Stormwater Analysis for The Town of Federalsburg, Maryland: A Student Supported Engineering Assessment

Prepared by

The Environmental Finance Center (EFC)

For

The Maryland Department of Natural Resources

And

The Town of Federalsburg, Maryland

April 30, 2014

This report was prepared by the Environmental Finance Center's Stormwater Financing & Outreach Unit for the Department of Natural Resources.

The Environmental Finance Center (EFC) at the University of Maryland is one of ten University-based centers across the country providing communities with the tools and information necessary to manage change for a healthy environment and an enhanced quality of life. EFC believes that environmental finance can be used to develop a shared community vision. Our focus is protecting natural resources and watersheds by strengthening the capacity of local decision-makers to analyze environmental problems, develop innovative and effective methods of financing environmental efforts and educate communities about the role of finance and economic development in the protection of the environment. The Stormwater Financing and Outreach Unit was created to address a community's stormwater financing questions and help craft a strategy that best meets local needs. For more information on the EFC's Stormwater Financing and Outreach Unit and the Environmental Finance Center at the University of Maryland, please visit:

http://efc.umd.edu/stormwater.html

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Table of Contents

Chapter 1. - Introduction

Federalsburg has a long and proud history. The Town was named for the Federalist Party, which met in the Town in 1821, and the Town was incorporated in 1823.[1] In 1868, the Seaford and Cambridge Division of the Pennsylvania Railroad was opened for traffic and marked a new era for Federalsburg, as the railroad, with its refrigeration accommodation, made urban markets accessible and spurred industrial and warehouse facilities to locate in the Town.[2] To this day, production is an important component of the Federalsburg economy, with companies such as Solo Cup, Jack and Jill Ice Cream, and Stove Top Stuffing all calling the Town home.

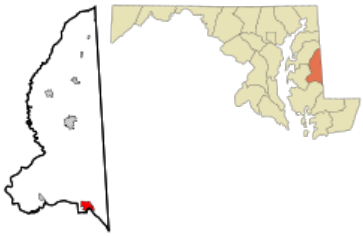
However, this history of industrialization and the subsequent decline of industrial facilities and infrastructure assets pose unique and difficult challenges in addressing stormwater issues for a Town the size of Federalsburg with limited resources. But the history and expertise located in Federalsburg also poses an unique opportunity for stormwater management to be a catalyst for urban redevelopment through the use of engineering, leveraging the intellectual and entrepreneurial "problem solving" spirit, and by using informed decision making to allocate resources to invest in stormwater and improve water quality in a way that provides a foundation on which to build and can serve as a catalyst for redevelopment and revitalization. An important first step in this process of stormwater management is the development of an inventory of the existing stormwater infrastructure. With such an inventory along with engineered data and plans, the Town of Federalsburg can then make informed decisions and allocate resources in the planning of future projects.

In this project, student interns from the A. J. Clark School of Engineering at the University of Maryland at College Park conducted field investigations to confirm the location and sizes of the existing stormwater system structures and pipes. The students collected the data in order to develop a Master Stormwater Plan, ultimately to be used in the administration of the Town's Stormwater Management Ordinance and for use in the future development of a stormwater capital maintenance budget and plan. Robert Rauch of the engineering firm Rauch and Associates supervised the students.[3] The Environmental Finance Center (EFC) sought to use a foundation of engineering along with geographic information analysis and financial analysis, to gather, organize, and synthesize data about stormwater in the Town of Federalsburg, as well as provide the Town with recommendations and a basis with which to make informed decisions about project planning and resource allocation in the future.

[1] "Profile for Federalsburg, Maryland, MD". ePodunk. And "Federalsburg, Maryland". City-Data.com.
[2] http://www.federalsburg.org/history.html
[3] October 21, 2013

Chapter 2 - Background Information

Demographics and Location



Federalsburg, Maryland is a located in Caroline County with a population of 2,739. [4] There are about 1,130 housing units. The median household income is about $24,200 and roughly 25% of the population is below the poverty line. The Town has a total area of 2.02 square miles of which 1.93 square miles is land and 0.09 square miles is water.[5]

The Marshyhope Creek is both literally and figuratively the core of the community. Flowing through downtown Federalsburg past the Federalsburg Recreation Park and Marina and the VFW Boat Ramp, the Creek forms the headwaters of the Northwest Fork of the Nanticoke River.

What is Stormwater?

Stormwater runoff is defined by the U. S. Environmental Protection Agency (EPA) as, "precipitation from rain and snowmelt events that flows over land or impervious surfaces and does not percolate into the ground. As the runoff flows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality if the runoff is discharged untreated."[6] Unlike the wastewater that enters the sewer system via sinks, toilets, and pipes, stormwater generally does not go to a wastewater treatment plan. Instead, it flows underground and then is discharged into the nearest body of water.

Urban and suburban development has magnified the impact of stormwater runoff. The increase in acreage covered by impervious surfaces including roads, parking lots, houses, swimming pools, buildings, compacted soil (including many lawns) and sidewalks has changed the land's ability to naturally absorb stormwater. Until recent stormwater legislation was passed requiring best management practices (BMPs) in the management of stormwater, developers built simple stormwater management systems, generally underground, to drain away rooftops, parking lots, driveways, and streets as quickly as possible in order to protect property and public safety. The stormwater eventually dumped from an exit pipe into a river, stream, bay, or ocean taking with it any pollutant picked up along the way. Storm sewer systems concentrate stormwater into straight channels, increasing the rate of flow as it travels underground. Thus, besides concerns about pollutant loads, the excessive volume leads to streamside erosion, scouring, sedimentation, and often, warmer-than-usual water temperatures, all of which adversely impact natural systems.

[4] http://www.federalsburg.org/geninfo.php
[5] "US Gazetteer files 2010". United States Census Bureau
[6] http://cfpub.epa.gov/npdes/home.cfm?program_id=6

State and Local Stormwater Regulations

Federalsburg is not currently a NPDES MS4 permitted community but it is subject to some other state and local regulations that shape its stormwater program. The state of Maryland enforces a number of other regulations, which impact Federalsburg directly or indirectly. Maryland's Critical Area Law is one such regulation affecting Federalsburg because it addresses the impact of land development on fragile shoreline and aquatic ecosystems. This law requires the Town to review and approve land modifications in the buffer area.

The state of Maryland is also subject to a total maximum daily load (TMDL) limitations for phosphorus, nitrogen, and sediment, and has sub-allocated TMDL limitations down to the county level. As an incorporated area in Caroline County, Federalsburg is a key stakeholder in the County's watershed implementation plan (WIP) for meeting its TMDL goals. The current target for Caroline County is 52,000 pounds of nitrogen reduced by retrofitting existing Town stormwater facilities. This goal is based on about 20,000 acres of urban land in Caroline. The data gathered in this project will help Federalsburg quantify urban land and associated drainage, positioning the Town to contribute to County data for the update of the state TMDL model in in 2015.[7]

Chapter 3 - Town of Federalsburg Stormwater Program Assessment

Stormwater Management in The Town Federalsburg

The Town of Federalsburg receives approximately 41 inches of precipitation a year, about half of which is rainfall. The issue of stormwater management appears multiple times in Federalsburg's Comprehensive Plan.[8] The Town of Federalsburg recognizes that stormwater management should be considered a key factor when reviewing development policies as these practices, combined with land use policies and decision making, can help combat nonpoint source impacts to the water quality of the Town. While the Tributary Strategy Report did give the Town of Federalsburg credit for their success in managing nonpoint source pollution from agricultural land, it also indicated that more must be done to manage runoff from urban areas.

Federalsburg's Comprehensive Plan discusses several ways in which stormwater management practices aimed at urban areas can be implemented. For instance, development on infill parcels and in growth areas will be required to incorporate Best Management Practices (BMPs) such as tree planting and creating natural areas around streams. Areas undergoing development will also be required to minimize impervious surfaces, or offset large areas of impervious surfacing through plantings and other setbacks.

On October 4, 2010, by Ordinance No. 2010-09, the Mayor and Council of Federalsburg adopted a Stormwater Management Ordinance.[9] The purpose of the ordinance is to protect, maintain, and

[7] http://www.myeasternshoremd.com/news/caroline_county/article_c8d875c6-4936-11e2-9504-001a4bcf887a.html

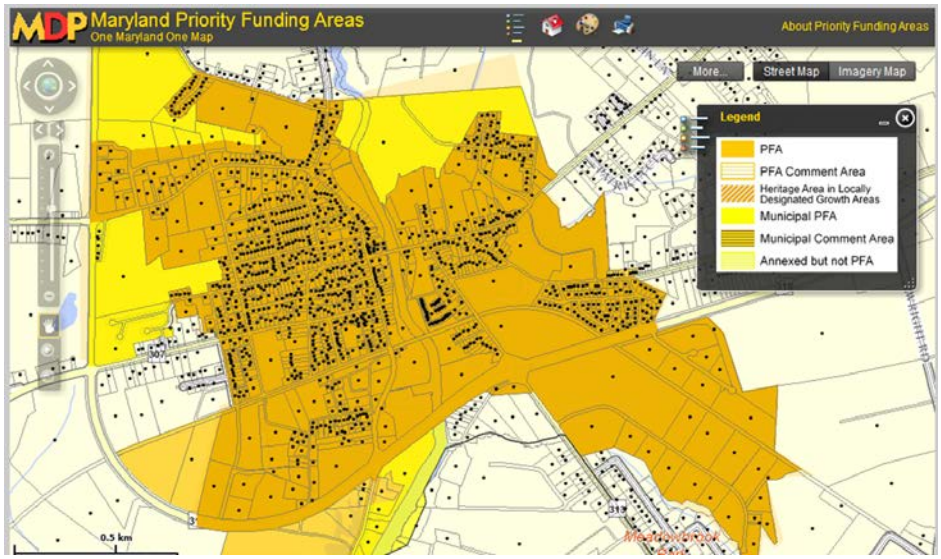
[8] http://www.mdp.state.md.us/PDF/OurWork/CompPlans/Caroline/Federalsburg/07_CMP_09_MGEWRE_Federalsburg.pdf

[9] The full stormwater management ordinance cade be found in Chapter 193 of the Code of Federalsburg located at http://ecode360.com/9900787

enhance the public health, safety, and general welfare of the community by establishing minimum requirements and procedures to control the adverse impacts associated with increased stormwater runoff.

The goal is to manage stormwater by using environmental site design (ESD) to the maximum extent practicable (MEP) to maintain, as nearly as possible, the predevelopment runoff characteristics in post-development scenarios. In addition, the ordinance is designed to reduce stream channel erosion, pollution, siltation and sedimentation, and local flooding, and use appropriate structural best management practices only when necessary. This will restore, enhance, and maintain the chemical, physical, and biological integrity of streams, minimize damage to public and private property, and reduce the impacts of land development.[10]

The Town of Federalsburg, or its designated agent, shall be responsible for the coordination and enforcement of the provisions of the stormwater management ordinance.[11] The ordinance contains a mechanism by which a waiver, under certain circumstances and certain conditions, can be issued for in-fill development located in a Priority Funding Area where the economic feasibility of the project is tied to the planned density redevelopment in priority areas under certain conditions and certain circumstances.[12] The map from the Maryland Department of planning provides information on Priority Funding Areas in and around the Town of Federalsburg.[13]



Federalsburg's Stormwater Infrastructure

Federalsburg's stormwater system consists of pipes, culverts, swales, outfalls, baysavers, and other assets, which that work together to convey or store stormwater and minimize pollution loading. Much of the stormwater system has been put in place over the course of the last 100 years. The composition

[10] Federalsburg Code, Chapter 193, Section 1 – A.
[11] Federalsburg Code, Chapter 193, Section 1 – C.
[12] Federalsburg Code, Chapter 193, Section 7
[13] http://planning.maryland.gov/OurWork/PFAIMap.shtml

of materials used for stormwater pipes and facilities range from iron to concrete to plastic composites. There are components of the system for which the Town of Federalsburg does not have accurate records, including the exact location, age, and condition of many of the pipes and culverts.

Maintenance and Capital Improvements

The Town of Federalsburg's Public Works Department maintains the Town's stormwater system. As is common with many small towns, Federalsburg does not have an individual staff person dedicated solely to stormwater management, but rather works on regular and emergency stormwater issues, and other public works related issues as necessary. Regular maintenance involves cleaning the pipes and culverts of trash and leaves, and cleaning the baysavers. Culverts are also inspected for collapse or fragility via flow. Not all of the Town's records of the stormwater infrastructure's location, condition, or repair history are kept in digital or GIS based form. Past and proposed capital improvement projects are generally institutional knowledge shared among individuals such as staff and officials. Capital improvement projects are prioritized based on a backlog queue and the urgency of a project; projects are ultimately selected and funded based on the budget decisions of the Mayor and Town Council.

