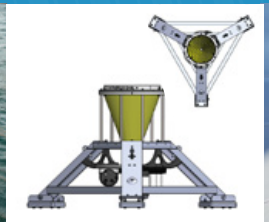
2022
YEAR IN REVIEW REPORT

Accomplishments of the

NAVY ENVIRONMENTAL SUSTAINABILITY DEVELOPMENT TO INTEGRATION PROGRAM



MISSION OF THE NESDI PROGRAM

The mission of the NESDI program is to provide solutions by demonstrating, validating and integrating innovative technologies, processes and materials; and filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Navy readiness and lethality. The program seeks to accomplish this mission through the evaluation of cost-effective technologies, processes, materials and knowledge that enhance environmental readiness of naval shore activities and ensure they can be integrated into weapons system acquisition programs.

The NESDI program is the Navy's environmental shoreside Research, Development, Test & Evaluation (RDT&E) program. The NESDI technology demonstration and validation program is sponsored by OPNAV N4I Installations Division and managed by the Naval Facilities Engineering Systems Command (NAVFAC) out of the Engineering and Expeditionary Warfare Center (EXWC) in Port Hueneme, CA. The program is the Navy's complement to the Environmental Security Technology Certification Program (ESTCP) which demonstrates and validates technologies important to the Department of Defense tri-services and the Department of Energy.

AVAILABLE FOR DOWNLOAD AT:
HTTPS://EPL.NAVFAC.NAVY.MIL/NESDI

INTRODUCTION

Ken Kaempffe

Welcome to the Navy Environmental Sustainability Development to Integration (NESDI) program's fiscal year (FY) 2022 Year in Review report.

This year's streamlined report highlights our efforts to recover from the challenges resulting from the COVID-19 pandemic where our investigators concentrated on project execution including intensive field and laboratory work.

From 1994 to the present year, the NESDI program has been funded as high as $10.2M in one year (2003) to as low as $3.7M (in 2015). Our future year funding is planned at approximately $5.8M.

Many of our projects enjoyed significant successes in FY22. In particular, I would like to draw your attention to the following projects of which more details can be found on pages 15 and 13 in this report.

In-Pipe Stormwater Treatment System (project no. 576) led by Brandon Swope of Naval Information Warfare Center (NIWC) Pacific evaluated the efficacy of a novel in-pipe treatment system to aid with stormwater permit compliance. Investigators completed the first field demonstration with a "commercializable" version of the best management process. Results were promising with reductions in total suspended solids, copper and zinc. A few final design modifications were made to further optimize the system and a patent for the system was issued in early October 2022.

INTRODUCTION (continued)

Innovative Activated Carbon Filters to Address Vapor Intrusion within Commercial/Industrial Buildings (project no. 571) led by Kirsten Marble of NAVFAC EXWC demonstrated an air filtration system that removes trichloroethene from indoor air and then provides Remedial Project Managers with a guide to the optimal selection, operation and maintenance of air purifying filters for vapor intrusion mitigation. During this reporting period, investigators completed laboratory testing of all three filter media, two of which performed better than expected—no breakthrough was observed in the laboratory. All three filter media were then demonstrated on board the Washington Navy Yard.

We also launched seven "new start" projects in FY22 — three of which are tackling the challenges associated with per and polyfluoroalkyl substances (PFAS) including quicker identification of PFAS in soil (project no. 605), treating PFAS co-constituents (project no. 606), and the use of a mobile unit to destroy PFAS in aqueous media (project no. 608).

All of these efforts are presented on the program's website (at https://epl.navfac.navy.mil/nesdi (CAC required)), our quarterly newsletters (*NESDI News: Highlights & Happenings*) and fact sheets.

These efforts would not have been achievable without the support and guidance that we receive from our resource sponsor, OPNAV N4I Installations Division, and members of our management team—the Technology Development Working Group (TDWG). I am grateful to you all.

I hope you find this Year in Review report to be a useful resource for additional insights into our projects and the overall operation and continued success of our program in FY23 and beyond.

Ken Kaempffe, P.E.
Program Manager
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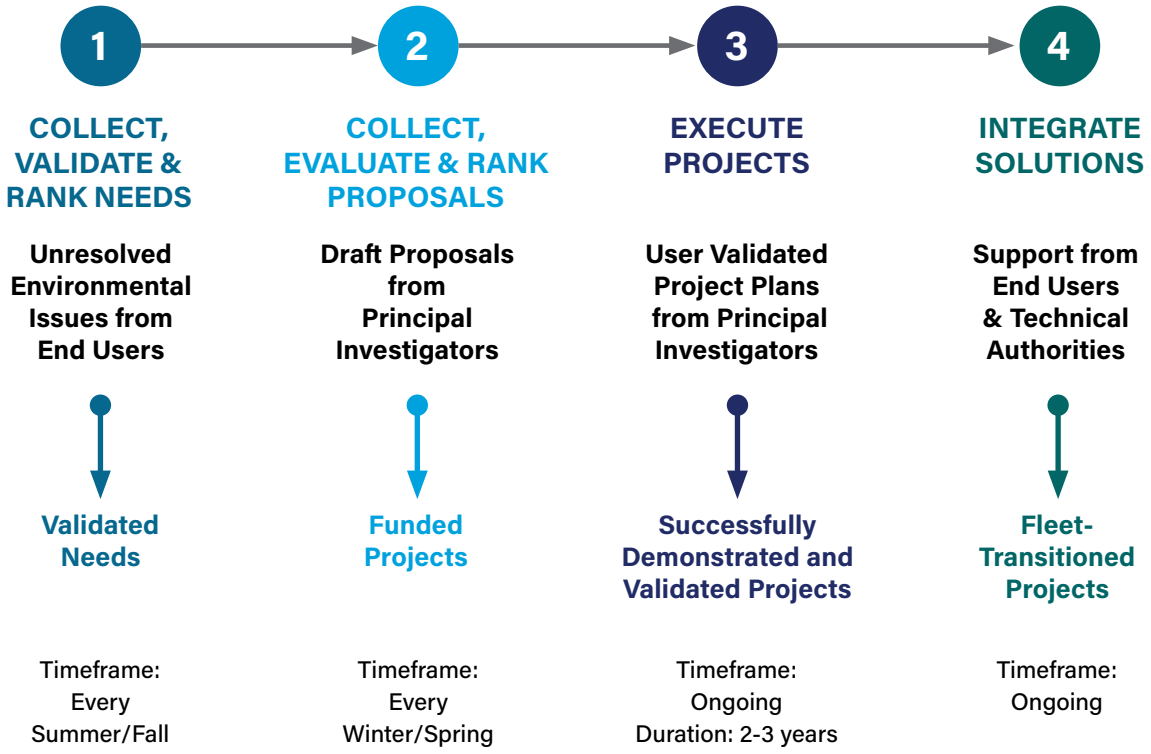
THE NESDI PROGRAM PROCESS

Each year, the NESDI program typically executes a four-phase process to ensure the comprehensive collection of outstanding needs from across the Navy through the successful transition of workable solutions into the Navy's shoreside operating environment and its range testing and training activities. Throughout this process, the program's targeted customers—including need submitters, end users, technical authorities and other stakeholders—provide valuable input to develop meaningful needs, support the ongoing execution of individual projects, and help to ensure the successful integration of resultant technologies and other innovations.



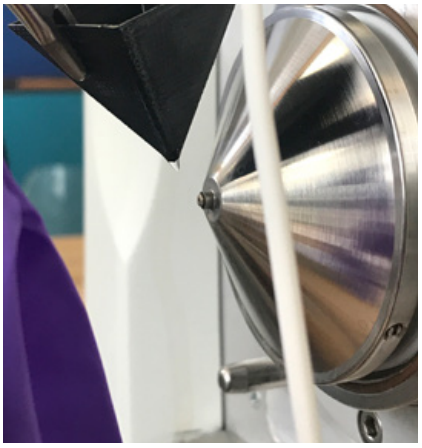
OUR SEVEN FY22 "NEW START" PROJECTS

In the fourth quarter of FY22, the NESDI program launched seven "new start" projects — three of which are tackling the challenges associated with per- and polyfluoroalkyl substances (PFAS) including quicker identification of PFAS in soil (project no. 605), treating PFAS co-contaminants (project no. 606), and the use of a mobile unit to destroy PFAS in aqueous media (project no. 608). The FY22 "new starts" also include an effort to demonstrate the capability of artificial intelligence (AI) and machine learning (ML) to predict the risk of an installation experiencing future Notices of Violation (project no. 607). Brief introductions to all FY22 "new start" projects can be found on the following pages.

