

Sean W. Kelley, P.E., M.S., B.S.

Coastal Engineer, Applied Coastal Research and Engineering, Inc.

Areas of Expertise

- Numerical analysis of coastal processes data sets
- Numerical modeling of nearshore wave transformation and sediment transport
- Numerical modeling of estuarine hydrodynamics and water quality
- Measurement of oceanographic processes (currents, tides, waves)
- Analysis of tidal inlet dynamics and sediment transport
- Development of data visualization software

Education

1999 M.S., Ocean Engineering, Texas A&M University
1993 B.S., Marine Engineering Technology, Maine Maritime Academy

Professional Registration

- Professional Engineer (Civil), Commonwealth of Massachusetts

Licenses and Certificates

- U.S. Coast Guard Unlimited Third Assistant Engineer, Steam and Motor Vessels

Work Experience

Mr. Kelley is a Coastal Engineer at Applied Coastal Research and Engineering, Inc. Since joining Applied Coastal, Mr. Kelley has been actively involved in a broad range of coastal engineering and analysis projects, including measurement and modeling of coastal processes.

Mr. Kelley has provided analysis input in the design of coastal engineering structures. He has performed overtopping risk assessments of an existing coastal dike in Matagorda Bay, TX, and also specified containment dike stone sizings and dike elevations, based on extreme hydrologic conditions, for the beneficial use of dredged sediments in the creation of wetlands in Chesapeake Bay. Mr. Kelley has also provided design wave conditions for commuter ferry terminals at several sites on Bermuda, including an analysis of wave transmission under proposed wave baffles at one of the sites. In addition to “hard” coastal structure design, Mr. Kelley has provided input in the design of “soft” engineering solutions, such as beach nourishments at Long Beach, Plymouth, MA; Winthrop Beach, Winthrop, MA; and Cockle Cove Beach in Chatham, MA.

Mr. Kelley has performed hydrodynamic modeling of estuaries in several towns in Massachusetts including Orleans, Bourne, Falmouth, Chatham, Barnstable, Mashpee, and Wareham. These modeling studies were conducted as part of the Massachusetts Estuary Project, a state sponsored project (through the MDEP and University of Massachusetts) to perform comprehensive analyses to determine the relative health of 89 estuarine systems in southeastern Massachusetts. His hydrodynamic modeling work in Falmouth, MA included water quality analyses, using the RMA4 constituent transport model to create a model for Nitrogen distribution within three coastal salt ponds. Models were calibrated using salinity and Nitrogen data from the ponds. The calibrated models were used to evaluate the merit of several possible scenarios of septic load reduction. His modeling work in Chatham was part of a Town-wide water quality modeling effort that included all major estuarine systems within the Town. As part of this project he also performed water quality modeling for an alternatives analysis for possible improvements to culverts in the Muddy Creek and Frost Fish Creek systems.

In addition to his work in Massachusetts estuaries, Mr. Kelley has performed hydrodynamic and two-dimensional sediment transport modeling analyses of Mason Inlet, North Carolina. The modeling effort included inlet conditions that existed since completion of the inlet relocation project in 2002, as well

as several possible dredging alternatives. The results of the hydrodynamics analysis for existing conditions illustrate the mechanisms likely responsible for the observed shoaling at different locations in the inlet system. The recommended dredging alternative provided potential significant cost savings to the project, and was also the most favorable for system stability and navigation interests within the inlet system.

Mr. Kelley has conducted shoreline change studies where numerical models, including GENESIS and a shoreline model that he developed, were used to predict long-term shoreline response to incident wave processes. For Cockle Cove in Chatham, MA, GENESIS was used together with wave model results to estimate the effectiveness and expected design life of several beach fill scenarios. A similar implementation of GENESIS was performed for Winthrop Beach, in Winthrop, MA. For an analysis of beach nourishment alternatives at historic Plymouth Long Beach, Mr. Kelley performed an analysis of long-term shoreline trends for selected fill designs.

Mr. Kelley also has been involved in offshore sand borrow site impact studies for sites offshore North Carolina (Outer Banks), eastern Florida, southern Virginia, northern New Jersey, and Long Island, New York. He has used the spectral wave model STWAVE to predict changes in wave propagation along coastlines due to offshore sand mining for beach nourishment. Wave mode results are used to compute sediment transport to provide a basis for estimating potential impacts on a shoreline. Mr. Kelley has additional experience with other spectral wave transformation models, and has authored a report that compares the performance of spectral models, including STWAVE, SWAN, and REF/DIF s. Mr. Kelley provided borrow site wave modeling and sediment transport potential impact analyses used in the environmental assessment of a current beach nourishment project in Virginia Beach, VA, which will use a resource area within the Minerals Management Service (MMS) jurisdiction, on Sandbridge Shoals offshore of southern Virginia.

