3.0. Hydrologic Modeling

3.1. Hydrologic Model Development

3.1.1. Introduction

One of the most widely recognized hydrologic models is the Rational Method, which essentially estimates flow on the basis of rainfall intensity, surface imperviousness, loss rates, and area of the watershed. The City's MP'D uses a customized version of the Advanced Engineering Software program called Stormwater Information Management System (SIMS). This software incorporates the County of Orange Hydrology Manual methodology. The computer program reads the hydrologic parameters (i.e. subarea acreage, soil type, development type, land use -impervious factor, time of concentration of runoff, etc.) directly from the data captured by the GIS.

The model input data for the City's MPD was developed through a Geographic Information System (GIS). For this purpose, ArcGIS (ESRI, Redlands, California) was used as the primary drawing and analysis tool. The existing City land base was utilized as the drainage model base map. The drainage facilities were then transferred to the base maps and plotted for development of watershed areas, flow paths and nodal schemes. Additional hydrologic layers, such as topography, drainage path flow arrows, rainfall zones and contours, soil groups and land use were developed separately then overlaid on to the drainage base map, by means of GIS themes.

As a simplistic explanation, a theme is a collection of graphic features such as points, lines, and closed polygons that carry certain alphanumeric attribute data in a database format. This data is used to identify and query spatial and geographic features, such as nodes, storm drain lines, or subarea polygons. In other themes, attribute information such as storm drain diameter or invert elevations can be stored. Related themes can then be assembled as a GIS coverage that combines spatial (geographic or drawing) and attribute (characteristic information) data. The coverage can then be separated from ArcGIS and analyzed using other mapping, database and spreadsheet software that allow varying levels of data and drawing analysis and interrogation.

The Orange County Hydrology Manual (1986) and subsequent addendums provide for the estimation of upper confidence level estimates of runoff. For example, use of a policy to use peak flow rates estimated at the 85-percent upper confidence level throughout Orange County will eventually result, after full build-out of the flood control system and tributary watershed, in 85-percent of the system elements being larger than what is exactly needed to carry the peak flow rate from the "expected" design storm. In this case, the term "expected" has a precise meaning; namely, it is the 50-percent upper confidence level value. Some view the 85-percent confidence level estimate as a form of application of a safety factor in design storm hydrology design and planning.
Many issues arise in the discussion of confidence interval estimates, but for planning purposes, it may be sufficient for most applications to use the lower 50-percent confidence interval estimate of runoff for testing existing storm drain elements as to whether they satisfy planning goals and objectives. Such goals may include the

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