NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

NPDES Permit No. MD0068322
State Discharge Permit No. 00-DP-3318

ANNUAL UPDATE NUMBER 19

Submitted to:

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HOWARD COUNTY, MARYLAND
NPDES PERMIT NO. MD0068322/STATE DISCHARGE PERMIT NO. 00-DP-3318
NPDES - ANNUAL UPDATE NUMBER 19

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LIST OF ABBREVIATIONS

There are many instances throughout this report where organizations or phrases are abbreviated. To assist the reader, the following list of frequently used abbreviations and their meanings is included:

BMP	Best Management Practice
BOH	Bureau of Highways
CSO	Combined (sanitary and storm) sewer overflow
DNR	Department of Natural Resources
DPZ	Department of Planning and Zoning
DPW	Department of Public Works
DRP	Department of Recreation and Parks
EMC(s)	Event Mean Concentrations
EQIP	Environmental Quality Improvement Program
FEMA	Federal Emergency Management Agency
FHT	Font Hill Tributary
FY	Fiscal Year
GIS	Geographic Information System
HSCD	Howard Soil Conservation District
MDE	Maryland Department of the Environment
MEMA	Maryland Emergency Management Agency
MNCPPC	Maryland National Capital Park and Planning Commission
MPEA	Middle Patuxent Environmental Area
MS4	Municipal separate storm sewer system
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PPP	Pollution Prevention Plan
SCA	Stream Corridor Assessment
SDPs	Site Development Plans
SIC	Standard Industrial Classification
SSO	Sanitary sewer overflow
SWM	Stormwater management
SWPPP	Stormwater Pollution Prevention Plan
SWMD	Storm Water Management Division
TAC	Technical Advisory Committee
TPH	Total petroleum hydrocarbons
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WHIP	Wildlife Habitat Incentives Program
WMA	Water Management Administration
WRAS	Watershed Restoration Action Strategy
WSSC	Washington Suburban Sanitary Commission
WTM	Watershed Treatment Model

SECTION I. INTRODUCTION

A. Background

Since passage of the Federal Water Pollution Control Act Amendments of 1972, subsequent amendments have increasingly emphasized the quality control of stormwater runoff. The most recent revision, the Water Quality Act of 1987, establishes permit requirements for both municipal separate storm sewer systems (MS4s) and stormwater discharges associated with industrial discharges. Section 402(p) of the Act requires phased permit applications, compliance requirements, and deadlines for application submission and approval.

On November 16, 1990, the final National Pollutant Discharge Elimination System (NPDES) Permit Application Regulations for Storm Water Discharges were published in the *Federal Register*. The Regulations establish permit conditions for large (serving populations greater than 250,000) and medium (serving populations greater than 100,000 but less than 250,000) MS4s. Included are requirements to effectively prohibit non-stormwater discharges into storm sewers and controls to reduce the discharge of pollutants to the maximum extent practicable. The Regulations also require NPDES permits for stormwater discharges associated with certain industrial activities.

The U.S. Environmental Protection Agency (USEPA) has delegated review and permitting authority for Maryland's large and medium municipalities to the Maryland Department of the Environment (MDE). Within the MDE, the Water Management Administration (WMA) is responsible for issuing permits to designated municipalities.

B. Howard County, Maryland

Howard County referred to as "the County", with January 2014 population of 299,944 per Howard County Department of Planning and Zoning (DPZ) Division of Research population data, is one of five medium and five large jurisdictions in Maryland that is regulated by a MS4 Permit. Additionally, the Maryland State Highway Administration also is under permit. Howard County's first permit, (MS-HO-95-008, which was subsequently renumbered to MD0068322, 99-DP-3318), went into effect on April 17, 1995 and expired on April 17, 2000. During this period, Howard County undertook an extensive effort to improve Maryland's water quality and became a state and national leader in the control of stormwater. Howard County's second permit, (Number MD0068322, 00-DP-3318), went into effect on June 15, 2000 and expired on June 15, 2005. This permit included conditions that reflected Howard County's progress toward stormwater management (SWM) program implementation under its NPDES MS4 permit. The County is now under its third permit (Number MD0068322, 00-DP-3318), which went into effect on June 20, 2005 and was to expire on June 20, 2010. Due to a delay in the issuance of the County's fourth permit, the County will continue to operate under its third permit per MDE until the fourth permit is issued. The conditions of the third permit are similar to

the second permit. As required by the conditions of the permit, the County must prepare Annual Updates to report on the progress made during the preceding permit year.

C. Annual Update Number 19

Annual Update Number 19 covers the nineteenth permit year, June 21, 2013 through June 20, 2014, as well as information through the end of the County's fiscal year, which ended June 30, 2014. Information is presented in the following ten sections (note that the report section title below is followed by the Permit Section Reference in parentheses):

Section II. Permit Administration (Part III.A.) and Legal Authority (Part III.B.)

Section III. Source Identification (Part III.C.)

Section IV. Discharge Characterization (Part III.D.)

Section V. Management Programs (Part III.E.)

Section VI. Watershed Assessment and Planning (Part III.F.)

Section VII. Watershed Restoration (Part III.G.)

Section VIII. Assessment of Controls (Part III.H.)

Section IX. Program Funding (Part III.I.)

Section X. Total Maximum Daily Loads (Part III.J.)

Section XI. Special Programmatic Conditions (Part V.)

Each section generally begins with a brief introduction followed by the permit conditions, which are denoted in bold italics. Following each permit condition is a description of the progress made towards meeting the permit conditions within the annual update permit year. (In some cases, the information covers a period different than the period 6/21/13 through 6/20/14. For example, some data results are compiled for a fiscal year or a calendar year. The reporting period is pointed out when appropriate.) In some instances, a third section follows that contains additional information or a status report on programs not specifically defined in the permit conditions.

SECTION II. PERMIT ADMINISTRATION AND LEGAL AUTHORITY

A. Introduction

The municipal NPDES regulations require Howard County to provide contact information for all personnel responsible for compliance with this permit. The regulations also require the County to have and maintain adequate legal authority to address water quality issues associated with stormwater discharges, prohibit illicit connections, and control spills and illegal dumping.

B. Permit Conditions

Permit Administration

Howard County shall designate an individual to act as liaison with the Maryland Department of the Environment (MDE) and provide the coordinator's name, title, address, phone number, and email address. Additionally, the County shall submit to MDE an organizational chart detailing personnel and groups responsible for major National Pollutant Discharge Elimination System (NPDES) program tasks. MDE shall be notified promptly and in subsequent annual reports of any changes in personnel or organization relative to NPDES program tasks.

Annual Update Number 19 Status

The County has included the current organizational information on the CD included as Attachment A in Section XII of this Annual Report.

Legal Authority

Adequate legal authority shall be maintained in accordance with NPDES regulations 40 CFR 122.26(d)(2)(i) throughout the term of this permit. In the event that any provision of its legal authority is found to be invalid, the County shall make the necessary changes to maintain adequate legal authority.

Annual Update Number 19 Status

The County previously submitted a certification from the County Attorney to MDE, which stated that the County possesses the authority to directly perform the activities described in 40 CFR 122.26(d)(2)(i) and the NPDES permit, specifically, the County Office of Law has certified that the laws of Howard County, Maryland provide adequate legal authority to carry out Howard County's NPDES Permit for Operators of MS4 programs. The legal authority is adequate to implement programs that control the quality as well as the quantity of water that is discharged through its storm sewer system.

SECTION III. SOURCE IDENTIFICATION

A. Introduction

The County is required to continue to identify sources of pollutants in stormwater runoff and link these sources to specific water quality impacts on a watershed-by-watershed basis. Pollutant source identification databases are to be used to define control measures that effectively improve stormwater quality and develop methodologies for long-term decision-making.

Howard County must also submit databases that identify and describe all major outfalls within the County as required by the USEPA NPDES regulations and MDE permit requirements. Additionally, the County must provide any information on new sources and must submit SWM facility construction completion data.

B. Permit Conditions

Sources of pollutants in stormwater runoff shall be identified and linked to specific water quality impacts on a watershed basis. This process shall be used to develop watershed restoration plans that effectively improve water quality. The following information shall be submitted in geographic information system (GIS) format with associated tables as required in PART IV of this permit:

1. ***Storm drain system: major outfalls, inlets, and associated drainage areas;***

2. ***Urban best management practices (BMP): stormwater management facility data including locations and delineated drainage areas;***

3. ***Impervious surfaces: delineated controlled and uncontrolled impervious areas;***

4. ***Monitoring locations: locations established for chemical, biological, and physical monitoring of watershed restoration efforts and the 2000 Maryland Stormwater Design Manual or other innovative stormwater management technologies approved by MDE; and***

5. ***Watershed restoration: restoration project descriptions and locations.***

Annual Update Number 19 Status

An updated version of the County's GIS is included on the CD included in Section XII of this Annual Report. The following specifically addresses the five items noted above:

Storm Drain System

Digitizing efforts continued for storm drain systems and drainage areas to major storm drain outfalls. The County's priority is the digitization of all storm drain and drainage features. A secondary priority is the digitization of the remaining elements of the proposed County GIS. The County is continuously updating the GIS with newer plans. The drainage areas to each major outfall have been linked to their respective outfall pipes, which is a task that can facilitate the calculation of pollutant loads from major outfalls. The current GIS layer with major NPDES outfalls is provided on the enclosed CD as Database A. There are now 386 major NPDES outfalls in the County's GIS, an increase of seven from last year's Annual Report.

Urban Best Management Practices (BMP)

The County maintains two databases for inventorying the SWM best management practices (BMPs). One has been developed on a GIS system. Parallel with the GIS system, a database of BMPs has been developed for use in implementing the County's comprehensive BMP inspection program. This database provides more extensive information for each BMP and is the database reported on in this Annual Report. The County continued to update both databases and work towards synchronizing these two databases. The most updated inspection-based BMP database is included as Database B on the CD in Section XII of this annual report. A total of 4,354 BMPs are included in the submitted database. This is an increase from the 2,977 submitted in last year's annual report.

The increase represents previously existing BMPs that were inspected and had latitude/longitude coordinates added to the database for the first time. It also includes new BMPs that were "dedicated" in the past year. Dedication is the step in the land development process in Howard County where the County accepts new developments as complete and the construction inspection process is essentially ended. Developments are dedicated in whole – including roads, water and sewer lines, sidewalks, etc., as well as stormwater BMPs. Before dedication, a BMP may be anywhere from a just approved construction plan to currently functioning facility. Hence, some of the BMPs not reported in the attached BMP database include BMPs that may be performing a water quality function, but are not yet dedicated.

The increase is also attributed to the thorough review performed by the County of all approved development plans dated 2009 to the present. This review was performed in order to verify the accuracy of the County's BMP inventory and to provide the MDE and the USEPA Chesapeake Bay Program with a "Historical BMP Cleanup" for their use in developing a new watershed model for the Chesapeake Bay TMDL. A draft database of cleanup information was submitted to MDE on June 30, 2014. A finalized version of the cleanup information will be submitted in May 2015.

The permit requires that drainage areas be delineated to all BMPs in the County. A total of 2,290 delineated drainage areas are now in the County's GIS, which is being submitted as Database B. The difference between the total number of BMPs and the number of BMP drainage areas is attributable to BMPs such as dry wells, and other small single lot LID practices, where it is impractical to delineate a drainage area to such a localized BMP. At present the County has no plans for delineating drainage areas to each of these individual lot BMPs, but these BMPs are factored into the

pollutant removal computations discussed later in this Annual Report. A total of 4,247 drainage areas (2,290 delineated and 1,957 assumed) are in the pollutant loading model.

Impervious Surfaces

The County has updated the amount of impervious surfaces within the County and has further separated the impervious surfaces into controlled and uncontrolled areas. The results can be found in Database C. Impervious Surfaces.

Monitoring Locations

From 2006 to 2009 the County conducted watershed based monitoring relative to assessing watershed restoration initiatives in the Centennial Lake and Wilde Lake watersheds using chemical, biological and physical techniques. In 2010 the County continued monitoring restoration progress in the Wilde Lake watershed; however monitoring efforts related to the Centennial Lake watershed were transitioned to the Red Hill Branch subwatershed. During the previous permit period and with the approval of MDE the County discontinued its biological and physical monitoring relative to the *2000 Maryland Stormwater Manual* on a tributary to the Hammond Branch and shifted that monitoring effort to Rumsey Run, a tributary to Red Hill Branch. The locations of the chemical, biological, and physical monitoring sites are included in the GIS submitted on the CD provided in Section XII under Databases E, E.1. and E.2.

Watershed Restoration

The County continues to perform watershed restoration projects. Locations and descriptions on the projects are included in Section VII of this Annual Report and the GIS database submitted on the CD provided in Section XII under Database D. Some watershed restoration projects are specifically located in targeted watersheds and others are in response to immediate needs. All projects provide improvements to water quality. Of the projects listed, many have already been constructed and others are in various stages of design or construction.

C. Additional Issues Relative to Source Identification

The County's Office of Technology and Communications (OTC) continues to oversee and coordinate all Geospatial related operations within Howard County. Howard County acquired new orthophotography in the fall of 2013. This imagery was captured in spring 2013 by the State of Maryland. The County contracted out the capture of major buildings and driveways from the new imagery. The County has updated the remaining planimetric features in-house using the 2013:

- Parking Lots Paved
- Parking Lots Unpaved
- Road Edge
- Road Edge Unpaved
- Major Sidewalks
- Minor Sidewalks (Lines)
- Swimming Pools

- Sports Fields
- Trails/Pathways

The County also acquired Pictometry (oblique) Imagery in the Spring of 2013. The County plans to complete a Common Place data set update by the end of Summer 2014.

In Spring 2014 the State of Maryland flew orthophotography for Howard County again. The County should receive that imagery in the Fall of 2014 and again capture planimetric features.

OTC has also been working with the Storm Water Management Division (SWMD) on improving several housekeeping items for the County's MS4 data management. The first item is an improved BMP inspection database, which went live October 28, 2013. The second item is in progress, and is a geodatabase that will link our BMP inspection database to a spatial database that will include all other relevant NPDES data, including the Attachment A data. The third item is an improved database that will be used to store and manage data associated with the County's Illicit Discharge Detection and Elimination (IDDE) program. The work on the IDDE database is currently in the planning stages.

SECTION IV. DISCHARGE CHARACTERIZATION

A. Introduction

In previous permits Discharge Characterization covered Howard County's efforts to help MDE characterize the quality and quantity of stormwater discharges to its Municipal Separate Storm Sewer System (MS4) as required by the USEPA NPDES regulations and MDE permit requirements, through long-term (chemical, physical and biological) monitoring; the effectiveness of a SWM system constructed with the *2000 Maryland Stormwater Design Manual* (the Manual); and pollutant loading estimates (annual and seasonal) for major outfalls. The County's long-term sites were in the Font Hill neighborhood within the Little Patuxent River watershed and the evaluation of the effectiveness of the new SWM techniques was done on a tributary (Hammond Branch Tributary) within the Emerson Development.

B. Permit Conditions

Howard County and ten other municipalities in Maryland have been conducting discharge characterization monitoring since the early 1990s. From this expansive monitoring, a statewide database has been developed that includes hundreds of storms across numerous land uses. Summaries of this dataset and other research performed nationally effectively characterize stormwater runoff in Maryland for NPDES municipal stormwater purposes. These data shall be used by Howard County for guidance to improve stormwater management programs and develop watershed restoration projects. Monitoring required under this permit is now designed to assess the effectiveness of stormwater management programs and watershed restoration projects developed by the County. Details about this monitoring can be found in PART III. H (Assessment of Controls).

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The third generation permit essentially shifts the chemical, biological, and physical monitoring requirements and discussions to Assessment of Controls (Section VIII of the Annual Update). With concurrence by MDE, the County discontinued its monitoring program at the Font Hill sites during the eleventh permit year. Since the inception of the monitoring at the three individual Font Hill sites in 1998, little change had been observed in the sampling results and little change to the watershed characteristics had occurred or was expected to occur. Since the third generation permit stresses the need to monitor relative to watershed restoration project implementation, the County felt it appropriate to shift its monitoring sites to the Centennial, Wilde Lake, and/or Red Hill Branch watersheds since the three previous sites had served their purpose, but would provide no further insight into the Font Hill Tributary watershed. Further discussion of the new sites and protocols are provided in Section H. Assessment of Controls.

SECTION V. MANAGEMENT PROGRAMS

A. Introduction

A major component of the County's NPDES permit is the management programs. The main goal of the management programs is to provide a framework for achieving long-term NPDES permit conditions through the reduced discharge of pollutants to the municipal storm sewer system to the maximum extent practicable. The management programs build on many of the programs that are currently in place in Howard County.

B. Permit Conditions

The following management programs shall be implemented in all areas served by Howard County's municipal separate storm sewer system. These jurisdiction-wide programs are designed to control stormwater discharges to the maximum extent practicable and shall be maintained for the term of this permit. Additionally, these programs are to be integrated with other permit requirements to promote a comprehensive approach toward solving water quality problems. The County shall address any needed program improvements identified as a result of periodic evaluation by MDE and annual self-assessment.

1. <u>Stormwater Management</u>

An acceptable stormwater management program shall be maintained in accordance with the Environment Article, Title 4, Subtitle 2, Annotated Code of Maryland. At a minimum, the County shall:

a. Conduct preventative maintenance inspections of all stormwater management facilities at least on a triennial basis. Documentation identifying the facilities inspected, the number of maintenance inspections, follow-up inspections, the enforcement action(s) used to ensure compliance, the maintenance inspection schedules, and any other relevant information shall be submitted in the County's annual reports;

b. Implement the stormwater management design policies, principles, methods, and practices found in the 2000 Maryland Stormwater Design Manual or other innovative stormwater management technologies approved by MDE;

c. Track the progress toward implementing the 2000 Maryland Stormwater Design Manual or other innovative stormwater management technologies approved by MDE and report annually the modifications needed to address any programmatic problems; and

d. Maintain programmatic and implementation information according to the requirements established as part of MDE's triennial stormwater program review.

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While implementing the 2000 Maryland Stormwater Design Manual and providing applicable feedback to MDE on programmatic problems is a condition of the current NPDES permit, MDE has updated the Design Manual per the requirements set forth by the Stormwater Management Act of 2007. Therefore, the County is now implementing the current version of the Design Manual, including the 2009 revision for Environmental Site Design (ESD), and providing feedback on that version as necessary. The County has had no modifications to the guidelines and no programmatic problems to address.

Preventative Maintenance Inspections

Preventative maintenance inspections of County, Board of Education, and private SWM facilities were conducted throughout calendar year 2013 and through June 2014. All facilities are to be inspected on a triennial basis. A summary of the inspections is listed in Table 1. The SWMD has been fully responsible for SWM BMP inspections, since the 1998-1999 reporting period.

Table 1: Preventative Maintenance Inspections

Inspection Detail	Inspections Jan-2013 through June 2014
County Maintained BMPs	749
Board of Education Maintained BMPs	59
Privately Maintained BMPs	896
Residential ESD BMPs	11
Total	1715

** The inspection cycle for Board of Education Maintained BMPs begins in August of each year.*

There are currently 988 County maintained BMPs, 113 Board of Education BMPs, and 1,886 privately owned and maintained BMPs, for a total of 2,987 BMPs, which are inspected on a three-year cycle. In addition, there are approximately 1,367 individual residential lot environmental site design BMPs (e.g. rain gardens, drywells, rain barrels, etc.). Documented inspection of the residential ESD BMPs began in 2014.

The general procedure for the inspection of privately maintained facilities is to use the owner information in the BMP database developed by the County to give prior notification to the BMP owners of the County's intent to inspect their facility; perform the inspection; provide the owner a complete record of the results of the inspection, including deficiencies that need to be repaired; then follow up with the owner to ensure the necessary repairs are made within a reasonable time frame. The County

has developed an extensive component to the BMP database to allow tracking of the inspection and maintenance process in detail for each BMP inspected. The County has found that considerable follow-up is needed for owners that do not readily respond to initial inspection notifications and the results of the inspections with repairs. Further, several site visits may be required of County inspection staff to meet with BMP owners and their maintenance contractors to better explain the repairs needed and to follow up until the repairs are completed.

Where pipes or other in ground structures are of concern, but cannot be safely entered by an inspector, videos obtained from remote video cameras are used to identify problems with the facilities and create a video database of the County's SWM facilities. GPS locations are collected for all County, Board of Education, and private facilities and are used to supplement current GIS mapping.

2. Erosion and Sediment Control

An acceptable erosion and sediment control program shall be maintained in accordance with the Environment Article, Title 4, Subtitle 1, Annotated Code of Maryland. At a minimum, the County shall:

a. Address any needed program improvements identified during MDE's evaluation of the County's application for the delegation of erosion and sediment control enforcement authority;

b. At least three times per year, conduct "responsible personnel certification" classes to educate construction site operators regarding erosion and sediment control compliance. Program activity shall be recorded on MDE's "green card" database and submitted as required in PART IV. of this permit; and

c. Report quarterly, information regarding earth disturbances exceeding one acre or more. Quarters shall be based on calendar year and submittals shall be made within 30 days following each quarter. The information shall be specific to the permitting activity for the preceding three months.

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MDE completed their evaluation of the County's application for delegation of erosion and sediment control enforcement authority and sent the County a re-authorization letter on November 7, 2012. The delegation authority is effective through June 30, 2015.

Responsible Personnel Certification

Howard County offered five Responsible Personnel training classes between January 2013 and June 2014. The Erosion and Sediment Control (E&SC) Responsible Personnel Training Certification Databases for each class were submitted to MDE within two weeks after each class; however, a summary of this

information is also included as Database J in Section XII of this Annual Report. John Seefried, who is certified by MDE as an instructor, taught the courses. Roni Landis served as Program Coordinator. There are online classes offered by MDE however, Howard County may offer tutorial classes in response to the high demand for in-person classes. Typical attendees are those responsible for installation and maintenance of E&SC practices including builders, developers, contractors, and County personnel.

Quarterly report on earth disturbances > 1 acre

In the 2013 calendar year through June 2014, 156 sites were reported to the Construction Inspection Division as having more than one acre disturbed. The site disturbances ranged from one to 83.20 acres with a total of 903.27 acres disturbed in Howard County. The County submits the quarterly reports on earth disturbances of greater than one acre, directly to MDE. This information is also included as Database K in Section XII of this Annual Report.

3. Illicit Discharge Detection and Elimination

Howard County shall maintain an inspection and enforcement program, or other alternative methods approved by MDE, to ensure that all discharges to and from the municipal separate storm sewer system that are not composed entirely of stormwater are either permitted by MDE or eliminated. At a minimum, activities shall include:

a. Field screening at least 100 outfalls annually. Each outfall having a discharge shall be sampled using a chemical test kit;

b. Conducting routine surveys of commercial and industrial watersheds for discovering and eliminating pollutant sources;

c. Maintaining a program to address illegal dumping and spills;

d. Using appropriate enforcement procedures for investigating and eliminating illicit discharges, illegal dumping, and spills. Significant discharges shall be reported to MDE for enforcement and/or permitting; and

e. Reporting illicit discharge detection and elimination activities as specified in PART IV. of this permit. Annual reports shall include any requests and accompanying justifications for proposed modifications to the illicit discharge detection and elimination program.

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Howard County's illicit discharge program incorporates four programs to meet the objectives:

- Prevention Program
- Detection Program
- Removal and Compliance Program
- Program Management and Reporting

The County's Illicit Discharge Program emphasizes public outreach and includes appropriate procedures for the prevention, detection, and removal of illicit discharges to the County's storm sewer system. The County emphasizes prevention of illicit discharges for existing and future development, and implements procedures to detect illicit discharges and connections to the County storm sewer system by identification, priority targeting and investigation. The County will apply appropriate procedures to stop or remove illicit discharges and connections.

