# TOWN OF BETHLEHEM

## STORMWATER MANAGEMENT PRACTICE (SMP) SELECTION MATRICES FORM

***Instructions****: This form is designed as a process of elimination for selecting SMPs suitable for a project site. The number of SMP groups and design variants available as Potential Practices decreases as the user progresses through the five steps. Submit this form with the Sketch Plan Application prior to scheduling a meeting with the Development Planning Committee.*

| ***Project Name:*** | ***Preparer:*** | ***Date:*** |
|---|---|---|

**STEP 1:** Based on the *land use* of the project, determine which SMPs are suitable for the site: (A) First, check the land use category; (B) Then, check the SMPs considered *potential practices* based on their suitability within the proposed land use.

**Table 1 - Land Use Selection Matrix**

| ***SMP Group*** | **SMP Design Variants** | **Rural** ☐ | **Residential** ☐ | **Roads and Highways** ☐ | **Commercial/ High Density** ☐ | **Hotspots** ☐ | **Ultra Urban** ☐ | ***Potential Practices*** |
|---|---|---|---|---|---|---|---|---|
| ***Ponds*** | Micropool ED Pond (P-1) | Y | Y | Y | D | A1 | N | ☐ |
| | Wet Pond (P-2) | Y | Y | Y | D | A1 | N | ☐ |
| | Wet ED Pond (P-3) | Y | Y | Y | D | A1 | N | ☐ |
| | Multiple Pond (P-4) | Y | Y | D | D | A1 | N | ☐ |
| | Pocket Pond (P-5) | Y | D | Y | D | N | N | ☐ |
| ***Wetlands*** | Shallow Wetland (W-1) | Y | Y | D | D | A1 | N | ☐ |
| | ED Wetland (W-2) | Y | Y | D | D | A1 | N | ☐ |
| | Pond/Wetland (W-3) | Y | Y | N | D | A1 | N | ☐ |
| | Pocket Wetland (W-4) | Y | D | Y | D | N | N | ☐ |
| ***Infiltration*** | Infiltration Trench (I-1) | D | D | Y | Y | N | D | ☐ |
| | Infiltration Basin (I-2) | D | D | D | D | N | D | ☐ |
| | Dry Well (I-3) | D | Y | N | D | N | D | ☐ |
| ***Filtering Practices*** | Surface SF (F-1) | N | D | Y | Y | A2 | Y | ☐ |
| | Underground SF (F-2) | N | N | D | Y | Y | Y | ☐ |
| | Perimeter SF (F-3) | N | N | D | Y | Y | Y | ☐ |
| | Organic Filter (F-4) | N | D | Y | Y | A2 | Y | ☐ |
| | Bioretention (F-5) | D | D | Y | Y | A2 | Y | ☐ |
| ***Open Channels*** | Dry Swale (O-1) | Y | D | Y | D | A2 | D | ☐ |
| | Wet Swale (O-2) | Y | N | Y | N | N | N | ☐ |

Notes:

Y = Yes – Good option in most cases based upon land use

D = Depends – Suitable under certain conditions or used to treat a portion of the site (justify not using a "Yes" practice)

N = No – Seldom or never a suitable option based upon land use

A1 = Acceptable, but may require a impermeable liner to reduce risk of groundwater contamination

A2 = Acceptable option if practice is not designed to infiltrate runoff

**STEP 2:** Using only the *potential practices* selected from Table 1, further screen for suitable SMPs based on the physical constraints of a site. Tests pits are required to determine seasonally high groundwater elevation directly below the SMP(s).

