Erosion and Sediment Deposits Formulas

List of 16 Erosion and Sediment Deposits Formulas

Erosion and Sediment Deposits

Channel Erosion

1) Equation for Suspended Sediment Load

Open Calculator

fx $$Q_s = K \cdot (Q^n)$$

ex $$229.5\text{t/d} = 0.17 \cdot \left((2.5\text{m}^3/\text{s})^3 \right)$$

2) Soil Erodibility Factor given Suspended Sediment Load

Open Calculator

fx $$K = \frac{Q_s}{Q^n}$$

ex $$0.17037 = \frac{230\text{t/d}}{(2.5\text{m}^3/\text{s})^3}$$

3) Stream Flow Discharge given Suspended Sediment Load

Open Calculator

fx $$Q = \left(\frac{Q_s}{K} \right)^{\frac{1}{n}}$$

ex $$2.501814\text{m}^3/\text{s} = \left(\frac{230\text{t/d}}{0.17} \right)^{\frac{1}{3}}$$

Density of Sediment Deposits

4) Average Unit Weight of Sediment Deposit during Period of T Years

Open Calculator

fx $$W_{av} = W_{T1} + (0.4343 \cdot B_w) \cdot \left(\left(\left(\frac{T}{T-1} \right) \cdot \ln(T) \right) - 1 \right)$$

ex $$15.05924\text{kN/m}^3 = 15\text{kN/m}^3 + (0.4343 \cdot 7) \cdot \left(\left(\left(\frac{25\text{Year}}{25\text{Year} - 1} \right) \cdot \ln(25\text{Year}) \right) - 1 \right)$$

5) Equation for Weighted Value of Sand, Silt and Clay

Open Calculator

$$B_w = \frac{W_{av} - W_{T1}}{0.4343 \cdot \left(\left(\left(\frac{T}{T-1}\right) \cdot \ln(T)\right) - 1\right)}$$

$$7.089812 = \frac{15.06\text{kN/m}^3 - 15\text{kN/m}^3}{0.4343 \cdot \left(\left(\left(\frac{25\text{Year}}{25\text{Year}-1}\right) \cdot \ln(25\text{Year})\right) - 1\right)}$$

6) Initial Unit Weight given Average Unit Weight of Deposit

Open Calculator

$$W_{T1} = W_{av} - (0.4343 \cdot B_w) \cdot \left(\left(\left(\frac{T}{T-1}\right) \cdot \ln(T)\right) - 1\right)$$

$$15.00076\text{kN/m}^3 = 15.06\text{kN/m}^3 - (0.4343 \cdot 7) \cdot \left(\left(\left(\frac{25\text{Year}}{25\text{Year}-1}\right) \cdot \ln(25\text{Year})\right) - 1\right)$$

7) Percentage of Clay given Unit Weight of Deposit

Open Calculator

$$p_{cl} = \frac{(W_{av}) - \left(\left(\frac{p_{sa}}{100}\right) \cdot (W_1 + B_1 \cdot \log 10(T))\right) - \left(\left(\frac{p_{si}}{100}\right) \cdot (W_2 + B_2 \cdot \log 10(T))\right)}{\frac{W_3 + B_3 \cdot \log 10(T)}{100}}$$

$$31.36078 = \frac{(15.06\text{kN/m}^3) - \left(\left(\frac{20.0}{100}\right) \cdot (16.4\text{kN/m}^3 + 0.20 \cdot \log 10(25\text{Year}))\right) - \left(\left(\frac{35}{100}\right) \cdot (19\text{kN/m}^3 + 0.10 \cdot \log\right.}{\frac{16\text{kN/m}^3 + 40 \cdot \log 10(25\text{Year})}{100}}$$

8) Percentage of Sand given Unit Weight of Deposit

Open Calculator

$$p_{sa} = \frac{(W_{av}) - \left(\left(\frac{p_{si}}{100}\right) \cdot (W_2 + B_2 \cdot \log 10(T))\right) - \left(\left(\frac{p_{cl}}{100}\right) \cdot (W_3 + B_3 \cdot \log 10(T))\right)}{\frac{W_1 + B_1 \cdot \log 10(T)}{100}}$$

$$20.06061 = \frac{(15.06\text{kN/m}^3) - \left(\left(\frac{35}{100}\right) \cdot (19\text{kN/m}^3 + 0.10 \cdot \log 10(25\text{Year}))\right) - \left(\left(\frac{31.3}{100}\right) \cdot (16\text{kN/m}^3 + 40 \cdot \log 10\right.}{\frac{16.4\text{kN/m}^3 + 0.20 \cdot \log 10(25\text{Year})}{100}}$$

9) Percentage of Silt for Unit Weight of Deposits

Open Calculator

fx
$$p_{si} = \frac{(W_{av}) - \left(\left(\frac{p_{sa}}{100}\right) \cdot (W_1 + B_1 \cdot \log 10(T))\right) - \left(\left(\frac{p_{cl}}{100}\right) \cdot (W_3 + B_3 \cdot \log 10(T))\right)}{\frac{W_2 + B_2 \cdot \log 10(T)}{100}}$$

ex
$$35.05232 = \frac{(15.06\text{kN/m}^3) - \left(\left(\frac{20.0}{100}\right) \cdot (16.4\text{kN/m}^3 + 0.20 \cdot \log 10(25\text{Year}))\right) - \left(\left(\frac{31.3}{100}\right) \cdot (16\text{kN/m}^3 + 40 \cdot \log\right.}{\frac{19\text{kN/m}^3 + 0.10 \cdot \log 10(25\text{Year})}{100}}$$