Illicit Discharge Inspections Database

The Howard County Illicit Discharge Detection and Elimination (IDDE) program implements procedures to detect illicit discharges and connections to the County storm sewer system by specifically targeting areas within the County, inspection and chemical testing of outfall and follow-up investigation of violations.

Howard County contractors performed 110 IDDE outfall inspections in 2013. The County performed 82 additional inspections. The majority of the outfalls were industrial or commercial land use. The program targets areas such as the Little Patuxent Watershed, the Route 1 corridor, and I-95 corridor. This year the Route 1 corridor was targeted as per permit recommendations.

A total of 78 discharges were found; 11 by the contractor and 67 by the County. Of the 78 violations, 15 were vehicle washing, 15 were dumpster leaks, 13 were cars leaking fluids, 12 were general wastewater discharges, four were general wash water, four were uncovered salt piles, and two were illicit connections. The remaining violations were related to trash and other types of spills. Information on the 2013 IDDE inspections is included as Database I included in Section XII of this Annual Report.

Vehicle/facility washing and dumpster juice/grease were considered to be the major causes of violations. The County has conducted follow-up investigations and resolution of all sites. MDE and the County are currently working toward an agreement to conduct chemical testing at one site in order to resolve what is thought to be an illicit connection at the site. The County had also issued a civil citation and fine to an industrial property owner for an illicit connection violation in 2013. This illicit connection has been identified and disconnected.

The County's procedure in dealing with illicit discharges is to send a Notice of Violation (NOV) to the companies or individuals responsible for the violation. This

NOV is accompanied by photos, and a field data sheet. The violators are asked to respond in writing within two weeks of the NOV with a plan for remediation. Follow-up phone calls, e-mails with photos, and/or site inspections are performed. All sites that had a violation the previous year are re-inspected for compliance.

In 2014, the Illicit Discharge program developed a brochure for general distribution to the public to provide education about the role that the County's Illicit4 Discharge Program plays in eliminating pollution entering our waterways. The brochure is available in County Offices and is mailed out to targeted audiences as part of the County's outreach program.

The County also utilizes an Illicit Discharge reporting form on its Storm Water Management website for public reporting of an illicit discharge. The web address is http://www.howardcountymd.gov/DisplayPrimary.aspx?ekfrm=530.

Complaints Database

In addition to annual IDDE field screening, the County SWMD maintains a complaint/inquiry database. During the 2013 calendar year through June 30, 2014 the County received 427 additional inquiries, complaints, or requests for information. These included concerns about erosion (8), flooding/ponding (77), waterway blockages (2), other/miscellaneous (19), and flood plain (311), and general information (10) requests.

4. County Property Management

Howard County shall identify all County-owned and municipal facilities requiring NPDES stormwater general permit coverage and submit Notices of Intent (NOI) to MDE for each. The status of pollution prevention plan development and implementation shall be submitted annually.

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The County has identified and listed County owned and municipal sites needing a permit below.

County Landfills

As required by the industrial NPDES discharge permits, Howard County DPW monitors surface discharge from groundwater treatment systems. The County maintains a General Industrial NPDES Discharge permits from MDE for New Cut and Carrs Mill landfills and an Individual Industrial NPDES Discharge permit with Stormwater for Alpha Ridge Landfill. Alpha Ridge Landfill is the only site under the NPDES permit that has stormwater requirements. The other two sites do not have stormwater requirements associated with their NPDES permits.

Alpha Ridge – The current State Discharge Permit #07-DP-3224, NPDES Permit #MD0067865, expires August 31, 2014. A renewal application for the NPDES permit was submitted in August 2012. The revised Individual Industrial Permit will

not include stormwater requirements and will require the site to meet NPDES 12SW requirements. Thus an NOI will be required six months after the Individual Industrial permit is renewed. The landfill is still active, but the majority of Howard County's solid waste is transferred out of state to Virginia. Alpha Ridge Landfill still buries a small amount of the overall waste generated within the County. The transfer station has been operational since September 2005. The installation of the groundwater remediation system was completed in 2000 and has been operating since that time. The Storm Water Pollution Prevention Plan (SWPPP) was most recently updated in May 2012 and includes inspections on a regular basis. The Bureau of Environmental Service's engineering technicians conduct these inspections.

General Permit for Stormwater Associated with Industrial Activities (12-SW)
Howard County has submitted NOIs to MDE for the seven county facilities covered under General Permit 12-SW. SWPPPs were developed for each of these sites and are currently in implementation.

- Cooksville Vehicle Maintenance Shop: The Spill Prevention Control and Countermeasure (SPCC) Plan for this site was updated in June 2014. Employees are trained annually on the SWPPP and the SPCCC, and inspections are conducted on a regular basis.
- Dayton Vehicle Maintenance Shop: The Spill Prevention Control and Countermeasure (SPCC) Plan for this site was updated in June 2014. Employees are trained annually on the SWPPP and the SPCCC, and inspections are conducted on a regular basis.
- Little Patuxent Water Reclamation Plant: The Spill Prevention Control and Countermeasure (SPCC) Plan for this site was updated in June 2014. Employees are trained annually on the SWPPP and the SPCCC, and inspections are conducted on a regular basis. See further discussion below in the section titled "County Waste Water Treatment Plant (LPWRP)".
- Mayfield Vehicle Maintenance Shop: The Spill Prevention Control and Countermeasure (SPCC) Plan for this site was updated in June 2014. Employees are trained annually on the SWPPP and the SPCCC, and inspections are conducted on a regular basis.
- Recreation and Parks Headquarters Vehicle Maintenance Shop: The Spill Prevention Control and Countermeasure (SPCC) Plan for this site was updated in June 2014. Employees are trained annually on the SWPPP and the SPCCC, and inspections are conducted on a regular basis.
- Ridge Road Vehicle Maintenance Shop: The Spill Prevention Control and Countermeasure (SPCC) Plan for this site was updated in June 2014. Employees are trained annually on the SWPPP and the SPCCC, and inspections are conducted on a regular basis.
- Bureau of Utilities Vehicle Maintenance Shop: The Spill Prevention Control and Countermeasure (SPCC) Plan for this site was updated in June 2014. Employees are trained annually on the SWPPP and the SPCC Plan, and inspections are conducted on a regular basis.

Park Equipment Maintenance Shops and Fueling Facilities

The MDE Wastewater Permits Program has agreed that the following park maintenance shops and fueling facilities are not required to apply for coverage under General Permit 12-SW. However, Howard County will continue to implement the BMPs identified in the previous SWPPPs at these sites.

- Cedar Lane Park Equipment Maintenance Shop
- Centennial Park Equipment Maintenance Shop
- Corridor Road Fueling Facility
- Rockburn Branch Park Equipment Maintenance Shop
- Savage Park Equipment Maintenance Shop
- Schooley Mill Equipment Maintenance Shop
- Western Regional Park Equipment Maintenance Shop

County Facility Wash Racks

In August 2011 a review of vehicle washing efforts at County fire stations, police stations, and several County parks identified the need for better treatment for vehicle wash water, in particular when vehicles are washed outside. The County has begun the design phase and approximately $2.5 million has been approved in the County's FY13 capital budget, and an additional $1.1 million has been approved for the FY14 capital budget, to cover the cost of design and construction to retrofit the existing facilities with the needed outdoor washing systems. As part of the design the County will harvest rainwater for use in vehicle washing operations. The County has completed a feasibility study and a preliminary design of all 14 locations.

County Waste Water Treatment Plant (LPWRP)

There were 4 spills reported to Maryland Department of the Environment (MDE) in 2013-2014.

On June 14, 2013 about 4000 gallons of septic waste from a manhole located near the Septiage Facility. The root cause was a blockage in the downstream lateral line that connects the manhole to the headworks of the Plant. No waterways were compromised. Lime was applied to the ground for neutralization.

On March 6, 2014 an underground waste activated sludge line leading to the dewatering building. The approximate volume loss was 10,000 gallons. Some run off did enter the Guilford Run and directly to the Little Patuxent River. The Health Department was notified and signage was posted. The root cause was a circumferential break in the waste line. Lime was dispersed on the ground around the affected areas and the break was fixed.

On March 30, 2014, the Denitrification Filter Complex was overflowing secondary effluent at a loss of 377,000 gallons. Some run off did enter into the Guilford Run and directly into the Little Patuxent River. The Howard County Health Department was notified and signage placed along the affected waterways. The root was the result of the extended area wide rain event to which heavy water flows impacted the filtering operations of the Plant. The flow was diverted to the sand filters and disinfection was applied prior to discharge into the Little Patuxent River.

On April 30, 2014, the Dentrification Filter Complex was overflowing secondary effluent at a loss of 100,000 gallons. Some run off did enter into the Guilford Run and directly into the Little Patuxent River. The Howard County Health Department was notified and signage placed along the affected waterways. The root was the result of the extended area wide rain event to which heavy water flows impacted the filtering operations of the Plant. The flow was diverted to the sand filters and disinfection was applied prior to discharge into the Little Patuxent River.

Environmental Stewardship
In partnership with the National Security Agency (NSA) and Howard County LPWRP, highly treated wastewater will be diverted and utilized as cooling water for national security technology. Much of the water will be evaporated during the cooling process.

A carbon-neutral power backup system was created at the Plant, which includes the combination of solar panels and diesel generators to ensure the Plant operates in all weather conditions and avoids potential overflows.

Annual Inspections & SWPPP Training
Plant inspections are completed on a monthly schedule. Any significant findings are reported to the Bureau of Environmental Services with corrective actions and follow-up correspondence. Each inspection is scanned and saved at LPWRP.

The annual SWPPP & SPCC training was completed in April of 2013 and 2014 for all Plant personnel.

5. Road Maintenance

Howard County shall maintain its plan to reduce pollutants associated with road maintenance activities. At a minimum, an annual progress report shall be submitted that documents the following activities:

a. Street sweeping;

b. Inlet cleaning;

c. Reducing the use of pesticides, herbicides, fertilizers, and other pollutants associated with roadside vegetation management through the use of integrated pest management (IPM); and

d. Controlling the overuse of winter weather deicing materials through continual testing and improvement of materials, equipment calibration, employee training, and effective decision-making.

Annual Update Number 19 Status
The Bureau of Highways (BOH) is responsible for the maintenance and repair of County-owned roadways (1,116 miles), bridges (158), and street trees (approximately 225,000). Some of the areas of operation that the BOH has focused on during the current permit year include:

- The County has continued performing street cleaning with the assistance of a private contractor. Street sweeping continued along approximately 1,376 curb miles on County roadways. Between January 1, 2013 and June 30, 2014, the County collected approximately 550 tons of street debris via street sweeping.
- The BOH continues studying and testing new paving mixes. The County is using "performance-driven" paving (rather than material-driven) specifications and implemented new Federal specifications for "Super Pave."
- The County has implemented the use of covered areas for vehicle storage, topsoil, and sand.
- The County cleans storm drain inlets as needed. In the fall, the County removes leaf litter from storm drain inlets.
- The BOH continues to utilize a contractor to assist in more frequent cleanings of Oil Grit Separators.
- The BOH continues to utilize and update AVL and GIS technology to record where and when de-icing chemicals were applied on county roads during winter storm events. This minimizes the possibility of inadvertent multiple applications of de-icing chemicals.
- The County continues to use more open-section highway designs and reduced roadway widths (reduced by two to three feet). These design techniques provide grass swale filters for roadway runoff and reduce impervious area associated with Howard County roadways.
- The County continues to reduce the amount of pesticides and herbicides used. Both the BOH and DRP reduced the gallons of chemicals used to treat County sites. BOH uses sprayer equipment for spot application and continues to use a closed system for treating trees called Mauget Micro-Injection system. With the closed system, chemicals are injected directly into the tree, minimizing or eliminating pollutants contaminating the landscape and, potentially, runoff to streams. DRP used pesticides and herbicides to control thistle.

Adopt-A-Road Program/Trash Collection

The County "Adopt-A-Road" program continues to be very successful. Table 2 Adopt-A-Road Summary below, provides a breakdown of the different zones for the Adopt-A-Road program from February 1, 2013 to March 4, 2014 that details the amount of trash collected, the mileage of road adopted, and the number of roads adopted by zones. A flyer about the Adopt-A-Road program can be found on the County's website.

Table 2: Adopt-A-Road Summary

Zone	Trash Bags Collected	Number of Roads Adopted	Estimated Miles
Central	646	45	40
East	620	40	50
West	226	26	35
Total	**1492**	**111**	**125**

Integrated Pest Management and Reduction
Howard County continues to use a closed system injection for both IPM and fertilization, using the Mauget injection system. At the present time the County is using Fungisol, Imicide, and Inject-A-Cide for IPM. The County is still using Inject-A-Min Iron - zinc stemix for fertilization. In an effort to be proactive on the Emerald Ash Borer, BOH has initiated a program for its Ash street trees. A combination of removal and replacement and inoculation are being implemented. BOH is using contractors for application of Emanectin Benzoate and Imidacloprid, for inoculation.

6. Public Education

A public education and outreach program shall be maintained to reduce stormwater pollutants. Outreach efforts are to be integrated with all aspects of the County's activities. These efforts are to be documented and summarized in each annual report. At a minimum, the County shall:

a. Continue to publicize a compliance hotline for the public reporting of suspected illicit discharges, illegal dumping, and spills.

b. Provide information regarding the following water quality issues to the general public:
- ***i. Water conservation;***
- ***ii. Stormwater management facility maintenance;***
- ***iii. Erosion and sediment control;***
- ***iv. Household hazardous waste;***
- ***v. Lawn care and landscape management (e.g., the proper use of herbicides, pesticides, and fertilizers, ice control and snow removal, cash for clippers, etc.);***
- ***vi. Litter control, recycling, and composting;***
- ***vii. Car care, mass transit, and alternative transportation;***
- ***viii. Private well and septic system management; and***
- ***ix. Pet waste management.***

c. Provide information regarding the following water quality issues to the regulated community when requested:
- ***i. NPDES permitting requirements;***
- ***ii. Pollution prevention plan development;***
- ***iii. Proper housekeeping; and***
- ***iv. Spill prevention and response.***

Annual Update Number 19 Status

Public education and outreach occurs throughout the County and is conducted by various agencies. The following is a summary of educational activities and outreach, which occurred throughout the current permit year:

Stormwater Management Division (SWMD) Education Programs

School Outreach

The SWMD continues to provide workshops to the schools and businesses in Howard County. Schools participate in County-sponsored programs and workshops designed to increase their awareness of water quality issues.

During this permit period the County met with one elementary school, one middle school, and one high school to discuss stormwater management and water quality as it applied to their particular school sites as well as the County. The County hopes to do more water quality projects at school sites, which will provide more opportunities for student outreach and involvement.

Howard Environmental Education Resource Organization (HEERO)

A resource group has been formed and is currently being led by the Howard County Public School elementary school environmental education coordinator. The group's goals are to promote and coordinate the various opportunities throughout the County for environmental education and awareness. HEERO members include County staff as well as local environmental interests and environmental non-profit organizations. The SWMD and DRP both have representatives in this group. While no meetings were held during the current permit term, the group still exists.

Other Educational Outreach Initiatives

The SWMD as well as DRP speak at the Howard County Legacy Leadership Institute for the Environment (HoLLIE), speak at Master Gardener training events, and are part of the Howard County Watershed Forum. The result of the forum was the first Howard County Watershed Steward Academy class in 2012. SWMD personnel were speakers and led a field walk as part of the Watershed Stewards Academy class. During the current permit term, the SWMD lead a Master Naturalist field walk and discussion on the benefits of stormwater management.

The SWMD also has a booth at the annual GreenFest and participated in a webinar for Elkridge Landing Middle School to help promote water quality and stormwater management. The result of all of these efforts is to create a more educated county citizen who will contribute to the improvement of water quality in Howard County and in the Chesapeake Bay.

Recycling Division Programs

Howard County recyclers turned in yet another strong performance during 2013 by recycling and diverting an estimated 47.9 percent of the County's trash from disposal. (Approximately 43.9 percent of the County's waste was recycled, and the State credited the County an additional 4 percent to its rate for its waste reduction efforts such as promoting backyard composting for a total recycling and diversion rate of 47.9 percent.) The County's recycling rate effectively more than doubles the State's mandated annual rate of 20 percent. The State of Maryland has not yet

released the official numbers for 2013; however, they are estimated to be close to the 2012 numbers.

Residential recycling includes curbside recycling and condominium recycling, and the Alpha Ridge Landfill Resident's Convenience Center. Special recycling projects include electronics recycling (or eCycling), Christmas tree recycling, carpet, backyard composting, trash and recycling route surveys, and education and outreach programs. More than 694 tons of electronics were recycled during 2013. More than 475 free backyard compost bins and kits were distributed in 2013 to County residents.

Recycling and Waste Reduction Division Public Outreach

During 2013, the Recycling Division distributed more than 70,000 pieces of recycling and waste reduction literature to households and businesses. In addition, material was available through local libraries, public buildings and events. Outreach to businesses and residents were also achieved through the County's website, www.HowardCountyRecycles.org.

The County provides recycling and waste reduction education and outreach through:

- Print ads in the Baltimore Sun, Generations, The Howard County Black Book, The Parent's Guide to Howard County, and Patuxent Publishing Newspapers, which includes The Howard County Times, The Columbia Flier and The Laurel Leader.
- A timely recycling message printed on the back of the County's tax envelopes.
- Promotional items that included jar openers made out of recycled tires, pencils made out recycled newspaper, magnetic memo clips made out of recycled plastic and reusable bags made out of recycled water bottles.
- Direct mailings of postcards with information about changes to the recycling program; including the new holiday slide schedule for curbside collection.
- Rolling advertisements on the Howard Transit and Paratransit vehicles.
- Free-standing vertical signs at the Columbia Mall.
- Windowed recycling carts displayed at libraries and County buildings to highlight the many items that can be recycled.
- Distribution of recycling and waste reduction literature at library branches, schools, County buildings, village centers, senior centers and private residences.
- Production of an easy Compost Guide to be handed out with the County's free compost bins.
- Traveling to community events with a recycling exhibit and educational materials, such as GreenFest, the 50+ Expo, Wine in the Woods, Triathlons and school festivals.
- Performing outreach activities at schools, community organizations, senior centers and professional organizations.
- Outreach through social media such as Twitter, using the twitter name, @HoCoRecycles
- A postcard providing positive feedback was sent to participants in the food scrap recycling program.

Outreach to Business Communities

The Business Recycling Program has been providing technical support to the Howard County Chamber of Commerce business collection co-op. A new section on specialty recycling along with business recycling options has been posted on the web-site.

Outreach to Students and Schools

The County's Recycling Coordinators continued distribution of school recycling information through school programs, brochures and visually appealing lunchroom recycling posters. Programs ranging from individual classroom talks and short lunchroom presentations to school-wide assemblies were conducted for students as young as 2 years old. The County is maintaining its presence in schools that has been established over the past four years.

Outreach and education was also provided outside of the school. Presentations and tours of the Alpha Ridge Landfill were provided to multiple Boy Scout and Girl Scout troops to enable them to earn merit badges. Active presentations, which included a hands-on relay game, were available for summer camps.

In addition to outreach, the School Board and the County continued to collaborate on a contract for front-end trash and recycling collection service. This new contract provides all County buildings, school and participating Condominium properties with consistent weekly service at a cost-competitive price.

Curbside Food Scrap Collection Pilot

The County has expanded its food scrap collection pilot to the Clarksville area with an additional 1100 homes participating along with the 1040 homes in the eastern Ellicott City and Elkridge. Collection is once weekly with a choice of two sizes of collection containers. The County has also opened a pilot scale aerobic composting facility at the Alpha Ridge Landfill that can accommodate food scraps as well as yard trim. This is the first facility of its kind being operated by a County government in the State of Maryland.

Department of Recreation and Parks (DRP)

Stream and Pond Cleanup Program

Since 1996, the Department has actively recruited volunteers and tracked their efforts removing trash and other debris from Howard County's waterways. In 2013, we had 78 people spend 232 hours in this program. Volunteers collected 1,201 pounds of trash and an additional 1,675 pounds of bottles, cans, tires and scrap metal were recycled. Since 1996 we have had 2,376 people spend 5,161 hours cleaning our waterways. These figures reflect the Department's participation in the Baltimore regional stream and watershed clean-up effort, "Project Clean Stream". This was the fifth year the Department participated in the International Coastal Clean-up providing one location. Since 2000, 37.39 miles of streams/rivers and 102.2 acres of lakes and ponds areas have been cleaned. Trash collected since 2000 totals 28,932 pounds with an additional 12,326 pounds of trash recycled!

The Bark Ranger Program

In the summer of 2013, the Park Rangers of Howard County Recreation and Parks implemented a new initiative program. “Bark Ranger” encourages patrons to clean up after their pets, more specifically dogs, and to use a leash while visiting a Howard County park. Dog feces not picked up is unsightly and negatively impacts our ground and surface water, and attracts rodents. It is important to keep your dog on a leash. Not only is it the law but it is being considerate to the other park patrons. We encourage you and your pooch to take the pledge and be committed to protecting our environment. Currently the program has 1,400 participants signed up that have taken the Bark Ranger pledge:

My Human and I care about our environment and the safety of others around us.
We pledge to do our "doodie" and clean up after ourselves.
I will remain on my leash by my Human's side at all times.

As part of the Bark Ranger pledge, participants receive a Bark Ranger cloth bandanna and a plastic bone which contains baggies to remove pet excrement. Through this initiative, visitors of Howard County Recreation and Parks facilities are made aware of the negative environmental impact that pet feces have. Through this interpretation, those who participate, are appreciated for the “dirty jobs” of pet-ownership and rewarded with a small token.

Forest Conservation/Reforestation Program

This is an exciting example of the private and public sectors working together. The program started in 1996 and provides developers, who do not have the room to do their forest conservation "on-site", the option to pay a fee-in-lieu to the County. A portion of this fee is passed down to the Department of Recreation & Parks, Natural Resources Division to perform the mitigation. The Department, which manages over 8,000 acres, determines where the trees are most needed. Our first priority is planting and enhancing riparian forest buffers. In 2013, we planted and enhanced a total of 14.26 acres of new forests. To date (1996-2013), a total of 378.15 acres have been planted through this program. This translates to 15.18 miles of stream buffer plantings and 123,556 plants**.**

Forest Conservation Easement Inspections

The Department of Recreation & Parks, Natural Resources Division is responsible for the inspection of any forest conservation easement established under a forest conservation agreement between a developer and the County pursuant to the Forest Conservation Act of Howard County. The inspection process forces developer compliance with County forest conservation requirements and includes the verification of easement boundaries, location of protective signage, identification of encroachments or deficiencies and the assessment of reforestation survival and overall forest health. Through December 2013, a total of 1,021 projects creating or modifying more than 5,648 acres of forest conservation easements have been digitized into the County’s forest conservation GIS layer, which is essential in identifying easement boundaries in the field in the absence of required signage. From January 2009 through December 2013, a total of 730 forest conservation inspections were performed and only 389 inspections (53.3%) found projects to be in compliance with their project-specific “Forest Conservation Plan”.

	2009	2010	2011	2012	2013	Total
Inspections	223	147	116	129	115	730
Passing	108	81	63	72	65	389
Percentage	48.4%	55.1%	54.3%	55.8%	56.5%	53.3%

The combination of forest conservation easement inspections and post-development enforcement allows the County to protect the forest conservation easements that currently exist within Howard County, Maryland. The inspection program ensures that developers follow requirements and best management practices. Regular inspections guarantee viable forests for the future that will continue to provide habitat, air and water quality and other environmental benefits. To date, 146 post-development enforcement actions have been undertaken by the County against violators of the Forest Conservation Act of Howard County. Post-development enforcement actions ensure that those who inherit or occupy property encumbered by or adjacent to easements comply with applicable forest conservation regulations following developer compliance.

