AECOM

Addendum to

Stormwater Management Inventory and Watershed Improvement Plan

(Needs Analysis and Funding Mechanism Assessment for Stormwater Programs)

March 2017

Addendum to

Stormwater Management Inventory and Watershed Improvement Plan

(Needs Analysis and Funding Mechanism Assessment for Stormwater Programs)

Prepared for
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Acronyms

BMP	Best Management Practice
CBP3	Community-Based Public-Private Partnership
CBT	Chesapeake Bay Trust
CIP	Capital Improvement Program
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Funds
DNR	Department of Natural Resources
DPW	Department of Public Works
EHA	Equivalent Hydraulic Area
EPA	Environmental Protection Agency
ERU	Equivalent Residential Unit
ESD	environmental site design
FTE	full-time employee
FY	fiscal year
GI	Green Infrastructure
GIS	Geographic Information System
GO	General Obligation
ID	Intensity of Development
MDE	Maryland Department of the Environment
MS4	Municipal Separate Storm Sewer System
NAFSMA	National Association of Flood and Stormwater Management Agencies
NFWF	National Fish and Wildlife Foundation
NPDES	National Pollutant Discharge Elimination System
O&M	Operations & Maintenance
P3	Public-Private Partnership
SWPP	Stormwater Pollution Prevention
TMDL	Total Maximum Daily Load
WRRDA	Water Resources Reform and Development Act

Executive Summary

This Needs Analysis and Funding Mechanism Assessment report was developed as an addendum to the Stormwater Management Inventory and Watershed Improvement Plan. The intent is to assist the City of Annapolis in understanding the scale of funding that will be needed to manage a comprehensive stormwater management program that will meet state and federal stormwater management regulatory requirements, maintain current stormwater infrastructure, improve quality of surface waters and natural resources, minimize localized flooding, and guide future development in the City. The City has owned and maintained a stormwater management infrastructure for many decades, and it includes several components such as storm drain pipes, storm drain inlets, storm drain outfalls, and stormwater management facilities. The effective management of stormwater is vital for improvement of surface water quality and to meet the requirements of the Clean Water Act, the upcoming National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Phase II Permit requirements, and the Chesapeake Bay Total Maximum Daily Load (TMDL) requirements.

The City developed a dedicated funding mechanism for stormwater management with the creation of a stormwater utility fee. However, the current annual fees of $875,000 collected by the City's stormwater utility will not be sufficient to meet the City's future stormwater program needs, regulatory requirements, or pay for regular operations and maintenance. To meet these mandates, the City desires to re-evaluate its current stormwater utility fee and explore additional funding options that can support the City's robust stormwater management program.

This study explores stormwater management funding and financing options that may be suitable for the City's operations, including expansion of the current stormwater utility fee, capital recovery/development impact fee, grants and technical assistance, and public-private partnerships.

As re-evaluation and expansion of the current stormwater utility was expressed as the favorable option by the City, a discussion of different utility fee structure options such as Equivalent Residential Unit (ERU), Intensity of Development (ID), and Equivalent Hydraulic Area (EHA) is also included in this study. Once the City selects the fee structure for the expansion of the current stormwater utility fee, it is recommended that they conduct outreach and education meetings and work sessions to get buy-in from the City residents and the City council.

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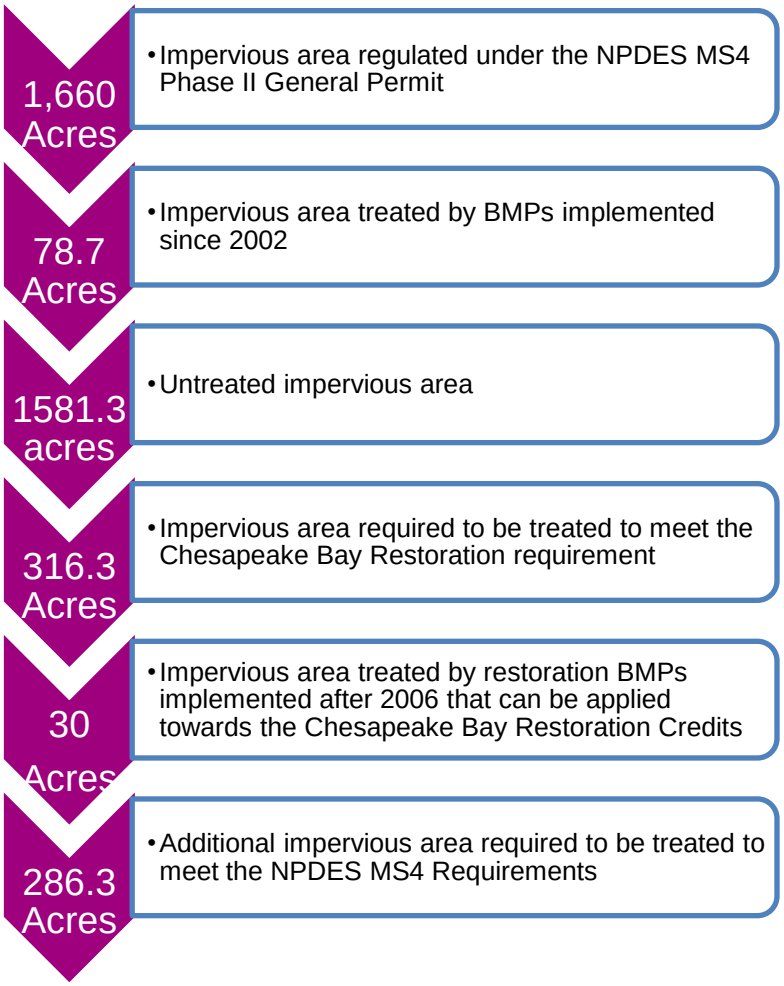
1 Introduction

The City of Annapolis is currently evaluating funding options to meet the Chesapeake Bay Total Maximum Daily Load (TMDL) and upcoming National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Phase II General Permit requirements. Funds are also needed for the day-to-day operations of the City's stormwater management program. This report analyzes needs and provides potential funding options that the City can consider, including re-evaluation of the current stormwater utility fee.

1.1 Regulatory Drivers

The City of Annapolis is a Small MS4 NPDES operator and has been subject to the requirements of the NPDES MS4 Phase II General Permit since 2003.

The current Phase II General Permit expired in 2008 and has been administratively extended by the Maryland Department of the Environment (MDE) until a new permit is issued. MDE has developed an interim guidance document "Chesapeake Bay Restoration: Getting Started" (August 2016), which allows Phase II municipalities to begin preparing for the additional requirements that are expected to be included as a part of the new permit. It is anticipated that the new General Permit would also require compliance with the Chesapeake Bay Restoration requirements to address the Chesapeake Bay TMDL reduction goals established by U.S. Environmental Protection Agency (EPA) for nitrogen, phosphorus, and sediment impairment. These new goals will require the City to implement stormwater management measures to treat 20 percent of the currently untreated impervious areas. EPA set a 2017 goal for implementing 60 percent of the actions needed to meet the TMDLs, and set 2025 as the year to achieve the final target loads.



Calculation of Chesapeake Restoration Requirements for the City of Annapolis

As a part of the Stormwater Management Inventory and Watershed Improvement Plan, AECOM computed the impervious area required to be treated to meet the Chesapeake Bay Restoration requirements. An impervious area of approximately 316 acres was

estimated to need treatment to meet the Chesapeake Bay Restoration requirements. According to MDE published guidance, impervious area treated by restoration best management practices (BMPs) implemented since 2006 can be applied toward meeting the Chesapeake Bay Restoration requirements. The City has approximately 30 acres of equivalent impervious area credits that it can receive from the restoration projects implemented since 2006. This would result in an impervious area of approximately 286 acres (i.e., 316 acres - 30 acres) that would be required to be treated by the City using stormwater management BMPs, environmental site design (ESD) practices, and alternative urban BMPs.

In addition, according to reporting and maintenance guidance published in the MDE document "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated" (August 2014), every BMP needs to be inspected and maintained triennially to rectify any deficiencies for the City to continue obtaining credits from the BMPs toward NPDES compliance.

1.2 Purpose of the Document

This document reports the results of the needs analysis and funding mechanism assessment, whose goals were to:

- Analyze the costs that would be incurred by the City for:
    - implementing restoration BMP projects, and public education and outreach programs
    - maintaining existing and future stormwater infrastructure including future BMPs
    - funding the salaries and benefits of the City's stormwater management program employees
- Provide a suite of funding and financing options including expansion of the current stormwater utility.
- Recommend the next steps to be taken by the City to meet the existing and future stormwater management program needs.

