PROJECT ID:
576

In-Pipe Stormwater Treatment System

The prototype ITU. Windows cut out along the longitudinal plane allow maximum water flow while still providing structural support. (Photo Credit: Brandon Swope)

ITUs will be fitted with different mesh types.
(Photo Credit: Brandon Swope)

In addition, managers must demonstrate that they are using the Best Available Technology and/or Best Commercial Technology (BAT/BCT) for implementation of those BMPs. Previous studies have demonstrated surface cleaning technologies may be effective at contaminant removal, but in order to meet the concentrations specified in the NALs, a multifaceted BMP strategy may be required. Therefore, additional BMPs need to be identified and evaluated. This project is proposing one such BMP.

OBJECTIVE:

The objective of this project is to evaluate the efficacy of a novel in-pipe treatment system to aid with stormwater permit compliance.

PROBLEM STATEMENT:

Stormwater discharges from industrialareas of Navy installations have been failing stormwater regulatory limits (Numeric Action Levels (NAL)) for copper, zinc, oil & grease as well as end-of-pipe acute toxicity. Naval Base San Diego, Naval Base Point Loma and Naval Base Coronado have all received regulatory notification that they have exceeded National Pollutant Discharge System (NPDES) permit NALs and further compliance failure will result in Exceedance Response Actions (ERA), which are costly in terms of both time and money. NPDES permits require that Best Management Practices (BMP) are implemented in order to meet NALs.

DESCRIPTION:

This project seeks to remove particulate matter and other contaminants from stormwater discharges directly within the outfall pipe. The novel system will consist of a series of individual treatment units (ITU) that are connected and deployed in-line within a discharge pipe. The base design of each ITU will be similar—a hollow cylindrical unit approximately 12 inches long and 1-1/4-inch in diameter, with windows cut out along the longitudinal plane to allow for maximum water flow while still providing structural support. Each ITU can be customized for specific contaminants.

ITUs with different mesh sizes in the window will focus on particulate metals removal while ITUs loaded with various media will be able to remove other contaminants such as dissolved metals and oil & grease. The treatment type can be individualized to specific areas and contaminants and can be scalable

to larger diameter pipes as well. A series of multiple (10 to 20) ITUs can be attached to a flexible cable and deployed along a segment of pipe, depending on the outfall length.

This project seeks to remove particulate matter and other contaminants from stormwater streams directly within the outfall pipe.

It is well established that a large number of stormwater contaminants, especially metals, are associated with fine particulates. Additionally, sorbent materials have been shown to effectively remove oil from a waste stream. This project seeks to demonstrate technology that can remove both particulate matter and oil from stormwater waste streams.

This effort will build upon initial prototypes of a modular in-pipe BMP treatment system that has been designed and built through leveraged funding from the then-water program manager at Navy Region Southwest. This project aims to further modify those designs and test the devices for different mesh sizes and oil-removing media.

The effort will begin with bench scale testing. This testing will consist of deploying a series of ITUs in a mock outfall fall pipe. For particle removal, various mesh sizes will be evaluated under different configurations. A standard created with a known concentration of total suspended solids and particle size distribution will be dispersed in the mock outfall. A mass balance of particulate levels will be calculated to evaluate particle removal efficacy. The same process will be done with oil as the contaminant, although the ITUs will be outfitted with different media types and a starting and final concentration of oil will be measured.

Bench scale testing will be followed by a field demonstration, in which a series of ITUs will be deployed in an outfall that is known to have issues with metals and oil. Installation will occur before a storm event. Afterwards, the amount of particles/metals and oil removed by the system will be quantified, and the outfall concentrations will be compared against NALs and historical outfall data.

TRANSITION DESCRIPTION:

The technology will be working towards receiving a full patent. The project team will also will try to identify a commercial partner to help transition this technology into the hands of water program managers across the Navy.

The team will present the results of this effort to regional water boards for their acceptance of the new BMP. End users will be engaged throughout the project, and will be made aware of final results and potential for future transition. Team members will also work with end users to establish general operations and maintenance plans. This could take the form of a statement of work that water program managers can use to implement this technology at their installations.

CONTACT:

For more specific information about this project, contact the Principal Investigator at 619-553-2761. Contact the NESDI Program Manager at 805-982-4893 for more general information about the program.

ABOUT THE NESDI PROGRAM

The Navy Environmental Sustainability Development to Integration (NESDI) program is the Navy's environmental research and development demonstration and validation program, sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division and managed by the Naval Facilities Engineering Systems Command from the Engineering and Expeditionary Warfare Center in Port Hueneme, CA. The mission of the program is to provide solutions by demonstrating, validating and integrating innovative technologies, processes and materials and by filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Navy readiness and lethality.

Visit the program's public website at https://www.navfac.navy.mil/NESDI for more information.