

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

4.0 Introduction

The requirements presented in this section shall be used to aid the design engineer or applicant in the preparation of drainage reports, drainage studies, and construction drawings for stormwater management facilities. The requirements presented are the minimum necessary and will be used to evaluate the adequacy of all submittals to the County.

4.1 Review Process

- 4.1.1 Drainage Report Requirements.** Drainage report submittal requirements related to the type of development or land use proposals are generally outlined in Table 4-1. The number of drainage reports submitted with any development or land use proposal shall be based on the requirements of the Planning Division. Two copies of the drainage report shall be submitted for proposals that do not originate with the Planning Division. In any case, additional copies of the drainage report may be requested by the County. The submittal shall include a cover letter stating the type of report submitted (e.g., Master, Phase I, Phase II, or Phase III) and for what purpose the report has been prepared.
- 4.1.2 Stand-Alone Document.** The drainage report shall be a stand-alone document. When references are made or assumptions are based on previously submitted studies or reports, the drainage report must include the appropriate excerpts, pages, tables, and maps containing the referenced information. Assumptions made in previous reports must be verified and substantiated in all new reports. All submitted reports shall be legible. If reports are unreadable, resubmittal of readable copies shall be required.
- 4.1.3 Submittal Adequacy.** Submittals with incomplete or absent information may result in the report being returned to the author without review. The County reserves the right to require additional information with any submittal.
- 4.1.4 Pre-application Consultation.** A pre-application consultation with Public Works Engineering staff is highly encouraged for all applicants undertaking any land development processing steps presented either herein or in the *Regulations*. The applicant shall consult with the County for general information regarding the *Regulations*, required procedures, possible drainage problems, and specific submittal requirements.
- 4.1.5 Review by Referral Agencies.** The review and approval by other agencies such as special districts, State or Federal agencies, local governments, affected jurisdictions, and other referral agencies may be required for some submittals. The applicant shall be required to address referral agency comments and obtain approvals when necessary.

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

**TABLE 4-1
DRAINAGE REPORT SUBMITTAL REQUIREMENTS**

SUBMITTAL TYPE	DRAINAGE SUBMITTAL REQUIREMENTS
ZONING	
Rural Site Plan	Phase III Drainage Report including floodplain analysis, if applicable.
Use by Special Review	Phase III Drainage Report (through Site Plan requirements)
Site Improvement Plan	Phase III Drainage Report
Location and Extent	Phase III Drainage Report
Rezoning	Phase I Drainage Report
SUBDIVISION	
Sketch Plan	Phase I Drainage Report “or” approved Master Plan of Drainage
Preliminary Plan	Phase II Drainage Report “or” approved Master Plan of Drainage
Final Plat	Phase III Drainage Report
Minor Development	Phase III Drainage Report
Replat	Phase III Drainage Report

NOTE: The drainage report submittal requirements as outlined in this table are general guidelines and do not represent all circumstances under which specific drainage submittals may be required. Prior to submittal, the applicant shall consult with Douglas County Public Works Engineering for submittal requirements regarding applications or processes not addressed in this Table.

4.2 Acceptance

4.2.1 Phase III Drainage Report Acceptance Required for Construction. The acceptance of a Phase III drainage report and construction drawings must be obtained prior to construction of any drainage improvements within the County. Phase I and Phase II drainage studies are conceptual and are reviewed by the County, but they do not receive a formal acceptance and cannot be used for construction.

4.2.2 Permanent Best Management Practices Plan Required Prior to Land Disturbance. The Phase II drainage report and plan must be reviewed and accepted by the County prior to the issuance of a Grading, Erosion, and Sediment Control (GESD) Permit for land disturbance activities. This requirement will not apply to proposed land disturbance activities or projects where post construction, permanent, water quality enhancement Best Management Practices are not required, as described in Chapter 14 Stormwater Quality, or as determined by the County.