3D-Printed Cone Spray Ionization Mass Spectrometry for the Rapid, Low-Cost and In-Situ Detection and Mapping of PFAS in Soil (project no. 605)

PRINCIPAL INVESTIGATOR: Patrick Fedick, Ph.D.

Traditional analysis methods for PFAS detection utilize time-consuming extraction methods followed by lengthy chromatographic separations with mass spectrometry detection. To overcome these issues, a cone spray ionization (CSI) method is used, consisting of a three-dimensional cone constructed of folded filter paper, which allows solid samples to be placed within the hollowed compartment. A hole at the tip of the cone allows PFAS to pass through for analysis. While this method produces good results, reproducibility can be a limitation due to variability of the manual cone construction. This team is using a rigid, 3D printed CSI (3D-PCSI) cone to replace the hand-shaped cone. The 3D-PCSI mass spectrometer will also be improved through the use of an autosampler, which will hold 6-8 cones at a time. This will result in a process that is at minimum 30 times faster than traditional chromatography MS.



Analysis of PFAS in bulk soil by 3D-printed cone spray ionization mass spectrometry.
(Photo Credit: Patrick Fedick)

OUR SEVEN FY22 "NEW START" PROJECTS (continued)

The XCPC system. (Photo Credit: Winston Cone Optics)

External Concentrating Parabolic Collector (XCPC) Solar Thermal Evaporation for PFAS-Impacted Wastewater Minimization (project no. 606)

PRINCIPAL INVESTIGATOR: Hunter Spence

Evaporation is an attractive option to reduce the volume of PFAS-impacted wastewater because PFASs of interest do not readily volatilize during boiling, and thus do not leave the bulk solution during evaporation. The External Compound Parabolic Concentrator (XCPC) is an emerging technology that, when combined with a commercial off-the-shelf (COTS) thermal evaporation unit and a steam condenser, is capable of achieving wastewater volume reductions of greater than 90 percent. This project will demonstrate and evaluate an XCPC system. At the end of the project, a peer-reviewed academic paper will document the results of the demonstration, and will serve as supporting evidence to regional regulators of the scientific validity of using this technique.

Artificial Intelligence for Environmental Compliance (project no. 607)

PRINCIPAL INVESTIGATOR: Hunter Klein

The objective of this effort is to demonstrate the capability of artificial intelligence (AI) and machine learning (ML) to predict the risk of an installation experiencing

OUR SEVEN FY22 "NEW START" PROJECTS (continued)

a future notice of violation (NOV) or noncompliance event.

Recent improvements in memory capacity, processing speed, and programming tools have made analytics via AI/ML more accessible and powerful than ever before. ML models present a way to evaluate large volumes of data to look for patterns, trends, relationships and other associations that can help the Navy to understand and predict the potential for violations. This project team will select candidate ML models based on prediction method and data constraints and apply them to identified regulatory data repositories. The end goal is to select a model or models that can be used to predict the probabilities of certain noncompliance events.

Machine learning and artificial intelligence are becoming part of everyday data science training programs. (Photo Credit: Elisha Gamboa)

Soil and/or wastewater from well installations can be a source of per and polyfluoroalkyl substances. (Photo Credit: Theanne Tangen)

Application of Supercritical Water Oxidation (SCWO) to Destroy PFAS-Impacted Waste Streams (project no. 608)

PRINCIPAL INVESTIGATOR: Ramona Iery, Ph.D.

This team is designing and demonstrating a mobile Supercritical Water Oxidation (SCWO) demonstration system capable of destroying PFAS. The SCWO technique has been demonstrated in the laboratory to destroy PFAS in various aqueous solutions. SCWO destroys PFAS compounds to form carbon dioxide, water, and hydrofluoric acid (HF). HF is neutralized with a base such as sodium hydroxide prior to discharging the treated water. SCWO differentiates itself from other PFAS treatment technologies in several ways, including the fact that it can destroy PFAS in aqueous media in less than 10 seconds.

OUR SEVEN FY22 "NEW START" PROJECTS (continued)

Because SCWO destroys PFAS rather than transferring them to other media, it eliminates future liability to the Navy. Successful demonstration of SCWO will validate it for application at sites having PFAS-impacted wastes and will provide data necessary for Navy project managers to assess the efficacy and cost of the technology.

Oxsol-Free and Low-VOC Surface Ship Topside Coatings for Maintaining Environmental Regulations (project no. 609)

PRINCIPAL INVESTIGATOR: Erick Iezzi, Ph.D.

Parachlorobenzotrifluoride (PCBTF), commercially known as Oxsol 100, is used in haze gray coatings for the exterior topside of Navy surface ships because it is the only solvent that is VOC-exempt with a flash point of greater than 100 degrees F. However, this solvent was recently deemed carcinogenic, and regulators in California plan to remove it from their VOC-exempt list. This project is performance testing Oxsol-free and low-VOC polysiloxane topcoats. Products that meet all requirements will be approved by NAVSEA and added to the Qualified Products List. In addition, Naval Research Laboratory will work with the coating manufacturers and Defense Logistics Agency (DLA) to obtain new national stock numbers for successful reformulated topside coatings.

Sailors painting the freeboard of the USS Essex (LHD-2) with single-component polysiloxane topcoat.
(Photo Credit: Erick Iezzi)

OUR SEVEN FY22 "NEW START" PROJECTS (continued)

Evaluation of Existing and Required Pierside Infrastructure to Accommodate Shoreside Collection and Treatment of Navy Vessel Ballast Discharges (project no. 610)

PRINCIPAL INVESTIGATOR: Rachel Jacobs

Ships regulate their draft, trim, and list by adding or removing ballast water from designated storage tanks. There are two types of tanks: "clean" ballast tanks are for seawater storage only; "compensated fuel ballast (CFB)" tanks hold a combination of seawater and fuel. Loading and offloading ballast water can result in the spread of nonindigenous species, and requires substantial management practices to prevent any fuel discharges into receiving waters. Shoreside collection can be used as an alternative option to manage ballast water discharge and could be an ideal practice for Navy vessels, especially for ship designs with insufficient footprint for integrated ballast water management. However, there are no designated ballast water receiving facilities in the U.S. and there are significant knowledge gaps regarding the infrastructure needed to implement this option. The purpose of this project is to create an initiation decision report (IDR) that investigates and identifies these knowledge gaps.

The CMU at Naval Station Everett.
(Photo Credit: Rachel Jacobs)

Subsurface Fate and Transport of Petroleum Based Contaminants in Naval Facilities (project no. 611)

PRINCIPAL INVESTIGATOR: Mario Malfavon

In the past decade, many successful studies have been conducted regarding the fate and transport of contaminants in surface water at naval facilities. A primary reason for these successes is the use of powerful modeling tools which have been accepted by regulators

OUR SEVEN FY22 "NEW START" PROJECTS (continued)

to help address compliance issues. This project seeks to further develop the Navy's in-house groundwater modeling capabilities to equip site/facility managers with the scientific knowledge they need for accurate research, development and decision-making—all without the significant cost of relying on contractors.

Camp Pendleton Beach is the site of ongoing efforts to study groundwater impacts, and is providing leveraged funding for this project. (Photo Credit: Sergeant Maximiliano Rosas)

PROJECT ACCOMPLISHMENTS

In this chapter of the FY22 Year in Review report, we highlight the projects that achieved notable accomplishments over the course of this fiscal year.

Biochar Adsorption for Dry Dock Effluent (project no. 560)

PRINCIPAL INVESTIGATOR: Lewis Hsu , Ph.D.

The goals for this project were to evaluate the use of biochar as a Best Management Practice that could aid in compliance with the metal content in dry dock discharges. In previous years, custom filters were designed for Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility (PHNSY&IMF) with the goal of reducing copper and zinc concentrations in dry dock effluent during storm events.

