NESDI News

Highlights & Happenings

SUMMER/ FALL 2022

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WHO WE ARE

The Navy Environmental Sustainability Development to Integration (NESDI) program is the Navy's environmental research and development, demonstration and validation (6.4) program, sponsored by the 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 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.

The NESDI Program:
Integrating Green Technologies Into the Fleet

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From the Program Manager's Desk

Ken Kaempffe

Welcome to the summer/fall 2022 issue of *NESDI News: Highlights & Happenings*—part of our ongoing effort to keep you informed about the Navy Environmental Sustainability Development to Integration (NESDI) program. We hope you will find these insights useful and that they encourage you to participate (or increase your involvement) in the program over the coming months.

In this issue, we highlight another four of our eight FY22 "new start" projects that were reviewed and approved by the program's resource sponsor (the OPNAV N4I Installations Division) and publish a year-out program schedule for your review and consideration.

Ken Kaempffe
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FY22 "New Start" Projects Launched

The following eight efforts have made significant progress as the program's FY22 "new start" projects:

No.	Project No.	Title	Principal Investigator	Performing Agency
1.	597	Remotely Operated Oil Spill Response Equipment: Down-Selection and Demonstration at a Navy Port	Marty McMorrow	NAVFAC EXWC
2.	598	Minimizing Hazardous Waste from Expired Paints and Associated Solvents from Ships Supply	Todd Heintzelman	NAVSUP WSS
3.	599	Pathways for Addressing Opportunistic Premise Plumbing Pathogens at Navy Installations	Autumn Resto	NAVFAC EXWC
4.	600	Advanced Anodize Repair	Alexander Westbrook	NAVAIR NAWC AD Pax River
5.	601	Chronic Toxicity and Bioaccumulation Evaluation of Multiple PFAS for Benthic and Pelagic Species Relevant to Marine Ecological Risk Assessment	Nicholas Hayman	NIWC Pacific
6.	602	Closed Loop, In Situ Soil Flushing at PFAS-Impacted Source Zones	Ben Rhiner	NAVFAC EXWC
7.	603	Characterization of Antifouling Paint and Environmental Loading with Navy Dome System	Channing Bolt	NIWC Pacific
8.	604	An Integrated Navy Approach to Estimate Risk and Cleanup Goals for Radionuclides Associated with Buildings at Current and Former Navy Installations	Kenda Neil	NAVFAC EXWC

The last four projects in the table above are highlighted in this issue. The first four projects were highlighted in the spring 2022 issue of *NESDI News*.

FY22 "New Start" Projects Launched *(continued)*

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

Dr. Nicholas Hayman (NIWC Pacific)

The objective of this study is to produce acute and chronic toxicity and bioaccumulation data for 10 priority polyfluoroalkyl substances (PFAS). PFAS are a group of thousands of chemicals that are persistent in the environment and may be present at Department of Defense (DoD) sites primarily due to their use in aqueous film-forming foam (AFFF), although they can be found worldwide at sites not influenced by DoD facilities. Currently, there are robust data sets that suggest two of these compounds, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), are detrimental to human health, resulting in significant regulatory and public concern. In addition, both PFOS and PFOA have been shown to be chronically toxic to aquatic organisms and bioaccumulate in aquatic systems, resulting in concerns over the environmental risk posed by these compounds. However, there is a lack of data regarding these chemicals' effects on marine species.

In the first task, the team will use PFAS-spiked marine water and sediment to conduct water toxicity tests for two critical pelagic marine species, the opossum shrimp (Americamysis bahia) and topsmelt fish (Atherinops affinis) and will report toxicity values such as lowest observed effect concentration (LOEC) and median lethal (LC50) or median effect (EC50) concentrations. If during this testing, no adverse effects are observed at concentrations well above (i.e., 100 times higher) detected concentrations of individual PFAS at AFFF-impacted sites, then species will be retested using a reduced concentration series to verify the no observed effect concentration (NOEC), and all test concentrations will be verified by a DoD-certified analytical laboratory (Eurofins). This testing will also sample tissue of exposed animals to develop water-to-tissue uptake factors.

Next, sediment testing will be conducted for a marine polychaete (Nephtys caecoides). Based on the project team's initial data, chronic toxicity effect thresholds for many PFAS in sediment are expected to be higher than the levels observed at AFFF sites, indicating that direct toxicity to sediment species is unlikely to drive risks at these sites. However, AFFF concentrations at these sites may still pose risks to aquatic-dependent wildlife, due to uptake of PFAS into tissues of benthic invertebrates. The team will test concentrations that are at the high end of the observed range at affected sites for all 10 PFAS, and

FY22 "New Start" Projects Launched *(continued)*

will also test two PFAS mixtures with concentrations within ranges that have been observed at Navy sites to provide sediment-to-tissue uptake values, which would indicate a risk to other aquatic life.

