Important Steady Flow into a Well Formulas PDF

Formulas
Examples
with Units

List of 10
Important Steady Flow into a Well Formulas

1) Change in Piezometric Head Formula

Evaluate Formula

Formula

$$dh = V_r \cdot \frac{dr}{K}$$

Example with Units

$$1.25\,\text{m} = 15.00\,\text{cm/s} \cdot \frac{0.25\,\text{m}}{3.0\,\text{cm/s}}$$

2) Change in Radial Distance Formula

Evaluate Formula

Formula

$$dr = K \cdot \frac{dh}{V_r}$$

Example with Units

$$0.25\,\text{m} = 3.0\,\text{cm/s} \cdot \frac{1.25\,\text{m}}{15.00\,\text{cm/s}}$$

3) Cylindrical Surface through which Velocity of Flow Occurs Formula

Evaluate Formula

Formula

$$S = 2 \cdot \pi \cdot r \cdot H_a$$

Example with Units

$$848.23\,\text{m}^2 = 2 \cdot 3.1416 \cdot 3\,\text{m} \cdot 45\,\text{m}$$

4) Discharge Entering Cylindrical Surface to Well Discharge Formula

Evaluate Formula

Formula

$$Q = \left(2 \cdot \pi \cdot r \cdot H_a\right) \cdot \left(K \cdot \left(\frac{dh}{dr}\right)\right)$$

Example with Units

$$127.2345\,\text{m}^3/\text{s} = \left(2 \cdot 3.1416 \cdot 3\,\text{m} \cdot 45\,\text{m}\right) \cdot \left(3.0\,\text{cm/s} \cdot \left(\frac{1.25\,\text{m}}{0.25\,\text{m}}\right)\right)$$

5) Discharge Observed at Edge of Zone of Influence Formula

Evaluate Formula

Formula

$$Q_{iz} = 2 \cdot \pi \cdot \tau \cdot \frac{s'}{\ln\left(\frac{r_2}{r_1}\right)}$$

Example with Units

$$2.5381\,\text{m}^3/\text{s} = 2 \cdot 3.1416 \cdot 1.4\,\text{m}^2/\text{s} \cdot \frac{0.2\,\text{m}}{\ln\left(\frac{10.0\,\text{m}}{5.0\,\text{m}}\right)}$$

6) Equilibrium Equation for Flow in Confined Aquifer at Observation Well Formula

Evaluate Formula

Formula

$$Q = \frac{2 \cdot \pi \cdot \tau \cdot \left(h_2 - h_1 \right)}{\ln\left(\frac{r_2}{r_1} \right)}$$

Example with Units

$$126.9061\,\text{m}^3/\text{s} = \frac{2 \cdot 3.1416 \cdot 1.4\,\text{m}^2/\text{s} \cdot \left(25\,\text{m} - 15\,\text{m} \right)}{\ln\left(\frac{10.0\,\text{m}}{5.0\,\text{m}} \right)}$$

7) Thiem's equilibrium equation for steady flow in confined aquifer Formula

Evaluate Formula

Formula

$$Q_{sf} = 2 \cdot \pi \cdot K \cdot H_a \cdot \frac{h_2 - h_1}{\ln\left(\frac{r_2}{r_1} \right)}$$

Example with Units

$$122.3737\,\text{m}^3/\text{s} = 2 \cdot 3.1416 \cdot 3.0\,\text{cm/s} \cdot 45\,\text{m} \cdot \frac{25\,\text{m} - 15\,\text{m}}{\ln\left(\frac{10.0\,\text{m}}{5.0\,\text{m}} \right)}$$

8) Transmissivity when Discharge and Drawdowns are considered Formula

Evaluate Formula

Formula

$$\tau = Q_{sf} \cdot \frac{\ln\left(\frac{r_2}{r_1} \right)}{2 \cdot \pi \cdot \left(H_1 - H_2 \right)}$$

