



MARINE ENVIRONMENTAL NEWSLETTER

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IMPROVING New Bedford's Waters

THE INSIDE STORY

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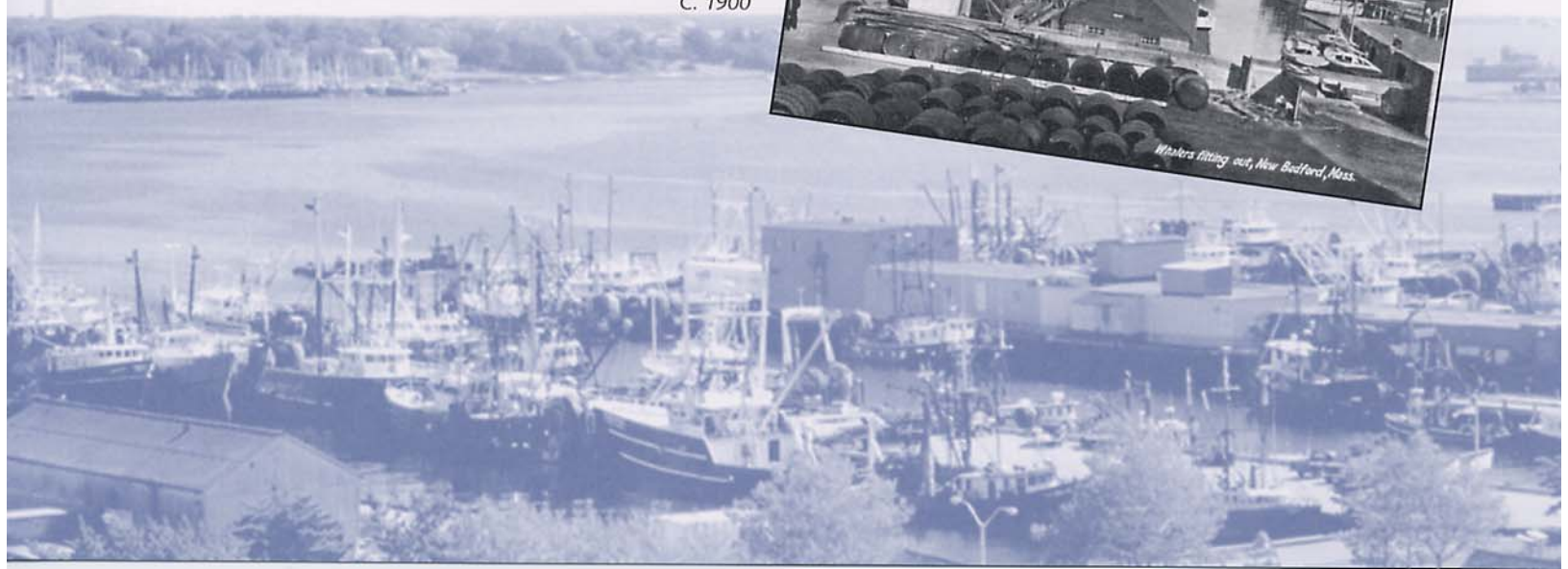
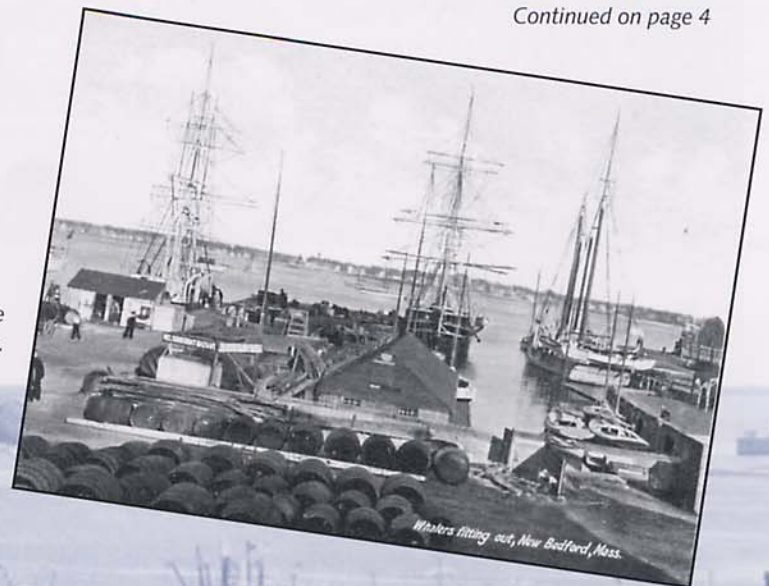
New Bedford, located 50 miles south of Boston, is a highly urbanized city in the Buzzards Bay watershed with a population of approximately 100,000. New Bedford was formerly a prosperous whaling port and producer of fine textiles. However, its industrial activity has had significant effects on the water quality, and has resulted in the Inner Harbor being classified as a federal Superfund site. A hurricane barrier divides New Bedford Harbor into the Inner Harbor (north of the barrier) and the Outer Harbor (south of the barrier), and water quality is better in the Outer Harbor due to flushing with the cleaner waters of adjacent Buzzards Bay. Shellfishing is partially allowed in the Outer Harbor for this reason. With the objective of assessing the conditions in New Bedford Harbor, ASA has been examining the flushing characteristics of the Inner Harbor, the consequences of dredging a navigation channel in the Harbor, and the effect of elevated fecal coliform concentrations on the shellfish resources.

