



REVIEW CHECKLIST for STORMWATER MANAGEMENT PLANS

DEVELOPMENT
NAME: _____ (PHASE/UNIT) _____

REVIEWED BY: _____ ENGINEER/PHONE # _____

DATE: _____ COMMERCIAL _____ INDUSTRIAL _____ MUNICIPAL _____ RESIDENTIAL _____

Note: Plans must adhere to standards in the Georgia Stormwater Management Manual (GSMM) Volumes I and II & the City of Perry's Local Design Manual

A. BACKGROUND/GENERAL INFORMATION

1. ____ Development name
2. ____ Engineer's seal, signature, address and telephone number
3. ____ Developer's name, address, and telephone number
4. ____ Date and vicinity map
5. ____ Include revision date

B. REGULATORY

1. ____ Provide statement of post-construction pond/storm water drainage ownership.
2. ____ Provide flood study per the Flood Plain Management Ordinance in accordance with FEMA approved methodology. The flood plain ordinance is available on the City of Perry Community Development website.
3. ____ Add engineer's certification to plans: "Engineer certifies that the flood study was prepared in accordance with a FEMA approved methodology". IF a LOMR or CLOMR, etc. is needed; the Applicant must send documents to FEMA w/copy sent along with plans to City of Perry Community Development.

B. REGULATORY (cont'd)

- 4. ____ Provide wetlands delineation. Show limits and area (acres or ft²) of encroachment.
- 5. ____ Offsite easements are/may be required (see plans). (Offsite easement needed for stormwater on a permanent basis must be delineated, legal description written and recorded in perpetuity at Houston County courthouse).
- 6. ____ Other _____

C. STORMWATER MANAGEMENT REPORT/HYDRO

- 1. ____ Provide Stomwater impact statement
- 2. ____ The submittal does not meet the requirements of the *Georgia Stormwater Management Manual*. Please refer to the appropriate sections in the manual that cover the topics of water quality treatment volume, channel protection volume, over-bank flood protection etc.
- 3. ____ Consider the use of available Better Site Design “credits” to reduce WQv and CPv.
- 4. ____ Provide supporting engineering calculations for all Better Site Design “credits”. Please see Section 1.4.4 of the GSMM for a complete listing of all available design credits.
- 5. ____ Provide brief summary of Better Site Design “credits”. Per the GSMM, design credits cannot be claimed twice for the same area. Credit areas and features must be identified and delineated on the construction drawings and final plat.
- 6. ____ Provide executive summary of the report’s findings to include a table similar to: Flow Summary

Basin	Cumulative Drainage Area	Return Frequency (yrs)	Pre-development Flow (cfs)	Post-development Flow (cfs)	Ponding Elevation (ft)
A		2			
		5			
		10			
		25			
		50			
		100			

- 7. ____ Include a narrative paragraph/summary in the report that includes a description of existing site, soils, slopes, vegetative cover, and proposed improvements, methodologies and procedures, calculations, summary of results and a conclusion detailing the findings of the drainage investigation.
- 8. ____ State the existing and proposed impervious surface by acre and percent of site for each basin.
- 9. ____ Provide a breakdown of proposed impervious surface by roofs, roads, sidewalks, access drives, driveways, etc.

