



MARYLAND DEPARTMENT OF THE ENVIRONMENT

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October 22, 2015

Mr. Dan Kane, Director
Department of Inspections and Permits
Anne Arundel County
Heritage Office Complex
2664 Riva Road, MS6201
Annapolis MD 21401

Mr. Larry R. Tom, Planning and Zoning Officer
Office of Planning and Zoning
Anne Arundel County
Heritage Office Complex
2664 Riva Road
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Dear Mssrs. Kane and Tom:

Thank you for the support and cooperation offered by your staff throughout the recent evaluation of Anne Arundel County's stormwater management program. Enclosed is the final version of the Maryland Department of the Environment (MDE) 2015 triennial review. As part of this review, MDE evaluated the County's plan approval process in order to assess implementation of environmental site design (ESD) to the maximum extent practicable (MEP). Also reviewed were the County's inspection and enforcement procedures that ensure proper construction and maintenance of approved stormwater management measures.

The results of this review find the County's stormwater management program to be acceptable. However, the following are some problems that need to be addressed:

- The County needs to be more consistent in the application of requirements and design standards in plan review;
- The communication between plan review and field inspection staff should be improved; and
- As noted in the review, and in MDE's review of the County's 2014 National Pollutant Discharge Elimination System (NPDES) Annual Report, the County is behind schedule on meeting inspection and maintenance responsibilities for stormwater management facilities.



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MDE commends the County for initiating the necessary measures to address these last two concerns. However, MDE will revisit these issues in September 2016 to ensure that Anne Arundel County follows through on its commitment to administer an acceptable stormwater program.

MDE recognizes and appreciates the extensive efforts undertaken by Anne Arundel County to implement and enforce ESD to the MEP. Thank you again for your commitment to the stormwater program and efforts to improve water quality in Maryland. If you have any questions, comments or concerns regarding this review, feel free to contact me at 410-537-3545 or Mr. Stewart Comstock of my staff at 410-537-3550 or by email at Stewart.Comstock@maryland.gov.

Sincerely,



Raymond P. Bahr
Program Review Division Chief
Sediment, Stormwater, and Dam Safety Program

Enclosure



**Maryland Department of the Environment
Water Management Administration
Stormwater Management Program Evaluation**

**Anne Arundel County
June 2015**

Introduction

In 1983, Maryland adopted statewide regulations¹ requiring local jurisdictions to implement effective stormwater management programs. The primary goal of these programs is to “maintain after development, as nearly as possible, the predevelopment runoff characteristics, and to reduce stream channel erosion, pollution, siltation and sedimentation, and local flooding by implementing environmental site design to the maximum extent practicable...” (Code of Maryland Regulations or “COMAR” 26.17.02.01A). By improving the quality and reducing the quantity of runoff from development, the counties and municipalities are the primary players in Maryland’s efforts to prevent stormwater pollution and clean up Chesapeake Bay.

The State’s stormwater regulations require counties to adopt stormwater management ordinances and administer programs that are acceptable to Maryland Department of the Environment (MDE). In accordance with the Environment Article §4-206, Annotated Code of Maryland and COMAR 26.17.02.03C, MDE periodically must review each local program to determine whether an acceptable program is in operation. To be acceptable, a local program must possess:

- An MDE-approved stormwater management ordinance;
- Planning and approval processes that provide:
 - Stormwater management for every land development subject to the approved ordinance;
 - The implementation of environmental site design (ESD) to the maximum extent practicable (MEP); and
 - The ability and information necessary to review adequately proposed stormwater management designs and maintenance measures;
- Inspection and enforcement procedures that ensure proper construction and maintenance of approved stormwater management measures.

As part of its mandate, MDE conducted plan review and field inspections of the Anne Arundel County stormwater management program in October 2014 and June 2015. The following are the results of this evaluation and a determination of the acceptability of the County’s program.

