NATHAN DILL, M.S.C.E., B.A.

Coastal Engineer

Qualifications Summary

- More than four years of experience in coastal science and engineering
- Skilled in developing and applying numerical models to support coastal restoration and coastal protection projects
- Experience planning and implementing field data collection programs designed specifically to support hydrodynamic modeling and hydraulic analyses
- Strong background knowledge of coastal processes and coastal hydrodynamics
- Strong written and verbal communication skills
- Routinely utilizing high-performance computing and parallel programming to improve numerical model efficiency
- Numerical model experience with EFDC, ADCIRC, FVCOM, RMA2, *HEC*-RAS, and CORMIX
- Programming experience with FORTRAN, MATLAB, SCILAB, C, KML, BASH, PERL, OpenMP, and MPI

Professional Affiliations

Member, Association of Coastal Engineers (ACE)

Fields of Expertise

Expertise in numerical modeling of hydrodynamics and water quality in the coastal environment, experience in selecting the appropriate model software for the job, applying and developing tools with various software and programming languages to support model development and meaningfully present model results, utilizing high performance computing and parallel programming to increase performance of numerical models and related data analysis.

Higher Education

M.S. Civil Engineering, Louisiana State University (2007)
B.A., Physics, Bowdoin College (2002)
Passed Fundamentals of Engineering Exam (2008)

Employment History

2007-Present	Coastal Engineer, Woods Hole Group
2006-2007	Coastal Scientist, URS Corp.
2004-2007	Research Assistant, Louisiana State University
2002-2004	Physics Teacher, Northfield Mount Hermon School

Key Projects

Ballard Street Marsh Restoration Project – Coastal Engineer/ Modeler
Numerical modeling to assess tidal restoration alternatives for the Ballard Street Marsh in Saugus, Massachusetts. The Ballard Street Marsh is a complex estuarine system of separate marsh areas connected by a network of small channels and various hydraulic structures. Because of the level of complexity, the multi-dimensional Environmental Fluid Dynamics Code (EFCD) was chosen to model the system. The modeling effort involved implementing a field data collection program, processing and analysis of the field data, development of the model grid, configuration and parameterization of the model, calibration and validation of the model using observed data, and application of the validated model to assess existing conditions and potential restoration alternatives.

Key Projects (continued)

Hydraulic Study of Sagamore Creek in Portsmouth, New Hampshire – Project Manager
Performed a hydraulic study and scour analysis to evaluate various design alternatives for replacement of the Route 1A bridge over Sagamore Creek in Portsmouth, NH. This involved the development of an unsteady one-dimensional hydrodynamic model (HEC-RAS) of Sagamore Creek and application of the model to characterize potential hydraulic conditions associated with 10, 100, and 500 year return period tidal flood events. Model results were utilized along with soil boring data from the site to assess the potential for scour associated with the various bridge design alternatives and storm events.

Palmisano Priority Project Tidal Assessment – Coastal Engineer
Conducted a tidal assessment to determine the restoration potential for Palmisano site in Orleans, Massachusetts. The study involved field reconnaissance, tide data collection, supplemental ground survey, and an assessment of existing tidal conditions at the site. Results of the study, along with a digital inventory containing all observed tide and survey data, were provided to the Massachusetts Office of Coastal Zone Management, Department of Ecological Restoration (DER) to assist DER in determining the practicability of advancing restoration planning for the Palmisano site.

Mayo Creek Restoration Study – Coastal Engineer/Modeler
Performed hydrodynamic modeling to support a feasibility study for the restoration of the Mayo Creek Salt Marsh in Wellfleet Massachusetts. This project involved the development and calibration of an analytical estuarine culvert model to simulate water levels in the marsh based on the hypsometry of the marsh and hydraulic characteristics of the culvert and duckbill tide gate, which connect the marsh to Wellfleet Harbor. The model will be applied to evaluate existing conditions as well as proposed restoration alternatives resulting from modifications to the existing culvert/tide gate.

