

## *Rapid Response: Automated Long-Term Monitoring System for Natural Resource Management*

### **Technology Description**

Long-term monitoring is the most vital, and yet the most lacking data requirement for effective natural resource management at Navy and Marine Corps installations. Long-term time series data supports and serves as a powerful backdrop to all other aspects of monitoring, research, and conceptual modeling about ecosystem structure, function, and interdependencies that take place.

In this project, a commercially off the shelf (COTS) probe and telemetry system (Aqua Buoy from In-Situ Inc.) was deployed for five months at SSC-Pacific Pier 302 in San Diego Bay. This is a self-contained, battery-powered system with telemetry capacity.



The deployment provided information on maintenance, recalibration, and costs requirements for the COTS systems. The COTS systems were intentionally allowed to fail to establish realistic maintenance schedules. This approach is similar to the “plug-and-play” mentality of deploying environmental sensors in coastal waters, neglecting maintenance and QA/QC of the data provided by the system. The information generated from this and previous efforts, suggests the minimal maintenance schedule, provides clues to understanding cues to equipment malfunctions, and potential erroneous data generation. This study establishes costs considerations to be contemplated when individuals use long-term environmental COTS sensors in coastal waters. Information on several manufacturers, antifouling options, maintenance schedule, calibration requirements, and costs are provided in the final report, and user guide.

Correctly managed COTS coastal water long-term environmental monitoring systems will provide continuous long-term background environmental information for managing natural resources in coastal areas. This information is critical for development of Integrated Natural Resource Management Plans (INRMP), National Environmental Policy Act documents and other and other base compliance measures, as required under the Sikes Improvement Act, OPNAVINST5090.1B, the Endangered Species Act, the Clean Water Act, and for the evaluation of management strategies and military construction investments.

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## **Value to the Warfighter**

The use of automated environmental field sensors and monitoring systems can decrease the dependence on laboratory, field, or at-sea monitoring procedures, and will enhance the capabilities by maximizing training and testing requirements within environmental constraints. The use of automated monitoring systems supports the evaluation and minimization of environmental constraints on shore readiness, platform operation and force protection, and provides a cost-effective management of environmental regulatory requirements. Furthermore, long-term monitoring of critical environmental and ecological parameters supports the continued, or enhanced use of training ranges.

## **Economics of the Technology: ROI or Payback**

The use of COTS environmental sensors is driven by regulatory requirements, which negatively impact the continuity of the Navy's shore side activities such as construction, industrial discharges, and training operations. The payback of using these COTS systems is assuring the steadiness of these activities.

## **Technology Transition Documentation**

This is a Technology Transition Category 4 by providing technology improvements for internal use by the Navy.

A user guide based on the final report will be provided that will focus on implementation of the system and any potential issues. For information contact Dr. Ignacio Rivera, SPAWAR Systems Center Pacific, [ignacio.rivera@navy.mil](mailto:ignacio.rivera@navy.mil), (619) 553-2373.

## **Site Implementation**

The COTS Aqua Buoy environmental sensor system was deployed for five months at SSC-Pacific Pier 302 in San Diego Bay. A battery-powered system was used, as the buoy system was deployed pier-side, to allow ease of access. However, battery life for communication resulted in battery renewal every 10 days. Grab samples collected by the buoy were analyzed for dissolved oxygen following the Winkler titration method. An In-Situ Aqua Troll 3500 hand-held environmental sensor system was deployed several times by the buoy sensor for comparison of data. Biofouling was allowed to grow over the sensors in order to provide information on maintenance requirements.

## **Specific Applications**

Buoy-based environmental sensors are the obvious option for long-term monitoring on coastal waters. The sensors can be deployed independently from pier-side structures. These COTS systems could be used in the determination of background levels of temperature, pH, primary productivity, particulates, noise levels, and a suite of environmental parameters that are used for the regulation of Navy shore-side activities.

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