I. Introduction

The goals of Maryland's National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer system (MS4) permits are to control stormwater pollution, improve water quality, and work toward meeting water quality standards. The permits require MS4 jurisdictions to implement restoration activities in order to meet stormwater wasteload allocations (SW-WLAs) included in Environmental Protection Agency (EPA) approved total maximum daily loads (TMDLs). The *2020 Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (Guidance) reflects updated permit crediting to address impervious acre restoration and nutrient load reductions consistent with Maryland's Phase III Watershed Implementation Plan (WIP) for the Chesapeake Bay TMDL and 2025 nutrient load targets.

The Guidance also incorporates the Phase 6 Chesapeake Bay Watershed Model (Phase 6 Model), new and updated best management practices (BMPs) approved by the Chesapeake Bay Program (CBP) expert panels, and stormwater management co-benefits. This Guidance was developed with the contributions of environmental non-governmental organizations, MS4 jurisdictions, State agencies, and EPA. The 2020 MS4 restoration credits and accounting principles supersede the 2014 guidance for reissued permits.

II. Restoration Credits and Accounting Principles

MS4 jurisdictions must use an impervious acre credit to account for MS4 restoration achieved through stormwater BMP implementation. The impervious acre credit is the MS4 permit's surrogate parameter for level of implementation required to show progress in total nitrogen (TN), total phosphorus (TP), and total suspended sediment (TSS) load reductions toward meeting Chesapeake Bay and local TMDLs. MS4 jurisdictions must also report load reductions achieved through BMP implementation. The procedures for calculating impervious acre credits and associated pollutant load reductions, and general accounting principles are summarized below and described in more detail in the body of this Guidance.

The impervious acre credit is used for accounting for upland BMPs that provide impervious acre water quality treatment. These BMPs are described in Chapters 3 and 5 of the *2000 Maryland Stormwater Design Manual* (Manual). The impervious acre credit is determined from three BMP variables: drainage area, impervious acres, and the rainfall depth treated. Impervious acres in the drainage area are considered treated 100% for water quality when the runoff from one inch of rainfall over the drainage area is captured and treated. More information on the impervious acre credit can be found in Section III. Impervious Acre Credits of Upland Best Management Practices.

Equivalent impervious acres (EIAs) are used to determine the impervious acre restoration credit for alternative BMPs that are not found in the Manual but are additional options for MS4 jurisdictions to reduce stormwater pollutants. Alternative BMPs include street sweeping, storm drain cleaning, floating treatment wetlands, land cover conversion, urban soil restoration, septic practices, shoreline management, stream restoration, and elimination of discovered nutrient discharges from grey infrastructure. A method has been developed using the CBP land cover unit loads and the reduction in pollutant loads from alternative BMPs for determining an EIA conversion factor (EIA_f). The EIA_f for all alternative BMPs for MS4 restoration crediting are

presented in Table 1. More detailed information on the EIA credits is found in Section V: Alternative Best Management Practices

MS4 jurisdictions are required to document progress toward meeting local and Chesapeake Bay TMDLs by reporting TN, TP, and TSS load reductions when implementing stormwater BMPs. All BMPs found in the Manual, i.e., Chapter 3 structural practices and Chapter 5 environmental site design (ESD) practices, plus alternative BMPs are acceptable for restoration and may be used to calculate load reduction credits. The TN, TP, and TSS removal efficiencies for these BMPs must be calculated in accordance with the CBP expert panel reports, using the Phase 6 Model and delivery factors based on the BMP's proximity to the Chesapeake Bay. Additional information can be found in Section IV: Pollutant Load Reductions for Upland Best Management Practices.

Table 1. EIA_f and Load Reductions for Alternative BMPs

BMP	Load Reductions (lbs/unit/yr)			EIA_f
	TN	TP	TSS	
Advanced Sweeping				**Per Mile Swept**
1 pass/12 weeks	0.00	0.07	401	0.027
1 pass/8 weeks	0.26	0.14	802	0.059
1 pass/4 weeks	0.36	0.21	1,203	0.087
Spring 1 pass/1-2 weeks else monthly	0.36	0.28	1,404	0.106
Fall 1 pass/1-2 weeks else monthly	0.73	0.34	2,005	0.148
1 pass/2 weeks	0.73	0.34	2,206	0.156
1 pass/week	1.09	0.55	3,209	0.235
2 passes/week	1.46	0.69	4,211	0.304
Mechanical Broom Sweeping				**Per Mile Swept**
1 pass/4 weeks	0.00	0.00	20	0.001
1 pass/week	0.00	0.00	100	0.004
2 passes/week	0.00	0.00	201	0.008
Storm Drain Cleaning				**Per Ton Removed**
Organic	4.44	0.48	400	0.17
Inorganic	3.78	0.84	1,400	0.25
Floating Treatment Wetlands (% of pond wet surface area covered by FTW)				**Per Impervious Acre**
FTW1 (10%)	0.10	0.02	74	0.008
FTW2 (11-20%)	0.22	0.05	151	0.017
FTW3 (21-30%)	0.32	0.07	225	0.026
FTW4 (31-40%)	0.43	0.09	295	0.034
FTW5 (41-50%)	0.53	0.11	369	0.042
Land Cover Conversion				**Per Acre of Land Cover Changed**
Forest Planting	11.12	1.78	2,805	1.10
Riparian Forest Planting	14.34	2.50	4,411	1.50
Conservation Landscaping	5.24	0.53	0.00	0.37
Riparian Conservation Landscaping	6.75	0.74	0.00	0.50

