Testimony to the U.S. Senate
Committee on Commerce, Science and Transportation
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Submitted by

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Hearing: "Five Years After Deepwater Horizon: Improvements and Challenges in Prevention and Response."

Chairman Thune, Ranking Member Nelson and distinguished members of the Committee, thank you for giving me the opportunity to appear before you today. My name is Nancy E. Kinner and I am a professor of Civil and Environmental Engineering at the University of New Hampshire. I am the UNH Co-Director of the Coastal Response Research Center (CRRC), a NOAA-funded center, and the Director of the Center for Spills in the Environment (CSE), a center that expands the scope of interaction to other governmental agencies, the private sector and NGOs.

1.0 The Coastal Response Research Center and The Center for Spills in the Environment

The mission of the two UNH Centers, CRRC and CSE, is to conduct and oversee research on spill response, assessment and restoration and make sure that research is transformed into practice. In addition, we serve as a hub for spill research and development (R&D), and facilitate collaboration among all stakeholders in the spill community including governmental agencies, NGOs, academia, and industry, both in the U.S. and globally. Since the Centers' inceptions in 2004, we have overseen 34 funded research projects, conducted 48 workshops, and currently manage five working groups on topics such as dispersants and dispersed oil, data management during environmental disasters, modeling and submerged oil response.

The Centers were started because NOAA and UNH, which is known for its strong programs in marine science and ocean and environmental engineering, knew that many R&D needs existed with respect to oil spill preparedness, response and restoration. Further, we realized that oil and chemical spills are always occurring and, that despite popular belief, there would continue to be major oil spills in the U.S. It may seem unusual that an oil spill center would be located in New Hampshire, a state that lacks any petroleum-based resources, but that fact makes sense when the goal is to have an independent and highly credible voice that can speak freely during a crisis and mediate difficult discussions among the diversity of stakeholders. The Centers have focused on R&D in a few key areas: dispersants and dispersed oil, toxic and sublethal effects of oil on organisms, Arctic spill response and restoration, human dimensions of spills, and environmental data management. As one example, the CRRC was asked to convene a meeting in May 2010, during the DWH, of a diverse group of renowned scientists to evaluate whether dispersants

should continue to be used. Fifty scientists, some of whom were diametrically opposed to dispersant use, met for two days to examine the data and state-of-the-science, regarding the potential impact of dispersant use on the environment. The overwhelming consensus of the group was that, while removing the oil from the environment using mechanical recovery is preferred, it was not always effective because of environmental conditions such as the wind and waves in the Gulf. Further, the scientists concluded that up to that point, use of dispersants and effects of dispersing oil into the water column had been generally less environmentally harmful than allowing that oil to migrate on the surface into the sensitive wetlands and nearshore coastal habitats.

In 2014, CRRC conducted a unique Forum on the campus of the University of New Hampshire on the 25th anniversary of the Exxon Valdez Oil Spill (EVOS) in Alaska and the 5th anniversary of the DWH. This forum brought together academicians, oil spill practitioners, industry representatives and federal and state agency personnel to discuss the lessons learned from EVOS and DWH that could help improve future oil spill response (e.g., the Arctic, pipelines and rail transport). Several initiatives came from the Forum which has set some new directions for CRRC/CSE.

- Expand the role of academic science in improving spill and environmental disaster response, assessment and restoration;
- Identify strategies and actions to improve governmental communication with the public and ensure journalists the information they need prior and during spills;
- Improve outreach to Congress on spill and environmental disaster science and response.

CRRC/CSE has begun to move forward with some of these new initiatives. CSE provided an initial briefing on oil spill response since the DWH for Senate staffers on April 21, 2015, sponsored by New Hampshire Senators Shaheen and Ayotte. In addition, in conjunction with Capitol Hill Ocean's Week 2015, we will host a forum with responders and journalists to discuss how to improve communication and provide information more effectively to the public.

