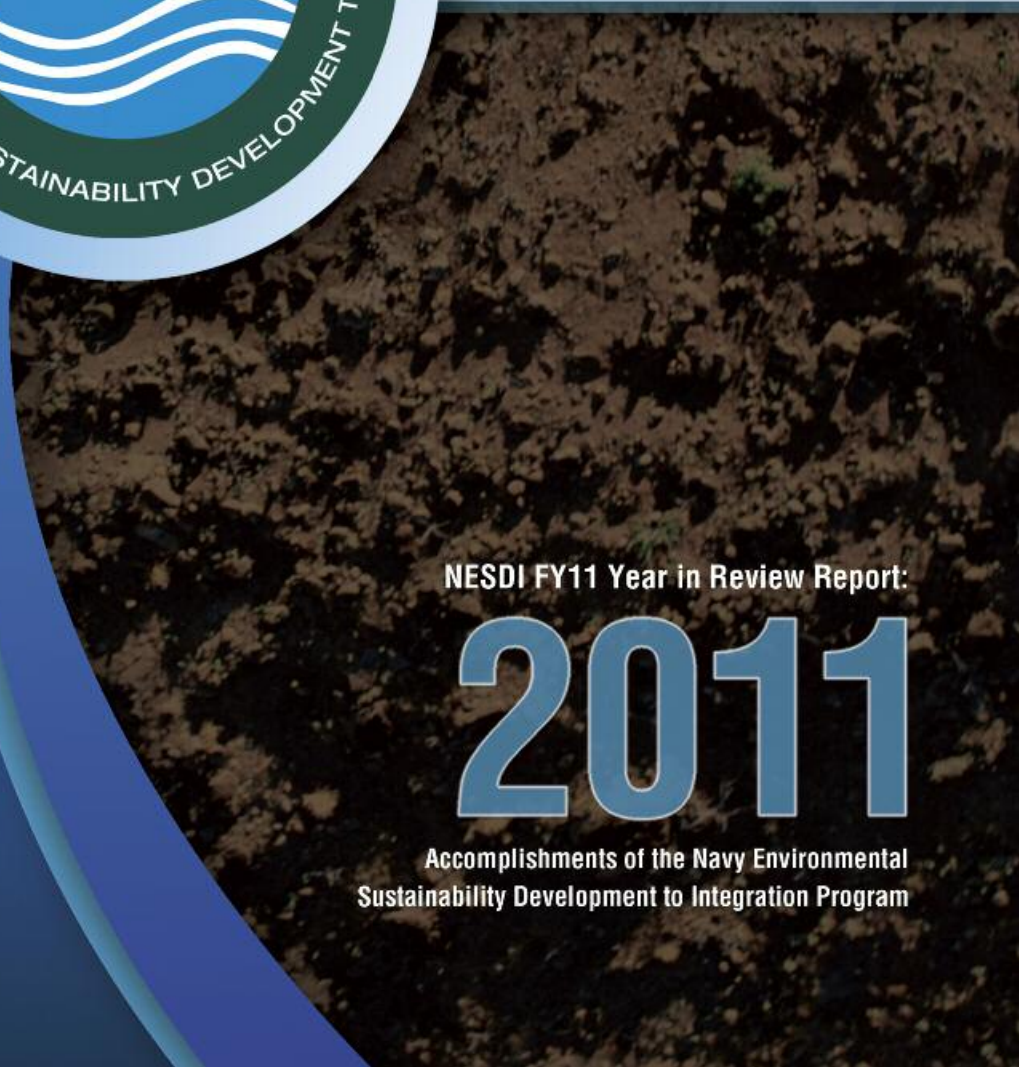
NESDI

NAVY ENVIRONMENTAL SUSTAINABILITY DEVELOPMENT TO INTEGRATION



NESDI FY11 Year in Review Report:

2011

Accomplishments of the Navy Environmental Sustainability Development to Integration Program

NESDI FY11 Year in Review Report:
Integrating Green Technologies into the Fleet

2011

Accomplishments of the Navy Environmental Sustainability Development to Integration Program

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A WORD FROM THE PROGRAM MANAGER

2011 Integrating Green Technologies into the Fleet

Welcome to the Fiscal Year (FY) 2011 Year in Review report for the Navy Environmental Sustainability Development to Integration (NESDI) program — Integrating Green Technologies Into the Fleet.

It has been another productive year for our research and management teams. Coordination with our resource sponsor—the Chief of Naval Operations Energy and Environmental Readiness Division (CNO N45)—has been strengthened by the periodic program reviews that we conduct. These reviews bring to the attention of the appropriate CNO N45 action officers the research capabilities that have been gained over the course of the year. This allows for a quicker response among the NESDI team, need submitters, the fleet, and our sponsor.

Also in FY11, project transition highlights were documented by revisiting all NESDI project completions and then promoting the capabilities gained and cost savings achieved for each of those projects. Synergism among our partners is being realized to even greater extents—essential in this time of shrinking budgets. We are happy to continue our partnerships with the Environmental Security Technology Certification Program (ESTCP), the fleets, System Command and activity-level research and development programs. Increased participation by Commander, Navy Installations Command (CNIC) this past year has been particularly beneficial in the water and storm water areas.

A particular noteworthy accomplishment is the launching of *NESDI News: Highlights and Happenings*—the program's quarterly electronic publication. This publication brings recent technical achievements and regulatory concerns to the forefront, along with highlights on our technical staff.

Because of the enhanced management structure, transparency and accountability of the NESDI program, other research and development programs are considering the NESDI model for their programs including CNO N45's Living Marine Resources program.

Among our technical project highlights for FY11 are our efforts to:

1. Demonstrate and validate an alternative green tank target which contains no hazardous components.

2. Validate the use of direct push and point-and-detect sensor systems, for use in the field, to measure perchlorate either for rapid screening and monitoring purposes or for contaminant source characterization of perchlorate in groundwater or surface waters.

3. Provide an effective, environmentally preferred media (corn hybrid polymer) to remove coatings from difficult, high-value, delicate substrates, including fiberglass, aluminum, carbon fiber, graphite, and Kevlar.

4. Demonstrate that zero valent zinc can be used to treat 1,2,3-Trichloropropane in groundwater.

5. Identify Waste-to-Clean Energy (WtCE) technologies for potential implementation across the Navy including the development of model WtCE case studies to facilitate technology implementation at different Navy regions and/or installations.

6. Improve the accuracy of the existing models to predict oil trajectories in Navy harbors and provide a validated modeling tool for use by Navy On-Scene Coordinators.

Why This Program is Important to the Navy

The NESDI program provides critical Research, Development, Testing, and Evaluation (RDT&E) with a focus on demonstration, validation, and technology integration support to the environmental shore community. The NESDI program will continue to strengthen its outreach and remain flexible to address the evolving needs coming from the Fleets; CNIC; CNO N45; the Field Engineering Centers; and other organizations. The NESDI program will work to improve the integration and procurement of environmental technology to meet fleet needs.

How You Can Participate

Technology integration is a challenging undertaking. The NESDI program relies on all Navy personnel to help identify environmental concerns and support the implementation of resultant solutions. We ask that, wherever possible, you find a way to use NESDI products.

You can participate in our process and play a vital role by:

- Submitting and validating environmental needs
- Reviewing technologies already in development
- Supporting transition efforts in your organization or at your installation
- Acting as a Principal Investigator on one of our projects
- Providing demonstration sites for our various projects
- Staying up-to-date by regularly visiting our web site (www.nesdi.navy.mil)

Looking Ahead

In the near future I anticipate that a number of evolving policy issues and research agendas will further focus and define the NESDI program:

1. The merger of energy and environmental practices within the CNO N45 organization

2. Climate change related initiatives such as greenhouse gas emissions, issues emerging in the Arctic as well as issues associated with executing the National Environmental Policy Act

3. Renewable energy research priorities including wind, ocean and solar power, the use and implementation of alternative fuels, energy-related environmental planning issues, and the intelligent integration of associated technologies into naval operations

4. Technology innovations to reduce waste generation and enhanced management practices at Navy facilities, including green procurement and sustainable infrastructure

5. Encroachment and other strategic issues as identified by CNO N45 as well as the range, shipyard, and aviation communities

Wherever possible, the NESDI program reaches into its user community and other program sponsors to leverage project resources appropriately. The results of these efforts are impressive, with a total cost sharing of over seven million dollars from 2008 to the present. This is a testament to the ongoing need for and urgency of the program's investments.

On behalf of the NESDI program resource sponsor, I would like to thank all of the System Command program participants including the Technology Development Working Group (TDWG) representatives, Functional Working Group members, and project Principal Investigators, engineers, scientists, and technicians that support the NESDI program.

If you would like to participate in the NESDI program, please contact me or your TDWG representative. And, as always, you can visit the program's web site at www.nesdi.navy.mil.

We will continue to strive for a high level of program capabilities throughout FY12 and beyond with your continued support.

Leslie A. Karr

Leslie Karr, P.E.
NESDI Program Manager

NESDI

NAVY ENVIRONMENTAL SUSTAINABILITY DEVELOPMENT TO INTEGRATION

2011 Integrating Green Technologies into the Fleet

EXECUTIVE SUMMARY

In FY11, the NESDI program accomplishments can be described as follows:

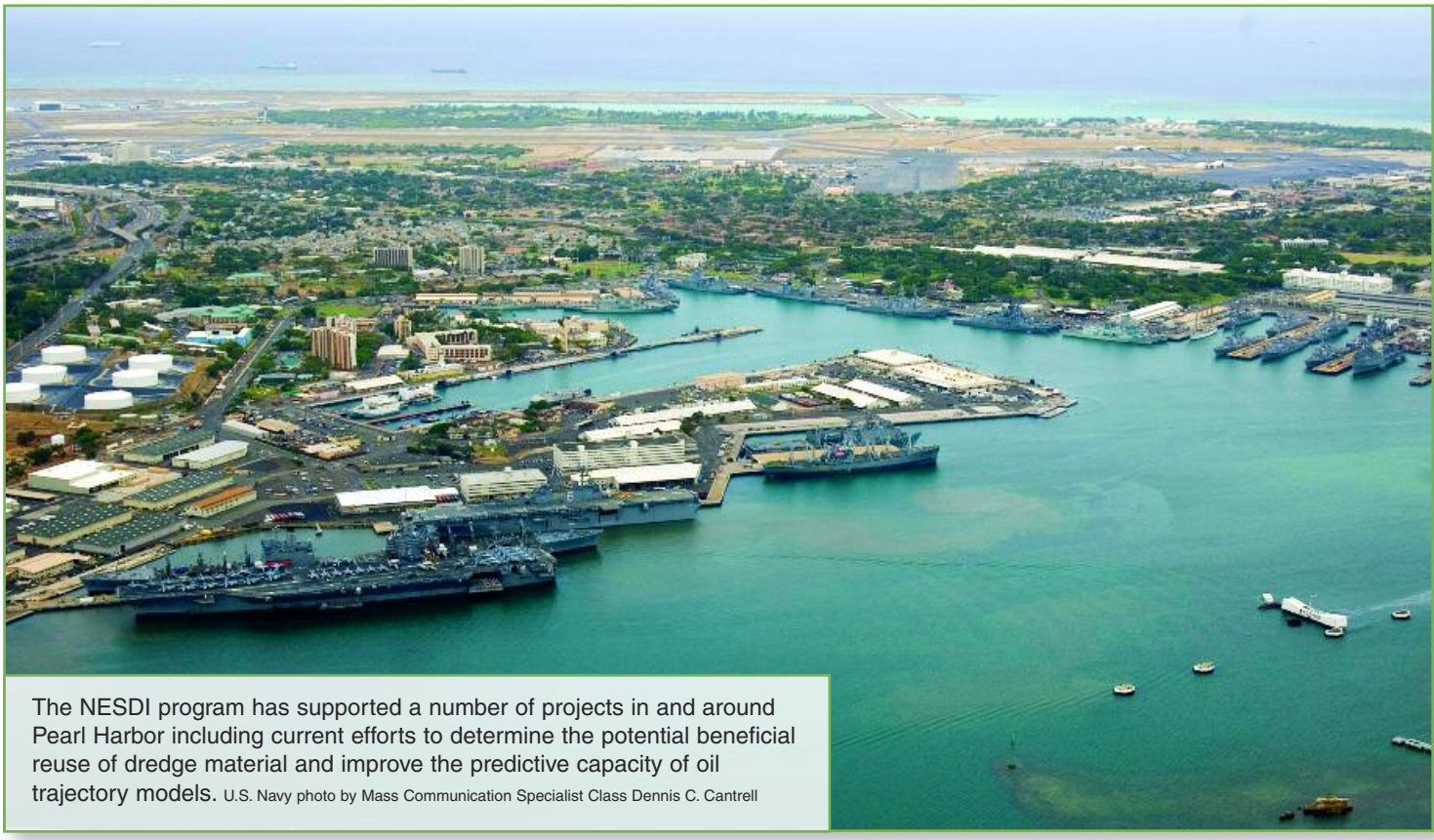
- **8:** The number of projects that were successful in demonstrating the use of innovative technology or collecting critical information
- **51:** The number of needs collected
- **15:** The number of proposals received to address the most highly-ranked needs
- **11:** The number of new projects approved to kick off in FY12
- **10:** The number of ESTCP leveraged projects

2011 Integrating Green Technologies into the Fleet

PROGRAM ACCOMPLISHMENTS

The NESDI program had an operating budget of $5.965 M for FY11 with 35 active projects—down from 40 active projects in FY10. Over 39 percent of the program's budget falls under the Regulatory and Base Operations investment area, which reflects the ongoing need to maintain compliance and avoid Notices of Violation, enhance the Navy's ability to effectively negotiate permits, and provide solutions for new requirements. Approximately 28 percent of the program's budget was dedicated to the Weapon Systems Sustainment, Ship-to-Shore Interface, and Air and Port Operations investment areas. Eleven percent of the program's budget was devoted to range sustainment and 18 percent was dedicated for leveraging with ESTCP. Program strengths continue to rely on dedicated personnel from the Principal Investigators and members of the TDWG, to the site hosts, field coordinators, need submitters, and participants from our resource sponsor organization (CNO N45).

While technology transition is difficult, eight projects were particularly successful in demonstrating the use of an innovative technology or collecting critical information to enhance the efficiency of environmental management programs across the Navy. These projects are listed in the following table and presented as case studies in this report.



The NESDI program has supported a number of projects in and around Pearl Harbor including current efforts to determine the potential beneficial reuse of dredge material and improve the predictive capacity of oil trajectory models. U.S. Navy photo by Mass Communication Specialist Class Dennis C. Cantrell

No.	Project	Number	Description	EEC	PI
1.	Operational Range Clearance—Alternative Green Targets	289	This project demonstrated and validated an alternative green tank target that lacks the hazardous components in tanks currently used on ranges. The green target is an effective replacement for the diminishing supply of M60 tanks.	2 (Range Sustainment)	Joey Trotsky
2.	Direct-Push and Point-and-Detect, In Situ Sensors for Perchlorate	353	This project validated the use of direct push and point-and-detect sensor systems for field use to measure perchlorate, either for rapid screening and monitoring purposes or for contaminant source characterization of perchlorate in groundwater or surface waters.	2 (Range Sustainment)	Mike Putnam
3.	Evaluation of Corn Hybrid Polymer Blast Media for the Removal of Coatings from Delicate Substrates	449	This project provided an effective, environmentally preferred media to remove coatings from difficult, high-value, NAVSEA and NAVAIR delicate substrates, including fiberglass, aluminum, carbon fiber, graphite, and Kevlar.	3 (Weapon System Maintenance)	Jim Howell
4.	Sustainable Naval Facilities	252	This project identified and evaluated a web based assessment tool that Navy personnel can use to reduce the environmental impact of the Navy's existing facilities through the use of sustainable practices, policies, and technologies.	5 (Regulatory and Base Operations)	Scott Hermon
5.	Dredge Spoil Management Alternatives Initiation Decision Report (IDR)	411	This project identified the Navy sites requiring dredging, determined the potential beneficial reuse of the dredged material from these sites, and evaluated the viability of using contaminated dredge spoils as a cement kiln feed stock.	4 (Air and Port Operations)	John Kornuc
6.	Abiotic Treatment of 1,2,3-Trichloropropane (TCP) to Protect Drinking Water Resources	434	This project demonstrated that zero valent zinc can be used to treat TCP in groundwater.	5 (Regulatory and Base Operations)	Nancy Ruiz
7.	Waste-to-Clean Energy (WtCE) IDR	435	This IDR identified WtCE technologies for potential implementation across the Navy. The IDR includes the development of model WtCE case studies to facilitate technology implementation at different Navy regions and/or installations.	5 (Regulatory and Base Operations)	Bill Venable
8.	Predictive Trajectory Model for Oil Spills for Navy Harbors	438	This project will improve the accuracy of the existing models to predict oil trajectories in Navy harbors and provide a validated modeling tool for the Navy On-Scene Coordinators with accurate information.	5 (Regulatory and Base Operations)	P.F. Wang

FY12 NEW STARTS

The NESDI program has approved for funding 11 "new starts" for initiation in FY12.

No.	ID	EEC	Title
1.	465	Range Sustainment (EEC-2)	Demonstration of Passive Samplers for Assessing Environmentally Realistic Concentrations of Munitions Constituents at Underwater Unexploded Ordnance (UXO) Sites
2.	466	Regulatory and Base Operations (EEC-5)	Separation, Detection and Removal of MEC/UXO from Dredged Sediment Using Physical Separation
3.	467	Air and Port Operations (EEC-4)	Methodology to Assess Essential Fish Habitat for Navy Coastal Properties
4.	468	Regulatory and Base Operations (EEC-5)	Low Cost Selective Polymer and Laser Interferometer Real Time Sensors for Detection of Solvents in Contaminated Groundwater Plumes
5.	469	Regulatory and Base Operations (EEC-5)	Validation of a Low Tech Storm Water Procedural Best Management Practice
6.	470	Weapon System Maintenance (EEC-3)	Cyanide Waste Reduction of Electroplating and Stripping Process
7.	471	Range Sustainment (EEC-2)	Detection and Classification of Munitions and Explosives of Concern (MEC) in Shallow Highly Dynamic Underwater Environments
8.	472	Weapon System Maintenance (EEC-3)	Lead-Free Electric Primers for Medium Caliber Ammunition (ESTCP leverage)
9.	473	Regulatory and Base Operations (EEC-5)	Dynamic Mixing Zone
10.	474	Regulatory and Base Operations (EEC-5)	Toxicity Associated with Polyaromatic Hydrocarbons Used in Clay Targets
11.	475	Weapon System Maintenance (EEC-3)	Mobile Pier and Facility Waste Water Treatment System

Integrating Green Technologies into the Fleet

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INTRODUCTION

MISSION

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 fleet readiness. The program seeks to accomplish this mission through the evaluation of cost-effective technologies, processes, and 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 6.4 Research, Development, Test and Evaluation (RDT&E) program. The NESDI technology demonstration and validation program is sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division (CNO N45) and managed by the Naval Facilities Engineering Command (NAVFAC). The program is the Navy's complement to the Department of Defense's Environmental Security Technology Certification Program (ESTCP), which demonstrates and validates technologies important to the tri-Services, U.S. Environmental Protection Agency (EPA), and Department of Energy (DOE).

