

EEMS Test Case Model Description

TC_1D_River

1 Overview

This model replicates a steady-state test case described in Thomann and Mueller [2], *Principles of Surface Water Quality Modeling and Control*. The objective is to use EFDC+ Explorer (EE) and EFDC+ to simulate contaminant transport in a one-dimensional river system using a conservative dye tracer.

The test case represents the discharge of municipal wastewater from an urban area into a relatively small river under average annual flow conditions. The wastewater is assumed to be treated by a trickling filter plant prior to discharge. A dye tracer is used as a surrogate to represent contaminant transport, providing a simplified framework for evaluating model performance.

2 Demonstration Feature

This test case demonstrates the capability of EFDC+ to simulate one-dimensional transport processes using the Dye Module. Specifically, it illustrates how conservative tracers can be used to represent contaminant movement in riverine systems under steady-state flow conditions. The theoretical background for this test case is described in Thomann and Mueller [2], while the numerical framework is based on the [EFDC+ modeling system](#) [1].

3 Model Description

The model configuration is summarized in Table 1. The model domain represents a simplified one-dimensional river system discretized into 39 horizontal cells, as shown in Figure 1. The vertical structure is represented using a single layer. The following EFDC+ modules are activated in this test case:

- **Hydrodynamics** – simulates the steady-state flow conditions along the river
- **Dye** – simulates the transport of a conservative tracer representing contaminant dispersion

Table 1 Model configuration summary

Dimensions	Horizontal cells	Vertical cells	Activated modules
2D	39 cells	1 layer	• Hydrodynamics • Dye

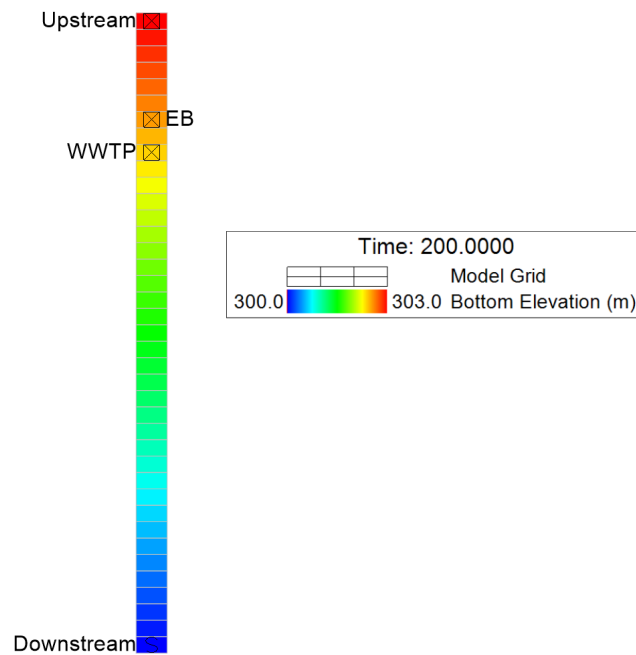


Figure 1 Model domain showing bottom elevation and boundary cells

4 Model Results

Figure 2 shows the simulated longitudinal dye concentration profile along the river compared with measured or reference data at Time = 218. The model captures the downstream transport and dispersion of the dye tracer, demonstrating good agreement with the expected concentration distribution. The results confirm that the EFDC+ Dye Module can reliably simulate conservative tracer transport in a one-dimensional system under steady-state flow conditions.

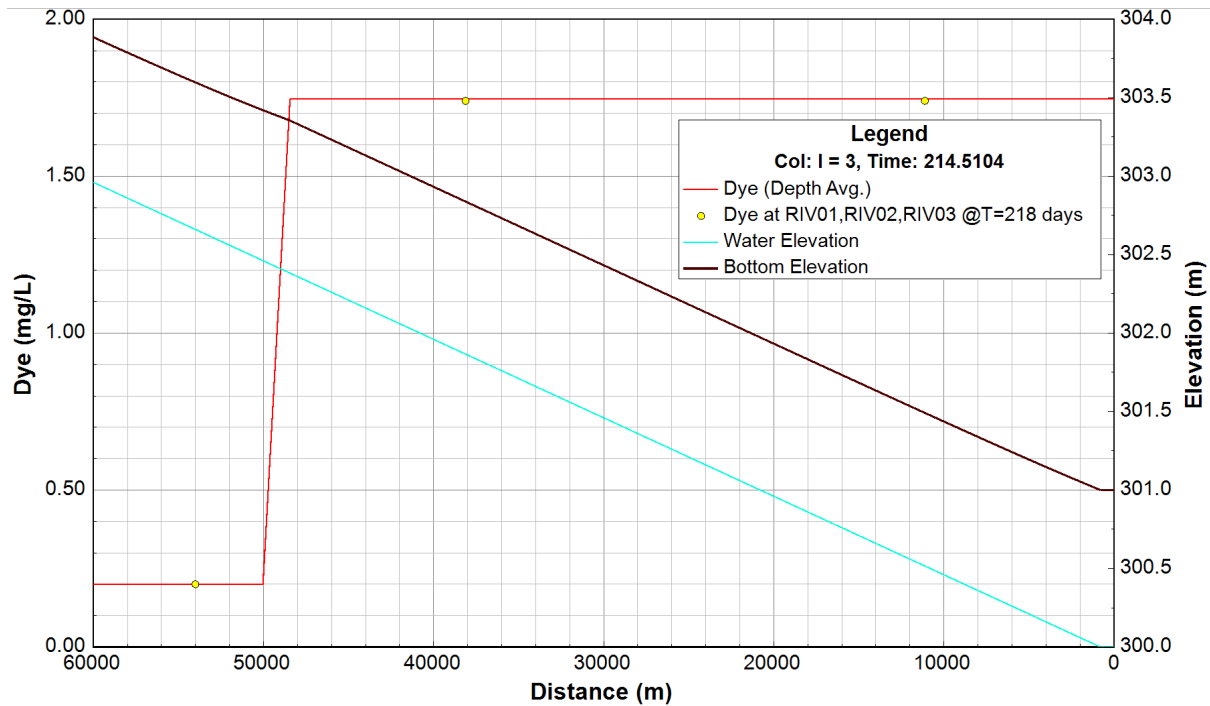


Figure 2 Longitudinal distribution of modeled and measured dye concentrations along the river from upstream to downstream

References

- [1] DSI LLC (2024). *EFDC+ Theory: Version 12*. DSI LLC, Edmonds, WA, USA. Accessed: 2026-04-06.
- [2] Thomann, R. V. and Mueller, J. A. (1987). *Principles of surface water quality modeling and control*.

Disclaimer: This model is provided to demonstrate that EFDC+ Explorer and EFDC+ can be used to better understand how to build this kind of model. The model is running as expected; however, it should not be considered final, as it can be modified and refined to obtain improved results.