



# ARAPAHOE COUNTY CHECKLIST FOR DRAINAGE REPORT – PHASE 2

Revised July 2018

Yes	No	N/A	Report Requirements
<b>I. COVER SHEET</b>			
			A. Name of Project/Site Name
			B. Address
			C. Owner Contact Information (Name, Address, Phone)
			D. Developer Contact Info (Name, Company, Address, Phone)
			E. Engineer Contact Info (Name, Company, Address, Phone)
			F. Submittal date and revision date(s) as applicable
			G. Case Number(s)
<b>Table of Contents</b>			
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			Certification Statement* - Engineer
			** see Stormwater Manual for Certification verbiage
<b>II. GENERAL LOCATION AND DESCRIPTION</b>			
			A. Site Location
			1. Site Vicinity Map
			2. Legal Description
			3. Township, Range, Section, and ¼ Section
			4. Existing and proposed streets, roadways, and highways adjacent to and within the proposed development, or within the area served by the proposed drainage improvements
			5. Names of surrounding or adjacent developments, including land use or zoning information
			B. Description of Property
			1. Total Site/Project Area in Acres
			2. Current and Proposed Zoning
			3. Existing Site Conditions Ground cover, vegetation, site topography and slopes
			4. Existing irrigation canals or ditches
			5. Significant geologic features
			6. NRCS Soils Classification Map and discussion
			7. Proposed Land Use, site activities and operations
			8. Total Proposed Impervious Area – existing and proposed. Include removed, replaced, and new impervious area (square feet and acres) and total change in impervious area
			9. Total Disturbed Area
<b>III. FLOODPLAIN</b>			
			A. Major Drainageway – Designated Floodplain
			1. Identify site Floodplain Zone



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			Source of Floodplain Delineation. FEMA Flood Insurance Rate
			2. Map(s) including panel date and number and/or UDFCD Flood Hazard Area Delineation (FHAD) study
			3. Floodplain Modifications required, including level of encroachment, velocities, depths, stabilization measures, water surface elevations, etc.
			4. Floodplain Modification Studies required, including Conditional Letter of Map Revision (CLOMR) and Letter of Map Revision (LOMR) requirements
			5. County Floodplain Development Regulations and Floodplain Development Permit
			<b>B. Major Drainageway – Undesignated Floodplain (non-FEMA&gt;130ac)</b>
			1. Discuss methodology of Floodplain Delineation
			2. Floodplain modifications required, including level of encroachment, velocities, depths, stabilization measures, water surface elevations, etc.
			3. County floodplain development regulations and Floodplain Development Permit
<b>IV. DRAINAGE BASINS AND SUB-BASINS</b>			
			<b>A. Major Drainage Basins</b>
			1. Major drainage basin characteristics and flow patterns and paths adjacent to and within the proposed development
			2. Existing and proposed land uses and impervious values within the basins
			3. Discussion of all drainageway master planning or studies that affect the major drainageways, such as UDFCD Major Drainageway Plan (MDP) and Outfall Systems Planning (OSP) studies
			4. Discuss site restrictions imposed by Master Plans, including design imperviousness
			5. Condition of the drainage channel within or adjacent to the development, including existing condition, need for improvements, and impact on proposed development
			6. Impacts of proposed development to major basin flow patterns and paths, under fully developed conditions
			<b>B. Minor Drainage Basins</b>
			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. Discuss previous Drainage Studies or Master Development Plans for the Site or Project



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			4. Discuss Drainage Studies for Adjacent Developments
			5. Discuss impacts of the Minor Basin Characteristics, flow patterns and paths, under both historic and developed conditions
			6. Summary of Sub-Basin Characteristics, size in acres, C2, C5 and C100 values and Q2, Q5 and Q100 values. Values to match calculations in appendix.
			7. Discuss impacts of the off-site flow patterns and paths, under fully developed conditions
			8. Discussion of irrigation facilities that will influence or be impacted by the site drainage

## V. EXISTING STORMWATER CONVEYANCE OR STORAGE FACILITIES

			A. Existing Stormwater Storage Facilities
			1. Accessibility to existing regional or sub-regional detention facility
			2. Discuss limitations and restrictions from Master development or drainageway plan, mentioning capacity and water quality. Include relevant source pages in Appendix
			3. Does existing facility meet current Standards and Regulations?
			4. Discuss existing storage facility modifications needed, including rebuild or abandonment
			B. Existing Stormwater Conveyance Facilities
			1. Existing Conveyance Facilities and how it will be incorporated into proposed development design
			2. Discuss limitations and restrictions from Master development or drainageway plan, including capacity. Include relevant source pages in Appendix
			3. Existing Conveyance Facility Modifications, including rebuild or abandonment
			4. Discuss any known issues with existing conveyance system

