

County Council Of Howard County, Maryland

2010 Legislative Session

Legislative Day No. 4

Resolution No. 38 -2010

Introduced by: The Chairperson at the request of the County Executive

A RESOLUTION revising Chapter 5, Stormwater Management, of Volume I (Storm Drainage) of the Design Manual in order to amend the standards and specifications relating to the design and construction of stormwater management facilities in Howard County.

Introduced and read first time _____, 2010.

By order _____
Stephen LeGendre, Administrator

Read for a second time at a public hearing on _____, 2010.

By order _____
Stephen LeGendre, Administrator

This Resolution was read the third time and was Adopted___, Adopted with amendments___, Failed___, Withdrawn___, by the County Council on _____, 2010.

Certified By _____
Stephen LeGendre, Administrator

NOTE: text in strike-out indicates deletions from existing law; TEXT IN SMALL CAPITALS indicates additions to existing law; Double strike-out indicates material deleted by amendment; Underlining indicates material added by amendment.

1 **WHEREAS**, on April 24, 2007 the Governor of Maryland signed the
2 “Stormwater Management Act of 2007” which is codified in Sections 4-201.1 and 4-203
3 of the Environment Article of the Annotated Code of Maryland; and
4

5 **WHEREAS**, the Stormwater Management Act of 2007 provides that each county
6 shall adopt revisions to its stormwater management regulations by May 4, 2010; and
7

8 **WHEREAS**, in accordance with Section 18.903 of the Howard County Code, the
9 Design Manual sets forth Howard County’s minimal control requirements and design
10 criteria for stormwater management, procedures for the approval of plans, and
11 construction inspection requirements for stormwater management in Howard County; and
12

13 **WHEREAS**, the Director of the Department of Planning and Zoning has
14 proposed a revision of Chapter 5, Stormwater Management, of Volume I (Storm
15 Drainage) of the Design Manual to amend the standards for the design and construction
16 of stormwater management facilities in accordance with the State’s Stormwater
17 Management Act of 2007; and
18

19 **WHEREAS**, the proposed revision incorporates environmental site design to
20 minimize the impact of development on water resources and to conserve natural features;
21 and
22

23 **WHEREAS**, the Public Works Board approved the revision at their meeting on
24 March 9, 2010; and
25

26 **WHEREAS**, for purposes of revisions to Chapter 5, as shown in the attached
27 Exhibit A, new language is shown in small caps and deleted text is shown in strike-outs.
28

29 **NOW, THEREFORE, BE IT RESOLVED** by the County Council of Howard
30 County, Maryland this ____ day of _____, 2010 that it amends Chapter 5,

1 Stormwater Management, of Volume I (Storm Drainage) of the Design Manual as shown
2 in the attached Exhibit A.

3

4 **AND BE IT FURTHER RESOLVED**, by the County Council of Howard
5 County, Maryland that the Director of the Department of Planning and Zoning is
6 authorized to publish Chapter 5 and to make any modifications necessary to the Table of
7 Contents.

8

9 **AND BE IT FURTHER RESOLVED**, by the County Council of Howard
10 County Maryland, that the revisions to Chapter 5, Stormwater Management, of Volume I
11 (Storm Drainage) of the Design Manual shall be effective when Council Bill No. 13-2010
12 is effective.

CHAPTER 5

STORMWATER MANAGEMENT

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CHAPTER 5

STORMWATER MANAGEMENT

5.1 INTRODUCTION AND APPLICABILITY

5.1.1 Introduction

Stormwater management may be defined as the control of the volume, rate and quality of stormwater runoff.

The purpose of stormwater management is to protect, maintain and enhance the public health, safety and general welfare by establishing minimum requirements and procedures to control the adverse impacts associated with increased stormwater runoff as a result of development. ~~The goals of the stormwater management program are: (a) to minimize damage to public and private property; (b) to reduce the effects of development on stream channel erosion; (c) to assist in the attainment and maintenance of water quality standards; (d) to reduce local flooding; (e) to maintain after development, as nearly as possible, the pre-development runoff characteristics.~~ THE GOAL IS TO MANAGE STORMWATER BY USING ENVIRONMENTAL SITE DESIGN (ESD) TO THE MAXIMUM EXTENT PRACTICABLE (MEP) 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, AND USE APPROPRIATE STRUCTURAL BEST MANAGEMENT PRACTICES (BMPs) ONLY WHEN NECESSARY. THE INTENT OF THESE PRACTICES IS TO RESTORE, ENHANCE, AND MAINTAIN THE CHEMICAL, PHYSICAL, AND BIOLOGICAL INTEGRITY OF STREAMS, MINIMIZE DAMAGE TO PUBLIC AND PRIVATE PROPERTY, AND REDUCE THE IMPACTS OF LAND DEVELOPMENT.

THE STORMWATER MANAGEMENT ACT OF 2007 (ACT) FURTHER REQUIRES THAT THE CODE OF MARYLAND REGULATIONS (COMAR) BE MODIFIED AND A MODEL ORDINANCE DEVELOPED FOR THE PURPOSE OF IMPLEMENTING ENVIRONMENTAL SITE DESIGN (ESD) TO THE MAXIMUM EXTENT PRACTICABLE (MEP). SIGNIFICANT CHANGES TO COMAR AND THE 2000 MARYLAND STORMWATER DESIGN MANUAL, VOLUMES I & II (MDE DESIGN MANUAL) WERE ADOPTED IN MAY 2009. THESE CHANGES SPECIFY HOW ESD IS TO BE IMPLEMENTED, THE MEP STANDARD IS TO BE MET, AND THE REVIEW OF EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT PLANS IS TO BE INTEGRATED.

THE ACT DEFINES ESD AS "...USING SMALL-SCALE STORMWATER MANAGEMENT PRACTICES, NONSTRUCTURAL TECHNIQUES, AND BETTER SITE PLANNING TO MIMIC NATURAL HYDROLOGIC RUNOFF CHARACTERISTICS AND MINIMIZE THE IMPACT OF LAND DEVELOPMENT ON WATER RESOURCES." ESD ALSO INCLUDES CONSERVING NATURAL FEATURES, DRAINAGE PATTERNS, AND VEGETATION; MINIMIZING IMPERVIOUS SURFACES; SLOWING DOWN RUNOFF; AND INCREASING INFILTRATION. THIS DEFINITION, ALONG WITH COMAR MODIFICATIONS AND THE MINIMUM CONTENT OF COUNTY AND MUNICIPAL ORDINANCES SPECIFIED BELOW, WILL REQUIRE MAJOR CHANGES TO THE WAY RUNOFF IS MANAGED IN THE STATE. ALSO, STORMWATER MANAGEMENT FOR NEW DEVELOPMENT AND REDEVELOPMENT WILL BE CONCEIVED, DESIGNED, REVIEWED, AND BUILT DIFFERENTLY FROM PROCEDURES USED PRIOR TO PASSAGE OF THE ACT.

5.1.1 INCORPORATION BY REFERENCE

FOR THE PURPOSE OF THIS MANUAL, THE FOLLOWING DOCUMENTS ARE INCORPORATED BY REFERENCE:

- A. THE 2000 MARYLAND STORMWATER DESIGN MANUAL, VOLUMES I AND II (MARYLAND DEPARTMENT OF THE ENVIRONMENT, APRIL, 2000) (MDE DESIGN MANUAL) AND ALL SUBSEQUENT REVISIONS, ARE INCORPORATED BY REFERENCE BY (GOVERNING AUTHORITY/AGENCY) AND SHALL SERVE AS THE OFFICIAL GUIDE FOR STORMWATER MANAGEMENT PRINCIPLES, METHODS, AND PRACTICES.
- B. USDA NATURAL RESOURCES CONSERVATION SERVICE MARYLAND CONSERVATION PRACTICE STANDARD POND CODE 378 (JANUARY 2000).
- C. HOWARD COUNTY CODE, TITLE 18, SUBTITLE 9 (CURRENT).

5.1.2 Applicability

- ~~A. No Person shall develop any land for residential, commercial, industrial or institutional uses shall be undertaken without having a stormwater management plan approved by the Department of Public Works and/or the Department of Planning & Zoning/Development Engineering Division to provide for the appropriate stormwater management measures that control or manage runoff from such developments, except as provided within this section. (See Subtitle 9, "Stormwater Management" of Title 18, "Public Works", of the Howard County Code).~~
- ~~B. The following activities are exempt from the provisions and requirements of providing stormwater management provided that the work will not cause an adverse impact of the receiving wetland, watercourse or water body:
 - ~~1. Additions or modifications to existing single family residential structures that do not disturb over 5,000 square feet of land area. Disturbance is defined as any area in which the natural, or existing, vegetative cover has been removed or altered (except grass to grass) and, therefore, is susceptible to erosion.~~
 - ~~2. Developments that do not disturb over 5,000 square feet of land area.~~
 - ~~3. Land development activities, which are regulated under specific State laws regarding management of stormwater.~~
 - ~~4. Agricultural land management activities.~~~~
- ~~C. Redevelopment, defined as any construction, alteration or improvement exceeding 5,000 square feet of land disturbance as a stand alone impact, on previously developed (impervious) areas, on sites where existing land use is commercial, industrial, institutional or multi family residential. The redevelopment area is governed by special stormwater sizing criteria depending on the amount of increase or decrease in impervious area created by the redevelopment. See section 5.2.1.E, this design manual, for specific control requirements.~~

5.2 STORMWATER MANAGEMENT CRITERIA

THE REGULATORY DEFINITION FOR MEP CONSISTS OF TWO PARTS. THE FIRST IS SUBJECTIVE AND REQUIRES THAT ALL REASONABLE OPPORTUNITIES FOR USING ESD PLANNING TECHNIQUES AND PRACTICES ARE EXHAUSTED. LIKE THE DEFINITION, THE THRESHOLD FOR MEETING THE MEP STANDARD CONSISTS OF TWO PARTS. FIRST, MEP IS MET IF CHANNEL STABILITY AND PREDEVELOPMENT GROUNDWATER RECHARGE RATES ARE MAINTAINED AND NONPOINT SOURCE POLLUTION IS MINIMIZED. IN BOTH THE DEFINITION AND PERFORMANCE THRESHOLD, THE SECOND CONDITION IS THE SAME; STRUCTURAL STORMWATER PRACTICES MAY BE USED ONLY IF DETERMINED TO BE ABSOLUTELY NECESSARY. WHILE SOME FLEXIBILITY AND BEST PROFESSIONAL JUDGMENT WILL BE NEEDED TO DETERMINE WHEN THESE FIRST CONDITIONS ARE MET, THE SECOND CONDITION IS STRAIGHTFORWARD. LOCAL PLANS REVIEW AND APPROVAL AGENCIES SHOULD NOT APPROVE STRUCTURAL BMPs IF ESD OPTIONS ARE AVAILABLE.

IN ADDITION TO THE STATE REGULATIONS, SECTION 5.2 OF THE LATEST EDITION OF THE MDE DESIGN MANUAL ALSO INCLUDES STANDARDS FOR MEP COMPLIANCE. THE PRIMARY MEP STANDARD IS TO USE ESD TO REDUCE POST DEVELOPMENT RUNOFF TO LEVELS FOUND IN NATURAL, FORESTED CONDITIONS. THIS REQUIRES CAPTURING AND TREATING FROM 1 TO 2.6 INCHES OF RAINFALL DEPENDING ON SITE AND DESIGN CONDITIONS (E.G., SOILS, PROPOSED IMPERVIOUSNESS). WHEN THIS GOAL IS MET, THE CPV, WQV, AND REV REQUIREMENTS ARE ADDRESSED. DESIGNERS WILL BE RESPONSIBLE FOR DETERMINING SPECIFIC RAINFALL TARGETS FOR THEIR PROJECTS USING THE METHODS OUTLINED IN SECTION 5.2.

THERE IS A SECONDARY STANDARD THAT MUST BE CONSIDERED WHEN ASSESSING MEP COMPLIANCE. ESD MUST BE USED TO TREAT RUNOFF FROM 1 INCH OF RAINFALL TO ADDRESS BOTH WQV AND REV REQUIREMENTS. THIS IS A MINIMUM LEVEL OF COMPLIANCE, NOT A CONTINGENCY STANDARD THAT IS USED WHEN SPECIFIC RAINFALL TARGETS CANNOT BE MET. DESIGNERS MUST CAPTURE AND TREAT AT LEAST 1 INCH OF RAINFALL WHILE USING ESD TO REDUCE RUNOFF AND ACHIEVE SPECIFIED GOALS.

5.2.1 Stormwater Control Requirements

- A. ~~The minimum stormwater control requirements shall require that the recharge volume, water quality volume, and channel protection storage volume criteria be used to design BMP's according to the latest edition of the Maryland Stormwater Design Manual, Volumes I & II for all developments.~~ THAT THE PLANNING TECHNIQUES, NONSTRUCTURAL PRACTICES, AND DESIGN METHODS SPECIFIED IN THE MDE DESIGN MANUAL BE USED TO IMPLEMENT ESD TO THE MEP. THE USE OF ESD PLANNING TECHNIQUES AND TREATMENT PRACTICES MUST BE EXHAUSTED BEFORE ANY STRUCTURAL BMP IS IMPLEMENTED. STORMWATER MANAGEMENT FOR DEVELOPMENT PROJECTS SHALL BE DESIGNED IN ACCORDANCE WITH THE HOWARD COUNTY CODE, TITLE 18, SUBTITLE 9. INFORMATION FOUND IN THIS DESIGN MANUAL IS SUPPLEMENTAL TO THE REQUIREMENTS FOUND IN THE CODE AND MDE DESIGN MANUAL REFERENCED ABOVE.

