# Revision of Anne Arundel County's 2014 Baseline & Impervious Surfaces Treated to the MEP

**NPDES MS4 Permit No. MD0068306 (11-DP-3316)**
**2018 Annual Report**

**Anne Arundel County Department of Public Works**
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# I. Purpose

Anne Arundel County's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit, effective February 12, 2014, required that an impervious area assessment to be submitted to the Maryland Department of the Environment (MDE) within one year of permit issuance. The County determined the total impervious area for which it was responsible but, at the time of that analysis, was unable to fully and accurately account for existing stormwater management. Only limited information was available for determining the impervious surfaces treated to the maximum extent practicable (MEP), partially treated, or untreated and available for retrofit. As a result of that assessment (final version submitted to MDE on May 26, 2015 and approved by MDE on July 7, 2015; Appendix A) Anne Arundel's twenty percent restoration requirement was not reflective of the actual stormwater management occurring in the County as of February 12, 2014.

The purpose of this document is provide MDE with a more accurate accounting of the County's managed and unmanaged impervious surfaces. This updated accounting is the result of significant time, effort, and resources invested by the County towards cleaning up and improving its best management practice (BMP) inventory. The County believes this document and the accompanying data support an adjustment of its baseline unmanaged impervious acreage and a revision the County's twenty percent restoration requirement.

# II. Background

It was clear to the County after the 2014 impervious area assessment that methods and tools being used to manage its BMP inventory were not keeping pace with evolving reporting requirements (e.g., the NPDES MS4 geodatabase format); the increase in the number of smaller, more dispersed BMPs being constructed to comply with environmental site design (ESD) standards; and the latest geospatial data management technology. Another obvious issue that the County needed to address was the lack of data attribution for the BMP records in the inventory, as well the likelihood that BMPs existed that were not included in the inventory. Some of this information was missing because the BMPs were constructed under a previous era of stormwater design and the data would not apply to the BMP; some was missing because the particular data (i.e., $P_e$) was never a part of previous reporting requirements; and some information was missing because the old BMP inventory system could not accommodate collection of the information.

For these reasons, the County undertook a comprehensive Urban BMP Database Historic Records Review and Update project. This work effort was introduced in the FY15 Annual Report and the project's scope of work was included as an appendix to that report. Work on this project was completed in July 2018. The product of this effort was a comprehensive BMP data inventory (as complete as existing source material would allow), collected in a consistent manner and subjected to rigorous quality assurance and quality control (QA/QC) procedures. This new inventory will allow the County to accurately account for managed impervious surfaces and meet its modeling needs for various Total Maximum Daily Loads (TMDLs).

The project outcomes included:

- The creation of a database structure and geospatial framework for the collection and QA/QC of BMP information, including, but not limited to: BMP type, location, drainage area, water quality treatment, built date, and any modifications to a BMP resulting from subsequent land development or other changes in site condition.

- The review of 9,728 grading permit files, during which information on over 24,000 stormwater BMPs was collected from as-built drawings, stormwater management reports, stormwater infrastructure datasets, and historical data sources for recordation in the database and in GIS.

- The development and documentation of standard operating procedures to standardize the review of grading permit files and QA/QC procedures during all steps of the BMP data development process.

Even after this intensive data collection exercise, the County recognizes that there are still data missing from the BMP inventory. Currently, most existing data sources have been exhausted. The scanning and electronic storage of as-built drawings and stormwater management reports only became feasible and common practice within the past ten years. Any older drawings and reports that were located have now been scanned and stored electronically, but there are some plans which simply no longer exist. The County will continue its efforts to fill in data gaps as time and resources allow, whether through the further research/discovery of missing drawings or review of aerial imagery to approximate a built date for visible BMPs. As new data becomes available, the County will reevaluate if there are additional BMPs with sufficient information to support managed impervious surface or TMDL crediting.

