OPERATION AND MAINTENANCE MANUAL

for the:

Americana Place

Township of East Windsor – Block 57, Lots 9, 10 & 11
Borough of Hightstown – Block 7, Lots 40.02 & 41
Mercer County, New Jersey

Prepared By:

Menlo Engineering Associates, Inc
261 Cleveland Avenue
Highland Park, New Jersey 08904
T.: 732.846.8585
F.: 732.846.9439

Under the Immediate Supervision of:

Gregory S. Oman, P.E.
NJ PE # 43441

GSO/SK
MEA # 2005.109.02
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menlo engineering associates

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Stormwater Management Maintenance:

On site Stormwater Management Maintenance will be performed by:

Katsifis Realty, LLC
359 US Highway 130, Suite 102
East Windsor, NJ
609-371-3516

MAINTENANCE RESPONSIBILITIES:

A) The above referenced party shall maintain a detailed log of all preventative and corrective maintenance for the stormwater management measures shown on the plans, including a record of all inspections and copies of all maintenance related work orders.
B) The person responsible for maintenance identified above shall evaluate the effectiveness of the maintenance plan at least once a year and adjust the plan as needed.
C) The person responsible for maintenance identified above shall retain and make available upon request by any public entity with administrative, health, environmental or safety authority over the site, the maintenance plan and the documentation required above.
D) Following is a list of specific areas requiring maintenance. For detailed information and schedules refer to the specific subsection for each item.

   a) Lawn and Landscaped Area Maintenance
   b) Stormwater Collection System Maintenance
   c) Bioretention Systems Maintenance

LAWN AND ANDSCAPE SYSTEM MAINTENANCE:

Description:
Maintenance involves routine periodic inspection of the vegetation, fertilization, and the correction of erosion problems.

Schedule III - annually or as noted

Shrubs & Trees:	Between March 1 and April 15
Mowing:	As specified per BMP
Fertilize:	Fall - Between September 1 and October 15
Liming:	Between September 1 and October 15
Soil Testing:	Between September 1 and October 15
Pest & Disease Control:	As required
Overseeding:	Between September 1 and October 15 (As required)
Aeration:	Between September 1 and October 15 (As required)

$600 x 12 times per year = $7,200.00

1) **Maintenance: General**
   a) The Contractor shall inspect all areas to verify that all work is being performed properly and as scheduled, locate potential problems, and correct unacceptable conditions. A brief verbal report is to be submitted to the Owner. Problems requiring immediate attention shall be reported to the Owner.

2) **Shrubs & Trees:**
   These plants shall be maintained in a natural setting. No shearing is allowed, shrubs and trees will be hand-pruned to remove dead or diseased branches. Dead plant material shall be replaced in kind unless cultural requirements necessitate change. When planting within compacted slopes, excavate larger holes and backfill with a suitable planting medium.
   (Cost: $100 per 1,000 SF)

3) **Mowing:**
   a) All clippings are to be raked, bagged and disposed off-site to prevent clogging of the outlet structure.
   (Cost: $250 per acre)

4) **Fertilize:**
   a) Fall: Fertilizer analyses and rates are to be based on soil test results. Standard fertilizer blends rather than custom blends are assumed.
   (Cost: $20 per 1,000 SF)

5) **Liming:**
   a) One application in the fall as required by a soil test. Minimum requirements – Lime with pulverized dolomite limestone at a rate of 100 lbs./1,000 s.f.
   (Cost: $10 per 1,000 SF)

6) **Soil Testing:**
   a) The Contractor shall take soil samples from grassed areas for the following analysis: ph, available Mg, P, K, C, recommended nitrogen application. Copies of the analyses for each area are to be furnished to the Owner. Samples shall be taken before liming and fertilization as noted on the schedule.