2 Current Funding and Financing for Stormwater Management Programs

The City's stormwater management Capital Improvement Program (CIP) is funded through the Stormwater Management Enterprise Fund, which are the funds collected from the stormwater utility. According to the City's published FY2016 – FY2021 Proposed Capital Improvement Program, some restoration CIP projects are funded through general operating funds, but more complex projects related to stormwater management and drainage are implemented with Stormwater Management Enterprise Funds.

The City currently has an ordinance (i.e., 17.10.180) that establishes a stormwater utility fee for the study, engineering, design, purchase, construction, expansion, repair, maintenance, landscaping, and inspection of public stormwater management systems. The City currently collects $875,000 annually from the current stormwater utility to pay the salaries of its stormwater management program employees and operation costs of the stormwater program.

The stormwater utility is included as a part of the utility bill. The utility bill is collected from City residents and commercial, industrial, and exempt properties quarterly and includes a fee for water, sewer, and residential refuse collection. As shown in Table 2-1, a fixed stormwater utility of $10.40 is collected from all residential properties, and a tiered approach is adopted for the collection of the fee from commercial and industrial properties based on their impervious cover. The City currently offers a reduction of up to 50 percent of the stormwater utility fee for properties that implement on-site stormwater management facilities.

Table 2-1: Current Stormwater Utility Structure in the City of Annapolis

Property Type	Stormwater Utility Collected Quarterly
Residential, per unit	$10.40
Commercial, industrial, exempt with impervious coverage of:	
Up to 5,000 sq. ft.	$39.02
5,001 to 10,000 sq. ft.	$78.03
Above 10,000 sq. ft.	$130.05

The majority of the collected funds are directed toward salaries and benefits of 6.32 full-time employees (FTEs) under the stormwater management program and operation costs of the program. A portion of the collected stormwater utility is directed toward the payment of principal and interest of the General Obligation (GO) bonds issued to the City for stormwater capital improvement projects. Table 2-2 shows a breakdown of the utilization of the current stormwater utility for the adopted fiscal year (FY) 2017 budget.

Table 2-2: Distribution of Collected Stormwater Utility

Distribution Type	Funds Allocated
Salaries and Benefits of 6.32 FTE	$602,629.62
Operating Costs	$70,102.88
Debt Payment (Principal and Interest for GO Bonds) for Capital Projects	$27,490.00
Other Expenditures (Depreciation and Adjustments, Inter-fund Allocations)	$98,463.24
Total Expenditure	**$798,685.74**

A surplus of $76,314.26 is estimated from the FY2017 allocated budget that can be directed towards additional stormwater management programs.

3 Needs Analysis

To prepare for future stormwater management costs, a needs analysis was conducted to identify the annual expenses currently being incurred by the City's stormwater management program and to project the expenditure likely to be needed to meet future stormwater program priorities. The City, with AECOM's assistance, identified the stormwater program priorities to meet the Chesapeake Bay TMDL timelines (i.e., through 2025).

To identify the current annual expenditure related to stormwater management, AECOM reviewed the current CIP projects related to stormwater management, and the current stormwater operation and maintenance budget. To project the stormwater-related expenses that would be incurred by the City through 2025, AECOM reviewed the FY2016 – FY2021 Proposed Capital Improvement Program published by the City, the Stormwater Management Inventory and Watershed Improvement Plan, as well as the MDE guidance on the upcoming requirements of the Phase II NPDES MS4 General Permit and Chesapeake Bay TMDL requirements.

The City's adopted FY 2017 CIP stormwater management projects include:

- Stream Restoration
- Watershed Management Plan
- Dorsey Avenue Storm Drain Repairs
- Stormwater Management Retrofit Projects

Additional stormwater CIP projects will need to be implemented, including the projects proposed as a part of the Stormwater Management Inventory and Watershed Improvement Plan (October 2016), to meet the NPDES MS4 General Permit requirements as well as the Chesapeake Bay TMDL requirements, for which the current annual funding may not be sufficient. A needs analysis was conducted to identify the annual funding that will be needed for the City to implement all BMPs required for its stormwater management program until the end of the Chesapeake Bay timeline (2025). The following items were considered for the development of the needs analysis:

- **Cost of Implementing the Proposed Projects:** AECOM reviewed the costs of BMP projects that would be necessary to implement to treat 286 acres of impervious area to meet the upcoming NPDES MS4 General Permit requirements. AECOM identified 19 projects as a part of the Stormwater Management Inventory and Watershed Improvement Plan that would treat 286 acres of impervious cover. The 19 projects are estimated to have a total implementation (design, construction, and permitting) cost of approximately $9 million. These projects were ranked in priority and grouped with the assumptions that they would be implemented annually from 2017 through 2025 as part of a phased approach. Based on City's recommendation, it is assumed that the annual cost that will be incurred by the City for implementation of BMPs will be funded through debt financing and paid over a 20-year period. An annual debt payment including the principal and interest was calculated and included in the needs analysis as part of the cost of implementing the proposed projects. An interest rate of 4.5 percent was assumed for the projects that would be implemented

Selection of Projects to Treat 286 Impervious Acres of Chesapeake Bay Restoration Requirements

- 16 concept designs treating 253 acres of impervious area
- 3 additional projects treating 33 acres of impervious area (BMP_11,City_05 and BMP_12)

through debt financing in the year of 2017 and an annual increase of 0.05 percent in the interest rate was assumed until the year 2025. This would result in an interest rate of 4.9 percent for the projects that would be implemented in the year 2025 though debt financing. Additionally, an annual inflation rate of 3 percent was assumed for the project implementation costs. Appendix A includes the annual debt payment calculation for the 19 BMP projects that would be implemented by the City from 2017 to 2025. Table 3-1 provides the year of implementation, debt financing interest rates and inflation adjusted implementation costs for the proposed 19 projects.

Table 3-1: Implementation Schedule of BMP Projects from 2017 through 2025

Project ID	Project Type	Implementation Cost	Year of Implementation	Inflation Rate (%)	Inflation Adjusted Implementation Cost	Interest Rate Assumed for Debt Financing (%)
BMP_15	Wet Pond Retrofit	$376,767	2017	0	$376,767	4.50
Out_01	Step Pool Conveyance System	$354,084	2017	0	$354,084	4.50
BMP_14	Wet Pond Retrofit	$283,175	2017	0	$283,175	4.50
CtyRqst_01	Step Pool Conveyance System	$1,018,621	2018	3	$1,049,180	4.55
BMP_20	Wet Pond Retrofit	$386,531	2019	6	$409,723	4.60
Out_04	Step Pool Conveyance System	$844,906	2019	6	$895,600	4.60
BMP_21	Wet Pond Retrofit	$219,528	2020	9	$239,286	4.65
Out_07	Step Pool Conveyance System	$667,470	2020	9	$727,542	4.65
BMP_07	Wet Pond Retrofit	$334,842	2021	12	$375,023	4.70
City_06	Step Pool Conveyance System	$674,665	2021	12	$755,625	4.70
City_01	Wet Pond	$348,530	2022	15	$400,810	4.75
BMP_08	Wet Pond Retrofit	$330,027	2022	15	$379,531	4.75
BMP_05	Dry Pond Retrofit to Sand Filter	$184,905	2022	15	$212,641	4.75
BMP_22	Grass Swale to Bio Swale Retrofit	$135,365	2023	18	$159,731	4.80
BMP_09	Wet Pond Retrofit	$193,759	2023	18	$228,636	4.80
BMP_12	Infiltration Basin Retrofit	$429,975	2023	18	$507,371	4.80
BMP_17	Bioretention Retrofit	$198,757	2023	18	$234,533	4.80
BMP_11	Wet Pond Retrofit	$1,164,763	2024	21	$1,409,364	4.85
City_05	Step Pool Conveyance System	$819,150	2025	24	$1,015,746	4.90

