Muskingum Flood Routing Coefficients and Outflow

Muskingum routing coefficients C_0, C_1, C_2 from the storage constant, weighting factor and time step, with the outflow at the end of one step of a river reach.

Method: Muskingum hydrologic routing

Input parameters

Unit system: SI

Parameter	Value	Unit
Storage (travel time) constant	12.000	h
Weighting factor (0 to 0.5)	0.20000	
Routing time step	6.0000	h
Inflow at the start of the step	120.00	m³/s
Inflow at the end of the step	260.00	m³/s
Outflow at the start of the step	100.00	m³/s

Calculated results

Parameter	Value	Unit
Coefficient on I_2	0.047619	
Coefficient on I_1	0.42857	
Coefficient on O_1	0.52381	
Outflow at the end of the step	116.19	m³/s
Change in reach storage over the step	1,769,143	m³

Notes for this case

- Muskingum storage S = K[XI + (1 − X)O] with the continuity equation over the step; $C_0 + C_1 + C_2 = 1$.

Formula and method

$$C_0 = \frac{\Delta t - 2KX}{2K(1-X) + \Delta t}, \quad C_1 = \frac{\Delta t + 2KX}{2K(1-X) + \Delta t}, \quad C_2 = \frac{2K(1-X) - \Delta t}{2K(1-X) + \Delta t}$$

$$O_2 = C_0 I_2 + C_1 I_1 + C_2 O_1$$

Variables

K	Storage (travel time) constant	s
X	Weighting factor (0 to 0.5)	-
Δt	Routing time step	s
I_1	Inflow at the start of the step	m³/s
I_2	Inflow at the end of the step	m³/s
O_1	Outflow at the start of the step	m³/s
C_0	Coefficient on I_2	-
C_1	Coefficient on I_1	-
C_2	Coefficient on O_1	-
O_2	Outflow at the end of the step	m³/s
ΔS	Change in reach storage over the step	m³

Method and standards

Muskingum linear storage routing.

Assumptions and limits

- Linear storage, no lateral inflow.

References

Muskingum hydrologic routing

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

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Reopens the calculator with the inputs of this report.