



**US Army Corps
of Engineers®**
Engineer Research and
Development Center

Coastal Inlets Research Program (CIRP)



Humboldt Bay, California

Description of Research

The [Coastal Inlets Research Program \(CIRP\)](#) advances knowledge and develops predictive technology to reduce the cost of dredging, promote navigation channel reliability, and improve means to maintain the sediment-sharing interactions between inlets and adjacent beaches. The research is conducted at the Engineer Research and Development Center's (ERDC's) [Coastal and Hydraulics Laboratory \(CHL\)](#) where studies range from physical processes from the watershed, through rivers and estuaries, and beyond the shore to deep water. CIRP research and development covers numerical modeling, physical modeling, lessons learned, and basic research on hydrodynamics (waves, currents, water level), sediment transport, and morphology change.

Problem

Navigation projects at coastal inlets must be designed, operated, and maintained in a complex hydrodynamic and morphologic environment. Inlet morphology responds to engineering actions in several time scales ranging from short-term, as in response to storms, to slow, gradual change caused by waves and currents. Because the hydrodynamics, inlet morphology, navigation channel, and longshore sediment transport are connected, navigation project maintenance and natural processes must be estimated to minimize channel dredging and to promote sediment bypassing, either by natural processes or through dredging-related activities. To meet the challenges of channel deepening nationwide and creation of new channels, quantitative predictive models and analysis tools must be developed that can calculate navigation channel and morphology change and connect the processes to the adjacent beaches.

Expected Products

CIRP comprises six work areas with selected major products as follows:

- **Inlet Channels and Adjacent Shorelines:** Automated coastal-sediment budget system; shoreline change numerical model for inlets; inlet database including educational materials and photograph archive
- **Inlet Modeling System:** Interconnected numerical models of tidal circulation, random waves, sediment transport, and morphology change, including channel infilling.

- **Inlet Geomorphology:** Numerical models of long-term morphology change at inlets, including sediment bypassing; numerical models of barrier island breaching; Empirical predictive formulas for inlet morphology change; data sets.
- **Inlet Structures:** Maintenance and modification of structures; Techniques for predicting and mitigating scour including the associated hydrodynamics.
- **Inlet Engineering and Laboratory Investigation of Inlet Processes:** Physical modeling of inlets; data sets on combined waves, currents, and morphology change; structure functional design to reduce channel shoaling and promote sediment bypassing
- **Program Management and Technology Transfer:** Coordinates with the CIRP and with other R&D programs and leveraging opportunities. Responsible for workshops and interfaces for models.

Potential Users

CIRP is producing information and tools to support the U.S. Army Corps of Engineers, private industry, and academia in addressing engineering and science problems at coastal inlets nationwide.

Projected Benefits

The program is designed reduce the cost of design, operation, and maintenance of Federal inlet navigation projects in a systems approach that includes the adjacent beaches. CIRP products have already yielded substantial cost savings and improvements for several Federal navigation projects, and many of the results are transferable to inlets nationwide.

ERDC Program Manager(s)

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Participating ERDC Laboratories

Coastal and Hydraulics Laboratory (CHL)