US Army Corps of Engineers®
Engineer Research and Development Center

Large-Scale Sediment Transport Facility

Purpose

The Large-Scale Sediment Transport Facility (LSTF) is a state-of-the-art, mobile-bed laboratory operated by ERDC's Coastal and Hydraulics Laboratory, which is capable of reproducing surf zone processes found on natural beaches. It was established to address deficiencies in existing calculation methods for total longshore sediment transport (LST). Effective design and maintenance of inlet navigation and shore protection projects require accurate estimates of the quantity of sand that moves along the beach. The LSTF simulates nearshore hydrodynamic and sediment transport processes at a relatively large geometric scale, including situations where considerable sand is mobilized and transported in suspension. It is available to U.S. Army Corps of Engineers Districts, public agencies, and private engineering consultants and design firms for testing and developing shore protection methods for use in all levels of coastal project design and maintenance and coastal sediment management.

Data from LSTF are used for more accurate predictions of longshore sediment transport

Specifications

The facility consists of a 30-m-wide-, 50-m-long-, 1.4-m-deep-basin and includes wave generators, a sand beach, a recirculation system, an instrumentation bridge, and sand traps. Waves are generated using four synchronized unidirectional spectral wave generators. A longshore current control system, which includes 20 independent vertical turbine pumps, each with its own piping and flow sensors, recirculates the prescribed longshore current distribution. The mobile, programmable instrumentation bridge spans the beach in the cross-shore. The bridge serves as a platform for visual observations and for mounting a cross-shore array of wave gauges, acoustic Doppler velocimeters, arrays of fiber-optic backscatter sensors, and a rapidly sampling beach profiler. A series of 20 sediment traps are located in flow channels at the downstream end of the facility. Traps are suspended from load cells, and the weight of sand that accumulates in each trap is recorded in real-time by the data acquisition system.

Benefits

Cost effectiveness is the main advantage. The accuracy of present methods for estimated LST rates is uncertain, but believed to be no better than +/- 30 to 50 percent. The CERC formula, which was developed for predicting total LST rates, has an accuracy estimated at +/- 50 percent and in some cases with less accuracy. Use of this formula along with wave

climate information to estimate net and gross LST rates can produce transport estimates that are too low or too high by several hundred percent. Estimates that are too low could result in insufficient sand placement in the project area, resulting in an unsuccessful project. Estimates that are too high could result in placing more sand than necessary, which would increase costs. In some instances a project may be aborted because of high cost estimates making it nonfeasible.

Success Stories

LSTF data were used to develop NEARHYDS, a numerical model that predicts the cross-shore distribution of longshore currents. A physics-based model to calculate the cross-shore distribution of longshore transport rates also is being developed.

Point of Contact

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