Throughout the project, the team will provide data to the end user community (regulators, risk assessors, site managers) via a variety of methods including publication of at least two peer-reviewed manuscripts, at relevant Navy working group meetings, and through an advisory panel created as part of the project that includes Navy RPMs as well as scientists from the EPA and the California State Water Board.

Closed Loop, In Situ Soil Flushing at PFAS-Impacted Source Zones (project no. 602)

Ben Rhiner
(NAVFAC EXWC)

The goal of this effort is to demonstrate that in situ soil flushing, used in conjunction with sorption and destructive treatments, is a viable method for the removal and subsequent destruction of PFAS from affected soil.

PFAS chemicals can persist for years following groundwater treatment. Further, waste management entities are becoming increasingly reluctant to accept any PFAS-laden material, thereby increasing the complexity of PFAS disposal. Meeting discharge limits will ultimately be achieved through both significantly reducing source area mass and destroying any PFAS captured during treatment. In situ source treatment will also decrease high concentration PFAS mass stored in soils, which may decrease the chemicals' persistence in soils and groundwater down the road. This approach is more accurate and less costly than treating the resultant plume.

In situ soil flushing is a minimally invasive technology that has historically been employed for subsurface remediation, allowing for sites to reach specified cleanup goals without excavation. This technology is predicated on the use of water to mobilize chemicals bound to source zone soils, after which the resultant mixture is pumped from an extraction well for subsequent treatment and reinjection. Certain PFAS compounds adhere to clays or organic matter found in soil more readily than that of other PFAS, but it is becoming increasingly apparent that these compounds may flush out quite rapidly under augmented flow.

The first task will be laboratory testing of sample soils taken from an affected area. Upon successful completion of this task, a pilot scale trailer utilizing conventional PFAS removal strategies will be mobilized to treat source area groundwater.

Using data leveraged from another NESDI project

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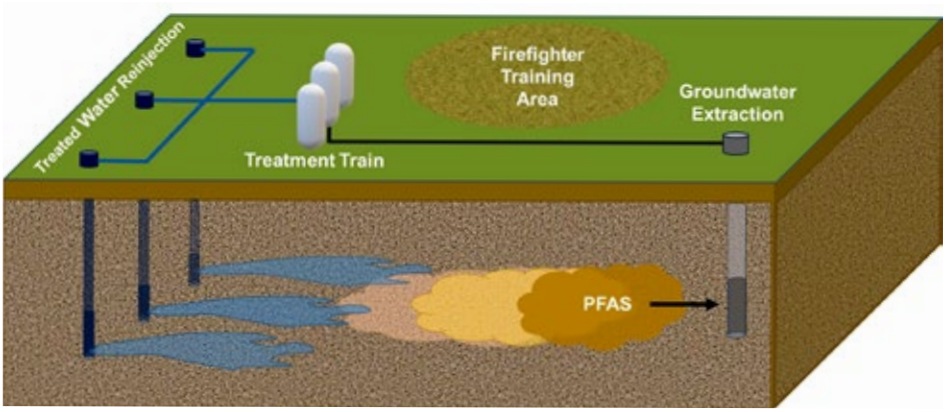
FY22 "New Start" Projects Launched *(continued)*



The fundamental processes involved in in situ soil flushing for PFAS-impacted sites.
(Graphic Credit: Dr. Jovan Popovic)

(no. 555: Demonstrating the Effectiveness of Novel Treatment Technologies for the Removal of Poly- and Perfluoroalkyl Substances from Groundwater), the project team will further investigate the potential for onsite sorbent regeneration. Sorbent regeneration can be achieved through either direct destruction of PFAS sorbed to the filter media (e.g., thermal, electrochemical or acoustic/sonolytic treatment) or eluting the sorbed PFAS into a small liquid matrix. This study intends to demonstrate the latter concept, where small batches of PFAS-containing liquid regenerant will undergo subsequent destruction using a pilot scale sonolysis reactor developed under a NAVFAC Headquarters-funded project.

It is hoped that this process will replace or limit the expensive soil excavation method previously used for PFAS-impacted soils and will eliminate the need for disposal of impacted soil.

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

Dr. Channing Bolt
(NIWC Pacific)

The goal of this project is to test copper release rates of various types and ages of antifouling hull coatings at Navy harbors to better support regulatory standard setting.

Meeting regulatory levels for copper concentrations in Navy harbors has long been an issue. One of the sources of copper is the antifouling coatings used on ship hulls. The current approach to determining the amount of copper released by these coatings is an American Society for Testing and Materials (ASTM) laboratory-based method that utilizes artificial seawater. This method is required for all paints to be registered and approved for use as antifouling coatings; but the method significantly overestimates the release rate of copper. Moreover, the method itself

FY22 "New Start" Projects Launched *(continued)*

specifies that the rates "are not to be used for environmental loading calculations." However, in the absence of better information and data, the ASTM data are used by regulatory authorities to calculate environmental loadings and regulate antifouling coatings. A more scientifically defensible method for calculating copper loading is needed.

