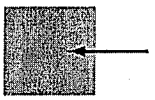
Area Weighted Flow vs Geometric Mean

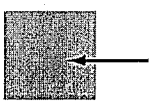
Exhibit DFG-C-47

Case 1:
K = 100 ft/day
Area = 100 sq.ft.
i = 0.1



Case 3:
GM of K = sqrt(100 ft/day * 1 ft/day) = 10 ft/day

Case 2:
K = 1 ft/day
Area = 100 sq.ft.
i = 0.1



Case 3:
GM of K = sqrt(1 ft/day * 100 ft/day) = 10 ft/day

Volume of water flowing through a streambed is sum of flow through all areas.

$$Q = K * i * A$$

Case 1: $Q1 = 100 \text{ ft/day} * 0.1 * 100 \text{ sq.ft.} + 1 \text{ ft/day} * 0.1 * 1 \text{ sq.ft.}$
$= 1{,}000 \text{ cu.ft./day} + 0.1 \text{ cu.ft/day}$

Q = 1,000.1 cu.ft./day

Case 2: $Q2 = 1 \text{ ft/day} * 0.1 * 100 \text{ sq.ft.} + 100 \text{ ft/day} * 0.1 * 1 \text{ sq.ft.}$
$= 10 \text{ cu.ft./day} + 10 \text{ cu.ft/day}$

Q = 20 cu.ft./day

Case 3: $Qgm = 10 \text{ ft/day} * 0.1 * 101 \text{ sq.ft.}$

Qgm = 101 cu.ft/day

Both examples have same volume of flow using a geometric mean.