Background

Maryland’s Stormwater Management Law, which was passed in 1982, required appropriate best management practices (BMPs) in order to maintain after development, as nearly as possible, the pre-development runoff conditions. Over the years, the stormwater management program has

¹ Code of Maryland Regulations (COMAR) 26.17.02

undergone significant revisions and enhancements, including the 2000 revisions to the regulations and the publication of the *2000 Maryland Stormwater Design Manual*² (Design Manual). The State's stormwater management program was revised again in May 2009 and April 2010 to implement the changes (e.g., ESD to the MEP) mandated by the Stormwater Management Act of 2007.

Each county or municipality was required to submit a revised ordinance that reflected the changes mandated by the Act by November 11, 2009. Additionally, each county was required to implement these changes by May 4, 2010. MDE approved Anne Arundel County's ordinance, including provisions for administrative waivers, on September 6, 2011. This current review focuses on the overall acceptability of Anne Arundel County's stormwater management program in relation to the Act and current requirements of the State's stormwater program. A summary of the review is provided below.

Administration

The administration of Anne Arundel County's stormwater management program is divided among three County Agencies; the Office of Planning and Zoning (OPZ), the Department of Inspections and Permits (DIP), and the Department of Public Works (DPW). The Development Division within the OPZ is responsible for plan review and approval. The Division is divided into four teams that have specific review responsibilities; North, South, Regional, and Critical Area. The North and South teams review residential and commercial subdivisions, commercial site plans, and grading and building permits within the respective regions of the County. The Regional team reviews larger projects (e.g., economic development projects, large residential subdivisions, and planned unit developments) and the Critical Area team reviews all subdivisions located within 1,000 feet of tidal waters (i.e., the Critical Area).

DIP operates the Permit Application Center (PAC). All applications are submitted to the PAC, which then distributes them to other agencies as needed. For example, the stormwater management plans are sent to OPZ Development Division for review. DIP is also responsible for conducting construction and maintenance inspections for stormwater management measures located on private projects. All publicly owned stormwater management practices are inspected and maintained by the County's DPW.

Plan Review

The OPZ Development Division is responsible for approving stormwater management plans in Anne Arundel County. The County has integrated the three-step approval process described in COMAR into their development processes. The initial "concept" phase is known as the Sketch Plan for residential projects or the Preliminary Plan for commercial projects. The second and third steps (i.e., Site Development and Final Plans) are the same for both residential and commercial development. If it is requested by an applicant, OPZ staff will meet to discuss stormwater management options and concerns prior to the Preliminary or Sketch Plan phase.

² *2000 Maryland Stormwater Design Manual, Volumes I & II* (MDE, 2000 & 2009)

The County allows applicants to combine phases of plan review for a shortened or “fast-tracked” review process. For residential projects, the Sketch Plan and Site Development Plan review phases can be combined into a single submission. For commercial projects, a Preliminary Plan is mandatory. However, the Site Development and Final Plan review phases may be combined. In both residential and commercial applications, all of the information required for each phase must be included with the combined submittal. While one had been implemented previously, Anne Arundel County no longer allows the use of a standard plan for single-family residential development.

The County has checklists for conducting Preliminary or Sketch, Site Development, and Final Plan reviews. These checklists and other information concerning the design of stormwater practices are found in the County’s *Stormwater Management Practices and Procedures Manual*³. The “Procedures Manual” is updated periodically to reflect newer design standards or changes in local administrative procedures.

As part of the review process, MDE evaluated several projects to determine the adequacy of the County’s plan review procedures to enforce the ESD to the MEP mandate. The evaluation included a determination of the completeness of the information submitted, and the accuracy and sufficiency of the stormwater management calculations. MDE also reviewed the quality of information shown on approved plans (e.g., details, construction specifications) for accuracy and conformance with the approved calculations.