## VI. DRAINAGE DESIGN CRITERIA

			A. Regulations
			1. County Criteria and optional provisions selected, as applicable
			2. UDFCD criteria and optional provisions selected, as applicable
			3. Cherry Creek Basin Control Regulation No. 72
			B. Compliance with Phase I Assumptions
			1. State any changes from the design assumptions used in the Phase I drainage calculations (i.e. the maximum % imperviousness value, slope of the basin, etc.)
			C. Hydrologic Design Criteria
			1. Methods used to determine runoff calculations



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			2. Design storm recurrence intervals, including water quality, minor and major storms
			3. Design rainfall
			4. Detention storage calculation method(s)
			5. Detention storage release rate calculation method
			<b>D. Hydraulic Design Criteria</b>
			1. Methods to determine conveyance facility capacities
			2. Hydraulic grade line calculation method and loss coefficients
			3. Methods used to calculate water surface profiles
			4. Detention pond routing
			<b>E. Water Quality Enhancement Design Criteria</b>
			1. Methods to be used to design water quality enhancement(s)
<b>VII. PROPOSED STORMWATER CONVEYANCE OR STORAGE FACILITIES</b>			
			<b>A. Proposed Stormwater Storage Facilities</b>
			1. Preliminary detention pond designs, including estimated release rates, storage volumes and water surface elevations for the WQCV, EURV, 100-year, and emergency overflow conditions, outlet structure location, emergency spillway location, etc.
			2. Pond outfall locations and design
			3. How is runoff conveyed from all pond outfalls to the nearest major drainageway, include discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway
			<b>B. Proposed Stormwater Conveyance Facilities</b>
			1. General onsite conveyance concepts, including drainage paths and patterns
			2. Preliminary storm sewer design, including inlet and pipe locations and estimated sizes, tributary basins and areas, peak flow rates at design points
			3. Discuss storm sewer outfall locations and design
			4. Proposed open channel and swale designs, including estimated dimensions, alignments, tributary basins and areas, peak flow rates at design points, water surface elevations, etc.
			5. Allowable street capacities
			6. Discuss general offsite conveyance concepts, including drainage paths and patterns. Discuss how proposed conveyance will connect to ultimate outfall.
			7. Discussion of the facilities needed offsite for the conveyance of minor and major flows to the major drainageway
<b>VIII. WATER QUALITY CONTROL MEASURE</b>			
			<b>A. Non-Structural Control Measures</b>



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			1. Discussion of non-structural control measures that will be part of the stormwater management plan; i.e. preserving open space, protecting natural systems, and incorporating existing landscape features into proposed development
			<b>B. Structural Control Measures</b>
			1. Preliminary design of all structural water quality control measures, including size and location
			2. How is runoff 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 design constraints
			<b>C. Exclusions</b>
			1. Discuss any potential exclusion(s) from Water Quality that may be considered. Include for which exclusion(s) the project qualifies and state conditions which the project meets. Also, include the acreage of the excluded impervious area.
<b>IX. ADDITIONAL PERMITTING REQUIREMENTS</b>			
			A. Compliance with Section 404 of the Clean Water Act
			B. Compliance with the Endangered Species Act
			C. Other local, State, or Federal requirements
<b>X. CONCLUSIONS</b>			
			<b>A. Compliance with Standards</b>
			1. Arapahoe County Criteria
			2. UDFCD Criteria
			3. Master Plans and UDFCD Outfall Systems Plans
			4. Cherry Creek Basin Control Regulation No. 72
			<b>B. Variances</b>
			1. Identify provisions by section number for which a variance will be requested, or has been approved by county (final version of Drainage Report)
			2. Provide justification for each variance requested
			<b>C. Drainage Concept</b>
			1. Discuss overall effectiveness of stormwater management design to properly convey, store and treat stormwater
<b>XI. DESIGN ASSUMPTIONS</b>			
			A. Summarize design assumptions used in the Phase II drainage calculation (i.e. the maximum % imperviousness value, slope of the basin). These assumptions will be confirmed with the Phase III drainage study.



