FINAL STORMWATER MANAGEMENT PLAN REVIEW CHECKLIST

STRUCTURAL BMPs (MD-378 ONLY)

(Please return this Checklist with each re-submission)

LEGEND: ✓ ACCEPTABLE X NOT ACCEPTABLE
R REQUIRED, NOT SUBMITTED NA NOT APPLICABLE
INC INCOMPLETE NC NOT CHECKED

Stormwater management design shall be based on the following:
1. Baltimore County Code, Article 33, Title 4, Stormwater Management:
4. All proposed stormwater management facilities are to be privately owned and maintained.
5. All sites within the Gwynns Falls, Jones Falls and Herring Run watersheds require 100-yr stormwater management.

I. SUBMISSION DOCUMENTS

   ✓ 1. Two (2) copies of Final SWM Plans.
   ✓ 2. Two (2) copies of Final SWM Report.
   ✓ 3. One (1) copy of Geotechnical Report.

Note: All submissions have to go to Permits, Approvals and Inspections (PAI). Please contact PAI and Baltimore County Soil Conservation District concerning separate submittal requirements.

II. PLAN REQUIREMENTS

   ALL PLANS SHALL BE ON 24” x 36” OR 30” x 42” SHEETS. 36” x 48” ARCHITECTURAL PLAN SHEETS MAY BE ALLOWED WITH PRIOR APPROVAL ONLY.

   A. Standard Title and Signature Blocks (all sheets)

      ✓ 1. Owner/Developer name, address and phone number.
      ✓ 2. Design Professional name, address, phone number and email.
      ✓ 3. Project name, address, election and councilmanic districts.
      ✓ 4. Plan scale, date and sheets numbered.
5. Maryland Coordinate System (MCS) should be indicated in the lower right corner of each sheet.

B. Vicinity Map Requirements (first sheet only)

1. Scale: 1” = 1,000’ (max.) with north arrow.
2. Benchmark(s) described and location(s) shown on map.
3. Site delineated.

C. Certifications and Stamps

1. Design Professional’s seal, signature and professional certification on each sheet including note regarding Phase I of development process, i.e., “This Plan is Sealed and Certified as being in accordance with the approved Development Plan”. (This note is not applicable to Minor subdivisions, or projects that have an “A” exemption from the DRC).
2. SWM certifications must be placed on plans as shown at the link below: (http://resources.baltimorecountymd.gov/Documents/Environment/SWM/swmcerts.pdf)
   a. Engineer's certification.
   b. Landowner’s / Developer's certification.
   c. Consultant’s hazard class certification.
   d. As-built certification.
   e. Contractor’s as-built note.
3. SWM stamps must be placed on plans as shown at the link below: (http://resources.baltimorecountymd.gov/Documents/Environment/SWM/swmstamps.pdf)

D. General Notes (first sheet only)

1. Unless otherwise noted, all construction and workmanship shall be in accordance with:
2. Stormwater management approved under Bill No. 25-10.
3. Ownership and maintenance responsibility of SWM facilities.
4. A state permit is required for this project.

E. Base and Topographic Information

1. Onsite existing contours labeled with legible lettering (at no greater an interval than 2’). Note: Field run topography is required within limit of disturbance.
2. Offsite topography (at no greater an interval than 2’) extending a min. of 100’ beyond the property boundaries or drainage area delineations. Note: Baltimore County GIS may be used.
3. Existing features, trees, buildings, pavement, utilities with size, etc. shown and labeled where appropriate.
4. Lines/line weight and symbols used are defined in legend and follow the standard plates C-A and C-B as found in the DPW Baltimore County Design Manual.
5. North arrow.
6. Minimum three (3) grid ticks.
F. **Existing Drainage Area Map**

1. Location of existing impervious areas (buildings, roadways, parking and sidewalks, etc.) shown; preferably shaded.
2. Overall drainage area and sub-areas clearly delineated.
3. Time of concentration paths clearly shown.
4. Drainage areas shown with acreage, RCN and time of concentration.
5. Design point clearly labeled.
6. Existing ground cover (woods, lawn, gravel, etc.) clearly labeled.
7. If natural drainage patterns within site are not clearly depicted by topographic information, provide flow arrows etc. that show drainage patterns.
8. Soil lines and hydrologic soils groups shown on the map and summarized in table format.