MDE also evaluated how Anne Arundel County has applied the Administrative Waiver provisions established in COMAR 26.17.02.01-2. These provisions allow projects that had received formal local approval prior to May 4, 2010 to be governed by the regulations in effect prior to that date. MDE’s review of these waivers included documentation of plan approvals and the completeness of the information submitted for approvals associated with issuance of waivers, variances, or modifications. MDE reviewed information found in the County’s files that supported decisions concerning Administrative Waivers. MDE evaluated Anne Arundel County’s program and found that the OPZ issued 114 Administrative Waivers. Of those, 87 were granted final approval prior to May 4, 2013. Administrative waivers for any project that did not receive final approval by that date have expired.

To evaluate the quality of plans approved by OPZ, the following projects were reviewed:

1. **Navy Federal Credit Union:** The project is the construction of a 10,500 square-foot commercial building and associated parking on a 3.77-acre parcel in the Annapolis area. The submittal included preliminary, site development, and final plans of the proposed development, and computations. Stormwater computations included hydrologic modeling (e.g., TR-55⁴, TR-20⁵), and calculations for the various ESD practices. The design included

³ *Anne Arundel County Stormwater Practices and Procedures Manual* (Anne Arundel County Office of Planning and Zoning, 2010 & 2012)

⁴ *Technical Release (TR) 55- Urban Hydrology for Small Watersheds*, United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) 1986

⁵ *Technical Release (TR) 20 – Computer Program for Project Formulation Hydrology*, USDA, NRCS 1982

bioswales, micro-bioretenion areas, and permeable pavement for meeting ESD requirements, and a step pool conveyance system (SPSC) provided stable conveyance of runoff to the receiving stream, Cowhide Branch. The plans included specific information, cross sections, and details for each practice. Accordingly, the information in the file was substantially complete and the quality of the review adequate. However, there were some irregularities in the calculations. For example, the ESD calculations for two of the bioswales included rainfall targets (P_E 's) that were greater than the maximum of 2.7 inches.

2. **Stonehouse Run:** The project is a 15-acre residential development with 65 proposed lots. The submittal included stormwater management plans and computations for the project consisting of two grass swales, four submerged gravel wetlands, four micro-bioretenion areas, and permeable pavement. In addition, the project has two SPSCs for conveying stormwater to the outfalls. The plans and computations contained specific information for each stormwater measure. While the file was complete and the quality of review adequate, there were some minor issues. Most notably, a P_E of 3.0 inches, which exceeds the 2.7-inch maximum, was used to design multiple ESD measures.
3. **Pleasant Place, Lot 3:** This residential project consists of the construction of a house and driveway on an existing 88,065 square-foot lot. The project's proposed limit of disturbance (LOD) was 36,851 ft² and proposed imperviousness was 8,282 ft² for the building and 7,524 ft² for the driveway. The design used rooftop disconnection and permeable pavement to address ESD requirements. The stormwater management computations were consistently based on the LOD. The plans, which included arrows showing disconnect flow paths, were satisfactory.
4. **Reed Property:** This is a residential project with three one-acre lots and 0.83 acres of imperviousness. The design ESD_v for the project was calculated as 2,248 ft³. To meet this target, ESD practices including seven dry wells (180 ft³), three rain gardens (472 ft³), and two bio-swales (2,222 ft³) were used to capture 2,874 ft³ of runoff. Additionally, a natural resource conservation area credit was claimed to provide a further 220 ft³ of managed runoff toward the treatment goals. In addition to the designs for the individual practices used, the stormwater management report included a suitable outfall study, storm drain computations, and a quantity management analysis.

Although the computations were complete, areas were used inconsistently when calculating percent impervious cover and ESD_v . The total drainage area (19.74 acres) was used when determining the percent impervious cover (4.2%) and the volumetric runoff coefficient (R_v). However, only the buildable area (7.0 acres) was used to determine the ESD_v . When calculating stormwater management requirements, the areas used to calculate site conditions (e.g., percent impervious cover) and stormwater management requirements should be consistent. If the buildable area had been used for the calculations, ESD_v for the site would be 3,810 ft³, or almost 1,500 ft³ more than what was used for the design.