2.0 Research Response Since DWH

Since the DWH, there has been a large influx of funds into oil spill R&D: most notably BP's $500 million over 10 years to the Gulf of Mexico Research Initiative (GoMRI), and the $500 million over 30 years given to the National Academy of Sciences for Gulf of Mexico and other Outer Continental Shelf R&D. Industry through the American Petroleum Institute (API), and other international petroleum associations (e.g., IOGP/IPIECA), has also funded a significant amount of new research. There are also some federal (e.g., BSEE) and state (e.g., Texas, California) R&D programs, though these tend to be funded at lower levels. This influx of funding for research has focused on a number of issues important to future oil spill response including:

- Short and Long Term Spill Impacts in the Gulf of Mexico as a Result of DWH;
- Studies of the Chemical and Physical Behavior of Oil Released in the Environment;
- Efficacy and Effectiveness of Various Response Actions;
- Public Health Impacts; and
- Social and Economic Impacts of Spills.

Gulf of Mexico Research Initiative

The Gulf of Mexico Research Initiative (GoMRI), one of the major new oil spill research institutions, was formed to investigate the impacts of the oil, dispersed oil, and dispersant on the ecosystems of the Gulf of Mexico and affected coastal states in a broad context of improving fundamental understanding of the dynamics of such events and their environmental stresses and public health implications. Another focus of GoMRI is developing improved spill mitigation, oil and gas detection, characterization and remediation technologies.

The ultimate goal of GoMRI will be to improve society's ability to understand, respond to and mitigate the impacts of petroleum pollution and related stressors of the marine and coastal ecosystems, with an emphasis on conditions found in the Gulf of Mexico. Knowledge accrued will be applied to restoration and to improving the long-term environmental health of the Gulf of Mexico. GoMRI has issued numerous RFPs for consortia and individual investigators.

National Academy of Sciences

As part of legal settlements associated with the DWH, the National Academy of Sciences (NAS) established a Gulf Research Program to fund and conduct activities to enhance oil system safety, human health, and environmental resources in the Gulf of Mexico and other U.S. outer continental shelf regions that support oil and gas production. The Program will work to enhance oil system safety and the protection of human health and the environment in the Gulf of Mexico and other U.S. outer continental shelf areas by seeking to improve understanding of the region's interconnecting human, environmental, and energy systems and fostering application of these insights to benefit Gulf communities, ecosystems, and the nation, safety, human health, and environmental resources. Given this context, the Program will address three interconnected goals:

- **Goal 1:** Foster innovative improvements to safety technologies, safety culture, and environmental protection systems associated with offshore oil and gas development;
- **Goal 2:** Improve understanding of the connections between human health and the environment to support the development of healthy and resilient Gulf communities; and
- **Goal 3:** Advance understanding of the Gulf of Mexico region as a dynamic system with complex, interconnecting human and environmental systems, functions, and processes to inform the protection and restoration of ecosystem services.

The Program will fund studies, projects, and other activities using three broad approaches specified in the legal settlements: research and development, education and training, and environmental monitoring.

ICCOPR

The Interagency Coordinating Committee on Oil Spill Research (ICCOPR) was created by Congress in the Oil Pollution Act of 1990 (OPA 90). ICCOPR is charged with two general responsibilities to: (1) prepare a comprehensive, coordinated federal oil pollution research and development plan; and (2) promote cooperation with industry, universities, research institutions, state governments, and other nations through information sharing, coordinated planning, and joint funding of projects. ICCOPR reports on its activities to Congress every two years. It is comprised of 15 federal independent agencies,

departments, and department components. The USCG chairs ICCOPR with NOAA, BSEE, and EPA rotating assignments as the vice-chair every two years.

ICCOPR is currently preparing, with the assistance of CRRC/CSE, an Oil Spill Research and Technology Plan (OSRTP) that will set the priorities for oil spill research for the next six years. The OSRTP will be completed in 2015.

Industry

In the wake of the DWH spill, the petroleum industry, API and IOGP/IPIECA, launched four Joint Industry Task Forces (JITFs) to critically assess capabilities and performance. Each JITF brought forth subject matter experts to identify best practices in offshore drilling operations and oil spill response and to share that knowledge across industry. The goal is to ensure environmental protection through enhanced safety.

The Oil Spill Preparedness and Response JITF is examining industry's ability to respond to a "Spill of National Significance (SONS)" or other large spills.

The program is developing guidance and planning documents, recommended practices, training and exercise guidelines, technology evaluations, and developing a database for research activities. As part of the overall research program, industry is developing communications/outreach and decision making tools. Topics include:

- Spill response planning;
- Oil sensing and tracking;
- Dispersants;
- In situ burning;
- Mechanical recovery
- Shoreline protection and
- Alternate response technologies.

