Anne Arundel County Office of Planning and Zoning

Storm Drainage Design Checklist

	Project Name	
	Project Number	
	Engineer	

Plans are to be designed based on the standards set forth in the Anne Arundel County Design Manual Standards and Specifications, and all other manuals as stipulated in the Anne Arundel County Code.

This checklist is being provided as a general guide for identifying the **minimum** features that should be addressed prior to submitting the plans for review. **The design consultant by assigning his/her seal and signature certifies that the plans were completed in accordance with the current design standards.**

Plans that are incomplete as per the checklist items will result in an incomplete review. Plans will be returned to the consultant and the resubmittal will be considered a first submittal in the review process.

Engineer's Certification (Seal, Signature and expiration information)

Instructions:

1. **The checklist must be submitted with the first submittal.**
2. Packages submitted without the completed checklist will not be reviewed and will be returned to the applicant.
3. Applicant should insert into each box either of the following:
   a. √ This item has been addressed
   b. **N** This item does not apply to this project
4. All boxes must be checked.
5. The review engineer will upon review of the plans verify by inserting either of the following:
   a. √ This item has been adequately addressed or agree that it does not apply.
   b. **X** This item has not been adequately addressed. (Use the remarks column to indicate via letter designation, which item needs to be addressed or if a more detailed response is required then indicate in the remarks column that the item is addressed in the comment letter).
6. A copy of the checklist will be returned to the applicant as an attachment to the comment letter.
7. The Checklist must be returned with the second submittal utilizing the same check format indicated in item 3 above.

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	First Submittal		Second Submittal		Storm Drain Checklist	Remarks
	Des.	Rev.	Des.	Rev.		
1					Adequacy of Facilities for Storm Drainage met. **A)** Adequate SWM on Site and **B)** Adequate conveyance to the point of investigation (Demonstrated by downstream analysis)	
2					**Point of Investigation:** A) Provide drainage area map that clearly shows B) Site drainage area C) Tributary Drainage area **Label** D) Site outfall E) Tributary outfall F) Point of Investigation G) Provide photo walking tour or computations to show non erosive conditions or velocity for the 10 year storm from site outfall(s) to the point(s) of investigation.	
	Computations					
3					**Design as per Anne Arundel County Design Manual Chapter V**	
4					**Computation booklet i**s A)Provided B) Bound, C) Sheets numbered D) Signed and Sealed by design professional E) Contains narrative which clearly indicates methodology used G) Broken into sections based on post development study points.	
5					**Study point(s):** A) Study point(s) same for pre and post development B) Clearly labeled and numbered.	
6					**Downstream Analysis POI:** Show :A) Site outfall drainage area B) Tributary outfall drainage area C) Point of investigation D) Include photo tour and velocity and capacity computations from site outfall(s) to POI E) Submitted with the first submittal	
7					**Adequacy of downstream facilities:** Closed system A) Verified by previously approved as built plans and computations (Copies provided with first submittal) or Analysis B)Addresses the capacity and hydraulic gradient C) Based on 10 year storm D) Runoff amount based on Zoning of contributing drainage area. Open Channel E) Velocity and flow depth computed at relevant points (Constrictions, additional tributary etc.)	
8					**Allowable discharge after site development** is based on capacity of receiving conduit. Flow to conduit is based on developed conditions of entire drainage area based on zoning.	
9					**Outfall computations** At pipe discharge below rip rap outfall show: A)Cross section B) Quantity C) Velocity D) Depth of flow E) Pre and post development flow conditions	
10					**Flood plain:A**) Determine if flood plain exists on site using 48 inch pipe rule. B) If flood plain exists use Hec-Ras to determine water surface elevations on site C) Starting watersurface elevation determined by acceptable methods (Hy-8 or culvert analysis if near culvert) D) Error messages in output addressed.	
11					The same method of computation used when comparing runoff (i.e. if Tr-20 used for post development runoff, it must be used for pre development as well)	
12					Drainage area information used in computations clearly depicted on drainage area maps.	
	Drainage Area Maps					
13					**All Drainage area maps**: **A)** Contours numbered with legible lettering **B)** contour lines extend at least 200 ' beyond drainage area boundaries **C)** Travel path for Tc shown with segments labeled (distance, slope and "n" factor) **D)** Curve number or C Factor areas shown by contrasting shading or colors E) acreage shown) **F)** North arrow shown **G)** Scale shown.	
14					Separate drainage area maps for existing and proposed conditions.	
15					**A)** All maps used for comparison such as existing and proposed development shown at same scale. **B)** Maps used to develop curve numbers such as zoning and soil shown at same scale as applicable drainage area map.	
16					A) Existing conditions drainage area map must show entire drainage area to site. Runoff amount for offsite areas must: B) Be shown C)Curve number based on zoning.	

