Moffatt & Nichol
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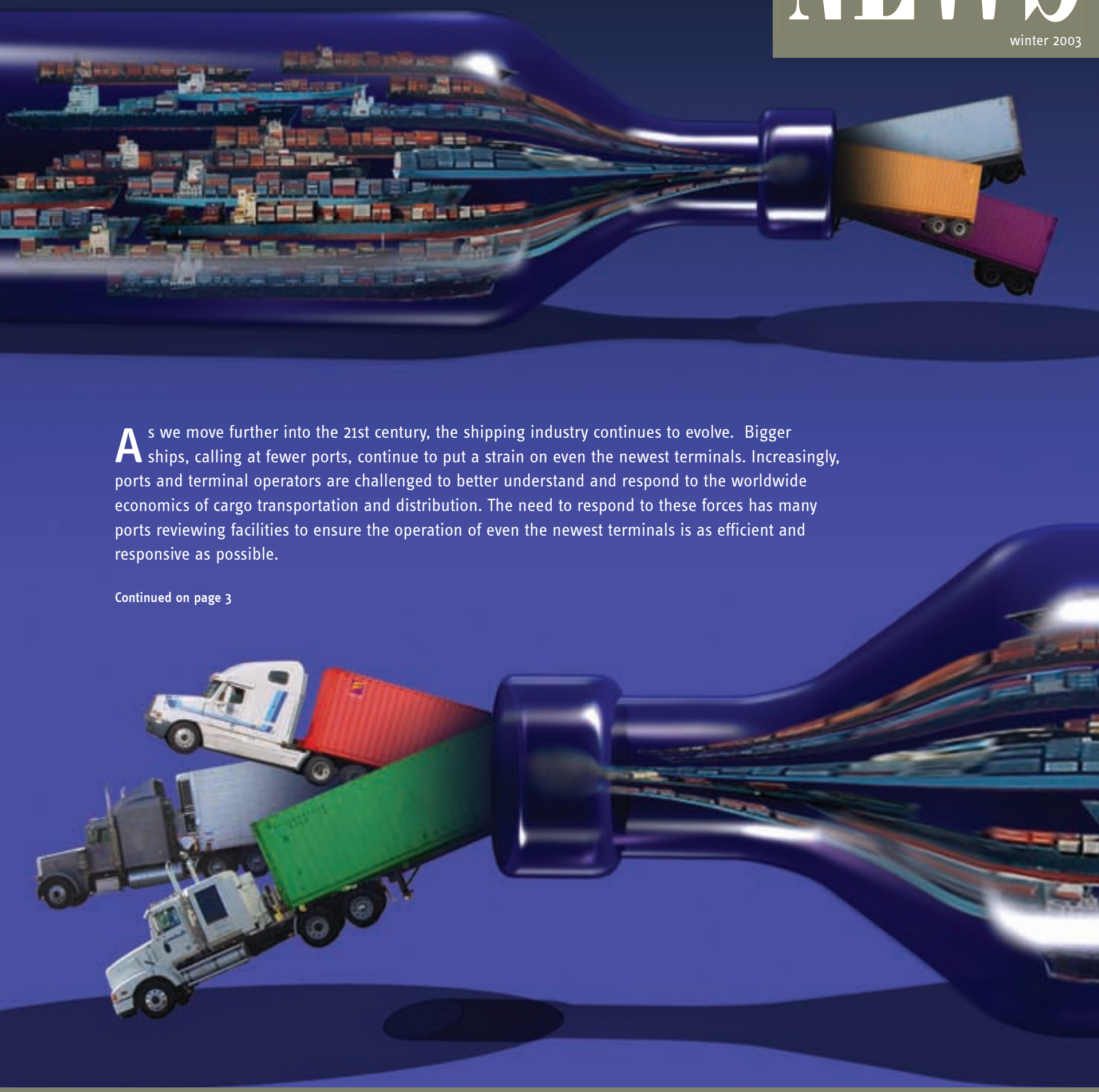
Leading Edge Solutions to Move Cargo Through Ports



As we move further into the 21st century, the shipping industry continues to evolve. Bigger ships, calling at fewer ports, continue to put a strain on even the newest terminals. Increasingly, ports and terminal operators are challenged to better understand and respond to the worldwide economics of cargo transportation and distribution. The need to respond to these forces has many ports reviewing facilities to ensure the operation of even the newest terminals is as efficient and responsive as possible.