## III. 2014 Impervious Area Assessment

There are several components of the 2014 impervious area assessment that the County did not feel required an update at this time. The full details of the various components are available in the *Establishing Baseline- Impervious Area Assessment - Impervious Surfaces Treated to the MEP* report, included as Appendix A of this document. Datasets developed during the 2014 analysis will be available in the *AA County Baseline Revisions Data* geodatabase (Appendix B), in the "FY14 Managed Impervious Credit" feature dataset, as noted below.

In brief, these components are:

- The determination of the portion of impervious area within the County that falls under County jurisdiction (jurisdictional impervious area). Impervious acreage that is outside of the County's jurisdictional impervious area includes Federal and State properties, and municipal properties that are regulated under other stormwater permits (Table 1 and Table 2). A total of 30,950 impervious acres were determined to be within the County's jurisdiction (Figure 1).

- Water quality improvement project credit –Prior to the issuance of the August 2014 guidance document (MDE 2014), the County did not track water quality volume treatment for environmental restoration projects. Per this guidance, the County was allowed to claim equivalent impervious surface treatment credits for stream restoration and living shoreline restoration projects implemented prior to February 2014, based on the linear feet of treatment per project. The County identified 58 previously completed restoration projects providing an equivalent impervious surface treatment credit of 461 acres. Each project has been assigned a unique Storm ID and incorporated into the Urban BMP database. See Appendix B – note that the County constructed 9 pond retrofits (for which water quality treatment was recorded) and 2 stream restoration projects after February 2014 for a total equivalent impervious surface restoration credit of 28.7 acres.

- Rooftop disconnection credit and open section roadway credit - The County conducted a systematic review (e.g., tiered analysis), including a representative field survey, to document and verify the portion of impervious surfaces within the rural areas of the County's MS4 jurisdiction that are treated to the MEP. Based upon this review, 660 acres (456 acres of rooftop disconnection and 204 acres of open section roads) of existing impervious cover within the rural RA and RLD zones of Anne Arundel County were determined to treat stormwater to the MEP for the purposes of the County's MS4 baseline.

- Septic system connection to wastewater treatment plant (WWTP) credit - The County received 0.39 acres of equivalent impervious management credit for each septic system connected to the County's wastewater treatment system prior to February 2014; there were 180 such connections made, equal to 70 acres for application to the baseline. See Appendix B – note that an additional 40 connections, included in the geodatabase, were made after February 2014; the resulting 15.6 acres of equivalent impervious surface reduction credit were applied toward the County's 20% impervious area restoration goal.

- Septic system upgrade to enhanced nitrogen removal (ENR) system credit – The County received 0.26 acres of equivalent impervious management credit for each septic system upgraded to an enhanced denitrification system prior to February 2014; the County made 710 such upgrades, equal to 185 acres or credit for application to the baseline. See Appendix B – note that an additional 15 upgrades, included in the geodatabase, were completed after February 2014; the 3.9 acres of equivalent impervious surface reduction credit were applied toward the County's 20% impervious area restoration goal.

