

Roughness Coefficients for Disturbed Areas

Within the rivers and creeks of the County, historically there is a cycle of large floods that tend to remove vegetation from channels, followed by periods of vegetation re-growth. In many locations, the level of vegetation that can re-establish itself is significant enough to substantially impede the flow of stormwater runoff. In some locations across the County, floodplains were mapped, or facilities were designed based upon the lower vegetation levels after a major flooding event, without considering possible future vegetation. The final dense vegetation levels later achieved in these areas would impede flows and increase flooding in ways that were not known, creating an unsafe situation. To prevent this, FEMA regulations clarify that the County is responsible for maintaining vegetation levels in accordance with the analyses used to establish the mapped floodplain (44 CFR 60.3.b.7).

Within the hydraulic analyses used for floodplain mapping and design, the parameter that is used to represent the obstruction to flow caused by varying vegetation levels is referred to as the “Manning’s n” roughness coefficient (for additional information please see the County’s Hydraulic Design Manual, Chapter 5). To ensure that mapping and facilities are based upon analyses that utilize appropriate Manning’s n values, the County has established standards and guidance for the values used in these analyses.

For the analyses of any area of a channel that is, or will be disturbed, the County offers three options for selecting an appropriate Manning’s n value:

1. Utilize a simplified, conservative default Manning’s n value of 0.15 for the disturbed areas.
2. Use a value lower than 0.15 based upon a nearby previously disturbed watercourse (same creek or watershed if possible) that has unmaintained vegetation in equilibrium. This process requires acceptable documentation by applicants, and verification by County staff. This option also requires certification by a registered professional engineer that the project has been designed to retain its flood carrying capacity without periodic maintenance.
3. Provide a written maintenance agreement that is officially recorded with the deed including sufficient specific details to ensure that vegetation levels would not exceed those of the representative n values used (this would normally just be in areas of a parks, or obviously well maintained grass).

For all other undisturbed areas, the appropriate Manning’s n value can be chosen from Table A-5 in the County’s Hydraulic Design Manual based upon the actual vegetation present at the time of the analyses.

These requirements allow for defensible analyses that can define the actual flooding hazard in the future due to possible and probable vegetation levels.

Resources

Chow, V. T. (1959). *Open Channel Hydraulics*. McGraw-Hill

U. S. Army Corps of Engineers (2016). *HEC-RAS River Analysis System User’s Manual*. Version 5.0
February 2016

U. S. Department of Transportation (1984). *Guide for Selecting Manning’s Roughness Coefficients for Natural Channels and Flood Plains*. FHWA-TS-84-204

Note: The County of San Diego Hydrology Manual Update Technical Advisory Committee (TAC) will convene in early 2019, and will be discussing and considering revisions to Manning’s n value guidance.