The county reserves the right, on a case-by-case basis, to require that management measures be provided as necessary to maintain the post-development peak discharges for a 24-hour, 1-year, 10-year, 25-year and/or 100-year frequency storm events at a level that is equal to or less than the respective 24-hour, 1-year, 10-year, 25-year and/or 100-year

predevelopment peak discharge rates, through stormwater management practices that control volume, timing and rate of runoff. Storage volume and RCN reductions by the use of ALTERNATIVE SURFACES AND Nonstructural Practices may be considered for only the 1-year event ~~may be considered when performing a post development peak discharge analysis. RCN reductions may be considered for all disconnected impervious area.~~

~~Additional control requirements may be considered in the form of Overbank Flood Protection (Q_p) and Extreme Flood Protection (Q_f) volumes. The Q_p (10-year design storm event) shall be employed when there is no control over infrastructure and the conveyance system is at design capacity, or it is determined that downstream flooding (based on recorded historical flooding problems) will occur as the result of the proposed development. The Q_f (100-year design storm event) is to be employed to prevent flood damage from large frequency storm events, to maintain the boundaries of the 100-year floodplain and protect the physical integrity of BMP structures. Storage volume and RCN reductions by the use of non-structural credit practices shall not be considered when designing for the Overbank or Extreme Flood Protection.~~

The upstream drainage areas to the Cabin Branch crossing Shaffers Mill Road, a tributary to the Dorsey Branch crossing Dorsey Mill Road and the drainage area associated with Bonnie Branch, which parallels Bonnie Branch Road, shall be required to provide ~~Q_p~~ (10-year) peak management control. Additional stream systems may be included at the sole discretion of Howard County.

The upstream drainage areas to the Tiber Branch above the Patapsco River and the Hudson Branch above the Tiber Branch and tributary drainage areas to the Deep Run above any railroad crossings shall be required to provide ~~Q_p~~ (10-year) and ~~Q_f~~ (100-year) peak management control. Additional stream systems may be included at the sole discretion of Howard County.

- ~~B. Stormwater management and development plans where applicable, shall be consistent with adopted and approved watershed management plans or flood management plans as approved by the Maryland Department of the Environment in accordance with the Flood Hazard Management Act of 1976.~~
- ~~C. Quantity stormwater management by detention shall be provided during construction in accordance with current Howard Soil Conservation District (HSCD) requirements.~~
- ~~D. Stormwater management measures shall be required to satisfy the minimum control requirements. Structural and non structural stormwater management practices to be utilized in developing a stormwater management plan shall be used, either alone or in a combination, in developing a stormwater management plan.~~
 - ~~1. Structural stormwater management measures
 - ~~(a) The following structural stormwater management practices shall be designed in accordance with the design manual to satisfy the applicable minimum control requirements established in this design manual:
 - ~~(i) stormwater management ponds;~~~~~~

- ~~———— (ii) — stormwater management wetlands;~~
- ~~———— (iii) — stormwater management infiltration;~~
- ~~———— (iv) — stormwater management filtering systems;~~
- ~~———— (v) — stormwater management open channel systems.~~

~~(b) — The performance criteria specified in the latest edition of the Maryland Stormwater Design Manual, Volumes I & II with regard to general feasibility, conveyance, pretreatment, treatment and geometry, environment and landscaping, and maintenance shall be considered when selecting structural stormwater management practices.~~

~~(c) — Structural stormwater management practices shall be selected to accommodate the unique hydrologic or geologic regions in the county.~~

~~2. — Non structural stormwater management measures~~

~~(a) — The following non structural stormwater management practices shall be applied in accordance with the latest edition of the Maryland Stormwater Design Manual, Volumes I & II to minimize increases in new development runoff:~~

- ~~———— (i) — natural area conservation;~~
- ~~———— (ii) — disconnection of rooftop runoff;~~
- ~~———— (iii) — disconnection of non-rooftop runoff;~~
- ~~———— (iv) — sheet flows to buffers;~~
- ~~———— (v) — grass channel; and~~
- ~~———— (vi) — environmentally sensitive development.~~

~~(b) — The use of non structural stormwater management practice shall be encouraged to minimize the reliance on structural BMP's.~~

~~(c) — The minimum control requirements listed in this design manual may be reduced when non structural stormwater management practices are incorporated into site designs in accordance with the latest edition of the Maryland Stormwater Design Manual, Volumes I & II.~~

~~(d) — The use of non structural stormwater management practices may not conflict with existing state or local laws, ordinances, regulations, or policies.~~

~~(e) — Non-structural stormwater management practices used to reduce the minimum control requirements shall be recorded in an easement to the extent practicable and remain unaltered by subsequent property owners. Prior approval from the county shall be obtained prior to the alteration of non-structural practices.~~

~~3. — Alternative structural and non-structural stormwater management practices may be used for new development water quality control if they meet the performance criteria established in the latest edition of the Maryland Stormwater Design Manual, Volumes I & II and are approved by the Maryland Department of the Environment. Practices used for redevelopment projects shall be approved by Howard County.~~

~~4. — For the purposes of modifying control requirements or design criteria, the owner/developer shall submit to the county an analysis of the impacts from stormwater flows to downstream areas of the watershed. The analysis shall include all required information set forth in Section 5.2.6.B of this design manual.~~

B. THE USE OF ESD PLANNING TECHNIQUES AND TREATMENT PRACTICES SHALL NOT CONFLICT WITH EXISTING STATE LAW OR LOCAL ORDINANCES, REGULATIONS, OR POLICIES. HOWARD COUNTY SHALL MODIFY PLANNING AND ZONING ORDINANCES AND PUBLIC WORKS CODES TO ELIMINATE ANY IMPEDIMENTS TO IMPLEMENTING ESD TO THE MEP ACCORDING TO THE MDE DESIGN MANUAL.

~~E. All redevelopment projects, previously defined as any construction, alteration or improvement, exceeding 5,000 sft. as a stand-alone impact, on previously developed (impervious) areas, shall reduce the existing site imperviousness by at least 20 percent. Where site conditions prevent the reduction of impervious area, stormwater management practices shall be implemented to provide qualitative control for at least 20 percent of the sites impervious area. When a combination of impervious area reduction and stormwater management practice implementation is used, the combined reduction shall equal or exceed 20 percent of the site's original impervious area.~~

~~1. — For redevelopment projects, the "site" may be limited to the area of the new construction up to and including the entire site, parcel or lot. For redevelopment projects the "site" area shall consist of the following:~~

~~(a) — if the development is only one building with a single user, or there are multiple stores/buildings on a site, i.e., a shopping center, and only one user is being redeveloped, the "site" shall consist of the expansion for the existing building/store, any parking lot improvements, travelways, entrance improvements and road improvements associated with that use;~~

~~(b) — where a specific improvement is less than the 5,000 sft. limit of disturbance, the redevelopment criteria may not be applicable at that time. If, however, a previous development occurred on the site, parcel or lot with a disturbance less than 5,000 sft. after March 7, 2001, and no stormwater management was provided, the cumulative area of disturbance shall be evaluated. If the cumulative disturbance exceeds 5,000 sft.,~~

~~stormwater management criteria for redevelopment shall apply to the cumulative area.~~

- ~~2. Further development of a partially developed site consists of a project that is not strictly “redevelopment” but includes additional undeveloped land. The stormwater management requirements for this type of development shall include the redevelopment criteria for any existing impervious area and full stormwater management (Rev, WQv, Cpv) for any area not previously developed with impervious cover.~~
- ~~3. Where conditions prevent impervious area reduction or on-site stormwater management, practical alternatives may be considered, including but not limited to:
 - ~~(a) fees;~~
 - ~~(b) off-site BMP implementation for a drainage area comparable in size and percent imperviousness to that of the project;~~
 - ~~(c) watershed or stream restoration;~~
 - ~~(d) retrofitting; or~~
 - ~~(e) other practices approved by the county.~~~~

C. REDEVELOPMENT

THE GOAL OF THE CURRENT REDEVELOPMENT REGULATIONS IS TO GAIN WATER QUALITY TREATMENT ON EXISTING DEVELOPED LANDS WHILE SUPPORTING COUNTY INITIATIVES TO IMPROVE URBAN COMMUNITIES. REDEVELOPMENT PROJECTS OFFER UNIQUE CHALLENGES AND STORMWATER MANAGEMENT ORDINANCES NEED TO BE TAILORED TO CONSIDER COUNTY GOALS, AVAILABLE RESOURCES, AND APPLICATION OF STORMWATER PRACTICES WITHIN HOWARD COUNTY.

REDEVELOPMENT PLANNING PROCESS:

THE DESIGN AND REVIEW PROCESSES FOR ANY REDEVELOPMENT PROJECT NEED TO CONSIDER THE MANY CONSTRAINTS THAT LIMIT EFFECTIVE IMPLEMENTATION OF STORMWATER PRACTICES. FACTORS SUCH AS UNDERGROUND INFRASTRUCTURE MAY RESTRICT AVAILABLE FACILITY OPTIONS, WHILE EXISTING STORM DRAIN ELEVATIONS MAY DICTATE HOW RUNOFF FLOWS THROUGH AND OFF A SITE. THIS INFORMATION AND OTHER EXISTING CONDITIONS SHOULD BE EVALUATED DURING THE CONCEPT PHASE OF PROJECT PLANNING IN ORDER TO ASSESS ALL OPTIONS FOR ESD IMPLEMENTATION AND OTHER POSSIBLE STORMWATER SOLUTIONS.

ALTERNATIVE MANAGEMENT STRATEGIES:

ALTERNATIVE MANAGEMENT STRATEGIES MAY BE CONSIDERED AFTER ALL OPPORTUNITIES FOR USING ESD HAVE BEEN EXHAUSTED DURING THE PLANNING PROCESS. ALTERNATIVE STRATEGIES AND POLICIES FOR MEETING STORMWATER REQUIREMENTS MAY INCLUDE, ON-SITE AND OFF-SITE STRUCTURAL BMPs, RETROFITTING EXISTING STRUCTURAL BMPs,

STREAM RESTORATION, TRADING POLICIES WITH OTHER POLLUTION CONTROL PROGRAMS, WATERSHED MANAGEMENT PLANS, AND FEES-IN-LIEU. ON A CASE BY CASE BASIS, MDE AND HOWARD COUNTY DEPARTMENT OF PLANNING AND ZONING WILL DETERMINE THE CONDITIONS, CRITERIA, AND PROGRAM DIRECTIVES DEDICATED TO IMPLEMENTING STORMWATER MANAGEMENT WHEN AN ALTERNATIVE OR OTHER POLICY IS USED TO MEET REDEVELOPMENT REQUIREMENTS.

5.2.2 Stormwater Management Performance Standards

- ~~A. The 14 Performance Standards as specified in the latest edition of the Maryland Stormwater Design Manual, Volumes I & II, shall be addressed in the stormwater management design for each development.~~
- ~~B. The requirement for quantity and quality management may be waived or modified if in accordance with the requirements outlined in Section 5.5 of this Design Manual.~~
- ~~C. In the recognition of the dynamic nature of water quality design technologies, other criteria not specifically included or referenced in the MDE Design Manual may be approved by Howard County if such methods are supported by published documentation for the Maryland Department of the Environment.~~

5.2.3 Stormwater Management Facilities

- ~~A. Stormwater management requirements may be achieved by any of the following methods or a combination thereof:
 - ~~1. By providing the necessary facilities within the project area.
 - ~~— A maintenance agreement shall be incorporated into the developer agreement for the project for those facilities, which will remain in private ownership or become joint maintenance responsibility with the County after completion. The agreement shall be executed prior to signature approval of the final plat. For stormwater management facilities that are proposed as part of the site development plan, the developer shall be required to execute a developer agreement, which includes a maintenance agreement, with the County for the construction and continued maintenance of the facilities prior to signature approval on the grading or site plan.~~~~
 - ~~2. By entering into a joint effort with other developers.~~
 - ~~3. By entering into an agreement with the County which provides for a fee based on the quantity storage requirements for the project, where authorized by the Department of Public Works or the Department of Planning & Zoning/Development Engineering Division. Such fees shall be held by the County and used as allowed by County Code. The fee will be equated to the average cost per acre foot of storage, which has been determined by county council resolution, and the cost of the land saved by the elimination of a facility.~~~~

~~— Fees will only be accepted if one of the following conditions is met:~~

- (a) ~~The Department of Public Works and/or the Department of Planning & Zoning/Development Engineering Division determines that the acceptance of the fee is in the best interest of the county.~~
 - (b) ~~Capital projects have been approved by the county to provide regional stormwater management for the area.~~
 - (c) ~~Another developer has previously entered into a developer agreement with the county for the construction of a stormwater management facility, which includes the proposed development.~~
4. ~~If the Department of Public Works and/or the Department of Planning & Zoning/Development Engineering Division determines that the development qualifies for the payment of fees as outlined above, and the developer elects this option, the developer shall:~~
- (a) ~~Submit computations showing the volume of storage required for the development, which must be reviewed and approved by the Department of Public Works and/or the Department of Planning & Zoning/Development Engineering Division. Computations for the fee for quantity stormwater management shall be based on the Cpv volume requirements for the 1-year design storm as outlined in the latest edition of the MDE Design Manual. No credit will be given for any volume provided for by an on-site quality facility.~~
 - (b) ~~Pay the fees to the Office of Finance prior to recording the plat or the signature approval on the site development plan, whichever applies.~~
5. ~~Water quality control shall be provided for all developments. The requirements shall not be waived nor a fee be accepted.~~
6. ~~Pond facilities shall be designed in accordance with criteria established in the latest edition of the Maryland Stormwater Maryland Stormwater Design Manual, Volumes I & II, Volumes I & II, this design manual, and the current edition of the USDA Natural Resources Conservation Service Maryland, Conservation Practice Standard, Pond, Code 378, (i.e. MD-378).~~
7. ~~Under special circumstances the county may accept ownership and maintenance of some or all stormwater management facilities serving commercial or industrial parcels. In this instance, the affected parcels shall be incorporated into special maintenance districts established to collect fees adequate to cover maintenance costs for these facilities. The decision to establish stormwater management special districts is the sole discretion of the Director of the Department of Public Works, who is under no obligation to provide this service.~~
- B. ~~General location of stormwater management facilities shall comply with any of the following or a combination thereof~~

1. ~~Stormwater management facilities should not be located in wetlands or 100-year floodplains. Exceptions are for quantity management behind road crossings, wetland ponding systems in degraded wetlands and retention facilities as long as all pertinent State and Federal permits are appropriated.~~
2. ~~Off-site structures, in order to be considered:~~
 - (a) ~~shall have a contributory drainage area not in excess of 400 acres unless a larger drainage area is approved by the Department of Public Works or the Department of Planning & Zoning/Development Engineering Division and the Maryland Department of the Environment;~~
 - (b) ~~shall provide for a permanent pool of water or provide for a 24 hour detention period for detaining and releasing the volume of runoff in accordance with the design criteria established in the latest edition of the Maryland Stormwater Design Manual, Volumes I & II;~~
 - (c) ~~where flooding conditions exist, shall manage the increase peak discharges for the 1 year, 10 year, 25 year and 100 year frequency storm events. This shall be determined on a case by case basis; and~~
 - (d) ~~may not be located so as to discharge to Class III Natural Trout waters identified in COMAR, except as authorized by the Department of Public Works in permits issued pursuant to Natural Resources Article, Sec. 8-803.~~

