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Evaluating Past and Future USCG Use of Ohmsett Test Facility

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N O T I C E

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16. Abstract (MAXIMUM 200 WORDS)

The U. S. Coast Guard (USCG) and the Bureau of Safety and Environmental Enforcement (BSEE), formerly the Minerals Management Service (MMS), have collaborated on many projects using Ohmsett, the Oil Spill Response Research and Renewable Energy Test Facility, that was previously known as a fully capitalized acronym, Ohmsett. This facility is located on the U.S. Naval Weapons Station Earle in Leonardo, New Jersey.

This report includes historical USCG utilization of Ohmsett and a description of the capabilities of Ohmsett to support the USCG, including testing capabilities, conference rooms for training, areas for set up, proximity to pier/water and other capabilities that have possible USCG applicability. It also presents ideas for alternative USCG uses of Ohmsett, including using the NWS Earle pier as a staging platform for other RDC projects.

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EXECUTIVE SUMMARY

The U. S. Coast Guard (USCG) and the Bureau of Safety and Environmental Enforcement (BSEE), formerly the Minerals Management Service (MMS), have collaborated on many projects using Ohmsett, the Oil Spill Response Research and Renewable Energy Test Facility, that was previously known as a fully capitalized acronym, Ohmsett. This facility is located on the U.S. Naval Weapons Station Earle in Leonardo, New Jersey.

This report includes historical USCG utilization of Ohmsett and a description of the capabilities of Ohmsett to support the USCG, including testing capabilities, conference rooms for training, areas for set up, proximity to pier/water and other capabilities that have possible USCG applicability. It also presents ideas for alternative USCG uses of Ohmsett.

The USCG has made extensive use of the Ohmsett facility, primarily for oil spill response research and training. The facility has additional potential for meetings and conferences. The NWS Earle pier also has potential use as a staging platform for other Research and Development Center (RDC) projects. Both RDC and the National Strike Force (NSF) will likely continue use of Ohmsett in the future. RDC use depends on its budget; so use may not be as frequent. NSF will likely continue training as Ohmsett is a unique facility for this effort.

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LIST OF ACRONYMS AND ABBREVIATIONS

BSEE	Bureau of Safety and Environmental Enforcement
BWI	Baltimore-Washington International
CBRN	Chemical Biological Radiological and Nuclear Defence
CGC	Coast Guard Cutter
CGHQ	USCG Headquarters
EPA	Environmental Protection Agency
FM	Frequency modulated
ft	Foot or feet
ICS	Incident Command System
JONSWAP	Joint North Sea Wave Project
km	Kilometer
lb(s)	Pound(s)
LISST	Laser In Situ Scattering and Transmissometry
m	Meter(s)
MMS	Minerals Management Service
MSL	Marine Safety Laboratory
NIMS	National Incident Management Systems
NSF	National Strike Force
NWS	Naval Weapons Station
Ohmsett	National Oil Spill Response Research and Renewable Energy Test Facility
OSRT	Oil Spill Response Technician
POPEIE	Probe for Oil Pollution Evidence in the Environment
PREP	Preparedness for Response Exercise Program
R&D	Research and Development
RDC	Research and Development Center
ROV	Remotely Operated Vehicle
SMART	Special Monitoring of Applied Response Technologies
SORS	Spilled Oil Recovery System
SUAS	Small Unmanned Aerial Systems
TTP	Tactics, techniques and Procedures
USCG	U.S. Coast Guard
USN	U.S. Navy
USV	Unmanned Surface Vehicle
UUV	Unmanned Underwater Vehicle
VOPS	Viscous Oil Pumping System
VOSS	Vessel of Opportunity Skimming System
WEC	Wave energy converter

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1 INTRODUCTION

1.1 Purpose

This report provides a comprehensive description of the use of Ohmsett, the Oil Spill Response Research and the Renewable Energy Test Facility, (that was previously known as a fully capitalized acronym, OHMSETT) by the U. S. Coast Guard (USCG) (both the Research and Development Center (RDC) and National Strike Force (NSF)) and assesses whether there may be other uses for Ohmsett besides oil spill response training and research.

1.2 Background

The Ohmsett facility (Figure 1) was constructed during the early 1970s by the U.S. Environmental Protection Agency (EPA) as a joint endeavor with the USCG. During the period 1974-1987, the facility was used extensively by the EPA, Minerals Management Service (MMS), USCG, U.S. Navy (USN), and Environment Canada to test a wide range of spill control equipment and systems including oil containment booms, oil skimmers, oil sorbents, dispersants, and in-situ burning techniques. As interest in oil spill response technology waned in the late 1980s, the testing at Ohmsett diminished such that EPA closed the facility in September 1988 and transferred the buildings and equipment to the USN.