3.0 Impediments to Transforming Research into Improved Response

The combined effort of all these programs has resulted in a significant body of information. It is difficult to remain current on all the papers being published related to oil spills. Each month, several new papers appear in journals and there are two to three major conferences each year solely dedicated to oil spill research. The question is, how much of this research will result in improvements to oil spill response? Unfortunately, the answer might be, not very much. There are several reasons for this.

A primary reason is that researchers and responders do not have much opportunity to interact and coordinate research. They usually do not attend the same meetings. Most researchers are not familiar with what occurs during a response: the pace at which decisions must be made and the types of trade-offs considered during a spill. Conversely, responders are often not familiar with the latest experimental techniques which scientists have at their disposal to assist in response decision-making.

Another significant problem is that it is very difficult to simulate the environment in a laboratory or small test tank or with mathematical modeling. For example, even though a solution of 200 ppm of dispersants can be created in water to test its toxicity on organisms, the findings may not be translated into what would happen in the field where concentrations of dispersants are likely to be at least 10 times lower. In addition, it is incredibly difficult to simulate the mixing that occurs at a deep well blowout where many gallons of oil and gas are billowing out of a pipe rapidly at very high pressure. Yet this is exactly what must be done to determine whether dispersants prevented oil from reaching the surface of the GOM during the DWH.

Finally scientific journals almost always publish papers that show effects: where the research shows that the experimental conditions resulted in a measurable change in some parameter. If no change is observed, a so-called "null" result, the paper will rarely be published even if that null result occurs many times. For example, if an experiment was conducted where oil was added to very cold seawater that contained naturally occurring microbes and the oil concentration did not change over time, the results would probably not be published. However, responders fighting an oil spill in the Arctic would want to know this information. You can see the implicit bias that might result when examining the scientific literature for possible response options that might improve spill response.

4.0 A Path Forward

So how can we effectively sort through the research that has been published since the DWH and the older, relevant research? First, we can bring responders and scientists together to develop research needs and design and conduct experiments to address those needs. One way we have done this at the Centers is to have responders and response scientists act as liaisons during the development of request for proposals (RFPs), selection of projects, design of experiments, and translation of results into practice. This approach was used very effectively in developing the Environmental Response Management Application (ERMA®) which was used as the Common Operating Picture (COP) during the DWH and provided the public easy access to information about the spill.

However, even if we start bringing responders and scientists together in this manner today, the results of the research would not be available for years. In the interim, we need to sort through the large amount of research published to determine if, and how, it can improve response. One example of how this might be done is a partnership between our Centers, NOAA and EPA. We have convened more than 70 scientists, representing a diversity of perspectives and expertise in the research and response communities, to read all of the applicable literature and determine the state-of-the-science of dispersants and dispersed oil in spill response especially as it applies to the Arctic. The scientists are asked to determine: 1) what is known; and 2) what is uncertain. Over 500 peer-reviewed papers and reports have been amassed in a database covering the period June 2008 to the present and this is been combined with an existing database of dispersant research from 1962 to 2008. The scientists have read the articles within their area of expertise and have been discussing whether each paper simulates the environment, has the necessary controls, and is statistically sound. What we have observed through our facilitated discussions is that a group of scientists can come to consensus when they focus on the details of the science. The results of the state-of-the-science discussions on dispersants and dispersed oil should be available later this year. I see this process as a way forward on many of the thorny issues of applying oil spill R&D to practice.

5.0 Summary

When oil is spilled, there is no single "silver bullet" response technology that provides a universal solution. Oil spills are bad, and cause very bad things to happen. The goal of response is to minimize, as much as possible, the damage. Hence, the challenge is to translate the results of oil spill research and development into better response.

In summary, there are many questions that must be addressed to improve response when oil is spilled, especially as we consider drilling in other outer-continental shelf regions and in the face of the energy renaissance in the U.S. We must take advantage of current and future investments in research, translating them into better response. I believe we can accomplish this by bringing responders and scientists together to determine what is known and what is uncertain with respect to response science. Those uncertainties can be used to identify research needs and design experiments whose results can be translated into improved response decision-making before, during and after spills.