

SECTION 5

CRITERIA

5-1 HYDROLOGY

The hydrology study criteria are in accordance with the 1986 Orange County Hydrology Manual, 1996 Local Drainage Manual, and the Hydrology Manual Addenda issued by the County. These documents provide information needed to develop the hydrologic parameters such as the time of concentration (Tc), rainfall data, rainfall intensity, soil type and land use impervious percentage. The Rational Method is the standard method used for determining the peak discharges in studies of drainage areas less than one (1) square mile (640 acres). For areas larger than (1) square mile, and for the pump station tributary areas, the Unit Hydrograph Method was applied to calculate the peak runoff rates and runoff volumes.

5-2 LEVELS OF FLOOD PROTECTION

The level of flood protection to be provided within the City boundary is selected to be in accordance with the Orange County Local Drainage Design Criteria. In general, the drainage systems shall be designed with sufficient capacity to convey a minimum of 10-year storm peak runoff if its tributary area is less than one (1) square mile (640 acres). The maximum water level in streets will be as shown on Figure 5-1, Orange County Public Works, Flood Protection Goals.

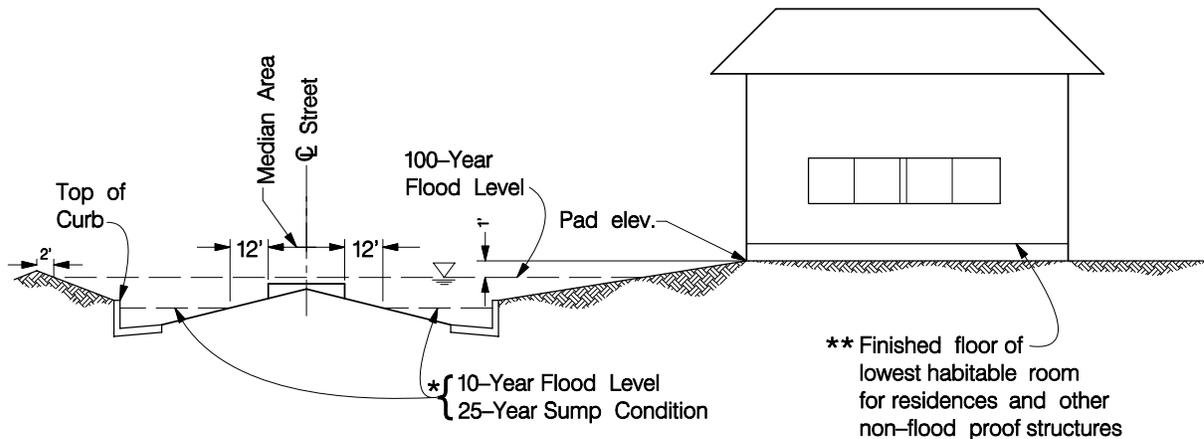
For areas with sump conditions, the drainage system shall be designed to convey a minimum of 25-year storm peak runoff. Sump conditions occur in areas where water will pond and flood the width of the street right-of way before it can drain by gravity.

The catch basins and storm drains that are tributary to pump stations, shall also be designed to convey the 25-year storm peak runoff. The stormwater pump station capacity shall be designed for the peak flow from a 25-year storm event.