THE NESDI PROGRAM PROCESS

The NESDI program follows a four phase process:

1 Collect, Validate & Rank Needs.
During this first phase of the process, the program's management team—the Technology Development Working Group (TDWG)—solicits environmental needs from across the Navy's shore community. Once received, the TDWG then validates and ranks those needs based on a variety of criteria including whether the need falls within one of the program's priority investment areas, the pervasiveness of the problem across the Navy, the extent and severity of the associated compliance risk, and the potential impacts on the mission of the fleet if the need isn't addressed.

2 Collect, Evaluate & Rank Proposals.
During this phase of the NESDI program process, the TDWG collects project proposals that address the needs already collected in the first phase of the program process. In particular, the TDWG requests, collects and reviews short pre-proposals and the subsequent detailed, full-length project proposals then recommends to the program's resource sponsor (CNO N45) which projects should receive program support.

3 Execute Projects.
Once proposals have been selected and funded, the program—through initial planning, ongoing reporting and management oversight—ensures that the projects remain properly focused on the needs they were intending to address.

4 Integrate Solutions.
Throughout the project lifecycle, program personnel concentrate on moving the demonstrated technologies and other solutions out of the laboratories and demonstration sites and into the appropriate operational environment. During this fourth and final phase of the NESDI program process, the TDWG, Principal Investigators and technology integration specialists work together to ensure that various solutions are successfully integrated into the fleet and weapons system acquisition programs and verify that the solutions provide the anticipated benefits.

The following diagram highlights the inputs, outputs, and timeframes associated with each of the above stages.

The NESDI Program Process

Priority Investment Areas

The NESDI program makes its primary investments in the following Environmental Enabling Capabilities (EEC) in order of priority:

1. **Range Sustainment (EEC-2).** Innovations that address environmental impacts and restrictions at Navy ranges to ensure that naval training ranges and munitions testing/manufacturing ranges are fully available and efficiently utilized.

2. **Ship-to-shore Interface (EEC-4).** Innovative techniques to manage ship hazardous material/waste offload to shore facilities.

3. **Weapon System Sustainment (EEC-3).** Solutions to reduce the cost of compliance and increase readiness for fleet maintenance personnel.

4. **Air and Port Operations (EEC-4).** Approaches for addressing issues pertaining to air and port operations that ensure fleet readiness.

5. **Regulatory and Base Operations (EEC-5).** Cost-effective methods for identifying, analyzing, and managing environmental constraints related to current and projected regulatory impacts.

A program analysis by EEC is presented in detail starting on page 23.

Strategic Direction

In FY12, the NESDI program will continue to invest in the core areas listed above. As regulatory scrutiny is increased, the Navy and the NESDI program, will be challenged to achieve lower discharge requirements, discover alternative materials that are less harmful to the environment, while maintaining peak operational performance and readiness.

In the future, the NESDI program will also engage in emerging issues including encroachment; the environmental component of climate change initiatives; the potential environmental impacts of alternative fuel usage; green procurement; the environmental implications associated with sustainable infrastructure projects; and environmental information technology requirements. The program will also help to sustain high value habitats for threatened and endangered species.

Ongoing budget constraints will require NESDI to further increase the leveraging of resources from other funding sources and partners to solve common issues.

A critical component of the NESDI program's strategy for technology development is a sound approach for the integration of program technologies into the daily operations of the fleet. This means that the outcome of any NESDI project must be communicated to those who have the responsibility to implement that project—whether the change involves a technology replacement, material substitution, new information or data, or new software. Increasing the awareness of the NESDI program's products is everyone's responsibility and must extend beyond the confines of this final report. Integrating solutions will help to maintain the NESDI program, its resources, and expertise for many years to come.

Integrating Green Technologies into the Fleet

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FINANCIAL REVIEW

PROGRAM ACCOMPLISHMENTS

The NESDI program has prioritized investments in various EECs based on their potential risk to the Navy mission. The NESDI program has aligned its investment portfolio based on priority, urgency and operational requirements. The table on the following page highlights the approximate breakdown of program investments by EEC.

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The NESDI program has prioritized investments in various EECs based on their potential risk to the Navy mission. The NESDI program has aligned its investment portfolio based on priority, urgency and operational requirements. The table below highlights the approximate breakdown of program investments by EEC.

NESDI Program Funding (by EEC)

EEC	FY09 Project Funding	FY10 Project Funding	FY11 Project Funding	FY12 Project Funding (Projected)	FY13 Project Funding (Projected)
EEC-2 (Range Sustainment)	1069	547	644	236	215
EEC-3 (Weapon Systems Sustainment)	1499	983	926	986	575
EEC-4 (Ship-to-shore Interface and Air & Port Operations)	623	467	721	403	76.1
EEC-5 (Regulatory & Base Operations)	2652	2381	2342	1680	1014
Management Costs	1995[1]	975	1031.5	975	975
Unallocated	0	0	290.5[2]	1390	3033.9
ESTCP Leveraging[3]		773.5	10	175	
TOTALS	**5843**	**5718**	**5965**	**5845**	**5889**

in $K

1: FY09 management costs include EEC project costs that were reallocated later during transition to a new program manager.
2: Resources to be awarded via contract.
3: Additional resources not reflected in EEC totals.

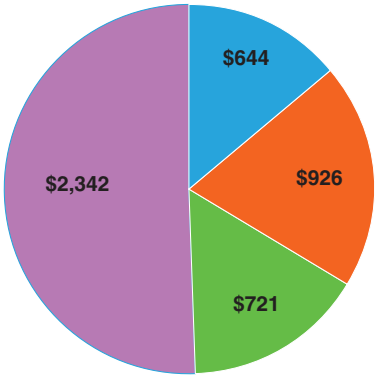
Project Funding & Active Projects in FY11

Most NESDI project funding and active projects fall into Regulatory and Base Operations (EEC-5) as represented in the charts below.

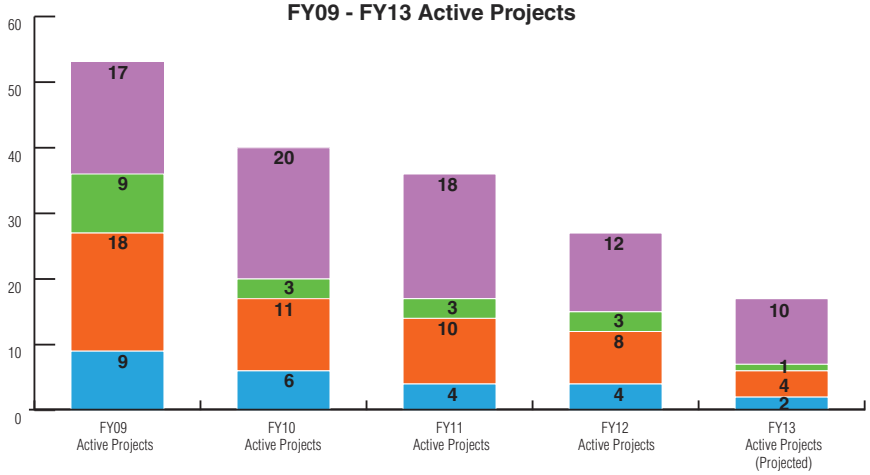
Project Funding (FY09 – FY13)

Since FY09, most NESDI investments have been made in Regulatory and Base Operations (EEC-5). Although overall program funding has decreased since FY09, this trend is projected to continue throughout FY13 as noted in the charts below.

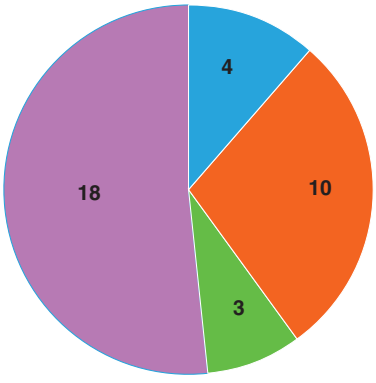
FY11 Project Funding ($K)



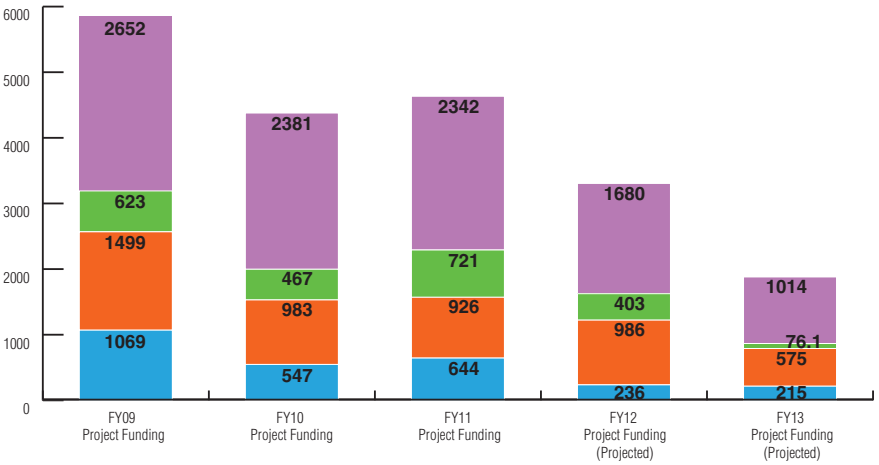
FY09 - FY13 Active Projects



FY11 Active Projects



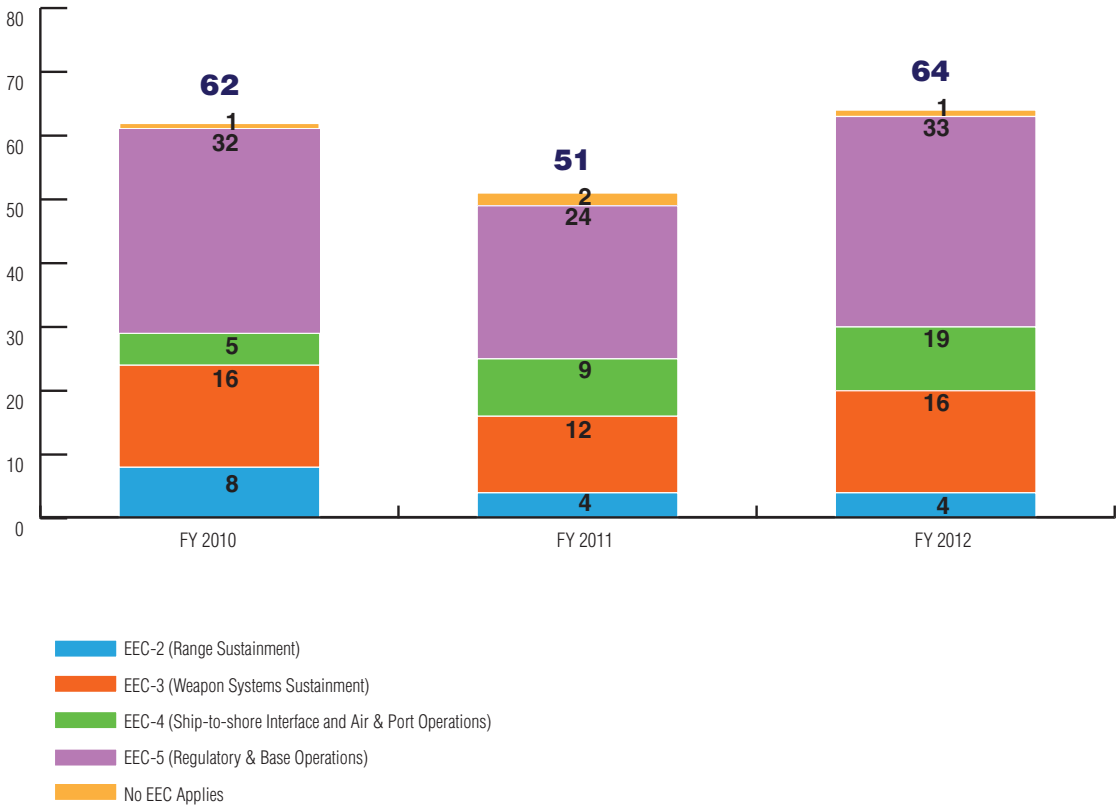
FY09 - FY13 Project Funding ($K)



EEC-2 (Range Sustainment)
EEC-3 (Weapon Systems Sustainment)
EEC-4 (Ship-to-shore Interface and Air & Port Operations)
EEC-5 (Regulatory & Base Operations)

Needs Collected (FY10 – FY12)

The needs collected by the NESDI program mimic the program's investments. That is, most needs are collected in Regulatory and Base Operations (EEC-5) and that is where most of the program's investments are as noted in the charts below.



NESDI & ESTCP Leveraged Funding by Project (2008 to date)

No.	ID	Title	EEC	ESTCP Funding (2008 to date)	NESDI Funding (2008 to date)
1.	348	Nanocrystalline Cobalt Phosphorous Electroplating as a Hard Chrome Alternative	3	438.5	190
2.	412	Demonstration of Biodiesel in Ground Tactical Vehicles and Equipment	5	1374	626
3.	448	Evaluation of Resuspension Associated with Dredging, Extreme Storm Events and Propeller Wash	5	673	370
4.	458	Advanced Non-Chromate Primers and Coatings	3	1325	230
5.	N/A	Biological Treatment of Paint	5	800	70
6.	N/A	Smart Water Conservation Systems for Irrigated Landscapes	5	450	25
7.	464	Water Conservation: Tertiary Treatment and Recycling of Waste Water	5	810	165
8.	N/A	Heavy Diesel Hybrid Demonstration	5	801	50
9.	459	Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects	5	397	147
10.	460	Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors	5	192	225
TOTALS				**7260.5**	**2098**

in $K

Leveraged ESTCP Projects (New Starts FY12)

The projects listed in the following table submitted proposals to and were approved by ESTCP. Both of these projects will receive leveraged funding from the NESDI program in the amounts designated in the following table.

No.	ID	Title	Total ESTCP Funding	NESDI Funding (to date)
1.	465	Demonstration of Passive Samplers for Assessing Environmentally Realistic Concentrations of Munitions Constituents at Underwater UXO Sites	250	405
2.	472	Lead-Free Electric Primers for Medium Caliber Ammunition	1200	40
TOTALS			**1450**	**445**

in $K

New Starts by EEC

The NESDI program has approved for funding 11 "new starts" for initiation in FY12.

EEC	FY12 New Starts	Funding of FY12 New Starts ($K)
EEC-2 (Range Sustainment)	2	199.0
EEC-3 (Weapon Systems Sustainment)	3	386.0
EEC-4 (Ship-to-shore Interface and Air & Port Operations)	1	0.0
EEC-5 (Regulatory & Base Operations)	5	786.5
TOTALS	**11**	**1371.5**

FY12 New Starts

No.	ID	Title	EEC	2012 Requested	2013 Requested	2014 Requested
1.	465	Demonstration of Passive Samplers for Assessing Environmentally Realistic Concentrations of Munitions Constituents at Underwater Unexploded Ordnance Sites	2	140.0	185.0	80.0
2.	466	Separation, Detection and Removal of MEC/UXO from Dredged Sediment Using Physical Separation	5	290.0	230.0	0.0
3.	467	Methodology to Assess Essential Fish Habitat for Navy Coastal Properties	4	0.0*	76.1	0.0
4.	468	Low Cost Selective Polymer and Laser Interferometer Real Time Sensors for Detection of Solvents in Contaminated Groundwater Plumes	5	100.0	0.0	0.0
5.	469	Validation of a Low Tech Storm Water Procedural Best Management Practice	5	90.5	70.0	0.0
6.	470	Cyanide Waste Reduction of Electroplating and Stripping Process	3	55.0	40.0	0.0
7.	471	Detection and Classification of Munitions and Explosives of Concern in Shallow Highly Dynamic Underwater Environments	2	59.0	0.0	0.0
8.	472	Lead-Free Electric Primers for Medium Caliber Ammunition (ESTCP leverage)	3	96.0	0.0	0.0
9.	473	Dynamic Mixing Zone	5	131.0	130.0	0.0
10.	474	Toxicity Associated with Polyaromatic Hydrocarbons Used in Clay Targets	5	175.0	200.0	200.0
11.	475	Mobile Pier and Facility Waste Water Treatment System	3	235.0	425.0	250.0
GRAND TOTAL (for all 11 projects)				**1371.5**	**1356.1**	**530.0**

** FY12 funded with FY11 dollars.*

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PROGRAM ANALYSIS

In this section of the Year in Review report, we provide an analysis of program operations over the course of the year, organized by EEC. For each EEC, we provide the following:

- A summary and analysis of the FY11 funding level
- The estimated funding level for FY12
- A listing of the active projects in FY11
- A listing of the project closeouts for FY11
- A listing of the needs collected in FY11
- A listing of the new projects to be initiated in FY12
- Case studies of successful projects

Range Sustainment (EEC-2)

Background
In this area, the NESDI program invests in innovations that address environmental impacts and restrictions to ensure that naval training ranges and munitions testing/manufacturing ranges are fully available and efficiently utilized. Example projects in this area are:

- **Environmental Effects of Lasers on Biota in the Marine Environment.** This study defined the extent and diversity of laser-based systems being used in an underwater environment and characterized the impacts of those systems on underwater flora and fauna. This study determined that there are no environmental risks associated with the use of those systems. The results of this study are now being accurately and consistently reflected in the National Environmental Policy Act compliance documentation necessary for the fielding of new undersea surveillance and communication systems.

