

USER GUIDE: GREEN STORMWATER INFRASTRUCTURE MAINTENANCE COST MODEL

1. PURPOSE

The purpose of this User Guide is to assist sister municipal stormwater agencies of the SFPUC that would like to apply the GSI maintenance model outside of the City and County of San Francisco. It is critical that the maintenance model be adapted to more accurately reflect your municipality. While this initial task requires some modifications to the maintenance model spreadsheet, these modifications are not overly technical and should be manageable for any municipal staff with familiarity in Microsoft Excel. Please carefully review the following directions prior to using the maintenance cost model.

2. CUSTOMIZING THE MAINTENANCE COST MODEL

The maintenance cost model must be customized by the user to accurately reflect the conditions of a municipal agency other than the SFPUC. Taking the time to customize the maintenance cost model will produce more accurate results of GSI maintenance obligations. The following categories can be customized by the user:

- BMP type, sub-type, and size
- Maintenance start date and end date
- Hourly wage rate
- Level of service
- BMP spatial distribution
- Proportion of cost
- Cost adjustment factor
- Escalation and discount rates

The following descriptions provide recommendations from the SFPUC on when to customize the maintenance model and directions for how to do so.

BMP Type and Size:

The BMP type, sub-type, and size are **required inputs** in the Project Input tab of the model. For example, bioretention BMPs can be customized to have either a soft edge (i.e., rain garden) or hard edge (i.e., planter), and be either infiltrative or underdrained. Please refer to the GSI Maintenance Cost Model Technical Memorandum for detailed definitions of each BMP type and sub-type. Please note that the unit costs of maintenance are specific to each BMP type and sub-type and can be found in Appendix B of the Technical Memorandum.

Maintenance Start Date and End Date:

Maintenance start date and end date **must be customized by the user** in the Project Input tab of the model. The Maintenance Start Date indicates the first year in which a **municipal agency** is responsible for maintenance of the BMP. For example, if a BMP is completed in June 2015 by an external contractor, whose contract includes a contractual maintenance period of 2 years following delivery, the Start Date should be entered as 2017.

The Maintenance End Date denotes the year when a **municipal agency** will end its maintenance responsibility for the BMP. For example, if a BMP is scheduled to be decommissioned in a certain year, or is only in operation for a certain construction phase, then that BMP will have a maintenance end date. Many (if not most) BMPs will have no end date, and this cell should then be left blank.

Hourly Wage Rate:

The Assumed Hourly Wage Rate **must be customized by the user** in the Cost Assumptions tab of the model (Cell L7). The Assumed Hourly Wage should be customized to reflect an average fully loaded hourly rate of a team of three Operations and Maintenance workers (two gardeners and one supervisor). For example, if the fully loaded hourly rate for a gardener is \$50 per hour and the hourly rate for a supervisor is \$75 per hour, then the Assumed Hourly Wage Rate should be $(\$50 + \$50 + \$75) / 3 = \58.33 . The Base Year for Wage Rate must also be customized by the user to reflect the real-dollar year for the Assumed Hourly Wage Rate (Cost Assumptions tab, Cell M7).

Level of Service:

Each BMP Service Level **must be customized by the user** in the Project Input tab of the model. The Service Level can be adjusted to reflect the frequency of maintenance for each BMP. The model assumes BMP-specific unit costs for each level of service (monthly, quarterly, etc.). This includes BMP-specific assumptions for the type of maintenance activities during regular maintenance visits vs. rehabilitation visits. Please refer to Appendix B and C of the Technical Memorandum for unit costs for each BMP. The following table provides the frequency of visits for both regular maintenance visits and rehabilitation visits for each service level. The user should choose the service level that best reflects their municipality's planned maintenance for each BMP.