Financing

Financing for the Town of Federalsburg's stormwater program currently comes from the general fund of the Town, via grants, through borrowing from sources such as the Maryland Water Quality Revolving Loan fund, and issuing general obligation bonds.

Recent or planned projects and the associated financing includes:

- A grant application request for $50,000 for strategic plan for revitalization with the goal of bringing together and updating all the existing studies and plans in place. [14]
- A two million dollar project to construction a separate and stormwater system in the Railroad Avenue area.[15]
- An ordinance to borrow $550,000 from the Maryland Water Quality Revolving Loan fund and to issue a general obligation bond for an amount not to exceed $550,000 in order to provide financing for the construction of the sanitary and stormwater sewer lines separating the combined sanitary/stormwater sewer system related to the Railroad Avenue project.[16]
- Funded engineering, design, and construction of the Holland Drive Water Main Loop within the Town of Federalsburg.[17]
- A Maryland Department of the Environment (MDE) bank replenishment project along the MarshyHope across from the VFW located near the dock. This is the first time that this type of bank replenishment project had been undertaken and will utilize a new living shoreline

[14] February 3, 2014 Minutes of Mayor and Council of Federalsburg Regular Monthly Meeting.
[15] http://www.myeasternshoremd.com/news/caroline_county/article_c8d875c6-4936-11e2-9504-001a4bcf887a.html
[16] January 6, 2014, Minutes of Mayor and Council of Federalsburg Regular Monthly Meeting
[17] November 4, 2013

technique installing oak logs as a foundation for natural growth along the Marshyhope Creek. In conjunction with this project Public Works has also installed a dry hydrant.[18]

View of the Marshyhope from the Dock at VFW Park

Federalsburg Current Fees and Property Taxes[19]

In the future as stormwater projects are developed and prioritized by the Town of Federalsburg, it will be necessary to consider the financing of stormwater projects. To provide some background and context, it may be helpful to consider stormwater within the context of other revenue received by the Town of Federalsburg such as current fees and taxes.

Water Service Charges

Residential and Commercial water use is metered and billed quarterly. Currently a water debt service charge of $21.80 and $2.20 per 1,000 gallons of water used is assessed for customers located within Town limits. Customers located outside of Town limits are assessed a water debt service charge of $32.70 and $3.30 per 1,000 gallons of water used. Industrial users are metered and billed monthly. Currently a water debt service charge of $24.00 and $2.50 per 1,000 gallons of water used is assessed for all industrial customers. A fee of $50.00 is assessed each time service is disconnected for non-payment. The tap-in fee is $2,500 per unit.

Sewer Service Charges

The sewer service charge is a debt service fee of $109.20, plus $4.65 per 1,000 gallons of metered water usage per quarter for customers located within the limits of the Town of Federalsburg. Customers located outside of Town limits are assessed a sewer debt service charge of $163.80 and $6.95 per 1,000 gallons of metered water usage per quarter. The tap-in fee is $2,500 per unit. The Industrial Sewer Service Charge is $136.50 debt service fee, plus $5.80 per 1,000 gallons.

The Federalsburg Wastewater Treatment Plant serves 1,157 homes, in addition to various commercial locations. The Wastewater Treatment Plant was originally designed for .75 million gallons per day (MGD). Before the completion of the Town's stormwater separation project, the WTTP saw average daily flows of about .25 MGD, increasing to a maximum of .375 MGD during wet seasons.

[18] January 6, 2014 …
[19] http://www.federalsburg.org/geninfo.php

Vacant Lot Charges

Owners of vacant lots are also charged a vacant lot charge to secure an allocation for water and sewer for any future development possibilities. The charge for all vacant lots is $32.75 per quarter.

Property Taxes

The tax rate for the Town of Federalsburg is .70 per $100 dollars of assessable value. The Town of Federalsburg's taxes are currently being issued and collected by the Caroline County Treasurer's Office. This means that the County and Town taxes are included on the same bill.

The Town of Federalsburg's Personal Property Tax Rate is $1.65 per $100 of assessable value. The Personal Property Tax is a business tax that is based on business equipment or machinery used in the local business. The Town receives an assessment from the State of Maryland, which is calculated based on inventory information on tax forms that every business sends to the State. The Town then generates a tax bill based on that assessment.

Chapter 4 - Student Supported Engineering Assessment

From October 2013 to April 2014, four students from the A. J. Clark School of Engineering at the University of Maryland at College Park, under the direction of the Town of Federalsburg's engineering firm Rauch & Associates, spent over 400 hours on site, on campus, and in Easton, Maryland at the engineering offices taking field measurements and developing engineering documents and plans.

The students' work included:

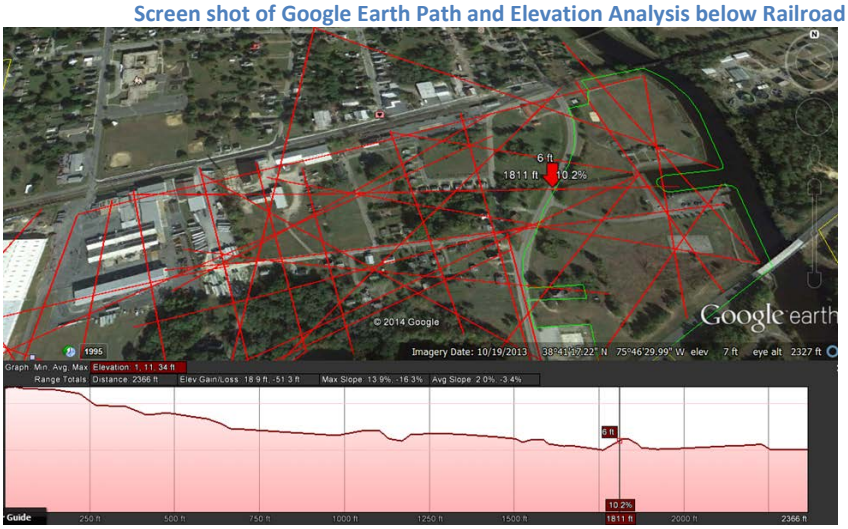
- On-site work in Federalsburg walking neighborhood streets to physically locate inlets and manholes and to take data readings and measurements;

Sample of Inlets and Manholes Documented and Measured by Engineering Students during field work on October 15, 2013

- Opening manholes and inlet grates to observe pipe invert elevations, material, and size;
- Measuring inverts of pipes in the inlets;
- Collecting elevation survey shots of various inlets and road centerlines;
- Diagramming the existing pipe network;
- Collecting land elevation points throughout Federalsburg to identify low and high points to determine the flow and direction of water runoff;
- Importing field information into AutoCAD Civil 3D;

- Within AutoCAD Civil 3D, analyzing land elevations and creating drainage basins;
- Identifying inlets in each drainage area within AutoCAD Civil 3D where water would eventually flow into and discharge from the pipes;
- Creating a base drawing file within AutoCAD Civil3D for the storm drain system;
- Entering and placing every known grated and curb inlet into AutoCAD mapping;
- Creating a map of drainage areas in Federalsburg within AutoCAD by finding where there were high points and connecting them together to form almost 200 unique drainage areas; [20]
- Utilizing Google Earth Path Analysis and Elevation Analysis Tools to establish drainage areas.[21]

Screen shot of Google Earth Path and Elevation Analysis below Railroad Avenue



- Drawing polylines using the AutoCAD Civil3D program to estimate the shape of the drainage areas;
- Determining the specific size of each of the 190+ drainage areas;
- Tracing out all impervious area within each drainage area;[22]
- Calculating square footage and percent- impervious areas for each of the 190+ drainage areas;
- Creating an excel file with drainage areas data and,
- Cataloguing infrastructure pipe data.

Stormwater Plans and Engineering Documents:

Summary pages of the student engineering work The result of the student engineering work are contained in the products below:

[20] In some cases, the students made professional estimates and assumptions because elevations were only taked from the public right of way on road surfaces and measurements were not taken within private property lots and residential backyards.

[21] Google Earth helped to provide elevations for any location on the map and while not as accurate as survey equipment located on a fixed point at a fixed time, the data was sufficient for a preliminary analysis and guide posting. Google Earth was used to efficiently select possible locations on which to take field measurements, thus reducing the amount of field time needed to locate high and low points for more detailed measurements.

[22] Impervious area is considered to be land cover and structures where water cannot infiltrate the ground surface such as pavement, buildings, sidewalk, etc.

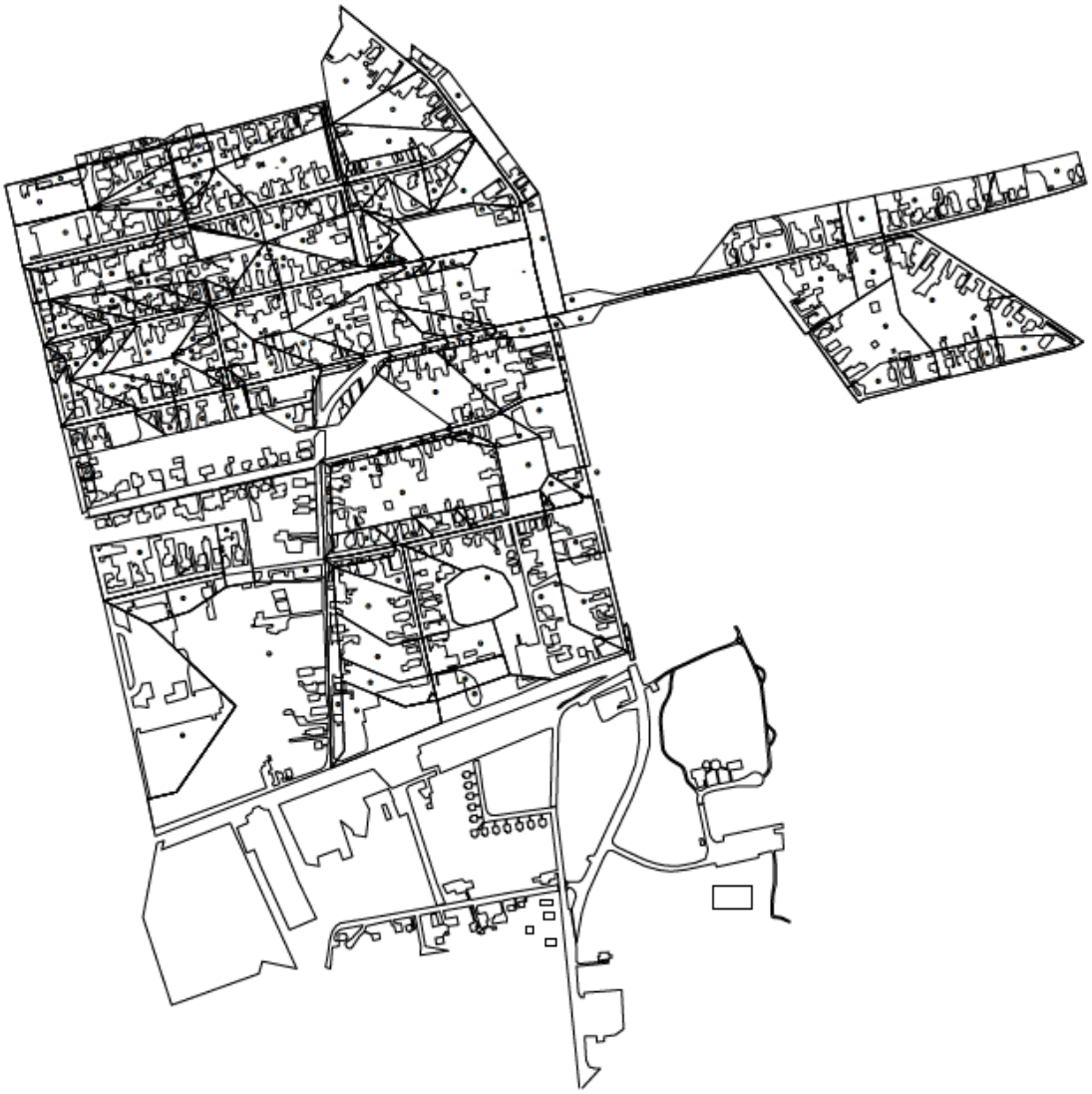
AutoCAD plans of Stormwater Infrastructure, Impervious Area, and Drainage Area[23]

[23] *Legend: Infrastructure (Purple), Impervious Area (Drainage Areas), and Drainage Areas (Red)*

AutoCAD plans without Land Aerial View

Impervious Areas without Aerial

This maps shows the boundary of the impervious areas in Federalsburg.



