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HEARING ON
RESEARCH AND TECHNOLOGY NEEDS FOR OIL SPILL RECOVERY

BEFORE THE
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

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Thank you, Chairman Baird and Members of the Committee, for the opportunity to testify on the Department of Commerce's National Oceanic and Atmospheric Administration's (NOAA's) role in the response to the Deepwater Horizon oil spill and NOAA's role in oil spill research and development.

My name is Doug Helton and I am the Incident Operations Coordinator for the Emergency Response Division in NOAA's Office of Response and Restoration (OR&R). I appreciate the opportunity to discuss the critical roles NOAA serves during oil spills and the importance of our contributions to protect and restore the resources, communities, and economies affected by this tragic event. Before I move on to discuss NOAA's efforts, I would first like to express my condolences to the families of the 11 people who lost their lives in the explosion and sinking of the Deepwater Horizon platform.

NOAA's mission is to understand and predict changes in the Earth's environment and conserve and manage coastal and marine resources to meet our Nation's economic, social, and environmental needs. NOAA is also a natural resource trustee and is one of the federal agencies responsible for protecting, assessing, and restoring the public's coastal natural resources when they are impacted by oil spills, hazardous substance releases, and impacts from vessel groundings on corals and seagrass beds. As such, the entire agency is deeply concerned about the immediate and long-term environmental, economic, and social impacts to the Gulf Coast and the Nation as a whole from this spill. NOAA is fully mobilized and working tirelessly to lessen impacts on the Gulf Coast and will continue to do so until the spill is controlled, oil is cleaned up, natural resource injuries are assessed, and restoration is complete.

My testimony today will discuss NOAA's role in the Deepwater Horizon response and natural resource damage assessment process associated with the Deepwater Horizon oil spill, for which BP is a responsible party; NOAA's role in oil spill research; and opportunities to strengthen the Federal response to future events through research and development.

NOAA'S ROLES DURING OIL SPILLS

NOAA has three critical roles mandated by the Oil Pollution Act of 1990 and the National Contingency Plan:

1. During the emergency response, NOAA serves as a conduit for scientific information to the Federal On-Scene Coordinator. NOAA provides trajectory predictions for spilled oil, conducts overflight observations of oil on water, identifies highly valued or sensitive environmental areas, and conducts shoreline surveys to determine clean-up priorities.
2. As a natural resource trustee, NOAA conducts a joint Natural Resource Damage Assessment (NRDA) with co-trustees to assess and restore natural resources injured by the oil spill. NRDA also assesses the lost uses of those resources, such as recreational fishing, canoeing, and swimming, with the goal of implementing restoration projects to address these injuries.
3. Finally, NOAA represents the Department of Commerce in spill response decision-making activities through the National Response Team.

Response

The U.S. Coast Guard (USCG) is the Federal On-Scene Coordinator and has the primary responsibility for managing coastal oil spill response and clean-up activities in the coastal zone. During an oil spill, NOAA's Scientific Support Coordinators deliver technical and scientific support to the USCG. NOAA's Scientific Support Coordinators are located around the country in USCG Districts, ready to respond around the clock to any emergencies involving the release of oil or hazardous substances into the oceans or atmosphere. Currently, NOAA has all of its Scientific Support Coordinators located throughout the country working on the Deepwater Horizon oil spill.

With over twenty years of experience and using state-of-the-art technology, NOAA continues to serve the Nation by providing its expertise and a suite of products and services critical for making science-based decisions. Examples include trajectory forecasts on the movement and behavior of spilled oil, overflight observations, spot weather forecasts, emergency coastal survey and charting capabilities, aerial and satellite imagery, and real-time coastal ocean observation data. Federal, state, and local entities look to NOAA for assistance, experience, local perspective, and scientific knowledge. NOAA's Office of Response and Restoration (OR&R) was called upon for scientific support 200 times in 2009.

Natural Resource Damage Assessment

Stewardship of the Nation's natural resources is shared among several federal agencies, states, and tribal trustees. NOAA, acting on behalf of the Secretary of Commerce, is the lead federal trustee for many of the Nation's coastal and marine resources, and is authorized by the Oil Pollution Act of 1990 (OPA) to recover damages on behalf of the public for injuries to trust resources resulting from an oil spill. OPA encourages compensation in the form of restoration of the injured resources, and appropriate compensation is determined through the NRDA process.