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Marina Project at Diamond Valley Lake Has Unusual Design Challenges

Diamond Valley Lake, the Metropolitan Water District's 800,000-acre-foot reservoir constructed of earth and rock in Riverside County, was completed two years ago to provide the nation's largest water storage facility for thirsty Southern California.

An engineering marvel that required excavation of 110 million cubic yards of rock, the reservoir measures 4.5 miles long by 2 miles wide and covers over 4,500 acres with a capacity of 260 billion gallons of water from Northern California and the Colorado River. Diamond Valley Lake also provides a number of recreational activities, including fishing and hiking trails, and soon it will have two marinas for pleasure boats.

Moffatt & Nichol Engineers is providing planning, design and construction services for the marinas including a breakwater, boat launch ramp, 378 boat slips, roads, parking and other facilities at Marina Cove on the eastside of Diamond Valley Lake. The first phase of the project, which will include the launch ramp, floating breakwater, access road and parking facilities, is scheduled for completion by July. In a second phase, the boat slips and other marina facilities are expected to be completed by 2005 at the $25-million Marina Cove project. Future plans call for construction of a second marina on the lake's west side.

One of the engineering challenges is the design and installation of the floating breakwater and boat slips at the marina where the water level can vary as much 120 feet depending on the amount of water in the lake. The water level will also determine the length of the launch ramp to be constructed.

The initial 750-foot long floating breakwater, designed to protect the launch ramp from wind waves up to three feet high, will be anchored to the bottom of the lake with a steel cable and buoy system that can be adjusted for the varying water level. A similar cable system will anchor the boat slips. A second 1,750-foot breakwater will protect the slips when they are completed.

The 11-lane boat launch ramp is designed using cast-in-place concrete in the dry and pre-cast concrete planks that can be put into place under water. The ramp will be extended as the water level drops during the coming dry seasons by relocating the planks and constructing new cast-in-place ramp sections in the dry. When water in the lake is at its lowest point, the launch ramp will extend approximately 700 feet at a 15-degree slope.

Design and construction of the marina is on a fast-track basis, according to Mike McCarthy, M&N Vice President and project manager in the Long Beach office. The firm is providing all civil, structural, coastal, mechanical and electrical engineering services. Only geotechnical and architecture services are being handled by subcontractors.

"The Metropolitan Water District is committed to its schedule and selected Moffatt & Nichol because all the major design disciplines necessary for this project are in-house," said McCarthy. "The firm has completed a number of similar projects throughout the state." ■

Economic Reanalysis Shows Delaware River Channel Deepening Project is Justified for Construction

The U.S. Army Corps of Engineers' economic reanalysis of the previously suspended Delaware River Main Channel Deepening Project, has concluded that the project is economically justified, thus allowing this vital northeastern United States navigation project to move forward toward construction.

Moffatt & Nichol Engineers performed as a sub-consultant to David Miller & Associates, who was contracted by the Corps to perform the overall economic reanalysis. M&N performed an independent technical review of dredging and associated port infrastructure costs for the project, which includes deepening the Delaware River channel from 40 to 45 feet between Philadelphia and the Atlantic Ocean, a distance of 102.5 miles.

The Corps of Engineers issued internal guidance requiring that certain navigation projects be re-evaluated for cost-effectiveness last year, including the Delaware project. Additionally, the U.S. General Accounting Office recommended a comprehensive re-analysis of the project to address uncertainties over the project's economics.

M&N was responsible for verifying cost estimates, and as an outcome of these efforts, worked with the Corps of Engineers to develop a more efficient dredging plan which uses larger capacity hopper dredges to reduce the cost of transporting dredged material from the dredging site to the upland disposal. This is expected to reap $40 million in savings during construction of the project. The findings of the overall study indicate that the project is justified in terms of benefit-cost ratio. The estimated construction cost for the project is about $250 million.

"These efforts have served to demonstrate that reanalysis, conducted in a cooperative and open manner, can produce a lot of innovations," said John Headland, M&N's Senior Vice President and project manager in the firm's New York office. "In this case, the combination of cost reductions and defensible benefits estimates have served to justify a project clearly in the national interest." ■

Moffatt & Nichol Opens Stockton/Sacramento Office

Moffatt & Nichol Engineers has opened a new Stockton / Scaramento office. The office, headed by Tom Rut, SE, is located in Stockton, California and will focus on the transportation needs of the northern California region. Rut previously managed structure maintenance and investigations for Caltrans and is an expert in bridge and highway structures.