TABLE 1. BMP LEVELS OF SERVICE

Service Level	Frequency of Visits	# of Regular Maintenance Visit per Year	# of Rehabilitation Visits per Year
A	Visit every month – Monthly	11	1
B	Visit every three months – Quarterly	3	1
C	Visit every six months – Semiannual	1	1
D	Visit every twelve months - Annual	0	1
E	Visit every five years - Quinquennial	0	1/5

BMP Spatial Distribution:

The spatial distribution of each BMP **must be customized by the user** in the Project Input tab of the model. The spatial distribution of each BMP has implications in the model for the travel time and efficiency of maintenance activities. Please refer to the Project Input tab for specific definitions of the spatial distribution of each BMP. For example, a Typical spatial distribution of a bioretention BMP assumes approximately 3,000 sq. ft. of bioretention area within an approximate 0.5-mile distance, while a Concentrated spatial distribution assumes more than 3,000 sq. ft. of bioretention within 1-2 blocks (<1,000 ft.). In extreme cases, an additional Cost Adjustment Factor can be applied to BMPs that are highly concentrated or highly dispersed. For example, in cases where at least 4,000 sq. ft. of bioretention is within 1-2 blocks, a Cost Adjustment Factor of up to -20% is recommended. Please

refer to the Project Input tab for additional Cost Adjustment Factors for the spatial distribution of each BMP.

Proportion of Cost:

The proportion of BMP cost is the percentage of the maintenance cost burden that your municipality will be responsible for. Customizing the proportion of cost is **optional for the user** in the Project Input tab of the model. For example, if your agency will be responsible for 50% of monthly maintenance visits and a separate municipal agency will be responsible for 50% of monthly visits, a proportion of cost factor of 50% can be applied. Customizing the proportion of cost is only recommended if you can estimate with a reasonable level of accuracy the percentage of the maintenance cost that will remain with your agency. If your municipality is only responsible for specific maintenance tasks, such as landscape maintenance, it is possible to adjust the unit cost estimates to create a task-specific proportion of cost estimate. This process is discussed below (see Adjusting Unit Cost Estimates).

Cost Adjustment Factor:

Applying a Cost Adjustment Factor to the maintenance of each BMP is **optional for the user** in the Project Input tab of the model. A Cost Adjustment Factor is applied as a percentage above or below 100% to reflect higher or lower anticipated costs of maintenance. For example, in a scenario in which a bioretention site is located along a high traffic corridor and is likely to accumulate a heavy amount of sediment and debris, we recommend applying a Cost Adjustment Factor of +46% to the maintenance cost. This value was generated by adjusting the unit cost estimate of bioretention to create a unique unit cost that accounts for double time spent on debris and sediment removal. This process is discussed further below (see Adjusting Unit Cost Estimates).

Escalation and Discount Rates:

Customizing the escalation and discount rates is **optional for the user** in the Other Assumptions tab of the model. Escalation and discount rates for operations and maintenance are given as percentages and are relative to the Start Year for the model. If more information on customizing the escalation and discount rates is desired, please contact AECOM (contact information provided below).

Adjusting Unit Cost Estimates:

If the information provided thus far is insufficient and you would like the ability to customize the maintenance model to allow further flexibility, we invite you to contact the Sustainable Economics Team at AECOM. For example, if you have a local non-profit that performs landscaping maintenance on your BMPs, it is possible to adjust the unit costs in Appendix C of the Technical Memorandum to reflect this scenario. In this case, the labor component for regular and rehabilitation visits could be changed by the user, thus creating a new unit labor cost for bioretention. From this value, a unique Cost Adjustment Factor can be generated by calculating the percent change between the new and original unit costs to reflect a scenario in which a non-profit provides landscaping maintenance for bioretention. **We do not recommend adjusting values in the Cost Assumptions tab of the model**, but rather generating project-specific Cost Adjustment Factors to be applied as needed.

Please proceed with caution when manipulating the maintenance model. If further information is desired, please refer to the Technical Memorandum. For further questions, please contact Michael Adamow, SFPUC GI Planning Specialist at madamow@sfwater.org, or Sarah Minick, SFPUC Utility Planning Division Manager at sminick@sfwater.org.