BMP	Load Reductions (lbs/unit/yr)			EIA_f
	TN	TP	TSS	
Table 1 Continued				
Forest Conservation	10.57	1.10	2,465	0.46
Impervious Surface Reduction	6.96	0.45	5,241	0.71
Street Trees	3.10	0.76	1,404	0.40
Urban Tree Canopy Planting	3.20	0.50	206	0.28
Urban Soil Restoration of Compacted Pervious Surfaces (soil excavation depth in inches)				**Per Acre of Soil Treatment**
Level 1 (15 inches)	4.4	0.72	278	0.40
Level 2 (20 inches)	8.9	1.44	557	0.80
Urban Soil Restoration of Removed Impervious Surfaces (soil excavation depth in inches)				**Per Acre of Soil Treatment**
Level 1 (15 inches)	13.7	0.7	1,696	0.91
Level 2 (20 inches)	15.0	0.77	1,864	1.00
Septic[1]				**Per System**
Septic Pumping	0.00	0.00	0.00	0.02
Septic Denitrification	0.00	0.00	0.00	0.16
Septic to WWTP Connection	0.00	0.00	0.00	0.23
Shoreline Management[2]/Stream Restoration and Outfall Stabilization[3]				**Per Linear Foot**
Shoreline Management (Default Rate)	0.173	0.122	328	0.04
Stream Restoration (Planning Rate)	0.075	0.068	248	0.02
Outfall Stabilization (Planning Rate)	0.075	0.068	248	0.02
Elimination of Discovered Nutrient Discharges from Grey Infrastructure[4]				**Per Discharge**
Elimination of Eight Approved Discharge Types	Protocol	Protocol	0.00	Individually Calculated

Notes:
[1] Actual load reductions must be reported through the local health department. Septic system credits only apply to the impervious acre restoration requirement. (WWTP = wastewater treatment plant).
[2] Default load reduction values can be used in cases when the shoreline management practice parameters are unavailable for the protocols recommended by the panel, such as in some planning efforts, historic projects, and/or nonconforming projects.
[3] Load reduction values and EIA_f are used for planning purposes only and must always be replaced with individual site-specific values prior to reporting for nutrient and sediment reduction credit and EIA restoration credit.
[4] TN and TP load reductions for individual discharges are calculated based on the protocols approved in the CBP's 2014 Grey Infrastructure Report. The EIA_f is determined using Equation 5: EIA_f Calculation for Alternative BMPs.

The BMPs approved by the CBP for TN, TP, and TSS reductions have been documented to provide reductions for other pollutants associated with local TMDLs. The 2015 report *Potential Benefits of Nutrient and Sediment Practices to Reduce Toxic Contaminants in the Chesapeake Bay Watershed* published by Chesapeake Stormwater Network substantiates that stormwater BMPs are also effective for reducing toxic pollutants. More information on the latest guidance for showing progress toward meeting local TMDLs are found on the Department's website: mde.maryland.gov/programs/Water/TMDL/DataCenter/Pages/TMDLStormwaterImplementation.aspx.

III. Impervious Acre Credits of Upland Best Management Practices

Upland BMPs are stormwater BMPs that meet the water quality criteria and design standards in the Manual. Upland BMPs include structural practices, nonstructural practices, and alternative surfaces. Impervious acre credits may be achieved when upland BMPs are implemented as part of a restoration, retrofit, or redevelopment project that provides water quality treatment for previously unmanaged impervious surfaces. BMPs must function properly to ensure that the expected water quality improvements are achieved. Upland BMPs must be regularly maintained and inspected a minimum of every three years. BMP data must be submitted within the MS4 Geodatabase.

1. Structural Practices

The impervious acre credit for structural practices is based on the impervious acres in a BMP's drainage area, the depth of rainfall treated, and the water quality volume (WQ_v) standards found in the Manual. For restoration and impervious acre crediting, the rainfall depth treated may be less than the 1 inch required for the WQ_v. For the purposes of this Guidance, the rainfall depth treated in restoration practices is referred to as the water quality treatment volume or "WQ_T". Treatment of 1 inch of rainfall across the drainage area of the BMP will provide full credit for the impervious acres in the BMP's drainage area. This WQ_T is considered the minimum treatment level for 1 impervious acre credit of restoration. Opportunities for restoration that treat less than 1 inch of rainfall (i.e., $WQ_T < 1$ inch) can be pursued where they make sense to an MS4 jurisdiction for local water quality, flooding, or co-benefits. Where the WQ_T is less than 1 inch, the impervious acre credit will be pro-rated on the fraction of the rainfall depth treated (see Equation 1).

