

THE NAVY'S ENERGY & ENVIRONMENTAL MAGAZINE

Currents

summer 2015

NAVFAC Engineers Execute

Energy & Water

Conservation Improvements at

CAMP LEMONNIER

Energy Saving Initiatives &
Other Efforts Successful
in Forward-deployed Environment

Chief of Naval Operations Environmental Award Winners Recognized
Spotlight on the New Deputy Assistant Secretary of the Navy
for Energy Joseph Bryan

Naval Medical Research Unit San Antonio Captures
Mercury-Containing Amalgam Waste

“What’s In
Your Bay?”
Poster
Inside!



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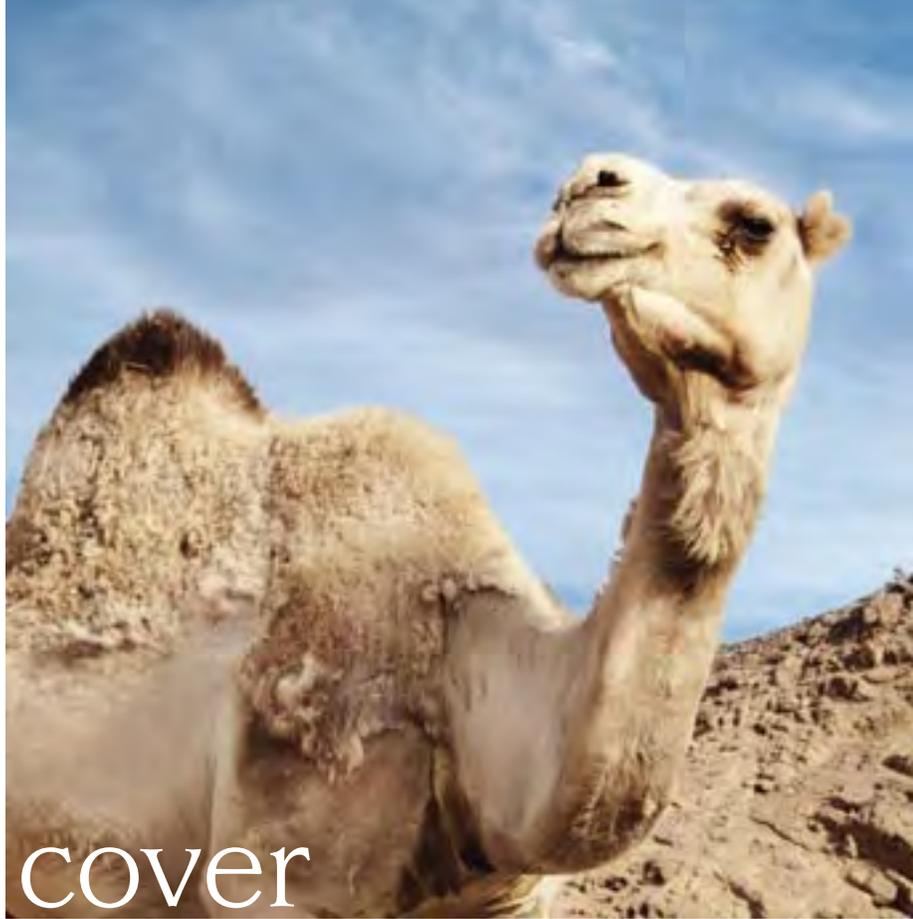
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cover

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NAVFAC Engineers Execute Energy & Water Conservation Innovations at Camp Lemonnier

Energy Saving Initiatives & Other Efforts Successful in Forward-deployed Environment

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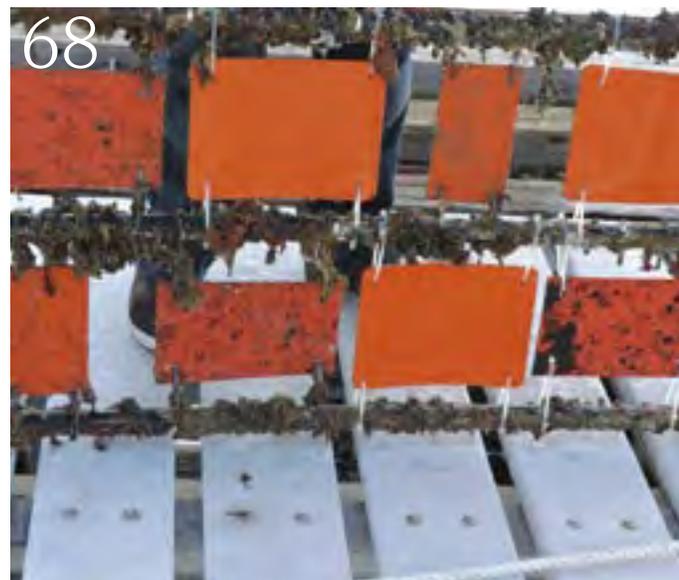
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Bringing Technology & Resource Management Innovations to Make Navy More Operationally Effective

WELCOME TO THE summer 2015 issue of *Currents*. I'd like to draw your attention to a number of the stories we have included in this issue of the magazine to highlight just some of the many energy and environmental issues and initiatives that your Navy is working on.

Featured in this issue of the magazine is the great work that was done by a number of engineers from the Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC) who successfully executed several projects to promote energy sustainability and water conservation at Camp Lemonnier, Djibouti Africa.



We gain insights from Mr. Joseph Bryan in this issue as he explains his priorities as the new Deputy Assistant Secretary of the Navy for Energy. Kenneth Hess from my staff and Bruce McCaffrey, managing editor of *Currents*, interviewed Mr. Bryan for our "Spotlight" feature to get his perspectives on the energy challenges facing the Navy today and what needs to be done to face those challenges.



Also in this issue is a behind-the-scenes look at the winners of the Chief of Naval Operations (CNO) Environmental Awards for fiscal year 2014. In our article "Chief of Naval Operations Environmental Award Winners Recognized" we describe the various efforts undertaken by the 2014 awardees that warranted this recognition. Admiral Greenert hosted the awards ceremony via video teleconference (VTC) on June 23, 2015 and I had the pleasure of participating. This was the third year the event was done as a VTC, with nearly every winning command worldwide dialing in remotely. High-level Navy, Department of Defense, U.S. Environmental Protection Agency, and National Oceanic

I would like to personally congratulate the winners of these prestigious awards that demonstrate how environmental stewardship is part of our operational mindset every day both at sea and ashore.

Our cover story "NAVFAC Engineers Execute Energy & Water Conservation Improvements at Camp Lemonnier" describes these efforts that range from improving the energy efficiency of the base's Containerized Living Units to increasing water conservation measures and reducing solid waste generated on the base.

and Atmospheric Administration officials, as well as representatives from the Ocean Conservancy and the Coastal States Organization, participated onsite at the Pentagon.

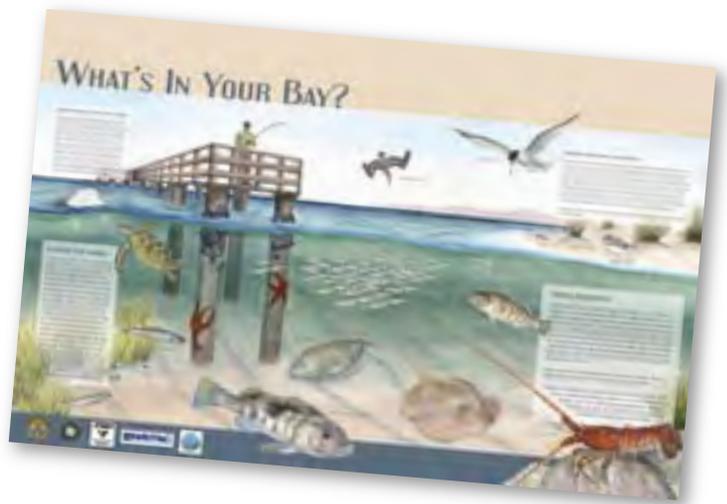


I would like to personally congratulate the winners of these prestigious awards that demonstrate how environmental stewardship is part of our operational mindset every day both at sea and ashore. As Admiral Cullom said when announcing the winners, “These achievements underscore that each contribution can have a tremendous long term impact in conserving our environmental surroundings and resources.”

N45’s research and development programs—the Living Marine Resources program run by Anu Kumar and the Navy Environmental Sustainability Development to Integration program run by Ken Kaempffe—both from NAVFAC EXWC in Port Hueneme, California.



Finally, our center spread in this issue contains a copy of the “What’s In Your Bay?” poster which you can detach and hang on the wall in your cubicle or office.



Two other feature stories round out the line-up for our summer issue. In our story “Carderock Testing New Oil Boom Fouling Release Material,” our colleagues from the Naval Surface Warfare Center in Carderock, Maryland discuss the work they are doing to validate the use of an environmentally friendly non-stick coating in conjunction with in-water cleaning to reduce the biofouling of oil

containment booms. And our “Naval Medical Research Unit San Antonio Captures Mercury-Containing Amalgam Waste” article discusses efforts of



personnel from the Naval Medical Research Unit San Antonio to capture the mercury-containing amalgam used in dental procedures and ensure ongoing environmental compliance of the Navy’s dental treatment facilities.

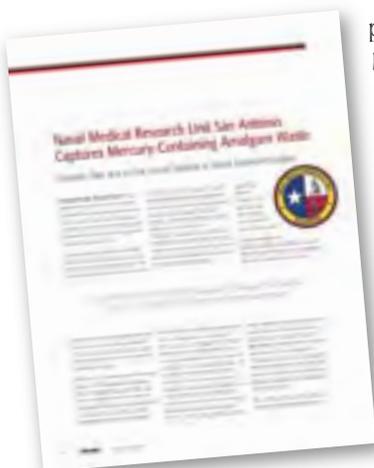
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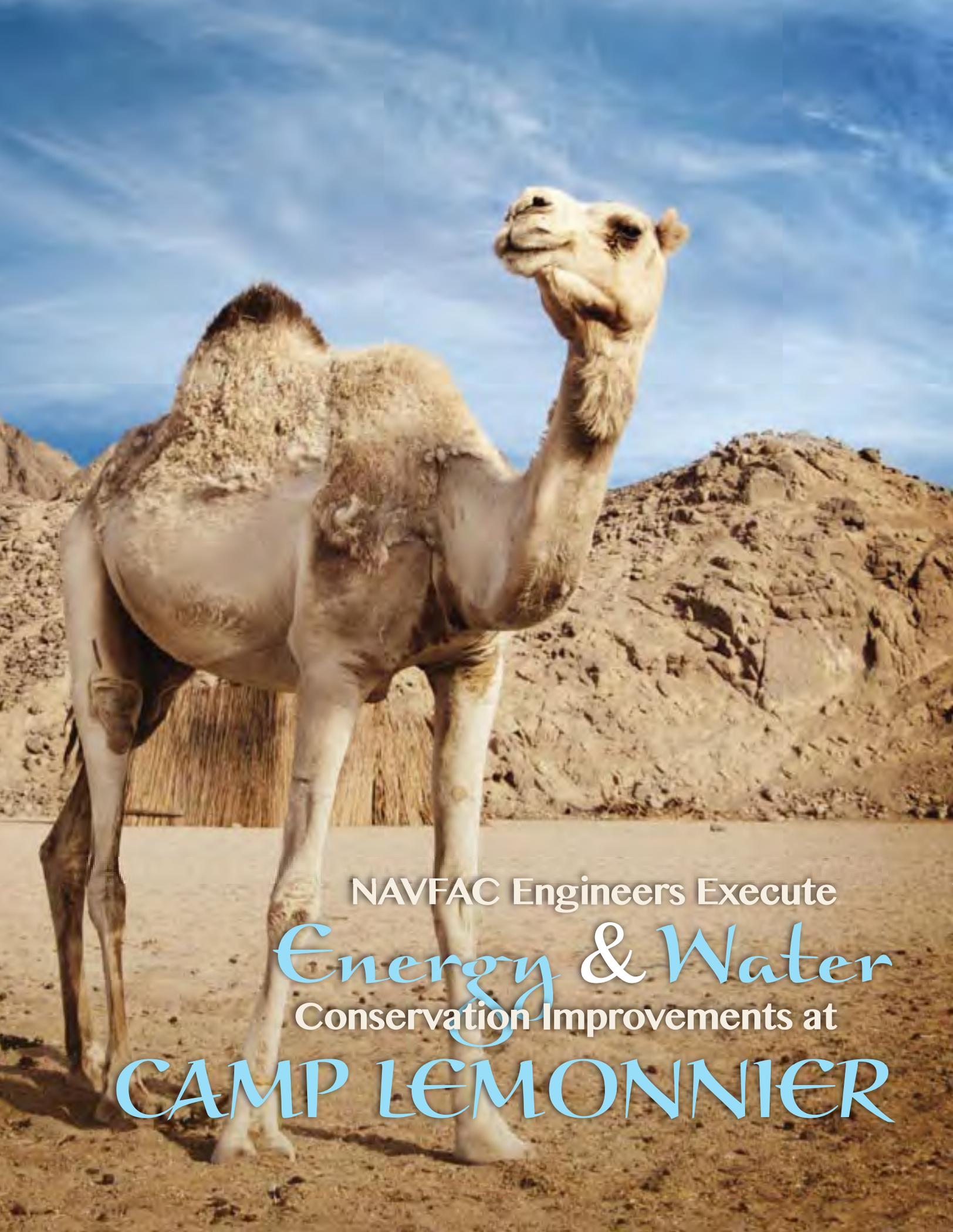
In our “Trends of the Environment” section, we alert you to the recent release of annual reports from two of CNO

This poster comes to us from our colleagues at the Naval Facilities Engineering Command Southwest and the Space and Naval Warfare Systems Center Pacific to help promote their efforts to protect the marine mammals and fishes that share the waters of San Diego Bay with us.

Thanks for reading *Currents*, and for your continued interest in the Navy’s energy and environmental programs. ⚓

Rear Admiral Kevin R. Slates
 Director, Chief of Naval Operation Energy and Environmental Readiness Division





NAVFAC Engineers Execute

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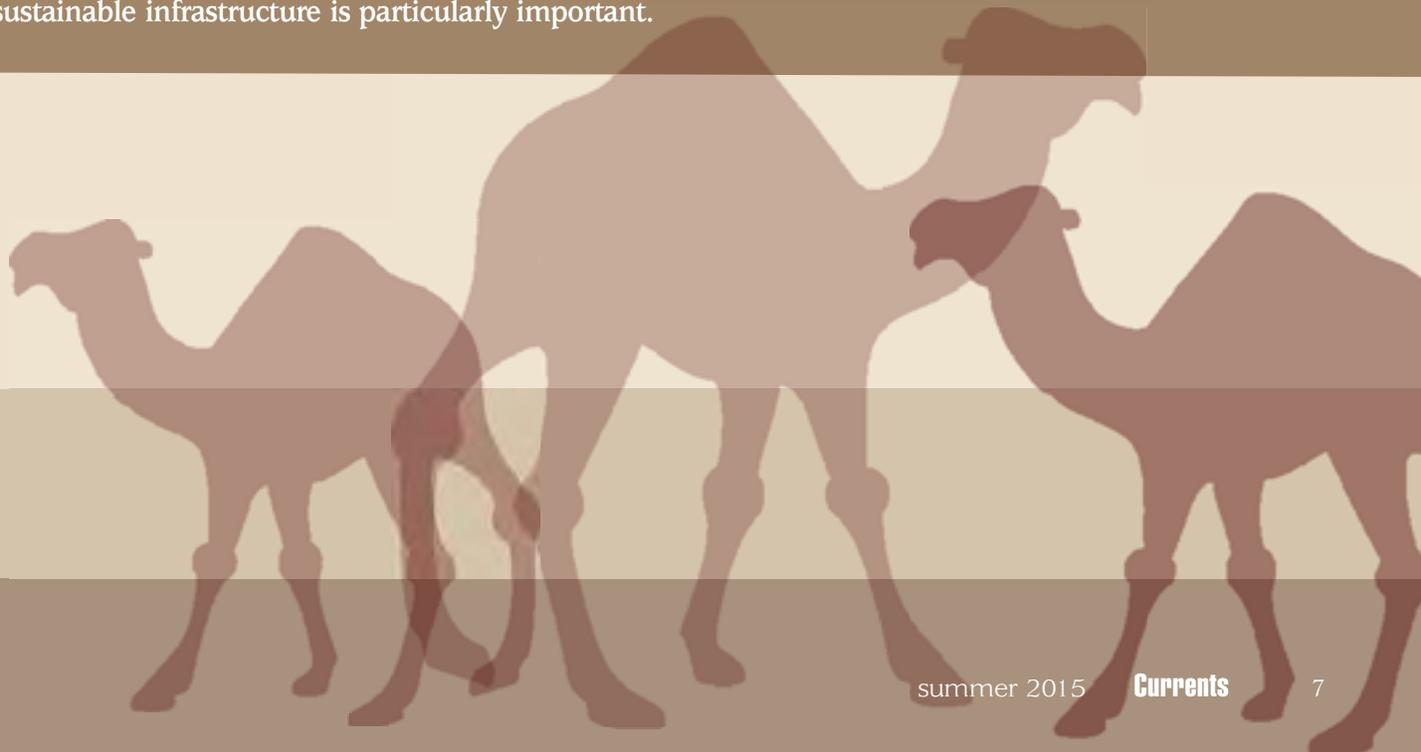
Energy Saving Initiatives & Other Efforts Successful in Forward-deployed Environment

Engineers from the Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC) successfully executed several projects to promote energy sustainability and water conservation at Camp Lemonnier, Djibouti (CLDJ) Africa.

Located in an extremely arid and harsh climate with base power provided overwhelmingly by diesel generators, the Camp Lemonnier NAVFAC EXWC Sustainability Team reduced energy intensity by 13.5 percent relative to the 2003 baseline by making efficiency upgrades to electric power generation and distribution, air conditioning units, and clothes washing machines. The team also reduced electric energy use by reducing the need for potable water generation and wastewater treatment by over 20 percent.

Their efforts were recently commended by Rear Admiral Kevin R. Slates, director of the Chief of Naval Operations Energy and Environmental Readiness Division. “Especially in areas like Djibouti, efforts to reduce water and fuel usage with no mission impact can be a huge cost saver and help reduce challenging logistics burdens,” said Admiral Slates.

Like all remote military facilities, CLDJ must contend with multiple challenges regarding energy and water use expenditures. This small country located in the Horn of Africa has a very limited supply of fresh water, a harsh climate, and an unreliable electric power grid. Because of the camp’s rapidly evolving mission with changing staffing requirements, flexible, sustainable infrastructure is particularly important.



HOW IT ALL BEGAN

The Energy Policy Act of 2005 and Executive Orders 13423 (Strengthening Federal Environmental, Energy, and Transportation Management) and 13514 (Federal Leadership in Environmental, Energy, and Economic Performance) all set mandatory goals that call for annual reductions in energy and water consumption as well as increased use of renewable energy and metering.

To identify what it would take to help CLDJ achieve its regulatory and Executive Order goals, engineers from the Naval Facilities Engineering Command's Engineering Service Center (NAVFAC ESC), now NAVFAC EXWC, traveled to the camp in 2008. They reviewed the base master plan supplied by NAVFAC Atlantic personnel, and conducted a preliminary facility sustainability assessment. The team concluded that CLDJ is unique from a sustainability perspective for the following reasons:

1. The facility's staffing and mission requirements are evolving, so infrastructure must be readably adaptable to changing needs.
2. The region does not have a reliable electric grid or potable water, so the base must be entirely self-sufficient.
3. The harsh climate imposes serious challenges in terms of developing sustainable infrastructure.

After several follow-up discussions with NAVFAC Europe Africa Southwest Asia, the NAVFAC ESC team again traveled to CLDJ to begin gathering data and researching potential solutions. They recommended that CLDJ implement the following efforts:

1. Address Containerized Living Unit (CLU) energy use.
2. Conduct energy sustainability studies.
3. Assess water conservation and aquifer sustainability.
4. Identify solid waste reduction opportunities.
5. Study the feasibility of solar photovoltaic systems.
6. Implement street lighting and conduct an energy audit.



7. Assess the viability of wind power.

8. Assess the efficiency and reliability of the camp's electric grid.

ADDRESSING CONTAINERIZED LIVING UNIT ENERGY USE

The inherent challenge with reducing energy usage at CLDJ exists because of the climate in Djibouti. The average high temperature in January is 84 degrees Fahrenheit (F) with nearly 80 percent average humidity. In July, the average high temperature is 106 degrees F with 43 percent humidity. These climate conditions require year-round air conditioning, which contributes to the base's high energy costs. Because of this, the air conditioning systems used in CLDJ's housing units were one of the team's highest priorities, and the largest single factor in reducing energy consumption.

CLDJ base personnel are primarily housed in metal CLUs, which are constructed by converting shipping containers into living spaces. The original CLUs were furnished with window air conditioners, which provided



Camels are a common sight in Djibouti.

Bruce Holden

uneven cooling at an unacceptably high noise level.

Just as important, these units place a high energy demand on the camp's diesel fuel resources. The camp estimated that CLU air conditioning consumed approximately 40 percent of its total energy load. It was thought that this could be significantly

reduced by improving the overall energy efficiency of the CLUs.

The objectives of this effort were to:

1. Identify the most energy efficient split air conditioning unit that was appropriate in a high humidity environment.
2. Use energy modeling and performance testing to identify the required cooling capacity.
3. Determine the optimum location for the evaporation portion of the system so that temperature differences within the living space were minimized.
4. Provide design specifications to improve the energy efficiency for newly-purchased CLUs.

This effort began in August 2011, as NAVFAC EXWC and Naval Air Weapons Station (NAWS) China Lake personnel collaborated on a heating,

ventilation and air conditioning test. NAWS China Lake was chosen as the test location due to its extreme summer weather conditions, with outside air temperature approaching levels experienced at CLDJ. A 20-foot insulated shipping container, similar in size and insulation performance to a single CLU room at CLDJ, was used to measure heat gain and experiment with several methods to distribute cooled air within the container.

These experimental data were used in conjunction with a building energy modeling software program to identify potential CLU energy conservation measures. It was determined that the existing 24,000 British Thermal Units (BTU) per hour window-type air conditioning units were much too large. A unit with 9,000 BTU per hour capacity was all that was required. This smaller unit would be less expensive to purchase and would provide better humidity control. The NAVFAC EXWC



The old (right) and new (left) CLU air conditioning units at Camp Lemonnier.

Bruce Holden

The camp estimated that CLU air conditioning consumed approximately **40 percent** of its total energy load.

Geothermal Potential?

A separate study in 2010 explored the potential for geothermal energy at CLDJ. The geothermal energy potential of Djibouti is estimated to be significant according to studies conducted intermittently since the 1970s, primarily by Djiboutian and Icelandic investigators. While the Navy Geothermal Program Office found no clear evidence of geothermal resources beneath or directly adjacent to the camp, it compiled a report detailing how to conduct a geothermal resource assessment/exploration process.

