3.6 Small Watershed Hydrograph Method

**Introduction
3.6.1**

The Small Watershed Hydrograph Method is a method for developing a curvilinear design hydrograph for small to moderate size drainage areas (less than 640 acres) which peaks at a designated flow rate and contains a runoff volume consistent with the design rainfall.

**Applications
3.6.2**

A common application of the Small Watershed Hydrograph Method is the design of detention basins for new development or public agency projects. It facilitates the design of the outlet structure and determination of storage volume.

**Caution
3.6.3**

Do <u>not</u> attempt to compare, combine, or route the hydrograph generated by the Small Watershed Hydrograph Method with hydrographs from the Watershed Modeling Method or effective FEMA models. There is no correlation.

**Hydrograph
Computation
Equations
3.6.4**

The Small Watershed Hydrograph Method consists of the following equations:

For projects with drainage to TxDOT, the peak flows will be calculated using Houston District Hydraulic Section Criteria

$$T_P = \frac{V}{1.39 Q_P}$$

$$q_i = \left(\frac{Q_P}{2}\right)\left[1 - \cos\left(\frac{\pi t_i}{T_p}\right)\right] \qquad t_i \leq 1.25 T_P$$

$$q_i = 4.34 Q_P e^{\left(-1.3 t_i / T_P\right)} \qquad t_i > 1.25 T_P$$

in which:

Q_P = peak discharge in cubic feet per second from Site Runoff Curves

T_P = time to Q_p in seconds

V = total volume of runoff for the design storm in cubic feet

t_i and q_i = the respective time and discharges which determine the shape of the hydrograph

Note: The argument of cosine ($\pi * t_i / T_p$) is in radians.

Source: Malcom, H.R., "A Study of Detention in Urban Stormwater Management," Report No. 156, Water Resources Research Institute, University of North Carolina, July 1980.