**Table 1. County Area and Impervious Acres by Ownership**

| Anne Arundel County Land Cover Categories | City of Annapolis | State | Federal | County | Private | City of Annapolis | State | Federal | County | Private | City of Annapolis | State | Federal | County | Private |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Land Acres | | | | | Impervious Acres | | | | | Percent Impervious | | | | |
| Airport | 0 | 1032 | 0 | 68 | 105 | 0 | 844 | 0 | 48 | 74 | 0% | 82% | 22% | 71% | 70% |
| Commercial | 980 | 691 | 1611 | 1881 | 7412 | 638 | 331 | 899 | 1160 | 4776 | 65% | 48% | 56% | 62% | 64% |
| Industrial | 21 | 512 | 369 | 424 | 3925 | 13 | 285 | 168 | 191 | 2421 | 61% | 56% | 46% | 45% | 62% |
| Transportation | 189 | 3779 | 929 | 3059 | 1726 | 145 | 2798 | 528 | 1974 | 502 | 77% | 74% | 57% | 65% | 29% |
| Pasture/Hay | 0 | 147 | 576 | 231 | 5059 | 0 | 1 | 4 | 5 | 18 | 0% | 1% | 1% | 2% | 0% |
| Row Crops | 0 | 135 | 565 | 395 | 10977 | 0 | 2 | 0 | 8 | 39 | 0% | 1% | 0% | 2% | 0% |
| Residential 1/2-acre | 110 | 60 | 46 | 1226 | 9444 | 28 | 14 | 11 | 644 | 1709 | 26% | 24% | 24% | 53% | 18% |
| Residential 1/4-acre | 1786 | 99 | 129 | 2783 | 14726 | 640 | 14 | 33 | 1614 | 3386 | 36% | 14% | 25% | 58% | 23% |
| Residential 1/8-acre | 568 | 132 | 678 | 3319 | 15411 | 243 | 33 | 211 | 1831 | 4665 | 43% | 25% | 31% | 55% | 30% |
| Residential 1-acre | 46 | 108 | 21 | 909 | 10528 | 9 | 13 | 1 | 376 | 1484 | 19% | 12% | 7% | 41% | 14% |
| Residential 2-acre | 35 | 224 | 59 | 1207 | 22216 | 9 | 24 | 5 | 402 | 2512 | 26% | 11% | 8% | 33% | 11% |
| Open Space | 254 | 2952 | 2929 | 3747 | 11008 | 15 | 154 | 94 | 172 | 217 | 6% | 5% | 3% | 5% | 2% |
| Water | 18 | 340 | 286 | 519 | 1018 | 1 | 1 | 1 | 2 | 207 | 5% | 0% | 0% | 0% | 20% |
| Open Wetland | 1 | 296 | 107 | 406 | 802 | 0 | 0 | 0 | 0 | 1 | 0% | 0% | 0% | 0% | 0% |
| Forested Wetland | 0 | 64 | 94 | 53 | 75 | 0 | 0 | 0 | 0 | 0 | 0% | 0% | 0% | 0% | 0% |
| Woods | 524 | 9038 | 12940 | 12795 | 70404 | 7 | 81 | 36 | 197 | 280 | 1% | 1% | 0% | 2% | 0% |
| Utility | 0 | 39 | 216 | 75 | 1600 | 0 | 2 | 1 | 6 | 30 | 0% | 4% | 0% | 7% | 2% |
| SubTotal | 4533 | 19648 | 21556 | 33098 | 186433 | 1748 | 4595 | 1993 | 8630 | 22320 | 39% | 23% | 9% | 26% | 12% |
| Total | 265269 | | | | | 8335 | | | 30950 | | 15% | | | | |
| | | | | | | 39285 | | | | | | | | | |

**Table 2. Breakdown of Non-County Jurisdictional Impervious Areas**

| Jurisdiction | Land Owner Entity | Acreage |
|---|---|---|
| City of Annapolis | City of Annapolis | 1,748 |
| Federal | Fort Meade Military Reservation | 1,183 |
| State | Maryland Aviation Administration | 1,102 |
| State | Maryland Department of Transportation | 107 |
| State | Maryland DNR Lands | 51 |
| State | Maryland State Highway Administration | 3,171 |
| State | Maryland State Institutional Lands | 163 |
| Federal | Other DOD Facilities | 153 |
| Federal | Patuxent Wildlife Reservation | 45 |
| Federal | Smithsonian Institution | 18 |
| Federal | US Coast Guard | 68 |
| Federal | US Navy | 288 |
| Federal | US Park Service | 208 |
| Federal | US Postal Service | 29 |
| Total Impervious Area (Non-County Jurisdictional) | | 8,335 |

In total, 1,376 acres of impervious surface management (Table 3) were documented during the 2014 impervious area assessment and will be incorporated into the 2018 baseline adjustment.