A geothermal resource must possess heat, fluids, and permeability to be a successful production prospect. As with the discovery of any natural resource in the ground, prospecting for geothermal energy revolves around identifying indicators of the occurrence of that resource. The process involves gathering and interpreting a wide variety of tectonic and geologic data to create a picture, or model, for the presence of a geothermal resource in the ground and then validating that model through actual drilling.

If a more comprehensive geothermal study is undertaken, the first stage would be a two-year exploration program in which detailed geological and geophysical data would be gathered and used to create a three-dimensional model with specific drilling targets. This stage also includes drilling several test holes to approximately 500 feet. This effort would result in a geologic model that would enable the NAVFAC EXWC Sustainability Team to determine whether additional geotechnical studies are required or sufficient information exists to proceed to the next stage which involves drilling deep discovery wells to a depth of 3,000 to 5,000 feet.

Altogether, if sufficient geothermal resources are found at or near Camp Lemonnier, the total time from inception of exploration to an operating power plant is estimated to be a minimum of seven years. Prior to actual construction of a power plant, upfront costs for exploration and well development are estimated to be up to \$17 million with no guarantee that an economically viable resource will be discovered.



Lac Asal is a region that has been identified as a promising area for geothermal power development.

Bruce Holden



Close-up of Lac Asal geothermal area shows salt crystalized on exposed rocks.

Bruce Holden

If resources are found off-base, a host of other issues such as security and contracting issues would have to be addressed. Fortunately, there is a strong desire on the part of the Djiboutian government to work with the Department of Defense (DoD) in the exploration for and development of resources. Two firms, Reykjavik Geothermal and Geothermal Development Associates, have also inquired if the DoD might be interested in entering into a Power Purchase Agreement. These firms have completed preliminary explorations in the nearby Lac Asal region, a known source of geothermal energy. If an agreement were to be reached, it is conceivable that a power plant could be online in three or four years.

The payback from geothermal energy is potentially very significant but the upfront costs are non-trivial and must be accepted before the exploration process can begin.



Camels along the road to Lac Asal, a promising geothermal region.

Bruce Holden

team also determined that the optimum split type units had more than twice the electrical energy efficiency of the existing window units.

Split unit systems are so named because they have two components—

an exterior compressor/condenser, and one or more interior units installed on a wall or ceiling. Refrigerant is pumped through tubing from the outdoor condenser and compressor to the indoor unit(s). Indoor air to be cooled is drawn across the unit's interior evaporator coil and distributed via a fan. Humidity is removed from the room's interior via a drain in the indoor unit.

Subsequent to the NAWS China Lake testing, the NAVFAC EXWC team performed numerous tests at CLDJ to identify the optimum location for the unit's evaporator such that temperature differences within the living space were minimized. NAVFAC EXWC engineers also completed performance electrical measurements to verify the results from the building energy modeling efforts. NAVFAC Atlantic personnel incorporated the split heating, ventilation, and air conditioning systems into all new CLU

purchases and ensured that the correct systems were installed at Camp Lemonnier.

Since CLU air conditioning was the largest single source of electricity use on the camp, the camp's replacement of all CLU air conditioning units has been the biggest energy conservation success.

In addition to the CLU air conditioning unit replacement, the NAVFAC EXWC team also investigated the use of CLU shading structures and several reportedly highly thermal reflective paints. Both technologies were initially tested at the NAVFAC EXWC facility in Port Hueneme, California. They were later tested at CLDJ. Unfortunately, the CLDJ testing proved that neither of these approaches provided significant value in reducing the load on the CLU air conditioning units, and the shading structures did not pass long-term wind durability testing so these ideas were not pursued.



A U.S. airman walks towards a housing area composed of CLUs at CLDJ. The triple-stacked units showed a three to five percent reduction in necessary power to cool the first and second levels simply by being shaded.

MC1 Class Eric Dietrich

The camp's *replacement* of all CLU air conditioning units has been the biggest energy conservation success.

CONDUCTING ENERGY SUSTAINABILITY STUDIES

Because of the inherent instability of the Djiboutian power grid, the Navy has chosen to generate almost all electricity at CLDJ by onsite diesel generators. The Djiboutian power grid has been known to fail up to several times a day for hours at a time. Even when the power is available from the Djiboutian power grid, its cost is above the approximately \$0.43 per kilowatt hour for the CLDJ generators.

To help reduce this dependence on fuel, NAVFAC EXWC personnel tasked the National Defense Center for Energy and Environment (NDCEE), operated by Concurrent Technologies Corporation (CTC), to oversee two energy reduction efforts at Camp Lemonnier.

Part of the effort to reduce consumption included an assessment of the energy grid. For this task, NDCEE hired Lockheed Martin to conduct an energy grid assessment. The goals of this assessment were to reduce fuel consumption by increasing generator operating efficiency and to increase overall system reliability and security. System reliability risks were also assessed through the examination of power source and distribution components by exposing single-point failures in the distribution and control design.

Lockheed Martin engineers spent one week on site gathering information pertaining to the generation, distribution and loading of the current power grid, which they then entered into their proprietary Microgrid Planning Tool to evaluate the power and energy balances between the loads and the sources. Through this tool,

Camp Lemonnier relies almost entirely on diesel fuel to power the base.

Bruce Holden



Lockheed Martin engineers developed various options for reducing fuel consumption and documented their recommendations.

About the Generators

Generators operate most efficiently at 75 to 80 percent of capacity. As the generator loading falls below this

The Basics About Camp Lemonnier

Camp Lemonnier is located on the south side of the Djibouti-Ambouli International Airport. Originally, the camp belonged to the artillery of France's 5th Overseas Task Force (5th RIAOM) and was named for a French general. Following use by the 5th RIAOM, the facility was operated by the Djiboutian Armed Forces. The U.S. government took up residence in May 2003 with the Combined Joint Task Force-Horn of Africa staff, a Marine Corp-based organization. In January 2007, it was announced that Camp Lemonnier would be expanded from 97 acres to nearly 500 acres. As part of the process of transferring the base from an "expeditionary" base to an enduring facility, tents were replaced with CLUs. Camp Lemonnier is now under the command of Commander, Navy Region Europe, Africa, Southwest Asia and is part of the U.S. Africa

Command. The camp has over 4,000 residents. For more about CLDJ, visit www.cnrc.navy.mil/regions/cnrcneurafswa/installations/camp_lemonnier_djibouti.html.



level, the generator becomes less efficient, which results in unburned fuel exhausted into the atmosphere. The result is carbon buildup inside the generators, requiring an increased maintenance frequency to remove the carbon. Underloading the generators also affects the engine bearings, resulting in greater maintenance requirements and shorter overall lifespan.

The Lockheed Martin team studied the efficiency and performance of every generator at CLDJ. Their report identified underperforming and underutilized generators and recommended installing an intelligent software control system to ensure that the most efficient generators are utilized to optimum capacity, and that the use of the lowest performing generators are avoided except as a last resort. This control system would integrate all prime power generators, regardless of manufacturer, and adds an additional layer to the existing control system.

Changing Power Distribution

The Lockheed Martin team also recommended extending the prime power distribution feeders to include areas of CLDJ that had been serviced by less efficient spot generators. Transferring these loads to the prime power generators is estimated to result in a savings of approximately \$1.2 million per year based on a reduction of 320,000 gallons/year of diesel fuel. In addition to extending the grid, the Lockheed Martin team also recommended that the existing prime power generators be integrated into one grid.

In total, the Lockheed Martin-recommended improvements to the operation of the energy grid could reduce the amount of fuel needed to produce electricity at Camp Lemonnier by up to 13 percent. Since this report was prepared, several of its recommendations have already been implemented including extending the electric grid, phasing out the least efficient generators and interconnecting the Camp's grid.

Heat Pump Water Heaters

Conventional water heaters use electricity or fuel to heat incoming water to a desired temperature. The water is stored in an insulated tank until used. Heat Pump Water Heaters (HPWH) use heat naturally present in the ambient air to heat the water and rely on electricity only to move the heat, resulting in a decrease in energy requirements. Because these water heaters can be two to three times more efficient than conventional electric water heaters,



A heat pump water heater.

Stephen Schroth

they were chosen for demonstration and validation at CLDJ.

HPWHs are designed to operate best at 40 to 90 degrees F. Although it is frequently hotter than this at CLDJ, positioning the water heaters inside a building has a secondary benefit. Because the HPWH absorbs heat from the air around it and pulls it in to heat water, it also cools the space where it is installed.

A HPWH was demonstrated at CLDJ by NDCEE personnel to evaluate its performance and to measure the resultant energy savings compared to a baseline conventional water heater.

Energy modeling was also used to model the recovery rate of the HPWHs and to calculate the maximum shower duration per day



Diesel generators at one of CLDJ's power plants.

Bruce Holden

Improvements to the operation of the energy grid could *reduce* the amount of fuel needed to produce electricity by up to 13 percent.

that could occur under desired conditions. For laundry purposes, modeling was used to calculate the maximum number of loads per day that could be washed and the maximum number of loads per hour while maintaining the desired wash temperatures.

The results of the demonstration and water use modeling effort indicated that implementing HPWHs will result in significant energy savings at CLDJ. Annual energy savings for one HPWH unit for ablution (shower and restroom) use is estimated at \$1,500 with a simple payback of 2.1 years. Annual energy savings for one HPWH unit at the laundry is estimated at \$4,466 with a simple payback of 0.7 years.

ASSESSING WATER CONSERVATION & AQUIFER SUSTAINABILITY

In addition to a punishing climate, Djibouti suffers from a scarcity of fresh water. Currently, CLDJ uses brackish groundwater beneath the camp as their primary water supply. This water is processed through a

reverse osmosis system before it is suitable for drinking. In conjunction with hydrologists from the U.S. Geological Survey, NAVFAC EXWC engineers conducted a study of groundwater quality and prepared a model to help evaluate current and potential impacts of the camp on the local water table. Their findings indicate that the camp is having a minimal impact to the water table. However, the city of Djibouti is depleting the groundwater at a faster rate than it is being replenished, due to its high temperatures, low rainfall and high evaporation rates. Saltwater intrusion has already been affecting some of the city's wells, raising concerns about long-term sustainability of the water supply. For these reasons, water conservation is a high priority at CLDJ.

NAVFAC EXWC engineers conducted a water conservation study and inventory in January 2012 with follow-up



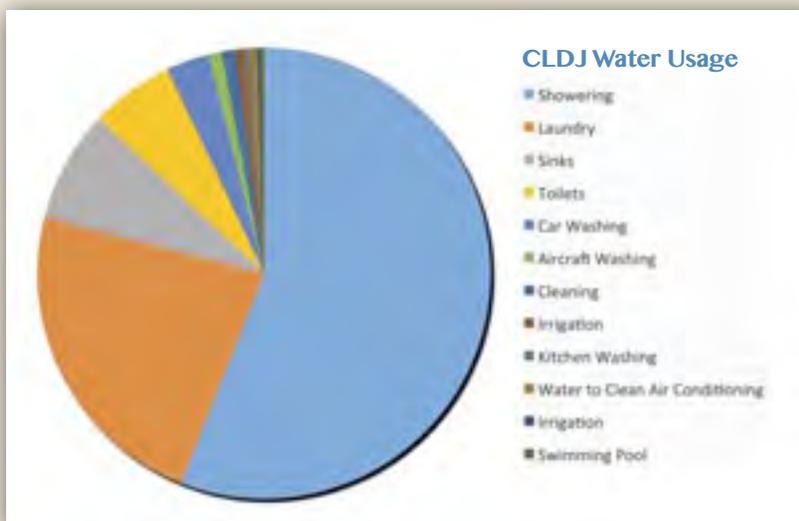
The groundwater in Djibouti is very limited and has a high salt content. Shown here is the camp's combined discharge from its wastewater treatment plant and reverse osmosis water treatment facility. Even though the groundwater has a high salt content, wild dogs still use it as a drinking water source.

Bruce Holden

study and inventory in April 2012. An inventory of water fixtures and testing of fixture flow rates was conducted to quantify water consumption in male and female ablution CLUs. The largest overall usage of water on the camp is for showering. Other primary uses of water include laundry operations, vehicle and aircraft washing, toilets, and rest room unit sinks.

Based on the findings and observations from this study, options were summarized into immediate, intermediate, and long-term recommendations.

Because of their dramatic impacts to overall water savings, the installation of low-flow shower heads and water-efficient washing machines was initiated immediately. After less than six months, actual observed reduction in water use from the installation of 238 low-flow shower heads and 72 new washing machines was 13 million gallons per year or 17 percent of overall base water use. Based on a \$0.05 per gallon water production and treatment cost, the installation of the first set of shower heads was estimated to save approximately



\$1 million per year. The remaining 771 shower heads and high-efficiency washing machines have been installed, and the resulting base-wide water savings are expected to reach 24 percent or 19 million gallons (over \$2 million per year).

Recommendations in the intermediate timeframe include installing water meters to better track water use, surveying and repairing leaks on a regular basis, and installing drinking



Bruce Holden



Abigail Goss

New shower heads, sink aerators and clothes washers at CLDJ are estimated to save approximately \$2.2 million per year in water costs.

fountains with water bottle fixtures to encourage the reuse of water bottles. The drinking water distribution system and drinking fountains are currently being installed.

Most of the long-term recommendations for water conservation relate to the treatment of wastewater. The wastewater plant at CLDJ currently treats approximately 180,000 gallons per day of wastewater. Of this, 125,000 gallons per day could theoretically be treated to tertiary standards and made available for water reuse applications. However, little of the available reuse water is actually being used. This low reuse rate is a function of not having a good reuse water distribution system.

IDENTIFYING SOLID WASTE REDUCTION OPPORTUNITIES

In October 2009, the NAVFAC EXWC team traveled to Camp Lemonnier to obtain onsite solid waste generation and disposal (recycling, incineration and landfilling) data. The team found that in fiscal year 2009 (FY09), CLDJ incinerated 7,897.52 tons of solid waste at a cost of \$650,000. For FY09, the camp had a diversion rate of 1.04 percent. This was far below the diversion goals of 40 percent for 2010 and 50 percent for 2015 set in Executive Orders 13423 and 13514.

A challenge to meeting its diversion goals was the low performance of the camp's incinerators. The incinerators were experiencing structural internal decomposition in part due to the high moisture content of the solid waste



At the outset of this effort, the camp had just a 1.04 percent diversion rate for recycling, well below the DoD's 40 percent goal.

being combusted. The incinerators were using up to 1,000 gallons per day of diesel fuel.

In 2012, the NAVFAC EXWC team conducted a solid waste characterization to identify the composition and amount of waste generated by the camp. The characterization entailed physically sorting solid waste into select categories. The intent of the characterization was to analyze the feasibility of energy recapture from the incinerators, look at the economics of a waste-to-energy (WtE) system, and identify opportunities to reduce the moisture content of the waste stream entering the incinerators. The study found the camp generated 12 tons per day of solid waste, with food waste accounting for approximately 30 percent of the camp's total waste stream, contributing to an overall moisture content of 40 percent.

Diverting the majority of this food waste would aid the camp in achieving its diversion goals as well as help the incinerators sustain a more

The resulting base-wide water savings are expected to reach 24 percent or 19 million gallons per year.

complete combustion and run much more efficiently. The heat content of the solid waste material was calculated to determine the energy available. WtE was feasible, but the current inefficient operations of the camp's incinerator made it undesirable at the time.

NAVFAC EXWC engineers recommended that the camp install the following:

1. **Sorting Conveyor**

A sorting conveyor will increase the diversion rate, remove non-combustibles and reduce the amount of moisture in the waste sent to the incinerator.

2. **Shredder**

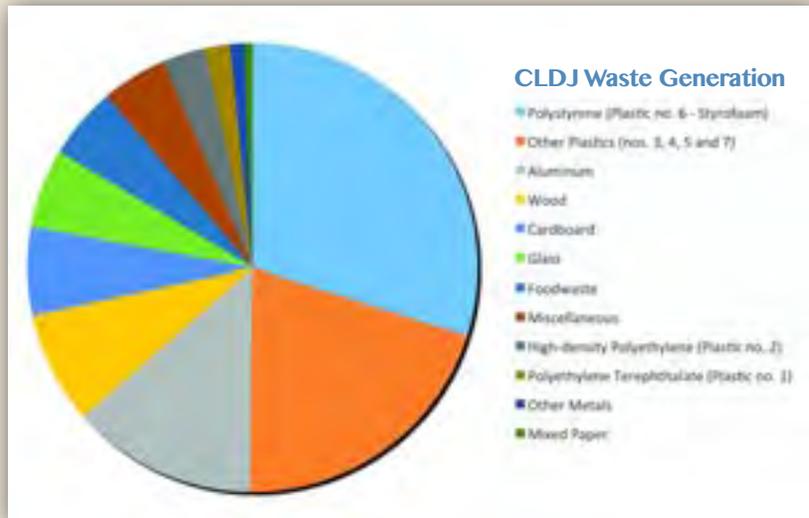
A dual axle shear shredder will reduce the particle size of solid waste material to create better refuse-derived fuel. It would also shred plastic bottles, thereby removing excess water contained therein.

3. **Composting System**

There is a suitable feedstock (food waste) to compost at CLDJ, and the incinerator's fuel usage provides a cost savings incentive to implement this program. Compost can be used as a soil amendment for the planting of ground cover, which would aid in

dust suppression. Adding compost to soil also aids in water retention and provides organic material.

The addition of a new galley on the camp in 2012 had the potential to alter the waste composition entering the incinerators, so a second solid waste characterization was conducted in 2013. The purpose of this follow-up



The Basics About the Naval Facilities Engineering and Expeditionary Warfare Center

NAVFAC EXWC is the Navy's premier activity for facilities and expeditionary technology solutions, engineering services, equipment logistics and products needed to equip the fleet and meet warfighter requirements. NAVFAC EXWC also delivers specialized engineering and technology solutions that support sustainable facilities and provides logistics and expeditionary systems support for Navy combat force capabilities.



For more information about NAVFAC EXWC, visit www.navfac.navy.mil/navfac_worldwide/specialty_centers/exwc.html.



study was to quantify any changes in the moisture content and WtE potential. In general, the results of the 2013 waste characterization were similar to the results of the 2012 study. It was determined that WtE was still not economically viable.

NAVFAC EXWC engineers developed an integrated solid waste management plan in 2013 that served as an update to the plan developed in 2009 and included the following recommendations:

1. Modify waste collection and segregation.
2. Convey incinerator ash off-site for proper disposal.
3. Ensure that sufficient space is available for a recycling center.
4. Develop a composting system.
5. Eliminate the use of plastic water bottles and reduce the number of liquid-filled water bottles being sent to the incinerator.
6. Ensure that construction and demolition debris is reused or recycled.
7. Eliminate the use of a local open dump through a combination of recycling, incinerating and composting.

Based on the original 2009 recommendations, NAVFAC EXWC purchased two vertical balers, recycle bins, a truck scale, pallet scale and scale management system to help CLDJ with solid waste management. In 2013, CTC conducted a solid waste manage-

ment technology study and recommended a specific composting system and shredder.

NAVFAC EXWC personnel prepared an Energy Conservation Investment Program (ECIP) submittal for the acquisition of the shredder and composter. The ECIP was approved and will fund the capital cost and a portion of the operation and maintenance cost and is slated for installation in FY15.

To help reduce the camp's reliance on bottled water, CLDJ recently switched to a water distribution system (piped water). This has helped to reduce the number of water bottles incinerated or diverted off-base. Construction of a new landfill was initiated in 2012. When finished, some waste (such as compost and noncombustible material) can be disposed of there.

STUDYING THE FEASIBILITY OF SOLAR PHOTOVOLTAIC SYSTEMS

As a result of NAVFAC EXWC's initial 2008 assessment, it was determined that solar-generated electric power might be one of the best options for incorporating renewable power at CLDJ and thus reduce diesel fuel consumption associated with the existing generators. Djibouti is located in an area of the world with one of the



Dust build-up caused electrical output from the PV panels on installed on a single camp CLU to fall 30 percent in just one month.



PV panels are now cleaned three times per week by an automatic sprinkler system.

A 12-PV CLU roof-mounted system was installed in September 2012.



highest solar radiation levels. To demonstrate the potential for solar power, solar photovoltaic (PV) panels were installed in 2010 by NAWS China Lake personnel on the roof of a single camp CLU. The installation included a data acquisition system so the team could monitor the system performance for a one-year test period.

The camp generated 12 tons per day of solid waste, with *food waste* accounting for approximately 30 percent of the camp's total waste stream.

Unfortunately, due to the dust, wind, and heat, the data acquisition system failed within two months. After a three-month period without data, the data acquisition system was briefly brought back on-line. At this point the demonstration was suspended. The limited results from this study showed that the electrical output was significantly reduced by a dust build-up on the panels, with the electric output falling up to 30 percent in one month. Particularly in the summer, Djibouti suffers from very frequent dust storms, so these results were probably not atypical.

Based on these results, it was decided to proceed with a new demonstration that included a panel washing system, an improved data acquisition system, and high-temperature rated inverters. The original PV system was removed and a 12-CLU roof-mounted system was installed in September 2012. Performance data were collected on the new system for a 7-month demonstration period. At the 7-month point, the new data acquisition system failed during a severe storm, although the system continues to produce approximately 57,000 kilowatt hours of electricity

The CLDJ PV panel installation team. Back row, left to right: Builder Constructionman (BUCN) Carnes; Construction Electrician Petty Officer 3rd Class Zonis; Construction Electrician's Petty Officer 2nd Class Piza; BUCN Seabee Combat Warfare, Michael Coria; Sam Edwards, NAWS China Lake; Matt Malone, NAWS China Lake. Front row, left to right: Steelworker Petty Officer 3rd Class Darcy Via, BUCN Hill, Utilitiesman Constructionman Smith.



per year. The main result of this demonstration was to determine that washing the panels three times per week was sufficient to maintain the system performance. Although the system currently uses potable water for the cleanings, in the future, reuse water could be employed.

The Camp Lemonnier NAVFAC EXWC Sustainability Team

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*NAWS China Lake employee

IMPLEMENTING A STREET LIGHTING IMPROVEMENT PROGRAM

Early in the sustainability program, street lighting at the camp was identified as an area where significant energy improvement could be achieved. At the onset of this project, there were over 500 High Pressure Sodium (HPS) light fixtures installed at CLDJ.

A NAVFAC EXWC task force undertook a one-year demonstration to determine a more efficient lighting solution to replace the HPS fixtures. In addition to reduced energy usage, the team's goals also included equal or better lighting performance with appropriate illumination. The team performed a market survey of information on three technologies—induction lighting, Light-emitting Diode (LED) and plasma lights. Plasma lighting was eliminated

from consideration since it was not yet a proven technology. So the demonstration proceeded with induction lighting and LED fixtures. Four induction and two LED fixtures were procured, installed, and monitored over a period of one year.

After a year, both lighting technologies performed as expected, with no observed drop-off in light intensity. Although the LED technology showed lower energy usage per kilowatt hour (kWh), the associated procurements costs are double that of the induction light. In addition, the LED bulbs provide less illumination, and CLDJ personnel encountered difficulty installing the fixtures to the existing street light poles.