Drainage Area CAD

This shows the locations and boundaries of the drainage areas identified in the Town. The data that was gathered, organized, and developed through the engineering work resulted in the identification of over 190 drainage areas. Total square footage was derived for each drainage area, as well as total square footage of the impervious area within each drainage area. Additional details on the drainage areas can be found in Appendix A

Infrastructure AutCAD

This shows the locations of the identified stormwater infrastructure (Pipes, in falls, outlets, and grates)

Chapter 5 - GIS analysis and maps

The data gathered by the engineering students was further analyzed The Environmental Finance Center utilizing ArcGIS software and data sources including:

- U.S. Fish and Wildlife Service National Wetlands Inventory
- Road data from Maryland State Highway Administration
- Property Tax and Parcel Data from Maryland Property Viewer
- Flood plain data from Maryland iMap
- Town of Federalsburg Drainage Area Map and database compiled by students

The reference maps below were compiled from the GIS analysis.

Federalsburg Drainage Areas Reference Map for Planning and Operations.

The map cross-references drainage area locations with the master excel list of drainage areas.

Feet
0 255 510 1 020 1 530 2 040

Wetland data from U.S. Fish and Wildlife Service National Wetlands Inventory
http://www.fws.gov/wetlands/Data/Index.html

Roads data from Maryland State Highway Administration
http://www.sha.maryland.gov/Index.aspx?PageId=282

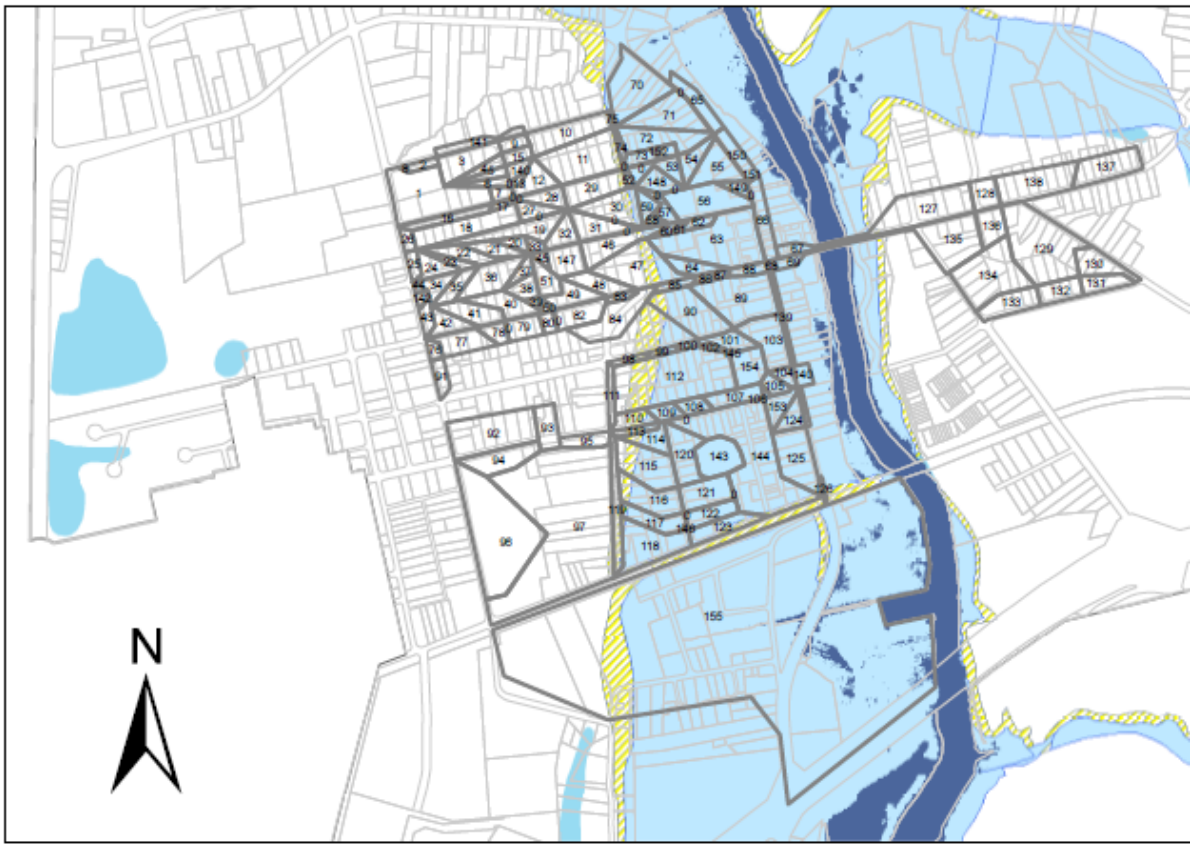
Parcels data from MDProperty View 2012

Federalsburg, MD Drainage Areas

by Albert Engel
Environmental Finance Center
University of Maryland
March 27, 2014

Federalsburg Drainage Areas and Flood Areas

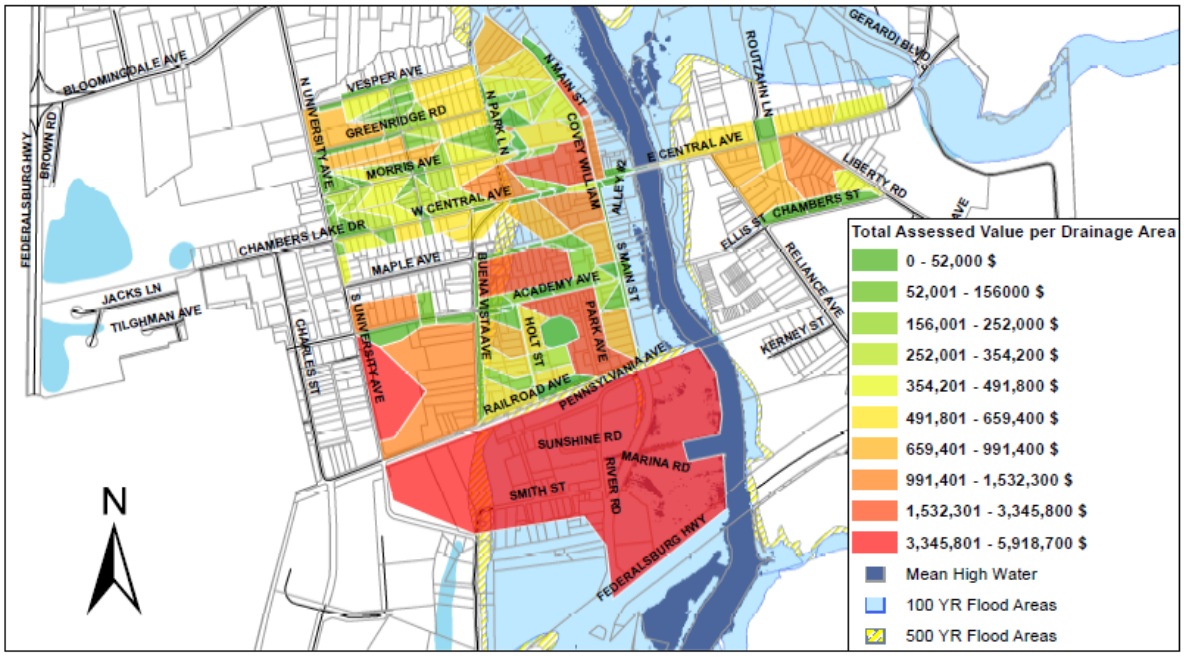
This map references the relationship of drainage areas to the 100 year and 500 year flood plain. Drainage areas located in these areas will have additional requirements and design considerations. Future investments in stormwater improvements in these areas will also contribute to addressing overall flood risks. Leveraging local investments in this way could reduce overall costs associated with risk and insurance.



Federalsburg GIS: Assessed Value of Property and Land with Drainage Areas

This map indicates the relationship between drainage areas and the assessed value of the properties within these drainage areas. Drainage areas with low total assessed property value are shown in green and drainage areas with high total assessed property value are shown in red.

While many other factors contribute to the overall stormwater investment decision-making, all other things being equal, this map can provide some high level indications as to how locating a stormwater project could increase overall property values in an area, or which locations may have a sufficient base with which to finance localized stormwater improvements.



Feet
0 355 710 1 420 2 130 2 840

Wetland data from U.S. Fish and Wildlife Service National Wetlands Inventory
http://www.fws.gov/wetlands/Data/Index.html

Roads data from Maryland State Highway Administration
http://www.sha.maryland.gov/Index.aspx?PageId=282

Parcels data from MDProperty View 2012

Federalsburg, MD Assessed Value of Flood Plain Drainage Areas

by Albert Engel
Environmental Finance Center
University of Maryland
April 1, 2014

Chapter 6 - Development of preliminary cost estimates

The data that was gathered, organized, and developed through the engineering work resulted in the identification of over 190 drainage areas. Total square footage was derived for each drainage area, as well as total square footage of the impervious area within each drainage area. Additional details on the drainage areas can be found in Appendix A

Because the impervious area was calculated, the protocol outlined in "Costs of Stormwater Management Practices in Maryland Counties" prepared for the Maryland Department of the Environment (MDE) can be used to determine a range of "planning level" cost estimates for implementing stormwater best management practices in the drainage areas. For each of the drainage areas, and estimated total project costs for 20 years, as well as an annual cost, were developed using this method.

The costs developed are costs per acre of impervious area teased and are estimated for Stormwater Best Management Practices specified in MDE's Maryland Assessment and Scenario Tool. Detail on calculations as well as assumptions are contained in Appendix B, C, and D. These are planning level estimates, which will change as further site specific details are developed. In addition, the estimates make no adjustments for BMP's which may currently be in place within the drainage areas. There were also no assumptions for efficiencies or scaling over time. Additionally there was not adjustment made or consideration given to the age and replacement costs of the stormwater infrastructure within the drainage area. Again, these are cost estimates based only on area, with no consideration of volume and no consideration of site and/or infrastructure conditions. They are planning level estimates and as such can be used for the purposes of determining areas of further investigation and for the purposes of beginning to make plans for the prioritization of projects as well as the management of future year capital reserves. As further site details are gathered when parcels are selected for development, and as further detail relating to infrastructure replacement costs are determined, these estimates can be further refined as part of the Town of Federalsburg stormwater management and budgeting program.

Based on the engineering data, there are approximately 87 acres of impervious area in the drainage areas. Applying the method outlined in Costs of Stormwater Management Practices in Maryland Counties[24] a cost range can be developed:

Drainage Area Stormwater Management BMP planning level costs:[25]

Costs over 20 years	$4 million - $18 million
Annualized costs per year	$208,000 - $911,000

[24] http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Documents/King_Hagan_Stormwater%20Cost%20Report%20to%20MDE_Final%20Draft_12Oct2011.pdf

[25] Detail on calculations are provided in Appendix B, C, and D.

Chapter 7: Financing Options for the Town of Federalsburg's Stormwater Program

There are a number of options for covering the costs associated with a stormwater program for the Town of Federalsburg. The stormwater program has historically been financed by grants, expenditures from the general fund, as well as borrowing. Throughout Maryland and the Mid-Atlantic region, there is a movement towards dedicated stormwater funding through the creation of a utility fee. There are also the options of bond financing and blended funding. The discussion that follows looks at these different funding options and reviews their advantages and disadvantages.

General Funding

Federalsburg currently develops a budget that allocates general funds towards maintaining and improving the Town's many services. The Town of Federalsburg is not alone in relying on general funding to cover stormwater program expenses – it remains the dominant form of stormwater financing for most Maryland municipalities. Nonetheless, with the possibility of annual stormwater program expenditures increasing significantly, the general fund may not be a sustainable source of funding. General fund based stormwater financing can be susceptible to shifting community priorities, changing commissioners or political landscape, or emergency situations. General fund financing is unlikely to be a stable source of long-term financing a stormwater program for the Town.

Grants

Grants have been used in the past to support Federalsburg's stormwater program as well. To the extent Federalsburg continues to show leadership and innovation in managing stormwater, the Town of Federalsburg's stormwater program will be an attractive use of grant funding for sponsors.

However, grants are variable in their availability and attainability and will not be sufficient enough to cover long-term costs of a comprehensive stormwater program. Competition for grant funding is always high and availability is contingent upon broader economic and political trends outside of the control of the Town. Federalsburg should not rely solely on grants to cover the expenses of its stormwater program, but grant programs can be an effective way of funding demonstration projects that engage the community, help residents develop a better understanding between runoff and water quality, and build demand for additional stormwater management investments. The following grant programs represent a short list of opportunities Federalsburg might consider pursuing to help defray costs:

National Flood Insurance Program, Community Rating System. This is a program that rewards communities for going beyond the minimum national flood insurance program requirements. Rewards do not include grant funding per se; instead, rewards include discounts on flood insurance premiums for the community's policyholders. This could help minimize per household impacts should a dedicated revenue stream be pursued in the future.

