

FINAL DRAINAGE REPORT CHECKLIST

Final Drainage Reports shall include the following as a minimum. The DCM Criteria must be shown to be met with the Final Drainage Report. Additional information may be required to show Criteria is being met.

REPORT TEXT

1. Cover Page

- a. Report type (i.e., "Final Drainage Report")
- b. Subdivision name matching Final Plat (or project name for capital projects)
- c. Prepared for
- d. Prepared by
- e. Date prepared

2. Signature Blocks

- a. Engineer – must be signed/stamped prior to City approval
- b. Owner/Developer – must be signed prior to City approval
- c. City Review

3. Introduction / Site Description

- a. Subdivision name, land use, project description
- b. Total site area, total disturbance area
- c. Section, township and range ("west of 6th principal meridian")
- d. City, County and State
- e. Reference criteria used
- f. Is the site in the Streamside Zone
- g. Soil conditions, including source of soils data (e.g., NRCS) and Hydrologic Soil Group
- h. Street classifications for any existing / proposed roads if street capacity calculations are needed

4. Previous Studies

- a. Discussion of prior studies affecting the site

5. Existing Drainage Conditions

- a. List major watershed (e.g. – Sand Creek Basin)
- b. List any existing site improvements (e.g. – grading, swales, utilities, storm drains, etc.)



- c. General drainage pattern (cardinal direction references)
- d. Specific drainage patterns and description of hydraulic routing and outfall locations
- e. Off-site drainage conditions affecting the site

6. Proposed Drainage Conditions

- a. Discuss proposed site improvements (e.g. – grading, swales, utilities, storm drains, etc.)
- b. Specific drainage patterns and description of hydraulic routing and outfall locations
- c. Discussion regarding compliance or variance with other drainage studies
- d. Public or private maintenance of facilities proposed

7. 4 Step Process / Detention

- a. Statement with disturbance area and whether 4 Step Process and detention criteria apply
- b. Statement on how detention is being provided for site
- c. Description of Exclusions, if applicable
- d. Description of compliance with each step individually
 - i. Step 1 – Volume Reduction
 - 1. Description of Planned Infiltration Areas (PIAs)
 - 2. List of percent of volume reduction
 - 3. Statement that Criteria is being met
 - 4. Reference to calculations and exhibit in Appendix
 - ii. Step 2 – WQSV
 - 1. Table with design points following format below
 - 2. Description of emergency spillway routing of PCM
 - 3. Tabulation of regional water quality contributing areas with new site included
 - a. Include tributary area diagrams as needed

Design Point	Associated Disturbance Area (ac)	Treatment Method	Ownership / Maintenance
1	1.72	Extended Detention Basin A	Private (Metro District)
2	0.05	75% Infiltration	Public
3	0.1	Utility Exclusion	N/A



4	0.1	Not Treated	N/A
Total	2.1		

iii. Step 3 – Channel Stabilization

1. Description of adjacent channels
2. Distance from site to nearest channel
3. Description of channel improvements if applicable or reference to Channel Design Report

iv. Step 4 – Source Control

1. Description of permanent non-structural source control measures implemented on site based on the land use of the site

8. Floodplain Statement

- a. Typically stated as either the following or a variation thereof:
- b. “No portion of the site is located within a 100 year floodplain as determined by the Flood Insurance Rate Map (FIRM) number ##### effective date, December 7, 2018 (see appendix)”
- c. If the site is within a floodplain, then the statement must state so
- d. Description of floodplain permitting (CLOMR/LOMR, No Rise) and US Army Corp of Engineers permitting

9. Drainage and Bridge Fees

- a. Must match what was provided in Preliminary Drainage Report

10. Variances

- a. List of variances requested, reference to Variance Request in Appendix

11. Summary

- a. Subdivision name matching Final Plat (or project name for capital projects)
- b. Statement that site runoff and storm drain and appurtenances will not adversely affect the downstream and surrounding developments
- c. Statement that this report and findings is in general conformance with the MDDP or Preliminary Drainage Report



APPENDICES

12. Vicinity Map

- a. Show surrounding streets and a label for the site, should show adjacent streets, nearby drainageways, and a few major roadways
- b. Site delineated with border shown or border and hatch
- c. North arrow and scale reference