A submarine awaits repair in dry dock.
(Photo Credit: MCS 1st Class Amanda R. Gray)

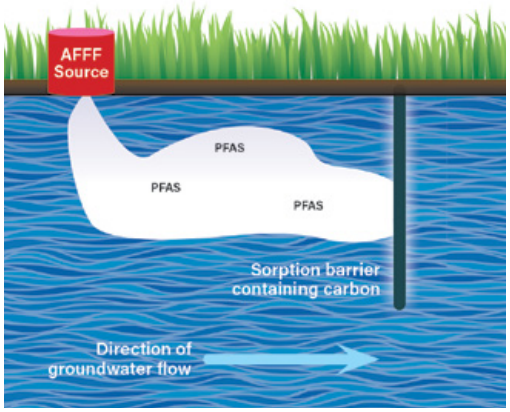
The filters and biochar media were successfully installed in the dry dock for evaluation as a best management practice during ongoing project work. Storm event samples were collected this year with final analysis pending for FY23. Work in FY23 will focus on determining the efficiency of the biochar filters and turnover of the physical filters to environmental personnel at PHNSY&IMF.

Field Demonstration of Colloidal Activated Carbon for In-situ Sequestration of Per- and Polyfluoroalkyl Substances (project no. 569)

PRINCIPAL INVESTIGATOR: Tony Danko, Ph.D.

This project demonstrates and validates the field application of colloidal activated carbon for in situ sequestration of PFAS in groundwater—mitigating the migration of these compounds. During this reporting period, investigators completed column tests which demonstrated that Colloidal Activated Carbon (Plumestop®) mitigated PFAS flux in the experimental timeframe

PROJECT ACCOMPLISHMENTS (continued)



(Illustration Credit: Nancy Horvat)

(simulated two years of ground-water flow). After this initial success and approval to proceed from the NESDI program, investigators completed additional site characterization and other pre-injection field efforts (including installing passive flux meters and piezometers, and conducting baseline sampling). Team members then injected Plumestop and visually inspected the soil cores. Groundwater samples will be collected and analyzed in early FY23.

Innovative Activated Carbon Filters to Address Vapor Intrusion within Commercial/Industrial Buildings (project no. 571)

PRINCIPAL INVESTIGATOR: Kirsten Marble

This project is demonstrating and validating an air filtration system that will remove trichloroethene (TCE) from indoor air and then provide Remedial Project Managers (RPM) with a guide to the optimal selection, operation and maintenance of air purifying filters for vapor intrusion (VI) mitigation.

During this reporting period, investigators completed laboratory testing of all three filter media (granular activated carbon (GAC), zeolites and SmogStop®). The zeolites and GAC performed better than expected, so for these two media, breakthrough was never observed in the laboratory. All three filter media were demonstrated in the crawlspace of Building 46/67 at the Washington Navy Yard (WNY). The construction manager for Building 46/67 expressed interest in using the filters in another WNY building (Building 210) which is under construction and in need of a VI mitigation solution that does not disturb the building envelope.

Carbon-based indoor air filter.
(Photo Credit: Austin Air)

Carbon filter used in indoor air filter.
(Photo Credit: Austin Air)

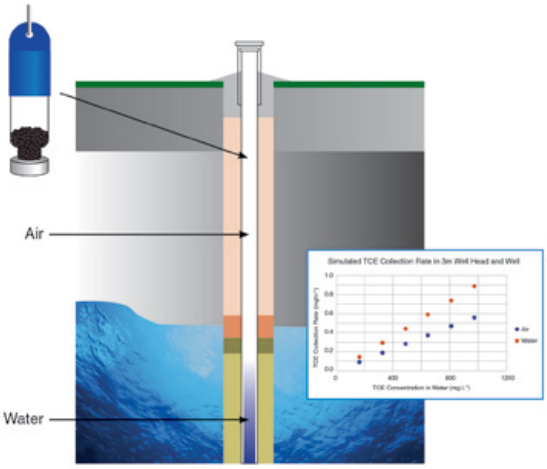
PROJECT ACCOMPLISHMENTS (continued)

In-Well Headspace Samplers for Long-Term Groundwater Chlorinated Hydrocarbon Monitoring (project no. 573)

PRINCIPAL INVESTIGATOR: Tom Boyd, Ph.D.

This project is validating the use of commercially available passive samplers for long-term monitoring of groundwater contaminant concentrations. Samplers were deployed in two wells with low and high relative historical trichloroethene (TCE) concentrations. Results indicate samplers may be deployed for over six months at wells with high TCE concentrations without overloading the samplers.

Using these data, final field-design samplers were deployed at eight separate wells — having varying historical TCE concentrations. Samplers were deployed immediately following a low-flow sampling event (which will provide "starting" TCE concentrations). Samplers were deployed with varying thickness polydimethylsiloxane (PDMS) plugs, at varying depths, and with varying headspace between plugs and groundwater.



By suspending samplers in well headspace (and by adding additional transitions) deployments can be lengthened to integrate in situ concentrations over long collection periods.

After the first several deployments, an average time (start-to-finish) to measure tubing, insert plugs, insert tubing into a well and seal in a commercial sampler was less than 10 minutes (typical low-flow sampling may take hours for a given well). Commercial samplers will be strategically left or recovered and replaced after approximately three months and again around six months. Final recovery will be timed with the next low-flow sampling event to integrate in situ calculated concentrations with low-flow sampling values. Variables such as costs, time-to-deploy, time-to-recover, sample analysis time and qualitative variables (e.g., deployment ease) will also be recorded and accumulated during all field work.

PROJECT ACCOMPLISHMENTS (continued)

Contaminant Monitoring and Mapping for Informing Stormwater Best Management Practices (project no. 575)

PRINCIPAL INVESTIGATOR: Patrick Sims, Ph.D.

This effort is demonstrating a handheld technology to identify and quantify sources of copper and zinc in stormwater runoff that provides the information needed to optimize the Best Management Practices (BMP) designed to mitigate those sources. During FY22, project investigators rapidly screened for metals using laser-induced breakdown spectroscopy (LIBS) to inform targeted remediation at sites at Naval Base San Diego (NBSD) and NAS North Island. At the NBSD site, the field screening with targeted remediation achieved 7-year lows for total zinc and copper concentrations in stormwater. These lows correspond to a 7-to-35 fold reduction for zinc and a 2-to-10 fold reduction for copper when compared to prior sampling results over that period.

The LIBS analyzer will be used to measure contaminants on urban/industrial surfaces and within soils. (Photo Credit: Patrick Sims)

Investigators presented their work at the Association for Environmental Health and Sciences Foundation Soil, Water, Energy and Air Conference showcasing that rapid screening of metals in particulate matter using LIBS correlates with the traditional metal quantification approach of inductively coupled mass spectroscopy. They also discussed the use of the LIBS device to map contamination levels.

In-Pipe Stormwater Treatment System (project no. 576)

PRINCIPAL INVESTIGATOR: Brandon Swope

The objective of this project was to evaluate the efficacy of a novel in-pipe treatment system to aid with stormwater permit compliance. Investigators successfully completed the first field demonstration with a "commercializable" version of the in-pipe stormwater BMP.

PROJECT ACCOMPLISHMENTS (continued)

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

The system was evaluated over the course of several storm events at Naval Amphibious Base Coronado. Results were promising with reductions in total suspended solids (TSS), copper and zinc. A few final design modifications were made to further optimize the system. A patent for the system (U.S. patent no. 11459744) was issued on 4 October 2022. Future work will include controlled BMP evaluation at the newly constructed pseudo-pipe testing site at Naval Information Warfare Center (NIWC) Pacific. The system consists of a 12-inch diameter, 30-foot-long pipe segment, with the ability to pump water representative of various storm flows. Additional work will focus on technology transition, both to additional sponsors and end users, as well as a path to commercialization.

Mesocosm Field Testing of In situ PFAS Treatment Trains (project no. 578)

PRINCIPAL INVESTIGATOR: Nick Hayman

The objective of this project is to develop methods for the Navy to evaluate PFAS sorbents cost effectively, in addition to evaluating commercial sorbents for a variety of water quality conditions using those same methods. The investigators have submitted a manuscript of the results of their laboratory testing on the efficacy of various sorbents in removing PFAS in various synthetic groundwaters for peer-review. In addition, the investigators have developed an apparatus for field-testing the PFAS sorbents on-site. This unit will allow site managers to test various sorbents using their actual groundwater to select the optimal sorbent, accounting for site-specific characteristics hard to capture in laboratory studies.