- **Toxicity/Bioaccumulation of Munitions Constituents in the Marine Environment.** This project resulted in the development of a comprehensive data set on the toxicity of munitions constituents to regulator-approved marine species and the definition of their potential for bioaccumulation, cellular level impacts and trophic transfer. The ultimate goal of this project is to evaluate the long-term environmental effects of leaving unexploded munitions in place and determine whether additional mitigations may be needed.

- **Environmental Effects of Military Expendable Material (MEM).** This project is assessing the potential environmental impacts from high priority MEMs to provide information necessary to support range complex environmental planning efforts.

- **Demonstration of Lime Application at Navy Open Detonation Sites.** This project is assessing the efficacy of applying lime for venting areas for practice, full-scale inert bombs to prevent regulatory action and sustain range operations by limiting the potential off-site migration of munitions constituents.

Summary

FY11 Funding Level:	$644,000
FY12 Funding Level (projected):	$236,000
Active Funded Projects in FY11:	4
Needs Collected in FY11:	4
New Starts in FY12:	2

Active Funded Projects in FY11

There were four active NESDI projects in EEC-2 over the course of FY11.

No.	ID	Title	Objective
1.	347	Long Term Disposition of Seafloor Cables	To provide the Navy a scientific basis for making sound decisions for balancing long-term disposition of seafloor cables in the marine environment.
2.	437	Implementation of Forensic Approaches to Address Background Perchlorate Source Identification and Characterization at Navy Facilities and Ranges	To develop and implement the approach, tools, and methods to quantify and distinguish the relative levels of naturally occurring perchlorate from those derived from anthropogenic sources.
3.	445	Demonstration of Lime Application at Navy Open Detonation Sites	To assess the efficacy of pH adjustment as a practical BMP for venting areas. To provide guidance on how to apply the BMP to Navy ranges.
4.	462	Military Expendable Material	To develop and analyze a prioritized list of MEM.

In addition to the four active projects listed above, there were another three projects in EEC-2 that were at various stages of project closeout in FY11.

No.	ID	Title	Objective
1.	289	Operational Range Clearance	To provide Navy and Marine Corps range managers with a strategy for minimizing range clearance costs while addressing safety requirements by identifying an optimum combination of innovative partnerships, innovative technology, procedures and equipment that considers key range characteristics including location and utilization. To also provide an implementation plan and cost model for each identified combination.
2.	258	Toxicity/ Bioaccumulation of Munitions Constituents in the Marine Environment	To develop a comprehensive data set on toxicity of munitions constituents to regulatory acceptable marine species, as well as conclusively define potential bioaccumulation, cellular level impacts, and trophic transfer.
3.	257	Degradation Processes of Munitions Constituents in Marine Matrices	To evaluate the applicability of existing freshwater data or develop a comprehensive data set regarding the degradation rates, adsorption coefficients and solubility constants of munitions constituents in marine water and sediments.

PROGRAM ANALYSIS

RANGE SUSTAINMENT (EEC-2)

Needs Collected in FY11

All four of the needs collected under this EEC during this reporting period were ranked highly by the TDWG and validated by the program's resource sponsor. Pre-proposals were requested to address two of those needs and two projects will be initiated in FY12. A list of those four needs is provided below.

No.	Need	Command	Title	Ranking	Status
1.	N-0744-11	NAVFAC	Investigation of Environmentally Relevant Munitions Constituents Concentrations for Development of Ecological Risk Assessment of Underwater Military Munitions Sites	HIGH	Request NESDI Pre-Proposal
2.	N-0749-11	NAVFAC	Determining Environmental Effects of Seafloor Cable Removal	HIGH	Being Addressed By Existing Efforts (NESDI)
3.	N-0750-11	NAVFAC	Detection of Munitions of Concern in Highly Dynamic Underwater Environments	HIGH	Request NESDI Pre-Proposal
4.	N-0770-11	SPAWAR	Development of RDT&E Tracking and Reporting System to be Used on Fleet Ranges and RDT&E Ranges	HIGH	Outside NESDI Scope

New Starts in FY12

In EEC-2, the NESDI program will initiate two projects in FY12.

No.	Title
1.	Demonstration of Passive Samplers for Assessing Environmentally Realistic Concentrations of Munitions Constituents at Underwater Unexploded Ordnance Sites
2.	Detection and Classification of Munitions and Explosives of Concern in Shallow Highly Dynamic Underwater Environments

Alternative Tank Targets—New Targets Provide Green Alternatives for Navy Ranges

Project Number: 289

Project Type:
TECHNOLOGY REPLACEMENT

A challenging aspect of sustainable range operations at the Navy's land-based air-to-ground (ATG) ranges is the lifecycle management of hard targets. Hard targets, traditionally surplus armored vehicles such as unserviceable tanks and armored personnel carriers, are required on high-explosive ranges because of their durability. However, these targets present environmental and operational challenges because of their environmental impacts, high lifecycle costs, occupational and explosive safety concerns, and their limited availability.

The ALFGT contains no hazardous components and is an effective replacement for the diminishing supply of M60 tanks.

Traditional hard targets, such as a surplus M60 tank, present environmental liabilities for range managers. The equipment must be carefully prepped to meet environmental requirements. Preparation includes the removal of hazardous, radiological, and special waste materials including:

- petroleum oils and liquids
- fuel, coolant, lubricants
- low-level radioactive waste
- asbestos containing items
- solid-state electronic components
- fire suppression equipment
- engine and drive train components

The latest prototype of the ALFGT being built.

CASE STUDY

RANGE SUSTAINMENT (EEC-2)

In addition to the hazardous wastes generated from target preparation, their use on-range presents a significant environmental liability. During preparation, not all of the wastes are recovered. Inevitably, some wastes remain in some of the components of a M60 tank because extracting all of the fluids is difficult. The fluids that remain can be released to the environment during its lifetime on-range as a target.

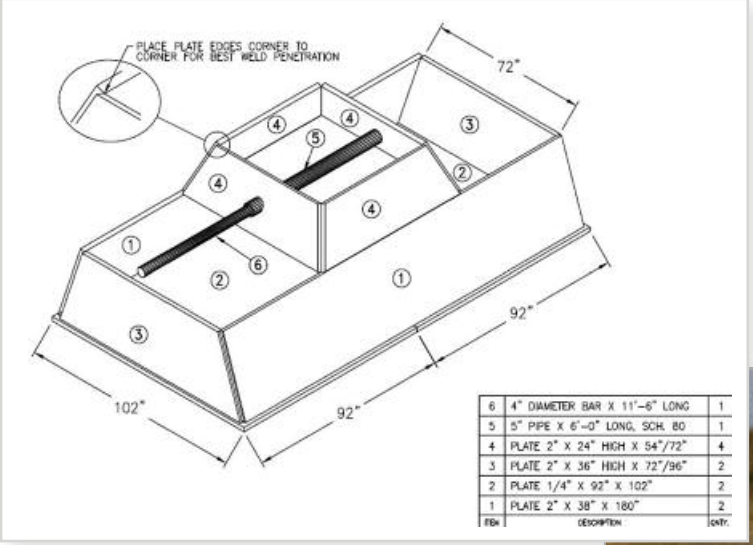
This project demonstrated and validated an Alternative Live Fire Ground Target (ALFGT) developed by the Naval Facilities Engineering Service Center (NAVFAC ESC). The ALFGT contains no hazardous components and is an effective replacement for the diminishing supply of M60 tanks.

The ALFGT is constructed of concrete and steel and is intended to replace traditional M60 tank targets. It is environmentally friendly and expected to have lifecycle costs on par with surplus military vehicles. Both Naval Air Station (NAS) Fallon and the Pinecastle Range Complex have the Navy's largest ATG training operations. The ALFGT was designed for use at these heavily used ranges, although it may also be used at other ranges as well.

The latest prototype of the ALFGT was designed by NAVFAC ESC and built on-site at the Pinecastle Range Complex in August 2009. Changes to the design were made based on lessons learned from the first prototype tested in April 2007. The ALFGT is 8.5-feet wide by 15.3-feet long by 5 feet tall, including the turret. The footprint of the alternative tank target is a little less than three-quarters of the size of a M60 tank, although the ALFGT is much shorter. The goal was to have the alternative target's size as close as possible to the M60 without exceeding the lifting weight limits

It has maintained its structural integrity despite sustaining many close hits, proving that it can be a viable target for ATG training.

The ALFGT survives close hits from 500 pound bombs.



ITEM	DESCRIPTION	QNTY.
6	4" DIAMETER BAR X 11'-6" LONG	1
5	5" PIPE X 6'-0" LONG, SCH. 80	1
4	PLATE 2" X 24" HIGH X 54"/72"	4
3	PLATE 2" X 36" HIGH X 72"/96"	2
2	PLATE 1/4" X 92" X 102"	2
1	PLATE 2" X 38" X 180"	2

Schematic of the ALFGT.

The latest prototype of the ALFGT placed in the live impact area.

of the moving equipment. Since both NAS Fallon and the Pinecastle Range Complex acquired tank retrievers after the design and testing of the first prototype, the ability to move the ALFGT led to a significant alteration of the design—it is now a single piece. The first prototype was modular in design, so that each component could be moved with lighter equipment. The first prototype may still be a viable option on island ranges where heavy moving equipment is not available.

The ALFGT is much stronger than the first prototype. It has thicker steel with many gussets joining the steel plates. It is also has angled sides to help prevent the penetration of bomb fragments. The design is much simpler and quick to build. Although it took about a week and a half for two workers to build the first ALFGT at the Pinecastle Range Complex, it should only take about a week to build subsequent targets with the proper equipment and experience.

The latest prototype—the second design—has been in use at the Pinecastle Range Complex since October 2009. It has maintained its structural integrity despite sustaining many close hits, proving that it can be a viable target for ATG training. New lessons learned will allow the next generation of tank targets to be even stronger.

These ALFGTs now provide the Navy with the capability to produce a green, affordable, long-lived target in-house for air-to-ground training that eliminates the need for either pre- or post-cleanup costs. A final report on this project is currently being written.

CUSTOMER TESTIMONIAL

"The alternative tank target is holding up well. I believe that this type of environmentally friendly target will be viable if funding can be obtained to construct it. Traditionally M60 tank targets that contained asbestos in their engine compartments were inadvertently placed on the range that resulted in abatement that cost over $35,000 to remediate."

—Chris Townsend (Pinecastle Range Facility)

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CASE STUDY

RANGE SUSTAINMENT (EEC-2)

Direct-Push and Point-and-Detect, In situ Sensors for Perchlorate— Perchlorate Sensor Now Part of Fielded Suite of Site Characterization Equipment

Project Number: 353

Project Type:
TECHNOLOGY REPLACEMENT

Perchlorate has been used as the oxidizer component and primary ingredient in solid propellant for rockets and missiles. Perchlorate is exceedingly mobile in aqueous systems and can persist for many decades under typical ground and surface water conditions. Perchlorate contamination of ground water has become a high profile public issue. In turn, detection and cleanup have become rapidly emerging needs. It has been found in roundwater, drinking water, and soils, mainly in the southwestern United States, at levels ranging from 8 to 3,700 parts per billion (ppb).

Perchlorate has been reported in 11 percent of California's public water supplies, and the state has established a 4 ppb provisional action level. In 1999, there were several known Navy perchlorate sites including Naval Weapons Industrial Reserve Plant McGregor, Outlying Landing Field San Nicolas Island, Allegany Ballistics Laboratory, Naval Surface Warfare Center Indian Head, and Marine Corps Air Station El Toro. This number may increase as more sites are evaluated.

Because perchlorate is considered to be an explosive residue, there is a need to screen for perchlorate to assess vulnerabilities related to environmental contamination to sustain range operations both on and off range and determine if environmental conditions impact range operations.

Perchlorate cannot be removed effectively from water by common filtration, sedimentation, air-stripping, or sorption onto activated carbon. Perchlorate can affect the thyroid gland by blocking iodine uptake resulting in lower thyroid hormone levels. This deficiency results in abnormal metabolism, growth and development.

While human health action levels are still being developed, the U.S. Environmental Protection Agency (EPA) has released a draft human health risk benchmark calculated at 1 ppb—substantially below previous benchmarks. The likelihood of significant monitoring requirements on past and active ranges is growing. Furthermore, because perchlorate is soluble in groundwater and highly stable, perchlorate contamination is often found at great distances from the source. Experience has shown that conventional sampling may not accurately represent perchlorate contamination levels. Regulators have begun to initiate policies that require intensive sampling efforts as a requirement for site closure. This type of sampling effort will be prohibitively expensive unless more effective site characterization methods are developed. To date, no such field screening methods to detect perchlorate exist.

Given the accuracy of the real-time sensor in comparison to standard methods, it can be used to rapidly delineate the location of perchlorate plumes.

In response, this NESDI project validated the use of a direct push and point-and-detect, field deployable sensor system—the Surface Enhanced Raman Spectroscopy (SERS) system—for real time and in-situ use to measure perchlorate either for rapid screening and monitoring purposes or for contaminant source characterization of perchlorate in groundwater or surface waters.

The SERS system is comprised of a portable Raman system (complete with laser, spectrometer, detector, and computer) with a detachable fiber optic probe. A SERS sensor module that houses the cationic-coated SERS substrates was designed and built to mount onto the fiber optic probe. The sensor module was deployed inside a direct push cone penetrometer sampling probe to measure perchlorate in-situ in real time as a function of depth.

Edward's Site 285 soil samples as deep as five meters below ground level were collected for later analysis using EPA Standard Method 6860.

In the computer room of the SCAPS truck, the perchlorate sensor is assembled inside of the first push rod. The rod string is hydraulically pushed into the ground and data are relayed back in real-time to onboard computers for analysis.

Demonstrations were conducted at Edwards Air Force Base Site 285. Located in the northern part of the base, Site 285 is the former site of the National Aeronautics and Space Administration's Jet Propulsion Laboratory solid rocket motor activities. Contamination at the site resulted from the use of ammonium perchlorate, an ingredient in solid rocket fuel. Soil samples were collected from Site 285 to test the sensor's ability to accurately measure levels of perchlorate concentrations in contaminated groundwater. Because perchlorate acts like a solid in soil but dissolves like table salt in groundwater, researchers were able to obtain groundwater samples from the soil at Site 285. Data from the sensor was compared with EPA Standard Method 6860. Using split samples, the correlation coefficient between the standard method and the real time sensor was 0.94. Given the accuracy of the real-time sensor in comparison to standard methods, it can be used to rapidly delineate the location of perchlorate plumes. Understanding the extent and concentration of underground plumes is important when designing the most cost effective remediation approach and determining the efficacy of the treatment process.

The SERS system has since been installed in all Navy Site Characterization Analysis Penetrometer System (SCAPS) trucks and is now available for use by Navy regional program managers with sites containing potential subsurface perchlorate plumes.

CUSTOMER TESTIMONIAL

"Letting the Navy access Site 285 last September was a no-brainer. This cutting-edge sensor will save the government time and money. Normally, a team has to send samples to a laboratory, where it can take two to six weeks for an analysis. Many times, it means two to six weeks of waiting for the sampling crew because the team relies on the test results to determine where the next samples need to be taken to delineate the plume. With the Navy's sensor, a team will be able to take samples and get on-site analysis in real-time. This expedites the cleanup process and saves time and money."

—Bruce Oshita (Edwards Air Force Base)

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Weapon System Sustainment (EEC-3)

Background
In this investment area, the NESDI program sponsors solutions for the fleet maintainer to reduce the cost of compliance and increasing fleet readiness. Example projects include:

- **Evaluation of Corn Hybrid Polymer Blast Media for the Removal of Coatings from Delicate Substrates.**
  This project is validating the use of corn hybrid polymer for the effective repair of aircraft radomes and other delicate substrates. The resulting technology provides an environmentally preferred method to replace chemical strippers and labor-intensive manual coating removal methods.

- **Removal of Coke Deposits from F404 Engine Drive Shafts.**
  This project successfully demonstrated the use of plastic blast media in a glove box environment to remove coke deposits from the F404 engine shaft, thereby eliminating the use of a hazardous cleaning compound from this maintenance procedure. This technology has been installed and is in use at Naval Air Station Oceana.

- **Advanced Non-Chromate Primers and Coatings.**
  The objective of this project is to evaluate coating systems built from current state-of-the-art non-chromate primers in conjunction with non-chromate metal finishes with the goal of implementing successfully characterized, demonstrated and authorized non-chrome primers on naval aviation assets.

- **Cadmium Tank Electroplating Alternative.**
  This project is demonstrating and validating an alkaline zinc-nickel alloy electroplating process as an alternative to tank cadmium electroplating on high strength steel and general surfaces at Fleet Readiness Center-level maintenance facilities. Additionally, this project will validate the tri-valent chrome process as an alternative to conventional hexavalent post treatments on the above alkaline zinc-nickel deposit.

Summary

FY11 Funding Level:	$926,000
FY12 Funding Level (projected):	$986,000
Active Funded Projects in FY11:	10
Needs Collected in FY11:	12
New Starts in FY12:	3

The NESDI program successfully demonstrated the use of plastic media to remove coke deposits from the drive shaft of the F404 engine like the one shown here.

U.S. Navy photo by Mass Communication Specialist 3rd Class Jason Johnston

Active Funded Projects in FY11

The following ten projects were active over the course of FY11.

