

DEVELOPMENT ENGINEERING DIVISION CHECKLIST FINAL PLAN - ROADS

To be completed by the applicant using the legend below. It is to be signed by the appropriate design professional with the initial document submittal. Subsequent checklist submittals will be at the discretion of the Development Engineering Division, DP&Z

I. Submission Documents

- A. Certification Letter from Professional Engineer that the Public Water/Sewer Plans have been submitted for review and site is included in Metropolitan District
- B. APFO Roads Test (Mitigation Plan included in plan set)
- C. Retaining Wall Computations, Plans w/Sections, Details, Profiles (Private)
- D. Stormwater Management/Storm Drain Computations/ECOP Approval Letter
- E. Geotechnical Report for Stormwater Management/Retaining Walls
- F. Noise Study (Mitigation identified on plans)
- G. Letter of notification for Offsite Disturbance

II. Road Construction Plans – General Information

- A. **Standard title and signature blocks (ALL SHEETS)**
 - 1. Owner/Developer name, address, and phone number
 - 2. Design Professional name, address, phone number, seal, signature, date
 - 3. Project name, zoning, tax map, election district, street address, parcel number
 - 4. Permit, file reference numbers, water& sewer contract numbers, etc.
- B. **Vicinity map requirements (COVER SHEET)**
 - 1. Scale 1" = 2000', north arrow shown
 - 2. ADC Map Coordinates
 - 3. Two (2) Howard County Geodetic Coordinates shown and labeled
 - 4. Site delineated
- C. **Notes and information (COVER SHEET)**
 - 1. Howard County Standard General Notes for Final Plans
 - 2. Site Analysis Data Sheet
 - 3. Legend
 - 4. Sheet Index
 - 5. Stormwater Management Practice Chart
- D. **Notes and information (COVER SHEET)**
 - 1. Howard County Standard General Notes for Final Plans
 - 2. Site Analysis Data Sheet
 - 3. Legend
 - 4. Sheet Index
 - 5. Stormwater Management Practice Chart
 - 6. Profiles, details, and cross-sections drawn to scale
 - 7. Design Professional's seal, signature, date, and certification statement
 - 8. Sheets numbered

E. Base Information of Road Construction Plan – Plan View

1. Existing Conditions
 - a) Streets – existing rights of way, property lines, all easements, pavement width, and street names and dimensioned
 - b) Existing Utilities – water and sewer, contract numbers, invert of existing storm drains at point of connection (where accessible), large electrical conduits (where accessible)
 - Storm drains, size, material
 - Telephone, gas, and electric lines, and street lights (if available)
2. Proposed Conditions
 - a) Lots shown in solid line with lots numbered
 - b) Separate plan sheets for work within SHA right-of-way
 - c) Floodplain limits shown with sections and WSEL's
 - d) Existing Utilities – Wetland limits shown with buffers

III. Road Construction Plans – (Design Information)

A. Roads

1. Show proposed street alignments, right of way widths, pavement widths, intersection taper dimensions, cul-de-sacs with radius
2. Provide horizontal curve data Delta, R, T, L, and chord length and bearing
3. Show plus stations of centerline equalities at all street intersections and pavement transitions
4. Show beginning and end of road construction by stations
5. Show all curb fillet radii, as well as fillet PC and PT elevations and stationing
6. Show direction flow; indicate by small arrows in the gutter line
7. Show tee or y-turnaround at terminus of the street with appropriate barricade detail
8. Show street tree locations, species, and quantities
9. Provide location of curb and gutter transitions
10. Show street lights type and location (in tabular form)
11. Show existing features including structures, floodplain, wetland, etc. within construction limits to be removed or retained
12. Show auxiliary lanes and improvements to existing roadways dimensioned and stationed in accordance with **Design Manual, Volume III, Section 2.5.2.D**
13. Show dimension and label sidewalks and ramps

B. Storm Drainage (Provide the following)

1. Drains – located by centerline stationing, coordinates or dimensions
2. Drains – size, type, class, length, and flow direction shown
3. Drains – structure numbered beginning at downstream end of system as per drainage area map
4. Drainage easements for surface flow greater than 5 cfs
5. Easements or fee simple transfers for storm drains, stormwater management, utilities, and 100 year floodplain (check against record plat). Show off-site easements
6. Road drainage at tee or y-turnarounds with provisions for erosion control and outlet protection
7. Label driveway culverts with pipe size and type shown for each lot
8. Label and dimension outlet protection

