

National Pollutant Discharge Elimination System

Municipal Separate Storm Sewer System Discharge Permit

2009 - 2011 Annual Report

Harford County, Maryland

Permit Number 99-DP-3310 MD0068268

August, 2012

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Annual Report 2009 - 2011

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**MARYLAND DEPARTMENT OF THE ENVIRONMENT
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
MUNICIPAL SEPARATE STORM SEWER SYSTEM DISCHARGE PERMIT**

PART I. IDENTIFICATION

A. **Permit Number:** 99-DP-3310 MD0068268

B. **Permit Area**

This permit covers stormwater discharges to and from the municipal separate storm sewer system owned and operated by Harford County, Maryland.

C. **Effective Date:** November 1, 2004

D. **Expiration Date:** November 1, 2009

PART II. DEFINITIONS

Terms used in this permit are defined in relevant chapters of the Code of Federal Regulations (CFR) or the Code of Maryland Regulations (COMAR). Terms not defined in CFR or COMAR shall have the meanings attributed by common use unless the context in which they are used clearly requires a different meaning.

PART III. STANDARD PERMIT CONDITIONS

A. **Permit Administration**

The County shall designate an individual to act as a liaison with the Maryland Department of the Environment (MDE) regarding permit issues. Additionally, the name, title, address, phone number, email address, and function of all primary administrative and technical personnel responsible for compliance with this permit shall be submitted to MDE. An organizational chart including the individuals identified above shall also be submitted and any changes immediately reported to MDE.

An updated organizational chart is included in Appendix A.

B. Legal Authority

Adequate legal authority shall be maintained in accordance with National Pollutant Discharge Elimination System (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.

No changes to the legal authority occurred during this annual report.

C. Source Identification

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;

Stormdrains

New stormdrains were installed associated with the eight and fourteen hundredths (8.14) miles of roadway accepted by Harford County during calendar years 2009-2011.

All stormdrain features, including point features (ie. outfalls, manholes, inlets, etc.), stormdrain pipes, and stormdrain drainage areas were entered into the geodatabase stormdrains.mdb. The locations for the point features (ie. outfalls, manholes, inlets, etc.) were input into the geodatabase by georeferencing stormdrain design drawings. Associated attributes for the point features were also entered. A map of the outfall locations and the outfall attributes are included in Appendix B. Ninety seven percent (97%) of the four hundred seventy (470) point features were input from rectified design drawings.

The county-maintained point features consist of sixty seven (67) outfalls, two hundred forty (240) inlets, one hundred fifty two (152) manholes, and eleven (11) various other features (ie. inflows, stubs, joints, etc.). The sixty seven (67) outfalls consist of fifty five (55) outfalls from closed systems, eight (8) culverts and four (4) water quality outfalls. Two (2) outfalls were from

systems 36" or larger in diameter from residential development, and one (1) outfall was from systems 12" or larger in diameter from commercial/industrial development.

Using the point features, arcs for the stormdrain pipe were added to the geodatabase and the associated attributes were entered. Three hundred ninety eight (398) pipes were added. By length, sixty nine percent (69%) are concrete pipe and seventy nine percent (79%) are fifteen (15) or eighteen (18) inches in diameter.

The enclosed CD contains the stormdrain geodatabase with feature classes for stormdrain points and stormdrain pipes.

Drainage Areas

Three (3) drainage areas to major outfalls (36" or larger in diameter for non-industrial and 12" or larger for industrial) for roads accepted during calendar years 2009-2011 were delineated (Appendix C).

The enclosed CD contains the stormdrain geodatabase with a feature class for the stormdrain drainage areas.

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

Stormwater Management Facilities and Drainage Areas

One hundred thirty (130) stormwater management facilities were completed during calendar years 2009-2011, including one hundred sixteen (116) new facilities, seven (7) expansions, and seven (7) repairs. The spatial and tabular data were added to the stormwater geodatabase (Appendix D).

Drainage areas for the stormwater facilities completed during calendar years 2009 – 2011 were not completed. The implementation of ESD and the use of multiple devices within a treatment

train have made delineation of drainage areas complicated and time consuming. Harford County does not use this data for planning purposes and requests additional guidance from MDE.

Within six months of the annual report, Harford County will submit to MDE a review and update of the stormwater management facility database including drainage areas. It is anticipated that the current database fields will need to be updated to focus on quantifying water quality and quantity values. Traditional fields such as RCN value, structure type, and acres managed may no longer be valid categories for determining modeled loads with the complexity of modern stormwater facilities.

Stormwater Management Waivers, Exemptions, and Fees in Lieu

Forty (40) waivers were approved during calendar years 2009-2011, and the spatial and tabular data were added to the stormwater geodatabase (Appendix E).

Ten (10) exemptions were approved during calendar years 2009-2011, and the spatial and tabular data were added to the stormwater geodatabase (Appendix F).

Twenty three (23) fees in lieu for stormwater management were approved during calendar years 2009-2011, and the spatial and tabular data were added to the stormwater geodatabase (Appendix G).

The enclosed CD contains the stormwater geodatabase including feature classes for facilities, drainage areas, waivers, exemptions and fees in lieu.

3. ***Impervious surfaces:*** *delineated impervious areas including those associated with BMP implementation;*

Aerial photography was updated in 2011 and is anticipated to be updated again in 2013. With the 2013 photography, there will be updates to the LIDAR, topography and planimetrics, including impervious cover.

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*

A total of eighty four (84) monitoring sites including forty five (45) chemical, ten (10) physical, twenty (20) biological, and nine (9) flow data collection sites were active during calendar years 2009-2011. There are an additional fifty one (51) inactive sites. A table of the attributes and map of the locations for active monitoring sites are included in Appendix H.

The enclosed CD contains the monitoring geodatabase.

5. **Watershed restoration:** *restoration project descriptions and locations identified in PART III. G., below.*

Seven (7) construction projects were completed between 2009 and 2011, and the spatial and tabular data were added to the restoration geodatabase. (Appendix I)

The enclosed CD contains the capital improvement geodatabase.

D. Discharge Characterization

Harford County and 10 other municipalities in Maryland have been conducting discharge characterization monitoring since the early 1990's. 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 Harford 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.

E. Management Programs

The following management programs shall be implemented in all areas served by the 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. Stormwater Management

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;*

During calendar year 2009, four hundred and five (405) stormwater management facilities were inspected for preventative maintenance. One hundred and eighty-nine (189) of these facilities were in compliance with Harford County's stormwater management regulations.

Ratings, which reflect the condition of the stormwater facility, were provided for each inspection. Two hundred and one sites (201) or fifty percent (50%) of overall inspections were considered to have ratings of 1 and 2 which consists of minimal maintenance such as mowing and/or clearing debris from the barrel or storm drain outfalls.

Five sites (5) or 1 percent (1%) of overall inspections with a rating of 3 required a moderate amount of work such as brush or tree removal from the dam.

Ten sites (10) or three percent (3%) of overall inspections with a rating of 4 were determined to

have major problems with their principal spillway.

Two principal spillway replacements were performed (Woodsdale Meadows and Harford Waste Disposal).

On average, three (3) inspections along with notices were sent to the owner before compliance was achieved. Corrective action was pursued on the remaining sites in the 2010 calendar year. One Thousand two hundred and seventy-two (1,272) maintenance inspections were conducted.

Seventy nine (79) sites were inspected for as-built approval; forty-six (46) sites were found to be in accordance with the stormwater management plans.

During calendar year 2010, four hundred and forty-eight (448) stormwater management facilities were inspected for preventative maintenance. One hundred and thirty-six (136) of these facilities were in compliance with Harford County's stormwater management regulations.

Ratings, which reflect the condition of the stormwater facility, were provided for each inspection. Two hundred and seventy-seven sites (277) or sixty-two percent (62%) of overall inspections were considered to have ratings of 1 and 2 which consists of minimal maintenance such as mowing and/or clearing debris from the barrel or storm drain outfalls.

Nineteen (19) or 4 percent (4%) of overall inspections with a rating of 3 required a moderate amount of work such as brush or tree removal from the dam. Sixteen sites (16) or four percent (4%) of overall inspections with a rating of 4 were determined to have major problems with their principal spillway. Two principal spillway replacements were performed (Amyclae Estates Sec 1, Pond 2 and Berg Family Dental)

On average, two (2) inspections along with notices were sent to the owner before compliance was achieved. Corrective action was pursued on the remaining sites in the 2011 calendar year. Six hundred and eighty-five (685) maintenance inspections were conducted.

Sixty-eight (68) sites were inspected for as-built approval; forty-two (42) sites were found to be in accordance with the stormwater management plans.

During calendar year 2011, one hundred and eighty-six (186) stormwater management facilities were inspected for preventative maintenance. Fifty-four (54) of these facilities were in compliance with Harford County's stormwater management regulations.

Ratings, which reflect the condition of the stormwater facility, were provided for each inspection. One hundred and fourteen sites (114) or sixty-one percent (61%) of overall inspections were considered to have ratings of 1 and 2 which consists of minimal maintenance such as mowing and/or clearing debris from the barrel or storm drain outfalls.

Eighteen (18) or 10 percent (10%) of overall inspections with a rating of 3 required a moderate amount of work such as brush or tree removal from the dam.

One site (1) had a rating of 4; it was determined to have major problems with the principal spillway's low flow pipe.

On average, two (2) inspections along with notices were sent to the owner before compliance was achieved. Corrective action will be pursued on the remaining sites in the 2012 calendar year. Two hundred and seventy-six (276) maintenance inspections were conducted.

Two principal spillway replacements were performed (Hampton Ridge Sec 2, Pond 2 and Kleins-Myers Catalogue Showroom).

Forty-six (46) sites were inspected for as-built approval; thirty-nine (39) sites were found to be in accordance with the stormwater management plans.

In addition, during 2009 – 2011 one hundred thirty six (136) field meetings were conducted with homeowner associations (HOAs), contractors, management companies and developers, four (4) SWM training classes were held for HOAs and contractors, and four (4) in house training classes

were conducted for estimating projects, delineating drainage area maps and understanding importance of SWM maintenance.

- 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*

In 2009, the engineering community continued to design the same types of facilities once they have received approval for that type, normally a sand filter with a dry pond and not try the other types of facilities. The County had no other problems with implementing the 2000 Design Manual in 2009.

In 2010, the county began to use ESD practices and implement Supplement 1 of the 2000 Design Manual. During 2010, the County had to deal with Administrative Waivers for projects caught in the regulation change. Ninety (90) administrative waivers were issued (Appendix K). The past 2-years have been a learning curve not only for the county but also for the engineering community.

Modifications to the program that need to be resolved are the contradictions in Supplement 1 of the Design Manual. There are several areas where there is one requirement on one page and a different requirement indicated on the next page. One example of this is in the Micro-Bioretenion section where on one page the drainage to the practice shall not exceed 20,000 sq. ft. but on the preceding page the manual states that if the drainage area exceeds ½ acre the practice effectiveness weakens.

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

All records and information for design, construction, and maintenance are being maintained as required for the triennial stormwater program review. The County's stormwater program has not been reviewed since the new design manual went into effect. When the program is reviewed by MDE the County will make any necessary revisions to its program. Harford County Stormwater Programmatic and Information is presented in Appendix K.

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;*

Delegation review was conducted in the fall of 2008. The review determined that Harford County's sediment and erosion control program was adequate and delegation was granted for the period of July 1, 2009 through June 30, 2011. No programmatic changes were implemented.

- b. *At least twice 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*

Between 2009 - 2011, Harford County conducted six (6) Responsible Personnel Certification classes on 4/30/2009, 10/14/2009, 9/30/2010, 8/25/2011, 8/26/2011 and 12/14/2011. One hundred sixty five (165) individuals received "Green Card" certification (Appendix L).

The enclosed CD contains the MDE Access database with the course attendees.

- 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.*

Between 2009 and 2011, two hundred (200) grading permits were issued (Appendix M). Quarterly reports were submitted to MDE. The enclosed CD contains the MDE Access database with the above information.

3. **Illicit Discharge Detection and Elimination**

The County shall implement 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;*

All of the outfalls identified in the 2008 report as potential illicit discharges have been investigated. The primary source of flow was attributed to groundwater. One outfall (OF000354) with intermittent flow was periodically monitored. Source tracking revealed this outfall receives flow from a commercial ice skating rink. When chlorine was detected in the flow, the Maryland Department of the Environment was contacted. MDE performed follow-up investigation. Follow-up actions by Harford County for illicit discharges from 2008 thru 2011 are included in Appendix N. The report appendices are included only on the CD.

