APPENDIX D

STRUCTURAL BMP PRIORITIZATION METHODOLOGY

Appendix D

Prioritization Elements for Stormwater Management Facilities in the Lycoming County MS4 Coalition

BACKGROUND

The purpose of this document is to describe the prioritization methodology used for evaluating existing and proposed stormwater management facilities within the eight municipalities involved in the Lycoming County MS4 Coalition. The identification and prioritization of these facilities is being completed to support compliance with Executive Order 13508 – Chesapeake Bay Protection and Restoration and to respond to the requirements of the Chesapeake Bay Pollution Reduction Plan.

The results of the prioritization provide the Coalition with a ranking of facilities so that limited funding can be dedicated to projects with the greatest expected outcome relative to compliance. The prioritization continues to be modified to favor more sustainable approaches, such as low impact development or LID, and to reflect emerging crediting guidance.

OVERVIEW

Stormwater Management facilities (BMPs) were prioritized based on information gathered during the field assessment and from GIS and CADD data provided, acquired, or developed as discussed in the main report. The purpose of prioritization is to develop a ranking system that is broadly applicable to all Coalition facilities and which will identify opportunities that provide the greatest benefit to restoring the Chesapeake Bay at a high benefit-to-cost ratio, and with minimal secondary impacts. To accomplish this, a ranking system based on four broad scoring categories, each with multiple elements, has been developed for this project. These categories are listed below and the table on the following page presents the categories along with their respective scoring elements and associated scoring information:

1) Benefits
2) Environmental Need
3) Constraints
4) Relative BMP Cost Factors

Category	Scoring Elements	Maximum Element Score	Maximum Category Score
1) Benefits	A. Area Treated by BMP	20	30 (25%)
	B. Pollution Removal Effectiveness	10	
2) Environmental Need	A. Located in Impaired Catchment	15	30 (25%)
	B. Existing Landscape & Land Use	10	
	C. Receiving Waterbody Sensitivity	5	
3) Constraints	A. Land Classification (Public/Private)	15	30 (25%)
	B. Space Constraints	5	
	C. Community Support	10	
4) Relative BMP Cost Factors	A. Planning Level Design & Construction Cost	10	30 (25%)
	B. Maintenance Burden/Cost	10	
	C. Available Funding Mechanisms	10	
Total Maximum Possible Score:			**120**
Fatal Flaws - Considerations that may preclude certain opportunities from being viable, as described at the end of this section of Appendix A			F

Following sections of this document provide an explanation of the method of assessment, rationale for scoring, and site-specific interpretation for each category and associated element. Site specific interpretation is helpful and necessary due to the broad scale differences between facilities (physiography being a prime example) and also to enhance the ability to differentiate within the facility. Ranking elements are intended to be widely applicable from facility to facility, and within any given facility to each discreet unit being assessed, have minimal redundancy, and be of a comprehensive nature based on available data sources for a planning study of this nature. These elements are aggregated to develop sub-total scores for each category. The sub-total allows for a quick assessment of the driving influence on total score that can then be considered when selecting BMPs for conceptual or final design and installation.

For each element, a scoring reference table is provided with the selection options and corresponding scores. To help maintain the desired flexibility, the element options tend to allow

a degree of subjectivity. It is noted that this flexibility is not intended to be used to undermine the relative importance of the various ranking elements, as denoted by their scoring. An overall total score of 120 is possible; BMPs in the top one-half, or those achieving a minimum threshold score, will be the focus of further review to assess their feasibility, practicality and cost-effectiveness relative to the other high-scoring BMPs.

The typical approach to identifying BMP locations involves eliminating areas that are not conducive to facility implementation. However, areas may appear feasible during the assessment, but later determined to have a fatal flaw that would prevent implementation. These fatal flaws may be based on present or future site conditions. The following fatal flaws have been identified..