4.2.3 One Year Acceptance for Phase III Drainage Reports. Phase III drainage reports will be valid for one year from the date of County acceptance. If construction drawings have not been developed and accepted by the County within one year of the drainage report acceptance, the Phase III drainage report

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

must be submitted for re-acceptance. In order to be re-accepted, it must be demonstrated that the concepts, designs, and calculations presented in the report are consistent with current County criteria and standards. If new concepts, criteria, or standards have been adopted since the drainage report was accepted and then expired, submittal of an updated Phase III drainage report will be required. The updated Phase III drainage report must be accepted by the County and that report will provide the foundation for development of the construction drawings. Phase I, Phase II, and Master Plan of Drainage studies are not formally accepted, and therefore not affected by the one year acceptance period.

4.3 Phase I Drainage Report and Plan

4.3.1 Requirement for Phase I Drainage Report and Plan Submittal. Submittal of a Phase I drainage report and plan is required with specific development or land use proposals, as generally outlined in Table 4-1. The Phase I report will describe, at a conceptual level, the feasibility and design characteristics of stormwater management facilities within the proposed development. The Phase I report shall be prepared on 8½" x 11" paper and bound. The drawings, figures, and tables shall be bound with the report or included in a pocket attached to the report. The report shall include a cover letter presenting the preliminary design for review and shall be certified by a Professional Engineer licensed in Colorado and shall be in accordance with the information presented in the following section.

4.3.2 Report Contents. The following is an outline of the **minimum** Phase I drainage report requirements:

- I. COVER SHEET
 - A. Name of Project
 - B. Address
 - C. Owner
 - D. Developer
 - E. Engineer
 - F. Submittal date and revision dates as applicable

- II. GENERAL LOCATION AND DESCRIPTION
 - A. Site Location
 - 1. Site Vicinity Map
 - 2. Township, Range, Section, and ¼ Section
 - 3. Streets, Roadways, and Highways adjacent to the proposed development, or within the area served by the proposed drainage improvements
 - 4. Names of surrounding or adjacent developments

 - B. Description of Property

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

1. Area in Acres
2. Ground cover, vegetation, site topography and slopes
3. Natural Resources Conservation Service (NRCS) Soils Classification Map and discussion
4. Major and minor drainageways
5. Floodplains delineated by UDFCD FHAD Studies or on FEMA FIRM Maps
6. Existing irrigation canals or ditches
7. Significant geologic features
8. Proposed land use

III. DRAINAGE BASINS AND SUB-BASINS

A. Major Drainage Basins

1. On-site and off-site major drainage basin characteristics and flow patterns and paths
2. Existing and proposed land uses within the basin if known
3. Reference all drainageway planning or floodplain delineation studies that affect the major drainageways, such as UDFCD FHAD Studies and Outfall System Planning Studies
4. Discussion of the impacts of the off-site flow patterns and paths, under full developed conditions

B. Minor Drainage Basins

1. On-site and off-site minor drainage basin characteristics and flow patterns and paths
2. Existing and proposed land uses within the basins
3. Discussion of the impacts of the off-site flow patterns and paths, under fully developed conditions

IV. EXISTING STORMWATER CONVEYANCE OR STORAGE FACILITIES

A. Existing Stormwater Conveyance Facilities

1. Existing conveyance facilities that will be incorporated into the design
2. Existing conveyance facilities that will be incorporated into the design with modifications
3. Existing conveyance facilities that will be rebuilt or abandoned

B. Existing Stormwater Storage Facilities

1. Existing storage facilities that will be incorporated into the design
2. Existing storage facilities that will be incorporated into the design with modification
3. Existing storage facilities that will be rebuilt or abandoned