The Stockton/Sacramento office location:
1520 Claremont Avenue, Suite 127
Stockton, CA 95207
ph: (209) 472-3740 fax: (209) 472-3745

Moffatt & Nichol Opens New Orleans Office

Moffatt & Nichol has opened an office in New Orleans, Louisiana. The new office will offer the full range of water and transportation related services found throughout the firm. Dennis Lambert,P.E., who has more than 15 years experience in the Louisiana region, will take on the responsibility for running the office. His past work includes the modification of the EPA's Water Quality Assessment Simulation Program (WASP). Lambert is a member of several local professional associations, and the environmental engineering PE Exam Committee of the National Council of Examiners for Engineering and Surveying (NCEES).

The New Orleans office location:
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Leading Edge Solutions to Move Cargo Through Ports

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Port authorities, facing a double-edge dilemma of a scarcity of land and limited budgets for larger container terminals, are turning to Moffatt & Nichol Engineers for strategies to raise cargo productivity and expand capacity of existing facilities. The firm's ability to offer freight economic analysis and forecasting as well as terminal operations consulting, along with a world-class port and terminal engineering practice, is leading clients to seek M&N's assistance in adjusting their course in these challenging times.

"Port land is ultimately limited and many major ports will run out of available land for new or additional terminal facilities in the foreseeable future," said Larry Nye, M&N Vice President, who heads port planning for the firm. "Port authorities and terminal operators are seeking ways to increase container terminal productivity and expand capacity of existing facilities without having to build new ones."

While some ports and terminals are adopting new technologies and automation, these solutions alone do not necessarily lead to greater productivity, and ultimately more capacity. However, in combination with other strategies including increasing density and lowering dwell time of containers on the docks, ports and terminals are making progress toward achieving these goals.

The physical elements that create throughput productivity at a terminal are berths and cranes, container storage space, and gate and rail facilities. It is typically the container storage yard that constrains terminal capacity. When land reaches its limit, ports and terminal operators must turn to increased density and decreased dwell time. Density can certainly be increased at terminals as seen throughout Asia, but it is costly due to labor and quickly reaches a maximum practical limit.

Port authorities and terminal operators are turning to alternative strategies to raise productivity and expand capacity of existing cargo facilities by retooling, upgrading and modernizing terminals as well as developing new cargo distribution networks to move containers through ports. M&N is providing leading edge solutions for clients who are raising port productivity and stretching terminal capacity, including most recently at the Port of New York and New Jersey.

At the Port of New York and New Jersey, terminal space is at a premium. M&N is working with port officials and terminal operators on a variety of projects to improve productivity and capacity at the nation's second largest port complex.

The Port Newark Container Terminal (PNCT) recently completed the first phase of a $175-million project to redevelop the 1970s-era container facility. Joint venture partners, P&O Ports and P&O Nedlloyd with planning, design and construction services assistance from M&N recently converted the 30-year-old facility from a low-density, wheeled-container operation to a high-density, straddle-carrier operation, designed with a throughput capacity in excess of a million containers annually. When the second phase of this 175-acre project is completed by mid-2003, the terminal's productivity is expected to exceed 6,000 containers per acre annually.

The straddle-carrier operation at PNCT allows for greater terminal density and lower dwell times, but requires careful planning to maximize container yard size and layout. At the PNCT, the conversion of the facility to a straddle-carrier operation required additional engineering and terminal improvements to accommodate the weight of the new equipment.

An important consideration in PNCT's decision to introduce straddle-carrier lifts at the terminal was the availability of trained and experienced personnel to operate the specialized container equipment. Other terminal operators at the port have been using straddle carriers at their facilities for some time. The availability of trained straddle-carrier drivers in the port made the decision easier for PNCT to move forward with the straddle-carrier strategy.

The real opportunity to increase efficiency of port land lies in reducing dwell time. As port land becomes increasingly scarce, cargo will by necessity be forced to move off the marine terminals to off-site storage yards or regional freight terminals for distribution, known as a Port Inland Distribution Network (PIDN), according to John Ricklefs, M&N Vice President and freight economics specialist. However, the success of this cargo distribution strategy requires a thorough study and analysis of freight economics and forecasting in the region.

Beyond new technologies, M&N has been working with the Port Authority of New York and New Jersey for a number of years to develop a new cargo distribution strategy. PIDN is designed to move containerized cargo by barge or rail from marine terminals in the Port of New York and New Jersey to strategically located regional freight terminals in New York, New Jersey and other Northeast states. The cargo then will be moved from the regional terminals by truck to local and regional customers.

