WRITTEN TESTIMONY OF
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FOR

"FIVE YEARS AFTER DEEPWATER HORIZONS: IMPROVEMENTS AND CHALLENGES IN PREVENTION AND RESPONSE"

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Chairman Thune and Ranking Member Nelson and Members of the Committee:

Thank you for the invitation to participate in the hearing, "Five Years After the Deepwater Horizon: Improvements and Challenges in Prevention and Response." It's an honor to provide my observations and recommendations on future oil spill response, in particularly from "lessons learned" in the aftermath of the *Deepwater Horizon* (DWH) disaster. This statement reflects my personal professional views and does not represent those of my institution, the Woods Hole Oceanographic Institution.

For the record, I am a Senior Scientist in the Department of Marine Chemistry and Geochemistry at the Woods Hole Oceanographic Institution (WHOI) in Woods Hole, Mass., principally investigating marine pollution. I have published more than140 peer-reviewed scientific journal articles and several book chapters on the chemistry of oil, how it interacts with the natural environment, and related subjects. I have studied or am currently studying the aftermaths of oil spills that occurred in 1969, 1974, 1996, 2003, two in 2007, and also the 1989 *Exxon Valdez* spill. More recently, I have been involved the Galveston Bay, Texas, spill in March 2014, the Bangladesh spill in December 2014, and the Yellowstone River oil spill in January 2015.

For the past five years, I have focused considerable efforts on the *Deepwater Horizon* oil spill. I have visited the Gulf of Mexico more than twenty times, participated or led four open-water trips near the Macondo well and three overflights of the region, collected hundreds of oiled beach samples, published 16 peer-reviewed papers on DWH, consulted with government and response officials, provided countless interviews to the media and written several opinion pieces on the topic, including ones on the role of academic scientists in disaster response. In September 2010, I was a scientist working at the Unified Command in New Orleans, the official operating center responding to the DWH oil spill.

In my experience, the disaster's impact was enormously exacerbated because the Macondo well pipe ruptured 5000 feet deep—a depth never encountered before. There was little or no

experience in getting a such a rupture under control or tracking its consequences at those depths. This was aqua incognita to most industry and oil response officials.

But it was a familiar neighborhood for scientists at my institution, who had long conducted basic research in the deep sea and mustered their deep-submergence technology and expertise to help. In the heat of the disaster, I worked with WHOI scientists and engineers who had developed an instrument, an Isobaric Gas-tight Sampler (IGT) to sample and preserve fluids spewing from seafloor hydrothermal vents. We used an IGT to get a definitive sample of oil spewing right from the Macondo well. On the same mission, I worked with Sentry, a deep-diving autonomous underwater vehicle—used to find plumes from hydrothermal vents—to map a trail of hydrocarbons from the well flowing at depth through the Gulf of Mexico, something that had theorized but never seen before.

In this story lies two lessons learned from *Deepwater Horizon*: This nation's community of academic scientists represents an insufficiently tapped reservoir of expertise and assets that can be of great service—both *during* and *before* a disaster.

1) We should seize the opportunity to build on the DWH experience to improve the integration of academic scientific expertise in disaster planning and response.

2) Basic research paid off—in this case, in unanticipated ways. We should invest in baseline research to understand all facets of environments we want to drill in—before we drill, rather than after an oil spill. This increased knowledge will give us the capacity to recognize opportunities to prevent future damages and to know quickly, under crisis conditions, where and how to allocate assets to limit damage.

Integration of the academic science community

I flashback to the spring and summer of 2010 while oil was flowing unstoppably from the seafloor 5,000 feet deep in the Gulf. U.S. officials and industry had an impressive track record responding to the hundreds of oil spills that occurred every year. But those spills, unlike *Deepwater Horizon*, were in shallow waters. Government officials had little need to keep abreast of such things as oceanographic robots equipped to operate at great depths or biological communities living on the deep seafloor. They were generally unaware of singular and valuable assets and technology that academia had available.

Academic scientists, on the other hand, had little incentive and few avenues to add their expertise. These were two cultures that infrequently met and were unaware of one another's perspectives.