Figure 1. Overview of Ohmsett facility.

In March 1989, the supertanker EXXON VALDEZ ran aground on Bligh Reef in Prince William Sound. The difficulties encountered during the subsequent cleanup effort underscored the need for continuing oil spill response technology development and the need for the Ohmsett testing capability. In April 1990, MMS initiated the restoration of Ohmsett by signing an agreement with the USN for use of the facility. Ohmsett

became operational again in July 1992. Today the facility is operated by the Bureau of Safety and Environmental Enforcement (BSEE), the successor agency to the MMS, as a government-owned, contractor-operated facility; and is available for testing and training on a reimbursable basis to government agencies, industry, and academia.

1.3 USCG Use of the Ohmsett Facility

The USCG has made extensive use of the facility during its entire history. Table 1 lists the USCG training and tests conducted from 1992-1999. Table 2 lists the RDC Ohmsett use 2000-present and Table 3 lists the NSF Ohmsett use 2000-present.

Table 1. USCG Ohmsett use 1992-1999.

Date	Summary of Effort
OCT-NOV 1993	Vessel of Opportunity Skimming System (VOSS) (5 Weeks)
APR-JUN 1996	Spilled Oil Recovery System (SORS) (8 Weeks)
APR 1997	Pumping Tests of Coast Guard Cutter (CGC) JUNIPER Spilled Oil Transfer System
NOV 1997	High Speed Skimmer Performance Tests
FEB 1998	Evaluation of the SORS on a JUNIPER Class vessel
APR 1998	Hazardous Materials Incident Response Training for First Responders
SEPT 1998	NSF Oil Spill Response Technician (OSRT) Training Course
SEPT- NOV 1998	Test and Evaluation of Four Fire Resistant Booms (9 Weeks)
APR 1999	NSF OSRT Training Course
SEPT 1999	Oil Spill Recovery Equipment Operator and Oil Lightering Training
NOV 1999	Testing of the USCG Viscous Oil Pumping System
NOV 1999	USCG VOSS Training

Table 2. RDC Ohmsett use 2000-present.

Date	Summary of Effort
JUN-OCT 2000	Innovative Response (Assorted Fast Water Containment and Skimmer Systems) (18 Weeks)
AUG 2001	Alterations to the USCG JBF DIP-600 High Speed Skimming System
JUN 2002	Probe for Oil Pollution Evidence in the Environment (POPEIE) Evaluation (automatic sample collection buoy designed for deployment from a ship, helicopter, or airplane for use by the USCG Marine Safety Laboratory (MSL))
APR 2003	Osprey Sampler (retrievable water surface oil-sampling device for use by the MSL)
AUG 2004	Desmi Terminator Skimmer Tests
FEB 2005	Heavy Oil Detection
JAN 2009	Evaluation of Sunken Oil Detection Equipment
OCT 2011	Sunken Oil Recovery
DEC 2013	Suspended Oil Detection
MAR 2015	Ice Management System Test

Table 3. NSF Ohmsett use 2000-present.

Date	Summary of Effort
SEPT 2000	Indoctrination Course and Half Hull
SEPT 2002	OSRT Training Course
SEPT 2004	OSRT Training Course
SEPT 2007	OSRT Training Course
MAR 2010	OSRT Class C School Training
MAR 2011	OSRT Class C School Training
MAY 2011	Class C School Training
JUN 2011	OSRT Class C School Training
MAR 2012	OSRT Class C School Training
JUL 2012	OSRT Class C School Training
SEPT 2012	Dual DOP Training Exercises
MAY 2013	OSRT Class C School Training
JUL 2013	OSRT Class C School Training
SEPT 2013	Oil recovery training and Special Monitoring of Applied Response Technologies (SMART) protocol demonstration
APR 2014	OSRT Class C School Training
AUG 2014	OSRT Class C School Training
APR 2015	OSRT Class C School Training
MAY 2016	OSRT Class C School Training
AUG 2016	OSRT Class C School Training

2 OHMSETT FACILITY AND CAPABILITIES

2.1 Testing Capabilities

Ohmsett is located at the Naval Weapons Station (NWS) Earle Waterfront facility in Leonardo, New Jersey. Ohmsett's above ground concrete test tank is one of the largest of its kind, measuring 667 feet (ft) (203 meters (m)) long by 65 ft (20 m) wide by 11 ft (3.35 m) high. The tank is filled to a depth of 8 ft (2.4 m) with 2.6 million gallons (~ 9.8 million liters) of saltwater.