G. **Proposed Drainage Area Map**

1. Proposed limits of clearing and grading (LOD) shown legibly.
2. Location of proposed impervious areas (buildings, roadways, parking and sidewalks, etc.) shown; preferably shaded.
3. Overall drainage area and sub-areas clearly delineated.
4. Time of concentration paths clearly shown, if applicable.
5. Drainage areas shown with acreage, RCN and time of concentration.
6. Design point clearly labeled and matches the one shown on the existing drainage area map.
7. BMP(s) shown and labeled with corresponding outfall(s) indicated.
8. Location of proposed utilities with size where applicable.
9. Soil lines and hydrologic soils groups shown on the map and summarized in table format.
10. Pond design summary table must be placed on plan as shown at the link below: [swmsummarytablessbmps.pdf](http://resources.baltimorecountymd.gov/Documents/Environment/SWM/swmsummarytablessbmps.pdf)
11. Pond specifications table must be placed on plan as shown at the link below: [swmsummarytablessbmps.pdf](http://resources.baltimorecountymd.gov/Documents/Environment/SWM/swmsummarytablessbmps.pdf)
12. Final design of 100-year stormwater management, if required.

H. **Plan Views**

1. Scale at 1” = 50’ or less; preferably at 1”=20’ or 1”=30’.
2. Existing and proposed contours are labeled legibly (1’ or 2’ interval).
3. Reflect positive drainage across pond bottom @ 0.5% min.
4. If required, show the proposed topography of the emergency spillway.
5. Proposed contours tying into existing at or beyond property line will require temporary construction easements off-site.
6. Interior slope within SWM facility labeled with directional arrow.
7. All Incoming drains, swales and channels are shown with methods of stabilization. (DPW S.D.2009 32 & 33)
8. Barrel outlet shown and outlet protection dimensioned.
9. Property lines, property owners (name, lot # and Liber/Folio). Streams, wetlands, forest buffers, flood plain, existing and proposed easements shown (including acreage).
10. Stationing along centerline of embankment.
11. A fence with a height of forty-two inches is required for all facilities with interior slopes steeper than 4:1. Provide 4’ ledge @ 4:1 slope around interior of fence. All fencing shall be black, vinyl coated chain link fence, unless otherwise approved by this department.
12. Access road to SWM area. Swing gate required. (18’ width on direct access, 24’ wide on skewed access)
13. Access ramp to bottom of pond @ 5:1 max. slope.
14. Utilities, private and public shown (drawing number if available).
15. Delineate boundary for no woody vegetation zone. No trees or shrubs allowed within 15’ of the toe of slope near a constructed pond embankment or within 25’ of the control structure.
16. Location of soil borings shown on plan with boring logs provided.

I. Principal spillway profile, cross section of dam:

1. Existing ground.
2. Proposed ground, constructed and settled (side slopes, 6’ minimum top width).
3. Cut-off trench:
   a. 4’ minimum depth below concrete cradle for barrel.
   b. Four feet minimum bottom width.
   c. Side slopes, 1:1.
4. Impervious core:
   a. Top at or above 10-yr WSEL (may be higher if it is a sediment basin)
   b. Four feet minimum top width.
   c. Side slopes, 1:1.
5. Geotechnical engineer note regarding depth of cutoff trench.
6. Riser:
   a. Dimensions, material.
   b. No barrel pipe exposed.
   c. Provisions for watertight seal between barrel and pre-cast concrete riser.
   d. Reinforcing steel detailed and dimensioned.
7. Trash rack.
8. Riser base shown and dimensioned.
9. Low flow or dewatering device component:
   a. Diameter.
   b. Material.
   c. Gage with corrugation size.
   d. Length and stations. (20’ min. length)
   e. Trash rack or stone cover.
   f. Perforated vertical stack 3’ min. above pond bottom.
   g. Horizontal pipe anchored w/ crown level w/ pond bottom
   h. Watertight seal for the orifice plate inside of the control structure
10. Barrel pipe:
    a. Diameter.
    b. ASTM C-361, unless otherwise approved by DEPS*
       *(Refer to MD-378-13 Table 5, for private facilities).
    c. Length and stations.
    d. Slope.
    e. Saturated length.
    f. Concrete cradle for concrete pipe.
    g. Multiple pipe spacing.
    h. Manning’s "n" value.
    i. Design Q's with velocities.
11. Phreatic line - start at the riser crest or 10-year water surface elevation, whichever is higher extending 4H:1V to barrel, pipe invert. The phreatic line cannot daylight the embankment.
12. Seepage control
    a. Anti-seep collar:
       (1) Minimum - maximum spacing requirements met.
(2) Size, dimensions shown.
(3) Minimum 1 ft. of earth cover between the top of collar and the slope face and no less than the minimum collar spacing between riser and first collar.
(4) Two foot minimum between collar and pipe joint note.

b. Filter and drainage diaphragm and/or toe drain:
   (1) Drain material.
   (2) Dimensions.
   (3) Minimum cover 2 ft.
   (4) Pressure relief drain pipe:
      a. Diameter.
      b. Material.
      c. Perforations pattern.

