



Watershed and Yield Formulas

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Examples!

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List of 13 Watershed and Yield Formulas

Watershed and Yield r₹

Watershed Simulation

1) Actual Evapotranspiration given Runoff

 $\mathbf{E}_{\mathrm{et}} = \mathrm{P}_{\mathrm{mm}} - \mathrm{Q}_{\mathrm{V}} - \Delta \mathrm{Sm}$

 $m ex |9.5m^3/s = 35mm - 19.5m^3 - 6m^3|$

2) Change in Soil Moisture Storage given Runoff

 $\Delta {
m Sm} = {
m P}_{
m mm} - {
m Q}_{
m V} - {
m E}_{
m et}$

 $ext{ex} \ 1.5 ext{m}^{ ext{3}} = 35 ext{mm} - 19.5 ext{m}^{ ext{3}} - 14 ext{m}^{ ext{3}}/ ext{s}$

3) Equation for Runoff

fx $Q_{
m V}=S_{
m r}+I$

 $m = 12.05m^3 = 0.05m^3/s + 12m^3/s$

4) Net Groundwater Outflow given Runoff

 $I = \mathrm{Q_V} - \mathrm{S_r}$

 $\boxed{19.45 \text{m}^3/\text{s} = 19.5 \text{m}^3 - 0.05 \text{m}^3/\text{s} }$

5) Runoff given Precipitation

fx $Q_{
m V}={
m P}_{
m mm}-{
m E}_{
m et}-\Delta{
m Sm}$

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 $15 \text{m}^3 = 35 \text{mm} - 14 \text{m}^3/\text{s} - 6 \text{m}^3$

6) Surface Runoff using Runoff

fx $m S_r = Q_V - I$

ex $7.5 \text{m}^3/\text{s} = 19.5 \text{m}^3 - 12 \text{m}^3/\text{s}$

7) Abstraction in Time given Yield of Catchment

Yield of Catchment

 $\mathbf{f} \mathbf{x} \mathbf{A}_{\mathrm{b}} = \mathbf{Y} - \mathbf{R}_{\mathrm{o}} - \Delta \mathbf{S} \mathbf{v}$

 $= 116 = 186 - 50 \text{m}^3/\text{s} - 20$

8) Change in Storage Volumes given Yield of Catchment 🗗

 $\Delta Sv = Y - R_0 - A_b$

m ex $21 = 186 - 50 m^3/s - 115$

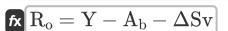
9) Natural Flow given Yield of Catchment 🗗

fx $m |R_N = Y - V_r|$

ex $176 \text{m}^3/\text{s} = 186 - 10 \text{m}^3/\text{s}$



10) Observed Runoff Volume at Terminal Gauging Station given Yield of Catchment



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 $m [6x] 51m^3/s = 186 - 115 - 20$

11) Volume of Return Flow given Yield of Catchment

fx $V_{
m r}=Y-R_{
m N}$

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 $m ex | 12m^3/s = 186 - 174m^3/s |$

12) Yield of Catchment by Water Balance Equation

fx $Y = R_N + V_r$

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 $|84| = 174 \mathrm{m}^3/\mathrm{s} + 10 \mathrm{m}^3/\mathrm{s}$

13) Yield of Catchment given Observed Runoff Volume at Terminal Gauging Station

 $\mathbf{K} \mathbf{Y} = \mathbf{R}_{\mathrm{o}} + \mathbf{A}_{\mathrm{b}} + \Delta \mathbf{S} \mathbf{v}$

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 $= 185 = 50 \mathrm{m}^3/\mathrm{s} + 115 + 20$



Variables Used

- A_b Abstraction in Time
- E_{et} Actual Evapotranspiration (Cubic Meter per Second)
- I Net Ground Water Flowing Outside Catchment (Cubic Meter per Second)
- P_{mm} Precipitation (Millimeter)
- Q_V Runoff Volume (Cubic Meter)
- R_N Natural Flow Volume (Cubic Meter per Second)
- Ro Observed Flow Volume (Cubic Meter per Second)
- S_r Surface Runoff (Cubic Meter per Second)
- **V**_r Volume of Return Flow (Cubic Meter per Second)
- Y Yield of Catchment
- ΔSm Change in Soil Moisture Storage (Cubic Meter)
- △Sv Change in Storage Volumes



Constants, Functions, Measurements used

- Measurement: Length in Millimeter (mm)
 Length Unit Conversion
- Measurement: Volume in Cubic Meter (m³)

 Volume Unit Conversion
- Measurement: Volumetric Flow Rate in Cubic Meter per Second (m³/s)

 Volumetric Flow Rate Unit Conversion





Check other formula lists

- Empirical Equations of Runoff Volume Formulas
- Rainfall-Runoff Correlation and Strange's Tables Formulas
- SCS-CN Method of Runoff Volume Formulas
- Watershed and Yield Formulas

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