

Stormwater Drainage Report Content

The following is the minimum Stormwater Drainage Report requirements.

Cover Page

1. Name of Project
2. Address
3. Owner/Developer
4. Design Engineer
5. Submittal date and revision dates (if applicable)
6. Stamp and signature of Design Engineer

Introduction

1. Location
 - a. Existing and proposed streets, roadways, and highways within and adjacent to the site or the area to be served by the drainage improvements
 - b. Names of surrounding developments or properties including land use or zoning information
2. Description of Property
 - a. Area in acres
 - b. Ground cover (type of ground cover, vegetation, and condition)
 - c. Existing land uses and known foreseeable future land uses
 - d. Topographic features, steepness of slopes
 - e. Drainage ways and receiving channels
 - f. Existing drainage facilities
 - g. Flood Hazard Zones
 - h. Existing irrigation ditches
 - i. Geologic Features (if applicable)
3. Previous drainage studies for the property (if any)
4. General Project Description
5. State or Federal Regulations (if applicable)
6. Geotechnical Report (attach if required)

Existing Site Conditions

1. Major Basin Description
 - a. Reference to major drainage way planning studies such as flood hazard delineation report, major drainage way planning reports, and FEMA flood areas and flood hazards
 - b. Major basin drainage characteristics and structures, existing and planned land uses within the basin
 - c. Summary of off-site and on-site basin characteristics and runoff rates.
2. Sub-Basin Description
 - a. Discussions of historic drainage patterns of the property.
 - b. Discussions of off-site drainage flows and flow patterns and impact on development under existing and fully developed basin conditions.
 - c. Summary of off-site and on-site basin characteristics and runoff rates.
3. Groundwater
 - a. Identify potential groundwater issues

- b. Discuss groundwater investigations and results
 - c. Discuss methods to manage groundwater impacts
- 4. Waterways and Wetlands
 - a. Discuss any waterway and wetlands adjacent to or on the site
 - b. Discuss methods to protect, preserve, and mitigate impacts to waterways and wetlands

Stormwater Design Criteria

- 1. Design Concepts
- 2. Drainage Criteria
 - a. Application standards or exceptions
 - b. Minor and Major Storm Frequencies
 - c. Hydrologic Methods
 - i. Rainfall
 - ii. Design Storms
 - iii. Stormwater Quality storm and treatment methods
 - iv. Runoff methods and computer models
 - v. Detention/infiltration calculation methods
 - vi. Detention storage release rate calculation method
 - d. Hydraulic Methods
 - i. Design standards
 - ii. Hydraulic models
 - iii. Methods used to determine channel and storm sewer capacities
 - iv. Methods used for design of hydraulic structures, outlet protection and erosion control
 - v. Methods used for designing stormwater pond outlet structures
- 3. Down-Gradient Analysis
 - a. A down-gradient analysis shall be conducted to identify and evaluate potential adverse impacts to downstream properties due to increased runoff from the proposed development.
 - b. This analysis shall continue through down-gradient areas to the point where the adverse impacts are deemed negligible, or to a point where the contributing drainage area is 1% (or less) of the total drainage area. The analysis shall include at a minimum:
 - i. Visual inspection of the site and down-gradient areas.
 - ii. A site map that clearly identifies the project boundaries, study area boundaries, down-gradient flow path, and any existing or potential areas identified as problematic.
 - iii. Existing or potential off-site drainage problems that may be aggravated by the project.
 - iv. The condition and capacity of the conveyance route, including existing and proposed elements, potential backwater conditions on open channels, constrictions or low capacity zones, surcharging of enclosed systems, and localized flooding.
 - v. The presence of existing natural or constructed land features dependent upon pre-developed surface or subsurface drainage

patterns.

- vi. Existing or potential erosive conditions such as scour or unstable slopes onsite or downgradient of the project.
- vii. Flood areas identified on FEMA maps.
- viii. If there are existing or potential off-site drainage problems down gradient of the project, the project must demonstrate that the proposed stormwater system has been designed to meet the following conditions:
 - 1. The stormwater runoff (volume and flow rate) leaves the site in the same manner as that of the pre-developed condition.
 - 2. The proposed design does not influence existing drainage problems or create a new drainage problem.
- ix. If down-gradient release of runoff is at a rate or volume greater than the pre-developed condition, then potential adverse impacts on down-gradient property and drainage infrastructure (due to an increase in stormwater rate, volume, velocity, and flow duration) shall be addressed and mitigated.