Harford County contracted with EA Engineering to conduct illicit discharge and facility inspections for 2009. One hundred and four (104) outfalls were inspected for illicit discharges from September through November 2009 (Appendix N). Three (3) new outfalls, undocumented by county GIS are included with the total count of inspected outfalls and will be added to the County's stormdrain database. Routine and follow-up outfall monitoring by contractors must include (1) quantitative analysis (pH, temperature, total residual chlorine etc.); (2) qualitative parameters (color, vegetative conditions, sedimentation etc.); and (3) visual inspection of the outfalls including photographs. Inspections must be conducted during dry weather flows. Potential illicit discharges were detected at fourteen (14) outfalls during dry weather conditions. No major parameters were detected during outfall inspections. (Appendix N). Harford County

has completed follow-up investigation at all fourteen (14) outfalls. None of the outfalls have flow from an illicit discharge. The primary source of flow was attributed to groundwater. Two (2) of the outfalls receive flow from facilities that have General Stormwater Permits issued by the Maryland Department of the Environment. Some areas had groundwater with a rusty brown color due to the presence of naturally occurring iron oxidizing bacteria or fungi. One outfall (OF002093) was monitored by Harford County and MDE to determine the source of color in flow. It was concluded that a natural bacteriological process was taking place inside the pipe. This was not an illicit discharge. The follow-up results are included in Appendix N. Nineteen outfalls (19) were identified by the County's contractor as needing maintenance. They have been referred to the responsible party for maintenance. All future illicit discharge outfall inspections will include previous and randomly selected new outfalls.

2010 RESULTS

Harford County contracted with Versar to conduct illicit discharge and facility inspections for 2010. One hundred and fifteen (115) outfalls were inspected for illicit discharges from October to December 2010 (Appendix N). Potential illicit discharges were detected at twenty-nine (29) outfalls during dry weather conditions. Follow-up investigations of all twenty-nine outfalls and field source tracking indicate that the flow was not from an illicit discharge but groundwater. One active illicit discharge was observed during field inspections by the contractor and County. The source was a private sanitary sewer line at the Windsor Valley Apartments. A manhole on the property had overflowed. The flow was entering a nearby stormdrain and discharging into a Storm Water Management Facility. County personnel immediately contacted the onsite apartment management and informed them they had to immediately address the problem and could not delay. The Harford County Health Department was contacted for follow-up investigation because they regulate the private sanitary sewers. Private sanitary sewer lines are not maintained by the county. They are the responsibility of the property owner. Twenty-seven (27) outfalls were identified by the County contractor as needing maintenance. They have been referred to the responsible party for maintenance.

2011 RESULTS

Harford County contracted with Versar to conduct illicit discharge and facility inspections for 2011. One hundred and fifteen (115) outfalls were inspected for illicit discharges from November 2, 2011 to January 5, 2012. A follow-up field day of testing was done on March 7, 2012 to correct errors detected during data review (Appendix N). Flow was detected at thirty-six (36) outfalls during dry weather conditions. The contractor established screening criteria for each chemical parameter. If the test result did not exceed the screening criteria it was not considered a potential illicit discharge. Eleven (11) outfalls that had flow fell into this category and were not considered potential illicit discharges. The contractor did perform field source tracking for the eleven (11) outfalls, and the flow was considered to be ground water. Follow-up investigations of the remaining twenty-five (25) outfalls and field source tracking indicate that the flow was not from an illicit discharge but from groundwater. Sixteen (16) outfalls were identified by the County contractor as needing maintenance. Each was referred to the responsible party.

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

The 2007 report identified one (1) seasonal facility that was not in compliance. The facility is now in compliance and is routinely monitored. All of the facilities identified as confirmed pollutant sources in 2008 have been investigated and are in compliance (Appendix N).

Facility inspections for the 2009 report were conducted in September 2009 to identify commercial or industrial sources that may be potential generators of pollutants. Based on guidance received from the May 2009 audit conducted by the Environmental Protection Agency, the contractor focused on industrial/commercial facilities adjacent to the Route 40 Edgewood and Joppatowne corridor.

Windshield inspections were conducted during dry weather conditions at fifty-four (54) facilities for the 2009 report (Appendix N). Seven (7) facilities were identified as confirmed or potential generators of pollutants. Harford County performed follow-up inspections on all seven (7) facilities. One of the facilities has gone out of business since the inspection. The potential

pollutant sources were in two categories waste management and maintenance. All of the six facilities are in compliance. Harford County investigated an additional four (4) commercial/ industrial facilities as possible generators of pollutants (Appendix N). All four of the facilities are in compliance.

2010 RESULTS

Facility inspections for the 2010 report were conducted during December 2010 to identify commercial or industrial sources that may be potential generators of pollutants. Again inspections were focused on the industrial/commercial facilities adjacent to the Route 40 Edgewood and Joppatowne Corridor. Windshield inspections were conducted at fifty (50) facilities. Forty (40) of the facilities were identified as confirmed or potential generators of pollutants. Three (3) of the facilities were referred to other County departments for follow-up. Two (2) facilities were referred to MDE for investigation because of above ground storage tanks and oil spills. The other thirty- five (35) facilities are in compliance. (Appendix N)

2011 RESULTS

Facility inspections for the 2011 report were conducted during December 2011 to identify commercial or industrial sources that may be potential generators of pollutants. Inspections were focused on the industrial/commercial facilities adjacent to the Route 40 Edgewood, Joppatowne and Abingdon Corridor. Windshield inspections were conducted at fifty (50) facilities. Seven (7) facilities were identified as confirmed generators of pollutants. One (1) facility the Deputy Director of Highways and Water Resources is doing follow-up investigation. Two (2) facilities are not in compliance. The remaining five (5) are in compliance (Appendix N).

Maintaining a program to address illegal dumping and spills;

Water Resources continues to implement and improve several initiatives to address illegal dumping and spills. Coordination continues with Harford County Division of Water and Sewer, Harford County Health Department and Harford County Emergency Operations Hazmat Team to ensure the public has adequate resources for reporting illegal dumping, spills and stormwater pollutants. The public has several phone numbers to report these activities. They can utilize

Water Resources (24hr) hotline number (410.638.3400) to report illegal dumping, spills and stormwater pollutants. This phone number is staffed by Harford County Emergency Operations Personnel. The staff is trained in emergency operations. Water Resources developed an emergency phone tree so that the staff can direct phone calls to the appropriate agency. This number is published in water and sewer bills, websites and public education literature (Appendix O). Citizens can also use the following phone numbers for reporting purposes: Harford County Government main phone numbers (410.638.3000 or 410.879.2000) and Water Resources Office phone number (410.638.3545). All reports of illegal spills, dumping and stormwater pollutants are referred to Emergency Operations. They performed the follow-up and document the calls in the Hazmat Reponses Report (Appendix O. If the illegal dumping or spill requires enforcement action this is done through The Local Emergency Planning Committee (LEPC). They conduct investigative hearings. Representatives from Emergency Operations serve on the LEPC.

The Harford County Health Department assists the Division of Water and Sewer with sewer overflows. They determine appropriate forms of public notification, identifying downstream users, directing stream testing and assessing adequacy of site cleanup. Water and Sewer is responsible for placing signs, issuing press releases, contacting downstream users, conducting stream testing and implementing cleanup.

The Health Department responds to citizen reports of leaking or overflowing septic systems and private sewer lines. Most of these calls are placed directly to the Health Department offices. A portion of citizen reports are routed from Emergency Operations. The Water Resources staff continues to work with sanitarians from the Bureau of Environmental Health to coordinate preventive and clean-up protocol regarding discharges (oil, grease, leaky dumpsters) from restaurants that impact the stormdrain system. Emergency Operations coordinates with the Recycling Office in distributing information on household hazardous waste disposal. They also schedule dates for citizens to drop off household hazardous waste.

During calendar year 2009, HAZMAT conducted two hundred and eight (208) responses. One hundred and nine (109) of the responses had a potential water quality impact (Appendix P).

During calendar year 2010, HAZMAT conducted one hundred seventy six (176) responses. One hundred fourteen (114) of the responses had a potential water quality impact (Appendix P).

During calendar year 2011, HAZMAT conducted one hundred and eighty two (182) responses. One hundred and seven (107) of the responses had a potential water quality impact (Appendix P).

Water Resources coordinated with appropriate agencies such as Sediment Control and the Soil Conservation District in developing a “Numbers to Know” for the Environment brochure. This brochure is now distributed as a public education tool. Harford County has utilized the Environmental Protection Agency [Door Hanger: "Stormwater Pollution Found in Your Area"](#) to inform and educate residents on stormwater pollution. Harford County has developed a brochure ["When it Rains it Drains \(Stormwater Pollution\)"](#) for public education. This brochure is now distributed as a public education tool. The video “Municipal Storm Water Pollution Prevention Storm Watch “was purchased as an in house training tool. Water Resources will use this video to train municipal employees in Stormwater Pollution Prevention and Illicit Discharge Detection in the field. In 2010 we purchased windshield adhesive labels that have the emergency phone number for reporting illegal dumping and spills. The labels were distributed to county vehicles to be posted on the windshield making the phone number readily available. This way a municipal employee will not have to remember it. In 2011, the local community college developed a public service announcement for illegal dumping, spills and stormwater pollution. Water Resources now maintains a phone log for emergency and routine calls received by our office this is included in (Appendix O. We continue to update the database established for public education materials distributed to commercial/industrial facilities.

- 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*

The Local Emergency Planning Committee (LEPC) is responsible for the enforcement of all reported illegal dumping and spills that take place in Harford County that are not classified as

criminal activity. They work in conjunction with Harford County Government Hazmat Operations Team to address these issues. They establish monetary fines and conduct hearings on reported environmental incidents. They conducted (2) hearings in 2009. The first hearing was for a diesel fuel spill at Corbin Fuel Company. The second for a fuel oil spill at Petro Fuel. They conducted (2) hearings in 2010. The first was for a hydraulic spill by Frank J. Goettner Construction Company. The second for petroleum spill from farm equipment owned by Smith Farm on Kalmia Road. They conducted one (1) hearing in 2011. The only hearing was for a chemical spill at Citrus & Allied Essence. Information on hearings conducted from 2009-2011 is included in (Appendix O). A representative from Water Resources is a member of the L.E.P.C.

The Environmental Crimes Unit is a part of the Emergency Operations Center. They are responsible for investigating and enforcement of all civil actions involving environmental crimes. Any environmental crime requiring criminal enforcement is referred to the Sheriff's Department. This unit is extensively trained in the investigation of Illegal Hazardous Materials and Waste Dumping, Transportation (DOT) violations, cleanup and reporting of accidental spills and enforcement of all federal, state and local laws. They routinely inspect numerous commercial activities within the county for compliance with federal, state and local laws. This unit also assists with planning for Hazardous Materials Response in Harford County through the Local Emergency Planning Committee (LEPC). The team is equipped with the necessary chemical / biological protective equipment to respond, analyze, and neutralize environmental threats in Harford County.

Harford County Emergency Operations is responsible for implementing SARA Title III. SARA Title III supports local emergency planning efforts by informing the public, state and local governments of potential chemical hazards in their community. Owners/operators of potential hazardous chemicals are required to submit the following information: inventory list, hazardous waste storage, spills and response to hazardous waste spills. Reports of spills are received through the 911 center and are directed to the Hazmat Team as appropriate.

Water Resources referred two (2) commercial facilities to MDE for enforcement and/or permitting in 2009. They are Banks Towing located at 3610 Conowingo Road, Street, Maryland 21154 and Ice World located at 1300 Governor Court, Abingdon, Maryland 21009.

Water Resources referred three (3) commercial facilities to MDE for enforcement in 2010. They are I-Mark located at 2710 Pulaski Highway, Edgewood, Maryland 21040, Plumb Crazy located at 1302 Continental Drive, Abingdon, Maryland 21009 and Texaco Gas Station located at 1845 Pulaski Highway, Edgewood, Maryland 21040.

Water Resources referred three (3) commercial facilities to MDE for enforcement and /or permitting in 2011. They are Norman's Salvage located at 1301 S. Philadelphia Road, Aberdeen, Maryland 21001; Auston Contractors located at 1202 Paul's Lane, Joppa, Maryland 21085 and Sherwood Concessions located at 514 Pulaski Highway, Joppa, Maryland 21085.

- d. 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.*

The Illicit Discharge monitoring program again has seen significant improvements the areas of inspection, remediation and public education. Consistently the mandatory number of outfalls and facilities has been inspected. A database is maintained that documents suspected illicit discharges and tracks corrective action and maintenance for outfalls. Commercial/ industrial facilities information is also maintained in a database. This information provides a valuable picture of the extensiveness of the stormdrain system and how facilities have an important impact. A few illicit discharges have been obtained from these activities but most from randomly driving around the county and emergency situations.

Public education has been invaluable tool for increasing community awareness of the stormwater system. Along with public education programs addressing illegal dumping and spills the County

also targets stormwater pollutants such as car washing, pet waste, lawn waste and swimming pools.