Another issue with this project's submittal was the use of the natural area conservation Credit to reduce stormwater management requirements. The system of credits was removed from the Design Manual and replaced with three nonstructural practices when Chapter 5 was

updated (see Supplement 1 to the Design Manual) in May 2009. The current practice, sheetflow to conservation areas, has more specific sizing criteria that must be met to be considered as stormwater treatment.

5. **Express Care:** This project consists of the redevelopment of a one-acre commercial property. The reviewed plans and information were for the preliminary plan submission, which the County had rejected because the applicant had not addressed storm drain adequacy. The existing and proposed impervious areas are 23,810 ft² and 26,360 ft², respectively. This is an increase of 2,550 ft². Stormwater management requirements for the proposed project are based on providing the WQ_v (i.e., runoff from one inch of rainfall) for 50% of the existing imperviousness and the ESD_v for 100% of the new imperviousness for a combined treatment volume of 1,450 ft³. The design includes a micro-bioretenion practice and a bio-swale to provide treatment. The stormwater management report contained a suitable outfall study, storm drain mapping, and hydrologic computations (TR-20, TR-55) for the site as well as design computations for each of the proposed practices. Because the design was still preliminary, many of the final details were not provided.
6. **2510 Riva Road:** This commercial redevelopment project is located on a 3.7 acre site in the Parole Town Center area. The project consists of an addition to the existing building and a reduction in parking area. The existing impervious area is 2.73 acres (73%) and the proposed imperviousness is 2.47 acres (66%). In addition to the 0.26-acre reduction in impervious area, the proposed stormwater management includes five micro-bioretenion practices.

The plans showed a typical section that could be used for all of the micro-bioretenion practices and a separate table listing specific variations for each (e.g., filter media thickness, ponding depth). However, the shapes and sizes of the different practices were significantly different so that a single section or detail may cause confusion during construction. Where the shape and size of multiple practices vary, there should be separate details to reduce problems during construction.

7. **1825 Poplar Ridge Road/Keshishian Property (Bortle Homes):** This residential project includes the removal of an existing, fire damaged house, and division of the existing lot into two separate lots with houses, driveways, wells and septic systems. The existing lot is 1.58 acres, and the two new lots, which are 0.91 acres and 0.61 acres in size, are both located in the Limited Development Area of the County's Critical Area. The proposed impervious area for both lots is 0.23 acres, or 14.6%. The original stormwater management plan consisted entirely of rooftop and non-rooftop disconnections. Although there were no computations, flow paths for each disconnection, which were shown on the plans, seemed reasonable.

The project was originally submitted in February 2008 and the concept plan was initially approved in June 2010. However, this approval was contingent upon the developer addressing specific County comments and submitting required documentation. These conditions were not met, and the County followed up with an enforcement letter in October 2011 terminating the permits and project approval. The applicant resubmitted plans in June 2012. While the stormwater management design was unchanged from the original, ESD computations were shown on the new plans. The County approved this concept with the

provision that certain comments be addressed within one year. The applicant addressed those comments and the County granted final approval in May 2013.

8. **McDonald's – 897 Bay Ridge Road:** The project involves modifications to an existing, 5,166 ft² building located on a 99,490 ft² commercial site. The applicant proposed several modifications to the existing structure and adjacent parking lot including a new drive-through configuration, re-striping of handicap parking spaces, and the removal of six parking spaces for the addition of a new cash booth. Because the total project disturbed less than 5,000 ft², the applicant requested and was granted modifications (i.e., waivers) to stormwater management, development process (e.g., preliminary plan, site development plan), and community meeting requirements. The County determined that the project was limited in scope and did not intensify use or impact public facilities, and accordingly granted the requested modifications in December 2013.
9. **Stromberg Property:** This small residential project involves the subdivision of a 1.77-acre parcel into five single-family homes. The Sketch Plan (concept plan) was approved in September 2014. The stormwater management plan included dry wells, rain gardens, an infiltration trench, rooftop disconnections and permeable pavement. The Sketch Plan contained adequate information for the review and subsequent approval including stormwater management structure and ESD summary tables.

