

APPENDIX H

STANDARDS FOR FLOOD HAZARD EVALUATIONS

- A. **General.** Land subject to being flooded by a flood of one hundred year (100) frequency as defined by Title 76, Chapter 5, M.C.A., or land deemed to be subject to flooding by the Commission, may not be subdivided for building or residential purposes, or other uses that may increase or aggravate flood hazards to life, health or welfare, or that may be prohibited by state or local floodplain or floodway regulations.
- B. **Intent.** The intent of a flood hazard evaluation is to assess all possible flooding hazards to a subdivision. Part of this evaluation must therefore address the uncertainty of predicted conditions during significant meteorologic, geologic, and hydrologic events, and the evaluation draws upon known and observed flood behaviors and dynamics for context. The regulatory flood maps and associated flood studies recognized by Carbon County may contain some of this information but do not address the full range of hazards and flooding conditions necessary for a Flood Hazard Evaluation.
- C. **Procedure.** If any portion of a proposed subdivision is within two thousand (2,000) horizontal feet and less than twenty (20) vertical feet of a stream draining an area of twenty five (25) square miles or more, and no official floodplain or floodway delineation (study) of the stream has been made, the subdivider shall provide in detail the calculated 100 year frequency water surface elevations and/or 100 year floodplain boundaries. This detailed study must be performed by a licensed professional engineer experienced in this field of work.
- D. **Submission of Report.** Three (3) copies of the required Flood Hazard Evaluation shall be submitted at the time of subdivision and preliminary plat application. This information may be submitted, upon the request of the Commissioners, to the Floodplain Management Section, Water Resources Division, Department of Natural Resources and Conservation (DNRC) for review and concurrence.
- E. **Flood Hazard Evaluation.** A Flood Hazard Evaluation is a professional assessment of all possible flooding hazards and a report of the risks associated with this potential flooding in the proposed subdivision. In addition to industry standard, one-dimensional, steady state water surface evaluation modeling, a flood hazard evaluation includes:
1. A discussion of overbank flow path uncertainty related to: rivers and stream channels that are topographically higher than surrounding

floodplains, shallow flooding channels, alluvial fan flooding, debris jams, ice jams and/or diversions, and ditches.

2. A discussion of possible or predicted channel stability during flood events, including the possibility of channel avulsion and/or thalweg migration that could affect the flooding dynamic in the project area.
 3. A discussion of the risk of landslides and/or debris flows occurring and affecting flood behavior in the project area drainages.
 4. An analysis of the stability and structural integrity of permitted and unpermitted floodplain fill in the vicinity of the project that contacts the regulatory 100-year floodplain, including rip rap, berms, levees, and other fill.
 5. A statement attesting that all proposed sanitary sewer infrastructure meets 100-year flood design standards and/or will not otherwise contribute to water pollution during periods of flooding or high groundwater.
 6. A discussion of irrigation ditches in the area and how they would affect the project should they fail, overtop or route surface runoff.
 7. An identification of depressional areas (areas below the Base Flood Evaluation or design flood evaluation but unconnected to a separate and discrete flow path).
- E. **Detailed Information.** The detailed information to be included in the Flood Hazard Evaluation shall include the following:
- a. Project information
 1. Brief description of project and study objectives
 2. Project location: Address, Legal and common
 3. Map or aerial photograph of project location
 - b. Hydrology
 1. Summary of available gauge sites and discharge estimations
 2. Explanation of choice of discharge estimation method
 3. Computations
 - c. Survey
 1. Benchmark description with datum (NGVD 1929, NAVD 1988 or reference)

2. Plan view showing watercourse, property bounds, cross section locations, proposed flood boundaries, benchmarks, and any bridges, diversion dams, levees or other pertinent structures.
3. Photocopy of current FIRM at project location with panel number noted
4. Plots of cross sections looking downstream
 - a. Cross-section elevations and stations should be determined at points representing significant breaks in ground slope and at changes in the hydraulic characteristics of the floodplain (i.e., points where ground cover, soil, or rock conditions change). Elevations must be reported in NAVD 88 or NGVD 29 datum.
 - b. Each cross-section must cross the entire floodplain. The cross-section alignment should be perpendicular to the general flow of the watercourse (approximately perpendicular to contour lines). Occasionally, wide floodplains require a dog-leg alignment to be perpendicular to the anticipated flow lines. Shots should be taken at the water's edge and measurements taken (if elevation shots cannot be taken) to determine the channel bottom shape. Cross sections must be accurately located on a USGS 7 ½ minute quad sheet.
 - c. The number of cross-sections needed, and the distance between cross-sections will vary depending on the site, the slope of the watercourse, the slope of the channel, and the hydraulic characteristics of the reach. A minimum of four cross sections are required over the entire reach with at least two cross-sections at the property where the elevations are desired. Additional cross-sections must be taken at bridges, control structures, or natural constrictions in topography.
5. Photos of channel, overbanks, and any hydraulic structures
6. Establish temporary benchmark near development
7. Topographic data if flood boundaries are being drawn. Spot elevations or contours.

d. Hydraulics

1. Discussion of choice of methodology, Normal Depth, Step Backwater (HEC-RAS), Other
2. Paper copies of input/output files and on CD
3. Discussions of model parameters including Manning's n values, starting surface water elevations, flow regime, etc.
4. Discussion of any special concerns, bridges, levees, side channels, ineffective flow areas, etc.

5. Discussion of model results, model warnings, assumed critical depths

e. Results

1. Summary
2. BFE at project location
3. Maps of floodplain boundary (if required)
4. P.E. Stamp
5. Cover Letter to Floodplain Administrator

- F. **Waiver of Requirement.** The Commission may waive this requirement where the subdivider contacts the Water Resources Division, DNRC, and that agency states in writing that data indicates that the proposed subdivision is not in the flood hazard area as defined in this Section. In considering a waiver the Commission shall consult with the Carbon County Floodplain Administrator.