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			B. List any conditions of Approval for the Phase III Drainage Report. (i.e. completion Master Drainage Plan or FHAD , etc.)
<b>XI. REFERENCES</b>			
			A. Source all tables, figures, charts, drawings, etc. that were used in design of stormwater management facilities and that are included in the appendix of the report
			B. Reference all criteria, master plans, reports, or other technical information used in development of the concepts discussed in the drainage report
<b>XII. APPENDICES</b>			
			A. Reference Material
			1. Vicinity Map. North Arrow, Scale, label adjacent arterial roadways and drainageways. No copyrighted material
			2. FEMA FIRM panel, with site location shown
			3. NRCS Custom Soil Resource Report (all pages)
			4. Relevant portions of the FHAD/OSP/MDP
			5. Relevant portions of the previous drainage study for the project
			B. Hydrologic Computations
			1. Design Rainfall Values, ACSWMM Table 6-1 or NOAA Atlas 14
			2. Land Use Assumptions, C values, for both existing and proposed developed conditions
			3. Determination of runoff coefficients, times of concentration, and runoff calculations, existing and developed conditions
			4. Peak flow rate calculations for the minor and major storms
			5. Hydrograph data, if applicable
			6. Floodplain hydrology
			C. Hydraulic Computations
			1. Storage facility preliminary sizing calculations
			2. Water quality facility(s) preliminary sizing calculations
			3. Storm sewer preliminary sizing calculations
			4. Street capacity preliminary calculations
			5. Open channel or swale preliminary sizing calculations
			6. Downstream/outfall capacity to the nearest major drainageway
			D. Drainage Plan
<b>HISTORIC/EXISTING DRAINAGE PLAN</b>			
			1. 24" x 36" in size, 22" x 34" also acceptable when half size sets will be produced
			2. Title block and legend
			3. Scale 1" = 20' to 1" = 100', as required to show sufficient detail
			4. Show boundaries of entire development or project and any off-site areas which flow to/through the development or project



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			5. Existing topographic contours with labels with a 5-foot maximum contour interval extending a minimum of 100-feet beyond property lines
			6. Show and label all existing stormwater conveyance or storage facilities
			7. Floodplain limits, based on available information or preliminary delineation information
			8. Drainage basin and sub-basin boundaries
			9. Show and label existing utilities and structures
			10. All property lines and existing drainage easements
			11. Streets and roadways with ROW and flowline widths, type of curb and gutter or roadside swale, slopes, flow directions and crosspans
			12. Location and elevation of all existing 100-year floodplain boundaries, including the source of designation. All floodplain designations that exist for the site should be included, i.e. FEMA FIS, FHAD, and others.
			13. Adjacent developments or ownerships
			14. Summary Runoff Table
			15. Case Number(s) in the lower left-hand corner
			<b>PROPOSED DRAINAGE PLAN</b>
			1. 24" x 36" in size, 22" x 34" also acceptable when half size sets will be produced
			2. Title block and legend
			3. Scale 1" = 20' to 1" = 100', as required to show sufficient detail
			4. Show boundaries of entire development or project and any off-site areas which flow to/through the development or project
			5. Existing (dashed or screened) and proposed (solid) topographic contours with labels with a 5-foot maximum contour interval (existing contours must extend a minimum of 100-feet beyond the property lines)
			6. Show and label all existing stormwater management facilities, including irrigation ditches, roadside swales, open channels and drainageways, storm sewers, culverts, detention ponds, water quality enhancement structures or features, etc.
			7. Drainage basin and sub-basin boundaries with basin designations and design points
			8. Conceptual location of stormwater management facilities, including roadside swales, open channels and drainageways, swales, storm sewers, culverts, detention ponds, water quality enhancement structures or features, etc.
			19. Proposed flow directions
			10. Show and label existing utilities and structures



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			11. All property lines and both existing and proposed drainage easements with type of easement noted
			12. Proposed and existing streets and roadways with ROW and flowline widths, type of curb and gutter or roadside swale, slopes, flow directions and crosspans
			13. Proposed outfall points and existing or proposed facilities to convey runoff to the nearest major drainageway, without damage to downstream properties
			14. 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 FIS, FHAD, and others.
			15. Adjacent developments or ownerships
			16. Summary Runoff Table, includes Basin ID, contributing area, runoff coefficient, % imperviousness, runoff values, and the routed flows.
			17. Case Number(s) in the lower left-hand corner
			18. Add notes: <ol style="list-style-type: none"> <li>1. Storm Sewer System will be designed with the Phase III Drainage Report. Conveyance Runoff will be through swales, roadway and underground storm system.</li> <li>2. The extended detention basin will be placed in an easement at the time of final site development plans.</li> </ol>