Since the enactment of OPA, NOAA, together with other federal, state, and tribal co-trustees have recovered approximately $500 million worth for restoration of natural resources injured by oil, hazardous substances and vessel groundings.

National Response Team

The National Oil and Hazardous Substances Pollution Contingency Plan, more commonly called the National Contingency Plan, is the federal government's blueprint for responding to both oil spills and hazardous substance releases. The purpose of the National Contingency Plan is to develop a national response capability and promote overall coordination among the hierarchy of responders and contingency plans. NOAA represents the Department of Commerce on the National Response Team and works closely with regional response teams and local area committees to develop policies on dispersant use, best clean-up practices and communications, and to ensure access to science-related resources, data, and expertise.

NOAA'S RESPONSE AND DAMAGE ASSESSMENT EFFORTS

NOAA's experts have been assisting with the response to the Deepwater Horizon oil spill from the beginning, providing coordinated scientific services when and where they are needed most.

At 2:24am (central time) on April 21, 2010, NOAA's OR&R was notified by the USCG of an explosion and fire on the Mobile Offshore Drilling Unit Deepwater Horizon, approximately 50 miles southeast of the Mississippi Delta. The explosion occurred at approximately 10:00pm on April 20, 2010. Two hours, 17 minutes after notification by the USCG, NOAA provided our first spill forecast predictions to the Unified Command in Robert, Louisiana. NOAA's National Weather Service Weather Forecast Office in Slidell, LA received the first request for weather support information from the USCG at 9:10am on April, 21, 2010 via telephone. The first graphical weather forecast was sent at 10:59am to the USCG District Eight Command Center in New Orleans.

Support from NOAA has not stopped since those first requests for information by the USCG. Over the past 7 weeks, NOAA has provided scientific support, both on-scene and through our headquarters and regional offices. NOAA's support includes twice daily trajectories of the spilled oil, weather data to support short and long range forecasts, and hourly localized 'spot' forecasts to determine the use of weather dependent mitigation techniques such as oil burns and chemical dispersant applications. We develop custom navigation products and updated charts to help keep mariners out of oil areas. NOAA uses satellite imagery and real-time observational data on the tides and currents to predict and verify oil spill location and movement. To ensure the safety of fishermen and consumer seafood safety, NOAA scientists are in the spill area taking water and seafood samples. In addition, NOAA's marine animal health experts are providing expertise and assistance with stranded sea turtles and marine mammals.

To facilitate on-the-ground understanding of the spill's impacts, NOAA is awarding grants for rapid response projects to monitor the impacts of the oil spill on Louisiana's coastal marshes and fishery species through the Sea Grant Program. To support the local communities as they deal with the economic, social, and environmental impacts of the spill, the Gulf Coast Sea Grant

Programs are hosting a series of open forums across the Gulf where citizens have the opportunity to interact with industry, government, and university representatives. NOAA-organized volunteer beach clean-ups to remove debris from state beaches are helping to facilitate the cleanup of oil along the shoreline.

With multiple agencies supporting a diverse array of research projects in response to the Deepwater Horizon oil spill in the Gulf of Mexico, it is important to coordinate research activities to ensure the best use of limited resources. NOAA's Gulf Coast Sea Grant Programs are developing a web site to serve as a central database listing ongoing research activities and identifying funding opportunities for oil-spill related research, whether conducted by government, academic, or privately-supported scientists. The website's intent is to provide a single, comprehensive view of research activities in the Gulf that are being undertaken in connection with the Deepwater Horizon oil spill and to foster coordination of these efforts.

At the onset of this oil spill, NOAA quickly mobilized staff from its Damage Assessment Remediation and Restoration Program to begin coordinating with federal and state co-trustees and the responsible parties to collect a variety of data that are critical to help inform the NRDA. NOAA is coordinating the NRDA effort with the Department of the Interior (another federal co-trustee), as well as co-trustees in five states and representatives for at least one responsible party, BP.