- **Cost of Maintaining Existing and Proposed BMPs:** The City has 741 existing BMPs and will continue to implement additional BMPs through the CIP. An increase in the number of BMPs will place an additional burden on the City to maintain them to ensure their performance. Additionally, according to MDE every BMP needs to be inspected and maintained triennially to rectify any deficiencies in order for the City to continue to obtain credits from the BMPs toward NPDES MS4 compliance. A cost for inspection and maintenance of one-third of the existing and proposed BMPs was estimated and included as a part of the anticipated annual cost. Planning-level maintenance costs provided in the University of Maryland's published document "Cost of Stormwater Management Practices in Maryland Counties" (October 2011) were used to estimate the annual maintenance costs that would be incurred based on the BMP type.
- **Current City Stormwater Management CIP Projects:** CIP projects adopted for FY2017 were provided by the City. The City-provided document also included projected costs for the projects through FY2022. In addition, current City CIP projects also included the annual budgeted costs for maintenance of storm drain infrastructure, annual street sweeping, and street sweeping equipment costs. The City expects to purchase street sweeping equipment that has a lifecycle of 7 years for $660,000 through debt financing, and will be paid for over 7 years. Based on the City's expectation, an annual debt payment including the principal and the interest of 3.0 percent were calculated and included in the needs analysis for a payment period of 7 years. Appendix A includes the annual debt payment calculation for the City for debt financing the street sweeping equipment for the next 14 years (two 7-year lifecycles for street sweeping equipment costs).
- **Salaries and Benefits of Existing Employees and Operating Costs:** Based on the City-provided information, the current stormwater utility funds 6.32 FTEs and operating costs. The needs analysis includes the salaries of the stormwater program employees and operation costs that will be incurred annually. An annual increment of 3 percent was added to the costs to account for increases in salaries and benefits.
- **Stormwater Pollution Prevention (SWPP) Training:** Based on the City's request, annual pollution prevention training for Department of Public Works (DPW), vehicle repair, Department of Recreation and Parks, and Small Engine Shop staff members were included as a part of the needs analysis.
- **Debt Payment of GO Bonds:** The City currently pays principal and interest toward previously issued GO bonds to implement Stormwater CIP projects (prior to 2016). The FY2017 budget included information related to the principal and interest amount, which were included in the needs analysis. It is assumed that the annual cost of debt payment to be made by the City will remain constant through 2025.

A table summarizing the needs analysis (Table 3-2) was developed that estimates the annual expenses that the City would incur from 2017 through 2025. Because the City would be debt-financing the proposed projects and the costs for purchasing the street sweeping equipment, the annual payment for these would continue beyond 2025. The annual debt-financing payment for the proposed projects is calculated through 2045 for the projects, and an amount of $15 million including principal and interest is estimated to be the total payment for the 20-year payment period. The annual debt financing for the street sweeping equipment is calculated through 2031 (for two equipment lifecycle terms) and an amount of $1.4 million is estimated to be the total payment for the 14-year payment period. Appendix A includes estimated annual payment for debt financing of the proposed projects and street sweeping equipment.

Table 3-2: Needs Analysis Funding Estimates from 2017 through 2025

Item	2017	2018	2019	2020	2021	2022	2023	2024	2025
Cost of implementation of BMP Projects to Treat 286 acres of impervious Area									
Cost of Implementing the Proposed Projects[1]	$96,332	$194,248	$314,890	$400,518	$500,273	$584,513	$680,345	$801,521	$881,016
Cost of Maintenance of Existing and Proposed BMPs									
Cost of Maintaining Existing and Proposed BMPs	$312,395	$312,395	$312,395	$312,395	$312,395	$312,395	$312,395	$312,395	$312,395
Current City Stormwater Management CIP Projects									
Stream Restoration of City's Tidal Creek	$101,000	$0	$305,000	$0	$0	$0	$0	$0	$0
Watershed Management Plan	$250,000	$0	$0	$0	$0	$0	$0	$0	$0
Dorsey Avenue Storm Drain	$246,275	$0	$0	$0	$0	$0	$0	$0	$0
Stormwater Management Retrofit Project	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Contract Services for Repair of Storm Drain System	$36,490	$36,490	$36,490	$36,490	$36,490	$36,490	$36,490	$36,490	$36,490
Street Sweeping Cost	$215,198	$215,198	$215,198	$215,198	$215,198	$215,198	$215,198	$215,198	$215,198
Street Sweeping Equipment Cost[2]	$114,086	$111,257	$108,429	$105,600	$102,771	$99,943	$97,114	$114,086	$111,257
Debt Payment for GO Bonds									
Debt Payment for GO Bonds	$27,490	$27,490	$27,490	$27,490	$27,490	$27,490	$27,490	$27,490	$27,490
Salaries and Benefits of Existing Employees and Existing Operational Expenses									
Salaries and Benefits of Existing Employees	$602,630	$620,709	$639,330	$658,510	$678,265	$698,613	$719,571	$741,158	$763,393
Operating Expenses	$70,103	$70,103	$70,103	$70,103	$70,103	$70,103	$70,103	$70,103	$70,103
Cost of Education and Outreach for Pollution Prevention									
SWPP Training for (Department of Public Works, Vehicle Repair, Parks and Recreation Department Staff and Small Engine Shop Staff)	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
Total	**$2,191,998**	**$1,707,890**	**$2,149,324**	**$1,946,304**	**$2,062,985**	**$2,164,745**	**$2,278,706**	**$2,438,441**	**$2,537,342**

[1]Principal and interest payment estimates for debt financing of proposed projects for a 20-year period until year 2045. Payments projected through 2025 only.
[2]Principal and interest payment estimates for debt financing of street sweeping equipment for 7-year period. Payments projected through 2025 only.

4 Potential Options for Funding, Financing, and Partnerships for Stormwater Programs

This section summarizes the potential options the City has for funding, financing, and partnering for stormwater programs. AECOM focused on new sources of revenue while also considering supplementing existing sources such as increases in stormwater utility fee. Multiple sources were used to recommend potential options, but three documents were relied upon extensively:

- Funding Stormwater Programs, EPA, April 2009.
- Guidance for Municipal Stormwater Funding, National Association of Flood and Stormwater Management Agencies (NAFSMA) (under grant provided by the Environmental Protection Agency), January 2006.
- Community-Based Public-Private Partnerships (CBP3s) and Alternative Market-Based Tools for Integrated Green Stormwater Infrastructure, U.S. EPA, April 2015.

4.1 Funding Options

4.1.1 Re-evaluation of Current Stormwater Utility

The City currently has an ordinance in place for a stormwater utility and re-evaluation, and expansion of the current utility to meet the funding needs is an option being considered by the City. Several rate structures and billing options can be considered for the expansion of the current stormwater utility based on the City's current operations. As this is the City's preferred option, this topic is discussed in depth, and details of potential rate structures that can be adopted are included in Section 6.

4.1.2 Capital Recovery Fees/Development Impact Fee

Capital recovery fees are most often intended to recover the fair share of capacity that was previously built into public systems in anticipation of their future needs. Impact fees are based on the cost of mitigating the impacts of individual developments by building public off-site improvements where impacts cannot be solved on site. Capitalization charges are different from impact fees regarding the purpose of the charges, the timing of the improvements with respect to when the charges are collected, and their relationship to the facilities that are funded through user fees.

The use of capitalization charges for stormwater management costs can be considered appropriate because drainage systems are typically designed to have capacity to accommodate future development in an economical manner. The use of such fees may, however, be complicated by the presence of a stormwater utility. Most utilities are built based on extent of impervious surfaces. An undeveloped parcel that is one day developed would have a fee assessed on the amount of new imperviousness generated for it, somewhat negating the need for capital recovery.

Impact fees are typically limited to situations in which the impact of new development on existing infrastructure systems is measurable and certain, of a definable geographic or systemic extent, and quantifiable in terms of the incremental capital investment that will be required to maintain an adequate service level given added growth. Impact fees cannot be used to bring inadequate existing systems up to an adequate service level. Therefore, their use in correcting common deficiencies that already exist in stormwater systems is limited.

Proponents of Capital Recovery or Development Impact Fees can argue that these fees are appropriate because developers need to pay for their developments. However, depending on the strength of the local real estate market, the costs may simply get added to the price of a new home or reflected in rental prices. These types of fees can also lower the price of undeveloped land as developers will factor the costs into their offers. Finally, these fees are typically assessed on a per-lot basis or number of bedrooms, with no correlation to assessed value. Thus they can be counter to affordable housing objectives.

4.1.3 Grants and Technical Assistance

Nonprofit organizations such as foundations often award grants. Among the more prominent in the Chesapeake Bay region are the Chesapeake Bay Trust (CBT) and the National Fish and Wildlife Foundation (NFWF).

The CBT's 15 grant programs are structured around three core objectives:

- Demonstration-based restoration
- Environmental education
- Community engagement

Restoration grants are awarded for projects including living shorelines; watershed assistance aimed at nutrient and sediment reductions; non-tidal wetland creation, restoration, enhancement, or preservation, and green streets. A review of currently open grant programs indicates that the CBT often partners with local government entities in their grant programs. Many non-profits and watershed groups in the City such as the Spa Creek Conservancy and Back Creek Conservancy have successfully obtained funding through the CBT grant program and have implemented restoration projects in the City.

