

## Designing Watercourse Crossings for Passage of the 100-Year Flood (Supplemental Information)

Prepared by Pete Cafferata, CDF, and Dr. Michael Wopat, CGS  
April 11, 2006

For small watersheds (less than 200 acres), one of the most common methods for sizing a culvert is to use the Rational Method (see Cafferata and others 2004 for a detailed description of this method). The Rational Method requires the following information:

- Basin drainage area (acres)
- Runoff coefficient
- Rainfall Intensity (inches per hour) for the 100-year storm

To obtain rainfall intensity data for a 100-year recurrence interval event for a short time period (typically 10 or 15 minutes), we recommend using the updated rainfall depth-duration-frequency data that is available on the Department of Water Resources "Climate" webpage at:

[http://www.climate.water.ca.gov/climate\\_data/](http://www.climate.water.ca.gov/climate_data/)

To successfully use the information on this website, complete the following:

- Prior to opening the website, open your Microsoft Excel program.
- From the menu tool bar, click on Tools, then Macros, then Security.
- Change the Security level (if necessary) from High to Moderate or Low.
- Open the DWR website page ([http://www.climate.water.ca.gov/climate\\_data/](http://www.climate.water.ca.gov/climate_data/)).
- Scroll down on the page to the bottom; find the major heading labeled "Depth-Duration-Frequency."
- Click on "Rainfall Depth-Duration-Frequency Data (preliminary)."
- Open the "CA Hydro Basins Map" pdf file and determine the zone where you are interested in finding data. For example, for the Mendocino County coast, the zone is F80. [note: you may have to "zoom in" to 125% to read the zone number]
- Open the Station Index file for a complete list of stations.
- At the "FTP Log On" screen, select "Anonymous" (ignore password request) and select "OK." Station names are listed alphabetically. The table provides data on elevation, station latitude and longitude, county, and hydrologic zone (e.g., F80 is displayed in column F for the Fort Bragg station). While this can be helpful, the data will more useful when sorted by county, etc. [A short description of how to accomplish this is presented on the following page].
- Open the folder labeled "Rain H DDF Hourly."
- Open the folder with the hourly rainfall data that corresponds to the zone where the crossing being designed is located (e.g., folder labeled "DDF HF for the F80 zone for the Mendocino coast).
- Observe the Excel files for the stations with hourly data in this zone (e.g., DDF HF). Select the station closest to the crossing being designed.
- For example, for the Mendocino coast, this might be Fort Bragg. Select the file labeled "F80H Fort Bragg 5N."
- Select "open."
- Enable macros if necessary (will be required if in step 3 above, you selected "moderate" for the security level in Excel).
- Observe that the 10-minute duration, 100-year return-period rainfall for the Fort Bragg station is 0.53 inches. This equates to 3.18 inches per hour, which is the value required for the Rational Method.

## Detailed Information on How to Sort the Station Index File

A Registered Professional Forester working on a company ownership will likely be interested in rainfall data from one to several counties in California. We suggest the following procedure for quickly locating available stations within a given county:

- Open the Station Index Excel file on the DWR Climate webpage, located under “Rainfall Depth-Duration-Frequency Data (preliminary).”
- Save the Station Index file to your personal computer (must save it to be able to sort).
- From the menu tool bar, select “Data” and click on “Sort.”
- Highlight the entire spreadsheet, except the initial row displaying header information (4906 rows).
- Sort by columns I (county [sort ascending]), L (latitude [sort descending]), and K (longitude [sort descending]) [or other desired attributes].
- Save the revised file to your hard drive.

The result of this sorting is a file in which the stations are sorted by county, and under each county, they are listed from north to south, and for any given latitude, from east to west. If you get the approximate latitude and longitude for the crossing site, then you can easily go to the correct county and identify the station(s) in that county that are closest to the crossing site. Note that not all of the stations in the index will have **hourly** depth-duration-frequency data. Then one can open the correct folder under Rain H DDF Hourly on the website and compare the available stations with hourly data in the county of interest to the list of stations from the Station Index file.

Once the Station Index file is downloaded, saved, and sorted as above, the RPF can remove all of the stations that will not be needed. Also, if the RPF works in a specific area, the list of stations for that area (e.g., Trinity County) can be printed out for future reference so that one does not always have to open up the file – one can just look at the printed list and then go to the database on the web and get the data.