Personnel from the Naval Information Warfare Center (NIWC) Pacific have developed novel methodologies to address knowledge gaps by conducting in situ assessments of leaching rates on vessel hulls. The most reliable one of these methods is known as the dome method. In this technique, an acrylic dome is positioned on a hull by a diver and connected via tubing to a peristaltic pump above the water line. The dome is adhered onto the hull with vacuum pressure, allowing the system to isolate and recirculate a fixed volume of water, over a known hull surface area, for a fixed duration. Samples are collected in 15-minute intervals, analyzed and a simple time versus concentration plot is generated to establish copper release rates.

A similar technology, the in-water hull cleaning sampling device (or hull scrubber) will be applied for measurement of particulate load from cleaning. This technique also uses a diver-applied device, with systematic pressure provided through a spring release. The device includes a shaft with a handle, that is configured for the attachment of different types of cleaning materials (i.e., brushes or abrasive pads) used for cleaning of ship hulls. Once the hull scrubber is positioned, the handle is rotated to simulate

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)

FY22 "New Start" Projects Launched *(continued)*

the hull cleaning process and a fixed amount of water around the hull is captured and transferred to the surface for analysis. Total copper is measured in the hull scrubber, and used for estimation of particulate mass and concentration release from the ship hull. This information is used to estimate loadings. This approach is used to describe and quantify the expected loading from cleaning and the release of copper and zinc content in the particles associated with cleaning efforts.

These methods have been tested and proven to be effective for use in determining regulatory limits, and have recently been used by the State of California Department of Pesticide Regulation. The early part of this project will improve these existing technologies.

NIWC Pacific has teamed with personnel from the Naval Sea Systems Command (NAVSEA) to identify ships with different paint ages and sample their hulls with contractor support from SEAWARD Marine.

Environmental loading quantifications estimated from measurements generated via this effort should support realistic assessment of environmental conditions, such as in Total Maximum Daily Load (TMDL) regulations, and assigning realistic and appropriate regulatory control (Uniform National Discharge Standards) of Navy discharges such as underwater ship husbandry and hull coating leachate.

This information can be included to support TMDL assessments in Navy harbors and at shoreside facilities via direct addition of the information into TMDL development, loading calculations or model improvement. A more realistic assessment of copper loadings associated with antifouling paints may lead to more lenient regulations and cost savings associated with required mitigation. The realistic loading scenarios produced by this effort should also be used for optimization of antifouling coatings lifecycle use.

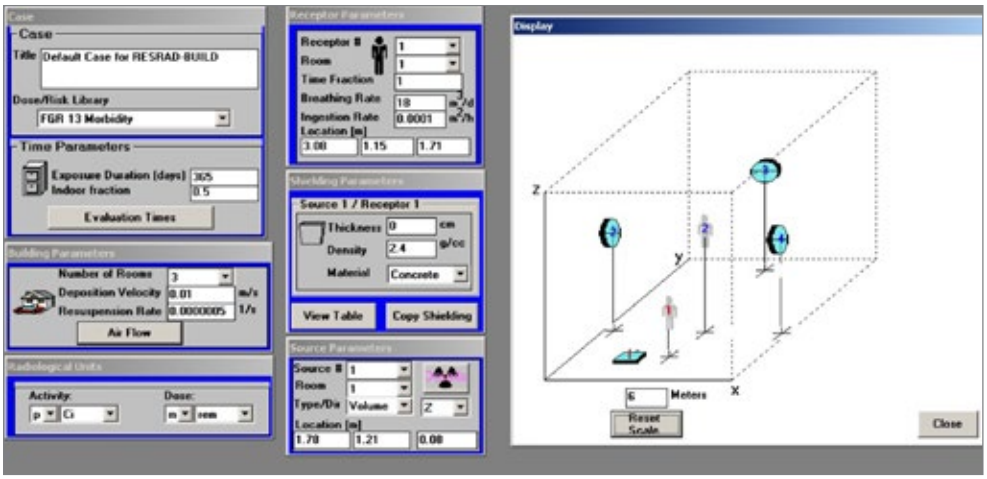
An Integrated Navy Approach to Estimate Risk and Cleanup Goals for Radionuclides Associated with Buildings at Current and Former Navy Installations (project no. 604)

Kenda Neil
(NAVFAC EXWC)

The purpose of this effort is to develop a Navy-wide approach for estimating risk and calculating cleanup goals for radiologically-impacted buildings.