| *'Yes' SMPs from Step 1* | **TABLE 2 - Physical Feasibility Matrix** | | | | | | | *Potential Practices* |
|---|---|---|---|---|---|---|---|---|
| | ***SMP Group*** | **SMP Design Variants** | **Soils** | **Water Table** | **Drainage Area (ac)** | **Site Slope** | **Head (ft)** | |
| ☐ | ***Ponds*** | Micropool ED Pond (P-1) | HSG A soils may require pond liner | 2 feet separation if hotspot or aquifer | 10 min[1] | No more than 15% | 6 to 8 ft | ☐ |
| ☐ | | Wet Pond (P-2) | | | 25 min[1] | | | ☐ |
| ☐ | | Wet ED Pond (P-3) | | | | | | ☐ |
| ☐ | | Multiple Pond System (P-4) | | | | | | ☐ |
| ☐ | | Pocket Pond (P-5) | OK | Below WT | 5 max[2] | | 4 ft | ☐ |
| ☐ | ***Wetlands*** | Shallow Wetland (W-1) | HSG A soils may require liner | Min. 2' separation if hotspot or aquifer | 25 min | No more than 8% | 3 to 5 ft | ☐ |
| ☐ | | ED Wetland (W-2) | | | | | | ☐ |
| ☐ | | Pond/Wetland System (W-3) | | | | | | ☐ |
| ☐ | | Pocket Wetland (W-4) | OK | Below WT | 5 max | | 2 to 3 ft | ☐ |
| ☐ | ***Infiltration*** | * Infiltration Trench (I-1) | Minimum fc > 0.5 in/hr; additional pretreatment required if fc > 2.0 in/hr | Minimum 3' separation or 4' if above a sole source aquifer | 5 max | No more than 15% | 1 ft[6] | ☐ |
| ☐ | | * Infiltration Basin (I-2) | | | 10 max[3] | | 3 ft | ☐ |
| ☐ | | * Dry Well (I-3) | | | 1 max[4] | | 1 ft | ☐ |
| ☐ | ***Filtering Practices*** | Surface Sand Filter (F-1) | OK | 2 feet[5] | 10 max[2] | No more than 6% | 5 ft | ☐ |
| ☐ | | Underground Sand Filter (F-2) | | | 2 max[2] | | 5 to 7 ft | ☐ |
| ☐ | | Perimeter Sand Filter (F-3) | | | 2 max[2] | | 2 to 3 ft | ☐ |
| ☐ | | Organic Filter (F-4) | | | 5 max[2] | | 2 to 4 ft | ☐ |
| ☐ | | Bioretention (F-5) | | | 5 max[2] | | 5 ft | ☐ |
| ☐ | ***Open Channels*** | Dry Swale (O-1) | Made Soil | 2 feet | 5 max | No more than 4% | 3-5 ft | ☐ |
| ☐ | | Wet Swale (O-2) | OK | Below WT | 5 max | | 1 ft | ☐ |

***** If an Infiltration SMP is selected for a site, initial feasibility testing is to be performed in accordance with Appendix D of the *NYS Stormwater Management Design Manual* to confirm the soil infiltration rates **prior** to submitting the SWPPP.

Notes:

1: Unless adequate water balance and anti-clogging device installed
2: Drainage area can be larger in some instances
3: May be larger in areas where the soil percolation rate is greater than 5.0 in/hr
4: Designed to treat rooftop runoff only
5: If designed with a permeable bottom, must meet the separation requirements for infiltration practices
6: Required ponding depth above the bottom geotextile layer

Explanation of Factors:

*Soils* - The key evaluation factors are based on an initial investigation of the NRCS hydrologic soils groups at the site

*Water Table* - Indicates the minimum depth to the seasonally high water table from the bottom elevation of the SMP

*Drainage Area* - Indicates minimum or maximum drainage area that is considered optimal based on water availability

*Slope* - Indicates slope restrictions for where the SMP is installed and/or the steepness of the contributing drainage area

*Head* - Provides an estimate of the elevation difference needed for a practice to function by means of gravity operation

**STEP 3:** Using only the *potential practices* selected from Table 2, further screen for suitable SMPs based on local resources to be protected and after discussing local water quality issues and/or flooding concerns with the regulating municipality. First check the watershed/regional factor, then select SMPs considered *potential practices* based on their restrictions in the factor.

| *'Yes' SMPs from Step 2* | **TABLE 3 – Watershed/Regional Factors Matrix** | | | | | | | *Potential Practices* |
|---|---|---|---|---|---|---|---|---|
| | ***SMP Group*** | **Streams** | **Aquifer** | **Lakes** | **Reservoir** | **Estuary/ Coastal** | **Cold Climate** | |
| | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | |
| ☐ | ***Ponds*** | Emphasize channel protection<br>Restrict in-stream Practices<br>Discouraged in trout waters due to warming | May require liner if HSG A soils are present<br>Pretreat 100% of $WQ_v$ from hotspots<br>Provide a 2' separation distance to water table | Encourage the use of large permanent pool to improve phosphorus removal<br>Promote long detention times to encourage bacteria removal | Encourage the use of large permanent pool to improve sediment and phosphorous removal<br>Promote long detention times to encourage bacteria removal | Encourage long detention times to promote bacteria removal<br>Provides high nitrogen removal<br>In flat areas, a pond drain may not be feasible | Incorporate design features to improve winter performance | ☐ |
| ☐ | ***Wetlands*** | Minimize surface area of the permanent pool and encourage shading of water | | | | | Encourage the use of salt tolerant vegetation | ☐ |
| ☐ | ***Infiltration*** | Strongly encouraged for groundwater recharge<br>Combine with a detection facility for channel protection | Provide 100' horizontal separation distance from wells and 4' vertical distance from the seasonally high groundwater table | OK. Provides high phosphorus removal | Provide separation distance from bedrock & water table<br>Pretreat runoff into infiltration practices | OK, but need separation distance to seasonally high groundwater<br>Sandy soils require more pretreatment | Incorporate features to minimize the risk of frost heave<br>Discourage infiltration of chlorides | ☐ |
| ☐ | ***Filtering Practices*** | Combine with a detention facility for channel protection | Excellent pretreatment for infiltration or open channel practices | OK, but designs with a submerged filter may result in phosphorus release | Excellent pretreatment for infiltration to open channel practices<br>Moderate to high coliform removal | Moderate to high coliform removal<br>Submerged filter bed designs appear to have very high nitrogen removal | Incorporate design features of Chapter 6 to improve winter performance | ☐ |
| ☐ | ***Open Channels*** | Combine with a detention facility for channel protection | OK, but hotspot runoff must be adequately pretreated | OK. Moderate phosphorus removal | Poor coliform removal for wet swales | Poor coliform removal for wet swales | Encourage the use of salt tolerant vegetation. | ☐ |

