DOWNSTREAM IMPACT ANALYSIS

(the Ten Percent Rule)

Introduction

The ten-percent rule recognizes the fact that a structural control providing detention has a "zone of influence" downstream where its effectiveness can be observed. Beyond this zone of influence the structural control becomes relatively small and insignificant compared to the runoff from the total drainage area at that point. Based on studies and master planning results for a large number of sites, that zone of influence is considered to be the point where the drainage area controlled by the detention facility comprises 10% of the total drainage area. For example, if the structural control drains 10 acres, the zone of influence ends at the point where the total drainage area is 100 acres or greater.

Prior to initiating a downstream impact analysis, a scoping meeting must be coordinated with the Engineering Department to develop an understanding regarding the modeling software, design criteria, limits of the study, acceptable assumptions, report format, and required deliverables. These studies are intended to be used to determine the impacts that the increase of stormwater runoff creates from the site through the zone of influence.

General Requirements

A. Hydrologic Analysis

- 1. Using a topographic map, identify the point at which the drainage area of the development or redevelopment becomes less than ten-percent of the total watershed area (10% point).
- 2. Using a hydrologic model (e.g. HEC-HMS) determine the pre-development peak discharges for the 50- and 100-year storm events and the timing of those peaks at each tributary junction beginning at the detention facility outlet and ending at the next tributary junction beyond the 10% point. Key detention structures in the zone of influence must be modeled. An approximate curve number should be used since the actual peak flow is not critical for initial analysis, only the change in flows is important. However, an accurate estimate of the time of concentration is essential.
- 3. Change the site land use to post-development conditions and determine the peak discharges for the 50- and 100-year storm events.
- 4. On a topographic map, show the pre and post development flows, the change in flows in cfs and in percentage at all hydrologic modeling locations.
- 5. Provide a written assessment of flow increases.

B. Hydraulic Analysis

- 1. If the hydrologic analysis indicates probable detrimental impacts to existing buildings, habitable structures, or culverts, a detailed hydraulic study must be provided. The study shall include hydraulic grade lines for open channel flow areas for the post-development 50- and 100-yr storm events using a standard step backwater hydraulic model (e.g. HEC-RAS).
- 2. Using topographic maps provide a flood inundation map for the critical structures within the study area.
- 3. Stream cross-sections, impacted buildings, habitable structures, and culvert crossings must be field surveyed.
- 4. Provide a written assessment of flood elevation increases.