Construction Inspection and Enforcement

Anne Arundel County's stormwater management ordinance contains the legal authority for inspection and enforcement of facility construction and maintenance. The County's DIP has specific procedures that ensure adequate administration of these aspects of the County's program. To ensure consistency, the County performs maintenance inspections using checklists that are based on MDE's draft *Stormwater Management Construction and Maintenance Inspection Manual*⁶.

In Anne Arundel County, onsite inspections by County staff, engineering certification, and a rigorous as-built plan requirement are used to ensure adequate construction. DIP's erosion and sediment control inspectors also inspect stormwater management facility construction to verify that practices are being installed correctly. Additionally, applicants are required to submit as-built plans along with any pertinent documentation (e.g., certifications, photographs) to demonstrate that stormwater management facilities are constructed in conformance with the approved plans. Construction of stormwater management practices is not considered complete until after a first year maintenance inspection is completed. Minor revisions that are made during the construction process are reviewed by DIP staff or referred to OPZ for a more technical review. In its 2014 National Pollutant Discharge Elimination System (NPDES) Permit Annual Report, the County reported that 860 construction inspections were performed and 71 construction correction notices were issued.

⁶ *Stormwater Management Construction and Maintenance Inspection Manual* (MDE DRAFT 2005)

The following construction sites were observed in the field by MDE:

1. **Tanyard Springs:** This project is a large planned unit development (PUD) located in northern Anne Arundel County. Multiple sections of the site were under construction and, as a result, MDE staff were able to observe several stormwater management structures under construction including:

a. **Bioswale/Infiltration:** MDE staff observed the construction of an infiltration swale located adjacent to a parking area of a section of townhomes. The practice was constructed using $\frac{3}{8}$ " to $\frac{5}{8}$ " diameter stone (i.e., No. 8), stabilization matting, and a surface layer of planting soil. There were heavy rains on the day prior to the site visit, and the site was not completely stabilized. As a result, there was a considerable amount of sediment in the recently constructed portions of the swale. Based on the County inspector's recommendations, the builder was removing sediment-laden stone and reconstructing damaged areas of the bio-swale.

b. **Micro-Bioretenion Areas:** There were several micro-bioretenion areas located adjacent to the road and between sections of townhomes. Each was constructed with a pretreatment forebay at the primary inflow. In several cases, these forebays were poorly located, ineffective and/or heavily eroded. Also, there were significant drops (e.g., two feet or more) into these forebays when located adjacent to the edge of the sidewalk. The use of forebays in each practice also resulted in precast outlet structures being located in the middle of the practice and away from the right-of-way. This placement significantly increases the amount of material (e.g., pipe) needed to safely convey overflow to a stable outfall, reduces the area available for landscaping, and negatively impacts the visual appeal of each structure.

Recognizing that the micro-bioretenion design does not require pretreatment, the County's inspectors had advised that the forebays be removed and outlet structures be relocated adjacent to the sidewalks where possible. However, the builder's representative noted that the forebays were required by the OPZ during the final plan approval. The builder further explained that before they could be removed, OPZ would first need to review and approve revised plans, which is a time-consuming and expensive process.

c. **Bio-swale:** Another practice used in this section of the development was a bio-swale. This swale was constructed on a moderate slope (3% to 5%) and captured and treated runoff from the rooftops of the townhomes. The level spreader located at the downstream/outflow end of the swale needed repairs and there were signs of erosion throughout its length. Additionally, much of the mulch that was placed on the swale's surface had washed away.

d. **Wet Pond:** A centrally located wet basin provided water quality treatment and peak management for a residential section of the development. This basin was recently converted from a sediment basin to a permanent practice. The County routinely inspects these facilities before releasing any bonds held for construction. As a result of the

inspection of this facility, the County noted several deficiencies, including:

- i. A poorly constructed riser and trash rack. The emergency release control valve within the riser was placed in the wrong location and, as a result, was inaccessible. The trash rack was welded together poorly, was not galvanized properly, and did not allow safe access into the riser.
- ii. The emergency spillway was graded incorrectly.
- iii. The two forebays were not stabilized properly and, as a result, there was significant erosion along the spillway from the forebays into the main pool.

