

Drainage Report Checklist

DESCRIPTION	PROVIDED (Engineer)	N/A	COMMENTS
General Info			
Cover sheet	☐	☐	
Project Name (Legal Name: Subdivision, Filing, Block, Lot, Address, etc.)	☐	☐	
Date (Revision Date, If Applicable)	☐	☐	
Applicant & preparer name and firm	☐	☐	
Responsible Party Certification	☐	☐	
PE certification statement, seal and signature	☐	☐	
Developer certification statement, signed & notarized	☐	☐	
Table of Contents	☐	☐	
Description of Property			
Location	☐	☐	
Township, range, section, quarter section	☐	☐	
City, County, State Highway and Local streets within and adjacent to the subdivision	☐	☐	
Names of surrounding developments	☐	☐	
General Project Description	☐	☐	
Area in acres (verify with plat if available)	☐	☐	
Major drainageways and facilities w/in and adjacent to the site	☐	☐	
Existing major irrigation facilities such as ditches and canals	☐	☐	
Drainage related easements within and adjacent to the site	☐	☐	
Existing ground cover (trees, shrubs, etc.)	☐	☐	
Existing soil conditions	☐	☐	
Proposed land use	☐	☐	
Drainage Basins & Sub-Basins	☐	☐	
Major Basin and Sub-Basin Descriptions	☐	☐	
Reference major drainageway planning studies	☐	☐	
Reference previous drainage studies affecting the site	☐	☐	
Identify presence of regulatory floodplains/floodways at site	☐	☐	
Reference FEMA flood insurance study/flood insurance rate maps	☐	☐	
Reference flood hazard area delineation (FHAD) report	☐	☐	
Discuss any proposed disturbance to most restrictive floodplain and if a LOMR will be required	☐	☐	
Basin drainage characteristics - existing and planned land uses affecting the site	☐	☐	
Coordination with surrounding development plans	☐	☐	
Identification of irrigation facilities within 100 feet of the project boundary and any which will influence or be influenced by project drainage flows (regardless of proximity)	☐	☐	
Identify presence or absence of any major drainageways on the site with total tributary area >130 acres	☐	☐	
Discussion of off-site drainage flow patterns onto the site and impact on development under existing and full developed basin	☐	☐	
Discussion of historic drainage pattern of the property (Supporting off-site delineation map included)	☐	☐	
Discussion of development impacts to off-site basins, if any	☐	☐	
Discussion of each proposed sub-basin, including drainage patterns, storm sewer configuration, and design points	☐	☐	

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Drainage Design Criteria			
Regulations	☐	☐	
Discussion of compliance with the City's Code regarding floodplain and ponding	☐	☐	
Residential lots - completely outside of the floodplain with structures min 12" above base flood elevation (BFE)	☐	☐	
Non-residential lots and tracts - buildable area outside floodplain & finished grade min 12" above BFE	☐	☐	
Permitted uses planned within the floodplain, if any	☐	☐	
Discussion of compliance with MHFD maintenance eligibility program (MEP) review, if applicable	☐	☐	
Development Criteria Reference and Constraints	☐	☐	
Discussion of previous drainage studies for the site that influence or are influenced by the drainage design	☐	☐	
Complies with previous study/Does not comply (Discussion on changes from the previous study)	☐	☐	
Discussion of effects and/or coordination with adjacent drainage studies and developments	☐	☐	
Discussion of site drainage constraints (such as streets, utilities, existing structures, etc.)	☐	☐	
Hydrologic Criteria	☐	☐	
Identify design rainfall event, frequency, and duration	☐	☐	
Hydrology based on fully developed watershed conditions based on future land use (imperviousness)	☐	☐	
Identify runoff calculation method used	☐	☐	
Identify calculation method for detention storage and discharge	☐	☐	
Discussion and justification of criteria or methods other than City Standards or USDCM	☐	☐	
Hydraulic Criteria	☐	☐	
Identify various capacity references utilized in design	☐	☐	
Identify detention pond outlet design method	☐	☐	
Identify check / drop structure criteria used	☐	☐	
Discussion of drainage facility design criteria other than City Standards & Specifications (i.e. MHFD, other)	☐	☐	
Variance from Standards and Specifications	☐	☐	
Identify provision by section number for which a variance is requested	☐	☐	
Provide justification and discussion for each variance requested, including specific location and updated condition	☐	☐	
Drainage Facility Design			
General Concept	☐	☐	
Discussion of typical existing drainage patterns	☐	☐	
Discussion of concept and proposed drainage patterns of the developed site	☐	☐	
Discussion of compliance with off-site runoff impacting the site and site runoff impacting downstream properties	☐	☐	
Discussion of all tables, charts, figures, drawings, calculations, etc. presented in the appendix	☐	☐	
Rip rap details and design	☐	☐	
Specific Details	☐	☐	
Discussion of specific drainage problems and solutions at design points	☐	☐	