The May 2009 audit of Harford County's NPDES program by region three of the Environmental Protection Agency was a valuable tool in providing immediate feedback for improvements to the program as well as regulatory expectations. Also working with other agencies and departments has strengthened the effectiveness of our program.

4. **County Property Management**

The 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.

Eight (8) County properties have been determined to require NPDES stormwater general permit coverage (Appendix P). NOIs have been submitted for each of the facilities and pollution prevention plans have been completed for six (6) of the eight properties. Draft plans for the two (2) remaining facilities operated by Parks and Recreation have been developed. Water Resources reviewed these documents and provided comments.

Harford County Public Schools is not owned by Harford County, Maryland and the status of their coverage is therefore not included in this section.

The implementation of the pollution prevention plans for the various facilities involves the use of best management practices such as good housekeeping, preventative maintenance, inspections, spill prevention and response, sediment and erosion control, management and runoff, and employee training.

Monthly evaluations are conducted to identify if:

- pollutants are entering the drainage system,
- the measures to reduce pollutant loading are effective, :

- the structural measures, sediment controls, and other storm water BMPs are operating properly, and
- spill response equipment is located in areas susceptible to pollutants entering the storm water.

In May 2009, EPA conducted an audit of Harford County's MS4 permit program visiting several of the county-owned facilities. Modifications to implementation of the pollution prevention plans as a result of their site visits and response to written comments have taken place including routine review of monthly inspections

In 2011, Water Resources conducted Pollution Prevention training at each of the County facilities. Topics included good housekeeping and spill prevention, vehicle and equipment washing and maintenance, spill reporting and response, outdoor storage of material and waste and landscaping and lawn care. Training was also provided on illicit detection and elimination. Addition divisions with field staff such as construction inspections and transportation services were also provided illicit detection and elimination training. Everyone that attended the training received a window decal to place in their county vehicle with the hotline number to report illegal spills. A total of four hundred thirty eight (438) County employees attended.

5. **Road Maintenance**

A plan to reduce pollutants associated with road maintenance activities shall be developed and implemented. At a minimum, an annual progress report shall be submitted that documents the following activities:

- Street sweeping;*
- Inlet cleaning;*
- Reducing the use of pesticides, herbicides, fertilizers, and other pollutants associated with roadside vegetation management through the use of integrated pest management (IPM); and*
- Controlling the overuse of winter weather deicing materials through continual testing and improvement of materials, equipment calibration, employee training, and effective decision-making.*

During calendar years 2009 through 2011, Harford County Bureau of Highways continued its road maintenance operations to ensure public safety in a cost-efficient manner.

Street Sweeping

Harford County maintains 1,045 miles of roadway. Approximately 80% of all public streets are swept annually with a mechanical brush vacuum truck. Additionally, certain major collector roads may be swept monthly. Between 2009 and 2011; 2,312 lane miles, 1,840 lane miles and 2,405 land miles respectively of hard surface roads were swept. Dirt roads are not swept. Between 2009 and 2011; 2,086 tons, 1,593 tons, and 2,022 tons respectively of material was collected during street sweeping. Material collected during street sweeping is disposed of in the local landfill or maintenance yard.

Inlet Cleaning

At a minimum, stormdrain inlets are cleaned on a scheduled basis once every five years. Inlets may be cleaned more frequently if needed. Drainage structures may be cleaned with vacuum sweepers, backhoes, or manually. In calendar year 2009, 2,649 structures were cleaned resulting in 1,325 cubic yards of material removed from the stormdrain system. In calendar year 2010, 2,551 structures were cleaned resulting in 1,275 cubic yards of material removed from the stormdrain system. In calendar year 2011, 4,110 structures were cleaned resulting in 2,055 cubic yards of material removed from the stormdrain system.

Roadside Vegetation Management

The only pesticides that Harford County utilizes for roadside maintenance are herbicides and continue to minimize their use. Harford County only applies Roundup to areas beneath guardrails which cannot be mowed. No herbicides are applied immediately adjacent to stream crossings. For calendar years 2009 through 2011, Harford County Bureau of Highways reported no herbicide usage. Harford County Bureau of Highways does not use fertilizer as part of the road maintenance operations.

Deicing

During 2009, Harford County Highways Division did not apply any sand/aggregate mix. Traction control and ice melting was achieved solely from salt application. In 2009, thirteen thousand nine hundred one (13,901) tons of salt was applied to one thousand forty seven (1,047) miles of County roads. In 2010, thirteen thousand nine hundred and ninety five (13,995) tons of salt was applied to county roads. In 2011, twelve thousand one hundred and eighty-five (12,185) tons of salt was applied to County roads. Harford County does not track the amount of material applied to State or municipal roads. County staff evaluates road conditions for each storm to determine the most effective treatment system (salt, aggregate, or combination) for the conditions of the particular storm and for the area of the County affected. Harford County Bureau of Highways has an internal employee training program for equipment operators at the beginning of each snow season. The training includes equipment operation, safety, maintenance, inspection and record-keeping.

6. Public Education

A public education and outreach program shall be implemented 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. Establish and 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.*

Public Outreach Events

Harford County Water Resources Engineering participated in various public outreach events in 2009, 2010 and 2011. These events include the Arbor Day Festival in April, Earth Day Festival in Aberdeen in April, and the Upper Western Shore Wade-In in June. The theme of the Water Resources Engineering booth is “watersheds”. The County has continued to offer our t-shirt drawing, which requires entrants to name the watershed in which they live. In addition, we offer literature on recycling, nonpoint source pollution prevention, and lawn care, hazardous household waste and other environmentally related material. We also offer other promotional materials such as pencils printed with Harford County’s watershed names along with beach balls and Frisbees with the Seymour Clearwater image to draw people to our booth.

Wheel Creek Watershed Public Outreach Events

In 2010, Water Resources staff participated in an In-Service day workshop for the biology and environmental science teachers in Harford County. This included a classroom presentation on the Wheel Creek watershed restoration efforts, impacts of land use changes, overview of monitoring efforts and techniques used to restore streams and retrofit stormwater management ponds. This was followed by a field tour of the proposed Calvert Walk stream restoration project and the Gardens of Bel Air stormwater retrofit.

In 2010, Water Resources and Parks and Recreation, Maryland DNR, University of Maryland, Master Gardeners, and Angler Environmental staff conducted a presentation at the Anita C. Leight Estuary Center for homeowners participating in the residential rain garden program sponsored by the Chesapeake and Atlantic Coastal Bays 2010 Trust Fund. The presentation included overviews of the Wheel Creek Restoration Project, the 2010 Trust Fund and the rain garden program, a description of rain gardens, how they work and why they are valuable, templates of rain garden design, installation, and maintenance followed by bay friendly gardening tips and advice.

In 2010, Water Resources staff gave a presentation to the Harford County Master Gardeners highlighting the Trust Fund efforts, the Wheel Creek Restoration Project, monitoring efforts in the County, and the importance and value in stream and habitat restoration.

In 2010 and 2011 Water Resources staff in partnership with Maryland DNR, the University of Maryland, Harford County Master Gardener's and the Harford County Library conducted a Rain Garden Workshop at the Abingdon Library. The focus of the workshop was how homeowners can create a rain garden in their own backyard. Topics included a description of rain gardens, how they work and why they are valuable, the role of native plants in the landscape, the importance of improving wildlife habitat, "bayscaping" and how each benefits our local streams. There was also be a tour of the rain garden constructed at the library in the Fall of 2010.

In 2010 and 2011 Water Resources staff set up a rain garden display at the Abingdon Library. The display included a concept design of the rain garden installed at the library, a cross-sectional

model of the materials used in the garden, a landscaping plan for the garden, native plant information and a description about how rain gardens work and why they are valuable.

School Activities

In April 2009 and 2010, staff participated in the North Harford High School, North Bend and Prospect Mill Elementary Schools' Earth Day celebrations. The purpose of the events was to provide hands on activities to promote environmental awareness with the students. Staff focused on the importance of monitoring benthic macroinvertebrates, fish and submerged aquatic vegetation (SAV), improving water quality, and understanding how human activities impact watersheds, ecosystems and water quality. The Staff provided various preserved fish and macroinvertebrates specimens, SAV and live benthic specimens collected in Winters Run and Laurel Brook to demonstrate the importance of these ideas.

In May 2009, 2010 and 2011, Water Resources staff conducted an aquatic insect demonstration for preschool and 1st grade students at North Harford Elementary School. Staff utilized preserved specimens and live specimens collected in Falling Branch and the Little Gunpowder River to demonstrate the importance of aquatic communities. The discussion included explanations of insect life cycles, food webs, ecosystems and watersheds, what they are and why they are important. The discussion explained how everyday human activities and land use changes impact our watersheds and water quality and also stressed what we can do to improve water quality.

In May 2009 and 2010, Water Resources staff participated in the annual Deer Creek Days for 7th graders at North Harford Middle School. The purpose of the event was to provide hands-on activities to promote environmental awareness with the students. Staff discussed the importance of monitoring and improving water quality, protecting water sources, and understanding how human activities impact ecosystems and water quality. Water quality samples were collected from five different streams and ponds around the County, and the students performed various physical and chemical tests on the samples and compared the results.

In March 2009, Water Resources staff conducted a presentation to 4th and 5th graders at Norrisville Elementary School on watersheds, the importance of imperviousness, land use changes and explained how everyday human activities and land use changes impact our watersheds and water quality and also stressed what we can do to improve water quality. The school is working towards green school status by ‘adopting’ a watershed, a tributary to Jackson Branch.

In July 2009 and 2010, Water Resources staff participated in the Summer Center for Action Investigation at Harford Glen Environmental Education Center. This was a two week summer camp program designed for gifted and talented students in grades 4 through 8 that focused on current environmental issues impacting the local area. The students were given a certain environmental problem and had two weeks to work on this project utilizing the knowledge gained during the camp. In 2009 staff conducted a one day field training session that enabled the students to learn various water quality monitoring techniques and to understand the importance of sample analysis and water quality. In 2010 staff conducted a one day training session on the background of the division and its role in administering the NPDES permit, the CWA, land use changes and impacts, importance of imperviousness, watershed assessments, and stream and habitat restoration projects completed in the County. The camp culminated with a presentation by the students outlining their respective environmental project, results and recommendations to improve the condition.

Harford County Envirothon Training

The Envirothon is an annual competition that focuses on teaching and training students in five resource areas: aquatics, forestry, soils, wildlife, and current environmental issues. The program is a year-long learning experience encompassing a fall field workshop, special resource workshops, habitat restoration projects, watershed studies, team presentations and spring competition. A team of five students representing each high school participates in challenging hands-on testing that involves teamwork, problem solving skills and an understanding of natural resources and environmental issues. The winning team then advances to the state competition.

In 2009 Harford County Public Works staff assisted the local high school students with the annual Envirothon competition by participating as members of the County's Envirothon steering committee, providing expertise in the aquatics category, providing expertise on individual team projects, judging the team presentations and testing the knowledge of the students during the spring competition. Harford Christian High School won the County competition and advanced on to the State competition.

Stormwater Management Workshops for Homeowners Associations and Property Management Companies

Most stormwater management facilities in Harford County are privately-owned, many by Homeowners Associations (HOAs). As part of our effort to improve maintenance of these facilities, stormwater management inspection staff routinely offers to meet with HOAs and professional property management companies to describe the purpose of and maintenance requirements of their stormwater management facilities. In calendar year 2009, Harford County staff conducted two (2) stormwater management training classes with HOAs and contractors and forty-one (41) meetings with individual HOAs and management companies regarding pond maintenance requirements, barrel replacement issues, beneficial user agreements and HOA assessments. In 2010, staff conducted one (1) stormwater management training class with HOAs and contractors, two (2) in-house training classes for project estimating and delineating drainage area maps and fifty-three (53) meetings with individual HOAs and management companies. In 2011, staff conducted one (1) stormwater management training class with HOAs and contractors, two (2) training classes for DPW highway maintenance shop on SWM maintenance and forty-two (42) meetings with individual HOAs and management companies.

Capital Project Community Meetings

Harford County staff met with the Laurel Valley Homeowners Association in March, 2009. Harford County staff briefed the HOA on the completion of the Laurel Valley Stream Restoration Project and County's plans for continued monitoring.

In May 2009, Water Resources staff attended a meeting with Harford County Parks and Recreation, the elected official and residents from the Foster Branch/Joppatowne area. Maintenance dredging is proposed for the navigable portions of Foster Branch and Rumsey Island. Water Resources staff provided a summary of streambank stabilization and stormwater management projects in the watershed that reduce sediment load to the tidal estuaries.