While it is still too early in the process to know what the full scope of the damage assessment will be, NOAA and co-trustees continue to collect data in the Gulf and across the five states. This data will be used to determine what natural resources have been injured and what human uses have been lost due to the spill. Several technical working groups comprising NOAA, federal and state co-trustees, and representatives from one responsible party (BP) are gathering existing scientific information and developing and implementing baseline (pre-spill) and post-impact field studies for multiple resource categories. Hundreds of miles of coastal shoreline were surveyed by air and samples were taken to determine baseline levels prior to the oil hitting land, to identify where the oil has made landfall to support clean-up activities. Resources being assessed include fish and shellfish, bottom-dwelling plant and animal life, birds, marine mammals, turtles, and sensitive habitats such as wetlands, submerged aquatic vegetation or seagrasses, beaches, mudflats, bottom sediments, deep and shallow corals, chemosynthetic organisms, and the water column. Some of these resources may be included within National Estuarine Research Reserves and National Marine Sanctuaries. In addition, NOAA and co-trustee field teams are determining how human uses, including cultural uses, and natural resource services are being impacted.

Needless to say, for both the response and the NRDA, offices throughout NOAA are mobilized and hundreds of NOAA personnel are dedicating themselves to assist with this unprecedented effort.

OPPORTUNITIES TO STRENGTHEN FEDERAL RESPONSE THROUGH RESEARCH AND DEVELOPMENT

When passed in 1990, OPA envisioned a robust oil spill research and development program coordinated by the Interagency Coordinating Committee (ICC) on Oil Pollution Research. OPA recognized the need for research and created the ICC to coordinate and direct a dedicated program on oil pollution research, technology development, and demonstration among industry, universities, research institutions and federal agencies, state governments and other nations, if appropriate. To date, funding has been provided through various state and federal agencies and industry for oil pollution research. While coordinated interagency research activities are occurring, important research questions remain.

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Achievement of the comprehensive and collaborative research and development program envisioned by OPA can only increase the effectiveness of our Nation's oil spill response and restoration capabilities. While existing research has resulted in advancement of some research technologies, more must be done to strengthen our Nation's response capabilities. A renewed commitment of the ICC to focus on the most pressing research needs — particularly deepwater releases and releases in cold/icy waters — is one place to start. The Administration is committed to this effort.

NOAA'S OIL SPILL RESEARCH EFFORTS

Strong science is critical to effective decision-making to minimize the economic impacts and mitigate the effects of oil spills on coastal and marine resources and associated communities.

OPA grants NOAA the authority to carry out research and development. NOAA's most significant effort in oil spill research was in 2004-2007 through a partnership with the University of New Hampshire's Coastal Response Research Center. Research at the Coastal Response Research Center focused on spill preparedness, response, assessment, and implementation of optimum oil recovery strategies. The partnership brought together the resources of a research-oriented university and the field expertise of NOAA's OR&R. In addition, through the Coastal Response Research Center, NOAA worked with partners to address other pressing research areas including the behavior of submerged oil, human dimensions of spills, assessment and restoration of ecosystem services, environmental tradeoffs, integrated modeling, and methods associated with in-situ burning approaches in coastal marshes to minimize further injury to resources. Other NOAA partners have supported more limited spill response research using NOAA funds, including the Cooperative Institute for Coastal and Estuarine Environmental Technology at the University of New Hampshire, and some Sea Grant partners. For example, Louisiana Sea Grant funded a research project to study the effectiveness of oil remediation techniques in a brackish intertidal marsh after Hurricane Katrina.

ACTIVITIES TO IMPROVE FUTURE RESPONSE AND RESOURCE ASSESSMENT EFFORTS

The Deepwater Horizon oil spill is a grave reminder that spills of national significance can occur despite the many safeguards and improvements that have been put into place since the passage of OPA. Although the best option is to prevent oil spills, the risk of oil spills remains a concern given the offshore and onshore oil infrastructure, pipes, and vessels that move huge volumes of oil through our waterways. If a spill does occur, responders must be equipped with the

appropriate tools and information. An effective response, based on solid science and smart decision-making reduces environmental and socioeconomic impacts, as well as clean-up costs. Research and development and technological innovation by the public or private sector in the following areas would greatly enhance the tools and technologies available in the event of a spill.

- ***Oil Fate and Behavior from Deepwater Releases***
  Our ability to know where the oil is located is limited by what we can see and detect. As the Deepwater Horizon oil spill is demonstrating, there is a need to understand how oil behaves and disperses within the water column when released at deep depths. The emerging advancement in modeling three dimensionally can greatly enhance response operations and mitigation efficacy. NOAA's surface trajectory models predict where the oil on the surface is going based upon wind, currents, and other processes, and visual overflights validate where it is now. NOAA is currently employing facets of deep water oil spill models that were developed in part from the findings of the MMS DeepSpill Joint Industry Research Project done in 1999-2000 with international participation. However, we still understand little about the movement of oil deep in the ocean or the movement of dispersed oil that is suspended in the water column. The enhancement of three dimensional models will improve our ability to predict the movement of oil at depth and allow us to direct precious resources to validate the model's trajectory. Currently, NOAA is working to implement FY 2010 funds to enhance three dimensional models.

