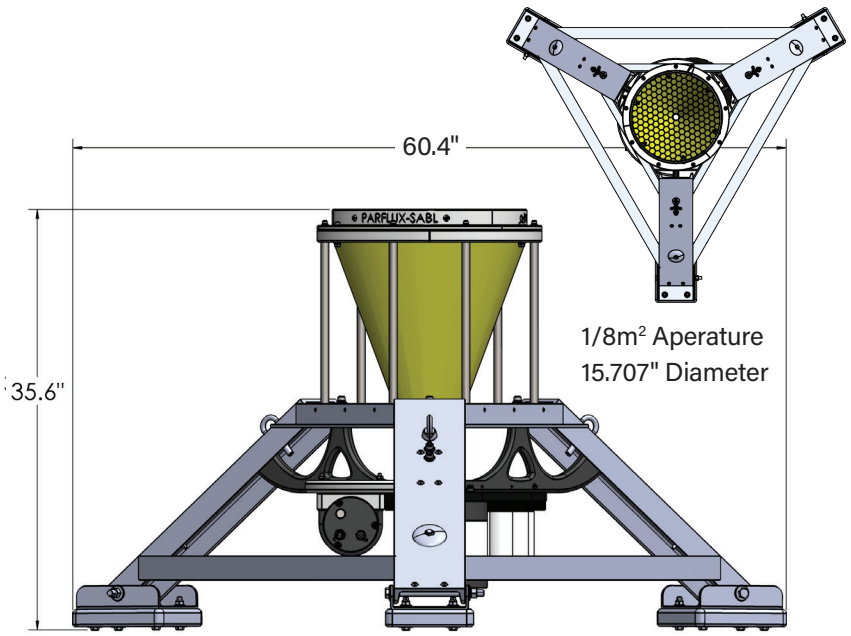
PROJECT ID:
595

Demonstration of a Signal Activated Bottom Lander Trap



This NESDI project is developing and demonstrating an automated technology (a signal-activated bottom lander) that can aid sediment remediation efforts by targeting specific particle discharge or resuspension events.

(Schematic Credit: Courtesy of McLane Research Laboratories)

OBJECTIVE

The objective of this project is to develop and demonstrate an automated technology that can aid sediment remediation efforts by targeting specific particle discharge or resuspension events.

PROBLEM STATEMENT

Determining the sources of sediment contamination in Navy harbors is a complicated endeavor. In addition, sites that have been identified for remediation often become recontaminated over time due to various environmental factors. Most contaminated sediment sites currently use sediment trap technology: passive, diver-deployed, cylindrical traps that capture particles as they settle to the seafloor. As these traps are passive and always open to the environment, they cannot distinguish between actual depositions associated with specific temporal particle discharge events (such as storms, dredging projects, ship activities, etc.) versus local resuspension that might be associated with bottom erosion (i.e., tidal influences).

There is an ongoing need for technologies that would more accurately evaluate sources of particulate deposition to better evaluate potential contamination and recontamination of sediments.

Two different sizes of a time-series sediment trap. (Photo Credit: Courtesy of McLane Research Laboratories.)

DESCRIPTION

For several decades, the oceanographic community has been developing and refining automated, time series sediment traps for deep water measurements. These systems generally consist of a cylindrical or conical trap aligned over a rotating carousel of sample bottles. Particles that settle into the trap are guided into the sampling bottle by the walls of the trap and captured. At preprogrammed intervals, the assembly rotates to a new bottle, thus providing a time series of samples that can be used to evaluate temporal variations in particle movement to the seafloor. These systems have been applied to a wide range of studies in the ocean, including measurements of sedimentation. However, to date, these systems have not found application in the assessment of contaminated sediment sites. This is due primarily to two factors: They are too tall to work well in shallower harbor environments. They have not been optimized for event-based sampling that would be of interest for contaminated sediment site characterization.