Post-Development Landscaping Inspections

The Department of Recreation & Parks, Natural Resources Division is responsible for the inspection of any perimeter, parking lot, private street, internal residential and stormwater management landscaping resulting from the subdivision or redevelopment of land in accordance with the requirements of Section 16.124 of the Howard County Code and the Landscape Manual. The Department of Planning & Zoning awarded full responsibility for such inspections to the Department of Recreation & Parks in December 2008. The inspection process forces developer compliance with a project-specific “Landscape Plan”. From January 2009 through December 2013, a total of 991 landscaping inspections were performed and only 360 inspections (36.3%) found projects to be in compliance with their project-specific “Landscape Plan”.

	2009	2010	2011	2012	2013	Total
Inspections	288	250	183	203	212	1,136
Passing	84	97	69	79	56	385
Percentage	29.2%	38.8%	37.7%	38.9%	26.4%	33.9%

Plant It Green Programs

Howard County Recreation and Parks was awarded funding through the Governors Stream Challenge Grant for the years 2013 through 2016. $434,890 will be provided by the Chesapeake Bay Foundation to be used for education and buffering streams throughout the County. Recreation and Parks will be utilizing the Tree Canopy and Stream ReLeaf Programs, part of “Plant It Green” to achieve the goals of this grant. Students will participate in recruitment for these programs as well as attend field trips with educational lectures and demonstrations to be held at key planting sites within Howard County parks.

Tree Canopy

A 2009 Tree Canopy Study, initiated by Howard County Recreation and Parks and the Baltimore Ecosystem Study and performed by the Spatial Analysis Laboratory of the

University of Vermont, found that many areas throughout Howard County were found to have less than adequate canopy cover. A healthy tree canopy provides water filtration and retention, clean air, climate cooling, energy conservation, water quality benefits, stream bank stabilization and wildlife habitat.

Tree Canopy is a new program designed to establish and increase urban tree canopy throughout Howard County by providing free native trees and shrubs to homeowners. Homeowners may have Tree Canopy trees planted anywhere on their property as long as they are not in a utility right-of-way or within existing heavy canopy coverage.

Year	Number of Participants	Number of Trees Planted
2011	1	30
2012	8	17
2013	356	1,821
Total	**365**	**1,868**

Stream ReLeaf

The Stream ReLeaf Program was initiated by the Howard County Stormwater Management Division (Department of Public Works) in 2003 as part of the implementation of the Little Patuxent River Watershed Restoration Action Strategy. The Program has grown and expanded in scope significantly over the years, and is now managed by the Natural Resources Division of the Department of Recreation and Parks.

Stream ReLeaf is a program designed to enhance riparian (stream) buffers by providing free native trees and shrubs to homeowners. The homeowner commits to planting the trees and shrubs on their property and the County delivers the requested plants. Requirements for the program are as follows: the area that the homeowner is willing to plant must be within 75 feet of a stream (rights of ways are not eligible); and the homeowner must commit to planting at least 12 trees.

Year	Number of Participants	Number of Trees Planted
2003	8	103
2004	15	468
2005[1]	1	150
2006	37	1,374
2007	31	1,208
2008[2]	28	709
2009	25	1,908
2010[3]	11	367
2011	81	1,780
2012	32	1,166
2013	69	2,353
Total	**338**	**11,586**

[1]Program not staffed.
[2]Some '08 plantings rescheduled for Spring '09.
[3]Some '10 plantings rescheduled for Spring '11.

Students Branching Out (SBO)

In the Spring of 2013, Howard County Recreation and Parks partnered with the Office of Sustainability to apply for a grant from the Chesapeake Bay Trust. The purpose of the grant was to combine efforts at improving water quality and stream health with student education. $373,100 was awarded to be used by June 30, 2015 for the involvement of students in planting 6,300 trees on a total of 47.5 acres.

The existing Stream ReLeaf and Tree Canopy programs provided a foundation for the creation and improvement of stream buffers and tree canopy throughout the County. The Alliance for the Chesapeake Bay was brought on board to aid in the partnership between the Natural Resources Division and schools throughout the County. Students were asked to create marketing materials to promote the Stream ReLeaf and Tree Canopy Programs and to help garner applicants. The schools that participated in this portion of Students Branching Out were:

- Bonnie Branch Middle School
- Centennial Lane Elementary School
- Clarksville Middle School
- Hammond High School
- Lake Elkhorn Middle School
- Patapsco Middle School

In addition, students took field trips to reforestation sites. Students learned about the importance of riparian forest buffers, the negative effects of storm water runoff, the Emerald Ash Borer, how to properly plant trees and participated in in a forest conservation stream buffer planting. Dunloggin Middle School and St. Paul's Resurrection School participated in these field trips. In November 2013, DRP hosted Family Volunteer Day where even more student volunteers participated in the reforestation projects at Rockburn Park.

In April 2014, there were two more Students Branching Out field trips. Oakland Mills Middle School and St. Paul's Resurrection School participated.

Jan 2013 – June 2014	Students Engaged	Service Hours	Trees/Shrubs Planted	Acres Planted
Total	663	1,379	4,757	30.1

Students Branching Out Phase 2 (SBO2)

In October 2013, further funding was obtained to expand the Students Branching Out project. An additional $448,000 was granted to plant 8,000 more trees on 40 acres of school property and parkland by 2015. This time, OES and DRP added the DPW and the Howard County Public School System (HCPSS) as partners to strengthen the outcome of the project by bringing together various areas of expertise.

SBO 2 added the goals of planting 20 acres of school ground sat 200 trees per acre. Students learn about stream buffers during the school year, culminating in an on-site tree planting project. OES and DPW lead this effort. An additional 20 acres of parkland plantings at 200 trees per acre are also scheduled to be completed by June 30th, 2015. Students from groups such as 4-H, Scouts, Environmental clubs, National Honors Societies and Youth Groups are recruited to aid in volunteer plantings.

To date, six schools have participated in on-site school plantings. They are:

- Glenwood Middle School
- Bushy Park Elementary School
- Bonnie Branch Middle School
- Ilchester Elementary School
- Dunloggin Middle School
- Northfield Elementary School

In April 2013, DRP also hosted an Earth Day volunteer tree planting at Alpha Ridge Park. Students from the Marriotts Ridge High School environmental club participated along with other volunteers.

In April 2014, DRP hosted an Earth Day volunteer tree planting at Hammond Park. Students from the World Value Society participated.

Jan 2013 – June 2014	Students Engaged	Service Hours	Trees/Shrubs Planted	Acres Planted
Total	305	406	3,205	19.6

Emerald Ash Borer Project

The Emerald Ash Borer Project is part of the Students Branching Out Grant. This effort consists of a plan to save the biodiversity of forested areas located within the boundaries of Howard County Park property. The process involves four steps which include surveying park property for the presence of ash forests, site preparation, under planting, and long term forest management. Since starting the project, we have identified 41.25 acres of Ash located on 30 parcels of parkland. In 2013, a total of ten acres was identified, prepared and planted within Rockburn Branch Park. 1,200 native trees were planted by middle school students, boy scouts and volunteers. No reports or symptoms of the borer have been present in the areas surveyed.

Private Property Forest Conservation Establishment (PFCE)

The PFCE program is designed to create forest conservation easements on private properties.

The Department of Recreation and Parks is responsible for site selection, development of forest conservation plans, preparation and recordation of forest conservation easement plats and agreements, site preparation, installation of forest plantings and management of plantings for a two year period. To be considered for the PFCE program, properties must be ten acres or larger and forest conservation planting sites

on these properties must be one acre or larger. Sites are chosen to maximize water quality and habitat benefits.

Easement	Acreage	Trees Planted	Feet of Stream Buffered	Year Planted
Conlon	7.591	2,600	3,820	2008
Horner	1.483	352	440	2009
Meissner	2.99	1,050	1,430	2009
Ziegler 1	4.642	1,430	3,010	2010
Zielger 2	2.156	700	1,107	2010
Litt	3.001	850	1,140	2010
Warfield	4.2603	1,250	1,180	2010
Earle	6.826	1,365	1,610	2010
Zoller	2.235	700	1,640	2011
Eyler	3.212	960	100	2012
Sharp-Waterford	8.2	2,600	1,530	2012
Sharp-Chase	6.9389	2,200	4,380	2012
Mariani	5.1095	1600	2,270	2012
Sharp-Chase 2	6	1800	2,160	2013
Sharp-Waterford 2	3.3	660	1,340	2013
Totals:	**67.9447**	**20,117**	**27,157**	

*No additional easements are being planned for the future.

Volunteer Tree Plantings

The Forestry section conducted two volunteer tree plantings during 2013. The spring planting was completed by students, scouts and volunteers at Rockburn Branch Park over the course of a week. The volunteers planted 1,000 trees along the Rockburn Branch stream to stabilize the banks and to provide shade in the future. The planting was part of the *Students Branching Out Grant*. The fall planting took place at Alpha Ridge Park and was part of the *Students Branching Out II Grant*. Volunteers from Winchester Homes planted 200 trees between the sports fields and parking lots. These trees will provide shade and intercept stormwater run-off from the sports fields.

Promotion of Natural Resources Programs

In 1989 the Department began to place more emphasis on educating the public in an effort to try to protect our environment through education rather than regulation enforcement. We have published nine brochures including, Living with Beaver, Don't Feed the Waterfowl, Stream Buffers, Frogwatch USA, Purple Loosestrife, Wildlife

Driving Tour brochure, Welcome to Our Open Space, Stream ReLeaf and a publication related to the Forest Conservation Act. In 2013, a new publication was created, The Howard County Amphibian & Reptile Checklist.

This year the Natural Resources Division redesigned and created marketing materials for its Tree Canopy, Stream ReLeaf and Bark Ranger programs. Materials include brochures, websites, social media, post cards and mailers, handouts, as well as large informative banners. These materials were used at Greenfest and the Howard County Fair to promote the programs and garner applicants.

Parkland, Open Space and Natural Resources Regulation Enforcement

In 1992, parkland regulations were revised to place stronger emphasis on natural resources protection. This gave Howard County its first "post-development" environmental regulations. To date, we have issued over 1,825 warnings and have achieved nearly 100% compliance.

Year	2009	2010	2011	2012	2013	Total
Warnings	74	35	22	130	133	394

Parkland Acquisition

During 2013 the following properties were added to our landownership holdings. We also verified our land holding acreage with the Real Estate Services Division. Total acreage can vary from year to year due to the reallocation of properties for other uses such as schools.

New Parkland Added in 2013 (included in Total)

Dobbin - Belmont Woods	
(To be sold, not included in total)	13.5332 acres
Open Space in 2013	43.1077 acres
Open Space Approved for Transfer	134.6680 acres

Total Recreation and Parks Land Holdings

Regional Parks	2,521.7600 acres
Community Parks (with Alpha Ridge Park)	882.3900 acres
Neighborhood Parks (including Playgrounds)	281.5250 acres
Natural Resource Areas	1,864.7100 acres
Historic Places	105.8020 acres
Open Space Total	3,494.5100 acres
	Total: 9,150.6970 acres

FrogWatch USA

FrogWatch USA was implemented in 2000. With amphibian populations declining worldwide, researchers at the federal level have a need to gather information on frog and toad population trends across the United States. In 2013, we had 29 volunteers that contributed hours. Since 2000, we have had 1,083 volunteers gather information for researchers at 30 sites in Howard County by conducting frog-calling surveys. They have contributed 5,580 hours of volunteer service.

Weed Warriors

The Purple Loosestrife Pluckers, an off shoot of the Department's Weed Warrior program, was initiated in 2006 to assist the Maryland Department of Natural Resources in identifying populations of purple loosestrife in the County and to assist Howard County Department of Recreation & Parks in the removal of this invasive wetland plant from Font Hill Park, Western Regional Park and Burleigh Manor open space. Garlic mustard was removed at Cedar Lane Park as well as Bradford pear and Japanese honeysuckle vines at Warfield's Pond Park. In 2013, 38 volunteers reported 190 hours of removing invasive plant species. To date, 150 volunteers have worked together for a total of 661 volunteer hours removing invasive plants.

Annual Butterfly Count

Since 2000, the Department has partnered with the Howard County Bird Club to assist with an annual census of North American butterflies found in the county. Each year on the third Saturday in July, teams assemble to survey County parklands. It is important to survey butterfly species as the disappearance of a species may indicate a watershed problem. In 2013, 20 volunteers reported 44 hours for this annual survey. Since 2007, the Department has used 63 volunteers in this effort contributing 200 hours of service.

Annual Dragonfly Count

Since 2000, the Department has partnered with the Howard County Bird Club to assist with an annual census of North American butterflies found in the county. Each year on the third Saturday in July, teams assemble to survey County parklands. It is important to survey butterfly species as the disappearance of a species may indicate a watershed problem. In 2013, 20 volunteers reported 44 hours for this annual survey. Since 2007, the Department has used 63 volunteers in this effort contributing 200 hours of service.

Maryland Amphibian & Reptile Atlas

This was the fourth year of a five-year statewide effort to document reptile and amphibian species. Howard County had 424 volunteers contributing 503 volunteer hours. Since 2010, we have had 916 volunteers contribute 2,322 volunteer hours to this survey. After completion, the Maryland Department of Natural Resources will use the data to produce range maps for reptile and amphibian species and over time will serve as an indicator of watershed health around the state. This survey will be repeated every 20 years.

Howard County Fair (Live Green Day)

In 2013, the Howard County Fair hosted a "Live Green Day" featuring community groups focused on environmental awareness. The Natural Resources Division set up a display featuring information about the Maryland Amphibian & Reptile Atlas. Two volunteers helped with manning the table during this event with a total of five volunteers assisting since 2012.

Howard County GreenFest

2013 was the sixth year for the County to host its' annual GreenFest. The theme this year was "Green Communities: Get Up. Get Out. Get Green." and featured many exhibits and vendors dealing with tree plantings, energy efficient home improvements,

rain barrels, gardening and composting, document shredding, Goodwill donations, Nike Reuse-a-Shoe collection, Bikes for the World collection, as well as live bird and reptile displays. Other features included the County's recycling program and community tree planting programs as well as many community groups focused on environmental awareness. Festival attendance this year was over 2,700 individuals. Since the beginning, attendance has reached over 12,700 people.

Agricultural Leased Lands

All lands leased to farmers have conservation plans developed by the Natural Resources Conservation Service and are being farmed accordingly. In 2013, the Department had 219.456 acres leased to three farmers.

Canada Goose Management Program

The Department continued its Canada goose population control program since the birds continue to cause degradation of the lake, pond waters and shoreline at Centennial Park and Font Hill Wetland Park. They continue to graze and trample shore line vegetation which causes erosion. In addition, this concentrated population of geese defecates excessively on areas in which the public uses for outdoor concerts and picnics which in turn elevate nutrient and bacteria levels in the lake water. Flocks of 300+ geese and ducks use Centennial Lake throughout the year. Font Hill's population fluctuates between 10 - 40 birds. Migratory geese overwinter in the region as well. In 2013, a total of 62 Canada goose nests were treated on Departmental lands under our federal permit that allows us to coat the eggs with vegetable oil to prevent hatching. A total of 271 eggs were treated over a period of four weeks.

Dealing with high population levels of resident Canada geese, mallards and illegally released domestic waterfowl will be an ongoing problem on Recreation and Parks lands. The Department will continue to address this issue through an integrated approach that will include public education, habitat modification, behavior modification and population reduction.

Trout Stocking on the Middle Patuxent and Little Patuxent Rivers & Centennial Lake

During spring and fall of 2013, 6,000 brown and rainbow trout were stocked in the Little Patuxent and Middle Patuxent Rivers. State Fisheries officials have determined that the water quality in these rivers are sufficient to support a recreational, three season fishery. In addition, Centennial Lake had 2,500 trout stocked in the spring.

Deer Population Management in Howard County Parks

In 2013, managed deer hunts were conducted in: West Friendship Park and the MPEA, along the Middle Patuxent River, Alpha Ridge, Blandair and David Force Parks, all in the Little Patuxent River watershed, and High Ridge and Schooley Mill Parks on the main stem of the Patuxent. All parks were found to be over-populated with deer based on observed vegetative damage, complaints from nearby residents, incidence of deer-vehicle collisions on area roads and population estimates performed using helicopter-mounted infrared video cameras. In addition to the managed hunt program, additional population management was carried out at the Alpha Ridge Landfill (adjacent to the park of the same name), Centennial Park, Gray Rock subdivision and the Meadowbrook Athletic Center in the Little Patuxent watershed, The Robinson Nature Center in the

Middle Patuxent watershed, Belmont Park, Daniels Mill Overlook subdivision, Governor's Run Subdivision, Rockburn Branch Park and Worthington Park in the Patapsco watershed, by sharpshooting at night with noise-suppressed rifles. Benson's Branch Park, in the Middle Patuxent watershed, is under agricultural lease and has deer management through a crop damage permit.

The hunts, which take place on prescheduled dates from October until February, are a response to continuing damage to trees, shrubs and groundcover in the parks from deer browsing. Without management, the current trends will continue causing degradation of forest shrubs and ground cover layers. Long-term forest health will also be impacted since replacement of mature canopy trees would be reduced or eliminated through destruction of seedling stock. These impacts have been documented on these properties, and are well confirmed in scientific literature.

During 2013, 344 deer were removed through the managed hunts and sharpshooting. This is a 17% improvement over the previous year. Approximately 15 deer were taken on the Benson's Branch Park crop damage permit, for which we do not have complete data at this time. Population estimates and vegetative surveys indicate that the understory in MPEA is recovering. At David Force Park and Alpha Ridge, statistical analysis indicates that the hunt is continuing to reduce the population of deer. Observation of the vegetative response also indicates recovery. Continued hunting is deemed necessary both to continue bringing down the herd sizes and to maintain the lower densities, once acceptable population levels have been achieved. Alpha Ridge Park is adjacent to the County sanitary landfill and additional deer removal through sharpshooting has further reduced the deer herd in this sensitive area at the head of the Little Patuxent River. Far fewer deer are being observed there than in years past. Additional effort is planned for these and other parks and open space lands in the future.

Additional managed hunting on nearby Washington-Suburban Sanitary Commission and Montgomery County park property is helping reduce the over-population of deer in the Patuxent River watershed. Continued monitoring through Infra-Red video surveys allows us to track trends in deer population. Bobby Jordan, an Eagle Scout Candidate from the Glenelg area (Middle Patuxent watershed), performed a deer density survey at Benson's Branch (Middle Patuxent watershed) and Rockburn Branch Park (Patapsco watershed) which revealed deer densities in excess of 30 deer per square mile at these sites. This is more than double the density that forest ecologists recommend, even though both sites have been actively managed for many years.

Deer Management Program Harvests

SEASON	SEASON TOTAL
1998	50
1999-2000	134
2000-2001	256
2001-2002	164
2002-2003	90
2003-2004	199
2004-2005	226
2005-2006	208
2006-2007	166
2007-2008	265
2008-2009	295
2009-2010	362
2010-2011	256
2011-2012	281
2012 – 2013	247
	3,199

The Middle Patuxent Environmental Area (MPEA)

The MPEA Integrated Natural Resources Management Plan for the 1,021-acre environmental area was initially drafted in June 2000, and was updated in 2013. The plan outlines strategies, techniques and protocols for environmental education, research, recreation, natural resources management and administration.

The implementation of the plan's projects and programs in 2013 has included the following accomplishments:

- 1,339 volunteer hours were spent maintaining 5 ½ miles of trails, conducting wildlife and stream surveys, controlling invasive exotic vegetation, planting native trees and shrubs and assisting with the managed deer hunts in the MPEA.

- Researcher Dr. Sonja Scheffer, from the USDA Systematic Entomology Lab, conducted insect sampling in riparian and upland habitats in MPEA in order to identify and catalog insect fauna and also to provide volunteers with educational experiences relating to entomology, scientific identification methods, insect curation and natural history. A reference collection of curated insect specimens will be created from this project.

- Implementation of the MPEA Woodcock Habitat Management Plan to restore breeding habitat for American woodcock and other early-successional species within the Middle Patuxent River watershed continued as an ongoing project in 2013.

- A multi-year floristic survey in cooperation with Towson University is now in phase two in the MPEA. Two primary functions of the survey are to evaluate the spread of invasive plant species since the time of the previous survey (2001) and also to identify any rare, threatened or endangered plant species within the boundary. Following analysis of the data, recommendations on management practices will be made. Preliminary recommendations support the need to control invasive plant species within the forested areas to maintain habitat quality and biodiversity.

- MPEA staff completed an assessment of the entire 5 ½ miles of natural surface trails in MPEA and delineated 16 perpetually wet spots for a trail drainage repair project. Some areas will be repaired using geotextile with encapsulated free-draining rock (sausage technique), while minor areas will be repaired by addressing the trail tread's side slope, and or the running slope, to improve drainage.

- The MPEA Independent Trail Maintenance Team volunteer program contributed 338 hours in 2013, with much of the time being spent on the installation and maintenance of drainage and erosion control structures. Check dams and water bars were installed and maintained along trails through riparian areas where trail erosion was evident.

- MPEA Conservation Stewardship Program volunteers worked to maintain native tree and shrub planting sites from previous seasons. Between the Conservation Stewardship Program and the Weed Warriors program, a total of 415 volunteer hours were contributed to the removal of non-native, invasive plant species within the environmental area.

- Tree shelter maintenance, invasive removal and monitoring was conducted on 1,160 native trees and shrubs previously planted in MPEA stream buffers and upland habitats.

- MPEA staff completed a systematic evaluation of all 35 storm drain outfalls within the environmental area in 2010, and in 2011 an additional 38 storm drain outfalls outside but impacting the area were inspected. Outfalls were placed into severity rating categories as follows: 1 – fairly good (about 50%), 2 – slight to moderate erosion (17%), 3 – slight to moderate erosion with severe stream bank erosion downstream (14%), 4 – moderate to severe erosion; unstable; some impact to infrastructure (14%), 5 – infrastructure damaged/under repair (5%). During the evaluation, one storm drain outfall with severe erosion and infrastructure damage was referred to the Storm Water Management Division and was repaired in 2012 using a regenerative stormwater conveyance design. This project now serves as a demonstration site for innovation in SWM techniques. In 2013, MPEA staff trained volunteers from the Middle Patuxent Environmental Foundation to repeat the original storm drain outfall surveys. 2013 data was compared to the baseline data from 2010 in order to monitor whether the outfalls were stable or if the erosion was progressing and to recommend actions to minimize future erosion.

- A volunteer from the Howard County Legacy Leadership Institute for the Environment (HoLLIE) completed work on conducting macroinvertebrate stream surveys on all 17 tributaries and the main stem of the Middle Patuxent River within the MPEA in 2011. In 2012, a subsequent volunteer continued work on the project with data analysis and creation of a PowerPoint presentation on the results, plus a synopsis of the Middle Patuxent Watershed's scope, stakeholders and education and monitoring strategies. In 2013, a Watershed Stewards Academy graduate used this data in a public presentation, entitled "Slow the Flow", at the Robinson Nature Center.

Pesticide Usage

The Department utilizes Integrated Pest Management (IPM) greatly reducing the pesticide usage in the park system. Pesticide use is shown in the table below by ounces per watershed.

Watershed	2009	2010	2011	2012	2013
Patuxent River	87.50	283.00	479.67	509.75	789.05
Cattail Creek	4,098.00	947.00	1,620.00	177.50	740.00
Middle Patuxent River	2,339.26	1,764.87	2,577.26	4,805.50	198.45
Little Patuxent River	10,616.50	7,555.41	4,728.12	8,849.89	10,481.20
Dorsey Run	16.00	260.00	16.00	94.00	54.00
Deep Run	493.25	863.60	15.60	2.00	160.60
Patapsco River	2,151.00	3,088.00	869.80	710.25	774.50
Hammond Branch	822.25	701.60	48.00	70.00	64.00
Totals:	**20,623.76**	**15,463.48**	**10,354.45**	**15,218.89**	**13,261.80**

Canada Thistle Control Program

This program was designed to eradicate Canada Thistle, a noxious weed regulated by the Maryland Department of Agriculture. The Department is required through state mandates to eradicate/control thistle infestations throughout the park system. To meet the State requirements, Thistle control will be carried out with existing staff and will be included in the pesticide usage section of the NPDES report until funding is reinstated.

