

## Riverside County Flood Control and Water Conservation District



### **REQUIRED CONTENT AND FORMAT FOR HYDRAULIC REPORTS UTILIZING HEC-RAS**

The following are minimum requirements for hydraulic analyses utilizing HEC-RAS:

#### **General**

1. The report must be signed and stamped by the registered civil engineer who is in responsible charge of preparing the hydraulic study. The report should be labeled "draft" for initial submittals.
2. The report must be organized in a logical manner, and a summary of the results and associated impacts resulting from the project must be given in the text portion of the report. Specifications for minimum content are provided below. Typical preferred report format is shown on [Figure 1](#).
3. The study limits must extend sufficiently far downstream to clearly establish the water surface elevation at the downstream end of the project.
4. The study limits must extend a sufficient distance upstream of the project to clearly demonstrate the impacts of the proposed project on the upstream properties. This generally means extending the run upstream to the point where the baseline (or pre-project) and post-project water surfaces are the same.
5. Should a floodway analysis be required, in addition to satisfying all FEMA floodway requirements, the floodway must be established by reducing equal conveyance in each overbank to a point where water surface elevations increase by no more than one foot. Deviations from this method must be discussed with and agreed upon by the District prior to submittal of the floodway analysis.
6. It should be noted that the District does not permit encroachments into the floodplain that adversely impact water surface elevations or velocities on adjacent properties without written permission from the affected property owners. This is in effect even if the encroachment takes place within a floodplain where a regulatory floodway is established, and the encroachment is outside of the regulatory floodway.

#### **Content – Work Maps**

Complete and separate existing and proposed condition work maps must be provided. The work maps must include the following:

7. Cross sections must be drawn at the proper length and include a layout line coinciding with the channel or floodplain centerline. The layout line shall be labeled with stationing on the work maps. The point where the layout line intersects each cross section is to be set to station zero. Cross section transverse stations will be positive to the right of the layout line and negative to the left, looking downstream.
8. Each cross section must be labeled with the cross section number. The label must be located at the left end of the cross section looking downstream. The right and left "overbank" locations on each cross section shall be marked on the work map in some consistent fashion (e.g., a circle, square or triangle must be placed on the cross section at each overbank location).