Past radiological activities have potentially impacted infrastructure (i.e., buildings) at installations Navy-wide. At Superfund sites, the Navy's approach differs from the EPA's approach for assessing risks associated with radiologically impacted buildings and environmental media

FY22 "New Start" Projects Launched *(continued)*



The RESRAD-BUILD software calculates radiological dose and risk incorporating site-specific parameters that would result in realistically conservative cleanup goals for U.S. Navy sites. (Graphic Credit: Kenda Neil)

and establishing cleanup goals, which leads to delays in the schedule and increases in life cycle costs when negotiating cleanup levels with the EPA.

Currently, there are two prevailing sets of models for estimating risk and dose from radiologically impacted infrastructure (e.g., buildings), which can lead to disparate cleanup goals. EPA's Building Preliminary Remediation Goals (BPRG) Calculator for radiological risk and Building Dose Compliance Concentration (BDCC) Calculator for radiological dose produce nonspecific and highly conservative risk estimates—often due to default assumptions not appropriate for Navy site conditions. This leads to unrealistically conservative remedial action levels. However, the Department of Energy's RESidual RADioactivity code for Buildings (RESRAD-BUILD) calculates radiological dose and risk incorporating site-specific parameters that would result in realistically conservative cleanup goals for Navy sites.

The approval and adoption of the RESRAD family of codes for deriving cleanup goals for Navy sites could speed cleanup negotiations and reduce programmatic lifecycle costs appreciably.

The project team will disseminate the results of this project to both federaland targeted non-federal sectors and stakeholders. The team will also provide radiological cleanup personnel with a set of case studies that provide an approach for conducting risk assessments and deriving appropriate cleanup levels.

Fact sheets for the above and other NESDI projects are under review and will be posted on the program's public website at www.navfac.navy.nil/nesdi.

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FY23 "New Start" Projects Awarded

The NESDI program with concurrence from the program sponsor, OPNAV N4i, approved 7 full proposals to become new starts in FY23.

1. 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)
2. External Concentrating Parabolic Collector (XCPC) Solar Thermal Evaporation for PFAS-Impacted Wastewater Minimization (project no. 606)
3. Artificial Intelligence for Environmental Compliance (project no. 607)
4. Application of Supercritical Water Oxidation (SCWO) to Destroy PFAS-Impacted Waste Streams (project no. 608)
5. Oxsol-Free and Low-VOC Surface Ship Topside Coatings for Maintaining Environmental Regulations (project no. 609)
6. Evaluation of Existing and Required Pierside Infrastructure to Accommodate Shoreside Collection and Treatment of Navy Vessel Ballast Discharges (project no. 610)
7. Subsurface Fate and Transport of Petroleum Based Contaminants in Naval Facilities (project no. 611)

All seven of these efforts will be profiled in subsequent issues of *NESDI News*.

FY23 Needs Solicitation Closed, Evaluations Underway

Our formal needs collection process for FY23 ran from 1 June until 1 August 2022. We collected 49 needs in all from across the Navy. The program's TDWG is in the process of screening and ranking these needs.

Schedule for FY23 In-Progress Reviews Announced

The program is will hold three In-Progress Reviews (IPR) over the course of FY23 following the schedule below. Principal Investigators and TDWG members are encouraged to adjust their calendars accordingly.

What	When	Investigators Presenting
First "West Coast" IPR	24-28 April 2023	NAVFAC EXWC
"East Coast" IPR	TBD	FRC Southeast, NAWC-AD Patuxent River & elsewhere
Second "West Coast" IPR	8-12 May 2023	NIWC Pacific & elsewhere

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Program Schedule

An entire program schedule for the next year is provided below.

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

Check out our website
www.navfac.navy.mil/nesdi/Schedule.aspx
for the latest version of our program schedule.

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GETTING ON OUR MAILING LIST

If you're not already on our mailing list and want to subscribe to *NESDI News*, please send your email address to Eric Rasmussen at eric.rasmussen@navy.mil.

CONTACT YOUR TDWG MEMBER

For more information about the operation of the NESDI program, contact Ken Kaempffe, the NESDI program manager, or members of the TDWG.

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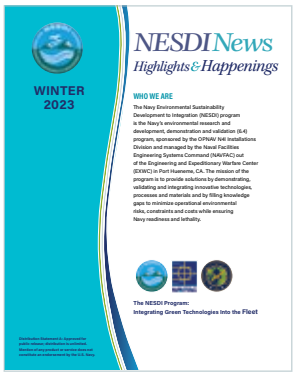

IN THE NEXT ISSUE OF *NESDI News*

There is a lot more information coming your way in the next issue of *NESDI News: Highlights & Happenings*. In our winter 2023 issue, we will provide you with updates on the launching of our FY23 "new start" projects and the progress we've made on the evaluation and ranking of needs collected via our FY23 solicitation.