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Methods to Predict Channel Shoaling Formulas

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List of 14 Methods to Predict Channel Shoaling Formulas

Methods to Predict Channel Shoaling

1) Change of Ebb Tidal Energy Flux across Ocean Bar between Natural and Channel Conditions

Open Calculator

fx $$E_{\Delta T} = \left(\frac{4 \cdot T}{3 \cdot \pi}\right) \cdot Q_{max}^{3} \cdot \left(\frac{d_{NC}^{2} - d_{OB}^{2}}{d_{OB}^{2} \cdot d_{NC}^{2}}\right)$$

ex $$161.6417 = \left(\frac{4 \cdot 130s}{3 \cdot \pi}\right) \cdot (2.5m^3/s)^{3} \cdot \left(\frac{(4m)^{2} - (2m)^{2}}{(2m)^{2} \cdot (4m)^{2}}\right)$$

2) Coefficient given Water Surface Slope by Eckman

Open Calculator

fx $$\Delta = \frac{\beta \cdot \rho \cdot [g] \cdot h}{\tau}$$

ex $$6.652178 = \frac{3.7E\hat{}\text{-}5 \cdot 1000kg/m^3 \cdot [g] \cdot 11m}{0.6N/m^2}$$

3) Density of Water given Water Surface Slope

Open Calculator

$$\rho = \frac{\Delta \cdot \tau}{\beta \cdot [g] \cdot h}$$

$$901.9603\text{kg/m}^3 = \frac{6 \cdot 0.6\text{N/m}^2}{3.7\text{E}\hat{}\text{-}5 \cdot [g] \cdot 11\text{m}}$$

4) Depth after Dredging given Transport Ratio

Open Calculator

$$d_2 = \frac{d_1}{t_r^{\frac{2}{5}}}$$

$$3.002042\text{m} = \frac{5\text{m}}{(3.58)^{\frac{2}{5}}}$$

5) Depth before Dredging given Transport Ratio

Open Calculator

$$d_1 = d_2 \cdot t_r^{\frac{2}{5}}$$

$$4.996599\text{m} = 3\text{m} \cdot (3.58)^{\frac{2}{5}}$$

6) Depth of Navigation Channel given Depth of Channel to depth at which Ocean Bar meets Sea Bottom

Open Calculator

$$d_{NC} = D_R \cdot (d_s - d_{OB}) + d_{OB}$$

$$3.98\text{m} = 0.33 \cdot (8\text{m} - 2\text{m}) + 2\text{m}$$

7) Hoerls Special Function Distribution

Open Calculator

$$V_R = a \cdot \left(FI^b\right) \cdot e^{c \cdot FI}$$

$$0.341386 = 0.2 \cdot \left((1.2)^{0.3}\right) \cdot e^{0.4 \cdot 1.2}$$

8) Maximum Instantaneous Ebb Tide Discharge per Unit Width

Open Calculator

$$Q_{max} = \left(E_{\Delta T} \cdot \frac{3 \cdot \pi \cdot d_{OB}^2 \cdot d_{NC}^2}{4 \cdot T \cdot \left(d_{NC}^2 - d_{OB}^2\right)}\right)^{\frac{1}{3}}$$

$$2.499991 m^3/s = \left(161.64 \cdot \frac{3 \cdot \pi \cdot (2m)^2 \cdot (4m)^2}{4 \cdot 130s \cdot \left((4m)^2 - (2m)^2\right)}\right)^{\frac{1}{3}}$$

9) Ratio of Depth of Channel to Depth at which Seaward Slope of Ocean Bar Meets Sea Bottom

Open Calculator

$$D_R = \frac{d_{NC} - d_{OB}}{d_s - d_{OB}}$$

$$0.333333 = \frac{4m - 2m}{8m - 2m}$$

10) Shear Stress at Water Surface given Water Surface Slope

Open Calculator

fx $$\tau = \frac{\beta \cdot \rho \cdot [g] \cdot h}{\Delta}$$

ex $$0.665218\text{N/m}^2 = \frac{3.7\text{E}\hat{}\text{-}5 \cdot 1000\text{kg/m}^3 \cdot [g] \cdot 11\text{m}}{6}$$

11) Tidal Period given Change of Ebb Tidal Energy Flux across Ocean Bar

Open Calculator

fx $$T = E_{\Delta T} \cdot \frac{3 \cdot \pi \cdot d_{OB}^2 \cdot d_{NC}^2}{4 \cdot Q_{max}^3 \cdot \left(d_{NC}^2 - d_{OB}^2\right)}$$

ex $$129.9986\text{s} = 161.64 \cdot \frac{3 \cdot \pi \cdot (2\text{m})^2 \cdot (4\text{m})^2}{4 \cdot (2.5\text{m}^3/\text{s})^3 \cdot \left((4\text{m})^2 - (2\text{m})^2\right)}$$

12) Transport Ratio

Open Calculator

fx $$t_r = \left(\frac{d_1}{d_2}\right)^{\frac{5}{2}}$$

ex $$3.586096 = \left(\frac{5\text{m}}{3\text{m}}\right)^{\frac{5}{2}}$$

13) Water Depth where Seaward Tip of Ocean Bar meets Offshore Sea Bottom

Open Calculator

fx $$d_s = \left(\frac{d_{NC} - d_{OB}}{D_R} \right) + d_{OB}$$

ex $$8.060606\text{m} = \left(\frac{4\text{m} - 2\text{m}}{0.33} \right) + 2\text{m}$$

14) Water Surface Slope

Open Calculator

fx $$\beta = \frac{\Delta \cdot \tau}{\rho \cdot [g] \cdot h}$$

ex $$3.3\text{E}\hat{}\text{-}5 = \frac{6 \cdot 0.6\text{N/m}^2}{1000\text{kg/m}^3 \cdot [g] \cdot 11\text{m}}$$

Variables Used

- **a** Hoerls Best-fit Coefficient a
- **b** Hoerls Best-fit Coefficient b
- **c** Hoerls Best-fit Coefficient c
- d_1 Depth before Dredging *(Meter)*
- d_2 Depth after Dredging *(Meter)*
- d_{NC} Depth of Navigation Channel *(Meter)*
- d_{OB} Natural Depth of Ocean Bar *(Meter)*
- D_R Depth Ratio
- d_s Water Depth between Sea Tip and Offshore Bottom *(Meter)*
- $E_{\Delta T}$ Change in Mean Ebb Tide Flow Energy Flux
- **FI** Filling Index
- **h** Eckman Constant Depth *(Meter)*
- Q_{max} Maximum Instantaneous Ebb Tide Discharge *(Cubic Meter per Second)*
- **T** Tidal Period *(Second)*
- t_r Transport Ratio
- V_R Hoerls Special Function Distribution
- **β** Water Surface Slope
- **Δ** Coefficient Eckman
- **ρ** Density of Water *(Kilogram per Cubic Meter)*
- **τ** Shear Stress at the Water Surface *(Newton per Square Meter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- Constant: **e**, 2.71828182845904523536028747135266249
  Napier's constant
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Pressure** in Newton per Square Meter (N/m^2)
  Pressure Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
  Volumetric Flow Rate Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m^3)
  Density Unit Conversion

Check other formula lists

- **Methods to Predict Channel Shoaling Formulas**
- **Nearshore Currents Formulas**
- **Wave Setup Formulas**

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