Equation 1. Impervious Acre Credits for Structural Practices

$$Impervious\ Acres\ in\ Drainage\ Area \times \left(\frac{Rainfall\ Depth\ Treated}{1\ inch}\right) = Impervious\ Acre\ Credit$$

Examples:

A structural BMP with a drainage area of 10 impervious acres receives the following credit based on the rainfall depth treated:

$$10\ Impervious\ Acres \times \left(\frac{1.0\ inch\ Rainfall\ Depth\ Treated}{1\ inch}\right) = 10\ Impervious\ Acres\ Credit$$

$$10\ Impervious\ Acres \times \left(\frac{0.75\ inch\ Rainfall\ Depth\ Treated}{1\ inch}\right) = 7.5\ Impervious\ Acres\ Credit$$

$$10\ Impervious\ Acres \times \left(\frac{0.5\ inch\ Rainfall\ Depth\ Treated}{1\ inch}\right) = 5\ Impervious\ Acres\ Credit$$

2. Nonstructural Practices

Nonstructural practices acceptable for MS4 restoration must meet the design criteria found in Chapter 5 of the Manual. These practices include disconnection of rooftop runoff,

disconnection of non-rooftop runoff, and sheetflow to conservation areas. Nonstructural practices combine relatively simple features, grading, and landscaping to divert runoff into vegetated areas and away from conventional storm drain systems. Runoff flows over these areas, filters through the vegetation, and soaks into the ground.

Impervious acre credits for nonstructural practices are directly proportional to the amount of impervious acres in a watershed that are disconnected from the storm drain system (see Equation 2).

Equation 2. Impervious Acre Credits for Nonstructural Practices

$$Impervious\ Acres\ in\ Drainage\ Area \times Percent\ Disconnect = Impervious\ Acre\ Credit$$

Example

A drainage area of 10 impervious acres will receive the following credit based on the percentage of impervious acres that are disconnected:

$$10\ Impervious\ Acres \times 100\%\ Disconnect = 10\ Impervious\ Acres\ Credit$$

$$10\ Impervious\ Acres \times 75\%\ Disconnect = 7.5\ Impervious\ Acres\ Credit$$

$$10\ Impervious\ Acres \times 50\%\ Disconnect = 5\ Impervious\ Acres\ Credit$$

3. Alternative Surfaces in Chapter 5 of the Manual

Alternative surfaces accepted for MS4 restoration must meet the design criteria found in Chapter 5 of the Manual. These practices include green roofs, permeable pavements, and reinforced turf. Replacing one acre of impervious surface with an approved alternative surface provides a credit of one acre of impervious area restoration.

4. Redevelopment

Impervious acres that drain to upland BMPs where the State regulatory requirements for redevelopment are met or exceeded are eligible for restoration credit. Since 2010, State regulations require water quality (WQ) treatment for 1 inch of rainfall for fifty percent of the untreated existing impervious acres within the project's limit of disturbance (LOD). Additional credit may be granted for any untreated existing impervious acres that are treated to meet or exceed the fifty percent requirement (see Equation 3).

Equation 3. Impervious Acre Credits for Redevelopment

$$Existing\ Untreated\ Impervious\ Acres \times \% \ of\ the\ Existing\ Untreated\ Impervious\ Acres\ Treated\ for\ WQ\ through\ Redevelopment = Impervious\ Acres\ Restoration\ Credit$$

Examples

Below are examples of the credits that a redevelopment project would achieve for treating different percentages of an existing 10 acres of untreated impervious surface within the LOD.

$$10\ Existing\ Untreated\ Impervious\ Acres \times 50\%\ of\ the\ Existing\ Untreated\ Impervious\ Acres\ Treated\ for\ WQ\ through\ Redevelopment = 5\ Impervious\ Acres\ Restoration\ Credit$$

$$10\ Existing\ Untreated\ Impervious\ Acres \times 75\%\ of\ the\ Existing\ Untreated\ Impervious\ Acres\ Treated\ for\ WQ\ through\ Redevelopment = 7.5\ Impervious\ Acres\ Restoration\ Credit$$

$$10\ Existing\ Untreated\ Impervious\ Acres \times 100\%\ of\ the\ Existing\ Untreated\ Impervious\ Acres\ Treated\ for\ WQ\ through\ Redevelopment = 10\ Impervious\ Acres\ Restoration\ Credit$$