In June 2009, Water Resources staff attended the Woodbridge Homeowners Association annual meeting. Residents were briefed on the proposed retrofit to their stormwater facility, answered questions, and received permission to move forward with the design.

In November 2009, Water Resources staff met with the owners of the stormwater pond located in the Gardens of Bel Air South community. Concept plans and financing of the work were discussed. Harford County received permission to move forward with design.

In August 2010, Water Resources staff met with several property owners along the Laurel Valley Stream Restoration project. There were many concerns regarding vegetation management. Harford County staff helped the property owners identify invasive species, native plantings, and provided guidance on the management of the riparian areas.

Water Resources staff sponsored a public meeting for the property owners in the Plumtree Run Watershed in November 2010. The purpose of this meeting was to inform the property owners of the information contained in the Plumtree Run Watershed Assessment Findings Report recently completed by Bayland Consulting & Designers. Also the public was introduced to a blogger to assist in improving communication with the property owners and Water Resources staff. Information such as a copy of the report and updates can be obtained from the blogger for the property owners to read.

In January 2011, Harford County met with the Woodbridge Homeowners Association to review plans and answer questions.

In May 2011, Water Resources staff met with property owners along the Woodbridge Stream Restoration Project. Plans were presented, the easement process was explained and a tentative schedule was discussed.

Miscellaneous Outreach

In September 2009 and 2010, Water Resources staff, along with park naturalists and natural resources professionals, participated in the third and fourth annual BioBlitz at the Anita C. Leight Estuary Center. The event was designed to increase the public's understanding of the variety of wildlife at the park by conducting a two-day survey of the park for plants and animals and then documenting the different species that make their home at the park and Bosely Conservancy. Sessions were conducted on inventories of marsh plants, submerged aquatic vegetation, insects, birds, herpes (snakes, turtles, and lizards), fish, trees, and bats.

During 2009 - 2011, Harford County continued the production of the *EnviroNews*, an environmental newsletter highlighting local issues. Winter, Spring-Summer, and Fall issues were produced in 2009. Approximately seven hundred and fifty copies were distributed to County libraries, environmental, , local museums, groups and businesses, as well as being available at www.harfordcountymd.gov. Copies of the 2009 – 2011 issues are included in Appendix Q.

During 2009 - 2011, Water Resources staff also served as the coordinator for the *Environmentality* group. Responsibilities include chairing meetings, setting meeting agendas, organizing and disseminating meeting minutes, updating memberships, encouraging the completion and submittal of membership directory forms to use in development of the *Environmentality* website, <http://www.harfordglen.org/enviro.htm>, and the collection and dissemination of information on current environmental events, research, job vacancies, etc. to **Environmentality members.**

Environmentality's mission is to be “a networking partnership dedicated to sharing information and resources and providing mutual support to promote environmental stewardship in Harford

County, Maryland.” The group meets quarterly, pooling each others knowledge and talents, and striving to keep each other informed of environmental actions they are taking, in order to coordinate such actions, share information, and avoid unnecessary overlap between agencies. Members include federal, state and county government agencies, teachers, school administrators, private environmental groups, and environmentally active citizens. *Environmentality* is not a political advocacy group, but serves as a clearinghouse, or library, of environmental issues. Members strive to increase public awareness of environmental issues through such actions as assisting with Harford County Earth Day, providing professional assistance to students, and establishing and maintaining an *Environmentality* website. *Environmentality* is “conservation through communication.”

During 2009 - 2011, Water Resources staff served as a board member for the Maryland Water Monitoring Council (MWMC). MWMC serves as a state-wide collaborative body to help achieve effective collection, interpretation, and dissemination of environmental data related to issues, policies, and resource management involving the Maryland water monitoring community.

The MWMC addresses the full range of aquatic watershed resources in Maryland. including ground and surface waters, freshwater, estuarine and marine environments, and associated watershed resources in Maryland.

During 2009 - 2011, Water Resources staff served as a board member of the Otter Point Creek Alliance (OPCA). OPCA is a non-profit organization dedicated to the support of the research, education, and conservation goals of the Otter Point Creek Component of the Chesapeake Bay National Estuarine Research Reserve in Maryland through raising money, securing volunteers, sponsoring special events and aiding staff in implementing the Reserve’s Management Plan.

In 2009 - 2011, Water Resources staff continued to participate in the Bush River Partnership. This partnership was formed for the purpose of providing information about existing programs and projects occurring within the Bush River Watershed; to explore areas of collaboration; and outline steps to improve and enhance the watershed. The partnership includes individuals representing federal, state and local agencies and various non-profit organizations that focus on

three sectors: Research and Monitoring; Management, Protection, and Restoration; and Education/Outreach & Training.

In 2009 through 2011, Harford County Government Bureau of Water Resources partnered in with Baltimore City and Baltimore County to introduce the Growing Home Campaign. This is an innovative public-private partnership to increase the regional urban tree canopy. This program provides education and a free discount coupon for homeowners to purchase a tree at participating nurseries and retailers. A presentation was offered to employees during the County's 'Lunch and Learn' series to familiarize them with the program. The Growing Home Campaign brochure is included in Appendix R.

In 2009 – 2010, Water Resources participated in an Environmental Scholarship Awards Program for Harford County Public High Schools. Staff reviewed applications and selected the award recipient. A representative from Water Resources attended the awards ceremony.

F. Watershed Assessment and Planning

The 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 perform detailed assessments of all watersheds in Harford County. These assessments shall be performed according to priorities established previously by the County and at an appropriate scale (e.g., Maryland's hierarchical twelve-digit sub-basins). At a minimum, watershed assessments 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;*

While the initial intent of the SCAs were to identify areas of degraded water quality on a watershed basis, the scale proved to be too large and projects ended up being pursued on a site specific basis. In 2007, Harford County initiated a small watershed assessment of Wheel Creek, described below. This smaller scale proved to be more manageable and more likely to achieve measurable results from restoration. During the next five year permit cycle, Harford County anticipates using the Wheel Creek Watershed Assessment as a model to pursue additional small watershed assessments in other areas.

Wheel Creek

In 2008, Harford County DPW completed the *Wheel Creek Watershed Assessment* and developed recommendations to control runoff from developed areas, correct stream channel instability problems, reduce sediment loadings and improve the overall water quality of Wheel Creek and its receiving waters, Winters Run, Otter Point Creek, and Bush River. The Wheel Creek watershed (unofficially named) is a 435 acre watershed and is centrally located in Harford County, approximately 3 miles south of the Town of Bel Air. It is a second order tributary to Winters Run (MDEDIGIT 02130702) and Atkisson Reservoir (MDE8DIGIT 02130703).

The management plan for the Wheel Creek watershed includes an education and outreach component; water quality, physical, and biological monitoring; and the implementation of stream restorations and stormwater retrofits. The cost of the management plan is approximately \$5 million. This management plan was used to submit an application for a grant through the Chesapeake and Atlantic Coast Bays 2010 Trust Fund, Local Implementation Grant. In 2009, 2010 and 2011 yearly grants in the amounts of \$160,000, \$370,000 and \$500,000 respectively have been awarded for the implementation of the management plan. Copies of the scopes of work are provided in the enclosed CD as Appendix S. As a result of the 2010 Trust Fund award, Harford County has received an additional \$50,000 in grant funding from Chesapeake Bay National Estuarine Research Reserve (CBNERR), MD DNR and National Oceanic and Atmospheric Administration (NOAA).

The Wheel Creek Restoration Project is intended to provide a template for small watershed plans for Harford County DPW to implement in other areas within the Bush River Basin.

Plumtree Run

In 2009, Harford County contracted with BayLand Consultants & Designers, Inc. and Clear Creeks Consulting to develop a Watershed Assessment and Small Watershed Action Plan for the Plumtree Run watershed. Plumtree Run is a second order tributary to Atkisson Reservoir and Winters Run within the Bush River watershed. The Plumtree Run watershed is 1,651 acres, with the headwaters located in the Town of Bel Air and discharges into Atkisson Reservoir. The watershed is extensively developed and is approximately 29% impervious. As a result, Plumtree Run is experiencing the stresses associated with impervious cover; streambank erosion, sediment loading, and nutrient enrichment.

In June 2011, Bayland's submitted the final Small Watershed Action Plan. The plan incorporates the elements required for EPA Section 319 criteria a through i for watershed plans. The plan includes an inventory of potential stormwater retrofit opportunities, potential new stormwater management facilities, and stream reaches that require restoration. The projects were prioritized, preliminary cost estimates and implementation schedule was developed. A copy of the report, including appendices is included in the enclosed CD as Appendix T.

Farnandis Branch Stream Restoration

Farnandis Branch, a tributary of Bynum Run, is under consideration for stream restoration to restore bank stability. In 2007, KCI Technologies, Inc. was contracted to assess baseline stream conditions before construction for comparison to future stream conditions after restoration is completed. The monitoring protocol included the evaluation of channel geometry and sediment load, macroinvertebrate community, and water quality conditions. Physical, biological and chemical monitoring continued through 2009.

The geomorphic assessment quantified basic stream characteristics through the measurement of cross-sections, surveying and analyzing cross-sections and thalweg profile, installing and monitoring bankpins, and evaluating substrate particle size distribution. The biological monitoring program included the collection and analysis of the macroinvertebrate community, a physical habitat assessment and measurement of *in situ* water chemistry. The water quality monitoring program consisted of the collection of baseflow and stormflow samples at three location within the study area. Samples were analyzed for nutrients, suspended solids, metals and *E. coli* bacteria.

The Farnandis Branch Stream Restoration Pre-Construction Monitoring Report Year Two is provided on the enclosed CD as Appendix U.

Sam's Branch

Sam's Branch, a tributary to Otter Point Creek, in Edgewood, MD exhibits typical responses to uncontrolled stormwater runoff. Bank instability, inadequate riparian buffers and water quality degradation may be contributing to sedimentation and water quality degradation in Otter Point Creek and the Bush River. In May, 2008, Harford County contracted with Biohabitats, Inc. to perform an assessment of the 373 acre Sam's Branch watershed. The goals of the assessment are to monitor stream health for two years and assess watershed conditions.

The watershed assessment plan includes several components. Biohabitats performed a survey of upland conditions by conducting a "Unified Subwatershed and Site Reconnaissance" along with a "Stormwater Management Retrofit Survey". A Community Awareness Survey was conducted in 2010 to help quantify land use behaviors that may impact water quality and to guide the development of a public education campaign. Biohabitats also performed a riparian condition survey, established baseline stream morphology conditions, conducted a biological survey and initiated a stream water quantity and quality monitoring program. In 2011, Harford County requested Biohabitats to add components to the report that meet EPA Section 319 criteria a through i for watershed implementation plans. If the plan is approved by EPA, implementation projects will be eligible for Federal funding through Section 319. This work and the final report,

are scheduled to be completed in 2012. A copy of the first year's report is included in the enclosed CD as Appendix V.

Future Small Watershed Assessments

Over the next five years, small watershed assessments will be pursued in watersheds with the greatest percentage of impervious surface and potential for restoration. These include the unofficially-named watersheds of Declaration Run (926 acres), Riverside (320 acres), Mariner Run & Rumsey Island (711 acres), Heavenly Waters (850 acres), Spenceola Run (3,262 acres), and Shamrock Run & Wright Creek (2,241 acres) and Lower Winters Run (3,216 acres). The format for watershed assessments will follow that of Wheel Creek and Plumtree Run. If there are any modifications required by EPA Section 319, these will be incorporated into the assessments to ensure project eligibility for Federal grant funding.

Bynum Run Stream Gage

Harford County Department of Public Works and the United States Geological Survey (USGS) reactivated the Bynum Run stream gaging station in June 1999 in an effort to support a strategy to create a state-wide stream gaging network. The stream gage is located on the mainstem of Bynum Run at MD Route 22, and at that point has a drainage area of 8.52 mi². The gage was previously operated by USGS from 1944 to 1951 and again from 1955 to 1970. The forthcoming flow data will supplement the historical data record by providing many beneficial uses to the federal, state and local agencies. Data collected at this station is presented in 'real-time' at <http://waterdata.usgs.gov/md/nwis/rt>. Funds for these activities are cost-shared between Harford County and USGS, and USGS has continued to perform all tasks associated with the maintenance and operation of the stream gage through 2011.

Plumtree Run Stream Gage

Harford County Department of Public Works and the USGS installed a stream gaging station on Plumtree Run at Plumtree Road in August 2001. The operation of this gage will support the

ongoing efforts to create a state-wide stream gaging network and the data will supplement information recorded at other gages throughout the County. Data collected at this station is presented in 'real-time' at <http://waterdata.usgs.gov/md/nwis/rt>. From 2009 to 2011, USGS has performed all tasks associated with the maintenance and operation of the stream gage while the County provided the annual funding for these activities.