C. Road Profiles (1"=5' vertical; 1"=50' horizontal)

1. Show existing ground profile on centerline and left and right building restriction lines on profile and date. Check driveway grades and check for requirement and guardrails
2. Profile grade line shown and location labeled
3. Show all plus stations, intersections, etc., and give P.G.L. elevations every 50 feet (25 feet in vertical curve)
4. Label proposed grade and check against minimum and maximum grades
5. Provide vertical curve data:
 - e) P.V.I. Station and Elevation
 - f) Length of vertical curve, PVC, and PVT stations and elevations
 - g) Correction
 - h) H.S.D. for sags and S.S.D. for crests
 - i) Stationing and elevations for sump locations or crest locations
6. When proposed paving is to be extended in the future, the profile grade line must be projects for a minimum of 400 feet
7. Provide all intersections approaches in accordance with the [Design Manual, Volume III, Section 2.5.2.I.](#)
8. Cul-de-sac linear profile. (P.G.L. station and elevation every 25 feet)
9. Show critical utility crossing(s). Insure adequate cover
10. Show design speed and road classification
11. Provide curb (or edge of paving for open sections roads) return profiles for all intersections fillets at 1"=2' vertical and 1"=20' horizontal
12. Profile to be located below road plan view where possible

IV. Storm Drain Profile Sheet (1"=5' vertical, 1"=50' horizontal)

A. Base Data

1. Existing and finished ground line and/or pavement at centerline of storm drain shown
2. Label road above profile (when appropriate)

B. Hydraulic Compliance

1. Label size, type, class, and grade of pipe quantity and velocity of design year flow; show partial velocity if pipe flow less than full (check minimum and maximum velocity)
2. Structures numbered and stationed (centerline to centerline)
3. Structure inverts labeled (upstream & downstream at each structure). Show size and inverts of all pipes at the structure(s)
4. 10-year hydraulic gradient shown and labeled (top of pipe minimum)

C. Structural Compliance

1. Pipe checked for allowable maximum and minimum cover
2. The use of pipe anchors, concrete cradle, bedding, or encasement checked
3. Compacted backfill areas (per AASHOTO T-180) identified and noted on plans
4. Show all utility crossing (*label ex: proposed, typed, and size*) and check clearance (1' minimum outside of pipe to outside of pipe)
5. Show all storm drain connections (including under-drains and roof drains) into the storm drain system

V. Construction Details

A. Road Details

1. Chart specifying paving type, road classification, design speed, and limits by station for each road
2. Road widening detail (section) for existing roads in accordance with Design Manual, Volume IV, Standards Detail, R-1.08
3. Details not covered by County standard specifications
4. Tree planting detail(s)
5. Work zone traffic control plan
6. Traffic control signage and striping plan

B. Storm Drainage Details

1. Details of non-standard structures
2. Structure schedule specifying type, location, standard detail, etc.
3. Pipe schedule specifying size, class, and total length of each
4. Riprap outlet protection detail and cross section
5. Channel cross section details with treatment, quantity and velocity of flow, and depth of flow

VI. Supplement Drawings, Information

A. Grading Plan (include as part of Final Plans)

1. Limit of disturbance shown
2. Proposed contours labeled
3. Proposed drainage breaks labeled
4. Insure no mitigation is proposed within DPW right-of-way or access easements
5. Letter of Permission for Offsite Disturbance

B. Storm Drain Drainage Area Map (include as part of Final Plans, maximum scale 1"=200')

1. Show and label proposed drainage system, pipe size, and structure numbers
2. Label and sub drainage areas to inlet structures and culverts; reference to design computations
3. Provide runoff data. Label sub area, "C" factor and percent of impervious area, (summary table may be used)
4. Label proposed contours (consistent with grading plan)
5. Show 100-year floodplain WSEL. Provide cross sections on Drainage Area Map or Grading Plan

C. Storm Drain Computations (include in supplemental computations)

1. Impervious area computations
2. Storm drain flow computations
3. Inlet and gutter computations
4. Hydraulic gradient and headloss computations

VII. Retaining walls (privately owned & maintained, outside of right-of-ways)

A. Grading Items to Include:

1. Retaining walls shall be designed per the [Howard County, Design Manual, Volume III, Chapter 3](#)
2. Retaining walls greater than 3' in height measured from finished grade at the front to the top of the wall shall require structural design
3. Grades shall not exceed 2:1 above the wall or 4:1 below the wall within the maintenance easement
4. Horizontal dimensions measured from bottom face of the wall at the proposed grade
5. Retaining walls shall not be constructed on fill materials
6. Retaining walls and supports shall not be within a Howard County right-of-way or easement
7. Retaining walls that cross property lines shall be placed in a maintenance easement
8. Computations signed and sealed by the appropriate design professional

