



PROJECT ID:
574

Developing Lines of Evidence to Support Nutrient Compliance



The USS George H.W. Bush (CVN 77) sits in a NNSY dry dock. NNSY has been selected as the demonstration site for this project since the shipyard is currently required to monitor and report stormwater nutrient impacts.

(Photo Credit: Mass Communication Specialist Seaman Steven Edgar)



Water sample collection will be an integral component of this project. A variety of samples will be collected and analyzed for total phosphorous, total kjeldahl nitrogen and nitrogen dioxide/nitrate. (Photo Credit: Pat Earley)

OBJECTIVE:

To facilitate the development of reasonable Total Maximum Daily Load (TMDL) requirements, this project is developing an approach to identify all nutrient sources that contribute to total discharging outfall nutrient loads and engage regulators in the process.

PROBLEM STATEMENT:

Nutrient pollution is caused by excess nitrogen and phosphorus in the air and water, and it is one of the country's most widespread and challenging environmental problems. Nutrient discharges are regulated nationwide, but regulations vary by region. West coast Navy facilities tend to have regulatory permit requirements with associated consequences for violation (e.g., Pearl Harbor Naval Shipyard), whereas east coast facilities (e.g., Norfolk Naval Shipyard) tend to have monitoring requirements that are in early stages of contributing to TMDL assessments and potential future regulatory obligations.

Waterfront Navy facilities are located at the base of drainage systems carrying contaminants from upland (non-Navy) sources, yet Navy program managers are responsible for compliance with National Pollutant Discharge Elimination System (NPDES) limits, wherever the nutrients may originate. A better understanding of available technology and nutrient sources, coupled with improved management approaches would aid in meeting NPDES requirements.

DESCRIPTION:

This project team will conduct a detailed assessment of groundwater and stormwater nutrient loadings and incorporate watershed modeling to support a specific understanding of nutrient sources. Key to this process will be including regulators throughout the process, so that they can gain a comprehensive understanding of nutrient sources at Navy facilities—ideally before nutrient limits are established; however the approach can also apply to facilities with limits that are already in place.



Norfolk Naval Shipyard (NNSY) has been selected as the demonstration site for this project. This shipyard is currently required to monitor and report stormwater nutrient impacts.

The first step will be the generation of a conceptual model. The conceptual model will establish known sources of nutrients associated with NNSY as either inputs or outputs. Once a conceptual model is generated, then the appropriate nutrient monitoring/sampling will be performed. The sample plan will be incumbent upon the nutrient sources identified within the conceptual model.

This improved understanding will lead to more relevant TMDL requirements that take into account specific conditions in the watershed around a Navy facility.

Following the nutrient sampling, modeling exercises will take place. Four common models will be used to simulate the fate and transport of nutrient loads from the shipyard. The models will generate loading input and discharge concentrations that are simple to understand, which will aid in management decisions with regulatory authorities. As part of the modeling

effort, investigators will develop a mass balance that will be used to estimate all of the loading components and nutrient concentrations at given locations. The final product of the mass balance will be an estimation of the contribution from each identified source to the total nutrient loading for NNSY.

This project will also include the examination of radon and radium isotopic ratios within groundwater and/or seepage water to establish the source and nature of the water entering Navy property. Examining isotopic ratios of these elements will help determine if they are the same source, separate sources or a mixture of two sources. The use of isotopic analysis is a robust method for source identification because there are zero biological or organic processes that impact the result.

This stepwise approach includes identifying sources of nutrient inputs from groundwater, stormwater and facility operations to assure the Navy a better nutrient compliance posture. This improved understanding will lead to more relevant TMDL requirements that take into account specific conditions in the watershed around a Navy facility.

TRANSITION DESCRIPTION:

Demonstrating and reporting project success is the best method to transition this approach for more widespread use. The results will be presented in a condensed blueprint that other facilities can follow to aid in compliance with nutrient limits and meeting TMDL requirements. Water program managers and facility compliance officers may not be able to execute all of the steps individually, so they will be presented a logical, stepwise approach to support the development of Statements of Work and engage appropriate Navy or contract laboratories.

When appropriate, project success will be communicated to the Shipyard Clean Water Act Working Group and briefed at professional conferences such as Society of Environmental Toxicology and Chemistry.

CONTACT:

For more specific information about this project, contact the Principal Investigator at 619-553-5753. 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.