C. STORMWATER MANAGEMENT REPORT/HYDRO (cont'd)

10. ____ Delineate all drainage areas/basins to include offsite drainage and bypass.
11. ____ Detailed pre and post developed drainage area maps are required.
12. ____ Rational “C” and/or SCS “CN” values need clarification and/or further explanation (see hydro).
13. ____ Show segmented T_c flow paths on scaled drainage maps.
14. ____ The time of concentration (T_c) for pre and/or post developed conditions needs clarification and/or further explanation (see hydro).
15. ____ The SCS method and other approved methodologies are required for detention analysis. The Rational method is only acceptable for pipe design within certain acreage limits. The Modified Rational Method can be used for detention design for drainage areas up to 1 acre per the Local Design Manual (4.1).
16. ____ A 10% downstream analysis is required. See Section 2.1.9 (GSMM). Provide basin drainage map showing POS, and peak flow analysis results with and without detention.
17. ____ Provide written description of land, topography, ditches between property and the 10% point.
18. ____ The 10% downstream analysis must specifically prove and state that no structures (businesses, homes, culverts, streets, etc) between the analysis points will be adversely impacted by the increase in site runoff.
19. ____ Provide WQ_v and CP_v calculations.
20. ____ Provide fore bay calculations (0.1”/acre of impervious area). Can be counted towards total WQ_v.
21. ____ Provide WQ_v and/or CP_v orifice sizing calculations for the 24-hour drawdown.
22. ____ Round orifice size up to the next smallest whole number (e.g. computed = 2.6”, round to 2”).
23. ____ The pond report (stage-storage) does not agree with what is dimensioned on the plans.
24. ____ The volumes required by the hydro do not agree with the proposed pond grading on the plans.
25. ____ Provide 50% of net WQ_v as dead pool storage for Wet Extended Detention pond.
26. ____ Micro pool pond required (10 – 25 acre drainage areas). Show 25-30% of net WQ_v as dead pool storage.
27. ____ Show that the 100-year storm, including offsite pass-through, is safely passed around the pond or through the emergency overflow weir. Otherwise, show how the offsite will be managed.
28. ____ Disturbed bypass areas greater than 10% of the drainage basin require water quality treatment.
29. ____ Extended dry detention must be used in conjunction with other onsite BMPs to meet the 80% TSS water quality requirements of the GSMM.
30. ____ Underground detention must comply with Section 3.4.3 of the GSMM.
31. ____ Include OCS details and pond cross section details. See Section 3.2, and Appendix in the GSMM for pond detail requirements.

C. STORMWATER MANAGEMENT REPORT/HYDRO(cont'd)

32. ____ If CP_v is waived, then the 2 through 100 year attenuation is required.
33. ____ If WQ_v and CP_v requirements are met, the only additional requirements are flood control for the 100-year event and safe passage of the 100-year event.
34. ____ Other _____

D. PLAN/DETAIL SHEETS

1. ____ Show existing and proposed R/W lines, lot lines/building envelop pavement and other impervious areas, curb and gutter, and R/W widths.
2. ____ Provide floodplain statement. Reference the 2006 FEMA Firm Panel number.
3. ____ Provide wetlands statement.
4. ____ Delineate wetland areas and note the areas (in acres/ft²) to be impacted.
5. ____ Further investigation of wetlands may be required
6. ____ Show areas of proposed cut/fill in the floodplain. Provide cut and fill sections. Cut and fill must balance, within boundary of site against floodplain. See Floodplain Management Ordinance for additional cut/fill requirements.
7. ____ Show all existing and proposed lakes with surface area, normal pool elevation, and dam height, top width, % slopes. Provide details for existing/proposed outlets/drain pipes and spillways.
8. ____ Show/note all Minimum Floor Elevations (MFE) for all lots located adjacent to the FEMA designated flood hazard area. For residential developments, the MFE is measured as 3' above the 100-year flood elevation to the bottom of the footing.
9. ____ Show/note the 100-year flood plain limits/sections, elevations, floodway limits. Indicate the source of the information.
10. ____ Provide copy of FEMA approved methodology flood study.
11. ____ Show the 25' (state) undisturbed stream buffers.
12. ____ Show stream buffer as measured from the wrested bank, not the centerline of the creek.
13. ____ Show/note the boundaries of other natural feature protection and conservation areas such as wetlands, lakes, ponds, and other setbacks (e.g. septic tank and drinking water well setbacks).
14. ____ Provide plan view of major manhole junctions to include pipe sizes, materials, angles and invert elevations.
15. ____ Identify/show/delineate all Better Site Design "credits". Note on plan that any conservation areas will be recorded at the Houston County Courthouse in perpetuity with the affected properties.