Using these deep-water traps as a starting point, this project team will design and build an automated prototype trap known as a signal-activated bottom lander (SABL). Landers are devices that accommodate various types of instrumentation and can be raised and lowered to and from the seabed without the assistance of divers. The SABL will be designed for the shallow water depths and navigation clearances required for typical U.S. Navy harbor applications. The prototype controller will also be adapted to accommodate sensor- or user-based event activation tailored to contaminated sediment sites. For example, samples can be collected manually when salinity, turbidity or rainfall parameters change due to currents, environmental events or physical activities at the site. Because the triggering condition may not always be based on conditions right at the system, the project team will also evaluate the ability to trigger the system remotely.

Once the SABL system is designed, it will be tested in the laboratory and pierside at Naval Information Warfare Center Pacific in San Diego, CA. This testing will evaluate both the functionality and stability of the prototype system. Finally, the SABL system will be validated in the field through two demonstrations alongside a standard passive system to determine significant differences in the deposition of particulate matter and evaluate the ease of deployment and recovery in a controlled setting.

RETURN ON INVESTMENT

Following modest additional upfront costs associated with procurement of SABL traps, it is anticipated that lifecycle costs will be considerably lower than traditional passive sediment traps considering the minimal additional engineering required, reduced diver support time and relatively low cost of acquiring considerably enhanced data resolution relative to existing sediment trap designs and methods. A full cost analysis would be conducted as part of the NESDI final report and will include maintenance costs, labor/overhead costs associated with the field work, logistics costs, consumables, analytical costs associated with the collected samples, and labor/overhead costs associated with data analysis and reporting. Many of these costs will be site-specific and will be detailed in the assessment.

NAVY BENEFITS

The dynamics and any impacts to marine communities related to stormwater runoff or other sources is currently a large data gap Navy-wide. The SABL would complement and significantly enhance ongoing stormwater, receiving water and sediment monitoring conducted by Navy Region Southwest under

their National Pollutant Discharge Elimination System permit for both stormwater and drydock discharges. In general, improved monitoring of ongoing particulate-based contamination is expected to lead to improved assessment, better remedy selection and reduced long-term management costs for contaminated sediment sites.

TRANSITION DESCRIPTION

The field demonstrations will be held at two locations with real-world contamination concerns. The demonstrations will address site-specific concerns regarding deposition, resuspension and potential recontamination at these locations. This also creates a direct path to regulatory visibility as the demonstrations will be presented to and reviewed by the regulatory teams at each of the demonstration sites.

Concurrently with the demonstrations, standard operating procedures will be developed for incorporation into the planning documents required for regulatory review. In order to ensure that the SABL is widely available, the project team is working with a commercial partner, McLane Research Laboratories, Inc., to create a viable commercial pathway for future Navy end users through purchase or lease agreements. Results of the demonstration/validation will also be presented at workshops and targeted meetings.

CONTACT

For more specific information about this project, contact the Principal Investigator at 858-349-2926.

ABOUT THE NESDI PROGRAM

The Navy Environmental Sustainability Development to Integration (NESDI) program is the Navy's environmental research and development, demonstration and validation (6.4) program, sponsored by the Chief of Naval Operations, Energy and Environmental Readiness Division (OPNAV N45) and managed by the Naval Facilities Engineering Systems Command (NAVFAC) out of the Engineering and Expeditionary Warfare Center (EXWC) in Port Hueneme, CA.

The mission of the program is to provide solutions by demonstrating, validating and integrating innovative technologies, processes, materials, and filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Fleet readiness and lethality. The program accomplishes this mission through the evaluation of cost-effective technologies, processes, materials and knowledge that enhance environmental readiness of naval shore activities and ensure they can be integrated into weapons system acquisition programs.

The program is the Navy's complement to the Department of Defense's Environmental Security Technology Certification Program which conducts demonstration and validation of technologies important to the tri-Services, U.S. Environmental Protection Agency and Department of Energy.

For more information, visit the NESDI program web site at www.navfac.navy.mil/nesdi or contact Ken Kaempffe, the NESDI Program Manager at 805-982-4893, DSN: 551-4893 or ken.kaempffe@navy.mil.