The Maryland Department of Natural Resources (DNR) Chesapeake and Atlantic Coastal Bays Trust Fund. Municipalities are eligible for funding under the program, which is aimed at maximizing nutrient and sediment reductions into Maryland's waterways by investing in a range of BMPs. This is a great opportunity for Federalsburg to consider supplementing their general funds going towards stormwater.

Stormwater Utility

A utility is an entity that collects fees for a specific purpose such as an electric utility, which collects fees for electricity provision and related services. Similarly, a stormwater utility would collect fees for the services provided by the stormwater program including removal and management of stormwater coming from Federalsburg's public and private property.

A stormwater utility is a dedicated method of funding a stormwater program, meaning the funds cannot be used for other purposes in the way that general funds can. A stormwater utility also generates revenue unlike bonds or loans, and is considered sustainable because the amount generated is roughly constant each year, unlike grants. Revenue collected under a stormwater utility could be used for any expense related to managing the stormwater program including personnel costs, public outreach and education, operations and maintenance, and stormwater related capital improvement projects.

There are 1,400 documented stormwater utilities in the United States including over 8 in Maryland and 20 nationally in communities with fewer than 1,000 people[26]. In 2012, the Town of Berlin in Worcester County (Pop. ~4,500) became Maryland's first eastern shore community to adopt a stormwater utility.

Stormwater utilities are typically structured to charge a recurring fee in tandem with the water and sewer bill. The fee is often calculated based on how much stormwater is "produced" at a given property, which is a measurement of the amount of impervious surface on the property (land that does not permit the absorption of rainwater). Therefore, property owners are typically assessed a fee based on the portion of their property covered with roof space, driveways, patios, parking lots, and other paved surfaces that prevent rainwater from directly percolating into the land.

In 2012, the average annual residential stormwater fee in the U.S. was $55 (or $4.60 per month). The highest residential stormwater fee in the U.S. was $250 per month with other communities charging close to zero.[27] The fee set by a given community is often commensurate with the ongoing and projected expenses associated with its stormwater program, as well as the population size, and economic make-up of the community. All things being equal, communities with higher projected stormwater program costs (e.g., due to upcoming capital improvements) and communities with fewer properties across which to distribute program costs, have higher residential stormwater utility fees.

Equality is often a central concern in designing a stormwater utility. The utility should be structured in a way that rewards responsible landowners for managing stormwater and provides exemptions where necessary. Additionally, utilities are often progressive whereby the monthly fee for smaller properties with less impervious surface is set proportionally lower to larger properties with more impervious

[26] https://www.wku.edu/engineering/documents/swusurveys/swusurvey-2012.pdf
[27] Ibid.

surface. This is usually accomplished through an equivalent residential unit (ERU), which is the average amount of impervious surface on residential homes. Residential and commercial properties are then assessed a fee based on how much they deviate from the ERU.

There are a few disadvantages associated with stormwater utilities. First, few communities have impervious surface data readily available and calculating the amount on each property can be a costly endeavor. Second, the administrative work associated with setting up and maintaining a stormwater utility can be burdensome, although over time, the effort associated with administering the utility should decrease. Third, and most importantly, a stormwater utility fee asks citizens and businesses to contribute directly to the stormwater program – an additional cost beyond their existing public tax and fee burden. A new public fee will always face major opposition unless its purpose and expected impacts are clearly articulated. In turn, a realistic path to adopting a stormwater utility requires extensive public outreach and education.

Loans and Bonds

Bonds and loans are an option for acquiring the upfront capital costs needed for a major capital improvement project and is a source of financing, which Federalsburg has utilized in the past and will continue to use in the future. One limitation with bonds and loans is that they must be repaid with interest, which increases the overall project costs, and this source of financing does not resolve the central issue of a dedicated revenue source for the repayment of the loaned capital or the life of the projects, which can be many years into the future. In the short term, the continued use of loans and bonds is an option for Federalsburg, but as the Town of Federalsburg prepares for the long-term future local officials will want to explore options where the cost of improvements and services is funded by a dedicated separate source, which is proportional to the uses and impacts of the service.

Blended Funding

In reality, most communities do not rely on a single funding option to manage their stormwater program, but instead use multiple options. In many cases blended funding allows the community to leverage financial resources with additional resources. For example, communities will receive better loan terms with a stormwater utility in place to cover future payments at lower rates and grants applications are more competitive when communities have established their willingness to lead and share costs. In the case of communities in good financial standing, it may be advantageous to mix general funds and utility financing. By making a substantial investment from the general fund, a community can lower the utility fee for the community as a whole and demonstrate a commitment to managing stormwater and willingness to jumpstart local stormwater program.

Chapter 7 - Recommended Goals for the Future Management of The Town of Federalsburg's Stormwater Program

The EFC's analysis of existing stormwater efforts and the engineering students' assessment of the current system and drainage patterns has led to a clearer sense of purpose, a set process, and direction for the Town of Federalsburg's stormwater program. The following are recommended goals and guiding principles for the Town to consider in managing and enhancing its stormwater program.

Goal: Reduce pollution attributable to stormwater and contribute to the future redevelopment and revitalization of the Town of Federalsburg to (1) ensure that public stormwater management is optimally designed and performing at a high level, and (2) increase private sector efforts to control stormwater through education and outreach.

Recommended steps to take in reaching goals:

- **Catalyze**: Raise topic awareness and community expectations by stating goals, communicating data, soliciting citizen feedback, and efficiently allocating the Town of Federalsburg's resources.
- **Continue to measure and evaluate**: Continue the process begun in this project and annually work to update, identify, inspect, and map the Town of Federalsburg stormwater infrastructure including inlets, culverts, tide gates and outfalls; and pinpoint sources and quantities of pollution.
- **Plan and prioritize**: Develop and then review annually a stormwater master plan that will strategically implement projects capable of reducing the severity and frequency of flooding as well as mitigate pollution loading.
- **Budget and implement**: Make stormwater planning and associated capital improvement projects a regular, on-going component of the annual and long-range budget process;
- **Secure sustainable and equitable financing**: Begin identifying sources funding and reserves and/or generating revenue to finance the program and ensure the distribution of costs is equitable.
- **Track and train**: Continue the process begun in this project and establish a process for regularly tracking and assessing the stormwater system and program implementation. This should include some training for Federalsburg staff in the necessary skills and technology to ensure ongoing improvement and efficiencies.
- **Engage and educate**: Develop and deliver relevant stormwater management information to homeowners, property owners, citizens and businesses through staff efforts, volunteers, and community partnerships.
- **Share engineering information and data with public:** Federalsburg has a strength and history of engineering and innovation through demonstration sites. This information should be shared with the community to engage them in the process of what changes will be occurring within their Town. It will make it easier to gain community support in the future.
- **Invest in order to gain multiple priority benefits**: Use investments in stormwater as a catalyst for redevelopment or in conjunction with flood cost mitigation through

prioritization and synergy with other public work projects.[28]

- **Incentivize stormwater Best Management Practices (BMPs)**: By using stormwater BMP's such as trees, green space, and rain gardens that help manage stormwater, Federalsburg will also contribute to promoting such things as health, property value, and revitalization of local economic conditions. Small details such as the choice of trees or the location of green space can go a long way to contributing to the overall revitalization movement.
- **Incentivize** property owners to take steps above requirements to manage stormwater through rebates, grant programs and education.
- **Leverage data for economic development**: Utilize the vast amount of engineering information as an asset in economic development. There is a significant amount of engineering work that has been undertaken by the Town of Federalsburg. For a Town of this size, it can consider itself advanced in the amount of engineering data that has been collected and organized. To a prospective business considering locating in the area, this type of data could save thousands of dollars in investigative engineering costs or investigative labor time for a prospective project.
- **Reserve for the future**: Analyze, create, and annually review a stormwater capital projects reserve so that a set number of projects that are identified can be implemented annually
- **Plan for the future:** Consider developing a green infrastructure plan. As the Town of Federalsburg seeks to revitalize and reinvest in the community, particularly the downtown area, there may be interest in continuing to implement green infrastructure projects. Many communities looking to address stormwater and water quality priorities, while also pursuing the revitalization of the local economy, have found that installing green infrastructure demonstration projects can help preserve resources and set an example for what can be duplicated by private property owners.
- **Fund operations and maintenance activities**: Develop and fund a dedicated program to clean baysavers, inlets, ditches, and drains on a regularly scheduled basis.

[28] http://www.myeasternshoremd.com/news/caroline_county/article_c2d25b12-9cb7-5404-994d-2575b5b4a7bf.html

Stormwater baysavers located in the Town of Federalsburg near the Marshyhope

- **Inform**: Data on impervious area and drainage areas can be used to quantify Federalsburg's contribution to urban loads in Caroline's County's WIP. This in turn can be used to inform and clarify loading estimates in the adjustments to the State's TMDL model in 2015.

Project Team

Environmental Finance Center at the University of Maryland

- **Joanne Throwe, Director – jthrowe@umd.edu** Hired in 2005 as the EFC's Agricultural Program Leader, Joanne Throwe became Assistant Director in 2007, Associate Director in 2008, and Director in 2009. In addition, she completed an 18-month assignment working with USDA/CSREES as shared-faculty to assist in the coordination of special agriculture projects. Ms. Throwe works with communities in the Mid- Atlantic region implementing innovative financing solutions for environmental protection. Her work experience includes extensive knowledge about agriculture, green infrastructure, biofuels, ecosystem services and solid waste management. Prior to joining the EFC, Ms. Throwe spent several years as a Development Resource Specialist at USDA's Foreign Agriculture Service and two years as an Agriculture Extension Agent for Peace Corps in the South Pacific. She holds a M.A. in Public Policy and Private Enterprise from the University of Maryland.

- **Eric Reed, Research Associate – ereed1@umd.edu** Eric's focus is on financial analysis to support the development of efficient, effective, and sustainable financing strategies for addressing resource management issues. He is involved with the development of a cohesive water infrastructure financing program that supports and expands the capacity of the EFC's Stormwater Financing and Outreach Unit and EFC's Water Systems Financing Unit. Eric also supports projects in which analysis can improve infrastructure asset management and the return on investments in sustainable projects. Eric holds an M.B.A. in Finance from The Robert H. Smith School of Business at The University of Maryland and a B.A. in Social & Behavioral Sciences from The Johns Hopkins University. Prior to joining EFC, Eric's professional experience includes work in Environmental Insurance Risk Management, Real Estate Development Finance, Environmental Finance, and International Human Rights. He has experience performing financial analysis of green infrastructure projects; performing financial and community impact analysis of real estate developments; structuring development and infrastructure project financing; and underwriting environmental insurance.

- **Albert Engel, Graduate Assistant – Graphical Information Science – aengel1@umd.edu**
Albert is pursuing a Master of Community Planning for the University of Maryland, College Park with an expected graduation of August 2015. Albert received a Bachelor of Science in Geography with a Minor in Geographic Information Science from the University of Maryland in 2013. His research experience includes work at Tufts University Department of Urban and Environmental Planning and work at the Department of Geographical Science at the University of Maryland. A special emphasis of his work is on GIS analysis of abandoned and vacant properties as well as indemnifying gaps infrastructure.

Robert D. Rauch & Associates, Inc.

A full service civil design firm with locations in Maryland and Virginia. The company has provided a full range of engineering service for clients since 1984. The firm serves as the engineer for the Town of Federalsburg. The firm's principal, Mr. Robert Rauch earned his B.S. in civil engineering from the University of Maryland in 1973. After graduation Mr. Rauch began his career with the Maryland Department of Natural Resources. In 1978, he became the state's youngest county engineer, serving for six years as director of public works and Talbot County engineer before his move to the private sector in 1984. Mr. Rauch is a member of the National Society of Professional Engineers, the

University of Maryland Civil Engineering Board, the American Society of Civil Engineers, the University of Maryland College of Architecture, and the Harry R. Hughes Center for Agro-Ecology, Inc. Board of Directors. Mr. Rauch remains a supporter amd involved with the University of Maryland in many capacities including providing professional knowledge to students in the Engineering program and the Real Estate Development Program.