13. Outlet protection:
   a. Length stationed.
   b. Thickness or depth.
   c. Material:
      (1) Median stone size.
      (2) Class IV gabion, PVC coated.
      (3) Filter cloth.

14. Elevations:
   a. Emergency spillway (dotted line at crest).
   b. Settled top of dam (1’ & 2’ freeboard).
   c. Constructed top of dam.
   d. Riser crest.
   e. Design storms:
      (1) Maximum design high water.
      (2) Ultimate 100 year water surface elevation, freeboard.
      (3) 1, 10 & 100 year water surface elevations.
      (4) Water quality storage, water surface elevation, if applicable.
   f. Inlet and outlet inverts of low flow and barrel pipes.
   g. Where county road serves as embankment, 3’ minimum between 100-yr ultimate WSEL and sump in road.

J. Emergency spillway profile
   1. Existing ground (spillway in cut).
   2. Stationing.
   3. Inlet and outlet sections, length and slopes.
   4. Level control section, elevation and length (min. 25’ - active spillway).
   5. Type and limits of channel protection.
   7. Flow quantity and velocity.
   8. 1’ minimum above riser crest

K. Profile of dam along centerline
   1. Top of dam (constructed & settled).
   2. Emergency and principal spillways stationed corresponding to plan view.
   3. Existing ground.
   4. Proposed ground line of projected pond bottom.
   5. Impervious core (minimum 10-yr WSEL) or above
6. Cutoff trench; 4’ minimum depth below pond bottom and existing ground. Trench side slopes perpendicular to barrel, 2:1 down to barrel invert, 1:1 below invert of barrel.

7. Elevations for vertical control.

8. Geotechnical engineer note regarding depth of cutoff trench.


1. Geotechnical investigation has been performed

2. Bearing strength (blow count).

3. Unified soil classification for each strata.

4. Groundwater at completion.

5. Groundwater @ 24 hours, minimum.


7. Location of soil borings shown on plan with boring logs provided.

M. Details to be shown on plans

1. Baltimore County DPW standard details referenced by plate numbers.

2. Riser:
   a. Riser base: length, width, thickness shown.
   b. Dimensions from riser crest to barrel and low-flow pipes.
   c. Vertical angles between riser, barrel and low-flow pipes.
   d. Horizontal angle between riser, barrel and low-flow pipes.
   e. Standard notes and dimensions.
   f. Reinforced concrete riser shown fully detailed on plans.

3. Anti-seep collars [378.6]:
   a. Dimensions.
   b. Specifications

4. Pipe bedding for concrete pipe. (Minimum 1/2 the height of the pipe)

5. Outlet channel

6. Dewatering device detail.

7. Fence crossing detail.

8. Welding trash rack detail.

9. Emergency spillway typical cross-section.

10. Diversion manhole (Appendix D.8 – SWM design manual) detailed with the following items:
    a. Baltimore County standard detail number; add a note if modified.
    b. General notes addressing any modifications, if applicable.
    c. Plan view and two (2) sections through structure at a legible scale.
    d. Inverts and elevations of all pipes and baffle wall(s) within manhole.

N. Construction Specifications and Sequence of Operation

1. Construction specifications per Appendix B.1 of the SWM design manual.

2. Sequence of operations clearly delineates installation/construction of SWM facility and seamlessly integrates into sediment control sequence of operations.

IIII. STORMWATER MANAGEMENT REPORT

A. Title Page

1. Project name.
2. Owner/Developer name, address, phone number and email.
3. Design professional name, address, phone number and email.
4. Date prepared.
5. Seal, signature and professional certification.

B. Table of Contents
1. Sections listed.
2. Appendix listed.
3. Figures and tables listed.

C. Narrative
1. General site information (location, acreage, existing and proposed use, soils, etc.).
2. Site specific information:
   a. Justification for type of pond used.
   b. Methodology/analysis used for design (reference all assumptions).
   c. Provide name of watershed and stream use designations for all discharge points.
   d. Design summary and pond specifications tables as shown on prop. drainage area map.
3. Suitability of stormwater outfall locations.
5. Appendix (contains all computations, design charts and relevant data references).