The NFWF, in partnership with the EPA, awards grants for projects that enhance local capacity to efficiently and effectively restore the habitats and water quality of the Chesapeake Bay and its tributaries. In 2016, NFWF offered three application and award cycles for agricultural conservation, restoration and community stewardship, and stormwater management. Funded projects are intended to enhance the technical capacity of local entities to implement more effective restoration through existing programs and future funding and project opportunities as opposed to providing funds for on-the-ground restoration actions.

State agencies such as MDE and Department of Natural Resources (DNR) offer funding through their grant programs as well as technical assistance in areas of stormwater management, stream restoration, and for implementation of alternative urban BMPs such as living shorelines. In 2017, Chesapeake and Atlantic Coastal Bays Trust Funds awarded by DNR offered funding and technical assistance in the area of nonpoint source control in geographically targeted areas in the state, and the City of Annapolis was identified as a high-priority trust fund zone.

Applying for grants and funds is an avenue the City is already considering to relieve capital burden for funding planned projects. For example, the City received a grant from the CBT for retrofitting the Ambridge community pond located near Langdon Court to improve its water quality treatment capacity. Funding options are also available for projects that address other areas of concern for the City, such as flooding. It is recommended that the City continue to pursue grant funding for restoration projects as a supplemental funding source.

4.2 Financing

4.2.1 Debt Financing

Debt financing is most often associated with bonding, but the use of intergovernmental loans also falls under this category. Debt is commonly used for major capital projects, land acquisition, and equipment. Debt should not be incurred to fund day-to-day operations, and some states prohibit their use in this manner. For example, the City is not allowed to use bonds to pay for stormwater facility maintenance costs. The opposite of debt is pay-as-you-go, wherein a government entity does not incur a large expense until it can afford to do so with current cash reserves.

Properly managed, incurring debt can be a wise investment in certain instances. Some projects may simply be too expensive to fund at one time for some municipalities. Others, such as flood protection or other public safety needs, may warrant a timely response and cannot be delayed for years while funds are set aside.

The principal disadvantage of debt is that it needs to be paid back with interest and could strain future budgets. However, this may be offset by the lower construction costs of building or purchasing in the present and not the future. Debt service of bonds is usually derived from one of two sources: GO and future revenues. GO bonding is backed by the "full faith and credit" of the issuing agency. Any revenues or other resources of the issuer including taxes may be used to service the debt. Bonding based on future revenues, such as utility payments, often has a higher interest rate because of the added risk for purchasers of the bonds. Some jurisdictions are able to issue bonds with future revenues as the funding source but are still backed by the full faith and credit of the issuer.

If debt is incurred, it is important for the issuing agency to have clear capital financing and debt management policies in place that provide decision criteria for when incurring debt is appropriate, guidelines for debt capacity, policies that address what type of debt financing is appropriate, and specify who is responsible for implementing and monitoring compliance with the policies. Some of the City's CIP projects are funded through GO bonds (Section 3), the annual payments for which are funded through the City's stormwater utility.

4.2.2 Loans

Loans for stormwater-related projects vary by state and region. Among government-sponsored programs are the Clean Water State Revolving Funds (CWSRF) program and the Clean Water Act (CWA) section 319 nonpoint source program, which is administered by states. The latter cannot be used for projects that are required as part of an NPDES permit. The MDE and DNR provide financial assistance for planning, design, and construction of many water management projects such as the retrofitting of stormwater management and conversion projects and stream restorations.

The CWSRF program was established by the 1987 amendments to the CWA as a partnership between EPA and the states that replaced EPA's Construction Grants program. States have the flexibility to fund a range of projects that address their highest-priority water quality needs.

The 51 CWSRF programs function like environmental infrastructure banks by providing low-interest loans to eligible recipients for water infrastructure projects. As money is paid back into the state's revolving loan fund, the state makes new loans to other recipients for high priority, water quality activities. Repayments of loan principal and interest earnings are recycled back into individual state CWSRF programs to finance new projects that allow the funds to "revolve" at the state level over time.

Beginning in 2009, Congress authorized the CWSRFs to provide further financial assistance through additional subsidization, such as grants, principal forgiveness, and negative interest rate loans. Through the Green Project Reserve, the CWSRFs target critical green infrastructure, water and energy efficiency improvements, and other environmentally innovative activities. CWSRFs fund a wide range of water infrastructure projects including:

- Construction of publicly owned treatment works
- Nonpoint source
- National estuary program projects
- Decentralized wastewater treatment systems
- Stormwater management
- Water conservation, efficiency, and reuse
- Watershed pilot projects
- Energy efficiency
- Water reuse
- Security measures at publicly owned treatment works
- Technical assistance

The program was amended in 2014 by the Water Resources Reform and Development Act (WRRDA). WRRDA broadened project funding to include watershed plans, water conservation, and stormwater recapture. It also enabled the leveraging of private funds through public-private partnerships (see Section 4.3.1).

4.3 Partnerships

4.3.1 Public-Private Partnerships

A Public-Private Partnership (P3), also referred by EPA as a Community-Based P3, is a partnership, between a local government and a private entity that provides flexibility, implements advances in technology, addresses dynamic community development trends and goals, and instills long-term financial and regulatory commitments for integrating Green Infrastructure (GI) and environmental site design (ESD) into stormwater management programs. A P3 typically involves a performance-based contract between the public and private sectors to arrange financing, delivery, and typically long-term operations and maintenance (O&M) of public infrastructure.

Stormwater management projects that are long-term and large-scale with multiple benefits and numerous scenarios for implementation, management, and financing could benefit from the flexible and adaptive management approach provided by a P3. Some of the key advantages of a P3 arrangement for stormwater management retrofits include:

- Increasing the ability to leverage public funds while minimizing impacts on a municipality's debt capacity.
- Accessing advanced (possibly proprietary) technologies not available through standard procurement approaches.

- Improving asset management and the scientific application of lifecycle cost practices.
- Drawing on private sector expertise and the widest range of private sector financial resources, including new sources of private capital, thereby eliminating the need to wait for future budget cycles to pay for needed infrastructure projects.
- Benefiting local economic development by creating a marketplace where small, minority, and disadvantaged businesses can grow and thrive.
- Relieving pressure on internal local government resources by using the private sector as a force multiplier.

In a P3, the conditions must be appropriate for the community and the contractor so that both receive equitable benefits for all actions and both partners gain from the efficiencies and reduced costs of adaptive management and advances in technology. Because of the need to negotiate multiple subcontract agreements, evaluate and make rapid implementation decisions, and coordinate with multiple stakeholders, the community must have a significant amount of trust that the contractor will act as an agent for the community throughout the long-term partnership.

A major benefit of a P3 is that with greater private involvement and use of market forces such as competition, efficiencies, flexibility, and economies of scale), urban retrofits can be made more affordable, technology can improve, and overall costs can be reduced. In many respects, existing government business models are too expensive, time-consuming, and generally lack incentives to drive down costs. The CBP3 model for stormwater retrofits has a number of distinct benefits and advantages over traditional infrastructure financing structures, including opportunities for:

- Economies of scale in the provision of critical services or activities
- Promoting, developing, and reflecting advances in reporting, verification, and cost effectiveness
- Mutual learning opportunities for all partners on procurement, job development, management, outreach, and reporting activities

Some factors that should be considered for setting up a P3 include:

- Ensuring that the City's legal structure allows a P3 to be implemented
- Identifying a dedicated funding source such as a stormwater utility fee for payment to the private entity
- Preparing agreements that clearly define the payment process to the private entity
- Developing a streamlined process and performance standards for managing and monitoring the P3 contract such that the risk transferred to the private entity is not transferred back to the public agency

4.3.2 Cost Sharing

Many successful stormwater management programs are supported by several sources of funding and effective collaboration of state, county, and local agencies. Stormwater runoff frequently flows across jurisdictional boundaries, and without sound planning and inter-governmental cooperation, improvements in one community can result in problems in another. For example, joint funding of an upstream regional detention structure could negate the need for more expensive downstream mitigation measures. Grant organizations sometimes award extra points to partnership-sponsored projects. The City of Annapolis has several state and Anne Arundel County properties where the City can implement

stormwater management projects by collaborating with them. Similarly, non-structural aspects of an overall stormwater program, such as public education, need not occur within a single jurisdiction.