In a recent groundbreaking agreement with the Port of Albany, the Port Authority of New York and New Jersey initiated the first PIDN service, using a barge service on the Hudson River to transport ocean containers to and from the nation's key East Coast port that serves the New York metropolitan region. Containers arriving at the Port of Albany will be placed on trucks or railcars for distribution to their final destination. Similarly, the Port of Albany can export goods in containers directly to the Port of New York and New Jersey by barge for worldwide distribution. The Albany service will be supported by $3.3 million in congestion mitigation and air quality funds as well as up to $1 million earmarked by the Port Authority of New York and New Jersey.

A primary goal of the PIDN is to reduce the heavy reliance by port customers on the use of congested highway corridors. About 84 percent of the containers handled by the Port of New York and New Jersey are transported by truck. When all the regional ports are in place, the percentage of containers initially moved by truck could fall by a third. When fully deployed, PIDN will transfer thousands of truck trips a day to barge and rail operations.

In addition to speeding the flow of cargo from the docks to regional consumer markets, the new cargo distribution network will provide important benefits, including more port-related jobs, less traffic on congested highways and improved air quality.

Elsewhere in the U.S., M&N is working with ports and terminal operators to improve productivity and increase capacity. But there is no single change or "silver bullet" technology that will provide a simple solution. Rather, it will be a large number of relatively small improvements over time, driven by necessity, economics and reasonable application of technologies.

Computer Modeling and Simulations Aid Project Development

Numerical modeling and computer simulations are specialized services that Moffatt & Nichol Engineers uses frequently in its ports and harbors, coastal and water resources, and urban waterfront practices. These sophisticated computer programs and models are designed to simulate a variety of hydrodynamic conditions, providing the firm's clients with accurate and reliable information useful in analysis and decision-making about the best design and construction alternatives for a project.

The firm has developed numerous computer programs or applies widely-accepted existing models of varying complexity to simulate an unlimited range of conditions for port and harbor infrastructure, marinas, channel systems, wetlands, estuaries and coastal waters. These include:

- **one- two- and three-dimensional models for circulation, tidal exchange and currents, and flows in ocean, estuarine and coastal areas**
- **numerical modeling techniques for sediment transport and dredging material disposal**
- **simulation of wave and structure interaction to study wave force on the design of breakwaters, fixed and floating structures, piles and walls**
- **harbor simulation modeling to study port operations including vessel traffic, navigation, congestion, berthing, and terminal operations**
- **numerical models to study port infrastructure involving harbor resonance, wave-slip-berth interaction, and ship moorings which are affected by surge and wave motion**
- **probability, statistical and spectral analysis of historical data used to determine risk assessment of a project.**

Typically modeling begins with the collection of current and historical data about a project. Using this data, computer programs run simulations based on a variety of conditions and design alternatives that can be tested and analyzed to determine the most appropriate solution before beginning final design and construction. This modeling enables designers to optimize alternatives, not only avoiding potential unseen errors, but also saving time and money.

Modeling is used to provide a better understanding of and the design for a variety of projects including port dredging, vessel maneuvering, ship motion, terminal layout, cargo throughput volume and projections, wetlands preservation, enhancement and restoration, watershed resource planning, coastal protection, and riverfront and waterfront redevelopment among other maritime and transportation projects.

With this multi-disciplined approach, M&N offers clients a specialized set of integrated services ranging from economic analysis and forecasting through project planning, conceptual and final design to construction services. Recent projects illustrate the firm's modeling capabilities:

- **Black Bayou Wetlands Restoration** - a hydraulic and hydrologic engineering project in southwestern Louisiana where numerical modeling is being used as part of the preservation and restoration of an aquatic habitat for marine fisheries.
- **Emerald Isle Stormwater Management Plan** - a flood mitigation project in North Carolina using computer modeling to evaluate surface/ground water interactions, develop flood proofing alternatives, and design pump stations and treatment wetlands.
- **Poplar Island Restoration** - hydrodynamic and coastal modeling, dredge design and engineering services for a landmark beneficial use project using dredge materials to restore 1,100 acres of wetlands and upland habitats in Chesapeake Bay, Maryland.
- **San Francisco International Airport Numerical Modeling** - numerical hydrodynamic modeling of San Francisco Bay to examine potential impacts of different runway alternatives on bay circulation, sedimentation and water quality.
- **New York/New Jersey Harbor Deepening Numerical Modeling** - an assessment to determine proposed shipping navigation channel deepening affects on environmental conditions including currents, water levels, salinity and temperatures.

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