3) **Watershed Map:** A watershed map showing existing and proposed drainage area boundaries along with all sub-area delineations and all areas of existing or proposed development.
4) **Discharge Calculations:** Discharge calculations specifying the methodology and key assumptions used, along with computed peak flow rates or hydrographs.
5) **Hydraulic Calculations:** Hydraulic calculations for outlet structure design, specifying the methodology used. All assumptions and values of design parameters must be clearly stated.
6) **Right-of-Way Map:** A map illustrating all existing and proposed rights-of-way.
7) **Benchmark Information:** A description of the benchmark used in obtaining field survey data, including the location, elevation, datum, and year of adjustment.
8) **Facility Layouts:** Plan view and typical cross-section(s) of proposed detention facility.
9) **Soils Report:** A soils report which addresses erosion and slope stability.

7.3.3 Detention Design For Drainage Areas of Less Than 50 Acres

The maximum allowable release rate from the detention facility during the 100-year storm event is the 100-year peak flow rate from the watershed of the detention facility under pre-development conditions. This flow rate should be determined using the Rational Method.

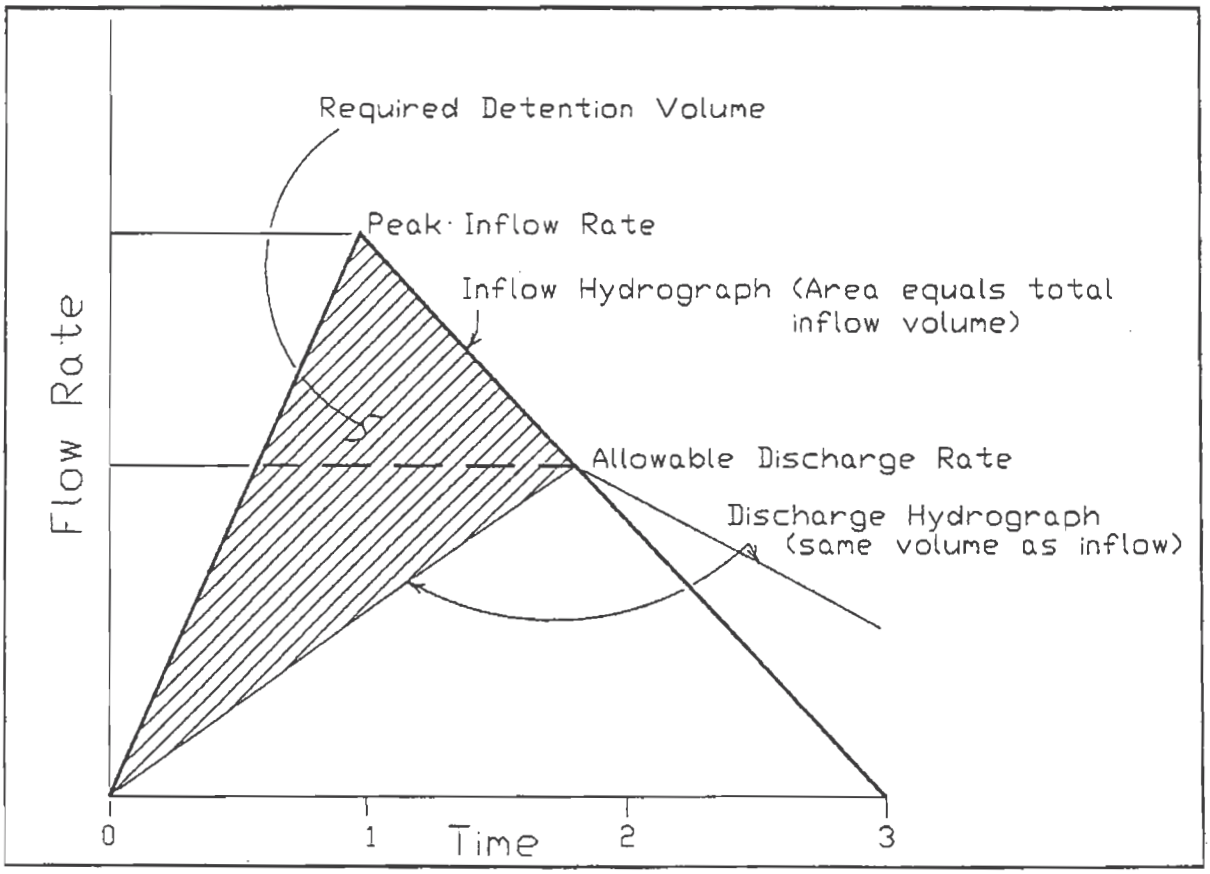

FIGURE 7.5 Required Detention Volume for Less Than 50 Acres

The volume of flood control storage to be provided by the facility for the 100-year storm event is to be determined using the triangular hydrograph method illustrated in Figure 7.5. The required volume may be computed using the following formulas:

$$B = \frac{43560 V_R}{0.5I} \qquad \text{Equation 7.1}$$

$$S = \frac{0.5B(I - O)}{43560} \qquad \text{Equation 7.2}$$

in which:

B = duration of inflow to the basin (seconds)

V_R = total basin inflow volume (acre-feet)

S = required flood storage volume (acre-feet)

I = peak inflow rate (cubic feet per second)

O = peak discharge rate (cubic feet per second).

This storage volume must be provided below the proposed maximum 100-year water surface elevation in the basin. The required storage volume for the 25-year storm event should be computed in the same way. The 25-year ponding elevation should be determined as the elevation below which the computed storage volume may be provided within the detention basin.

The size of the outlet pipe that is require to pass the maximum allowable release rate during the 100-year storm is to be computed assuming outlet control (See SECTION 4), by establishing a maximum ponding level in the detention facility during the 100-year storm and determining the appropriate a tailwater elevation in the outfall channel.

7.3.4 Detention Design For Drainage Areas of 50 Acres to 640 Acres

For drainage areas greater than or equal to 50 acres but less than 640 acres (one square mile), an inflow hydrograph must be developed and routed through the detention facility. The inflow hydrograph may be assembled using the drainage area versus peak discharge curves for Montgomery County and the Small Watershed Method of hydrograph development, both of which are described in SECTION 2. Alternatively, the inflow hydrograph may be developed using the HEC-1 computer program and the guidelines for HEC-1 applications presented in SECTION 2.

Routing of flows through the detention facility may be accomplished using the ***Modified Puls*** method. This method is described by the equation:

$$\frac{I_1 + I_2}{2}\Delta t + S_1 - \frac{O_1}{2}\Delta t = S_2 + \frac{O_2}{2}\Delta t \qquad \text{Equation 7.3}$$

in which:

I = instantaneous inflow rate at the beginning of a routing period (cfs)

O = instantaneous outflow rate at the beginning of a routing period (cfs)

S = instantaneous storage volume at the beginning of a routing period (cfs)

Δt = duration of routing period (seconds).

The HEC-1 computer program may be used to perform detention routing computations using the Modified Puls method. Other programs which utilize the Modified Puls method are available. The routing equation given above may also be solved graphically and used in manual routing computations.