| Table 3. Summary of Credit from 2014 Impervious Area Assessment Included in 2018 Baseline Revision | |
|---|---|
| **Source of Credit** | **Acres** |
| *Managed Impervious (prior to February 2014)* | |
| Water quality improvement projects | 461 |
| Rooftop disconnection and open section roadway | 660 |
| Septic connection to WWTP | 70 |
| Septic upgrades to ENR | 185 |
| ***Total Credit toward Baseline*** | **1,376** |
| | |
| *Restored Impervious (after February 2014)* | |
| Water quality improvement projects | 28.7 |
| Septic connection to WWTP | 15.6 |
| Septic upgrades to ENR | 3.9 |
| ***Total Credit toward Restoration*** | **48.2** |

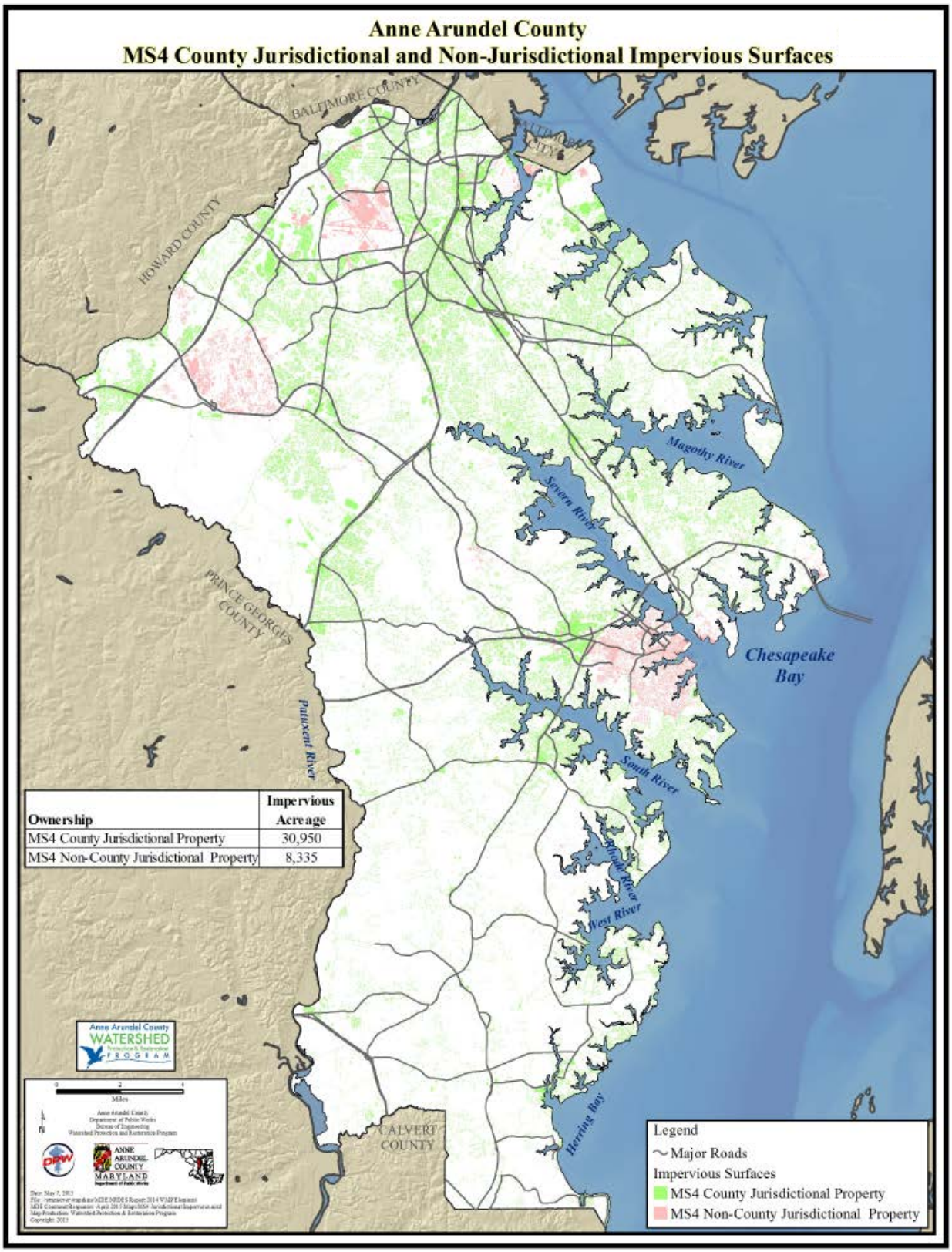


**Figure 1. Map of the County's MS4 Jurisdictional & Non-Jurisdictional Impervious Area**

# IV. 2018 Impervious Area Assessment

The focus of the County's 2018 impervious area assessment was existing BMPs and additional credit from water quality projects installed before February 2014. The data for this assessment were gathered over the course of this permit term and were the result of a sizeable amount of research performed by both contractors and County staff. While the County may continue to add older BMPs to its inventory as documentation for them is unearthed, the current inventory (see the complete BMP dataset submitted in the MS4 Geodatabase as Appendix A of the F18 MS4 annual report) is considered to be a thorough and substantially complete accounting of available information for the County's stock of BMPs.

### *Existing BMPs*

In 2014, although the County had an inventory of over 10,800 BMPs, sufficient information was only available for 238 (2.2%) BMPs, so that they could be claimed for managed impervious credit (263 acres). The County's Urban BMP Database Historic Records Review and Update project essentially started from scratch, developing all BMP records directly from as-built plans, stormwater management reports, and other information available in grading permit and Soil Conservation District files. The old BMP inventory was used for reference and to confirm findings during plan and document reviews, but was not relied on or considered to be a primary source of information.