2. **Fort Smallwood Park:** This project is the reconstruction and modernization of the infrastructure at the County-owned Fort Smallwood Park. The County is installing several small-scale stormwater management measures (e.g., micro-bioretenion areas, submerged gravel wetlands) in conjunction with the reconstruction of the access roads and parking. MDE and County staff observed the placement of planting soil/filtering media in a micro-bioretenion area. MDE and County staff noted that there were large roots and other woody debris in the compost used as organic material for the filtering media. This is contrary to State specifications for this media, which states that the media "...shall be a uniform mix, free of stones, stumps, roots or other similar objects larger than two inches." (see p. B.4.4 of the Design Manual). Upon further inspection, it was noted that the construction plans did not include these specifications.

At a second micro-bioretenion practice, MDE staff was shown an alternative method for protecting these practices during construction. The Design Manual recommends that micro-bioretenion practices not be constructed until the contributing drainage area is stabilized. Where that is not possible, runoff from disturbed areas must be diverted away from installed practices. Because the practice was located within a major drainage swale, it was necessary to construct it first. This location also made it impractical to divert runoff from disturbed areas around the practice. Therefore, the County directed the builder to place an impermeable liner across the surface of the facility. This liner was anchored in place with a layer of pea gravel. MDE staff observed a layer of fine sediment from upstream construction on the surface of the liner. However, upon closer inspection, the filtering media was found to be intact.

3. **WalMart (Pasadena):** The project is the redevelopment of an older shopping center and reconfiguration of the parking lot. As part of the redevelopment, several micro-bioretenion practices were installed throughout the new parking lot. Construction of the building and stormwater management practices was nearly complete, and the stormwater practices were in good condition. During the site visit, the County inspector instructed the builder to remove inlet protection from several of the micro-bioretenion areas and re-stabilize one or two areas where erosion was noted.
4. **Steak 'n Shake:** The project is the construction of a fast food restaurant and parking area. Stormwater management for the project is provided by a micro-bioretenion practice located at the back of the site. There have been several ongoing issues with the construction of this practice. According to the plans, a precast inlet structure would serve as the outlet control

structure. However, the contractor was unable to secure a precast inlet in time for the restaurant's proposed opening. Therefore, the contractor constructed a poured-in-place riser structure. However, the dimensions and thickness of concrete are inconsistent, and the weir openings are too small and incorrectly cut. As a result, the structure is unacceptable. The County is working with the contractor to ensure that the riser is either repaired or replaced and that the facility is constructed according to the plans.

Maintenance Inspection and Enforcement

As described above, Anne Arundel County has two agencies that are responsible for inspecting and maintaining stormwater management facilities. DIP is responsible for conducting maintenance inspections on all private facilities within the County. DIP is also responsible for inspecting approximately 300 publicly owned stormwater management facilities that are maintained by the County's Departments of Central Services and Recreation and Parks, and the Board of Education. DPW's Infrastructure Management Division is responsible for the maintenance of the more than 800 remaining public stormwater management practices.

In its 2014 NPDES Annual Report, DIP reported that there were 902 first year of operation inspections and 1,252 triennial maintenance inspections. As a result of these inspections, 606 three-year maintenance correction notices were issued. However, the County's Urban BMP Database reported that there were 584 maintenance inspections within the same period. The total inspections reported in the database and as part of the stormwater management program activities should match.

In 2013, DIP had one inspector who was responsible for conducting both the triennial maintenance inspections and illicit discharge detection and elimination inspections. With this level of staffing, DIP was unable to maintain a sufficient schedule to ensure that BMPs were inspected triennially. At the beginning of 2014, DIP hired an Inspections Supervisor and five additional inspectors to implement this critical program. With these additional inspectors, the County has initiated a more aggressive schedule in order to meet triennial inspection requirements.