Contracted Thistle Control

Year	2009	2010	2011	2012	2013
Total (oz.)	1,491.52	0.00	0.00	988.00	2,469.00

Note: Due to the economic downturn, funds for this effort were cut for FY10 and FY11 and reinstated in FY12.

Trail Maintenance Projects on Parkland

The Howard County Department of Recreation and Parks (DRP) manage over 9,000 acres of public land for a wide range of purposes. One very important component of the Department's mission is to provide opportunities for outdoor recreation. DRP lands provide a variety of recreational activities including, but not limited to fishing, bird

watching, hiking, trail running, cross country skiing, mountain biking, dog walking and horseback riding.

Most of the lands managed by the DRP have a trail network, planned or unplanned. In many cases, the network is substantial and has been in place for some period of time. The task faced by the Department is to upgrade and improve the management of the existing trail system and to determine where construction of new trails will be necessary to meet user demands or to protect resources.

The Department has developed a trail management policy for consistency for trail and pathway planning, design, installation and management. The purpose of the Howard County trail and pathway system is:

- To provide opportunities for all people to recreate in a natural setting without causing damage to the resource.
- To provide opportunities to stimulate and accommodate public interest in wildlife conservation and habitat restoration through controlled access.
- To provide alternative transportation corridors.
- To accommodate and balance conflicting trail uses.

Trail Construction & Maintenance Workshop
In March 2013, the Department hosted a trail training class for Park Maintenance Workers and other staff that currently maintain trails within our parks. The course focused on sustainable trail principles and practices that minimize trail erosion.

Bridge Installation at Howard Conservancy Property
An 8-foot by 38-foot bridge was replaced at the Howard Conservancy Property in Woodstock. This effort replaced an old bridge that was damaged during Hurricane Sandy.

Trail Assessments
A detailed trail assessment of the entire natural surface trail system occurring at Benson Branch Park was performed in 2013. This document will help the Department identify current trail tread conditions and make recommendations to repair, re-align or close degraded trail segments. It will be up to Department managers to prioritize trail maintenance projects needed to upgrade the trail system to a more sustainable standard. The Department is looking to reduce trail user impacts, simplify future trail maintenance and save time and money over both the short term and long term.

Robinson Nature Center
The Robinson Nature Center, in operation since September 2011, serves as a model of innovative water conservation methods and officially received its LEED Platinum certification by the USGBC in 2012. Innovative water conservation methods incorporated into the building and property include:

- Porous Paving in the parking lot
- Geothermal HVAC heating and cooling system that utilizes rain water collected in tanks underneath the Porous Paving in the parking lot
- Contracted for Green Power
- Green Roof technology

- Efficient Landscapes including four rain gardens that incorporate native plantings
- Water use reduction using waterless urinals and high efficiency toilets and faucets

Property and trail enhancements have continued since the initial construction of the building and the following projects and programs are highlighted accomplishments for 2013:

- 807 volunteers contributed 5,064 hours towards conservation stewardship and environmental education programs at the Nature Center. Volunteers greatly improved the grounds assisting with native tree, shrub and wildflower plantings, invasive plant removals, trail maintenance and effectively assisted naturalist/educators with educational opportunities at nature camps, scout programs, school field trips and special events.

- The Robinson Tree Arboretum was completed and installed along the walking trails. The Nature Center staff, volunteers and the Howard County Forestry Board worked collaboratively selecting 17 native canopy and understory tree species. This informative and educational trail allows trail users and visitors the opportunity to learn more about native trees and shrubs that if planted would improve watershed quality.

- Invasive plant species were removed throughout the year with assistance from volunteers and staff. Targeted species among understory and riparian sites included Wineberry, Japanese Barberry, Autumn Olive and Multi-flora Rose. Continued monitoring and removal efforts will provide effective measures combating these nuisance species.

- Howard Community College Environmental Engineering and Science students assisted with selecting and planting additional native plants that improved and enhanced the Nature Center's rain gardens. More than 240+ native plants were planted and mulched and will continue filtering runoff pollution, recharging local groundwater and improving water quality throughout the Middle Patuxent watershed.

- Native plantings continue to be incorporated throughout the property, including in the center's backyard demonstration area that serves as an educational display for residents. Existing native plantings continue to be monitored, maintained through regular volunteer weeding events and replaced as needed when predation occurs. These plantings reduce the need for irrigation, pesticides, herbicides, etc., while providing a habitat for wildlife.

- Working with local nurseries and volunteers, the center planted 80+ new native trees and shrubs along hillsides and surrounding portions of the trail to further enhance soil stabilization in these areas.

- The "Name the Stream Contest" highlighted the unnamed tributary that flows through the Nature Center grounds to the Middle Patuxent River. The contest

allowed visitors and trail users to creatively select an appropriate name for the stream in Middle Patuxent watershed. Skunk Cabbage Creek was approved by the U.S. Board on Geographic Names and was added to the Geographic Names Information System, the nation's official geographic names repository.

- Since 2012, the nature center has participated as a host site for "Project Clean Stream", a Baltimore regional stream and watershed clean-up effort. In 2013, 120+ native trees and shrubs were planted by volunteers to improve the riparian buffer zone alongside Skunk Cabbage Creek.

- Researcher Dr. Sonja Scheffer, from the USDA Systematic Entomology Lab, conducted insect sampling in upland habitats at the Robinson Nature Center in order to identify and catalog insect fauna, and also to provide volunteers with educational experiences relating to entomology, scientific identification methods, insect curation and natural history. A reference collection of curated insect specimens will be created from this project.

- Professor Kevin Omland, from UMBC (University of Maryland, Baltimore County), conducted field research which focused on migration routes preferred by Orchard and Baltimore Orioles in upland and riparian habitats. The birds were captured via mistnets, color banded, fixed with geolocators and then released. Subsequent years will focus on recapturing and then downloading data and reconstructing migrating routes from Central and South America. The research will increase the understanding of where and how orioles are throughout the year.

Robinson Nature Center Awards for the Environment:

- 2013 Maryland Tourism and Travel Summit, Robinson Nature Center became a "Green Tourism Partner"
- 2013 State of Maryland Award for Green and Sustainable Practices

Using the building as a teaching tool, Robinson Nature Center facility educates the public about green technologies, sustainability, environmental stewardship and techniques that can help reduce stormwater run-off, as well as reducing water and energy consumption:

- *Interpretive signage* in the building and on the grounds describes to visitors how different features reduce the environmental impact of the building by mitigating stormwater run-off and minimizing water and electricity use.

- *A backyard demonstration area* shows the public what they can do on their own properties to improve the management of water. Rain barrels demonstrate catchment of water for use in the garden and a compost bin shows how fertilizer can be produced from organic food scraps and reducing the amount of chemical fertilizers that need to be used.

- *The Chesapeake Bay exhibit* (one of three permanent exhibits in the building) educates the public about water quality issues. A scaled reproduction of the Bay covering the floor of the exhibit allows visitors to walk the connections between

Howard County and the Bay. Through interactive displays, visitors learn about the plight of oysters, how products they use can contribute to stormwater run-off issues and how they can help save the Bay.

- *A touch tank* filled with sea creatures has been added to our Children's Discovery room. This tank serves as an extension to our Chesapeake Bay exhibit and further demonstrates how bodies of water are connected. It is our hope that through face to face interactions with creatures, visitors will develop a greater appreciation for our waterways and their inhabitants.

In addition to using the building's features to educate the public, Robinson Nature Center offers informal and formal educational opportunities that help educate the public about Howard County's connection to the Chesapeake Bay and about the LEED certification program:

- In 2013, Robinson staff held just under 450 educational programs (including field trips, public programs, birthday parties and camps). These programs engaged over 17,400 participants. Mission-driven programming connecting participants to their natural resources is a key component of the Nature Center's goals and promotes environmental stewardship to all generations. Key programs of note contributing to education on stormwater runoff and management include:
    - World to A River Dweller Field Trip
    - Weather the Weather Field Trip
    - Powered on Sunshine Field Trip
    - River Explorers I and River Explorers II Summer Camps
    - Lil' Pine Cones Water Wonders Mini-camp

- In 2013, Robinson staff members led numerous LEED tours. These tours provide in-depth information on what it means to be LEED certified and detail the green technologies incorporated into Robinson. These tours give groups a further understanding of how building design can play a key role in the management of natural resources. 26 LEED-focused tours have been given since the building opened, educating over 590 visitors. Additionally, Robinson staff has the "Green Technologies and LEED at Robinson" brochure for visitors who are unable to schedule a tour.

- Farm to Table - Robinson Nature Center developed and facilitated in 2013 the first Farm to Table meal event to educate patrons on buying and eating local food. The program educated attendees on local food sourcing, vendor resources, recipes, seasonings, cooking and grilling tips. The information demonstrated showed advantages to both the local economy and in reducing the carbon footprint in the environment.

- Residential Storm Water Management with Watershed Stewards Academy – In 2013, Robinson Nature Center, in coordination with the Watershed Stewards Academy, assisted in the planning and facilitation of an informational program for Howard County residents and regarding water runoff issues. The Watershed Stewards Academy presented opportunities and strategies to reduce and mitigate the negative impact of water runoff at individual homes and residences.

Robinson Nature Center has officially taken over raising the trout for the Natural Resources Division in partnership with Trout in the Classroom. This program teaches students about the value of cool, clean water to the life of trout. In 2013, the Nature Center released 200 trout into the Middle Patuxent River.

Robinson Nature Center partners with local and regional groups to promote programs that recycle organic materials for uses consistent with mitigating stormwater runoff and sediment discharge.

- In 2013, Howard County Master Gardeners held free compost demonstrations at the Center during which residents of the County were provided with instructions on how to create and manage their own backyard compost piles. Howard County's Office of Recycling provided free compost bins to residents at these demonstrations. The residential composting operations allow families to use organic, natural fertilizer in place of commercial and chemical fertilizer.

- In 2013, Robinson Nature Center created a partnership with the Oyster Recovery Partnership. The Center is now an official drop-site for oyster shell recycling. Members of the public can drop their oyster shells at the Center's new shell recycling caddie and staff from the ORP retrieves the shells for use in oyster reef recovery programs in the Chesapeake. The recycled shells provide substrate upon which new oysters can grow, thus helping revitalize the oyster population and its valuable ecosystem service of filtering the waters of the Chesapeake Bay.

Robinson offers professional development opportunities to teachers that allow them to bring water conservation and stewardship issues back to the classroom.

- In 2013, Robinson Nature Center was awarded Green School Center status by the Maryland Association of Environmental and Outdoor Educators (MAEOE) in recognition of Robinson's commitment to providing professional development opportunities, community support and innovative lessons to schools certifying or recertifying as Maryland Green Schools. Water conservation/stewardship is among one of many categories that schools must report on to achieve this status and are issues that both students and teachers can learn about at the Center.

- In 2013, Robinson Nature Center and the Howard County Conservancy teamed up to offer a series of environmental education workshops including Projects WET, WILD, Learning Tree and WOW. Each of these curriculums touches on water quality/conservation issues and gives teachers the tools they need to educate about these issues at their own schools.

Robinson Nature Center exhibited and educated attendees on environmentally responsible and sustainable practices which would positively impact local waterways and Chesapeake Bay water quality at the following events in 2013**:**

- Howard County 50 Plus Expo, Living Green Exhibit Area
- 2013 Maryland Green Schools Youth Summit
- University of Maryland Extension (celebrating Howard County Agriculture), Howard County Economic Development Authority - Fourth Annual Howard County Film FEASTival

- "Threshing of the Wheat" Living Farm Heritage Museum
- Howard County Fair
- Howard County GreenFest
- State of Maryland Motor Vehicle Administration's Office of Environmental Management's 2013 Environmental Fair in Celebration of Earth Day

Horticulture and Land Management Division

Construction Repair

The Division was involved with two major sodding projects, one at Western Regional Park's playground and the other at Worthington Dog Park. At the Harriett Tubman Center, a pile of stone dust was removed and a poor turf area renovated. At the Dorsey Building, concrete structures and a satellite dish were removed restoring the area to turf. The Division fixed ruts along sidewalks, graded along new curbing and converted an old landscape bed to turf at the Howard Complex. At Cedar Villa Heights Park, the Division hauled 80-tons of topsoil from Blandair Park to fill in the old playground. This project totaled 17,000 square feet of sod and 4,000 square feet of additional turf area.

Grading

The Division reestablished turf at several County sites. The new pathway at Savage Park was re-graded and stabilized along its edge. At the Scaggsville Public Safety Complex, turf repair was completed along the building. The Division assisted with repairing water lines at the garden plots. At North Laurel Community Center, soil was graded around a new sculpture pad and other sculpture spots were renovated. These project repairs totaled approximately 9,000 square feet.

Landscape Changes

The Division removed a mulch bed of unhealthy hemlocks and converted it to 400 square feet of turf at the Central Branch Library. At Riverside Fire Station, the Division repaired several areas by seeding and reestablishing 2,000 square feet of vegetation. The Division reduced erosion issues at Long Reach Garden Plots by covering a dirt road with 2,500 square feet of compact stone.

Rain Gardens

The County assisted the Restoring the Environment and Developing Youth organization (READY) with the construction of rain gardens in various locations throughout the County. This program uses college students and community associations to create rain gardens and other stormwater enhancements at churches, schools and open space areas. The Division assisted by digging out areas where the rain gardens were to be installed for an eight week period during the summer. During this timeframe the READY program established more than 18,000 square feet of rain gardens.

Stump Removal and Seeding

The Division, utilizing its stump grinder, removed 168 stumps at parks and government buildings and leveled and seeded 6,000 square feet of land.

Control of Invasive Species
At Meadowbrook Park, The Division removed forty Bradford pears and fifteen autumn olives growing in native areas. Invasive plants are being controlled in several stream buffer areas. In the Font Hill Drive area, the Division mechanically removed and treated a 5,000 square foot area of Japanese Knotweed. This effort may take several years to eradicate through monthly maintenance of the area. The Division cleared a 3,000 square foot area covered by bittersweet at Long Reach Garden Plots and converted it to turf. The Division is also treating and clearing areas of bamboo at Font Hill Park and another in the Gorman Road area totaling 4,000 square feet.

Stream Banks
Several log jams have been cleared to prevent flooding and stream bank erosion. Along the Woodcrest pathway, the Division repacked soil and seeded using erosion blankets and riprap to stabilize the stream bank to prevent erosion reestablishing 400 square feet of land.

Sink Holes
Sink holes were filled in at Roger Carter Recreation Center and Shadow Lane. At the Howard County Center of the Arts, the sink hole was filled in with stone and topsoil and then seeded. The Division also filled in a sink hole behind 2870 Thornbrook Rd. These efforts reestablished 3,000 square feet of land.

Protective Fences
The Division installed 660 linear feet of split rail fencing and boulders at Haviland Mill and Blandair Park to protect several acres of turf from vehicle damage. Tire ruts were re-graded repairing a 25 square-foot area.

Regional Parks Division

Rockburn East
Rockburn East had 120ft of fencing installed to prevent foot traffic on a steep hill to eliminate erosion.

Rockburn West
Area at the end of the parking lot by field seven and eight were identified as excessive run off; contacted Environmental Services and plans are being drawn up to install a bio-retention pond.

Waterloo Park
Ball diamond at the park was renovated by contractor which consisted of cutting lip to outfield and re-grading infield to correct the drainage issue and eliminate run off.

Athletic Field Aeration
Aeration, over seeding and top dressing of athletic fields in Zone was completed to reduce compaction and enhance turf. 1,000 pounds of seed and 120+ yards of soil were used to complete this task.

Worthington Dog Park
New sidewalks and blacktop parking lot were installed; soil and sod were laid to help eliminate heavy use trails and erosion. 60 yards of soil were added and sod was laid along with 300 pounds of seed used.

Three Tier Fertilizing
In 2009, DRP began using Three Tier fertility products, which are liquid fertilizers that are safe for application on most plants, crops and turf. By using Three Tier products Howard County has reduced the amount of Nitrogen and Phosphorous applied on its fields. Programs were developed and implemented to compare the new Maryland standards for Nitrogen and Phosphorous that became effective in October 1, 2013. The new standards allow for a maximum of 2.5 lbs. per 1,000 sq. ft. annually, and Phosphorous is used only as a starter fertilizer. Park Operations have noticed a steady increase in overall health of our turf, and soil samples are showing a more stable balanced soil profile.

Moving forward with the Three Tier program for 2014, DRP is using a new product to help stay within the new fertilizer law. No-Phos is a unique combination of nitrogen sources that achieves a balanced release of nitrogen in multiple forms. No-Phos combines urea, nitrate and organic forms of nitrogen that produces controlled growth while improving soil structure for sustained turf health. This new formula is phosphorus free and provides potash for improved wear tolerance. This ultra-low salt formula is the perfect foliar fertilizer for regular use throughout the growing season, in cold weather, after flushing rain events, and when additional nitrogen is needed for strong growth. The department as a whole also has had several employees become licensed certified fertilizer applicators to remain in compliance with this newly established law. A total of 70 athletic fields are currently being managed under Three Tier.

Pesticide Free Parks
The department is researching the merits of pesticide free parks and has started a pilot study.

- Consultant was hired in 2013
- Pilot site has been selected: Dayton Oaks Park
- Site evaluation is in progress
- Methodology:
    - Freeze
    - Burn
    - Vinegar
    - Horticulture oil

Inmate Work Detail
The inmate work detail was utilized from June through August to clean up trash along the Savage Mill trail and various community parks. Inmates collected 1,500 pounds of trash.

Training
Nine of the Zone 1 staff attended training in March, which was provided by Environmental Services. Subjects that were covered are as follows: potential

stormwater pollution sources, spill prevention, spill response and inspection, best management practices, hazardous waste packaging and labeling and handling. The training was two hours long.

Waterway/ Stream Cleanup
4.5 miles of stream waterways within Schooley Mill Western Regional and Benson Branch parks were cleaned through removal of debris and log jams that prevented natural stream water flow producing log jams and bank erosion. September and November Scout troops 007 and 737 committed 320 hours to this project.

Capital Projects Park Planning Division

Timbers at Troy Golf Course Bridge & Pathway Renovations
Staff removed existing decking and re-decked five cart path bridges. The renovated bridges will allow safe pedestrian access through the course eliminating unwanted cart travel in sensitive areas and through the streams. General paving joined four separate maintenance vehicle short cuts to existing paths by installing new asphalt path connections. Erosion is now eliminated from the areas.

Open Space Pathway Renovations
HTI Contractors overlaid four sections of open space pathways. They were Burleigh Manor Cottage, Felsview, Woodbridge Court and Northbrook Court. A deteriorated asphalt pathway located in Rockburn Township was removed and returned to turf due to little use.

C. Additional Issues Relative to Management Programs

Soil Conservation Programs

Envirothon Program
In 2013, the 21st Howard County Envirothon was held. Three teams (14 students) from River Hill High School and Wilde Lake High School participated. During the school year approximately 25 students studied and prepared for the event.

The 2014 Howard County Envirothon was held in April with four teams (20 students) from River Hill High School and Wilde Lake High School participated. During the 2013-14 school years 31 students studied and prepared for the event.

Environmental Quality Incentives Program (EQIP)
The USDA, NRCS continued to work with the HSCD to administer the EQIP, the main conservation cost share program available to farmers and farm owners from the federal agriculture department. The following practices were installed in the County through this program:

(1) 27.5 acres Prescribed Grazing
(3) 1,825 feet Fencing

(5) 1520.2 acres Nutrient Management
(5) 5 each Watering Facility
(3) 1150 feet Pipeline
(2) 0.1 acre Heavy Use Area
(2) 9.8 acres Access Control
(1) 30 feet Underground Outlet
(1) 1 each High Tunnel

Practices Completed With State or Local Cost Share or Without Cost Share Assistance

These practices were completed with technical assistance from the HSCD. Some projects received cost sharing from either Maryland Agriculture and Water Quality Cost Share (MACS) program or Patuxent Reservoirs Watershed Protection Group local cost share program while other practices received no cost share.

(15) 1694.8 acres Cover Crop
(11) 2.6 acres Grassed Waterway
(2) 0.4 acre Critical Area Planting
(26) 1,352.0 acres Nutrient Management
(1) 1 each Roof Runoff Structure
(1) 1 each Waste Storage Facility
(1) 9.0 acres Pest Management
(1) 1.0 acre Heavy Use Area Protection

Conservation Planning

In providing technical assistance, the HSCD writes conservation plans. Plans are also written for land that is proposed for the agricultural land preservation program. Also, existing preservation parcels have conservation plans that may be updated. During this timeframe, January 1, 2013 through June 30, 2014, there were 29 new conservation plans on 1,681.5 acres and 44 revised conservation plans on 4,737.1 acres written by the HSCD office.

Stormwater *Management Division*

Floodplain Management Program

The SWMD manages the County's Floodplain Management Programs. The SWMD responds to property owner inquiries pertaining to floodplain locations and assists residents in dealing with flood insurance issues. Howard County will continue to apply for FEMA and MEMA Federal grants under the Hazard mitigation grant program to help resolve property owners' flood insurance issues.

The County coordinated with MDE, FEMA, and the Corps of Engineers to update and create digital Flood Insurance Rate Maps (DFIRMs) for Howard County. On May 6, 2013 FEMA issued a Letter of Final Determination, which approved the new model and report as final. The new maps and models became effective for flood insurance purposes on November 6, 2013.

The County Code was recently amended and Bill 41-2103 updated the Floodplain ordinances and was approved by the County Council on July 30, 2013.

Countywide Biomonitoring Program

The SWMD initiated the Howard County Biological Monitoring and Assessment Program in the spring of 2001 to establish a baseline ecological stream condition for all of the County's watersheds. The program involves monitoring the biological health and physical condition of the County's water resources and is designed on a five year rotating basis such that each of the County's 15 watersheds will be sampled once within a five year period. The monitoring involves sampling instream water quality, collection, and analysis of the biological community (benthic macroinvertebrates) using Maryland Biological Stream Survey (MBSS) methodologies. For 2013, the watersheds assessed were Upper, Middle, and Lower Little Patuxent watershed. Biological results for the watersheds indicate "Poor" to "Very Poor" conditions. Fifteen sites were in "Poor" condition, 11 were in "Very Poor" condition, and 3 sites were in "Good" condition. Habitat results for the watershed were, "Partially Supporting" for the Upper and Lower Little Patuxent and "Non-Supporting" in the Middle Little Patuxent. The report is available for viewing online at http://www.howardcountymd.gov/DisplayPrimary.aspx?id=359

Urban Nutrient Management Group

The SWMD continues to attend the Urban Nutrient Management Group meetings when they are held. The Fertilizer Use Act of 2011 was promoted through the group and was advertised in the County Stormwater newsletter.

Rain Barrel Program

The SWMD continues to provide residents with free barrels through the County's Rain Barrel Program. Predrilled rain barrels are available free of charge to residents who attend seminars at the Alpha Ridge landfill. Residents purchase the hardware needed and the Master Gardeners provide free instruction on how to assemble the rain barrels. In 2013, Howard County gave away 210 rain barrels to residents resulting in a total of 586 rain barrels given away within the past four years.