4. Analysis Point(s) where pre- and post-development flows are calculated

Proposed Design

1. Discussion of general conveyance concepts
2. Discussion of proposed drainage paths and patterns
3. Discussion of storm sewer design, including inlet and pipe locations and sizes, peak flow rates at analysis points, hydraulic grade lines, groundwater impacts, etc.
4. Discussion of street capacities, spread widths, and inlet bypass flow
5. Discussion of storm sewer outfall locations and design, including method of energy dissipation
6. Discussion of how the Stormwater Quality Control storm is addressed. Include Montana Post-Construction Storm Water BMP Design Guidance Manual calculations for RRV, RTV and RTF as required.
7. Discussion of how runoff is conveyed from all outfall to the nearest public stormwater system
8. Discussion of open channel and swale designs, including dimensions, alignments, tributary basins, peak flow rates, stabilization, water surface elevations, groundwater impacts, etc.
9. Discussion of easements, maintenance, and access aspects of the design
10. Discussion of facilities proposed offsite for the conveyance to a public storm drainage system.
11. Discussion of flooding hazards and describe minimum building elevations
12. Detention Ponds
 - a. Discussion of detention pond designs, including tributary area, release rates, storage volumes, and water surface elevations, emergency overflow conditions, outlet structure design, etc.
 - b. Discussion of the design of all water quality treatment BMPs
 - c. Discussion of pond outfall locations and designs, including method of energy dissipation
 - d. Discussion of easements, maintenance, and access aspects of the design
13. Infiltration Facilities
 - a. Discussion of infiltration facility designs, including tributary area, infiltration rates, storage volumes, water surface elevations, emergency overflow conditions, groundwater impacts, etc.
 - b. Discussion of the design of all water quality treatment BMPs

- c. Discussion of easements, maintenance, and access aspects of the design

Summary

1. Summary of proposed improvements
 - a. Pre- and post-development flow rates
 - b. Storm Sewer
 - c. Culverts
 - d. Open channels
 - e. Detention storage
 - f. Infiltration facilities
 - g. Geotechnical/groundwater impacts
 - h. On and off-site impacts and mitigation measures
2. Floodplain impacts
3. Compliance with applicable regulations and standards

References

1. Reference all criteria, reports, or other technical information used in development of the drainage report, calculations, and plan

Appendices

1. Background Data
 - a. Applicable reports or report excerpts
 - b. Floodplain maps
2. Hydrologic Computations
 - a. Land uses, soil types, coverages
 - b. Proposed land uses for project by basin
 - c. Time of concentration and runoff coefficients for each basin
 - d. Basin parameters used for modeling including basin area, length, slope, distance, and routing elements
 - e. Minor and Major storm event peak runoff at analysis points for off-site and on-site flows
 - f. Off-site historic and fully developed runoff computations at specific analysis points
 - g. Hydrographs at critical analysis points
 - h. Schematic diagram of hydrology model showing basins and routing elements and combinations of elements.
3. Hydraulic Computations
 - a. Culvert capacities and inlet/outlet protection
 - b. Storm sewer capacity, including energy grade line (EGL) and hydraulic grade line (HGL) elevations
 - c. Gutter capacity as compared to allowable spread width
 - d. Storm inlet capacity
 - e. Open channel or swale capacities
 - f. Detention area volume capacity and outlet capacity calculations, depths of detention basins, outlet configuration, emergency spillway sizing calculations
 - g. Downstream capacity for the Major Storm.
4. Detention/Infiltration Facility Computations
 - a. Facility sizing calculations including discussion of infiltration capacity
 - b. Stage-storage calculations

Appendix 6-C

- c. Stormwater Quality Control calculations per Montana Post-Construction Storm Water BMP Design Guidance Manual.
- 5. Operations and Maintenance Manual and Private Stormwater Facility Maintenance Covenant and Right to Access.
 - a.