CHAPTER 4. SUBMITTALS

Presented in this chapter are elements of a hydrology report that help to make the report complete and readily understandable. There will of course be times when all the information need not be presented and times when much more information will be needed, but typical report elements are described below.

4.1   PROJECT DESCRIPTION

The project description should include maps, tabular data, and text, as described below.

Maps

Sample project description maps are presented in Figures B-1 and B-2 (Appendix B). The project description map or maps should show:

- The project boundary

- Areas of each land use type, if the project includes more than one land use type.

- Watershed or subshed boundaries within the project, and if relevant, beyond the project. The watersheds/subsheds should be clearly labeled so that they can be correlated with tabulated data or computer model input/output files.

- Existing drainage facilities, including pipes, channels, creeks, detention basins, pump stations, or any other relevant drainage facilities. The sizes and slopes of the facilities should either be shown on the map or summarized in a table. Relevant capacities should also be shown on the map or summarized in a table.

- Planned drainage facilities, including pipes, channels, creeks, detention basins, pump stations, or any other relevant drainage facilities. The sizes, slopes, and capacities of all planned facilities should either be shown on the map or summarized in a table.

- Runoff flow direction and ground slope.

- The locations of any analysis points with labels so that they can be correlated with tabulated data or computer model input/output.

If the project includes detention basins, pump stations, or other facilities, conceptual layouts or schematic drawings of these facilities should be included.

Tabular Data

As applicable, the data described below should be summarized in tables.

Land Uses. The acreage of each land use type within each watershed/subshed. The table should include subtotals for each land use type, subtotals for each watershed/subshed, and a grand total. An example is presented in Figure B-1.

Detention Basins. If the project includes detention basins or reservoirs, a table summarizing the basin/reservoir elevations, surface areas, and storage volumes should be presented. If the basin has a gravity flow release structure (*e.g.*, a specified diameter discharge pipe), the planned discharge rates should also be included in the table. Notes that further explain the basin/table should also be included. An example is presented in Table 4-1.

Table 4-1. Detention Basin Data[a]

Elevation, feet MSL	Surface Area, acres[b]	Storage Volume, acre-feet[c]	Discharge Capacity, cfs[d]
41 (release pipe flow line)	0	0	0
42 (start of side slopes)	2.14	1.1	4.1
44	2.37	5.6	20
46	2.61	10.6	30
48 (maximum water surface elevation)	2.87	16.1	36
49 (basin top)	3.00	19.0	40

[a] Detention basin is sized for a 100-year, 24-hour storm. Basin is square with an area of 3.0 acres at the top elevation of 49 feet.
[b] The elevation versus area relationship is based on 4 horizontal:1 vertical side slopes.
[c] Volume in each layer is calculated as the average of the layer top and bottom areas times the layer depth. The storage volume is the sum of all layer volumes below the given elevation.
[d] Discharge Rate is based on a 24-inch reinforced concrete pipe with a square edge headwall.

Pump Stations. If the project includes a pump station, the pump capacities and on/off elevations should be summarized in a table. The presence of standby pumps should also be clearly noted in the table. An example is presented in Table 4-2.

Table 4-2. Pump Station Data[a]

Elevation, feet MSL	Low Flow Pump (2 cfs)	Primary Pump 1 (15 cfs)	Primary Pump 2 (15 cfs)	Total Pumping Rate, cfs
35 (Wet Well Bottom)	—	—	—	0
37	Off when emptying	—	—	0
40	On when filling	Off when emptying	—	2
42	—	On when filling	Off when emptying	17
44	—	—	On when filling	32

[a] The pump station includes a 2 cfs low flow pump, 2 primary 15 cfs pumps, and a standby 15 cfs pump. Detention basin bottom is at 41 feet, basin top is at 49 feet, and the 100-year, 24-hour maximum water surface elevation is 48 feet.

Text

In the text, the project should be described and the maps and tables should be explained. Any elements of the system that are not fully explained in the figures and tables should be thoroughly explained in the text. For example, use of the standby pump could be explained as follows:

"For storms larger than the design storm (100-year, 24-hour event), the water surface elevation (WSEL) will exceed the design level of 48.0 feet. At a WSEL of 48.1 feet, the 15 cfs standby pump would come on, providing a total pump station capacity of 47 cfs."

4.2   HYDROLOGIC ANALYSIS DATA

Tables should be used for presenting such hydrologic information as:

- Watershed/subshed MAP and precipitation losses (see Tables C-1 or D-2 in Appendices C and D for examples).

- Development of hypothetical storm precipitation depths (see Tables C-4 or D-1 for examples). If a hyetograph is used rather than a hypothetical storm, the time *vs.* precipitation data should be provided in a table or appendix.

- Development of watershed average percent imperviousness (see Table D-3 for an example).

- Development of Snyder's standard lag time and Snyder's peaking coefficient (see Tables C-2 or D-4).

The information in the tables should be labeled to correlate with the watersheds/subsheds shown on the project description maps.

4.3   HYDROLOGIC ANALYSIS RESULTS

The hydrologic analysis results should be summarized in a table with labels corresponding to the watersheds/subsheds or analysis points shown on the project description map. Examples are shown in Tables B-2 and D-5.

The hydrology report should also include hydraulic data or other results that are required by the agency responsible for approving the drainage facilities. For example, the City of Vacaville requires that the hydraulic grade line (HGL) remain at least 1.5 feet below the top of curb for the 10-year storm. Consequently, a table of curb elevations and maximum HGL elevations should be included in the report.

4.4   COMPUTER MODEL FILES

For computer models, copies of the input and output files should be presented in the report appendices. See Appendices B, C, and D for examples.