B. Construction Drawings – Plan View:

1. Retaining walls in plan view at a maximum scale of 1"=50'
2. Grading around the retaining wall showing flow patterns around the wall
3. Grading around the wall shall show spot elevations every 50' along the length of the wall at the top and bottom of the wall
4. Sheet flow approaching wall
5. For all walls, a 10' wide maintenance setback is required from the face of the wall
6. For all walls, a maintenance setback is required along the rear of the wall. The width of the setback (or easement) shall be equivalent to the height of the wall plus one-half the wall height
7. The maintenance setback shall be clear of floodplains, buffers, wetlands, property boundaries, structures, utility easements, environmentally sensitive areas
8. No structures shall be within the maintenance easement
9. A global stability analysis is required for all walls 10' in height or greater (including tiered walls where the effective height is 10' or greater)
10. A "NO TREE PLANTING ZONE" for all block or timber walls is identified
11. Maintenance easement shall not encroach on the building envelope of any residential lot

C. Construction Drawings – Elevations:

1. Elevations for all walls at a scale not to exceed 1"=5" (1"=10' horizontal for walls over 50' long). Provide a vertical scale bar and horizontal stationing across the bottom of the elevation
2. Section breaks clearly identified
3. Element of the elevation shall include:
 - a) Complete outline of the wall
 - b) Finished grade line superimposed over the wall at top and bottom
 - c) Locations of weep holes (40' on center or as required by Geotechnical Engineer)
 - d) Location of all utilities in proximity to the walls shown
 - e) Proposed geogrid arrangement location and length
 - f) Vertical placement of geogrid identified
 - g) Required allowable bearing strength for each typical section indicated
 - h) Dimension typical section maximum height allowed

D. Construction Drawings – Cross Sections:

1. Typical cross section for each wall as it varies by height and geogrid placement and/or other significant design features. Maximum scale 1"=5'
2. Typical reinforcement for reinforced concrete walls
3. Design notes for reinforced concrete walls including spacing requirements
4. Indicate the slope above and below the wall
5. Drain placement behind the base of the wall shown, details, fabric placement
6. Geogrid placement by layers and length shown in cross section detail

E. Construction Drawings – Elevations:

1. Computations shall contain a failure analysis meeting the following factors of safety:
 - a) 2.0 for sliding failure (1.5 for manufactured block)
 - b) 2.0 for overturning failure
 - c) 2.0 for bearing failure for concrete or timber walls
 - d) 3.0 for bearing failure for concrete walls
 - e) 1.3 for global stability for critical walls
2. Failure analysis shall contain likely or anticipated surcharge loads

3. For manufactured block walls, supplemental design booklets may be substituted for failure analysis, but shall not be considered as part of the construction drawings
4. Provide a complete set of design calculations, including the placement and spacing of steel reinforcement for reinforced concrete walls

F. Construction Drawings Required Notes:

1. On all retaining wall general notes include the following:
 - a) Retaining walls shall only be constructed under the observation of a registered Professional Engineer and a (NICET, WACEL, or equivalent) certified soils technician
 - b) The required bearing pressure beneath the footing of the wall shall be verified in the field by a certified soils technician. Testing documentation shall be provided to the Howard County Inspector prior to the start of construction. The required test procedure shall be the Dynamic Cone Penetrometer Test ASTM STP-399
 - c) The suitability of fill material shall be confirmed by the onsite soils technician. Each eight (8) inch lift shall be compacted to a minimum of 95% Standard Procter Density and the testing report shall be made available to the Howard County Inspector upon completion of the construction
 - d) For “CRITICAL” walls, one soil boring shall be required every 100’ along the entire length of the wall. Copies of all boring reports shall be provided to the Howard County Inspector prior to the start of construction
 - e) If no surcharge loads are considered, add a note to the cross section details stating, **“THIS WALL NOT DESIGNED FOR SURCHARGE LOADS.”**
2. All information required for the construction of the retaining walls shall be included on the construction drawings including:
 - a) Material Specification
 - b) Block wall system manufacturer notes
 - c) Design Engineer notes
 - d) Specific instruction for non-typical designs
3. Design plans and computations shall include:
 - a) Seal, signature, and date of responsible design professional
 - b) Name, address, telephone number of responsible design firm
 - c) Name, address, telephone number of owner/developer

G. Tiered Walls:

1. Tiered walls 10’ high or greater shall be designed as “CRITICAL” walls
2. Setback between walls shall be equal to the height of the lower wall or greater
3. Slope between tiered walls shall not exceed 4:1