Mayo Creek Tide Study – Project Manager
Designed and implemented data collection program to assess the level of tidal restriction and feasibility of restoring the Mayo Creek Salt Marsh in Wellfleet, Massachusetts. Topographic survey data, water levels, and salinity data were collected, processed, and analyzed to assess restoration potential for the Mayo Creek Marsh. The assessment included determination of mean water levels and tidal range within the marsh along with harmonic analysis to better characterize astronomical contributions to changes in water level within the marsh. Data collected and analyzed during this study will also support the development of a numerical model for the Mayo Creek Salt Marsh.

South Easton's Pond Wave Run-up and Overtopping Analysis – Coastal Engineer
Performed analysis of wave run-up and overtopping to evaluate design alternatives for the northern and western embankments at South Easton's pond in Newport, Rhode Island. Wave conditions corresponding to 2, 10, 25, 50, and 100-year return periods were used to compute wave run-up levels and overtopping rates for various alternative embankment designs. Because of the unique shape of the pond, wave amplification due to wave reflection was considered in the

Key Projects (continued)

analysis, Design guidance was provided, including minimum stone sizes and layer thicknesses for riprap-armored revetments.

Louisiana Coastal Emergency Risks Assessment (CERA) – Project Manager
Operated the ADCIRC Surge Guidance System (ASGS) and provided ADCIRC expertise for the CERA group; a coastal modeling research and development effort at the Louisiana State University Hurricane Center providing operational advisory services related to impending hurricane events and other coastal hazards. CERA provides near real-time storm surge forecasts to various local, state and federal emergency response teams, including the Louisiana Governor's Office of Homeland Security & Emergency Preparedness (GOHSEP), whenever a tropical cyclone is forecast to make landfall on or near the Louisiana coastline.

Hydraulic Analysis of Flow Control Structures for Wetlands Restoration, Town Creek, MA – Coastal Engineer/Modeler
Collected hydrographic data, conducted hydraulic study, developed hydrodynamic model and evaluated a range of possible alternatives to assess potential restoration options for the Town Creek estuarine system. The preferred culvert and tide control alternative 1) increased the capacity of the marsh to drain during flood event, 2) provided the Town with a greater ability to preserve flood storage by closing off the system prior to predicted storm event, and 3) provided the means for small, incremental increases in tidal range over an extended time period as part of a well-monitored, risk-adverse, adaptive management approach to tidal restoration.

Flood Insurance Study appeal support for Cameron Parish, Louisiana, Lonnie G. Harper and Associates, Inc. – Project Manager
Reviewed development and validation of the ADCIRC model used by the Federal Emergency management Agency (FEMA) to determine Still Water ELevations (SWEL) for Southwestern Louisiana. Identified Parish specific discrepancies in model input data and errors in model output by comparing model data to observations of land elevation and historic storm surge. Made improvements to the model grid and conducted sensitivity tests and validation simulations demonstrating how improvement in model results can be achieved with the use of accurate input data and proper model calibration.

Herring River Estuary Restoration Project, Wellfleet, MA, Town of Wellfleet – Coastal Engineer/Modeler
Conducted a numerical modeling program to support planning for restoration of over 1000 acres of wetland within the Herring River Estuary in Wellfleet, Massachusetts; the largest Estuary on Cape Cod. After evaluating the potential application of over twenty different hydrodynamic models, the Environmental Fluid Dynamics Code (EFDC) was chosen as the most suitable model for the project. The modeling program included the development of a large curvilinear-orthogonal grid, calibration, and verification of the model for simulating hydrodynamics and salinity throughout the estuary, simulations of various alternatives for the restoration of tidal exchange to the estuary, and support for the design of engineering structures for restoration. This large complex system contains more than a dozen hydraulic control structures (dikes, culverts, sluice gates, flap gates) and a vast floodplain making the modeling effort particularly

Key Projects (continued)

difficult. Significant enhancements were made to the EFDC code to overcome these difficulties including: developing a multi-threaded version of EFDC with OpenMP to improve simulation time. Developing subroutines for explicitly calculating flow through various control structures (sluice gates, flapper gates, box culverts, pipe culverts), enhancing the GEFDC grid generation code to account for aspect ratio control and sliding boundary points making it possible to generate a nearly orthogonal grid covering over 1000 acres with resolution down to 2 meters using only 85,000 cells, and modifications to the wetting/drying code to aid in simulating smooth flooding and draining of the estuary's large inter-tidal zone.