3. ~~Regional Techniques~~

~~For many on site and most off site stormwater management facilities, regional techniques may be the most feasible. These techniques may be suitable for larger watersheds and may serve any kind of development. They can often be developed on a watershed basis as a joint effort between two or more developers or under a Stormwater Management Developer's Agreement with the county. The design of such facilities shall be in accordance with the design criteria established in the latest edition of the Maryland Stormwater Design Manual, Volumes I & II.~~

5.2.42 Design Considerations

- A. ~~The stormwater management system shall be considered in the initial phase of all development projects.~~
- B. ~~Consideration shall be given to incorporating the use of natural topography and land cover such as wetlands, ponds, natural swales and depressions as they exist before development to the degree that they can accommodate the additional flow of water.~~
- C. ~~Trees and natural vegetation provide natural water quality and should be saved where possible.~~

- ~~D. The Department of Public Works or the Department of Planning & Zoning/Development Engineering Division shall give preference to the use of swales in place of traditional use of curbs and gutters where either an open or closed section is allowed. A case by case review of the stormwater management plans will be performed.~~
- ~~E. The design shall consider the future maintenance requirements for the stormwater management system proposed.~~
- FA. Where a stormwater plan ~~involves concentration or~~ SHOWS AN increase of runoff from the site IN EXCESS OF 2.0 CFS FOR THE 1-YEAR STORM EVENT, it MAY BE REQUESTED ~~shall be the responsibility~~ of the developer TO ANALYZE THE DOWNSTREAM IMPACTS UP TO 500 FT OF THE OUTFALL AT THE PROPERTY LINE TO INSURE SAFE CONVEYANCE TO AN ADEQUATE OUTFALL AND to obtain from the adjacent property owners any easements or other necessary property interest concerning the flowage of water. ~~Approval of a stormwater management plan does not create or affect any such responsibilities.~~
- ~~G. Trees shall not be allowed to grow on the dam of any stormwater management structure. No trees are permitted within 15 feet of the top of cut or toe of fill of a pond dam or within 25 feet of the principal spillway structure in accordance with the Maryland Stormwater Design Manual, Volumes I & II requirements. This shall be noted as a "NO WOODY VEGETATION ZONE" on the design plans.~~
- ~~H. Stormwater management facilities shall be designed and constructed to serve the entire watershed within which they are located. However, stormwater management is required only for stormwater originating on the subdivision or site. The developer will not be required to provide stormwater management for upstream runoff which enters his land either by overland or channel flow, although the passage of such flows shall be considered in the design of the stormwater management and storm drainage facilities.~~
- ~~I. A pond buffer shall be provided for all stormwater management facilities in accordance with the criteria set forth in the Maryland Stormwater Design Manual, Volumes I & II. The minimum distance from the end of the outlet structure, including riprap exit channel, or edge of an underground facility, to the downstream property line shall not be less than 25 feet. Along other parts of the facility, the minimum distance from the toe of embankment or top of cut to the property lines, public easements, rights of way and structures shall be 25'. For structures adjacent to the facility where the top of cut cannot be defined and the grading condition encroaches onto a residential lot, the distance from the 100-year water surface elevation within the facility or the edge of an underground facility shall be 25' minimum horizontal and two (2) feet minimum vertical to the lowest floor elevation of a habitable structure.~~
- ~~J. Outfall channel improvements from stormwater management facilities shall not extend into stream or wetland buffers unless waivers have been approved, alternative compliance granted, or the County has determined through plan review that the outfall is satisfactory.~~
- B. WHEN SLOPES WARRANT A SPREADING DEVICE ADJACENT TO A WOODED CONSERVATION AREA, AN INFILTRATION BERM SHALL BE USED. IF CONSTRAINTS PROHIBIT THE USE OF AN INFILTRATION BERM, A GRAVEL DIAPHRAGM OR LEVEL SPREADER MAY BE USED.

5.2.53 Design Requirements

- A. Runoff shall be computed using the USDA SCS TR-55 or TR-20 methodologies as described in Chapter 6 of this design manual. Do not use TR-55 Figures 2-1, 2-3, Exhibit 4-I, Exhibit 4-IA, 4-III. The TR-55 methodology for computation of runoff shall be limited to analysis of a single drainage area. The TR-20 methodology may be used in all cases and shall be used when multiple drainage areas are analyzed or the single drainage area exceeds 100 acres.
- ~~B. The pre development peak discharge rate shall be computed assuming that all land uses in the site to be developed are in good hydrologic condition per Design Manual, Volume I, Chapter 3.~~
- ~~C. All crop, pasture, range, agricultural or grasslands shall be assumed to be meadow in good condition.~~
- ~~D. Wood grass combination may be used only in existing tree nurseries, tree farms or orchards.~~
- E B. The runoff curve number (RCN) shall be computed based on zoning for the development. For those developments that are “cluster” type developments, a composite runoff curve number based on actual lot size, open space, right of way and woods may be used with the written permission of Howard County. For proposed conditions, measured impervious area may be used to compute a composite runoff curve number with an approved Alternative Compliance. Existing runoff curve numbers shall be based on existing land use such as grass, woods and impervious areas. NRCS land use impervious cover relationships can be used to estimate impervious cover (see Table 2.2a in TR-55, NRCS, 1986). Estimates shall be based on zoning, actual land use and homogeneity. THE MEASURED AREA OF A SITE THAT DOES NOT HAVE VEGETATIVE OR PERMEABLE COVER SHALL BE CONSIDERED TOTAL IMPERVIOUS COVER. ESTIMATES OF PROPOSED IMPERVIOUSNESS MAY BE USED DURING THE PLANNING PROCESS WHERE DIRECT MEASUREMENTS OF IMPERVIOUS COVER MAY NOT BE PRACTICAL. ESTIMATES SHOULD BE BASED ON ACTUAL LAND USE AND HOMOGENEITY AND MAY REFLECT NRCS LAND USE/IMPERVIOUS COVER RELATIONSHIPS (SEE TABLE 2.2A IN TR-55, USDA-NRCS, 1986) WHERE APPROPRIATE. THE PERCENT IMPERVIOUSNESS (%I) MAY BE CALCULATED FROM MEASUREMENTS OF SITE IMPERVIOUSNESS.
- ~~F. In the apartment or condominium districts, commercial, business and industrial developments, the RCN will be computed as given in the tables in the SCS TR-55 and may not be split between pervious and impervious areas without an approved Alternative Compliance.~~
- ~~G. For time of concentration computations, fallow, cultivated soils, range or Bermuda grass surface values shall not be allowed in sheet flow computations. The travel path for sheet flow shall not exceed 100 feet.~~
- ~~H. The drainage area for the entire watershed upstream of the facility shall be included in the design.~~

~~I. The design of the control structure shall include an analysis of barrel vs. riser control. The table in Figure 5.01 can be used to summarize outflow data for the control structure.~~

~~J. Anti seep collars or filters diaphragms shall be used on all stormwater management facilities as required by USDA Natural Resources Conservation Service Maryland, Conservation Practice Standard, Code 378, (i.e. MD-378). The phreatic line shall be assumed as being 4:1 from the 10-year design storm elevation.~~

~~It is the responsibility of the design professional to obtain the current edition of MD-378 from the Howard Soil Conservation District prior to the design of a stormwater management facility, as the most current edition shall govern.~~

~~K. Concrete cradles shall be provided based on SCS TR 46, "A 2" concrete cradle. Modifications for multiple pipes shall be shown on the detail sheet for construction.~~

~~L. Cutoff and core trenches shall be required for all facilities in accordance with the current MD-378 requirements. For those facilities not governed by MD-378, cutoff and core trenches shall also be required. The limits of the cutoff and core trenches shall be determined on a case-by-case basis but in no case shall be less than 2 feet.~~

~~M. A floatation analysis shall be required for each control structure. A factor of safety of 1.5 shall be maintained for all structures.~~

~~NC. Structural details and supporting computations, signed and sealed by the appropriate design professional, registered in the State of Maryland, shall be provided for all non-standard structures.~~

~~O. For basins with maintenance benches, all storm drain outfalls shall be located beyond the bench. The bench may be elevated to allow for the pipe crossing with a two (2) foot minimum cover over the pipe.~~

~~P. For basins with permanent pools, provide a hood, inverted elbow or other device over the low flow orifice opening to prevent oils and other floatable objects from leaving the pond during low frequency storm events. The hood should extend at least 12 inches below the surface of the permanent pool. Adequate clearance shall be provided below the inverted elbow to avoid blockage (minimum one (1) foot).~~

~~If it can be incorporated into the design, the elbow or hood should draw from the bottom 1/3 of the permanent pool to provide for a cooler discharge and to minimize the effects of thermal pollution.~~

~~QD. The appropriate checklist for stormwater management facilities shall be complied with and submitted with the design plans for the development signed and sealed by the appropriate design professional, registered in the State of Maryland. The current checklists are available from the Department of Public Works or the Department of Planning & Zoning/Development Engineering Division.~~

~~R. Stormwater management on sites with multiple drainage areas require that the Water Quality Volume (WQv), the Channel Protection Volume (Cpv) and the peak discharge~~

~~rate (Q_p) management shall be provided for within each drainage area. The Recharge Volume (Rev) management for the project can be provided within any drainage area or within a single BMP.~~

SE. ~~In the design computations required to meet the Rev , WQ_v and Cp_v , the following shall be considered:~~

- ~~1. When calculating the impervious percentage of a site (I), on sites with a mixture of various lot sizes or land uses such as woods and open space, a weighted impervious percentage may be used.~~
- ~~2. When computing the Rev requirements for a development, the appropriate equation shall be used as specified in the Stormwater Design Manual, Volumes I & II. If a site contains an area with no proposed disturbance or impervious area, WHICH DOES NOT DRAIN TO A BMP, that specific area DOES NOT HAVE TO BE CONSIDERED FOR STORMWATER MANAGEMENT. ~~can be deducted from the "A" factor of the equation. Only areas that are designated as one of the practices may use the non-structural method of achieving the required Rev volume. Only those structural practices that meet Rev requirements listed in the Stormwater Design Manual, Volumes I & II can be used if a BMP is chosen.~~~~
- ~~3. When computing the WQ_v requirements, if an ED BMP is chosen, a minimum of 50% of the WQ_v shall be located in a permanent pool, excluding the forebay volume. The remaining 50% of the WQ_v shall be used to determine the control orifice size based on the Stormwater Design Manual, Volumes I & II criteria. The portion of the volume not provided for in the permanent pool, can be included as part of the Cp_v when routing using the USDA NRCS TR 20 computer model.~~
- ~~4. When determining the need for Cp_v for stormwater management, the 2 cfs threshold for the 1 year storm event is determined for the site (or drainage area for sites with multiple drainage areas) and includes any upstream offsite runoff conveyed through the site at a study point along the site boundary. The offsite area shall be modeled at its present land use in good condition. When the site or drainage area with proposed development generates runoff of 2 cfs or greater, the Cp_v criteria shall be applied to the site. Generally, the offsite runoff can be diverted around the proposed BMP and merely pass through the site.~~

~~If the offsite runoff is diverted around the BMP and merely passes through the site, thus lowering the proposed development runoff below the 2 cfs threshold, Cp_v shall not be provided for the site or drainage area.~~

~~Under the condition that the offsite area is passed through the BMP, the facility shall be sized appropriately.~~

- ~~5. For developments that have multiple drainage areas, Cp_v may be calculated for the entire site or by individual drainage area. However, Cp_v may be distributed proportionally to each drainage subarea. Each drainage area shall be evaluated on its own based on impacts to the channel and be treated within each subarea. Where drainage areas combine onsite, a single BMP may be used, however, it is~~

~~encouraged that management be provided within each subarea. For uncontrolled subareas, the impact shall be evaluated and every effort shall be made to ensure that the receiving channel impacts are mitigated. Increases in channel flow shall require that the responsible design professional reexamine the affected area to utilize credits and/or add a BMP if applicable.~~

- ~~6. All BMP's using extended detention to meet the Cpv requirements shall be sized to provide either the 18—24 hours of lag time for a Class I or II waterway or 10—12 hours of lag time for a Class III or IV waterway between the inflow and outflow hydrograph centroids. Verification that this time lag requirement has been met shall be provided in the routing analysis and it shall be included in the report documentation.~~

- ~~T. Stormwater credits can be utilized on development projects in accordance with the Stormwater Design Manual, Volumes I & II and shall be utilized in each specific drainage area where they are located if multiple drainage areas are used. The following are requirements for specific credits to be used:~~
 - ~~1. The use of the Natural Area Conservation credit shall be restricted to open space lots. Where this is not possible, the Subdivision and Land Development Regulations, Section 16.120(b)(4)(iii), shall govern. Most of the environmental features listed in that section are areas that can be considered for the Natural Area Conservation credit except areas of reforestation. All Natural Area Conservation credit areas shall be designated on the plans and record plats as a "STORMWATER CREDIT EASEMENT".~~

 - ~~2. The use of the Disconnection of Rooftop Runoff credit shall be restricted to providing a 75' vegetative filter strip at a maximum slope of 5% for each downspout to meet the trapping removal efficiency required. The 75' length shall begin at the downspout or in close proximity thereof. The 75' length can be reduced to 60' where the runoff sheet flows to a roadside ditch or swale. The maximum contributing rooftop drainage area shall be limited to 500 sft. per downspout. The property shall be graded to promote sheet flow and meet all criteria established in the State Design Manual.~~

~~— The use of dry wells and rain gardens to reduce or eliminate the 75' sheet flow requirement shall be limited to no more than two (2) per lot. Due to the high failure rate of dry wells, which become clogged with fine particles that fill in the voids in the stone, more frequent maintenance shall be required and shall be designated on the design plans. Dry wells used to meet the disconnection credit for WQv management shall be designed as infiltration trenches as per Section 5.2.7.G.~~

 - ~~3. The use of Disconnection of Non Rooftop Runoff Credit shall be in accordance with the Stormwater Design Manual, Volumes I & II. For runoff from driveways on individual lots or parcels, the runoff shall enter [and flow as sheet flow with a contribution length in accordance with Table 5.7 of the Stormwater Design Manual] a grass filter strip, vegetative non-engineered swale or channel section (no gravel or underdrain material) and the length shall be equal to or be greater~~