H. Retaining Walls in Stormwater Management Facilities:

1. Toe of retaining wall, tie backs, geogrid outside the phreatic line
2. Maximum height of 3’ in publicly maintained facilities
3. Maximum height of 10’ in privately maintained facilities
4. Upper walls of tiered walls do not influence lower walls
5. Retaining walls above upper maintenance bench less than 3’ and in cut
6. Retaining walls designed to withstand hydrostatic pressure and saturated ground conditions
7. Retaining walls shall not be used as a pond embankment
8. Retaining walls in excess of 30” in height shall have appropriate safety railing or fence

VIII. Storm Water Management

**NOTE: OTHER AGENCIES RESERVE THE RIGHT TO ENFORCE MORE STRINGENT CRITERIA AND SHOULD THEREFORE BE CONSULTED AS TO THEIR ADDITIONAL REQUIREMENTS
THE MORE RESTRICTIVE CRITERIA SHALL GOVERN**

Are ESD Practices Required? (Check if yes)	Yes	No
Are Structural Practices Required? (Check if yes)	Yes	No

A. Report Submission

1. Title Page
 - a) Job Name
 - b) Owner
 - c) Design Professional
 - d) Date Prepared
 - e) Seal, Signature, and Professional Certification
2. Table of Contents
 - a) Sections Listed
 - b) Appendix Listed
 - c) Figures and Tables Listed
3. Narrative
 - a) Introduction – gives overview of what is contained in report
 - b) Field Investigation – gives overview of findings of design professional from site visit prior to starting design. Includes narratives on drainage areas, time of concentration paths, ground cover, downstream hazards, soil investigations, etc.
 - c) General Site Information – (i.e. acreage, zoning, location, slopes, soils, vegetation, average conditions, variances, restrictions, etc.)
 - d) Impervious cover information (existing and proposed)
 - e) Site Specific Information
 - 1) Justification for type of ESD to the MEP practices used
 - 2) Justification for type of Structural Practices used
 - 3) Provide narrative in response to each of the Performance Standards defined in the [MDE SWM Design Manual, Vol. I, Chapter I](#)
 - 4) Define facility ownership (ESD and Structural Practices)
 - 5) Methodology/analysis used for design (reference all assumptions)
 - 6) WQv, Rev, and/or ESDv requirements/analysis (as applicable)
 - 7) Quantity requirements/analysis
 - 8) Facility summary (ESD and Structural Practices)
 - 9) Drainage easements
 - 10) Drainage systems
 - 11) Floodplain information
 - 12) Affects of development on adjacent properties
 - 13) Affects of development on the natural and traditional character of the waterway
 - 14) Erosion sedimentation control measures
 - 15) Cut/fill and soil disposal
 - 16) Impact on existing and proposed utilities
 - 17) Provide name of watershed and stream use designations for all discharge points (Verify need to provide Qp and Qf with DPZ/DED)

B. Drainage Area Maps

1. ESD Drainage Area Map
 - a) Soil types and hydrologic soils groups shown on the map
 - b) ESD practices shown and labeled with corresponding outfalls indicated
 - c) Drainage areas showing the areas (in acres), impervious area, pervious area, woods, and ESDv required to each micro-scale practice
 - d) Grading shown to justify volume, surface area, disconnection practices, and outfall locations
 - e) Summary table with required and provided stormwater ESDv, Pe, Cpv Q10, and Q100 requirements (if applicable) listed
2. Structural Practices – Existing Drainage Area Map
 - a) Sub-areas shown per [Design Manual, Volume I, Section 2.2.4](#) requirements. Identify study points
 - b) Sub-areas include offsite area draining through the property
 - c) Time of concentration paths shown from the hydrologically most distant point in the sub-area. Segments are shown as sheet flow (100' maximum length), concentrated flow, and channel flow. Each segment specific type, length, and slope
 - d) Existing Tc, RCM, Area (acres) specified for each sub-area
 - e) Soil types and hydrologic soil groups shown on the map
 - f) Summary table with existing peak runoff for Q1, Q10, and Q100 listed for each study point
3. Structural Practices – Proposed Drainage Area Map
 - a) Sub-areas shown per [Design Manual, Volume I, Section 2.2.4](#) requirements. Identify study points
 - b) Sub-areas include offsite area draining through the property
 - c) Time of concentration paths shown from the hydrologically most distant point in the sub-area. Segments area shown as sheet flow (100' maximum length), concentrated flow, and channel flow. Each segment specific type, length, and slope
 - d) Existing Tc, RCM, Area (acres) specified for each sub-area
 - e) Soil types and hydrologic soil groups shown on the map
 - f) Rough grading contours (2' maximum interval) on the map
 - g) Summary table with existing peak runoff for Q1, Q10, and Q100 listed for each study point