In addition to numerical modeling of coastal processes, Mr. Kelley has performed measurements of inlet dynamics with the use of an Acoustic Doppler Current Profiler (ADCP). He performed an ADCP survey of Rudee Inlet, in Virginia Beach, VA, and computed the volume of the tidal prism based on the current data. He was involved in similar ADCP surveys for St. Lucie Inlet, FL (Martin County); Hyannis Inner Harbor, MA; the Thames River, New London, CT; and the Hudson River, NY.

Before joining Applied Coastal, Mr. Kelley was a research assistant to the head of the Ocean and Coastal Engineering division of the Civil Engineering department at Texas A&M University. Through this work, he gained extensive experience with finite element model simulations of storm surge caused by tropical storms and hurricanes using the ADCIRC hydrodynamic software developed by the US Army Corps of Engineers. The focus of his thesis research was the development of a storm surge forecast system based on the ADCIRC code and the Unified Planetary Boundary Layer model. Other projects that Mr. Kelley was involved with at Texas A&M include the evaluation of revetment designs for ALCOA and BP in Lavaca Bay, TX.

Before attending Texas A&M, Mr. Kelley was employed by the Electric Boat Corporation, in Groton, Connecticut, as a member of the Advanced Concepts group. He was responsible for the initial design of several propulsion plant and nuclear fluid systems, including component specifications and system arrangements. He also worked with the hydromechanics analysis group, where his work included performing CFD analyses on several submarine hull and propulsion concepts.

Reports and Publications

Kelley, S.W., J.S. Ramsey, and M.R. Byrnes (in review). Evaluating the physical effects of offshore sand dredging for beach nourishment. *Journal of Coastal Research*.

Kelley, S.W., J.S. Ramsey, 2004. Coastal Engineering Design Guidance Study for the Nahant Causeway Seawall, Nahant, Massachusetts. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for Vollmer Associates and Massachusetts Department of Conservation and Recreation. 24 pp.

Kelley, S.W., J.S. Ramsey, 2003. Mason Inlet and Middle Sound System, New Hanover County, North Carolina: Hydrodynamic and Sediment Transport Analyses of Present Conditions and Dredging Alternatives. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for Gahagan and Bryant

Associates, Inc., and New Hanover County, NC. 44 pp.

Byrnes, M.R., R.M. Hammer, B.A. Vittor, S.W. Kelley, D.B. Snyder, J.M. Côté, J.S. Ramsey, T.D. Thibaut, N.W. Phillips, and J.D. Wood, 2003. Collection of Environmental Data within Sand Resource Areas Offshore North Carolina and the Environmental Implications of Sand Removal for Coastal and Beach Restoration. U.S. Department of the Interior, Minerals Management Service, Leasing Division, Sand and Gravel Unit, Herndon, VA. OCS Report MMS 2000-056, Volume I: Main Text 256 pp. + Volume II: Appendices 69 pp.

Howes, B.L., R. Samimy, D. Schlezinger, S.W. Kelley, J.S. Ramsey, E. Eichner, 2003. Massachusetts Estuary Project: Linked Watershed-Embayment to Determine Critical Nitrogen Loading Thresholds for Stage Harbor, Sulphur Springs, Taylors Pond, Bassing Harbor, and Muddy Creek, Chatham, Massachusetts. 246 pp.

Kelley, S.W. and J.M. Côté, 2003. Hydrodynamic Analysis of the Three Bays Estuary System, Barnstable, Massachusetts. Technical Report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for the Town of Barnstable, Massachusetts. 48 pp.

Kelley, S.W. and J.M. Côté, 2003. Data Analysis and Hydrodynamic Modeling for Estuarine Systems of Orleans, Massachusetts. Technical Report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for the Town of Orleans, Massachusetts. 40 pp.

Kelley, S.W. 2002. Shoreline Modeling of Nourishment Scenarios for Plymouth Beach, Massachusetts. Technical Report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for the Town of Plymouth, Massachusetts. 28 pp.

Kelley, S.W., J.S. Ramsey 2002. Storm Surge and Wave Analysis for the Rockefeller Wildlife Refuge, Cameron and Vermillion Parishes, Louisiana. Technical Report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for Shiner Mosley and Associates, Inc. 41 pp.