- **Located outside of Regulated MS4 area:** Any existing or proposed BMP facility located outside of the Regulated MS4 area that will not help achieve compliance with the Pollutant Reduction Plan requirements.
- **Aquatic Resource Impact:** Any proposed BMP activity that threatens to negatively impact a regulated water body (stream, wetland, etc.), particularly when the proposed impact is permanent and/or the water resource quality is high.
- **Threat to Cultural or Historic Resource:** Any proposed BMP activity that threatens the integrity of a cultural or historic resource (e.g. archeological sites, historic buildings, etc.) without an apparent solution to mitigate the potential impact.
- **Operational Constraints:** Any proposed BMP activity that is impractical based on present or future land use, logistical considerations, access or site layout constraints including property boundaries or adjacent land use conflicts, groundwater contamination, or other comparable factors that impinge on the viability of the area selected for opportunity siting, or make the recommendation unsuitable will be considered a fatal flaw.
- **Unacceptable Flooding Risk:** If riverine or tidal flooding has a high likelihood of occurring, or occurring frequently, within the operable life of the BMP and this would pose significant risk to the long-term viability of BMP, a fatal flaw designation is applied based on this unacceptable risk for flooding.

PRIORITIZATION MATRIX

CATEGORY 1: BENEFITS (Score Range: 0 to 30)

This category delineates water quality and water quantity to be derived from opportunity implementation and includes:

- Water quantity score based on BMP size
- Water quality score pollution removal effectiveness

A. Water Quantity Score for Drainage Area Treated (0 to 20): Evaluates the BMP opportunity

1. Method: Performed with GIS or CADD measurement based on topographic data provided, analysis of sewer sheds, field observations, or available data provided by County.
2. Rationale: The BMP drainage area is strongly correlated to the mitigated runoff volume. Note that if the BMP size is too small to treat this volume, the Constraints score based on available space (refer to Category 3, Element B) may be reduced to counter-balance the BMP Size score.
3. Facility Specific Interpretation or Notes: The area draining to each BMP was estimated from available data. Where Acres Treated data was not available, a relative score was used based on BMP type
4. Calculation: The top 15% of sites with the largest contributing drainage areas (DAs) were assigned the maximum score. All other BMPs DAs were scored as a percentage of the 85th percentile DA based on the equation:

Score = BMP DA / 85% Percentile DA x Maximum Score

OR

Stormwater Management Practice Relative DA	Score	Comment
Extra Large	18	
Large	16	
Medium	10	
Small	4	
Extra Small	2	

C. **Water Quality Score for Pollution Removal Effectiveness (0 to 10):** Evaluates the BMP opportunity

1. Method: Determine solely by BMP type and data from the Chesapeake Bay Expert Panel Report.
2. Rationale: The BMP type is strongly correlated to the benefits to the water quality of the runoff.

3. Facility Specific Interpretation or Notes: The Chesapeake Bay report utilizes terminology that matches Virginia Regulations. The table below has been reworded to match PaDEP terminology for all BMPs analyzed.

Stormwater Management Practice	Score	Comment
- Rooftop disconnection - Tree box filter - Herbaceous buffer establishment - Soil amendment	1	Average N, P, Sed. removal efficiency 0-5%, or No Credit.
- Step pool storm conveyance system - Dry detention - **Hydrodynamic structures (incl. Oil Water Separators)** - **Underground Detention System** - Vegetated (grass) open channels	3	Average N, P, Sed. removal efficiency 5-25%.
- Flow to open space or filter strip C/D soils - Permeable pavement C/D soils - **Dry extended detention**	5	Average N, P, Sed. removal efficiency 25-35%.
- Constructed wetland (Shallow marsh pond) - **Bioretention or bioswale C/D soils, with underdrain** - **Rain Garden** - **Wetland restoration** - **Forest buffer establishment**	6	Average N, P, Sed. removal efficiency 35-45%.
- Flow to open space or filter strip A/B soils - Permeable pavement A/B soils, with underdrain - Filtering practice sand/organic/peat	8	Average N, P, Sed. removal efficiency 45-65%.
- **Impervious cover removal** - Reforestation/Land Use Conversion - Bioretention or bioswale A/B soils, with or without underdrain - Permeable pavement A/B soils, no underdrain - **Infiltration A/B**	10	Average N, P, Sed. removal efficiency 65-90%.