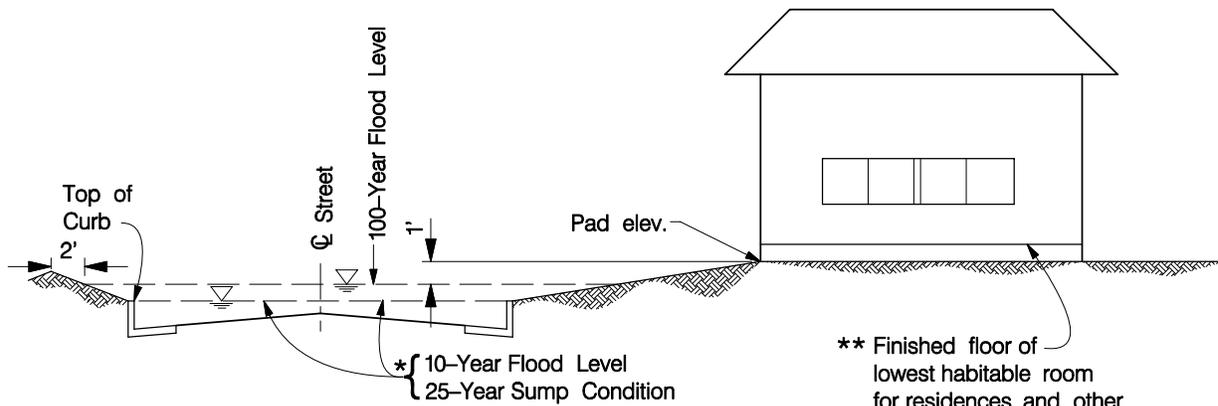
5-3 HYDRAULIC ANALYSIS CRITERIA

The Water Surface and Pressure Gradient (WSPG) computer program (F0515P), developed by the Los Angeles County Flood Control District (LACFCD) was utilized to calculate the hydraulic grade line (HGL) in the drainage system. The computational procedure is based on solving Bernoulli's equation for the total energy at each section and Manning's equation for friction loss between the sections in a reach. The open channel flow procedure utilizes the standard step method. Confluences are analyzed using the pressure plus momentum theory.

The majority of the City's existing drainage system is not capable of conveying the 25-year storm runoff. The proposed recommendations and new storm drains will increase the flood protection levels throughout the City. However, criteria will not be met at several locations due to site restrictions described in further detail in this report.



ARTERIAL HIGHWAY



LOCAL STREET

NOTE

- * For Arterial Hwy and Local Street, depth times velocity cannot exceed six.
- ** The elevation of the lowest floor of buildings, including basements or cellars, must be at least 1 foot above the 100-year flood water surface elevation pursuant to Section 7-9-113.5 of the County Ordinance.

5-4 STREET CAPACITY CRITERIA

Streets are open channels that convey surface runoff to catch basins and into storm drain systems. The street capacity of conveying surface runoff depends on the street slope, cross-fall, curb height, and street width. On local streets, when the water level exceeds the top of curb during the design storm event, a new storm drain shall be installed to intercept the runoff. On arterial streets, one (1) travel lane in each direction shall be free from inundation during the design storm event. Otherwise a new storm drain shall be installed, or the size of the existing drain shall be increased to meet this criterion.

The street widths and slopes were calculated from the one (1) foot contour maps and have been used to determine where new storm drains are needed to meet the flood protection criteria. During the design stage, detailed street capacity studies should be conducted with updated hydrologic studies to determine actual location and size of the new storm drains.

5-5 PROPOSED STORM DRAIN SYSTEM CRITERIA

For the proposed storm drain facilities, the following criteria are applied:

1. Storm drain mainlines shall be designed to convey the design storm peak runoff, with the HGL a minimum of one (1) foot below the street gutter grade. The design storm peak runoff may be conveyed in a combination of the storm drain and the street as long as the water level does not exceed the top of curb.
2. Connector pipes shall be sized to provide a minimum of 6-inch freeboard at drainage inlet, such as catch basin or grate inlet.

There are exceptions to the above criteria. Several locations throughout the City cannot meet the criteria, due to one or more of the restrictions listed hereon:

- Limited storm drain easement
- Shallow ground cover over the pipe
- Very flat slopes in the system
- Fixed high invert elevations and/or control water surface elevations at existing downstream facilities
- Existing utility crossings
- Existing storm drains are underneath buildings

The criteria cannot be met in the College Park East community, east of the Old Ranch Golf Course along Guava Avenue, Elder Avenue, Candleberry Avenue, and Basswood Street due to the high downstream water surface control elevations and the limited easement available for the storm drains. The recommended improvements along Electric Avenue between Corsair Way and Main Street will not meet the criteria due to extremely flat slopes and the high downstream water surface control elevation.

Although flooding during the design storm event cannot be prevented at these locations, improvements will still be recommended to shorten the duration of flooding and also reduce the flooding areas.

3. The slope of the main line shall not be less than 0.001 (ft/ft).
4. The storm drains shall be of reinforced concrete pipe (RCP) or box (RCB).
5. The connector pipes between catch basins and mainlines shall be a minimum of 24-inch in diameter or the equivalent box size.

5-6 DOWNSTREAM WATER SURFACE/HGL CONTROL CRITERIA

The City's drainage facilities discharge to various outlet points, as listed below:

- Orange County Flood Control District Facilities (Los Alamitos Channel, Bolsa Chica Channel, Seal Beach Pump Station; etc.)
- Los Angeles County Flood Control District Facilities (San Gabriel River)
- Private Facilities (Hellman Property, Boeing Property; etc.)
- West End Pump Station (City owned)
- Old Ranch Golf Course (Detention Basin)
- Anaheim Bay

The downstream control water surface elevation or HGL utilized in Section 7 - Hydraulic Studies is determined from the given data shown on the OCRDMD drainage design plans, FEMA Flood Insurance Rate Maps, and Old Ranch Golf Course project report to analyze the existing and future storm drain systems.