No.	ID	Title	Description
1.	248	Cleaning Solvents for the 21st Century	To develop and sustain a Joint Service Solvent Substitution framework and methodology to be used for each solvent substitution effort. To identify and prioritize maintenance operations requiring test and evaluation, prioritized based on the solvent and quantity used. To establish criteria for qualifying and implementing an environmentally sound cleaner.
2.	328	Non-Chromated Post Treatments	To reduce Navy-wide use of chromate post-treatment coatings by testing and authorizing the Trivalent Chrome Process as a non-chromated replacement. The replacement shall be suitable to the environment, pose no health risk to naval personnel, and have identical or improved performance characteristics compared to chromated post-treatment coating.
3.	348	Nanocrystalline Cobalt Phosphorous (nCoP) Electroplating as a Hard Chrome Alternative	To demonstrate/validate and qualify pulse-electroplating technology for deposition of nCoP coatings as a replacement for Electrolytic Hard Chrome (EHC) plating for both NAVAIR and NAVSEA Systems. This project will be performed in conjunction with ESTCP (WP-0411), utilizing leveraged funding to prioritize Navy-unique requirements. The nCoP coating is an electrodeposited cobalt alloy that employs a plating bath with consumable cobalt anodes.
4.	370	Large Paint Facility Flow Rate Computational Fluid Dynamics (CFD) Modeling and Verification	To develop and field verify a CFD model confirming that a lower flow rate is sufficient to control paint overspray and provides no significant deterioration of health protection, thus reducing the size for the fans, motors and air pollution control equipment in large paint facilities.
5.	399	Prohibited and Controlled Chemical (PCCL) and NAVSEA Target Chemical (TCL) Lists	To generate a computer algorithm capable of batch processing specifically identified health, safety, and environmental regulatory impact factors that are weighted by hazard severity to obtain a composite, quantitative value, thus allowing the prioritization of the universally accepted EPA List of Lists.
6.	428	Bio-based Hydraulic and Metal Working Fluids	To develop new specifications for evaluating bio-based metal working fluids. The classes of metal working fluids that will be investigated will include straight oil, soluble oil, semi-synthetic, and synthetic and selected based on the pervasiveness of use.
7.	449	Evaluation of Corn Hybrid Polymer Blast Media for the Removal of Coatings from Delicate Substrates	To provide an effective, environmentally preferred media to remove coatings from difficult, high-value, NAVSEA and NAVAIR delicate substrates, including fiberglass, aluminum, carbon fiber, graphite and Kevlar.
8.	450	Cadmium Tank Electroplating Alternative	To demonstrate and validate DIPSOL IZ-C17+ as an alternative to tank cadmium electroplating on high strength steel/general surfaces within Depot-level maintenance. To validate DIPSOL IZ-264 as an alternative to conventional hexavalent post treatments on the above alkaline zinc-nickel deposit.

(continued on the next page)

Active Funded Projects in FY11 *(continued)*

No.	ID	Title	Description
9.	451	Navy Demonstration of Cadmium and Hexavalent Chromium Free Electrical Connectors	To expand upon previous laboratory testing by NAVAIR and the Army Tank and Automotive Command "beyond specification" test effort on new connector plating classes in a leveraged effort focused on Navy-relevant field testing of alternatives. Testing will quantify the differences among the new and existing plating classes including MIL-DTL-38999L Class P, T, Z, W (cadmium/chromate controls) including two other new coatings being spearheaded by the Army. Other relevant controls such as nickel-on-stainless will be included.
10.	458	Advanced Non-Chromate Primers and Coatings	To evaluate coating systems built from current state-of-the-art non-chromate primers in conjunction with non-chromate metal finishes. Focus on testing leading metal finishing alternatives.

In addition to the ten active projects listed on the previous page and above, the following four projects were also active but in various stages of project closeout.

No.	ID	Title	Description
1.	330	Advanced Anodizing Using Process Control Technology	To demonstrate and validate Metalast™ anodizing technology using advanced process control for processing of Type II and III coatings within a one-tank system and to further evaluate capabilities for producing Type IIB (Type I alternative) coatings using the above Metalast System Controller within the same bath chemistry. To evaluate the use of a non-hexchrome post sealer as a potential replacement to existing dichromate sealing of the above coating types.
2.	349	Low Temperature Powder Coating	To demonstrate, validate and successfully implement a low temperature cure powder coating on DoD production hardware.
3.	429	Demonstration of a Single Drum Batch Dense Particle Separator (DPS) for Recycling PlasticMedia Beads (PMB)	To demonstrate a prototype batch DPS that is easy to operate and maintain; compact; low cost; and able to meet the recycling requirement established by NAVAIR's PMB specification for metallic and composite materials.
4.	433	User Friendly Oxygen Cleaning Alternatives to Navy Oxygen Cleaner	To identify and validate effective non-ozone depleting chemicals as an alternative to Navy Oxygen Cleaner for components.

Needs Collected in FY11

Of the 12 needs collected in EEC-3 in FY11, three of those needs were ranked highly by NESDI program personnel. Pre-proposals were requested to address two of those needs and three projects will be initiated in FY12. A list of all 12 needs is provided below.

No.	Need	Command	Title	Ranking	Status
1.	N-0721-11	Other	Bed Liner or a Polyurethane Non-Slip Surface on Tow Tractor	Not Ranked	Similar/Duplicate Need, Merge
2.	N-0723-11	NAVAIR	Rhinoliner and Rhinoliner-Like Coatings for Support Equipment	MEDIUM	More Information Required
3.	N-0728-11	NAVAIR	Environmentally Benign Repairs of High Temperature Composites with Cyanate Ester Resins: Moisture Effects on Repair Efficiency	MEDIUM	More Information Required
4.	N-0731-11	NAVAIR	Graphite-Based Paint as Replacement for Copper-Based Ship Hull Anti-Fouling Coatings	LOW	Not Ready For Dem/Val
5.	N-0732-11	NAVAIR	Machine Coolant Waste Reduction — Process Improvement, Monitoring, and Materials Substitution	MEDIUM	More Information Required
6.	N-0733-11	NAVAIR	Cyanide Waste Reduction of Electroplating and Stripping Processes	MEDIUM	Request NESDI Pre-Proposal
7.	N-0734-11	NAVAIR	Chemical Depaint Waste Stream Reduction Utilizing Alternative (Non-Chemical) Organic Coating Removal Technologies for Airframes and Components	HIGH	Not Ready For Dem/Val
8.	N-0735-11	NAVAIR	Chemical Depaint Waste Stream Reduction Utilizing Alternative Chemical Organic Coating Removal Technologies for Airframes and Components	HIGH	Not Ready For Dem/Val
9.	N-0736-11	NAVAIR	Aviation Hazardous Materials Lists	MEDIUM	Outside NESDI Scope
10.	N-0751-11	NAVAIR	Evaluation of Rework Cycle for Powder Coated Equipment	LOW	Outside NESDI Scope
11.	N-0753-11	NAVSEA	Demonstration of an Alternative, Non-Media Methodology for Coatings Removal and Selective Stripping Processes	HIGH	Not Ready For Dem/Val
12.	N-0755-11	NAVSEA	Waste Minimization for Navy Shipyard Blasting Media	LOW	More Information Required
13.	N-0772-11	NAVSEA	Mobile Pier and Facility Waste Water Treatment System	MEDIUM	Request Pre-proposal

New Starts in FY12

In EEC-3, the NESDI program will initiate three projects in FY12.

No.	Title
1.	Cyanide Waste Reduction of Electroplating and Stripping Process
2.	Lead-Free Electric Primers for Medium Caliber Ammunition (ESTCP leverage)
3.	Mobile Pier and Facility Waste Water Treatment System

ESTCP Leveraged Projects

In EEC-3, for the past several years the NESDI program also was able to leverage resources from ESTCP to support the following four projects.

No.	Title	ESTCP Funding (to date)	NESDI Funding (to date)
1.	Nanocrystalline Cobalt Phosphorous Electroplating as a Hard Chrome Alternative	438.5	190
2.	Advanced Non-Chromate Primers and Coatings	1325.0	230
3.	Modeling and Verifying Aircraft Paint Hangar Air Flow Reduction (Phase II proposal)	0.0	25
4.	Lead-Free Electric Primers for Medium Caliber Ammunition	1200.0	40
TOTAL		**2963.5**	**485**

in $K

Evaluation of Corn Hybrid Polymer (CHP) Blast Media for Coatings Removal— New Media Proven Effective on Delicate Substrates

Project Number: 449

Project Type:
TECHNOLOGY REPLACEMENT

This project was initiated in response to a need to develop an alternative stripping method for coating removal and selective stripping of delicate substrates (NESDI need N-0355-06). Federal, state, and local environmental, health, and safety laws, restrictions, and regulations have placed stringent emission and waste management requirements on Department of Defense (DoD) industrial operations involving coatings removal from military assets. As a result, prevailing manufacturing, repair, and rework practices have become increasingly difficult, less efficient, and more costly. DoD industrial facilities are therefore trying to reduce or eliminate emissions and waste associated with routine manufacturing, repair, and overhaul activities including coatings removal and selective stripping.

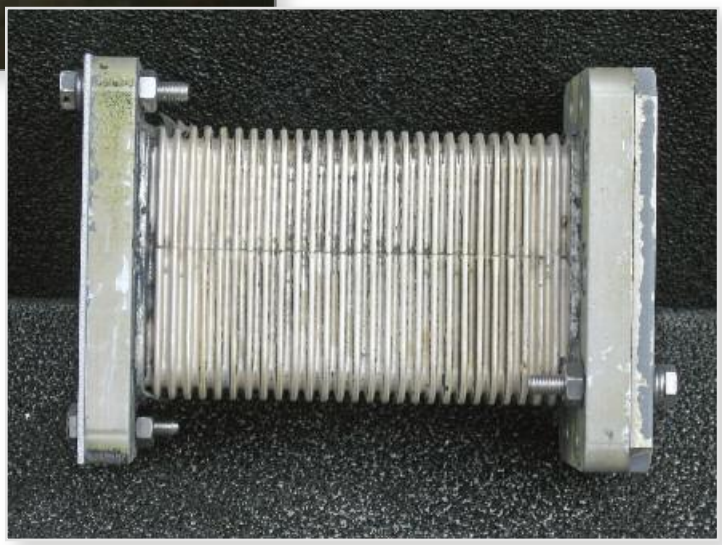
Delicate substrates, such as composites and thin aluminum alloys, can be easily damaged during the coatings removal process. These damaged substrates require rework, impede the performance of military equipment and vehicles, and result in reduced service life and increased equipment down time. In order to prevent damage while removing coatings, chemical strippers and manual coatings removal methods, such as pneumatic hand sanding, are utilized. These methods can release solvent vapors into the atmosphere, generate hazardous waste, and expose workers to potentially unsafe working conditions.

To address these issues, the NESDI program sponsored this project to:

1. Provide an effective, environmentally preferred media to remove coatings from difficult, high-value, Naval Sea Systems Command (NAVSEA) and Naval Air Systems Command (NAVAIR) delicate substrates including fiberglass, thin aluminum alloys, carbon fiber, graphite and Kevlar
2. Introduce the media to facilities where it is not currently in use
3. Implement the use of CHP media on a broader and larger scale

CHP was used to strip this fiberglass radome mast at the Trident Refit Facility Bangor.

Composite antenna mast from Pearl Harbor Naval Shipyard after CHP stripping.



Aluminum antenna waveguide from Norfolk Naval Shipyard after being stripped with CHP.

CUSTOMER TESTIMONIAL

"NAWC Lakehurst was very impressed with the results of both the standard and low temperature powder coated test coupons blasted with CHP at the Norfolk demonstration. The low blast pressures did not affect the surface profiles of the test coupons. NAVAIR has given approval to utilize CHP as a qualified Type VII media in their blasting processes, and are adding media-specific information into the Support Equipment Cleaning, Preservation, and Corrosion Control (17-1-125) manual."

—Dana Kaminsky (NAWC Lakehurst)

Throughout this project, successful demonstrations were completed at three Navy shipyards and other facilities between FY09 and FY11 including:

1. Norfolk Naval Shipyard
2. Naval Undersea Warfare Center Keyport
3. Navy Region Northwest:
   - Naval Station Kitsap
   - Naval Air Station Whidbey Island
   - Puget Sound Naval Shipyard
4. Pearl Harbor Naval Shipyard
5. Naval Air Warfare Center (NAWC) Lakehurst

Accomplishments to date include the following:

- NAWC Lakehurst has received formal NAVAIR approval to utilize CHP as a qualified Type VII media in their blasting processes, and added media-specific information into the Support Equipment Cleaning, Preservation, and Corrosion Control (17-1-125) manual.
- The Puget Sound Naval Shipyard and Intermediate Maintenance Facility is converting one of their blasting booths and a glove box/cabinet blaster to CHP blast media.
- Portsmouth Naval Shipyard was impressed with the results documented by the Northwest regional and east coast demonstrations, and are preparing a new shipyard blast booth for CHP use.
- Norfolk Naval Shipyard is considering the conversion of a glove box blaster to CHP for small delicate substrate items (i.e. waveguides).
- The Corpus Christi Army Depot has approved CHP for use on H-60 helicopter components (rotor blades) which includes Army, Navy and Marine Corps assets.
- Florida, Tennessee, North Carolina, Missouri, Mississippi, Kansas, Oklahoma, Utah, Texas and California are among the states that have already approved CHP for bio-based media recycling.

Additional detailed information on CHP will be provided to NAWC Lakehurst for incorporation into the next update of the 17-1-125 manual and integration of the media with other interested stakeholders will continue.

As a result of these efforts, the manufacturing, repair and rework processes will become easier, more efficient, and less costly for the end user, thereby reducing the health and safety risks compared to current hand sanding and chemical stripping methods of coatings removal from delicate substrates.

These demonstrations confirmed that CHP media causes no damage to these substrates during coatings removal processes due to the nature of the media and the lower blast pressures used. CHP can be used in standard, light abrasive blast equipment and as a “drop-in” replacement for many plastic media blasting systems.

These demonstrations confirmed that CHP media causes no damage to these substrates during coatings removal processes due to the nature of the media and the lower blast pressures used.

The media can be used repeatedly (typically 12 to 15 times), and can be recycled through an approved Treatment, Storage and Disposal Facility.

Overall, the project has provided Navy and DoD facilities a more effective, environmentally preferred media to remove coatings from difficult, high-value, delicate substrates, including fiberglass, aluminum, carbon fiber, graphite and Kevlar.

Project team members included:

- **Jim Howell**
  (Principal Investigator)
  Naval Surface Warfare Center — Carderock Division
- **Bill Thomas**
  (technical lead)
  Concurrent Technologies Corporation
- **Webb Kane**
  Midvale Environmental Technologies
- **Kurt Doehnert**
  (shipyard technology insertion liaison)
  NAVSEA

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Ship-to-shore Interface and Air & Port Operations (EEC-4)

Background

In this area, the NESDI program invests in innovative techniques to manage ship hazardous material/waste offload to shore facilities. Example projects in the ship-to-shore interface area are:

- **Surface Cleaning of Dry Dock Floors.** This ongoing effort seeks to select, procure and integrate proven technologies that collect and concentrate solids and fine particles from dry dock floors, pump wells, cross connection channels, trenches, rail tracks, and adjacent areas to the dry dock. The selected solutions will allow shipyards to conduct their core business of maintaining Navy ships with fewer risks associated with environment compliance and a reduction in the manual labor associated with facility cleaning.

- **Motion Assisted Environmental Enclosure (MAEE) for Capturing Paint Overspray in Dry Docks.** This NESDI effort demonstrates and integrates a low-cost, modular device that combines semi-autonomous motion with portable containment to maximize operator productivity while capturing paint overspray before it is incorporated into dry dock industrial operations or discharges associated with flooding or storm water runoff into nearby waterways.

- **Hull Maintenance Shroud.** This project will leverage existing technologies to demonstrate a hull shroud which will provide a simple, economical solution for capturing waste streams associated with coating removal and surface preparation during ship repair and painting operations.

Summary

FY11 Funding Level: $721,000
FY12 Funding Level (projected): $403,000
Active Funded Projects in FY11: 3
Needs Collected in FY11: 9
New Starts in FY12: 1

The MAEE can be assembled on a conventional boom lift in approximately one hour.

The control system's micro-computer converts the operator's instructions into precise commands that follow along the ship's hull.

Active Funded Projects in FY11

There were three active NESDI projects in EEC-4 over the course of FY11.

No.	ID	Title	Objective
1.	440	Surface Cleaning of Dry Dock Floors	To demonstrate sufficiently capable, convenient, versatile, robust, and cost effective practical surface cleaning technology for shipyard use to mitigate problematic contaminants in discharges from dry docks and from other possible industrial areas that present similar challenges and opportunity for improvement.
2.	441	Motion Assisted Environmental Enclosure for Capturing Paint Overspray in Dry Docks	To demonstrate and integrate a low-cost, modular device that combines semi-autonomous motion with portable containment to capture paint overspray in dry dock and enhance environmental compliance.
3.	456	Hull Maintenance Shroud	To provide a simple, economical solution to capturing waste streams associated with coating removal and surface preparation during repair and painting operations over water. Specific objectives include: 1. Develop and modify technologies to perform in-port coating repair. 2. Capture the waste stream from coating repair operations before it is introduced into the adjacent water body. 3. Validate equipment effectiveness for regulatory acceptance 4. Transition technology to the user community.

In addition to the three projects listed above, the following three projects were also active but in various stages of project closeout.

No.	ID	Title	Objective
1.	240	NoFoam™ System for Aircraft Hangar Fire Suppression System Foam Discharge Checks	To demonstrate and validate the effectiveness of the NoFoam™ System technology in minimizing or eliminating the Aqueous Film Forming Foam (AFFF) generated wastewater from aircraft hangar fire suppression foam system annual discharge checks.
2.	288	NoFoam™ System For Automotive Fire Apparatus Vehicle Foam	To demonstrate and validate the effectiveness of the modified NoFoam™ System in eliminating the AFFF wastewater Discharge Checks generated during annual testing of automotive fire apparatus vehicles.
3.	411	Dredge Spoil Management Alternatives	To identify Navy sites requiring dredging and to determine the potential beneficial reuse of the dredged material from these sites. To evaluate the viability of using contaminated dredge spoils as a cement kiln feed stock.

Needs Collected in FY11

The NESDI program collected nine needs in this EEC during FY11. Of those nine needs, two were ranked "HIGH" and six needs were ranked "MEDIUM." The final result is one new project to be initiated next fiscal year. The entire list of needs collected in EEC-4 follows.

No.	Need	Command	Title	Ranking	Status
1.	N-0740-11	NAVFAC	Integrity Inspection Testing of Above Ground Tank Less Than 30,000-Gallon Size Without Going Inside Tank	LOW	Other
2.	N-0743-11	CNIC	Naval Air Station Jacksonville Needs a Hard Surface Cleaning Capability Due to Thousands of Aircraft Padeyes and Railroad Tracks Embedded into Our Aircraft Parking Areas	MEDIUM	Request NESDI Pre-Proposal
3.	N-0746-11	NAVFAC	Assessing the Effectiveness of Man-Made Structures Designed for Habitat Enhancement	MEDIUM	Request NESDI Pre-Proposal
4.	N-0752-11	NAVAIR	Assessment of New Generation Biofuels in the Marine Environment	HIGH	Request NESDI Pre-Proposal
5.	N-0757-11	CNIC	Navy Pier-Side Waste Stream as a Resource	MEDIUM	More Information Required
6.	N-0758-11	NAVSEA	Removal of Runway Rubber and Paint Marking	MEDIUM	Other
7.	N-0764-11	CNIC	Determination of In-Water Ambient and Construction Noise and Noise Attenuation Near Navy Facilities and Shallow Ranges	MEDIUM	Request NESDI Pre-Proposal
8.	N-0765-11	CNIC	Methodology to Assess Essential Fish Habitat	MEDIUM	Request NESDI Pre-Proposal
9.	N-0776-11	NAVSEA	Reduced Generation of Shoreside Managed Waste from Pierside Supported Underwater Ship Husbandry Operations	HIGH	Request NESDI Pre-Proposal

New Starts in FY12

In EEC-4, the NESDI program will initiate one project in FY12.