D. PLAN/DETAIL SHEETS(cont'd)

16. ____ Show grading of all open channels. Include cross-sections and calculations in accordance with Local Design Manual, velocities, dimensions, freeboard, and permanent grassing/sodding details to sustain the Q_{p25} velocity.
17. ____ Drainage other than sheet flow across two or more lots requires a dedicated drainage easement.
18. ____ Show a 20 ft minimum Access/Maintenance/Utility easement to and around the outer limits of the pond(s).
19. ____ Use Figure 1 at end of this section to determine the minimum drainage easement width requirement per Section 3-8-108 (Easements & Widths) (20' minimum).
20. ____ Show storm sewers extending to the rear of the lot unless discharging to defined channel approved by the City of Perry Public Works Dept.
21. ____ Show water quality ponds and BMPs outside of creeks/streams, wetlands, and buffers.
22. ____ General minimum slope for pond(s) is 3:1. Show 3:1 grading of pond(s).
23. ____ Residential pond(s) should be located within a subdivision common place. No part of the facility should be located on private property.
24. ____ Pond construction requires minimum setback of 20' from property line, 100' to 250' from a private well and 50' from a septic tank/leach field
25. ____ Show and dimension the aquatic bench.
26. ____ Show the fore bay. (0.1" per impervious acre)
27. ____ Show the micro pool (25-30% of net WQ_v).
28. ____ Show a safety bench if the pond is deeper than 4' or required slopes of greater than 3:1.
29. ____ Provide pond under drain (3" min. drain pipe with 3" min. gate valve located in OCS). Also, provide manufacturer and maintenance specs.
30. ____ **Add note to plan:** "The pond's maintenance under drain is intended to drain the pond for infrequent maintenance and inspection purposes. The gate valve must be closed immediately after construction of the pond. After construction is completed, it can only be opened upon authorization by the City of Perry Public Works Department.
31. ____ Provide a **complete pond profile detail sheet** including compaction detail, water surface elevations, structure and freeboard elevations, perforated and wrapped under drain pipe, material specifications, cutoff trench with anti-seep collar, orifice and spillway sizes and location, minimum 10' embankment berm width and minimum slopes of 3:1 per GSMM. (only excavated ponds require an 8' berm).
32. ____ Provide construction detail for emergency spillway.
33. ____ Consider use of reverse slope pipe attached to riser, with its inlet submerged 1' below the permanent pool elevation.

D. PLAN/DETAIL SHEETS (cont'd)

34. ____ For earthen embankments, use impervious cut-off trench with anti-seep collar to restrict piping of soils through embankment.
35. ____ Provide a trash rack or skimmer hood. (a flat top trash rack is not advised for private developments. It is not allowed for public single-family residential developments). Trash rack must have 10 times the surface area of the orifice it protects.
36. ____ Provide a wetland seeding schedule for extended detention wet pond. See Appendix F of the GSMM.
37. ____ Add note to plan: "No woody vegetation is allowed within 15' of the downstream toe of earthen embankment". (i.e. stumps, etc)
38. ____ Add note to plans that all retaining wall designs greater than 4' in height shall be submitted and approved by the City of Perry Community Development Department prior to installation. Keystone block walls are unacceptable for the pond's retaining wall.
39. ____ Junction boxes are required to have manhole access. Plans should reference AASHTO M294 requirements.
40. ____ Provide pipe bedding detail.
41. ____ Show curb inlet placement at low points in road.
42. ____ Show the 100-year ponding elevation at inlet. Ponding shall not occur on adjacent property without obtaining a drainage easement.
43. ____ Provide appropriate energy dissipation devices at all pipe outlets, open channels, and outlet control structures and culverts if exit velocities exceed 5 fps. Show/note the type of energy dissipation to be provided. Provide sizing calculations if rip-rap is proposed.
44. ____ Provide emergency spillway construction detail.
45. ____ Provide 4' chain link fence with two (2) 10' gates. Fence to be placed along the outer edge of the 20' access/maintenance easement around the pond.

Figure 1

Drainage Easement Worksheet

The following formula/worksheet is a tool to be used in determining the required width for drainage easements assigned to storm pipes.

The minimum required easement width for storm pipe installation is a function of the required clearance on each side of the pipe, the pipe diameter, the embankment slope and the pipe's depth at the deepest point.