Investigators are currently demonstrating the apparatus at former Marine Corps Air Station

Possible sorbents to be evaluated in this project include granulated activated carbon, ion-exchange resin and biochar. (Photo Credit: Nick Hayman)

PROJECT ACCOMPLISHMENTS (continued)

Tustin (which is now a BRAC site) in the fall of 2022. They have presented data on this project at various venues including a poster at the 2022 SoCal Society of Environmental Toxicology and Chemistry (SETAC) annual meeting and a poster at the North America (SETAC) annual meeting and the Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology and Certification Program (ESTCP) Symposium as well as a project brief to the Tustin Restoration Advisory Board.

Development and Implementation of Methods to Reduce Sealant Waste in Fleet/Depot Level Operations (project no. 580)

PRINCIPAL INVESTIGATOR: Diane Kleinschmidt

To reduce the quantity of expired hazardous materials (HAZMAT) disposed of annually and improve fleet readiness, one of the primary goals of this project was to demonstrate cure property indicators of polysulfide and polythioether sealant degradation that would lead to development of a simple test protocol/tool kit for assessing sealant usability at or beyond its shelf life initially for Fleet Readiness Center (FRC) and potentially for operational-level users with low risk of sacrificing sealant performance.

This NESDI project seeks to develop a simple test protocol for assessing sealant usability of various aircraft programs (including the F/A-18F Super Hornet). (Photo Credit: Mass Communication Specialist Seaman Apprentice Conner Foy)

Thus far, investigators have tested seven representative sealants from various manufacturers with over 16 months of aging environments of conditions both natural (per manufacturer instructions) and consistent with worst-case hot-location storage. They have also demonstrated the simple cure property tests to multiple HAZMAT center personnel at FRC Southwest to assess ease of transition of the process. The following are highlights of project efforts:

1. Regardless of storage environment, tensile strength/elongation and peel specimens passed well beyond the 9-month shelf life (SL). Of sealants tested, worst case for tensile/elongation suggests a minimum of 16 months (SL +7 months) and for peel suggests a minimum of 12 months (SL +3 months).

PROJECT ACCOMPLISHMENTS (continued)

2. Standard cure time, measured by hardness, is unaffected by storage conditions or age such that if the sealant cures, it will reach required thresholds and the field-capable tests (application time, tack-free time) are the early indicators of sealant degradation vs the "gold standard" laboratory tests (tensile strength/ elongation, peel strength).
3. HAZMAT center personnel at FRC Southwest found the simple cure property tests would not require any additional training.

Alternatives to Cadmium (ACE) for Electrical Wiring and Interconnect System (project no. 581)

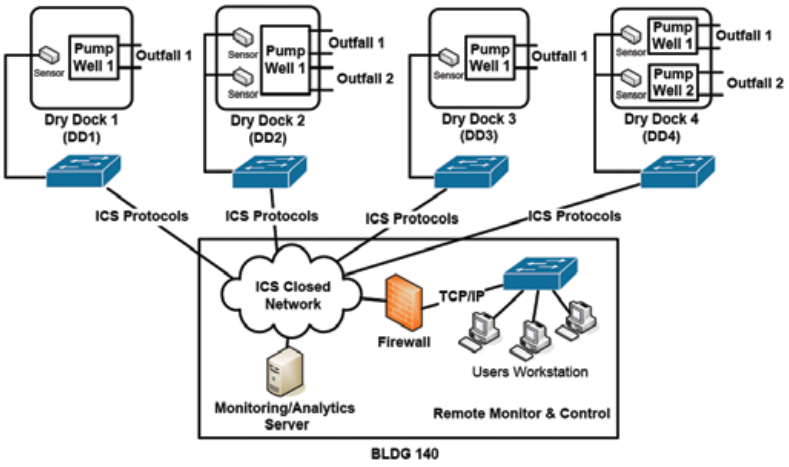
PRINCIPAL INVESTIGATOR: Joe Marchica

This project is assessing the performance issues surrounding zinc-nickel and other cadmium-alternative plating technologies for Electrical Wiring and Interconnect System (EWIS) components. Conductivity, wear resistance and corrosion resistance will be assessed including the questions associated with the mating and demating of these components with legacy cadmium-plated components. During this reporting period, project investigators successfully demonstrated the Navy Electrical System Testbed (NEST) prototype, using it to conduct a 4.5 month-long outdoor exposure test on MIL-DTL-38999 and MIL-DTL-85049 EWIS components. Based on preliminary results, commercially available options are not sufficient to replace cadmium in moderately harsh service environments. Following these tests, investigators swapped out the replaceable NEST components and began testing a second harness. Once all components were secured, AWTS testing was initiated.

Degraded wires (left) and degraded connectors (right) from the V-22 Osprey Full Authority Digital Engine Control (FADEC) and Flight Control Wiring.
(Photos compliments of NAWC-AD Patuxent River Wiring Laboratory.)

Two avenues of work remain, including follow-on testing to eliminate the remaining barriers to transition for any finishes whose corrosion resistance and wear performance during testing warrants it and the development of the NEST from a prototype into a polished asset that can be used for future testing projects, or even incorporated into the appropriate specs and qualification tests.

PROJECT ACCOMPLISHMENTS (continued)



Conceptual framework for closed network monitoring solution with data analytics and user interface. (Schematic Credit: Henry Au)

Sensor Interface and Instrumentation Monitoring (project no. 582)

PRINCIPAL INVESTIGATORS: Lewis Hsu , Ph.D. and Henry Au

This project is developing an integrative approach to implementing near real-time monitoring of environmental data in areas where communications infrastructure is poor or lacking. The project team has designed and vetted a long-range wireless networked telemetry solution from DISA-approved hardware and implemented cybersecurity measures to help with future accreditation packages aimed at gaining Authority to Operate. The project team is working with environmental engineers at Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY&IMF) to provide discharge monitoring data from the waterfront to the environmental offices. The team has also worked with the stakeholders to develop a graphical user interface (GUI) with predictive analytics to assist in identifying situations at high risk of non-compliance with regulatory permits. The network was assembled and tested outdoors for data transfer speeds and stability at the NIWC Pacific facilities in Hawaii to verify performance at long distances. Work is ongoing to complete installation of physical infrastructure at various PHNSY&IMF sites and is expected to be completed in FY23 so that operational test and evaluation of the network can be completed. Additional work will look at training end-users on the equipment and GUI interface as well as assisting with turnover of the system if it meets expectations.

PROJECT ACCOMPLISHMENTS (continued)

Evaluating Potential Effects to Marine Biota from Small-scale, Legacy Radioactive Objects (project no. 593)

PRINCIPAL INVESTIGATOR: Nicolette Andrzejczyk, Ph.D.

This project is evaluating the potential for detrimental effects on marine biota of small-scale objects containing radioactive material relevant to the U.S. Navy. Investigators have initiated a literature review which includes the compilation of a database listing of the thermodynamic constants for radium bonding with various environmentally relevant anions. A technical paper related to measurement techniques is in progress.

Sediment sorption experiments using radium-painted watch hands obtained from an online vendor considered the influence of seawater concentration and pH on radium sorption. Results suggest that the distribution coefficient decreases significantly with seawater concentration but does not change significantly across the range of pH considered (7-9). Soil characterization studies are underway including the analysis of surface area, elemental analysis, particle size analysis, x-ray diffraction, total organic matter content and cation exchange capacity. Investigators completed initial experiments on the uptake of aqueous Radium-226 in mussels. Sample processing and manuscript writing are underway. Investigators were able to leverage an already-scheduled dredging activity in San Diego Bay to collect the targeted sediments which resulted in a savings of $100,000 in sampling contractor expenditures. Future plans include the completion of the literature review and sediment characterization studies to inform the development and completion of a geochemical model. Investigators will also continue with the necessary mussel exposure experiments and initiate dose and food chain modeling.

Radium painted dials like the one on this ship's clock can contain small, usually microscopic, radioactive particles and are sometimes found in the marine environment at Department of Navy locations. (Photo Credit: Jovan Popovic)

PROJECT ACCOMPLISHMENTS (continued)

AquaGate+ amendments being deployed at a Navy site. (Photo Credit: Courtesy of ESTCP project no. ER-201131)

Demonstration and Application of Amendments Targeting Comingled Organics and Metals in Sediments (project no. 594)

PRINCIPAL INVESTIGATOR: Gunther Rosen

The objective of this project is to demonstrate and validate performance and stability of sediment amendments towards in situ treatment of comingled organic- and metal-contaminated sediments at Navy facilities. Sediment amendments, including sorbents such as powdered activated carbon (PAC), have proven to be effective alternatives to potentially more expensive or complicated means of sediment remediation, including dredging and capping.

