

APPENDIX D

STANDARDS FOR

FLOOD HAZARD EVALUATION

When a Flood Hazard Evaluation is required, the following information shall be included in the study.

1. Certification by a professional engineer licensed to practice in Montana.
2. An overall plan view or project map drawn to scale with vertical elevations and horizontal distances showing the following:
 - a. watercourse;
 - b. floodplain boundaries;
 - c. location of the proposed subdivision;
 - d. contours;
 - e. cross sections of the watercourse;
 - f. bridges and other contractions in the floodplain; and,
 - g. USGS gauging stations, if any.
3. The locations and elevation of any temporary benchmarks established within the proposed subdivision and referenced to mean sea level with appropriate elevation adjustment.
4. Cross-sectional information including the following items.
 - a. Elevations and stations at points that represent significant breaks in ground slope and 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 (*i.e.*, approximately perpendicular to the contour lines). Occasionally, wide floodplains require a dogleg alignment to be perpendicular to the anticipated flow lines. Shots should be taken at the edge of water 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 them will vary depending on the site, slope of the watercourse, slope of the channel, and the

hydraulic characteristics of the reach. A minimum of four cross-sections is 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. Photogrammetric methods may be used in lieu of cross-sections when approved by the floodplain administrator.

5. Descriptions and sketches of bridges within the reach, showing unobstructed waterway openings and elevations.
6. Elevation of the water surface is to be determined by survey as part of each valley cross-section.
7. Engineering reports of computer computations, calculations, and assumptions that may include:
 - a. Research of published hydrology or calculations showing how hydrology was derived;
 - b. Input files in hard copy and digital files; and,
 - c. Output files in digital form only.