The Ohmsett test tank allows testing of full-scale equipment. The tank's wave generator creates realistic sea environments, while state-of-the-art data collection and video systems record test results. The facility provides controlled, reproducible conditions, which have proven to be ideal for testing equipment, evaluating acquisition options, and validating research findings.

Government agencies, academia, and industry use Ohmsett as a research center to test oil spill containment/clean-up equipment and techniques, test new designs in response equipment, conduct training with actual oil spill response technologies, and test certain types of renewable energy systems. Features and capabilities common to oil spill response and renewable energy research and testing include:

- A main towing bridge capable of towing test equipment at speeds up to 6.0 knots.

- A wave generator capable of simulating regular waves up to 0.6 meters in height, as well as a simulated harbor chop/irregular waves of up to 0.8 meters, frequency modulated (FM) slides with selectable: slue rates, start and stop; Pierson-Moskowitz and Joint North Sea Wave Project (JONSWAP) spectra parameterized by wind speed and scale.
- A movable, wave-damping artificial beach.
- A control tower with a fully-computerized 32-channel data collection system as well as above- and below-water video.
- An electrolytic chlorinator to control biological activity.
- A vacuum bridge to clean the bottom of the tank.
- Staging and shop area for special fabrication.
- 15,000 pound (lb) forklift.
- A deck crane with 1500 lb working load and a bridge crane of 1000 lb capacity with 41-ft (12.5-m) extension. The deck crane is located at the north end on the deck to facilitate bring in equipment from the parking lot and one is mounted on the main bridge.

2.2 Oil Spill Response Testing

Real-world spill conditions are created in the test basin where equipment or remediation techniques are evaluated and translated to field use. The facility has been successfully used for testing and analyzing the practical effectiveness of oil spill response equipment such as booms, skimmers, sorbents, temporary storage devices, pumping systems, and remote sensing devices. Ohmsett continually adapts to support research and testing needs by developing applicable testing environments. Examples of these capabilities include in-situ burns for fire boom testing, dispersant-related evaluations, emulsion formation, and Arctic water testing.

Additional features and capabilities for oil spill response research and testing include:

- An auxiliary bridge oil recovery system to quantify skimmer recovery rates.
- An oil distribution and recovery system that can handle heavy, viscous oils and emulsions.
- Blending tanks with a water and oil distribution system to produce custom oil/water emulsions for testing.
- A filtration and oil/water separator system.
- Permanent and mobile storage tanks that can hold over 60,000 gallons (227,000 liters) of test fluids.
- On-site oil/water chemistry laboratory.

Sensors and instrumentation available for oil spill response testing and evaluation include:

- Surface thermal imaging.
- Wave height altimeters and capacitance probes.
- Pressure transducers.
- Acoustic oil slick thickness sensor.
- Acoustic Doppler velocimeter.
- In-situ fluorometry.
- Particle size distribution (Laser In-Situ Scattering and Transmissometry (LISST)).
- Load and strain gauges.
- Torquemeter.

Through a variety of mechanical, electrical, and chemical systems at Ohmsett, the following test parameters can be controlled or measured:

- Sea state (wave height, length, and period).
- Tow speed.
- Meteorological data.
- Water temperature and salinity.
- Volume of oil encountered and recovered by test equipment or protocol.
- Oil-water ratios.
- Physical characteristics of experimental oil.
- Behavior of treated oils.

2.2.1 Renewable Energy Testing

BSEE collaborates with research institutions and industry on testing wave and current energy systems at Ohmsett. The wave and towing test tank is available for Research and Development (R&D) and testing of large to full-scale equipment processes for ocean wave and current technologies.

Ohmsett capabilities that are specifically useful for renewable energy testing include the three movable bridges in the test tank that are programmable to 0.01 knot increments (up to 6.0 knots) to simulate ocean current flow. The robust tow bridges are able to accommodate the torque and forces of the largest current turbines and wave energy converter (WEC) equipment. The Control Tower is fully computerized and data from various sensors and video cameras are collected for synthesis and analysis. There is an on-site chemistry laboratory and a complete meteorological station for continuous weather measurements.