Over the one-year period, the induction lights used 56 percent less energy than the HPS fixtures. This translates to an annual savings of \$139,000 with an expected payback period of less than four years.

NAVFAC EXWC personnel recommended the procurement of induction light technology for retrofit of all 544 of the lamps in street lights at CLDJ. CLDJ submitted an ECIP proposal which was approved. Street light retrofits are slated for FY15.

INVESTIGATING WIND POWER

A feasibility analysis for wind turbine power was performed at Camp Lemonnier between April 2011 and June 2012. Data were collected using a Sonic Detection and Ranging (SODAR) unit—a device that is placed on the ground and sends sonic “chirps” into the

Jeff Heath, a former NAVFAC EXWC engineer, in front of the SODAR unit that measures wind velocity.

Lawrence Batch



atmosphere. Wind velocity is measured by detecting the shift in the reflection of the chirp. This device measures wind at 20 meter intervals from 40 meters to 200 meters high. The unit takes 10 minute averages and records wind speed, direction, and vertical speed.

The wind resource at CLDJ was found to be poor. The average wind speed at 80 meters is 4.6 meters per second (m/s) or 10.3 miles per hour. At 40 meters, the wind speed is 4.3 m/s (9.6 miles per hour). In most cases, this would be a non-starter for a wind project since the minimum speed usually required for such a project must be at least 13 miles per hour at the turbine's hub height. But due to the high cost of energy at CLDJ, an economic analysis was performed.

Because CLDJ has an airfield and is next to an airport, there are restrictions that would limit the height of any wind turbine. Analyses were performed for two turbines of acceptable size. However, the combination of low performance and high construction costs clearly showed that neither project would break even. For all of these reasons, wind is not a cost-effective energy alternative for Camp Lemonnier.



NAVFAC EXWC personnel recommended the procurement of induction light technology for the lamps in all of CLDJ's street lights.

Over the one-year period, the *induction lights* used 56 percent less energy than the High Pressure Sodium fixtures.

SAVINGS TO DATE

In total, the NAVFAC EXWC-initiated projects to reduce electricity use and produce renewable energy have reduced the total camp electric load by an estimated 3.4 percent. The split air conditioning improvements alone are estimated to save 1,575,276 kilowatt hours per year. In total, these electric savings reduced the camp's need for fuel oil by over 400 gallons per day. Additional efforts by CLDJ to consolidate the camp's electric grid into a single grid and phase out their least efficient diesel generators has led to an overall 13.5 percent reduction in energy intensity relative to the 2003 baseline. Water savings from NAVFAC EXWC's efforts have been even more substantial. A 22 percent reduction in water use has been achieved.

Significant additional savings will occur once the following ECIP projects are completed:

- 1. Food Waste Composting**
Food waste composting will reduce the quantity of fuel oil required to operate the waste incinerators by up to 1,500 gallons per day.
- 2. Street Lighting Retrofits**
Street lighting retrofits will result in daily savings of 1,835 kWh.
- 3. Reuse Water Piping System**
A reuse water piping system will save potable water once new military construction projects are initiated that are designed to utilize reuse water. Potential savings cannot be estimated at this time.

NAVFAC EXWC has spent \$4.9 million on this five-year effort. Overall, the expected payback period is 1.6 years. In addition to cost savings, another important benefit to these projects is



improved energy security achieved by the reduced consumption of fuel to run the camp's generators.

HOW OTHERS CAN BENEFIT

The energy-saving practices being enacted at Camp Lemonnier have wide-ranging implications, particularly for military bases located in hot or remote climates. Facilities in California and the American Southwest, for example, are already subject to water shortages, and many bases worldwide struggle with high energy costs. For Forward Operating Bases powered by diesel generators, the information provided in these reports and assessments provide valuable assistance with improving generator performance as well as cutting energy demand.

News about the CLU air conditioning improvements (known as the SuperCLU) is spreading. Soldier Warfighter Operationally Responsive Deployer for Space (SWORD) is using a SuperCLU administrative structure as a Command Launch Center for its test site in Cape Canaveral, Florida.

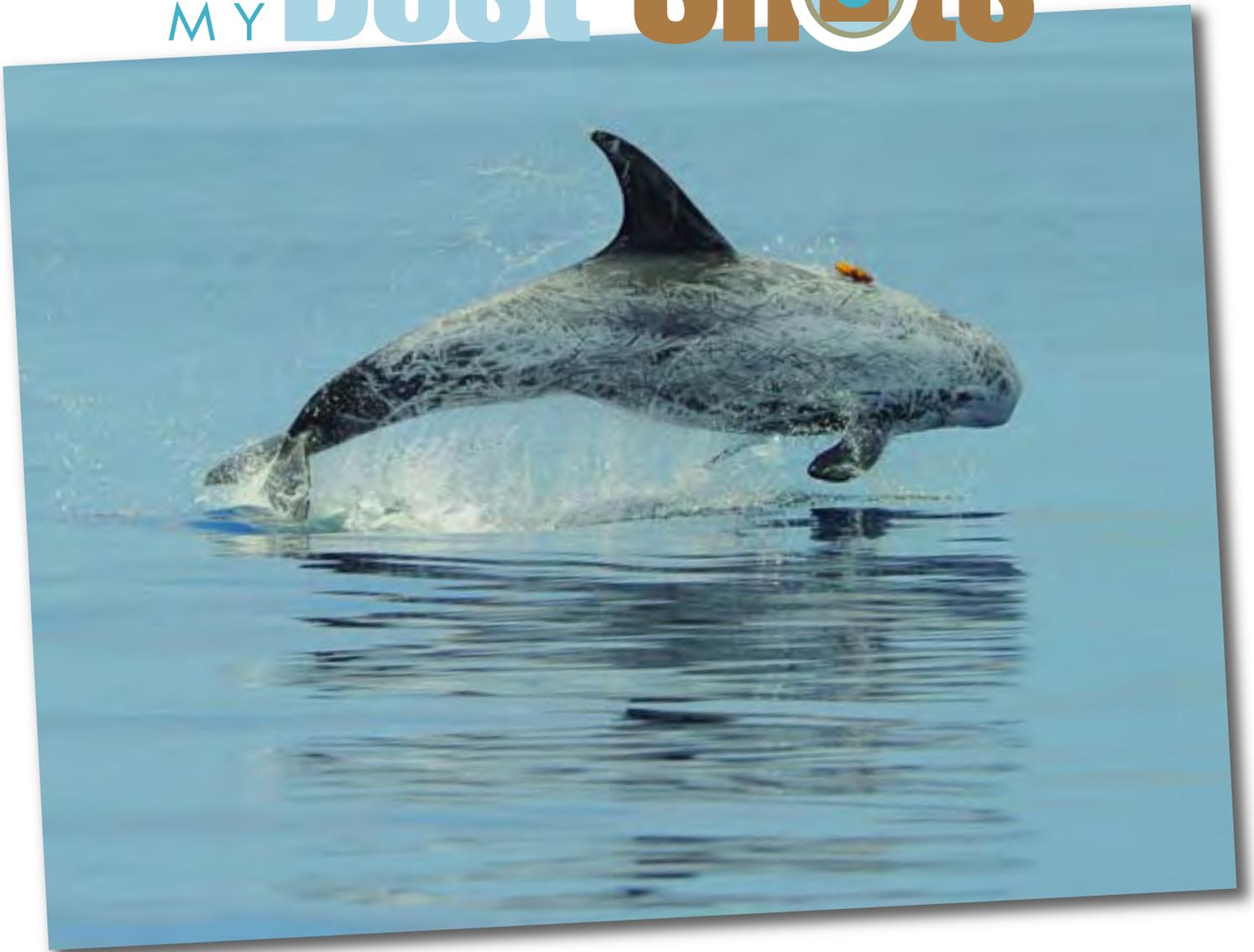
SWORD is a joint DoD/National Aeronautics and Space Administration project to develop and demonstrate a very low-cost expendable nano-launch vehicle for on-call delivery of miniaturized satellites into Earth's orbit.

Transformative Reductions in Operational Energy Consumption (TROPEC) just concluded a test of the SuperCLU at Anderson Air Force Base in Guam. TROPEC is an assessment platform for expeditionary camp solutions. The Army and Air Force conducted concurrent tests. The Army has requested use of the SuperCLU prototype for 12 months. The NAVFAC EXWC team has been coordinating funding with U.S. Army Natick Soldier Research, Development and Engineering Center.

For more information on any of these projects, contact one of the members of the Camp Lemonnier NAVFAC EXWC Sustainability Team. [🔗](#)

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ONE OF MY Best Shots



I captured this image of a Risso's dolphin (*Grampus griseus*) off of Catalina Island, California during field work for the Southern California Behavioral Response Study. The tag seen on the animal is a digital tag—a multi-sensor acoustic recording tag that measures the fine-scale movement of the animal and records

sounds that the animal both makes and hears. The work was performed under National Marine Fisheries Service permit number 14534.

The photo was taken with a Nikon D3s with a 300mm/f2.8 lens, ISO-400 at f/7.1, shutter speed 1/1600.

Ari Friedlaender ● Associate Professor, Fisheries & Wildlife
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Submit your own Best Shot to Bruce McCaffrey ● *Currents'* Managing Editor ● brucemccaffrey@sbcglobal.net

Naval Medical Research Unit San Antonio Captures Mercury-Containing Amalgam Waste

Chairside Filter Acts as First Line of Defense at Dental Treatment Facilities

PERSONNEL FROM THE Naval Medical Research Unit San Antonio (NAMRU-SA) are exploring an innovation to capture mercury-containing amalgam and to ensure ongoing environmental compliance in Navy dental treatment facilities (DTF).

A large number of cavities are filled each year by Navy dentists to ensure Sailors are ready for deployment. The dental amalgam waste produced from

In response to this complex environmental challenge, Navy dental facilities across the globe are being armed with a novel amalgam filter technology—a chairside amalgam separator (Navy U.S. Patent No. DD2011)—developed at NAMRU-SA and sponsored by the Navy Bureau of Medicine and Surgery that may establish Navy dental facilities as models of environmental stewardship.

investigator and Head of NAMRU-SA's Biomaterials and Environmental Surveillance Department.

Dental amalgam is a metallic mixture consisting of about 50 percent liquid mercury and a powdered alloy that contains silver, tin, and



The DD2011 chairside amalgam separator is designed to remove up to 96.7 percent of amalgam from dental wastewater.

placing or removing amalgam restorations can result in a large release of mercury into publically owned wastewater streams if it is not controlled at the dental clinic site.

With the U.S. Environmental Protection Agency's (EPA) legislation regarding dental amalgam waste pending, new efforts to develop novel materials to increase the efficiency and specificity of contaminant removal from dental wastewater have been accelerated.

The DD2011 chairside amalgam separator is designed to remove up to 96.7 percent of amalgam from dental wastewater. It is inexpensive, easy to install, and available for use across all services. "In this separator design, we focused on minimizing and mitigating the Navy's amalgam waste impact on water, land, air quality, and even biodiversity. We worked on a systemic solution to reduce mercury load into the wastewater stream," said Dr. Amber Nagy, Principal Inves-

tigator. When mixed, the two components harden and become a solid material (commonly referred to as silver fillings), which is used to fill cavities in teeth. Dental amalgam is completely safe for use in adults and children over the age of six. Because dental amalgam is safe, cost effective, strong, and durable, it is frequently used to fill cavities.

Since 2006, the Navy has enforced instructions mandating the use of

dental amalgam separators since 2006. In fact, the Navy developed and patented the International Organization for Standardization (ISO) certified DD2011 chairside amalgam separator which is now widely used in Navy DTFs and in the private sector.

The DD2011 chairside amalgam separator is installed on individual dental chairs and acts as the first line of defense for capturing amalgam waste. Recently, the EPA released a draft rule that included the mandatory use of amalgam separators in all DTFs to reduce mercury emissions into publicly-owned wastewater streams.

Effective Lifetime of Chairside Amalgam Separators & Effects of Storage

NAMRU-SA conducted a clinical field study to evaluate the effective lifetime of DD2011 chairside amalgam separators. The intent of the study was to determine the length of time that each separator could remain installed



The DD2011 chairside amalgam separator is installed using existing dental chair hoses. Several adaptors with various diameters are available to accommodate dental hose specifications.
Flisa Stevenson

before requiring replacement using quantitative parameters such as vacuum strength. Metal concentration in effluents collected downstream of the separator was also evaluated. Using data from this study, the effective lifetime of the DD2011 dental amalgam separator is now designated as 60 days for high volume DTFs.

The effect of DD2011 chairside amalgam separator storage on metal retention was also studied to simulate

mobile DTF deployment. Results revealed that storage of used DD2011 chairside separators should be minimized (less than one year). For mobile dental units, separator exchange should be performed approximately every three months.

Lastly, storage conditions are being tested to determine if inorganic mercury can be converted to organic mercury, which is more toxic and can accumulate in the aquatic food chain.

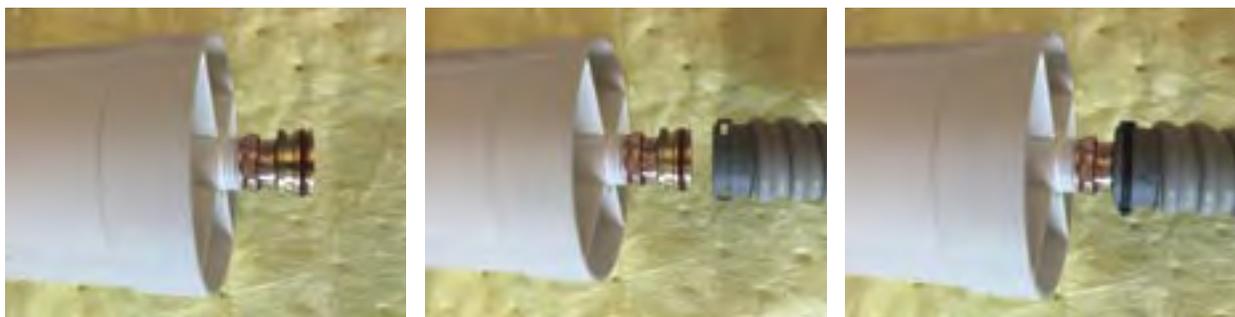
More About the Naval Medical Research Unit San Antonio

NAMRU-SA WAS DESIGNATED to lead mercury abatement efforts for DTFs in 2011. NAMRU-SA's Department of Biomaterials and Environmental Surveillance encompasses not only mercury abatement efforts, but also investigates novel solutions to ensure Navy DTFs comply with federal and local environmental conservation laws. The department is led by Dr. Amber Nagy and utilizes interdisciplinary expertise of dentists, microbiologists, toxicologists, chemical engineers, and analytical chemists. The main goal of the department is to manage the dental waste burden from dental clinics and reduce mercury release.

The NAMRU-SA laboratory is fully functional and has expert capabilities in heavy metal analysis by atomic absorption spectrophotometry, small molecule quantification by high performance liquid chromatography/mass spectrometry (HPLC/MS), automated microwave digestion and dilution systems, and cyto-

toxicity assays. Additional capabilities to measure metals at part per billion levels using inductively coupled plasma mass spectrometer are expected to be completed by September 2015. NAMRU-SA's environmental surveillance team takes full advantage of these capabilities.

The NAMRU-SA environmental surveillance team has several projects underway aimed at improving the current amalgam separator systems and developing novel, more efficient waste filtration solutions. These projects include investigating the effects of DD2011 storage, utility of DD2011 in removal of Bisphenol A (BPA), improvements for a quick disconnect of the DD2011, an alarm system to signal time to change the separator, educating and training Navy DTFs and the public about the availability and proper use of the DD2011, and the development of next generation filtration strategies.



LEFT: Female connector attached to end of the DD2011 chairside amalgam separator.
 CENTER: Dental chair hose with male adaptor that will clamp onto the female end and form a seal with the o-ring.
 RIGHT: Fully connected hose and separator, secured with pin.

Flisa Stevenson

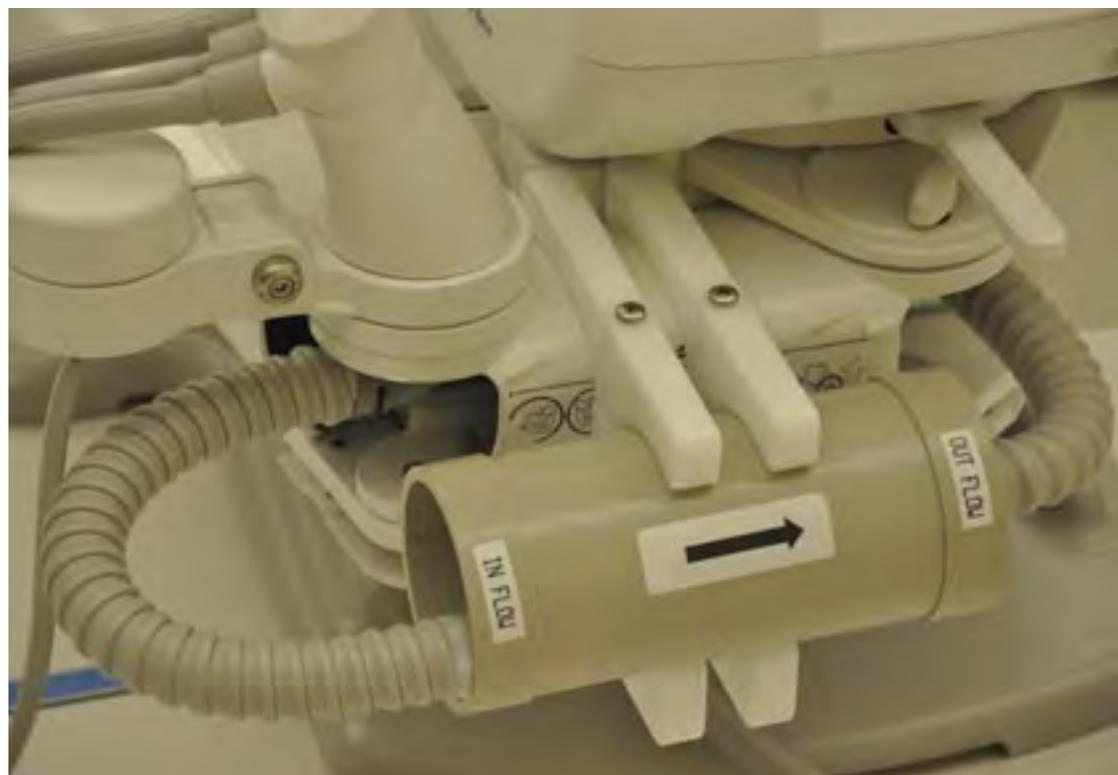
The NAMRU-SA team is developing a highly sensitive method for organic mercury detection using HPLC/MS. This method will allow for fast identification of mercury species in wastewater. Data from these studies will lead to better filtration systems that may reduce mercury conversion into the more toxic organic forms by capturing mercury and other metal ions before entering the public wastewater systems.

amalgam separator. For more information about EPA's efforts to minimize the potential environmental impacts of BPA, visit the following page on the Agency's website: www.epa.gov/opptintr/existingchemicals/pubs/actionplans/bpa.html.

Based on data reported in scientific literature, NAMRU-SA hypothesized that the contact angle of the filter inside amalgam separators is an important factor to consider

Utility of Chairside Amalgam Separator Against Bisphenol A

Environmental effects of chemicals originating from dental wastewater are not limited to amalgam. Filling materials such as dental resin composites can also contain parent materials that can degrade into BPA. BPA is listed on the EPA's chemicals of concern list due to its hormone disrupting properties. An EPA-developed action plan aims to reduce input of BPA into the environment and will likely result in the development of a BPA best management practice. Recognizing the impact of BPA on the environment, NAMRU-SA is evaluating the BPA retention efficiency of the DD2011 chairside



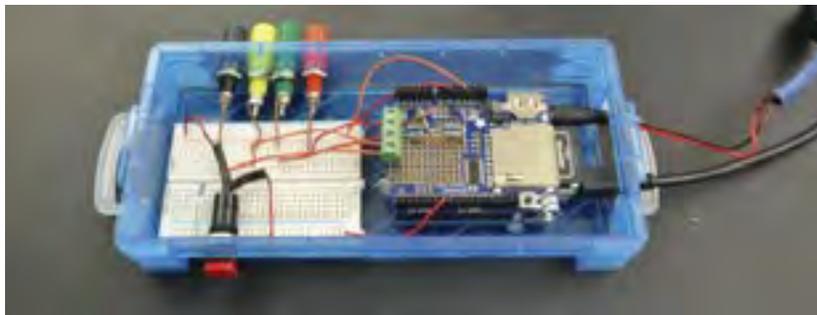
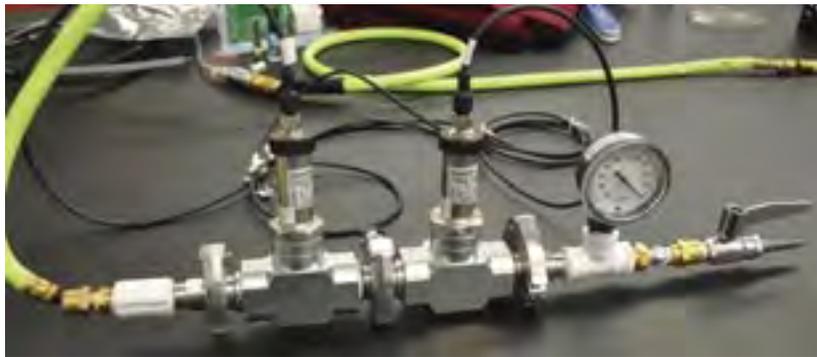
The chairside amalgam separator is easily installed on a dental chair and secured by brackets to reduce leakage and minimize tripping hazards.

Flisa Stevenson

when assessing retention efficiency of filtering material against organic chemicals such as BPA. The contact angle of a filter determines if the filter media is hydrophilic (low contact angle) or hydrophobic (high contact angle). Current studies are underway to better understand the utility of DD2011 amalgam separators to remove BPA and BPA-derived contaminants.

Quick Disconnects for Chairside Amalgam Separators

Results from a recent field survey revealed difficulties with the installation and replacement of the chairside amalgam separators. The survey identified the need for new quick disconnects to secure the separator onto vacuum tubing to expedite separator removal and reinstallation efforts.



Prototypic vacuum pressure transducers and data logger.
TOP: The vacuum transducer setup assembly and calibration.
CENTER: Prototypic pressure transducer installed on a dental chair for validation experiments.
BOTTOM: Computing device for data logging and output for subsequent data conversion to pressure values.

Flisa Stevenson

The survey also identified the need for bracket clamps to secure the separator to dental chairs, reduce tripping hazards and other safety related issues associated with storing separators on the floor. No commercial off-the shelf products are available.

Quick disconnect adapter fittings have been developed to resolve separator removal and reinstallation efforts for Navy DTFs worldwide. The quick disconnects are expected to be available for bulk purchase by the fall of 2015.

Alarm System Development for Chairside Amalgam Separators

One of the major issues plaguing nearly all of the amalgam separator systems on the market is the fact that none contain alarm systems to alert dental staff when the system has reached its effective lifetime. The current mode of operation is to exchange separators based on the amount of time they are in service. The proposed maintenance protocol of the amalgam separator calls for replacing individual filters every 60 days, regardless of use.

