WRITTEN STATEMENT BY
LAURA K. FURGIONE

ACTING ASSISTANT ADMINISTRATOR FOR WEATHER SERVICES AND
ACTING DIRECTOR, NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

ON
PREPARING FOR OFFSHORE DRILLING IN THE ARCTIC:
LESSONS LEARNED FROM THE FIRST SEASON

FIELD HEARING BEFORE THE
COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION
UNITED STATES SENATE

October 11, 2012
Anchorage, AK

Chairman Rockefeller, Ranking Member Hutchison, Senator Begich, and distinguished members of the Committee, thank you for the opportunity to submit testimony on preparations for, and lessons learned from, the first season of drilling in the Arctic. My name is Laura Furgione, Acting Assistant Administrator for Weather Services of the National Oceanic and Atmospheric Administration (NOAA). This year in the Arctic we have witnessed the lowest sea ice extent on record, 18 percent below the previous minimum in 2007 and 49% below the 1979 to 2000 average. Shifts in ocean ecosystems are evident from the Aleutian Islands to Barrow, Alaska and across the Arctic Ocean, due to a combination of Arctic warming, natural variability, and sensitivity to changing sea ice conditions. As sea ice retreats, the Arctic waters become more accessible, creating cascading needs for scientific information and emergency response planning.

As the maritime community anticipates a future open Arctic trade route, and as the energy industry anticipates and prepares for years of oil and gas exploration in the Chukchi and Beaufort Seas, this hearing puts a well-deserved spotlight on emerging Arctic opportunities and challenges, as well as the Federal Government's role in helping the United States (U.S.) to safely and sustainably manage the use of its Arctic resources. One of NOAA's missions is gathering and disseminating environmental information for situational awareness, economic decision-making, and public safety. We are receiving more requests for services such as detailed Arctic weather forecasts and severe storm warnings, better short- and long-term sea ice forecasts, and more comprehensive and up-to-date nautical charts. NOAA also stands ready to deliver on its other core science and stewardship roles, such as providing baseline data for fisheries management and protected species and ecosystems, understanding how oil behaves in frigid waters, and assisting with emergency response.

Federal agencies with Arctic responsibilities must work together to maximize effectiveness and continue to generate the sound science necessary for upholding these responsibilities. Dr. Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere, told U.S. Coast Guard (USCG) Academy Cadets this past April, "Nowhere is the need for partnerships, stewardship, and leadership seen more keenly than in the Arctic." In my testimony, I will describe NOAA's contributions to a unified Federal government approach that supports safe and environmentally sustainable economic activity in the Arctic, including oil and gas exploration.

NOAA'S ARCTIC VISION AND STRATEGY

After listening to what Arctic stakeholders said they needed via various means, including public comment, Alaska/regional meetings with stakeholders, and conversations with sister agencies on their Arctic requirements, in 2011 NOAA developed a comprehensive Arctic strategy that integrates and aligns our numerous and diverse capabilities within the broader context of our Nation's Arctic policies and research goals. NOAA's Arctic Vision and Strategy[1] has six priority goals to directly support the efforts of our local, state, Federal, and international partners and stakeholders. NOAA has since organized its Arctic efforts around these goals:

1. Forecast Sea Ice
2. Strengthen Foundational Science to Understand and Detect Arctic Climate and Ecosystem Changes
3. Improve Weather and Water Forecasts and Warnings
4. Enhance International and National Partnerships
5. Improve Stewardship and Management of Ocean and Coastal Resources in the Arctic
6. Advance Resilient and Healthy Arctic Communities and Economies

These goals were selected because they represent areas where NOAA can address and provide leadership on urgent and timely issues that meet two key criteria: providing the information, knowledge, and policies to meet NOAA mandates and stewardship responsibilities and providing the information, knowledge, and services to enable others to live and operate safely in the Arctic. A strategic approach to leveraging our strengths and those of other Federal agencies with Arctic missions is essential for the United States to take advantage of emerging economic opportunities there without causing irreparable harm to this fragile region.

NOAA'S ARCTIC TOOLS AND PRODUCTS

Within NOAA's existing capacity for Arctic action, we have had some successes in implementing our strategic goals, particularly those relating directly to improving stewardship on management of coastal resources and advancing communities and economies, such as marine transportation and oil and gas exploration. Additionally, NOAA has been working with its Federal partners through the National Ocean Council to

[1] http://www.arctic.noaa.gov/docs/arctic_strat_2010.pdf

implement actions to improve Arctic environmental response management and sea ice forecasting, enhance Arctic communications systems, and advance Arctic mapping and charting.

Weather and Sea Ice Forecasting

NOAA delivers public, marine, and aviation weather forecast services to protect life and property, enhance the economy and fulfill U.S. obligations under international treaties for the safety and security of marine transportation, oil and gas exploration, and tourism activities, and to protect northern and western Alaska coastal communities from storm surge and other hazards. Major stakeholders and partners, including the USCG and the State of Alaska's Division of Homeland Security and Emergency Management, require more accurate weather and water information for planning and decision making to protect lives, property, and manage the region's many resources. For example, we learned during Hurricane Irene that it takes seven hours to evacuate Connecticut's coastal residents. By contrast, it takes 24 daylight hours to evacuate the villages along Alaska's west coast where hurricane-strength storms are becoming more frequent, impressing the need for more accurate and advanced notice regarding potential hazards. Since road systems are not viable transportation options in Alaska, Arctic populations rely heavily on aviation and marine weather for safe transportation and access to goods and services.