V. PROPOSED STORMWATER CONVEYANCE OR STORAGE FACILITIES

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

- A. Proposed Stormwater Conveyance Facilities
 - 1. Conceptual discussion of proposed drainage patterns and difference from historic patterns
 - 2. Conveyance of off-site runoff
 - 3. Discuss the content of any pertinent tables, charts, figures, graphs, drawings, etc. that are presented in the report
 - 4. Discussion of anticipated conveyance problems and potential solutions
 - 5. Discuss the maintenance and access aspects of the design
- B. Proposed Stormwater Storage Facilities
 - 1. Detention storage locations and conceptual outlet structure design
 - 2. Discuss anticipated storage problems and potential solutions
 - 3. Discuss the maintenance and access aspects of the design
- VI. WATER QUALITY ENHANCEMENT BEST MANAGEMENT PRACTICES
 - A. Non-structural Best Management Practices
 - 1. Discussion of non-structural Best Management Practices that will be part of the stormwater management plan
 - B. Structural Best Management Practices
 - 1. Discuss structural Best Management Practices that will be part of the stormwater management design
 - 2. Discuss the operation, maintenance, and access aspects of the design
- VII. FLOODPLAIN MODIFICATIONS – (for additional information on floodplain modification see Chapter 5)
 - A. Major Drainageway – Undesignated Floodplain
 - 1. Discuss potential modifications of existing major drainageway floodplains
 - 2. Discuss why the floodplain modifications are proposed
 - B. Major Drainageway – Designated Floodplain
 - 1. Discuss potential modifications of existing major drainageway floodplains that have a designated floodplain
 - 2. Discuss the source of the floodplain information and level of detail (UDFCD Flood Hazard Area Delineation or FEMA Flood Insurance Rate Maps)
 - 3. Discuss why the floodplain modifications are necessary
 - 4. Discuss Conditional Letter of Map Revision (CLOMR) and Letter of Map Revision (LOMR) requirements
 - 5. Discuss County floodplain development regulations and Floodplain Development Permit
- VIII. POTENTIAL PERMITTING REQUIREMENTS

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

Identify other potential local, State and Federal permitting requirements

VIII. REFERENCES

Reference all criteria, master plans, reports, or other technical information used in development of the concepts discussed in the drainage report

IX. APPENDICES

Provide copies of all pertinent information from referenced materials

4.3.3 Phase I Drainage Plan Requirements. The following is an outline of the **minimum** Phase I drainage plan requirements. All plans must be bound.

I. OVERALL DRAINAGE PLAN

- A. 24"x36" or 22"x34" are acceptable plan sizes
- B. Title block and legend
- C. Existing or proposed streets, roadways, or highways
- D. Show the limits of all major basins, including off-site basins where feasible
- E. General drainage patterns and flow paths, including those entering and leaving the site
- F. Topographic information with a 5-foot maximum contour interval
- G. Identify existing stormwater management facilities, upstream, downstream, or within the site, which will provide a storm water management function for the site
- H. Overlay or figure showing layout of detailed drainage plan sheets if more than one detail drainage plan sheet is required

II. DETAILED DRAINAGE PLANS

- A. 24"x36" or "22"x34" are acceptable plan sizes
- B. Title block and legend
- C. Scale 1"=20' to 1"=100', as required to show sufficient detail
- D. Existing topographic contours with a 5-foot maximum contour interval
- E. Existing stormwater conveyance or storage facilities
- F. Floodplain limits, based on available information
- G. Major drainage basin boundaries
- H. Conceptual locations of stormwater conveyance or storage facilities, including detention ponds, water quality enhancement features, storm sewers, culverts, swales, etc., consistent with the proposed development plan
- I. Proposed flow directions
- J. Proposed contours, if they are available

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

4.4 Phase II Drainage Report and Plan

4.4.1 Requirement for Phase II Drainage Report and Plan Submittal. Submittal of a Phase II drainage report and plan is required with specific development or land use proposals, as generally outlined in Table 4-1. The purpose of the Phase II drainage report is to identify and refine conceptual stormwater management solutions to the challenges that may be present or occur on-site and off-site. All reports shall be prepared on 8-1/2"x11" paper and shall be bound. The drawings, figures, and tables shall be bound with the report or included in a pocket attached to the report. The report shall include a cover letter presenting the preliminary design for review and shall be certified by a Professional Engineer licensed in Colorado.

4.4.2 Report Contents. The Phase II drainage report generally consists of a narrative portion and appendices with supporting calculations and other pertinent information. The narrative shall lead the reader logically through the entire analysis and design process and provide a clear picture of all stormwater management issues. The narrative portion shall provide detailed discussion regarding the general location and description of the site, off-site and on-site drainage basins and sub-basins, drainage design criteria, stormwater management facility design, and conclusions, as provided in Sections II through V of the outline presented in this section. Discussion of methodology, assumptions, input, and a summary of results shall be provided in the narrative for all hydrologic or hydraulic modeling efforts. Peak flow rates, storage volumes, critical water surface elevations, and stormwater management facility sizes shall also be summarized or discussed in the report narrative. The appendices must provide the appropriate backup information and calculations, but the reader should not have to review information contained in the appendices to have a clear and thorough understanding of the project and the stormwater management analysis and facility designs.