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Discussion of detention storage required	☐	☐	
Minimum required 100 yr storage volume (& reference source and calculation used)	☐	☐	
Minimum required EURV storage volume (& reference source and calculation used)	☐	☐	
Proposed right-of-way frontage improvements routed to storage facility and included in storage volume	☐	☐	
Actual provided pond volumes (& reference source and calculation used)	☐	☐	
Water surface elevations (& reference source and calculation used)	☐	☐	
100 yr WSE based on 100yr detention volume	☐	☐	
Max spillway WSE based on spillway flow depth for 2x the 100yr flow	☐	☐	
Freeboard requirements (1' min above spillway flow depth) and elevation (& reference)	☐	☐	
Discussion of water quality (WQCV or accepted alternative) requirements and implementation of treatment method(s)	☐	☐	
Adjacent right-of-way frontage tributary to site included in treatment or (if existing) intercepted and bypassed	☐	☐	
A. WQCV for full tributary area to the site (including all tributary ROW areas) calculated	☐	☐	
B. EURV for entire development site including only new ROW improvements calculated	☐	☐	
Greater of A or B above used as basis for WQ release rate in the full spectrum detention design	☐	☐	
Discussion of Plugged Sump Inlet Overflow Analysis (confirmation no lots or buildings are effected, max ponding depth)	☐	☐	
Open Channels, Swales, and Roadside Ditches	☐	☐	
Discussion of design and applicable criteria	☐	☐	
Discussion of maintenance access and aspects of the design	☐	☐	
Discussion of easements and tracts dedicated for drainage & maintenance purposes	☐	☐	
Identify stormwater facilities proposed for acceptance into the MHFD MEP (if any)	☐	☐	
Environmental Protection Criteria			
Identify wetland areas, jurisdictional status, "Waters of the U.S." and "Waters of the State"	☐	☐	
Discuss project impacts and protections for the above elements	☐	☐	
Discuss compliance with State and Federal environmental permitting regulations	☐	☐	
Identify permitting and mitigation requirements	☐	☐	
Provide copy of 404 permit or determination of non-jurisdictional status from USACE for any identified wetlands	☐	☐	
Provide copy of Authorization, Exemption, or Exclusion documentation per State Regulation No. 87 - Dredge and Fill	☐	☐	
Conclusions			
Compliance	☐	☐	
City Standards & Specifications, Code, Ordinances, & Policies	☐	☐	
City of Thornton MS4 (with summary of any undetained and/or untreated basins)	☐	☐	
Major drainageway plans (MHFD Outfall Systems Plan)	☐	☐	
MHFD USDCM Recommendations	☐	☐	
State of Colorado requirements (laws regarding drain times, water law)	☐	☐	
Additional permitting requirements (404, Endangered Species, CLOMR/LOMR, other)	☐	☐	
Drainage Concept	☐	☐	
Effectiveness of design to control storm runoff	☐	☐	
Discussion of maintenance responsibility for public and private drainage facilities	☐	☐	
Discuss impact of proposed development on the Major Drainageway Planning Studies recommendations	☐	☐	
Variances	☐	☐	
Identification and justification of sections of Standards for which variances are requested	☐	☐	
References			
List all drainage reports and technical information used (including editions/dates)	☐	☐	
List all computer software used in analysis (including editions/dates)	☐	☐	