Wave-making capabilities useful for renewable energy testing include:

- Programmable amplitude, frequency, and wavelength.
- 1.9 ft (0.59 m) height ($H_{1/3}$ at 23 ft (7 m) wavelength).
- 2.7 ft (0.83 m) height ($H_{1/3}$ irregular waves).
- Wavelengths up to 98 ft (30 m).
- Wave damping beach system.

2.3 Conference Rooms for Training

Ohmsett provides a venue for government agencies and industry to train their personnel in the deployment and operation of oil spill equipment and systems. The training facility includes a 20-25 seat classroom with state-of-the-art audio-visual equipment. This room can be divided into two smaller classrooms if required.

2.4 Areas for Set-Up

A vast amount of indoor and outdoor work space is available to prepare and modify test equipment, including a high bay area garage space. Figure 2 shows the outdoor set-up space.

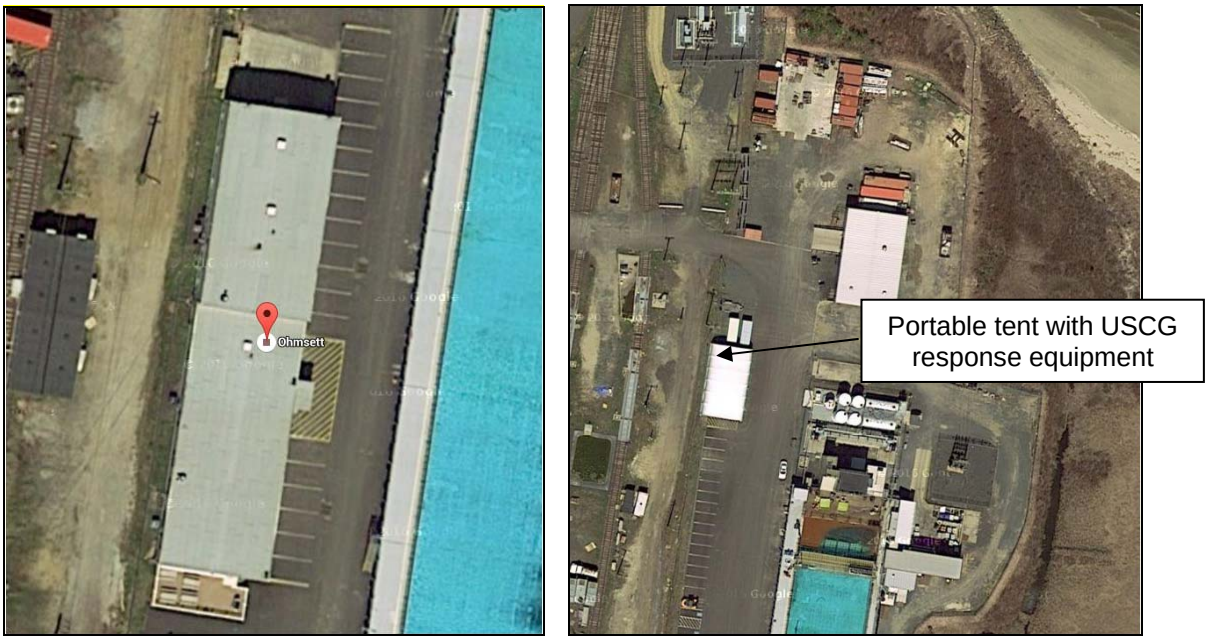

Figure 2. Ohmsett set-up spaces.

2.5 Proximity to Pier/Water

Ohmsett is located adjacent to the NWS Earle Waterfront facility's pier complex. This pier is one of the longest "finger piers" in the world. A two-mile (3 kilometer (km)) trestle connects to three finger piers. One mile from the shore the trestle branches off to Pier 1. See Section 3 for more information on the NWS facility.

3 NAVAL WEAPONS STATION EARLE

NWS Earle is a United States Navy base located approximately one hour south of New York City, in Monmouth County, New Jersey. There are two sites for NWS, Mainside and Waterfront (3).