Engineering Students from the A. J. Clark School of Engineering at the University of Maryland

- **Brian Fitzgerald –** Candidate for Bachelor of Science, Civil Engineering (May 2015)
  LinkedIn: http://www.linkedin.com/in/brianbfitzgerald
- **Boris Gamazaychikov –** Candidate for Bachelor of Science, Civil Engineering. (May 2014)
  LinkedIn: http://www.linkedin.com/pub/boris-gamazaychikov/79/a65/485
- **Ashraf Khan –** Candidate for Bachelor of Science, Dual Concentration in Structural Engineering and Project Management (May 2015)
  LinkedIn: http://www.linkedin.com/pub/ashrafuzzaman-khan/57/51a/21b
- **Sonela Mustafa –** Bachelor of Science, Civil Engineering (Earned December 2013), Candidate for Master of Science, Geotechnical Engineering (May 2015)
  LinkedIn: http://www.linkedin.com/pub/sonela-mustafa/68/51b/709

Appendix A – Federalsburg Maryland Drainage Area Reference Data

Federalsburg Maryland Drainage Area Reference Data												
Federalsburg Master Stormwater Plan Drainage Areas						Maryland Chapter 2 Design Standards						
						WQv (inches per acre)	Site Recharge Volume Requirement (Based on Soil Type)				Overbank Flood Protection (inches)	Extreme Flood Volume (Inches)
						Rainfall Control (Inches)	Group A	Group B	Group C	Group D	Two Year Storm Qp2	100 Yr Storm Qf100
Drainage Area ID	Drainage Area (ft^2)	Impervious Area (ft^2)	Permeable Area (ft^2)	Impervious Area (Acres)	Percent Impervious	1	0.38	0.26	0.13	0.07	3.4	7.6
Total	8,696,258	3,803,487	4,892,771	87.32	43.74%	0.897	33.180	22.702	11.351	6.112		
1	143,436	91,585	51,851	2.10	63.85%	0.015	0.799	0.547	0.273	0.147		
2	9,767	1,705	8,062	0.04	17.46%	0.001	0.015	0.010	0.005	0.003		
3	52,028	28,611	23,417	0.66	54.99%	0.005	0.250	0.171	0.085	0.046		
4	15,867	3,797	12,070	0.09	23.93%	0.002	0.033	0.023	0.011	0.006		
5	13,424	3,438	9,986	0.08	25.61%	0.001	0.030	0.021	0.010	0.006		
6	14,142	2,743	11,399	0.06	19.40%	0.001	0.024	0.016	0.008	0.004		
7	11,526	6,461	5,065	0.15	56.06%	0.001	0.056	0.039	0.019	0.010		
8	1,203	692	511	0.02	57.52%	0.000	0.006	0.004	0.002	0.001		
9	13,304	4,903	8,401	0.11	36.85%	0.001	0.043	0.029	0.015	0.008		
10	67,561	32,459	35,102	0.75	48.04%	0.007	0.283	0.194	0.097	0.052		
11	110,197	33,353	76,844	0.77	30.27%	0.011	0.291	0.199	0.100	0.054		
12	33,731	17,323	16,408	0.40	51.36%	0.004	0.151	0.103	0.052	0.028		
13	4,241	2,272	1,969	0.05	53.57%	0.000	0.020	0.014	0.007	0.004		
14	12,313	4,156	8,157	0.10	33.75%	0.001	0.036	0.025	0.012	0.007		
15	14,243	1,481	12,762	0.03	10.40%	0.001	0.013	0.009	0.004	0.002		
16	26,059	15,875	10,184	0.36	60.92%	0.003	0.138	0.095	0.047	0.026		
17	6,072	3,685	2,387	0.08	60.69%	0.001	0.032	0.022	0.011	0.006		
18	78,609	28,991	49,618	0.67	36.88%	0.008	0.253	0.173	0.087	0.047		
19	57,956	17,852	40,104	0.41	30.80%	0.006	0.156	0.107	0.053	0.029		
20	11,975	7,733	4,242	0.18	64.58%	0.001	0.067	0.046	0.023	0.012		
21	23,821	11,598	12,223	0.27	48.69%	0.002	0.101	0.069	0.035	0.019		
22	30,273	11,864	18,409	0.27	39.19%	0.003	0.103	0.071	0.035	0.019		
23	11,429	5,749	5,680	0.13	50.30%	0.001	0.050	0.034	0.017	0.009		
24	24,846	12,428	12,418	0.29	50.02%	0.003	0.108	0.074	0.037	0.020		
25	11,755	7,009	4,746	0.16	59.63%	0.001	0.061	0.042	0.021	0.011		
26	10,264	4,639	5,625	0.11	45.20%	0.001	0.040	0.028	0.014	0.007		
27	21,747	7,712	14,035	0.18	35.46%	0.002	0.067	0.046	0.023	0.012		
28	26,073	12,993	13,080	0.30	49.83%	0.003	0.113	0.078	0.039	0.021		
29	54,998	23,277	31,721	0.53	42.32%	0.006	0.203	0.139	0.069	0.037		
30	58,427	19,652	38,775	0.45	33.64%	0.006	0.171	0.117	0.059	0.032		
31	45,530	20,671	24,859	0.47	45.40%	0.005	0.180	0.123	0.062	0.033		
32	26,925	11,375	15,550	0.26	42.25%	0.003	0.099	0.068	0.034	0.018		
33	8,398	4,393	4,005	0.10	52.31%	0.001	0.038	0.026	0.013	0.007		

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						WQv (inches per acre)	Site Recharge Volume Requirement (Based on Soil Type)				Overbank Flood Protection (inches)	Extreme Flood Volume (Inches)
						Rainfall Control (Inches)	Group A	Group B	Group C	Group D	Two Year Storm Qp2	100 Yr Storm Qf100
Drainage Area ID	Drainage Area (ft^2)	Impervious Area (ft^2)	Permeable Area (ft^2)	Impervious Area (Acres)	Percent Impervious	1	0.38	0.26	0.13	0.07	3.4	7.6
34	22,865	12,551	10,314	0.29	54.89%	0.002	0.109	0.075	0.037	0.020		
35	22,516	7,287	15,229	0.17	32.36%	0.002	0.064	0.043	0.022	0.012		
36	56,598	20,821	35,777	0.48	36.79%	0.006	0.182	0.124	0.062	0.033		
37	13,543	6,493	7,050	0.15	47.94%	0.001	0.057	0.039	0.019	0.010		
38	21,791	10,139	11,652	0.23	46.53%	0.002	0.088	0.061	0.030	0.016		
39	4,970	3,667	1,303	0.08	73.78%	0.001	0.032	0.022	0.011	0.006		
40	41,707	12,987	28,720	0.30	31.14%	0.004	0.113	0.078	0.039	0.021		
41	39,836	17,750	22,086	0.41	44.56%	0.004	0.155	0.106	0.053	0.029		
42	28,256	17,179	11,077	0.39	60.80%	0.003	0.150	0.103	0.051	0.028		
43	14,390	6,710	7,680	0.15	46.63%	0.001	0.059	0.040	0.020	0.011		
44	2,939	1,677	1,262	0.04	57.06%	0.000	0.015	0.010	0.005	0.003		
45	6,423	2,384	4,039	0.05	37.12%	0.001	0.021	0.014	0.007	0.004		
46	53,561	30,350	23,211	0.70	56.66%	0.006	0.265	0.181	0.091	0.049		
47	99,288	49,870	49,418	1.14	50.23%	0.010	0.435	0.298	0.149	0.080		
48	33,737	18,446	15,291	0.42	54.68%	0.004	0.161	0.110	0.055	0.030		
49	34,964	24,700	10,264	0.57	70.64%	0.004	0.215	0.147	0.074	0.040		
50	3,678	3,100	578	0.07	84.28%	0.000	0.027	0.019	0.009	0.005		
51	26,449	13,435	13,014	0.31	50.80%	0.003	0.117	0.080	0.040	0.022		
52	4,278	1,600	2,678	0.04	37.40%	0.000	0.014	0.010	0.005	0.003		
53	31,043	12,046	18,997	0.28	38.80%	0.003	0.105	0.072	0.036	0.019		
54	26,574	13,650	12,924	0.31	51.37%	0.003	0.119	0.081	0.041	0.022		
55	54,721	46,883	7,838	1.08	85.68%	0.006	0.409	0.280	0.140	0.075		
56	82,645	74,321	8,324	1.71	89.93%	0.009	0.648	0.444	0.222	0.119		
57	17,524	15,073	2,451	0.35	86.01%	0.002	0.131	0.090	0.045	0.024		
58	3,944	2,017	1,927	0.05	51.14%	0.000	0.018	0.012	0.006	0.003		
59	16,976	9,269	7,707	0.21	54.60%	0.002	0.081	0.055	0.028	0.015		
60	6,825	5,087	1,738	0.12	74.53%	0.001	0.044	0.030	0.015	0.008		
61	3,103	1,637	1,466	0.04	52.76%	0.000	0.014	0.010	0.005	0.003		
62	11,812	10,515	1,297	0.24	89.02%	0.001	0.092	0.063	0.031	0.017		
63	161,612	35,118	126,494	0.81	21.73%	0.016	0.306	0.210	0.105	0.056		
64	25,253	17,225	8,028	0.40	68.21%	0.003	0.150	0.103	0.051	0.028		
65	34,549	19,399	15,150	0.45	56.15%	0.004	0.169	0.116	0.058	0.031		
66	43,381	40,298	3,083	0.93	92.89%	0.005	0.352	0.241	0.120	0.065		
67	16,251	16,251	0	0.37	100.00%	0.002	0.142	0.097	0.048	0.026		
68	2,872	2,850	22	0.07	99.23%	0.000	0.025	0.017	0.009	0.005		
69	14,096	14,000	96	0.32	99.32%	0.002	0.122	0.084	0.042	0.022		

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Drainage Area ID	Drainage Area (ft^2)	Impervious Area (ft^2)	Permeable Area (ft^2)	Impervious Area (Acres)	Percent Impervious	1	0.38	0.26	0.13	0.07	3.4	7.6
70	104,472	48,200	56,272	1.11	46.14%	0.011	0.420	0.288	0.144	0.077		
71	78,005	23,700	54,305	0.54	30.38%	0.008	0.207	0.141	0.071	0.038		
72	67,758	16,223	51,535	0.37	23.94%	0.007	0.142	0.097	0.048	0.026		
73	23,217	11,917	11,300	0.27	51.33%	0.002	0.104	0.071	0.036	0.019		
74	7,489	3,173	4,316	0.07	42.37%	0.001	0.028	0.019	0.009	0.005		
75	2,061	843	1,218	0.02	40.90%	0.000	0.007	0.005	0.003	0.001		
76	9,280	6,300	2,980	0.14	67.89%	0.001	0.055	0.038	0.019	0.010		
77	42,109	11,482	30,627	0.26	27.27%	0.004	0.100	0.069	0.034	0.018		
78	17,126	10,000	7,126	0.23	58.39%	0.002	0.087	0.060	0.030	0.016		
79	28,840	21,000	7,840	0.48	72.82%	0.003	0.183	0.125	0.063	0.034		
80	11,659	8,850	2,809	0.20	75.91%	0.001	0.077	0.053	0.026	0.014		
81	790	215	575	0.00	27.22%	0.000	0.002	0.001	0.001	0.000		
82	39,973	28,000	11,973	0.64	70.05%	0.004	0.244	0.167	0.084	0.045		
83	6,731	3,103	3,628	0.07	46.10%	0.001	0.027	0.019	0.009	0.005		
84	70,386	30,104	40,282	0.69	42.77%	0.007	0.263	0.180	0.090	0.048		
85	11,670	8,287	3,383	0.19	71.01%	0.001	0.072	0.049	0.025	0.013		
86	5,417	3,680	1,737	0.08	67.93%	0.001	0.032	0.022	0.011	0.006		
87	4,760	3,900	860	0.09	81.93%	0.001	0.034	0.023	0.012	0.006		
88	14,874	13,730	1,144	0.32	92.31%	0.002	0.120	0.082	0.041	0.022		
89	115,890	69,616	46,274	1.60	60.07%	0.012	0.607	0.416	0.208	0.112		
90	89,872	32,832	57,040	0.75	36.53%	0.009	0.286	0.196	0.098	0.053		
91	17,555	15,503	2,052	0.36	88.31%	0.002	0.135	0.093	0.046	0.025		
92	121,719	59,096	62,623	1.36	48.55%	0.013	0.516	0.353	0.176	0.095		
93	34,790	15,385	19,405	0.35	44.22%	0.004	0.134	0.092	0.046	0.025		
94	72,217	31,541	40,676	0.72	43.68%	0.007	0.275	0.188	0.094	0.051		
95	23,700	14,640	9,060	0.34	61.77%	0.003	0.128	0.087	0.044	0.024		
96	433,875	200,584	233,291	4.60	46.23%	0.045	1.750	1.197	0.599	0.322		
97	283,601	29,761	253,840	0.68	10.49%	0.028	0.260	0.178	0.089	0.048		
98	8,434	6,310	2,124	0.14	74.82%	0.001	0.055	0.038	0.019	0.010		
99	6,627	5,285	1,342	0.12	79.75%	0.001	0.046	0.032	0.016	0.008		
100	4,647	3,355	1,292	0.08	72.20%	0.001	0.029	0.020	0.010	0.005		
101	28,108	16,857	11,251	0.39	59.97%	0.003	0.147	0.101	0.050	0.027		
102	4,581	1,903	2,678	0.04	41.54%	0.000	0.017	0.011	0.006	0.003		
103	66,521	41,052	25,469	0.94	61.71%	0.007	0.358	0.245	0.123	0.066		
104	12,419	7,713	4,706	0.18	62.11%	0.001	0.067	0.046	0.023	0.012		
105	14,846	8,112	6,734	0.19	54.64%	0.002	0.071	0.048	0.024	0.013		