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Appendices			
Vicinity Map	☐	☐	
Onsite and offsite basin delineation maps with design points (historic and proposed)	☐	☐	
Studies & Reports	☐	☐	
Soils Maps (NRCS Custom Soil Resource Report, additional maps if used)	☐	☐	
Relevant portions of major drainageway planning studies, previous drainage studies affecting the site, FHAD, FEMA	☐	☐	
FIRM, wetlands study, 404 Permit, or any other applicable documents			
Hydrologic Computations (Historic and Developed)	☐	☐	
Most current edition / version of calculation spreadsheets (including MHFD-Inlet, MHFD-EDB, etc.) used	☐	☐	
Imperviousness Calculation & Runoff Coefficient Summary Tables	☐	☐	
Time of Concentration	☐	☐	
Rational Method Analysis for 5 yr and 100 yr	☐	☐	
For each basin and design point (i.e., routed cumulative flow)	☐	☐	
NOAA Atlas 14 rainfall data for site location as basis for rainfall events (preferred over quantities in City Standards)	☐	☐	
Storm Sewer Hydraulic Computations	☐	☐	
Minimum pipe size 18-inch RCP for all public storm sewers	☐	☐	
StormCAD (or equivalent) Analysis	☐	☐	
Pipe & Structure (Node) Schematic with MH and pipe labels matching Construction Drawing Plan & Profiles	☐	☐	
5 yr modeled HGL assumes a free outfall condition	☐	☐	
Peak 100 yr WSE at outfall used as tailwater condition for the 100 year HGL	☐	☐	
5 yr and 100 yr StormCAD Profiles (minor storm contained within the pipe, major below ground surface)	☐	☐	
5 yr and 100yr Input/Output Summary Tables	☐	☐	
Pipe Velocities (min 3 ft/s at half pipe flow wherever possible, max 20 ft/s)	☐	☐	
Inlet sizing and capacity calculations	☐	☐	
MHFD-Inlet outputs included (with all workbook sheets provided with expanded details)	☐	☐	
Basin ID & inlet Number identified on each sheet	☐	☐	
Outlet protection design calculations	☐	☐	
Pipe velocity and Froude number calculation at pipe outlet	☐	☐	
Streets Hydraulic Computations	☐	☐	
Street name and classification and inlet number/design point identified	☐	☐	
Street Capacity Analysis (see City Standards Section 400 and USDCM) (as performed by MHFD-Inlet)	☐	☐	
Use MHFD-Inlet "Q-allow" worksheets for upstream of sump/vertical curve and for on-grade inlets	☐	☐	
Verify max flow depth and spread width is acceptable (Per COT & USDCM)	☐	☐	
(12" max or crown of road measured at gutter flowline, cannot encroach onto any residential lot, contained within the ROW)	☐	☐	
Culverts Hydraulic Computation	☐	☐	
Calculations for flow capacity and developed flow and velocity through structure	☐	☐	
Identification of controlling condition (entrance or outlet)	☐	☐	
Maximum HW/D = 1.5	☐	☐	
Water surface elevations calculated and compared to allowable overtopping (with design storms identified)	☐	☐	
Open Channels (including Swales & Ditches) Hydraulic Computation	☐	☐	
Calculation of developed flow through the channel (type, velocity, etc.)	☐	☐	
Supporting labeled calculations for water surface elevations and required freeboard	☐	☐	
Riprap design calculations	☐	☐	

DESCRIPTION	PROVIDED (Engineer)	N/A	COMMENTS
Extended Detention Basin (EDB) Hydraulic Computations	☐	☐	
Calculations of volume of storage required (WQCV, EURV and 100-year event)	☐	☐	
MHFD-Detention Workbook results included within report (PDF)	☐	☐	
MHFD-Detention workbook Excel file submitted as a supporting document alongside report	☐	☐	
Volume of provided detention pond (maximum volume)	☐	☐	
Based on spillway crest elevation (must be $\geq$ required 100 yr volume)	☐	☐	
Supporting labeled calculations for water surface elevations	☐	☐	
Supporting labeled calculations for minimum of one foot freeboard requirement	☐	☐	
Emergency overflow calculations	☐	☐	
Weir and spillway sized for 2x 100 yr developed peak inflow (from MHFD-Inlet) into pond (weir calculation provided)	☐	☐	
1 ft min freeboard above flow through spillway (as calculated immediately above)	☐	☐	
Calculations for spillway riprap sizing provided	☐	☐	
Inflow(s) energy dissipation method, sizing, and calculations (as applicable)	☐	☐	
Forebay - volume calculations and quantified release rate demonstrating velocity is slowed	☐	☐	
Trickle channel capacity (sized for forebay weir release rate)	☐	☐	
Outlet Structure Computations (per MHFD-EDB or SWMM Model)	☐	☐	
Shall meet allowable/required drain times based on USDCM	☐	☐	
Trash Rack (overflow) & safety grate(s) sizing calculations (with open area and clogging factor used)	☐	☐	
Capacity, velocity, and Froude No. calculations for outlets into pond and outlet structure outfall pipe	☐	☐	
Calculations for pond inflow(s) energy dissipation	☐	☐	
Calculations for outlet protection for outlets into pond and outlet structure pipe outfall	☐	☐	
Free outfall condition confirmed for receiving pipe when MHFD-EDB is used	☐	☐	
CUHP SWMM Model (or equivalent) provided if downstream receiving pipe is surcharged in 100-year event	☐	☐	
Bridges - Hydraulic computation performed in accordance with recommendations of USDCM Volume 2 Chapter 11	☐	☐	
Plugged Sump Inlet Overflow Analysis (Max Depth of Ponding based on local grading, resulting WSE, Overflow Route)	☐	☐	
Other Permanent SCM Calculations (if applicable)	☐	☐	
Calculations for WQCV requirements	☐	☐	
Calculations for storage volume requirements	☐	☐	
Supporting labeled calculations for outlet structure design	☐	☐	
Inflow(s) energy dissipation method, sizing, and calculations (as applicable)	☐	☐	
Runoff reduction calculations and exhibit (if applicable)	☐	☐	
All other design calculations necessary for design of Permanent SCM	☐	☐	
Construction SCM Calculations (if applicable) using UD-BMP (such as diversion swales, temporary sedimentation basins)	☐	☐	
Base Design Standards worksheets for Thornton MS4 compliance	☐	☐	
(https://www.thorntonco.gov/government/infrastructure/stormwater/Documents/design_standards_worksheet_April_2023.pdf)			