~~than the contributing length of impervious cover. These are not considered BMP's and will not require easements unless they serve more than one lot. If the swale or filter strip serves more than one lot, a "PRIVATE STORMWATER MANAGEMENT, DRAINAGE & UTILITY EASEMENT" shall be required.~~

- ~~4. The use of Sheet Flow to Buffer Credit shall be in accordance with the Stormwater Design Manual, Volumes I & II. If the buffer area is to be located on open space lots or adjacent parcels, a "STORMWATER CREDIT EASEMENT" shall be provided over the buffer area to insure that it is not adversely impacted by future development. This easement, if located on a residential lot, shall be a minimum of 15 feet from any habitable structure, including decks or overhangs from the building.~~
- ~~5. The use of the Grass Channel Credit shall be in accordance with the Stormwater Design Manual, Volumes I & II. This credit may apply to both Rev and WQv, however, both Rev and WQv shall be treated separately. Only the impervious areas that drain to a roadside or paved area ditch that has a grass lining may get the Rev credit, regardless of slope, size or shape. In order to get the WQv credit, it shall be demonstrated that there is sheet flow into the ditch or swale, that the ditch or swale is in a cut situation and that the 1-year storm discharge rate falls within the permissible velocities for the designed slope. The ditch or swale shall also be checked to insure that it meets the normal open channel design parameters listed in Section 4.2 of this design manual.~~

~~In order to receive the Grass Channel Credit for the WQv volume, all of the design parameters in the Stormwater Design Manual, Volumes I & II shall be met. The longitudinal slope of the swale or channel shall not exceed 4% with a velocity that shall not exceed 1.0 fps based on the runoff from a 1" rainfall. A Manning's coefficient for the grass shall be specified and justified by the design professional for the type of grass being used in the swale or channel. The average residence time of 7 minutes shall be used for all grass swale or channel designs calculated from the last point of entry of impervious area into the swale or channel.~~

~~Check dams within ditches or swales shall not be allowed within the right of way for publicly maintained facilities but shall be allowed for privately owned and maintained facilities. For the Grass Channel Credit for Rev management only, a V-Ditch is acceptable. If the Grass Channel Credit is being used to meet the WQv requirements, the ditch or swale shall be designed in accordance with the Stormwater Design Manual, Volumes I & II. The ditch section shall be consistent along the entire length of the paved surface where possible. At a minimum, the section shall be consistent between intersections.~~

~~The limits of the area managed by the Grass Channel Credit shall be clearly defined on all plans. Bold notes shall be shown on the plans and typical sections identifying those areas as stormwater management credit areas for Rev, WQv or both. As the bottom width of any channel or swale varies, the right of way shall be adjusted accordingly. The right of way shall be consistent throughout the road's entire length, regardless of whether it is warranted or not. Where larger~~

~~right of way is required to include the channels or swales, the increased width shall be in increments of 5 feet only.~~

~~6. The use of the Environmentally Sensitive Development Credit shall be in accordance with the Stormwater Design Manual, Volumes I & II. All items listed for either single lot or multiple lot development shall be met. There shall not be any reduction of RCN for rooftop disconnection. When considering the project in its entirety, the individual building lot area shall average 0.5 acres. Roadways outside of lot areas shall be managed for Rev, WQv Cpv and Qp accordingly. Roadways, including the use in common driveways, shall address the stormwater management requirements located on individual residential lots. When clustering techniques are used in a development, the lot size shall average 2 acres based on net tract area.~~

~~U. Stormwater management facilities (structural or non structural BMP's) shall not be located on individual residential lots with the exception of dry wells, rain gardens and level spreaders which treat the individual lot management requirements. For swales and ditches along use in common access driveways, the swale or ditch shall be in a non-engineered section (no gravel or underdrain material) and shall be contained within a defined "PRIVATE USE IN COMMON ACCESS, STORMWATER MANAGEMENT, DRAINAGE & UTILITY EASEMENT."~~

5.2.6 Criteria Common to All Types of Facilities

~~A. All facilities, either public or private, shall comply with the most recent edition of MD-378.~~

~~— If the limits as specified in MD-378 are exceeded, then approval is required from the Maryland Department of the Environment. In some cases, approval of the facility by the Maryland Department of the Environment may be required in addition to HSCD approval.~~

BF. Where deemed necessary by the Department of Public Works or the Department of Planning & Zoning/Development Engineering Division, the developer shall submit to the appropriate agency an analysis of the impacts of stormwater flows downstream in the watershed. The analysis shall include hydrologic and hydraulic calculations necessary to determine the impact of hydrograph timing on a dam, highway, structure, or natural point of restricted stream flow. The analysis shall be performed to a point where either:

(a)1. The first downstream tributary, or a point downstream, whose drainage area equals or exceeds the contributing area to the facility; or

(b)2. The first downstream tributary whose peak discharge exceeds the largest designed release rate of the facility, ~~established in COMAR.~~

The designed release rate of the structure shall be modified if any increase in downstream flooding or stream channel erosion would result at the downstream dam, highway, structure, or natural point of restricted stream flow. The release rate of the structure shall meet the minimum control requirements.

~~C. Velocity dissipation devices shall be placed at the outfall of all facilities in accordance with the latest edition of MD 378 and this Design Manual.~~

DG. Maintenance (IN ADDITION TO THE MDE DESIGN MANUAL, THE FOLLOWING ARE ALSO REQUIRED)

1. ~~In order to insure that the Stormwater management facility has~~ FACILITIES SHALL HAVE adequate access for maintenance, ~~the following criteria are required:~~

a. ~~A 12-foot wide level area surrounding the facility providing direct access to the maintenance bench shall be provided (level means 3% or less cross-slope). This requirement, that the access area surround the facility, may be reduced to a minimum one half of the facility only if a turnaround area is provided near the embankment area sufficient for maintenance vehicle mobility (minimum size 30' x 30').~~

b. ~~The maximum allowable access grade shall be 10% on grass and 12% with crushed stone or other reinforced surface.~~

~~€(A) If the stormwater management facility is not immediately adjacent to a county roadway, an access easement from a county roadway, marked by bollards, capable of allowing maintenance equipment to reasonably access the facility shall be provided. The minimum allowable access easement width shall be 20 feet. At least 12 feet must be clear for vehicular passage without riding on pathways unless the pathway section will accommodate the maintenance vehicles.~~

~~Đ(B) Facilities, which are to be owned/or maintained by the county, shall have their access in fee simple ownership or by easement across HOA or other type of open space.~~

~~2. An on-site stockpile area shall be provided in proximity to the maintenance access for temporary drying of cleaned out material from the pond basin. It shall not be located within non-tidal wetlands and/or saved tree areas. The county reserves the right to require mitigation of wetlands and/or tree save areas that are disturbed due to placement of the on-site material.~~

~~In lieu of providing an onsite stockpile area, cleaned out material may be transported off-site to an approved stockpile area. A note to this effect shall be provided on the plans and included in the Operation & Maintenance Schedule required to be placed on the plans.~~

32. Stormwater management facilities required for commercial and condominium or apartment developments shall be maintained by the property owner. Stormwater management facilities required for single-family detached or single-family attached developments serving more than one lot shall be maintained in accordance with Figure 5.03.

43. County maintenance responsibility for JOINTLY MAINTAINED OR PUBLIC facilities located on HOA property shall be limited to the structural maintenance of the man-made elements of the facility (e.g. pipes, headwalls, riprap, dams and risers, etc.). County maintenance responsibilities shall also include removal of accumulated sediment. HOA IS RESPONSIBLE FOR ALL OTHER FACILITY MAINTENANCE.
54. ~~Homeowner's association maintenance responsibilities shall include landscape maintenance and trash removal. Landscape maintenance shall include mowing of all areas of the embankment and no woody vegetation zones in open space including the embankment top, side slopes, emergency spillway and graded or natural slopes around the perimeter of the facility except that the bottom of the facility shall not be mowed. Vegetation shall not exceed 18 inches in height nor shall it be mowed to less than 4 inches in height. Woody vegetation shall not be allowed to grow on the dam or within 15 feet of the top of cut or toe of embankment (see section 5.2.4.G). Landscape maintenance shall also include pruning, mulching, repair and replacement of dead or dying "planted" vegetation that is an inherent part of the BMP function. The maintenance responsibilities shall be included in the Homeowner's Association By-Laws and be recorded with the developer agreement for the project.~~
65. Maintenance of the facilities shall be as specified for the type of facility designed in accordance with the criteria outlined in the latest edition of the Maryland Stormwater MDE Design Manual, Volumes I & II and as outlined in Figure 5.03.

~~E. Side Slopes~~

1. ~~The side slopes of an earthen embankment facility shall be no steeper than 3:1 anywhere around the facility. Side slope requirements for retention ponds and extended detention ponds shall be as specified in the Stormwater Design Manual, Volumes I & II for those types of facilities.~~
2. ~~The side slopes of alternative material used for embankments of facilities, i.e., concrete retaining walls, gabions, stone, etc., can be steeper than 3:1 with an approved Alternative Compliance from the Department of Public Works or the Department of Planning & Zoning/Development Engineering Division. The use of alternative materials for embankment construction shall be in accordance with current policies and guidelines for the specified material being used.~~

~~F. Fencing~~

~~County policy is not to fence stormwater management facilities except as determined by the Director of the Department of Public Works and the Chief, Development Engineering Division. At the option of the Department of Public Works or the Department of Planning & Zoning/Development Engineering Division, fences or landscaping may be required when a stormwater management facility is adjacent to sidewalks, pathways, schools, playgrounds or when other extenuating circumstances prevail. Maintenance of the fence or landscaping shall remain with the property owner and not with the county unless otherwise agreed to.~~

GH. Wetlands Mitigation

Wetlands mitigation areas may not be part of a stormwater management facility to be owned and/or maintained by the county, except for county capital projects or with the written approval of the Director of the Department of Public Works or the Chief, Development Engineering Division.

HI. Geotechnical Requirements

A ~~geotechnical~~ SOILS analysis is required for all stormwater management facilities. The analysis shall be in accordance with the requirements as stipulated in the current edition of the ~~Maryland Stormwater Design Manual, Volumes I & II~~ MDE DESIGN MANUAL, and shall include:

- ~~1. Soil boring information shall be obtained from a minimum of two borings along the centerline of the embankment, one of which shall be at the control structure or barrel and the other one at the emergency spillway, with an additional boring in the pool area (minimum total of three borings required). This can be done by either standard penetration testing or test pits.~~
- ~~For narrow underground facilities, at least two (2) borings shall be required, one at each end of the facility. For wide underground facilities, at least four (4) borings shall be required, one at each corner of the facility. For any manhole type pretreatment facility, one boring shall be required to determine groundwater and rock impacts.~~
21. The minimum soil boring depth shall be to the seasonal high ground water table; five feet below the bottom of an infiltration or storage device; equal to the embankment height plus five (5) feet; or to refusal.
32. Soil boring information shall be provided for each known borrow area to be used in the construction of the facility.
43. Laboratory testing shall include such appropriate tests as permeability analysis, grain size, liquid limit, plastic limit, natural moisture, compaction tests, consolidation and shear tests as deemed necessary by the appropriate design professional for each specific application.
54. Provide seepage and uplift analysis when deemed necessary by the appropriate design professional.
- ~~6. Provide settlement analysis of embankment slope for both construction and rapid draw down cases when deemed necessary by the appropriate design professional.~~
75. For infiltration trenches and underground facilities, at least two soil borings are required; there shall be at least one boring at each end of the structure.
86. Soil boring information shall be in the Unified Soil Classification System

97. Underground water table shall be shown if encountered for all soil borings.
- ~~10. Bearing strength (number of blows), shall be required for embankment foundation borings only.~~
118. For infiltration facilities, the infiltration rate shall be provided based on in-situ permeability tests as described in Appendix D.1 of the ~~Stormwater Design Manual, Volume I & II~~ MDE DESIGN MANUAL. A minimum of two (2) in-situ tests shall be required for each facility. The minimum allowable infiltration rate shall be 1.02 inch per hour.
- ~~12. Dry wells used to provide only Rev volume, or rain gardens used to provide Rev and WQv requirements, requires at least one (1) boring or test pit to determine the rock and groundwater table elevations. The borings shall be located within 50 feet of the proposed dry well or rain garden locations. Dry wells used to meet WQv requirements, shall be treated as an infiltration facility. At least one boring shall be provided and meet the boring requirements stated in item 11 above and the Stormwater Design Manual, Volumes I & II.~~
9. A geotechnical report prepared, signed and sealed by the appropriate design professional, registered in the State of Maryland shall be submitted ~~regarding the stability of the embankment and appurtenant structures~~ and shall contain conclusions and recommendations regarding SPECIFIC PRACTICE REQUIREMENTS. ~~infiltration and construction of facilities.~~
10. Boring locations ~~and/or boring logs~~ shall be shown on the plans AS REQUIRED BY SPECIFIC PRACTICE. ~~and the boring logs shall be shown on the profile sheet where a longitudinal section of the dam is shown.~~
- J. All structural BMP facilities outlined in the ~~Stormwater Design Manual, Volumes I & II~~ MDE DESIGN MANUAL shall be required to be located on open space lots within the appropriate easements. The easements shall follow the standard nomenclature of Howard County. BMPs on individual lots such as dry wells, rain gardens and overland flow used to obtain stormwater management disconnection credits shall not be required to have easements. Instead, a note shall be placed on the plat as follows:
- “LOTS X, Y AND Z HAVE DRY WELLS (or RAIN GARDENS) ON THEM TO MEET ESD PRACTICES USING ROOFTOP RUNOFF DISCONNECTIONS. OPERATION AND MAINTENANCE SCHEDULES HAVE BEEN RECORDED WITH THE HOMEOWNERS ASSOCIATION DOCUMENTATION. FAILURE TO INSTALL OR MAINTAIN THESE FACILITIES MAY RESULT IN THE LOSS OF STORMWATER MANAGEMENT APPROVAL AND THE BEST MANAGEMENT PRACTICE (BMP) FACILITIES VOLUME SHALL BE INCREASED APPROPRIATELY.”**
- K. A landscape plan shall be required for all stormwater management facilities in accordance with the current ~~Stormwater Design Manual, Volumes I & II~~ MDE DESIGN MANUAL and the Howard County Landscape Manual. Where stormwater management

facilities are located in a residential neighborhood, signage shall be required around the limits of the functional landscaping to indicate that no mowing or disturbance is allowed in the specific area.