The following is an outline of the **minimum** Phase II drainage report requirements:

- I. COVER SHEET
 - A. Name of Project
 - B. Address
 - C. Owner
 - D. Developer
 - E. Engineer
 - F. Submittal date and revision dates as applicable

- II. GENERAL LOCATION AND DESCRIPTION
 - A. Site Location
 1. Site Vicinity Map
 2. Township, Range, Section, and ¼ Section

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

3. Existing and proposed streets, roadways, and highways adjacent to and within the proposed development, or within the area served by the proposed drainage improvements
 4. Names of surrounding or adjacent developments, including land use or zoning information
- B. Description of Property
1. Area in Acres
 2. Ground cover, vegetation, site topography and slopes
 3. NRCS Soils Classification Map and discussion
 4. Major and minor drainageways
 5. Floodplains delineated by UDFCD FHAD studies or on FEMA FIRM Maps
 6. Existing irrigation canals or ditches
 7. Significant geologic features
 8. Proposed land use

III. DRAINAGE BASINS AND SUB-BASINS

- A. Major Drainage Basins
1. On-site and off-site major drainage basin characteristics and flow patterns and paths
 2. Existing and proposed land uses within the basins if known
 3. Discussion of all drainageway planning or floodplain delineation studies that affect the major drainageways, such as UDFCD FHAD Studies and Outfall System Planning studies
 4. Discussion of the condition of any channel within or adjacent to the development, including existing conditions, need for improvements, and impact on the proposed development
 5. Discussion of the impacts of the off-site flow patterns and paths, under fully developed conditions
- B. Minor Drainage Basins
1. On-site and off-site minor drainage basin characteristics and flow patterns and paths under historic and developed conditions
 2. Existing and proposed land uses within the basins
 3. Discussion of irrigation facilities that will influence or be impacted by the site drainage
 4. Discussion of the impacts of the off-site flow patterns and paths, under fully developed conditions

IV. DRAINAGE DESIGN CRITERIA

- A. Regulations
1. County criteria and optional provisions selected, when applicable
 2. *UDFCD Manual* criteria and optional provisions selected, when applicable

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

- B. Drainage Studies, Outfall Systems Plans, Site Constraints
 - 1. Discuss previous drainage studies or master plans for the site or project that influence the stormwater facility design
 - 2. Discuss drainage studies for adjacent developments and how those developments affect the stormwater facility design
 - 3. Discuss UDFCD Outfall Systems Plans and how recommendations in those studies affect the design
 - 4. Discuss impacts to stormwater management facility design caused by site constraints, such as streets, utilities, light rail, rapid transit, existing structures, etc
- C. Hydrology
 - 1. Runoff calculations method(s)
 - 2. Design storm recurrence intervals
 - 3. Design rainfall
 - 4. Detention storage calculation method(s)
 - 5. Detention storage release rate calculation method
- D. Hydraulics
 - 1. Methods used to determine conveyance facility capacities
 - 2. Hydraulic grade line calculation method and discussion of loss coefficients
 - 3. Methods used to calculate water surface profile
 - 4. Detention pond routing
- E. Water Quality Enhancement
 - 1. Discuss proposed Best Management Practices
 - 2. Identify design procedures

V. STORMWATER MANAGEMENT FACILITY DESIGN

- A. Stormwater Conveyance Facilities
 - 1. Discuss general conveyance concepts
 - 2. Discuss proposed drainage paths and patterns
 - 3. Discuss storm sewer design, including inlet and pipe locations and sizes, tributary basins and areas, peak flow rates at design points, hydraulic grade lines, etc.
 - 4. Discuss storm sewer outfall locations and design, including method of energy dissipation
 - 5. Discuss how runoff is conveyed from all outfalls to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway
 - 6. Discuss open channel and swale designs, including dimensions, alignments, tributary basins and areas, peak flow rates at design points, stabilization and grade control improvements, low flow or trickle channel capacities, water surface elevations, etc
 - 7. Discuss allowable street capacities