7) **Turf disease and pest control:**
   a) As required. Submit to the Owner the following information before spraying:
      i) Targeted pests or diseases.
      ii) Materials and methods used.
   (Cost: $20 per 1,000 SF)

8) **Overseeding:**
   a) Overseeding is scheduled, as required per field inspection; or a minimum of once every four (4) years. A variseeder or equal equipment should be used to overseed designated lawn areas. Seed type and rate per the following schedule.
   (Cost: $200 per 1,000 SF)

      i) Seed type and rates for grass basin bottoms:
      Lofts Reclaim Conservation Mix-Damp Formula
      (At a rate of 5 lbs./1,000 s.f.)
      45% Tall Fescue

10% Perennial Ryegrass
25% Poa Trivalis
10% Salty Alkaligrass
5% Redtop
5% Reed Canary Grass

ii) Seed type and rates for lawn areas, grass basin side slopes and berm:
SCS Seed Mix 16
(3.5 lbs./1,000 s.f) Tall Fescue
(0.4 lbs./1,000 s.f) Kentucky Bluegrass (blend)
(0.4 lbs./1,000 s.f) Perennial Ryegrass (blend)

iii) Seed type and rates for low maintenance areas:
Lofts Reclaim Native Grass Mixture
(At a rate of 60lbs/acre)
30% Little Bluestem
20% Indiangrass
20% Azure Blue Fescue
15% Side Oats Grama
10% Big Bluestem
5% Switchgrass

9) **Aeration:**
a) A coring with 3" minimum hollow tines should be used to aerate lawn areas, followed by a steel drag mat to disperse cores. Coring should be timed for adequate soil moisture to insure proper penetration and plug removal. Coring should be done in conjunction with fertilization and/or liming and overseeding in the fall, once a year.
(Cost: $10 per 1,000 SF)

STORMWATER COLLECTION SYSTEM MAINTENANCE:

Schedule I-four times annually and after every storm exceeding 1 inch of rainfall
Schedule II-annually

Description:
Stormwater collection system maintenance involves routine periodic inspection of the storm collection system, the removal of accumulated sediment and debris, and the correction of any structural problems.

1) **Inspection: General**
a) The contractor shall inspect all areas to verify that all work is being performed properly and as scheduled, locate potential problems, and correct unacceptable conditions. A brief verbal report is to be submitted to the owner. Problems requiring immediate attention shall be reported to the owner.
(Cost: $150 per visit x 4 = $600)

2) **Inspection: Schedule I**
   a) Inlets, conduit, outfalls and other conveyance elements: Inspect for and clear debris from the gratings, inlets and pipes. This is to prevent clogging of the inlets and subsequent backup of stormwater runoff. Any problems or defects shall be reported to the owner.
   (Cost: $1,000 per visit x 4 (excludes visits for 1"+ of rainfall events) = $4,000.00)

3) **Inspection: Schedule III (annually)**
   a) Visual inspection of all components of the onsite stormwater collection system. Inspect for and remove silt and sediment, litter and other debris from all inlets, gratings and drainage pipes. All inlets and manholes are to be vacuumed. (Frequency of vacuuming may be adjusted if maintenance records indicate that sediment and debris accumulation is insignificant). In the event that the accumulated material exceeds 10% of the pipe diameter, it must be flushed/vacuumed out of the system.
   (Cost: $2,500)

4) **Prevention of Water Pollution**
   a) The contractor's activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter, contaminates, debris or other pollutants and wastes into the downstream conveyance system. Such pollutants and wastes include, but are not restricted to, refuse, garbage, cement, collected silt and sediment, etc. Disposal of debris and trash should be done only at suitable disposal/recycling sites and must comply with all applicable local, state and federal waste regulations.

BIORETENTION SYSTEM MAINTENANCE:

Description
Effective Bioretention system performance requires regular and effective maintenance. Maintenance involves routine periodic inspection of the system and vegetation, the removal of accumulated sediment and debris, and the correction of any structural or erosion problems.

Schedule I - four times annually and after every storm exceeding 1 inch of rainfall
Schedule IA - once a month during the growing season
Schedule II - bi-annually, during the growing season and the non-growing season
Schedule III - annually

1) **Maintenance: General**
   a) The Contractor shall inspect all areas to verify that all work is being performed properly and as scheduled, locate potential problems, and correct unacceptable conditions. A brief verbal report is to be submitted to the Owner. Problems requiring immediate attention shall be reported to the Owner.
   (Cost: $150 per visit x 4 = $600)

2) **Maintenance: Schedule I**
   a) System Outlet: Inspect for and clear debris from the trashrack/grate and exit ports of the basin outlet structures. This is to prevent clogging of the outlets and subsequent backup of detained water.
   b) Inspect for and clear excessive debris from the basin bottom, pipe inlets and aprons.