The County's current BMP inventory includes over 24,000 records. The subset of these BMPs included for credit in this analysis are presented in the *AA County Baseline Revisions Data* geodatabase (Appendix B) in the "FY18 Managed Impervious Credit" feature dataset. These data are presented according to the MS4 Geodatabase format (MDE 2017). Rainfall depth treated and impervious area are included in the "BMPPOI" feature class; an additional field was added to this feature class (FinalImpCreditAcres) to allow for the inclusion of managed impervious credit calculations. BMP type and built date are included in the "BMP" table. The "BMPDrainageArea" feature class contains a set of topologically correct polygons representing the drainage areas for all credited BMPs. Managed impervious acreage was calculated based on depth of rainfall treated by the BMP and impervious surface within the BMP's drainage area, as per MDE's *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* guidance (2014). The geodatabase presents the following subset of the BMP inventory that met the minimum threshold for crediting (i.e., built prior to February 2014 had a drainage area delineated, and had recorded impervious drainage and rainfall depth treated):

- 7,360 BMP points of investigation (POI),
- 7,360 BMP drainage area polygons (13,795 acres),
- 10,912 BMP table records, and
- 3,606.6 acres of managed impervious surface credit.

In addition, there are 10,182 records in the "BMPInspections" table – 9,851 of these inspections have taken place since July 1, 2015. Due to the number of new BMPs found during the historic BMP record review and that project only being completed in July 2018, the County has a small backlog (relative to the County's total BMP inventory) of inspections to complete. In recent years,

the County increased the number of Stormwater Inspector positions to seven. As evidenced by the increasing number of triennial inspections completed year over year, the County intends to quickly progress through the backlog and bring all BMPs into triennial inspection compliance.

### *Water Quality Improvement Projects*

The County recognized an increase in equivalent impervious credit associated with water quality improvement projects due to the identification of existing shoreline management sites (completed prior to February 2014) and the updated crediting of a set of previously reported stream restorations.