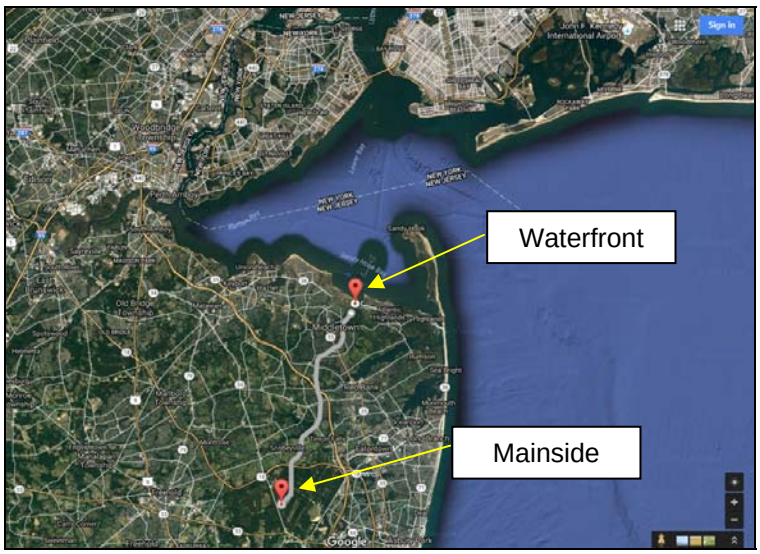

Figure 3. Location of Naval Weapons Station Earle.

The inland site (Mainside) is approximately a half-mile south of where the New Jersey State Highway 34 intersects Route 357 in Colts Neck (201 NJ-34, Colts Neck, NJ). Freehold is approximately 10 miles west and Asbury Park lies approximately 10 miles east. The entrance to the Waterfront site, home of Ohmsett (801 State Route 36, Leonardo, NJ), is off New Jersey State Highway 36 on Sandy Hook Bay on the border of the town Leonardo and Middletown Township.

3.1 Transportation

There are two ferry terminals in close proximity to NWS Earle waterfront, both with service to Wall Street in New York City. Neither ferry allows cars. The Belford Ferry terminal (10 Harbor Way, Belford, NJ) is approximately three miles from Ohmsett (4, left). The Sandy Hook Ferry terminal (35 Hartshorne Drive, Sandy Hook, NJ) is approximately eleven miles from Ohmsett (Figure , right) but only operates during the summer. Figure 5 shows the ferry schedules and fees.

The closest train station to Ohmsett is NJ Transit – North Jersey Coast Line's Middletown station (Railroad Ave and Church Street), about 4 miles from Ohmsett. The closest AMTRK is Metropark Station in Iselin, NJ (about 25 miles). Newark International Airport is about 35 miles away.

The FY17 government per diem rate for NWS Earle Waterfront/Ohmsett is $103 for lodging and $59 for meals year round.