5 Stormwater Utilities

5.1 Basics of a Stormwater Utility

A stormwater program, or stormwater utility, can be a means to provide a “SAFE” funding source. SAFE is an acronym standing for the following terms:

- Stable – Funding does not fluctuate year-to-year based on prior years’ occurrences
- Adequate – Determined by actual expenditures plus projected future needs
- Flexible – Rates can be adjusted as conditions warrant
- Equitable – Cost is borne by the user based on demand placed on the drainage system

The City desires an assessment of its current process of collecting stormwater utility fees and recommendations regarding potential new approaches for expansion of the current utility that would be more equitable.

A stormwater utility functions similarly to a city’s water / wastewater and electric utilities in that revenues and expenditures associated with surface water conveyance and management are accounted for separately from other City services. Under the stormwater utility concept, residences and businesses are assessed a fee based on the amount of stormwater runoff that they contribute to the drainage system. Collected revenues are then used for stormwater-related expenses. The City of Annapolis has a stormwater utility structure where a standard flat fee is assessed on residential properties irrespective of the impervious area covered by them. Commercial and industrial properties have a tiered utility fee system based on the impervious cover, as discussed in Section 2. For the expansion of the current stormwater utility, the City could consider accounting for the impervious cover as the basis for all land use types, including residential areas, which occupy 57 percent of the City’s land use cover.

There is a direct correlation between the amount of impervious surface (rooftops, parking areas, driveways, etc.) and the rate and volume of runoff resulting from storm events on any given property. Because this runoff is most often handled by a public stormwater conveyance system, once it leaves the property, those properties contributing more runoff to the conveyance system should also be responsible for contributing more revenue. Rates for water, sewer, and electric services are determined in a similar fashion. In the case of stormwater though, it is not possible to measure runoff from a particular site, so the amount of impervious surface on a property is commonly used as a proxy. However, measuring the amount of imperviousness can be a tedious and time-consuming exercise. Therefore, other approaches are often used to minimize this effort. In its simplest form, a stormwater fee based on impervious cover would be the revenues needed for the desired level of service divided by the total impervious area. There are, however, numerous ways to arrive at a fee.

Communities with stormwater utility fees have the added benefit of funding that can broaden the scope of stormwater management to include related issues such as land use and development regulation, environmental protection, and habitat reservation. This can result in opportunities for linkages with other programs. For example, properties used for detention and groundwater recharge can be developed into active recreation facilities like neighborhood playgrounds, soccer fields, etc. Similarly, greenways and trails can be built alongside of streams.

5.2 The City of Annapolis' Current Storm Water Utility

The City of Annapolis FY2017 budget indicates that the Stormwater Fund will collect $875,000 in revenues. AECOM calculated that there are 1,749.3[1] impervious acres, or about 76,200,000 square feet. Using the anticipated revenues, a purely impervious surface-based (including public facilities, roads, and exempt properties) stormwater fee would be about $11.48 per 1,000 square feet per year.

While the current utility process is administratively simple and thus desirable from a public administration standpoint, it is not as equitable as it could be. For example, homes on larger lots could easily have 3,000 or 4,000 square feet of impervious surface, but would only pay about a quarter of the amount paid by a commercial establishment with 5,000 square feet of impervious cover. Conversely, a very large commercial establishment of 100,000 square feet would only pay about 13 times as much as a homeowner on a small lot with 2,000 square feet of impervious surface even though it has 50 times the impervious area.

Depending on the method that is suitable for City operations, various fee structure and rate structure alternatives can be applied to the properties to collect the stormwater fee, and these are described in Section 6

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[1] 1,749.3 acres includes the Phase II MS4-regulated impervious area of 1,660 acres, as well as state- and county-owned properties and industrial properties covered by the General Permit for Discharges of Stormwater Associated with Industrial Activity within the City boundary.

6 Stormwater Utility Fee Structure Options

The fee structure has implications on a number of issues including equity, complexity and cost of program administration, and legal defensibility. There are two main property types to consider when establishing the fee structure: residential and non-residential. Embedded in the residential property type are various land use categories based on total lot size. Given the two main property types of residential and non-residential, there are six different rate structures based on whether a tiered, variable, or flat rate scheme is used. Different rate schemes can be applied to the property types in various combinations.

Tiered: The fee increases in steps based on the size associated with the land use type and impervious area. This creates classes or tiers based on the size of the impervious areas, with each tier being charged a different fee.

Variable: The fee increases incrementally based on the amount of impervious area within a range or other defined unit, such as the equivalent residential unit (ERU). As an example, the fee may be charged for every 800 square feet of impervious area, or for each fraction or multiple of the ERU.

Flat Rate: The fee is uniform for all properties in the land use category. Under this scheme, all of the same property type is charged a flat rate.

After taking into consideration the program's goal to maximize equity and minimize administrative costs, there are a few appropriate pairings for each of the schemes related to the City's property types. For residential properties, all three of the above may be employed, with tiered and flat rates being more common in Maryland. For non-residential properties, tiered and variable are the most common. The fee structure used for one property type generally influences the fee structure used for the other when program criteria are considered equally for each type. Some examples of these rate scheme combinations are discussed below. In particular, the options below describe how the fees will be apportioned to residential and non-residential properties.

6.1 Equivalent Residential Unit (ERU) Approach

Since single-family homes typically comprise 75 percent or more of total tax parcels in any given city or town but often only 25 percent of total imperviousness, it is often considered impractical to calculate the imperviousness for each such parcel. Even if the City has GIS coverage of imperviousness for each parcel, the amount of impervious surface on residential parcels can fluctuate often based on additions and other property changes, and keeping up with those frequent changes can be an administrative burden. Instead of basing fees on each residential parcel's unique impervious surface calculation, the average imperviousness of single-family homes, either in aggregate or by zoning district or other method, is often used. That average is termed an ERU. Conversely, commercial and industrial locations usually comprise a minority of lots but a majority of total imperviousness. Thus it is considered worth the time investment to measure the impervious area on each lot and classify the imperviousness as an equivalent number of ERUs. The ERU approach is used by more than 80 percent of all stormwater utilities nationally (EPA 2009), and is sometimes referred to as "you pave, you pay" because stormwater issues are directly related to impervious area.

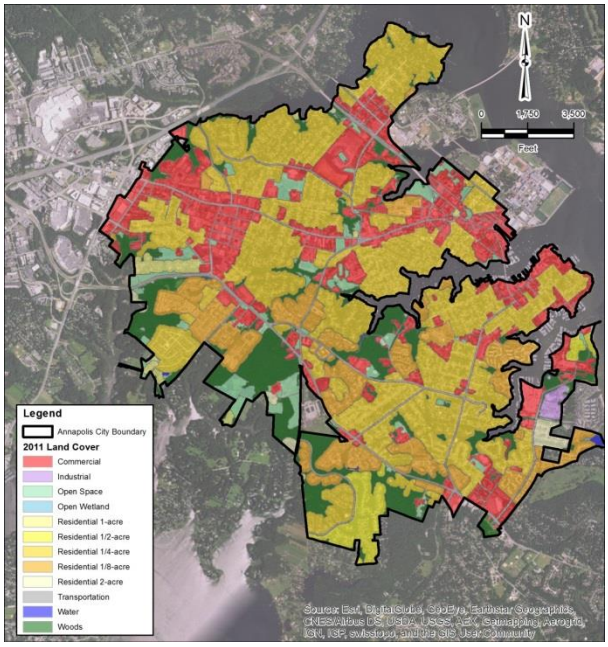
Cities implementing utility fees are left with a choice of how to measure the imperviousness of each single-family residential lot:

(i) On a parcel-by-parcel basis;

(ii) Categorize like properties together, often by zoning district; or

(iii) Treat all single-family residential parcels the same as if each has the same amount of impervious cover.

The first approach is the most equitable, but it can be costly and time-consuming. Furthermore, the lot-by-lot approach would also be burdensome in future years, as methods would be needed to track building additions, driveway extensions, etc. The third approach tends to be administratively simpler but somewhat inequitable, as properties with less impervious coverage than the average would still be assessed at the same rate. The second option strikes a balance between equitableness and administrative ease. To provide a common measure of single-family uses of different sizes and configurations, as well as non-single-family uses, ERUs are often used as an alternative to measuring imperviousness on each lot.



The ERU can be calculated based on a multitude of parcel information resources, depending on the overall composition of land within a jurisdiction. This value is used to equate all parcel types to a statistically representative single-family residential parcel size. In these calculations, the ERU is defined as the median of all single-family detached homes, as these are the most common residential parcels. This method has been widely implemented in communities in Maryland such as the City of Rockville, where an ERU of 2,330 square feet is estimated based on the median value of imperviousness on residential properties. In some cases the ERU is based on all single family residential parcels including detached, semi-detached, and attached (townhouse) parcels. A separate non-residential ERU is developed for the non-residential properties and is updated by the City of Rockville every 2 years.