Per the methodology laid out in the FY17 MS4 annual report, County staff performed a detailed review of all shoreline in Anne Arundel County, supplemented with permitting information and communication with non-governmental organizations and community groups. This review resulted in the identification of approximately 20,000 linear feet of living shoreline; shoreline projects are credited at 0.04 equivalent impervious acres per linear foot, resulting in 800 acres of credit toward the baseline. These projects are documented in the *AA County Baseline Revisions Data* geodatabase (Appendix B), in the "FY18 Managed Impervious Credit" feature dataset. The data were compiled into the "AltBMPLine" feature class, according to the MS4 geodatabase format (MDE 2017).

Per MDE's letter to the Maryland Association of Counties, dated December 26, 2018, the County calculated the equivalent impervious credit for a subset of stream restoration projects using the Chesapeake Bay Program (CBP) protocols (Appendix C). Credit was capped by the amount of impervious surface within a project's drainage area. For the 18 projects identified, the original credit calculated using the 0.01 equivalent impervious acres per linear foot of stream restoration was 192.09 acres. The CBP protocol crediting for these projects provided 378.57 acres of credit, for a net gain of 186.5 acres of equivalent impervious credit. Documentation of the individual project credits are in the "ExistingSTRE_CBP_AltCreditCalcs" table in the *AA County Baseline Revisions Data* geodatabase (Appendix B).

The combined additional credit provided by water quality improvement projects for the 2018 baseline assessment is 986.5 acres of impervious credit.

## V. Revised Impervious Baseline & Restoration Goal

The 2014 impervious area assessment resulted in a total of 1,639 managed impervious acres. Based on the 2018 impervious area assessment revision, the County can now claim a baseline of 5,969.1 managed impervious acres, an increase of 4,330 acres (Table 4).

| Table 4. Summary of Managed Impervious Acreage (prior to February 2014) | | |
|---|---|---|
| **Source of Credit** | **Acres** | **Analysis** |
| Existing BMPs | 3,606.6 | 2018 baseline |
| Water quality projects | 461.0 | 2014 baseline |
| Additional water quality projects | 986.5 | 2018 baseline |
| Rooftop disconnect and open section roadways | 660.0 | 2014 baseline |
| Septic connections to WWTP | 70.0 | 2014 baseline |
| Septic upgrades to ENR | 185.0 | 2014 baseline |
| **Total managed impervious area** | **5,969.1** | |

The County's NPDES MS4 Permit requires that the County restore 20% of its unmanaged impervious area. The County has a total of 30,950 impervious acres within its MS4 jurisdictional area. The total managed impervious acres are deducted from the County's total, resulting in the County's baseline of unmanaged impervious area. The breakdown of the managed acreage, unmanaged acreage, and the required 20% impervious area restoration goal that resulted from this work effort is presented in Table 5. The baseline revision resulted in a 15% reduction to the County's impervious goal, from 5,862 acres to 4,996. The County believes this to be a reasonable adjustment to its impervious baseline and impervious surface restoration requirement.

| Table 5. Revised Baseline and 20% Impervious Surface Restoration Goal | | |
|---|---|---|
| **Baseline Component** | **Acres** | **Analysis** |
| County MS4 impervious area | 30,950 | 2014 baseline |
| Total managed impervious area | 5,969 | 2018 baseline |
| Total unmanaged impervious area | 24,981 | 2018 baseline |
| **Restoration requirement** | **4,996** | **20% of unmanaged area** |

# VI. References

MDE (Maryland Department of the Environment). 2017. *National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4), Geodatabase Design and User's Guide.* Prepared for: Environmental Protection Agency (EPA) Chesapeake Bay Restoration and Protection Funding (CBRAP). Version 1.2.

MDE (Maryland Department of the Environment). 2014. Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated – Guidance for National Pollution Discharge Elimination System Stormwater Permits.