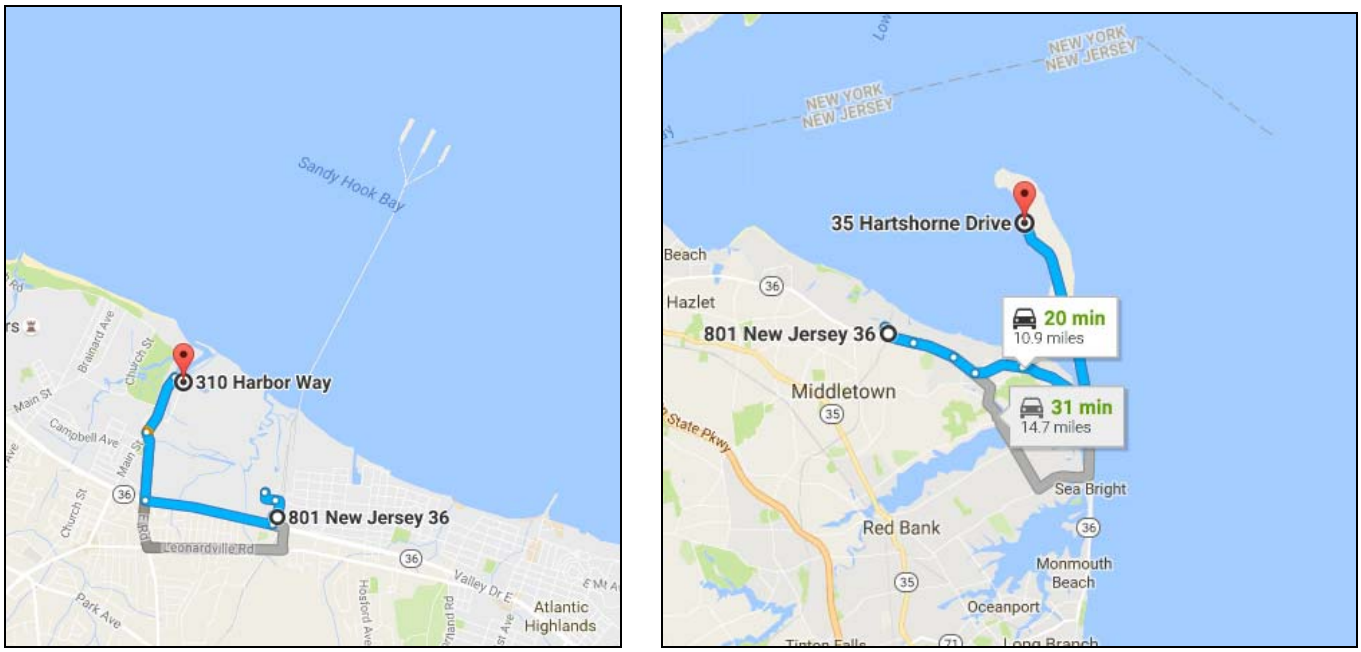

Figure 4. Locations of Belford and Station Sandy Hook ferry terminals.

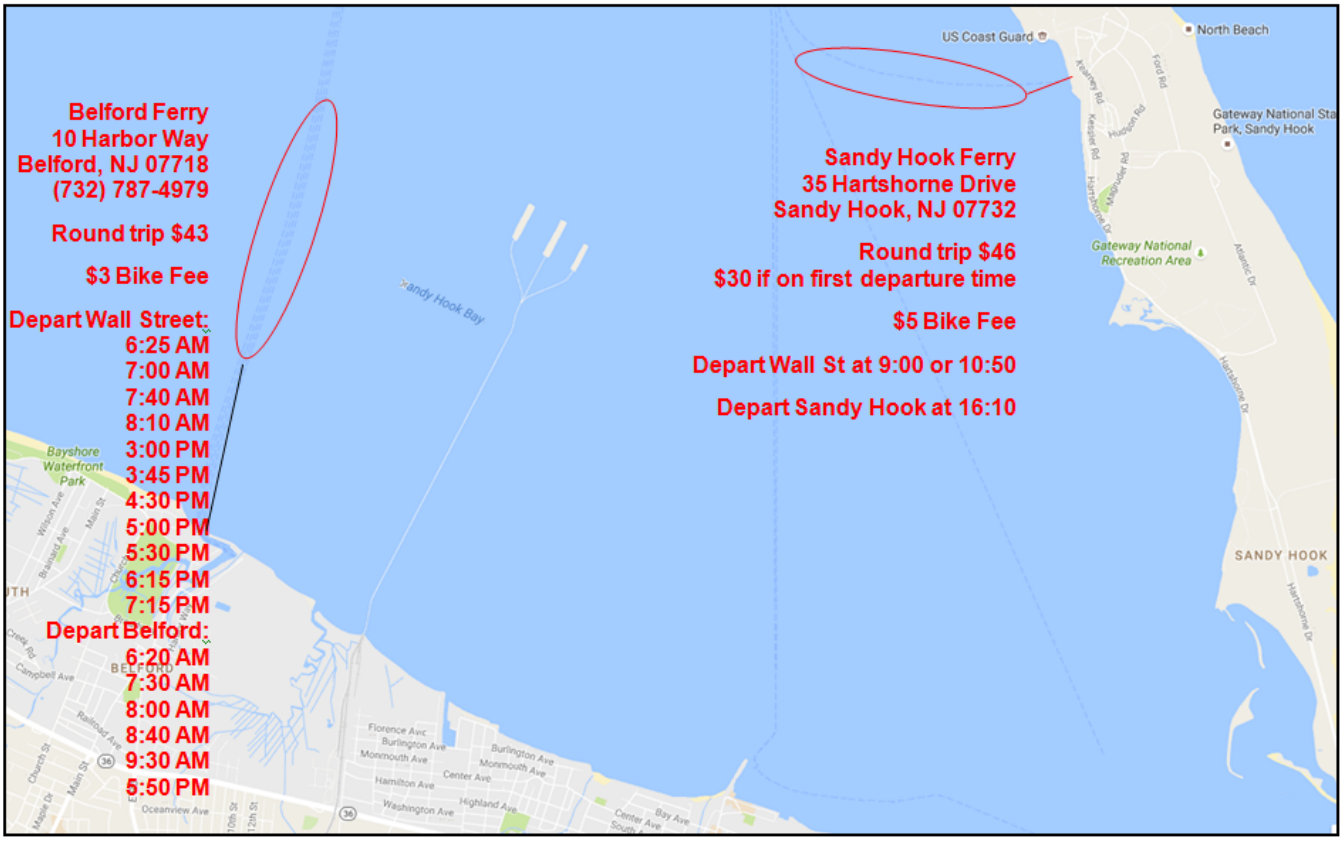

Figure 5. Ferry schedules and fees.