Federalsburg Maryland Drainage Area Reference Data

Federalsburg Master Stormwater Plan Drainage Areas						Maryland Chapter 2 Design Standards						
						WQv (inches per acre)	Site Recharge Volume Requirement (Based on Soil Type)				Overbank Flood Protection (inches)	Extreme Flood Volume (Inches)
						Rainfall Control (Inches)	Group A	Group B	Group C	Group D	Two Year Storm Qp2	100 Yr Storm Qf100
Drainage Area ID	Drainage Area (ft^2)	Impervious Area (ft^2)	Permeable Area (ft^2)	Impervious Area (Acres)	Percent Impervious	1	0.38	0.26	0.13	0.07	3.4	7.6
106	2,251	1,752	499	0.04	77.83%	0.000	0.015	0.010	0.005	0.003		
107	32,105	23,593	8,512	0.54	73.49%	0.003	0.206	0.141	0.070	0.038		
108	17,397	12,402	4,995	0.28	71.29%	0.002	0.108	0.074	0.037	0.020		
109	17,493	10,385	7,108	0.24	59.37%	0.002	0.091	0.062	0.031	0.017		
110	24,185	12,763	11,422	0.29	52.77%	0.003	0.111	0.076	0.038	0.021		
111	15,081	8,290	6,791	0.19	54.97%	0.002	0.072	0.049	0.025	0.013		
112	217,753	46,154	171,599	1.06	21.20%	0.022	0.403	0.275	0.138	0.074		
113	14,274	1,215	13,059	0.03	8.51%	0.001	0.011	0.007	0.004	0.002		
114	11,527	1,002	10,525	0.02	8.69%	0.001	0.009	0.006	0.003	0.002		
115	9,573	3,549	6,024	0.08	37.07%	0.001	0.031	0.021	0.011	0.006		
116	9,367	4,554	4,813	0.10	48.62%	0.001	0.040	0.027	0.014	0.007		
117	28,122	19,464	8,658	0.45	69.21%	0.003	0.170	0.116	0.058	0.031		
118	1,987	1,243	744	0.03	62.56%	0.000	0.011	0.007	0.004	0.002		
119	2,156	1,983	173	0.05	91.98%	0.000	0.017	0.012	0.006	0.003		
120	4,515	2,058	2,457	0.05	45.58%	0.000	0.018	0.012	0.006	0.003		
121	6,549	2,832	3,717	0.07	43.24%	0.001	0.025	0.017	0.008	0.005		
122	8,384	4,275	4,109	0.10	50.99%	0.001	0.037	0.026	0.013	0.007		
123	6,679	400	6,279	0.01	5.99%	0.001	0.003	0.002	0.001	0.001		
124	73,827	47,542	26,285	1.09	64.40%	0.008	0.415	0.284	0.142	0.076		
125	136,116	58,689	77,427	1.35	43.12%	0.014	0.512	0.350	0.175	0.094		
126	3,265	2,635	630	0.06	80.70%	0.000	0.023	0.016	0.008	0.004		
127	117,222	47,267	69,955	1.09	40.32%	0.012	0.412	0.282	0.141	0.076		
128	30,369	9,859	20,510	0.23	32.46%	0.003	0.086	0.059	0.029	0.016		
129	167,641	51,028	116,613	1.17	30.44%	0.017	0.445	0.305	0.152	0.082		
130	41,434	12,925	28,509	0.30	31.19%	0.004	0.113	0.077	0.039	0.021		
131	28,531	7,183	21,348	0.16	25.18%	0.003	0.063	0.043	0.021	0.012		
132	33,943	16,325	17,618	0.37	48.10%	0.004	0.142	0.097	0.049	0.026		
133	45,471	17,174	28,297	0.39	37.77%	0.005	0.150	0.103	0.051	0.028		
134	120,923	21,764	99,159	0.50	18.00%	0.012	0.190	0.130	0.065	0.035		
135	103,451	54,480	48,971	1.25	52.66%	0.011	0.475	0.325	0.163	0.088		
136	34,800	6,855	27,945	0.16	19.70%	0.003	0.060	0.041	0.020	0.011		
137	63,285	26,013	37,272	0.60	41.10%	0.007	0.227	0.155	0.078	0.042		
138	84,718	38,037	46,681	0.87	44.90%	0.009	0.332	0.227	0.114	0.061		
139	14,801	14,501	300	0.33	97.97%	0.002	0.127	0.087	0.043	0.023		
140	20,181	19,416	765	0.45	96.21%	0.002	0.169	0.116	0.058	0.031		
141	25,262	10,776	14,486	0.25	42.66%	0.003	0.094	0.064	0.032	0.017		

Federalsburg Maryland Drainage Area Reference Data

Federalsburg Master Stormwater Plan Drainage Areas						Maryland Chapter 2 Design Standards						
						WQv (inches per acre)	Site Recharge Volume Requirement (Based on Soil Type)				Overbank Flood Protection (inches)	Extreme Flood Volume (Inches)
						Rainfall Control (Inches)	Group A	Group B	Group C	Group D	Two Year Storm Qp2	100 Yr Storm Qf100
Drainage Area ID	Drainage Area (ft^2)	Impervious Area (ft^2)	Permeable Area (ft^2)	Impervious Area (Acres)	Percent Impervious	1	0.38	0.26	0.13	0.07	3.4	7.6
142	5,607	3,058	2,549	0.07	54.54%	0.001	0.027	0.018	0.009	0.005		
143	96,435	6,116	90,319	0.14	6.34%	0.009	0.053	0.037	0.018	0.010		
144	51,957	17,637	34,320	0.40	33.95%	0.005	0.154	0.105	0.053	0.028		
145	415	182	233	0.00	43.86%	0.000	0.002	0.001	0.001	0.000		
146	39,732	14,635	25,097	0.34	36.83%	0.004	0.128	0.087	0.044	0.024		
147	39,442	12,669	26,773	0.29	32.12%	0.004	0.111	0.076	0.038	0.020		
148	26,909	10,648	16,261	0.24	39.57%	0.003	0.093	0.064	0.032	0.017		
149	11,527	7,556	3,971	0.17	65.55%	0.001	0.066	0.045	0.023	0.012		
150	28,235	21,013	7,222	0.48	74.42%	0.003	0.183	0.125	0.063	0.034		
151	587	238	349	0.01	40.55%	0.000	0.002	0.001	0.001	0.000		
152	2,393	764	1,629	0.02	31.93%	0.000	0.007	0.005	0.002	0.001		
153	26,081	19,549	6,532	0.45	74.95%	0.003	0.171	0.117	0.058	0.031		
154	21,811	15,773	6,038	0.36	72.32%	0.002	0.138	0.094	0.047	0.025		
155	22,886	20,662	2,224	0.47	90.28%	0.003	0.180	0.123	0.062	0.033		
156	21,482	16,929	4,553	0.39	78.81%	0.002	0.148	0.101	0.051	0.027		
157	36,515	31,716	4,799	0.73	86.86%	0.004	0.277	0.189	0.095	0.051		
158	57,922	26,082	31,840	0.60	45.03%	0.006	0.228	0.156	0.078	0.042		
159	29,072	13,246	15,826	0.30	45.56%	0.003	0.116	0.079	0.040	0.021		
160	11,639	7,104	4,535	0.16	61.04%	0.001	0.062	0.042	0.021	0.011		
161	80,289	20,126	60,163	0.46	25.07%	0.008	0.176	0.120	0.060	0.032		
162	63,621	12,016	51,605	0.28	18.89%	0.006	0.105	0.072	0.036	0.019		
163	40,779	18,634	22,145	0.43	45.70%	0.004	0.163	0.111	0.056	0.030		
164	56,775	24,711	32,064	0.57	43.52%	0.006	0.216	0.147	0.074	0.040		
165	9,944	5,428	4,516	0.12	54.59%	0.001	0.047	0.032	0.016	0.009		
166	20,197	17,347	2,850	0.40	85.89%	0.002	0.151	0.104	0.052	0.028		
167	39,741	23,783	15,958	0.55	59.84%	0.004	0.207	0.142	0.071	0.038		
168	63,937	12,794	51,143	0.29	20.01%	0.006	0.112	0.076	0.038	0.021		
169	9,140	7,257	1,883	0.17	79.40%	0.001	0.063	0.043	0.022	0.012		
170	5,361	3,890	1,471	0.09	72.56%	0.001	0.034	0.023	0.012	0.006		
171	4,810	3,765	1,045	0.09	78.27%	0.001	0.033	0.022	0.011	0.006		
172	6,304	3,247	3,057	0.07	51.51%	0.001	0.028	0.019	0.010	0.005		
173	21,401	11,703	9,698	0.27	54.68%	0.002	0.102	0.070	0.035	0.019		
174	10,298	5,139	5,159	0.12	49.90%	0.001	0.045	0.031	0.015	0.008		
175	17,448	7,458	9,990	0.17	42.74%	0.002	0.065	0.045	0.022	0.012		
176	3,339	2,941	398	0.07	88.08%	0.000	0.026	0.018	0.009	0.005		
177	4,256	3,504	752	0.08	82.33%	0.000	0.031	0.021	0.010	0.006		

Federalsburg Maryland Drainage Area Reference Data

Federalsburg Master Stormwater Plan Drainage Areas						Maryland Chapter 2 Design Standards						
						WQv (inches per acre)	Site Recharge Volume Requirement (Based on Soil Type)				Overbank Flood Protection (inches)	Extreme Flood Volume (Inches)
						Rainfall Control (Inches)	Group A	Group B	Group C	Group D	Two Year Storm Qp2	100 Yr Storm Qf100
Drainage Area ID	Drainage Area (ft^2)	Impervious Area (ft^2)	Permeable Area (ft^2)	Impervious Area (Acres)	Percent Impervious	1	0.38	0.26	0.13	0.07	3.4	7.6
178	3,805	3,805	0	0.09	100.00%	0.000	0.033	0.023	0.011	0.006		
179	1,924	747	1,177	0.02	38.83%	0.000	0.007	0.004	0.002	0.001		
180	261,187	100,542	160,645	2.31	38.49%	0.027	0.877	0.600	0.300	0.162		
181	59,901	59,901	0	1.38	100.00%	0.007	0.523	0.358	0.179	0.096		
182	13,939	13,939	0	0.32	100.00%	0.002	0.122	0.083	0.042	0.022		
183	21,286	21,286	0	0.49	100.00%	0.002	0.186	0.127	0.064	0.034		
184	31,314	31,314	0	0.72	100.00%	0.004	0.273	0.187	0.093	0.050		
185	9,432	9,432	0	0.22	100.00%	0.001	0.082	0.056	0.028	0.015		
186	96,572	81,316	15,256	1.87	84.20%	0.011	0.709	0.485	0.243	0.131		
187	56,047	44,735	11,312	1.03	79.82%	0.006	0.390	0.267	0.134	0.072		
188	35,982	5,579	30,403	0.13	15.50%	0.004	0.049	0.033	0.017	0.009		
189	142,326	47,754	94,572	1.10	33.55%	0.014	0.417	0.285	0.143	0.077		
190	168,694	49,431	119,263	1.13	29.30%	0.017	0.431	0.295	0.148	0.079		
191	302,017	117,082	184,935	2.69	38.77%	0.031	1.021	0.699	0.349	0.188		
192	16,689	9,712	6,977	0.22	58.19%	0.002	0.085	0.058	0.029	0.016		
193	47,228	25,017	22,211	0.57	52.97%	0.005	0.218	0.149	0.075	0.040		
194	142,470	7,181	135,289	0.16	5.04%	0.014	0.063	0.043	0.021	0.012		
195	23,733	5,156	18,577	0.12	21.73%	0.002	0.045	0.031	0.015	0.008		
196	39,020	14,598	24,422	0.34	37.41%	0.004	0.127	0.087	0.044	0.023		
197	242,208	120,996	121,212	2.78	49.96%	0.025	1.056	0.722	0.361	0.194		
198	249,538	45,942	203,596	1.05	18.41%	0.025	0.401	0.274	0.137	0.074		
199	144,892	66,807	78,085	1.53	46.11%	0.015	0.583	0.399	0.199	0.107		