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

8. Discuss maintenance aspects of the design and easements and tracts that are required for stormwater conveyance purposes
 9. Discussion of the facilities needed off site for the conveyance of minor and major flows to the major drainageway
- B. Stormwater Storage Facilities
1. Discuss detention pond designs, including release rates, storage volumes and water surface elevations for the 2-year, 100-year and emergency overflow conditions, outlet structure design, emergency spillway design, etc
 2. Discuss pond outfall locations and design, including method of energy dissipation
 3. Discuss how runoff is conveyed from all pond outfalls and emergency spillways to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway
 4. Discuss maintenance aspects of the design and easements and tracts that are required for stormwater storage purposes
- C. Water Quality Enhancement Best Management Practices
1. Discuss the design of all structural water quality Best Management Practices, including tributary areas, sizing, treatment volumes, design features, etc
 2. Discuss how runoff is conveyed from all pond outfalls to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway
 3. Discuss the operation and maintenance aspects of the design and easements and tracts that are required for stormwater quality enhancement purposes
- D. Floodplain Modification
1. Discuss why the floodplain modifications are proposed
 2. Discuss the source of the floodplain information and level of detail (UDFCD Flood Hazard Area Delineation or FEMA Flood Insurance Rate Maps)
 3. Discuss details of floodplain modifications, including level of encroachment, velocities, depths, stabilization measures, water surface elevations, etc
 4. Discuss Conditional Letter or Map Revision (CLOMR) and Letter or Map Revision (LOMR) requirements
 5. Discuss County floodplain development regulations and Floodplain Development Permit
- E. Additional Permitting Requirements
1. Section 404 of the Clean Water Act
 2. The Endangered Species Act
 3. Other local, state, or federal requirements

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

F. General

1. Discuss all tables, figures, charts, drawings, etc. that were used in design of stormwater management facilities and describe materials that are included in the appendix of the report

VI. CONCLUSIONS

A. Compliance with Standards

1. Douglas County Criteria
2. UDFCD Criteria
3. Master Plans and UDFCD Outfall Systems Plans
4. Cherry Creek Reservoir Control Regulation No. 72
5. Chatfield Reservoir Control Regulation No. 73

B. Variances

1. Identify provisions by section number for which a variance will be requested, or has been approved by the County (final version of Drainage Report). Additional information on variances is available in Chapter 1 General Provisions
2. Provide justification for each variance request

C. Drainage Concept

1. Discuss overall effectiveness of stormwater management design to properly convey, store and treat stormwater

VII. REFERENCES

Reference all criteria, master plans, reports or other technical information used in development of the concepts discussed in the drainage report

VIII. APPENDICES

A. Hydrologic Computations

1. Determination of runoff coefficients and times of concentration
2. Land use assumptions for off-site areas
3. Colorado Urban Hydrograph Procedure input parameter determination
4. UDSWM input parameter determination
5. Peak flow rate calculations for the minor and major storms
6. Rainfall information
7. CUHP/UDSWMM input and output
8. Hydrograph data (if applicable)
9. Connectivity diagram showing relationship/connectivity of basins, conveyance facilities, detention ponds, and design points

B. Hydraulic Computations

1. Culvert capacities

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

2. Storm sewer capacities and hydraulic grade lines, including the loss coefficients
 3. Street capacities
 4. Inlet capacities
 5. Open channel or swale capacities
 6. Low flow and trickle channels
 7. Stabilization and grade control improvements
 8. Water surface profiles
 9. Stage-storage-discharge determination for detention ponds
 10. Detention pond routing calculations
 11. Emergency spillway sizing calculations
 12. Downstream/outfall capacity to the nearest major drainageway
 13. Energy dissipation at pipe outfalls
- C. Water Quality Enhancement Best Management Practices
1. Design and sizing
- D. Referenced Information
1. Copies of pertinent portions of all referenced materials or drainage reports

Note: Hydraulic computations will be required with the Phase II drainage report if the information necessary to perform the calculations is available. Availability of information will be determined by the Public Works Engineering staff, based on the level of detail contained in the application submitted to the Planning Division. Regardless of present availability, all hydraulic computations will be required in the Phase III drainage report.