3.2 Proximity to USCG Units

3.2.1 USCG Research and Development Center

The drive from the RDC is approximately 184 miles (approximately 3.3 hours).

3.2.2 USCG Headquarters

The drive from USCG Headquarters (CGHQ) is approximately 220 miles with a duration of approximately 4 hours. For those traveling from other parts of the country, the drive from Baltimore-Washington International (BWI) airport is approximately 185 miles (approximately 3 hours).

3.2.3 Staten Island and New York City

Accessing Ohmsett from USCG Station New York (10 Search Lane, Staten Island, NY) and New York City airports can be done either by the ferries discussed above or by driving (~ 37 miles, ~ 50 minutes).

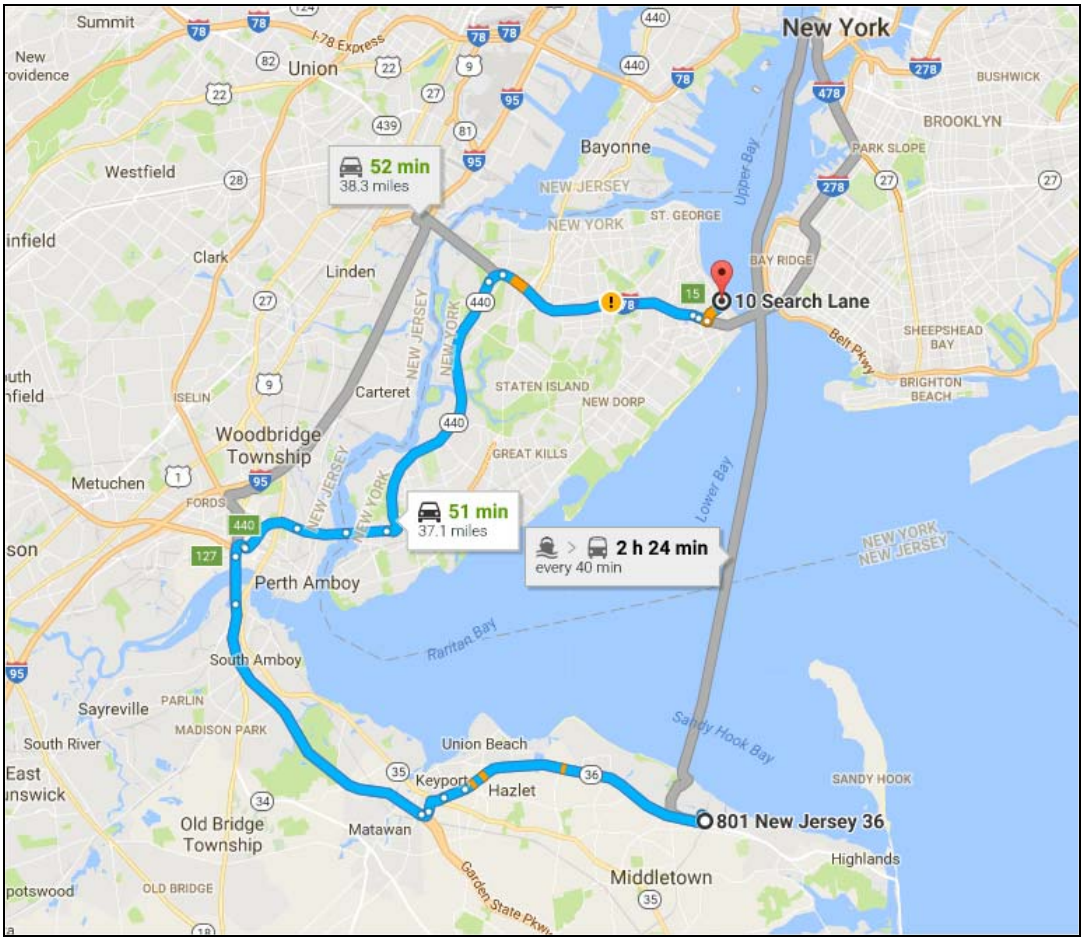

Figure 6. Driving from Staten Island to Ohmsett.

