

Reclamation Manual

Directives and Standards

Inundation Map Requirements

1. **Bureau of Reclamation Inundation Studies and Maps.** Inundation maps will be reviewed and subsequently revised (if needed) if significant deficiencies in current inundation studies or maps are identified by the Program and Emergency Management Office (PEMO), in coordination with the Dam Safety Office (84-44000) and the regional dam safety coordinator. When it becomes necessary to prepare or revise an inundation map, the following criteria will apply in addition to those contained in FEMA 64 and FEMA P-946: *Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures*.
 - A. Mapped flood boundaries, representing the dam failure condition will be based on sunny day failure at the top of active conservation and a hydrologic loading condition that may be as large as the probable maximum flood, or other plausible worst case scenario identified via risk analysis process.
 - B. Mapped flood boundaries, representing a life-threatening operational release condition, will also be prepared to indicate inundation that would result from spillways and/or other appurtenant structures operating at design capacity. Local conditions may warrant mapping boundaries for other levels of flooding smaller than the design-capacity flood. Mapping of operational release flood boundaries would generally only be done in reaches where dam-failure floods are mapped.
 - C. Mapping of flood boundaries will be continuous and will extend from the dam through downstream areas until the flood reaches the point of adequate floodwater dispersal, where the flood no longer poses a significant risk to life. Adequate floodwater dispersal can be achieved through attenuation down to safe channel capacity, or by the absorption of dam failure flood volumes into a downstream reservoir which is not required to make flood stage releases due to inflows.
 - D. Maps will be prepared at a scale and quality that enables a person familiar with the area to clearly comprehend an aerial view of the extent of flooding.
 - E. Minimum requirements for information to be included on published inundation maps are:
 - (1) a description of the inundation scenario (e.g., sunny day failure, hydrologic inflow based failure, maximum operational release) and a summary of the inundation modeling assumptions;
 - (2) initial reservoir level;
 - (3) leading edge flood wave travel times;

Reclamation Manual

Directives and Standards

- (4) assumed dam breach parameters;
 - (5) dam breach peak discharge and total volume released by flood event;
 - (6) hydraulic model used for the analysis;
 - (7) map scale and scale bar; and
 - (8) a map title block that adequately describes the facility and its location.
- F. Mapping of inundation studies using one-dimensional hydraulic modeling will include details of the modeling output at the selected cross section locations (e.g., cities, towns, bridge crossings, recreational area, significant physical changes in the flood plain geometry), maximum water surface elevation, maximum depth, time to leading edge flood wave arrival, maximum discharge, and time to arrival of maximum flooding.
- G. Mapping of inundation studies using two-dimensional hydraulic modeling will include maximum inundation color-coded by ranges of water depth and leading edge flood wave lines or total inundation “snapshots in time.”
- H. All final electronic data used for the inundation map and studies (e.g., inundation maps, inundation report) will be provided to regional or area offices.

2. Interim Inundation Maps.

- A. Many Reclamation dams have inundation maps that were developed in the 1990’s or before. As new technologies become available, PEMO, the Dam Safety Office, or regional dam safety coordinator may determine that some of these inundation maps do not meet the requirements in Paragraph 1. Due to the time and cost associated with producing new inundation maps that meet the requirements described in Paragraph 1, existing maps that do not meet these requirements will be considered “interim” inundation maps and used until the maps meet the requirements of Paragraph 1.
- B. PEMO, the Dam Safety Office, or regional dam safety coordinator will determine the timeframe required for the interim inundation map to be updated to meet the requirements of Paragraph 1 on a dam-by-dam basis. The timeframe will be determined only after consultation with the applicable area and regional offices, and will be based on severity of deficiencies, availability of resources, timing of planned special projects that require new inundation maps (e.g., addition of gates), and other considerations.