Rain Garden Program

During the summer of 2013 Howard County provided the funding for the second year of the READY (Restoring the Environment and Developing Youth) Rain Garden Program. Led by the Alliance for the Chesapeake Bay, People Acting Together in Howard (PATH), Parks and People Foundation, and the University of Maryland Extension Service, the READY Program teaches young adults about environmental issues, trains them to build water quality projects, asks them to give presentations throughout the community, and has them install local projects. Several groups including the Cove Condominiums, North St. John's Swim and Tennis Club and the Stonebrook Community Association participated in the READY program. Some statistics from this season include:

- 44 young adults employed as READY workers (range: 16-26 years old, average age 19)
- Interactions with 37 customers, thereof 16 new installation locations

- Installation of 42 rain gardens, conservation landscapes, and erosion control measures
- Maintenance and redesign of 11 rain gardens and conservation landscapes
- Total drainage area of more than 375,000 sq. ft. addressed
- Man-made impervious surfaces of 100,000 sq. ft. addressed

In contrast to 2012 during which it was possible to treat large parking lots, the opportunities available this year mainly involved treating rooftops. However, many of the watershed protection measures this year also encompassed terrain such as eroded slopes within the drainage areas. Maintenance and redesign was a component of the activity this year. While maintenance does not increase impervious surfaces treated, the adjustments help to ensure proper ongoing performance of the watershed protection measures. By revisiting prior sites the students could also see how well certain practices performed.

Planning and Zoning

Agricultural Land Preservation Program

The Howard County Agricultural Land Preservation Program (ALPP) uses County funds to purchase preservation easements on farmland. The County also obtains agricultural easements through the dedication of preservation parcels to the ALPP as part of the density sending and clustering provisions of the subdivision regulations. As of June 30, 2014, the County had purchased easements on 14,959 acres, the State had purchased easements on 4,041 acres (MALPF and Rural Legacy) and the County had acquired easements through dedication on 2,972 acres. In the January 2013-June 2014 reporting period, the County purchased agricultural easements on 5 properties totaling 327 acres. There were no easements purchased by MALPF or dedicated to the ALPP in the reporting period.

Fee-In-Lieu-Of SWM Fund

The County has a fee-in-lieu-of SWM fund that allows developers of minor subdivisions to pay a fee instead of building quantity SWM, when it would present a hardship. “Fee-in-lieu-of” funds result from quantity management releases only; water quality treatment is still required. No additional fee-in-lieu-of SWM funds were collected during the current permit year. The County is using the collected funds to address stormwater impacts in a variety of ways including pond retrofit and stream restoration projects. With the current stormwater regulations in place, “fee-in-lieu-of” quantity management is rarely an option; therefore, funds are rarely collected.

Other County Agencies

Fire Department Hazardous Spills Response

From 1/1/2013 through 6/30/2014 the Fire Department responded to 47 spills that required mitigation by the hazardous materials team. Materials involved in these spills included mercury, food grease, pesticides, liquid fertilizer, hydrofluoric acid, antifreeze and various petroleum products. Not all spills were large enough to generate a spill report.

Environmental Sustainability Board

On the recommendation of the Commission on Environment and Sustainability (February-August 2007) Howard County created an Office of Environmental Sustainability and a permanent Environmental Sustainability Advisory Board. The board consists of 13 citizens with a broad range of expertise. Meeting agendas and notes can be found at http://www.howardcountymd.gov/ESB.htm.

Since the Commission's final report, the Office and Board have systematically worked to achieve the goals put forth by the Commission report as well as continuing to develop new goals and initiatives. The Board also advises the County Council and County Executive on environmental concerns, including stormwater management.

Office of Environmental Sustainability

The Office of Environmental Sustainability (OES) continues to lead the County's Stormwater Cabinet that includes the directors and key senior staff from DPW, DPZ, DRP, OES, and the County Executive's Office. Policy issues as well as project initiatives are shared in order to bring greater efficiency to stormwater operations and maintenance initiatives.

From a community outreach perspective, OES has developed a stormwater management awareness campaign that includes a website, informational brochures, workshops and a variety of multi-media programs to raise awareness and offer a variety of stormwater management solutions suitable for residential and small commercial properties. The following logo has been adopted and a new website, cleanwaterhoward.com is near completion:

clean H2OWARD
Howard County Stormwater Solutions

For the seventh year running, OES worked with other departments to organize Howard County GreenFest (howardcountymd.gov/greenfest.htm), a community-focused environmental fair that provides information and education on sustainable environmental practices. This year the theme was "Water Quality Begins at Home".

Health Department

Since 2012, the Howard County Health Department has maintained information on its webpage noting that old prescriptions and medicines should not be poured down the drain or flushed since it may negatively affect the quality of streams, waterways, and the Bay. As part of the on-going Bay Restoration Fund (BRF) grant program, the Health Department is identifying and inspecting qualifying properties with failing septic systems, coordinating the connecting of qualifying homes currently on septic systems within the Metropolitan District, and also evaluating system upgrades for acceptance into the grant program. Based upon increased available funding through a legislative approved doubling of the fee, some BRF money may also be available for new installations of units utilizing best available technology (BAT). Recent State

legislation (effective January 2014), now requires that all new construction utilizing on-site sewage disposal, must be outfitted with BAT units which may create an across the board reduction in the nitrogen levels potentially impacting overall TMDL limits. The current grant award of $214,000 is through June 2015 with the potential for an additional supplement midway through the year. Future renewals and/or supplemental funding will be based upon established criteria and available funding distributed by MDE.

Howard County Public School System

The following environmental projects were completed on Howard County School Property during the 2013-2014 school year:

- Worked with the Alliance for the Chesapeake Bay and Restoring the Environmental And Developing Youth (READY) to design Rain Gardens at the Manor Woods ES, Dayton Oaks ES, Forest Ridge ES, and Atholton ES.
- Relining of outfall pipe at Elkridge ES.
- Repairs to inlet leading to SWM at Oakland Mills HS.
- Repair to the outflow area at Wilde Lake HS.
- Repair to outfall area behind Northfield ES.
- Stabilized embankment erosion leading to SWM at Murray Hill MS.
- Repair yard inlet and made improvements to surrounding yard drain at Long Reach HS.
- Installed bioretention ponds at our schools during Renovation projects. Stevens Forrest ES, Deep Run ES, Ducketts Lane ES, Gormans Crossing ES, Laurel Woods ES, Longfellow ES and Running Brook ES
- Heavily involved in the Howard County recycling program.
- Elementary Schools involved in grounds survey to identify environmental problems on school grounds.
- The following Schools installed small gardens as part of the school curriculum: Folly Quarter MS, Waverly ES, Talbott Springs ES, Harpers Choice MS, Veterans ES, Hammond HS, Worthington ES,

SECTION VI. WATERSHED ASSESSMENT AND PLANNING

A. Introduction

The entire County must be assessed on an individual watershed basis to evaluate existing water quality conditions and then recommend structural and non-structural projects, which when implemented will improve water quality within that watershed and in turn improve water quality in the County as a whole.

B. Permit Conditions

Howard County shall continue the systematic assessment of water quality within all of its watersheds. These watershed assessments shall include detailed water quality analyses, the identification of water quality improvement opportunities, and the development and implementation of plans to control stormwater discharges to the maximum extent practicable. The overall goal is to ensure that each County watershed has been thoroughly evaluated and has an action plan to maximize water quality improvements.

At a minimum, the County shall:

1. Continue to develop watershed management plans for all watersheds in Howard County. These assessments shall be performed according to priorities established previously by the County. At a minimum, watershed management plans shall:

a. Determine current water quality conditions;

b. Identify and rank water quality problems;

c. Identify all structural and non-structural water quality improvement opportunities;

d. Include the results of a visual watershed inspection;

e. Specify how the restoration efforts will be monitored; and

f. Provide an estimated cost and a detailed implementation schedule for those improvement opportunities identified above.

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Howard County continues the systematic assessment of water quality in all its watersheds. The process began during the second-generation permit period with a task to divide the County into manageable size sub-watersheds and then prioritize the watersheds for doing detailed assessments. The first two detailed studies were

for the Centennial Lake and Wilde Lake watersheds. The County previously completed detailed watershed assessments for the Sucker Branch and Rockburn Branch sub-watersheds as part of the larger-scale Lower Patapsco WRAS. The portions of the Lower Patapsco WRAS study area not in Sucker or Rockburn Branches had been field assessed as part of the overall WRAS work. The County revisited all potential water quality improvement sites in the Lower Patapsco WRAS area and added these sites to its master list of countywide restoration projects.

All of the watershed plans noted herein identified current water quality conditions and ranked the problems according to their severity. The detailed studies listed structural as well as non-structural improvement projects along with cost estimates to implement the projects. A list of potential projects has been generated from each detailed study, from previous stream assessments not mentioned above, and from citizen complaints. A master list of all potential projects is extensive, but it provides the County with a priority list, which continues to be used for adding new water quality improvement projects to the capital budget subject to available funding.

Monitoring for the specific projects noted above will be handled through various monitoring efforts. The County is performing watershed level biological, physical, and chemical monitoring for the Wilde Lake and Red Hill Branch watersheds. Specific projects in these watersheds and within other watersheds may also include monitoring on a case-by-case basis per specific project permit requirements.

2. Develop watershed management plans until all land area in Howard County is covered by a specific action plan to address the water quality problems identified. At a minimum, the County shall perform a detailed watershed management plan for one County watershed during this permit term.

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Howard County

As noted above, the County is systematically developing watershed management plans for all of its watersheds. The County completed the Upper Little Patuxent River (ULPR) Watershed Study during the 15th permit year, which met the requirement for the one watershed study during the third permit term. The ULPR study area begins at the headwaters of the Little Patuxent River and includes all tributaries down to where the Little Patuxent River crosses Old Annapolis Road. The final ULPR report, which includes the methods and results of the study, and an implementation plan, was completed in 2009 and is available on the County's Stormwater Management Division's webpage.

In 2013, the County completed two countywide assessments, which identified water quality enhancement projects to help the County meet its TMDL requirements. The first study reviewed all County owned properties (including properties owned by the Howard County Public School System) to identify LID projects to treat currently untreated impervious areas. The second study reviewed all dry ponds and extended detention ponds in the County to identify opportunities for water quality upgrades.

Design and construction of projects from these studies began in 2013 as soon as the studies were completed.

The County is also working on a Countywide Implementation Strategy (CIS) for addressing its TMDL requirements. The CIS will include a large scale assessment that will provide the framework for moving forward with more detailed studies and watershed restoration plans. In 2014and 2015, the County plans to initiate detailed assessments in the Little Patuxent Watershed and the Middle Patuxent Watershed to identify additional projects and to develop restoration plans for these watersheds.

Columbia Association

The Columbia Association (CA) has developed a Columbia Watershed Management Plan (CWMP) that outlines a long-term, far-reaching strategy to protect and restore the Little and Middle Patuxent Rivers and adjacent waters within Columbia. The CWMP will support ongoing efforts and provide a sustainable pathway to effectively manage these Columbia watersheds going forward consistent with the CWMP's vision statement: Protecting and Restoring the Waters of Columbia.

Additionally, CA developed a watershed web site at www.columbiawatershed.org, where stakeholders can find information on numerous activities to help protect and restore the watershed. The web site includes links to other resources that provide more in-depth information. There are also sections with activities for kids and an interactive map for pinpointing which stream is nearest to your home. There are links to this website on all other CA websites.

The CWMP identified 18 retrofits in the Elkhorn sub-watershed for implementation and presented concept plans for the projects. In 2012, six of these projects were completed: five bioretention facilities treating a total drainage area of 5.16 acres and one bio-swale treating a total drainage area of 0.55 acres. In 2013, three stormwater outfall stabilization projects, 2 bioretention facilities and a wetland bench were completed, These projects treat 8.49 acres of impervious area. These projects are fully funded by CA's capital budget and are also being funded through a 2010 Trust Fund grant. For additional information on the retrofit projects please go to the watershed website and download the CWMP http://www.columbiawatershed.org/html/management.html. The projects completed this year cost a total of $965,757.35.

CA also sponsors or participated in a number of community engagement activities, including the Columbia-wide stream cleanup, CA's Watershed Advisory Committee and The River Hill Community Association Watershed Sub-Committee. Through these events over 200 volunteers were engaged.

3. Provide, in the first annual report for this permit, complete watershed management plans for Wilde Lake and Centennial Lake. Subsequent annual reports shall continue progress reporting and the detailed watershed management plan required in PART III.F.2. above shall be submitted no later than the fourth annual report.

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The final Centennial Lake and Wilde Lake Watershed Restoration Plan has previously been provided to MDE. Implementation of the Centennial Lake and Wilde Lake Watershed Restoration Plan continues and will be reported on in Section VII. Watershed Restoration below.

SECTION VII. WATERSHED RESTORATION

A. Introduction

The goal of the Watershed Assessment and Planning section of the County's NPDES permit is to identify projects, which when implemented will improve water quality in the County. Section VII. Watershed Restoration includes a description of the projects selected by the County for implementing its watershed restoration approach.

B. Permit Conditions

Howard County shall implement those practices identified in PART III. F. above to control stormwater discharges to the maximum extent practicable. The overall goal is to maximize the water quality in a single watershed, or combination of watersheds, using efforts that are definable and the effects of which are measurable. At a minimum, the County shall:

1. Continue the implementation of those restoration efforts that were identified and initiated during the previous permit term to restore ten percent of the County's impervious surface area. The watershed, or combination of watersheds where the restoration efforts are implemented shall be monitored according to PART III. H. below to determine effectiveness toward improving water quality.

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The County continues looking to implement water quality improvement projects identified in the Centennial Lake and Wilde Lake Watershed Restoration Plan. Two restoration projects were ongoing in the Wilde Lake watershed during the current permit year. The first project is a large underground storage facility at Wilde Lake High School which is under construction during Summer 2014. The facility will capture runoff from the Wilde Lake watershed. The second project is a bioretention facility enhancement at Harpers Choice Middle School. This project is currently on hold. The Centennial Park North Pond Retrofit project will be done in conjunction with the dredging project planned for Centennial Lake, currently planned for fiscal year 2016.

2. Begin to implement restoration efforts in a watershed, or combination of watersheds, to restore an additional ten percent of the County's impervious surface area. These efforts shall be separate from those specified in PART III. G.1. above and shall be monitored according to PART III. H. below to determine effectiveness toward improving water quality.

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As noted in Section VI. Watershed Assessment and Planning, the County has developed a single prioritized list of water quality improvement projects. The list includes potential projects from watershed studies as well as from responding to citizen complaints. The County selects projects from that list for implementation. The nature of the list allows the County to implement restoration efforts in additional watersheds or combinations of watersheds as required by the County's NPDES permit conditions. During the current permit year, the County continues the design/construction of restoration projects identified in the Upper Little Patuxent River Watershed Study as well as other high priority projects in other watersheds.

3. Report annually:

a. The progress toward meeting the goals established in PART III. G.1. and 2. above;
b. The estimated cost and the actual expenditures for all watershed restoration activity; and
c. The progress toward meeting the overall watershed restoration goals established in PART III.F. above.

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As noted previously in Section VII Watershed Restoration, the County continues to work towards meeting the goals in the specific detailed watershed studies as well performing watershed restoration on a countywide basis. The County has completed or is currently working on many projects to meet its watershed restoration goals. In addition to the new projects noted above, the list below notes other current restoration projects. For projects completed during previous permit years only the name and completion year are given. All other projects have a brief description. "CA" is used to designate projects performed by Columbia Association.

- **Preston Court Pond Retrofit-Baltimore-Washington Industrial Park** (2010)
- **West Durham Road** (1999)
- **Kingscup Court Stream Restoration** (2002/2003)
- **Yellowbell Lane Slope Stabilization** (2004)
- **The Bowl Pond** (2004)
- **Columbia Gateway Pond Retrofit** (2004)
- **St. Johns Woods Pond Retrofit** (2006)
- **Danmark Drive Pond Retrofit** (2006)
- **Wilde Lake Stream Restoration – Reach D** (2006)
- **Ducks Foot Lane Stream Restoration – Phase 1** (2006)
- **Ducks Foot Lane Stream Restoration – Phase 2** (2006)
- **Autumn Harvest Stream Restoration** (2006)
- **Willowwood Way Slope Stabilization** (2006)
- **Cherry Creek Stream Restoration – Phase 1** (2006)
- **Fulton/Haddaway Channel Stabilization** (2006/2007)

- **Farewell Road Stream Restoration** (2007)
- **Oakland Executive Park Pond Retrofit** (2008)
- **Rockburn Township Pond Retrofit** (2008)
- **Brightwood Court Stream Restoration** (2008)
- **Brookmede Stream Restoration** (2008)
- **Green Clover Stream Restoration** (2008)
- **Wilde Lake Middle School Bioretention** (2008)
- **Burleigh Manor Middle School Bioretention** (2008)
- **Board of Education Headquarters Pond Retrofit** (2008)
- **Centennial Park Sand Filter** (2008)
- **ARL Site Channel Retrofit** (2009)
    - **ARL Site Dry Swale** (2012)
    - **ARL Site Micropool** (2010)
- **Howard County Center for the Arts Water Quality Project** (2009)
- **Wesleigh Drive Stream Restoration** (2009)
- **Tiller Drive Stream Restoration** (2009)
- **Tall Maple Stream Restoration** (2009)
- **Brampton Hills Pond Retrofit** (2010)
- **Cherry Creek Stream Restoration – Phase 2** (2010)
- **Paul Mill Road Stream Restoration** (2011)
- **Cedar Lane Park – North Entrance Water Quality Retrofit** (2010)
- **Dorsey Building Parking Lot Water Quality Retrofit – 3 Bioretention Facilities** (2010)
- **Red Hill Branch Rain Garden Program** (2010)
- **Village of River Hill Shallow Marsh Restoration** (2010)
- **West Zone Repair Center Pond Retrofit** (2010)
- **Farmington Court Water Quality Swale** (2010)
- **Saint John' Green Pond Retrofit** (2011)
- **Wilde Lake Stream Restoration – Reach C** (2011) "CA"
- **Red Hill Way Stream Restoration** (2011)
- **Old Willow Way Stream Restoration** (2011)
- **Atholton Park Water Quality Retrofit** (2011)
- **Stratford Downs Stormwater Retrofit** (2011)
- **Great Drum Circle Restoration** (2012)
- **Great Oaks Way Stormwater Retrofit** (2012)
- **Faulkner Ridge Circle Stream Stabilization** (2011)
- **Savage Park Water Quality Enhancement** (2011)
    - **Bioretention**
    - **Stream Restoration**
- **Autumn Harvest – Phase 2 Stream Restoration** (2011)
- **Waverly Woods Stormwater Retrofit** (2011)
- **Hickory Ridge Village Center Pond Outfall Restoration** (2011)
- **Hi Tech Road Stream Restoration** (2011)
- **Mount Hebron High School Stormwater Retrofit** (2012)
- **LPPSI Stream Mitigation Project – Site A** (2011)
- **Lake Elkhorn Bioretention – Site LE-RRI-504** (2011) "CA"

- **Y of Central Maryland Bioretention – Site RU 8** (2011) "CA"
- **Threshfield Court Stream Restoration** (2012)
- **Bramhope Lane Stream Restoration** (2012)
- **Meadowbrook Park Stream Restoration** (2012)
- **Salterforth Place Pond Retrofit – Pond 1** (2012)
- **Trotter Road Bank Stabilization** (2012)
- **Salterforth Place Pond Retrofit – Pond 2** (2012)
- **LPPSI Stream Mitigation Project – Site B** (2013)
- **Cypress Bay Court Pond Retrofit** (2013)
- **Elmmede Road Stream Restoration** (2013)
- **Dower Drive Stream Restoration** (2013)
- **Windflower Drive Stream Restoration** (2013)
- **Wheatfield Way Stream Restoration** (2013)
- **Country Lane Pond Retrofit #1** (2013)
- **Country Lane Pond Retrofit #2** (2013)
- **Oak West Drive Water Quality Enhancements** (2013)
    - **Bioretention Facility**
    - **Stream Restoration**
- **Ashmede Road Pond Retrofit** (2014)
- **Tiller Drive Phase 2 Stream Restoration** (2013)
- **Stone Trail Court Stream Restoration** (2014)
- **Whiterock Court Stream Restoration** (2014)
- **Angelas Valley Pond Retrofit** (2014)
- **Tuscany Road Stream Restoration** (2014)
- **LPPSI Wetland Mitigation Project** (2014)

Centennial Park North Pond Retrofit Project – A design was initially done to convert an in-stream sediment forebay dam to a natural stream reach. The scope of the project has since changed to a rehabilitation of the existing dam, with design currently being completed. The proposed work area drains directly to Centennial Lake and is located within the Centennial Lake Watershed area. Construction is expected to be done as part of the lake dredging project planned for the near future.

Rainwater Harvesting and Washpads – As mentioned previously in this Annual Update, the County is currently designing the addition of outdoor washpads and rainwater harvesting from the roofs of most of the County's fire stations and several park maintenance shops. These projects will collect and treat the washwater as well as utilize the harvested rainwater for the washing activities. The County has completed a feasibility study of all fourteen locations and is currently in the design phase.

Whitworth Way Pond Retrofit – Design has begun on a water quality retrofit to an existing dry stormwater management pond. The drainage area to the pond is approximately 85 acres. Construction is anticipated in Summer 2015 to coincide with schools being closed since construction access is via a walking path to a local elementary school.

Stevens Forest Elementary School Retrofit – Installing two microbioretention facilities and one bioswale for the school's paved surfaces. Construction began in Summer 2014 and will be completed during the next permit cycle.

Turf Valley Overlook Pond 3 Retrofit – Design of a pond retrofit was begun during this permit period. This project will retrofit a dry stormwater management pond to provide water quality treatment. Construction is anticipated in Winter 2015.

Old Mill Pond Retrofit –This project will retrofit a dry stormwater management pond to provide channel protection. Construction is anticipated to be completed in Fall 2014.

Warfields Range Pond Retrofit – This project will retrofit a dry stormwater management pond to provide water quality treatment. Construction is anticipated in Winter 2015.

Gerwig Lane Pond Retrofit –This project will retrofit a wet stormwater management pond with the addition of water quality treatment. WQv and channel protection treatment will be provided for the entire drainage area. Construction is anticipated in Winter 2014.

Pinehurst Court Stream Rehabilitation Project – Design of this stream restoration project is nearing completion. Construction is anticipated to begin in Fall 2014. The project involves stabilization of approximately 450 linear feet of a tributary to the Little Patuxent River and the installation of a shallow marsh BMP that will provide water quality treatment for over 2 acres of imperviousness.

Southview Road Stream Restoration Project – Design of this stream restoration project is nearing completion. Construction is anticipated to begin in Fall 2014. The project involves the stabilization of over 2,700 linear feet of a tributary to Plumtree Branch in the Little Patuxent Watershed.

Wilde Lake High School Retrofit Project – The Wilde Lake High School Retrofit Project treats a drainage area of 23.09 acres with an impervious area of 12.88 acres. Channel protection volume is managed by 600 linear feet of 96-inch pipe. Water quality treatment is provided by four devices (two storm filters and two Voortechs. The entire system is located underground, beneath the athletic fields of Wilde Lake High School. The system is designed to intercept runoff from the parking areas at the Interfaith Center and the High School as well as the roof areas. Construction is ongoing and anticipated to be completed early Fall 2014.

Dorsey Hall Village Center Stream Restoration and Outfall Stabilization – This project consists of approximately 1,200 linear feet of stream restoration and several outfall stabilizations for over 14 acres of impervious surface area in the Dorsey Hall Village Center area. Design is ongoing, and construction is anticipated during FY15.