AECOM performed a GIS analysis of the City's land uses. As shown in Table 6-1, nearly all imperviousness in Annapolis is the result of just three land use categories: residential, commercial, and transportation.

Table 6-1: Land Use Distribution in City of Annapolis

Land Use Category	Area (Acres)	Impervious Cover (Acres)	Percent of Total Imperviousness
Commercial	906.8	605.0	34.59%
Forested Wetland	70.6	0.2	0.01%
Industrial	23.1	13.3	0.76%
Open Space	168.8	10.7	0.61%
Open Wetland	12.0	0.0	0.00%
Pasture/Hay	24.8	0.7	0.04%

Land Use Category	Area (Acres)	Impervious Cover (Acres)	Percent of Total Imperviousness
Residential 1/8-acre	714.7	302.0	17.26%
Residential 1/4-acre	1,831.2	641.0	36.64%
Residential 1/2-acre	47.3	8.4	0.48%
Residential 1-acre	51.8	7.0	0.40%
Residential 2-acre	24.5	1.5	0.09%
Transportation	198.5	154.4	8.83%
Water	21.1	0.3	0.02%
Woods-Coniferous	2.1	0.0	0.00%
Woods-Mixed	450.9	4.7	0.27%

AECOM further analyzed that data focusing on the impervious characteristics of the five classes of residential properties. While each city's characteristics are unique, in general, larger lots tend to have more impervious area because of larger houses, driveways, etc. Our analysis for Annapolis did not result in similar findings. Table 6-2 shows the findings of the analysis of the residential properties in Annapolis.

Table 6-2: Residential Land Use Distribution in City of Annapolis

Land Use Type	Impervious Cover (Acres)	Approximate Number of Parcels	Average Imperviousness (Square Feet)	Percent of Residential Lots
Residential 1/8-acre	302.0	4,603	2,858	36.82%
Residential 1/4-acre	641.0	7,554	3,696	60.43%
Residential 1/2-acre	8.4	251	1,458	2.01%
Residential 1-acre	7.0	73	4,177	0.58%
Residential 2-acre	1.5	20	3,267	0.16%

The class name "Residential ⅛-acre" also contains multi-family units, so the average imperviousness of 2,858 square feet is likely skewed. It is recommended that the parcels containing multi-family uses be isolated from the single-family dwelling units and handled separately.

The City's zoning code allows numerous non-residential but compatible uses such as schools and churches in most or all of its residential zones. These land use types would typically be located in districts that allow larger lots, which are the "Residential ½-acre," "Residential 1-acre," and "Residential 2-acre" class names. A close comparison of the land use data with aerial imagery also indicated that the "Residential ½-acre" land use type contains a number of undeveloped parcels that do not have any impervious cover, and may have resulted in a lower average imperviousness than the smaller lots. These findings could explain why the average imperviousness by lot size does not follow a more logical progression for these larger lot sizes. Upon further evaluation, it is also recommended that non-residential uses be isolated from the single family dwelling units and handled separately. It was noted that, collectively, imperviousness of these three residential land use types is less than 1 percent of the City's impervious surface, as shown in Table 6-1.

The City of Annapolis has more than a dozen types of residential zones:

- R1 Single-Family Residence
- R1-A Single-Family Residence
- R1-B Single-Family Residence
- R2 Single-Family Residence
- R2-NC Single-Family Residence Neighborhood Conservation
- R3 General Residence
- R3-NC General Residence Neighborhood Conservation
- R3-NC2 General Residence Neighborhood Conservation 2
- R3-R General Residence Neighborhood Revitalization
- R4 General Residence
- R4-R General Residence Neighborhood Revitalization
- C1 Conservation Residence
- C1A Special Conservation Residence

For point of reference, Anne Arundel County has consolidated its residential zones into three tiers for the development of its Watershed Protection and Restoration Fee:

- Zoning Districts R1, R2, R5 – $85 (Base Rate)
- Zoning Districts R10, R15, R22 – $34 (0.4 X Base Rate)
- Zoning Districts RA, RLD – $170 (2 x Base Rate)

Further GIS analyses would be needed to identify an appropriate ERU square footage and number of tiers.

6.2 Intensity of Development (ID) Approach

In this approach, the stormwater utility fee is based on the percent of impervious cover on the parcel. All parcels within the City, including vacant parcels, would be charged following this approach and a tiered system, or a variation in the fee would be based on the percentage of impervious area. Based on the example provided by the EPA-published document Funding Stormwater Programs (January 2009), the rate structure for the ID approach could be developed as shown in Table 6-3.

Table 6-3: Example of Stormwater Utility Estimated Based on the Intensity of Development Approach

Example Impervious Percentage Range	Example Rate per Month per 1,000 Square Feet of Served Area
Vacant/Undeveloped	$0.08
Light Development (1% to 20%)	$0.12
Moderate Development (21% to 40%)	$0.16
Heavy Development (41% to 70%)	$0.24
Very Heavy Development (70% to 100%)	$1.50

Although this method is more equitable than the ERU approach, it may not be suitable for Annapolis, as it would need a detailed review of each parcel in the City to estimate the impervious cover and could create an unmanageable administrative burden.

6.3 Equivalent Hydraulic Area (EHA)

In this approach, parcels in the City would be billed based on the runoff characteristics of pervious and impervious areas. The pervious areas in each parcel are charged a lower fee than the impervious areas. Even though this method is more equitable than the ERU approach as it considers the runoff from the pervious portions of the parcels, it is not recommended. This method requires significant resources and administrative costs to estimate the billing units and is likely to not be well received by the City residents due to the complexity of calculation of the billing units.

6.4 Selection of Fee Structure

After assessing the pros and cons of each of the stormwater utility assessment options, AECOM recommends that the City adopt an ERU approach for its stormwater utility fee structure using tiers. This option provides a straightforward and widely accepted method for rate generation. Different tiers can be adopted based on the median or mean size of the impervious area on single-family detached residential parcels, or zoning can be chosen for the estimation of the ERU. This option does not require frequent data updates and analysis because if a single-family property adds impervious surface due to an addition or other work, it will likely still remain in the same tier. Commercial and industrial properties can be charged directly based on their impervious surface as an equivalent number of ERUs. Regular evaluation is recommended, as development of commercial/industrial properties tends to add more impervious cover.

7 Additional Factors for Consideration for Re-evaluation of Stormwater Utility Fee

7.1 Calculation of Credits

Stormwater control practices employed on some properties may result in a lesser contribution to the drainage system than comparable properties. Examples include detention / retention basins maintained by homeowners' associations or disconnecting impervious areas (discharging roof downspouts onto unpaved ground instead of a paved area), or individual residents could install rain barrels, or place porous pavement in lieu of concrete or asphalt. Since these types of activities, theoretically, reduce the burden on the agency responsible for drainage, a credit policy can be developed to offer a reduction in the fee. Less quantifiable, but still worthy of credits, are programs such as public education activities. Similarly, lot characteristics, such as soil types or vegetation, could be considered for credits as well.

Annapolis already offers a 50 percent credit in instances where stormwater management structures or devices have been installed on a property. A restructuring of the fee should also include evaluation of the credit program.

7.2 Inclusion of Tax-Exempt Properties

Tax exempt properties such as state lands, churches, or not-for-profit enterprises create an interesting situation. On the one hand, they are exempt from property taxes, and a stormwater utility fee is essentially a property-based fee. On the other hand, the impervious surfaces on these properties and the resulting runoff must be managed as with any other property. Being the state capital and county seat, the City of Annapolis has a disproportionate amount of tax-exempt properties above and beyond those commonly found in other cities. Though the legalities of such fee assessments vary from state to state, courts, including those in Maryland, have typically ruled that assessing a fee on tax-exempt properties, just like fees for water and sewer services, is legitimate. Currently the City collects stormwater utility fees from all property owners in the City, including state and county properties. It is recommended that the City continue to maintain this approach, even with the change in fee structure.

8 Next Steps

As part of the next steps for re-evaluation and expansion of the current stormwater utility fee, it is recommended that the City consider initiating a new study to determine the appropriate fee structure that will meet the City's current stormwater management needs, as well as upcoming program costs through 2025 as determined in the Needs Analysis (Section 3).

No matter which method the City chooses for the re-evaluation and expansion of the current stormwater utility fee, it is recommended that the City consider providing opportunities for its residents who are rate payers to have their questions and comments addressed prior to the receiving the first revised stormwater utility bill. As the City already has a stormwater utility fee, questions related to the reasoning behind the expansion of the utility may be expected. In an effort to get resident buy-in, the City could consider conducting public outreach meetings to include residential, non-residential, and tax-exempt properties.