To better understand the lifetime effectiveness of the DD2011 chairside amalgam separator, NAMRU-SA executed a method to convert and record vacuum pressures. Specifically, NAMRU-SA designed a prototypic vacuum sensor that uses pressure transducers to convert pressure measurements upstream and downstream of the chairside amalgam separator into electrical signals. These signals are then digitized, logged, and converted to pressure values. Data are recorded in real time, and if vacuum levels fall below pre-programmed numbers, an auidal alarm alerts users that the DD2011 amalgam separator

may be clogged and should be replaced. This prototype will be instrumental for testing the performance of new amalgam separator materials and designs.

NAMRU-SA is also developing a minimally invasive flow sensor that monitors the lifespan of individual chairside separators, thereby reducing maintenance cost and waste. The monitoring system will implement a flow meter, which is an effective and economical method to quantify the volume of fluid in the dental chair system. The flow meter system, positioned downstream of the separator, calculates the total volume of fluid serviced through the separator and notifies the users, visually and audibly, of scheduled cleaning and maintenance. By quantifying the lifespan of individual separators, DTFs can extend the use of the chairside amalgam separator without sacrificing the separator efficacy. These projects are crucial for implementing dental amalgam separation strategies to maintain environmental compliance.

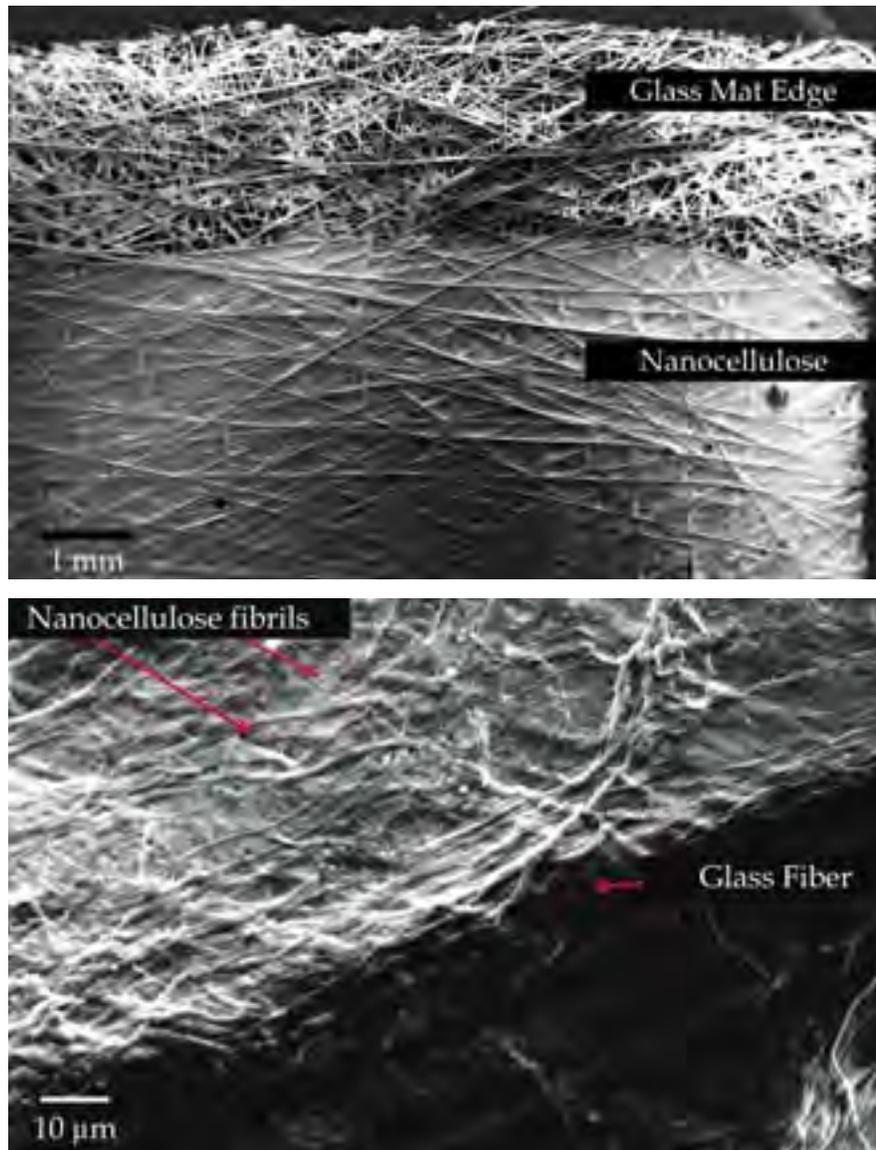
Education & Training on Chairside Amalgam Separators

One of the most important goals of the NAMRU-SA environmental surveillance team and the dental waste mercury abatement program is educating Navy DTFs and the public about the availability and proper use of the DD2011 chairside amalgam separator. Commands can purchase the DD2011 along with brackets to secure the separator onto dental chairs. Additionally, NAMRU-SA

supports a mercury abatement website at www.med.navy.mil/sites/nmrc/Pages/mercury_pgfin.html.

The website highlights the importance of EPA compliance and provides links for training manuals and a presentation to share with dental staff. Commands should take special care to dispose of used separators by following their Command's hazardous

waste disposal instructions. Important information regarding safe and proper disposal of the separators and details for ordering replacement separators can be found online in the training manuals. The NAMRU-SA mercury abatement program has a dedicated hotline available to answer questions regarding DD2011 purchase, installation, and disposal.



Scanning electron microscopy of nanocellulose filter membranes.
TOP: Glass mat substrate that supports nanocellulose membrane deposits.
BOTTOM: Higher magnification of nanocellulose membrane supported by glass fibers.
Dr. Joyce Breger



The chairside amalgam separator has a relatively small footprint and is an easy, low-cost solution for minimizing release of dental amalgam waste.

Flisa Stevenson

The Next Generation of Filtration Strategies

With the EPA's legislation regarding dental amalgam waste pending, new efforts are underway to develop novel materials to increase the efficiency and specificity of contaminant removal from dental wastewater. NAMRU-SA and Dr. Michael Daniele and Dr. Joyce Breger from the Naval Research Laboratory's Center for Bio/Molecular

Science & Engineering in Washington, D.C. have forged a new collaboration to develop a functionalized filter medium consisting of nanocellulose to enhance the efficiency of amalgam separators. Customization and functionalization of the nanocellulose platform will provide additional measures to remove harmful substances from dental waste. Further, nanocellulose is an excellent candidate material to use because it is sustainable and is amenable to chemical modifications. This approach will not only remove metal contaminants, but also be effective against BPA.

The researchers are hopeful that development and functionalization of nanocellulose as an alternative, biocompatible filtration strategy can be incorporated into other practical applications that enhance the health, safety, and operational readiness of Sailors. ⚓

Note: The data discussed in this article were collected using resources provided by the Bureau of Medicine and Surgery.

Contact the Mercury Abatement Program

Website: www.med.navy.mil/sites/nmrc/Pages/mercury_pgfin.html

Hotline: 210-539-8209

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Puget Sound Naval Shipyard Continues Industrial Energy Innovations

Facility Improvements Save Energy While Improving Productivity

OVER THE YEARS, the Puget Sound Naval Shipyard & Intermediate Maintenance Facility (PSNS&IMF) has implemented many facility improvements that save energy and even improve productivity.

Approximately 45 percent of the facility energy use for Navy Region Northwest can be attributed to PSNS&IMF, a tenant command of Naval Base Kitsap located in Bremerton, Washington.

PSNS&IMF has implemented a number of facility improvements to save energy and improve productivity.

The shipyard's mission of repairing and overhauling the Navy's fleet is energy intensive and industrial in nature. Standard facility energy improvements appropriate for office spaces may have little impact on the command's overall energy use. Shipyard specific energy improvements are needed for industrial energy savings. Over the years, PSNS&IMF has implemented the following facility improvements to save energy and improve productivity:

1. Automated doors

High speed automated roll-up doors open and close as forklifts approach.

2. Fluorescent lighting

Fluorescent lighting designed for mounting heights up to 80 feet in high-bay shop areas, provides improved light quality when compared to previous halide and sodium lighting, and uses half the energy. Fluorescent lights can be turned on and off as needed, while halide and sodium lights had to be left on to avoid long warm-up periods.

3. Electric motor driven fans

More efficient electric motor driven fans replaced many of the compressed-air movers used to ventilate spaces on ships in overhaul. They use a fraction of the energy and are quieter.

4. Compressed air drive mechanisms

Drive mechanisms for large forge hammers used in steel fabrication were changed from steam-driven to compressed air, saving considerable energy when the forge hammers are in standby.

5. Automated valves in water distribution lines

Exposed water distribution lines on piers and dry-docks are protected from freezing by automated valves that allow a trickle of water to flow during freezing temperatures.

6. Energy-efficient power supplies

Most welding machine power supplies were replaced with more energy-efficient models.

Striving for sustainability, the Naval Base Kitsap Energy Team in Bremerton continues to identify and implement energy improvements for the industrial infrastructure.

Boilers at the base's steam plant will undergo an upgrade that is scheduled for completion in summer 2015. The project involves recovering heat from the boiler's exhaust gases, using an energy recovery heat exchanger and pumping system, and pre-heating the boiler's feed water using the recovered heat.

The project also replaces the constant speed exhaust gas fan with a variable speed fan and motor. Driving the fan at reduced speed saves significant energy when operating at partial load. Boiler tubes were cleaned to improve heat transfer, and condensate tanks were insulated to retain heat from the returned condensate.

Because the 2,300-volt high-intensity street light fixtures were wired in series, repairs required shutdown of the entire string to replace lamps. The new light-emitting diode light fixtures use 480-volt power, require less maintenance, consume about half the energy, and will be individually wired. This project is scheduled for completion in the summer of 2015.

Smaller industrial energy initiatives can collectively add up to big savings. Some improvements recently completed or currently in construction include:



The aircraft carrier USS Nimitz (CVN 68) is undergoing a planned incremental availability at PSNS&IMF where the ship will receive scheduled maintenance and upgrades.

MC2 Ryan J. Mayes

- Reducing steam distribution pressure in certain distribution lines during the summer period of low steam use
- Insulating welding rod storage ovens
- Sealing unused mezzanine roof ventilators
- Installing additional high speed roll-up doors
- Replacing rectifiers with energy-efficient models
- Adding controls to the cooling of rectifier power supplies and a metal parts degreaser
- Changing the heat source for parts cleaning dip tanks from steam to hydronic
- Replacing compressed air agitators in dip tanks with mechanical agitators
- Recovering waste heat from furnaces
- Recovering waste heat from compressors
- Replacing dampers on gravity vents
- Installing variable frequency drives on motors
- Repairing compressed-air leaks
- Improving daylight controls in shop areas with large windows

- Adding accessible switching for shop lighting systems
- Adding insulation

Additional projects are under development include steam trap replacements, retro-commissioning of building heating, ventilation and air conditioning controls, installation of more light-emitting diode lighting, improvement of photocell controls, installation of water-saving fixtures, and installation of a steam alternative in an inefficient steam distribution leg.

Achieving a steady drop in energy use over the long term in an industrial setting isn't easy. Many of the systems aren't covered in energy management text books, and most of them are considered mission critical. Industrial energy management requires a continuing commitment to evaluating energy-using processes, communicating with the personnel who do the work, and implementing improvements. ⚓

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Join SERDP & ESTCP for an Upcoming Webinar

Promoting the Transfer of Innovative, Cost-Effective & Sustainable Solutions

THE STRATEGIC ENVIRONMENTAL Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP) will continue offering their webinar series throughout 2015 to promote the transfer of innovative, cost-effective and sustainable solutions developed by both programs. The series targets end users, including practitioners, the regulatory community and researchers. The primary objective of the series is to provide these end users with cutting-edge and practical information from sponsored research and technology demonstrations in an easily accessible format at no cost to participants.

The webinars are held approximately every two weeks on Thursdays from 12:00 to 1:30 pm Eastern time. Each webinar features distinguished speakers from one of SERDP and ESTCP's five program areas:

1. Energy and Water
2. Environmental Restoration
3. Munitions Response
4. Resource Conservation and Climate Change
5. Weapons Systems and Platforms

Webinar dates and topics for the rest of the year include the following:

DATE	TOPIC
July 16, 2015	Watershed Assessment and Stormwater Management Optimization Tools
August 20, 2015	Characterization and Remediation in Fractured Rock Environments
September 17, 2015	Munitions Response: Water Geophysical Sensors
October 1, 2015	Hexavalent Chrome Elimination from Hard Chrome Surface Finishing
October 15, 2015	Remote Methods for Water Conservation
October 29, 2015	Assessment and Treatment of Contaminated Sediments
November 12, 2015	Munitions Response: Land Based Program Closeout
December 3, 2015	Emerging Contaminants: DoD Overview and State of Knowledge on Fluorochemicals and 1,4-Dioxane
December 17, 2015	Resource Conservation and Climate Change

Following the completion of each live webinar, archives of the presentation and audio will be available online.

To view the complete schedule of upcoming webinars as well as to access archived files of past webinars, visit www.serdp-estcp.org/Tools-and-Training/Webinar-Series.

SERDP is the Department of Defense's (DoD) environmental science and technology program, planned and executed in partnership with the Department of Energy and the U.S. Environmental Protection Agency, with participation by numerous other Federal and non-Federal organizations. The program focuses on cross-service requirements and pursues solutions to the Department's environmental challenges while enhancing and sustaining military readiness.



ESTCP is DoD's environmental technology demonstration and validation program. Projects conduct formal demonstrations at DoD facilities and sites in operational settings to document and validate improved performance and cost savings. Demonstration results are subject to rigorous technical reviews to ensure that the conclusions are accurate and well supported by data.

For more information, visit www.serdp-estcp.org. 

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 SERDP and ESTCP Support Office
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U.S. Postal Service Launches Free Federal Trade-in & Recycling Program

BlueEarth Program Allows Defense Department Employees to Drop Their Recyclables in the Mail

DO YOU KNOW that the average American home has 24 used, unwanted electronic items? Products such as old computers, cell phones and other electronics are difficult to dispose of because they typically contain hazardous constituents such as lead, cadmium and mercury.

To simplify recycling of these items, the United States Postal Service (USPS) has launched the BlueEarth™ federal recycling program. This program allows participating government service employees to recycle their personal small electronics and empty printer cartridges through a simple three-step process.

Executive Order 13514, Federal Leadership in Environmental Energy and Economic Performance (2009) authorized the program, which was set forth in a Memorandum of Understanding between the USPS and the Department of Defense (DoD).

Proper disposal of personally owned electronic waste (e-waste) by service members and families living in military housing or aboard military vessels is the responsibility of the service member, unless disposal is otherwise addressed in the terms of a Public Private Venture housing contract. Disposal as municipal waste may be prohibited

by local regulations and should be discouraged even where local regulations permit landfill disposal of electronic waste.

Local recyclers and businesses may offer free electronics recycling and if so, DoD installations are encouraged to partner with them. If not, the new BlueEarth program provides an easy alternative. Personally-owned printer cartridges and small electronics such as cell phones, laptops, and almost any such item under 20 pounds can be shipped free of charge to a pre-authorized address for secure disposal by Clover Technologies, Inc. Hard drives will be erased via DoD data sanitization standards. (Note: This program is only for personally owned E-waste. Unwanted government property should be turned into the Defense Logistics Agency (DLA). If an item is damaged and unacceptable for disposal by DLA, your command will provide an alternative.

To participate, simply box up the item or items you'd like to dispose of, then go to www.fedrecycling.com.

The BlueEarth program can even provide your office with measurable results through online reports.

To participate, simply box up the item or items you'd like to dispose of, then go to www.fedrecycling.com. After entering your address and a few details about your item, you can print out a mailing label, and either drop your item in a mailbox or schedule a pickup at your home, all via the same website.

It's easy and a great way to keep thousands of items out of landfills.

For more information about the BlueEarth program visit <http://blueearth.usps.gov>.

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CNO Environmental Research & Development Programs Release Annual Reports

First-ever LMR Report Joins Latest NESDI Year In Review Report

THE LIVING MARINE Resources (LMR) program and the Navy Environmental Sustainability Development to Integration (NESDI) program have released their annual reports to highlight each program's accomplishments in fiscal year 2014 (FY14).

The LMR program addresses the Navy's key research needs and transitions the results and technologies for use within the Navy's at-sea environmental compliance and permitting processes. Its goals include improving marine species impact analysis (including marine mammal take estimates), mitigation measures and monitoring capabilities. As the first report of a relatively new program (formed in 2012), the LMR 2014 report includes a summary of the program's history, along with its mission statement, an explanation of program structure and relative responsibilities of Navy research and monitoring programs, and an overview of how the LMR process works. It also provides a list of publications from 2013 and 2014 that were partially or fully funded by the LMR program.

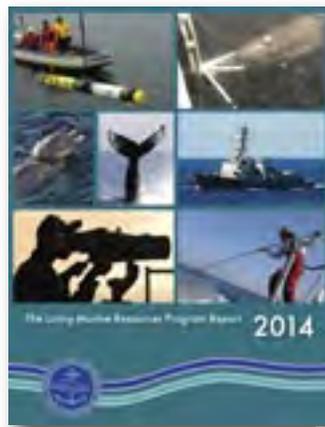
The NESDI program's mission is to demonstrate, validate and integrate innovative technologies, processes, and materials; and to fill knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Fleet readiness. The NESDI report contains information on program funding and trends, as well as a detailed description of the program's process, including an overview of needs collected and the proposals gathered in FY14.

The LMR report includes two-page descriptions of the nine projects launched during FY14. These include:

- Project 2: Integrated Real-time Autonomous Passive Acoustic Monitoring System (PAM)

Packaging a system of low, medium and high frequency sensors and on-board digital signal processors into an autonomous underwater vehicle to support detection, classification, localization and tracking of baleen and beaked whales.

- Project 3: Simple Performance-characterized Automatic Detection of Marine Mammal Sounds
Building a database of specific, characteristic marine mammal audio signals that can be integrated into an existing PAM software package (Ishmael) to automatically detect and classify many marine mammal species.
- Project 4: Demonstration of High-performance PAM Glider and Profiler Float
Demonstrating two autonomous PAM glider and float platforms that would allow the Navy to cost-effectively monitor marine mammals anywhere in the world including remote and non-instrumented training areas.
- Project 5: Development of Automated Whistle and Click Detectors and Classifiers for Odontocete Species
Building on existing acoustic data to create fully-automated and geographically-specific whistle and click classifiers for odontocetes, initially focused on three Navy range locations.
- Project 6: Database and Metrics for Testing Automated Signal Processing for Passive Acoustic Monitoring
Constructing marine mammal call datasets that can be used for development, testing and evaluation of automatic PAM signal processing systems that would support call detection and classification for each of the major naval training areas.



■ **Project 7: Technology Demonstration for Navy Passive Acoustic Monitoring**

Modifying the High-frequency Acoustic Recording Package (HARP), currently used on several Navy ranges, for new storage media that will boost data storage capacity, enabling sensors to be deployed continuously with infrequent servicing.

■ **Project 8: Improving the Navy's Automated Methods for Passive Underwater Acoustic Monitoring of Marine Mammals**

Adjusting algorithms in the Generalized Power Law (GPL) processor, a transient signal detector that has worked well with humpback whale data, to use with specific marine mammals. Call counts will be environmentally calibrated to improve density estimates.

■ **Project 9: Electrophysiological Correlates of Subjective Loudness in Marine Mammals**

Finding a correlation between specific features of auditory evoked potentials (AEP) and perceived loudness in marine mammals to define weighting functions will help to identify frequencies where auditory sensitivity is high and allow more individuals/species to be directly tested.

■ **Project 10: The Effects of Noise on Marine Mammals**

Developing a publicly accessible database of literature on marine mammal bioacoustics as part of a broader project to update a highly cited 1995 book on the effects of noise on marine mammals. Overall this project will consolidate two decades of marine mammal studies relevant to the Navy at-sea environmental compliance process.

The NESDI report profiles “new starts” for FY14 and discusses projects that were particularly successful over the course of the year in demonstrating the use of an innovative technology or integrating critical information to stakeholders across the Navy. Some notable accomplishments in FY14 include:

■ **Project 440: Surface Cleaning of Drydock Floors**

This project developed a method and vehicle for removing hazardous wastes from drydock floors.

For More Information

FOR MUCH MORE insights into the LMR program's recent investments, read our cover story “LMR Program Launches Efforts to Improve Marine Species Monitoring Techniques, Equipment & Analyses: New Projects Range from Hardware Upgrades to Improved Data Collection & Analysis Methods” in the spring 2015 issue of *Currents*. You can find an electronic copy of this article and browse the *Currents* archives at the Department of the Navy's Energy, Environment and Climate Change web site at <http://greenfleet.dodlive.mil/currents-magazine>.



■ **Project 455: Modeling Tool for Navy Facilities to Quantify Sources, Loads, and Mitigation Actions of Metals in Stormwater Discharges**

This team developed a modeling tool to help site managers develop and implement control practices to reduce metal concentrations in stormwater runoff.

■ **Project 458: Advanced Non-Chromate Primers and Coatings**

In an effort to remove hexavalent chromium from the waste stream, this team demonstrated and validated a new, state-of-the-art non-chromate primer and drafted an authorization letter to allow seven aircraft platforms to use it.

■ **Project 459: Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects**

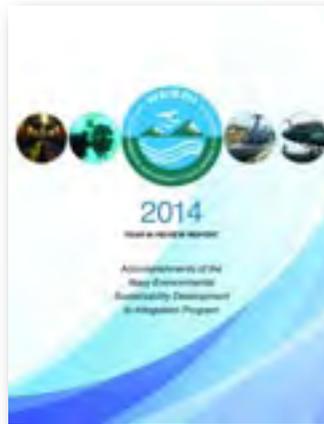
The team conducted a successful field stormwater demonstration of an integrated in situ bioassessment tool, the Sediment Ecotoxicity Assessment Ring, developed under a Strategic Environmental Research and Development Program project.

■ **Project 464: Tertiary Treatment and Recycling of Waste Water**

This project team demonstrated a manmade wetland for reclamation and reuse of wastewater. In FY14, the team received a permit allowing its use for subterranean irrigation at Marine Corps Recruit Depot San Diego.

■ Project 469: Validation of a Low Tech Stormwater Procedural Best Management Practice

This team validated that power vacuuming and high-pressure washing of impervious surfaces reduced average loading of copper and zinc on three San Diego piers by 75 percent and 40 percent, respectively.



Both the LMR and NESDI programs are sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division and managed by the Naval Facilities Engineering Command.

To obtain a hard copy of either report, contact Lorraine Wass at 207-384-5249 or ljwass@outlook.com.

An electronic (pdf) version of the LMR report can be downloaded from www.lmr.navy.mil. An electronic (pdf) copy of the NESDI report can be downloaded from www.nesdi.navy.mil. 