C. Hydrologic Computations

1. ESD to the MEP Calculations
 - a) Overall Site Analysis
 - 1) Site area
 - 2) Limit of Disturbance (LOD)
 - 3) Impervious area by soil type
 - 4) Pervious area by soil type
 - 5) Woods area by soil type
 - 6) Target RCNwoods
 - 7) Rainfall target (Pe)
 - 8) Runoff depth to size ESD practices (Qe)
 - 9) Total runoff volume required (Rev)
 - 10) Recharge volume required (Rev)
 - 11) Cpv requirements (if applicable)
 - b) Sub Area Analysis
 - 1) % Impervious
 - 2) Reduced RCN (if applicable)
 - 3) ESDv required

- 4) ESDv provided
- 5) Rev provided per device/sub area
- 2. Structural Practices Calculations (TR-55 & TR-20 Methods Only)
 - a) Existing RCN (All cropland assumed to be meadow, developed land, and other covers in good hydrologic condition only)
 - b) Onsite developed RCN shall be based on actual land use within the drainage area
 - c) Time of concentration computations (sheet flow max. 100' in developed condition concentrated flow and channel flow as per TR-55, channel flow must have cross sectional information for velocity computation)
 - d) Discharge computation
 - 1) 1-year storm managed (as required)
 - 2) 10-year storm managed (as required)
 - 3) 100-year storm managed (as required)
 - e) BMP Design Methodology
 Final design computations considering credits for all proposed structural practices (including credit for non-structural practices):
 - 1) Stormwater Management Pond:
 - i P-1 micropool extended detention pond
 - ii P-2 wet pond
 - iii P-3 wet extended detention pond
 - iv P-4 multiple pond system
 - v P-5 pocket pond
 - 2) Stormwater Wetlands
 - i W-1 shallow wetland
 - ii W-2 ED shallow wetland
 - iii W-4 pond/wetland system
 - iv W-5 picket wetland
 - 3) Infiltration Systems:
 - i I-1 infiltration trench
 - ii I-2 ED infiltration basin
 - 4) Stormwater filtering systems:
 - i F-1 surface sand filter
 - ii F-2 underground sand filter
 - iii F-3 perimeter sand filter
 - iv F-4 organic filter
 - v F-5 pocket sand filter
 - vi F-5 bioretention
 - 5) Open Channel Systems:
 - i O-1 dry swale
 - ii O-2 wet swale
 - 6) Others (must be approved by MDE, DPZ/DED)
 - f) Storage Computations:
 - 1) Storage of runoff required and provided (use TR-55 worksheet 2,3,4,&6)
 - 2) Forebay storage (363 cft. over impervious surfaces) does not count toward the WQv storage requirement

D. Structural Practices Hydraulics & Other Computations

1. Stage – storage table and curve
2. Stage discharge table and curve (composite hydraulic performance table including detailed design of orifice, weir, and barrel flow)
3. Check barrel control prior to riser/orifice flow
4. 1-year, 10-year, and 100-year routing TR-20 method
5. Emergency spillway sized per MD-378. Routing table and curve provided
6. Flotation analysis (factor of safety 1.5:1)
7. Dam Breach Analysis
8. Anti-seep collar design as per USDA/SCS/MD-378
9. Outlet protection (per SCD). Use 10-year, 100-year if no emergency spillway
10. 100-year flood plain study referenced, provided
11. Channel Impact Analysis (if required) using HEC-RAS showing existing and proposed velocities with channel improvement and slope stabilization
12. Retention/Infiltration pond dewatering device (capped)
13. Stability analysis of pond's side slopes for surface drainage

E. Soils Investigation

1. Geotechnical report submitted by the appropriate design professional giving conclusions and recommendations. Report shall include registration number, date, seal, signature, and professional certification of the responsible design professional
2. Minimum boring locations:
 - a) Structural BMPs – At least 1 in the embankment centerline, 1 in the pool area, 1 in emergency spillway minimum depth of 5 feet below the proposed bottom of structure, seasonal high ground water or refusal. (Proposed bottom of infiltration structure to be a minimum four feet above both)
 - b) ESD Micro-scale practices – Minimum boring locations: 1 at least within 50 feet of each device.
3. Unified Soil Classification System textural classification for various layers with depth
4. Seasonal high ground water determination
5. Fill areas identified
6. In-situ permeability test, minimum geotechnical requirements for infiltration, shall be based on Volume II of the Stormwater Design Manual, Appendix D.1. Minimum rate of 1.02 in/hr required for acceptability. (ex. Drywells and pervious pavement over 10,000 sft.)
7. Rate of infiltration
8. Scaled boring location map with surface elevation

