



Newtown Creek Superfund Site – OU1 Chemical Fate and Transport Model Status

CAG Meeting
November 15, 2023





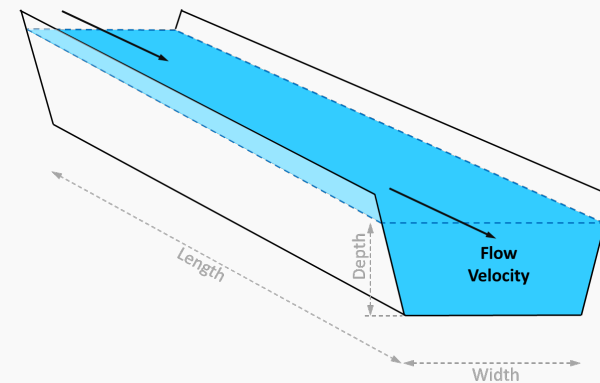
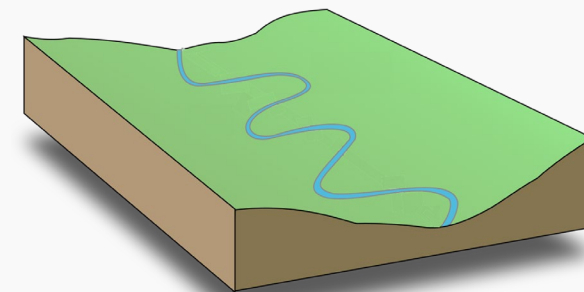
Presentation Overview

- Role of models in Superfund decision-making
- Conceptual site model
- Modeling framework
- Chemical fate and transport (CFT) model status
- Comment-response process for CFT model
 - Overview of key comments, including examples
- Schedule for CFT model



Role of Models in Decision-Making

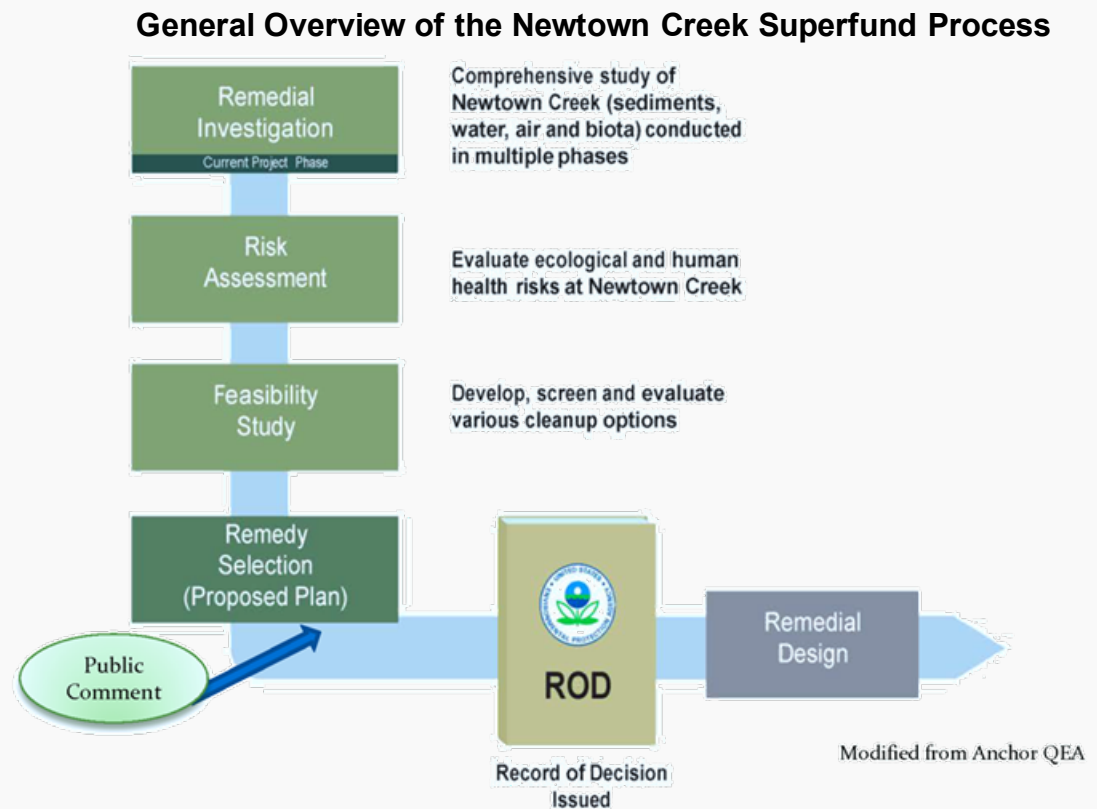
- What are models?
 - Computational or numerical models
 - A simplification of reality...formal representation in mathematical terms (USEPA, 2009)
 - Implementation in software algorithms
 - Flexible applications
 - Spatially-variable
 - Time-variable





Role of Models (Contd.)