Given a minimum 2 feet of clearance between the pipe walls and an embankment slope of 2:1 (H:V), the formula is:

Minimum easement width = 4' + diameter + (4 x maximum depth) = total easement width (feet), to be centered on structure/pipe.

E. PIPE PROFILES/CULVERT DESIGN/OPEN CHANNELS

Pipe

1. ____ Show a minimum of 12" of cover for pipe. Additional cover may be required depending on expected loading.
2. ____ All pipes requiring a manhole base larger than 48" in diameter must be identified by showing base unit and reduction cone, inverts of pipes, etc.
3. ____ Verify that the pond outlet discharge pipe has been checked for inlet and outlet control.
4. ____ Match crowns on adjacent pipe.
5. ____ Provide a minimum of 12" vertical and horizontal separation between all buried utilities & storm pipes.
6. ____ Show all sanitary and water line, and other utility crossings on storm profiles.
7. ____ Show catch basin top and pipe invert elevations.
8. ____ Show curb inlet at low point of street
9. ____ Provide pipe profiles with existing and proposed ground surface profiles, pipe lengths, slopes, inverts, and type.
10. ____ Show 25-year hydraulic grade line. It must be below the crown of the pipe. Please provide supporting data in pipe profile chart or hydro study.
11. ____ Inverts on all structures shown to be paved smooth.
12. ____ Minimum acceptable pipe diameter is 15 inches.
13. ____ Velocity in pipe No. (s) _____ exceeds 15 fps. Velocities should be between 3-15 fps.
14. ____ RCP is required / recommended under roads.
15. ____ Angle conflict among pipes will require a larger manhole for structure.

Pipe chart indicating the following:

1. ____ Pipe Numbers
2. ____ Invert elevations
3. ____ Pipe Sizes
4. ____ Pipe Slope
5. ____ Pipe Length
6. ____ Contributing Drainage Area
7. ____ Design discharge (Per Local Design Manual)
8. ____ Design storm frequency (Per Local Design Manual)
9. ____ Runoff Coefficient for CMP
10. ____ Pipe material/coating. Indicate corrugation spacing and height
11. ____ Velocity (V_{25} may not exceed erosive velocity at outlet headwall unless additional energy dissipation is provided.)
12. ____ Gutter spread(Per Local Design Manual)

Open channel chart indicating the following:

1. ____ Open Channel Numbers
2. ____ Contributing Drainage Area
3. ____ Runoff coefficient (per future land use plan and assuming no detention)
4. ____ Conveyance Size. Provide typical cross section
5. ____ Lining Material (riprap, sod, vegetative, etc.)
6. ____ Channel Length
7. ____ Channel Slope (for min and max values)
8. ____ Velocity (V_{25} may not exceed erosive velocity)
9. ____ Design Storm frequency
10. ____ Design discharge
11. ____ Normal Flow Depth
12. ____ Indicate free board capacity

Culverts

1. ____ Headwater & Tailwater Limitations: For drainage facilities with cross-sectional areas equal to or less than 30 ft^2 , HW/D for the 100-year frequency storm must be equal to or less than 1.5. For drainage facilities with cross-sectional areas greater than 30 ft^2 , HW/D for the 100year frequency storm must be equal to or less than 1.2. Culverts must be sized to maintain flood-free conditions on major thoroughfares with at least 18-inches freeboard at the low-point of the road. (All criteria from Section 4.3, culvert design, of the GSMM are required.)
2. ____ As stated above, inlet/outlet control calculations are required for all street crossings in addition to Manning's equation. Insure that T_c is representative of the drainage area.
3. ____ The weighted runoff coefficient for major culvert analysis ($Q=C_rCIA$) should be based on full build-out using the current zoning plan for the entire receiving area.
4. ____ Show 100-year ponding limits above pipe (culvert).
5. ____ Show 100-year hydraulic grade line in all culverts.
6. ____ RCP is required for culvert(s) placed in streams with any base flow.

OTHER REVIEW COMMENTS:

CITY OF PERRY GA

Direct questions regarding the above issues to:

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Ronnie T. Jones, EIT – Director of Public Works @ 478-988-2729