c) Inspect for any erosion of banks or other hazards. Any erosion shall be immediately repaired and stabilized accordingly. Maintain seeded areas until they are established.
d) Inspect receiving waters for damage, obstructions and unsightly debris. All obstructions shall be removed immediately and any damage repaired.
e) Any problems or defects shall be reported to the Owner.
(Cost: $1,000 per visit x 4 (excludes visits for 1"+ of rainfall events) = $4,000.00)

3) **Maintenance: Schedule IA (monthly during growing season)**
a) Vegetated Areas: Mowing and/or trimming of vegetation must be performed on a regular schedule based on specific site conditions. Grass should be mowed at least once a month during the growing season.
(Cost: $100 per visit x 12 = $1,200)

4) **Maintenance: Schedule II (bi-annually)**
a) The planting soil bed at the bottom of the system should be inspected at least twice annually. The permeability of the soil bed material should be retested as field conditions warrant.
b) Once established, inspections of vegetation health, density, and diversity should be performed during both the growing and non-growing season at least twice annually.
c) The vegetative cover should be maintained at 85 percent. If vegetation has greater than 50 percent damage, the area should be reestablished in accordance with the original specifications (see seeding specification) and the inspection requirements presented above. All use of fertilizers, mechanical treatments, pesticides and other means to assure optimum vegetation health must not compromise the intended purpose of the vegetative filter. All vegetation deficiencies should be addressed without the use of fertilizers and pesticides whenever possible.
(Cost: $100 per visit x 2 = $200)

5) **Maintenance: Schedule III (annually)**
a) Vegetated areas must be inspected annually for erosion and scour. Vegetated areas must be inspected for unwanted growth, which must be removed with minimum disruption to the planting soil bed and remaining vegetation.
b) When establishing or restoring vegetation, biweekly inspections of vegetation health must be performed during the first growing season or until the vegetation is established.
(Cost: $1000)

6) **Basin Performance Criteria**
The Bioretention systems should completely drain as follows:

Bio-basin #1 – 26.5 hrs
Bio-basin #2 – 44.3 hrs
Bio-basin#3 – 33.6 hrs
Bio-basin #4 – 40.9 hrs
Bio-basin #5 – 34.3 hrs
Bio-basin#6 – 36.0 hrs
Bio-basin #7 – 46.7 hrs
Bio-basin #8 – 47.5 hrs

If significant increases or decreases in the normal drain time are observed, or if the 72-hour maximum drain time is exceeded, the basin's outlet, underdrain system, filter medium and both groundwater and tailwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements and maintain the proper functioning of the basin.

7) **Prevention of Water Pollution**

a) The contractor's activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter, contaminates, debris or other pollutants and wastes into the downstream conveyance system. Such pollutants and wastes include, but are not restricted to, refuse, garbage, cement, collected silt and sediment, etc. Disposal of debris and trash should be done only at suitable disposal / recycling sites and must comply with all applicable local, state, and federal waste regulations.

EQUIPMENT, TOOLS AND SUPPLIES:

Debris, Trash and Sediment Removal Equipment

a. Loader
b. Backhoe
c. Grader

Grass Maintenance Equipment

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

Materials

a. Topsoil
b. Fill
c. Seed
d. Soil amenities (fertilizer, lime, etc.)
e. Chemicals (pesticides, herbicides, etc.)
f. Mulch

Miscellaneous Equipment

a. Shovels
b. Rakes
c. Picks
d. Wheelbarrows
e. Gloves
f. Brooms
g. Standard Mechanic Tools
h. Safety Equipment

Transportation Equipment

a. Trucks for Transportation of Materials
b. Trucks for Transportation of Equipment
c. Vehicles for Transportation of Personnel

Vegetative Cover Maintenance Equipment

a. Saws
b. Pruning Shears
c. Hedge Trimmers
d. Aquatic Weed Harvester
g. Paint Removers
h. Spare Equipment Parts