Additional watershed restoration projects currently under design and construction for FY15 include:

- Bonnie Branch Stream Restoration
- Cedar Lane Park Design
- Deep Earth Lane Repair and Retrofit Design
- Department of Recreation and Parks Headquarters Retrofits
- Ellicott Mills Road Bioretention
- Font Hill Park Repair
- Garand Drive Pond Retrofit
- Harpers Choice Middle School Pond Retrofit
- Heron's Flight Repair/Retrofit
- Howard Community College Stream Restoration
- Lynwood Manor Retrofit
- Long Meadow Pond Repair 1
- Long Meadow Pond Repair 2
- Parking Lot D Retrofits
- Parking Lot E Retrofits
- Patapsco Park Estates Repair and Retrofit
- Patapsco River Road Bumpouts
- Patapsco River Road Pond Repair and Retrofit
- Pebble Beach Pond 2 Retrofit
- Rainwater Harvesting and Washpads (County Fire, Police, and Park sites)
- Red Cravat Pond Repair and Retrofit
- Rockburn Park Retrofit
- Rusty Rim Pond Retrofit
- Savage Library Water Quality Enhancements
- Students Branching Out FY15 Tree Planting
- Stonehouse Drive Outfall Stabilization
- Velvet Path Pond Retrofit and Outfall Stabilization
- Willow Bend Court Stream Restoration
- Woodlot Stream Restoration

While they are not specific watershed restoration projects identified through a watershed study, the County continues to annually repair or replace numerous existing stormwater management pond barrel pipes. In some cases this also involves the replacement of the old riser structure and dredging of the pond. These maintenance projects will not be included in the database of restoration projects, but it is worth noting that this work is taking place concurrent with the restoration projects noted above and there will be a net environmental improvement from the pipe replacements. Where practical the County will incorporate a water quality enhancement into the barrel replacement projects.

The County has identified the estimated and actual costs for implementing the watershed restoration projects noted above in Section VII of this Annual Update. As of the date of this annual report, the estimated cost is approximately $12,134,000

and the actual cost is approximately $25,497,000 for a total expenditure of approximately $37,631,000. The “actual” costs reflect designs and/or construction phases that have been completed. The “estimated” costs reflect design and/or construction phases that are currently in process where a purchase order has not been issued yet, therefore, these tasks do not yet have an “actual” cost associated with them.

Starting with Permit Year 14, there were a large number of projects begun, which was primarily due to the influx of funding from a Chesapeake Bay 2010 Trust Fund Local Implementation Grant and other State and Federal grants. The County continues to receive Trust Fund grant money, which has allowed the County to accelerate the number of projects that can get done annually.

SECTION VIII. ASSESSMENT OF CONTROLS

A. Introduction

Howard County's municipal NPDES management program effectiveness is evaluated through a combination of chemical, biological, and physical assessments to document the water quality impacts of the County's water quality improvement and watershed restoration efforts.

B. Permit Conditions

Assessment of controls is critical for determining the effectiveness of the NPDES stormwater management program and progress toward improving water quality. Therefore, the County shall use chemical, biological, and physical monitoring to document work toward meeting the watershed restoration goals identified in PART III. G., above. Additionally, the County shall continue physical stream monitoring in the Hammond Branch watershed to assess the implementation of the 2000 Maryland Stormwater Design Manual or other innovative stormwater management technologies approved by MDE. Specific monitoring requirements are described below.

1. Watershed Restoration Assessment

The County shall continue monitoring in the Font Hill watershed, or, select and submit for MDE's approval a new watershed restoration project for monitoring. Ample time shall be provided so that pre-restoration monitoring, or characterization monitoring, can take place. Monitoring activities shall occur where the cumulative effects of watershed restoration activities can be assessed. An outfall and associated in-stream station, or other locations based on a study design approved by MDE, shall be monitored. The minimum criteria for chemical, biological, and physical monitoring are as follows:

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As noted in Section D. Discharge Characterization, the County, with MDE approval, previously replaced the Font Hill watershed monitoring with monitoring efforts in the Centennial Lake and Wilde Lake watersheds. The monitoring program included geomorphic, chemical, physical habitat, and biological assessments conducted throughout the watersheds to determine if the restoration efforts outlined in the *Centennial and Wilde Lake Watershed Restoration Plan* (CWP, 2005) were succeeding in reducing pollutant loading and increasing the health of the lakes and streams. The goal of the monitoring strategy is to assess the overall condition rather than focusing on specific sites.

Branch subwatershed was initiated. The Red Hill Branch subwatershed was identified as a priority subwatershed in the County's Upper Little Patuxent Watershed Management Plan. The County has therefore focusing restoration and restoration monitoring efforts in this area. As described in more detail below, Red Hill Branch monitoring was initiated in late 2009 with geomorphic assessments, and in early spring of 2010 with biological assessment, continuous discharge, baseflow and stormflow water quality, and sediment sampling. Monitoring focuses on determining the pollutant loading/removal rates at three sites; Salterforth Pond Retrofit, Bramhope Lane Stream Restoration, and Meadowbrook Park at the downstream end of the subwatershed.

Since full Year 1 monitoring was not complete until late 2010, summary results of the Red Hill Branch Monitoring from 2010 were not included in Annual Update Number 15, and were, instead, included in Annual Update Number 16. Similarly, since full Year 2 and Year 3 monitoring was not completed until late 2011 and 2012, respectively, summary results from these years were included in Annual Update Number 17, and in last year's report (Annual Update Number 18), respectively. This year's report includes summary results of the Red Hill Branch Monitoring from Year 4 (2013). A full report of Red Hill Branch monitoring methods, data analysis, and results from Year 4 is provided in the *Red Hill Branch Watershed Restoration Year 4 –2013 Post-Restoration Conditions Monitoring* report, which is included as a stand-alone document with the annual update.

Under Howard County's previous permit, physical stream monitoring in the Hammond Branch watershed was undertaken to determine the effectiveness of stormwater management practices for stream channel protection. In 2010, monitoring of Hammond Branch was discontinued, and in 2011 Howard County (in conjunction with MDE) replaced monitoring at the Hammond Branch site with another site in order to meet the conditions of the County's NPDES MS4 permit. To evaluate the effectiveness of recent stormwater controls from developed sites, Howard County and MDE chose an unnamed tributary to Red Hill Branch (hereafter called Rumsey Run) within the Red Hill Branch subwatershed for this analysis. The County is monitoring the effectiveness of the *2000 Maryland Stormwater Design Manual* and other innovative stormwater management technologies through geomorphic assessments, limited runoff investigations, and modeling in Rumsey Run. A full report of Rumsey Run monitoring methods, data analysis, and results are provided in the *Evaluation of Maryland Stormwater Management Methods in Rumsey Run Year 3 – 2013* report, produced as a stand-alone document and submitted as part of the annual update.

The specific monitoring strategies in place for Wilde Lake are discussed further in sub-sections a, b and c below. Due to a change in the County's reporting deadline to the state, results of biological and geomorphic monitoring conducted in Wilde Lake Watershed during Spring 2014 will be reported along with the full year of water chemistry monitoring conducted during 2014 in the *Wilde Lake Watershed Stream Monitoring; Year Nine – 2014* report, produced as a stand-alone document which will be included next year as part of the annual update. This will standardize the timeframe of collection of data within Wilde Lake Watershed. The full methods and data analysis for biological and geomorphic monitoring conducted during 2013 were reported in the *Wilde*

Lake Watershed Stream Monitoring; Year Eight – 2013 report, produced as a stand-alone document included as part of last year's annual update (Annual Update 18). The full methods and data analysis for water chemistry monitoring conducted during 2013 are reported in the *Wilde Lake Watershed Stream Monitoring; Year Eight – 2013 Water Chemistry Supplemental* report, produced as a stand-alone document included as part of this year's annual update. The following subsections will provide a more detailed explanation of the chemical, biological, and physical components of the monitoring work:

a. <u>Chemical Monitoring</u>:

i. Eight (8) storm events shall be monitored per year at each monitoring location with at least two occurring per quarter. Quarters shall be based on the calendar year. If extended dry weather periods occur, baseflow samples shall be taken at least once per month at the monitoring stations if flow is observed;

ii. Discrete samples of stormwater flow shall be collected at the monitoring stations using automated or manual sampling methods. Measurements of pH and water temperature shall be taken;

iii. At least three (3) samples determined to be representative of each storm event shall be submitted to a laboratory for analysis according to methods listed under 40 CFR Part 136 and event mean concentrations (EMC) shall be calculated for:

Biochemical Oxygen Demand (BOD_5)	***Total Lead***
Total Kjeldahl Nitrogen (TKN)	***Total Copper***
Nitrate plus Nitrite	***Total Zinc***
Total Suspended Solids	***Total Phosphorus***
Total Petroleum Hydrocarbons (TPH)	***Oil and Grease****
Fecal Coliform or E. coli	***(*Optional)***

iv. Continuous flow measurements shall be recorded at the in-stream monitoring station or other practical locations based on an approved study design. Data collected shall be used to estimate annual and seasonal pollutant loads and for the calibration of watershed assessment models.

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As reported in previous Annual Reports, the County selected two new in-stream monitoring locations where automatic samplers and continuous flow monitoring

equipment were installed. The Wilde Lake site is located on the main channel draining to Wilde Lake and is located on Columbia Association property behind Green Mountain Circle. Due to channel conditions and access issues, the selected site is approximately 1700 feet upstream of Wilde Lake. The sampling station includes a probe for continuous instream water quality monitoring, continuous flow monitoring, and a refrigerated unit for collection of stormwater samples. No rain gage is installed; however the Wilde Lake site is located in close enough proximity to the Meadowbrook rain gauge along with other rain gauges in the County, whose data can be applied to the Wilde Lake site.

In 2013, the County performed seven storm sampling events and one baseflow sampling event at the Wilde Lake site, and eight storm sampling events at the Red Hill Branch site located in Meadowbrook Park. The results of the sampling at all sites are submitted on the CD provided as outlined in Attachment A as part of the accompanying geodatabase.

Stormflow data were collected at Wilde Lake on seven occasions during the 2013 monitoring period (January 30, February 13, June 6, August 13, October 7, November 16, and December 6, 2013). Baseflow data were collected on one occasion during the 2013 monitoring period (February 10, 2014). Average (2007-2013) concentrations of metals in stormflows (Cadmium, Lead, Copper and Zinc) at the Wilde Lake sampling site have been consistently below their associated acute criteria set by MDE. TSS levels in stormflow samples are elevated, but not excessive, as would be expected during storm events. Fecal coliform concentrations, however, have been consistently high during the six years that storm samples have been collected, and have increased further during the 2013 monitoring period.

Stormflow data were collected at the permanent water quality monitoring station at Meadowbrook Park on eight occasions in 2013 (January 31, February 8, May 23, July 21, October 7, November 1, November 17, and December 6, 2013). Median concentrations of storm runoff total nitrogen, TSS, and total phosphorus were 1.54 mg/L, 19 mg/L, and 0.30 mg/L, respectively. Average metal concentrations at Meadowbrook Park were below their respective acute MDE criteria. Fecal coliform levels remained elevated during 2013.

A total of eight wet weather events were sampled at the Red Hill Branch retrofit site in 2013 (February 8, March 18, May 24, July 21, October 7, November 1, November 17, and December 6, 2013).

During 2013, Salterforth Pond total nitrogen concentrations ranged from 0.64 to 4.38 mg/L for the influent and 0.56 to 6.60 mg/L for the effluent. Concentrations of total phosphorus ranged from 0.08 to 2.80 mg/L for the influent and 0.06 to 0.70 mg/L for the effluent. TSS concentrations ranged from 5 to 64 mg/L for the influent and 0 to 100 mg/L for the effluent.

A total of eight wet weather events were sampled at the Red Hill Branch restoration site in 2013 (February 8, March 18, May 24, July 20, October 10, November 1, November 17, December 6, 2013).

Bramhope Lane restoration site baseflow data showed that baseflow total nitrogen and total phosphorus concentrations were elevated in comparison to EPA guidelines while TSS concentrations were within acceptable ranges. The maximum stormflow concentration of total phosphorus ranged from 2.20 mg/L at the upstream station to 1.20 mg/L at the downstream station. The maximum stormflow TSS concentration ranged from 137 mg/L at the upstream station to 193 mg/L at the downstream station. The maximum stormflow concentration of total nitrogen ranged from 4.90 mg/L at the upstream station to 5.00 mg/L at the downstream station. The median suspended solids concentrations in samples collected from the siphon samplers at the upstream Bramhope, downstream Bramhope, and Meadowbrook stations were 73.5, 22, and 100 mg/L, respectively. The median dry-weight mass of sediment transported at the upstream Bramhope, downstream Bramhope, and Meadowbrook stations were 0.5, 0.8, and 7.2 pounds, respectively.

b. Biological Monitoring:

i. Samples shall be gathered each Spring between the outfall and in stream stations or other practical locations based on an approved study design; and

ii. The County shall use the U.S. Environmental Protection Agency's (EPA) Rapid Bioassessment Protocol III, Maryland Biological Stream Survey (MBSS), or other similar method approved by MDE.

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Due to a change in the County's reporting deadline to the state, results of biological and geomorphic monitoring conducted in Wilde Lake Watershed during Spring 2014 will be reported along with the full year of water chemistry monitoring conducted during 2014 and included in next year's annual update. Biological monitoring was conducted in Spring 2013 at five sites in the Wilde Lake watershed, and was reported on in last year's annual update (Number 18). 2013 was the 8th consecutive year of monitoring at Wilde Lake, which began in the spring of 2006. In 2006, sites were selected using a randomized census approach to assess the condition and reaction of the stream's biological integrity to the implementation of the stream and watershed restoration plans. To enable an assessment of changes at the sites over time, sites first sampled during 2006 to 2010 will be re-visited during a second round of sampling. In 2011, sites that were first sampled in 2006 were re-sampled. In 2012, sites that were originally monitored in 2007 were re-visited. Similarly, in 2013, sites that were originally monitored in 2008 were re-assessed. The monitoring included the collection and analysis of the benthic macroinvertebrate community, assessment of the physical habitat, and instream water quality sampling. The full methods and data analysis are in the *Wilde Lake Watershed, Stream Monitoring; Year Eight 2013* report, produced as a stand-alone document included as part of last year's annual update.

A biological monitoring program was initiated in Red Hill Branch during the spring of 2010, which included the collection and analysis of the macroinvertebrate community,

physical habitat assessments, and measurements of *in situ* water chemistry. Biological assessments involved macroinvertebrate sampling at three sites located at the downstream end of the major drainage areas within the Red Hill Branch subwatershed as well as a fourth control site located in an adjacent watershed. The monitoring stations are being used for the assessment of restoration activities in this watershed. During the spring of 2013, benthic monitoring continued at these sites. The full methods and data analyses for assessments conducted in 2013 are presented in the *Red Hill Branch Watershed Restoration Year 4 –2013 Post-Restoration Conditions Monitoring* report, produced as a stand-alone document and included as part of the annual update.

Biological assessment methods within Howard County are designed to be consistent and comparable with the methods used by Maryland Department of Natural Resources (DNR) in their Maryland Biological Stream Survey (MBSS). The County has adopted the MBSS methodology to be consistent with statewide monitoring programs and programs adopted by other Maryland counties.

As reported last year, results of the Year 8 biological and physical habitat assessments in Wilde Lake indicated that the streams varied in habitat quality, but were only marginally capable of supporting aquatic life. Three of the five sampling sites had habitat that rated Partially Supporting; the remaining two rated Not Supporting. Using MBSS's Physical Habitat Index (PHI), habitat at one site rated Partially Degraded while the habitat at the remaining four sites rated Severely Degraded. Benthic macroinvertebrate sampling results were split between Very Poor and Poor ratings, with two sites in the Very Poor range and three sites rating Poor. The QC benthic macroinvertebrate site also rated Very Poor, scoring slightly lower than the original site it duplicates, which received an overall rating of Poor. The sample from original site had slightly fewer Chironomids than the duplicate site, resulting in a slightly higher score. Overall, the stream system in the Wilde Lake watershed exhibits evidence of the urban stressors affecting it and has not demonstrated marked improvement over the eight years of monitoring.

In Red Hill Branch, post-restoration monitoring results indicate a subwatershed in an overall degraded ecological condition, with little change from the first two years of pre-restoration monitoring. During 2013, one study reach and the control reach were classified as 'Very Poor' for biological condition, with an overall BIBI score of 1.67. The remaining study reaches were each classified as 'Poor' with scores of 2.00.The restoration reach received a "Severely Degraded" habitat condition rating and its habitat was evaluated as 'Not Supporting' aquatic life. Habitat at the remaining study reaches was rated "Degraded" and was classified as "Non Supporting" of aquatic life. The control reach received a habitat rating of 'Degraded' due to a low abundance of woody habitat and because of its close proximity to a road, but was rated 'Partially Supporting' of aquatic life based on frequency of riffles and epifaunal substrate.

c. <u>Physical Monitoring:</u>

i. A geomorphologic stream assessment shall be conducted between the outfall and in stream monitoring locations or in a reasonable area based on an approved study design.

This assessment shall include an annual comparison of permanently monumented stream channel cross-sections and the stream profile;

ii. A stream habitat assessment shall be conducted using techniques defined by the EPA's "Rapid Bioassessment Protocol for use in Streams and Rivers," or other similar method; and

iii. A hydrologic and/or hydraulic model shall be used (e.g., TR-20, HEC-2, HSPF, SWMM, etc.) to analyze the effects of rainfall; discharge rates; stage; and, if necessary, continuous flow on channel geometry.

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Wilde Lake Watershed

Since 2006, a yearly geomorphic assessment has been conducted during the spring at sites throughout the Wilde Lake watershed. Assessment occurs at the same locations each year. The main goal of the monitoring is to assess the temporal variability of the geomorphic stability of the stream channels upstream of the lakes as they react to restoration activities. Assessment techniques include the survey of channel cross-sections, particle size analysis, longitudinal profile, and Rosgen Level II analysis. Due to a change in the County's reporting deadline to the state, results of geomorphic monitoring conducted in Wilde Lake Watershed during Spring 2014 will be reported and in next year's annual update. Geomorphic monitoring was conducted in Spring 2013 in the Wilde Lake watershed, and was reported on in last year's annual update (Number 18).The full methods and data analysis are in the *Wilde Lake Watershed, Stream Monitoring; Year Eight - 2013* report, produced as a stand-alone document included as part of last year's annual update.

Cross-sections have been surveyed annually in the spring since 2006 to assess changes in channel geometry. A total of four cross-sections are surveyed in the Wilde Lake watershed. The cross-sections are located generally at the downstream ends of subwatersheds to identify the cumulative effects of the proposed upstream stormwater retrofits and stream restoration activities. Particle size analysis was completed at each cross-section. Three longitudinal profile surveys were conducted across the watershed, totaling approximately 2960 feet.

As reported last year, based on 2006 – 2013 geomorphic assessments, the Wilde Lake main stem continues to degrade with localized major changes in channel section and profile. Changes in bed features include bank erosion, bar formation, and high sediment supply. Sediment deposition and transport are common with significant mid-channel accumulations in some areas. Bed and bank erosion is most evident along the downstream profile. Upstream reaches are not experiencing the same level of erosion as the downstream reach. A complete riparian buffer is lacking along most of the channel.

As reported last year, stream physical habitat assessments were conducted in the Wilde Lake watershed in 2013 in conjunction with the 5 biological sites described under Biological Monitoring above. Physical habitat for the Wilde Lake watershed was assessed using the EPA's Rapid Bioassessment Protocol (RBP) (Barbour, *et al*, 1999) habitat assessment for high-gradient streams. The Wilde Lake sites showed low overall habitat availability, with three sites rated 'Partially Supporting' of aquatic life, and the other two rated 'Not Supporting' in 2013. By design, these sites sampled in 2013 were the same locations first sampled in 2008, when similar habitat scores were attained. In 2008, two sites rated 'Partially Supporting' and three sites rated as 'Not Supporting.' One site on Reach C improved from "Not Supporting" during the 2008 survey to scoring just above the "Partially Supporting" threshold during the 2013 survey. For the most part, habitat degradation has been observed at these Wilde Lake sites over time. During the initial year of monitoring (2006), three sites rated 'Supporting' and two sites rated as 'Not Supporting.' Between 2007 and 2012, there were three sites rated as 'Supporting,' 16 sites rated as 'Partially Supporting' and 11 sites 'Not Supporting.'

In 2007 a hydrologic and hydraulic (H&H) model analysis was performed to assess the stability of the main stem channels in the Centennial and Wilde Lake watersheds with results indicating erosion as the dominant channel process in both watersheds. The hydraulic model was updated in 2009 with similar results. Erosion remains the dominant channel process, but results indicated a move toward a more stable channel. The H&H analysis is generally consistent with the Wilde Lake geomorphic assessment results. Based on field data, many reaches are eroding, which is resulting in localized areas of point bar formation.

Red Hill Branch Subwatershed

Geomorphic assessments in the Red Hill Branch subwatershed were conducted in the spring of 2013 one year after the completion of the Bramhope Lane stream restoration project to evaluate the effectiveness of this and other restoration projects undertaken in this subwatershed. Assessments were conducted at three sites, one within the lower portion of the restoration site, one downstream of the restoration site, and one on a similar channel in an adjacent watershed intended to serve as a control. Assessment included longitudinal profiles, permanently monumented cross-section surveys, pebble counts, substrate facies mapping, bulk-bar sample sieve analysis, and measurement of bed/bank pins and scour chains. The full methods and data analyses for assessments conducted in 2013 are in the *Red Hill Branch Watershed Restoration Year 4 –2013 Post-Restoration Conditions Monitoring* report, produced as a stand-alone document included as part of this annual update.

Geomorphic data collected in 2013 serve as a comprehensive assessment of the second year of post-restoration conditions within the Red Hill Branch subwatershed. These data can be compared to results of two years of surveys of pre-restoration conditions conducted during 2009 and 2011 and the previous year's post-restoration data collected within the watershed. Comparisons between pre-restoration and post-restoration surveys will quantitatively evaluate changes in conditions as a result of restoration efforts throughout the subwatershed.

From the longitudinal profiles, Year 4 slopes were compared to those from two years of pre-restoration monitoring. Slope estimates increased slightly at all three reaches between the first two years of baseline monitoring, and increased slightly at the downstream and control reaches between the Year 2 pre-restoration and Year 3 post-restoration assessments. The slope at the restoration reach did not change between the pre-restoration assessment conducted in 2011 and the first post-restoration assessment conducted in 2012. In the year following restoration (between 2012 and 2013), the slope at the restoration reach increased slightly, while the slopes at the other reaches slightly decreased. The surveyed profiles from 2013 were plotted, overlain, and compared to the baseline condition profiles to assess changes occurring in the bed structure. At the restoration reach, little change was observed between the 2012 and 2013 post-restoration surveying with the exception of slight deposition in the series of step pools. At the downstream reach, a logjam that formed between the 2011 and 2012 survey was still in place during the 2013 survey, but it has broken up slightly which has allowed for more sediment to pass through. Between Years 3 and 4, the bed elevation of the upstream portion has lowered. At the control reach, a picnic table and resultant debris jam was present within the channel during all four years of monitoring, but slowly migrated downstream between each assessment year. Downstream of this jam, several smaller debris jams also formed, and have resulted in the continued shifting of features along the bed surface particularly in the middle to downstream portions of this reach. Future annual profiles will be plotted, superimposed, and compared to the baseline condition and yearly surveyed profiles to assess changes occurring in the bed structure.

At the downstream reach, there was noticeable deepening in 2013 along the right bank at the riffle cross-section. At the meander bend cross-section, the thalweg elevation remained relatively stable during all study years, but the remainder of the cross-section has widened considerably as both banks have experienced erosion. Bank erosion between post-restoration years has been comparatively unchanging. At the control reach, the riffle cross-section remained relatively stable during four years of assessments, while the meander bend cross-section continues to downcut and deepens. Prior to restoration, the downstream reach was highly incised and the stream did not have access to its floodplain. In the two years of pre-restoration monitoring, surveyed cross-sections at this reach remained relatively stable, with some slight widening occurring at the meander bend cross-section. Restoration of the channel at this location (including raising the bed elevation and grading back the streambanks) resulted in the stream no longer being incised and enabled the stream to have good access to its flood plain. Post-restoration surveying has shown slight deposition to the left bank at the riffle cross-section. At the meander bend cross-section, the bed has marginally deepened and widened along the banks between Years 3 and 4, but has overall remained stable. Future surveyed cross-sections will be plotted, superimposed, and compared to the baseline condition and yearly surveyed profiles to assess changes occurring in channel dimensions.

