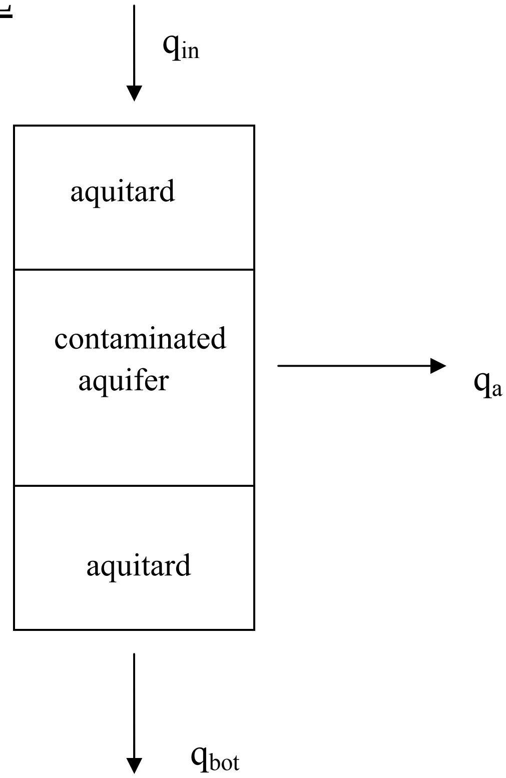
<u>MASS BALANCE MODEL</u>



- Flow mass balance:

$$q_{in} = q_a + q_{bot}$$

where q_{in} and q_{bot} are uncertain.

- The vertical linear velocity to the underlying aquifer is q_{bot}/n where n is the uncertain porosity.

- The initial mass of contaminants (NAPL) in the aquifer per unit area is given by:

Thickness of aquifer * porosity * NAPL saturation * NAPL density

$b\ (L^3/L^2)$ * $S\ (mg/L^3)$

- The fraction of the mass that enters the bottom aquitard is q_{bot}/q_{in}. This assumes that the concentration in the aquifer column and the concentration entering the underlying aquitard are the same. The mass that exits through the underlying aquitard is a fraction of the total mass in the aquifer:

$$M_{bot} = \frac{q_{bot}}{q_{in}} M_{tot}$$

- Assume that the contaminant concentration in the aquifer decays with time:

$$C = C_0 e^{-\lambda t}$$

Therefore the mass exiting through the bottom aquitard is:

$$M_{bot} = q_{bot} \int_0^{\infty} C_0 e^{-\lambda t} dt$$

giving:

$$M_{bot} = q_{bot} \frac{C_0}{\lambda}$$

Finally, combining equations gives:

$$C_0 = \frac{\lambda M_{tot}}{q_{in}}$$

- The uncertain variables are: q_{in}, q_{bot} = v n , S (mass concent. in aquifer), λ, and n (porosity)

- The source equation is:

$$C_0 = \frac{\lambda M_{tot}}{q_{in}} = \frac{\lambda S b}{q_{in}}$$

- e.g. C_0 = 1000 mg/l, λ = 0.023/yr, q_{in} = 0.152 m/yr, b = 10 m gives

S = 660.87 mg/l