Example with Units

$$2.6918\,\text{m}^2/\text{s} = 122\,\text{m}^3/\text{s} \cdot \frac{\ln\left(\frac{10.0\,\text{m}}{5.0\,\text{m}} \right)}{2 \cdot 3.1416 \cdot \left(15.0\,\text{m} - 10.00\,\text{m} \right)}$$

9) Transmissivity when Discharge at Edge of Zone of Influence Formula

Evaluate Formula

Formula

$$T_{iz} = \frac{Q_{sf} \cdot \ln\left(\frac{r_2}{r_1} \right)}{2 \cdot \pi \cdot s'}$$

Example with Units

$$67.2939\,\text{m}^2/\text{s} = \frac{122\,\text{m}^3/\text{s} \cdot \ln\left(\frac{10.0\,\text{m}}{5.0\,\text{m}} \right)}{2 \cdot 3.1416 \cdot 0.2\,\text{m}}$$

10) Velocity of Flow by Darcy's Law at Radical Distance Formula

Evaluate Formula

Formula

$$V_r = K \cdot \left(\frac{dh}{dr} \right)$$

Example with Units

$$15\,\text{cm/s} = 3.0\,\text{cm/s} \cdot \left(\frac{1.25\,\text{m}}{0.25\,\text{m}} \right)$$

Variables used in list of Steady Flow into a Well Formulas above

- **dh** Change in Piezometric Head *(Meter)*
- **dr** Change in Radial Distance *(Meter)*
- h_1 Piezometric Head at Radial Distance r1 *(Meter)*
- H_1 Drawdown at Start of Recuperation *(Meter)*
- h_2 Piezometric Head at Radial Distance r2 *(Meter)*
- H_2 Drawdown at a Time *(Meter)*
- H_a Width of Aquifer *(Meter)*
- **K** Coefficient of Permeability *(Centimeter per Second)*
- **Q** Discharge Entering Cylindrical Surface into Well *(Cubic Meter per Second)*
- Q_{iz} Discharge Observed at Edge of Zone of Influence *(Cubic Meter per Second)*
- Q_{sf} Steady Flow in a Confined Aquifer *(Cubic Meter per Second)*
- **r** Radial Distance *(Meter)*
- r_1 Radial Distance at Observation Well 1 *(Meter)*
- r_2 Radial Distance at Observation Well 2 *(Meter)*
- **s'** Possible Drawdown in Confined Aquifer *(Meter)*
- **S** Surface through which the Velocity of Flow Occurs *(Square Meter)*
- T_{iz} Transmissivity at Edge of Zone of Influence *(Square Meter per Second)*
- V_r Velocity of Flow at Radial Distance *(Centimeter per Second)*
- **τ** Transmissivity *(Square Meter per Second)*

Constants, Functions, Measurements used in list of Steady Flow into a Well Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **ln**, ln(Number) *The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.*
- Measurement: **Length** in Meter (m) *Length Unit Conversion*
- Measurement: **Area** in Square Meter (m²) *Area Unit Conversion*
- Measurement: **Speed** in Centimeter per Second (cm/s) *Speed Unit Conversion*
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m³/s) *Volumetric Flow Rate Unit Conversion*
- Measurement: **Kinematic Viscosity** in Square Meter per Second (m²/s) *Kinematic Viscosity Unit Conversion*

Download other Important Groundwater Hydrology PDFs

- Important Aquifer Analysis and Properties Formulas
- Important Coefficient of Permeability Formulas
- Important Distance-Drawdown Analysis Formulas
- Important Open Wells Formulas
- Important Steady Flow into a Well Formulas
- Important Unsteady Flow in a Confined Aquifer Formulas

Try our Unique Visual Calculators

- Reverse percentage
- HCF calculator
- Simple fraction

Please SHARE this PDF with someone who needs it!

This PDF can be downloaded in these languages

English Spanish French German Russian Italian Portuguese Polish Dutch

7/8/2024 | 8:53:35 AM UTC