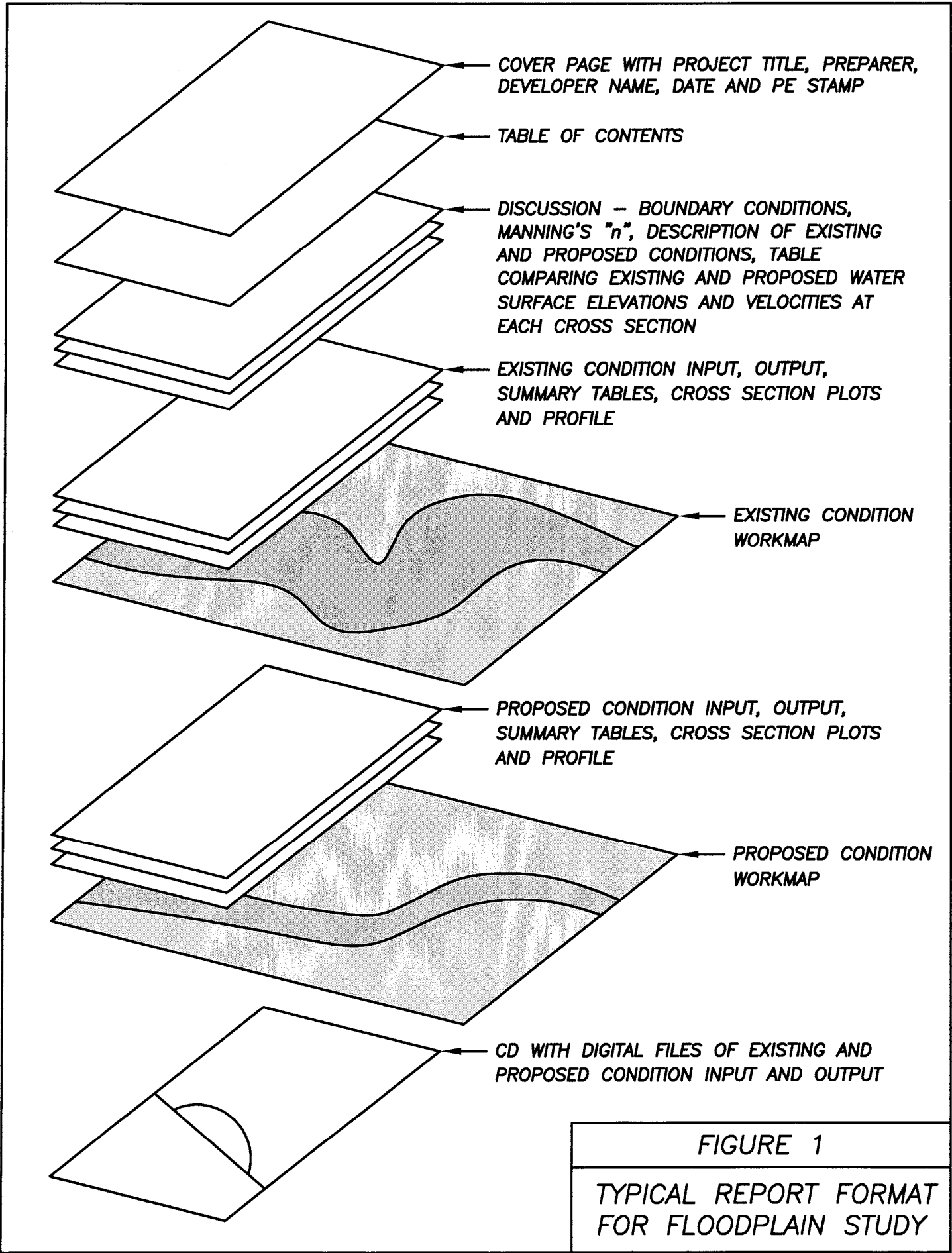
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9. The pre-project and post-project floodplain must be accurately plotted on each work map.
10. Areas of ineffective flow must be clearly shown.
11. The underlying topography and contour labels on the work map must be legible.
12. All proposed grading, culverts, bridges, drop structures, access ramps, etc. that impact the floodplain must be shown.
13. Proposed access roads and turnarounds must be shown.
14. Proposed finished grade elevations adjacent to the floodplain must be shown. When proposed conditions grading is shown on/over existing topography, sufficient labeling of grades at top and toe of slopes and flowlines shall be provided to allow the reviewer to reconcile the model cross sections to the work maps.
15. Legend, scale and north arrow shall be shown.

### **Content - Narrative and Supporting Information**

A complete hydraulic study must be provided including:

16. A printout of HEC-RAS input and output files for both pre-project and post-project conditions must be provided. The output files should also include at least one summary table. The report must include a narrative and, if multiple scenarios are modeled, a table explaining the computer modeling runs. There are often multiple "Projects" and "Plans" employed. The names and interrelationship of all component input files and output files shall be explained.
17. All proposed grading, culverts, bridges, drop structures, access ramps, etc. that impact the floodplain must be included in the modeling.
18. A CD or other digital format with the input and output files shall be included in the report package.
19. A summary table including cross section station, 100-year flowrate, pre-project and post-project water surface elevations, difference in water surface elevation and velocities for pre-project and post-project conditions. Table may be included in narrative or on workmap.
20. A channel centerline profile plot showing thalweg elevation, water surface elevation and critical depth must be provided. The thalweg need not necessarily coincide with the layout line.
21. Cross section plots for all cross sections plotted at no more than four per each 8½ x 11 sheet must be provided. Each cross section must be labeled with the cross section number and must show the entire cross section, water surface elevation and distribution of Manning's "n" values over the cross section. If feasible, it is greatly preferred that the scale of the cross section plots be consistent.
22. A description of the Manning's "n" values used and an explanation for why they were chosen must be provided.
23. A description of and a rational explanation for how the upstream and downstream boundary conditions were established must be provided in the report narrative and should be annotated in the hydraulic input file comment fields.
24. Photographs of the existing study reach should be included if it is felt they will assist in conveying information to the reviewer.



**FIGURE 1**  
**TYPICAL REPORT FORMAT FOR FLOODPLAIN STUDY**