James Run Stream Gage

Harford County Department of Public Works and the USGS installed a stream gaging station on James Run at Creswell Road in October 2004. The operation of this gage will support the ongoing efforts to create a state-wide stream gaging network and the data will supplement information recorded at other gages throughout the County. Data collected at this station is presented in 'real-time' at <http://waterdata.usgs.gov/md/nwis/rt>. From 2009 to 2011, USGS has performed all tasks associated with the maintenance and operation of the stream gage while the County provided the annual funding for these activities.

Swan Creek Stream Gage

Harford County Department of Public Works and the USGS installed a new gage on Swan Creek in 2007. With the installation of this stream gage, a majority of the urban watersheds will be gaged. The operation of this gage will support the ongoing efforts to create a state-wide stream gaging network and the data will supplement information recorded at other gages throughout the County. Data collected at this station is presented in 'real-time' at <http://waterdata.usgs.gov/md/nwis/rt>. From 2009 to 2011, USGS has performed all tasks associated with the maintenance and operation of the stream gage while the County provided the annual funding for these activities.

Bynum Run, Plumtree Run and James Run Baseline Nutrient and Bacteria Sampling

Harford County Department of Public Works and the USGS conducted water quality sampling at the Bynum Run and Plumtree Run stream gages from July 2005 through and initiated sampling

at James Run in July 2006. At each of the three sites, USGS collects monthly surface water samples during baseflow conditions that are analyzed for nutrients and bacteria. Samples are collected using established USGS procedures for collection and processing and are shipped to the USGS Water Quality Laboratory in Denver, Colorado for nutrient analysis. The nutrient and in-stream water quality parameters for each station are entered into a national database and are published in the USGS annual water-data report along with the streamflow records. Water quality data results for each station are available at <http://waterdata.usgs.gov/nwis>. Bacteria samples are delivered to Community Environmental Laboratory in Aberdeen, Maryland for *E. coli* analysis. A summary is included in the enclosed CD.

Wheel Creek Stream Gage

Harford County Department of Public Works and USGS installed a new gage on Wheel Creek in 2009. The construction and operation of this gage is in support of the implementation of the Wheel Creek Watershed Management Plan and monitoring efforts associated with the County's NPDES permit, the Chesapeake and Coastal Bays 2010 Trust Fund Grant and the Chesapeake Bay Program's Non-tidal Monitoring Network. Data collected at this station is presented in 'real-time' at <http://waterdata.usgs.gov/md/nwis/rt>. From 2009 to 2011, USGS has performed all tasks associated with the maintenance and operation of the stream gage while the County provided the annual funding for these activities.

Bush River Shallow Water Monitoring Project

Since 2003, Water Resources has provided funding for the Maryland Department of Natural Resources (DNR) to conduct temporally intensive water quality monitoring in the Bush River. The continuous monitoring component of the program is designed to acquire temporal records of water quality of data at shallow water stations throughout the Chesapeake and Maryland Coastal Bays. The purpose of the program is to characterize water quality and habitat conditions to assess compliance with the Environmental Protection Agency's (EPA) Chesapeake Bay ambient water quality criteria for dissolved oxygen, water clarity and chlorophyll. DNR deployed and maintained YSI 6600TM datasondes (multi-parameter logging instruments) from approximately

March through October to collect water quality data at 15-minute intervals for the following parameters: water temperature, salinity, dissolved oxygen, fluorescence (to estimate chlorophyll concentrations), pH and turbidity. Data from salinity, chlorophyll and turbidity readings were also used to calculate the coefficient of light attenuation. Discrete whole water samples were collected biweekly to measure chlorophyll *a*, pheophytin, total suspended solids, volatile suspended solids, ammonium, nitrite, nitrate, total dissolved nitrogen, particulate nitrogen, phosphate, particulate phosphate, total dissolved nitrogen and particulate carbon.

Since the inception of the project, continuous monitoring data had been collected at two sites in the Bush River: Otter Point Creek (XJG7035) which was funded through a cooperative agreement with the National Oceanic and Atmospheric Administration's National Estuarine Research Reserve System (NERRS) Program and Lauderick Creek (XJG4337) which was funded by Harford County. In 2009, data collection at the Otter Point Creek site continued, while data collection at Lauderick Creek ceased. The instruments used at Lauderick Creek were relocated to Church Point (XJG7461) in order to expand continuous monitoring coverage of the Bush River watershed.

A summary of 2009 report indicates that salinity levels remained low during the wetter than average year peaking at 3.7 parts per thousand (ppt) and Church Creek and 2.0 ppt at Otter Point Creek. Dissolved oxygen levels generally remained at healthy levels in 2009, particularly at Otter Point Creek where the dissolved oxygen criteria failure rate (3.96%) was the lowest since 2003. Algal blooms were infrequent and short in duration as only approximately 1% of chlorophyll readings measured levels indicative of significant blooms. Water clarity continued a declining trend as nearly 100% of all measurements were beyond thresholds considered optimal for underwater grass growth. Submerged aquatic vegetation (SAV) total area (381 acres) was 9% higher than the restoration goal, but the total area has decreased by 41% since 2007.

Real-time data from these sites are available at DNR's "Eyes on the Bay" web site <http://mddnr.chesapeakebay.net/eyesonthebay/index.cfm> and monitoring reports are available at <http://mddnr.chesapeakebay.net/eyesonthebay/publications.cfm>. The 2009 Bush River Shallow Water Monitoring Data Report is included in the enclosed CD as Appendix W.

Baseline *Escherichia coli* Monitoring

From 2006 - 2009, the County established ten monitoring sites on Winters Run, Bynum Run, HaHa Branch and James Run to assess the baseline concentrations of *Escherichia coli*. Due to the paucity of bacteria data available for the County's tributaries, the goal of this project was to attempt to characterize the baseline concentrations of *E. coli* within the streams located in the county's development envelope. Grab samples were collected monthly or bimonthly during baseflow conditions at each of the ten sites, and the samples are analyzed for *E. coli* by Community Environmental Laboratory. A summary of the results are included in the enclosed CD as Appendix X.

Bush River Larval Fish Study

Water Resources staff partnered with DNR CBNERR, DNR Fisheries and volunteers from the Anita C. Leight Estuary Center by providing staff time and funding for the continuation of the larval fish program. After the successful completion of the Bush River pilot study in 2005, funding was used to support a contractor to coordinate the collection and analysis of egg and larval fish samples and coordinate, schedule, and analyze seine and trawl data at historical and present sites in the Bush River.

This study was composed of ichthyoplankton sampling, haul seining and bottom trawling. An average of 22 volunteers collected 630 ichthyoplankton samples over the four years of the study. This accounted for 82% of the scheduled samples and samples not collected were generally due to high water and/or hazardous conditions.

Biweekly haul seine sampling was conducted at four sites from July to October in the Bush River. Over the four years of the study, volunteers conducted 65 haul seines. During haul seining over 5,500 fish including 41 different fish species were captured annually resulting in a catch-per-seine of 5.4 fish.

Bottom trawling in the Bush River was conducted biweekly from July through October at three locations. During sampling, 4,500 fish were captured including 29 fish species by 77 trawls resulting in a catch-per-trawl of 5.8 fish.

The significant numbers of juvenile or adult fish captured during bottom trawling in the Bush River during 2005-2008, indicated a diverse fish community and when compared to other DNR sampled systems in 2008, ranked as the most diverse in species and most significant in catch-per-seine. This data indicated that the Bush River serves as a significant spawning area for river herring and a significant nursery area for many fish species in the Chesapeake Bay.

Nutrient loading, particularly nitrogen, appears to be a significant problem in the river basin, while water temperature, dissolved oxygen, conductivity and pH were all within normal levels and do not appear to be a limiting factor.

The fragility of the Bush River watershed was indicated by the high degree of impervious surface within it (12.8%) stressing its protection from further development. Land-use planning must be evaluated carefully in the Bush River watershed to minimize potential impacts to water quality and the fisheries. A final report is included in the enclosed CD as Appendix Y.

G. Watershed Restoration

The 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. Complete 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.*

2. *Within one year of permit issuance, 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.*
3. *Report annually:*
 - a. *The progress toward meeting the goals established in PART III. G.1. and 2. above;*

Harford County has been implementing structural restoration projects since 2001 including new stormwater management facilities, retrofitting existing stormwater management facilities and stream restorations. Restoration has focused on providing the maximum management possible considering site constraints and property owner limitations. Stormwater management facilities are privately owned and there are no easements along streams. Therefore, extensive property owner coordination and construction easements are required for all restoration projects.

Local stream bank erosion has been the focus for Harford County's watershed restoration program; maximizing opportunities for channel protection first and water quality second. During this permit term, guidelines for credits towards restoration goals have been informal and somewhat vague. Harford County calculated full credit for restoration projects regardless of the level and type of management required should be applied since the opportunities on a site by site basis were maximized.

As a result of the Bay TMDL, the focus has been more regional on achieving water quality and less on water quantity. Because of the aggressive schedule and level of management proposed within the Bay Watershed Restoration, Harford County is forced to focus away from local quantity issues and towards improving water quality. With few local TMDLs and limited monitoring to demonstrate local water quality impairments, prioritizing restoration has become difficult. Restoration projects are very costly and should focus on restoring local problems, not just an urgency to tabulate credits for modeling purposes.

Harford County is currently developing a new tracking system for restoration projects that includes water quality and water quantity management required and provided. This system will be used for prioritizing projects and quantifying management towards water quality goals. Harford County is also currently reviewing / updating the stormwater management database to ensure all facilities are included and fully documented. Focus will be placed on quantifying water quality within facilities constructed prior to 2000, since this is the basis for the restoration goal. Harford County anticipates this quantity to be minimal since water quality management was not required by Harford County prior to this date. A quantity overestimated in past annual reports.

In addition to structural restoration, Harford County is investigating other opportunities to determine if existing impervious areas are currently managed such as disconnected rooftops and disconnected non-rooftops and open section roadways. Harford County is currently conducting a survey of the Wheel Creek watershed to determine methods to quantify disconnected impervious areas. This project is funded through a grant from the Bay Trust and also includes encouraging property owners to disconnect downspouts. A copy of the grant scope of work is included in Appendix Z.

Harford County is currently working on determining opportunities for improved management of green spaces on County property including management of herbicide application, establishment of health turf grasses and opportunities for conversion of turf grass to meadow grass and forests. A copy of the scope of work is included in Appendix Z.

Harford County will continue to pursue these types of non-structural programs to determine the potential for lower cost alternatives to structures measures.

b. The estimated cost and the actual expenditures for program implementation; and

Actual expenditures for Harford County's capital improvement projects completed between 2009 and 2011 are included in Appendix Z. Harford County's total impervious area excluding the municipalities and State highways is 12,000 acres. This total does not include completed

restoration projects, existing stormwater management (now anticipated to be minimal) or potential reductions such as disconnected impervious areas. A restoration goal of 20% (as proposed in the draft MS4 permit for Harford County) would therefore be 2,400 acres. Based on actual expenses and discussions with other MS4 jurisdictions, an estimate of \$40,000 per acre of impervious area treated would require \$96,000,000 over the five year permit or approximately \$19,000,000 per year. The current capital budget for Water Resources is \$2,000,000.

As required by House Bill 987, Harford County is investigating methods to implement a stormwater utility. To fully fund the watershed restoration program, average costs per household are approximately \$400 per year.

- c. *The monitoring data and surrogate parameter analyses used to determine water quality improvements.*

Water Resources Engineering Division Capital Project Monitoring and Assessment

During this permit term, Harford County has established a capital project monitoring program. The goal of the program is to quantitatively establish improvements in water quality, habitat quality and/or bank stability over pre-construction conditions. In some instances, the scope and duration of monitoring is dictated by requirements of the waterway construction permit. Each project site is unique, with its own set of goals and expectations. The monitoring plans for each site must reflect the goals of the individual project. The capital project monitoring program has allowed the County to improve upon the design and construction of a variety of restoration techniques.

Mt. Royal Stormwater Management Facility and Stream Restoration Project

In 2004, Water Resources contracted with KCI Technologies to perform annual assessments of the Mt. Royal Stream Restoration Project. The success and stability of the restoration effort was evaluated by performing fluvial geomorphological assessments, inspection of stabilization structures, and vegetative stabilization inspections. The fluvial geomorphologic assessment suggests that the site is stable. The survey conducted in 2006 completes the annual three (3) year

post construction monitoring for this site. Harford County anticipates monitoring this site on a five (5) year cycle.