- Modeling in the Superfund process
 - Remedial investigation
 - Feasibility study
 - Remedy design





Role of Models (Contd.)

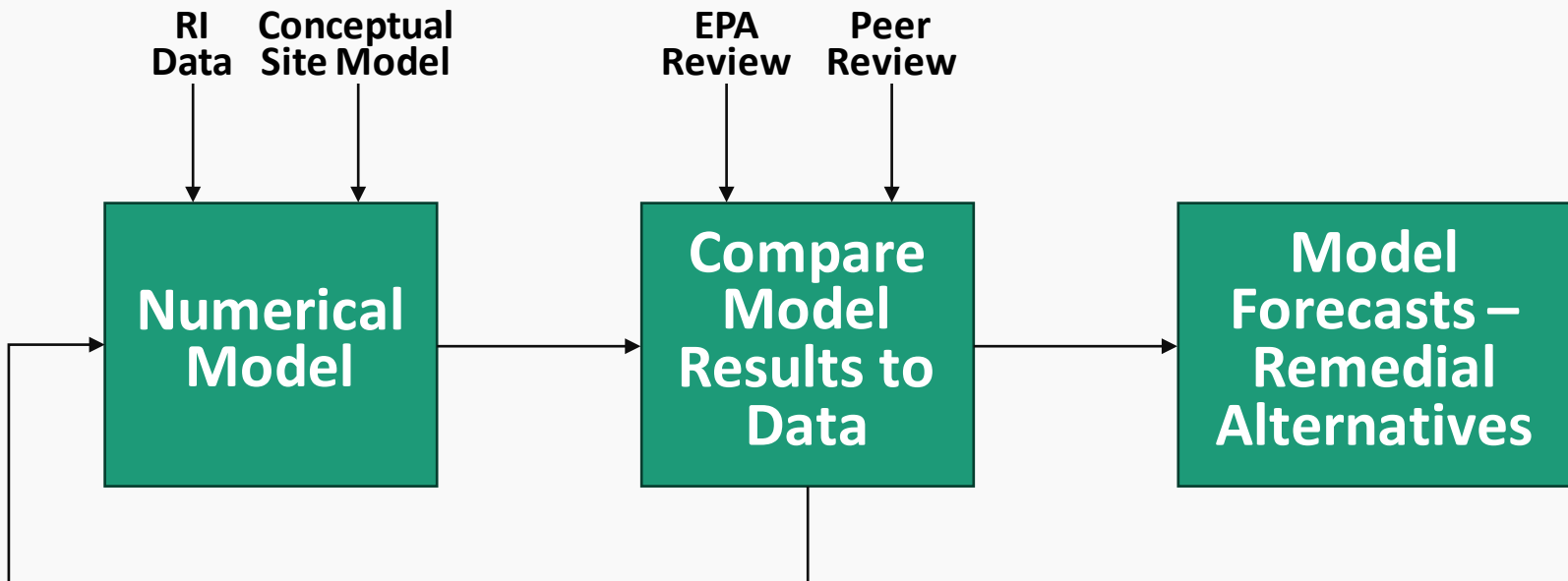
- Why use models?
 - Issues related to site characterization
 - Identify data gaps
 - Quantitative assessment of contaminant fate and transport – sources, sinks, etc.
 - Develop conceptual site model
 - Issues related to site management
 - Develop site management options
 - Predictive tool for comparison of remedial alternatives
 - Provides another line of evidence in addition to empirical observations in developing a remedy
 - Support remedy design
 - Engineering design of remedial elements, environmental and flood impacts assessments, etc.