In September 2010, I was asked to join the Unified Command to serve as a liaison between federal officials and the academic community. I saw that some federal officials were bitter toward my colleagues and me, and much of it was justified. They thought we did not appreciate their efforts and successes and that we were naïve about their shorter-term responsibilities to control the disaster. They remarked that academics did not understand that occasionally our high-

handed comments to the press forced the officials to respond and took precious time away from them performing their urgent mission.

The unprecedented *Deepwater Horizon* disaster created an unprecedented intersection of stakeholders. A silver lining to the DWH disaster is that it compelled previously disparate cultures to introduce themselves and join forces.

One piece of evidence for this came just a few weeks ago in a single email. It was sent by one of the lead federal officials responsible for responding to oil spills after an inquiry from one of my academic colleagues. It was sent the day after the April 1 explosion of a Mexican oil-processing rig in the Gulf of Mexico that killed four people and created a slick, informing the recipients what happened, what was known, and the chances of oil reaching U.S. waters.

It was the recipient list that made it a milestone event. The email was sent not only to .govs and .mils, but .edus. So not just to employees in government agencies, but also to several scientists from academic institutions who have been conducting research in the Gulf of Mexico. I would wager that the federal official who sent the recent email and her predecessors had written similar emails, faxes, and teletypes about past oil spills, small or large, without including academic researchers. Now the government official is sending the same information she gives to her own people to a host of academic scientists—not a watered-down version, or even worse, a carefully worded message to "stay away."

Before *Deepwater Horizon*, there were few meetings for much interaction among the federal, academic, and industry stakeholders and media to cover the results. The annual meeting of the new Gulf of Mexico Research Initiative (GOMRI), funded after DWH, has now provided a forum for them to meet, exchange ideas, share data, and begin collaborations.

I have participating in another project that is forging key relationships between agency responders and academic experts: the "Science Partnerships Enabling Rapid Response" (SPERR) project, coordinated by the Center for Ocean Solutions and ChangeLabs at Stanford University. Academic scientists and government decision-makers from agencies such as NOAA, EPA, Coast Guard and USGS involved in this project have a common goal: to understand the obstacles to effective scientist-responder collaborations that emerged during Deepwater Horizon and co-design a solution to bridge the cultural divide and build trust across those communities.

Over the last year, the SPERR project has explored the tensions that arose around motivations and incentives within academic research institutions and government response agencies, and their inability to collaborate before and during large oil spills. The project team and partners have since crafted a solution that we believe will powerfully address these tensions and catalyze the agency and academic partnerships and resource sharing pathways that are imperative for improving oil spill response in the future.

The proposed solution, called the Science Action Network, will be a network of academic and professional scientists that are linked to regional government planning and response bodies—such as Regional Response Teams—to coordinate and streamline scientific input for decision-

making. In the proposed Network, Regional Academic Liaisons in each of the ten response regions would ensure academic expertise is leveraged from universities, and government bodies such as NOAA and the Coast Guard have streamlined access to relevant science before and during disasters.

As we glean lessons learned from *Deepwater Horizon*, there is strong consensus among agencies and academia alike: improved integration of science and scientific expertise into disaster planning and response is essential. In order for a scaled, national solution like the Science Action Network to be implemented, funding is needed for formalized coordinator positions, such as the Regional Academic Liaisons, and Network operation. We must institutionalize the communication and collaboration demonstrated by the email I cited, so that the next time a spill occurs, we can effectively leverage our unparalleled scientific expertise to improve decision-making and, ultimately, minimize spill impacts on human and ecological communities. The challenge of integrating scientific expertise into decision-making is not unique to oil spills and the investment in formalized solutions like the Science Action Network will pay off in the short term across all types of large disasters.

I've already seen beneficial changes:

• When I was researching some mysterious oil sheens near the DWH site in 2012, BP provided me with satellite overflight data and other information. With BP's help, we were able to grab invaluable samples that eventually showed that the oil was not from a leak at the repaired Macondo well, but a trickle of oil that leaking from the wreckage of the toppled rig.