Finally, it is strongly recommended that the City staff continue to keep City Council informed on the process and the progress toward expansion of the current stormwater utility fee. Meetings with the Environmental Matters Committee should be planned to inform them of the outcomes of the needs analysis and potential methods that could be adopted for rate changes.

9 References

City of Annapolis. 2011. Annapolis Bicycle Master Plan 2011. Available at: http://www.annapolis.gov/docs/default-source/transportation-pdf/final-bicycle-master-plan---2011.pdf?sfvrsn=0.

City of Annapolis. 2016. Stormwater Management Inventory and Watershed Improvement Plan. Available at: http://www.annapolis.gov/docs/default-source/dnep-documents-pdfs/Watershed-improvement-plan.pdf?sfvrsn=10.

MDE. 2014. Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated. Available online at: http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/Documents/NPDES%20MS4%20Guidance%20August%2018%202014.pdf.

MDE. 2016. Chesapeake Bay Restoration: Getting Started. Available at: http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/SedimentandStormwaterHome/Documents/Phase%20II%20Getting%20Started%20Fact%20Sheet.pdf.

National Association of Flood and Stormwater Management Agencies (NAFSMA). 2006. Guidance for Municipal Stormwater Funding, (grant provided by the Environmental Protection Agency). January. Available at: https://www.epa.gov/sites/production/files/2015-11/documents/guidance-manual-version-2x-2.pdf.

University of Maryland 2011. Cost of Stormwater Management Practices in Maryland Counties. Draft, Available at: http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Documents/King_Hagan_Stormwater%20Cost%20Report%20to%20MDE_Final%20Draft_12Oct2011.pdf.

U.S. Environmental Protection Agency (EPA). 2009. Funding Stormwater Programs Available at https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/FundingStormwater.pdf.

U.S. EPA. 2015. Community-Based Public-Private Partnerships (CBP3s) and Alternative market-Based Tools for Integrated Green Stormwater Infrastructure. Available at: https://www.epa.gov/sites/production/files/2015-12/documents/gi_cb_p3_guide_epa_r3_final_042115_508.pdf.

Appendix A

Table A-1
Payment Calculations for Debt Financing of the Proposed Projects BMP_15, Out_01, and BMP_14 in the Year 2017 for a 20-Year Period with an Interest Rate of 4.5%

Year	Yearly Principal Payment	Yearly Interest Payment	Total Yearly Cost Incurred by the City (Principal + Interest)	Debt Balance
2017	$50,701	$45,631	$96,332	$1,014,026
2018	$50,701	$43,350	$94,051	$963,325
2019	$50,701	$41,068	$91,769	$912,623
2020	$50,701	$38,786	$89,488	$861,922
2021	$50,701	$36,505	$87,206	$811,221
2022	$50,701	$34,223	$84,925	$760,520
2023	$50,701	$31,942	$82,643	$709,818
2024	$50,701	$29,660	$80,362	$659,117
2025	$50,701	$27,379	$78,080	$608,416
2026	$50,701	$25,097	$75,798	$557,714
2027	$50,701	$22,816	$73,517	$507,013
2028	$50,701	$20,534	$71,235	$456,312
2029	$50,701	$18,252	$68,954	$405,610
2030	$50,701	$15,971	$66,672	$354,909
2031	$50,701	$13,689	$64,391	$304,208
2032	$50,701	$11,408	$62,109	$253,507
2033	$50,701	$9,126	$59,828	$202,805
2034	$50,701	$6,845	$57,546	$152,104
2035	$50,701	$4,563	$55,264	$101,403
2036	$50,701	$2,282	$52,983	$50,701
2037	$0	$0	$0	$0

Table A-2
Payment Calculations for Debt Financing of the Proposed Project CtyRqst_01 in the Year 2018 for a 20-Year Period with an Interest Rate of 4.55%

Year	Yearly Principal Payment	Yearly Interest Payment	Total Yearly Cost Incurred by the City (Principal + Interest)	Debt Balance
2018	$52,459	$47,738	$100,197	$1,049,180
2019	$52,459	$45,351	$97,810	$996,721
2020	$52,459	$42,964	$95,423	$944,262
2021	$52,459	$40,577	$93,036	$891,803
2022	$52,459	$38,190	$90,649	$839,344
2023	$52,459	$35,803	$88,262	$786,885
2024	$52,459	$33,416	$85,875	$734,426
2025	$52,459	$31,029	$83,488	$681,967
2026	$52,459	$28,643	$81,102	$629,508
2027	$52,459	$26,256	$78,715	$577,049
2028	$52,459	$23,869	$76,328	$524,590
2029	$52,459	$21,482	$73,941	$472,131
2030	$52,459	$19,095	$71,554	$419,672
2031	$52,459	$16,708	$69,167	$367,213
2032	$52,459	$14,321	$66,780	$314,754
2033	$52,459	$11,934	$64,393	$262,295
2034	$52,459	$9,548	$62,007	$209,836
2035	$52,459	$7,161	$59,620	$157,377
2036	$52,459	$4,774	$57,233	$104,918
2037	$52,459	$2,387	$54,846	$52,459
2038	$0	$0	$0	$0

Table A-3
Payment Calculations for Debt Financing of the Proposed Projects BMP_20 and Out_04 in the Year 2019 for a 20-Year Period with an Interest Rate of 4.60%

Year	Yearly Principal Payment	Yearly Interest Payment	Total Yearly Cost Incurred by the City (Principal + Interest)	Debt Balance
2019	$65,266	$60,045	$125,311	$1,305,323
2020	$65,266	$57,043	$122,309	$1,240,057
2021	$65,266	$54,040	$119,307	$1,174,791
2022	$65,266	$51,038	$116,304	$1,109,525
2023	$65,266	$48,036	$113,302	$1,044,259
2024	$65,266	$45,034	$110,300	$978,992
2025	$65,266	$42,031	$107,298	$913,726
2026	$65,266	$39,029	$104,295	$848,460
2027	$65,266	$36,027	$101,293	$783,194
2028	$65,266	$33,025	$98,291	$717,928
2029	$65,266	$30,022	$95,289	$652,662
2030	$65,266	$27,020	$92,286	$587,395
2031	$65,266	$24,018	$89,284	$522,129
2032	$65,266	$21,016	$86,282	$456,863
2033	$65,266	$18,013	$83,280	$391,597
2034	$65,266	$15,011	$80,277	$326,331
2035	$65,266	$12,009	$77,275	$261,065
2036	$65,266	$9,007	$74,273	$195,798
2037	$65,266	$6,004	$71,271	$130,532
2038	$65,266	$3,002	$68,268	$65,266
2039	$0	$0	$0	$0

Table A-4
Payment Calculations for Debt Financing of the Proposed Projects BMP_21 and Out_07 in the Year 2020 for a 20-Year Period with an Interest Rate of 4.65%

Year	Yearly Principal Payment	Yearly Interest Payment	Total Yearly Cost Incurred by the City (Principal + Interest)	Debt Balance
2020	$48,341	$44,957	$93,299	$966,828
2021	$48,341	$42,710	$91,051	$918,486
2022	$48,341	$40,462	$88,803	$870,145
2023	$48,341	$38,214	$86,555	$821,804
2024	$48,341	$35,966	$84,307	$773,462
2025	$48,341	$33,718	$82,060	$725,121
2026	$48,341	$31,470	$79,812	$676,779
2027	$48,341	$29,222	$77,564	$628,438
2028	$48,341	$26,974	$75,316	$580,097
2029	$48,341	$24,727	$73,068	$531,755
2030	$48,341	$22,479	$70,820	$483,414
2031	$48,341	$20,231	$68,572	$435,073
2032	$48,341	$17,983	$66,324	$386,731
2033	$48,341	$15,735	$64,077	$338,390
2034	$48,341	$13,487	$61,829	$290,048
2035	$48,341	$11,239	$59,581	$241,707
2036	$48,341	$8,991	$57,333	$193,366
2037	$48,341	$6,744	$55,085	$145,024
2038	$48,341	$4,496	$52,837	$96,683
2039	$48,341	$2,248	$50,589	$48,341
2040	$0	$0	$0	$0

Table A-5
Payment Calculations for Debt Financing of the Proposed Projects BMP_07 and City_06 in the Year 2021 for a 20-Year Period with an Interest Rate of 4.70%