From 2007 - 2010, Water Resources contracted with KCI to evaluate the nutrient removal capabilities and water quality improvement potential of the Mt. Royal stormwater management facility and its impact on macroinvertebrate colonization in the downstream reach. Monitoring efforts were developed to compare the water quality entering and exiting the stormwater management pond and the biological conditions of the associated reach directly downstream. Monitoring protocols for the facility were thus implemented to evaluate the effectiveness of the facility at reducing pollutants and to determine whether or not it is having a positive impact on macroinvertebrate colonization downstream. The monitoring program began in the fall of 2006 and has continued through the current Spring 2010 season.

The water quality monitoring program consists of both baseflow and stormflow sampling at three locations within the study area. All samples were sent to a certified laboratory and analyzed for total phosphorus, total nitrogen, total suspended solids, chlorides, lead, copper, zinc, cadmium, and nickel.

The Effluent Probability Method, was used to evaluate the ponds ability to improve effluent water quality. This is the only stand-alone method recommended in the Urban Stormwater BMP Performance Monitoring guidance manual (USEPA, 2002). This method is straightforward and directly provides a clear picture of the ultimate measure of BMP effectiveness, effluent water quality, by first determining if the BMP is providing treatment (i.e., the influent and effluent EMCs are statistically different from one another) and then examining either a cumulative distribution function of influent and effluent or a standard parallel probability plot (USEPA, 2002).

The Year 3 monitoring report confirmed some of the results of the previous year's studies, which suggested that the Mt. Royal stormwater management facility is reducing storm discharges and pollutant loads to the unnamed tributary to Swan Creek downstream. Current findings suggest that KCI was unable to detect a significant reduction in nutrients, chlorides, and suspended

sediments, while significant reductions in metal concentrations (i.e., zinc, copper, and lead) have been statistically verified. While it was possible to demonstrate reductions in the concentrations of these parameters, actual removal rates were unable to be determined due to complications arising from continuous flow monitoring and seasonal flow imbalances. Nonetheless, this report provides valuable insight into the performance of the stormwater management facility in light of new data and analysis techniques. Although it is not immediately clear why measureable reductions have not been detected in parameters such as nitrogen or phosphorus while passing through the facility, it is possible that continuously elevated concentrations in the base flow are either at, or exceeding, the uptake/assimilation capacity of the facility such that storm loads simply pass through unchanged. A thorough review of nutrient reduction technologies is recommended to help identify practical solutions that may increase this facility's capacity to reduce nutrients loads to the receiving waters, and ultimately, the Chesapeake Bay.

The Year 2 and Year 3 Monitoring Reports are included in the enclosed CD as Appendix AA.

Box Hill – South Tributary Stream Restoration

In 2004, Water Resources contracted with KCI Technologies, Inc. to perform annual assessments of the Box Hill Stream Stabilization Project. The success and stability of the restoration effort is evaluated by performing fluvial geomorphological assessments which include bankfull width, mean depth, width/depth ratio and cross-sectional area. In addition, annual monitoring tasks include macroinvertebrate sampling, inspection of stabilization structures, and vegetative stabilization inspections. In 2008, Year Five monitoring was completed.

Upon completion of five years of monitoring, it has been concluded that the structures are functioning normally and providing bank stability. Some areas of concern exist, primarily at points where the boulder walls tie in with existing banks. Vegetation has become well-established although there continues to be issues with some homeowners dumping yard waste along the banks. The macroinvertebrate community improved from “Very Poor” in 2007 to “poor” in 2008. Physical habitat conditions continue to be rated as “Severely Degraded”.

The results of five years of monitoring have allowed Harford County to reflect on the design and implementation of the streambank stabilization measures. The County believes that the restrictions placed on the design by the permitting agencies (no work outside the existing channel) resulted in the failure of vegetative means of stabilization. Because the stream has no floodplain access, stormflow velocities remain high, thus requiring the structural remediation measures undertaken in 2007. In addition, the project would have benefited from a continuous homeowner education campaign. Although all the homeowners received education regarding streamside behaviors, several of the properties have sold and the new homeowners did not receive the benefit of education.

Box Hill Long-term Monitoring Plan

Beginning in 2009, Harford County monitored the project at a reduced effort. The goal of the long-term monitoring program is to ensure the stability and functionality of the channel stabilization structures and assess the impact, if any on the biological community. This effort includes visual inspection and photographic documentation semi-annually, in the Spring and Fall. Macroinvertebrate sampling and habitat assessment is conducted biennially in the Spring. Fish surveys will be conducted once every five years, beginning in 2012. Photo documentation is included in the enclosed CD as Appendix BB.

Five-Year Monitoring Schedule

Activity	2009		2010		2011			2012			2013	
	Spr	Fall	Spr	Fall	Spr	Summer	Fall	Spr	Summer	Fall	Spr	Fall
Visual Inspection	X	X	X	X	n/a		X	X		X	X	X
Macroinvertebrate/ habitat					X						X	
Fish						Postponed to 2012			X			

Laurel Valley Stormwater Retrofit and Bioretention Project and Laurel Valley Stream Restoration Project

Construction of the Laurel Valley Stormwater Retrofit and Bioretention Project began in October 2004, and was completed in Spring 2005. In December, 2008, construction began on the Laurel

Valley Stream Restoration Project, immediately downstream of the stormwater retrofit. In 2007, the County contracted with KCI Technologies, Inc (KCI) to perform pre-construction monitoring. The annual monitoring plan for Laurel Valley includes a geomorphic analysis; both within and downstream of the restoration reach. A biological analysis is performed upstream of the stormwater retrofit as well as the downstream channel.

Two years of monitoring occurred prior to the installation of stream restoration measures to establish base-line conditions. The County continued to monitor and assess stream conditions for a minimum of three years post-construction.

The Laurel Valley Stream Restoration Year One and and Year Two Post-Construction Monitoring Reports are provided on the enclosed CD as Appendix CC.

Bynum Ridge Stream Restoration Project

This project was constructed in Spring 2011 and involved the removal of crumbling concrete and timber walls along a sharp bend in the stream channel and replacing them with imbricated rip-rap and vegetation. Because of the limited scope of this project, no biological or physical monitoring is proposed.

Plumtree Run @ Tollgate Road Restoration Project

This project involves bank stabilization and buffer enhancement along 1,200 feet of Plumtree Run, a tributary of Winters Run. In 2006, the design of the invasive species management portion of the project was completed. Treatments were conducted in July and October 2007. Post-construction inspection determined that 90% of the targeted invasive plants were removed. Four additional treatments were conducted during the 2008 growing season. Construction of the stream restoration was completed during the winter of 2010 - 2011. Although no monitoring is schedule for this specific site, a monitoring plan for the Plumtree Run watershed will be developed.

Sunnyview Stream Restoration Project

This project involves the stabilization and buffer enhancement of an unnamed tributary to Bynum Run. In 2005, Harford County contracted with KCI Technologies, Inc. to initiate pre-construction monitoring. The monitoring program involves both physical and biological assessments as well as a sediment and discharge analysis. KCI completed the third year of pre-construction monitoring. The data show the channel is continuing to erode laterally. The biological community continues to be ranked as “Poor” to “Very Poor” and the physical habitat was “Degraded”. The text of the Year 3 Monitoring Report is provided in the enclosed CD as Appendix DD.

Woodbridge Stream Restoration Project

This project involves the restoration of approximately 1,500 linear feet of a tributary to Foster Branch, immediately downstream of a proposed stormwater retrofit. In 2005, Harford County contracted with KCI Technologies, Inc to initiate pre-construction monitoring involving both physical and biological assessments.

Based on three years of physical assessment, the data indicate that severe erosion is continuing to occur in the upper 1,000 feet of the study reach and spotty erosion is occurring along the downstream 800 linear feet. Within the proposed restoration reach, macroinvertebrate scores decreased from “poor” on 2005 to “very poor” in 2007. Upstream of the proposed restoration reach, the macroinvertebrate community remained in the “poor” range.

In 2008, design for the stream restoration project was initiated. The project design will be complete in 2012, with construction scheduled for summer 2013.

Woodbridge Stormwater Management Retrofit

In conjunction with the Woodbridge Stream Restoration Project, the County investigated the feasibility of modifying an existing stormwater pond servicing the Woodbridge community. In 2008, KCI Technologies, Inc. completed a concept plan for modifying the pond to provide additional quantity and quality management. The concept plan was presented to the Woodbridge Homeowners' Association in June 2009, and the County obtained permission to complete the design of the pond retrofit. The project design was completed in 2011 and will be constructed in 2012. There are no specific monitoring requirements for this project.

Gardens of Bel Air Stormwater Management Retrofit

Gardens of Bel Air stormwater management pond was identified in the *Wheel Creek Watershed Assessment* as an existing facility to retrofit that would provide opportunity for additional stormwater storage for water quality volume (WQv), channel protection volume (CPv) and provide considerable opportunity to enhance water quality. Criteria used for selecting this pond included percent impervious cover draining to the facility, location within the drainage area, and existing downstream conditions.

The pipe and riser are both significantly corroded and near the end of the design life for CMP structures. The proposed project is to replace the aging spillway pipe and riser and to incorporate channel protection volume management to the maximum extent possible without exceeding freeboard limits or increasing the discharge of the higher storm events downstream. This stormwater retrofit will provide 61% of the required CPv while upgrading the deteriorating spillway pipe and riser. This volume will be achieved by excavating ~1.2 acre-ft. of material from the existing pond bottom, constructing of a new, multi-stage concrete riser, and constructing of a concrete weir that elevates and constricts the existing emergency spillway. Beyond annual visual inspection, there is no project-specific monitoring proposed, the overall effects of this and other restoration projects within Wheel Creek will be evaluated through the Wheel Creek Watershed Monitoring Plan. Final plans are included in the enclosed CD as Appendix EE.

Calvert's Walk Stream Restoration Project

Calvert's Walk Stream Restoration Project was identified in the *Wheel Creek Watershed Assessment* as a priority for restoration due to the severity of stream bank erosion, increased sediment loads to downstream reaches and because of safety concerns due to the close proximity of adjacent properties. The proposed restoration involves stabilizing 900 linear feet of stream by constructing a step pool for grade control and installing over 200 native trees and shrubs and over 300 live stakes. Annual visual inspection of the project is proposed. Like Gardens of Bel Air, the project will be evaluated as part of the Wheel Creek Watershed Monitoring Plan. Final plans are included in the enclosed CD as Appendix FF.

Heavenly Pond Dam Removal / Stream and Wetland Creation

The Heavenly Pond project involves the removal of a dam and conversion of a recreational pond into a stream and wetland complex. The area of the instream pond is approximately 1.5 acres and the drainage area is approximately 76 acres. The pond is located on County owned property approximately one mile west of the Town of Bel Air. The pond embankment and barrel are failing and in need repair, and the pond does not provide stormwater management. Harford County Water Resources in coordination with the Department of Parks and Recreation determined that removing the dam and reestablishing a stream channel and wetland complex would be the best alternative. In 2011, the County has contracted with Parsons Brinkerhoff to develop a concept plan for the dam removal and the stream and wetland creation. The monitoring plan for this project includes monthly baseflow sampling upstream and downstream of the project site. Parameters collected will be total and dissolved nitrogen and phosphorus. A copy of the scope of services is included in enclosed CD as Appendix GG.

H. Assessment of Controls

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

Church Creek 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 Winters Run watershed, or, select and submit for MDE's approval a new watershed restoration project for monitoring. 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:

a. **Chemical Monitoring:**

- 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;

Brentwood Park / Woodland Hills 2009

During 2009, Harford County contracted with EA Engineering, Science and Technology, Inc. (EA) to collect the stormflow samples at the long-term monitoring stations. Stormflow samples were collected during eight (8) sampling events during this period. Three discrete grab samples were collected at the outfall and instream stations over the course of each storm event. The instantaneous discharge, level, velocity, water temperature and pH were recorded at the time the samples were collected.

Harford County Water Resources staff collected eleven (11) monthly baseflow samples in 2009. Three discrete grab samples were collected at the outfall and instream stations at thirty-minute intervals. The instantaneous level, water temperature, pH, velocity and discharge were recorded at the time the samples were collected.

Harford County contracted with Atlantic Coast Laboratory to analyze the water quality samples. EPA methods are currently being used for analysis. Harford County requests that MDE review these methods and detection limits and provide alternatives if found to be unacceptable. Each sample was analyzed for the following parameters:

Parameter	Method	Reporting Limit
5-day Biological Oxygen Demand (BOD5)	SM 5210 B	4.00 mg/L
Total Suspended Solids (TSS)	SM 2540 D	4.00 mg/L
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	0.2 mg/L
Nitrite plus Nitrate (NO ₂ 3)	EPA 300.0	0.15 mg/L
Total Phosphorus (TP)	EPA 365.4	0.05 mg/L
Total Petroleum Hydrocarbons (TPH)	EPA 1664	5.00 mg/L
Total Copper (Cu)	EPA 200.7	0.005 mg/L
Total Zinc (Zn)	EPA 200.7	0.01 mg/L
Total Lead (Pb)	EPA 200.7	0.005 mg/L
<i>E. coli</i>	SM 9221C	1.0 MPN/100mL

EA conducted comparisons and statistical trend analyses for the baseflow and stormflow samples collected from 1998-2009 for each of the above-mentioned water quality parameters.