Schematic of Modeling Process

Model Development

Model Application



← Current Status of CFT Model →



Scope of Newtown Creek Modeling Study

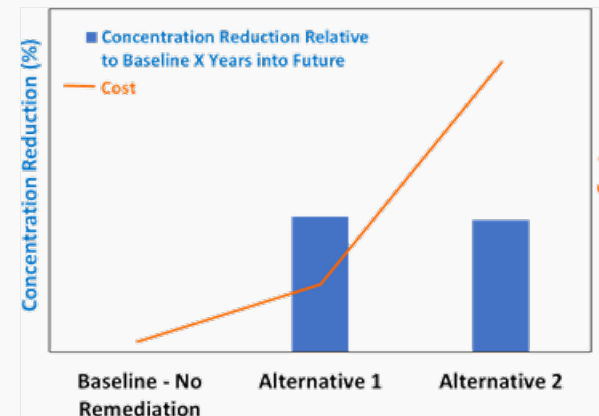
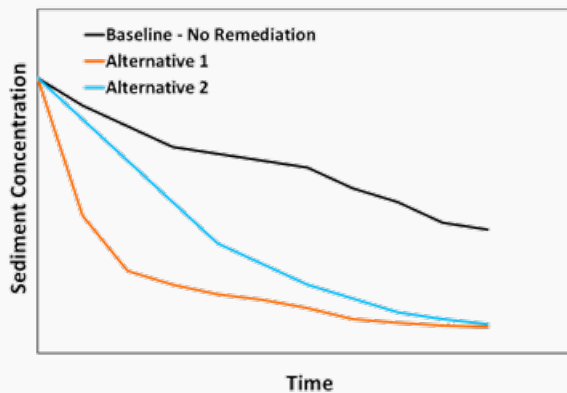
- Primary objective is to develop a reliable management tool that can be used to
 - Inform the conceptual site model
 - Evaluate the efficacy of remedial alternatives
 - The numerical model is one of several lines-of-evidence to support assessment of remedial alternatives



Model Application for Feasibility Study

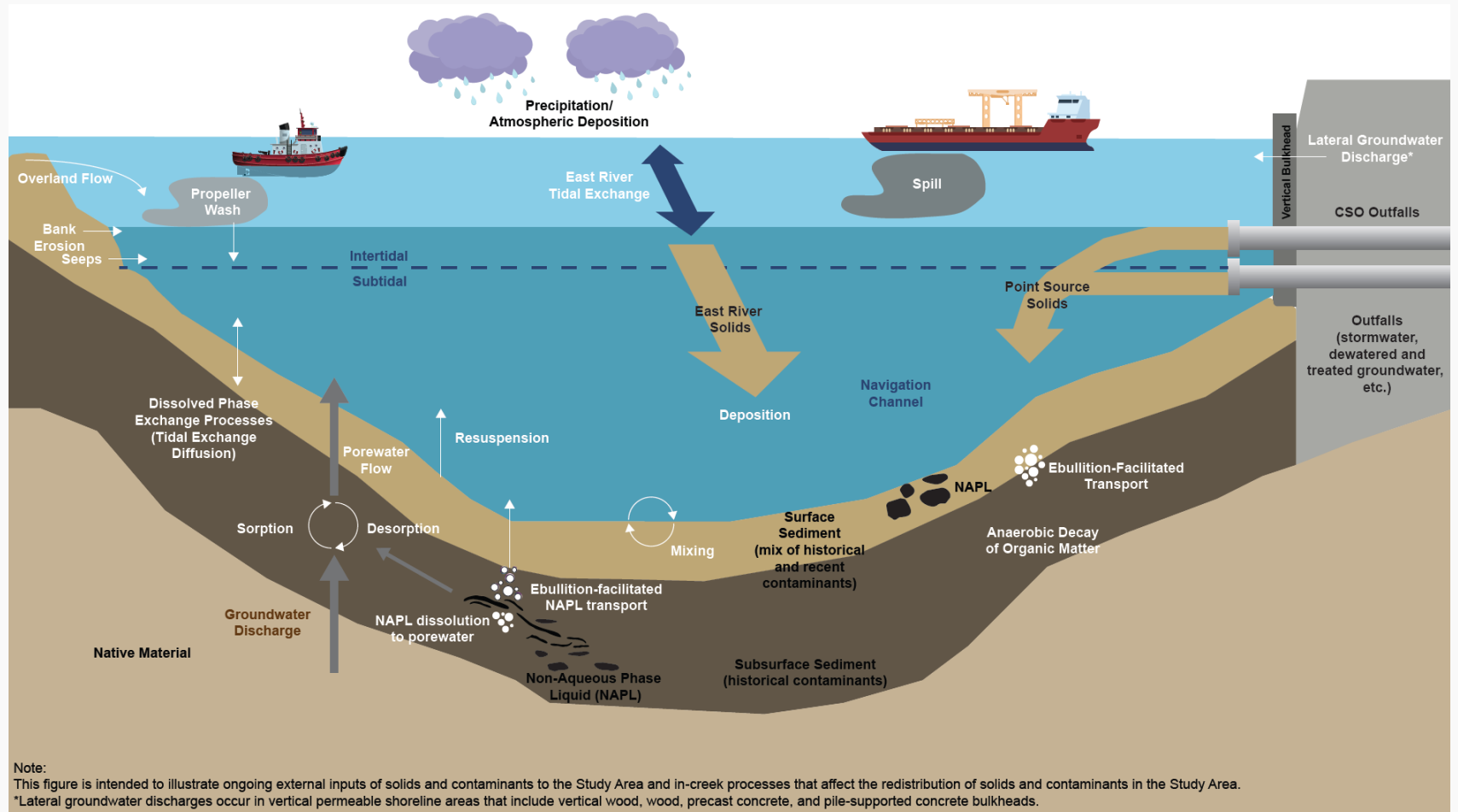
- Model forecasts
 - Typically, a few decades into the future
 - Comparison of several metrics for various alternatives
 - Baseline (no remediation)
 - Various alternatives including remediation