Explanation of Factors:

*Streams* - Check if on the NYSDEC 303d list, Priority Waterbody List (PWL), or trout waters with Class C(t) and higher.

*Aquifers* - Take special care to select a practice and incorporate design considerations that help protect groundwater quality.

*Lakes* - Phosphorus removal and bacteria are typically of concern, check with the community and local watershed groups.

*Reservoirs* - Turbidity, phosphorous removal, and bacteria are typically of concern for any public drinking water supplies.

*Estuary/Coastal* - In the Hudson River Estuary, nitrogen is typically a concern due to the potential for eutrophication.

*Cold Climates*- The Town of Bethlehem is designated as 'Cold Climate', consider all items in this column in the design.

**STEP 4:** Using only the *potential practices* selected from Table 3, further screen for suitable SMPs based on capability of the SMP to address water quality and quantity issues. If a SMP is not a GOOD or FAIR option for meeting the management goal, use of a supplemental practice is required, i.e. a dry swale for water quality and a dry detention pond for water quantity.

| *'Yes' SMPs from Step 3* | **Table 4 – SMP Capability Matrix** | | | | | | | *Potential Practices* |
|---|---|---|---|---|---|---|---|---|
| | ***SMP Group*** | **SMP Design Variants** | **Water Quality** | | | **Water Quantity** | | |
| | | | **Nitrogen** | **Metals** | **Bacteria** | **Channel Protection** | **Flood Control** | |
| ☐ | ***Ponds*** | Micropool ED Pond (P-1) | Good | Good | Good | Good | Good | ☐ |
| ☐ | | Wet Pond (P-2) | | | | | | ☐ |
| ☐ | | Wet ED Pond (P-3) | | | | | | ☐ |
| ☐ | | Multiple Pond System (P-4) | | | | | | ☐ |
| ☐ | | Pocket Pond (P-5) | | | | | | ☐ |
| ☐ | ***Wetlands*** | Shallow Wetland (W-1) | Good | Fair | Good | Good | Good | ☐ |
| ☐ | | ED Wetland (W-2) | | | | | | ☐ |
| ☐ | | Pond/Wetland System (W-3) | | | | | | ☐ |
| ☐ | | Pocket Wetland (W-4) | | | | | D1 | ☐ |
| ☐ | ***Infiltration*** | Infiltration Trench (I-1) | Good | Good | Good | Poor | Poor | ☐ |
| ☐ | | Infiltration Basin (I-2) | | | | D2 | D2 | ☐ |
| ☐ | | Dry Well (I-3) | | | | Poor | Poor | ☐ |
| ☐ | ***Filtering Practices*** | Surface Sand Filter (F-1) | Good | Good | Fair | D1 | D1 | ☐ |
| ☐ | | Underground Sand Filter (F-2) | | | | Poor | Poor | ☐ |
| ☐ | | Perimeter Sand Filter (F-3) | | | | Poor | Poor | ☐ |
| ☐ | | Organic Filter (F-4) | | | | Poor | Poor | ☐ |
| ☐ | | Bioretention (F-5) | | | | D1 | D1 | ☐ |
| ☐ | ***Open Channels*** | Dry Swale (O-1) | Fair | Good | Poor | Poor | Poor | ☐ |
| ☐ | | Wet Swale (O-2) | | | | | | ☐ |

Notes:
GOOD - option for meeting management goal, has pollutant removals of >30% TN, >60% Metals, >70% Bacteria
FAIR - option for meeting management goal, has pollutant removals of 15-30% TN, 30-60% Metals, 35-70% Bacteria
POOR - option for meeting management goal, has pollutant removals of <15% TN, <30 Metals, <35% Bacteria
D1 – In most cases, cannot meet this goal, but the design may be adapted to add storage component.
D2 – Generally cannot meet this goal, except in areas with soil percolation rates greater than 5.0 in/hr