*Adapted from: Final_CBP_Approved Expert_Panel_Report_on_Stormwater Performance_Standards LONG.pdf, Accessed 1/5/15

CATEGORY 2: ENVIRONMENTAL NEED (Score Range: 0 to 30)

This category delineates environmental factors related to the degree of impact anticipated from implementation of that opportunity and includes the following:

- Receiving waterbody impairment
- Stormwater benefits from existing landscape and land use
- Receiving waterbody sensitivity.

A. Receiving Waterbody Impairment (0 to 15): Describes the extent to which the receiving waterbody is impaired. Impairment due to nutrients, solids, or sediments was

prioritized because these are pollutants of greater concern to the Bay and pollutants that BMPs can mitigate.

1. Method: Obtain best available data from 303(d) list and use classification.
2. Rationale: Increased sensitivity of receiving water increases the benefit to be derived from implementation of the opportunity.
3. Facility Specific Interpretation or Notes:

Impairment	Score	Comment
No impairment	0	No known sensitivity or problems (other than Bay-wide nutrient and sediment TMDL).
Moderate impairment	3	Receiving water impairment for pollutants other than nutrients, solids, or sediments.
High impairment	5	Receiving water impairment for nutrients, solids, or sediments.

B. Stormwater Benefits from Existing Landscape and Land Use (0 to 10): Benefits from existing landscape describes the extent to which existing vegetation or ground cover serves to disconnect impervious areas by slowing and dispersing runoff and reducing pollutant transport. Where possible, stormwater retrofit opportunities that encourage infiltration are desirable both from a pollutant removal standpoint and from an environmental quality standpoint (groundwater recharge, vegetation management, etc.). Land Use describes the character of development, or lack-there-of, in the subwatershed draining to an opportunity

1. Method: Aerial imagery and field visual observation.
2. Rationale: Sites that receive benefit from the existing landscape are a lower priority for implementation as lower amounts of pollutants will enter the site. Land use is a potential indicator of the type and extent of pollutants derived from runoff over the landscape to the opportunity location. A higher score is given to land use types that contribute more pollutants. Facility specific interpretation of this category should be given appropriate consideration in making assumptions based on land use.
3. Facility Specific Interpretation or Notes: BMP-sheds with drainage to natural areas or through buffers were scored as low priority. Some areas drained immediately to ditches. In cases where these ditches drain to hydraulic structures that detain water, the opportunities were considered low or medium priority, where no such treatment existing, they were considered medium to high priority. Juxtaposition of pollutant generating surfaces were considered in the evaluation. Opportunities with a high percentage of impervious surface were typically called “Commercial”, particularly when they include road or parking facilities that receive frequent use. BMPs that only collect rooftop runoff typically scored as “Residential”. If an area has some industrial activity, or a comparable activity with a potential to produce comparable types of loading, these scored highest –

included in this category are known areas of fertilized turf. Impervious areas that are small, do not receive (or only receive minimal) traffic, or are a mix of impervious and pervious typical to residential settings were called “Residential”. Open Space was reserved for areas consisting predominantly of unmowed grass and/or woods.

Priority based on Stormwater Benefits from Existing Landscape	Score	Comment
Meadow/Woods	0	Existing buffer width, vegetation height and density, and flow path length has significant affect in dispersing runoff and/or encouraging infiltration.
Grass	3	Existing buffer width, vegetation height and density, and flow path length has a moderate effect on dispersing runoff and/or encouraging infiltration.
Impervious	5	Existing buffer width, vegetation height and density, and flow path length has minimal effect on dispersing runoff and/or encouraging infiltration – e.g. Impervious areas directly connected.

Priority based on Land Use	Score	Comment
Open Space	0	
Residential	1	Unfertilized, applies to BMP-sheds that include only rooftop runoff, applies to BMP-sheds with low total acreage of impervious area, level of usage of roads/parking considered, and high percent grass/gravel.
Commercial	2	Typical source of N, P from atmospheric deposition on impervious surfaces, must include paved road/parking lot runoff or runoff from compacted gravel surfaces.
Urban	4	Typical source of N, P from atmospheric deposition on impervious surfaces, must include nearly 100% paved road/parking lot runoff or runoff from compacted gravel surfaces.
Industrial/ Fertilized Turf	5	Fertilized turf applies golf courses or other sports facilities where application has been verified.