5.2.4 CRITERIA FOR ESD PRACTICES

ESD PRACTICES SHALL BE USED TO THE MEP. THE FOLLOWING ARE HOWARD COUNTY REQUIREMENTS FOR SPECIFIC CREDITS TO BE USED ALONG WITH REQUIREMENTS SHOWN IN THE MDE DESIGN MANUAL:

1. [M-7] RAIN GARDENS - ALL RAINGARDENS SHALL HAVE A MINIMUM PLANTING SOIL DEPTH OF 24". ALL RAINGARDENS SHALL BE DESIGNED WITH AN APPROPRIATE UNDERDRAIN WHICH OUTFALLS NO CLOSER THAN 5- FEET FROM THE PROPERTY LINE. RAINGARDENS SHALL NOT BE LOCATED WITHIN 10- FEET OF A PROPOSED STRUCTURE. A SOIL BORING, VERIFYING GROUNDWATER OR BEDROCK, SHALL BE LOCATED WITHIN 50- FEET OF EACH RAINGARDEN.

2. [M-8] SWALES – WHERE SWALES ARE DESIGNED TO TREAT WQV, INTERNAL SLOPES SHALL NOT EXCEED 4% AND MUST BE IN CUT SOILS. IF SLOPES GREATER THAN 4% CAN NOT BE AVOIDED, CHECK DAMS MAY BE UTILIZED UP TO 8% TO REDUCE RUNOFF VELOCITY. SWALE SLOPES GREATER THAN 8% CANNOT BE USED TO TREAT WQV.

THE SWALE SHALL ALSO BE CHECKED TO INSURE THAT IT MEETS THE NORMAL OPEN CHANNEL DESIGN PARAMETERS LISTED IN SECTION 4.2 OF THIS DESIGN MANUAL.

GABION (ADJACENT TO WOODED AREAS) OR WOODEN CHECK DAMS (ADJACENT TO DEVELOPED LOTS) WITHIN SWALES SHALL BE ALLOWED WITHIN THE RIGHT-OF-WAY FOR PUBLICLY MAINTAINED FACILITIES. ALL OPEN CHANNEL SYSTEMS SERVING MORE THAN ONE LOT AND BEING USED TO MEET STORMWATER MANAGEMENT CRITERIA SHALL BE PLACED WITHIN OPEN SPACE, A PUBLIC RIGHT-OF-WAY, OR A PUBLIC EASEMENT. UNDER DRAINS ARE REQUIRED IN ALL BIO-SWALES. ESD DEPTH IS PERMITTED TO EXCEED 4" ADJACENT TO CHECK DAMS.

THE CENTERLINE OF ALL OPEN CHANNEL SYSTEMS SHALL BE LOCATED A MINIMUM 25' FROM ANY RESIDENTIAL STRUCTURE. THE OPEN CHANNEL SYSTEM SHALL BE DESIGNED TO CONVEY THE STORMWATER RUNOFF FROM A 10-YEAR FREQUENCY STORM EVENT.

3. LEVEL SPREADERS

IF THE USE OF INFILTRATION BERMS ARE NOT FEASIBLE DUE TO PHYSICAL CONSTRAINTS, LEVEL SPREADERS CAN BE USED TO MEET THE SHEET FLOW TO CONSERVATION AREAS UNDER THE FOLLOWING:

- (A) THE PURPOSE OF A LEVEL SPREADER IS TO CREATE A SHEET FLOW CONDITION WHEN THE AVERAGE SLOPE OF 5% HAS BEEN EXCEEDED WITHIN THE CONTRIBUTING AREA THAT IS TO RECEIVE THE CREDIT. MAXIMUM CONTRIBUTING FLOW LENGTHS TO THE DEVICE SHALL BE IN ACCORDANCE WITH MDE DESIGN MANUAL.

- (B) THE LEVEL SPREADER SHALL BE CONSTRUCTED WITH THE TOP OF THE DEVICE AT AN EQUAL ELEVATION AT ALL POINTS ALONG THE LENGTH OF THE DEVICE.
- (C) THE SPREADER DEVICE SHALL BE LOCATED ON THE RESIDENTIAL PROPERTY, OUTSIDE THE BUILDABLE LOT AREA. THE DEVICE SHALL NOT CROSS PROPERTY LINES.
- (D) THE LEVEL SPREADER MAY BE CONSTRUCTED IN ACCORDANCE WITH MDE APPENDIX D.8. OR MAY BE CONSTRUCTED BY A 2' WIDE BY 1.5' DEEP TRENCH FILLED WITH CLEAN, WASHED STONE (1.5" - 2.5" BRG PREFERRED) LINED WITH FILTER FABRIC ON ALL SIDES AND BOTTOM OF THE TRENCH.
- (E) A DETAIL OF THE LEVEL SPREADER WITH MATERIAL SPECIFICATIONS SHALL BE PROVIDED ON THE FINAL PLANS.
- (F) THE LEVEL SPREADER SHALL BE INSTALLED AFTER THE CONTRIBUTING SITE HAS BEEN STABILIZED UNLESS FILTER FABRIC IS PLACED OVER THE DEVICE IMMEDIATELY AFTER CONSTRUCTION TO DIVERT SEDIMENT FROM ENTERING THE DEVICE. AFTER THE SITE HAS BEEN STABILIZED AND WITH THE INSPECTOR'S APPROVAL, THE FABRIC MAY BE REMOVED.
- (G) MAINTENANCE SHALL BE PERFORMED BY THE OWNER OF THE LEVEL SPREADER WHEN SEDIMENT IS VISUALLY APPARENT WITHIN THE STONE VOIDS. THE PORTION OF THE STONES THAT ARE AFFECTED SHALL BE REMOVED AND REPLACED WITH CLEAN STONE.
- (H) THE LEVEL SPREADER DEVICE SHALL BE LOCATED BOTH HORIZONTALLY AND VERTICALLY ON THE AS-BUILT GRADING CERTIFICATE. ELEVATIONS SHALL BE TAKEN ON THE LOW SIDE OF THE SPREADER AT THE STONE/GROUND INTERFACE OR AT THE TOP OF THE CONCRETE LIP. SPOT SHOTS SHALL BE TAKEN EVERY FIVE (5) FEET AND AT EACH END. THE LEVEL SPREADER SHALL BE CONSTRUCTED TO WITHIN 6" TO 8" OF THE DESIGN ELEVATION TO BE CONSIDERED AS HAVING ACCEPTABLE VERTICAL TOLERANCES.

5.2.75. Criteria For STRUCTURAL PRACTICES Specific Types of Facilities

Design criteria and operation and maintenance requirements for specific stormwater management practices shall be in accordance with approved methodologies as specified in the latest edition of the ~~Maryland Stormwater Design Manual, Volumes I & II Tables 4.3, 4.4 and 4.5~~ MDE DESIGN MANUAL and as follows ONLY AFTER ESD TO THE MEP HAS BEEN EXHAUSTED:

A. GENERAL DESIGN CRITERIA

- 1. ALL FACILITIES, EITHER PUBLIC OR PRIVATE, SHALL COMPLY WITH THE MOST RECENT EDITION OF MD-378. IF THE LIMITS AS SPECIFIED IN MD-378 ARE EXCEEDED, THEN APPROVAL IS REQUIRED FROM THE MDE. IN SOME CASES,

APPROVAL OF THE FACILITY BY THE MDE MAY BE REQUIRED IN ADDITION TO HSCD APPROVAL.

2. A POND BUFFER SHALL BE PROVIDED FOR ALL STORMWATER MANAGEMENT FACILITIES IN ACCORDANCE WITH THE CRITERIA SET FORTH IN THE MDE DESIGN MANUAL. THE MINIMUM DISTANCE FROM THE END OF THE OUTLET STRUCTURE, INCLUDING RIPRAP EXIT CHANNEL, OR EDGE OF AN UNDERGROUND FACILITY, TO THE DOWNSTREAM PROPERTY LINE SHALL NOT BE LESS THAN 25 FEET. ALONG OTHER PARTS OF THE FACILITY, THE MINIMUM DISTANCE FROM THE TOE OF EMBANKMENT OR TOP OF CUT TO THE PROPERTY LINES, PUBLIC EASEMENTS, RIGHTS-OF-WAY AND STRUCTURES SHALL BE 25'. FOR STRUCTURES ADJACENT TO THE FACILITY WHERE THE TOP OF CUT CANNOT BE DEFINED AND THE GRADING CONDITION ENCROACHES ONTO A RESIDENTIAL LOT, THE DISTANCE FROM THE 100-YEAR WATER SURFACE ELEVATION WITHIN THE FACILITY OR THE EDGE OF AN UNDERGROUND FACILITY SHALL BE 25' MINIMUM HORIZONTAL AND TWO (2) FEET MINIMUM VERTICAL TO THE LOWEST FLOOR ELEVATION OF A HABITABLE STRUCTURE.
3. THE DESIGN OF THE CONTROL STRUCTURE SHALL INCLUDE AN ANALYSIS OF BARREL VS. RISER CONTROL. THE TABLE IN FIGURE 5.01 CAN BE USED TO SUMMARIZE OUTFLOW DATA FOR THE CONTROL STRUCTURE.
4. ANTI-SEEP COLLARS OR FILTERS DIAPHRAGMS SHALL BE USED ON ALL STORMWATER MANAGEMENT FACILITIES AS REQUIRED BY MD-378. THE PHREATIC LINE SHALL BE ASSUMED AS BEING 4:1 FROM THE 10-YEAR DESIGN STORM ELEVATION.

IT IS THE RESPONSIBILITY OF THE DESIGN PROFESSIONAL TO OBTAIN THE CURRENT EDITION OF MD-378 FROM THE HOWARD SOIL CONSERVATION DISTRICT PRIOR TO THE DESIGN OF A STORMWATER MANAGEMENT FACILITY, AS THE MOST CURRENT EDITION SHALL GOVERN.

5. CONCRETE CRADLES SHALL BE PROVIDED BASED ON SCS TR-46, "A-2" CONCRETE CRADLE. MODIFICATIONS FOR MULTIPLE PIPES SHALL BE SHOWN ON THE DETAIL SHEET FOR CONSTRUCTION.
6. CUTOFF AND CORE TRENCHES SHALL BE REQUIRED FOR ALL FACILITIES IN ACCORDANCE WITH THE CURRENT MD-378 REQUIREMENTS. FOR THOSE FACILITIES NOT GOVERNED BY MD-378 [WITH AN EMBANKMENT OF 4' OR GREATER], CUTOFF AND CORE TRENCHES MAY ALSO BE REQUIRED. THE LIMITS OF THE CUTOFF AND CORE TRENCHES SHALL BE DETERMINED ON A CASE-BY-CASE BASIS BUT IN NO CASE SHALL BE LESS THAN 2 FEET.
7. A FLOATATION ANALYSIS SHALL BE REQUIRED FOR EACH CONTROL STRUCTURE. A FACTOR OF SAFETY OF 1.5 SHALL BE MAINTAINED FOR ALL STRUCTURES.
8. FOR PONDS WITH MAINTENANCE BENCHES, ALL STORM DRAIN OUTFALLS SHALL BE LOCATED BEYOND THE BENCH. THE BENCH MAY BE ELEVATED TO ALLOW FOR THE PIPE CROSSING WITH A TWO (2) FOOT MINIMUM COVER OVER THE PIPE.

9. FOR PONDS WITH PERMANENT POOLS, PROVIDE A HOOD, INVERTED ELBOW OR OTHER DEVICE OVER THE LOW FLOW ORIFICE OPENING TO PREVENT OILS AND OTHER FLOATABLE OBJECTS FROM LEAVING THE POND DURING LOW FREQUENCY STORM EVENTS. THE HOOD SHOULD EXTEND AT LEAST 12 INCHES BELOW THE SURFACE OF THE PERMANENT POOL. ADEQUATE CLEARANCE SHALL BE PROVIDED BELOW THE INVERTED ELBOW TO AVOID BLOCKAGE (MINIMUM ONE (1) FOOT).

IF IT CAN BE INCORPORATED INTO THE DESIGN, THE ELBOW OR HOOD SHOULD DRAW FROM THE BOTTOM 1/3 OF THE PERMANENT POOL TO PROVIDE FOR A COOLER DISCHARGE AND TO MINIMIZE THE EFFECTS OF THERMAL POLLUTION.

10. MAINTENANCE

- (A) A 12-FOOT WIDE LEVEL AREA SURROUNDING THE FACILITY PROVIDING DIRECT VEHICULAR ACCESS TO THE MAINTENANCE BENCH SHALL BE PROVIDED (LEVEL MEANS 3% OR LESS CROSS-SLOPE). THIS REQUIREMENT, THAT THE ACCESS AREA SURROUND THE FACILITY, MAY BE REDUCED TO A MINIMUM ONE-HALF OF THE FACILITY ONLY IF A TURNAROUND AREA IS PROVIDED NEAR THE EMBANKMENT AREA SUFFICIENT FOR MAINTENANCE VEHICLE MOBILITY (MINIMUM SIZE 30' X 30').
- (B) THE MAXIMUM ALLOWABLE ACCESS GRADE SHALL BE 10% ON GRASS AND 12% WITH CRUSHED STONE OR OTHER REINFORCED SURFACE.
- (C) THE MINIMUM ALLOWABLE ACCESS EASEMENT WIDTH SHALL BE 20 FEET. AT LEAST 12 FEET MUST BE CLEAR FOR VEHICULAR PASSAGE WITHOUT RIDING ON PATHWAYS UNLESS THE PATHWAY SECTION WILL ACCOMMODATE THE MAINTENANCE VEHICLES.
- (D) AN ON-SITE STOCKPILE AREA SHALL BE PROVIDED IN PROXIMITY TO THE MAINTENANCE ACCESS FOR TEMPORARY DRYING OF CLEANED OUT MATERIAL FROM THE POND BASIN. IT SHALL NOT BE LOCATED WITHIN NON-TIDAL WETLANDS AND/OR SAVED TREE AREAS. THE COUNTY RESERVES THE RIGHT TO REQUIRE MITIGATION OF WETLANDS AND/OR TREE SAVE AREAS THAT ARE DISTURBED DUE TO PLACEMENT OF THE ON-SITE MATERIAL.

IN LIEU OF PROVIDING AN ON-SITE STOCKPILE AREA, CLEANED OUT MATERIAL MAY BE TRANSPORTED OFF-SITE TO AN APPROVED STOCKPILE AREA. A NOTE TO THIS EFFECT SHALL BE PROVIDED ON THE PLANS AND INCLUDED IN THE OPERATION & MAINTENANCE SCHEDULE REQUIRED TO BE PLACED ON THE PLANS.