Earlier results from this project identified multiple amendments, including PAC and other cost-effective materials, that could be useful either alone, or potentially in combination, towards reducing ecological risk associated with PCBs and metals. Cost and availability of candidate amendments was a key factor towards selection for further evaluation.

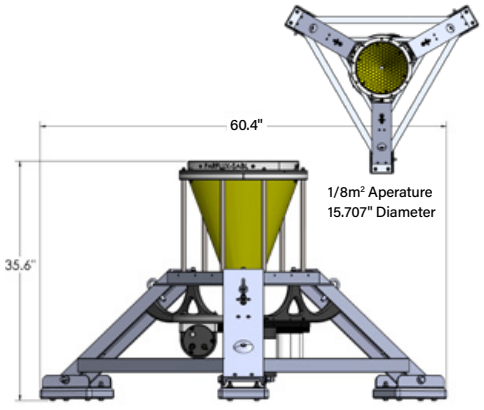
During FY22, laboratory data derived for multiple Navy contaminated sediment sites were used to down-select amendments towards a field study using a DoD-validated mesocosm technology at one site (Naval Support Facility Indian Head). The 5-month-long field study incorporated AquaGate®+ as a delivery mechanism of the powderized amendments to field sediments, followed by multiple measures of sediment quality including bulk sediment concentrations, bioaccumulation endpoints, and passive sampling for both metals and PCBs. A final laboratory-based study on samples recovered from the field demonstration will commence in early FY23 towards verification of the most suitable amendments for potential application at contaminated Navy sediment sites.

PROJECT ACCOMPLISHMENTS (continued)

Demonstration of a Signal Activated Bottom Lander Trap (project no. 595)

PRINCIPAL INVESTIGATOR: Molly Colvin

This project is developing and demonstrating an automated technology that can aid sediment remediation efforts by targeting specific particle discharge or resuspension events. During this reporting period, NIWC investigators accepted delivery of two signal activated bottom lander (SABL) sediment traps and successfully established remote communications with the units. Remote communications were established through the use of a cellular modem to act as a serial cellular gateway. The modem is directly connected to the SABL units via a communications cable. The user can remotely connect to the SABL from any wireless connection via a Virtual Network Connection (VNC) and actively control the SABL unit to move the rotator platform to enable collections of unique sediment deposition samples.



This NESDI project is developing and demonstrating an automated technology (a signal-activated bottom lander) that can aid sediment remediation efforts by targeting specific particle discharge or resuspension events. (Schematic Credit: Courtesy of McLane Research Laboratories)

Preliminary deployments off the NIWC research pier confirmed remote connectivity while the unit was deployed an approximately 15-foot depth over a 5-day period. A full demonstration deployment at Naval Base San Diego was conducted December 2022 through February 2023. The deployment successfully captured 12 unique depositional events. Current efforts include the processing of the contents for direct comparison of the SABL unit to the standard passive traps which were demonstrated alongside the SABL.

Integrated Analytical Approach to Transition from Active to Passive Treatments at Munitions Sites (project no. 596)

PRINCIPAL INVESTIGATOR: Tony Danko, Ph.D.

This project is developing a protocol to ease transition from active to passive remediation at Navy sites

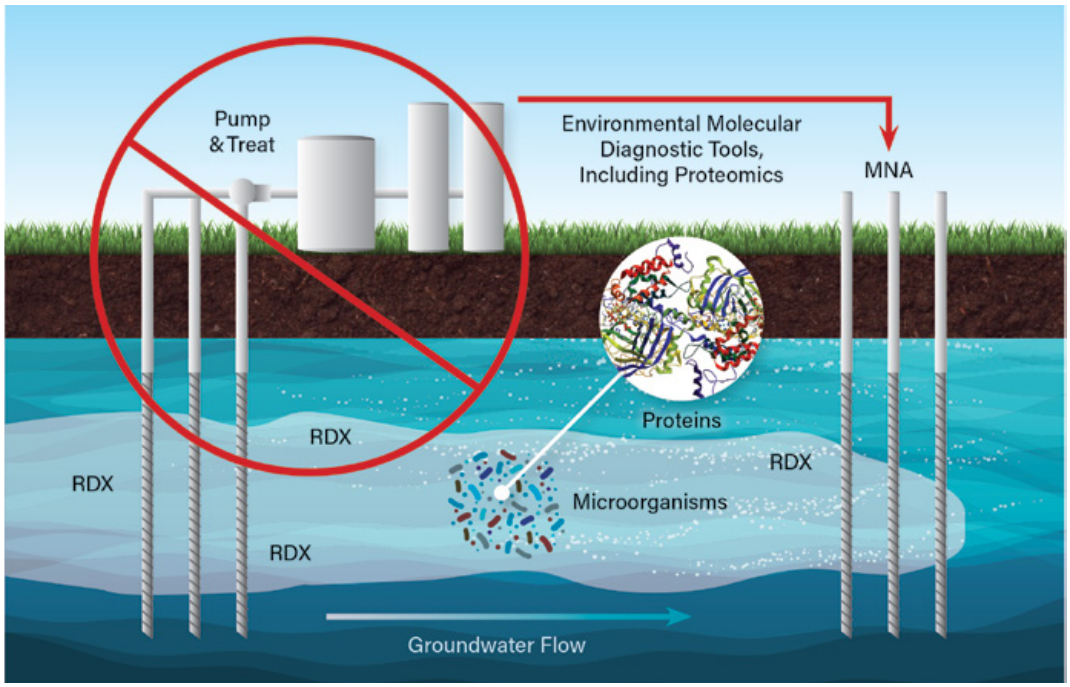
PROJECT ACCOMPLISHMENTS (continued)

contaminated with munitions constituents. During FY22, project investigators completed the necessary sample collection at two Pacific Northwest sites. Resultant laboratory efforts (microcosms) indicated that several wells at these sites were positive for aerobic and anaerobic biodegradation of RDX. Investigators advanced the positive microcosms to further enrichment steps in an attempt to identify the proteins involved in the RDX biodegradation. During this reporting period, project investigators also initiated pure culture studies. Cultures indicated biodegradation of RDX with next steps of protein extraction and biomarker evaluation.

Minimizing Hazardous Waste from Expired Paints and Associated Solvents from Ships' Supply (project no. 598)

PRINCIPAL INVESTIGATOR: Todd Heintzelman

The objective of this study is to minimize the amount of hazardous waste produced by expired paints and associated solvents originating from ship supplies. During this reporting period, project investigators completed an Initiation Decision Report (IDR). The report reviewed and evaluated current practices and procedures that lead to paint expiring and being wasted at Puget Sound Naval Shipyard.



(Illustration Credit: Nancy Horvat)

PROJECT ACCOMPLISHMENTS (continued)

PSNS&IMF loses over $600,000 annually on the disposal of expired paint. This includes the original purchase value of the paint as well as the associated waste costs. (Photo Credit: Mass Communication Specialist 2nd Class Eric Coffer)

Areas of emphasis included cradle-to-grave tracking of hazardous material and hazardous waste by Naval Supply Systems Command (NAVSUP) and Puget Sound Environmental personnel, paint forecasting and ordering by both the ships and the shipyard, shelf-life management and testing, hazardous material off-load and storage during ship availability and container sizes for two-part paint kits.

Recommendations include increased collaboration between NAVSUP and NAVFAC for their hazardous material and hazardous waste web-based management systems, a paint usage and waste study onboard ships to gain more accurate data, a study to determine if paint requires lab tests or just visual tests to extend shelf life, and a durability and waste study of small two-part paint kit burst-packages onboard ships. A ten percent decrease in paint waste at Puget Sound Naval Shipyard would result in the removal of 5,000 pounds of paint hazardous waste a year and an annual cost savings of $60,000.

Chronic Toxicity and Bioaccumulation Evaluation of Multiple PFAS for Benthic and Pelagic Species Relevant to Marine Ecological Risk Assessment (project no. 601)

PRINCIPAL INVESTIGATOR: Nick Hayman

This FY22 "new start" project sought to fill PFAS marine ecotoxicity data gaps. To that end, investigators completed range-testing of six PFAS compounds (PFBS, PFHxS, PFOS, PFBA, PFHxA, PFOA) with the 7-day chronic larval topsmelt (fish) growth and survival test. Investigators also completed testing of three PFAS compounds (PFBA, PFHxA, PFOA) with the 7-day chronic juvenile mysid growth and survival test.