C. Receiving Water Sensitivity (0 to 5): Classifies the receiving waterbody with some level of sensitivity to existing fish habitat

1. Method: Obtain best available data from Pa Code Chapter 93 list and use classification.

2. Rationale: Increased sensitivity of receiving water increases the benefit to be derived from implementation of the opportunity.
3. Facility Specific Interpretation or Notes

Sensitivity	Score	Comment
WWF	2	Minor habitat concerns
TSF	3	Seasonal habitat concerns
HQ-CWF	5	High Quality or Exceptional Value waterways.

CATEGORY 3: CONSTRAINTS (Score Range: 0 to 30)

This category refers to site-specific factors that would impact design, construction, and/or maintenance costs of a proposed BMP opportunity and includes:

- Land Classification
- Space constraints
- Community Support

A. Land Classification (0 to 15): Evaluates whether the BMP is located on lands easily accessible to the municipality for future maintenance activities.

1. Method: BMPs are classified by their location on private or public land
2. Rationale: BMPs located on private lands may not be maintained in accordance with permit regulations. These BMPs are not reliable credits towards meeting the permit.

Land Classification	Score	Comment
Private	-15	Located on Private lands with no municipal easements or other access rights.
Public	15	Located on public lands or private lands where the landowner has granted access to the municipality through an easement or similar.

B. Space Constraints (0 to 5): Evaluates whether there is enough space available in the opportunity area to meet applicable design criteria.

1. Method: Available space is determined through aerial imagery and field verification
2. Rationale: Undersized BMPs increase likelihood of failure, higher maintenance requirements and may be partially or total ineligible for programmatic recognition of benefits. The design of future BMPs in space constrained areas may complicate the design and construction resulting in higher costs. They should therefore be given a lower ranking.
3. Facility Specific Interpretation or Notes: Available space was determined based on parcel size. Large parcels of land where any future expansion / retrofits to existing BMPs would not negatively impact any adjacent landowners are

preferable sites to use. Existing BMPs that utilize the entire parcel size and future BMPs that appear undersized relative to the drainage area may not be able to mitigate the entire pollution load entering the site and receive a lower score.

Space Constraint	Score	Comment
Inadequate	2	Appears too small to treat entire drainage area. Utilizes entire parcel or BMP abuts on adjacent landowners
Sufficient	3	Space available for BMP is fair to good in terms of BMP size relatives to drainage area size.
Unlimited	5	Site is located away from adjacent landowners or on a very large land parcel.

C. Community Support (0 to 10): Evaluates whether any community or local groups may work to support or oppose the BMP

1. Method: Local knowledge utilized to identify sites where strong community support or opposition exists.
2. Rationale: Community support from local groups will reduce BMP costs by providing maintenance for the municipality. Strong community opposition may cause additional costs to be incurred during the design and construction phase.
3. Facility Specific Interpretation or Notes: Local support may reduce costs and expedite the design process. Community opposition may delay project implementation and undermine BMP effectiveness (i.e. by mowing naturalized basins)

Community Support	Score	Comment
For	10	Local community group will provide long term maintenance of the BMP and reduce BMP cost
Neutral	5	No help or opposition anticipated from community or adjacent landowners.
Against	1	Opposition anticipated that may impact the BMP design and increase BMP cost.

CATEGORY 4: RELATIVE BMP COST FACTORS (Score Range: 0 to 30)

This category refers to BMP type and site specific factors that would impact design, construction cost, and maintenance costs of a proposed BMP opportunity and includes:

- Planning Level Design & Construction Cost
- Maintenance Burden/Cost
- Available funding mechanisms

A. Planning Level Design & Construction Cost (0 to 10): Planning-level cost estimate of BMP implementation based on BMP type. This distinguishes between BMPs by BMP

type from less costly (e.g. swales) and more costly (e.g. permeable pavement). This favors Existing BMPs as their Design and Construction costs have already been incurred.

