

STATE WATER RESOURCES CONTROL BOARD
DIVISION OF FINANCIAL ASSISTANCE
PRELIMINARY FUNDING COMMITMENT (PFC)
CLEAN BEACHES INITIATIVE (CBI) GRANT PROGRAM
FAAST PIN: 24689

RECIPIENT: SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT (SCCWRP)

PROJECT TITLE: AUTONOMOUS SYSTEMS FOR MONITORING BEACH WATER QUALITY (PROJECT)

TOTAL PROJECT COST: \$1,300,985

TOTAL CBI GRANT REQUEST: \$1,300,985

GRANT MANAGER: Andrew Tsiu, Environmental Scientist (916-319-9123 or Andrew.Tsiu@Waterboards.ca.gov)

AUTHORITY

The Clean Beaches Initiative (CBI) Grant Program provides funding for projects that restore and protect the water quality and the environment of coastal waters, estuaries, bays and near shore waters. The CBI Grant Program was initiated in response to the poor water quality and significant exceedances of bacterial indicators revealed by Assembly Bill (AB) 411 monitoring at California's beaches. Funding is available from the *Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act* (Proposition 84). In addition, there are unused or re-appropriated funds remaining from the *California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act of 2002* (Proposition 40) and the *Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002* (Proposition 50).

The State Water Board adopted Resolution No. 2012-0020 on June 5, 2012, which revised the CBI Guidelines used to solicit applications, evaluate proposals, and award grants for Proposition 84, Chapter 7 funds, and any unused or re-appropriated Proposition 40 and 50 CBI funds. The resolution authorized the Deputy Director of the Division of Financial Assistance (Division) to approve proposed projects, execute grant agreements and amendments to implement the proposed projects and utilize funds from projects which are withdrawn or completed under budget to fund additional projects recommended by the Clean Beaches Task Force (CBTF), or augment the scope and budget of projects previously awarded.

The Concept Proposal for this Project was submitted to FAAST on August 23, 2012. The CBTF met on October 22, 2012 and recommended this Project be invited to submit a detailed application. The applicant submitted a Detailed Application on July 3, 2013, and it has been determined to be complete. This PFC shall be posted on the State Water Board's internet website, and circulated to the CBTF for review and comment prior to the Deputy Director executing a grant agreement.

PROJECT OBJECTIVE

The State Water Board funded the development of new rapid indicators of microbial pollution using laboratory-based quantitative polymerase chain reaction (qPCR) techniques. This project presents the next step in the advancement of rapid indicators technology through development of a mobile (qPCR) instrument. It will allow rapid microbial source tracking (MST) studies to be conducted in a mobile vehicle. Currently MST studies involve bringing water samples to a laboratory, performing analyses

Autonomous Systems for Monitoring Beach Water Quality
Preliminary Funding Commitment

and generating results in days, weeks or months depending on the scale of the study. With the electronic sample processor (ESP), an MST study could be done in a mobile vehicle. By quickly getting data on multiple qPCR targets in a sample (e.g., Enterococcus and human-associated HF183), there is the potential to literally "chase" a fecal pollution signal up into the watershed in near real-time. This will allow beach managers to more quickly identify sources of pathogen problems. This project will upgrade an existing instrument from an open-ocean design to a vehicle-based system, and develop a novel qPCR module that can rapidly test for multiple targets at once and accurately quantify them in-situ.

PROJECT DESCRIPTION

With the new EPA recreational water quality criteria released in 2012, qPCR technology is becoming more main-stream both for routine water quality monitoring and MST. The ability to automate this technology - and bring this automation out of the lab and into the field - has tremendous advantages for end users in terms of time savings, accuracy, precision, and real-time data. While great strides in qPCR *in situ* automation have already been made, there remain several key areas where improvement will realize the full potential of this technology for MST and water quality monitoring. These include reducing the size and increasing the portability of the instrument, making it possible to detect several target organisms rapidly, and accurately quantifying those targets *in situ* without repeatedly requiring complex assay standardization and calibration procedures.