Monitoring data consisting of precipitation, stream flow, and water quality were used to conduct the following analyses:

1. Calculation of storm event mean concentrations (EMCs)
2. Estimation of annual constituent loading
3. Comparison of EMCs to Maryland Department of the Environment (MDE) ambient water quality criteria
4. Comparison of EMCs to Maryland National Pollutant Discharge Elimination System (NPDES) and National Urban Runoff Program (NURP) EMCs
5. Correlation between water quality data and benthic data
6. Spatial comparisons and temporal trend analysis of EMCs
7. Comparison of pollutant loads per acre to other local watersheds

The enclosed CD contains the interpretive report of the water quality data and the MDE Access database with the continuous flow data for the eight (8) storm events at the instream station and at the outfall station (Appendix HH).

In December of 2006, Water Resources staff, EA and Dr. Mark Frana from Salisbury University (SU) developed a monitoring plan for Bacterial Source Tracking (BST) in the watershed. The BST study plan was designed to address both dry weather and wet weather conditions as well as seasonality. From November 2007 to December 2008, a total of seventeen (17) surface water samples were collected during baseflow and stormflow conditions. From October 2007 – December 2008 sixty-eight (68) scat samples were collected and identified as deer, goose, fox, raccoon, horse, dog, rabbit or passerine bird. In addition, seventeen (17) human sewage samples were also collected. In total, the scat and sewage samples yielded 637 known-source isolates that were grouped into four categories: human, livestock, pet and wildlife. Samples were analyzed using the Antibiotic Resistance Analysis (ARA) method.

The results of the study showed that wildlife was the largest contributor to fecal bacterial comprising on average 43% of the classified isolates. The human source was the second largest contributor at 30% of the classified isolates followed by 18% pet, and 9% livestock. The 72-hour antecedent rainfall was found to be the best predictor of high total *Enterococcus* concentration, with heavy rainfall increasing *Enterococcus* concentrations by one to two orders of magnitude. The surface water samples collected in June and July had the highest average *Enterococcus* concentrations, while samples collected in January and February had the lowest. This BST study shows relatively high concentration of *Enterococcus*, of which approximately

30% may be attributed to human fecal pollution, such as sanitary sewer leaks or failing septic systems within the watershed.

In order to address the human source contribution determined in the study, the Harford County Health Department and Water and Sewer Division conducted field inspections in the watershed. The Health Department inspected each of the properties with septic systems and no problems were observed. Water and Sewer verified sanitary sewer overflow records and system capacity for this area. Two reported overflows were documented in 2004 and 2006 due to vandalism at a manhole and a split in the PVC pipe at the Woodland Hills pump station. Per the Sewer System Capacity Analysis Program (SSCAP) and the design drawings, there are no capacity issues in this area that would result in overflows during dry or wet weather conditions. The WS maintenance group field verified the infrastructure in the watershed and checked the lag time from the Woodland Hills pump station to the discharge manhole. No problems were found.

If funding allows, future source tracking studies in this watershed could include a groundwater monitoring component, soil testing and applying improved BST methodologies that provide more exact results and limit the amount of error associated with the techniques. The technology for BST is rapidly moving toward a technique called quantitative real time polymerase chain reaction (qPCR)) that could replace other ARA and PCR methodologies. In addition, *E. coli* and Enterococcus are being phased out as target organisms in favor of Bacteroides. Bacteroides is a very common organism in the gastrointestinal tract of birds and mammals. Unlike *E. coli* and Enterococcus, Bacteroides does not exist in soil and vegetation, and cannot persist outside of its host for long periods. Researchers have identified genetic markers in the Bacteroides genome that are very host-specific. Testing for these markers does not require a known-source library (i.e., scat collection).

A final BST report is included in the enclosed CD as Appendix II.

Water Resources staff contracted with Biohabitats to develop a watershed assessment and management plan for the ambient station watershed. During 2008 and 2009, Biohabitats reviewed and analyzed the existing water quality data, evaluated the average event mean

concentration data, analyzed the differences between the upstream and downstream stations and verified the comparison of the EMCs with published data, including the new National Stormwater Quality Database (Pitt et al., 2004). Biohabitats also conducted a field reconnaissance to identify potential pollutant loading sources and retrofit opportunities within the watershed. This included a stream corridor assessment utilizing the Center for Watershed Protection's (CWP) Unified Stream Assessment (USA) and an uplands survey utilizing CWP's Unified Subwatershed and Site Reconnaissance (USSR) methodologies.

The Brentwood Park and Woodland Hills Watershed Assessment and Management Plan are included in the enclosed CD as Appendix JJ.

The Brentwood Park and Woodland Hills monitoring location was discontinued following the 2009 monitoring.

Wheel Creek Watershed 2010 – 2011

In 2009, Water Resources staff and the MDE selected the Wheel Creek watershed to monitor ambient conditions. The Wheel Creek watershed (unofficially named) is centrally located in Harford County, approximately three (3) miles south of the Town of Bel Air. It is a second order tributary to Winters Run (MDEDIGIT 02130702) and Atkisson Reservoir (MDE8DIGIT 02130703) in the Bush River watershed (MDE6DIGIT 021307). Wheel Creek is situated along the eastern edge of the Piedmont physiographic province, drains 435 acres, and contains approximately 27% impervious cover. A mixture of commercial and high density residential land use dominate the headwaters, along with a mixture of medium and low density residential land use. The Harford Glen Environmental Education Center, which is part of the Harford County Public School system, is located in the lower reaches of the watershed and is predominately forest.

This watershed was selected based on the channel instability, sedimentation, pond retrofit and stream restoration opportunities and implementation recommendations outlined initially in the *Bush River Water Restoration Action Strategy* and more detailed in the *Wheel Creek Watershed*

Assessment. Five (5) stormwater retrofits and four (4) stream restoration projects are proposed for this watershed to improve water quality, decrease stormwater discharges and improve stream habitat. Project development and success will be evaluated through a pre and post construction monitoring effort that includes chemical, biological and physical monitoring components.

Three permanent water quality monitoring stations were established in the Wheel Creek watershed beginning in the summer of 2010 and installation was completed in the spring of 2011. Station WC002 is an instream station located on the mainstem of Wheel Creek just downstream of Wheel Road. Station WC003 is located on the Middle Branch of Wheel Creek at the outfall of the SWM facility located on Cinnabar Lane. Station WC004 is an instream station located upstream of WC003 on the Middle Branch just off of Wheel Court.

During 2010 and 2011, Harford County contracted with Versar, Inc. to collect the stormflow samples at the three (3) long-term monitoring stations in the Wheel Creek watershed. In 2010, stormflow samples were collected during six (6) sampling events and in 2011 stormflow samples were collected during eight (8) sampling events. Three samples were collected and composited at each station over the course of the storm hydrograph. The instantaneous discharge, level, velocity, water temperature and pH were recorded at the time the samples were collected.

Harford County Water Resources staff collected discrete baseflow samples at each station during ten (10) sampling events in 2010 and eleven (11) events in 2011.

To supplement baseline water quality conditions, a spring synoptic survey was conducted during 2010 and 2011 in the Wheel Creek and reference watersheds. Samples were collected at eight (8) stations located at each tributary and confluence throughout both watersheds to provide coverage of the entire area and were analyzed for dissolved nitrogen and phosphorus. Samples were collected in the spring to coincide with the period of maximum nitrogen concentration in the stream.

Harford County contracted with Atlantic Coast Laboratory (QC Laboratory) and Enviro-Chem Laboratory to analyze the water quality samples. Standard Methods or EPA methods are

currently being used for the analysis. Harford County requests that MDE review these methods and detection limits and provide alternatives if found to be unacceptable. Each sample was analyzed for the parameters listed in the table below.

Parameter	Method	Reporting Limit
5-day Biological Oxygen Demand (BOD5)	SM 5210 B	4.00 mg/L
Total Suspended Solids (TSS)	SM 2540 D	4.00 mg/L
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	0.200 mg/L
Nitrate (NO3)	EPA 300.0	0.100 mg/L
Nitrite (NO2)	EPA 300.0	0.0500 mg/L
Ammonia (NH3)	SM 4500NH3-G	0.200 mg/L
Total Phosphorus (TP)	EPA 351.2	0.0500 mg/L
Ortho Phosphate (PO4)	SM 4500P E	0.0100 mg/L
Total Petroleum Hydrocarbons (TPH)	EPA 1664	5.00 mg/L
Total Copper (Cu)	EPA 200.7	0.005 mg/L
Total Zinc (Zn)	EPA 200.7	0.01 mg/L
Total Lead (Pb)	EPA 200.7	0.005mg/L
<i>E. coli</i>	SM 9223B	1.0 MPN/100mL

Monitoring data consisting of precipitation, stream flow, and water quality were used to conduct the following analyses:

1. Calculation of storm event mean concentrations (EMCs)
2. Estimation of annual constituent loading
3. Comparison of EMCs to Maryland Department of the Environment (MDE) ambient water quality criteria
4. Spatial comparisons and temporal trend analysis of EMCs

An interpretive report of the water quality data is presented in the enclosed CD as Appendix KK.

b. Biological Monitoring:

- i. Benthic macroinvertebrate 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 Protocols (RBP), Maryland Biological Stream Survey (MBSS), or other similar method approved by MDE.*

Brentwood Park / Woodland Hills 2009

Harford County staff collected the macroinvertebrate samples on June 22, 2009 at three stations located in the sampling reach between the instream monitoring station upstream to the outfall monitoring station utilizing the Rapid Bioassessment Protocol III.

Each benthic sample was submitted to the Maryland Department of Natural Resources (MDDNR) and sorted and identified to genus or to the lowest possible taxonomic level. Results of these findings were submitted in spreadsheet format to Harford County.

Harford County contracted with EA to complete a benthic community assessment and a physical habitat assessment. Metric selection and data analysis for the benthic analysis followed the Maryland Biological Stream Survey (MBSS) program guidance documents (Stribling et. al. 1998). The suite of nine (9) metrics used to calculate the Index of Biotic Integrity (IBI) and the Hilsenhoff Biotic Index (HBI) for the Piedmont Region include Total Taxa, EPT Taxa, Ephemeroptera Taxa, Diptera Taxa, Percent Ephemeroptera, Percent Tanytarsini of Chironomidae, Intolerant Taxa, Percent tolerant Taxa, and Percent Collectors. To evaluate Harford County's monitoring stations against the 'best achievable' urban reference condition, an Urban Reference Index (URI, EA 2001) was then calculated for comparison with IBI scores determined from MBSS data collected from forty six (46) streams in urban areas. A regression analysis was then performed on the IBI and HBI scores to determine temporal trends and seasonal trends at each of the stations. Additionally, the Wilcoxon Signed-Rank Test was used to investigate the differences in IBI and HBI scores among the three stations.

An interpretive report of the Benthic Community Assessment and the Physical Habitat Assessment is included in the enclosed CD as Appendix LL.

Wheel Creek Watershed 2009 – 2011

In support of Chesapeake and Atlantic Coastal Bays Trust Fund monitoring, the Maryland Biological Stream Survey (MBSS) sampled seven (7) stations in Wheel Creek and one (1) station in a reference watershed during the spring and summer sampling periods from 2009 – 2011. During the spring, temperature loggers were deployed in the stream at each site then sites were sampled for water chemistry, physical habitat, presence of vernal pools, herpetofauna, and benthic macroinvertebrates. These same sites were also sampled once each summer for fish, crayfish, freshwater mussels, reptiles, amphibians, invasive riparian vegetation, and instream habitat. Sampling was conducted following the Maryland Biological Stream Survey Sampling Manual: Field Protocols (Stranko, et. al, 2010). A Technical Memorandum summarizing MBSS's baseline biological data is included in the enclosed CD as Appendix MM.

c. ***Physical Monitoring:***

- 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;*

Brentwood Park / Woodland Hills 2009

Harford County contracted with KCI Technologies, Inc. to conduct the physical stream assessment. In May 1999, KCI established 3 permanent monuments and completed cross-sectional surveys and a longitudinal profile. KCI resurveyed the cross-sections and the longitudinal profile annually through 2009. The cross-sections and profile were plotted showing the results from the 1999 – 2009 field surveys. The results of the survey are presented in the enclosed CD as Appendix NN.

