



PROJECT ID:  
599

# Pathways for Addressing Opportunistic Premise Plumbing Pathogens at Navy Installations



**Navy drinking water treatment facility with potable treated water storage tanks and reverse osmosis tanks.** (Photo Credit: Autumn Resto)

## OBJECTIVE

This project team is studying ways to reduce or eliminate Opportunistic Premise Plumbing Pathogens (OPPP) in drinking water at U.S. Navy facilities.

## PROBLEM STATEMENT

OPPPs are pathogens that are known to cause serious human infections such as legionella. The Navy medical community is seeing an increase in OPPP-related illnesses stemming from domestic water systems at Navy facilities. This may be due to the combined effects of conflicting policy requirements, water and energy conservation efforts, aging infrastructure, reduced system demands, low flows, limited disinfection residuals and combined Navy oversized potable and firefighting distribution systems.

## DESCRIPTION

The goal of this effort is to perform a “deep dive” into the conservation measures that are adversely affecting the quality of Navy drinking water.

Current Navy water system operation and maintenance plans, conservation methods, distribution systems, novel and current treatment technologies and methodologies as well as conflicting Navy, federal, state and local policies are being analyzed to offer potential solutions. A review of a broad range of operational and conservation issues that impact water quality—such as toilet flush volumes, water heater temperatures and combined drinking water/firefighting infrastructure are being made to determine the best course of action to address each, and how they negatively impact drinking water quality. Investigations will be made to determine key areas where water restrictions may need to be removed or reduced, which operations need optimizing, conflicting policies that should be restructured and areas where infrastructure can be modified and retrofitted.

Other efforts include document reviews, emerging technology research,



input and coordination with Navy public health and environmental subject matter experts, as well as evaluations of performance and effectiveness of current Navy water treatment methods and operations. Regular hydrant flushing, for example, has been prescribed to help remedy water age issues. Yet the costs of hydrant flushing can be as high as \$20,000 annually per installation and waste thousands of gallons in water. Areas of analysis will include other water main flushing technologies, point-of-use disinfection booster stations, recirculating pump stations to address water age, infrastructure upgrades, pipe cleaning methods, holding tanks and contact basins, surveys, databases, ozone disinfectors and small-scale thermal energy storage technologies that can utilize water heater tanks to offset energy usage. A review will discuss what municipalities, private industry and other nations have done to address these water quality issues. Once areas that need attention are identified, potential solutions and recommendations for next steps will be considered and addressed.

### RETURN ON INVESTMENT

Financial costs related to violations of the Safe Drinking Water Act (SDWA) can range up to \$32,500 per day for water treatment facilities. In addition, the costs of hydrant flushing can range, at a minimum, anywhere from \$5,000 to \$20,000 annually per installation. These costs include labor, equipment, thousands of gallons of wasted potable water, and any costs related to loss of mission operation.

According to a 2014 Centers for Disease Control study of emerging infectious diseases, the lifetime economic burden of 2014 Legionnaires' disease cases in the United States totals about \$835 million. This total includes an estimated \$21 million in productivity losses caused by absenteeism and a \$412 million loss in productivity caused by premature deaths.

A recent estimate of the direct medical costs imposed by domestically acquired Legionnaires' disease in 2014 included \$402 million in costs incurred as a result of hospitalizations and emergency department visits. One 2012 financial case study of a single Legionella outbreak in Edinburgh, UK, which infected 101 people and killed three, calculated the combined financial healthcare and work productivity loss at a cost of over \$2.5 million.

With a conservative estimation of the approximate 40 named major Department of Navy-operated U.S. military installations, Department of Defense (DoD) costs can add up to an average of \$250,000/year at a minimum. This could result in a potential return on investment of one year for the information gathered from this initial study. Moreover, with the collective U.S. domestic costs ranging in the hundreds of millions annually to treat five of the major waterborne diseases (giardiasis, cryptosporidiosis, Legionnaires' disease, otitis externa and nontuberculous mycobacterial infection) in drinking water systems, a major response is desperately needed. These five major waterborne diseases

are responsible for an estimated 432 million cases per year in the U.S. alone. Based on system flushing costs, potential prevention of Notices of Violation and system downtimes, the total return on investment of this project would be an estimated period of less than one year for one distribution system or installation.

### NAVY BENEFITS

These efforts aim to help determine the optimal balance of water and energy conservation measures that still allow for safe, sustainable and reliable drinking water both domestically and overseas. This will positively impact human health and will decrease or eliminate the risk of receiving an SDWA violation.

### TRANSITION DESCRIPTION

The team will provide guidance and recommendations in the form of an initial draft, interim and final report. These reports will include recommendations on ways to modify existing water system operation and maintenance plans, Unified Facilities Criteria, and governing standards and practices where applicable.

The project team will work with the NESDI program's Technology Development Working Group, Public Works Officers and installation environmental program managers to integrate recommendations at DoD installations.

### CONTACT

For more specific information about this project, contact the Principal Investigator at 805-982-3626.



## ABOUT THE NESDI PROGRAM

The Navy Environmental Sustainability Development to Integration (NESDI) program is the Navy's environmental research and development, demonstration and validation (6.4) program, sponsored by the Chief of Naval Operations, Energy and Environmental Readiness Division (OPNAV N45) and managed by the Naval Facilities Engineering Systems Command (NAVFAC) out of the Engineering and Expeditionary Warfare Center (EXWC) in Port Hueneme, CA.

The mission of the program is to provide solutions by demonstrating, validating and integrating innovative technologies, processes, materials, and filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Fleet readiness and lethality. 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 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.navfac.navy.mil/nesdi](http://www.navfac.navy.mil/nesdi) or contact Ken Kaempffe, the NESDI Program Manager at 805-982-4893, DSN: 551-4893 or [kenneth.c.kaempffe.civ@us.navy.mil](mailto:kenneth.c.kaempffe.civ@us.navy.mil).

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