Flushing

The Acushnet River estuary (New Bedford Inner Harbor) is a unique area confined by a Hurricane Barrier that restricts the exchange of waters between the Inner and Outer Harbors and reduces the flushing of the estuary. The low flushing rate, in addition to nitrogen loading from sources in the watershed, creates a potentially significant water quality problem in the estuary. Flushing characteristics of the Acushnet River estuary were examined as a first step in determining the nitrogen Total Maximum Daily Load (TMDL) that the estuary can assimilate. The flushing analysis for the estuary was performed using three separate approaches: the fresh water ratio, which is based on an assumption of salinity distribution; the modified tidal prism, which is based on an assumption of tidal volume flux; and numerical simulations using ASA's WQMAP hydrodynamic and pollutant transport models, calibrated with dye data. An intensive field program was

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*Vintage postcard of whale
boats in New Bedford Harbor.
C. 1900*



Cross-Sound Cable Project

The planned Cross-Sound Cable Project is a high voltage, direct current cable that will run between New Haven, Connecticut, and Brookhaven, Long Island. The 24-mile submarine cable system consists of two 10-cm diameter cables buried beneath the sea floor that can transport up to 330 megawatts of direct current power in either direction between Connecticut and Long Island. The cable system will be laid on the seafloor in New Haven Harbor.

New Haven Harbor is located on the north shore of Long Island Sound, separating Connecticut and Long Island, New York. The harbor extends approximately 7.5 km in the north-south direction and varies from 0.5 km to 7 km in the east-west direction.

The planned route of the cable system runs beneath a dredged channel that is maintained by the U.S. Army Corps of Engineers and extends up the Harbor's center. Because a substantial portion of the bottom of New Haven Harbor is leased to grow seed oysters for subsequent transplantation to cleaner waters outside the harbor, this route will minimize environmental effects.