1. Method: Based on BMP type chosen. Flexibility is allowable for BMPs where known engineering constraints exist that would greatly increase the BMP design cost
2. Rationale: There are BMPs that are more and less costly to implement. This element scores the cost of the selected BMP on a consistent basis for comparison.
3. Facility Specific Interpretation or Notes: The scoring was based on BMP type and not BMP size because size has already been accounted for in the scoring system. Using size criteria twice would unfairly skew the rankings. A more accurate cost will be generated during conceptual design of the facility.
4. Calculation: For Proposed BMPs where the costs of design have been budgeted, but the costs of construction have not been incurred it is assumed that some of the total cost has already been incurred and the score is based on the equation:

   Score = (Maximum Score - Design & Construction Cost Score) /2 + Design & Construction Cost Score

Design & Construction Cost	Score	Comment
Underground Detention System	1	Relatively high design and construction cost.
Detention Basin	2	Relatively high design and construction cost.
Infiltration Basin	3	Relatively moderate design and construction cost.
Rain Garden	5	Relatively moderate design and construction cost.
Detention Basin Naturalization	6	Relatively low design and construction cost.
Wetland/Stream Restoration	6	Relatively low design and construction cost.
Riparian Buffer	7	Relatively low design and construction cost.
Oil/Water Separator	8	Relatively low design and construction cost.
Existing BMP	10	No design or construction cost.

B. Maintenance Burden/Cost (0 to 10): Assesses the long term maintenance requirements of the recommended BMP opportunity.

1. Method: Based on BMP type chosen, and with consideration of site conditions.
2. Rationale: Maintenance is not an insignificant factor in cost and planning for BMP installations and low-maintenance BMPs should be given favor when appropriate.
3. Facility Specific Interpretation or Notes: The primary factor considered was BMP type. In general, planting, naturalization and stream or wetland restoration was considered low. Above ground facilities with outlet structures and/or underdrains

were considered medium. Underground facilities, such as oil/water separators and infiltration practices, were considered high. Factors such as presence of sediment sources, undersized BMPs or BMPs treating high end of intended impervious area range, and other higher maintenance risk conditions were considered in the ranking.

Maintenance	Score	Comment
Oil/Water Separator	1	Relatively high maintenance cost in comparison to typical pollution reduction achieved for BMP Type.
Underground Detention System	2	Relatively high maintenance cost in comparison to typical pollution reduction achieved for BMP Type.
Detention Basin	3	Relatively high maintenance cost in comparison to typical pollution reduction achieved for BMP Type.
Infiltration Basin	4	Relatively moderate maintenance cost in comparison to typical pollution reduction achieved for BMP Type.
Rain Garden	5	Relatively moderate maintenance cost in comparison to typical pollution reduction achieved for BMP Type.
Wetland/Stream Restoration	6	Relatively moderate maintenance cost in comparison to typical pollution reduction achieved for BMP Type
Detention Basin Naturalization	7	Relatively low maintenance cost in comparison to typical pollution reduction achieved for BMP Type.
Riparian Buffer	8	Relatively low maintenance cost in comparison to typical pollution reduction achieved for BMP Type.

C. Available Funding Mechanisms (0 to 10): Assesses the availability of funding for the BMP.

1. Method: Based on local knowledge of available funding sources
2. Rationale: BMPs that have funding available or previously allocated are prioritized in the ranking. BMPs with funding sources available to help offset BMP costs are also scored higher.

Maintenance	Score	Comment
None	1	No outside funding sources available. No monies allocated towards the BMP.
Partial	5	Some outside funding may be available to offset BMP cost. Some money previously allocated towards BMP, but this pot may not cover the entire BMP cost.
Complete	10	The BMP cost has already been accounted for in the capital budget or outside funding sources will cover the entire cost of BMP implementation.
Unknown	3	Possibility of outside funding exists, but source and amount unknown.