11. FENCING

COUNTY POLICY IS NOT TO FENCE STORMWATER MANAGEMENT FACILITIES EXCEPT AS DETERMINED BY THE DIRECTOR OF THE DEPARTMENT OF PUBLIC WORKS AND THE CHIEF, DEVELOPMENT ENGINEERING DIVISION. AT THE OPTION OF THE DEPARTMENT OF PUBLIC WORKS OR THE DEPARTMENT OF PLANNING & ZONING/DEVELOPMENT ENGINEERING DIVISION, FENCES OR LANDSCAPING MAY BE

REQUIRED WHEN A STORMWATER MANAGEMENT FACILITY IS ADJACENT TO SIDEWALKS, PATHWAYS, SCHOOLS, PLAYGROUNDS OR WHEN OTHER EXTENUATING CIRCUMSTANCES PREVAIL. MAINTENANCE OF THE FENCE OR LANDSCAPING SHALL REMAIN WITH THE PROPERTY OWNER AND NOT WITH THE COUNTY UNLESS OTHERWISE AGREED TO.

12. GEOTECHNICAL REQUIREMENTS

- (A) SOIL BORING INFORMATION SHALL BE OBTAINED FROM A MINIMUM OF TWO BORINGS ALONG THE CENTERLINE OF THE EMBANKMENT, ONE OF WHICH SHALL BE AT THE CONTROL STRUCTURE OR BARREL AND THE OTHER ONE AT THE EMERGENCY SPILLWAY, WITH AN ADDITIONAL BORING IN THE POOL AREA (MINIMUM TOTAL OF THREE BORINGS REQUIRED). THIS CAN BE DONE BY EITHER STANDARD PENETRATION TESTING OR TEST PITS.
- (B) PROVIDE SETTLEMENT ANALYSIS OF EMBANKMENT SLOPE FOR BOTH CONSTRUCTION AND RAPID DRAW DOWN CASES WHEN DEEMED NECESSARY BY THE APPROPRIATE DESIGN PROFESSIONAL.
- (C) BEARING STRENGTH (NUMBER OF BLOWS), SHALL BE REQUIRED FOR EMBANKMENT FOUNDATION BORINGS ONLY.

AB. Retention Ponds – Wet Basins (P-2 WET POND, P-4 MULTIPLE POND, P-5 POCKET POND)

Additional requirements for designs in Howard County consist of the following:

1. A forebay with a volume of 363 cft per acre of impervious cover within the drainage area shall be located at each inlet to the facility. This volume shall be in addition to the design storage volume required. The forebay may be located within the permanent pool area at the entrance to the facility. The required forebay volume shall not be included in the WQv required for sizing the permanent pool.
2. A maintenance bench shall be provided 1 foot above the normal pool elevation suitable for access for maintenance and emergency vehicles to serve as a safety feature. The bench shall have a minimum slope of two (2) percent toward the normal pool. The bench shall be 12' minimum width and may require stabilization with 6" of CR-6 or other accessible material as the vehicle access road leading to the outfall, inlet structure and forebay only. All other areas of the bench shall be stabilized with vegetation. Stabilization requirements shall be at the sole discretion of the county.
3. For wet ponds deeper than two (2) feet, an underwater bench shall be provided extending five (5) feet into the normal pool. The bench shall be flat or up to a two (2) percent grade and shall be 6" to 1' below the normal pool elevation and extend around the entire perimeter of the pool. This bench shall be planted with wetland vegetation to act as a physical barrier restricting access to the pool.

4. All wet ponds shall have drains located at or near the outlet structure with the valve stem anchored to the control structure and extending to the top of the riser for maintenance access. The drain shall be adequately sized to drain the pond within 24 hours under normal flow conditions.
5. For ponds with a micropool, the micropool shall be located at the control structure.
6. Maintenance Requirements
 - (a) Removal of sediment when accumulation exceeds 50% of the design storage volume. In forebays, removal of sediment when the accumulation exceeds 50% of the forebay volume.
 - (b) Removal of accumulated paper, trash and debris as necessary.
 - (c) Vegetation growing on the embankment top and faces of the forebay or basin is not allowed to exceed 18 inches in height at any time.
 - (d) Annual inspection and repair of the structure.
 - (e) Corrective maintenance is required any time a forebay does not drain within 60 hours (i.e., no standing water is allowed unless designed for).
 - (f) Maintenance of pond landscaping shall include replacement of dead or dying vegetation, as necessary.

BC. Extended Detention Ponds - WET (P-1 MICRO-POOL ED POND, P-3 WET ED POND, W-2 ED WETLANDS) OR DRY

Additional requirements for designs in Howard County consist of the following:

1. For extended detention ponds, the one-year frequency storm shall be detained for 24 hours. In essence, the detention time will be the difference between the center of mass of the inflow and outflow hydrographs. In the event that the analysis using the USDA-NRCS TR-20 computer hydrograph routing gives results that do not yield a 24-hour time difference, the county will consider that extended detention has been provided if the design methodology has been followed and the resulting detention time is no less than 18 hours. For Class III and IV waterways, the time difference shall be no less than 10 hours and no more than 12 hours.
2. The desirable minimum size of the low flow orifice shall be 3 inches. The absolute minimum orifice size shall be 1-1/2 inches with the appropriate orifice protection. The minimum diameter of the low flow pipe shall be 6 inches.
3. A forebay with a volume of 363 cft per acre of impervious cover within the drainage area shall be located at the inlet to the facility. This volume shall be in addition to the design storage volume required. The required forebay volume shall not be included in the required extended detention volume.

4. A safety bench 5 foot wide shall be placed one (1) to 1.5 feet below the designed Cpv control elevation. THE 5 FOOT SAFETY BENCH SHALL ALWAYS BE PROVIDED WITHIN THE MICRO-POOL AREA. The safety bench shall not be required for basins with extended detention depth averaging less than two (2) feet across the floor.
5. FOR MICRO-POOL AND ALL SHALLOW FACILITIES, A MAINTENANCE BENCH SHALL BE PROVIDED TO THE CONTROL STRUCTURE AND FOREBAY SUITABLE FOR ACCESS FOR MAINTENANCE AND EMERGENCY VEHICLES TO SERVE AS A SAFETY FEATURE. THE BENCH SHALL HAVE A MINIMUM CROSS SLOPE OF TWO (2) PERCENT TOWARD THE NORMAL POOL. THE BENCH SHALL BE 12' MINIMUM WIDTH AND MAY REQUIRE STABILIZATION WITH 6" OF CR-6 OR OTHER ACCESSIBLE MATERIAL AS THE VEHICLE ACCESS ROAD LEADING TO THE OUTFALL, INLET STRUCTURE AND FOREBAY ONLY. ALL OTHER AREAS OF THE BENCH SHALL BE STABILIZED WITH VEGETATION. STABILIZATION REQUIREMENTS SHALL BE AT THE SOLE DISCRETION OF THE COUNTY.

56. Maintenance Requirements

- (a) Removal of sediment when accumulation exceeds 30% of the design storage volume. In forebays, removal of sediment shall occur when the accumulation exceeds 50% of the forebay volume.
- (b) Removal of accumulated paper, trash and debris as necessary.
- (c) Vegetation growing on the embankment top and faces is not allowed to exceed 18 inches in height at any time.
- (d) Annual inspection and repair of the structure.
- (e) Corrective maintenance is required any time an extended detention basin does not drain within 60 hours (i.e., no standing water is allowed).
- (f) Corrective maintenance is required any time the forebay does not drain down completely within 60 hours (i.e., no standing water is allowed).
- (g) Maintenance of pond landscaping shall include replacement of dead or dying vegetation, as necessary.

CD. Detention Ponds – Dry Basins

All detention ponds shall be designed to conform to MD-378 criteria and these standards. ~~Dry detention ponds are not acceptable as stand alone water quality management practices for new developments.~~

1. Access shall be provided to the bottom of the pond at the control structure and to the forebay.

2. A forebay with a volume of 363 cft per acre of impervious cover within the drainage area shall be located at the inlet to the facility. This volume shall be in addition to the design storage volume required.
3. The bottom of the dry detention facility shall be at least 4 feet above any groundwater. Underdrain systems shall not be permitted which are used to drain groundwater from under the facility to meet this requirement.
4. Maintenance Requirements
 - (a) Removal of sediment when accumulation exceeds 30% of the design storage volume. In forebays, removal of sediment shall occur when the accumulation exceeds 50% of the forebay volume.
 - (b) Removal of accumulated paper, trash and debris as necessary.
 - (c) Vegetation growing on the embankment top and faces is not allowed to exceed 18 inches in height at any time.
 - (d) Annual inspection and repair of the structure.
 - (e) Corrective maintenance is required any time the forebay does not drain down completely within 60 hours (i.e., no standing water is allowed).
 - (f) Maintenance of pond landscaping shall include replacement of dead or dying vegetation, as necessary.

DE. Underground Facilities – Private Only F-2 UNDERGROUND SAND FILTER, UNDERGROUND QUANTITY CONTROL

Underground facilities are defined as the use of attenuation pipes, structures or other structural measures used to provide stormwater management ~~and/or water quality underground.~~

Underground stormwater management facilities shall be required to meet the following criteria:

1. Design Requirements
 - (a) Delineate the outfall or downstream storm drainage system.
 - (b) Delineate the extent of the underground facility. Label manhole locations allowing access for maintenance. An access manhole shall be provided at all corners and for each underground attenuation pipe. Access shall be outside of traveled areas and behind curb lines.
 - (c) Show the 100-year ponding and/or safe overflow pathways.

- (d) Show all utilities and maintain a 5' horizontal minimum distance away from the utilities and a 10' clearance from all utility easements.
- (e) Provide crossover connector pipes between storage pipes.
- (f) Provide a profile of the entire system with inverts, pipe sizes, pipe type and slopes indicated. A 0.5% slope is preferred in the attenuation facility to allow for positive drainage, however, a 0% slope is satisfactory.
- (g) Provide a 10-year Hydraulic Grade Line through the facility.
- (h) Provide details of the controls used for attenuation.
- (i) Provide a minimum of 48" diameter pipes for storage for ease of maintenance and inspection.
- (j) Provide gauge and corrugation size for metal pipes.
- (k) All access points shall be vented and be wide enough to accommodate maintenance personnel with breathing equipment.
- (l) Provide cross sections and plan view.
- (m) Provide watertight joints at all pipe connections (for reinforced concrete pipe, ASTM C-361, Rubber Gasket Pipe).
- (n) Provide a note on plan that all debris is to be kept out of the facility during and after construction.
- (o) Retention underground shall not be permitted.
- (p) Infiltration trenches shall not be allowed below the attenuation pipes.
- (q) The low-flow opening on the control structure must be protected with a trash rack.
- (r) All metal surfaces shall be galvanized and painted with two coats of battleship gray paint or equivalent.
- (s) The control structure shall be composed of the same material as the pipe attenuation facility.

2. Computations

- (a) Provide all structural computations and information for non-standard structures or modified structures. Computations shall include all reinforcing steel, span widths and other structural information necessary to determine loading factors. Structures must be designed to handle H-20 loading. The structural computations must be signed and sealed by an appropriate design professional licensed in the State of Maryland.

- (b) Anti-floatation analysis is required to check for buoyancy if the facility is located within groundwater as stipulated by the soil borings. Anchors shall be designed to counter buoyancy by at least 1.5 factor of safety.
 - (c) Inlet capacity computations for underground facilities must be shown that inlets are capable of handling the design storm use in the underground facility.
 - (d) The low-flow opening on the control structure must be protected with a trash rack computed as 3 times the area of the opening.
 - (e) Provide HGL computations and consider tailwater conditions if applicable.
3. All underground facilities shall have a pretreatment device to minimize sedimentation within the facility. The pretreatment device shall be cleaned as deemed necessary by manufacturer's recommendations or as specified on the required Operation & Maintenance Schedule. The underground facility shall be maintained in accordance with the specified Operation & Maintenance Schedule accordingly.

EF. Stormwater Management Retrofits

Stormwater management retrofit of any existing facility which is to be used to improve the management or treatment of stormwater runoff shall meet the following requirements:

- 1. For new development and redevelopment, stormwater management retrofits of any existing facility shall comply with the requirements of ~~Section 5.2.1~~ of this design manual.
- 3. For capital projects, stormwater management retrofits used to address the negative and inefficiencies of facilities designed in accordance with previous design standards, or new facilities used to improve stormwater management quantity or quality in watersheds where no facilities were previously utilized, the facilities shall be designed to meet ~~as much of the applicable design standards as possible~~-ESD TO THE MEP. The Department of Public Works shall determine the scope, intent and design standards of the work to be performed. Plans and computations shall state the intent of the retrofit design and show through descriptions, calculations, drawings or other information that the intent has been met to the maximum extent practical.

