**

OPERATION & MAINTENANCE AGREEMENT

**APPENDIX C**

PLAN SET OR DRAWINGS