Year	Yearly Principal Payment	Yearly Interest Payment	Total Yearly Cost Incurred by the City (Principal + Interest)	Debt Balance
2021	$56,532	$53,140	$109,673	$1,130,648
2022	$56,532	$50,483	$107,016	$1,074,115
2023	$56,532	$47,826	$104,359	$1,017,583
2024	$56,532	$45,169	$101,702	$961,051
2025	$56,532	$42,512	$99,045	$904,518
2026	$56,532	$39,855	$96,388	$847,986
2027	$56,532	$37,198	$93,731	$791,453
2028	$56,532	$34,541	$91,074	$734,921
2029	$56,532	$31,884	$88,417	$678,389
2030	$56,532	$29,227	$85,760	$621,856
2031	$56,532	$26,570	$83,103	$565,324
2032	$56,532	$23,913	$80,446	$508,792
2033	$56,532	$21,256	$77,789	$452,259
2034	$56,532	$18,599	$75,132	$395,727
2035	$56,532	$15,942	$72,475	$339,194
2036	$56,532	$13,285	$69,818	$282,662
2037	$56,532	$10,628	$67,160	$226,130
2038	$56,532	$7,971	$64,503	$169,597
2039	$56,532	$5,314	$61,846	$113,065
2040	$56,532	$2,657	$59,189	$56,532
2041	$0	$0	$0	$0

Table A-6
Payment Calculations for Debt Financing of the Proposed Projects City_01, BMP_08 and BMP_05 in the Year 2022 for a 20-Year Period with an Interest Rate of 4.75%

Year	Yearly Principal Payment	Yearly Interest Payment	Total Yearly Cost Incurred by the City (Principal + Interest)	Debt Balance
2022	$49,649	$47,167	$96,816	$992,981
2023	$49,649	$44,808	$94,457	$943,332
2024	$49,649	$42,450	$92,099	$893,683
2025	$49,649	$40,092	$89,741	$844,034
2026	$49,649	$37,733	$87,382	$794,385
2027	$49,649	$35,375	$85,024	$744,736
2028	$49,649	$33,017	$82,666	$695,087
2029	$49,649	$30,658	$80,307	$645,438
2030	$49,649	$28,300	$77,949	$595,789
2031	$49,649	$25,942	$75,591	$546,140
2032	$49,649	$23,583	$73,232	$496,491
2033	$49,649	$21,225	$70,874	$446,842
2034	$49,649	$18,867	$68,516	$397,193
2035	$49,649	$16,508	$66,157	$347,543
2036	$49,649	$14,150	$63,799	$297,894
2037	$49,649	$11,792	$61,441	$248,245
2038	$49,649	$9,433	$59,082	$198,596
2039	$49,649	$7,075	$56,724	$148,947
2040	$49,649	$4,717	$54,366	$99,298
2041	$49,649	$2,358	$52,007	$49,649
2042	$0	$0	$0	$0

Table A-7
Payment Calculations for Debt Financing of the Proposed Projects BMP_22, BMP_09, BMP_17 and BMP_12 in the Year 2023 for a 20-Year Period with an Interest Rate of 4.80%

Year	Yearly Principal Payment	Yearly Interest Payment	Total Yearly Cost Incurred by the City (Principal + Interest)	Debt Balance
2023	$56,514	$54,253	$110,766	$1,130,270
2024	$56,514	$51,540	$108,054	$1,073,757
2025	$56,514	$48,828	$105,341	$1,017,243
2026	$56,514	$46,115	$102,629	$960,730
2027	$56,514	$43,402	$99,916	$904,216
2028	$56,514	$40,690	$97,203	$847,703
2029	$56,514	$37,977	$94,491	$791,189
2030	$56,514	$35,264	$91,778	$734,676
2031	$56,514	$32,552	$89,065	$678,162
2032	$56,514	$29,839	$86,353	$621,649
2033	$56,514	$27,126	$83,640	$565,135
2034	$56,514	$24,414	$80,927	$508,622
2035	$56,514	$21,701	$78,215	$452,108
2036	$56,514	$18,989	$75,502	$395,595
2037	$56,514	$16,276	$72,789	$339,081
2038	$56,514	$13,563	$70,077	$282,568
2039	$56,514	$10,851	$67,364	$226,054
2040	$56,514	$8,138	$64,651	$169,541
2041	$56,514	$5,425	$61,939	$113,027
2042	$56,514	$2,713	$59,226	$56,514
2043	$0	$0	$0	$0

Table A-8
Payment Calculations for Debt Financing of the Proposed Project BMP_11 in the Year 2024 for a 20-Year Period with an Interest Rate of 4.85%

Year	Yearly Principal Payment	Yearly Interest Payment	Total Yearly Cost Incurred by the City (Principal + Interest)	Debt Balance
2024	$70,468	$68,354	$138,822	$1,409,364
2025	$70,468	$64,936	$135,405	$1,338,896
2026	$70,468	$61,519	$131,987	$1,268,428
2027	$70,468	$58,101	$128,569	$1,197,959
2028	$70,468	$54,683	$125,152	$1,127,491
2029	$70,468	$51,266	$121,734	$1,057,023
2030	$70,468	$47,848	$118,316	$986,555
2031	$70,468	$44,430	$114,898	$916,087
2032	$70,468	$41,012	$111,481	$845,618
2033	$70,468	$37,595	$108,063	$775,150
2034	$70,468	$34,177	$104,645	$704,682
2035	$70,468	$30,759	$101,228	$634,214
2036	$70,468	$27,342	$97,810	$563,746
2037	$70,468	$23,924	$94,392	$493,277
2038	$70,468	$20,506	$90,974	$422,809
2039	$70,468	$17,089	$87,557	$352,341
2040	$70,468	$13,671	$84,139	$281,873
2041	$70,468	$10,253	$80,721	$211,405
2042	$70,468	$6,835	$77,304	$140,936
2043	$70,468	$3,418	$73,886	$70,468
2044	$0	$0	$0	$0

Table A-9
Payment Calculations for Debt Financing of the Proposed Project City_05 in the Year 2025 for a 20-Year Period with an Interest Rate of 4.90%

Year	Yearly Principal Payment	Yearly Interest Payment	Total Yearly Cost Incurred by the City (Principal + Interest)	Debt Balance
2025	$50,787	$49,772	$100,559	$1,015,746
2026	$50,787	$47,283	$98,070	$964,959
2027	$50,787	$44,794	$95,582	$914,171
2028	$50,787	$42,306	$93,093	$863,384
2029	$50,787	$39,817	$90,605	$812,597
2030	$50,787	$37,329	$88,116	$761,810
2031	$50,787	$34,840	$85,627	$711,022
2032	$50,787	$32,352	$83,139	$660,235
2033	$50,787	$29,863	$80,650	$609,448
2034	$50,787	$27,374	$78,162	$558,660
2035	$50,787	$24,886	$75,673	$507,873
2036	$50,787	$22,397	$73,184	$457,086
2037	$50,787	$19,909	$70,696	$406,298
2038	$50,787	$17,420	$68,207	$355,511
2039	$50,787	$14,931	$65,719	$304,724
2040	$50,787	$12,443	$63,230	$253,937
2041	$50,787	$9,954	$60,742	$203,149
2042	$50,787	$7,466	$58,253	$152,362
2043	$50,787	$4,977	$55,764	$101,575
2044	$50,787	$2,489	$53,276	$50,787
2045	$0	$0	$0	$0

Table A-10
Payment Calculations for Debt Financing of the Street Sweeping Equipment for a 7-Year Period with an Interest Rate of 3.0%

Year	Yearly Principal Payment	Yearly Interest Payment	Total Yearly Cost Incurred by the City (Principal + Interest)	Debt Balance
Street Sweeping Equipment Purchased in 2017 with Lifecycle of 7 Years				
2017	$94,286	$19,800	$114,086	$660,000
2018	$94,286	$16,971	$111,257	$565,714
2019	$94,286	$14,143	$108,429	$471,429
2020	$94,286	$11,314	$105,600	$377,143
2021	$94,286	$8,486	$102,771	$282,857
2022	$94,286	$5,657	$99,943	$188,571
2023	$94,286	$2,829	$97,114	$94,286
2024	$0	$0	$0	$0
Street Sweeping Equipment Purchased in 2024 with Lifecycle of 7 Years				
2024	$94,286	$19,800	$114,086	$660,000
2025	$94,286	$16,971	$111,257	$565,714
2026	$94,286	$14,143	$108,429	$471,429
2027	$94,286	$11,314	$105,600	$377,143
2028	$94,286	$8,486	$102,771	$282,857
2029	$94,286	$5,657	$99,943	$188,571
2030	$94,286	$2,829	$97,114	$94,286
2031	$0	$0	$0	$0