F. ~~Rain Gardens~~

- 1. ~~If disconnection of rooftop runoff or promotion of sheet flow into protected buffers will not provide stormwater management for the proposed construction, then using rain gardens is the preferred alternative for addressing stormwater requirements. Although physically constructed, rain gardens are considered a non-structural practice if the amount of impervious area treated by each is 1,000 sft or less. If the impervious area draining to each rain garden exceeds 1,000 sft,~~

~~then the rain garden shall be designated as a bioretention facility and shall be designed accordingly.~~

- ~~2. Rain gardens are small scale practices designed to treat stormwater by using planting soils and vegetation to filter runoff within shallow depressions. Rain gardens are versatile and may be used in areas with limited space. This method may be used as an alternative for the front yard, back yard or both areas with steep slopes, small lot sizes or other constraints, to provide adequate treatment of all proposed impervious surfaces.~~
- ~~3. In order to be considered for management of the WQv, the following requirements shall be met:
 - ~~(a) The maximum impervious area shall be 1,000 sft.~~
 - ~~(b) Rain gardens shall consist of the following components:
 - ~~1. A 2 1/2 to 4 ft. deep planting soil bed.~~
 - ~~2. A 3" surface layer.~~
 - ~~3. A maximum surface ponding depth of 12".~~~~
 - ~~(c) A minimum 4" perforated pipe underdrain in a gravel layer shall be provided. The underdrain shall be located at the invert of the rain garden and provide a non-erosive discharge to an acceptable outlet. The outlet shall not cross the lot line. Outlet protection may be required at the outlet location depending on velocity of the discharge and erosion potential of the soil.~~
 - ~~(d) The surface area of the rain garden shall be at least 7% of the contributing impervious area.~~
 - ~~(e) A landscaping plan that covers at least 50% of the surface area of the rain garden shall be provided. Native plants shall be required and be selected based on tolerance zones. The selection of trees or shrubs shall be indicated on the design plans and woody vegetation shall not be located at inflow locations.~~
 - ~~(f) The contributing drainage area shall be stabilized prior to installation.~~
 - ~~(g) The rain garden shall be located to prevent basement or foundation seepage, erosion or flooding of adjacent properties. A minimum setback from all structures shall be 10'~~~~
- ~~4. Rain gardens designed for Rev management shall have a Rev storage chamber located below the 4" underdrain pipe. Rain gardens used for Rev management shall not be located within steep slope areas or within fill areas.~~
- ~~5. A 2' buffer shall be maintained between the invert of the rain garden and the seasonably high ground water table.~~
- ~~6. A soil boring is required within 50' of each rain garden.~~

7. ~~Terraced rain gardens shall require a minimum 3' wide earthen embankment with a 3:1 side slope to the invert of the ponding area.~~
8. ~~Raingardens located on Single Family Detached (SFD) lots, managing only that lot's runoff must meet the following setbacks:~~
 - a. ~~The outfall shall be a minimum of 5' from any property line,~~
 - b. ~~Any edge of the facility shall be a minimum of 5' from any property line and 15' from any portion of the house or deck, and~~
 - c. ~~The facility shall not be located in any easement or landscape buffer area.~~

G. Dry Wells

~~Dry wells shall conform to the same feasibility criteria as infiltration facilities. The limitations shall consist of:~~

1. ~~Dry wells shall not be located on slopes greater than 15% or within fill areas.~~
2. ~~Dry wells shall be prohibited within areas of karst topography.~~
3. ~~Dry wells shall be separated by at least four vertical feet from seasonably high groundwater table or bedrock layer documented by onsite soil testing.~~
4. ~~Dry wells shall be located a minimum 100 feet horizontally from any water supply well.~~
5. ~~Dry wells shall not be placed in locations that cause water problems to downgrade properties.~~
6. ~~Dry wells shall be placed at least 10 feet down grade from any structure.~~
7. ~~Dry wells shall have a maximum impervious drainage area of 500 sft.~~

H. Infiltration Trenches

~~Infiltration trenches shall conform to the feasibility criteria as specified in the Stormwater Design Manual, Volumes I & II.~~

I. Micropool ED

~~For all micropool ED facilities, the surface area of the micro pool shall be 1% of the drainage area to the facility and shall conform to the requirements of the Stormwater Design Manual, Volumes I & II.~~

J. Open Channel Systems

~~For all open channel systems, in order to qualify for the Grass Channel Credit, the swale or channel shall be located in cut areas only and conform to the requirements of the Stormwater Design Manual, Volumes I & II. In addition the following criteria shall be met:~~

- ~~1. All open channel systems serving more than one lot and being used to meet stormwater management criteria shall be placed within HOA owned Open Space or be within a public right of way.~~
- ~~2. The centerline of all open channel systems shall be located a minimum 25' from any residential structure. The open channel system shall be designed to convey the stormwater runoff from a 10-year frequency storm event.~~

~~K. Bioretention Facilities~~

~~Bioretention facilities shall conform to the feasibility criteria as specified in the Stormwater Design Manual, Volumes I & II. In addition the following criteria shall be met:~~

- ~~1. The maximum embankment fill side slopes shall not exceed 3:1.~~
- ~~2. A minimum of one (1) tree and two (2) shrubs per 50 sft shall be provided with the facility landscaping.~~
- ~~3. The landscaping for the facility shall cover at least 50% of the surface area.~~
- ~~4. Bioretention facilities located on Single Family Detached (SFD) lots, managing only that lot's runoff must meet the following setbacks:~~
 - ~~a. The outfall shall be a minimum of 5' from any property line,~~
 - ~~b. Any edge of the facility shall be a minimum of 5' from any property line and 15' from any portion of the house or deck, and~~
 - ~~c. The facility shall not be located in any easement or landscape buffer area.~~

~~L. Level Spreaders~~

~~Level Spreaders can be used to meet the Sheet Flow to Buffer Credit under the following:~~

- ~~a. The purpose of a level spreader is to create a sheet flow condition when the average slope of 5% has been exceeded within the contributing area that is to receive the credit. Maximum contributing flow lengths to the device shall be in accordance with MDE Stormwater Manual, Section 5.4[3].~~
- ~~b. The level spreader shall be constructed with the top of the device at an equal elevation at all points along the length of the device.~~

- e. ~~Unlike MDE Section, 5.4[3], the spreader device shall be located on the residential property, outside the buildable lot area. The device shall not cross property lines.~~
- d. ~~The level spreader may be constructed in accordance with MDE Appendix D.8. or may be constructed by a 2' wide by 1.5' deep trench filled with clean, washed stone (1.5"–2.5" BRG preferred) lined with filter fabric on all sides and bottom of the trench.~~
- e. ~~A detail of the level spreader with material specifications shall be provided on the plans.~~
- f. ~~The level spreader shall be installed after the contributing site has been stabilized unless filter fabric is placed over the device immediately after construction to divert sediment from entering the device. After the site has been stabilized and with the inspector's approval, the fabric may be removed.~~
- g. ~~Maintenance shall be performed on the level spreader when sediment is visually apparent within the stone voids. The portion of the stones that are affected shall be removed and replaced with clean stone.~~
- h. ~~The level spreader device shall be located both horizontally and vertically on the as-built grading certificate. Elevations shall be taken on the low side of the spreader at the stone/ground interface or at the top of the concrete lip. Spot shots shall be taken every five (5) feet and at each end. The level spreader shall be constructed to within 6" to 8" of the design elevation to be considered as having acceptable vertical tolerances.~~

~~M. Stream Restoration and Stabilization~~

~~Upon written approval by the Department of Planning and Zoning and/or the Department of Public Works, stream restoration and/or stabilization may be considered as an alternative to meet stormwater management requirements to mitigate for downstream impacts due to changes in stormwater hydrology as a result of proposed or existing development.~~

~~1. Minimum Design Requirements~~

- (a) ~~All stream restoration or stabilization project designs shall be based on selection of channel width, depth, slope and hydraulic roughness and a stream channel plan form such that the designed channel will pass incoming sediment load without significant degradation or aggradation.~~
- (b) ~~All stream restoration or stabilization project designs shall be based on the dominant discharge or channel sizing storm discharge rate.~~
- (c) ~~The cross-sectional area for the dominant discharge for each proposed reach section shall remain the same from existing conditions to proposed conditions.~~

- ~~(d) — The 100 year floodplain elevation along the stream reach to be restored or stabilized cannot increase from existing conditions to proposed conditions.~~
- ~~(e) — Proposed structures shall not be placed in an existing or proposed public utility easement.~~
- ~~(f) — All state and local permits shall be obtained by the applicant.~~
- ~~(g) — A Subdivision Waiver shall be approved for disturbance or fill in the floodplain, stream, wetland and associated buffers prior to approval of a stream restoration or stabilization project.~~
- ~~(h) — Proposed stream stabilization and restoration techniques shall be in accordance with most recently adopted Maryland Department of the Environment, Water Management Administration Waterway Construction Manual.~~
- ~~(i) — Acceptable stabilization techniques include, but are not limited to, imbricated riprap, gabions, riprap, vortex rock weirs, rock veins, j hooks, live stakes, live fascines, biologs, step pools, erosion control matting and root wads.~~
- ~~(j) — All stream restoration or stabilization designs shall incorporate in stream aquatic and riparian habitat enhancement.~~

~~2. — Minimum Plan Submission Requirements~~

- ~~(a) — Computations shall be provided for all stream restoration or stabilization projects and shall include:

 - ~~1. — sheer stress analysis;~~
 - ~~2. — field analysis results used to determine dominant discharge WSEL;~~
 - ~~3. — determination of design storm;~~
 - ~~4. — stream stabilization techniques selection table; and~~
 - ~~5. — a scour depth estimation.~~~~
- ~~(b) — A design plan with reach locations clearly marked shall be provided for all stream restoration or stabilization projects and shall include:

 - ~~1. — denotation of the existing stream channel thalweg;~~
 - ~~2. — denotation and station proposed stream channel thalweg;~~
 - ~~3. — labels and identification of all stream reaches;~~~~

- ~~4. denotation and labeling of floodplain cross sections with existing and proposed 100-year WSEL's;~~
 - ~~5. denotation of dominant discharge boundary;~~
 - ~~6. identification of location and type of proposed channel stabilization;~~
 - ~~7. identification of existing storm drain and utilities;~~
 - ~~8. denotation of existing public and/or private easements with recording reference;~~
 - ~~9. labeling of property lines and ownership within the vicinity of the project;~~
 - ~~10. provide field surveyed topography at minimum 2' contours with spot elevations where appropriate;~~
 - ~~11. delineation of existing and proposed floodplain;~~
 - ~~12. denotation of existing and/or proposed floodplain easement with recording reference;~~
 - ~~13. a drainage area map;~~
 - ~~14. thalweg geometry with inside and outside meander curve data;~~
 - ~~15. a proposed sediment and erosion control plan; and~~
 - ~~16. a proposed landscaping plan, planting details and plant schedules.~~
- ~~(c) Profiles, sections and typical details shall be provided in the plans and shall include:~~
- ~~1. typical details with dimensions for all proposed stabilization techniques;~~
 - ~~2. a stream channel profile showing existing and proposed top of bank, channel invert and dominant discharge WSEL, location of all proposed stabilization techniques; and~~
 - ~~3. cross section details at each cross over reach and meander bend showing existing and proposed topography, dominant discharge WSEL, and stream thalweg.~~

5.3 PLATS AND PLANS

5.3.1 Plats

All subdivision plats shall clearly indicate easements, lots and parcels, which are dedicated for stormwater management facilities and their access roads. A note shall be provided in the general Notes on the plat indicating how stormwater management has been provided for.

5.3.2 Stormwater Management Plans and Computations

The stormwater management documents shall contain supporting computations, drawings and sufficient information describing the manner, location and type of measures in which stormwater runoff will be managed for the entire development. The appropriate checklist shall be used to develop the stormwater management documents and shall be submitted with the construction drawings. The current checklists can be obtained from the Department of Public Works and/or the Department of Planning & Zoning/Development Engineering Division.

5.3.2.A REVIEW AND APPROVAL OF STORMWATER MANAGEMENT PLANS

FOR ANY PROPOSED DEVELOPMENT, THE OWNER/DEVELOPER SHALL SUBMIT MULTI-STEP STORMWATER MANAGEMENT PLANS TO HOWARD COUNTY FOR REVIEW AND APPROVAL. EACH PLAN SUBMITTAL SHALL INCLUDE THE MINIMUM CONTENT SPECIFIED IN THE HOWARD COUNTY CODE.

HOWARD COUNTY MAY GRANT AN ALTERNATIVE COMPLIANCE BY VARIANCE OR WAIVER TO THE STORMWATER MANAGEMENT CRITERIA IN ACCORDANCE WITH THE GUIDELINES SET FORTH IN THE HOWARD COUNTY CODE SECTION 18, SUBTITLE 9.

~~An Operation and Maintenance (O&M) schedule shall be included on the construction plans for all stormwater management and water quality facilities regardless of whether the facilities are to be publicly owned and maintained, privately owned and maintained or privately owned and jointly maintained. The specific responsibilities of each entity shall be outlined in the Operation and Maintenance Schedule.~~

~~A design summary for each facility shall be provided on the design drawings in addition to being included in the computations. The summary shall include the facility identification, type of facility, drainage area to the facility, invert elevation, water surface elevations, storage volumes at each water surface elevation, inflow and outflow for each design storm, top of dam elevation, riser type and material, principal spillway type, size and material, emergency spillway size, type and material, groundwater recharge (Re_v), WQ_v , Cp_v , over bank flood protection (Q_t) and maintenance responsibility. The county reserves the right to add to or delete from the required summary information to be included on the plans.~~

5.4 MAINTENANCE AND INSPECTION

5.4.1 Maintenance

Maintenance shall be according to the provisions specified in the current edition of the Maryland Stormwater Design Manual, Volumes I & II and this design manual for each specific type of stormwater management system.

5.4.2 Inspection

A. Inspection Schedule and Reports

1. The developer shall notify the county at least 48 hours before commencing any work in conjunction with the stormwater management plan and upon completion of a project when a final inspection will be conducted.
2. ~~Inspections shall be conducted by the Department of Public Works or its authorized representative. Written inspection reports shall be made of the periodic inspections necessary during construction of stormwater management systems to ensure compliance with the approved plans.~~REGULAR INSPECTIONS SHALL BE MADE AND DOCUMENTED FOR EACH ESD PLANNING TECHNIQUE AND PRACTICE AT THE STAGES OF CONSTRUCTION SPECIFIED IN THE DESIGN MANUAL BY HOWARD COUNTY, ITS AUTHORIZED REPRESENTATIVE, OR CERTIFIED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF MARYLAND. AT A MINIMUM, ALL ESD AND OTHER NONSTRUCTURAL PRACTICES SHALL BE INSPECTED UPON COMPLETION OF FINAL GRADING, THE ESTABLISHMENT OF PERMANENT STABILIZATION, AND BEFORE ISSUANCE OF USE AND OCCUPANCY APPROVAL.
3. Written inspection reports shall include:
 - (a) Date and location of the inspection;
 - (b) Whether construction was in compliance with the approved stormwater management plan;
 - (c) Any variations from the approved construction specifications; and
 - (d) Any violations that exist.
4. The owner/developer and on-site personnel shall be notified in writing when violations are observed. Written notification shall describe the nature of the violation and the required corrective action.
5. No work shall proceed until the county inspects and approves the work previously completed and furnishes the developer with the results of the inspection reports after completion of each required inspection.