Examples of Typical Feasibility Study Assessments





Conceptual Site Model



Note:
This figure is intended to illustrate ongoing external inputs of solids and contaminants to the Study Area and in-creek processes that affect the redistribution of solids and contaminants in the Study Area.
*Lateral groundwater discharges occur in vertical permeable shoreline areas that include vertical wood, wood, precast concrete, and pile-supported concrete bulkheads.

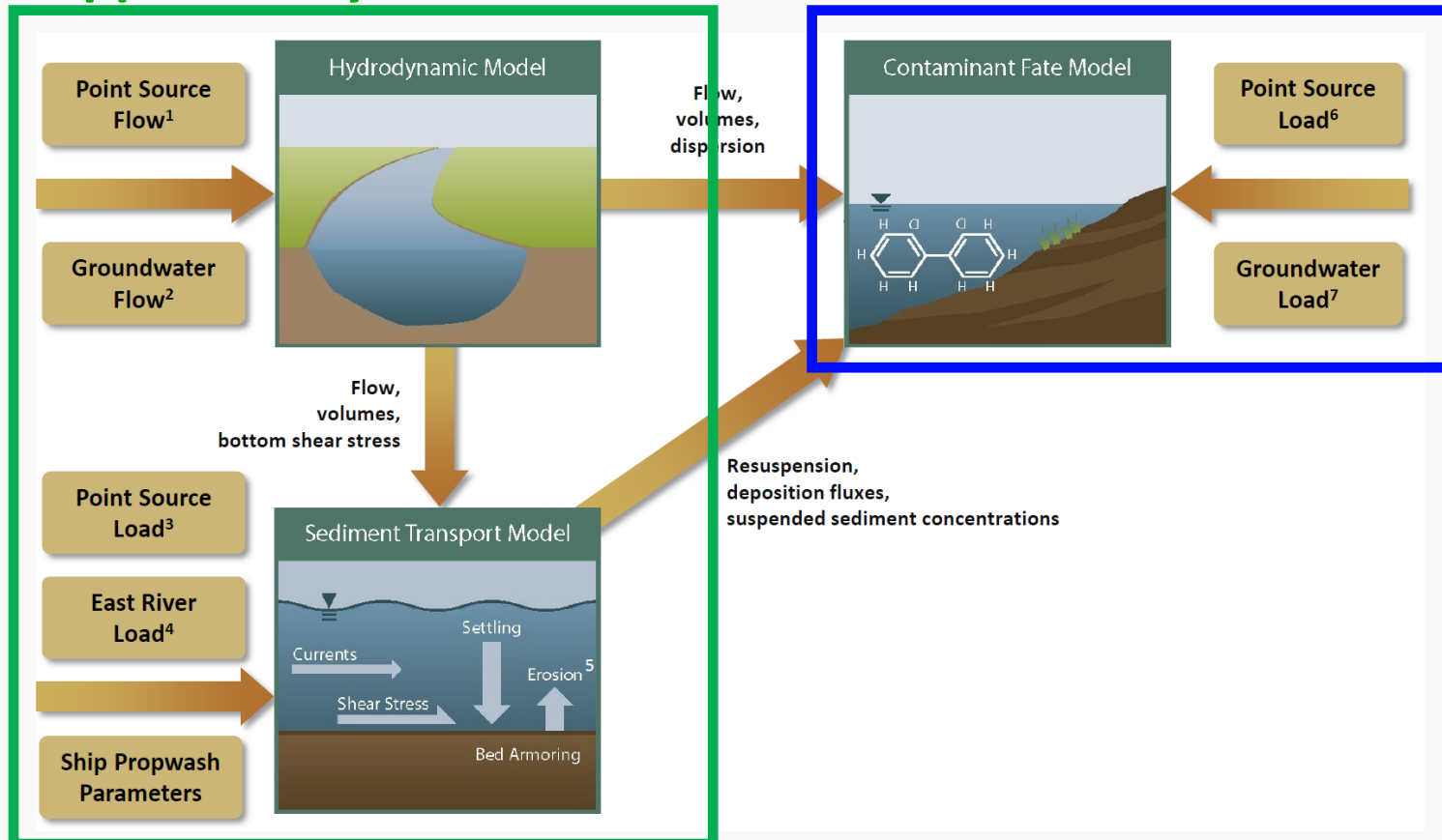
Figure is adapted from Figure 8-1 in the Remedial Investigation Report, RI/FS, Newtown Creek, March 2023 prepared by Anchor QEA.