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Tell Your Story in *Currents* • Due Date for Winter 2016 Issue Submissions is October 16, 2015

Have some good news about your energy or environmental program? Want to share it with others? *Currents* is the place to do it. *Currents*, the Navy's official energy and environmental magazine, has won first place in the Navy's Chief of Information Merit awards competition three times. Most recently, the magazine snagged an honorable mention in the 2014 competition. Its people like you and the stories you submit that make *Currents* the best magazine in the Navy.

So if you have a story that you'd like us to promote in our winter 2015 issue, submit your text and images by Friday, October 16, 2015. Any submissions received after this date will be considered for our spring 2016 issue.

You can get a copy of the *Currents* article template by sending an email to Bruce McCaffrey, our Managing Editor, at brucemccaffrey@sbcglobal.net. This template has proven to be a tremendous asset in helping us edit and track your article submissions. Bruce is also available at 773-376-6200 if you have any questions or would like to discuss your story ideas. And don't worry. If writing isn't one of your strengths, we'll handle all of the editing necessary to get your submission into publishable form.

As a reminder, your Public Affairs Officer must approve your article before we can consider it for inclusion in the magazine.

Don't forget to "like" us on Facebook at www.facebook.com/navycurrents. *Currents'* Facebook page helps expand the reach of the magazine and spread the news about all the great work you're doing as the Navy's energy and environmental guardians.

Currents Deadlines

Winter 2016 Issue: Friday, October 16, 2015
Spring 2016 Issue: Friday, January 15, 2016
Summer 2016 Issue: Friday, April 15, 2016
Fall 2016 Issue: Friday, July 15, 2016

You can also refer to your *Currents* calendar for reminders about these deadlines.

What's Behind the "What's In Your Bay?" Poster

PERSONNEL FROM THE Navy Facilities Engineering Command (NAVFAC) Southwest and the Space and Naval Warfare Systems Center Pacific (SSC Pacific) commissioned a "What's in Your Bay?" poster to promote the Navy's efforts to protect the habitat in and around San Diego Bay as well as the green turtles and fishes that inhabit the bay. This beautifully illustrated poster (see next page) highlights four focus areas of the Navy's natural resource management efforts to ensure compatibility with its operations and the ongoing health of the bay and its inhabitants.

This beautifully illustrated poster highlights four focus areas of the Navy's natural resource management efforts.

1. Eastern Pacific Green Sea Turtles

A small population of federally threatened East Pacific green sea turtles has been living throughout San Diego Bay since at least the mid-1800s. Collisions with boats and accidental ingestion of trash, especially plastic bags and balloons threaten their survival. You can help recover San Diego Bay's green sea turtles by not polluting the bay with trash and obeying all posted boating speed limit signs.

2. Essential Fish Habitat

San Diego Bay's extensive eelgrass beds support a healthy marine ecosystem and help conserve a sustainable recreational fishery enjoyed by many anglers. Eelgrass, a type of marine plant, has been classified as Essential Fish Habitat under federal law, as these

plants provide many ecological benefits for fishes and invertebrates in the marine environment.

3. Sensitive Shorebirds and Seabirds

San Diego Bay is home to thousands of migratory and resident birds and waterfowl. Some of the sensitive bird species you may spot while on the bay include the federally endangered California Least Tern, federally threatened Western Snowy Plover, and the successfully recovered California Brown Pelican. These birds find no better home for nesting or feeding than San Diego's shorelines and nearshore coastal waters. Managing these sensitive bird species provides for the sustainability of natural resources, which supports the Navy's mission.

4. Fishing Regulations

California state fishing regulations require all anglers to have a fishing license for shore and boat fishing, with the exception of public piers in ocean or bay waters. It is your responsibility to comply so that this great sport can be enjoyed by future generations.

For an electronic copy of this poster, contact Jessica Bredvik at jessica.bredvik@navy.mil or 619-532-4182. And be on the lookout for the next poster from our NAVFAC Southwest and SSC Pacific colleagues—Life on the Edge—in a future issue of *Currents*. 

About the Illustrations

ILLUSTRATIONS IN THE poster were created by Calene Luczo of Luczo Illustration & Design. Calene takes a multi-step process when designing renditions of biological species. She conducts research and collects hundreds of reference images to ensure that anatomy and physical characteristics are appropriate. Calene then hand-paints each species using watercolor paint and gouache (an opaque watercolor paint). She then scans all of the hand-painted images at high resolution and uses both Adobe Photoshop and Adobe Illustrator to complete her design and incorporate final copy and logos.



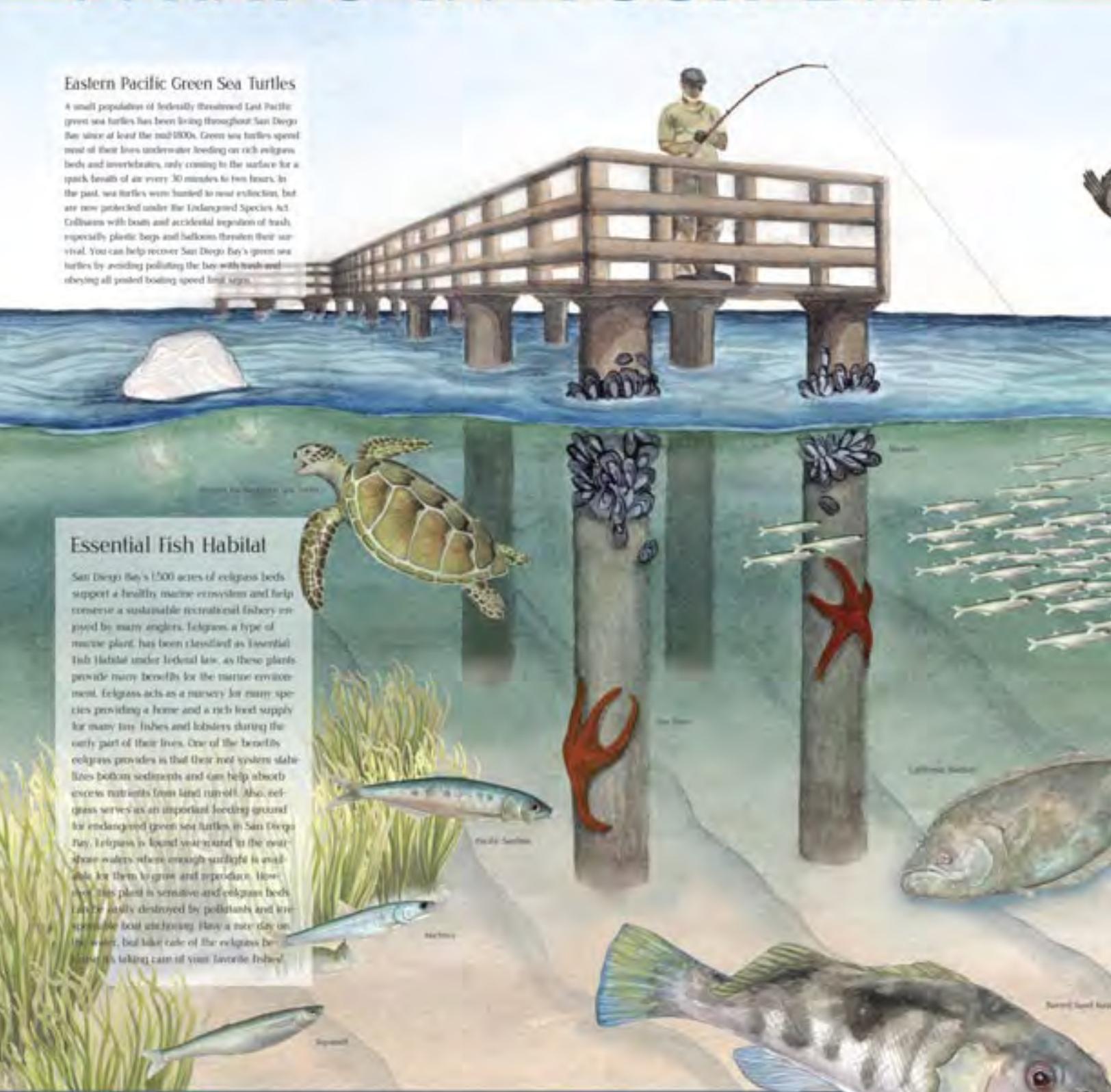
WHAT'S IN YOUR BAY?

Eastern Pacific Green Sea Turtles

A small population of federally threatened East Pacific green sea turtles has been living throughout San Diego Bay since at least the mid 1800s. Green sea turtles spend most of their lives underwater feeding on rich eelgrass beds and invertebrates, only coming to the surface for a quick breath of air every 30 minutes to two hours. In the past, sea turtles were hunted to near extinction, but are now protected under the Endangered Species Act. Collisions with boats and accidental ingestion of trash, especially plastic bags and balloons threaten their survival. You can help recover San Diego Bay's green sea turtles by avoiding polluting the bay with trash and obeying all posted boating speed limit signs.

Essential Fish Habitat

San Diego Bay's 1,500 acres of eelgrass beds support a healthy marine ecosystem and help conserve a sustainable recreational fishery enjoyed by many anglers. Eelgrass, a type of marine plant, has been classified as Essential Fish Habitat under federal law, as these plants provide many benefits for the marine environment. Eelgrass acts as a nursery for many species providing a home and a rich food supply for many fish and lobsters during the early part of their lives. One of the benefits eelgrass provides is that their root system stabilizes bottom sediments and can help absorb excess nutrients from land runoff. Also, eelgrass serves as an important feeding ground for endangered green sea turtles in San Diego Bay. Eelgrass is found year-round in the near-shore waters where enough sunlight is available for them to grow and reproduce. However, this plant is sensitive and eelgrass beds can be easily destroyed by pollutants and irresponsible boat anchoring. Have a nice day on the water, but take care of the eelgrass by responsibly taking care of your favorite fishes!





California Brown Pelican



California Least Tern

Sensitive Shorebirds and Seabirds

San Diego Bay is home to thousands of migratory and resident birds and waterfowl. Some of the sensitive bird species you may spot while on the bay include the Federally endangered California Least Tern, Federally Threatened Western Snowy Plover, and the successfully recovered California Brown Pelican. These birds find no better home for nesting or foraging than San Diego's shorelines and near-shore coastal waters. California Least Terns most commonly feed on fishes smaller than two inches in shallow waters. When foraging terns hover over the bay before they stoops plunge into the water and capture their unsuspecting prey. Western Snowy Plovers nest on the sandy coastline of San Diego. The beach dwelling females place their eggs on bare beach and leave the nest guarding to the males. Chicks are able to walk mere hours after hatching. Brown pelicans are a common sight in San Diego Bay where adults actively feed and can eat as much as four pounds of fish a day.

Managing these sensitive bird species provides for sustainability of natural resources which supports the Navy's mission.



Western Snowy Plover



Species of Small Fish



Fishing Regulations

California state fishing regulations require all anglers to have a fishing license for shore and boat fishing, with the exception of public piers in ocean or bay waters. Unfortunately, Navy owned piers are not open to the general public and a license is required for all anglers. Report cards are required in addition to a fishing license to collect California Spiny Lobster. These can be purchased from the California Department of Fish and Wildlife. Licenses and report cards must be on the angler, boat, or within 500 yards of a diver's shore entry. Measurements for minimum size limits in total length are taken from the tip of the head (with the mouth closed) to the longest tip of the tail.

Please refer to the California Department of Fish and Wildlife, "Ocean Sport Fishing Regulations" for the most up to date information.

Fishing is a privilege and the regulations are put in place to protect fish stocks and make sure fishing is available for everyone. Ignorance of the law is no excuse and it is your responsibility to comply so that this great sport can be enjoyed by future generations. Remember, it's called fishing, not catching!



Spiny Lobster

California Spiny Lobster

Cuban Boa Helps to Maintain Ecosystem Balance at Guantánamo Bay

Navy & Toledo Zoo Team Studies Reproduction of Cuba's Largest Predator

RESEARCHERS FROM THE Naval Facilities Engineering Command (NAVFAC) Atlantic, NAVFAC Southeast, and the Toledo Zoo are studying the demographics of the Cuban boa to develop a species management plan for Naval Station (NS) Guantánamo Bay.

Living on the rocky hillsides and grassy slopes of NS Guantánamo Bay is a large snake species (up to 15 feet long) that serves a key role in maintaining ecosystem balance. The Cuban boa (*Chilabothrus angulifer*) is the top predator in this ecosystem and understanding its population dynamics and reproductive biology directly supports the military mission by providing a healthy ecosystem for military testing and training.

Researchers from NAVFAC Southeast, NAVFAC Atlantic, the Toledo Zoo, and the NS Guantánamo Bay Environmental Department take a special interest in ensuring the boa's future on the Station. They have

completed a long-term radio-telemetry study on Cuban boa habitat use and movement patterns, and are now tackling the more difficult problems of determining the population dynamics of NS Guantánamo Bay Cuban boas, especially the population density and its trajectory toward expansion or decline. Using this information, along with data from their prior research, they will develop a management plan for the Cuban boa

to ensure its continued survival on the Station. The unique advantages of NS Guantánamo Bay, such as large tracts of undisturbed habitat, active protection of wildlife, and veterinary support, make collection of this information feasible.

Cuban boas may live more than 30 years in the wild and the reproductive potential of large females, which are rare in Cuba outside the fence line, is



Naval Station Guantánamo Bay.

not known. As females reproduce no more often than once every two years and take five or more years to mature, it takes a long-term research commitment to collect the data necessary to understand the life history parameters and demographic trends that allow modeling of Cuban boa populations. A variety of factors determine the population dynamics of the Cuban boa including: age at first reproduction, reproductive interval, litter size, survivorship, and other factors relating to the demographics of the population. The combination of Command and Joint Task Force buy-in, partnership synergy, and shared financial and logistical support has made this effort possible.

Cuban boas court and mate on the Station from mid-April to early June and, although females mate biennially, males are capable of reproducing every year and seek out new females when their preferred females are unreceptive. Males, several of which may compete for attention of the same female simultaneously often exhibit ritualized male combat, a form of body wrestling in which males attempt to push each other to the ground or dislodge a competitor from contact with a female. After the dominance of a particular male is established, he uses his pelvic spurs



Peter Tolson from the Toledo Zoo wrangles a large gravid (pregnant) Cuban boa prior to its examination.

NS Guantánamo Bay Public Affairs Office

For More Information

For more information about efforts to use technology to collect habitat and movement pattern data on the Cuban boa aboard NS Guantánamo Bay, read our article "Toledo Zoo & Navy Partner to Study Cuban Boa: Researchers Use GIS & Other Technology to Collect Biological Data" from the winter 2007 issue of *Currents*. An electronic copy of this article is available from Bruce McCaffrey, our managing editor, at brucemccaffrey@sbcglobal.net or 773-376-6200.





A gravid female Cuban boa emerges from a NS Guantánamo Bay grassland.
Peter Tolson

(vestigial legs) and body contact to stimulate the female and induce her to mate. The courtship process may take as long as two or three weeks. As in many other snake species, mate selection is the prerogative of the female, and researchers have observed several instances of mate fidelity over the years. Boa mating at NS Guantánamo Bay has been observed in abandoned structures, grasslands, or even burrows of the Cuban rock iguana (*Cyclura nubila*).

Cuban boas do not lay eggs. The young are born alive in September and October; gestation takes between 150 and 180 days and is dependent on the temperatures the

female is exposed to during her pregnancy. Normally the female will seek out a sunny spot in the grass or in a forest clearing in late afternoon or mid-morning to bask in the sun and elevate her body temperature.

Researchers at NS Guantánamo Bay have collected reproductive data from females with body masses from seven to 45 pounds and ranging from five to more than 12 feet



Two large Cuban boas mate in an abandoned bunker.
Peter Tolson



A bag containing 18 Cuban boa babies is prepared for release back into the wild.
Peter Tolson



ABOVE: A single litter of Cuban boas born in October 2014. Note the associated placentas and yolk sacs.

LEFT: A Cuban boa neonate being weighed at the NS Guantánamo Bay veterinary clinic.

Peter Tolson

in total length and have learned quite a bit already about Cuban boa reproductive strategies. Larger females not only give birth to larger litters (up to 20 babies) than smaller females, but their babies are also significantly longer and heavier than those born to smaller females. This means that females become more reproductively valuable as they grow older and larger, and a 20-year-old female has the reproductive potential to produce more than 100 very large babies during her reproductive life. This many offspring is crucial because fewer than one in ten of them will survive their first year, most dying from starvation or predation by feral cats or birds of prey. Snakes in populated areas of NS Guantánamo Bay also face the threat of vehicle strikes. Fourteen percent of the 51 boas researchers have tracked on the Station have been killed on the road.

The death of a large female in her reproductive prime, whether by feral dog attack or by a speeding car, creates a significant tear in the ecological fabric of the Station. The greatest such loss known on NS Guantánamo Bay occurred when a 15-foot, 11-inch female was run over by a truck in 1989. This enormous female would have produced more than 30 babies every other year.

The Cuban boa is a tremendous ally in controlling the large population of Desmarest's hutias, a keystone species on the Station. Hutias are critical to the overall ecology of the Station, but they can also become a nuisance, impeding military readiness by chewing through vehicle wiring, fiber-optic cables, and water lines. They also contribute to erosion and the subsequent sedimentation of coral reefs by devouring entire stands of trees. Young boas are also preda-

tors of the exotic rats and mice that can infest military and residential areas. By devouring these rodent pests, the Cuban boa has become essential in maintaining the healthy landscapes needed to support long-term military testing, training, and national security requirements on NS Guantánamo Bay. [📍](#)

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Renewable Energy Veteran Shares His Perspectives on Current Energy Challenges & Opportunities

I**N THE SPOTLIGHT** for this issue of *Currents* is Mr. Joseph Bryan, the newly-appointed Deputy Assistant Secretary of the Navy (DASN) for Energy. On Tuesday, February 10, 2015 Kenneth Hess, director of communication and outreach for the Chief of Naval Operations Energy and Environmental Readiness Division (CNO N45) and Bruce McCaffrey, managing editor of *Currents* magazine, sat down with Mr. Bryan in his Pentagon office to get his perspectives on the energy challenges facing the Navy today. Also joining in on the discussion was LT Chika Onyekanne from the U.S. Navy Chief of Information (CHINFO).

CURRENTS: For readers who may not be familiar with your background, please provide some insights into the positions you've held.

BRYAN: I started my career in New York working with the consumer, environmental, and business communities to create an environment that was conducive to the adoption of energy efficiency and renewable energy. We worked very hard to create a climate that was open to emerging technologies and the adoption of cost-effective applications of those technologies.

We worked very hard to create a climate that was open to emerging technologies and the adoption of cost-effective applications of those technologies.

Then, my wife and I moved to South Africa, and I went to work for the University of Cape Town's Energy and Development Research Center.

After a couple of years, I came back to Washington and spent most of the past 15 years on Capitol Hill. The majority of that time was spent working for Senator Carl Levin of Michigan, who was chairman of the Senate Armed Services Committee (SASC) for many years until he retired in 2014.



When Senator Levin established a team within the SASC staff to conduct independent investigations into issues before the committee, I came over from the Senate Intelligence Committee, where I had been working for him, to lead the group. I spent seven years doing long-term investigations into topics that were important to the chairman and the committee.

CURRENTS: And how did that work prepare you for your current assignment?

BRYAN: The Committee chairman and its ranking members set our priorities. Senator Levin's view was that some things required a deeper look—issues that may be fundamentally different than the way they appeared on the surface. He was focused on getting well-sourced, detailed answers to important questions facing the Department of Defense (DoD).

My wife finished law school in New York, and we decided to do something different.

That is the same approach I plan to take in my new job. I want us to focus on issues that are important to the Department of the Navy, drill down to understand them and come up with solutions that are both consistent with the mission and sustainable for the long term.

CURRENTS: Tell us a little about your tenure with the University of Cape Town's Energy and Development Research Center. Why Cape Town?

BRYAN: My wife finished law school in New York, and we decided to do something different. So we moved to South Africa. We chose South Africa because it was the late 1990s—an important period in the history of that country. The post-apartheid government had come into power in 1994. Nelson Mandela was elected president, and it was an exciting time to see a country that was transforming on many levels.

I ended up landing a job with the University of Cape Town at a center that focused on energy policy in sub-Saharan Africa. There weren't too many academic institutions which did that work at the time. The center set up a project to support South Africa's parliamentary portfolio committee on minerals and energy. I worked closely with the

incoming chairman and tried to act as a bridge between the committee and the technical experts in the energy arena.

CURRENTS: Did you work with the Navy or other parts of the military in the past? If so, what was that like?

The Basics About Joseph M. Bryan

JOSEPH M. BRYAN was appointed as Deputy Assistant Secretary of the Navy for Energy in November 2014. Mr. Bryan serves as the Secretariat focal point on all matters pertaining to the Department of Navy's energy initiatives.

Mr. Bryan joined the Department of the Navy from the United States Senate where he served in several professional staff roles. Most recently, Mr. Bryan was the Investigations Team Lead for the Committee on Armed Services. During his tenure, the committee completed investigations into cyber intrusions affecting U.S. Transportation Command contractors, U.S. costs and allied contributions to support the U.S. military presence overseas, the presence of counterfeit electronic parts in the military supply chain, the use of private security contractors in Afghanistan, and the treatment of detainees in U.S. custody.

From 2005 to January 2007, Mr. Bryan served on the Select Committee on Intelligence, where he advised Senator Carl Levin on legal, policy, and programmatic issues affecting the U.S. intelligence community. He also represented Senator Levin in legislative negotiations and investigations into pre-Iraq war intelligence.

From 2001 to April 2005, he was responsible for legislative issues related to Senate Judiciary and Governmental Affairs Committees, including judicial nominations, criminal justice, legal reform, and federal employees.

Earlier in his career, Mr. Bryan worked at the University of Cape Town's Energy and Development Research Center, Cape Town, South Africa. In this position, he coordinated research and briefings for Chairman of the South African Parliamentary Portfolio Committee on Minerals and Energy on the development and regulation of domestic energy industries. He also advised Namibian Ministry of Minerals and Energy on the development of a white paper to guide development of national energy policy.

Mr. Bryan received a bachelor's of arts degree in 1991 from Fordham University and a master's of arts from the University of Delaware in Urban Affairs and Public Policy, with a focus on energy and environmental policy.

BRYAN: My experience with the DoD and the individual services largely comes from my work on SASC. Many of the issues we focused on impacted the acquisition process and getting hardware into the field. We looked at some matters that affected DoD as a whole, but often I dealt directly with representatives of the Army, Navy, Air Force and Marine Corps.

A good example is the committee's investigation into the presence of counterfeit electronic parts in the DoD supply chain. There is a massive overseas counterfeiting industry that sells to the U.S. defense industry. It's a challenge for all of the services and defense contractors to determine how best to distinguish real parts from counterfeits.

We discovered that counterfeit parts were in mission computers for Terminal High Altitude Area Defense (THAAD) missiles. We also found counterfeit parts that were used in the ice detection systems on some of our aircraft. These are the types of components that you really don't want to fail. So if you take a long, careful look at the problem—and with the committee's resources and personnel, we could—you can get to the root cause of the problem.