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17					Information shown on drainage area map must correlate with information used in computation booklet.	
18					Scale shall be 1" = 100' for sites with acreage ≤ 25 acres, or 1" = 200' for sites with acreage > 25 acres.	
19					**Drainage area map for proposed drainage system: A)M**ust be shown schematically, complete with manhole, inlets and structures numbered B) Each tributary area must be lettered for reference to schedules and flow tabulations C) Use a scale that allows information to be clearly shown	
	Information required on drawings					
20					For small projects, road, storm water management and storm drainage design details may be shown as one plan set with each item (road, storm drain etc.) being shown on separate sheets. If the number of plan sheets for each item exceeds 4 sheets, then it should be broken out as a separate set with its own title sheet etc.	
21					***Title block*** *(Anne Arundel County Office of Planning and Zoning title block required on all sheets) shall include: A) Project Name and number B) Sheet Title C) Date, D) Tax Map, Block and Parcel E) Assessment District, F) Zoning*	
22					Legal name, address, and telephone number of the owner, developer, applicant, and design consultant, and	
23					Signature block with design consultant information	
24					Signature and seal of a design professional registered in the State of Maryland (Comar, Section 14-101),	
25					Revision Block	
26					**Vicinity Map** (minimum 4" x 4" Scale 2000' = 1") (Title Sheet) A) Located in upper right hand corner, B) North arrow shown to top C) Scale shown D) Roads labeled	
28					**Location Plan (Title Sheet)** Scale 1"=200'	
29					**Index of Drawings Table (Title Sheet)** A) All drawing titles are shown in table and labeled accordingly**.**	
31					**Coordinates -** Three "tics" shown on all applicable plan sheets in multiples of 250'	
32					**North Arrow shown**	
33					**General Notes (Notes common to all drawings on Title sheet only)**	
34					Project specific notes added *(such as meter note, jacking note, SHA Agreement/Permit on state roads, etc.)* .	
35					**Benchmark** - B. M. No.,description and elevation. (Vertical control NAVD 1929 or NAVD1988) consultant must indicate which is used. No assumptions	
36					***Special Details*** must be shown in accordance with Standard Details, as much as is feasible.	
37					**Scale** shown in title block or centered below plan/profile.	
38					Match lines shown were applicable and correctly labeled	
39					Outfall statement on title page	
40					**Drafting standards** As per design manual (Chapter 1 section II.D.3)	