4 OTHER POTENTIAL USES BY USCG

4.1 RDC

Time was spent with each of the Branch Chiefs at RDC to discuss potential additional uses of Ohmsett. All were provided with information describing the location and capabilities of the Ohmsett facility as well as the surrounding area including the NWS Earle pier and local USCG units in the New York City area. The input received from these meetings includes:

- The Ohmsett facility is located at a convenient location so that both RDC and CGHQ personnel can easily travel without the need for flying. The meeting room facilities would be useful. RDC and BSEE have met there for planning and coordination meetings with participants driving in one morning, meeting for an afternoon and morning and then driving home (only a two-day effort). It would be a good place for meeting with CGHQ sponsors outside of the Washington, DC area.
- The close proximity to Stations Sandy Hook and New York and Sector New York may be useful in future demonstrations. Conducting a test near New York City may also help increase public awareness of RDC projects.

- The point at Sandy Hook was used in 2013 by the RDC to begin to evaluate alternatives to pyrotechnic distress signals. The use of the pier was considered; but the amount of lighting on the pier itself and the requirements for up to a six-mile distance in multiple directions with multiple background lighting combinations could not be met. Future work may include additional options as the RDC had to secure Park Service permission to use the sand dunes at Sandy Hook.
- No specific use of the tank was identified in the near term other than oil spill research. It is too small for some of the sensor and drift research being done at this time. In addition, tests that may cause personnel to come into contact with the water, which is considered hazardous, are not permitted. This would exclude tests for boarding team equipment.
- Ohmsett has proven to be flexible in doing fresh water research in small tanks; consideration could be given for larger fresh water tests. This is generally outside of BSEE concerns but may be useful for other organizations such as the CG and U.S. EPA.
- Some other future research may require a deeper tank. While many requirements in the past have extended down to 200 ft (61 m), a more nominal depth of a 50-ft (15-m) tank would be reasonable. This would probably also need the capability of filling with fresh water. The diameter would need to be at least 25 ft (7.6 m) in order to easily accommodate full-sized skimmers and underwater vehicles.
- The trestle and pier areas were of some interest:
    - Small Unmanned Aerial Systems (SUAS) could be launched from the pier and immediately be working without the need for a USCG patrol boat or contractor vessel to be deployed, regardless of the wave and current conditions. This location especially helps with the line-of-sight requirements, particularly since there are large airports nearby.
    - Other unmanned or remotely-operated systems that could potentially be tested using the pier include:
        - Unmanned Surface Vehicle (USV).
        - Unmanned Underwater Vehicle (UUV).
        - Remotely Operated Vehicle (ROV).
    - The long trestle arrangement might be useful for on the water sensor evaluation without needing small boats.

4.2 National Strike Force (NSF)

Representatives from the NSF provided the following list for use of Ohmsett and the local area in the future:

- Continued site for the CG Oil Spill Recovery Technique course that trains approximately 48 Coast Guard personnel per year.
- Viscous Oil Pumping System (VOPS) training and deployment:
    - Building off original work done here.
- Conduct PREP/VOSS deployments with USCGC KATHERINE WALKER (WLM 552) home ported in Bayonne, NJ, other CG District 1/District 5 cutters, and / or Other Government Agency (OGA) vessels to test equipment or train personnel.
- Classes for SMART Training, Tactics, and Procedures training, both for dispersant and in-situ burning.
- Conduct contaminated water diving/decon training with oil or HAZMAT, to develop Tactics, Techniques and Procedures (TTP) or test TTP.
- Conduct offshore CBRN response research/TTP development.

4.3 Other Capabilities That Have Possible USCG Applicability

- National Incident Management Systems (NIMS) IS-700 training.
- NIMS Incident Command Systems (ICS) IS-100 training.
- Confined space entry courses.
- Lightering training class is being developed.

5 SUMMARY

The USCG has made extensive use of the Ohmsett facility, primarily for oil spill response research and training in the past. Both RDC and NSF will likely continue use of Ohmsett in the future at the same general pace. The facility has additional potential for meetings and conferences. The NWS Earle pier also has potential use as a staging platform for other RDC projects.

6 REFERENCES

Internet information on NWS Earle: http://www.cnic.navy.mil/regions/cnrma/installations/nws_earle.html

Ohmsett Testing and Training Schedule (2010-Onward): http://Ohmsett.com/schedule.html

Summary of Activities Ohmsett (1993-2009): http://www.Ohmsett.com/activities.html.

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