We were able to change the law to help the DoD keep its supply chain secure.

Over the course of the investigation—looking only at a small sample of the industry—we were able to identify more than a million counterfeit parts. We traced most of them back to China. What we at SASC were able to see, and what the DoD may have had a harder time seeing on its own, were vulnerabilities in the acquisition system that allowed counterfeit parts to be slipped into the supply chain. These vulnerabilities could be fixed, and some of the fixes were very simple.

At the end of that investigation, we were able to change the law to help the DoD keep its supply chain secure. Manufacturers and contractors are now subject to a higher level of scrutiny as they procure parts for the Department.

The SECNAV's Energy Goals

ENERGY IS CRITICAL to the Department of the Navy's (DoN) ability to provide the global presence necessary to ensure stability, deter potential adversaries, and present options in times of crisis—wherever and whenever they might arise. In 2009, Secretary of the Navy Ray Mabus issued five aggressive goals aimed at transforming the DoN's energy use.

1. Increase Alternative Energy Use DoN-Wide

By 2020, 50 percent of total energy consumption will come from alternative sources.

- a. The DoN demonstrated certain alternative fuels to be effective drop-in replacements for conventional fossil fuels and qualified them to compete to supply fuel to the DoN through the Defense Logistics Agency Energy.

2. Increase Alternative Energy Ashore

By 2020, DoN will produce at least 50 percent of shore-based energy requirements from alternative sources.

- a. The DoN's Renewable Energy Program Office (REPO) is on target to have 1 Gigawatt of renewable energy—enough to power about 250,000 homes or 14 Arleigh Burke-class Destroyers—under procurement by 2016, at a price at or below brown power

3. Sail the "Great Green Fleet"

By 2012, DoN will demonstrate a Green Strike Group in local operations and sail it by 2016.

- a. The DoN demonstrated alternative fuel blends on all ships and aircraft that participated in the 2012 Rim of the Pacific (RIMPAC) exercise. Ship and air platforms operating on alternative fuel blends performed at full capability during the exercise. Planning is underway to deploy the Great Green Fleet 2016.

4. Reduce Non-Tactical Petroleum Use

DoN will reduce petroleum use in the commercial vehicle fleet by 50 percent.

- a. The DoN has significantly grown its fleet of alternative fuel-capable vehicles, is expanding its use of telematics to improve fleet performance, and is working to deploy zero-emissions vehicles.

5. Energy Efficient Acquisition

Evaluation of energy factors will be mandatory when awarding contracts for systems and buildings.

- a. DoN has issued policy guidance concerning the use of energy-related factors in acquisition planning, technology development, and source selections for platforms and weapons systems.

CURRENTS: What kind of cooperation did you get from the services?

BRYAN: Our working relationship with the services was generally quite good. It's not always easy to be asked hard questions. But the folks we worked with in the military and in the contracting community are loyal, patriotic Americans who want to do good things for the country. Nobody wants to have counterfeit parts in their airplanes, ships, or radar systems.

That's not to say the process of getting to a solution can't be difficult for those involved. When folks have been doing things the same way for a long time, it can be hard to change. But at the end of the day, we found that people want to know if they have a problem and how to fix it. At least then they can move forward with open eyes about the challenges they face.

I built some great relationships with people in the Navy and the other services. We tapped into some top notch in-house expertise on some of our investigations. We took a subject matter expert from the Naval Surface Warfare Center in Crane, Indiana to Hong Kong with us as part of our investigation into counterfeit parts because he was one of the best assets in the U.S. government to address that problem. The services cooperated with us. They wanted to get it right. I think we're all focused on that.

I don't think you can underestimate the value of leadership that says, "Let's look at this differently."

CURRENTS: Other senior leaders have stated that while technology is an important aspect of resolving our energy issues, it will take changes in individual behavior and organizational "culture" to get where we need to go. Your thoughts?

BRYAN: We all have been doing things a certain way for a long time in the energy space. Now, across the country and around the world, opportunities are emerging on the energy side which will enable us to do better. We have to be open to asking a different question or taking a different approach than we have in the past.

Thankfully, we have tremendous leadership support across the Navy, in Secretary Mabus who has set very aggressive energy goals, and Assistant Secretary of the Navy for Energy, Installations & Environment (ASN (EI&E)) McGinn who is focused on finding creative solutions to these problems. I don't think you can underestimate the value of leadership that says, "Let's look at this differently."

That message of "let's do this differently" has been coming from DoN leadership for years, and now it is finding its way into the conversations of the people executing important, mission-focused jobs for the Navy.

During my last visit to Norfolk, I met some Sailors from the USS Porter (DDG 78) who are doing some amazing work. They are asking questions about how they can use energy more efficiently, so they can spend more time on the mission and less time refueling. I talked with one of the USS Porter's navigators, who is doing some innovative thinking about how her ship can better use fuel while underway.

The Basics About the USS Porter

THE USS PORTER is a guided missile destroyer and is part of the Atlantic Fleet homeported in Norfolk, Virginia. Named after two American naval legends—Commodore David Porter and his son, Admiral David Dixon Porter, DDG 78 is the fifth ship to bear the name Porter. Using the strategies and techniques provided by Naval Sea Systems Command's Shipboard Energy Conservation guide, the Porter achieved the 10th highest level of underburn in the Atlantic Fleet for the fourth quarter of fiscal year 2014.

USS Porter (DDG 78).
MC1 Rafael Martie





Commanding Officer, CDR Blair H. Guy welcomes DASN Energy Joseph Bryan aboard the USS Porter (DDG 78) for a ship's tour and a briefing on energy conservation initiatives that the ship is undertaking to increase their combat capability and mission effectiveness. Captain Guy has empowered his crew to be innovative and think of process improvements that can conserve energy.

MC2 Jonathan Donnelly

We are working to increase the energy security and resiliency of our installations and surrounding communities.

She had looked at voyage planning from Norfolk to Florida, to find a way to accomplish the trip without refueling as often—to spend more time on mission and less time tied to an oiler. On her own time, she looked at navigational charts and weather reports, worked on some options with her crew, and charted a course to take advantage of the Gulf Stream current to use less fuel. And it worked.

What's most important in this story is that this young officer said "energy is important to us" and, on her own time, did something to make her mission more successful, more energy efficient. She did what was best for the mission. And her commanding officer said, "Do it," to empower her along the way. That is a challenge for

leaders in all organizations—to be open to doing things differently and challenging their own assumptions.

Energy is an area where there's a lot of room for innovation, a lot of room for new thinking. This doesn't mean you have to come up with a new technology—it can mean you pull out your old paper charts to find a better way.

CURRENTS: In your own words, what is the mission of the Office of the Deputy Assistant Secretary of the Navy (Energy)?

BRYAN: We are a driver for energy solutions, pushing innovation and building partnerships that advance the DoN's goal of optimizing energy use to enhance combat capability and energy security. The world is changing, and the DoN needs

to change with it so that we can continue to provide the presence necessary to ensure stability, deter potential adversaries, and provide options in times of crisis.

We will continue to face energy challenges both afloat and ashore that we need to overcome in order to complete the mission. The best course of action is for us to prepare for those challenges—by planning and making smart investments—so that we stay ahead of the changes in energy that are happening all around us.

CURRENTS: What are you thinking about in terms of infrastructure improvements?

BRYAN: Today, our shipyards and other shore installations play a greater role in accomplishing the mission than ever before. We are working to increase the energy security and resiliency of our installations and surrounding communities, by improving energy efficiency and diversifying our energy supplies. And, we're leveraging private sector financing to an unprecedented extent to accomplish those goals.

We're using energy savings performance contracts (ESPC) and utility energy services contracts (UESC) to improve our energy infrastructure. In UESCs and ESPCs, private companies buy and install efficient energy equipment on our bases and assure the equipment performance. In return for their investment, the Navy pays the companies a portion of the energy savings that result from replacing old, inefficient equipment with the new, more efficient equipment. These agreements are a win-win for the Department and the private sector.

CURRENTS: How about on the Marine Corps side? What aspects of their energy efforts would you like to mention?

BRYAN: The Marines are doing incredible work, particularly at forward operating bases (FOB). They know that the logistics to support fuel requirements at FOBs creates risks for them.

Colonel Caley (director of the Marine Corps Expeditionary Energy Office) tells a story about a line of trucks idling, before a particular exercise. He didn't think this made much sense. So he ran a test at Twenty-nine Palms with

two lines of trucks. For one line, he installed a simple meter that showed the Marines how much fuel they were burning. The second line of trucks had no such gauge. He didn't tell the Marines what to do. He simply gave them information that enabled them to make their own decisions. He found that the Marines who had the gauges realized a significant reduction in their fuel consumption.

If we can put our folks in a position to do what they know is right, with the right information, then they will make good decisions.

What this proves to me is that, like the navigator in Norfolk, with the right information, Sailors and Marines will make decisions to save energy while accomplishing their mission.

People join the Navy and Marine Corps because they want to serve and want to do the right thing. If we can put our folks in a position to do what they know is right, with the right information, then they will make good decisions.

CURRENTS: What do you think your major challenges will be, and what are your strategies for meeting those challenges?

BRYAN: One challenge is changing the way we think about problems. Challenging the assumptions we make. Opening ourselves up to good ideas that exist outside of our own organization. That's tough for any organization, particularly when you are talking about emerging technologies in the energy space. The fact remains that the world is changing, and there are people out there who are figuring it out. We need to learn from them.

For More Details

FOR MORE DETAILS about one of the Navy's successes with a UESC at the Naval Undersea Warfare Center (NUWC) in Newport, Rhode Island, read our article "NUWC Newport Partners with National Grid to Tackle Energy Conservation: Annual Energy Savings of Plan Estimated at \$1.5 Million" in the summer 2014 issue of *Currents*.



For More Insights

FOR MORE INSIGHTS into Colonel Caley's perspective, read our article "Spotlight on the Marine Corps Expeditionary Energy Office: Colonel James Caley Talks About Getting Energy Innovations into the Hands of Marines" in the summer 2014 issue of *Currents*.



Better, cleaner, cheaper—that's a pretty attractive option.

Energy is important, and it matters to the mission. I think that's part of the message that Sailors and Marines are getting from their senior leaders, and it's resonating with folks. So we're looking to solve the challenges we face by doing things differently when it makes sense. We are starting to see a culture where people are not only open to change but are agents of change themselves.

CURRENTS: What do you believe to be the most significant economic, security and environmental benefits of renewable energy?

BRYAN: Renewable energy at our installations can enhance energy security and increasing resiliency. Renewable assets on our installations can—in addition to producing clean, cost-competitive power—serve as a hedge against disruptions in the commercial grid. We know that the electrical grid is a target for cyberattacks, and we've seen how weather and natural events can

affect it. A photovoltaic array located on a Marine Corps base can help keep the base up and operating, even should the grid go down.

To that end, Secretary Mabus stood up the Renewable Energy Program Office. Bob Griffin and his REPO team are doing amazing work. We are entering into contracts for the purchase of renewable energy at prices that are equal to or below brown power, and we're on track to achieve our goal of 1 Gigawatt of renewable power by 2016.

Better, cleaner, cheaper—that's a pretty attractive option.

CURRENTS: As you know, we have several initiatives underway that focus on biofuels. What is your perspective on alternative fuels?

BRYAN: Using alternative fuels adds supply options, increasing freedom of action and reducing our vulnerability to those who would use energy as a weapon against us.

It's about increasing operational flexibility, and making sure that our platforms can use the fuel that's available. We don't know where our platforms will be operating in five or ten years, whether in combat, providing deterrence or rescuing victims of natural disasters.

We don't know where the next F-18 Super Hornet is going to be deployed or whose fuel tank it's going to be alongside. So, we need to make sure that aircraft can fly on whatever fuel is available—whether it's conventional petroleum or an alternative fuel.

In 2012, we proved during the Rim of the Pacific Exercise that our ships and aircraft could run on a blend of up to 50/50 drop-in alternative fuels and conventional fossil fuel. Since then, we've certified all our platforms on two alternative fuel pathways—called Highly Enriched Fuel Assembly and Fischer-Tropsch.

Any alternative fuels that we use must be "drop-in." In other words, our engines and supply equipment can't tell the difference between the alternative fuel and conventional fossil fuel. There can be no need for any modifications to systems.

Secretary Mabus has committed—and the law has been changed to require—that we will not purchase operational quantities of drop-in alternative fuels unless they are cost competitive with conventional fossil fuels.

Finally, being able to operate on alternative fuels reduces our dependence on oil-producing countries, some of which aren't always friendly to us. The investments we make today will develop a domestic alternative fuels production capability that is a national security imperative. It's a strategic investment into building a long-term capability.

We take the best that industry and academia have to offer and figure out how we can make it work for the Navy.

CURRENTS: The Secretary of the Navy talks about the fluctuation in international fuel prices and the impact that has on our operations. For example, if the expected price of fuel increases one dollar, it costs the Navy 30 million dollars which, by necessity, needs to come out of our operational budget one way or another. So if there is a domestic source of alternative fuels, is there some sense that it can be used to offset those costs in the future?

BRYAN: The fact is we can look at oil prices today, but it's anybody's guess where they'll be in a year. Two years ago, oil was 120 dollars a barrel. Today, it's closer to 40 dollars a barrel. You don't want to make long-term decisions based on short-term prices, especially when it comes to oil.

CURRENTS: Is your office working with industry or academia, and if so how?

BRYAN: CAPT Jim Goudreau is our Director of Policy and Partnerships, and he is focused on building partnerships with the private sector and academia. Secretary Mabus and ASN (EI&E) McGinn both encourage us to widen our aperture to get outside perspectives. So we take the best that industry and academia have to offer and figure out how we can make it work for the Navy.

We're working with a number of universities—Columbia, Purdue, Arizona State, and others—and we have partnerships with the private sector to develop new technologies and adopt new approaches that will address our energy challenges. We need to know what

F/A-18F Super Hornet strike fighter fueled with a 50/50 blend of biofuel and conventional fuel.

Liz Goettee



they're doing, how they're doing it, and then adopt the technologies and practices that make sense for us. It's a great way to generate new ideas about how to approach a persistent challenge.

CURRENTS: Could you speak briefly about the way forward for the Department of the Navy from an energy standpoint?

BRYAN: We are transforming the Department of the Navy's energy use to make us better warfighters, deploying next-generation capabilities that boost combat effectiveness, maximize strategic options, and better protect our Sailors and Marines.

Efficient energy use is a force multiplier. It can help us go farther on a tank of gas, stay longer without needing resupply or peeling back to refuel, and to deliver more payload when we're there. At the same time, diversifying our energy sources—using conventional fuels, alternative fuels and renewable energy—can improve our energy security and resiliency ashore and give operational commanders and planners the flexibility they need to complete the mission. And that's what it's all about.

CURRENTS: Thank you for taking the time to speak with us today, sir.

BRYAN: Glad to do it. Thank you. ⚓

Chief of Naval Operations Environmental Award Winners Recognized

Accomplishments Exemplify Navy's Commitment to Environmental Stewardship

WINNERS OF THE annual Chief of Naval Operations (CNO) Environmental Awards program have been announced for fiscal year (FY) 2014. The awards recognize Navy ships, installations, and individuals for their exceptional environmental stewardship.

The competition categories for the FY14 competition included natural resources (large installation), cultural resources management (small installation and individual/team), environmental quality (industrial installation and overseas installation), sustainability (non-industrial installation and individual/team), environmental restoration (installation), and afloat (includes various competitive sub-categories).

Nominations were judged by subject matter experts on accomplishments from October 1, 2012 through September 20, 2014. Chief of Naval Operations Admiral Jonathan Greenert recognized 27 award winners during a video teleconference ceremony held June 23, 2015 at the Pentagon in Washington, D.C.

Accomplishments of the winners are highlighted below.

Natural Resources

This award recognizes efforts to promote the conservation of natural resources, including the identification, protection, and restoration of biological resources and habitats; the sound long-term management and use of the land and its resources; and the promotion of a conservation ethic.

Large Installation

Joint Base Pearl Harbor-Hickam, Hawaii

Serving as one of the world's largest military installations, Joint Base Pearl Harbor-Hickam (JBPHH) encompasses over 28,000 acres of land and nearly 70,000 marine miles in the surrounding area of the Hawaiian island of O'ahu. JBPHH oversees an extensive natural resources program covering various topographies and habitats from mountainous regions to oceans. Given their large area of responsibility and wide span, JBPHH contains more endangered species than any other Navy installation. The coconut rhinoceros



The coconut rhinoceros beetle, first discovered on JBPHH in December 2013, is a destructive invasive pest that is native to Southeast Asia. The beetle has caused the loss of more than 50 percent of all coconut palm trees on the island of Guam.

For More Insights

FOR MORE INSIGHTS into JBPHH's efforts to eradicate the coconut rhinoceros beetle, read our article "JBPHH Joins the Team to Fight Coconut Rhinoceros Beetle: Invasive Insect Poses Real Threat to Hawaii's Palm Trees" in the winter 2015 issue of *Currents*. You can find an electronic copy of this article and browse the *Currents* archives at the Department of the Navy's Energy, Environment and Climate Change web site at <http://greenfleet.dodlive.mil/currents-magazine>.



beetle (native to Southeast Asia) began infesting the premises of JBPHH in large numbers and feeding on palm trees from 2012 to 2014. Base personnel implemented an invasive species management plan that was shared and adopted by nearby Army and Marine Corps properties to eradicate the beetle. They installed approximately 400 traps around the base and removed infected palm trees and mulch. Infected green waste was incinerated through the use of air curtain burners that generated less smoke and ash emissions. This method resulted in a potential \$500,000 savings for the Navy compared to regular incineration techniques.

At the JBPHH Lualualei Annex, the natural resources team took steps to preserve the critical habitat necessary for the survival of 22 threatened and endangered plant species. This included maintaining fenced boundaries and invasive plant monitoring and management. A non-native

mangrove was also removed within the Pearl Harbor complex due to mangroves' ability to choke shorelines and mudflats, which can threaten surrounding wildlife. The Lualualei Annex team also partnered with the U.S. Fish and Wildlife Service (USFWS) to assess the impact of nearby airfield construction and operations on native waterbirds.

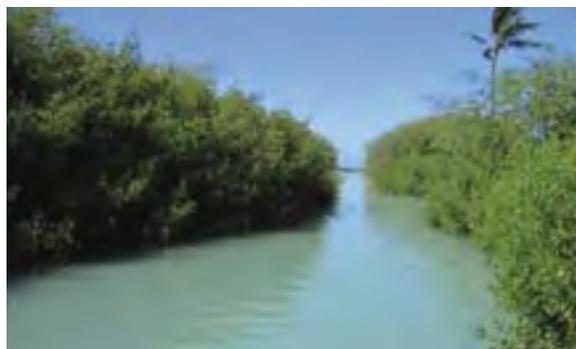
Environmental Quality

These awards recognize efforts to ensure mission accomplishment and protection of human health in the areas of environmental planning, waste management, and environmental law and regulation compliance.

Industrial Installation

Fleet Readiness Center Southwest, California

The Fleet Readiness Center Southwest's (FRCSW) mission is to carry out responsive maintenance, repair, and overhaul support to U.S. and allied warfighters. To support this mission, FRCSW conducts industrial processes, such as electroplating, chemical cleaning, stripping, painting, and jet engine testing. The latter generates hazardous waste and emis-



Mangrove is considered beneficial in every part of the world except Hawaii, where it is not native. It can choke shorelines and mudflats, rendering them unusable for native Hawaiian waterbirds and shorebirds. At left is the Kumumau Canal before mangrove removal, and at right is the canal after mangrove removal. This had the dual benefit of increasing drainage of water away from the airfield during heavy rains (thereby reducing standing water on the airfield which attracts birds) and providing habitat in the canal itself.



FRCSW participates in multiple community events including the San Diego Earthworks' Earth Fair, the Coronado Flower Show and Restoration Advisory Board meetings.

sions. The FRCSW environmental program office continuously monitors the production of hazardous waste and strives to find opportunities to mitigate the environmental impacts caused by activities at FRCSW. The team at FRCSW has successfully implemented tactics to reduce energy costs by nearly \$447,000 per year, reduce water use by 1.2 million gallons and reduce compressed air use resulting in a savings of \$1 million. FRCSW also encourages public outreach and education about their efforts at events including the San Diego Earthworks' Earth Fair and the Coronado Flower Show.



FRCSW's energy/water team performs energy audits to determine where conservation measures can be implemented. This hangar (circa 1940s) is an example of a lighting retrofit project that resulted from those energy audits. The command has saved hundreds of thousands of dollars a year on lighting retrofits alone.

Naval Base Kitsap, Washington

Formed in 2004, Naval Base Kitsap encompasses nearly 11,200 acres (60 percent of which is forested), and due to the nature of its mission, produces hazardous waste, water discharges, and air emissions. Despite those facts, Naval Base Kitsap has been able to maintain International Organization for Standardization 14001 conformance as part of the Navy Region Northwest Environmental Management System (EMS). The installation is committed to replacing aging technologies with more state-of-the-art, fully compliant systems, including the replacement of many underground storage tanks (UST) and a wastewater treatment system. In an effort to reduce energy consumption, new light emitting diode exterior lighting was installed, reducing energy consumption by 53 percent.

Due to the large size of the installation, several species listed as threatened or endangered under the Endangered Species Act (ESA) call Naval Base Kitsap home.



A 6,000-gallon single-walled underground storage tank undergoing removal. This 30-year-old tank is one of eleven slated for removal from Naval Base Kitsap.

Each major construction project, such as the Pier 6 fender pile replacement project (380 piles), has a monitoring program in place in order to ensure ESA-listed species are protected and operations are within permit limits. One such construction project was the replacement of a culvert on a Union River tributary, which was identified as a barrier to fish passage. After five months, the old culvert was replaced with a 20-foot diameter natural-bottom tunnel. This will allow such ESA-listed species as the steelhead trout and the coho salmon to migrate upstream and spawn.

Fleet Readiness Center Southeast, Florida

Fleet Readiness Center Southeast (FRCSE) is one of eight Fleet Readiness Centers that provides maintenance and repair services for naval aircraft, engines, weapon systems and components. Several accomplishments of the team at FRCSE include:

- An energy reduction of 81 Million British Thermal Units (MBTU) per thousand square feet, which resulted in a 32 percent energy reduction from the 2003 baseline.
- A reduction in the hazardous waste stream by more than 80 percent (approximately 900,000 pounds) since 2008, lowering the cost of operations by more than \$720,000 annually.
- Use of a waste compactor in July 2014 for production waste, resulting in estimated annual savings of approximately \$17,000.
- Reclamation of 13 EA-6B Prowler aircraft, which resulted in the recovery of more than 900 aircraft parts, saving the Navy \$94.4 million.
- The creation of the Environmental Pacesetter of the Quarter Award, which recognizes an employee who personifies environmental stewardship.



FRCSE installed a paint solvent recycler for the aircraft paint facility to reclaim solvent used to clean paint lines. This reduced the amount of solvent material purchased by 7,126 pounds/year.

