

Simulations of Sediment Transport and Deposition from Jet Plow and Excavation Operations in the Hudson River



CLIENT:

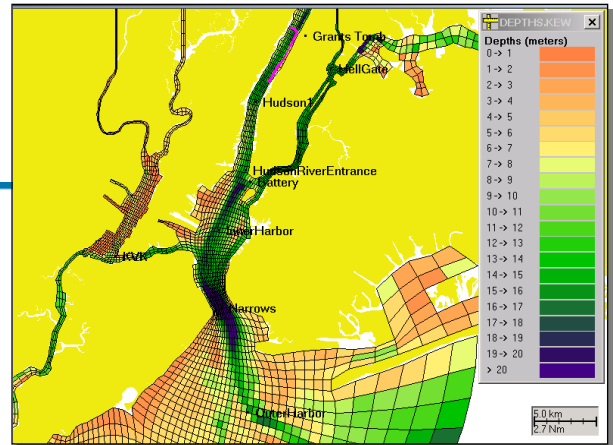
PSEG Power Cross Hudson Corp. through Environmental Science Services, Inc.

PROJECT ELEMENTS:

- Jet Plow Dredge disposal modeling
- WQMAP BFHYDRO hydrodynamic modeling
- SSFATE sediment transport modeling

PROBLEM. PURPOSE.

The planned Cross Hudson Project involves burial of two bundled electrical cable circuits in adjacent trenches in a route that runs from Manhattan, New York to Edgewater, New Jersey, over a distance of approximately 6.1 kilometers (3.8 miles). The bundled cable will be installed in two separate trenching events, and will be buried into the riverbed using jet plow embedment technology combined with horizontal directional drilling.



SCIENCE. SERVICES. SOLUTIONS.

ASA utilized numerical models to predict the extent of sediment transport, the thickness of the resulting sediment deposition, and the water column concentration of suspended sediment particles during and after the cable burial process.

The first step in the modeling effort was to define the circulation and hydrodynamic characteristics of the lower Hudson River in the vicinity of the Project area. ASA used its hydrodynamic model, WQMAP BFHYDRO, to simulate the currents in the lower Hudson, adjacent rivers, and New York Harbor that have the potential to transport riverbed sediments suspended by the jet plow embedment process.

The model uses a sophisticated boundary fitted approach to calculate the water surface elevation and velocities throughout the river and harbor areas. The model was successfully calibrated using previously collected hydrodynamic data, and was then used to create the data set used in subsequent sediment modeling.

SSFATE, a numerical model originally designed for the prediction of sediment transport from dredging operations, was modified to simulate sediment concentrations in the water column and the deposition of sediments on the bottom resulting from jet plow operations. It was also used to simulate sediment suspension and bottom deposition from the excavation of the submarine cable conduit receiving pits at each submarine cable landfall by means of clamshell dredge.

Using the hydrodynamic model output, specification of sediment sizes and estimates of the initial sediment distribution from the jet plow device, the model simulated the movement and relative water column concentration of suspended sediment as it was transported horizontally by the currents and settled through the lower water column until its deposition on the river bottom.

PRODUCTS. RESULTS.

The modeling results demonstrate that the majority of the jetted sediment column quickly settles back into the immediate trench area disturbed by the jet plow and at the receiving pit locations.