Kelley, S.W., and Côté, J.M., 2002. Hydrodynamic Analysis of Back River and Eel Pond, Bourne, Massachusetts. Technical Report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for the Town of Bourne, MA. 23 pp.

Kelley, S.W., J.S. Ramsey, M.R. Byrnes, 2001. Numerical Modeling Evaluation of the Cumulative Physical Effects of Offshore Sand Dredging for Beach Nourishment. U.S. Department of the Interior, Mineral Management Service, International Activities and Marine Minerals Division (INTERMAR), Herndon, VA. OCS Report MMS 2001-098, 95 pp. + 106 pp. appendices.

Kelley, S.W., J.S. Ramsey, J.L. Baker, 2001. Coastal Engineering Reconnaissance Study for Barren Island, Maryland. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for Gahagan and Bryant Associates, Inc., and the Maryland Environmental Service. 26 pp.

Howes, B.L., Ramsey, J.S., Kelley, S.W., 2001. Nitrogen Modeling to Support Watershed Management: Comparison of Approaches and Sensitivity Analysis. School of Marine Science and Technology (University of Massachusetts Dartmouth) and Applied Coastal Research and Engineering, Inc., report prepared for the Massachusetts Dept. of Environmental Protection, and the U.S. Environmental Protection Agency. 94 pp.

Kelley, S.W., Ramsey, J.S., Côté, J.M., Wood, J.D., 2001. Tidal Flushing Analyses of Coastal Embayments in Chatham, MA. Technical Report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for the Town of Chatham, MA. 115 pp.

Ramsey, J.S., Kelley, S.W., 2000. Wave Climate Analysis for Replacement Ferry Project, Bermuda. Technical Report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for Bourne Consulting Engineering, Inc., Franklin, MA. 27 pp.

Kelley, S.W., 2000. Observation of tidal currents in the Thames River, New London, CT. Technical Report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for Connecticut DOT. 8 pp.

Ramsey, J.S., Howes, B.L., Kelley, S.W., Li, F., 2000. Water Quality Analysis and Implications of Future

- Nitrogen Loading Management for Great, Green, and Bourne Ponds, Falmouth, Massachusetts. Environmental Cape Cod, 3(1), 1-20.
- Kelley, S.W., 2000. Observation of Tidal Currents at Rudee Inlet, Virginia Beach, VA. Technical report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for Olsen Associates, Inc. 21 pp.
- Ramsey, J.S., Kelley, S.W., 2000. Shoreline Change Modeling and Conceptual Beach Nourishment Design for the Winthrop Shores Reservation, Winthrop, MA. Technical report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for Parsons Brinckerhoff, Inc., and the Metropolitan District Commission, Boston, MA. 24 pp.
- Wood, J.D., Ramsey, J.S., Kelley, S.W., 1999. Two-Dimensional Hydrodynamic Modeling of Barnstable Harbor and Great Marsh, Barnstable, MA. Technical report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for the Town of Barnstable, MA. 28 pp.
- Kelley, S.W., Ramsey, J.S., 1999. Shoreline Change Modeling for Cockle Cove, Chatham, MA. Technical report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for the Town of Chatham, MA, for the Town of Chatham, MA. 33 pp.
- Ramsey, J.S., Kelley, S.W., Howes, B.L., 1999. Water Quality Modeling of Great, Green, and Bourne Ponds, Falmouth, MA. Technical Report. Applied Coastal Research and Engineering, Inc., Mashpee, MA, for the Town of Falmouth, MA. 51 pp.
- Kelley, S.W., Ramsey, J.S., Byrnes, M.R., 1999. Comparison of Numerical Spectral Wave Transformation Models for Evaluating Physical Environmental Impacts of Offshore Sand Mining. Technical report. Applied Coastal Research and Engineering, Inc., Mashpee, MA. 24 pp.
- Kelley, S.W., Wood, J.D., Ramsey, J.S., 1999. Analysis of Potential Impacts to Skaket Beach Following Removal of the Seawall Structure. Technical report. Applied Coastal Research and Engineering, Inc., Mashpee, MA
- Ramsey, J.S., Wood, J.D., Kelley, S.W., 1999. Two-Dimensional Hydrodynamic Modeling of Great, Green, and Bourne Ponds Falmouth, MA. Technical report. Applied Coastal Research and Engineering, Inc., Mashpee, MA. 41 pp.
- Kelley, S.W., 1999. Real-time Storm Surge Prediction for Bays on the Texas Gulf Coast. Master's Thesis. Texas A&M University, College Station, TX. 115 pp.