Victor Pitts

For More Information

FOR MORE INFORMATION about Naval Base Kitsap's efforts to replace a culvert on a Union river tributary, read our article "Naval Base Kitsap Replaces Fish-Blocking Culvert: After Decades, Wild Salmon Returning to Their Spawning Grounds" in the fall 2014 issue of *Currents*.



Overseas Installation

U.S. Naval Hospital Yokosuka, Japan

The U.S. Naval Hospital (USNH) Yokosuka encompasses one 48-bed military treatment facility and seven branch clinics located on mainland Japan, Korea, and Diego Garcia with over 1,200 staff providing care to over 42,000 active duty personnel and their families. The hospital's hazardous and medical waste operations manager oversaw a five percent reduction in total infectious waste costs between FY13 and FY14. This was possible through a complete overhaul of its medical waste management processes and the implementation of a new pharmaceutical hazardous waste disposal program. New staff training was implemented to teach personnel how to differentiate between potentially infectious waste, non-infectious waste and regular trash. The sustainability of these USNH Yokosuka programs can be attributed to three implementations:

1. Appropriate dedication of resources to institutionalize new polices, processes and systems that have been developed by dedicated subject matter experts
2. Development of procedures based on best practices and fundamental requirements approved by higher authority or regulations
3. Fostering and growth of new ideas to improve environmental stewardship across the entire command.



USNH Yokosuka supporting the U.S. Army Veterinary Clinic via a Memorandum of Agreement requiring the collection of medical waste. Designated Army personnel transport properly contained medical waste from the veterinary clinic to the USNH Yokosuka collection site. Each permanently-sealed and disposal-ready white plastic containers house only red-bagged medical waste, per prefecture-specific regulations.

Naval Air Facility Atsugi, Japan

Naval Air Facility (NAF) Atsugi must ensure they fully comply with environmental regulations from the Japan Environmental Governing Standards (JEGS). JEGS combine U.S. and Japanese environmental laws and agreements. Installation personnel successfully implemented the first-in-Navy lifecycle Preliminary Environmental Assessment Review (PEAR) process dictating over 30,000 environmental requirements for more than 50 construction and rehabilitation projects in 2014. The compliance tracker tool serves as a complement to PEAR and even received an Innovation Award from Naval Facilities Engineering Command (NAVFAC) Far East. This tool is a real-time measurement of compliance of the 50 applicable and individual environmental requirements.

NAF Atsugi negotiated a solid waste contract to provide cost incentives to waste service providers to separate

waste for recycling. Approximately 5,400 tons of material were recycled in FY13 and FY14. A potable water system produced solely by NAS Atsugi has resulted in a savings of \$5.8 million. The installation uses their own ground source supply and ensures standards meet or exceed U.S. Environmental Protection Agency (EPA) regulations. The shutdown of Navy Radio and Receiving Facility Totsuka and Naval Support Facility Kamiseya resulted in a massive clean-up. This clean-up removed 1,000 tons of solid waste and 1,500 of hazardous waste. In FY14, NAF Atsugi reduced a 15 year backlog of hazardous waste totaling 141,884 pounds. Their offsite Qualified Recycling Program (QRP) recycled 2,000 pounds worth of material from several transformers deemed free of polychlorinated biphenyls, thereby eliminating disposal fees.

U.S. Naval Support Activity Bahrain, Bahrain

The environmental team for Naval Support Activity (NSA) Bahrain provides oversight of the environment

program at Isa Air Base, the Ports of Jebel Ali and Fjairah in the United Arab Emirates (UAE), the waterfront development (NSA II), the UAE Coast Guard Base, and several homeported ships. The environmental program supports the mission and operations of the installations and the Commander, Fifth Fleet by maintaining compliance with all applicable environmental laws and regulations, protecting human health and the environment, and implementing pollution prevention initiatives to reduce the production of hazardous waste. During the last two years, Navy Region Europe Africa Southwest Asia has achieved approximately a 50 percent reduction in the quantity and cost of hazardous waste disposal. Through the implementation of a QRP, 1,900 tons of trash were diverted from the disposal stream and recycled for over \$100,000 in proceeds, which are used to sustain the QRP. The team, along with the environmental program itself, has been recognized for its robust, versatile and aggressive outreach and



Each year, NSA Bahrain conducts at least three oil spill exercises to ensure that Navy personnel are trained and to ensure that the Navy's spill plan and that of the host nation are compatible. This joint exercise in Fujairah involved deployment of the Navy's and host nation assets.

Jayakumar Nair

waste minimization programs by the UAE, the State of Qatar Armed Forces, and the National Crisis and Emergency Management Authority.

Sustainability

These awards recognize efforts to prevent or eliminate pollution at the source, including practices that increase efficiency and sustainability in the use of raw materials, energy, water, or other resources. Sustainable practices ensure that Department of Defense (DoD) protects valuable resources that are critical to mission success.

Non-Industrial Installation

Naval Medical Center San Diego, California

Naval Medical Center San Diego's (NMCS D) sustainable practices ensure that the installation protects valuable resources that are critical to mission success. Through systematic training of NMCS D's staff, they successfully instituted a comprehensive recycling and food composting program through the City of San Diego. Composting was implemented to divert unnecessary waste from being landfilled and to prevent or eliminate pollution at the source. On average, 177.5 tons of food waste and 590 tons of recycled materials per year are diverted, in addition to 36,000 gallons of cooking oil that is transported and rendered, so it may eventually be used for biofuel. This effort was accomplished through the collaboration of the NMCS D environmental staff, NAVFAC Southwest Sustainable Solid Waste program office, NAVFAC Southwest Recycling, and the NMCS D nutrition management department staff. Additional accomplishments include the following:

- The composting program diverts approximately 15 tons of food waste a month from the landfill.
- NMCS D diversion rate for the facility is approximately 75 percent (excluding construction and demolition debris) which exceeds the 50 percent diversion rate stated in Executive Order 13514.
- Composting along with recycling has reduced the installation waste disposal costs by 25 percent.
- The City of San Diego uses composted materials as fertilizer.

Naval Base San Diego, California

Naval Base San Diego (NBSD) and the Space and Naval Warfare Systems Command (SPAWAR) conducted a



NMCS D food waste being dumped at Miramar Greenery. This waste will be treated for 70 days and then used as a soil nutrient.

particle tracking experiment to analyze the use of fluorescent magnetic particles to link sources to sediments at Navy sites. During this study, SPAWAR placed 35 magnetic collectors in the area around NBSD Pier 8 and Paleta Creek and mapped a tracer plume at various distances ranging from 30 to 400 meters away. SPAWAR then released 750 kilograms of particle tracer from a vessel as it moved between the dock and about 60 meters out into the water. The magnets were recovered and showed where the tracer sank and was deposited in the bottom sediments. Sediment samples were then



NBSD has partnered with the City of National City, the City of San Diego, the Main Street Association, the San Diego 8th District Council, the Barrio Logan Association and surrounding communities to conduct a volunteer cleanup of the bay and shore. NBSD continually contributes to the betterment of San Diego, National City, Chula Vista, and surrounding communities.

Kristina Walton

collected and sent for laboratory analysis to compare to previous collections. This study helped determine where potential releases may spread and identify where clean-up efforts should be concentrated.

In addition, NBSD installed two new filtration systems for stormwater runoff to divert and capture potential pollutants from entering the San Diego Bay. NBSD also oversaw the removal of over 45,000 pounds of debris from the surrounding waterways over the last twelve months and organizes a Base Pride Clean-Up event. The volunteers at this year's clean-up collected over 90 pounds of trash across the installation.

Naval Support Activity Monterey, California

Through staff interaction, adoption of cutting edge technology, forward-looking engineering, and solid leadership, NSA Monterey is setting the standard for sustainability within the Navy and the DoD. Located in Monterey, California, NSA Monterey is host to over 4,035 military, civilian and international personnel and 15 tenant commands, each with unique and critical mission requirements. The installation has built a committed EMS Executive Steering Committee (ESC) that brings together senior leadership from across the installation and tenant commands as partners in environmental decision making and communication. This group strives to exceed the sustainability principles set forth in Department of the Navy and other guidance. The EMS ESC was able to accomplish the following:

- A 34 percent reduction in energy consumption
- A 41 percent increase in scrap metal diversion
- A 77 percent solid waste diversion rate
- A 40 percent decrease in potable water use (as compared to the FY08 baseline)

Individual or Team

Mr. Len Sinfield and Mr. Thomas Niday, Naval Base Coronado, California

Under the purview of Naval Base Coronado (NBC), the Naval Auxiliary Landing Field, San Clemente Island (SCI) is located approximately 67 miles offshore. Potable water is transported via barge to SCI where it is chlorinated, stored, and then distributed. Due in part to long storage time, as is necessary for emergency and fire protection, the SCI potable water system was out of compliance with EPA's Disinfection Byproducts Rule for Total Trihalomethane (TTHM). NBC implemented several short- and mid-term compliance measures, but these measures were unsustainable in the long term. Alternatives identified were space, time, and cost prohibitive (ranging from \$2 to \$31 million).

After lengthy research, Mr. Len Sinfield and Mr. Thomas Niday (from NAVFAC Southwest) found an affordable and effective solution through spray aeration. Although spray aeration was considered experimental by the EPA, NBC was able to get approval to conduct a pilot scale test. After success of the initial pilot test, regulators accepted NBC's



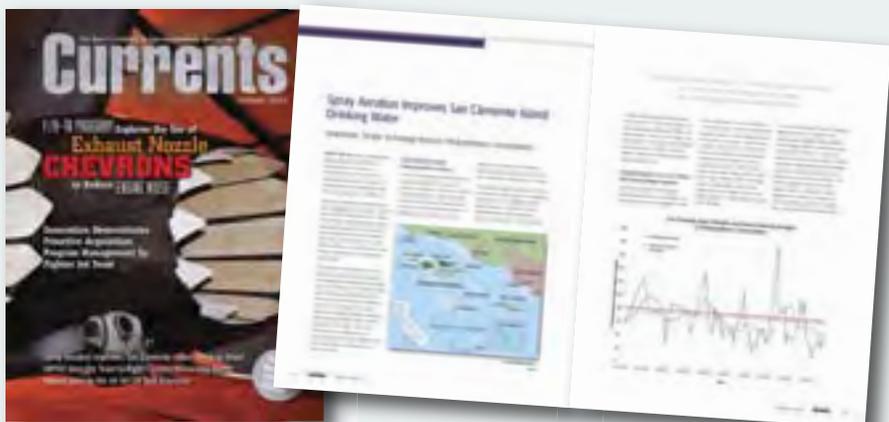
In an attempt to reduce the amount of fossil fuel used on NSA Monterey, 14 electric carts have been acquired. During FY13-14 these carts were driven over 15,000 miles on the main base.



SCI is the cornerstone of the tactical training ranges supporting the Southern California Operations Area—the largest concentration of naval forces in the world.

For More Information

FOR MORE INFORMATION about the use of spray aeration technology to reduce concentrations of trihalomethanes in the SCI drinking water system, read our article “Spray Aeration Improves San Clemente Island Drinking Water: Inexpensive, Simple Technology Reduces Trihalomethane Concentrations” in the winter 2015 issue of *Currents*.



proposal to expand the spray aeration system to all the tank systems at SCI. Spray aeration, combined with implementation of several other efforts, has proven effective as SCI is now in compliance with the EPA TTHM requirements. At a material and installation cost of less than \$80,000, this fairly low-cost solution to a large problem would not have occurred without the years of technical experience and dedication to the Navy showed by Mr. Sinfield and Mr. Niday.

Fleet Logistics Center San Diego, California (Fuels Department)

Naval Supply Systems Command (NAVSUP) Fleet Logistics Center (FLC) San Diego supports 86 home-ported ships, submarines, transient vessels and 11 over-the-horizon naval bases and air stations in California and Nevada. During the replacing of their Bulk Fuel Facility (referred to as military construction (MILCON) project no. P-401), the FLC San Diego team was able to divert over 70 percent (nearly 40,000 tons) of the associated construction waste from landfills by onsite reuse. The remaining construction waste was processed by another recycling center off site. The team was awarded the Leadership in Environmental and Engineering Design (LEED) Silver award for the project, which represented the first “green” Navy fuel terminal. Energy consumption declined by 33.2 percent.

The project consolidated the fuel terminal’s expanse by over half from 200 to 75 acres. This lessened the impact on surrounding coastal habitat and wildlife including native canary palm trees.

Tainted soil was decontaminated on site and used as backfill to seal off old USTs. This resulted in a \$10 million cost avoidance by eliminating the need to import new soil. The project also replaced a 100-year old operational pier with an innovative new design that meets operational readiness requirements and environmental regulations. The updated pier’s construction includes safeguards for marine life during construction, and structural modifications per California’s seismic regulations, as well as sea level rise predictions. Over 1.8 million gallons

of speculation fuel were sold as a result of fuel oil reclamation efforts, eliminating an estimated \$50 million in waste disposal fees.



The old Bulk Fuel Facility’s footprint. Despite the challenges of multiple MILCON projects requiring extensive demolition and construction, unit cohesiveness was achieved with regular partnering sessions between all stakeholders, allowing NAVSUP FLC San Diego to meet operational and mission demands for all of its customers.



File cabinets and many other types of metal furniture are cut and processed for sale in the metals commodities markets breathing new life into NRSW wastes. Although furniture reuse is practiced extensively, some metal furniture and other components are beyond recovery and are processed as metal scrap. The SSW team developed processes and standards for metal recovery.

Navy Region Southwest, California (Sustainable Solid Waste Program)

Navy Region Southwest (NRSW) contains ten installations across six states (primarily California) consisting of 5,750 square kilometers of land with nearly 10,000 personnel supporting approximately 480 tenant commands. Activities of the Environmental Sustainability (ES) program at NRSW have included LEED building construction, electrical energy and water conservation, and renewable energy generation among others. In particular, the ES program has successfully encouraged the transition from a standard integrated solid waste management program to a sustainable solid resource and management program. The new sustainable solid waste (SSW) program has a wide range of programs including:

- Integrated solid waste management (combined refuse and recycling)
- Construction and demolition debris management

- Military industrial waste
- Disaster debris management
- Office property reuse
- Food waste composting program

NRSW is recognized as a leader within DoD for the management of solid waste. Its SSW program has been honored as the 2014 Recycler of the Year by the City of San Diego (for the ninth year in a row) and the California Governor’s Environmental and Economic Leadership Award in the Waste Reduction Category for 2013 (the state’s most significant environmental award).

Environmental Restoration

This award recognizes efforts to protect human health and the environment by cleaning up identified sites in a timely, cost-efficient, and responsive manner. Restoring these sites impacted by historic defense practices protects military personnel and the public from potential environmental health and safety hazards.



Installation of the waste isolation barrier at NAS Alameda Site 1 used a crane-mounted vibrating hammer to drive a series of interlocking sheet piles into the soil surrounding burn area waste. This technology creates “isolation cells” that will contain waste and prevent it from entering the San Francisco Bay during seismic activity.

Installation

Former Naval Air Station Alameda, California

Naval Air Station (NAS) Alameda was identified for closure under the base realignment and closure (BRAC) program in 1993 and fully ceased operation in April 1997. In 1999, NAS Alameda was added to the EPA's National Priorities List. The environmental program at NAS Alameda achieved several significant environmental remediation successes. A portion of the site was incorporated into the East Bay Trail System, which allows for public access to nearby wetlands. Also, in an effort to protect the endangered California Least Tern, a wildlife refuge was created to be managed by the USFWS and maintained by the Department of Veteran Affairs (VA). NAS Alameda was also able to transfer 624 acres of the installation to the VA in 2014. The VA will develop on this land a much needed clinic and national cemetery

to honor our veterans. Finally, an additional 1,704 acres were transferred to the City of Alameda in what was the achievement of a landmark programmatic goal for the BRAC program management office mission.

Naval Submarine Base New London, Connecticut

Naval Submarine Base (NAVSUBASE) New London's mission is to provide the facilities and the services for combat-ready submarines and training professional submariners. The installation consists of 687 acres, with over 70 tenant commands and activities. Approximately, 6,500 active duty Sailors and approximately 2,000 civilians are employed here and 12,000 family members call NAVSUBASE New London home. Historic activities that may have had a detrimental effect on the base's environmental conditions include waste disposal practices, battery maintenance and overhaul, petroleum product leaks from USTs, and

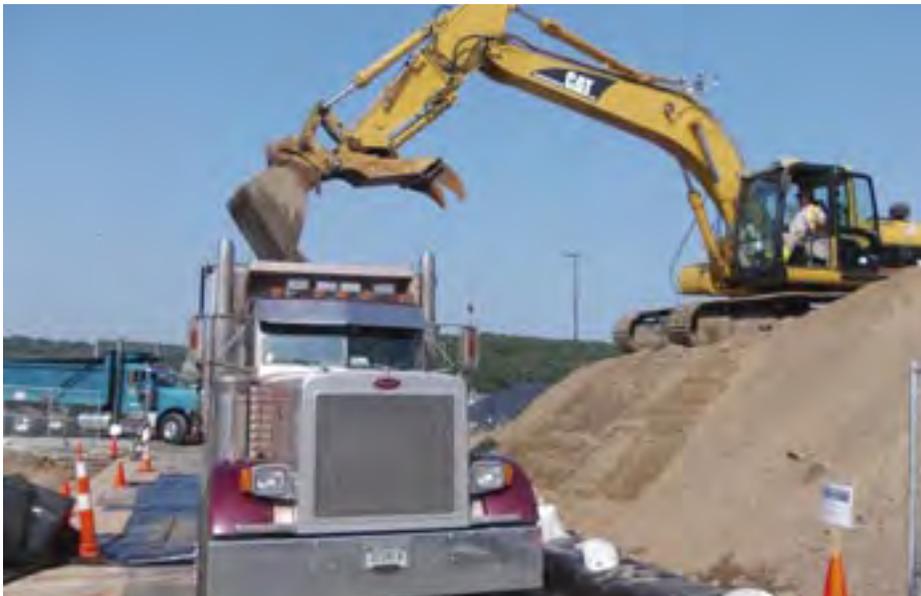
disposal of ash and dredged material. The NAVSUBASE New London environmental restoration team oversaw the removal of approximately 375 cubic yards of contaminated sediment from Pier 1, the disposal of at least 2,000 tons of lead-contaminated soils, and a wetland restoration project. The project involved the removal of 3,000 tons of non-hazardous contaminated sediment as well as the construction of eight topographical reliefs to support approximately 36,400 square feet of native trees and shrub woody areas. Remedial actions are expected to be completed in 2015.

Portsmouth Naval Shipyard, Maine

Portsmouth Naval Shipyard (PNSY) serves as a nuclear-powered submarine maintenance installation. Expediting cleanup actions under the PNSY environmental restoration program promotes environmental stewardship at the shipyard while supporting the military mission.

Specific accomplishments included completing three Records of Decision in FY13 while accelerating review schedules by four months, as well as providing remedial strategies that meet the mission requirements, sustainability goals, and human health and environment protectiveness objectives.

PNSY completed a No Further Action Decision Document in FY14 for a former galvanizing plant tank vault site. The installation also dredged approximately 7,500 tons of contaminated sediment at four off-shore monitoring



Soil remediation on board NAVSUBASE New London. Contaminated soil mixed with Portland cement is loaded into trucks to be disposed of at an approved landfill. The linear and confined physical limitations of the lower base required extensive planning, staging, and site management to keep access to the piers open during excavation, loading, and backfilling.



Early phases of the former galvanizing plant removal action involved the removal of the existing building concrete slab floor via a jack hammer-equipped skid steer. A rubber-tracked excavator was utilized in the excavation of the 450 tons of non-hazardous fill contained within the vault. The removal action resulted in a No Further Action Decision which allowed for adaptive reuse of the historic building for a new Deep Submergence Testing Facility.

stations to coincide with approved in-water work windows for threatened and endangered fish species protection. The program enhanced the remedial action for the excavation of approximately 18,200 tons of contaminated soil by implementing an innovative stabilization method to render soil as non-hazardous waste. All sustainability goals were met through the reduction of disposal costs, transportation distance, and associated air emissions and safety risks.

Cultural Resources Management

These awards recognize efforts to promote cultural resources stewardship by highlighting outstanding examples of cultural resources

management. Awards are designed to showcase extensive cultural resources including archaeological sites, the historic built environment, and cultural landscapes. Desired initiatives include partnering with external stakeholders such as Native Americans, state



Helicopter Maritime Strike Squadron FIVE-ONE (HSM-51) conducts an exercise around Mount Fuji. HSM-51 is one of 40 tenant commands at NAF Atsugi supporting the Navy's mission in the Seventh Fleet area of responsibility.

MC1 Barry Riley

historic preservation officers, and local communities, as well as those working with internal stakeholders, such as master planning, public works, and range management. Through cultural resources management programs, Navy and DoD identify areas likely to contain historical assets and work to protect these resources for future generations in partnership with Native American tribes and historic preservation authorities.

Small Installation

Naval Air Facility Atsugi, Japan

NAF Atsugi supports up to five different aircraft types from Carrier Air Wing FIVE—the Navy's only forward-deployed carrier wing. NAF Atsugi lies in a highly urbanized area in Japan within 25 miles from the foot of Mount Fuji and within 20 miles of Tokyo. During the award period, NAF Atsugi's environmental division team created the first EMS in the Far East that incorporated lifecycle environmental impacts on the environment. These improvements to the EMS ensured that all cultural resources were identified and protected prior to the start of work or completion of any contract documents.

The team also developed a compliance tracker tool to assess and document compliance status with all cultural resources requirements—requirements with which NAF Atsugi has remained in full compliance. In addition, the team initiated external stakeholder partnering meetings with experts from the Kanagawa Prefecture and adjacent cities' boards of education and historical/cultural resources. These meetings resulted in an informal working agreement that detailed how consultation and coordination with the host nation regulatory agency will be conducted.

Pacific Missile Range Facility, Hawaii

Capable of supporting surface, subsurface, air and space operations simultaneously, the Pacific Missile Range Facility (PMRF) is the world's top multi-dimensional integrated training and test range. It also encompasses some of the most sacred cultural sites on the island of Kauai. PMRF has supported successful outreach projects to the surrounding communities and streamlined the cultural resources consultation and National Historic Preservation Act's (NHPA) section 106 review process. The team's major accomplishments include:

- Design and installation of education signage throughout the base with the goal of highlighting the Navy's commitment to cultural resource stewardship and public education.
- Recovery of a Japanese navigational buoy, which had traveled across the ocean following the 2011 tsunami disaster.

- A NHPA survey of over 300 acres of the southern portion of the installation.
- Physical site protection measures implemented on sand dunes to slow the erosion of cultural deposits through the use of geo-webbing technology.
- Continued outreach programs to civic clubs, school groups and native Hawaiian organizations for cultural experiences, which also allows the staff at PMRF to ensure the installation is aligned with the community.