F. Plans Submission – Include All of the Following on Plans

1. Stormwater Management Plan (1"=50' or less) for ESD micro-scale practices
 - a) Genreal Items
 - 1) Type of ESD and/or Disconnection Practice labeled per MDE nomenclature (i.e. M-1, M-2, N-1, N-2, etc.)
 - 2) Existing and final contours (1' or 2' interval)
 - 3) Existing and proposed improvements
 - 4) Locations of soil borings
 - 5) Outflow pipe, outlet protection (detail required), and outfall channel
 - 6) Positive overflow drainage away from structures
 - 7) Existing and proposed utility locations
 - 8) Show floodplain, environmental sensitive areas, wetlands, etc.

- 9) 5' buffer from end of outfall to property lines
- 10) Outlet channel outside of stream or wetland buffers
- b) Maintenance Items – Provide vehicular access to all shared ESD practices
 - 1) Indicate the ownership and maintenance responsibility of the facility (i.e. private, HOA, or public)
 - 2) Minimum easement width = 20'
 - 3) Maximum slope for unpaved surface is 10%
 - 4) Maximum slope for paved surface is 12%
 - 5) Maximum cross slope is 3%
 - 6) Clear of structures (e.g. Utilities, drainage, fences, and streetlights)
2. Stormwater Management Plan (1"=50' or less) for ESD structural practices
 - a) General Items
 - 1) Type and hazard classification of BMP facility labeled
 - 2) Existing and final contours (1' or 2' interval)
 - 3) Existing and proposed improvements
 - 4) Delineated of permanent, Rev, WQv, Cpv, Qp10, Qp100 WSEL elevations
 - 5) Locations of soil borings
 - 6) Outflow pipe, outlet protection (detail required), and outfall channel
 - 7) Inflow improvements (appropriate details required), storm drains carried to normal pool (wet) or pond's bottom (dry)
 - 8) Emergency spillway level section and outlet channel
 - 9) Existing and proposed utility location/protection
 - 10) Ponding and/or pond slopes on private property must have easements
 - 11) Show floodplain, environmentally sensitive areas, wetlands, etc.
 - 12) 15' no woody vegetation zone delineated from toe of slope
 - 13) 25' pond buffer from 100-year WSEL, top of cut or toe of fill to property lines
 - 14) Adjacent structures 2' vertical from 100-year WSEL
 - 15) 25' buffer from end of riprap outlet channel to property lines
 - 16) Outlet channel outside of stream or wetland buffers
 - 17) Provide a summary table identifying the area in acres, the required and provided Rev, WQ v, Cpv, Qp10, and Qp100 for each drainage area
 - 18) Forebay delineated, invert above permanent pool elevation or extended detention 1-year pool elevation, gabion embankment, and control structure
 - b) Maintenance Items – Provide vehicular access to all shared ESD practices
 - 1) Maintenance Access – from public right-of-way or publicly traveled road or a private road in a multifamily responsibility:
 - i) Indicate the ownership and maintenance responsibility of the facility (i.e. private, HOA, or public)
 - ii) Minimum level width = 12' (surrounding the pond)
 - iii) Minimum easement width = 20'
 - iv) Maximum slope for unpaved surface is 10%
 - v) Maximum slope for paved surface is 12%
 - vi) Maximum cross slope = 3%
 - vii) Provided around the entire pond
 - viii) Access to riser, emergency spillway, forebays and outfall structures
 - ix) Clear of structures (e.g. utilities, drainage, fences, and streetlights)