- 4.4.3 Certification Statement.** The report shall contain a certification page with the following statement:

“This report and plan for the Phase II drainage design of (Name of Development) was prepared by me (or under my direct supervision) in accordance with the provisions of Douglas County Drainage Design and Technical Criteria for the owners thereof. I understand that Douglas County does not and will not assume liability for drainage facilities designed by others.”

SIGNATURE: _____
Registered Professional Engineer State
Of Colorado No. _____
(Affix Seal)

- 4.4.4 Standard Forms.** Use appropriate copies of the County’s standard forms and UDFCD design spreadsheets applicable to the design. When using County and UDFCD standard forms, charts, nomographs, etc., the form must be annotated as necessary to depict the specific information pertinent to the site. The engineer is required to show the appropriate information relative to the design and provide the lines, notes, etc. to depict how the design information was

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

arrived at. For example, when using street gutter capacity charts, a separate chart for each street section shall be submitted, with the specific street criteria highlighted and the final result circled. Forms that are copied out of the book without the appropriate annotations are not adequate.

4.4.5 Checklists. Design or report checklists as referenced in the individual sections of this *Criteria*, and as available on the Douglas County website, must be completed and submitted with the drainage report. Appropriate notations shall be provided with the checklist to assist the reviewer in determining whether the design is complete (i.e., if a specific item is not addressed, an explanation should be provided). All design or report checklists that have been developed will be available on the Douglas County website. New and/or revised checklists will be added as they are developed.

4.4.6 Phase II Drainage Plan Requirements. The following is an outline of the **minimum** Phase II drainage plan requirements. All plans must be bound:

I. OVERALL DRAINAGE PLAN

- A. 24" x 36" or 22" x 34" are acceptable size
- B. Title block and legend
- C. Show boundaries of entire development or project
- D. Existing or proposed streets, roadways, or highways
- E. Show limits of all major basins, including off-site basins where feasible
- F. General drainage patterns and flow paths, including those entering and leaving the site
- G. Topographic information with a 5-foot maximum contour interval
- H. Identify existing and proposed stormwater management facilities, upstream, downstream, or within the site, which will provide a stormwater management function for the site
- I. Overlay or figure showing layout of Detailed Drainage Plan sheets

II. DETAILED DRAINAGE PLANS

- A. 24" x 36" or 22" x 34" are acceptable sizes
- B. Title block and legend
- C. Basin designations, design points, flow rates, volumes and release rates
- D. Scale 1"=20' to 1"=100', as required to show sufficient detail
- E. Existing (dashed or screened) and proposed (solid) contours with a 2-foot maximum contour interval. In terrain where the slope exceeds 15%, the maximum interval is 5-feet. Contours must extend a minimum of 100 feet beyond property lines and contour elevation labels must be included
- F. Existing utilities and structures
- G. All property lines and easements with type of easements noted
- H. Adjacent developments or ownerships

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

- I. Streets and roadways with Right-of-Way and flow line widths, type of curb and gutter or roadside swale, slopes flow directions, and crosspans
- J. Drainage basin and sub-basin limits
- K. Existing and proposed stormwater management facilities, including irrigation ditches, roadside swales, open channels and drainageways, storm sewer, culverts, detention ponds, water quality enhancement structures or features, etc. Information must be included regarding materials, sizes, shapes, and slopes
- L. Proposed outfall points and existing or proposed facilities to convey runoff to the nearest major drainageway, without damage to downstream properties
- M. Location and elevation of all existing and proposed 100-year floodplain boundaries, including the source of designation. All floodplain designations that exist for the site should be included (i.e. FEMA Flood Insurance Rate Maps, UDFCD Flood Hazard Area Delineation, and others)
- N. Summary runoff table

NOTE: The items listed above will be required with the Phase II drainage report or a written explanation as to why information cannot be provided.

4.4.7 Master Plan of Drainage. The Douglas County Subdivision Resolution makes reference to a Master Plan of Drainage in the Sketch Plan and Preliminary Plan discussion regarding procedures and submittal requirements, and that is reflected in Table 4-1. The Master Plan of Drainage shall be considered equivalent to a Phase I or Phase II drainage report for the Sketch Plan and Preliminary Plan submittals, respectively, and must meet those minimum requirements.