PROJECT ACCOMPLISHMENTS (continued)

A Sailor carries a tank of aqueous fire-fighting foam (AFFF) during a fire drill. AFFF is highly effective yet contains polyfluoroalkyl substances.
(Photo Credit: MCS 2nd Class Nathan K. Serpico)

These range-finding tests are critical to the correct testing range for definitive toxicity testing, for which investigators will produce point-estimate values. This effort involves coordination among several stakeholder groups including an advisory panel that includes members from NAVFAC, EPA's Office of Research and Development and the California State Water Board. Project investigators are also members of PFAS ecotoxicity method development groups which consists of members from Army, EPA, U.S. Geological Survey and others. Involvement in these groups ensures good coordination among these different groups to produce high-quality data to fill PFAS ecotoxicity data gaps as efficiently as possible.

This project is leveraged with a recently-awarded SERDP PFAS ecotoxicity project that will increase the number of species and endpoints that will be tested with the goal of producing enough data for EPA water quality criteria (WQC) calculations. Data from a previous related effort looking at PFOS and PFOA toxicity data using acute bioassays (conducted by the NIWC Pacific laboratory) was incorporated into the recent EPA draft acute marine WQC. This indicates that EPA finds data produced by NIWC Pacific to be acceptable for use in their WQC calculations. This suggests that data in this current effort will be incorporated in future WQC calculations, which is a major objective of this project. Investigators have presented data from this project at various venues including a poster at the 2022 SETAC annual meeting and a plan to present a poster at the North America SETAC annual meeting and at the SERDP/ESTCP Symposium.

Characterization of Antifouling Paint and Environmental Loading with Navy Dome System (project no. 603)

PRINCIPAL INVESTIGATOR: Channing Bolt, Ph.D.

This project is testing the copper release rates of various

PROJECT ACCOMPLISHMENTS (continued)

types and ages of antifouling hull coatings at Navy harbors to better support regulatory standard setting. Project investigators collected field measurements from four different Navy vessels with various antifouling coatings and ages, leveraging additional funding sources for this field effort. Investigators then measured and analyzed the field samples for copper and zinc—a first step towards the goal of acquiring a repertoire of data associated with the particulate and dissolved copper and zinc leach rates from various types and ages of antifouling coatings, using NIWC's patented "dome" and "hull scrub" technologies and methodology.

From the data generated thus far, investigators are compiling a "living document" containing historic and current datasets for dissolved and particulate leach rates associated with antifouling coatings of different ages. From this "living document", they will be able to characterize antifouling coating lifecycles and provide environmentally realistic copper and zinc loadings. Investigators have requested information from shipyard water program managers on Total Maximum Daily Loads (TMDL) issues associated with copper and zinc in Navy shipyards.

USS Gerald R. Ford (CVN 78) enters Newport News Shipyard for planned maintenance. Copper is traditionally used in ship hull coatings due to its antifouling properties. (Photo Credit: Mass Communication Specialist 3rd Class Zack Guth)

PROJECT CLOSEOUTS

Each year, the NESDI program works to transition the results of its completed projects into the ongoing operations of the Navy. Thirteen such projects have moved into this transition phase where the program looks for additional support from regional, installation and ship personnel to leverage these validated technologies where appropriate. Those projects are described below.

Enhanced Trivalent Chromium Pretreatment for Improved Coloration and Corrosion Performance of Aluminum Substrates (project no. 514)

PRINCIPAL INVESTIGATOR: Peter Sheridan

Conversion coatings are pretreatments used for the surface finishing of aluminum to improve corrosion performance and adhesion of subsequent coatings. Traditionally, hexavalent chromium has been used for this process. An alternative process has been developed; however, the technology lacked a perceptible color change—an indication that that coating has reacted properly with the aluminum. FRC Southeast (FRCSE) began the development of a trivalent chromium conversion coating solution that incorporated organic dyes typically used in the aluminum anodizing industry. This combination is known as an enhanced trivalent chromium pretreatment/process (eTCP™).

Spray application of eTCP ready-to-use at FRC Southeast to an aluminum panel. Production environment and panel orientation mimic spray conversion coating on aircraft as it is performed at FRC Southeast. (Photo Credit: Sjon Westre)

FRCSE entered into a cooperative research and development agreement (CRADA) with a leading trivalent chromium conversion coating and anodizing solution developer (CHEMEON Surface Technology, LLC). The CRADA effort produced the rapid development of a COTS eTCP™ product that is now qualified to MIL-DTL-81706, and was implemented at FRCSE's surface finishing/electroplating work center.

PROJECT CLOSEOUTS (continued)

Worker applying polyurethane coating to an F/A-18 aircraft. (Photo Credit: Jennifer Nunez)

Non-Isocyanate Polyurethane-Free Formulation Coatings for Aircraft and Support Equipment (project no. 525)

PRINCIPAL INVESTIGATOR: Jack Benfer

The main objective of this project was to validate, approve and transition non-isocyanate polyurethane-free formulation topcoats as a replacement of MIL-PRF-85285 and MIL-PRF-81352 polyurethane materials to achieve a VOC reduction of 50 percent across NAVAIR Level III maintenance sites. The team looked at two major uses of the topcoat: low-gloss and high-gloss developed by the Naval Research Laboratory under an ESTCP project. As a result of the demonstration, the low-gloss polysiloxane topcoat materials were matured from TRL-7 to TRL-9. The high-gloss coating will remain at TRL-7 due to poor coating cure properties; this coating will be developed further under future efforts between NRL and Naval Air Warfare Center Aircraft Division, Patuxent River, MD. Reducing the VOCs in these formulas by 50 percent will yield substantial cost savings and multiple environmental benefits.

Smart Electronic Tools for Navy Environmental Compliance Monitoring and Reporting (project no.540)

PRINCIPAL INVESTIGATOR: Itzel Godinez, Ph.D.

This project field tested and demonstrated the use of tablets, EMSWeb, Microsoft Office 365,

PROJECT CLOSEOUTS (continued)

This NESDI project evaluated the performance of tablets and other mobile devices for use in the field during audits and inspections. (Photo Credit: iStock. Illustration Credit: Nancy Horvat)

and a PDF application versus the use of the conventional method of collecting audit data via pen and paper checklist. The combined use of a tablet and EMSWeb allowed auditors to reduce the overall monthly labor hours invested in Tier 1 internal audits resulting in productivity increases of 20 and 37.5 percent for these audits at the test sites. By conducting internal audits in real-time, auditors did not have to rely heavily on handwritten notes, diagrams and/or any mental recollection of visuals gathered while in the field.

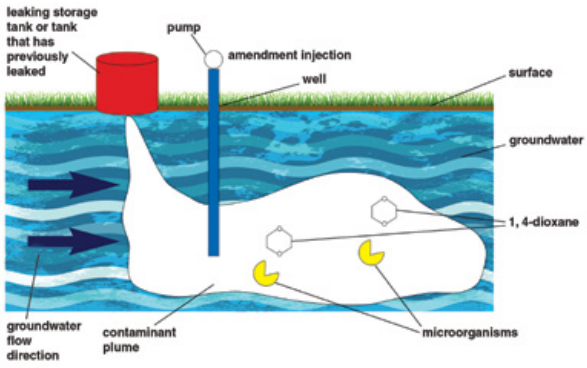
For Tier II internal audits, labor hour reduction of about 20 percent was attained at Naval Base Ventura County. For the external audits phase of the project, no labor savings was realized through the use of tablets, EMSWeb, and Microsoft Office 365 due to the rapid pace of these audits and the number of tasks that must be completed in order to substantiate findings.

In Situ Treatment of 1,4-Dioxane using Enhanced Biodegradation (project no. 545)

PRINCIPAL INVESTIGATOR: Tony Danko, Ph.D.