- ***Technology for Oil Detection in the Water Column and on the Seafloor***
  Research on new technologies for rapid and accurate detection of oil in deep water and plumes in the mid-water is needed. This would include the development of technologies to enhance our understanding of the fate and transport of oil, and to better understand the effects of oil on mid-water and deep water benthic habitat. There also appears to be some utility in applying existing technologies in a new and unique way to reach these same goals. For example, in limited research applications, modern multibeam echo sounders have been able to detect oil in the water column and on the seafloor. In addition, sensors on autonomous underwater vehicles and gliders are capable of detecting the presence of oil and gas in the water column. Whether provided by new technologies, or through re-examining the capabilities of current technologies, highly accurate information on the precise location of spilled oil would be of significant benefit to a spill response, such as Deepwater Horizon oil spill. Timely understanding of the precise location of the spilled oil would allow responders to position their activities and better utilize limited resources to maximize our contributions to protect and restore the resources, communities, and economies affected by these tragic events.

- ***Surface Observations and Trajectory Models***
  Real-time data on currents, tides, and winds as well as sustained observations of physical and chemical parameters of the whole water column are important in driving the models that inform the trajectory forecast for the spilled oil. As the Integrated Ocean Observing System generates more data from technological advances like high frequency radar, the prediction of oil location can be improved by pulling these observations into trajectory models in real-time. Through the collaborative efforts of the U.S. Integrated Ocean Observing System (IOOS), two of the three radars along the northern Gulf of Mexico

coast were quickly re-established and made operational and now all three are delivering surface current data. Because we cannot predict where a spill will occur, data delivery from high frequency radars is envisioned to be part of a seamless national system.

Data collected by space-based synthetic aperture radar can be used to produce high resolution images of the Earth's lands and oceans and can also be used in all types of weather, as it can "see through" clouds and darkness. Current use of NOAA-generated experimental products suggest that data from space-based synthetic aperture radar can assist in detecting and refining the areal extent of oil, which would provide valuable information to help determine where response efforts and resources should be deployed.

Current hydrographic surveys carry out sustained observations of the whole water column in the Gulf of Mexico, Florida Bay, Florida Keys, and will be extended if the oil or dispersant spread through the Strait of Florida and into the Gulf Stream. These surveys, along with satellite observations and numerical models, allow monitoring of currents and features responsible for the transport of oil and dispersant. A sustained observing system for this region would allow NOAA to provide predictive information about how the spill may impact the East Coast of the United States.

- ***Long-Term Effects on Species and Habitats***
  Spilled oil can remain in the sediments along the shoreline and in wetlands and other environments for years. More than 20 years later, there are still toxic levels of sub-surface oil in Prince William Sound from the Exxon Valdez spill. Research is needed to improve our understanding of the long-term effects of oil on sensitive and economically important species and habitats. Continued research is also needed to determine the effects of oil and dispersants that are suspended in the water column on mid-water and pelagic species, as well as research on the effects of oil on deep water corals, chemosynthetic communities (animal communities living in the deep sea on dissolved gases and benthic habitats) and benthic habitats. Important interagency studies are currently underway which will provide valuable information on the sensitivity and/or resilience of these deepwater communities and can inform response actions.

- ***Data Management Tools for Decision Making***
  The key to effective emergency response is efficiently integrating current science, information technology, and real-time observational data into response decision-making. NOAA has developed the Emergency Response Management Application (ERMA), a web-based information management application, to facilitate preparedness, response, and restoration decision-making for oil spills and for other coastal hazards. ERMA integrates real-time observations (e.g., NOAA National Buoy Data Center data, weather data, shoreline data, vessel traffic information, etc.) with archived data sources (e.g., NOAA's National Oceanographic Data Center's historical data) in an easy to use, Google-based format to aid in evaluating resources at risk, visualizing oil trajectories, and planning rapid tactical response operations, injury assessment and habitat restoration. Having access to retrospective data is critical to bring value to real-time observational data being collected.