Numerical Model Framework

Peer Reviewed and
Approved by EPA in 2022

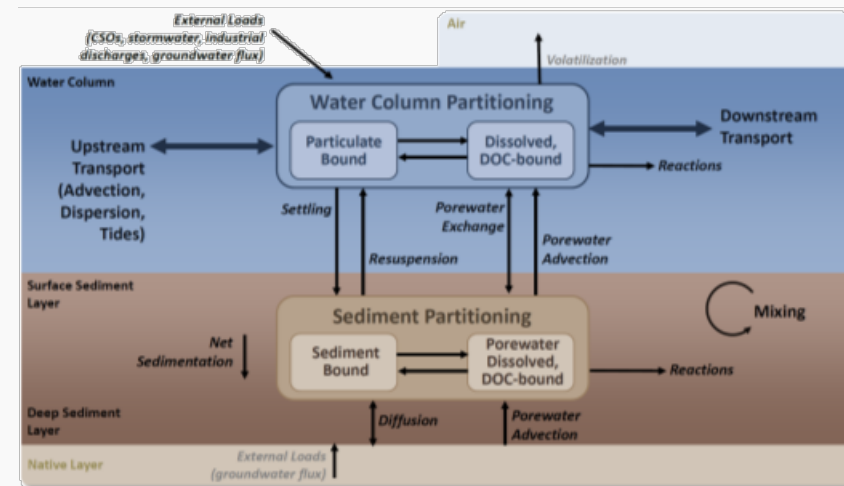
Under EPA Review





CFT Model

- Parameters/formulations simulated
 - Water column and bed contaminants
 - External loadings, advection, dispersion
 - Resuspension and deposition
 - Partitioning
 - Sediment-water column dissolved exchange
 - Bioturbation
 - Volatilization
 - Porewater advection
 - Ebullition



