

## APPLIED COASTAL

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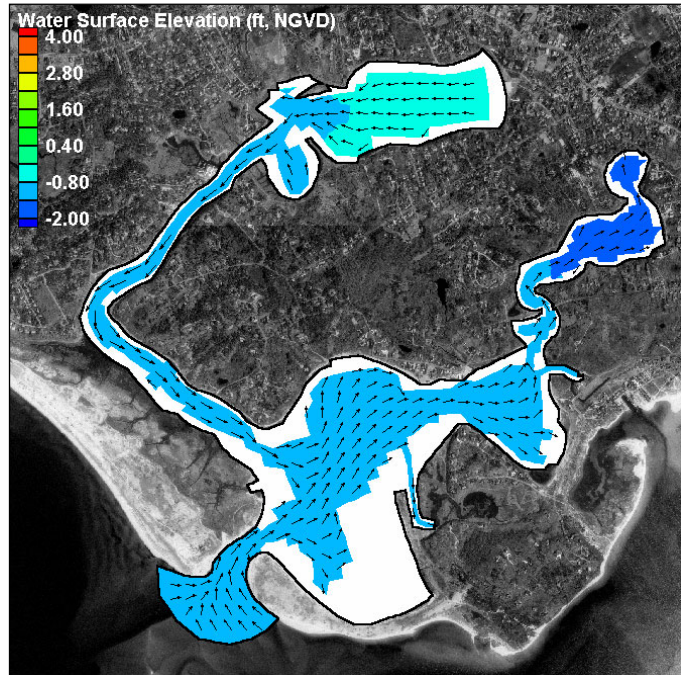
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**Project:** Chatham Embayments Water Quality Analysis

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In support of the Chatham Comprehensive Wastewater Management Planning (CWMP), an evaluation of tidal flushing was been performed for the coastal embayments within the Town Limits of Chatham, Massachusetts, on Cape Cod. The field data collection and hydrodynamic modeling efforts for this project provided the first step towards evaluating the water quality of these estuarine systems, as well as understanding nitrogen loading thresholds. The hydrodynamic modeling effort served as the basis for the total nitrogen (water quality) model, which incorporated upland nitrogen load and benthic regeneration within bottom sediments. In addition to the tidal flushing evaluation for these estuarine systems, alternatives analyses of tidal flushing improvement strategies have been performed for selected sub-embayments.

This comprehensive project required development of hydrodynamic models for the estuarine systems within the Stage Harbor and Pleasant Bay Regions of Chatham. For each estuarine system, the calibrated model provided an understanding of water movement through the estuary. Tidal flushing information was utilized as the basis for a quantitative evaluation of water quality. Nutrient loading data combined with measured environmental parameters within the various sub-embayments provided the basis for an advanced water quality model based on total nitrogen concentrations. To calibrate the hydrodynamic model, field measurements of water elevations and bathymetry were required. For the Stage Harbor Region, tide data was acquired within Nantucket Sound (two gauges were installed offshore of Cackle Cove Beach), Oyster Pond, Mill Pond, Little Mill Pond, Sulphur Springs, and Taylors Pond. For the Pleasant Bay Region, tide data were acquired within Pleasant Bay (two gauges were installed at the Chatham Yacht Club in Pleasant Bay), Crows Pond, Ryder Cove, Frost Fish Creek, and Muddy Creek. All 13 temperature-depth recorders (TDRs) were installed for a 30-day period to measure tidal variations through an entire neap-spring cycle. In this manner, attenuation of the tidal signal as it propagates through the various sub-embayments was evaluated accurately. In addition, currents were measured through a tidal cycle within the Stage Harbor and Bassing Harbor systems. These current measurements provided model verification data.



Estuarine hydrodynamics control a variety of coastal processes including tidal flushing, pollutant dispersion, tidal currents, sedimentation, erosion, and water levels. Numerical models provided a cost-effective method for evaluating tidal hydrodynamics because they require limited data collection and were utilized to numerically assess a range of management alternatives. Once the hydrodynamics of an estuary system were understood, computations regarding related coastal processes became relatively straight-forward extensions to the hydrodynamic modeling.