Appendix G: Development of a Prioritization and Ranking Tool

Introduction

A standardized set of criteria will be applied to prioritize and rank each identified BMP opportunity in the SWIP, including new BMPs, existing BMP retrofits, and stream restoration projects to help meet Objectives 1.2, 1.3, 1.4,.2.1, 2.3, 3.1, and 3.2 (see main SWIP document)

Ranking Factor Development

The City developed ranking factors and scoring guidelines for three categories of BMPs: new BMPs, existing BMP retrofits, and stream restoration projects. These ranking factors and scoring guidelines were developed so that they could be updated in the future to accommodate changes in City priorities and goals, thus changing the rankings. The Public Land Study (CWP 2013) was used as the initial basis for developing the ranking factors. The final list of 10 ranking factors can be separated into 3 categories as follows. SWAC input was used to further craft the ranking factors. The final list of 10 ranking factors can be separated into 3 categories as follows:

- Cost and Cost-effectiveness Ranking Factors are based on the nitrogen load reduction and the cost percentile compared to the other BMPs in the category (new BMPs, existing BMP retrofits, and stream restoration projects).
    - Pounds TN Removed Percentile
    - Cost Effectiveness ($/lb TN) Percentile
    - Project Cost (design/construction) Percentile
    - 50 out of 100 points are in this category to give a high priority to cost effective BMPs
- Site and Schedule Constraints Ranking Factors consider how easy it would be to implement a BMP. These factors consider land ownership, utility conflicts (above and below ground), slope of the site, access limitations (e.g., fenced area, distance from parking), permitting requirements, and if there are other City projects that the BMP could be bundled with.
    - Land Acquisition
    - Site Constraints & Potential Utility Constraints
    - Implementation Schedule
    - Synergy
    - 28 put of 100 points are in this category
- Other Ranking Factors look at other problems (e.g., drainage) or issues (e.g., increased operation and maintenance costs) the BMP might address, along with some benefits (aesthetics).
    - Drainage Issues
    - Long-term Maintenance Burden
    - Aesthetics /Visual Appeal
    - 22 out of 100 points are in this category

Ranking Factors and Scoring Guidelines

SWAC reviewed and provided comments on the City's draft ranking factors and scoring guidelines. The finalized factors and guidelines are presented in Table G-1. The final list of BMPs and their rankings are

included in Appendix H. The BMP ranking scores were used to determine the high priority BMPs (Appendix I).

Table G-1. SWIP Ranking Factors and Scoring Guidelines

Ranking Factor	Scoring Guidelines	Score
Pounds TN Removed	Each retrofit scored as % of best TN removal × 20. Maximum Score = 20	20
Cost Effectiveness ($/lb TN)	Each retrofit scored as % of best cost effectiveness × 20. Maximum Score = 20	20
Project Cost ($ design/ construction)	Each retrofit scored as % of highest cost × 10. Then subtract from 10 (10-X) for final score. Maximum Score = 10	10
Land Acquisition	City owned lands = 10	10
	Minimal easement acquisitions = 5	
	Significant easement or property acquisitions = 0	
Drainage Issues	Addresses flooding/infrastructure risk in area with known drainage issues = 10	10
	Provides detention or conveyance benefits but not in area with known drainage issues = 5	
	Does not provide additional detention or conveyance benefits = 0	
Maintenance Burden (Long-term)	Low maintenance burden = 10	10
	Medium maintenance burden = 5	
	High maintenance burden = 0	
Site Constraints & Potential Utility Constraints	No apparent site or utility constraints = 7	7
	Vegetation or utilities present but relatively easy to avoid (e.g., electric or phone lines) = 5	
	Access somewhat constrained = 3.5	
	Vegetation or utilities present but relatively easy to avoid (e.g., electric or phone lines) AND Access somewhat constrained = 2.5	
	Poor access, major grading required, or karst area OR Major utilities must be moved (e.g., sewer) = 1	
	Poor access, major grading required, or karst area AND Major utilities must be moved (e.g., sewer) = 0	
Implementation Schedule	Project can be implemented in under 12 months, with no permitting requirements = 6	6
	Project can be implemented in under 12 months, with permitting requirements = 4 OR Project can be implemented in 12 to 24 months, with no permitting requirements = 4	
	Project can be implemented in 12 to 24 months, with permitting requirements = 2 OR Project cannot be implemented in under 2 years, with no permitting requirements = 2	
	Project cannot be implemented in under 2 years, with permitting requirements = 0	
Synergy	Project can be incorporated within other city infrastructure plans and projects AND provides environmental benefits beyond SWM = 5	5
	Project can be incorporated within other city infrastructure plans and projects, including other potential BMPs = 4	
	Project may provide multi-purpose or environmental benefits beyond SWM = 2.5	
	Other project benefits are very unlikely = 0	
	Practice adds landscaping and/or would enhance aesthetics at the site = 2	2

Ranking Factor	Scoring Guidelines	Score
Aesthetics / Visual Appeal	Practice neither detracts from aesthetics nor adds much in the way of value OR project out of general public view = 1	
	Practice would not decrease aesthetics based on the practice type and location= 0	
	TOTAL =	100

Cost Development

Two ranking factors rely on knowing the cost of each BMP. Knowing the exact cost of each BMP would require design plans for each. Therefore, at the SWIP development stage, the City developed unit costs for each BMP type instead as described below.