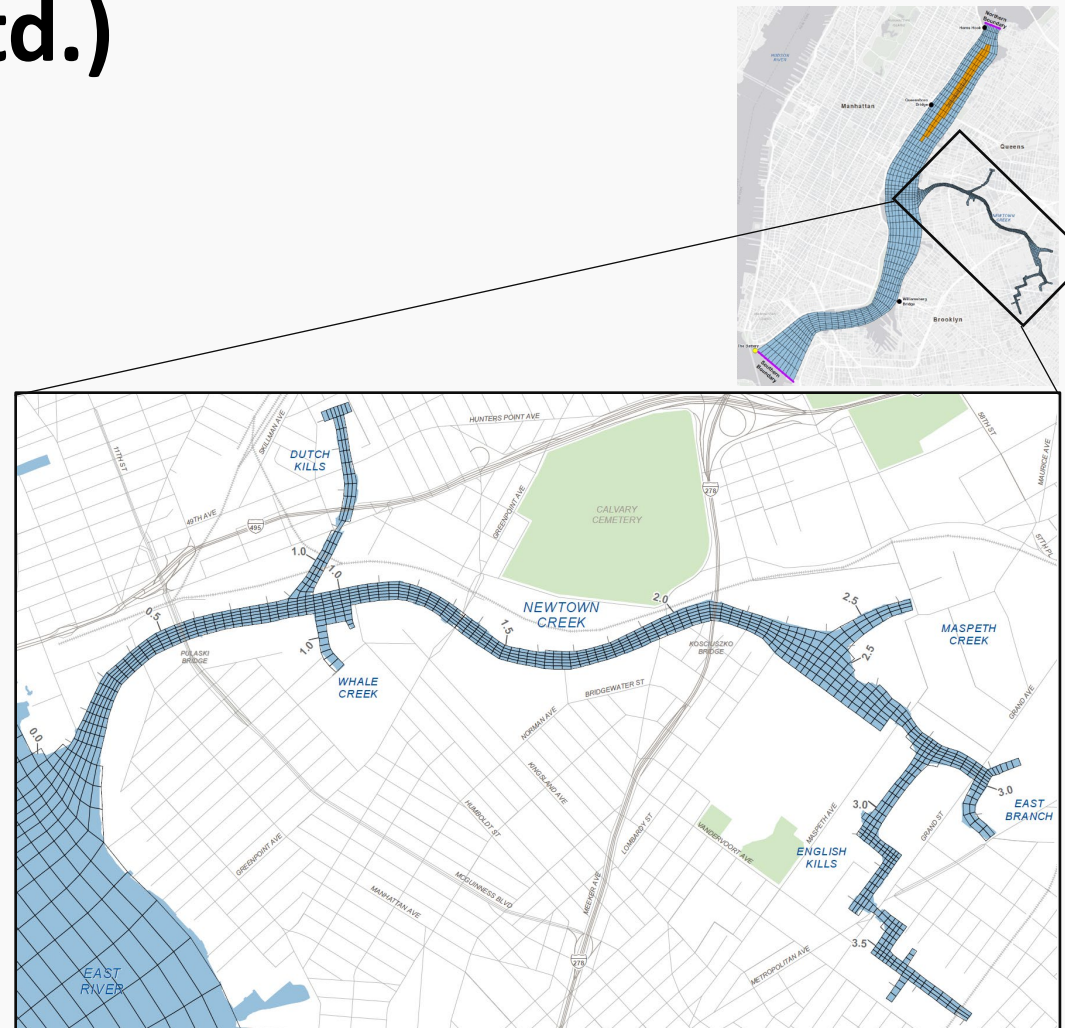
Anchor QEA, 2014

- Processes simulated
 - Fate and transport of contaminants from various sources
 - Quantitative evaluation of various contaminant fate and transport processes
 - Contaminant exposure over various temporal & spatial scales



CFT Model (Contd.)

- Model framework
 - AQFATE
 - Contaminants – PAHs, PCBs, and Copper
- Model domain covering Newtown Creek and near-Creek portion of East River
- Model inputs, e.g.,
 - Current chemical concentrations in sediment bed
 - External sources of chemicals
 - Partition coefficients
- Model performance relative to chemical concentration data in
 - Water column
 - Sediment bed
 - Sediment traps





Status of CFT Model

- CFT model developed by NCG
 - Using RI data
 - Based on conceptual site model
 - Using insights and results from the point source, groundwater, hydrodynamic, and sediment transport models
 - Model performance assessed by comparing model results to measured chemical data in water column, sediments, and sediment traps
- Draft report submitted by NCG in April 2022
 - Main body of report – 500 pages of text and figures
 - Seven appendices – 1600 pages of text and figures
- Review comments from EPA/NYC/NYS were complied and provided to NCG
 - Approximately 400 comments submitted over late-2022 and early-2023
- NCG currently addressing comments and revising the model and report accordingly



Overview of Comments on CFT Report

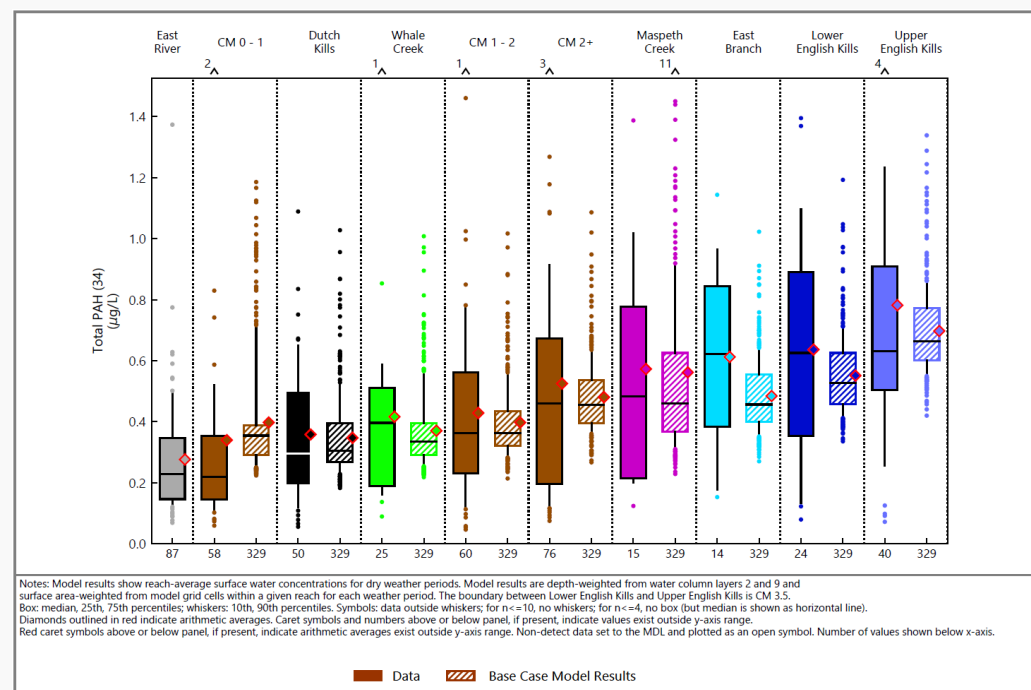
- Several categories of comments, including
 - Additional documentation
 - External sources of chemicals to the Creek
 - Model configuration and parameter values
 - Model performance
 - Model uncertainty and utility for assessing remedial alternatives