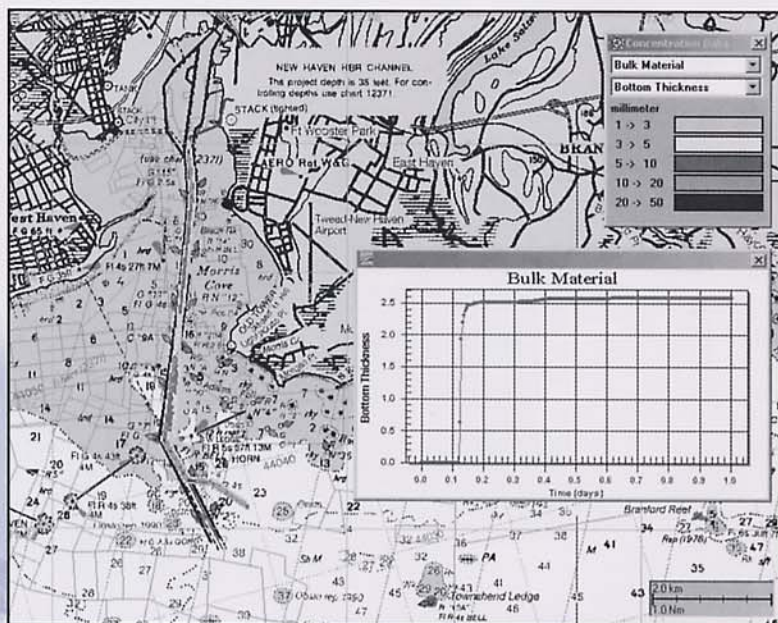
The cable system will be buried using a jet plow system, which uses high-pressure water to fluidize the sediment through downward pointed nozzles. A fraction of the sediment is introduced into the water column during this process and subsequently settles back down to the sea floor. ASA's HYDROMAP-BF and SSFATE were used to determine the extent and thickness of the resulting sediment deposition patterns.

HYDROMAP-BF, one of ASA's hydrodynamic models, was used to simulate the currents in the New Haven Harbor that have the potential to transport the suspended sediment. The model calculated water surface elevation and velocities throughout the harbor that were successfully calibrated to previously collected data. The model was then used to create a data set for subsequent sediment modeling. Maximum currents in the channel were predicted to be up to 25 cm/s in the north-south portion and were aligned in the same direction as the channel.

SSFATE simulated the deposition of sediments on the bottom from jet plow operations. Using the hydrodynamic model output, specification of sediment sizes, and estimates of the initial sediment distribution from the jet plow, the model tracked the sediment as it was transported horizontally by the currents and settled through the lower water column until its deposition on the bottom. The model results showed that the turbidity event associated with the jet plow disturbance of the bottom is short-lived. The deposition was immediate, with most of the sediment quickly settling back into the area disturbed by the jet plow operations or within a short distance to either side.

Computer animations of these model simulations were presented to the Connecticut Siting Council in October, 2002. They aided the approval of the Cross-Sound Cable Project by the Council in January, 2002. The U.S. Army Corps of Engineers issued their permit for the project in March, 2002.

Output from jet plow simulation.



Personnel

Eric Anderson and **Chris Galagan** conducted a training session for the Maritime and Port Authority (MPA) of Singapore on the use of the Crisis Management System (CMS), a software application used to train individuals to manage the response to oil and chemical spills, ferry boat mishaps, and hazardous materials releases. Chris also participated in a four-day training course for MPA personnel conducted by former US Coast Guard Captain Don Jensen in the use of the Incident Command System.



In January, **Eoin Howlett** and **Roddy Thomas** delivered Oilmap for Arcview to the AGIP Division of ENI in Italy. They met with staff from both AGIP Milan and AGIP Ravenna. The session focused on the use of Oilmap for Arcview and integration within Agip's GEOS environmental data management program. Initially, this integration will provide Agip with improved tools to better plan for and respond to potential emergency incidents in the Mediterranean region.



refinery outfall chemical constituents and potential oil and chemical spill physical transport for a planned refinery development in Daya Bay, in the Peoples Republic of China.

26 - 27 February, **Deborah French McCay**, **Nicole Whittier**, and **Colleen Dalton** provided Wolfgang Konkel, Mike Zelenka, Carol Lee and Alexis Steen from ExxonMobil with training on ASA's chemical spill model, CHEMMAP. They worked with chemical fates in the water and atmosphere and a drill exercise.

On March 26, **Eoin Howlett** provided Oilmap training to Response Management Associates (RMA) in Houston, Texas. The training focused on GIS data integration and the use of OILMAP for oil spill drills and real-time response.