4.4.8 “Transitional” Phase II Drainage Report. The Phase II drainage report requirements may be reduced at the request of the applicant if there is uncertainty regarding the final developed characteristics of individual parcels, lots, or sites within the proposed development. There is frequently uncertainty with commercial and business park developments at the preliminary or final plat stage regarding the size and placement of buildings, the detailed lot or parcel grading, the extent of paved areas, and the location of local stormwater management facilities and detention facilities. As the individual lots or parcels develop, separate Phase III drainage reports are typically prepared as the site characteristics and layout, are determined. If a transitional Phase II drainage report is prepared for a development, the Phase II drainage report requirements shall be adhered to with the following exceptions or modifications:

1. Conservative assumptions may be made for areas where there is uncertainty regarding drainage factors related to the development of the site.
2. The level of detail may be reduced in the hydraulic and hydrologic analysis in areas where uncertainty exists.

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

3. Areas where assumptions are made and where the level of detail is limited shall be clearly identified so that they can be analyzed in full detail with the individual Phase III drainage reports and updated transitional Phase II drainage report.
4. Stormwater runoff routing calculations shall be completed using the assumed conditions. The drainage plan shall show flow paths and the method of conveyance (open channel, street, or street and storm sewer). In addition, preliminary sizing shall be provided for all conveyance facilities, based on the conservative assumptions, if necessary.
5. The longitudinal slope on streets may not be established, but the direction of the slope and the location of the high points and the sumps in the streets shall be determined.
6. The location of detention and water quality facilities shall be shown on the plan. The volume and land area required shall be conservatively estimated; and the type of detention shall be described. The detailed outlet design calculations are not required.

It is important that all other requirements of a Phase II drainage report are addressed in detail. Specifically, attention needs to be given to the following points.

1. Full detail shall be provided on the analysis of offsite flows entering the development.
2. Full detail shall be provided on the analysis of the conveyance of flow from the development to the nearest major drainageway.
3. Detailed floodplain delineations shall be provided for all major drainageways within or adjacent to the development.

A transitional Phase II drainage report is not considered to be final until it has been updated to reflect the land use characteristics, final grading, and local storm sewer facilities of the individual lots or parcels within the development. The developer must commit to updating the transitional Phase II drainage report, as Phase III drainage reports are completed for the individual lots or parcels. Continuous updating is necessary, as details become available, to ensure that the original assumptions are valid, to ensure that general drainage patterns are consistent with the original assumptions, and to ensure that properly sized stormwater conveyance facilities, detention facilities, and water quality facilities are provided for the entire development.

4.5 Phase III Drainage Report and Plan

- 4.5.1 Requirement for Phase III Drainage Report and Plan Submittal.** The purpose of the Phase III drainage report is to update the concepts, and to present the design details on construction plans for the drainage facilities discussed in the Phase II drainage report. Also, any change to the Phase II concept must be presented. All reports shall be typed on 8½" x 11" paper and bound. The drawings, figures, charts and/or tables shall be bound with the report or included in a folder/pocket attached at the back of the report.

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

4.5.2 Report Contents. The Phase III drainage report shall be prepared in accordance with the outline shown in Section 4.4.2, above.

4.5.3 Certification Statement. The report shall be prepared by or under the direction of an engineer licensed in Colorado, certified as shown below. The report shall also contain a developer certification sheet as follows:

“This report and plan for the Phase III drainage design of (Name of Development) was prepared by me (or under my direct supervision) in accordance with the provisions of Douglas County Drainage Design and Technical Criteria for the owners thereof. I understand that Douglas County does not and will not assume liability for drainage facilities designed by others.”

SIGNATURE: _____

Registered Professional Engineer State
Of Colorado No. _____
(Affix Seal)

“(Name of Developer) hereby certifies that the drainage facilities for (Name of Development) shall be constructed according to the design presented in this report. I understand that Douglas County does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that Douglas County reviews drainage plans pursuant to Colorado Revised Statutes, Title 30, Article 28; but cannot, on behalf of (Name of Development), guarantee that final drainage design review will absolve (Name of Developer) and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer’s drainage design.”