Comments – Documentation

- Model-data comparisons showing spatial trends in chemical concentrations in water column
 - Draft report only includes such comparisons during dry-weather conditions
- Comments about also including such comparisons using data and model results during wet-weather conditions

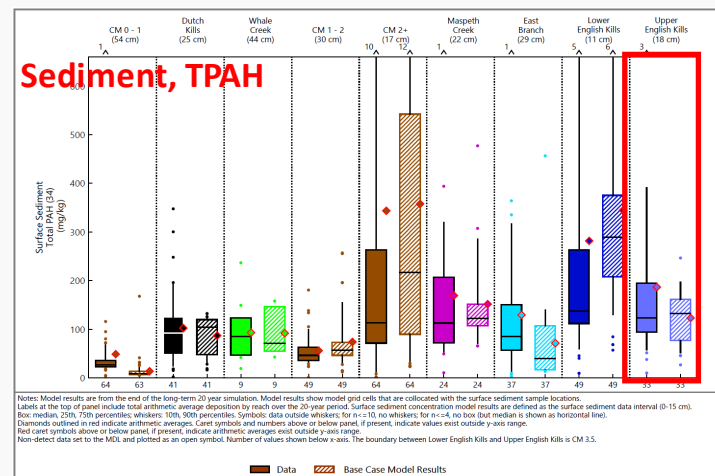
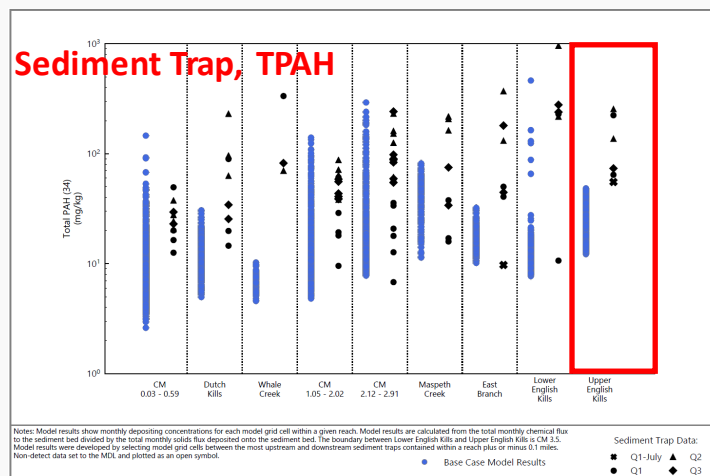
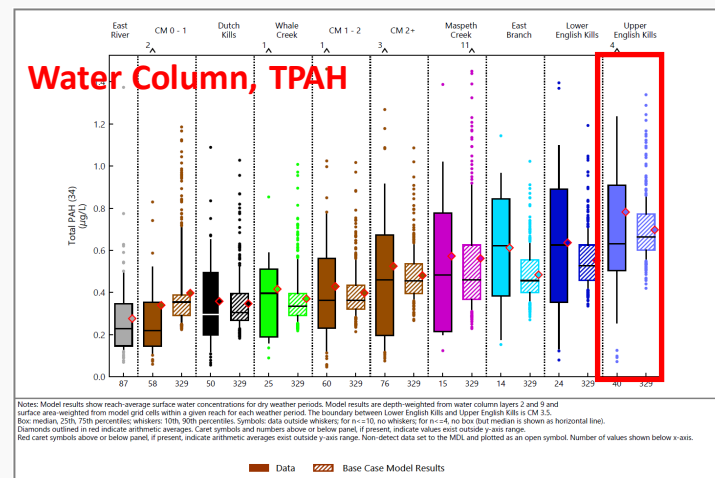
Water Column Model-Data Comparison During Dry-Weather





Comments – External Chemical Sources

- Model performance for some chemicals comparable to measured chemical concentrations in water column and sediments but not in sediment traps
- Comments about performance bias potentially indicative of additional chemical sources to Creek not currently included in the model