Sengekontacket Pond ENF/EIR, Town of Edgartown, Massachusetts – Coastal Engineer/Modeler
Performed data analysis for bathymetric and water level data collected by Woods Hole group for the project. Used the collected data to construct and calibrate a RMA2 model of Sengekontacket and Trapps ponds to simulate tidal circulation. Once calibrated, the model was utilized to compute flushing times and evaluate impacts of proposed dredging projects within Sengekontacket Pond.

Feasibility Analysis of Alternate Discharge Locations for Reverse Osmosis Water Treatment Plant in Melbourne, FL. Reiss Environmental Inc - Coastal Engineer/Modeler
Assessed feasibility of increasing the discharge volume and relocating the outfall for Reverse Osmosis (RO) concentrate produced by the Melbourne RO water treatment plant. Concerns of negative water quality impacts at times of low flow at the current outfall in the Eau Gallie River and increased demand for potable water in the City of Melbourne have led to the desire to find a more suitable discharge location for the RO concentrate produced by the plant. Both the Indian River Lagoon and the Atlantic Ocean were considered as alternatives. Data collected from previous studies were used to determine the necessary mixing zone sizes that would be required to meet Florida water quality standards for the radio-nucleotides combined radium (226/228) and gross alpha, and potential for acute toxicity was assessed by examining the bulk dilution. Different diffuser designs, including a single port and a multi-port diffuser were considered for each location.

Assessing Baseline and Modified Astronomical Tide Propagation in the Pontchartrain Basin Using ADCIRC, LA – Graduate Assistant (work conducted as a research assistant at Louisiana State University under the direction of Clinton Wilson and Bob Jacobsen for URS Corp. under contract to U.S. Army Corp of Engineers). Developed a large finite element mesh (~300,000 nodes) for a parallel ADCIRC model of the Lake Pontchartrain basin. Executed model simulations and performed pre and post processing of model data. The model was developed to evaluate the potential impact on tidal circulation within the Pontchartrain basin resulting from the introduction of barrier structures for storm protection and hydrologic restoration. Astronomical tides were simulated in the basin and resulting tidal amplitudes and currents were examined to demonstrate the relative effect on tidal circulation caused by alternative restriction scenarios of major tidal passes.

Key Projects (continued)

Mississippi River Re-introduction into Maurepas Swamp, Reserve, LA – Coastal Scientist (completed while working for URS Corp.) Performed pre and post processing for parallel ADCIRC simulations of a proposed Mississippi River diversion into the Maurepas swamp. Developed a particle tracking code (in SCILAB language) to aid in steady-state flow field visualization and estimation of median residence time of diverted water. Performed mesh modifications to calibrated model to add the proposed diversion channel then conducted various simulations with further modification to maximize distribution and residence time of diverted water. Simulations were also conducted to evaluate the potential effect of the diversion on the drainage of nearby communities whose storm water drains into the swamp. For this evaluation output from a SWMM model of the drainage network was used to provide boundary conditions for the ADCIRC model and vice-versa in an iterative fashion to simulate a rainfall event.

Publications and Presentations

Dill, Nathan. 2010. "Numerical modeling of flow control structures in Cape Cod Bay estuaries" New England Estuarine Research Society, fall 2010 meeting presentation.

Dill, Nathan. 2009. "Newly Installed, Hurricane Hardened, Real-time Observation Stations on the Gulf Coast" ASCE 2009 Louisiana Section Spring Conference presentation.

Dill, Nathan L. 2007. "Hydrodynamic Modeling of a Hypothetical River Diversion Near Empire, Louisiana" Master's Thesis, Louisiana State University, Baton Rouge, LA.

Wilson, Clinton S., Nathan Dill, William Barlett, Samantha Danchuk, and Ryan Waldron. 2007. "Physical and Numerical Modeling of River and Sediment Diversions in the Lower Mississippi River Delta" ASCE Coastal Sediments 2007, 1, 749-761.