The objective of this project is to develop an automated, field-portable instrument for tracking sources of microbial pollution that impact the beneficial uses of water bodies. The instrument will be simple to use, with automated sample concentration and analysis steps; the only requirements of the operator will be to input a water sample and perform a limited number of basic computer operations. The project goal will be achieved by adapting technology originally developed for detecting harmful algal blooms (HABs) and other water-borne microbes. The existing instrument, known as the ESP, was initially developed with a gene microarray approach to detect HAB species. Later, a relatively simple, single-reaction qPCR module was developed for the ESP. This qPCR-enabled ESP has been successfully deployed in open-ocean microbial ecology studies for water quality monitoring in pilot projects. The project will be to overhaul this device to quickly generate qPCR data for multiple targets and to re-design the instrument for portable field use.

Although the ESP has a proven track record in both autonomous operation and the identification of a variety of organisms, several modifications are needed to turn it into an effective easily portable platform for MST. SCCWRP will develop a new digital qPCR module. This new form of qPCR, known as "digital" PCR (dPCR), is very rapid and does not require repetitive, cumbersome and labor-intensive efforts to generate standard curves needed to calibrate the equipment. Recent work has shown that the standard reference materials are one of the largest sources of variability in qPCR; therefore the elimination of the calibration steps will improve the quantification and reduce the effort associated with applying PCR technology. In addition, dPCR is well-suited for detecting and quantifying multiple targets in a single run (multiplex reactions). Digital PCR is also highly flexible in terms of the range of targets that can be detected, and it is well suited for miniaturization. It is anticipated that this new device will detect and precisely quantify multiple targets in less time than it currently takes to autonomously quantify one target. The new prototype will be designed to fit easily in a car or van, as well as inside an autonomous underwater vehicle (AUV).

The total eligible cost of the Project is \$1,300,985. SCCWRP requested a CBI grant amount of \$1,300,985 for the Project.

ENVIRONMENTAL IMPACT

For this project, the Division has filed a Notice of Exemption (NOE) for CEQA compliance at the State Clearing House on May 22, 2013. The project meets the following exemptions:

Section 15306: Class 6 Information Collection - Basic data collection and research with no disturbance to an environmental resource. No environmental impacts are expected a result of this project.

FISCAL IMPACT

As of July 1, 2012, the cumulative balance available for the CBI Grant Program funded by Proposition 40, 50, and 84 is:

July 1, 2012:	\$49,520,820
Fiscal Year 2012-2013 Approved PFCs	--
Draft PFCs (proposed commitments):	\$6,032,454
SCCWRP - FAAST PIN: 24689	<u>\$1,300,985</u>
Funds Remaining for Future Commitments:	\$42,187,381

REGIONAL WATER BOARD IMPACT

The Project does not directly impact a Regional Water Board. The State Water Board's Division of Water Quality supports the Project.

ROUTINE, NON-CONTROVERSIAL PROJECT

The proposed Project is routine and non-controversial based on Division staff's consideration of the documents and information provided by SCCWRP, regulatory agencies, and written responses from the general public. There has been no indication of a protest or controversy regarding the proposed Project.

PUBLIC REVIEW

The PFC will be posted on the State Water Board's internet website for public review for 10 days.

APPROVAL

Using the authority delegated by the State Water Resources Control Board on June 05, 2012, in Resolution No. 2012-0020, I hereby:

Approve a Clean Beaches Initiative Grant Program Preliminary Funding Commitment of \$1,300,985 for SCCWRP's Autonomous Systems for Monitoring Beach Water Quality Project.

Elizabeth L. Haven, Deputy Director
State Water Resources Control Board

Date

SCCWRP
Autonomous Systems for Monitoring Beach Water Quality
Preliminary Funding Commitment

Division of Financial Assistance

Reviewed by:
Office of Chief Counsel
Date:

DRAFT