No.	Title
1.	Methodology to Assess Essential Fish Habitat for Navy Coastal Properties

Dredge Spoil Management Alternatives Initiation Decision Report— Study Assesses the Viable Use of Contaminated Dredge Spoils

Project Number: 411

Project Type: STUDY

The Navy regularly produces large volumes of dredged material during routine dredging of ports and waterways to maintain navigable depths and during construction and restoration projects. Dredged material is typically disposed in open ocean disposal areas or, in the case of contaminated dredged material, in managed confined disposal areas. However, these options are becoming increasingly limited due to environmental concerns, regulatory constraints, and limited capacity of existing confined disposal sites.

As a result of chemical and toxicity testing, together with increasingly stringent regulations, a larger amount of dredged material is now being classified as unsuitable to dispose of using traditional options such as open ocean disposal. Disposing larger volumes of dredged material has become particularly problematic due to the presence of chemical contaminants and/or failed toxicity testing and a lack of low-cost disposal options.

Dredged sediment—desalination and phytoremediation

Most unsuitable dredged material is currently placed in confined disposal cells in upland (landfills) or aquatic (Confined Aquatic Disposal) locations. These disposal options are very costly, potentially diverting funds from essential mission-related functions and impeding operational readiness. Therefore, alternatives to traditional dredged material disposal methods, such as reuse for a beneficial application, are needed.

The beneficial reuse of dredged material encompasses a broad range of applications ranging from beach nourishment and island creation, to use as a construction material feedstock. Depending on the chemical and physical nature of the dredged material, certain reuse options may be more feasible than others for the Navy.

This project produced an Initiation Decision Report (IDR) which focused on such issues. The IDR identified Navy sites requiring dredging and the volume, frequency, and nature of the dredged material generated, and current disposal practices. Based on this information and after reviewing the current state of beneficial reuse alternatives in the U.S. and Europe, the report determined the most promising beneficial reuse options for Navy dredged material.

The project team began their work by identifying Navy dredge sites and exploring alternative disposal (e.g., landfill cover and other fill applications) and reuse options (cement feedstock, lightweight aggregate production, topsoil creation) for contaminated dredged sediments. Both maintenance/construction and Installation Restoration (IR) dredging sites were included in the survey. The Navy's Risk Assessment Workgroup (RAW) assembled information about restoration sites, including the associated Engineering Field Division contacts, the current phase of the IR site (study, in progress, closed), whether the site is marine or fresh water, contaminants of potential concern, cost to complete, and priority status.

Using this information, the project team contacted site personnel and obtained information regarding the physical properties of the sediment, the amount requiring disposal, and other pertinent site features for inclusion in the report.

As a first alternative, this Navy site-specific information was compared to the requirements for use of dredged material as a cement kiln feedstock to determine whether Navy sites are potential candidates for this reuse application. The research group focused on thermal processing to produce cement and lightweight aggregate specifically, because this reuse option is supported by both the U.S. Environmental Protection Agency (EPA) and industry as an environmentally acceptable and economically beneficial reuse option for dredged material and because previous research has demonstrated that the cement kiln process is economically attractive.

During the early stages of the IDR, the project team determined that the greatest benefit of beneficial reuse would be realized at Navy locations that produce high salinity material of varying particle sizes (ranging from predominantly silts/clays to mixtures of silts with sand and gravel). However, it was also determined that many sites produce large volumes only intermittently.

Blending of dredged material with amendments, such as compost, to produce topsoil is a promising low-cost approach for beneficial reuse.

Cement feed stocks require a relatively consistent, lower salinity feed to produce cement of known specification. Additionally, it was found that Navy locations which generate dredged material are geographically distant from existing cement kilns and transportation costs would therefore negate the economic benefit of this reuse method. Therefore, it was determined that the cement kiln feedstock option is not presently feasible for the Navy.

Dewatered dredged material.

Freshly dredged marine sediment.

After comparing Navy needs and potential dredged material disposal and beneficial reuse methods, the following findings were made, as presented in the IDR:

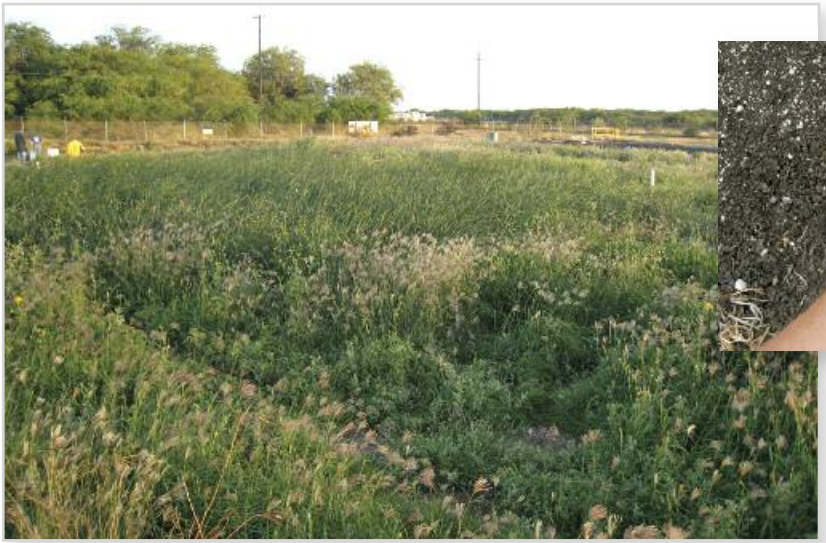
- The Navy dredges a widely varying amount annually ranging from 100,000 cubic yards (cy) to 7,000,000 cy, according to U.S. Army Corps of Engineers Open Ocean Disposal Database. Because there is no centralized database to track all Navy dredging, a data gap was identified.

- IR sites containing sediment are most often small volume sites with contaminant levels ranging from low to moderate. The small volumes associated with many of these sites, which are typically upland and therefore freshwater, are likely best suited for small removal actions where sediment is dealt with in a manner similar to small volumes of contaminated soil (i.e. by excavation and disposal in an appropriate landfill).

- Fewer IR sites with large volumes of sediment exist, but these sites could benefit by alternative methods such as reuse since contaminant levels are typically low and the large volumes make it economically attractive. However, since these sites would not produce a consistent volume of dredged material as would, for example, maintenance dredging at a Navy port, reuse of dredged material would be accomplished on an "as-needed" basis depending on the opportunity for reuse in a particular locale. For instance, reuse as a construction fill material may only be appropriate if a nearby large-scale construction project is underway, or other sources of fill material are unavailable or expensive. A centralized database of available dredged material as described in the data gap, together with a database of local needs, would promote reuse at such sites.

CASE STUDY

AIR & PORT OPERATIONS (EEC-4)



Conditioning cell with final product

The end result—biologically conditioned dredged material.

- Maintenance dredging and large construction projects, such as piers, result in the largest volumes of Navy dredged material. These projects also produce the most material deemed to be unsuitable for open ocean disposal since it typically contains a significant fraction of fine particles (silts, clays) to which contaminants adsorb. Beneficial reuse of such material requires that the contaminants be treated prior to reuse for most applications. Due to the large volumes and the wide variety of contaminants of concern at low-concentrations, "low-tech," low-cost treatment approaches are needed to promote beneficial reuse. These approaches would also produce the greatest returns for the Navy due to the large volumes and ongoing stream of dredged material from these sites.

- All Navy dredged material from navigational channels and ports potentially contains Munitions and Explosives of Concern (MEC) which must be removed (or screened by detectors) and certified MEC-free prior to reuse. Existing MEC detection/removal methods are slow, costly, and imprecise, and must be improved if reuse of Navy dredged material is to be economically viable on a large scale.

- Physical separation of dredged material is a promising technology because it can produce coarse-grained fractions (sand, gravel, lime) immediately useable for applications in construction and agriculture. The fine grained fractions containing contaminants could be segregated and treated separately, resulting in a significant volume reduction requiring treatment or disposal.

- Blending of dredged material with amendments, such as compost, to produce topsoil is a promising low-cost approach for beneficial reuse. The amendments act as a bulking agent to improve the physical properties, such as permeability of fine-grained dredged material, and as a stimulus for microbial growth promoting degradation/ sequestration of contaminants, while the mixture matures into a soil product suitable for use as a soil product.

This IDR is now available on the NESDI web site at www.nesdi.navy.mil.

CUSTOMER TESTIMONIAL

"This is among the best soil available on the island (Oahu)."

—Matt Flach
(Joint Base Pearl Harbor-Hickam) after handling the treated dredged material

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Regulatory & Base Operations (EEC-5)

Background

In this investment area, the NESDI program sponsors cost-effective methods for identifying, analyzing, and managing environmental constraints related to current and projected regulatory impacts. Example projects include:

- **Biodiesel for Ground Tactical Vehicles and Equipment.** This project is establishing guidelines and limitations for the use of biodiesel with ground tactical vehicles and equipment in order to reduce hazardous emissions from diesel engines.

- **Pollutant Source Tracking.** This project is quantifying Navy contaminant loads by demonstrating and validating contaminant source tracking technologies and developing a technical framework that enables water program managers to attribute existing contamination loads to support their compliance programs. Inability to distinguish between Navy releases, background conditions, and other non-Navy responsible parties can result in excessive or unnecessary remediation costs for the Navy.

- **Improved Assessment Strategies for Vapor Intrusion.** The result of this project was a technical report that identified existing best practices, knowledge and data gaps, and future research in vapor intrusion assessment strategies.

The NESDI program also receives multiple requests each year to help storm water managers improve storm water compliance. To address these challenges, the program provides resources to demonstrate and validate commercially available systems and as well as emerging systems as possible Best Management Practices (BMP) to maintain pollutant concentrations below permitted levels. Recent projects include:

- **Electrochemical Detection and Load Reduction of Copper and Zinc in Storm Water Runoff.** The objectives of this project are to quantify copper and zinc levels in storm water runoff using electrochemical methods and to track and identify the source.

- **Optimization of the Storm Water Dual Media Filtration System.** This project is optimizing a storm water filtration system at the Navy Regional Recycling Center, San Diego so that the system consistently meets National Pollution Discharge Elimination System permit requirements for metals and other pollutants.

- **Storm Water BMP Decision Support Tool Web Site.** This web-based system was designed to help users identify the most cost effective storm water BMPs to address storm water runoff requirements.

Summary

FY11 Funding Level:.....$2,342,000
FY12 Funding Level (projected): $1,680,000
Active Funded Projects in FY11: 18
Needs Collected in FY11: 24
New Starts in FY12: 5

Active Funded Projects in FY11

There were 18 active NESDI projects in EEC-5 over the course of FY11.

No.	ID	Title	Objective
1.	135	QwikLite and QwikLite for Sediment	To promote regulatory acceptance and to integrate the commercialized QwikLite 200 toxicity test system into existing Navy regulatory programs, providing a rapid and cost saving bioassay for assessing toxicity of discharges, receiving environments, or sediments.
2.	252	Sustainable Naval Facilities	To identify and evaluate a web-based assessment tool that can be used by Navy personnel to reduce the environmental impact of the Navy's existing facilities through sustainable practices, policies, and technologies.
3.	356	Demonstration of Real-Time Drinking Water Quality Monitoring Technologies	To demonstrate a real-time continuous drinking water quality monitoring system that protects drinking water systems from intentional and unintentional contaminations.
4.	400	Vertical Launch System (VLS) Wastewater Treatment System	To develop a cost-effective treatment system for removing cadmium, lead, and cyanide in VLS wastewater that meets user requirements.
5.	412	Biodiesel for Ground Tactical Vehicles and Equipment	To establish guidelines and limitations for use of biodiesel in tactical vehicles and equipment.
6.	424	Improved Assessment Strategies for Vapor Intrusion (VI)	To identify, evaluate, select, and demonstrate promising field assessment methodologies for cost-effective reduction of uncertainty in the direct field assessment of VI exposure.
7.	425	Automated Condition Assessment of Coral Reefs	To assist in providing the Navy with an integrated automated system to assess and monitor the health of coral reefs. To provide a method that allows for the timely mitigation of possible adverse impacts to coral reefs resulting from military construction in their vicinity.
8.	434	Abiotic Treatment of 1,2,3-Trichloropropane (TCP) to Protect Drinking Water Resources	To demonstrate that zero valent zinc can be used to treat TCP in groundwater.
9.	435	Waste-to-Clean Energy (WtCE) Initiation Decision Report (IDR)	To evaluate the feasibility of using WtCE conversion technologies as alternatives to landfill and incineration.
10.	438	Predictive Trajectory Model for Oil Spills for Navy Harbors	To improve the predictive accuracy of the existing models in predicting oil spill trajectories in Navy harbors. To provide a validated modeling tool for Navy On-Scene Coordinators with accurate information to manage oil spill scenarios, for both pre-scenario planning and post-scenario response/analysis, cost effectively and efficiently.

(continued on the next page)

No.	ID	Title	Objective
11.	446	Demonstration of Physical and Biological Conditioning of Navigational Dredged Material for Beneficial Reuse	To evaluate the effectiveness of conditioning methods on weathered and freshly dredged marine sediment to enhance its beneficial reuse potential.
12.	447	Chemical Safety Environmental Management System Enterprise (CS-EMS-E)	To develop a pilot hazardous waste management application version of CS-EMS-E for Navy Region Mid-Atlantic.
13.	448	Evaluation of Resuspension Associated with Dredging, Extreme Storm Events, and Propeller Wash	To demonstrate and validate innovative methods to quantify resuspension and recontamination potential of contaminated sediments from propeller wash. To utilize the validated methods to evaluate and quantify the resulting effects from these resuspension events on remedial efforts.
14.	452	Innovative Technologies to Control/Reduce Emissions from Metal Cutting Operations	To identify metal cutting operations and possible capture solutions that comply with environmental regulations and can be used as effectively as the current method (oxy-fuel cutting) in supporting the marine vessel breaking process.
15.	454	Optimization of the Storm Water Dual Media Filtration System at NRRC, San Diego	To optimize performance of the Navy developed dual medial filtration system.
16.	455	Modeling Tool for Navy Facilities to Quantify Sources, Loads, and Mitigation Actions of Metals in Storm Water Discharges	To provide Navy facility environmental managers with a storm water management tool that will allow them to identify and quantify potential sources of storm water metals as well as quantify the potential reductions expected from a variety of Best Management Practice mitigation actions.
17.	457	Compliance with the Emerging Requirements of the Stage II Disinfectant and Disinfection Byproduct Rule	To demonstrate and validate a cost effective ceramic membrane filtration technology for the removal of disinfectant byproduct precursors (natural organic material, humic and fulvic acids) in Navy drinking water systems.
18.	463	Methodology for Identifying and Quantifying Metal Pollutant Sources in Storm Water Runoff	To demonstrate and validate a web-based storm water methodology and module that will assist Navy storm water managers in identifying and quantifying problematic metal pollutant point sources in storm water runoff.

Needs Collected in FY11

Of the 51 needs that the NESDI program collected during FY11, nearly half (24 in all) were collected in EEC-5. Of those 24 needs, 6 needs were ranked "HIGH" and 15 needs were ranked "MEDIUM." The result is five new projects to be initiated next fiscal year. The entire list of 24 needs follows.

No.	Need	Command	Title	Ranking	Status
1.	N-0729-11	NAVFAC	Federal Facility Renewable/Alternative Energy Technologies Prioritized By Geographic Region	Not Ranked	Outside NESDI Scope
2.	N-0730-11	NAVFAC	Sustainable Alternative Drinking Water Production For Remote Island Facilities	HIGH	Being Addressed by Existing Efforts (NESDI)
3.	N-0737-11	NAVAIR	Collection of Common Environmental, Safety and Occupational Health Technical Risks for Programmatic Environmental Safety and Health Evaluation Development	MEDIUM	Being Addressed by Existing Efforts (NESDI)
4.	N-0739-11	NAVFAC	Drinking Water — Automatic Continuous Inline Bioluminescent Toxicity Test	HIGH	Solution Exists (NESDI)
5.	N-0741-11	NAVFAC	Waste To Energy (WTE) Incinerator	HIGH	Request NESDI Pre-Proposal
6.	N-0742-11	NAVFAC	Toxicity Associated With Polynuclear Aromatic Hydrocarbons Used in Clay Targets	MEDIUM	Request NESDI Pre-Proposal
7.	N-0745-11	NAVFAC	Washington Navy Yard Fecal Coliform Study	MEDIUM	More Information Required
8.	N-0747-11	NAVFAC	Underwater Detector for Classification of Explosives Fillers in Underwater Munitions	MEDIUM	Not Ready For Dem/Val
9.	N-0748-11	NAVFAC	Nutrient Total Maximum Daily Loads	MEDIUM	More Information Required
10.	N-0754-11	NAVFAC	Long-Term Monitoring for Development of Adaptive Natural Resources Management Strategies	MEDIUM	Not Ready For Dem/Val
11.	N-0756-11	CNIC	Navy Base San Diego Food Waste as a Resource	MEDIUM	More Information Required
12.	N-0759-11	CNIC	San Clemente Island Solid Waste Diversion Study	MEDIUM	Not Ready For Dem/Val
13.	N-0760-11	NAVFAC	Storm Water Best Management Practices Validation	HIGH	Request NESDI Pre-Proposal
14.	N-0761-11	NAVFAC	Unmanned Aerial Reconnaissance System for Mitigation of Underwater Detonations	MEDIUM	Other
15.	N-0762-11	CNIC	Marine Invasive Species Early Detection and Rapid Response	Archived	Similar/Duplicate Need, Merge
16.	N-0763-11	CNIC	Marine Invasive Species Early Detection and Rapid Response	MEDIUM	Request NESDI Pre-Proposal
17.	N-0766-11	NAVFAC	Improved Munitions and Explosives of Concern Detection and Removal from Dredged Material	HIGH	Request NESDI Pre-Proposal

(continued on the next page)

Needs Collected in FY11 (continued)

No.	Need	Command	Title	Ranking	Status
18.	N-0767-11	SPAWAR	Improved Long-Term Shoreline Response Models and Monitoring to Support Assessment of Sea Level Rise Vulnerability at Navy and Marine Corps Coastal Installations	MEDIUM	Outside NESDI Scope
19.	N-0768-11	SPAWAR	Linkage Model for the Assessment of Sediment Impacts from National Pollutant Discharge Elimination System Discharges	MEDIUM	Other
20.	N-0769-11	NAVFAC	Low Cost Real-Time Sensors for Detection of Chlorinated Solvents in Contaminated Groundwater Plumes	MEDIUM	Request NESDI Pre-Proposal
21.	N-0771-11	NAVFAC	Tools for Preventing or Mitigating the Proliferation of Aquatic Invasive Species in Navy Harbors	MEDIUM	Outside NESDI Scope
22.	N-0773-11	NAVFAC	Physical Separation of Coarse and Fine Fractions of Dredged Material	MEDIUM	More Information Required
23.	N-0774-11	NAVFAC	Invasive Species from Military Equipment and Vehicles During Transfer and Washdown Operations at the Shoreline – Naval Station Rota	Not Ranked	More Information Required
24.	N-0775-11	NAVAIR	Dynamic Mixing Zone Modeling	HIGH	Request NESDI Pre-Proposal

New Starts in FY12

In EEC-5, the NESDI program will initiate five projects in FY12.