Name of Developer

Authorized Signature

4.5.4 Phase III Drainage Plan Requirements. The report drawings shall follow the requirements presented in Section 4.4.6, above.

4.6 Stormwater Management Facility Operation and Maintenance Manual

4.6.1 Stormwater Management Facility Operation and Maintenance Manual (O&M Manual) Requirement. Detention ponds, open channels, post-construction water quality Best Management Practices, and other stormwater management facilities require proper maintenance in order to ensure that they function as designed. An O & M Manual must be developed in conjunction with the final

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

design to provide operation and maintenance guidance for all detention ponds, open channels, post-construction Best Management Practices, and other stormwater management facilities as determined by the County, to be submitted for County acceptance prior to County acceptance of the construction drawings. The O&M Manual shall be prepared by the design engineer and certified by the owner and design engineer in accordance with O&M Manual template provided on the Douglas County website and as described in Section 4.6.2.

The purpose of the O&M Manual is to educate and provide guidance and standard forms for those entities that will be responsible for the maintenance of stormwater management facilities.

- 4.6.2 Development of the O&M Manual.** The O&M Manual template developed by the County shall be used as the foundation for all stormwater management facility O&M Manuals. There are locations identified on the template cover page and in the table of contents and narrative sections where project specific information must be inserted. In general, the project specific information that must be inserted includes, but is not limited to, project name and location, developer name and contact information, design engineer and contact information, a general project description, and a description of the stormwater management facilities and Best Management Practices constructed with the project and that are covered by the O&M Manual.

The template also identifies standard appendices that must be included in the O&M Manual. Standard operating procedures, inspection forms, and maintenance forms have been developed by the County for some of the commonly constructed stormwater management facilities. If standard operating procedures, inspection forms, or maintenance forms are available for a specific stormwater management facility, they shall be used and inserted in the appropriate appendix. If standard operating procedures, inspection forms, or maintenance forms have not been developed by the County for a specific stormwater management facility, they must be developed by the design engineer in a format that is consistent with those developed by the County. The stormwater facility maintenance notification form is a standard form that has been developed by the County. The remaining appendices consist of an overall site plan and the project construction drawings, which are developed by the design engineer. The County accepted construction drawings and/or the approved Site Improvement Plan shall be included in these appendices.

The O&M Manual development instructions, the O&M Manual template, and facility-specific standard operating procedures, inspection forms, maintenance forms, and the stormwater facility maintenance notification form are available on the Douglas County website.

4.7 Construction Drawings

- 4.7.1 Stormwater Management Improvements.** Stormwater management improvements within the public Right-of-Way or easements are required to be

Chapter 4. Drainage Report and Construction Drawing Submittal Requirements

designed, constructed, and accepted in accordance with County standards and criteria. Construction drawings must be developed for all stormwater management improvements and submitted to the County for review. County acceptance of final construction drawings is a condition for issuance of construction permits.

4.7.2 Construction Plan Submittal. Detailed information regarding construction drawing submittal procedures is provided in Chapter 2, Submittal Procedures, of the *Douglas County Roadway Design and Construction Standards Manual*.

4.7.3 Construction Plan Requirements. In general, the information required for stormwater management facility construction drawings shall be in accordance with sound engineering principles, Douglas County and UDFCD criteria, and the County requirements for subdivision design and stormwater quality Best Management Practices sample drawings. Construction drawings shall include geometric, dimensional, structural, foundation, bedding, hydraulic, landscaping, and other details as needed to construct the stormwater management facilities. Detailed information regarding construction drawing requirements and certification is provided in Chapter 3, Submittal Requirements for Construction Plans, of the *Douglas County Roadway Design and Construction Standards Manual*.

4.8 Record Drawings

All stormwater improvements that have been constructed within the County Right-of-Way and stormwater easements must be accepted by the County. The County's acceptance process verifies that the improvements have been constructed in accordance with the requirements.

4.8.1 Record Drawing Requirements. Record drawings, including the required "Statements of Substantial Completion" by the project engineer and Surveyor shall be submitted in accordance with Chapter 7 of the *Douglas County Roadway Design and Construction Standards Manual*. Additional details regarding the submittal of record drawings are provided in Chapter 7, Record Drawings of the *Douglas County Roadway Design and Construction Standards Manual*.