10) Rough Estimation for Unit Weight of Deposit by Koelzer and Lara Formula

Open Calculator

fx
$$W_T = \left(\left(\frac{p_{sa}}{100}\right) \cdot (W_1 + B_1 \cdot \log 10(T))\right) + \left(\left(\frac{p_{si}}{100}\right) \cdot (W_2 + B_2 \cdot \log 10(T))\right) + \left(\left(\frac{p_{cl}}{100}\right) \cdot (\right.$$

ex
$$15.05006\text{kN/m}^3 = \left(\left(\frac{20.0}{100}\right) \cdot (16.4\text{kN/m}^3 + 0.20 \cdot \log 10(25\text{Year}))\right) + \left(\left(\frac{35}{100}\right) \cdot (19\text{kN/m}^3 + 0.10 \cdot \log 10\right.$$

11) Weighted Value given Average Unit Weight of Deposit

Open Calculator

fx
$$B_w = \frac{(p_{sa} \cdot B_1) + (p_{si} \cdot B_2) + (p_{cl} \cdot B_3)}{100}$$

ex
$$12.595 = \frac{(20.0 \cdot 0.20) + (35 \cdot 0.10) + (31.3 \cdot 40)}{100}$$

Movement of Sediments from Watersheds

12) Equation for Sediment Delivery Ratio

Open Calculator

fx
$$\text{SDR} = k \cdot (A^m) \cdot \left(\frac{R}{L}\right)^n$$

ex
$$0.001965 = 0.1 \cdot \left((20\text{m}^2)^{0.3}\right) \cdot \left(\frac{10}{50\text{m}}\right)^3$$

13) Watershed Length when Sediment Delivery Ratio is considered

Open Calculator

fx $$L = \frac{R}{\left(\frac{SDR}{k \cdot (A^m)}\right)^{\frac{1}{n}}}$$

ex $$50.0014m = \frac{10}{\left(\frac{0.001965}{0.1 \cdot \left((20m^2)^{0.3}\right)}\right)^{\frac{1}{3}}}$$

14) Watershed Relief when Sediment Delivery Ratio is considered

Open Calculator

fx $$R = L \cdot \left(\frac{SDR}{k \cdot (A^m)}\right)^{\frac{1}{n}}$$

ex $$9.99972 = 50m \cdot \left(\frac{0.001965}{0.1 \cdot \left((20m^2)^{0.3}\right)}\right)^{\frac{1}{3}}$$

Trap Efficiency

15) Capacity Inflow Ratio

Open Calculator

fx $$CI = \frac{C}{I}$$

ex $$0.714286 = \frac{20m^3}{28m^3/s}$$

16) Equation for Trap Efficiency

Open Calculator

fx $$\eta_t = K_{C/I} \cdot \ln(CI) + M$$

ex $$99.31712 = 6.064 \cdot \ln(0.7) + 101.48$$

Variables Used

- **A** Watershed Area *(Square Meter)*
- **B_1** Constant B1
- **B_2** Constant B2
- **B_3** Constant B3
- **B_w** Weighted Value of B
- **C** Capacity of Reservoir *(Cubic Meter)*
- **CI** Capacity-Inflow Ratio
- **I** Inflow Rate *(Cubic Meter per Second)*
- **k** Coefficient K
- **K** Soil Erodibility Factor
- **$K_{C/I}$** Coefficient K dependent on C/I
- **L** Watershed Length *(Meter)*
- **m** Coefficient m
- **M** Coefficient M dependent on C/I
- **n** Constant n
- **p_{cl}** Percentage of Clay
- **p_{sa}** Percentage of Sand
- **p_{si}** Percentage of Silt
- **Q** Stream Discharge *(Cubic Meter per Second)*
- **Q_s** Suspended Sediment Load *(Ton (metric) per Day)*
- **R** Watershed Relief
- **SDR** Sediment Delivery Ratio
- **T** Age of Sediment *(Year)*
- **W_1** Unit Weight of Sand *(Kilonewton per Cubic Meter)*
- **W_2** Unit Weight of Silt *(Kilonewton per Cubic Meter)*
- **W_3** Unit Weight of Clay *(Kilonewton per Cubic Meter)*
- **W_{av}** Average Unit Weight of Deposit *(Kilonewton per Cubic Meter)*
- **W_T** Unit Weight of Deposit *(Kilonewton per Cubic Meter)*
- **W_{T1}** Initial Unit Weight *(Kilonewton per Cubic Meter)*
- **η_t** Trap Efficiency

Constants, Functions, Measurements used

- Function: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- Function: **log10**, log10(Number)
  The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Year (Year)
  Time Unit Conversion
- Measurement: **Volume** in Cubic Meter (m^3)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
  Volumetric Flow Rate Unit Conversion
- Measurement: **Mass Flow Rate** in Ton (metric) per Day (t/d)
  Mass Flow Rate Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m^3)
  Specific Weight Unit Conversion

Check other formula lists

- **Erosion and Sediment Deposits Formulas**
- **Prediction of Sediment Distribution Formulas**
- **Soil Loss Equation Formulas**

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