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Engineer Research and Development Center

Fact Sheet

Inlet Geomorphologic Evolution

Description Maintenance of Federal coastal navigation projects occurs within nearshore and estuary geomorphology that evolves on a scale much greater than engineering and planning time lines. For example, ebb and flood shoals may take hundreds of years to develop, depending on the size of the inlet (tidal prism). Modification of a channel or jetty similarly has far-reaching and long-term consequences. Long-term geomorphic rules of change cannot yet be predicted with process-based models. This work unit takes advantage of modern computational power and digital data, e.g., Lidar, not previously available to identify and quantify geomorphic behavior at and around inlets. Objectives are to: (1)Assemble known and develop new predictive relations on inlet geomorphology, including the channel, tidal shoals, adjacent beaches, nearshore, estuary, and their interactions; (2) Develop an Inlet Engineering Toolbox housing inlet morphologic relations for engineering analysis and evaluation of O&M alternatives. Such relations would include channel migrational and cross-sectional area stability, equilibrium (natural) channel width and depth, tendency, evolution of the adjacent beaches, evolution of the estuary, ebb and flood tidal shoal volumes and areas, scour at jetties, and considerations of diurnal and semi-diurnal inlets and river mouths as applicable to all coasts of the United States; (3) Extend the Inlet Reservoir Model for shoal development and sand bypassing to include options for automatic determination of sand bypassing coefficients, and investigate and include terms to describe jetties and partial or complete ebb shoal collapse; and (4) Develop a computationally fast regional breaching model that accounts for presence of existing inlets and multiple breaches, based on geomorphic concepts and their mathematical representation. The model will include breaching adjacent to jetties and multiple permanent inlets.

Issue USACE Districts have expressed strong need for engineering predictive capability to estimate channel infilling and geomorphic response to inlets and their navigation improvements. This technology must be reliable, yet fast enough to allow evaluation of multiple alternatives during project development.

Users USACE coastal districts and divisions, resource agencies, private consultants, and academia.

Products Reliable empirical relations governing coastal inlets based on data from all coasts of the United States. Inlet Engineering Toolbox compiling empirical knowledge on a PC that is expected to be the front line for coastal inlet analysis at Districts. The toolbox will run the Inlet Reservoir Model and the regional breaching model.

Benefits Quantitative knowledge on improved coastal inlets is limited (as compared to natural inlets) and not available in ready form to practicing engineers. Work will provide numerous robust and reliable predictive tools for the Districts in support of O&M-related projects and evaluation of alternative practices at coastal inlets.

Corps Program Coastal Inlets Research Program; Dr. Nicholas C. Kraus, Program Manager.

Sponsors USACE O&M Program

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