The main source of cost information was obtained from CAST, which was developed for the Chesapeake Bay Program (CBP 2017). CAST has unit cost information ($/impervious acre) for construction costs in 2006 dollars. The City used the Construction Cost Index (CCI) adjustment factors to convert these costs to 2016 dollars. The CAST unit costing information has multiple costing metrics (or categories); the City chose to use the median retrofit category from the *Urban BMP Unit Cost Spreadsheet* for this SWIP. The City calculated the unit soft/preconstruction costs (e.g., planning, design) as a percentage of the unit construction costs. The *Urban BMP Unit Cost Spreadsheet* was used as a guide to estimate a median soft/preconstruction cost factor of 22.5% for all BMPs.

In addition to the design and construction costs, the City calculated the operation and maintenance (O&M) costs for the useful life of the BMP, which was assumed to be 25 years for all BMP types. The annual unit O&M costs were calculated as a percentage of the construction cost using BMP-specific factors (based on the severity of necessary O&M to keep facility functioning) provided in the *Urban BMP Unit Cost Spreadsheet*. The lifetime O&M unit costs were computed as a product of annual O&M unit costs and the useful BMP life. The total unit cost was computed as a sum of the unit costs for construction, preconstruction, and O&M.

There are two exceptions to this procedure: stream restoration and the East Market Street Regenerative Stormwater Conveyance (RSC) project. The unit cost for design and construction of stream restoration projects was based on the construction estimates for the Mountain View Drive stream restoration project in a recent study, as a local example. The overall cost proposal for that project was divided by the stream length being restored to get the unit cost per linear foot. The O&M unit costs were taken from the CAST values. Similarly, the unit cost for the East Market Street Regenerative Stormwater Conveyance project was based on the actual engineering cost estimate for that project. The O&M unit cost was considered the same as for stream restoration.

The unit costs are for the average installation of a given BMP. Site conditions (e.g., utilities) can increase the cost of individual BMPs. To account for this, "add-on" unit costs were estimated using professional experience for the following considerations.

- Trench drain/flow diversion
- Underdrain
- Curb cuts
- Move utilities
- Move stormwater structure

- Utility crossing (stream restoration only)
- Excessive pavement or vegetation removal

While performing BMP ranking, the City recorded whether the BMP could require one of the cost add-ons. This information was then used to adjust the estimated cost of that BMP in the SWIP.

Future SWIP Updates and Tracking

The City created a SWIP project tool using Microsoft Excel. The Excel tool contains all the load reduction calculations, BMP ranking determinations, and cost calculations for new BMPs, existing BMP retrofits, and stream restoration projects in a single Excel worksheet. Having all this information in one spreadsheet makes future updates to the SWIP easy. Future updates could include refined unit costs (based on observations during initial BMP implementation) or changes to the ranking factors and scoring guidelines. The City can also remove and replace non-viable projects in the SWIP. The spreadsheet also contains load reduction calculation worksheets for street sweeping, catch basin cleaning, septic connections, homeowner BMPs, and tree planting. Finally, the spreadsheet has a worksheet for the City to track progress towards the SWIP load reduction goals (Figure G-1). The tool contains a *ReadMe* tab that instructs users how to add new implementation activities to their respective sheets, update BMP ranking information, and update cost information. The SWIP tool is fully editable and adaptable to future program needs by the City.

Figure G-1. Screenshot of the SWIP Project Excel Tool for Tracking SWIP Progress.

Stormwater Implementation Plan		TN Load Reduction (lb/yr)	TP Load Reduction (lb/yr)	TSS Load Reduction (lb/yr)
Total Reduction Needed		6,711.0	885.0	759,697
SWIP Restoration Activity	Street Sweeping	301.4	75.7	37,153
	Stream Restoration	1,974.3	1,592.6	1,020,380
	Homeowner BMP	161.1	14.6	0
	Septic Connections	290.5	0.0	0
	BMP Retrofits	817.3	122.9	97,883
	New BMPs	5,553.0	617.0	492,303
Total SWIP Reductions		9,097.7	2,422.9	1,647,720

Implemented Restoration Activities		TN Load Reduction (lb/yr)	TP Load Reduction (lb/yr)	TSS Load Reduction (lb/yr)
SWIP Restoration Activity	Street Sweeping	78.8	26.2	37,153
	Stream Restoration	100.0	101.5	63,260
	Homeowner BMP	133.6	10.5	0
	Septic Connections	184.0	0.0	0
	BMP Retrofits	36.8	6.6	6,379
	New BMPs	131.1	10.0	7,123
Other	Tree Planting	0.2	0.0	2
Total Implemented Reductions		664.5	154.8	113,917
Load Reduction Gap		6,046.5	730.2	645,780

Tracking					
ID / Year	Restoration Type	TN Load Reduction (lb/yr)	TP Load Reduction (lb/yr)	TSS Load Reduction (lb/yr)	Notes
2016	Street Sweeping	78.8	26.20	37,153	**Update yearly**
2016	Septic Connections	184.0	0.00	0	Existing connections
2012	New BMPs	1.3	0.12	0	Water Cisterns at DPW
2017	New BMPs	129.8	9.90	7,123	Thomas Harrison MS
2017	BMP Retrofits	36.8	6.60	6,379	Westover Park
2017	Homeowner BMP	133.6	10.50	0	5 homeowners
2017	Stream Restoration	100.0	101.50	63,260	Mountain View Dr
2017	Tree Planting	0.2	0.01	2	30 Trees

Note: Values in the *Implemented Restoration Activities* and *Tracking* tables are for illustration purposes only.