Appendix B – Federalsburg Maryland Drainage Area BMP Cost Estimations[29]

BMP Assumption	Total Initial Costs	Annualized Initial Costs	Average Annual Maintenance Costs	Total Stormwater BMP Costs per Impervious Acre Treated	
				Costs (Over 20 Years)	Average Annual Cost
1. Applying King Costs to determine costs per impervious acre treated					
Average BMP excluding outliers	$45,554	$3,062	$1,058	$66,712	$3,336
Average All BMPs	$71,474	$4,804	$1,208	$95,636	$4,782
50% Tree Planting, 50% Grass Buffers	$28,325	$1,904	$1,040	$49,132	$2,457
100% Bioretention Urban Retrofit	$183,750	$12,351	$1,531	$214,370	$10,719
2. Adjusting for locality					
Caroline County Adjustment Factor	0.97	Table 3a, pg 24, King			
Average excluding outliers	$44,370	$2,982	$1,030	$64,978	$3,249
Average all BMP's	$69,616	$4,679	$1,177	$93,150	$4,657
50% Tree Planting, 50% Grass Buffers	$27,589	$1,854	$1,013	$47,854	$2,393
100% Bioretention Urban Retrofit	$178,973	$12,030	$1,491	$208,796	$10,440
3. Determining total Costs for Drainage Areas					
Total Impervious Acres in Drainage Areas	87.32				
Average excluding outliers	$3,874,364	$260,418	$89,974	$5,673,845	$283,692
Average all BMP's	$6,078,850	$408,594	$102,750	$8,133,847	$406,692
50% Tree Planting, 50% Grass Buffers	$2,409,032	$161,925	$88,480	$4,178,635	$208,932
100% Bioretention Urban Retrofit	$15,627,879	$1,050,439	$130,211	$18,232,108	$911,605

[29] http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Documents/King_Hagan_Stormwater%20Cost%20Report%20to%20MDE_Final%20Draft_12Oct2011.pdf

4. Expressing annual costs as a rate per $100 of assessed property value	Total (Land and Improvements)	Land Only
Drainage Area Assessed Property Tax Base	$200,000,000	$62,000,000
Average excluding outliers	0.14	0.46
Average all BMP's	0.20	0.66
50% Tree Planting, 50% Grass Buffers	0.10	0.34
100% Bioretention Urban Retrofit	0.46	1.47

Appendix C – BMP Cost Source

Planning Level Unit Cost Development for Stormwater Best Management Practices (BMPs)

Life Cycle (20 years) and Annual Stormwater BMP Unit Cost Estimates[30]

Stormwater BMP	Total	Annualized Initial Costs	Average Annual Maintenance Costs[1] (From Table B)	Total Stormwater BMP Costs per Impervious Acre Treated	
				Costs (Over 20 Years)	Average Annual Cost
Impervious Urban Surface Reduction	$ 96,250	$ 6,470	$ 885	$ 113,957	$ 5,698
Urban Forest Buffers	$ 33,000	$ 2,218	$ 1,210	$ 57,207	$ 2,860
Urban Grass Buffers	$ 23,650	$ 1,590	$ 870	$ 41,057	$ 2,053
Urban Tree Planting	$ 33,000	$ 2,218	$ 1,210	$ 57,207	$ 2,860
Wet Ponds and Wetlands (New)	$ 24,115	$ 1,621	$ 763	$ 39,368	$ 1,968
Wet Ponds and Wetlands (Retrofit)	$ 63,998	$ 4,302	$ 763	$ 79,251	$ 3,963
Dry Detention Ponds (New)	$ 39,000	$ 2,621	$ 1,231	$ 63,620	$ 3,181
Hydrodynamic Structures (New)	$ 42,000	$ 2,823	$ 3,531	$ 112,620	$ 5,631
Dry Extended Detention Ponds (New)	$ 39,000	$ 2,621	$ 1,231	$ 63,620	$ 3,181
Dry Extended Detention Ponds (Retrofit)	$ 67,500	$ 4,537	$ 1,231	$ 92,120	$ 4,606
Infiltration Practices w/o Sand, Veg. (New)	$ 58,450	$ 3,929	$ 866	$ 75,770	$ 3,789
Infiltration Practices w/ Sand, Veg. (New)	$ 61,250	$ 4,117	$ 906	$ 79,370	$ 3,969
Filtering Practices (Sand, above ground)	$ 49,000	$ 3,294	$ 1,431	$ 77,620	$ 3,881
Filtering Practices (Sand, below ground)	$ 56,000	$ 3,764	$ 1,631	$ 88,620	$ 4,431
Erosion and Sediment Control	$ 26,000	$ 1,748	$ 10	$ 26,207	$ 1,310
Urban Nutrient Management	$ 61,000	$ 4,100	$ 31	$ 61,620	$ 3,081
Street Sweeping	$ 6,049	$ 407	$ 451	$ 15,079	$ 754
Urban Stream Restoration	$ 64,500	$ 4,335	$ 891	$ 82,320	$ 4,116
Bioretention (New - Suburban)	$ 46,875	$ 3,151	$ 1,531	$ 77,495	$ 3,875
Bioretention (Retrofit - Highly Urban)	$ 183,750	$ 12,351	$ 1,531	$ 214,370	$ 10,719
Vegetated Open Channels	$ 24,000	$ 1,613	$ 610	$ 36,207	$ 1,810
Bioswale (New)	$ 42,000	$ 2,823	$ 931	$ 60,620	$ 3,031
Permeable Pavement w/o Sand, Veg. (New)	$ 239,580	$ 16,104	$ 2,188	$ 283,347	$ 14,167
Permeable Pavement w/ Sand, Veg. (New)	$ 335,412	$ 22,545	$ 3,060	$ 396,603	$ 19,830

[1]Includes routine annual maintenance costs, average annual intermittent maintenance costs, and county implementation costs.

30

http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Documents/King_Hagan_Stormwater%20Cost%20Report%20to%20MDE_Final%20Draft_12Oct2011.pdf

Appendix D – Estimate Costs by Drainage Areas

Federalsburg Master Stormwater Plan Drainage Areas						Total Stormwater BMP Est. Costs per Impervious Acre Treated			
Drainage Area ID	Drainage Area (ft^2)	Impervious Area (ft^2)	Permeable Area (ft^2)	Impervious Area (Acres)	Percent Impervious	Est. Costs Range (Over 20 Years)[31]		Average Annual Cost Range	
1	143,436	91,585	51,851	2.10	64%	$100,614	$438,995	$5,031	$21,950
2	9,767	1,705	8,062	0.04	17%	$1,873	$8,173	$94	$409
3	52,028	28,611	23,417	0.66	55%	$31,432	$137,141	$1,572	$6,857
4	15,867	3,797	12,070	0.09	24%	$4,171	$18,200	$209	$910
5	13,424	3,438	9,986	0.08	26%	$3,777	$16,479	$189	$824
6	14,142	2,743	11,399	0.06	19%	$3,013	$13,148	$151	$657
7	11,526	6,461	5,065	0.15	56%	$7,098	$30,970	$355	$1,548
8	1,203	692	511	0.02	58%	$760	$3,317	$38	$166
9	13,304	4,903	8,401	0.11	37%	$5,386	$23,502	$269	$1,175
10	67,561	32,459	35,102	0.75	48%	$35,659	$155,586	$1,783	$7,779
11	110,197	33,353	76,844	0.77	30%	$36,641	$159,871	$1,832	$7,994
12	33,731	17,323	16,408	0.40	51%	$19,031	$83,034	$952	$4,152
13	4,241	2,272	1,969	0.05	54%	$2,496	$10,890	$125	$545
14	12,313	4,156	8,157	0.10	34%	$4,566	$19,921	$228	$996
15	14,243	1,481	12,762	0.03	10%	$1,627	$7,099	$81	$355
16	26,059	15,875	10,184	0.36	61%	$17,440	$76,094	$872	$3,805
17	6,072	3,685	2,387	0.08	61%	$4,048	$17,663	$202	$883
18	78,609	28,991	49,618	0.67	37%	$31,849	$138,963	$1,592	$6,948
19	57,956	17,852	40,104	0.41	31%	$19,612	$85,570	$981	$4,279
20	11,975	7,733	4,242	0.18	65%	$8,495	$37,067	$425	$1,853
21	23,821	11,598	12,223	0.27	49%	$12,741	$55,593	$637	$2,780
22	30,273	11,864	18,409	0.27	39%	$13,034	$56,868	$652	$2,843
23	11,429	5,749	5,680	0.13	50%	$6,316	$27,557	$316	$1,378
24	24,846	12,428	12,418	0.29	50%	$13,653	$59,571	$683	$2,979
25	11,755	7,009	4,746	0.16	60%	$7,700	$33,596	$385	$1,680
26	10,264	4,639	5,625	0.11	45%	$5,096	$22,236	$255	$1,112
27	21,747	7,712	14,035	0.18	35%	$8,472	$36,966	$424	$1,848
28	26,073	12,993	13,080	0.30	50%	$14,274	$62,279	$714	$3,114

[31] Utilizing ranges developed in Appendix C

29	54,998	23,277	31,721	0.53	42%	$25,572	$111,574	$1,279	$5,579
30	58,427	19,652	38,775	0.45	34%	$21,589	$94,198	$1,079	$4,710
31	45,530	20,671	24,859	0.47	45%	$22,709	$99,082	$1,135	$4,954
32	26,925	11,375	15,550	0.26	42%	$12,496	$54,524	$625	$2,726
33	8,398	4,393	4,005	0.10	52%	$4,826	$21,057	$241	$1,053
34	22,865	12,551	10,314	0.29	55%	$13,788	$60,161	$689	$3,008
35	22,516	7,287	15,229	0.17	32%	$8,005	$34,929	$400	$1,746
36	56,598	20,821	35,777	0.48	37%	$22,874	$99,801	$1,144	$4,990
37	13,543	6,493	7,050	0.15	48%	$7,133	$31,123	$357	$1,556
38	21,791	10,139	11,652	0.23	47%	$11,139	$48,599	$557	$2,430
39	4,970	3,667	1,303	0.08	74%	$4,029	$17,577	$201	$879
40	41,707	12,987	28,720	0.30	31%	$14,267	$62,251	$713	$3,113
41	39,836	17,750	22,086	0.41	45%	$19,500	$85,081	$975	$4,254
42	28,256	17,179	11,077	0.39	61%	$18,873	$82,344	$944	$4,117
43	14,390	6,710	7,680	0.15	47%	$7,371	$32,163	$369	$1,608
44	2,939	1,677	1,262	0.04	57%	$1,842	$8,038	$92	$402
45	6,423	2,384	4,039	0.05	37%	$2,619	$11,427	$131	$571
46	53,561	30,350	23,211	0.70	57%	$33,342	$145,477	$1,667	$7,274
47	99,288	49,870	49,418	1.14	50%	$54,786	$239,042	$2,739	$11,952
48	33,737	18,446	15,291	0.42	55%	$20,264	$88,417	$1,013	$4,421
49	34,964	24,700	10,264	0.57	71%	$27,135	$118,395	$1,357	$5,920
50	3,678	3,100	578	0.07	84%	$3,406	$14,859	$170	$743
51	26,449	13,435	13,014	0.31	51%	$14,759	$64,398	$738	$3,220
52	4,278	1,600	2,678	0.04	37%	$1,758	$7,669	$88	$383
53	31,043	12,046	18,997	0.28	39%	$13,234	$57,740	$662	$2,887
54	26,574	13,650	12,924	0.31	51%	$14,996	$65,429	$750	$3,271
55	54,721	46,883	7,838	1.08	86%	$51,505	$224,725	$2,575	$11,236
56	82,645	74,321	8,324	1.71	90%	$81,648	$356,243	$4,082	$17,812
57	17,524	15,073	2,451	0.35	86%	$16,559	$72,250	$828	$3,612
58	3,944	2,017	1,927	0.05	51%	$2,216	$9,668	$111	$483
59	16,976	9,269	7,707	0.21	55%	$10,183	$44,429	$509	$2,221
60	6,825	5,087	1,738	0.12	75%	$5,588	$24,384	$279	$1,219
61	3,103	1,637	1,466	0.04	53%	$1,798	$7,847	$90	$392
62	11,812	10,515	1,297	0.24	89%	$11,552	$50,402	$578	$2,520
63	161,612	35,118	126,494	0.81	22%	$38,580	$168,331	$1,929	$8,417
64	25,253	17,225	8,028	0.40	68%	$18,923	$82,565	$946	$4,128
65	34,549	19,399	15,150	0.45	56%	$21,311	$92,985	$1,066	$4,649
66	43,381	40,298	3,083	0.93	93%	$44,271	$193,161	$2,214	$9,658
67	16,251	16,251	0	0.37	100%	$17,853	$77,896	$893	$3,895
68	2,872	2,850	22	0.07	99%	$3,131	$13,661	$157	$683
69	14,096	14,000	96	0.32	99%	$15,380	$67,106	$769	$3,355