No.	Title
1.	Separation, Detection, and Removal of MEC/UXO from Dredged Sediment Using Physical Separation
2.	Low Cost Selective Polymer and Laser Interferometer Real Time Sensors for Detection of Solvents in Contaminated Groundwater Plumes
3.	Validation of a Low Tech Storm Water Procedural Best Management Practice
4.	Dynamic Mixing Zone
5.	Toxicity Associated with Polyaromatic Hydrocarbons Used in Clay Targets

This project is demonstrating the effectiveness of sweeping and pressure washing technologies at Navy industrial sites to reduce metals and nutrients from storm water runoff.

ESTCP Leveraged Projects

In EEC-5, for the past several years the NESDI program also was able to leverage resources from ESTCP to support the following eight projects.

No.	Title	ESTCP Funding	NESDI Funding (FY08-FY14)
1.	Demonstration of Biodiesel in Ground Tactical Vehicles and Equipment	1374	626
2.	Evaluation of Resuspension Associated with Dredging, Extreme Storm Events, and Propeller Wash	673	370
3.	Biological Treatment of Paint	800	70
4.	Smart Water Conservation Systems for Irrigated Landscapes	450	25
5.	Water Conservation: Tertiary Treatment and Recycling of Waste Water	810	165
6.	Heavy Diesel Hybrid Demonstration	801	50
7.	Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects	397	147
8.	Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors	192	225
	TOTALS:	**5497**	**1678**
	in $K		

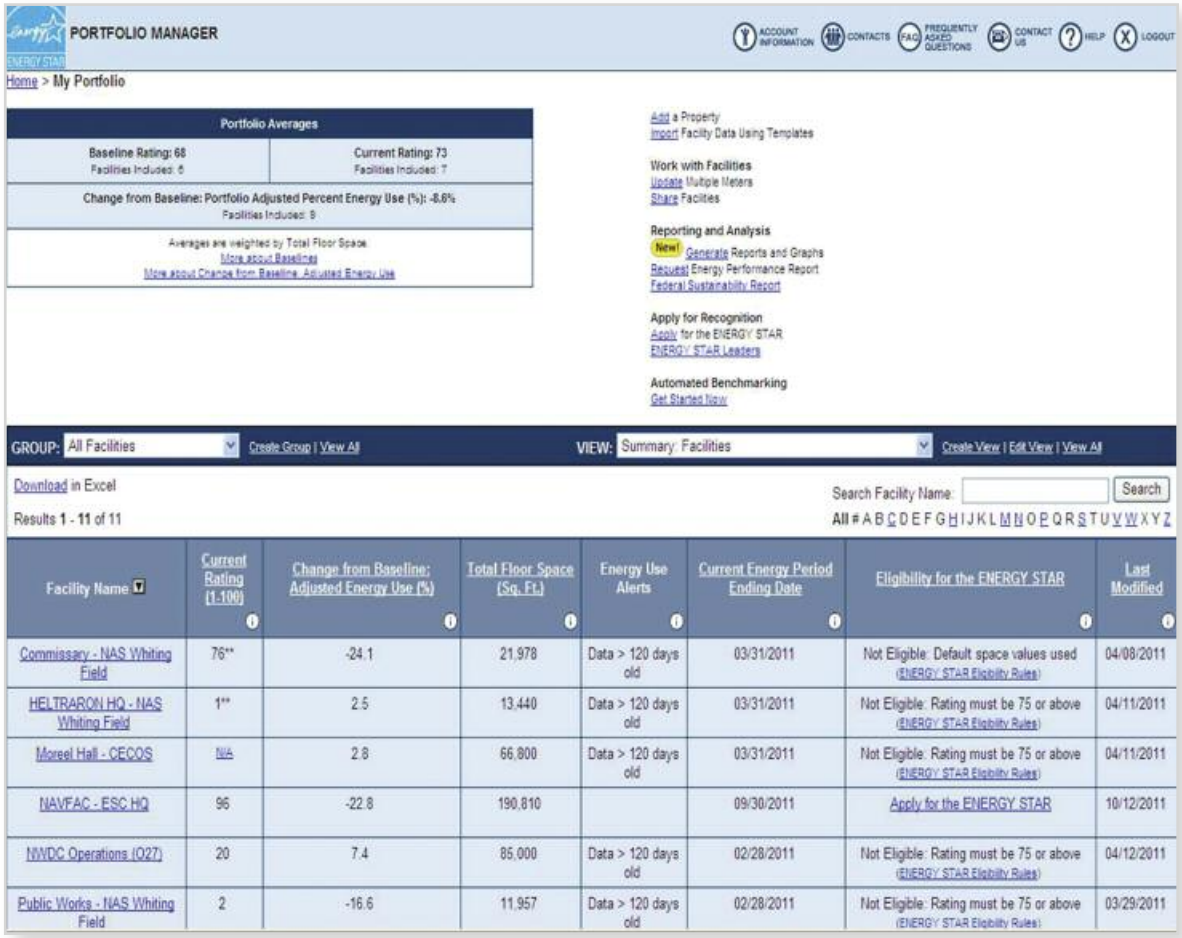
Industrial site before and after sweeping.

Sustainable Naval Facilities—EPA Software Helps Navy Managers Assess Sustainability of Current Infrastructure

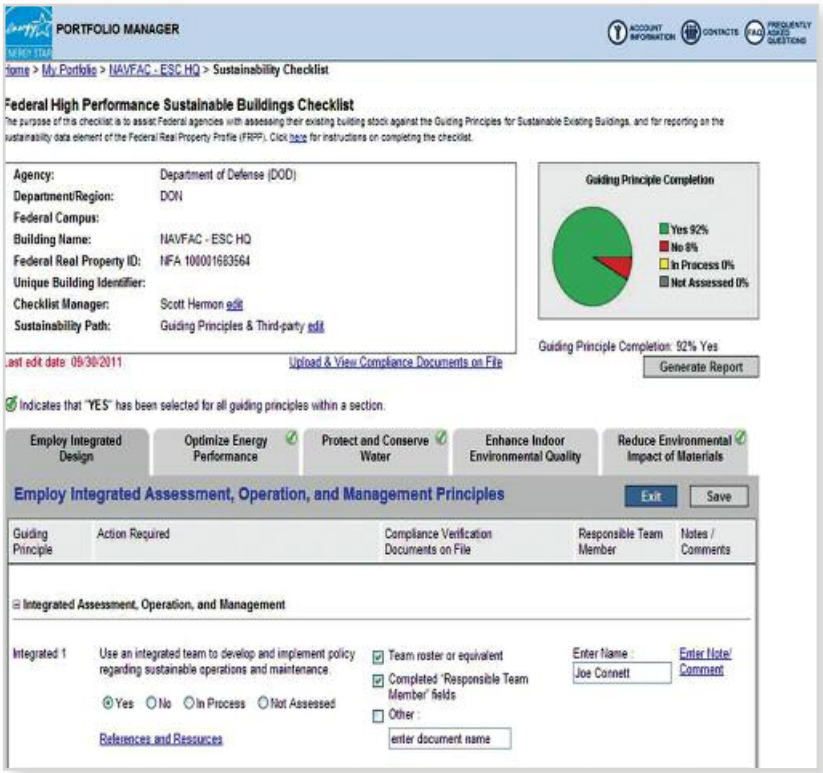
Project Number: 252

Project Type:
INFORMATION TECHNOLOGY

The Navy has been leading the drive to implement sustainable practices for new construction over the last decade. The Navy was the first Federal agency to have a building certified under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) system. The Bachelor Enlisted Quarters at the Great Lakes Naval Training Center achieved LEED-New Construction Bronze certification in 2000. Current Naval Facilities Engineering Command (NAVFAC) policy requires LEED® certification for all new construction. This policy may soon be supplemented with a requirement to address sustainability in existing buildings.



Facility Name	Current Rating (1-100)	Change from Baseline: Adjusted Energy Use (%)	Total Floor Space (Sq. Ft.)	Energy Use Alerts	Current Energy Period Ending Date	Eligibility for the ENERGY STAR	Last Modified
Commissary - NAS Whiting Field	76**	-24.1	21,978	Data > 120 days old	03/31/2011	Not Eligible: Default space values used (ENERGY STAR Eligibility Rules)	04/08/2011
HELTRARON HQ - NAS Whiting Field	1**	2.5	13,440	Data > 120 days old	03/31/2011	Not Eligible: Rating must be 75 or above (ENERGY STAR Eligibility Rules)	04/11/2011
Morell Hall - CECOS	NA	2.8	66,800	Data > 120 days old	03/31/2011	Not Eligible: Rating must be 75 or above (ENERGY STAR Eligibility Rules)	04/11/2011
NAVFAC - ESC HQ	96	-22.8	190,810		09/30/2011	Apply for the ENERGY STAR	10/12/2011
NWDC Operations (027)	20	7.4	85,000	Data > 120 days old	02/28/2011	Not Eligible: Rating must be 75 or above (ENERGY STAR Eligibility Rules)	04/12/2011
Public Works - NAS Whiting Field	2	-16.6	11,957	Data > 120 days old	02/28/2011	Not Eligible: Rating must be 75 or above (ENERGY STAR Eligibility Rules)	03/29/2011



Progress on the HPSB checklist for NAVFAC ESC.

Executive Orders (EO) 13423 and 13514 include a sustainability assessment system called the Guiding Principles and specifically require that 15 percent of an agency's buildings over 5,000 square feet comply with these Federal sustainable principles. It will be challenging for the Navy to certify 15 percent, or 2,300 of its approximately 15,764 buildings (over 5,000 gross square feet).

The Guiding Principles were developed in collaboration with, and agreed upon, by Federal Agency department heads, including the Secretary of Defense. These principles provide common goals for energy, water, and material resource conservation in Federal facilities. The Department of Energy (DoE) created criteria that can be used to characterize the Guiding Principles as specific metrics for monitoring performance. These metrics are defined in the form of the High Performance Sustainable Building (HPSB) checklist. It is this HPSB checklist and the associated web based functions that will give facility managers a decision making tool to help measure compliance with the Guiding Principles. This is especially important now that the Navy has adopted the Guiding Principles and their application in all new construction and major renovation projects.

The NESDI program completed an evaluation of this decision making tool that addresses environmentally sustainable practices and identifies an integration strategy for implementing a sustainable process in existing Navy owned facilities.

The NESDI program completed an evaluation of this decision making tool that addresses environmentally sustainable practices and identifies an integration strategy for implementing a sustainable process in existing Navy owned facilities. This project evaluated several commercially available and government owned applications that could be utilized to achieve compliance with the Guiding Principles through the HPSB checklist.

The project considered both a commercially available tool designed for LEED® certification of building projects and a DoE and the U.S. Environmental Protection Agency (EPA) web-based sustainable assessment tool under the Energy Star Portfolio

Manager (Portfolio Manager). Portfolio Manager is an umbrella web based tool that provides the basic information and utility data needed to demonstrate compliance. The HPSB checklist uses this data

One of the major benefits of Portfolio Manager is that it does not require modifications to meet the Navy's needs and conducts sustainability assessments at significantly reduced costs.

and additional inputs from the facility manager to measure compliance. An example is that energy use data entered into Portfolio Manager is used to calculate the percent reduction or even increase in energy use with a trend analysis.

One of the major benefits of Portfolio Manager is that it does not require modifications to meet the Navy's needs and conducts sustainability assessments at significantly reduced costs. Portfolio Manager is a government owned system which also eliminates license fees and data management costs. (Portfolio Manager is available at www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager_benchmarking.)

Portfolio Manager is used to measure the energy performance of a facility compared to similar facilities. It captures detailed facility information, space use, and utility consumption to evaluate overall performance of the facility and create a ranking of the building against its peers. This was a suitable place to add the requirements of the Guiding Principles since energy and water efficiency are two of the most significant elements that contribute to the overall sustainability of a facility with respect to capital investment.

The HPSB checklist under Portfolio Manager specifically targets the pillars of sustainability outlined in the Guiding Principles:

- Employ Integrated Design
- Optimize Energy Performance
- Protect and Conserve Water
- Enhance Indoor Environmental Quality
- Reduce Environmental Impact of Materials

The HPSB checklist is very similar to the structure of the LEED® rating systems—based around a series of credits that must be met in order to satisfy EOs 13423 and 13514. Many of the credits in both systems including energy efficiency and purchasing policies directly apply to each system. While the LEED® rating systems require demonstration of compliance over a performance period, the HPSB checklist only requires that documentation of the appropriate sustainable policies is in place. Another notable difference is that 100 percent compliance with the HPSB checklist is required to meet the Guiding Principles.

Portfolio Manager, a relatively mature framework in which to incorporate the Guiding Principles, offers many other advantages including:

- Numerous metrics such as energy intensity, water efficiency, energy efficiency, utility use, and percent compliance with Guiding Principles
- Federally-owned database and application
- Free to use (no license fees)
- Ability to track multiple buildings or regions
- Reporting functionality for facility managers
- Online accessibility anywhere in the world

To evaluate Portfolio Manager, the project team used the software to evaluate an ideal case—the NAVFAC Engineering Service Center (NAVFAC ESC) building that recently gained LEED Silver certification.

Portfolio Manager is used to measure the energy performance of a facility compared to similar facilities.

In addition, seven other naval installation facilities which had some to no significant sustainable upgrades were used to evaluate Portfolio Manager.

The key performance objectives included compatibility with existing information technology frameworks, usability (measures the ease with which the system can be executed by users), and the ability to measure sustainability with reference to the Guiding Principles. Portfolio Manager and the HPSB checklist were able to meet these key performance objectives.

Federal Sustainability Portfolio Report

Facility	Sustainability Path	Date Certification Achieved	Date Certification Anticipated	Employ Integrated Design				
				Integrated Assessment, Operation, and Management				Commissioning
				Integrated 1	Integrated 2	Integrated 3	Integrated 4	Commissioni
Commissary - NAS Whiting Field	Guiding Principles for Sustainable Existing Building			Yes	Yes	No	No	No
HELTRARON HQ - NAS Whiting Field	Guiding Principles for Sustainable Existing Building			No	Yes	No	No	No
Moreel Hall - CECOS	Guiding Principles for Sustainable Existing Building			No	Yes	No	No	No
NAVFAC - ESC HQ	Both	08/21/2009		Yes	Yes	Yes	No	Yes
NWDC Operations (027)	Guiding Principles for Sustainable Existing Building			No	Yes	No	No	No
Public Works - NAS Whiting Field	Guiding Principles for Sustainable Existing Building			No	Yes	No	No	No
VT-2/VT-6 HQ Hangar - NAS	Guiding Principles for Sustainable Existing Building			No	Yes	No	No	No
Wings Club - NAS Whiting Field	Guiding Principles for Sustainable Existing Building			Yes	Yes	Yes	No	No

The report function in the Portfolio Manager tracks multiple building compliance with the Guiding Principles.

The Guiding Principles were designed to be implemented at the individual building level. However, Navy facilities are managed based on a campus approach, with facility management typically performed at the installation level by the Facilities Engineering and Acquisition Division. An important conclusion of this project is that the Navy should strive to achieve concurrence from DoE on the implementation of Navy-wide, regional, or installation policy on the sustainable purchasing policies and the requirements for storm water pollution prevention plans, moisture control, tobacco smoke control, waste management, integrated pest management, and tenant education.

Most of these policies and plans are already being implemented at the installation or regional level. Significant cost savings to comply with the Guiding Principles can be achieved by applying these policy requirements to the Navy's campus approach. Otherwise, costs to implement these policies and plans on an individual building basis will significantly increase the overall cost for compliance.

The recommended approach for integrating the use of Portfolio Manager and the HPSB checklist is to create workgroups to identify the best candidate buildings that can realistically achieve the goals of the Guiding Principles. Workgroups should be at the local and regional level and be tasked with identifying and auditing the facilities using the HPSB checklist, and developing and implementing a facility-specific sustainability plan.

One effective method to collecting the information needed to meet the metrics in the HPSB checklist is to incorporate that information into annual energy audit inspections. These inspections are already in place and provide detailed energy related condition assessments of a facility. Portfolio Manager allows the Navy to use an existing system to capture the data needed to complete a facility assessment. One of the keystones of the LEED® process is that the reviews are performed by an independent entity. As part of this process, it is beneficial to maintain audit integrity of the HPSB checklist by creating and using an independent entity to verify compliance with the Guiding Principles. This independence can be accomplished using a Regional Command to verify and validate compliance with the Guiding Principles.

The recommended approach for integrating the use of Portfolio Manager and the HPSB checklist is to create workgroups to identify the best candidate buildings that can realistically achieve the goals of the Guiding Principles.