If any deficiencies are found when conducting an inspection of a privately owned facility, DIP issues a Maintenance Correction Notice detailing the issues that must be addressed. If the Correction Notice is ignored, a formal Violation Notice Letter is issued to the owner. If that notice fails to result in compliance, then the County's Office of Law initiates the appropriate legal actions to enforce violations and obtain compliance.

The review of Anne Arundel County's stormwater management program included an evaluation of the County's inspection and maintenance procedures to ensure that stormwater BMPs are functioning as designed. The following projects and conditions were observed in the field by MDE:

1. **Annapolis Plaza (150 Jennifer Road):** An older (circa 1992) wet pond provides both quality and quantity management for this commercial retail plaza. DIP issued a Correction Notice citing the need for repairs to the riser and spillway, and the removal of trees from the

embankment and within 25 feet of the riser structure. When MDE visited the site, most of the work had been completed. However, there were still some animal burrows that needed to be filled. Also, there was a small sinkhole forming between two manholes on the outfall. DIP staff will continue to monitor this problem and the ongoing repairs to ensure that they are addressed.

2. **Navy Federal Credit Union:** The Naval Federal Credit Union is a recently constructed project. There are five micro-bioretenion practices, a bioswale, permeable pavement, and a SPSC system on the site. Of these, two of the micro-bioretenion practices were not draining properly. Also, much of the landscaping was planted in mid-summer and, as a result, several trees needed replacement. The remaining facilities were functioning properly and the site was in good repair.
3. **St. John Neumann Church:** There were two stormwater management ponds, which were approved in 1998, located on this institutional site. The larger of the two facilities was a combination of an infiltration and wet pond for addressing both water quality and peak management requirements. This is an unusual combination of practices because the presence of a permanent pool indicates that the infiltration practice is not functioning properly. The second facility, originally a dry detention basin, also had a permanent pool.

When last inspected in April 2013, DIP staff noted that both facilities were holding water and were in need of repair. Some issues noted were erosion problems adjacent to the gabion-lined inflow, trees and woody vegetation along the embankments, and outlet controls that were not functioning properly which resulted in ponded, stagnant water. Since that inspection, the owner had performed the necessary repairs to bring the facilities into compliance.

4. **Church of Latter Day Saints (MD Rte 450):** The stormwater management for this institutional project was designed to meet the 2000 State regulatory requirements (e.g., WQ_v, Cp_v) and was built in 2009. There are two facilities on the site. The first is a wet pond that captures runoff from the building and parking lot. This pond was in good repair. However, there was some erosion at the outfall. These conditions were noted by the County's inspectors and were passed on to the facility's owners.

The second, smaller practice is a sand filter that captures runoff from an access road. Inflow to the practice is through a small curb cut and grass swale. From the field observations, it appeared that a section of the grass swale was higher than the curb cut. As a result, it was possible that runoff was bypassing the filter and flowing onto the public road. This issue was noted and should be revisited during a rain event when runoff patterns are more visible.

5. **Deep Creek Village:** This larger, residential development consists of several sections of townhomes. Stormwater management throughout the development is provided by many different practices. While in the field, MDE staff visited a micro-bioretenion practice located in community open space and adjacent to a row of townhomes. This practice included the use of pea gravel along the side slopes of the practice as shown in Figures 5.14, 5.15, and 5.16 of the Design Manual. DIP had received many complaints from the adjacent

homeowners about this specific design feature. In this instance, landscape crews were having difficulty mowing the areas adjacent to the practice and maintaining the gravel slopes.

The pea gravel slopes are an optional design feature that the OPZ has been requiring on practices within the County. MDE confirmed that the side slopes could be stabilized with grass or additional landscaping. However, any modifications to the existing practice will need to be locally approved. DIP will continue to work with the local homeowner's association and OPZ to resolve this situation.