70	104,472	48,200	56,272	1.11	46%	$52,952	$231,037	$2,648	$11,552
71	78,005	23,700	54,305	0.54	30%	$26,036	$113,601	$1,302	$5,680
72	67,758	16,223	51,535	0.37	24%	$17,822	$77,762	$891	$3,888
73	23,217	11,917	11,300	0.27	51%	$13,092	$57,122	$655	$2,856
74	7,489	3,173	4,316	0.07	42%	$3,486	$15,209	$174	$760
75	2,061	843	1,218	0.02	41%	$926	$4,041	$46	$202
76	9,280	6,300	2,980	0.14	68%	$6,921	$30,198	$346	$1,510
77	42,109	11,482	30,627	0.26	27%	$12,614	$55,037	$631	$2,752
78	17,126	10,000	7,126	0.23	58%	$10,986	$47,933	$549	$2,397
79	28,840	21,000	7,840	0.48	73%	$23,070	$100,659	$1,154	$5,033
80	11,659	8,850	2,809	0.20	76%	$9,722	$42,421	$486	$2,121
81	790	215	575	0.00	27%	$236	$1,031	$12	$52
82	39,973	28,000	11,973	0.64	70%	$30,760	$134,213	$1,538	$6,711
83	6,731	3,103	3,628	0.07	46%	$3,409	$14,874	$170	$744
84	70,386	30,104	40,282	0.69	43%	$33,072	$144,298	$1,654	$7,215
85	11,670	8,287	3,383	0.19	71%	$9,104	$39,722	$455	$1,986
86	5,417	3,680	1,737	0.08	68%	$4,043	$17,639	$202	$882
87	4,760	3,900	860	0.09	82%	$4,284	$18,694	$214	$935
88	14,874	13,730	1,144	0.32	92%	$15,084	$65,812	$754	$3,291
89	115,890	69,616	46,274	1.60	60%	$76,479	$333,691	$3,824	$16,685
90	89,872	32,832	57,040	0.75	37%	$36,069	$157,374	$1,803	$7,869
91	17,555	15,503	2,052	0.36	88%	$17,031	$74,311	$852	$3,716
92	121,719	59,096	62,623	1.36	49%	$64,922	$283,265	$3,246	$14,163
93	34,790	15,385	19,405	0.35	44%	$16,902	$73,745	$845	$3,687
94	72,217	31,541	40,676	0.72	44%	$34,650	$151,186	$1,733	$7,559
95	23,700	14,640	9,060	0.34	62%	$16,083	$70,174	$804	$3,509
96	433,875	200,584	233,291	4.60	46%	$220,358	$961,461	$11,018	$48,073
97	283,601	29,761	253,840	0.68	10%	$32,695	$142,654	$1,635	$7,133
98	8,434	6,310	2,124	0.14	75%	$6,932	$30,246	$347	$1,512
99	6,627	5,285	1,342	0.12	80%	$5,806	$25,333	$290	$1,267
100	4,647	3,355	1,292	0.08	72%	$3,686	$16,082	$184	$804
101	28,108	16,857	11,251	0.39	60%	$18,519	$80,801	$926	$4,040
102	4,581	1,903	2,678	0.04	42%	$2,091	$9,122	$105	$456
103	66,521	41,052	25,469	0.94	62%	$45,099	$196,775	$2,255	$9,839
104	12,419	7,713	4,706	0.18	62%	$8,473	$36,971	$424	$1,849
105	14,846	8,112	6,734	0.19	55%	$8,912	$38,883	$446	$1,944
106	2,251	1,752	499	0.04	78%	$1,925	$8,398	$96	$420
107	32,105	23,593	8,512	0.54	73%	$25,919	$113,089	$1,296	$5,654
108	17,397	12,402	4,995	0.28	71%	$13,625	$59,447	$681	$2,972
109	17,493	10,385	7,108	0.24	59%	$11,409	$49,778	$570	$2,489

110	24,185	12,763	11,422	0.29	53%	$14,021	$61,177	$701	$3,059
111	15,081	8,290	6,791	0.19	55%	$9,107	$39,737	$455	$1,987
112	217,753	46,154	171,599	1.06	21%	$50,704	$221,230	$2,535	$11,062
113	14,274	1,215	13,059	0.03	9%	$1,335	$5,824	$67	$291
114	11,527	1,002	10,525	0.02	9%	$1,101	$4,803	$55	$240
115	9,573	3,549	6,024	0.08	37%	$3,899	$17,011	$195	$851
116	9,367	4,554	4,813	0.10	49%	$5,003	$21,829	$250	$1,091
117	28,122	19,464	8,658	0.45	69%	$21,383	$93,297	$1,069	$4,665
118	1,987	1,243	744	0.03	63%	$1,366	$5,958	$68	$298
119	2,156	1,983	173	0.05	92%	$2,178	$9,505	$109	$475
120	4,515	2,058	2,457	0.05	46%	$2,261	$9,865	$113	$493
121	6,549	2,832	3,717	0.07	43%	$3,111	$13,575	$156	$679
122	8,384	4,275	4,109	0.10	51%	$4,696	$20,491	$235	$1,025
123	6,679	400	6,279	0.01	6%	$439	$1,917	$22	$96
124	73,827	47,542	26,285	1.09	64%	$52,229	$227,883	$2,611	$11,394
125	136,116	58,689	77,427	1.35	43%	$64,475	$281,314	$3,224	$14,066
126	3,265	2,635	630	0.06	81%	$2,895	$12,630	$145	$632
127	117,222	47,267	69,955	1.09	40%	$51,927	$226,565	$2,596	$11,328
128	30,369	9,859	20,510	0.23	32%	$10,831	$47,257	$542	$2,363
129	167,641	51,028	116,613	1.17	30%	$56,058	$244,593	$2,803	$12,230
130	41,434	12,925	28,509	0.30	31%	$14,199	$61,954	$710	$3,098
131	28,531	7,183	21,348	0.16	25%	$7,891	$34,430	$395	$1,722
132	33,943	16,325	17,618	0.37	48%	$17,934	$78,251	$897	$3,913
133	45,471	17,174	28,297	0.39	38%	$18,867	$82,320	$943	$4,116
134	120,923	21,764	99,159	0.50	18%	$23,910	$104,322	$1,195	$5,216
135	103,451	54,480	48,971	1.25	53%	$59,851	$261,139	$2,993	$13,057
136	34,800	6,855	27,945	0.16	20%	$7,531	$32,858	$377	$1,643
137	63,285	26,013	37,272	0.60	41%	$28,577	$124,688	$1,429	$6,234
138	84,718	38,037	46,681	0.87	45%	$41,787	$182,323	$2,089	$9,116
139	14,801	14,501	300	0.33	98%	$15,931	$69,508	$797	$3,475
140	20,181	19,416	765	0.45	96%	$21,330	$93,067	$1,067	$4,653
141	25,262	10,776	14,486	0.25	43%	$11,838	$51,653	$592	$2,583
142	5,607	3,058	2,549	0.07	55%	$3,359	$14,658	$168	$733
143	96,435	6,116	90,319	0.14	6%	$6,719	$29,316	$336	$1,466
144	51,957	17,637	34,320	0.40	34%	$19,376	$84,540	$969	$4,227
145	415	182	233	0.00	44%	$200	$872	$10	$44
146	39,732	14,635	25,097	0.34	37%	$16,078	$70,150	$804	$3,508
147	39,442	12,669	26,773	0.29	32%	$13,918	$60,726	$696	$3,036
148	26,909	10,648	16,261	0.24	40%	$11,698	$51,039	$585	$2,552
149	11,527	7,556	3,971	0.17	66%	$8,301	$36,218	$415	$1,811

150	28,235	21,013	7,222	0.48	74%	$23,085	$100,722	$1,154	$5,036
151	587	238	349	0.01	41%	$261	$1,141	$13	$57
152	2,393	764	1,629	0.02	32%	$839	$3,662	$42	$183
153	26,081	19,549	6,532	0.45	75%	$21,476	$93,704	$1,074	$4,685
154	21,811	15,773	6,038	0.36	72%	$17,328	$75,605	$866	$3,780
155	22,886	20,662	2,224	0.47	90%	$22,699	$99,039	$1,135	$4,952
156	21,482	16,929	4,553	0.39	79%	$18,598	$81,146	$930	$4,057
157	36,515	31,716	4,799	0.73	87%	$34,843	$152,025	$1,742	$7,601
158	57,922	26,082	31,840	0.60	45%	$28,653	$125,019	$1,433	$6,251
159	29,072	13,246	15,826	0.30	46%	$14,552	$63,492	$728	$3,175
160	11,639	7,104	4,535	0.16	61%	$7,804	$34,052	$390	$1,703
161	80,289	20,126	60,163	0.46	25%	$22,110	$96,470	$1,106	$4,824
162	63,621	12,016	51,605	0.28	19%	$13,201	$57,596	$660	$2,880
163	40,779	18,634	22,145	0.43	46%	$20,471	$89,318	$1,024	$4,466
164	56,775	24,711	32,064	0.57	44%	$27,147	$118,447	$1,357	$5,922
165	9,944	5,428	4,516	0.12	55%	$5,963	$26,018	$298	$1,301
166	20,197	17,347	2,850	0.40	86%	$19,057	$83,150	$953	$4,157
167	39,741	23,783	15,958	0.55	60%	$26,128	$113,999	$1,306	$5,700
168	63,937	12,794	51,143	0.29	20%	$14,055	$61,326	$703	$3,066
169	9,140	7,257	1,883	0.17	79%	$7,972	$34,785	$399	$1,739
170	5,361	3,890	1,471	0.09	73%	$4,273	$18,646	$214	$932
171	4,810	3,765	1,045	0.09	78%	$4,136	$18,047	$207	$902
172	6,304	3,247	3,057	0.07	52%	$3,567	$15,564	$178	$778
173	21,401	11,703	9,698	0.27	55%	$12,857	$56,096	$643	$2,805
174	10,298	5,139	5,159	0.12	50%	$5,646	$24,633	$282	$1,232
175	17,448	7,458	9,990	0.17	43%	$8,193	$35,748	$410	$1,787
176	3,339	2,941	398	0.07	88%	$3,231	$14,097	$162	$705
177	4,256	3,504	752	0.08	82%	$3,849	$16,796	$192	$840
178	3,805	3,805	0	0.09	100%	$4,180	$18,239	$209	$912
179	1,924	747	1,177	0.02	39%	$821	$3,581	$41	$179
180	261,187	100,542	160,645	2.31	38%	$110,454	$481,929	$5,523	$24,096
181	59,901	59,901	0	1.38	100%	$65,806	$287,124	$3,290	$14,356
182	13,939	13,939	0	0.32	100%	$15,313	$66,814	$766	$3,341
183	21,286	21,286	0	0.49	100%	$23,384	$102,030	$1,169	$5,102
184	31,314	31,314	0	0.72	100%	$34,401	$150,098	$1,720	$7,505
185	9,432	9,432	0	0.22	100%	$10,362	$45,210	$518	$2,261
186	96,572	81,316	15,256	1.87	84%	$89,332	$389,773	$4,467	$19,489
187	56,047	44,735	11,312	1.03	80%	$49,145	$214,429	$2,457	$10,721
188	35,982	5,579	30,403	0.13	16%	$6,129	$26,742	$306	$1,337
189	142,326	47,754	94,572	1.10	34%	$52,462	$228,900	$2,623	$11,445
190	168,694	49,431	119,26	1.13	29%	$54,304	$236,938	$2,715	$11,847

			3						
191	302,017	117,082	184,935	2.69	39%	$128,624	$561,210	$6,431	$28,061
192	16,689	9,712	6,977	0.22	58%	$10,669	$46,553	$533	$2,328
193	47,228	25,017	22,211	0.57	53%	$27,483	$119,914	$1,374	$5,996
194	142,470	7,181	135,289	0.16	5%	$7,889	$34,421	$394	$1,721
195	23,733	5,156	18,577	0.12	22%	$5,664	$24,714	$283	$1,236
196	39,020	14,598	24,422	0.34	37%	$16,037	$69,973	$802	$3,499
197	242,208	120,996	121,212	2.78	50%	$132,924	$579,971	$6,646	$28,999
198	249,538	45,942	203,596	1.05	18%	$50,471	$220,214	$2,524	$11,011
199	144,892	66,807	78,085	1.53	46%	$73,393	$320,226	$3,670	$16,011