Eoin Howlett provided refresher Oilmap training to Aramco Services Company in Houston, Texas to assist personnel in preparation for an upcoming oil spill drill.

Roddy Thomas recently delivered ASA's latest version of OILMAP and training to OSRL, Southampton. OSRL uses OILMAP as part of their emergency response capability, consultancy work and training programmes in support of their oil operator members worldwide and other clients.

ASA Ltd attended Interspill 2002, in Brest, France, 11-15 March. This was the second international oil spill conference and exhibition to be staged in Europe. Interspill 2004 will be hosted by Norway.

Deborah French McCay is serving on the National Academy of Sciences, Polar Research Board Review Committee for the Oil Spill Recovery Institute's (OSRI) Research Programs. OSRI, in Cordova, Alaska, was established by OPA 90 to perform research and development related to oil spill response and assessment of impacts. Dr. French McCay is focusing on the review of the modeling components of the OSRI program.

Eric Anderson, along with A.D. Little, U.K. personnel, presented water quality and accidental spill analysis to BSF (Bechtel, Foster Wheeler and Sinopec) and CSPC (CNOOC and Shell Petrochemicals Company Limited) clients in Beijing in March. The work assesses the potential inputs of

Eoin Howlett and **Eric Anderson** attended and presented at a SAR Enhancement Joint Application Design (JAD) session at the U.S. Coast Guard Research and Development Center, Groton, CT on Thursday February 14th. The focus of the meeting was to provide a forum for discussion of recent work and products in the field of Search & Rescue planning.

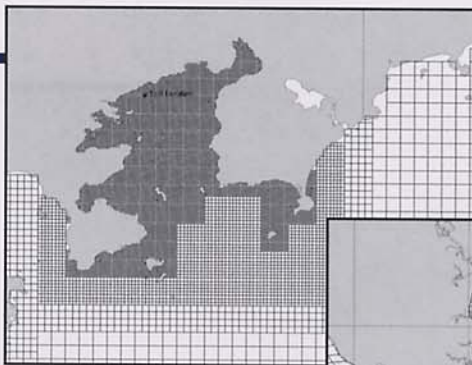
ASA'S HYDRODYNAMIC MODELS

HYDROMAP-VR

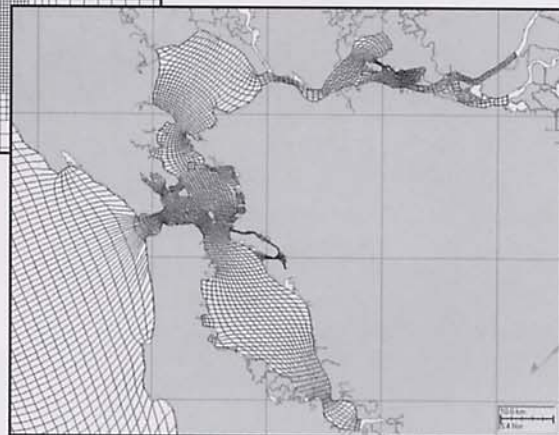
HYDROMAP-VR is a globally relocatable two-and three-dimensional hydrodynamic model that generates current velocity fields. The model operates with a variable-rectangular gridding approach that enables several levels of grid size to be used at the same time. This novel gridding strategy permits the complex geometry of a river-estuarine system to be handled simultaneously with the open geometry of the coastal shelf. HYDROMAP-VR includes two sources of global tidal open boundary elevation data, and supports both tidal and wind-induced currents. Output from HYDROMAP-VR is coupled directly with OILMAP, CHEMMAP, SARMAP, and other ASA models.

HYDROMAP-BF

HYDROMAP-BF is based on a non-orthogonal boundary-fitted coordinate modeling technique. The model generates tidal elevations, velocities, and salinity and temperature distributions. The boundary-fitted gridding technique generates grids that hug the shoreline boundaries of the water body, enabling accurate representation of the study area. The model may be applied in either two or three dimensions dependent on the nature of the problem and the complexity of the study.