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	Rights-Of-Way, Easements and Surveys					
41					Bearing and distances shown on plan and plat	
42					Easements labeled as temporary or permanent	
43					Existing and proposed right of way widths shown.	
44					Right of Way plats at same scale as public drawings plan view.	
45					Topographic information is field run	
46					Horizontal control established using current criteria (NAD 83).No assumptions	
47					Rights To Discharge: A) Acquired for offsite properties B) Shown for on-site	
48					Offsite easements and rights of way **acquired**	
	Construction Drawings					
49					Outfall statement on title page	
50					Overall drainage area map showing entire drainage area to site	
	Existing Features					
51					Names of all roads and streets are shown and are not obstructing other information.	
52					**Abutting properties** show A) Lot numbers, and street address numbers B)Owners name and Tax Account Number	
53					Show all existing surface features including poles, fences, buildings, driveways, hydrants, shrubs, trees, pavement, inlets, curb and gutter lines, manholes, etc.	
54					Show existing grades at least 100' beyond right-of-way lines and 200' beyond ends of traffic ways or beyond limits of disturbance.	
56					Existing and proposed sewer and water lines and structures are located and labeled.	
57					Flood plain limits shown, and flood plain source referenced, if previously platted flood plain.	
	Proposed construction					
	Plan View					
58					**Scale 1"=40'** (Alternate scale approved by OPZ)	
59					All structures A) adequately located in plan view either by offset from permanent structures or coordinates B)Labeled and Numbered starting from downstream end of the system.	
60					Topography A) Existing contours B) Proposed contours	
61					Existing and proposed utilities A) Shown with appropriate line weight and symbol B) Clearances from Storm Drain shown on plan and profile.	
62					Drawing and file number shown for all existing sewer, water, storm drains and their manholes, fire hydrants, and appurtenances in accordance with the record drawings.	
63					Invert and rim elevations for existing utilities are shown and checked against Record Drawings.	
64					Pipes A) are dimensioned from surveyed location (property lines, road centerlines, traverse lines, etc.). B) Size of pipe between each structure is labeled	
65					Proposed and existing easements shown and dimensioned.	
66					Curve data is shown for pipes laid on curves (minimum length is 4').	
67					Method of crossing existing roads labeled (Jack and bore, open cut, etc.)	
68					Each inlet is dimensioned from surveyed location (dimensioned from P.C. or P.T. of curb, property lines, traverse lines, station and offsets or are coordinated).	
69					**Open Channels** A) Typical section shown B)Flow Q10, Velocity (V10), Depth (d), Slope (S) shown	
70					Show location of septic systems in close proximity to open swales (25' minimum clearance)	
71					Outfall apron dimensions shown (width, length, dimensioned),	

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	Profiles					
72					The profile is to be shown below the corresponding plan. If profile is shown on a separate sheet, the profile should be labeled to indicate the location of the plan view.	
73					**Scale** 1"= 40' horizontal scale and 1"= 4' vertical	
74					**Existing and proposed** grades shown and extended 100 feet beyond storm drain.	
75					**Structures** A) Structure numbers same as in plan view B) 10 yr HGL elevation shown C) Inverts labeled (upstream and downstream) D)Centerline stations are shown and are same as plan view.	
76					**Pipes between each structure** A) Inverts labeled B) Flow (Q10) C) Velocity(V10) D) Friction Slope (SF) E) Actual Slope, material, class (if applicable) shown below each run.F) Encasement or Concrete cradle shown as necessary, G) Maximum and minimum cover checked H) Utility crossings shown I) Type of utility (water, sewer etc) and clearances labeled	
77					A) Full trench compaction and/or flowable fill is shown as required.B)Protective fill indicated for all pipes with less than two feet of cover C) Protective coating/ special construction details specified for pipes in areas of acid soils or other similar conditions.	
78					**Outfall** A) End sections and Headwalls labeled B) Riprap apron length, depth, type,D50 and toe wall shown C) Profile of existing ground shown for 200 feet below riprap D) Cross section beyond toe of rip rap shows existing and proposed E) Flow F)Velocity G) Depth for 10 and 100 year rainfall event.	
79					**Culverts** A) Sized using appropriate storm event based on the road classification B) Show erosion protection upstream and downstream C) Show water surface elevation for design storm in profile.	
80					**Tables** A) Flow tabulation (preferably shown on same sheet as drainage area map) B) Structure schedule shown (preferably shown on same sheet as structures)	
81					**Structure Schedule** shall contain A) Structure type (inlet, manhole etc.) B) Size C) Top grate or rim elevation D) Invert elevations E) Number F) Location (coordinates or station & offset) G) County Detail number H) If special structure indicate where detail is found.	
82					**Flood Plain** A)Cross sections shown and labeled B) Q100 and Elevation shown for each cross section	
	Miscellaneous					
83					**Quality control** A)Information shown in computations is same as on plans B) Corresponding information on plan view is same as on profile.	
84					**Plat** check easements/ROW shown on plans are shown on applicable plats.	
85					***Traffic Control Plan*** (see section VIII, Anne Arundel County Dept. of Public Works Design Manual, January 2001).	