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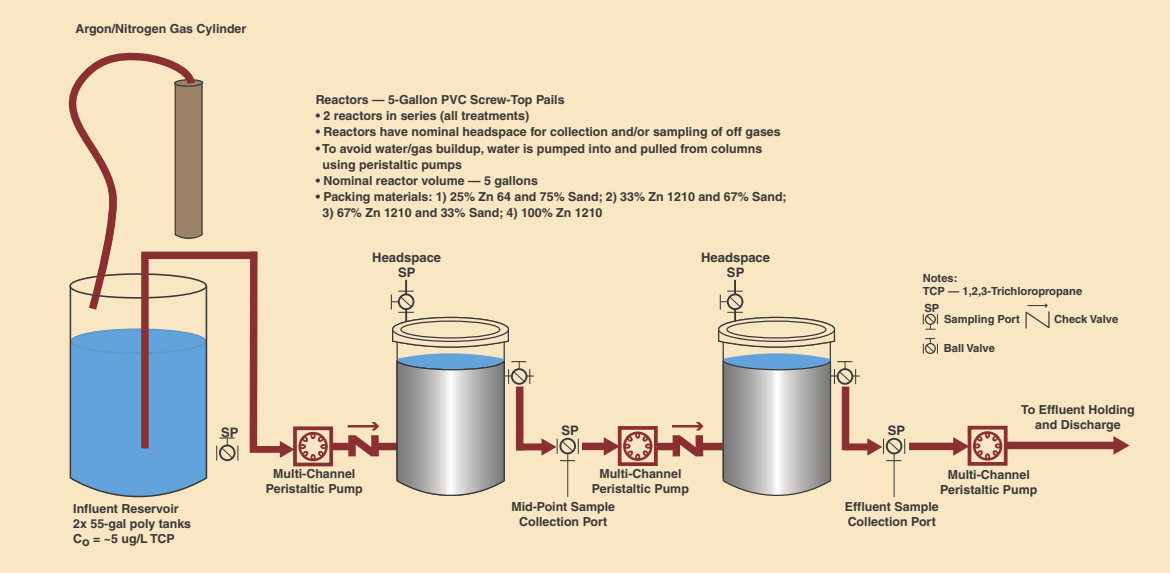
Abiotic Treatment of 1,2,3-Trichloropropane (TCP) to Protect Drinking Water Resources—Pendleton Pilot Study Shows Promise for Removing TCP from Groundwater

Project Number: 434

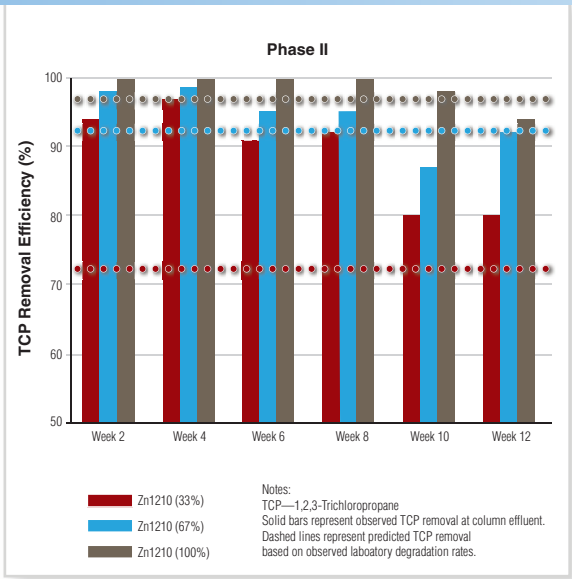
Project Type: NEW TECHNOLOGY

The solvent 1,2,3-Trichloropropane (TCP), which is toxic to humans, is attracting regulatory attention. At Marine Corps Base Camp Pendleton, California, (Camp Pendleton) TCP was detected at levels above California's action level, resulting in two groundwater wells being removed from service. Addressing TCP contamination was a challenge for Camp Pendleton officials due to the fact that TCP is highly persistent in groundwater, taking a long time to degrade.

Under this project, Dr. Nancy Ruiz, Principal Investigator from the Naval Facilities Engineering Service Center (NAVFAC ESC) teamed with Dr. Paul Tratnyek from the Oregon Health and Science University and Geosyntec consultants from Oakland, CA to test zero-valent metals as a possible treatment option to degrade TCP. Joe Murtaugh, Installation Restoration Branch Head, Assistant Chief of Staff, Environmental Security at Camp Pendleton and Theresa Morley of NAVFAC Southwest provided local support for the project. The study demonstrated that TCP remediation may be possible. The study also provided modeling results for cost estimates of scaling the technology. Specifically, zero-valent zinc (ZVZ) may be economically feasible for in situ application. This project drew upon results of a Strategic Environmental Research and Development Program research project (ER-1457) which investigated abiotic degradation pathways initiated by various materials, including iron and zinc (Zn).



Schematic of optimized columns to treat TCP.



TCP degradation in optimized Phase II columns.

The specific objectives of this project included the following:

- Assess the ability of ZVZ and/or zero-valent iron (ZVI) to effectively degrade TCP in Camp Pendleton groundwater.
- Evaluate potential secondary water quality effects (e.g., changes in pH or dissolved zinc concentration) that could affect future implementation of a ZVZ or ZVI remedy.
- Identify potential factors that may affect performance of ZVZ or ZVI as a remedy for TCP in groundwater.
- Conduct a preliminary evaluation of the full-scale applicability of ZVZ or ZVI for treatment of TCP in groundwater at Camp Pendleton.

The first stage of this effort was laboratory (bench-scale) testing—conducted to help identify which zero valent materials (ZVM) were most suitable for the Camp Pendleton groundwater conditions. This bench-scale testing was also conducted to provide information necessary for subsequent on-site testing to evaluate ZVM performance.

This project demonstrated that the chemical and cost effectiveness of using ZVZ, in particular ZN 1210, was particularly promising since it exceeded TCP degradation capabilities.

Two phases of on-site column testing were completed to evaluate multiple types of reactive media. Phase I tested:

- A 25% Zn 64 and 75% sand mixture
- A 100% Zn 1210
- A 50% ZVI and 50% sand mixture

Phase II tested:

- A 25% Zn 64 and 75% sand mixture
- A 33% Zn 1210 and 67% sand mixture
- A 67% Zn 1210 and 33% sand mixture
- A 100% Zn 1210

Based on the results of the preliminary laboratory studies and on-site column testing, models were developed to evaluate the costs of applying this technology at scale both in situ (e.g., permeable reactive barrier) and ex situ (e.g., wellhead treatment of TCP at an affected water supply well). This project demonstrated that the chemical and cost effectiveness of using ZVZ, in particular ZN 1210, was particularly promising since it exceeded TCP degradation capabilities.

The project and its results prepare the Navy for increasing regulatory demands regarding TCP and support the remediation of groundwater contaminated by TCP.

Camp Pendleton is now considering a pilot-scale project to treat affected groundwater using a permeable reactive barrier.

CUSTOMER TESTIMONIAL

"I want to thank the NESDI program for sponsoring this study. We were really scratching our heads trying to figure out how to remediate such a toxic, emergent, recalcitrant compound."

—Theresa Morley
(NAVFAC Southwest)

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Waste-to-Clean Energy Initiation Decision Report—Study Evaluates Viable Options to Landfill Disposal of Solid Waste

Project Number: 435

Project Type: STUDY

Southern California is experiencing a shortage of landfill availability, a problem the rest of the country could face in the near future. Siting new landfills is difficult and greenhouse gas regulations are becoming more stringent. Therefore, naval bases located in southern California must seek alternatives to manage refuse. Commander Navy Region Southwest facility's landfill is projected to reach capacity in 2019.

This Initiation Decision Report (IDR) addressed Waste-to-Clean-Energy (WtCE) technologies as viable solutions to the growing compliance problem of landfill space limitations near Navy shore facilities. The IDR evaluated the feasibility of using WtCE conversion technologies as alternatives to landfill disposal and incineration to:

1. Alleviate the closure impacts of solid waste landfills near installations
2. Enhance Navy use of waste as resources and generation of clean renewable energy
3. Prevent overburdening of landfills
4. Avoid ever-increasing landfill disposal costs

This waste management approach will drastically reduce the volume of the Navy's non-recyclable waste stream by utilizing it as feedstock material for conversion of WtCE. This IDR identified

This waste management approach will drastically reduce the volume of the Navy's non-recyclable waste stream by utilizing it as feedstock material for conversion of WtCE.

WtCE technologies for potential implementation across the Navy, including development of model WtCE case studies to facilitate technology implementation at different Navy regions and installations.

Personnel from the Naval Facilities Engineering Command Engineering Service Center (NAVFAC ESC) partnered with Dr. Eugene Tseng of the University of California at Los Angeles (UCLA) Engineering Extension. Dr. Tseng founded UCLA's Recycling/Municipal Solid Waste Management Program.

The team reviewed over 40 technologies and classified them into three general categories utilized by the Navy:

1. Commercially proven technologies

2. Emerging technologies

3. Developmental technologies

Currently, there are over a dozen commercially proven technologies and over 30 emerging and developmental technologies. Planning and operations information corresponding to these technologies was acquired by the team during facility site visits in over a dozen countries. Discussions with facility developers/operators and the regulatory agencies provided information supporting WtCE project planning, design, and operations strategies.

WtCE thermal conversion technologies have been documented and proven for reliable operation.

The key findings and recommendations contained in this IDR are as follows:

1. **Thermal Conversion Technologies.** WtCE thermal conversion technologies have been documented and proven for reliable operation. They are commercially available to meet the Navy's combined goals of renewable energy, distributed power generation, improved recycling recovery, maximizing landfill diversion, and reducing greenhouse gas emissions. WtCE thermal conversion technologies are capable of complying with the most stringent of air emissions standards and can beneficially impact climate change.

2. **Other Technologies and the "EcoPark Approach."** Other types of commercially proven, non-combustion conversion technologies are operational around the world. These technologies, such as anaerobic digestion, are utilized to complete the "EcoPark" approach that is discussed in this IDR. (Note: EcoPark is an integrated material recovery and conversion technology facility concept.) Such an integrated approach is expected to maximize the amount of waste diverted from landfill while providing additional energy generation and production of other useful byproducts.

CUSTOMER TESTIMONIAL

"I want to thank the NESDI program for educating us via this study. NESDI personnel certainly rose to the occasion. We are looking at a waste management crisis here in San Diego in the coming years and this study provided us with some viable alternatives."

—Leslie McLaughlin (Navy Region Southwest)

The two main types of non-combustion conversion technologies are thermochemical and biochemical, also differentiated in the terms "thermal" and "biological," respectively. A summary of these classifications is provided in the following table.

Summary of Non-Combustion Conversion Technologies

Conversion Technology Classification	Type of Technology	Preferred Feedstock Materials
Thermochemical (High heat process to convert the organic fraction to synthesis gas or fuel gas)	Gasification	Low Moisture Organics (paper, and other carbon based materials including not readily decomposable organics, e.g. plastics, rubber, etc.)
	Pyrolysis	Low Moisture (dry) Organics (carbon based materials, sludge, including plastics)
	Pyrolysis /Gasifier	Low Moisture Organics (carbon based materials, sludge, including plastics)
Biochemical (Biological and chemical breakdown of organic materials to produce gas, alcohols, or other chemical products)	Anaerobic Digestion	Readily biodegradable Components, food waste, green waste, paper, etc. (plastics and rubber cannot be converted, woody and ligneous materials are difficult to process)
	Fermentation	

Primary Product(s)	Secondary Product(s)	Solid Residues	Notes
Fuel Gases (CO_2, CH_4, H_2) or Synthesis Gas	Fuels, chemicals, and electricity	Inorganic ash, metals, ceramics, glass, stones, etc. (other nonprocessables from preprocessing)	Synthetic gases can be used to produce methanol, ethanol, and other fuel liquids and chemicals.
Fuel Gases (CO_2, CO, CH_4, H_2) or Synthesis Gas, and Pyrolitic Liquids & Tars	Electricity, some fuels	Carbonaceous char, ash, metals, glass, ceramics, stones, etc. (other nonprocessables from preprocessing)	Synthetic gases can be used to produce methanol, ethanol, and other fuel liquids and chemicals.
Fuel Gases (CO_2, CO, CH_4, H_2) or Synthesis Gas	Electricity, some fuels	Carbonaceous char, ash, metals, glass, ceramics, stones, etc. (other nonprocessables from preprocessing)	Carbonaceous char often used as a substitute for low grade non-structural carbon black filler applications.
Biogas (CO_2 and CH_4), Ethanol	Heat, power, solvents, acids, and other biobased chemicals for refining, and soil amendment	Residue can include inorganics, metals, glass, undegraded/ unprocessed biomass	Bacterial breakdown of biodegradable organic materials. In absence of oxygen. Operates at lower temperatures.
Ethanol	Heat, and other bio-based chemicals for refining, and soil amendment	Inorganics, metals, glass, undegraded/unprocessed biomass	Plastic and rubber cannot be converted.

3. **Funding, Acquisition, and Benefits.** Naval installations are a small stakeholder in solid waste management. In many cases, the total lifecycle costs of a WtCE facility suggest that the state and/or local governments should be responsible for the costs supporting the development and operation of a WtCE facility, since they are mandated to ensure compliant, cost-effective solid waste disposal within their respective jurisdictions. It should also be noted that conversion technology projects can be privately funded, designed, procured, constructed, and operated as turnkey projects.

4. **Supplemental to the Current, On-Going Navy Effort.** The Navy should have an ongoing effort to track and evaluate emerging/developmental technologies in addition to developing an ongoing effort to monitor and evaluate the various projects that are being developed by local governments and private industry. The "lessons learned" from the development and implementation projects of appropriate and financially sustainable WtCE technologies will be invaluable to the Navy.

5. **Recommendations Based on a Model Site Case Study.** Naval Base San Diego (NBSD) was used as the model for a case study to formulate the recommendations in this IDR. Currently, NBSD accumulates approximately 100 to 150 tons of waste per day, which is not sufficient for the "economy of scale benefits" from Material Recovery Facilities with WtCE technologies. The Navy should determine the feasibility of being a principal player/investor and also be an advocate of cost effective, "green" options (of which one is WtCE) for solid waste management via Component Regional Environmental Coordinators responsible for interfacing with State and local governments.

6. **Other Recommendations.** Recommendations for installation consideration of WtCE technologies referenced in this IDR include the following:

- Optimize solid wastes recovery and recycling practices
- Remove objectionable wastes (e.g., food wastes, consumer batteries) that may reduce the energy value of the remaining solid wastes
- Assess and characterize remaining solid wastes to estimate energy value and requirements for pre-processing technologies (e.g., shredding, grinding)
- Conduct a feasibility study of suitable and sustainable WtCE alternatives
- Initiate action supporting the alternatives recommended in the feasibility study

The project team also reviewed and analyzed solid waste generation data from a report funded by Commander Naval Installations Command and completed by Battelle in January 2011, together with the waste composition data provided by the State of California. Based on its findings and discussions, the team determined that the available solid waste feedstock tonnage at the majority of the naval facilities is not of sufficient volume for a stand-alone regional or community-based WtCE demonstration project that is economically feasible. Based on current energy and landfill disposal costs, the Navy should continue to support WtCE technologies as a provider of solid wastes to local commercial and/or municipal WtCE facilities.

The results of this IDR are being vetted through the Navy's Waste Management and Sustainability Media Field Team for Navy-wide communication and implementation by Navy Regional Commands. A critical part of this study is the determination of how the potential project will be integrated into the Navy's existing and long-term renewable energy plans, recycling/solid waste management plans, and Navy infrastructure. The design and evaluation of all potential project scenarios will incorporate all technical, legal, regulatory, policy, and security guidelines and constraints. A decision-making tool will be utilized in the evaluation of alternative project and technology scenarios.

Over the course of this project, this team completed the following tasks:

1. Provided methodologies for determining the amount of usable waste available (volumes/tonnages) through waste characterization and other means.
2. Provided a public affairs/outreach plan to help the Navy develop partnership opportunities with local communities, states, and other entities to leverage sustainability and renewable energy efforts.
3. Identified and evaluated available WtCE conversion technology alternatives, determined the maturity of each alternative, and identified how the various technologies can be integrated into existing Navy infrastructure.
4. Provided site availability criteria and utilities demand in conjunction with each alternative.
5. Determined the potential long-term markets for end products, such as energy, from the implementation of WtCE conversion technologies.
6. Identified the potential National Environmental Policy Act documentation necessary for technology implementation per viable alternative.
7. Provided a process to review existing traffic studies and consider traffic impacts in conjunction with technology implementation.
8. Provided a process to evaluate environmental justice issues for WtCE technology implementation.
9. Developed budgetary capital and typical operational costs of the technologies.
10. Recommended technologies for potential Navy demonstration and implementation.
11. Provided model case studies for successful technology implementation at representative Navy region and installation levels.
12. Finalized project specifications and completed the WtCE IDR.

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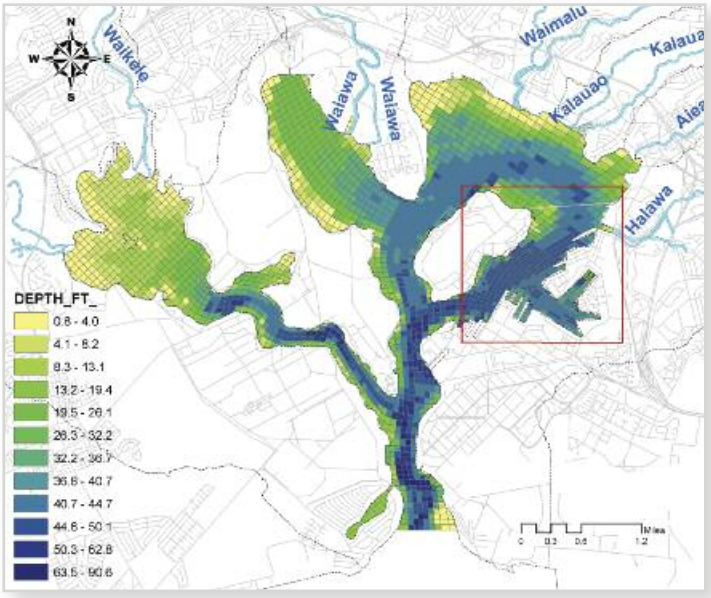
Predictive Trajectory Model for Oil Spills for Navy Harbors— New Model Increases Accuracy of Oil Spill Trajectory Predictions

Project Number: 438

Project Type:
TECHNOLOGY REPLACEMENT — MODEL

Oil spills in harbors pose great risks in terms of degrading the environment and creating hazards to safe navigation of the waterways. The recent British Petroleum spill in the Gulf of Mexico illustrated how much damage an oil spill can cause, both short term and long term. In order to reduce the risk of oil spill occurrence and to effectively design and conduct cleanup and recovery efforts, the Navy needs accurate numerical models to simulate oil spill events, including the transport of oil slick trajectories.