HYDROMAP-VR application to Daya Bay, People's Republic of China.



HYDROMAP-BF application to San Francisco Bay.

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Improving New Bedford's Waters

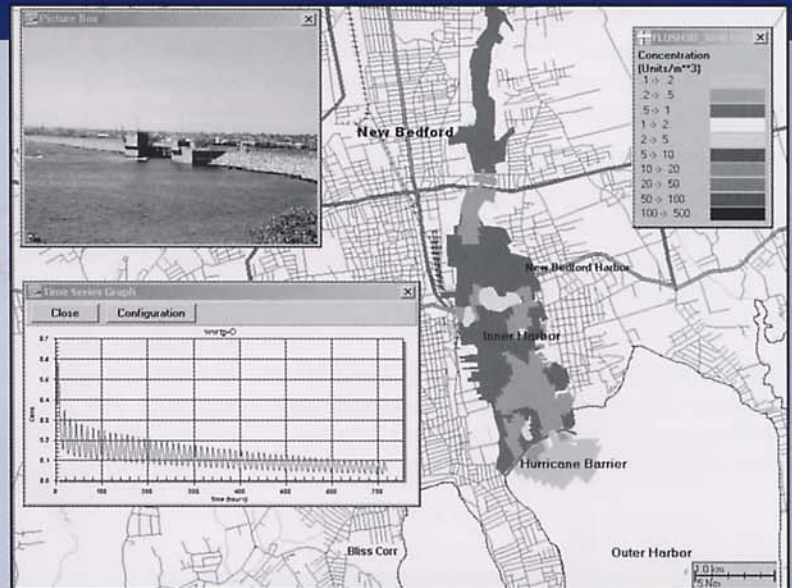
conducted to collect salinity and dye data in order to support the flushing study. The estuary flushing analyses all yielded consistent flushing times ranging between 13 and 19 days.

Dredging

Massachusetts Coastal Zone Management has developed a dredged material management plan for New Bedford Harbor. The plan is to dredge the federal navigation channel in the Inner and Outer Harbor and to dispose of the material at two designated Contained Aquatic Disposal sites in the Harbor. WQMAP hydrodynamic and pollutant transport models were used to simulate circulation and the fate and transport of various metals (mercury, lead, cadmium, arsenic, chromium, copper, nickel, zinc), polychlorinated biphenyls (PCBs), and total petroleum hydrocarbons (TPHs) discharged during the disposal operation and to assess the water quality impacts to the Harbor. An instantaneous release of material showed a greater initial impact to the water quality, but concentrations rapidly decreased with time. A continuous disposal operation showed a steady increase in pollutant concentration with time. None of the contaminant levels reached the Massachusetts state chronic water quality limit, with the exception of copper concentrations.

Water quality

The quahog is the predominant species in Outer New Bedford Harbor, with populations estimated at higher than 200 bushels/acre in certain areas of the Harbor. However, access to this resource has been restricted by the Massachusetts Division of Marine Fisheries due to elevated fecal coliform (FC) concentrations in the Harbor. Potential sources of the elevated FC concentrations include failing individual septic systems, large bird colonies in the Outer Harbor, and sewage facilities sources. ASA has begun a water quality assessment of the Outer New Bedford Harbor, with particular emphasis on the east side (Sconticut Neck), to evaluate the sources and distribution of FC bacteria in the Outer Harbor. Initial field results indicate that the highest FC levels exist near the Hurricane Barrier and in the vicinity of the Boys and Girls Creek further east, and that the levels at other locations throughout the Harbor are at or below the allowable shellfish limit of 14 FC/100mL. WQMAP will be used to simulate the FC fate and transport in New Bedford Harbor, and these simulations in addition to DNA fingerprinting techniques will be used to determine if the sources of FC concentrations are from animal or human waste.



Sample WQMAP output for flushing calculations in New Bedford Inner Harbor.

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