Inspection Checklist Log

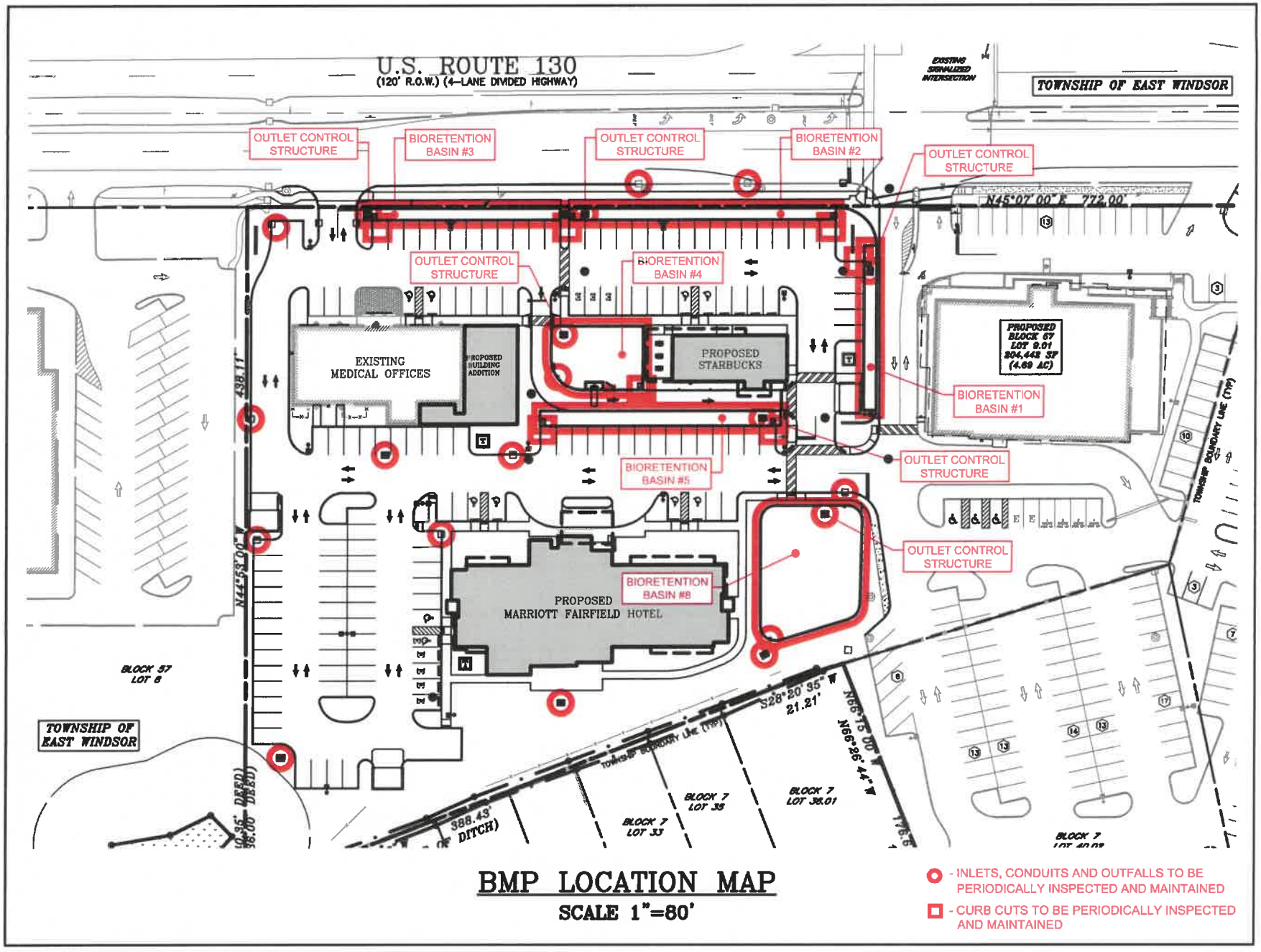
Cycle of Inspection	Stormwater Management Measure No.	Checklist No.	Date(s) of Inspection

Preventative Maintenance Log

Maintenance Schedule	Stormwater Management Measure No.	Preventative Maintenance Record No.	Date(s) of Maintenance

Corrective Maintenance Log

Maintenance Schedule	Stormwater Management Measure No.	Corrective Maintenance Record No.	Date(s) of Maintenance



BMP LOCATION MAP

SCALE 1"=80'

- INLETS, CONDUITS AND OUTFALLS TO BE PERIODICALLY INSPECTED AND MAINTAINED
- CURB CUTS TO BE PERIODICALLY INSPECTED AND MAINTAINED