Following an oil spill in an estuary or harbor, the spilled oil immediately undergoes a series of processes controlling its fate and transport. Factors such as wind speed, water currents, and turbulence make it difficult for Navy On-Scene Coordinators (NOSC) and other Navy personnel to predict the oil's trajectory.



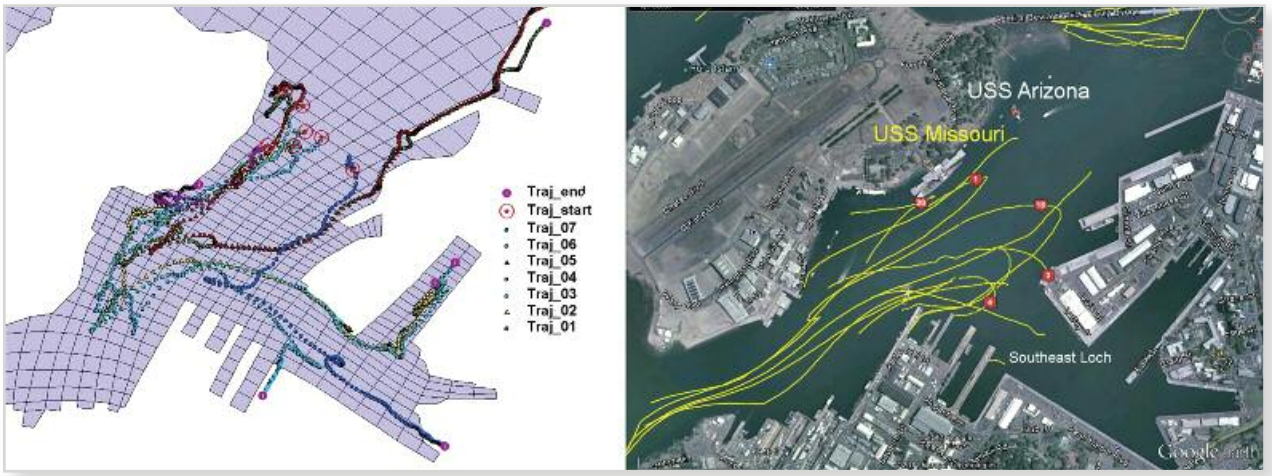
Model grid for the linked CH3D+GNOME model for Pearl Harbor with bathymetry in color contours.

Currently, Navy personnel use the National Oceanic and Atmospheric Administration's (NOAA) model—known as GNOME (General NOAA Operational Modeling Environment)—for predicting oil spill trajectories. GNOME is designed and used by NOAA's Office of Response and Restoration Emergency Response Division (ERD) as a first response to an oil spill event. The setup, running, and output of this model is fast, timely, and flexible enough to deal with various time scales. However, oil trajectories predicted by GNOME involve high uncertainty and lack accuracy because it is a transport model and not a hydrodynamic model. GNOME does not compute currents, but relies on data from an external source.

The objectives of this project were to improve the predictive accuracy of these existing oil spill trajectory models and provide a validated modeling tool to more cost-effectively and efficiently manage oil spill scenarios.

This project implements and links two existing models, NOAA's GNOME model and the Navy's Curvilinear Hydrodynamics in 3-dimensions (CH3D), to improve the predictions of oil trajectories following oil spills in Navy harbors. The linked model includes the oil properties and transport prediction from GNOME and the accurate hydrodynamic calculations, including currents and water mass movement in fine resolutions, from CH3D.

During the first phase, project engineers and scientists from the Space and Naval Warfare Command, Systems Center Pacific evaluated simulation performance of linking targeted functions from GNOME and CH3D. Personnel processed and fed fine resolution currents and water mass movement predicted by CH3D into the GNOME model to drive the transport and fate of oil at the same fine temporal and spatial resolutions.



Simulated oil slick trajectories (left) released near the USS Arizona Memorial versus drogue-drifting trajectories.

GNOME and CH3D were linked by two methods—an external linkage and an internal linkage. For the external linkage to be complete, output from the calibrated hydrodynamic CH3D model was stored in a data file, which was then read by GNOME to simulate trajectory of the oil slick. A comparison of these data with existing GNOME output shows significant improvement.

Internal linkages for Pearl Harbor have also been completed. In addition, the project team conducted and tested the internal dynamic transport using the CH3D-predicted currents. Predicted trajectory patterns from the internal dynamic transport in CH3D are similar to those predicted by the linked CH3D+GNOME. Internal linkage between CH3D and GNOME will involve modification of the current GNOME structure and may be addressed by follow-on projects.

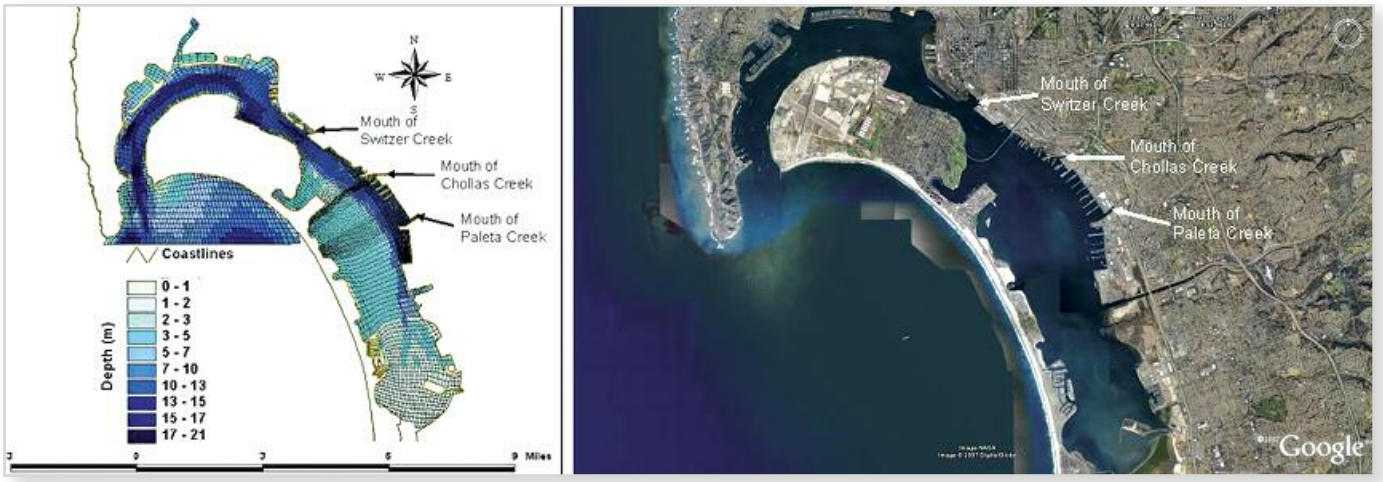
Once these external linkages were complete, model predictions were compared using measured or synthetic (analytical, empirical) data. NOAA and Navy inventory field data were used to document predicted oil trajectories. The accuracy of those predictions was also documented.

Project personnel selected two Navy harbors to be used for the demonstration of the merged model—Pearl Harbor, HI and San Diego Bay, CA. These harbors were selected based on multiple factors including traffic volume, accumulated knowledge about the site, accessibility of the site, and relevant data about the site.

Weak currents in Pearl Harbor persist and produce drift currents, which tend to transport oil slicks in a steady state manner. Field observations have confirmed and validated such drift phenomenon. Such long-term drift of oil slicks can only be simulated by the linked model, which is a significant improvement over the existing model.

The linked model for Pearl Harbor uses the same model grid and time step as those for the hydrodynamic model, providing adequate fine resolutions of transport in both space and time. (The study of San Diego Bay is underway.) Therefore, the transport of oil slicks is simulated at greater resolution with improved accuracy, compared to the old oil spill model. For example, oil slicks released by design near the USS Arizona Memorial were projected to oscillate back and forth by the "approximate" tidal currents near the release site. With the linked model, oil slicks are projected to be transported to wider and farther ranges depending on the timing of release and tidal conditions, both of which are adequately simulated by the linked CH3D+GNOME model. The same level of requirements and predictive accuracy are expected when the linked CH3D+GNOME model is applied to other harbors.

> ***In particular, NOSCs will have access to a better modeling system that can be used for both pre-planning (forecast) and cleanup for oil spill events.***



Model grid for the linked CH3D+GNOME model for San Diego Bay with variable grid sizes.

The integrated CH3D+GNOME modeling system was transitioned to NOAA's ERD team to help them better predict oil spill trajectory. The same modeling system for simulation of spill scenarios for 2011 has been delivered to the NOSC at the Naval Facilities Engineering Command (NAVFAC) Hawaii (Cynthia Pang). Simulation for scenarios for 2012 is underway and will also be delivered once complete.

In addition to the above two transition routes mentioned above, the project team will continue to explore further opportunities to promote the use of this product. The CH3D+GNOME model will be discussed at an upcoming meeting of NOSCs and local managers in the San Diego Bay region, including NAVFAC Southwest and Navy Region Southwest. Direct discussion with end users for potential use of the linked oil spill model will also be conducted.

At the completion of this effort, the Navy will have a model that simulates oil slick trajectories from an oil spill in Navy harbors with improved prediction accuracy. In particular, NOSCs will have access to a better modeling system that can be used for both pre-planning (forecast) and cleanup for oil spill events. Overall, the Navy's oil spill management teams may more effectively and efficiently prepare and deploy spill recovery and cleanup equipment through the use of the predictive model results.

CUSTOMER TESTIMONIAL

"A key element in effectively managing the response to a large oil spill is to deploy response resources in advance to areas where the oil may have an impact. This new model will provide NOSCs with a more accurate tool to predict the fate and transport of that oil. As a result, responders can prevent the oil from damaging environmentally, culturally, and economically sensitive areas which are vital to the people of Hawaii."

—Cynthia Pang (NAVFAC Hawaii)

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Integrating Green Technologies into the Fleet

2011

PROGRAM WEB SITE

ENHANCEMENTS TO THE PROGRAM WEB SITE

After unveiling the program's consolidated web site in FY06, program personnel implemented a series of enhancements in FY11 to better execute the program. The program web site (www.nesdi.navy.mil) provides a single, centralized repository for information pertaining to the management of the program and execution of program sponsored projects. The site promotes efficient management of program information and timely communication of critical deadlines and other information to key program personnel across the Navy. The web site also allows personnel from other R&D programs to obtain up-to-date insights into the NESDI program's priorities and ongoing projects. It's simple, efficient, and provides site visitors with quick access to program resources and information.

2011 Integrating Green Technologies into the Fleet

ENHANCEMENTS TO THE PROGRAM WEB SITE

The following enhancements were made to the program web site in FY11:

- **Improved Financial Management.**
  In a typical year, the NESDI program may fund up to 30 different projects. Within each project, there may be multiple performers at various facilities funded to execute specific tasks. The web site was capable of tracking the funds provided for each project but did not have the capability to effectively track resources at the individual performer or task level. This required manual intervention by the program manager which was both difficult and time consuming.

  Considering that a single performer may receive funds to execute various tasks across several different projects, a change to the web site structure was implemented to automate reporting and tracking at the individual performer and task level. This new structure provides more granularity and insight into the program's funding profile without burdening the program manager with the manual approach previously required.

  Another challenging and time consuming task for the program manager was to determine where to send funding for each project task. Funds are generally sent directly to the activity performing each task. Occasionally, funds are sent to an intermediate activity that provides them to the performing activity. The updated web site structure now identifies a Fund Receiving Activity (FRA) for each project task. The FRA identifies where the funds are to be sent for each project task including the Business Financial Manager and required contact information. Reports can now be generated to indicate total amounts to be sent to each FRA with a detailed breakout of the individual tasks and their costs.

- **Improved Program Publicity and Content Distribution.**
  An e-mail distribution list for publicizing various program events and news has been incorporated into the web site. The email list provides a mechanism to maintain and update a distribution list of individuals that are interested in various elements of the program. Automated emails are sent to members to highlight events such as:
  - New releases of the program's quarterly newsletter—*NESDI News: Highlights & Happenings*
  - The needs submission deadline for each fiscal year
  - Open season for submitting pre-proposals each fiscal year

This effort contributes to an overarching goal to increase NESDI program knowledge and participation throughout the Navy.

The Details Behind the NESDI Web Site

The web site serves two primary program requirements:

1. **Public Component**
   The public component (www.nesdi.navy.mil) provides the general public with information about the program's mission, technology investments, and successes. It also serves a single entry point to collect environmental needs and research proposals.

2. **Secure Program Management Component**
   The secure program management component (www.nesdi.navy.mil/ProjectManagement) is a collaborative work flow application that supports all aspects of the program's business processes. This component is based on multiple account roles so that each user within a particular role has access only to the appropriate functionality and data. Primary functions are as follows:

   - Collect and leverage input from management to validate/approve submitted environmental needs and their associated research proposals. This input is ultimately used to arrive at program investment decisions.
   - Provide automated feedback services to needs and proposals submitters and provide final review results via automated emails.
   - Provide automated scheduling services through automated emails. These services notify the appropriate members (based on their user roles) of upcoming deadlines with instructions on how to accomplish their required actions.
   - Collect and manage data for research proposals and funded projects such as financial requirements/expenditures, schedule, milestones, and status updates.
   - Provide reporting capability for various metrics which are used to present progress to the program's resource sponsor.

The web site platform utilizes two basic technologies:

1. Client requests and server responses are handled using **Microsoft Active Server Pages (ASP) NET.** The system handles information requests from each user and provides output back to their browser.

2. **Microsoft SQL Server 2005** is the database platform that functions as the repository for all program data and serves as the retrieval point for all data requests made through the web site.

What's next:

PLANS FOR FY12 & BEYOND

In FY12, NESDI program personnel will continue to engage the program's resource sponsor and end users to ensure that program investments are properly focused and that program-generated technologies are incorporated into the fleet's daily operations.

The program has established the following specific goals to be achieved in FY12 and beyond:

1. **Maintain visibility of the program.** The NESDI program will continue to provide its resource sponsor with the information it needs to increase visibility of and support for the program across CNO N45 and elsewhere. This will be accomplished via regular programmatic reviews, publication of program successes in *Currents* magazine and other publications, the quarterly on-line publication of a program newsletter—*NESDI News: Highlights & Happenings*, and the use of the NESDI logo and standard language about the program in all conference presentations and posterboards.

2. **Continue to review and update strategic plan and roadmaps.** Also in FY12, the NESDI program will update its strategic plan and develop roadmaps to target investments in priority areas. Existing roadmaps will be updated in the range and storm water areas. The storm water roadmap was the focus of a January 2012 strategic planning session. A third roadmap for the elimination of hexavalent chromium will be updated in conjunction with the draft NAVAIR Engineering Circular on Non-chromate Coatings Systems. Although there are no direct ties between the NESDI program and CNO N45's energy security portfolio, communications in this area have been opened and a roadmap in the alternative and renewable energy arenas will be considered.

2012

3. **Maintain accountability of project Principal Investigators.**
   In an ongoing effort to reduce risk and increase the utility of its projects, NESDI management personnel will continue to monitor and adjust the execution of its active projects as necessary. Project Management Plans are now required for all new start projects.

4. **Continue focus on improved needs collection.**
   NESDI program personnel will continue to improve its needs collection process by:
   a. Holding field visits to improve communication with end users and need submitters.
   b. Pre-screening needs and following up with need submitters for additional insights and clarification before a final ranking occurs.
   c. Designating a technical program liaison with NAVFAC Media Field Teams, the Corrosion Fleet Focus Team and other field teams.

5. **Manage out-of-cycle requests for support.**
   Subject to funding availability, the NESDI program will also continue to entertain requests for support that fall outside of its annual business processes. These requests include quick turnaround appeals for technical assistance, funding of high priority projects, development of strategies and protocols for information technology investments, and routine technical support to CNO N45 as needed.

6. **Maintain focus on technology integration.**
   To promote the successful integration of program-sponsored projects, NESDI program personnel will conduct site visits, encourage a focus on technology transition with other partners and activities, and maintain an ongoing dialog with end-users to increase their participation in annual program In-Progress Reviews.

7. **Enhance program web site.**
   Finally, the NESDI program will continue to enhance its web site via the addition of a repository for final reports, an updated design and other functional upgrades.

FY12 SCHEDULE

WHAT	JULY 2011	AUG 2011	SEPT 2011	OCT 2011	NOV 2011	DEC 2011	
Announce Needs Solicitation	5 July 2011 (for 2012)						
Close Needs Solicitation		29 August					
Screen Needs			6-9 September				
Evaluate & Rank Needs			26-30 September				
Obtain Sponsor Review & Approval of Needs				3-14 October			
Request Pre-proposals				17 October			
Close Pre-proposal Collection					18 November		
Collect TDWG Comments on Pre-proposals					29 November		
Evaluate Pre-proposals					29 November – 1 December		
Request Full Proposals						12 December	
Collect Full Proposals							
Collect Functional Working Group Comments on Full Proposals							
Collect TDWG Comments on Full Proposals							
Screen Full Proposals							
Evaluate Full Proposals							
Obtain Sponsor Review & Approval of Full Proposals							
Conduct In-Progress Reviews							
Announce New Starts							
Quarterly Status Reports Due (all Fridays)				14 October			
Conduct CNO N45 Programmatic Review				6 October			

	JAN 2012	FEB 2012	MARCH 2012	APRIL 2012	MAY 2012	JUNE 2012	JULY 2012
		23 February					
			9 March				
			21 March				
			26-30 March				
						18-22 June	
							9-23 July
	Stormwater: 10-11 January				West: 7-11 May	East: 18-22 June	
							30 July
	13 January			13 April			13 July

FOR MORE INFORMATION

For more information about the operation of the NESDI program, contact Leslie Karr at 805-982-1618 (DSN: 551-1618) and leslie.karr@navy.mil.

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The TDWG at the east coast In-Progress Review (June 2011). *Not pictured:* Chaela Hall and Jerry Olen. Also pictured: Lorraine Wass who provided administrative support. C. Kurt Holter

To get up-to-date information about NESDI-sponsored R&D projects, participate in the ongoing execution of the program, and download an electronic copy (pdf) of this Year in Review report, visit the NESDI program web site at www.nesdi.navy.mil.

Document preparation assistance and graphic design services were provided by Bruce McCaffrey Consulting, Inc. under General Services Administration contract number GS-10F-0375K.

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NESDI FY11 Year in Review Report: Integrating Green Techologies into the Fleet

2011

Accomplishments of the Navy Environmental Sustainability Development to Integration Program

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