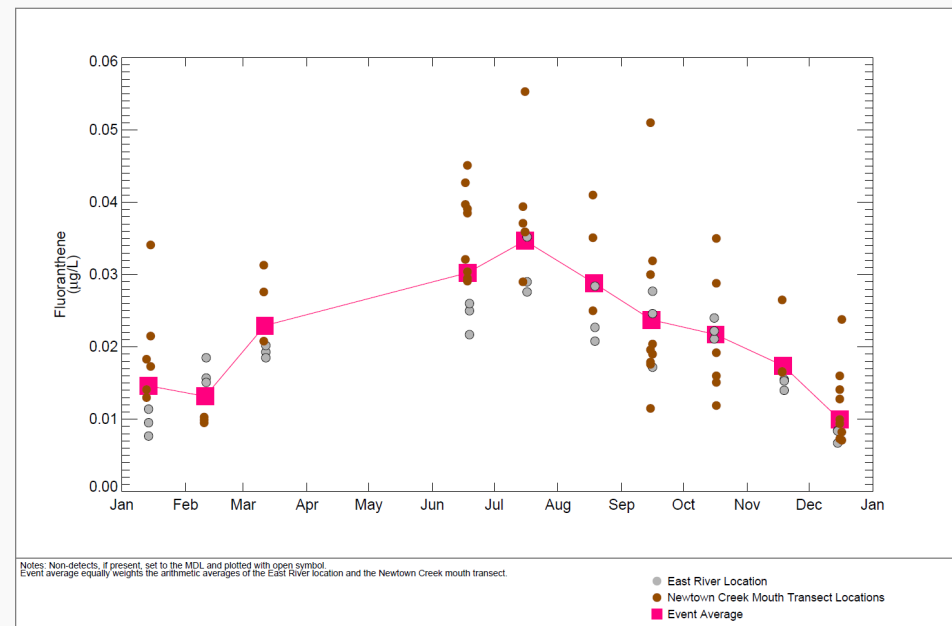




Comments – Model Configuration

- Model development typically includes various choices, e.g., for concentrations entering Newtown Creek from East River
 - Monthly variations
 - Model inputs based on monthly average
 - Limited or no data for some months
 - Model inputs based on interpolation
- Comments about assessing impact of such limitations on model performance

East River Concentrations for a PAH-class Chemical

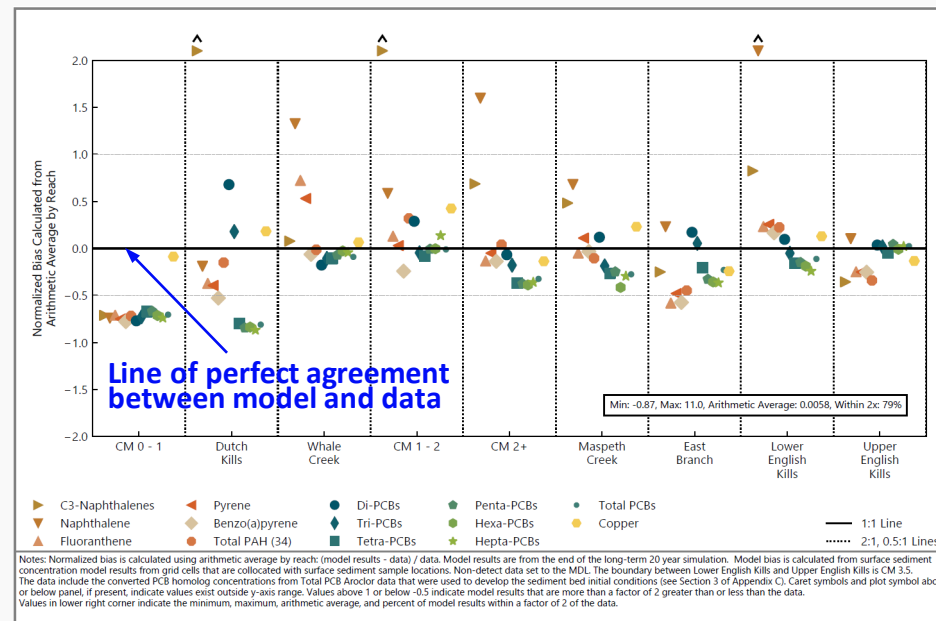




Comments – Model Performance

- Model performance comparable to data for most chemicals and areas within the Creek
 - Performance limitations for limited chemicals and areas
- Comments about potential impact on model application for remedy development

Model Performance Assessment for Sediments





Comments – Model Uncertainty/Utility

- Comments seeking to assess and document
 - Limitations in model performance
 - e.g., for specific chemicals or specific areas of the Creek
 - Model uncertainties
 - e.g., potential impact on the use of the model for comparing remedial alternatives
 - Potential measures to improve model performance
 - e.g., collect additional data



Schedule for CFT Model

- NCG currently addressing EPA and stakeholder comments
- Revised CFT report scheduled for submittal to EPA in April 2024
- The model will then be Peer reviewed by a group of modelling experts under EPA oversight. The Peer reviewers will provide comments to EPA in November 2024
- NCG to address peer review comments and include the data obtained from lateral groundwater study into the CFT. Revised report to EPA in June 2025
- NCG to address all comments and submit final draft to EPA in February 2026
- EPA to approve final report in May 2026



Questions?