B. Inspection Requirements During Construction

1. At a minimum, regular inspections shall be made and documented at the following specified stages of construction:
 - (a) Ponds
 - (i) upon completion of excavation to sub-foundation and when required, installation of structural supports or reinforcement for structures, including but not limited to core trenches for structural

embankments, inlet and outlet structures, anti-seep collars or filter diaphragms, watertight connectors on pipes and trenches for enclosed storm drain facilities;

- (ii) during placement of structural fill, concrete and installation of piping and catch basins;
 - (iii) during backfill of foundation and trenches;
 - (iv) during embankment construction; and
 - (v) upon removal of any temporary sediment control feature or devices; and
 - (vi) upon completion of final grading and establishment of permanent stabilization.
- (b) Wetlands
- (i) at stages specified for pond construction;
 - (ii) during and after wetland reservoir plantings; and
 - (iii) during the second growing season to verify a vegetation survival rate of at least 50 percent.
- (c) Infiltration trenches
- (i) during excavation to subgrade;
 - (ii) during placement of backfill of underdrain systems and observation wells;
 - (iii) during placement of geotextiles and all filter media;
 - (iv) during construction of appurtenant conveyance systems such as diversion structures, pre-filters, filters, outlets and flow distribution structures; and
 - (v) upon completion of final grading and establishment of permanent stabilization.
- (d) Infiltration basins
- (i) at stages specified for pond construction; and
 - (ii) during placement and backfill of underdrain system.
- (e) Filtering systems

- (i) during excavation to subgrade;
 - (ii) during placement and backfill of underdrain system;
 - (iii) during placement of geotextiles and all filter media;
 - (iv) during construction of appurtenant conveyance systems such as diversion structures, pre-filters, filters, outlets and flow distribution structures; and
 - (v) upon completion of final grading and establishment of permanent stabilization.
- (f) Open channel systems
- (i) during excavation to subgrade;
 - (ii) during placement and backfill of underdrain systems for dry swales;
 - (iii) during installation of diaphragms, check dams, or weirs; and
 - (iv) upon completion of final grading and establishment of permanent stabilization.
- (g) Non-structural practices
- (i) upon completion of final grading;
 - (ii) upon the establishment of permanent stabilization; and
 - (iii) before the issuance of the final certificate of occupancy approval.
2. The county shall enforce the design plans in accordance with procedures stipulated by the County Code.
 3. Once construction is complete, an as-built plan certification shall be submitted by the appropriate design professional licensed in the State of Maryland to ensure that constructed stormwater management practices and conveyance systems comply with the specifications contained in the approved plans. At a minimum, as-built certification shall include a set of drawings comparing the approved stormwater management plan with what was constructed. The county reserves the right to require additional information it deems necessary to ensure compliance with the approved plans.
 4. The county shall submit notice of construction completion to the Maryland Department of the Environment, on a form supplied by MDE for each structural stormwater management practice within 45 days of construction completion. If

BMP's requiring HSCD approval are constructed, notice of construction completion shall also be submitted to HSCD.

C. ~~Maintenance Inspection~~

- ~~1. The Department of Public Works shall ensure that preventative maintenance is performed by inspecting all stormwater management systems during the first year of operation and at least every 3 years thereafter. The Department of Public Works shall notify in writing any property owner of any deficiencies in the stormwater management system that are found during the inspections pursuant to the criteria set forth in this design manual.~~
- ~~2. Inspection reports shall be maintained by the county for all stormwater management systems.~~
- ~~3. Inspection reports for stormwater management systems shall include the following:
 - ~~(a) The date of the inspection;~~
 - ~~(b) Name of inspector;~~
 - ~~(c) The condition of: all items in the current Department of Public Works
Inspection Checklist;~~
 - ~~(d) Description of needed maintenance.~~~~

5.5 ~~ALTERNATIVE COMPLIANCE AND WAIVERS~~

5.5.1 ~~Alternative Compliance~~

~~The Department of Public Works, may grant an alternative compliance of the stormwater management requirements for capital projects and the Department of Planning & Zoning/Development Engineering Division, may grant an alternative compliance of the stormwater management requirements for individual developments with site development or subdivision plans if the applicant can demonstrate with descriptions, drawings and any other information that the proposed development will not cause an adverse impact on the quantity or quality of runoff from that property, and receiving waters. Separate alternative compliance requests shall be required for any subsequent addition or extension to or modification of a development receiving an alternative compliance approval.~~

- ~~A. Stormwater management quantitative control alternative compliance requests shall be granted only to those projects within areas where watershed management plans have been developed consistent with section 18.902(D)(5) of the Howard County code, or per provisions below.~~
- ~~B. If watershed management plans consistent with section 18.902(D)(5) of the Howard County code have not been developed, then stormwater management quantitative control alternative compliance may be granted to projects that:~~

- ~~1. The 1-year post-development peak discharge rate is less than or equal to 2 cfs; or~~
 - ~~2. The county determines that circumstances exist that prevent the reasonable implementation of quantity control practices.~~
- ~~C. Stormwater management qualitative control alternative compliance apply only to:~~
- ~~1. Development projects where stormwater management implementation is not feasible;~~
 - ~~2. Redevelopment projects if the requirements of Section 18.902(G) of the Howard County code are satisfied; or~~
 - ~~3. Sites where the county determines that circumstances exist that prevent the reasonable implementation of quality control practices.~~
- ~~D. Granting of an Alternative Compliance shall:~~
- ~~1. Be on a case-by-case basis;~~
 - ~~2. Consider the cumulative effect of the county alternative compliance policy;~~
 - ~~3. Reasonably ensure that the development will not adversely impact stream quality; and~~
- ~~E. A watershed management plan developed for the purpose of implementing stormwater management policies for alternative compliance and redevelopment shall:~~
- ~~1. Include detailed hydrologic and hydraulic analyses to determine hydrograph timing;~~
 - ~~2. Evaluate both quantity and quality management;~~
 - ~~3. Include cumulative impact assessment of watershed development;~~
 - ~~4. Identify existing flooding and receiving stream channel conditions;~~
 - ~~5. Be conducted at a reasonable scale;~~
 - ~~6. Specify where on-site or off-site quantitative and qualitative stormwater management practices are to be implemented;~~
 - ~~7. Be consistent with the general performance standards for stormwater management in Maryland found in Section 1.2 of the Maryland Stormwater Design Manual, Volumes I & II;~~
 - ~~8. Be approved by the Maryland Department of the Environment.~~

5.5.2 Waivers

~~The Department of Public Works, in the case of capital projects, and the Department of Planning & Zoning/Development Engineering Division, in the case of developments with site development or subdivision plans, may consider granting a written waiver for relinquishment from or modifications to any requirement of this design manual if the applicant can demonstrate with clear and convincing descriptions, drawings, calculations and other information that there are exceptional circumstances applicable to the site such that compliance with the provisions of this design manual will result in the removal of reasonable use of the property.~~

~~Waivers may be considered, on a case-by-case basis, where the county determines circumstances exist that prevent reasonable implementation of quantity or quality control practices and a fee in-lieu of providing stormwater management is not applicable in the case of quantity management. Waivers may be approved in part or in whole, with or without conditions, subject to clear and convincing demonstration by the applicant that all reasonable alternatives have been investigated. Any subsequent addition to or modification of a development receiving a waiver approval shall require a re-evaluation of the original waiver approval.~~

REFERENCES

1. Maryland Department of the Environment, Water Management Administration, Stormwater Design Manual, Volume I & II, latest edition.

FIGURES

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Figure 5.03

Stormwater Management Ownership & Maintenance Responsibility

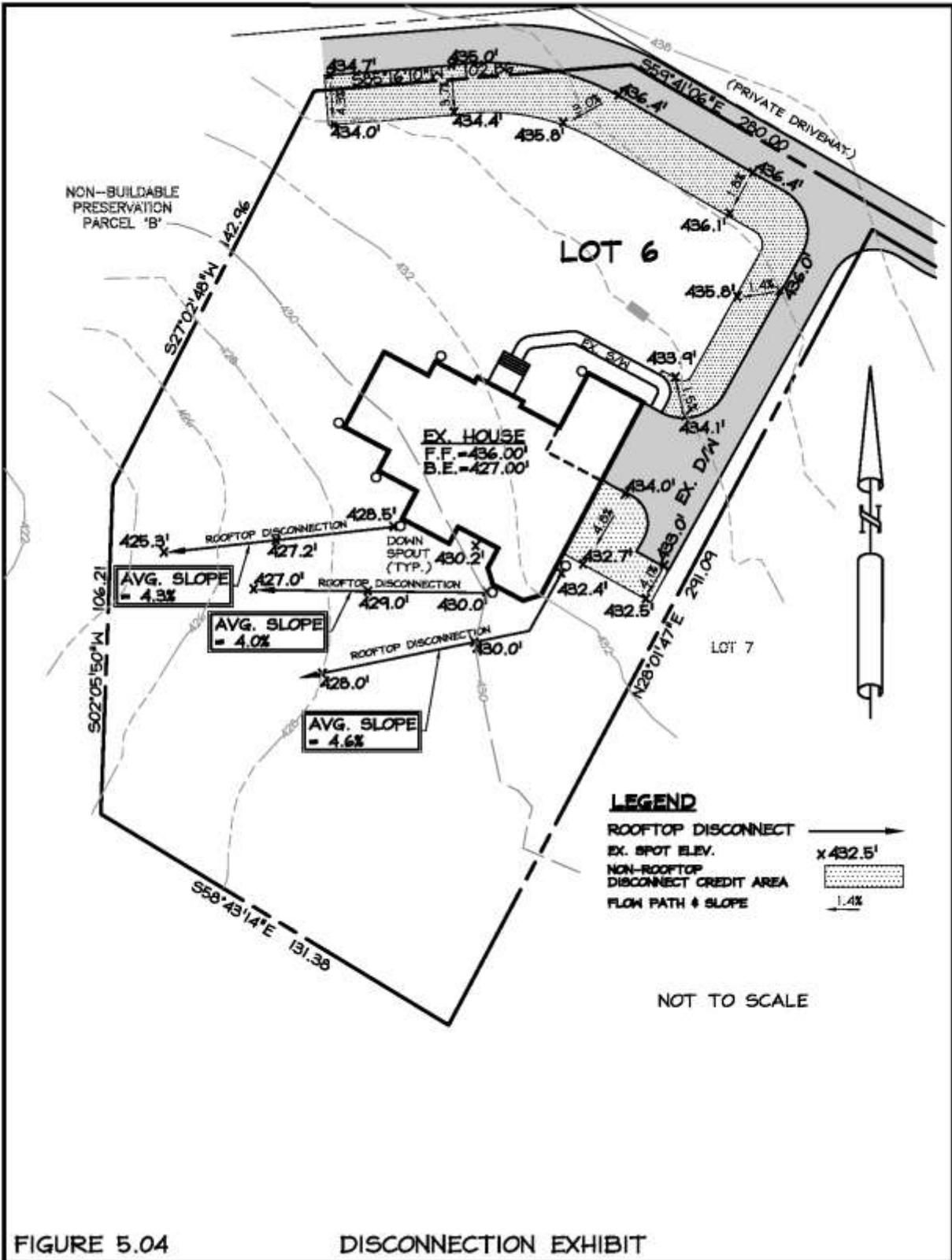
SWM Code	BMP Type	County Ownership & Maintenance Responsibility	Private Ownership & Maintenance Responsibility
P-1	Micro pool ED	Y/ All except Landscaping & Plantings	S/ Landscaping & Plantings or, Y/all
P-2	Wet Pond	Y/ All except Landscaping & Plantings	S/ Landscaping & Plantings or, Y/all
P-3	Wet ED Pond	Y/ All except Landscaping & Plantings	S/ Landscaping & Plantings or, Y/all
P-4	Multiple Pond	Y/ All except Landscaping & Plantings	S/ Landscaping & Plantings or, Y/all
P-5	Pocket Pond	Y/ All except Landscaping & Plantings	S/ Landscaping & Plantings or, Y/all
W-1	Shallow Wetland	Y/ Embankment, Riser, Mucking	S/ Landscaping & Plantings or, Y/all
W-2	ED Wetland	Y/ Embankment, Riser, Mucking	S/ Landscaping & Plantings or, Y/all
W-3	Pocket/Wetland	Y/ Embankment, Riser, Mucking	S/ Landscaping & Plantings or, Y/all
W-4	Pocket Wetland	Y/ Embankment, Riser, Mucking	S/ Landscaping & Plantings or, Y/all
I-1	Infiltration Trench	N	Y/All
I-2	Infiltration Basin	N	Y/All
F-1	Surface Sand Filter	N/ if Cpv not provided in facility Y/ with Cpv, Dam only	Y/All Y/Sand Filter and Underdrain
F-2	Underground Sand Filter	N	Y/Observation well, No PVC, Lock cap
F-3	Perimeter Sand Filter	N	Y/All
F-4	Organic Filter	N	Y/All
F-5	Pocket Sand Filter	N	Y/All
F-6	Bioretention	N	Y/All
O-1	Dry Swale	N	Y/All
O-2	Wet Swale	N	Y/All
A-1	GREEN ROOFS	N	Y/ALL
A-2	PERMEABLE PAVEMENTS	N	Y/ALL
A-3	REINFORCED TURF	N	Y/ALL
N-1	DISCONNECTION OF ROOFTOP RUNOFF	N	Y/ALL
N-2	DISCONNECTION OF NON-ROOFTOP RUNOFF	N	Y/ALL
N-3	SHEETFLOW TO CONSERVATION AREAS	N	Y/ALL
M-1	RAINWATER HARVESTING	N	Y/ALL
M-2	SUBMERGED GRAVEL WETLANDS	N	Y/ALL
M-3	LANDSCAPE INFILTRATION	N	Y/ALL
M-4	INFILTRATION BERMS	N	Y/ALL
M-5	DRY WELLS	N	Y/ALL
M-6	MICRO-BIORETENTION	Y/ ALL EXCEPT LANDSCAPING,	Y/ALL

		MULCH& PLANTINGS	
M-7	RAIN GARDENS	N	Y/ALL
M-8	SWALES	Y/ ALL EXCEPT LANDSCAPING, MULCH & PLANTINGS	Y/ALL
M-9	ENHANCED FILTERS	N	Y/ALL

Note: Y = Yes
N = No
S = Shared

General Notes:

- 1 No public facility on Private Opens Space lots.
- 2 Landscaping costs for the BMP shall be added to the pond bond amount.
- 3 All SWM facilities on Commercial sites shall be Privately Owned and Maintained
- 4 SWM facilities on residential lots shall treat only that lot.
- 5 For Bioretention and other facilities on lots, no easements will be required, however, a maintenance agreement and a note on the Record Plat shall be required for continual ownership and maintenance.
- 6 The on-lot private SWM shall become part of the builder grading certification required for the U&O.



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