## List of Supplemental and Alternative Stormwater Management Practices from the *Design Manual*

**Supplemental Practices from Chapter 5** (suitable *only* if incorporated with a standard SMP)

Pretreatment:
Oil/grit separators, Hydrodynamic structures, Deep sump catch basins, Vegetated filter strips, and Grass channels

Channel/Flood Protection:
Dry detention ponds, Underground vaults for flood control, and On-line storage in the storm drain pipe network

**Alternative Practices from Chapter 9** (suitable *only* for Redevelopment Projects)

Rain Gardens, Cisterns, Green Roofs, Stormwater Planters, Permeable Paving, and Select Proprietary Products

**STEP 5:** Using only the *potential practices* selected from Table 4, further screen for suitable SMPs based upon the local community and/ or environmental factors to determine the SMPs considered acceptable practices on the project site.

| *'Yes' SMPs on Table 4* | **Table 5 - Community and Environmental Factors Matrix** | | | | | | | *Acceptable Practice* |
|---|---|---|---|---|---|---|---|---|
| | ***SMP Group*** | **SMP Design Variants** | *** Ease of Maintenance** | **Community Acceptance** | **Affordability** | **Safety** | **Habitat** | |
| | | | ☐ | ☐ | ☐ | ☐ | ☐ | |
| ☐ | ***Ponds*** | Micropool ED Pond (P-1) | Moderate | Moderate | High | High | Moderate | ☐ |
| ☐ | | Wet Pond (P-2) | High | High | High | Low | High | ☐ |
| ☐ | | Wet ED Pond (P-3) | High | High | High | Low | High | ☐ |
| ☐ | | Multiple Pond System (P-4) | High | High | Moderate | Low | High | ☐ |
| ☐ | | Pocket Pond (P-5) | Low | Moderate | High | Moderate | Low | ☐ |
| ☐ | ***Wetlands*** | Shallow Wetland (W-1) | Moderate | High | Moderate | High | High | ☐ |
| ☐ | | ED Wetland (W-2) | Moderate | Moderate | Moderate | Moderate | High | ☐ |
| ☐ | | Pond/Wetland System (W-3) | High | High | Moderate | Low | High | ☐ |
| ☐ | | Pocket Wetland (W-4) | Low | Low | High | High | Moderate | ☐ |
| ☐ | ***Infiltration*** | Infiltration Trench (I-1) | Low | High | Moderate | High | Low | ☐ |
| ☐ | | Infiltration Basin (I-2) | Low | Low | Moderate | High | Low | ☐ |
| ☐ | | Dry Well (I-3) | Low | Moderate | Moderate | High | Low | ☐ |
| ☐ | ***Filtering Practices*** | Surface Sand Filter (F-1) | Moderate | Moderate | Low | High | Low | ☐ |
| ☐ | | Underground Sand Filter (F-2) | Low | High | Low | Moderate | Low | ☐ |
| ☐ | | Perimeter Sand Filter (F-3) | Low | High | Low | High | Low | ☐ |
| ☐ | | Organic Filter (F-4) | Moderate | High | Low | High | Low | ☐ |
| ☐ | | Bioretention (F-5) | Moderate | Moderate | Moderate | High | Moderate | ☐ |
| ☐ | ***Open Channels*** | Dry Swale (O-1) | High | High | Moderate | High | Low | ☐ |
| ☐ | | Wet Swale (O-2) | High | Moderate | High | High | Moderate | ☐ |

*** For Town-Owned SMPs, Stormwater Ponds and an Ease of Maintenance rating of 'High' is the preferred SMP.**

Explanation of Factors:

*Ease of Maintenance* - This column assesses the relative maintenance effort of each SMP, in terms of three main criteria: frequency of scheduled maintenance, chronic maintenance problems (such as outlet clogging) and reported failure rates.

*Community Acceptance* - This column assesses community acceptance, as measured by three factors: consumer market and preference surveys, reported nuisance problems, and visual orientation (i.e. is it prominently located or is it in a discrete underground location). It should be noted that a low ranking can often be improved by a better landscaping plan.

*Affordability* - The SMPs are ranked according to their relative construction cost per acre of impervious cover treated.

*Safety* - A comparative index evaluating relative safety of an SMP for access to deep pools or standing water that may create potential safety risks. Evaluation of liability and safety are of paramount concern in many residential settings.

*Habitat - SMPs* are evaluated on their ability to provide wildlife or wetland habitat, assuming by SMP and its buffer are landscaped appropriately. Objective criteria evaluated include size, water features, wetland features and vegetative cover.

## Identify the Acceptable SMP(s):

| | |
|---|---|
| ***Proposed SMP #1:*** | ***Supplemental or Alternative SMP:*** |
| ***Proposed SMP #2:*** | ***Supplemental or Alternative SMP:*** |