Bank pin erosion rates in the restoration reach ranged from 0.01 to 0.14 feet/year during 2013 with the most erosion occurring on the lower portion of the outer meander bend at the upper end of the reach. Deposition rates ranged from -0.01 to -0.23 feet/year during 2013 with the most deposition located on the lower portion of the outer meander bend at the lower end of the reach. Erosion rates at the downstream reach ranged from 0.03 to

1.90 feet/year during 2013 with the most erosion occurring at the lower portion of the outer mender bend at profile station 2+29. Deposition rates ranged from -0.05 to -1.31 feet/year during 2013 with the most deposition occurring at the lower portion of the outer meander bend at profile station 1+18. Erosion rates in the control reach ranged from 0.03 to 0.67 feet/year during 2013. Deposition rates at the control reach ranged from -0.02 to -0.05 feet/year during 2013. Scour chains were studied at all three reaches throughout 2013. Scour rates in the Bramhope restoration reach ranged from 0.13 feet/year (scour) to -0.14 feet/year (deposition) during 2013. In the downstream reach, net scour was observed at each chain, with scour rates ranging from 0.49 feet/year to 0.67 feet/year during 2013. At the control reach, scour rates ranged from 0.18 feet/year to -0.29 feet/year during 2013.

Particle size analyses continued within Red Hill Branch during the fourth year of monitoring. The results indicate that the restoration reach has slightly smaller riffle surface median (D50) particle size, but larger D50 particle sizes for the entire reach as compared to the downstream and control reaches. However, the D84 at the restoration reach for both the riffle surface and reachwide counts exceeded that of the other sites. Reachwide, the median particle size (D50) increased at all three reaches between the first two years of pre-restoration monitoring, with the greatest increase observed at the downstream reach. Results from all four assessment years of bar sample analyses indicate that the downstream reach transported more fine particles (i.e., sand) than the other two reaches assessed while the control reach transported the largest particles. The size of particles transported at all three reaches increased or remained the same during the two years of pre-restoration monitoring, and then decreased in the 2012 post-restoration assessment. In 2013, the size of particles transported increased from those during the first year of post-restoration monitoring. The results of the facies mapping data collected during four years of monitoring within Red Hill Branch illustrate changing substrate conditions among all three reaches. Between pre-restoration Years 1 and 2, the proportion of sand-dominated facies increased at all three reaches.

During 2012, the proportion of sand-dominated facies increased at both the downstream and control reaches. The restoration reach, however, experienced the most noticeable change in its facies distribution following restoration. The restoration reach was still dominated by sand-dominated facies, but the addition of boulders, large rocks, and cobble used in the construction of the newly-restored channel resulted in increased percentages of larger facies. During 2013, the substrate of the restoration reach changed from a majority of sand-dominated facies to a majority of cobble and secondarily gravel-dominated facies as fine particles set in motion during restoration of the channel and upstream activities washed through.

Stream physical habitat assessments were conducted in conjunction with monitoring of the four biological sites described under Biological Monitoring above. Physical habitat for the Red Hill Branch subwatershed was assessed using the Maryland Biological Stream Survey (MBSS) Physical Habitat Index (PHI) (Paul et al., 2002), and EPA's Rapid Bioassessment Protocol (RBP) (Barbour et al., 1999) habitat assessment for high-gradient streams. The Red Hill Branch sites show low overall habitat availability, with habitat at two study reaches rated 'Degraded' and "Severely Degraded" at a 3rd study site under the PHI. Three study sites rated "Not-Supporting" of aquatic life using

the RBP assessment. The control reach received a PHI rating of 'Degraded', but was rated 'Partially Supporting' using the RBP assessment due to slightly higher scores for frequency of riffles, channel alteration, and channel flow. It also received the second highest score of all sites for in-stream cover, meaning good habitat for fish.

Rumsey Run Watershed

In 2010, geomorphic monitoring of Hammond Branch was discontinued, and in 2011 Howard County (in conjunction with MDE) replaced monitoring at the Hammond Branch site with geomorphic monitoring of an unnamed tributary to Red Hill Branch (hereafter called Rumsey Run) within the Red Hill subwatershed. To evaluate the effectiveness of recent stormwater controls from developed sites, Howard County is monitoring the effectiveness of the *2000 Maryland Stormwater Design Manual* and other innovative stormwater management technologies through geomorphic assessments, limited runoff investigations, and modeling in Rumsey Run.

Geomorphic surveys were conducted throughout Rumsey Run to enable comparisons between upstream areas with little to no stormwater controls, mid-reach areas affected by a subdivision designed and constructed using Environmental Site Design (ESD) practices for stormwater management, and downstream areas constructed with traditional stormwater practices. Five permanently monumented cross-sections established in 2011 along almost 4,000 linear feet of stream were re-surveyed during Fall 2012 and Fall 2013, along with the complete longitudinal profile, reach-wide and representative pebble count surveys.

In addition, to improve model accuracy, an additional 11 cross-sections were installed and surveyed during Fall 2013 to provide more comprehensive data. Analysis of the graphical overlays shows cross-sections throughout Rumsey Run remained more stable between the 2012 to 2013 monitoring efforts than between the baseline assessment in 2011 to 2012. Cross-sectional areas increased somewhat at all sites except the furthest upstream site, where the cross-sectional area decreased slightly. Width/depth ratios increased at sites in the middle of the reach, but decreased slightly at the uppermost and lowermost sites. Future surveyed cross-sections will be plotted, superimposed, and compared to the baseline condition and yearly surveys to assess changes occurring in channel dimensions.

Year 3 longitudinal profile data were compared with baseline and Year 2 data to evaluate changes in the overall channel slope. Changes in slope varied throughout the reach, as slope decreased at two cross-sections, increased at two cross-sections, and remained stable at the remaining cross-section. Sandy substrate dominates the upper and middle portions of the stream reach, and the continual shifting of features in these sections is evident in analyses of the longitudinal profile overlays. The surveyed longitudinal profiles in future years will be plotted, overlain, and compared to the baseline condition and yearly surveyed profiles to assess changes occurring in the channel slope and bed structure.

Pebble count data indicate finer particles dominate the reach in the upstream portion, and increase in roughness moving downstream. An increase in the median particle size

in each section of the reach was observed during the 2013 assessment, as fewer finer particles were prevalent throughout the reach than during 2012. However, the dominant particle size class remained the same at each cross-section except one, where the dominant size class increased from sand and gravel to cobble and sand. A full report of Rumsey Run Year 3 monitoring methods, data analysis, and results is included in the *Evaluation of Maryland Stormwater Management Methods in Rumsey Run Year 3 – 2013* report, produced as a stand-alone document and submitted as part of the annual update.

d. <u>Annual Data Submittal</u>: The County shall describe in detail its monitoring activities for the previous year and include the following:

i. EMCs submitted on MDE's long-term monitoring database as specified in PART IV. A.2.d. below;

ii. Chemical, biological, and physical monitoring results and a combined analysis for Font Hill or other approved monitoring locations; and

iii. ***Any requests and accompanying justifications for proposed modifications to the monitoring program.***

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EMC information is included later in the annual report under Section C. Additional Information Relative to Assessment of Controls. EMC values have been updated to reflect the addition of 2013 chemical data.

Summary descriptions of all chemical, biological, and physical monitoring activities performed during the past year are included in the Assessment of Control section herein and in more detail in the stand alone documents provided as part of this annual report: *Wilde Lake Watershed Stream Monitoring, Year 8 – 2013 Water Chemistry Supplemental* (water chemistry only)*; Red Hill Branch Watershed Restoration Year 4 – 2013 Post-Restoration Conditions Monitoring;* and *Evaluation of Maryland Stormwater Management Methods in Rumsey Run Year 3 –2013.* The full methods and data analysis for biological and geomorphic monitoring conducted during 2013 were reported in the *Wilde Lake Watershed Stream Monitoring; Year 8 – 2013* report, produced as a stand-alone document included as part of last year's annual update (Annual Update 18).

The problems associated with installing the chemical sampling unit in the Centennial Lake watershed have been described previously in this report. In lieu of continuing to look for locations to place the sampling unit in the Centennial Lake watershed, the County felt a more appropriate course of action was to install the sampling site in the Upper Little Patuxent River (ULPR) Watershed study area (Red Hill Branch) in conjunction with proposed restoration projects. Additionally, the County received a Chesapeake and Atlantic Coastal Bays 2010 Trust Fund Local Implementation Grant for work in the Little Patuxent River Watershed. The County selected Red Hill Branch as the first subwatershed (which is in both the ULPR study area and the 2010 Grant study

area) where numerous restoration projects were planned, and many have been undertaken.

The County developed a monitoring approach for the 2010 Grant acceptable to DNR (who administers the 2010 Grant), which includes the placement of the chemical sampling unit within Meadowbrook Park at the lower end of the Red Hill Branch subwatershed. Monitoring within Red Hill Branch also includes extensive biological and physical monitoring. Installation of the Meadowbrook unit was completed in early 2010 and sampling began shortly thereafter. Results of the Meadowbrook monitoring are provided in this Annual Update. The County has terminated the biological, physical, and chemical sampling in the Centennial Lake watershed as previous noted and replaced it with the more detailed Red Hill Branch monitoring efforts.

2. Stormwater Management Assessment

The County shall continue monitoring in the Hammond Branch watershed to determine the effectiveness of stormwater management practices for stream channel protection. Physical stream monitoring protocols shall include:

a. An annual stream profile and survey of permanently monumented cross-sections in the Hammond Branch to evaluate channel stability;

b. A comparison of the annual stream profile and survey of the permanently monumented cross-sections with baseline conditions for assessing areas of aggradation and degradation; and

c. A hydrologic and/or hydraulic model shall be used (e.g., TR-20, HEC-2, HEC-RAS, HSPF, SWMM, etc.) to analyze the effects of rainfall; discharge rates; stage; and, if necessary, continuous flow on channel geometry.

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After 10 years of monitoring at the Hammond Branch Tributary Watershed, the County requested and was given permission by MDE to discontinue monitoring at this location. The County and MDE worked together to select another site for the County to perform monitoring in lieu of the Hammond Branch Tributary site. An unnamed tributary to Red Hill Branch (hereafter called Rumsey Run) within the Red Hill Branch subwatershed was chosen and monitoring began during permit year 17. To evaluate the effectiveness of recent stormwater controls from developed sites, Howard County plans to monitor the effectiveness of the *2000 Maryland Stormwater Design Manual* and other innovative stormwater management technologies through annual geomorphic assessments, limited runoff investigations, and modeling in Rumsey Run. A full report of Rumsey Run monitoring methods, data analysis, and results is provided in the *Evaluation of Maryland Stormwater Management Methods*

in Rumsey Run Year 3 – 2013 report, produced as a stand-alone document and provided as part of the annual update.

a. An annual stream profile and survey of permanently monumented cross-sections in the Hammond Branch to evaluate channel stability;

During the Fall of 2011, five permanently monumented cross-sections were established along the almost 4,000 linear feet of stream in Rumsey Run. The five cross-sections, along with the complete longitudinal profile, were re-surveyed in Fall of 2012 and Fall of 2013 to evaluate channel stability throughout the reach. The distribution of cross sections throughout the entire reach was intended to enable comparisons between (1) upstream areas with little to no stormwater controls, (2) mid-reach areas affected by a subdivision designed and constructed using Environmental Site Design (ESD) practices for stormwater management, and (3) downstream areas constructed with traditional stormwater practices. Analysis of the cross-section overlays shows cross-sections throughout Rumsey Run remained more stable between the 2012 to 2013 monitoring efforts than between the baseline assessment in 2011 to 2012.

During the 2011 - 2013 surveys, the upstream portion of the reach was characterized by a low-gradient channel with access to a wide, forested floodplain, with flow that disappears underground in some areas. Channel substrate in the upstream portion of the reach was dominated by fine particles, which are frequently moved. As the channel becomes more defined and incised in the middle portion of the reach, several headcuts are present, the riparian area is diminished, and bed and bank erosion is prevalent. Channel substrate in the middle portion was still dominated by sand, but some larger particles were present. Channel incision and bank erosion remains present in the downstream portion of the reach, where floodplain access diminishes and substrate coarsens.

b. A comparison of the annual stream profile and survey of the permanently monumented cross-sections with baseline conditions for assessing areas of aggradation and degradation; and

The 2013 survey of five permanently monumented cross-sections and nearly 4,000 linear feet of stream profile serve as a comprehensive annual assessment of conditions of Rumsey Run. Results of the 2013 monitoring and annual monitoring from additional years can be compared to the baseline conditions found in 2011 to assess areas of aggradation and degradation. Compared to the baseline surveys from Fall 2011, cross-sections in the upper and middle portions of Rumsey Run exhibited deposition and aggradation within the thalweg channel during 2012, while cross-sections in the lower portion of the reach experienced some bank erosion and deposition. Cross-sections throughout Rumsey Run remained more stable between the 2012 to 2013 monitoring efforts than between the baseline assessment in 2011 to 2012. Cross sectional areas increased somewhat at all sites except the furthest upstream site, where the cross sectional area decreased slightly due to deposition

and aggradation. Width/depth ratios increased at sites in the middle of the reach, but decreased slightly at the uppermost and lowermost sites where thalweg deposition and/or bank erosion was observed. Year 3 longitudinal profile data were compared with previous longitudinal profile data to evaluate changes in the overall channel slope. Slope decreased at two cross-sections, increased at two cross-sections, and remained stable at the remaining cross-section. Sandy substrate dominates the upper and middle portions of the stream reach, and the continual shifting of features in these sections is evident in analyses of the longitudinal profile overlays.

c. A hydrologic and/or hydraulic model shall be used (e.g., TR-20, HEC-2, HEC-RAS, HSPF, SWMM, etc.) to analyze the effects of rainfall; discharge rates; stage; and, if necessary, continuous flow on channel geometry.

A hydrologic and hydraulic analysis was updated for Rumsey Run using WinTR-55 to model drainage characteristics for the watershed with 15 contributing drainage areas. Subareas were defined to assess the impact of the three existing stormwater management ponds and several LID projects within the watershed on discharges within the main channel. Using the stage-storage-discharge curves and WinTR-55 data for existing hydrologic conditions, an existing conditions WinTR-20 model was used. This model was previously run for the 0.5-, 1-, 2-, 10-, 25-, 50- and 100-year events and with three measured storms in 2012, with daily rainfall totals ranging from 1 to 7 inches. Model runs included current conditions with and without the three existing ponds and for pre-development (forested) land use conditions.

A HEC-RAS model was updated using five original field-surveyed cross sections that were re-surveyed and 11 new field-surveyed sections to add additional detail to the model. The cross-sections extend from the top of the Rumsey Run watershed through the project limits just above the confluence with Red Hill Branch. The WinTR-20 routing of existing conditions, including the modeling of the stormwater management ponds, were used for the analysis of design rainfall events in comparison with peak stage measurements at three of the cross-section stations where peak stage records are available. The models will continue to be updated and calibrated, as measurements of SWM pond inflows and outflows become available, along with peak stage records within the main stream channel for various storm events. Additional details are provided in the *Evaluation of Maryland Stormwater Management Methods in Rumsey Run Year 3 – 2013* report, produced as a stand-alone document and provided as part of the annual update.

C. Additional Issues Relative to Assessment of Controls

The County uses a pollutant loading model to assess the pollutant reductions achieved from structural improvements throughout the County. The following describes the model and its results in more detail.

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As noted in previous Annual Reports the County uses a GIS-based analysis tool to compute pollutant load values. The load computations are based on the State's 8-digit watershed codes. Howard County falls within seven of the state's 8-digit watersheds as follows:

- Little Patuxent River (02131105)
- Middle Patuxent River (02131106)
- Patapsco River - North Branch (02130906)
- Patapsco River - South Branch (02130908)
- Patuxent River - Brighton Dam (02131108)
- Patuxent River - Rocky Gorge Dam (02131107)
- Patuxent River – Upper (02131104)

A GIS-based tool was developed in 2007 to estimate pollutant loads and reductions to major outfalls, outlet of major watersheds, and countywide. The model was enhanced during Permit Year 17 to be a GIS-based GeoDatabase Model. Several modifications were made to the model as part of the GeoDatabase creation, which are described in more detail in Annual Report 17. The following provides a summary of the approach:

Drainage Network – The focus is on identifying the overall drainage area for each major watershed then accounting for the sub-drainage areas for outfalls and BMPs within the major watershed. The drainage areas are stored as polygons in a GIS layer and are developed in part from the County's LIDAR digital terrain mapping, and As-Built construction plans. As noted previously, it is not practical to delineate drainage areas for all small single lot and pre-treatment BMPs, e.g. dry wells, rain gardens, Stormceptors, BaySavers, etc. To account for pollutant removal from these BMPs, the County has pre-defined a standard drainage area size to these facilities, which is used in the analysis tool spreadsheet. During the current reporting period an additional 179 BMPs were delineated and added to the model as were 7 new major NPDES outfalls as compared to those previously modeled in 2013.

Structural BMPs – The model accounts for pollutant load reductions by structural BMPs. The reductions for each pollutant are applied to BMP sub-drainage areas. The model manages the sequence of load estimates and reductions within an outfall drainage area and for each major watershed. For each BMP type, removal efficiencies for the various pollutants are pre-defined. The BMP efficiencies, many of which were revised and described in Annual Update Number 17, come from published literature. Removal efficiencies not available through literature are from best engineering judgments based on similar pollutant removal physical processes of the other reported BMPs. The model considered the sequence of BMPs in series to account for reduction of loads prior to treatment by the next downstream BMP.

Stormwater Pollutants – For each sub-drainage area, pollutant loads are computed sequentially and the model considers the nesting of BMPs that are in-line of each other. The County is using 2010 Maryland Office of Planning Land Use (LU) data, and for each LU has identified pollutant rates based on Event Mean Concentrations (EMCs). Table 3 presents the EMCs used in the Pollutant Load computations. The full Chemical Monitoring spreadsheet is provided in Database F of Attachment A on the CD provided in Section XII.

The results are presented in Tables 4a through 4g for each major watershed and Table 4h for Countywide. The drainage area managed by BMPs within each major watershed is included. The load reduction percentages in the tables below were comparable to last year's, although the results varied from previous years due to the inclusion of more accurate drainage area delineations and the removal of a large flood control lake (Centennial Lake) from the model. Average annual rainfall used in the Permit Year 18 modeling efforts was 42.7 inches. Final values for Permit Year 19 were compared to 2013 values and they show a consistent improvement in pollutant reduction management.

Table 3: Event Mean Concentrations Used in the Pollutant Loading Models

Pollutant	Units	Land Use										
		Water/ Wetlands	Low Density Residential	Medium Density Residential	High Density Residential	Commercial	Industrial	Institutional	Paved	Public Open Space	Forest	Agricultural/ Undeveloped
BOD5	mg/L	7	11	4.15	26	32	28	18.82	36.89	7	3.15	30
Copper	mg/L	0.0111	0.11	0.0049	0.24	0.29	0.26	0.17	0.33	0.0111	0.0049	0.0111
Fecal Coliform	1000 col/ml	1000	1000	2973	1000	1000	1000	1000	1000	1000	1000	1000
Lead	mg/L	0.02	0.04	0.0046	0.09	0.11	0.1	0.06	0.13	0.02	0.0046	0.03
Nitrate	mg/L	0	1.1	1.6	2.5	3	2.7	1.76	3.46		0	
Nitrite & Nitrate	mg/L	0.03	1.5	1.96	2.9	4.4		2.59	5.07	0.03	0	2.5
Total Ammonia + Organic N	mg/L	2.5	3.4	1.29	7.8	9.5	8.4	5.59	10.95	2.5	1.29	8.3
Total Nitrogen	mg/L	4.69	4.72	4.72	6.87	6.87	6.87	4.72	6.87	4.72	1.73	9.32
Total Phosphorus	mg/L	0.31	0.19	0.19	0.83	0.83	0.83	0.19	0.83	0.19	0.04	1.02
Total Suspended Solids	mg/L	0	142.92	142.92	916	916	916	142.92	916	142.92	109.61	736.37
Zinc	mg/L	0.02	0.08	0.0271	0.19	0.23	0.21	0.14	0.27	0.02	0.02	0.11

These values provide relative pollutant loads and do not represent actual loads in Howard County

Taken from Howard County's long-term NPDES monitoring program data

Taken from published literature data and Schueler's Simple Method for pollutant load calculations

Derived from the ratio of percent of imperviousness relative to the commercial land use

Taken from values published in the *2000 Maryland Stormwater Design Manual*

Taken from the Annual Report Update #17 Attachment B (TN, TP, and TSS updated to reflect Bay MAST Model. Other values added based on adding two new land use categories from Maryland Office of Planning data)

Table 4a: Little Patuxent River - Pollutant Loads and Reductions

	Total Watershed	Major Outfall	BMPs in Major Outfalls	BMPs Not In Major Outfalls	Managed by BMPs					
Drainage Areas (Acres)	37,994	12,549	4,146	6,763	28.71%					
Pollutant Loads	TN	TP	TSS	BOD5	CU	NO2+NO3	PB	TKN	ZN	Fecal
Pre BMP	544,721	53,350	56,217,003	1,943,441	16,355	217,454	6,303	581,871	13,860	132,148,734
BMP Reduction	469,246	39,794	37,109,636	1,581,498	12,223	175,863	4,103	580,563	9,790	100,653,157
Current Effective BMP Reduction	13.86%	25.41%	33.99%	18.62%	25.26%	19.13%	34.90%	0.22%	29.36%	23.83%
Previous Effective BMP Reduction	13.82%	25.33%	33.89%	18.56%	25.19%	19.08%	34.81%	0.22%	29.26%	23.68%

Table 4b: Middle Patuxent River - Pollutant Loads and Reductions

	Total Watershed	Major Outfall	BMPs in Major Outfalls	BMPs Not In Major Outfalls	Managed by BMPs					
Drainage Areas (Acres)	37,074	2,284	1,455	4,355	15.67%					
Pollutant Loads	TN	TP	TSS	BOD5	CU	NO2+NO3	PB	TKN	ZN	Fecal
Pre BMP	227,018	17,916	15,946,891	690,444	4,292	85,406	1,795	204,908	4,231	50,235,719
BMP Reduction	210,146	15,675	13,052,231	633,589	3,729	77,025	1,453	204,753	3,607	45,557,380
Current Effective BMP Reduction	7.43%	12.51%	18.15%	8.23%	13.12%	9.81%	19.06%	0.08%	14.73%	9.31%
Previous Effective BMP Reduction	7.43%	12.50%	18.15%	8.23%	13.12%	9.82%	19.05%	0.08%	14.73%	9.32%

Table 4c: Patapsco River / North Branch - Pollutant Loads and Reductions

	Total Watershed	Major Outfall	BMPs in Major Outfalls	BMPs Not In Major Outfalls	Managed by BMPs
Drainage Areas (Acres)	24,393	2,416	1,534	5,894	30.45%

Pollutant Loads	TN	TP	TSS	BOD5	CU	NO2+NO3	PB	TKN	ZN	Fecal
Pre BMP	247,693	22,474	23,452,339	835,988	6,881	100,309	2,662	251,365	5,915	64,591,783
BMP Reduction	217,382	18,042	16,873,240	729,862	5,732	88,915	2,027	250,927	4,707	54,597,035
Current Effective BMP Reduction	12.24%	19.72%	28.05%	12.69%	16.70%	11.36%	23.87%	0.17%	20.42%	15.47%
Previous Effective BMP Reduction	12.19%	19.68%	28.02%	12.67%	16.68%	11.37%	23.85%	0.17%	20.39%	15.48%

Table 4d: Patapsco River / South Branch - Pollutant Loads and Reductions

	Total Watershed	Major Outfall	BMPs in Major Outfalls	BMPs Not In Major Outfalls	Managed by BMPs
Drainage Areas (Acres)	16,132	113	3	299	1.87%