NOAA is currently using certain components of the Gulf of Mexico ERMA for the Deepwater Horizon oil spill response to help manage the common operational picture for all command posts. While still under development, when the Gulf of Mexico ERMA is fully operational it will provide a more dynamic and automated tool allowing for greater access, and provide more layers of data and high resolution photography. ERMAs allow users to navigate through different layers of information to reveal actual data and magnify areas of geographic interest – ultimately improving decision-making. For example, ERMA could provide a picture of diverse shoreline development (e.g., industry, residential, protected habitats, tourist/ recreational use), information on routine shipments of oil and chemicals through the Gulf, and the proximity of wildlife management areas and conservation easements. Currently, ERMA is fully operational in the U.S. Caribbean and New England.

- ***Natural Resource Protection Tools***
  Environmental Sensitivity Index (ESI) database and map products provide information that helps reduce the environmental, economic, and social impacts from oil and hazardous substance spills. ESI maps include information on biological resources (such as birds, shellfish beds, and endangered species), sensitive shorelines (such as marshes, tidal flats, and marine sanctuaries), and human-use resources (such as public beaches, parks, and drinking water intakes). ESI maps are one tool that spill responders can use to identify priority areas to protect from the spreading oil, develop cleanup strategies to minimize impacts to the environment and coastal communities, and reduce overall cleanup costs. NOAA's goal is to update ESI maps approximately every 10 years to ensure responders have up-to-date information.

- ***Research to Improve Tools for Assessment and Restoration***
  Current techniques to assess and restore injured natural resources need to be constantly updated and refined. As our understanding of complex ecosystems evolves, so should our modeling tools and restoration techniques. For example, currently, site-specific protocols for assessing injuries to unique, high-value habitats such as those found in the Arctic are needed. In addition, research and tools to better assess and quantify natural resource services — such as water filtration and capture, flood protection, carbon sequestration, recreation, and education — across a range of habitat types can help ensure the public is fully compensated and the environment fully restored.

- ***Air Quality Impacts***
  In addition to its marine responsibilities, NOAA is also responsible for predicting the air quality impacts from oil and hazardous substance spills. The characteristics of pollution released from large areas of burning oil and the widespread evaporation of oil are significantly different from routine air quality/atmospheric dispersion scenarios. Research and development of improved tools to estimate the characteristics of compounds entering the atmosphere, and integration of those tools with NOAA's existing atmospheric modeling capabilities, would significantly improve NOAA's ability to predict smoke and chemical concentrations in the atmosphere resulting from such incidents.

- ***Oil in Arctic Environments***
  Continued acceleration of sea-ice decline in the Arctic Ocean as a consequence of global warming may lead to increased Arctic maritime transportation and energy exploration that in turn may increase the potential of oil spills in the Arctic. Recent studies, such as the Arctic Monitoring and Assessment Programme's Oil and Gas Assessment, indicate that we currently lack the information to determine how oil will behave in icy environments or when it sinks below the surface. We also lack a basic understanding of the current environmental conditions, which is important for conducting injury assessments and developing restoration strategies. Research is needed to better understand the challenges of spill response in Arctic waters and the most effective tools and techniques to utilize in such environments.

- ***Human Dimensions***
  Research is needed on how to incorporate impacted communities into the preparedness and response processes to help to address the human dimensions of spills, including social issues, community effects, risk communication methods, and valuation of natural resources. Transparency and communications can be improved to share information with impacted communities on how and why decisions are made, and the breadth of response and NRDA activities that have been and will be undertaken for the Deepwater Horizon oil spill.

CONCLUSION

As this Committee is well aware, research takes time. A major research cruise can take a year to plan. A model can take years to develop and validate. A report can take months to get right. The Deepwater Horizon oil spill is causing harm that will impact coastal environments for years to come. Applying the latest science and continued research and development efforts in the public and private sectors can improve our response decisions, thereby reducing injury to our Nation's economy and environment.

I would like to assure you that we will not relent in our efforts to protect the livelihoods of affected Gulf Coast residents and mitigate the environmental impacts of this spill. In the wake of such an event, we are reminded of the fragility of our coastal ecosystems and the dependence of coastal economies on the health and prosperity of our seas. Thank you for allowing me to testify on NOAA's response and damage assessment efforts and areas for future research. I am happy to answer any questions you may have.