Wheel Creek Watershed 2009 – 2011

Harford County contracted with KCI Technologies, Inc. from 2009 – 2011 to conduct the physical stream assessment in the Wheel Creek Watershed. The primary goal of the monitoring was to assess the geomorphic stability of the stream channels in the Wheel Creek watershed as they respond to restoration activities. Assessment techniques included a survey of permanently-monumented channel cross-sections, a longitudinal profile survey, particle size analysis, substrate facies mapping and assessment of bank pins and scour chains. Four assessment reaches were established for geomorphic monitoring based on the following treatments:

1. within a proposed stream stabilization reach (WC-01);
2. downstream of a stream stabilization reach and BMP retrofit location (WC-02);
3. downstream of a BMP retrofit location only (WC-03); and
4. a control site with no proposed restoration activities (WC-04).

Cross-sectional and longitudinal profile surveys were conducted to establish baseline conditions of channel geometry and slope, to which subsequent data can be compared in determining whether lateral or vertical migration of the channel is occurring. Bank and bed pins were monitored to determine rates of potential bank and channel bed erosion or aggradations, while scour chains were used to quantify the extent of bed material scouring. Pebble counts were conducted to assess substrate particle size distribution and track changes in channel roughness. Facies mapping was conducted to track changes in sediment/substrate transport throughout each reach. Detailed methodologies and results of the physical assessment are presented in the enclosed CD as Appendix OO.

- ii. A stream habitat assessment shall be conducted using techniques defined by the EPA's RBP, MBSS, or other similar method approved by MDE; and*

Brentwood Park / Woodland Hills 2009

The physical habitat assessment was conducted by Water Resources staff on June 22, 2009 utilizing MBSS protocols and data were recorded on the MBSS Stream Habitat Assessment Data Sheets. The County contracted with EA to complete an analysis of the physical habitat data.

Metric selection and data analysis followed the guidance document A Physical Habitat Index for Freshwater Wadeable Streams in Maryland, Final Report, (Paul, et al. 2002). Eight metrics were used to calculate the Physical Habitat Index (PHI) for the Piedmont or Non-Coastal Plain ecoregion. These metrics include percent embeddedness, remoteness, percent shading, epifaunal substrate, instream habitat, instream woody debris and rootwads, bank stability and riffle run quality.

An interpretive report of the Benthic Community Assessment and the Physical Habitat Assessment is included in the enclosed CD as Appendix LL.

Wheel Creek Watershed 2009 – 2011

The physical habitat assessment was conducted by the MBSS utilizing MBSS protocols and Stream Habitat Assessment Data Sheets. Metric selection and data analysis followed the guidance document A Physical Habitat Index for Freshwater Wadeable Streams in Maryland, Final Report, (Paul, et al. 2002). Eight metrics were used to calculate the Physical Habitat Index (PHI) for the Piedmont or Non-Coastal Plain ecoregion. These metrics include percent embeddedness, remoteness, percent shading, epifaunal substrate, instream habitat, instream woody debris and rootwads, bank stability and riffle run quality. A Technical Memorandum summarizing MBSS's baseline biological data is included in the enclosed CD as Appendix MM.

- 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.*

Brentwood Park / Woodland Hills 2009

A hydrologic and hydraulic model was developed for the stream section between the in-stream and outfall stations during 2007. Results of analysis were submitted in the 2007 annual report.

Wheel Creek Watershed 2009 – 2011

A preliminary hydrologic analysis of the existing conditions was performed for portions of the Wheel Creek watershed in order to develop estimates of the 1,2,10 and 100 year rainfall events. The peak discharge rates were estimated using HydroCad 7.00, which is based on TR-55 and TR-20 developed by the Soil Conservation Service (SCS/NRCS). A more refined analysis will be conducted in subsequent permit years. A summary of the preliminary analysis was included in the Wheel Creek Watershed Assessment Report.

- d. **Annual Data Submittal:** *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 the Winters Run or other approved monitoring locations; and*
 - iii. *Any requests and accompanying justifications for proposed modifications to the monitoring program.*

2. **Stormwater Management Assessment**

The County shall continue monitoring the Church Creek Watershed for determining 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 at an unnamed tributary to Church Creek to evaluate channel stability in conjunction with the residential development of Wexford;*
- 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.*

Harford County continued to monitor the Wexford development to assess the best management practice criteria found in the Maryland Stormwater Design Manual. The 181-acre drainage area

includes commercial redevelopment and new a residential development. Approximately twenty percent (20%) of the watershed was developed under the new design criteria while forty percent (40%) has existing development. Wexford is a single-family detached residential subdivision located along the south side of Route 7. The project is adjacent to the Riverside Commercial Park on its southern and eastern boundaries and borders the Bristol Forest Townhome Community to the west. The project is located on tax map 57, parcel 97. Construction of the Wexford Development was substantially completed in 2004.

The project site is served by two stormwater management facilities. Each pond is a micropool-type design with extended detention. In addition, one rain garden and two swales were constructed to provide water quality treatment. The combined facilities meet the 2000 Design Manual guidelines.

Beginning in 2003, the receiving channel has been surveyed annually for longitudinal profile and four permanently-monumented channel cross sections. Note that previous annual reports incorrectly stated that five cross-sections were surveyed instead of four. The profiles and cross-sections for Calendar Years 2009 through 2011 are provided in the enclosed CD as Appendix PP. The channel is surveyed annually to assess any changes in the channel profile and width.

No substantive changes in planform or cross-section were noted between 2005 and 2006. In 2006, it appeared that cross-section 3 was experiencing a shift in the thalweg . The 2007, 2008 and 2009 data indicate that this is, in fact, occurring and is not simply a function of normal variability in the survey. The 2008 data appear to confirm a permanent shift in the location of the thalweg and this shift continues in 2009 and 2010. It is probable that the debris jam first noted in 2007 has caused the shift in the thalweg. No new substantive changes in planform were noted in 2009 or 2010. In 2010, it was noted that there appears to be some change in the bed elevation at the cross sections, indicating a shift in sediment as it is transported downstream.

I. Program Funding

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.

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

Harford County has continued to maintain program funding sufficient to fulfill the permit requirements, despite significant fiscal challenges. The approved operation budget (FY11) of \$701,798 includes personnel costs, office equipment and supplies, vehicle charges, laboratory services, public outreach, and chemical/physical/ biological analysis. The FY11 operating budget was \$275,911 less than the approved FY10 budget. The reductions were achieved primarily through employee furloughs, reducing public outreach purchases and printing costs. The FY12 approved operating budget was \$1,308,285. The increase in FY12 was primarily a result of the transfer of seven existing employees into the Water Resources budget.

With the completion of the Swan Creek, Bynum Run, Foster Branch, Winters Run and Little Gunpowder Falls and Church Creek Stream Assessments, along with the Bush River Watershed Restoration Action Strategy, and the Deer Creek Watershed Restoration Action Strategy, Harford County has identified numerous potential capital projects. In FY10, Harford County initiated the Wheel Creek Watershed Assessment. That study led to the identification of several new capital projects which will be funded as the budget allows. Because of significant County-wide budget reductions, few new projects were funded in FY11 and FY12. In FY11, Harford County initiated the design of Bynum Run @ St Andrews Way Stream Restoration and in FY12, funds were allocated to the Wheel Creek Small Watershed Restoration.

Activity	FY08	FY09	FY10	FY11	FY12
Stormwater Enhancement Watershed Restoration Improvement Projects	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Bynum Ridge Stabilization	\$391,000.00	\$700,000.00	-\$500,000.00	\$215,911.00	\$0.00
Laurel Valley Stream Restoration	\$100,000.00	\$0.00	\$0.00	\$0.00	\$0.00
Plumtree Run @ Tollgate Rd Stream Restoration	\$0.00	\$0.00	\$0.00	-\$68,639.00	\$0.00
	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Woodbridge SWM Retrofit and Stream Restoration	\$300,000.00	\$0.00	\$0.00	\$0.00	\$0.00
Stream Valley Buffer Enhancement	\$0.00	\$0.00	\$0.00	-\$72,272.00	\$0.00
Watershed/Stream Assessment Studies	\$100,000.00	\$500,000.00	-\$150,000.00	\$0.00	\$0.00
Stream Gage Stations	\$105,000.00	\$135,000.00	-\$75,000.00	\$0.00	\$0.00
Maintenance/Repair of Dams	\$25,000.00	\$35,000.00	\$0.00	\$0.00	\$0.00
Sunnyview Stream Restoration	\$110,000.00	\$100,000.00	\$0.00	\$0.00	\$0.00
Moose Lodge Restoration	\$50,000.00	\$0.00	\$0.00	\$0.00	\$0.00
Bel Air Acres Sam's Branch Assessment	\$250,000.00	\$0.00	-\$250,000.00	\$0.00	\$0.00
Woodland Run		\$50,000.00	\$0.00	\$0.00	\$0.00
Edgewood Plaza			\$250,000.00	\$0.00	\$0.00
Wheel Creek			\$725,000.00	\$0.00	\$142,818.00
Bynum Run @ St Andrews Way				\$260,000.00	\$0.00
Deer Creek Watershed Restoration				\$0.00	\$0.00
Plumtree Run Watershed Restoration					\$0.00
Stormwater Pollution Prevention					\$0.00
Total by Fiscal Year	\$1,431,000.00	\$1,620,000.00	\$0.00	\$335,000.00	\$142,818.00

Grant Requests

In an effort to supplement the capital projects program, Harford County applies for grant funding from various sources. A summary of grant request for Calendar Year 2009 through 2011 is provided in Appendix QQ.

J. Total Maximum Daily Loads

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.

Harford County has been actively cooperating with Maryland Department of the Environment on the development and review of TMDLs. In addition, Harford County is collecting, analyzing and reporting supplemental water quality data for the purpose of TMDL development. Harford County acknowledges that stormwater management is an integral part of the implementation component of a TMDL.

PART IV. PROGRAM REVIEW AND ANNUAL PROGRESS REPORTING

A. Annual Reporting

1. *Annual progress reports, required under 40 CFR 122.42(c), will facilitate the long-term assessment of Harford County's NPDES stormwater program.*

The County shall submit annual reports on or before the anniversary date of this permit that include:

- a. *The status of implementing the components of the stormwater management program that are established as permit conditions;*
 - b. *A narrative summary describing the results and analyses of data, including monitoring data that is accumulated throughout the reporting year;*
 - c. *Expenditures for the reporting period and the proposed budget for the upcoming year;*
 - d. *A summary describing the number and nature of enforcement actions, inspections, and public education programs; and*
 - e. *The identification of water quality improvements or degradation.*
2. *To further judge the effectiveness and progress of implementing this permit, the following information shall be submitted on databases (in a format) consistent with Attachment A. Annually, except where noted, the following shall be*

submitted:

- a. *Storm drain system mapping (PART III. C.1.);*
- b. *Urban BMP locations (PART III. C.2.);*
- c. *Impervious surfaces (PART III. C.3.);*
- d. *Chemical monitoring (PART III. C.4. and PART III. H.1.);*
- e. *Watershed restoration project locations (PART III. C.5.);*
- f. *Responsible personnel certification information (PART III. E.2.);*
- g. *Grading permit information – quarterly (PART III. E.2.);*
- h. *Illicit Discharge Detection and Elimination activities (PART III. E.3.);*
and
- i. *Fiscal analyses - cost for NPDES related implementation (PART III. I.).*

B. Program Review

In order to assess the effectiveness of the County's NPDES program for eliminating non-stormwater discharges and reducing the discharge of pollutants to the maximum extent practicable, MDE will review program implementation, annual reports, and periodic data submittal on an annual basis. Procedures for the review of local erosion and sediment control and stormwater management programs exist in Maryland's Sediment Control and Stormwater Management Laws. Additional periodic evaluations will be conducted to determine compliance with permit conditions.

C. Reapplication for NPDES Stormwater Discharge Permit

Continuation or reissuance of this permit beyond November 1, 2009 will require the County to reapply for NPDES stormwater discharge permit coverage in its fourth year annual report. As part of this application process, Harford County shall submit to MDE an executive summary of its NPDES stormwater management program that specifically describes how water quality goals set by the County are being achieved. This application shall be used to gauge the effectiveness of the County's NPDES stormwater program and will provide guidance for developing future permit conditions. At a minimum, the application summary shall include:

1. *Harford County's NPDES stormwater program goals;*
2. *Program summaries for the permit term regarding:*

- a. Illicit connection detection and elimination results;*
 - b. Watershed restoration status including County totals for impervious acres, impervious acres controlled by stormwater management, and the current status of watershed restoration projects and acres managed;*
 - c. Pollutant load reductions as a result of this permit; and*
 - d. Other relevant data and information for describing County programs;*
- 3. Program operation and capital improvement costs for the permit term; and*
- 4. Descriptions of any proposed permit condition changes based on analyses of the successes and failures of the County's efforts to comply with the conditions of this permit.*