Pollutant Loads	TN	TP	TSS	BOD5	CU	NO2+NO3	PB	TKN	ZN	Fecal
Pre BMP	67,280	5,529	4,514,480	203,891	857	20,710	417	59,802	1,073	11,891,948
BMP Reduction	66,351	5,400	4,349,224	200,277	820	19,988	393	59,802	1,026	11,704,655
Current Effective BMP Reduction	1.38%	2.33%	3.66%	1.77%	4.38%	3.49%	5.78%	0.00%	4.35%	1.57%
Previous Effective BMP Reduction	1.38%	2.33%	3.66%	1.77%	4.38%	3.49%	5.78%	0.00%	4.35%	1.57%

Table 4e: Patuxent River / Brighton Dam - Pollutant Loads and Reductions

	Total Watershed	Major Outfall	BMPs in Major Outfalls	BMPs Not In Major Outfalls	Managed by BMPs
Drainage Areas (Acres)	36,743	424	196	1,394	4.33%

Pollutant Loads	TN	TP	TSS	BOD5	CU	NO2+NO3	PB	TKN	ZN	Fecal
Pre BMP	156,746	12,914	10,148,192	463,197	1,719	45,717	891	135,196	2,330	26,751,736
BMP Reduction	153,766	12,590	9,784,444	451,376	1,613	44,417	835	135,194	2,214	26,058,034
Current Effective BMP Reduction	1.90%	2.51%	3.58%	2.55%	6.14%	2.84%	6.30%	0.00%	4.99%	2.59%
Previous Effective BMP Reduction	1.90%	2.51%	3.58%	2.55%	6.14%	2.84%	6.30%	0.00%	4.99%	2.59%

Table 4f: Patuxent River – Rocky Gorge Dam - Pollutant Loads and Reductions

	Total Watershed	Major Outfall	BMPs in Major Outfalls	BMPs Not In Major Outfalls	Managed by BMPs
Drainage Areas (Acres)	7,839	86	36	544	7.41%

Pollutant Loads	TN	TP	TSS	BOD5	CU	NO2+NO3	PB	TKN	ZN	Fecal
Pre BMP	33,110	2,189	1,890,856	88,714	529	11,230	224	26,817	541	8,753,114
BMP Reduction	31,760	2,022	1,684,952	84,779	492	10,452	203	26,817	492	8,189,735
Current Effective BMP Reduction	4.08%	7.65%	10.89%	4.44%	7.05%	6.92%	9.64%	0.00%	9.06%	6.44%
Previous Effective BMP Reduction	4.04%	7.57%	10.81%	4.36%	7.04%	6.95%	9.61%	0.00%	9.00%	6.51%

Table 4g: Patuxent River / Upper - Pollutant Loads and Reductions

	Total Watershed	Major Outfall	BMPs in Major Outfalls	BMPs Not In Major Outfalls	Managed by BMPs					
Drainage Areas (Acres)	1,662	309	365	530	53.82%					
Pollutant Loads	TN	TP	TSS	BOD5	CU	NO2+NO3	PB	TKN	ZN	Fecal
Pre BMP	25,397	2,553	2,728,327	92,642	789	12,382	302	27,732	663	6,282,212
BMP Reduction	21,717	1,964	1,816,166	78,720	644	10,622	213	27,695	509	5,347,479
Current Effective BMP Reduction	14.49%	23.09%	33.43%	15.03%	18.45%	14.21%	29.46%	0.13%	23.30%	14.88%
Previous Effective BMP Reduction	14.49%	23.09%	33.43%	15.03%	18.45%	14.21%	29.46%	0.13%	23.30%	14.88%

Table 4h: Countywide - Pollutant Loads and Reductions

	Total Watershed	Major Outfall	BMPs in Major Outfalls	BMPs Not In Major Outfalls	Managed by BMPs					
Drainage Areas (Acres)	161,836	18,180	7,735	19,779	17.00%					
Pollutant Loads	TN	TP	TSS	BOD5	CU	NO2+NO3	PB	TKN	ZN	Fecal
Pre BMP	1,301,965	116,924	114,898,087	4,318,317	31,423	493,209	12,594	1,287,691	28,614	300,655,246
BMP Reduction	1,170,369	95,486	84,669,893	3,760,102	25,253	427,282	9,226	1,285,751	22,346	252,107,475
Current Effective BMP Reduction	10.11%	18.33%	26.31%	12.93%	19.64%	13.37%	26.74%	0.15%	21.90%	16.15%
Previous Effective BMP Reduction	10.08%	18.29%	26.25%	12.89%	19.59%	13.35%	26.69%	0.15%	21.85%	16.08%

SECTION IX. PROGRAM FUNDING

A. Introduction

Howard County must analyze the resources needed to implement the proposed NPDES plan for the permit period and describe the resources available to implement the plan.

B. Permit Conditions

1. Annually, a fiscal analysis of the capital, operation, and maintenance expenditures necessary to comply with all conditions of this permit shall be submitted as required in PART IV. below.

Annual Update Number 19 Status

The Howard County budget shows that approximately $85.8 million was appropriated to implement various aspects of NPDES activities and associated work during permit years FY06 through FY14 and an additional $25 million has been proposed for FY15. For the previous five-year permit term, i.e. prior to FY06, the County appropriated $17.7 million to fund NPDES initiatives. Tables 5 through 7 present the fiscal analysis separated into three general categories, i.e. capital, operation and maintenance expenditures, respectively. Table 8 provides a summary of the three funding areas.

The County notes that the funding tables provided below account for programs specifically required by the NPDES permit conditions and not necessarily all programs within the County that promote water quality. For example the tables do not include the costs associated with the County erosion and sediment control inspection program. While this program has definite benefits to maintaining good water quality, the program is not mandated by the County's NPDES permit; rather the NPDES permit requires the County to maintain and report on the status of its erosion and sediment control program. Therefore, the status of the program is reported on within the Annual Update but the funding for the erosion and sediment control program is not included in the funding tables.

Capital Expenditures

Table 5 below summarizes the capital expenditures appropriated in support of the County's NPDES program for FY06 – FY14 and proposed for FY15. Capital expenditures primarily include stream restoration and SWM construction projects, but also include the cost for monitoring of these specific projects and the purchase of monitoring equipment.

Table 5: NPDES Funding – Capital Expenditures

Permit Condition	Year 1-5 (FY06-10)	FY11	FY12	FY13	FY14	FY15
B. Legal Authority						
C. Source Identification 1. GIS/Database maintenance	35					
E. Management Programs 1. Stormwater Management 2. Pollution Prevention 3. Erosion and Sediment 4. Public Education 5. Road Maintenance Street Sweeping Inlet Cleaning			2,262			
F. Watershed Assessment and Planning 1. Assessment/evaluation 2. Restoration Projects	230		400	500	350	1,400
G. Watershed Restoration 1. 10% restoration 2. Water quality improvement monitoring.	15,256 265	4,460 220	9,273 114	8,833 192	15,090 185	16,119 302
H. Assessment of Controls 1. Chemical Monitoring 2. Biological Monitoring 3. Physical Monitoring 4. Design Manual Monitoring	109					
TOTAL	$15,896	$4,680	$12,049	$9,525	$15,625	$17,821

All values are in thousands of dollars.

Operation Expenditures

Table 6 below summarizes the operation expenditures appropriated in support of the County's NPDES program for FY06 – FY14 and proposed for FY15. Operation expenditures primarily include SWM division staff, supplies, and annually repeated expenses such as monitoring, illicit discharge inspections, SWM facility inspections, and public outreach efforts.

Table 6: NPDES Funding – Operation Expenditures

Permit Condition	Year 1-5 (FY06-10)	FY11	FY12	FY13	FY14	FY15
B. Legal Authority						
C. Source Identification						
1. GIS/Database maintenance	424	72	74	73	79	89
E. Management Programs						
1. Stormwater Management	2,851	654	621	658	1375	1,588
2. Pollution Prevention	254	54	54	54	95	30
3. Erosion and Sediment						
4. Public Education	722	121	143	221	668	797
5. Road Maintenance						
Street Sweeping						
Inlet Cleaning						
F. Watershed Assessment and Planning						
1. Assessment/evaluation	139	30	31	29	560	172
2. Restoration Projects						
G. Watershed Restoration						
1. 10% restoration	1,038	224	231	373	855	3,091
2. Water quality improvement monitoring.						
H. Assessment of Controls						
1. Chemical Monitoring	186	29	33	40	40	60
2. Biological Monitoring	549	44	82	140	108	113
3. Physical Monitoring	148	27	24	38	27	28
4. Design Manual Monitoring	215	34	50	47	47	58
TOTAL	$6,527	$1,289	$1,343	$1,673	$3,853	$6,020

All values are in thousands of dollars.

Maintenance Expenditures

Table 7 below summarizes the maintenance expenditures appropriated in support of the County's NPDES program for FY06 – FY14 and proposed for FY15. Maintenance expenditures primarily include the operational budget for the Bureau of Highways Storm Water Maintenance Program and also include street sweeping, which is run from the Bureau of Environmental Services.

Table 7: NPDES Funding – Maintenance Expenditures

Permit Condition	Year 1-5 (FY06-10)	FY11	FY12	FY13	FY14	FY15
B. Legal Authority						
C. Source Identification 1. GIS/Database maintenance						
E. Management Programs 1. Stormwater Management 2. Pollution Prevention 3. Erosion and Sediment 4. Public Education 5. Road Maintenance Street Sweeping Inlet Cleaning	 6,105 2,000 50	 838 400 10	 890 400 10	 1,067 400 10	 1,142 400 10	 1077 400 10
F. Watershed Assessment and Planning 1. Assessment/evaluation 2. Restoration Projects						
G. Watershed Restoration 1. 10% restoration 2. Water quality improvement monitoring						
H. Assessment of Controls 1. Chemical Monitoring 2. Biological Monitoring 3. Physical Monitoring 4. Design Manual Monitoring						
TOTAL	$8,155	$1,248	$1,300	$1,477	$1,552	$1,487

All values are in thousands of dollars.

Table 8, which is located on the following page, provides the total funding appropriated in FY06 – FY14 and proposed for FY15 in support of the County's NPDES program initiatives.

The FY15 budget in Table 8 includes the second year of the County's Watershed Protection and Restoration Fund (WPRF), which was first collected in FY14. As alluded to in Annual Update No 18 the County Council modified the WRPF legislation after Annual Update No 18 was submitted to the State. The revised legislation reduced the fee collected in FY14, which has been reflected in Tables 5 through 8.

The County has reapplied for and was selected to receive additional Chesapeake and Atlantic Coastal Bays Trust Fund Local Implementation Grant for FY15. $1,440,000 was granted for capital projects and is accounted for in the tables above. Another $1,060,000 is also currently being considered by the State for several special project initiatives. Receipt of this grant

continues to help the County leverage its available capital funds to be able to complete even more NPDES related projects.

Table 8: NPDES Funding – Summary

Permit Condition	Year 1-5 (FY06-FY10)	FY11	FY12	FY13	FY14	FY15
B. Legal Authority						
C. Source Identification						
1. GIS/Database maintenance	460	72	74	73	79	89
E. Management Programs						
1. Stormwater Management	8,958	1,492	1,511	1,725	2517	2,665
2. Pollution Prevention	254	54	2,316	54	95	67
3. Erosion and Sediment						
4. Public Education	722	121	143	221	668	443
5. Road Maintenance						
Street Sweeping	2,000	400	400	400	400	400
Inlet Cleaning	50	10	10	10	10	10
F. Watershed Assessment and Planning						
1. Assessment/evaluation	370	30	431	529	494	1,572
2. Restoration Projects						
G. Watershed Restoration						
1. 10% restoration	16,294	4,684	9,504	9,206	15945	19,210
2. Water quality improvement monitoring	265	220	114	192	185	318
H. Assessment of Controls						
1. Chemical Monitoring	295	29	33	40	40	44
2. Biological Monitoring	549	44	82	140	108	96
3. Physical Monitoring	149	27	24	38	27	28
4. Design Manual Monitoring	214	34	50	47	47	53
TOTAL	$30,581	$7,217	$14,692	$12,674	$20,615	$24,994

All values are in thousands of dollars.

2. Adequate program funding to comply with all conditions of this permit shall be maintained.

Annual Update Number 19 Status

The County intends to maintain an adequate level of funding throughout the current permit term. As noted in previous Annual Updates, all funding shown herein and proposed is subject to yearly approval by the County Council and the County Executive.

SECTION X. TOTAL MAXIMUM DAILY LOADS

A. Introduction

MDE had identified the need for NPDES municipalities to meet waste load allocations through the implementation of the NPDES permit conditions. By meeting the conditions of the NPDES permit, the municipality will be deemed to have controlled stormwater pollution to the maximum extent practicable.

B. Permit Conditions

Stormwater BMPs and programs implemented as a result of this permit must be consistent with available waste load allocations (WLA's) [see 40 CFR 122.44(d)(1)(vii)(B)] developed under a Total Maximum Daily Load (TMDL). MDE has determined that owners of storm drain systems that implement the requirements of this permit will be controlling stormwater pollution to the maximum extent practicable. Therefore, satisfying the conditions of this permit will meet WLA's specified in TMDL's developed for impaired water bodies. If assessment of the stormwater management program indicates TMDL WLAs are not being met, additional or alternative stormwater controls must be implemented to achieve WLAs.

Annual Update Number 19 Status

Howard County understands that if it continues to implement the requirements of municipal NPDES permit # MD0068322 and continues to satisfy the conditions of that permit, it will be considered to have controlled stormwater pollution to the maximum extent practicable. The County further understands that additional or alternative stormwater controls may be requested by MDE if MDE determines that TMDL WLAs are not being met by meeting the County's current permit conditions.

While not part of the current NPDES permit, the County is actively working towards meeting the requirements of the Chesapeake Bay TMDL as well as the milestones set out by MDE for meeting the Bay TMDL. The County is performing MAST modeling and coordinating the results with MDE. The County is also in the process of developing a Countywide Implementation Strategy (CIS) designed to define the general types and locations of restoration efforts and stormwater management improvements that will be needed to meet both the County's local TMDLs as well as the Bay TMDL. The County also developed 2-Year Programmatic Milestones for the 2013 through 2015 time frame in order to maintain progress toward achieving the County's Watershed Implementation Plan (WIP) commitments for meeting the Bay TMDL.

Watershed Protection and Restoration Fund (WPRF)

In March of 2013, the County adopted legislation to enact the Watershed Protection and Restoration Fee (WPRF) to be charged based on the number of 500 square-foot impervious units for all properties. In July of 2013 the legislation was amended to modify the manner in which residential properties were charged based on the size of the parcel. Three tiers were established, and the rates for townhomes, properties less than ¼ acre and properties greater than ¼ acre are charged $15, $45, and $90 per year, respectfully. In addition, programs were established to provide reduced fees for agriculturally assessed properties and non-profit properties if they met certain criteria identified that reduced the potential for impact. Further, residential and commercial project reimbursement and fee credit programs were established for property owners that chose to add additional stormwater BMPs to their parcel.

The WPRF was billed on the December property tax bill. $10.4 M was collected for FY14. These funds were budgeted among the various County agencies to fund the following programs:

- BMP controls to manage stormwater flow and reduce pollutants
- Stormdrain infrastructure, operation, repairs and upgrades
- MS4 permit compliance, including monitoring and enforcement
- Stormwater education, outreach and incentive programs

The distribution of funds is presented in a pie chart on www.cleanwaterhoward.com in compliance with the state legislation.

The County is working with the SeaGrant Extension and the Chesapeake Bay Program Office to pilot a residential BMP tracking tool to certify BMPs as to type and pollutant removal efficiency. Each installed BMP pursuing a reimbursement or credit is entered into this tool and subsequent field verified to ensure the design and function of the BMP meet defined standards. Once certified the practice is eligible for both reimbursement of a portion of construction costs as well as a 20% reduction from the WPRF. In 2014 of the 58 applications received, 51 reimbursements were granted at a total cost of $23,513. These practices in total treated 0.6 acres for a per acre equivalent cost of $38,400. We expect the program to grow over the next few years as more outreach is underway. Information about the programs is available to the public on the dedicated stormwater webpage www.cleanwaterhoward.com.

SECTION XI. SPECIAL PROGRAMMATIC CONDITIONS

A. Introduction

MDE recognizes that working to improve water quality does not follow strict governmental boundaries, i.e. County lines. It is important that municipalities work with neighboring jurisdictions within shared watersheds in order to address stormwater and water quality issues. It is also important in some cases to go beyond locally shared tributaries and to coordinate on a statewide or regional basis.

B. Permit Conditions

Since the signing of the Chesapeake Bay Agreement in 1983, Maryland has been working toward reducing the discharge of nutrients and sediments to Chesapeake Bay. Howard County lies within two of the Bay's ten major tributaries. These include the Patuxent and the Patapsco/Back tributaries. This NPDES permit encourages Howard County to assist with the implementation of the Tributary Strategy designed to meet the nutrient and sediment reduction goals of each of its two tributaries.

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The County recognizes the importance of the Tributary Strategy objectives and has been working with MDE and other municipalities to help achieve the goals of the new 2000 Bay Agreement. The following paragraphs describe Howard County's recent and ongoing participation in programs that address the Chesapeake Bay water quality goals.

Patuxent Reservoirs Technical Advisory Committee
In 1996, Howard County joined Montgomery County, Prince George's County, WSSC, Maryland National Capital Park and Planning Commission (MNCPPC), HSCD, and Montgomery Soil Conservation District (MSCD) in signing the Patuxent Reservoirs Watershed Protection Agreement. The Agreement recognized the importance of protecting the long-term biological, physical and chemical integrity of the watershed. The Agreement established a Policy Board and a Technical Advisory Committee (TAC) to oversee implementation of a protection strategy for the watershed.

TAC member activities have included water quality monitoring and modeling, implementing agricultural best management practices, stormwater retrofits and stream channel restoration, and public outreach and education. The TAC has developed a list of priority resources in the watershed: the reservoirs and drinking water supply; terrestrial habitat; stream systems; aquatic biota; rural character and landscape; and public awareness and stewardship. TAC member agencies continued progress in the following areas: agricultural BMP implementation, reservoir monitoring, and public outreach. The TAC is currently in the process of engaging consultant services to evaluate progress toward TMDL implementation for

the Patuxent reservoirs. The TAC also revised the Patuxent Reservoirs Protection Strategy Memorandum of Understanding, which established an Agricultural BMP Cost Share Program, to make more properties eligible for the program and increase the types of BMPs the program would fund. WSSC and Howard County renewed program funding for HSCD; MSCD still has funds remaining. The TAC produces an annual report that documents the TAC's accomplishments for the past year and priorities for the upcoming year.

Howard County's major initiatives in the Patuxent Reservoirs watershed include the now completed Cherry Creek watershed restoration projects, as well as ongoing biomonitoring and public outreach activities. The first round of biomonitoring was conducted in the reservoirs watershed in 2001 and 2003, and a second round of monitoring was done in the Cattail Creek and Brighton Dam watersheds in 2005 and in the Rocky Gorge watershed in 2009. The third round of biomonitoring was conducted in 2012 and performed at the Upper and Lower Brighton Dam and Cattail Creek watersheds. A report can be found at http://www.howardcountymd.gov/DisplayPrimary.aspx?id=359. Howard County public outreach activities include support for the TAC's annual Earth Month and Reservoir Watershed Day events and the fall Campfire Program, when possible.

Patuxent River Commission

Howard County is a member of the Patuxent River Commission. The Commission provides oversight for implementation of the Patuxent River Policy Plan and development of the Chesapeake Bay Watershed Implementation Plan (WIP). The Policy Plan is a land management strategy to reduce nonpoint source pollution, and protect and restore habitat in the Patuxent River watershed. The WIP specifies actions to achieve pollutant load reductions from wastewater treatment plants, septic systems, agriculture and urban stormwater, to meet the Chesapeake Bay Total Maximum Daily Loads for nitrogen, phosphorus and sediment. . In 2013, the Commission began developing an update to the Policy Plan to reflect the new Bay TMDLs, and is moving forward with local and State adoption of the updated Policy Plan in 2014. For more information about the Patuxent River Commission, please see the Maryland Department of Planning web page at http://www.mdp.state.md.us/OurWork/PatuxentRiverCommInfo.shtml .

Lower Patapsco Watershed Restoration Action Strategy

The Lower Patapsco Watershed Restoration Action Strategy (WRAS) was issued in 2006. The WRAS is a watershed restoration plan and implementation strategy that serves as a work plan for restoring and protecting water quality and aquatic and terrestrial habitats, and for addressing community needs for environmental outreach and education in the Lower North Branch Patapsco River watershed. The WRAS included a more detailed assessment of restoration opportunities in the Rockburn Branch and Sucker Branch subwatersheds. Recommended projects in the WRAS include stormwater retrofits, stream and buffer restorations, and public outreach and education. The County has added priority restoration projects identified through the WRAS to the County capital budget for implementation.

Patapsco/Back River Tributary Team

Howard County is a member of the Patapsco/Back River Tributary Team. The Team no longer receives official staff support from DNR, however, a team member remains active and helps organize communications and meetings voluntarily. The Team focuses on serving as a forum for information exchange and brings together jurisdictions and groups within the watershed as needed. The Team works to inform and increase stakeholder participation in the Chesapeake Bay TMDL and the Watershed Implementation Plan (WIP) process.

Water Resources Element

The Howard County Water Resources Element (WRE), adopted in April 2010, is an amendment to PlanHoward 2030 that adds Policies and Actions intended to ensure that the County has adequate water resource capacities to meet future growth needs through 2030. In particular, the WRE seeks to ensure a safe and adequate supply of drinking water, and adequate land and water capacity for the treatment of wastewater and stormwater. The WRE reflects the opportunities and limitations presented by local and regional water resources. It is intended to improve protection of land and water resources and to address water resource goals within the context of local and State smart growth policies. For more information on the WRE, please see the Department of Planning and Zoning web page at http://www.howardcountymd.gov/DisplayPrimary.aspx?id=4294967721.

Cooperative Project with the U.S. Geological Survey

Howard County continues cost-sharing for the cost to operate a U.S. Geological Survey (USGS) flow gauging station on the Little Patuxent River near Savage, MD.

Maryland Water Monitoring Council

The County continues to participate in the MWMC's annual conferences, which are held at the Maritime Institute in Linthicum, MD. This year's conference was held on December 5, 2013 and the theme of the conference was "Conserving Maryland's High Quality Waters - From Monitoring to Action".

SECTION XII. ANNUAL REPORT DATABASES

As required by the NPDES permit, the County is submitting all Annual Report Databases on the attached DVD in an Access Database geodatabase file, *HowardNPDESAttachmentA2014.mdb*. The databases include those listed below:

	Database	Comment
A	Storm Drain System Mapping	Spatial data included
B	Urban Best Management Practices (BMPs)	Spatial data included
C	Impervious Surfaces	Spatial data included
D	Water Quality Improvement Project Locations	Spatial data included
E	Monitoring Site Locations	Spatial data included
E.1	Monitoring Site Locations – Use for Multiple Land Use Values in the Drainage Area	Spatial data included
E.2	Monitoring Site Locations – Use for Multiple Stormwater BMPs in the Drainage Area	Spatial data included
F	Chemical Monitoring	Spatial data included
G	Pollutant Load Reductions	Spatial data included
H	Biological and Habitat Monitoring	Spatial data included
I	Illicit Discharge Detection and Elimination	
J	Responsible Personnel Certification Information	
K	Quarterly Grading Permit Information	Spatial data included
L	Fiscal Analyses	
M	NPDES Contacts	

Currently, the format of the geodatabase is based on the Attachment A format provided by MDE and dated January 16, 2013. As MDE updates the Attachment A database format and develops its own Geodatabase, Howard County will make efforts to modify the databases and populate the data fields accordingly.

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ATTACHMENT A

- **Annual Report Databases**