The goal of this project was to develop and scale up several robust 1,4-dioxane degrading cultures in lab settings, and then test the effectiveness of these cultures in field conditions. Important findings included:

1. Biostimulation was not effective as a standalone measure for improving 1,4-dioxane biodegradation rates at the test site;
2. One of the two bioaugmentation cultures—PH-06—did not



An idealized representation of the treatment of a groundwater plume containing 1,4-dioxane via amendment (in this case microorganisms) injection to facilitate remediation. (Diagram Credit: Amy Jungers)

PROJECT CLOSEOUTS (continued)

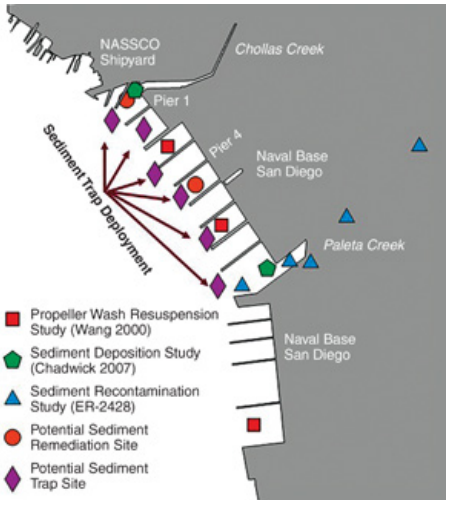
appear to successfully colonize the targeted area during push pull testing;
3. CB1190 appeared to be a better candidate because it was able to colonize the test area and reduce 1,4-dioxane concentrations at an appreciable rate; and
4. The oxygen amendment strategy was successful in enhancing local dissolved oxygen levels in both the PH-06 bioaugmentation test and the CB1190 bioaugmentation test.

Prior to field-scale implementation of this technology, it is recommended that a pilot-scale test be performed to ensure distribution and activity of the selected bioaugmentation culture. This technology is considered suitable for sites where injection/infiltration of liquid and gaseous amendments into the subsurface is achievable and not cost-prohibitive.

Impact of Sediment Resuspension by Propeller Wash and Shore Sediment Dynamics on Remediation Options (project no. 551)

PRINCIPAL INVESTIGATOR: Pei-fang Wang, Ph.D.

The objective of this project was to provide guidance on evaluating propeller wash effects on sediment remediation options for contaminated sediment sites. A suite of advanced models was developed to predict and quantify the impacts of propeller wash. Maynord's model is implemented for propellers with a single engine and twin propellers and may not be applicable for deep-draft vessels. The Finite Analytic Navier-Stokes (FANS) model has the ability to simulate keel wakes for deep-drafted vessels and to simulate tugboat activities inside of a pier. The linked EFDC+Prop Wash model is another innovative model that integrates a propeller wash model (e.g., Maynord's model) into the 3D hydrodynamic and sediment transport model. This model is an ongoing effort and it is the



Sediment traps were deployed in San Diego Bay to assess the effectiveness of various sediment remediation methodologies under real-world stressors such as propeller wash and wave activity.
(Diagram Credit: Pei-fang Wang)

PROJECT CLOSEOUTS (continued)

first of its kind for simulating/predicting erosion and subsequent re-migration/recontamination potential. All of these innovative models and the modeling approaches have been or are being accepted by stakeholders and regulators in studies of propeller wash and its impacts to the sediment bed.

Study of Waste Management and Minimization for AFFF Wastewater (project no. 553)

PRINCIPAL INVESTIGATOR: Hunter Spence

The objective of this project was a pilot study to determine residual concentrations of PFAS within aqueous fire-fighting foam (AFFF) systems after rinsing them out. In the demonstration, two mobile systems originally containing legacy AFFF were rinsed with varying methods and the rinsate was analyzed for a suite of PFAS. The results indicate that a triple rinse with either water or a butyl carbitol (BC)/water mix significantly reduces the amount of PFAS in the tank. However, concentrations of PFOS were greater than the current mil-spec value of 800 ppb in the new Qualified Product List (QPL)-approved AFFF after a 24-hour equilibration period, and therefore, the triple rinse methods used in this experiment were not successful.

Pilot scale cleanout of a mobile Aircraft Rescue and Fire Fighting vehicle at NAS Meridian.
(Photo Credit: Andy Vasquez)

Addressing Temporal Variability in Industrial Building Vapor Intrusion Assessments (project no. 554)

PRINCIPAL INVESTIGATOR: Kirsten Marble

This was a year-long data collection program conducted at a building site at Naval Station (NS) Norfolk, Virginia, to assess temporal variability of VOC concentrations in indoor air and subslab soil gas (SSSG). The project had the following objectives:

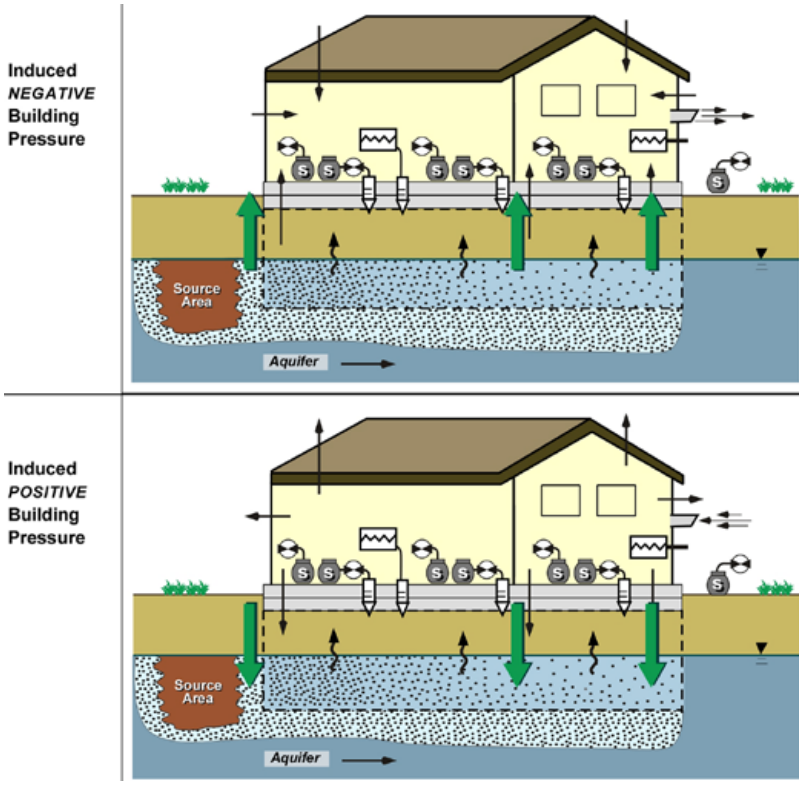
1. Evaluate whether near-worst-case vapor intrusion (VI) conditions can be induced in industrial buildings by controlling building pressure;

PROJECT CLOSEOUTS (continued)

2. Collect and compare the variability of indoor air concentrations from VI in Navy industrial buildings against those in residential buildings;
3. Define strategies and conditions for identifying and selecting building sampling zones and time of sampling for optimizing VI evaluations.

All three objectives were realized and the results of the project will provide guidance to future VI investigations.

Specific recommendations include sampling subslab radon and monitoring indoor radon within the sampling zone at the same time SSSG and indoor air VOC samples are collected. This will allow for the evaluation of the data to assess whether indoor radon can be used as a tracer for long-term monitoring of VI, for estimating upper percentile VOC concentrations in indoor air, and for determining when to conduct follow-up VOC sampling. Building pressure cycling tests are also recommended as a supplement or an alternative to the long-term monitoring program.



How pressure cycling works. (Schematic compliments of GSI Environmental for NESDI project no. 424: Improved Assessment Strategies for Vapor Intrusion.)

PROJECT CLOSEOUTS (continued)

Demonstrating the Effectiveness of Novel Treatment Technologies for the Removal of Poly- and Perfluoroalkyl Substances from Groundwater (project no. 555)

PRINCIPAL INVESTIGATOR: Jovan Popovic, Ph.D.

The broad objective of this project was to better understand performance of available ex situ technologies for the treatment of groundwater impacted by per and polyfluoroalkyl substances (PFAS). The primary focus was to assess sorbent performance in PFAS-impacted liquids with conditions most relevant to the Navy. Multiple commercially available and/or experimental sorbents and an ion exchange resin were vetted for their PFAS binding capacity using both site-derived groundwater and synthetic groundwater. This effort further investigated the potential for sorbent regeneration and PFAS desorption to better understand the possibility for both increasing the life cycle of filter materials, and offering a strategy to limit offsite PFAS disposal, especially considering potential implications associated with secondary release.