6. **Broadneck Evangelical Presbyterian Church:** Stormwater management for this institutional project is provided by a bioretention filter and infiltration trenches. Runoff from the parking lot and the front of the building is captured and treated in a bioretention filter, an underground infiltration trench, and an infiltration basin. Runoff from the back of the building roof flows into a smaller infiltration basin located behind the building. A number of minor maintenance items were noted during the County's last inspection. These items included clearing and stabilizing the grass swale, and replacing loose bricks and repairing the trash rack on the larger infiltration basin. During the site visit, MDE and DIP staff noted that these items had been addressed.
7. **84 Lumber:** The commercial lumberyard has two stormwater management ponds; the smaller of the two is a sand filter that discharged directly into the larger, wet detention basin. Both of the facilities were in reasonably good repair. There were some areas of exposed earth or patchy vegetation where additional stabilization was needed.

The major concern with this site was that the outfall for the system discharges directly onto a two-lane State highway (MD Rte. 648). Managed runoff from the site flows from the riser outlet and across MD Rte. 648. Water then flows across the entrance to a residential community, through a curb cut and into a wooded area that drains into Mill Creek. Residents of the community have filed several complaints concerning flooding and unsafe conditions as a result of this discharge. However, the situation remains unresolved. DIP should continue to monitor the outfall to determine if discharges from the facility are a safety issue.

Prior to 2014, DIP had one full time inspector, and the County's maintenance program was unable to conduct enough inspections to meet triennial inspection requirements. As a result, inspections were conducted on a priority basis with the larger practices (e.g., wet ponds, wetlands) serving commercial or industrial areas and large residential subdivisions receiving top priority. However, the County has hired several inspectors. With the additional staff, the County is redoubling its efforts to meet maintenance inspection requirements.

Conclusion

Anne Arundel County's stormwater management program is acceptable. Currently, plans are being submitted to the County for review and approval that reflect ESD and the new standards found in the Design Manual. During this evaluation, MDE found that Anne Arundel County is enforcing the ESD to the MEP mandate in its plan approval process. MDE found that in some cases (e.g., 1825 Poplar Ridge), the County had required stormwater management designs be

revised to reflect ESD to the MEP. While it is not required, Anne Arundel County meets with applicants to discuss how ESD may be integrated into a project's design. These meetings have helped expedite plan approval as applicants better understand how ESD may be used.

While Anne Arundel County is doing good work, there is room for improvement. Problems that need to be addressed stem from the inconsistent application of requirements and design standards. In several of the projects reviewed (e.g., Pleasant Place, Reed Property), MDE found that areas were used inconsistently when calculating impervious cover and ESD requirements. This issue was also noted in MDE's review of the Turtle Run at Deep Cove Sketch Plan for the State of Maryland, Critical Area Commission, Chesapeake and Atlantic Coastal Bays. The calculations for impervious cover and stormwater management requirements must be consistent; if site area is used to determine impervious cover, then it must also be used to determine ESD targets. MDE also found instances (e.g., Navy Federal Credit Union, Stonehouse Run), where the rainfall targets (i.e., P_E 's) used for design exceeded the 2.7-inch maximum recommended in the Design Manual.

Another problem that needs the County's attention is the use of discontinued practices or techniques for stormwater management. For example, the County allowed the use of the natural area conservation credit in the design of the Reed Property project. As discussed above, because ESD is now required, the system of credits found in the original Design Manual have been replaced with a series of nonstructural techniques. The County must ensure that the nonstructural techniques and the relevant design criteria found in the current Design Manual be used in the development of stormwater management plans.

Other plan review problems like poor construction details and improper BMP selection and location could be easily resolved if DIP and OPZ staff had a good working relationship where these issues could be discussed openly. MDE recommends that the County foster better communication between plan review and field inspection staff. MDE understands that the County is taking steps to improve the lines of communication between plan review and inspection staff. MDE also understands that DIP and DPW are collaborating on a joint database to track maintenance inspection information across the County. MDE is encouraged by both of these efforts and will evaluate their impact in future reviews.

As a result of this review, MDE considers Anne Arundel County's stormwater management program acceptable. However, the County needs to address the program weaknesses relative to plan review consistency and communication between plan review and inspection staff. Solving these problems will improve the County's stormwater management program immeasurably.