DEPARTMENT OF ECOLOGY
Water Resources Program / Dam Safety Office

Recommended protocols for using NRCS storms for the dam safety inflow design flood

Eastern Washington – NRCS/SCS type II storm

Climatic Regions 77, 07

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Objective:

Identify a combination of NRCS 24-hour storms with intensity and volume characteristics equivalent to the Dam Safety design storms as described in Technical Note 3, for use in H/H software that does not easily allow user-specified storm hyetographs.

Procedures:

1. Downstream hazard; Design step.

   Conduct a dam failure analysis to identify the inundation area and the population and/or other resources at risk from a dam failure. Compute the design step per Tech Note 2 and spreadsheet DesStep.

2. Design precipitation

   Compute the long-duration storm rainfall per Tech Note 3 (Oct 2009) and spreadsheet PrecipLookup3-Long. For the appropriate design step, identify the 24-hour scaling precipitation P_{sd}, and the 72-hour total storm precipitation for the long duration storm (call this P_T). Compute the incremental precipitation $P_T - P_{sd}$.

   Compute the short- and intermediate-duration storm rainfalls per Tech Note 3 (Oct 2009) and spreadsheets PrecipLookup1-Shrt and PrecipLookup2-Intm. For the appropriate design step, identify the total storm precipitation for each storm. Compare these total storm values to the 24-hour scaling precipitation P_{sd} computed above. Use the largest of these three rainfall values as the revised 24-hour scaling precipitation P_{sd}.

If the total storm rainfall from the short- or intermediate-duration storm is substituted for the original 24-hour P_{sd}, the incremental precipitation $P_T - P_{sd}$ will need to be recalculated. If the revised P_{sd} exceeds the original 72-hour P_T, an antecedent storm is not needed, just a 24-hour design storm per item 5 below.

3. Peak storm intensity

   To obtain a peak 30-minute rainfall with an NRCS type II storm that matches the peak 30-minute rainfall of the Dam Safety short-duration storm, a 24-hour NRCS rainfall that equals or exceeds 2.22 times the short-duration total storm rainfall is required. (Note: This ratio of 2.22 applies to Climatic Regions 77 and 07. Regions 14, 147 and 13 have a different ratio as described in the separate Recommended Protocols for those climatic regions.)

   Multiply the previously calculated total storm precipitation for the short-duration storm times 2.22. Compare this value to the 24-hour scaling precipitation P_{sd} computed above in step 2. Use the larger of these two rainfall values as the 24-hour scaling precipitation P_{sd}. Use this adjusted value for 24-hour P_{sd} for further storm computations per items 4 and 5 below.

   If the 24-hour P_{sd} is increased to match the peak intensity of the short-duration storm, the incremental precipitation $P_T - P_{sd}$ will need to be recalculated. If the adjusted P_{sd} exceeds the original 72-hour P_T, an antecedent storm is not needed, just a 24-hour design storm per item 5 below.

4. Antecedent storm

   Compute the runoff from a 24-hour NRCS storm with rainfall equal to the incremental precipitation $P_T - P_{sd}$ (as calculated per item 2 or adjusted per item 3). If using the NRCS curve number method, use CN's for AMC-II. Note the peak water level that occurs in the pond/reservoir from this storm.

5. Design storm

   Compute the runoff from a 24-hour NRCS storm with rainfall equal to the 24-hour scaling precipitation P_{sd} (as revised per item 2 or adjusted per item 3). If using the NRCS curve number method, use CN's for AMC-**III**. (If an antecedent storm is not needed, use CN's for AMC-II.) Use the peak water level in the pond or reservoir from the antecedent storm as the initial water level in the pond/reservoir for the design storm. Compare the peak water level from the design storm with freeboard requirements per Guidelines Part IV, Section 4.6, and spreadsheet FreeBoard.

[end]