PFAS column treatability study construction at NAVFAC EXWC's environmental laboratory(left) and commercially available sorbents for batch and flow-through column studies (right). (Photo Credit: Jovan Popovic)

Based on these studies, there is presently no all-encompassing treatment approach for PFAS-impacted groundwater, as variability between site conditions could potentially make one treatment approach less favorable than another. Data contained within these studies do offer valuable treatability information across a diverse set of conditions which practitioners can leverage when deciding on the most feasible treatment strategy.

In Situ Automatic Stormwater Sampling Device for Use at Tidally Impacted Sampling Locations (project no. 558)

PRINCIPAL INVESTIGATOR: Ernie Arias

This project demonstrated a low-cost, user friendly, automatic stormwater sampler for use at tidally impacted sampling locations. An oceanographic water sampler known as the Programmable Automatic Water Sampler (PAWS) was modified for stormwater

PROJECT CLOSEOUTS (continued)

The PAWS system electronics and pump. (Photo Credit: Ernie Arias)

sampling at the affected locations.

The unit was field tested during 11 storm events at two sites in Southern California. The sampler was placed in the stormwater path prior to a predicted rain event and retrieved after the storm, after which the sample was removed for analysis. During 13 placements, the sampler leaked and experienced catastrophic failure twice. Therefore, it was determined that the sampler did not meet performance requirements.

Elimination of Hexavalent Chromium from Magnesium Conversion Coating Processes at Fleet Readiness Centers (project no. 562)

PRINCIPAL INVESTIGATOR: Alan Grieve, Ph.D.

In an effort to remove hexavalent chromium from the waste stream without sacrificing performance, this project studied an alternative non-chromium conversion coating for use in aerospace applications on magnesium. A previous effort showed that either trivalent chromium process coatings or non-chromium-containing conversion coatings were promising alternatives to chromate pre-treatments, but that the products tested were problematic due to the difficulty in visually determining how effectively the pre-treatments coated the components—the hexavalent chromium treatments produce a dark orange/brown coating when applied.

A colored material, developed under another NESDI project, was qualified for use on aluminum. This project team optimized both the formulation and the deposition process to improve overall performance in terms of corrosion resistance and paint adhesion. However, relative to the current chromate-based pre-treatments, there was still a performance deficit, thus it should not be used on magnesium substrate at this time.

NESDI investigators are demonstrating the effectiveness of hexavalent chromium-free conversion coatings on magnesium alloys for future use on H-53 helicopters and other Navy weapons platforms. (Photo Credit: Lance Cpl. Jason Monty)

PROJECT CLOSEOUTS (continued)

Low-VOC Primers for Ground Support Equipment Application (project no. 563)

PRINCIPAL INVESTIGATOR: Michael Brindza

The purpose of this effort was to laboratory test, demonstrate, validate, and authorize a low-VOC primer(s) for use on NAVAIR ground support equipment. After successful laboratory testing of a MIL-DTL-53022-qualified primer, a single dem/val was performed in February 2020 prior to a fleet-wide shutdown of coating dem/vals due to the pandemic. The low-VOC primer (PPG CA7320) was applied to GSE towbars and evaluated for application characteristics and user friendliness. The durability of the new coating systems is currently being monitored. After approximately one year without additional dem/val(s) and inability to establish a concrete dem/val schedule, a decision was made to discontinue the project.

This truck is among the targeted GSE for the low-VOC primers being demonstrated under the NESDI program. (Photo Credit: Michael Brindza)

The Army has successfully tested the PPG 7320 material to the MIL-DTL-53022 specification requirements. When PPG provides the Army Research Lab with the CA7320 certificate of composition, it will be added to the MIL-DTL-53022 QPL as a Type IV, Class U material. Additional demonstration/validations will be needed to fully transition this material.

Evaluation of Various Real-Time Monitors to Accelerate On-Site Analysis for Vapor Intrusion Active Project Technology Replacement (project no. 568)

PRINCIPAL INVESTIGATOR: Christopher Patterson

In the study of vapor intrusion (VI), onsite analysis of air samples with real-time results provides the ability to "follow the smoke trail" to the VOC source. Currently, most projects utilizing a real-time investigation approach use a HAPSITE GC/MS for analysis of air samples. However, there are now newer, more reliable instruments to consider. This project conducted benchtop testing of four such instruments, and field demonstration of three of them. Two of these, the 8610C GC/ECD and the AR-VOC GC/CRDS, performed the best, meeting overall performance requirements.

PROJECT CLOSEOUTS (continued)

A number of COTS instruments including this one were demonstrated in this NESDI effort that sought to identify the most reliable device for the mobile analysis of indoor air and soil gas samples. (Photo Credit: Travis Lewis)

While onsite analysis does not typically eliminate the need to collect one or more samples for offsite analysis, the results from onsite analyses can be used to guide the collection of the confirmation samples, ensuring that these samples provide the information needed to make definitive determinations regarding the presence or absence of VI and accurate decisions for site management.

Flexible Under Pier Sediment Assessment Decision Tool (project no. 572)

PRINCIPAL INVESTIGATOR: Jessica Carilli, Ph.D.

To tackle the problem of sediment recontamination in Navy harbors, this project created a simple and cost-effective solution to quantify the volume and contaminant loads of under-pier sediments. The project also ascertained the potential magnitude of contamination recurring from unremediated under-pier sediments slumping into dredged and/or remediated areas between piers. Sediment volume and slumping was quantified using repeat acoustic-bathymetry surveys conducted with a small, remotely controlled vessel—the Teledyne Z-boat 1800. The Z-boat was developed for bathymetric and habitat mapping, and has been successfully used by personnel from the NIWC Pacific team in estuarine systems.

The team measured bathymetry multiple times at five piers, sampled and analyzed sediments from four to five sampling locations per pier, and ultimately estimated the recontamination potential at these piers. Investigators completed all field and laboratory work and resultant data analysis, presented the results to the Navy Sediment Workgroup, and received approval to post the project's final report to the NESDI website.

This project also developed and validated a method for collecting

PROJECT CLOSEOUTS (continued)

grab and core samples from under-pier areas that would be otherwise inaccessible using standard sediment sampling approaches. While the sample sizes were limited to shallower depths, in general the sediments under the studied piers appeared relatively uncontaminated.

Overall, the sediments under the piers appeared generally stable with time, with no evidence for large-scale slumping of material from under the piers. However, it was determined that this methodology could not accurately detect small-scale changes in the sediment pile beneath piers. The project team recommends that if the detection of relatively small-scale changes is required, a sidescan sonar survey should be completed alongside the pier.

The NIWC "Z-boat" is key to this effort to develop a simple and cost-effective solution to ascertain the potential magnitude of recontamination occurring from unremediated underpier sediments slumping into dredged and/or remediated areas between piers. (Photo Credit: Chuck Katz)

OUR FY23 SCHEDULE

No.	What	When
1.	Evaluate & Rank Needs	26–30 September 2022
2.	Obtain Sponsor Review & Approval of Needs	1–14 October 2022
3.	Request Pre-proposals	15 October 2022
4.	Pre-proposals DUE	9 December 2022
5.	Evaluate Pre-proposals	9 December 2022 13 January 2023
6.	Request Full Proposals	20 January 2023
7.	Conduct Programmatic Review with NAVFAC Headquarters and OPNAV N4I Installations Division	January 2023
8.	Full Proposals DUE	10 March 2023
9.	Screen Full Proposals	27–31 March 2023
10.	Principal Investigator Answers to Full Proposal Screening Questions DUE	21 April 2023
11.	Full Proposal Review and Evaluation	21 April to 12 May 2023
12.	Conduct First In-Progress Review	24–28 April 2023
13.	Conduct Second In-Progress Review	8–12 May 2023
14.	Complete Evaluation of Full Proposals	19 May 2023
15.	Obtain Sponsor Review & Approval of Full Proposals	22 May to 30 June 2023
16.	Announce FY24 Needs Solicitation	1 June 2023
17.	Close FY24 Needs Solicitation	1 August 2023
18.	Screen FY24 Needs	21–25 August 2023
19.	Quarterly Status Reports Due	3 October 2022 2 January 2023 3 April 2023 3 July 2023

Check out the NESDI website (https://epl.navfac.navy.mil/nesdi) for the latest version of our program schedule.

FOR MORE INFORMATION

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