- x Entrance marked at right-of-way with bollards
- xi Severe horizontal geometry avoided
- 2) Maintenance easement (10' beyond any structure) shall include: riser structure, embankment, outfall, 100-year ponding area, access, adjacent property if necessary
- 3) Minimum permanent pool depth = 4'
- 4) Pond bottom slopes no flatter than 1%, 2% desirable
- 5) Concrete low flow channel for dry ponds at 1% minimum slope
- c) Public Safety Considerations
 - 1) Maximum side slopes for earthen embankment no steeper than 3:1
 - 2) **Design Manual Alternative Compliance** required for side slopes for alternative materials
 - 3) Required benches for specific pond types
 - 4) Riser design minimizing accessibility by small children
 - 5) Fencing of all pipe outfalls 48" diameter or greater
 - 6) End sections/headwall for outfalls
- d) Landscaping/Multiple Use/ Aesthetic Considerations
 - 1) Landscaping plan, where required (e.g. low maintenance vegetation on steep slopes optional a forestation outside of 1-year pool, aquatic plantings, etc.)
 - 2) Recreation plan, where required (active and/or passive)
 - 3) Aesthetic consideration of riser design
 - 4) Natural, variable looking pond shapes
 - 5) Clear maintenance access
 - 6) Dam clear of tree and shrub plantings
- e) Wetlands Mitigation / Stream Restoration / Retrofit
 - 1) Mitigation areas not part of SWM facility
 - 2) Stream restoration plans for offsite mitigation
 - 3) Farm ponds retrofit for SWM (needs to meet current SWM requirements)
- 3. Profiles and Details for ESD Practices (consisten scales – e.g. 1"=5', 1"=50')
 - a) Alternative Surfaces (A-1, A-2, A-3)
 - 1) A-1 Green Roof – provide a typical green roof section
 - 2) A-2 Permeable Concrete – provide a section for the alternative pavement section
 - 3) A-3 Reinforced Turf – provide a section for the alternative turf surface
 - b) Section & Profile through Micro-Scale Practice (M-2, M-5, M-6, M-7, M-9)
 - 1) Existing ground and proposed grade
 - 2) Soil boring locations with plot of textural classes
 - 3) Observation well location(s) (centered)
 - 4) Observation well cap and lock with depth clearly marked
 - 5) Aggregate depth – give elevations and inverts
 - 6) Aggregate size – 12 to 1-1/2" minimum (with no fines)
 - 7) 1-foot minimum soil or gravel covering
 - 8) 6-inches of clean, washed sand on bottom of ESD practice
 - 9) Filter cloth specifications and location. No filter cloth on bottom of ESD practice
 - 10) Minimum 10' from basement walls and 100' from water wells in non-residential projects
 - c) Section & Profile through Micro-Scale Practice (M-2, M-5, M-6, M-7, M-9)
 - 1) M-1 Rainwater Harvesting – provide a typical detail showing all connections and diversions

- 2) M-3 Landscape Infiltration – provide a cross section and profile along the berm
 - 3) M-4 Infiltration Berm – provide a cross section and profile along the berm
 - 4) M-8 Swales – provide a cross section and profile along the swale. Show any check dams locations and provide a detail as applicable
- d) Landscaping Section and Details**
- 1) Provide landscaping plan for all pertinent ESD practices
 - 2) Provide a stormwater management landscape summary table specifying plan types, locations, and quantities.
- 4. Profiles for Structural Practices (consistent scales – e.g. 1"=5', 1"=50')**
- a) Principle Spillway**
- 1) Existing ground
 - 2) Proposed ground (label slopes, 12' minimum top width, outfall protection, etc.)
 - 3) Cut-off trench (4' bottom, 1:1 slopes, 4' depth, bottom elevation) fill material County approved
 - 4) Impervious core (top width, top elevation)
 - 5) Riser (concrete, set into embankment)
 - 6) Trash rack shown
 - 7) Riser base (provide detail separately)
 - 8) Low flow structure (diameter, class, type, trash, rack, filter)
 - 9) Barrel (diameter, class, length, slopes, saturated length, concrete per ASTM C-361)
 - 10) Phreatic line and slope based on design storm
 - 11) Anti-seep collars (size, location, 2' minimum from pipe joint)
 - 12) Rubber gaskets ASTM(C-361) at pipe joints
 - 13) Riser to be of same material as barrel
 - 14) Show 1-year, 10-year, 100-year tailwater and 10-year H.G.L.
 - 15) Barrel size (minimum 24' without an emergency spillway)
 - 16) SCS TR-46 A-2 concrete cradle (provide detail)
 - 17) Outlet protection (length, width, thickness, stone class, d50, filter cloth, 3' toe wall, 10-year discharge and velocity provide design data in report)
 - 18) Elevations:
 - i Emergency spillway (dotted line at crest)
 - ii Settled top of dam (1' & 2' freeboard)
 - iii Constructed top of dam
 - iv Riser crest
 - v Design storms water surfaces shown
 - vi Inlet and outlet pipe elevations (low flow, barrel)
 - 19) Pond Drain:
 - i DIP, CIP, and RCP, non-clogging, easy access, reseating valve, out of constant flow, removable elbow at intake
 - ii Pond drain capable of draining permanent pool within 72 hours
 - 20) Forebay:
 - i Profile through control section
 - ii Show existing ground, proposed grading, and elevations
 - iii Slope and limits of protection