Portsmouth Naval Shipyard, Maine

Established in 1800, PNSY is the oldest continuously operating naval shipyard in the nation; its historic district is listed on the National Register of Historic Places. During FY13 and FY14, over 200 consultation packages facilitating NHPA section 106 compliant work supported over \$127,600,000 of projects on historic facilities. Nine studies were successfully executed (totaling \$1.3 million) during the award period. One of the installation's projects involved the search for a suitable replacement option for corrugated wire glass windows. These windows are no longer manufactured, but remain a character-defining feature of many of the older buildings' historic character. An aluminum polycarbonate curtain wall system has been selected as the best alternative that replicates the previous windows' familiar pattern, and are also more energy efficient. Due to the age of the infrastructure on the installation, the island setting, and the dynamic mission, PNSY will continue to present unique cultural resources management challenges.



The interior of PNSY's Building 76 is an excellent example of the historic industrial character exemplified at the shipyard. Originally constructed in 1902 as a forge, Building 76 still operates in that capacity today. The massive forge hammers are character-defining features and will be retained when the building is renovated.

Kerry Vautrot

Individual or Team

Mrs. Heather Robbins, Naval Facilities Engineering Command, Mid-Atlantic, Norfolk, Virginia

The current Navy's Regional Historic Preservation Officer for the Hampton Roads region is also the Cultural Resources Team Lead at NAVFAC Mid-Atlantic, and the installation level Cultural Resources Manager at six Navy installations. Mrs. Robbins provides cultural resources management support as well as contract management to the Navy installations in the Navy Region Mid Atlantic's area of responsibility from Maine to North Carolina. She has provided leadership on how to minimize or avoid adverse effects to historic properties and on identification procedures of cultural resources requirements such as



Heather Robbins is responsible for cultural resources compliance through review of designs for proposed rehabilitations of historic buildings. Building G29 (the Pennsylvania House) is one such building. The building was constructed as part of the 1907 Jamestown Exposition held in Norfolk, Virginia and is a smaller scale replica of Independence Hall.

archaeological or architectural investigations in support of construction projects. A brief overview of Mrs. Robbins' accomplishments include:

- The successful execution of 18 cultural resources contracts in FY14 with 100 percent execution of funds received.
- The management of 32 contract actions in FY13 and FY14 that delivered products such as archaeological surveys, viewshed analyses, public education exhibits and brochures.
- The foundation of strong consultation relationships with three federally-recognized tribes in Oklahoma, Kansas and Wisconsin.
- The development and issuance of training at Hampton Roads installations that served to increase awareness of cultural resources,



Lono arrives by canoe at Hickam Beach during the Makahiki. The Makahiki is an ancient annual festival dedicated to Lono, the deified guardian of agriculture, rain, health, and peace. For more than 2,000 years, early Hawaiian people celebrated their beliefs associated with Lono during Makahiki festivals throughout the Hawaiian Islands.

promote cultural resources stewardship, and also give individuals a day-to-day understanding of cultural resources compliance.

Mr. Jeffrey Pantaleo, Joint Base Pearl Harbor-Hickam, Hawaii

Managing a diverse range of cultural resources (including some native Hawaiian sites that date back to 1200 A.D.), Mr. Pantaleo is the Cultural Resources Program Manager for both Navy Region Hawaii and JBPHH. Mr. Pantaleo has focused his efforts on developing outreach and education programs, which has resulted in a balanced approach that both supports mission objects and continued cultural resources stewardship. He has successfully obtained over \$250,000 in project orders through the execution of seven contracts. One of his most significant roles is that of the Navy's main point of contact for Native Hawaiian Organizations (NHO). He has taught DoD personnel in Hawaii how to engage in meaningful consultation with NHOs. Working directly with the NHOs, Mr. Pantaleo consults and helps organize the annual Makahiki

festival, which honors the Hawaiian deity Lono. This festival provided an opportunity for military families to appreciate and learn more about the history and culture of Hawaii. At the former Hickam Air Force Base at Halealoha Haleamau Burial Platform, Mr. Pantaleo managed the National Public Lands Day activities and was also able to organize the permanent re-burial of six native Hawaiian remains through careful consultation with the NHOs.

Mr. Michael Smolek, NAS Patuxent River, Maryland

The cultural resources management program at NAS Patuxent River, Maryland has been built on a solid foundation that includes comprehensive resource inventories, partnership development, stakeholder involvement, community outreach, and strong scientific research. This strong foundation can be generally accredited to Mr. Smolek. He is the regional archaeologist for Naval District Washington and the cultural resources manager at NAS Patuxent River. The Patuxent River Complex has 19 properties totaling 15,000 acres spread

over five Maryland counties, and hosts the Naval Air Warfare Center's Aircraft Division. Through his personal knowledge of aviation, Mr. Smolek is able to keep a mission-first focus on all historic preservation compliance and stewardship actions.

Each year, Mr. Smolek assesses and manages several hundred facilities and test projects, as he is the installation's only cultural resources professional. He has aggressively pursued the collection, cataloguing, and storage of historic records and documents, which has helped historians gain better access to items of cultural resource significance. Mr. Smolek also recognizes the importance of scientific research that may benefit cultural resource management. For example, he currently supports a project involving the search for buried paleosol soils that may hold evidence of human occupation in the area during the Pleistocene Epoch.

Environmental Planning

This award recognizes outstanding environmental planning efforts that benefit the Navy, the environment, and the public at large.

Team

Hawaii-Southern California Training and Testing Environmental Impact Statement Team, Pearl Harbor, Hawaii

The Hawaii-Southern California Training and Testing (HSTT) Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) team is composed of Navy and contractor personnel with backgrounds in Navy fleet operations, environmental planning, marine biology, and environmental law, among many other disciplines. The primary goal of the team was to initiate the National Environmental Policy Act (NEPA) process through meeting all regulatory requirements and obtaining all relevant regulatory permits and authorizations to ensure that naval forces are able to continue conducting critical training and testing in Southern California, Hawaii, and the transit corridor in between. The sheer geographic scope (over 2.1 million square miles) of this EIS/OEIS was quite unusual and demanded effective coordination with local, state (Hawaii and California) and federal agencies.

The team was able to make use of a new Navy acoustic model along with a new stressor-based approach which allowed for the analysis of a more accurate simulation of

For More Insights

FOR MORE INSIGHTS into the Navy's significant commitment to understanding the behavior and abundance of marine mammals within and in near proximity to its at-sea training and testing activities, read our cover story, "Pacific Fleet Supports Range Capability Through Marine Species Monitoring: Passive Acoustic Monitoring & Tagging on Hawaii Range Complex Helps Safeguard Training & Advances Science," in the winter 2014 issue of *Currents*.



marine mammal behavior. The team refined the Navy's approach on further minimizing the potential effects of sonar and explosives on marine mammals and sea turtles. Along with face-to-face public meetings and strong media outreach, a comprehensive website was also developed by the HSTT EIS/OEIS team through coordination with the Atlantic Fleet Training and Testing team and the



Researchers from the Cascadia Research Collective approach a short-finned pilot whale in an effort to place a satellite tag on it as part of U.S. Pacific Fleet's marine mammal monitoring program. The range's passive acoustic monitoring system enables scientists to locate marine mammals and estimate their exposure to sonar, while satellite tags and photographs provide movement, habitat use and population information.



The final Environmental Impact Statement for the U.S. Navy F-35C West Coast Home Basing. The scope of Final EIS required expertise in a wide range of subject matters, including airfield operations, noise analysis, environmental planning and compliance, natural resources, and program management.

Lt. j.g. Johnny Michael

Chief of Naval Operations Energy and Environmental Readiness Division—giving the public access to supporting documents and an opportunity to comment during the NEPA process.

U.S. Navy F-35C West Coast Home Basing Environmental Planning Team, Norfolk, Virginia

With the FA-18 Hornet aircraft nearing the end of its service life, Congress has approved the replacement of the aircraft with the F-35C aircraft. The environmental planning team of the U.S. Navy F-35C West Coast Home Basing, led by the U.S. Fleet Forces Command (USFF), was brought together to study the impacts of bringing the new aircraft into service and the potential environmental impacts of facilities to support home basing 100 F-35C aircraft in the Pacific Fleet. Coordination among Navy stakeholder commands was necessary to identify operational requirements, shore infrastructure necessities, and potential environmental impacts in numerous resource areas. Due to congressional and local public interest in this transition, the team conducted media training and developed a public outreach/engagement strategy to ensure consistent responses to inquiries from the public, the media, and elected officials. The team achieved all of its

objectives to date and prepared a NEPA document which met all operational timelines. The arrival of the F-35C is expected in 2017.

Supplemental Environmental Impact Statement for the Introduction of P-8A Aircraft into U.S. Navy, Norfolk, Virginia

The new P-8A aircraft was approved by Congress as the replacement for the Navy's aging P-3 maritime patrol and surveillance aircraft. Since the release of the 2008 final EIS for this transition, the Navy has determined that two home basing locations, rather than three, for the P-8A squadrons would still meet current strategic operational objectives, but also provide potential cost savings.

The purpose of this Supplement EIS (SEIS) was to enhance the basing alternatives and analysis in the original 2008 EIS with additional information based on current conditions.

Coordination between USFF and additional Navy stakeholder commands was needed to successfully complete all requirements of the SEIS through the identification of all operational requirements and shore infrastructure needs, the analysis of all potential environmental impacts in 11 resource areas, and continuous outreach to



Lt. Brett Eckert, assigned to the Pro's Nest of Patrol Squadron (VP) 30, observes Royal Air Force squadron leaders Andy Bull and Mark Faulds as they participate in a flight simulator exercise for the P-8A Poseidon.

David Giorda

the Navy leadership and to the media. The P-8A SEIS Environmental Planning Team was able to meet the aggressive 17-month schedule with the final federal register publication of their NEPA document in June 2014. The revised basing strategy resulting from the SEIS will save an estimated \$100 million in one-time infrastructure and training simulator costs. Aircraft delivery is expected to begin in FY16 at NAS Whidbey Island.

Afloat

The Afloat awards recognize outstanding contributions to fleet readiness, increased morale, and efficient, economical use of resources to promote environmental protection at sea.

Littoral or Amphibious Warfare

LCS Crew 102

Stationed in San Diego, California, LCS Crew 102 is assigned to both USS Freedom (LCS 1) and USS Fort Worth (LCS 3). Each crew of 54 officers and Sailors is proud to execute mission tasking to meet warfare demands while maintaining a culture of environmental responsibility and sustainability. LCS Crew 102 had zero incidences of spill or inadvertent discharge of hazardous substances to the environment, inclusive of four refueling-at-sea evolutions, in-port defueling, and onload/offload of hazardous materials. Engineers operating the oil-water separator (OWS) system demonstrated a comprehensive technical understanding of the system and reduced generation of oily waste and corrected casualties. Through efficient engine use practices, LCS Crew 102 maintained station for 12 days of underway operations in April 2014 on a platform that averages refueling once every three to four days. Underway operations conducted during whale migration season and other periods resulted in zero occurrences of negative marine mammal interactions. LCS Crew 102's commitment to environmental excellence also is evident in community service projects where they have adopted and conducted cleanups of the Tidelands Park in Coronado, California.



Sailors assigned to Surface Warfare Detachment Four of the littoral combat ship USS Fort Worth Crew 102, prepare to board a naval training vessel as part of maritime interception operation training. *Katarzyna Kobiljak*

Surface Combatant Category

USS Dewey (DDG 105)

An Arleigh Burke-class guided-missile destroyer, USS Dewey is homeported in San Diego, California. Its crew of 300 officers and enlisted Sailors conducts sustained at-sea combat operations as part of Destroyer Squadron One and Carl Vinson Carrier Strike Group (CSG 1). In August 2014, the USS Dewey began a 10-month deployment that transitioned through both the 5th and 7th Fleet areas of responsibility. By modifying standard operating procedures to meet new challenges, and training watchstanders on local laws and regulations, USS Dewey had zero spills while offloading oily waste from holding tanks in port. In FY14, Dewey unloaded three million gallons of diesel fuel with zero spills or mishaps. As a credit to aggressive management of fuel and outstanding maintenance practices, USS Dewey reduced its fuel consumption by 105,000 gallons compared to the DDG class average, which saved over 2.3 million pounds of carbon dioxide from being released into the atmosphere. During three CSG 1 anti-submarine warfare exercises, USS Dewey completed reporting for over 180 hours of active sonar time via the web-based Sonar Positional Reporting System, which allowed the Naval Mine and Anti-Submarine Warfare Command to produce a thorough report on



Sailors aboard the guided-missile destroyer USS Dewey heave a line during a replenishment-at-sea with the Military Sealift Command fleet replenishment oiler USNS Joshua Humphreys (T-AO 188).

James Vazquez

how marine mammal encounters affect ships in a tactical environment.

Large Deck Combatant Category

USS Essex (LHD 2)

With 1,075 shipboard personnel, USS Essex started the year with the completion of a major maintenance overhaul in its homeport of San Diego, California, without any environmentally adverse incidents. USS Essex received a “green” grade with many assessments being above standards for the type commander (TYCOM) material inspection. Once in service, the ship transferred four million gallons of fuel during seven replenishments, and metered and transferred 500,000 gallons of sewage to barges or trucks during Seattle Seafair, all without incident. Through operations under the Hazardous Material Minimization Center, the crew saved approximately \$1.6 million through the reuse of excess hazardous materials and reducing the overall volume of hazardous materials



The Wasp-class amphibious assault ship USS Essex transits the Pacific Ocean.

Huey Younger, Jr.

ordered. Essex also efficiently processed 2.3 million pounds of solid waste during underway days in 2012-2014, and was even able to reduce the amount of space needed to store plastic waste by 30 to 1 through the use of shredders and four plastic waste processor units. Finally, the crew's own strong culture of environmental stewardship is demonstrated by the development of a unique in-port recycling program that resulted in a potential cost savings of \$50,000, as well as their regular management of the San Diego Main Street cleanup effort for NBSD.

Submarine Category

USS Tennessee (SSBN 734)

Homeported in Kings Bay, Georgia, the USS Tennessee has recently returned to service after a three year engineering refueling overhaul conducted in Portsmouth, Virginia. With a crew of 160 personnel, USS Tennessee conducted six strategic deterrent patrols and several subsequent upkeep periods. The ship was assessed as "Above Standards" during the supply management inspection by the TYCOM also received an "Above Standards" in hazardous materials management. Tennessee also received an "Above Standards" rating in May 2014 during the most recent Naval Safety Center survey. The crew has received over 1,500 man hours of environmental awareness training, which has resulted in individuals who strive daily to support sound environmental stewardship practices. These ideals have brought about a systematic plastics waste program and a "first in / first out" program, where all expiring material are utilized first. This reduces the volume of unnecessarily off-loaded materials at port. Finally the crew of USS Tennessee was proud to note the lack of reportable pollutant spills or violations of the Protective Measures Assessment Protocols.

All winners were recognized in a video teleconference ceremony by the CNO Admiral Jonathan Greenert for their efforts. Vice Admiral Philip H. Cullom, deputy chief of



The Ohio-class ballistic missile submarine USS Tennessee departs NAVSUBASE Kings Bay.
Ashley Hedrick

naval operations for fleet readiness and logistics and Rear Admiral Kevin R. Slates, director, chief of naval operations energy and environmental readiness division attended to congratulate the honorees as well. 📍

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Carderock Testing New Oil Boom Fouling Release Material

New Material Reduces Biofouling, Simplifies Cleaning

PERSONNEL FROM THE Naval Surface Warfare Center, Carderock Division (NSWCCD) are validating the use of an environmentally friendly non-stick coating in conjunction with in-water cleaning to reduce the biofouling of oil containment booms.

An oil containment boom is a floating physical barrier used around ships

boom is not weighed down by the fouling, which would reduce the boom's effectiveness as an oil spill containment barrier. Typically, the boom must be removed from the water and cleaned with a pressure washer.

To reduce manpower labor and time, NSWCCD personnel, with resources provided by the Navy Environmental

Sustainability Development to Integration (NESDI) program under project number 489, are investigating the use of a prototype oil containment boom manufactured with a commercially developed, non-toxic, biofouling release material. The material used in this oil boom prototype has been well demonstrated in civilian applications.

The U.S. Navy is the world's largest user of permanent oil boom.

and waterfront facilities to proactively contain oil and fuel spills. Permanently deployed oil booms are used extensively by the U.S. Navy around the world—in fact, the U.S. Navy is the world's largest user of permanent oil boom.

To maintain their effectiveness, booms must be periodically cleaned of marine biofouling such as barnacles and sea grass. This cleaning must be performed to ensure the



Boom segments as deployed prior to cleaning at Port Canaveral. Shown are Hank Loeb of Severn Marine Technologies (left) and Kody Lieberman, Florida Institute of Technology.

Abe Stephens

It has been shown to retard early stage accumulation of marine biofouling on netting for fish pens and security barriers, on the transducer faces of oceanographic instruments, and on acoustic streamers (towed arrays used for seismic surveys). This foul-release material has been similarly used to reduce marine biofouling and associated drag on autonomous ocean crossing gliders, a relatively new class of autonomous underwater vehicles.

On this NESDI-sponsored effort, oil boom prototype barrier segments were constructed by impregnating polyester fabric with a novel silicone foul-release polymer. This resulted in a highly resilient, durable material with a non-stick surface. The material's durability and flexibility makes it difficult for marine growth and barnacles to settle on and remain attached to the boom. In the long term, these material properties create a boom that can easily be cleaned by mechanical methods to a like-new condition. This cannot be achieved with currently-used stock boom, short of expending additional labor and harsh chemicals.

Because this foul-release oil boom prototype does not rely on biocides, it is nontoxic throughout its effective life cycle and disposal. At the end of its useful life, it can be buried or burned. With its ability to be cleaned so thoroughly that little if any bio-matter remains, it can also be safely recycled as filler material for other products.

NSWCCD personnel chose three sites for the demonstration and validation of the prototype boom:

1. Naval Magazine Indian Island on Puget Sound Washington
2. Naval Base Ventura County in Port Hueneme, California
3. Florida Institute of Technology/Center for Corrosion Biofouling Control (FIT/CCBC) in Port Canaveral, Florida

Beginning in April 2014, all three sites deployed oil boom prototype and stock test segments 10 to 12 feet in length along with smaller swatches of boom material samples.

Initial observations of deployed boom test segments during the first few months revealed that the foul-release-based booms shed marine biofouling more readily than the stock control booms during handling. Similarly, with ambient wave and wake action, there was less accumulation of marine growth observed on the treated prototype.

FIT/CCBC, being a hull-coating biofouling test site of record with Office of Naval Research, also fielded



Photo adhesion and shear force biofouling testing showed the prototype boom performed three to five times better than the stock boom.

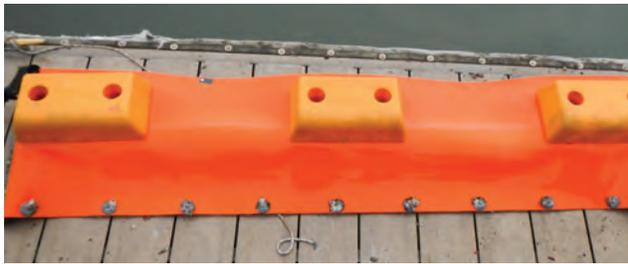
Pat Morrow

numerous small swatches or coupons for shear force biofouling adhesion measurements. These tests attempt to measure the force with which barnacles and other biofouling matter adhere to a surface. Results of this testing indicated that biofouling adherence was three to five times lower in the prototype boom.

The first cleaning tests were conducted at Port Canaveral after the prototype boom was in the water for nine months. This two-part effort started with a test to determine the reduction in cleaning time that could be achieved by using oil booms with foul-release coating.



Stock boom segment after cleaning.



Foul-release boom segment after cleaning.



Test coupons of stock and treated boom as shown before cleaning.

Kody Lieberman



Test coupons after cleaning. The prototype boom coupons are shown on the top row, second and fourth coupons from the left, and on the bottom row, third coupon from the left.

Kody Lieberman

In the second test, a portion of each test boom, both stock and foul-release prototype, underwent in-water cleaning using a pressure washer operating from a small skiff with the boom segments moored along a floating dock.

The out-of-water cleaning tests showed the time required to clean the foul-release based boom was reduced by 52 percent when compared to the stock boom of similar design. Additional testing further indicated that in-water cleaning is likely practical and has significant potential for labor savings on the order of 80 to 90 percent.

This is mainly because in-water cleaning eliminates much of the labor required to remove the boom from the water. In-water cleaning could further reduce the overall inventory of required oil boom, because any boom removed for cleaning must be immediately replaced with another boom.

Another significant result showed that the prototype boom belting displayed comparable damage resistance to the stock boom during pressure washing at nominal working pressures of 3,000 pounds per square inch. However, some minimal care was required in handling and cleaning to avoid damaging the foul-release-coated floats. In-water cleaning efforts demonstrated the practical advantage of reducing the wear and tear associated with handling and hauling the booms for out-of-water cleaning.

The ad hoc in-water cleaning tests at Port Canaveral demonstrated that the prototype boom remained clear of fouling better than existing booms, and further demonstrated that it is practical to remove an acceptable amount of fouling to maintain the proper performance of the prototype foul-release boom. However, fouling still occurs and periodic cleaning will be required.

More field testing is planned to develop additional methods for efficient in-water cleaning. The focus will continue to be on reducing environmental impact and determining whether more or less frequent cleaning is warranted with the use of these booms. The idea of more frequent cleanings would be to clean often and lightly before heavy and hard fouling becomes well established. The benefits of less frequent cleanings are lowered labor costs and less wear and tear from handling. With the foul-release material, the projection to date has been the ability to clean easier, faster, and less often.

The Basics About the NESDI Program

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

The NESDI program is the Navy's environmental shoreside (6.4) Research, Development, Test and Evaluation program. The program is sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division and managed by the Naval Facilities Engineering Command out of the Naval Facilities Engineering and Expeditionary Warfare Center in Port Hueneme, California. The program is the Navy's complement to the Department of Defense's Environmental Security Technology Certification Program which conducts demonstration and validation of technologies important to the tri-Services, U.S. Environmental Protection Agency and Department of Energy.

For more information, visit the NESDI program web site at www.nesdi.navy.mil or contact Ken Kaempffe, the NESDI Program Manager at 805-982-4893, DSN: 551-4893 or ken.kaempffe@navy.mil.

For a one-page summary of this project, visit the NESDI web site, select "Projects" then select the "Fact Sheet" link for project 489.



Initial observations of deployed boom test segments revealed that the foul-release-based booms shed marine biofouling more readily.

Two different types of untreated stock boom were tested alongside the foul-release boom. Unexpectedly, there was an observed improvement in the performance of the textured stock boom over the smooth stock boom. The reasons for this are being considered for further investigation.

More long-term study is needed regarding cleaning savings and material longevity before a more detailed estimate can be made of the effective return on investment. At present, this material offers significant improvement in performance for a cost premium.

It was found during the Florida cleaning trials that cleaning effectiveness could be improved through ergonomic alterations to the wand of the pressure washer as well as fixtures for securing the boom during cleaning. These and other lessons learned will be applied at the Navy sites on the west coast.

Upon completion of cleaning tests at the California and Washington locations, more conclusive performance information will be available. Thus far, from the combined results of in-water observations and the recent cleaning tests at Port Canaveral, the foul-release material performance is encouraging. ⚓

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