D. Hydrology

Runoff Curve Numbers (RCN)
1. Uses Maryland Soil Group Classification.
2. Soil group classification adjusted for compaction (A to B, B to C).
3. Land use – existing and proposed.
4. Based on SCD “Good” hydrologic condition.
5. Off-site areas to Limits of Zoning for Freeboard (unmanaged storms, if any).
6. Drainage Areas (acres & square miles).
7. Average RCN.
8. Use woods in good hydrologic condition for predevelopment land use.

Time of Concentration (Tc)
1. Selected path “typical” of area.
2. Sheet flow
   a. Proper length. 100’ maximum for pre-development and post development conditions.
   b. Proper “n” value.
   c. Proper slope.
3. Shallow concentrated flow
   a. Proper length.
   b. Proper slope.
   c. Proper velocity.
5. Closest hundredth of an hour input for TR-20 (Tc = 0.1 hour minimum).
6. Time of Travel - Calculations. Required when Tc Path leaves Drainage Area.

Site Discharge Analysis
1. Runoff Increase to be “Traded Off”. Acceptable to County if Trade-Off and Controlled Areas recombine on-site.

3. Appropriate Storms Managed
   a. 100 year required in Jones Falls, Gwynns Falls and Herring Run watersheds.
   b. 1-yr required in **ALL** watersheds unless otherwise indicated.
   c. 100-yr may also be required if so indicated by Baltimore County Public Works or Soil Conservation District.
   d. 10-yr / Overbank flood protection (Qp) volume is required if downstream flooding problems exist.

4. Developed Discharges. (Computed Hydrographs if Tabular Hydrograph Method is used with TR-55. TR-20 is used for Routing).

5. Ultimate Discharges (Off-site areas to Limits of Zoning). Used where off-site areas contribute to controlled drainage area.

E. Hydraulics
   2. Elevation - discharge table and graph.
   3. Barrel controls before riser passes from weir to orifice flow.
   4. Release structure hydraulics. Invert elevations of all structure openings shall be included in input data for TR-20 or Hydraflow.

F. Routings
   1. Water quality volume is not used in quantity routing.
   2. Elevation - storage table.
   3. Storage - indication method, TR-20 or Hydraflow.
   4. Inflow hydrographs.
   5. 1-, 10- and 100-yr routing.

G. Outfall study
   1. Suitable outfall.
   2. Determine tailwater elevations and impact on pond freeboard, if any.
   3. Dam breach analysis and danger reach, TR60, TR66 or HEC 1.
   4. Hazard Classification.
   5. Velocity and outfall design substantiating median stone size and depth.

H. Miscellaneous Items
   1. Emergency spillway capacity sized by MD Code 378.
   2. Riser anti-flotation computations.
   3. Structural reinforcing steel computations sealed by MD PE for cast-in-place and precast risers prior to plan approval. (Must be submitted prior to SWM plans approval).
   4. Anti-seep collar or alternative seepage control design computations.
   5. Flow splitter / Diversion manhole computations, if applicable.

IV. **ADDITIONAL SUBMISSION DOCUMENTS**
   1. SWM construction cost estimate(s). Note: If there are multiple facilities, each facility must have its own cost estimate. Do **NOT** combine the cost estimates. Must be submitted prior to SWM plan approval.
   2. Pond summary sheet (MD-ENG-14). Note: Must be submitted prior to SWM plan approval.
3. Small pond approval forms (5 signed copies required).
4. Operation and maintenance forms (5 signed copies required).
5. SWM data sheet (1 for each facility) and a summary SWM data sheet (if there are multiple facilities).
6. SWM easement agrees with record plat delineated with bearings, distances and acreage.
   Note: Provide dedication table on plans for SWM easements. Please click on the link below for more information about **ESD and SWM Easements for Private Maintenance:**
7. Right-of-way plats. Note: R/W plats and/or record plat may be recorded in advance of final stormwater management plan approval if the recording is approved by the Department based upon sufficient evidence that stormwater management can be achieved in the locations designated on the plat.
9. One (1) copy of the existing/proposed storm drain profiles if runoff is being conveyed to the proposed ESD practice(s) through an existing/proposed storm drain system.

ADDITIONAL COMMENTS:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Plans reviewed by: ____________________________ Date: __________

Updated 10/01/18