• In March 2014, the *Kirby* barge released 168,000 gallons of fuel oil in Galveston Bay, Texas. I immediately dispatched a team from my lab to collect samples. After several exchanges with NOAA officials, my team was granted badges and easy access to study this location. This contrasts starkly with an experience I had in 2007 when I was trying to collect samples in San Francisco Bay following the *Cosco Busan* oil spill. Gaining access to field samples was challenging, and often I was not permitted access to oiled locations, limiting my capacity to provide valuable insights into that spill.

• In December 2014, I heard that there was a devastating release of a very heavy, viscous oil along the coast of Bangladesh. With a keen interest in the behavior of these types of oils, I offered my services and willingness to help NOAA personnel who was sent to assist. I was sent a sample of the oil and was able to prepare a report on the behavior of the spilled oil, which was forwarded to the Bangladeshis.

• In January 2015, there was a pipeline break in the Yellowstone River in Montana that released Bakken crude oil. The use and transport of Bakken crude oils continues to increase, but little is know about how they biodegrade, so I emailed NOAA personnel on how I could access samples. Thru a NOAA intermediate, I was introduced to the lead EPA on-scene coordinator. With assistance and guidance, he introduced me to the spiller who shared samples with me. I was then able to provide a report on the fate of the oil to the spiller within two months.

Last Thursday, I was a guest lecturer in Commander Gregory Hall's marine pollution class at the United States Coast Guard Academy in New London, Conn. I could have presented some new scientific results on DWH on how sunlight broke down the oil, how much oil is on the seafloor, or that some oiled samples we find on the beaches of the Gulf are not from the Deepwater Horizon, but my lesson for these future Coast Guard officers—who will be on the frontline of lines of future oil spills—is that they will have to interact with numerous stakeholders who have different interests. What I have learned, and others have observed, is that the best outcomes occurred when members of academia and the oil spill response community had pre-existing relationships. I encouraged these future officers to get to know those they may work with during a crisis. It may sound trite, but a cup of coffee and an exchange of emails may save miles of coastlines from oiling.

Wise pre-emptive research

I could give you numerous examples—from Woods Hole Oceanographic Institution alone—where investments in basic research paid unanticipated dividends in assessing the DWH disaster. WHOI and other academic institutions were "preadapted" to respond to the spill. Preadaptation' is a term borrowed from evolutionary biology. It refers to natural selection turning an existing structure to a novel use when the right conditions develop. In an analogous manner, our culture of scientific inquiry meant that knowledge applicable to the oil spill response already existed and could be applied to a new use.

But my suggestion is not a blanket call for more investment in research because it often turns out to be useful and applicable. More specifically, I recommend more investment in collecting baseline information about environments we intend to drill in.

The DWH disaster exposed how little we knew about fundamental physical, chemical, and biological conditions and processes that exist in the Gulf of Mexico. In an area full of oil rigs, where a spill was a good bet (if not inevitable), we had not conducted extensive, long-term research that would have captured what the Gulf was like before it was dosed with oil. We lacked baseline knowledge about preexisting conditions, making it extremely hard to assess damages afterward.

And although after-the-fact assessment studies will teach us lessons, in some ways it is like providing knowledge to firefighters and insurance adjusters after the fire. Another approach is to focus research on learning what we can about how individual ecosystems operate—because they all operate differently—*before* we invest in constructing oil rigs in them.

Let us learn from the Gulf before we look to drilling in the Arctic. The Arctic is a unique ecosystem that we know very little about. It is also far more unpredictable, remote, harsh than the Gulf, with far less infrastructure nearby to combat spills.

With knowledge and predictability about their operating environment, oil spill responders will have the ability to plan more effective responses and be prepared with necessary equipment. In other words, what to do and what is needed and where—in much the way, for example, that

firefighters have surveyed how tall the buildings are in their city are and have mapped their city's streets, so that they can take the fastest routes, bringing trucks with ladders of sufficient heights.

Oil spills are inevitable. This is a pay-me-now-or-pay-me-later situation in which up-front investments now can save lives, property, and money later.

I appreciate the opportunity to testify and am prepared to respond to any questions from Members of the Committee.