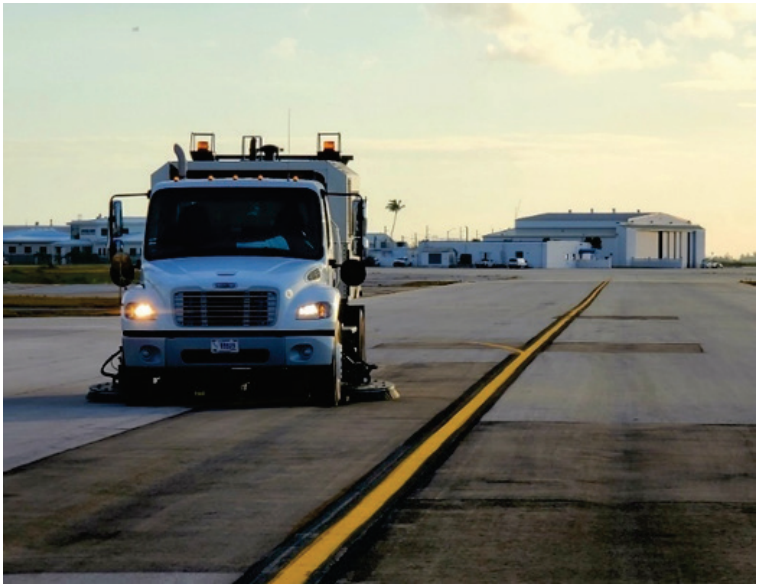
Assessing Emerging Chemicals of Concern and Loading from Navy Industrial Surfaces

PROJECT ID:
629



Street sweepers are one of many BMPs implemented by installations to help control debris, including tire wear particles, on impervious surfaces. (Image Credit: U.S. Navy photo by Rosamaria Gonzales/Released).

OBJECTIVE

This objective of this project is to pair the demonstration and validation (DEM/VAL) of a water vacuum sampling system (WRASSE) with in-house analytical methods to assess chemical loading on impervious surfaces.

PROBLEM STATEMENT

Water managers at Navy industrial facilities desire tools which accurately identify and measure the mass of chemicals fated for receiving waterbodies. These discharge areas are subject to regulatory control under National Pollution Discharge Elimination System (NPDES) permits to fulfill the Clean Water Act (CWA) requirements. NPDES permits set criteria for legacy pollutants with a reasonable potential to be present in a discharge, but these criteria are not set for constituents of emerging concern (CECs) like microplastics and tire wear particles (TWPs) despite States' calls to action. 6PPD is one such chemical that is added to tires to prevent degradation and extend lifespan. When it reacts with ozone from the air, it forms 6PPD-quinone (6PPD-q), which is toxic to coho salmon and other aquatic life.

DESCRIPTION

Wet-dry vacuums or sponges can extract water from horizontal surfaces but don't preserve sample integrity or quality. In contrast, the WRASSE uses negative pressure to collect water and particulates, depositing them directly into a certified clean sample bottle, ensuring sample quality. This direct flow minimizes sample loss and sample contamination, addressing QA/QC concerns for field sampling metals and microplastics when combined with clean sampling techniques.

Project team members supporting this 3-year effort will routinely sample predetermined sites at Puget Sound Naval Shipyard (PSNS). Using prescribed standard operating procedures (SOPs), the team will collect samples using stratified or transect sampling methods. This variety of sampling designs will account for unique spatial variability and pollutant distributions at different sites (i.e., roadways, parking lots, lay-down areas) where hot spots and rare characteristics consistent with non-homogenized distributions of particulates and debris may be present. Nearby best management

practices (BMPs) will be evaluated before and after implementation for their effectiveness with respect to TWPs.

Samples will be processed and analyzed at the NIWC Pacific laboratories for organic and inorganic constituents of concern, including microplastics. Organic analyses will specifically focus on dissolved 6PPD-Q leachates from collected particulates as this has recently become more of a regulatory concern for Washington State. TWPs contribute this chemical to surface waters via stormwater, potentially resulting in toxic effects to aquatic species and/or risking non-compliance for Navy discharges if above emerging regulatory thresholds.

At the conclusion of this effort, load values for TWPs will be calculated and effectiveness of associated BMPs will be determined.

RETURN ON INVESTMENT

The return on investment (ROI) for the WRASSE device can be significant for the Navy, with savings in labor, time, and operational costs. By enabling a single operator to conduct efficient sampling, the system reduces personnel requirements and training time, cutting the associated costs. The streamlined workflow speeds up data collection, improving operational efficiency and reducing fieldwork time. Additionally, the device's reliable, reproducible data supports better pollution management decisions, helping avoid costly fines and environmental remediation. With its low maintenance and long-term use, the WRASSE enhances the Navy's operational capacity while ensuring regulatory compliance, ultimately providing strong ROI over time.

NAVY BENEFITS

This lightweight, portable system provides significant benefits to the Navy by enabling a single operator, with minimal training, to efficiently use the WRASSE for sampling impervious surfaces. By streamlining the workflow, the system reduces the time, personnel, and costs typically associated with both large- and small-scale monitoring efforts. Navy personnel will be able to acquire and operate this equipment, enhancing their capability to support ongoing monitoring. With reliable sampling methods and reproducible field collection, the system helps Navy facility managers meet data quality objectives (DQOs) for site characterization, providing critical data that will inform pollution management decisions.

TRANSITION DESCRIPTION

Site managers will receive regular briefings throughout the project on the results, culminating in a final report with a framework for adaptive management of pollutant loading related issues. Additionally, a SOP will be developed to outline sampling methods and spatial analyses for the different strata within a shipyard. This SOP will serve as a guide for site managers to implement these methods in the future, allowing for evaluation as new operations or BMPs are introduced.

CONTACT

For more specific information about this project, contact the Principal Investigator at nicolas.c.sarracco.civ@us.navy.mil.

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 Office of the Chief of Naval Operations (OPNAV) Compliance and Mission Readiness Division (N4I1) and managed by the Naval Facilities Engineering Systems Command (NAVFAC) from the Engineering and Expeditionary Warfare Center (EXWC) in Port Hueneme, CA.

The mission of the NESDI program is to support Fleet readiness by minimizing operational constraints associated with environmental and human health risks and to reduce cost of environmental compliance by demonstrating, validating, and integrating innovative technologies, processes, materials, and by filling knowledge gaps.

For more information, visit the program's web site at www.navfac.navy.mil/nesdi
or contact the NESDI Program Managers at NESDI.fct@navy.mil