13. Soils Data

- a. NRCS (or other) map copy or print with soil types (numbered) labeled
- b. Site delineated with border shown or border and hatch
- c. North arrow and scale reference

14. FEMA Floodplain Map

- a. FIRM copy or print out (maps can be made on the FEMA web site)
- b. Site delineated with border shown or border and hatch
- c. North arrow and scale reference
- d. FEMA map number and map effective date

15. Hydrologic Calculations – 5yr and 100yr minimum

- a. Rational Method calculations – it must be clearly shown that DCM Criteria is being used/met
 - i. Composite C calculations, including composite percent imperviousness
 - ii. Tc calculations
 - iii. Maximum Tc checks
 - iv. Intensity calculations
 - v. Discharge values
- b. Routing calculations (if applicable)
 - i. CN calculations, including % imperviousness
 - ii. Rainfall values
 - iii. Inlet summary
 - iv. Model schematic
 - v. Output tables with relevant values boxed or highlighted
- c. Design points with contributing basins table



16. Hydraulic Calculations – all necessary input/output reports/figures must be included to show DCM Criteria is being met

- a. Conveyance infrastructure
 - i. Street capacity calculations
 - ii. Inlet calculations
 - iii. Hydraulic Grade Line (HGL) calculations, including profile printouts
- b. Culverts and bridges
 - i. Headwater / Depth calculations
 - ii. Velocity calculations
- c. Channels
 - i. See Channel Design Report requirements
- d. Swales
 - i. Manning's formula calculations
- e. Outlet protection
 - i. Calculations related to outfall protection for all pipe outlets and culverts (e.g., riprap calcs, etc.)

17. 4 Step Process / Detention Calculations

- a. Composite % impervious calculations for each design point
- b. Volume Reduction spreadsheet for each design point
- c. Green infrastructure diagram showing all UIAs and PIAs
 - i. Unconnected Impervious Areas (UIAs) must be shown as translucent blue
 - ii. Planned Infiltration Areas (PIAs) must be shown as translucent green
 - iii. Include scale and flow arrows
 - iv. Clearly label between individual areas in diagram and corresponding areas in Volume Reduction spreadsheet
 - v. Total disturbance area must be delineated with 4 Step Process exclusion areas clearly labeled
- d. Additional green infrastructure calculations as needed
 - i. Swales
 - ii. Flow spread from point discharge location
- e. MHFD-Detention spreadsheet or summary of drain time outputs based on routed model with water rights (SDI) spreadsheet for each design point
- f. UD-BMP for Rain Gardens and Sand Filters (in addition to MHFD-Detention)
- g. Additional PCM calculations as needed (forebay notch, riprap embankment protection, etc.)

18. Variance Request Letter



19. Drainage Maps – Existing and Proposed as separate maps

- a. Property boundary with label or legend item
- b. Streets with labels
- c. Curb and gutter with type noted
- d. Buildings, parking and landscape areas with labels
- e. Existing (and Proposed) contours, with elevation labels
 - i. Existing contours must be shown at minimum 50-feet beyond basin delineations or property line, whichever is greater
- f. Lot labels
- g. Underground conveyance pipe and structures labeled with size, material, type and public/private (and condition if applicable)
- h. Ditches/swales/channels with labels and grades (and cross section identifier if applicable)
- i. Design point identifier
- j. Basin boundaries with label or legend item (full offsite basin extents must be shown)
- k. Adjacent development plat name labels
- l. Flow arrows
- m. Basin identifiers
- n. Basin/Design Point summary table
- o. Drainage easements or tracts with labels
- p. 100-yr floodplain and streamside overlay limits (if applicable) with label or legend reference
- q. Planned Infiltration Areas (PIAs) delineated and labeled
- r. Permanent Control Measures (PCMs) labeled with type and maintenance responsibility (public/private)
 - i. Major features (forebays, outlet structures, low-flow channels, retaining walls, emergency spillways, maintenance access roads, etc.)
 - ii. Slopes for access roads, low-flow channels, and basin sides

