Substituting into Eqn. 12.27 and 12.25

$$t_e = \frac{0.94(500)^{3/5}(0.014)^{3/5}}{(3)^{2/5}(0.0001)^{3/10}} = 30.86 \text{ min}$$

$$D_e = \frac{0.000818(3)^{.6}(.014)^{.6}(500)^{1.6}}{(.0001)^{.3}} = 40.28 \text{ cu ft/ft}$$

The routing equation is, for any Δt:

$$\bar{q} = 3.3698\text{x}10^{-5}(\bar{D})^{5/3}(1 + 9.1808\text{x}10^{-6}\bar{D}^3)^{5/3} \qquad (1)$$

where $\bar{D} = (D_1 + D_2)/2$

The increase to surface detention during the storm is ΔD. For solution, it is set equal to rainfall rate during the 60-minute storm and then made equal to zero afterwards (assumes infiltration and interflow are negligible). For a 5-min routing interval, $\Delta D = (3.0 \text{ in./hr})(500 \text{ ft}^2/\text{ft})(\text{ft}/12 \text{ in.})(5 \text{ min})(\text{hr}/60 \text{ min}) = 10.42 \text{ ft}^3/\text{ft}$.

Thus, during the first 60 min, for each Δt,

$$D_2 = D_1 + 10.42 - \bar{q}\,\Delta t \qquad (2)$$

giving two equations in two unknowns, $\bar{q}$ and D_2. The solution can be found by trial or by Newton's method. Eqs. (1) and (2) can be solved by a trial procedure:

1. Guess D_2
2. Calculate $\bar{q} = (D_1 - D_2 + 10.42)/\Delta t$
3. Calculate $\bar{D} = (D_1 + D_2)/2$
4. Check $\bar{q}$ from Eqn. (1)

Because the slope is so flat, no runoff occurs for a significant time until detention storage accumulates.

Using a 5-min interval and writing Eqn. (2) as

$$\bar{q} = (D_1 - D_2 + 10.42)/.08333:$$