- b) Emergency Spillway Profile
 - 1) Existing ground, proposed grading (spillway in cut)
 - 2) Inlet, control, and outlet section (lengths, elevation)
 - 3) Slope
 - 4) Flow quantity and velocity
 - 5) Limits of channel protection
 - c) Cross Section of Dam Along Centerline
 - 1) Existing ground
 - 2) Proposed ground line within pond (invert)
 - 3) Top of dam (constructed and settled) (*add 10% minimum additional fill to account for settlement*)
 - 4) Emergency and principal spillways stationed
 - 5) Core (fill material County approved)
 - 6) Cut-off trench (County approved fill)
 - 7) Existing and proposed utility locations
 - 8) Location of soil borings
 - d) Cross Section of Forebay Dam Along Centerline
 - 1) Existing ground
 - 2) Proposed ground line within pond (invert)
 - 3) Top of dam (constructed and settled) (*add 10% minimum additional fill to account for settlement*)
 - 4) Location of soil borings
 - e) Section & Profile Through Infiltration Trench
 - 1) Existing ground and proposed grade
 - 2) Test boring locations with plot of textural classes
 - 3) Observation well location(s) (centered)
 - 4) Observation well cap and lock with depth clearly marked
 - 5) Aggregate depth – give elevations and inverts
 - 6) Aggregate size: 12 to 3 inch minimum (with no fines)
 - 7) 1-foot minimum soil or gravel covering
 - 8) 6-inches of clean, washed sand on bottom of trenches
 - 9) Filter cloth specifications and location. No filter cloth on bottom of trench/well
 - 10) Minimum 10' from basement walls and 100' from water wells in non-residential projects
 - f) Soil Information
 - 1) Boring logs on plan
 - 2) Unified soil classification system
 - 3) Infiltration rate on log
 - 4) Seasonal high ground water
 - 5) Bearing strength
5. Details
- a) Riser with reinforcement, key joint detail, pipe connection, strapping/wrapping, etc.
 - b) Anti-seep collar with reinforcement or filter diaphragm (provide construction specifications)
 - c) Low flow control
 - d) Pipe bedding
 - e) Outlet channel (cross-section & profile for channel improvements and stabilization)
 - f) Emergency spillway typical cross-section

- g) Trash Rack Detail:
 - 1) Minimum 6" from face of structure
 - 2) Galvanized
 - 3) Removable
 - 4) Spacing 8" c.c. (maximum)
 - 5) Painted Battleship Grey
- h) Cradle detail shown, (SCS TR-46 A-2 concrete cradle)
- i) End walls and head walls
- j) Dewatering device
- 6. Construction Specifications (latest MD-378 or for ESD practices, Appendix B.4 of the [MDE SWM Design Manual](#). "Construction Specifications for Environmental Site Design Practices.")
 - a) Site Preparation
 - b) Earth fill (embankment, core cut-off)
 - c) Structural backfill
 - d) Concrete – meet Howard County requirements
 - e) Stabilization
- 7. Notes
 - a) Structure hazard classification (A,B,C, or D)
 - b) Pertinent notes from standard list
 - c) Additional stormwater management data
 - d) Operation and maintenance schedule for each type of facility specifying routine and non-routine maintenance
 - e) Sequence of construction with approximate time frames for each operation
- 8. Certifications
 - a) Design professional, sealed, signed, and dated
 - b) Developer's signed and dated

(NOTE: SUBMISSION WILL NOT BE REVIEWED WITHOUT PROPER SIGNATURES)
- G. *Letter of Map Amendment/Revision (LOMA/LOMR) – FEMA*
 - 1. Was a LOMA/LOMR required at Preliminary Plan? Yes No
 - 2. Provide verification that FEMA has received Information to approve requested LOMA/LOMR
 - 3. Approval letter from FEMA with a copy to Howard County Department of Public Works, Bureau of Environmental Services, Stormwater Management Division (required prior to signature approval of Plat)

IX. Financial

A calculation worksheet is to be filled out by the design professional and can be found under the Resources Tab of the plan review e-form.

Developer Review Fees – An up-front charge equivalent to one-half (50%) of the fee based on the developer's preliminary construction cost estimate total must be paid simultaneously with the submission of the original preliminary plan equivalent. If payment has not been made for this development, please submit at this time.

Company:

Check the Help and Resources Instructions accessible from the ProjectDox login screen for appropriate locations to upload all documentation including this checklist. Once you have completed your uploads, remember to complete your ProjectDox task.