Weather prediction in the Arctic is generally not of the same accuracy, resolution (temporal and spatial), and reliability as similar products over the lower 48 states and mid-latitudes. The Arctic region has very little of the information infrastructure needed to provide weather forecast and warning services of a caliber comparable to the mid-latitudes. A primary reason for this discrepancy is the relative scarcity of field observations to support meteorological and oceanographic modeling and environmental observations and studies supporting weather and ice forecasts. Existing observations are highly limited in both geographic scope and frequency. The Arctic region also presents unique numerical modeling challenges with respect to the dynamic coupled interaction of the ocean, sea ice, and atmospheric processes both in near- and long-term prediction scales. For example, there is inadequate real-time meteorological data in U.S. Arctic waters to support accurate forecasting of ocean storms, which have the potential to threaten marine transportation, offshore oil and gas operations, and the Arctic coastal communities.

Sea ice formation in the Arctic Ocean is a complicated process related to many environmental factors, including: winds, temperatures, and radiation that vary over time; surface and sub-surface ocean temperatures, water salinity, ocean currents; and antecedent ice conditions. Despite these complexities, there are techniques that can be used to formulate some objective sea ice freeze-up guidance with varying degrees of uncertainty. NOAA employs many methods to forecast the development and movement of sea ice in the Arctic, including analog, dynamic sea ice models, and statistical methods. Considerable uncertainties in long-term sea ice forecasting and a rapidly changing baseline in the Arctic make it difficult to provide a precise date for the timing of sea ice freeze-up in the open water or in the many communities along Alaska's coastline.

Accordingly, NOAA uses a probabilistic approach when possible, and delivers information in simpler terms (ranges of most probable dates) for the public. NOAA maintains strong relationships with its customers and stakeholders, providing briefings and outlook information to support tactical and strategic operational decision-making for the Arctic. In addition, NOAA partners with the U.S. Navy and USCG to operate the National Ice Center in Suitland, Maryland, which delivers global scale operational analyses and forecasts of sea ice conditions to a broad constituency of national and international users. NOAA's sea ice operations in Alaska and Maryland collaborate to provide daily products serving the U.S. Arctic five days a week. NOAA, along with the National Aeronautics and Space Administration and the National Science Foundation, also supports the National Snow and Ice Data Center within the Cooperative Institute for Research in Environmental Sciences at the University of Colorado, where a vast array of Arctic data are collated, managed, and made available to both academic and public users. NOAA has been implementing an ongoing expansion of the U.S. Climate Reference Network in Alaska with an aim to continue reducing the uncertainty in temperature and precipitation trends, which is critical to the accurate characterization of climate variability and change.

Currently, NOAA uses *in situ,* airborne, and satellite technologies to inform the meteorological and oceanographic datasets that generate forecasts in the Arctic. NOAA's international partners also contribute meteorological information to these datasets. However, to improve local and global forecasts in this region, new *in situ* and airborne technologies would be needed to enhance forecast coverage in the Arctic. Science and technology will need to be leveraged based on advanced numerical models, including being able to depict and convey ranges of uncertainty in the predictions. Improved Earth system models will include coupling of atmosphere, ocean, land, and ice at local, regional, and global scales. Improving forecasts of sea ice, on all but the shortest time periods, requires parallel improvement in general weather forecasts, especially wind forecasts as wind speed and direction are key drivers of ice dynamics at this scale driving the requirement for increased wind observations.

Satellites

In data-sparse areas like Alaska, polar-satellite data are critical to weather forecasting, an essential component of aviation safety. Light aircraft aviation is a $400 million a year industry in Alaska, and since many Alaskan communities are not accessible by roads, residents often rely on aircraft as a primary mode of transportation. Furthermore, since geostationary satellite coverage is not available in large areas of the Arctic, NOAA's Search and Rescue beacon program relies heavily on polar-orbiting satellites to receive signals from distressed mariners and aircraft personnel. Although we experienced funding instability in FY 2011, with the support from Congress in FY 2012 ($924.0 million for polar orbiting satellites), NOAA has made significant progress, gained momentum, and established a foundation to move the Joint Polar Satellite System (JPSS) program forward. NOAA could still face a data gap beginning in 2016 in the U.S. civilian polar orbit if the Suomi NPP mission were to cease operations at the end of its projected life in 2016 before JPSS-1 becomes fully operational. Data from NOAA's polar orbiting

satellite are critical in real-time forecasting and warning of events such as rapid sea ice formation and storms carrying hurricane force winds that are major hazards for life, property, and economic activities in the Arctic. This critical piece of national infrastructure will be instrumental at a time when Arctic development is expected to ramp up to protect U.S. assets in this region. NOAA is doing everything it can to minimize the potential data gap.

Marine Transportation

NOAA recognizes both the value and the challenge of improving the marine transportation system in Arctic waters. Currently, Alaska has limited geospatial infrastructure; sparse tide and current measurements and predictions; obsolete shoreline and hydrographic data; and poor nautical charts. Most Arctic waters that have been charted were surveyed with obsolete technology, some dating back to the 19th century, before the region was part of the United States. In addition, the large scales of most of the charts are not detailed enough to adequately support coastal navigation. As a result, confidence in the Arctic region's nautical charts is low.

NOAA policy places a high priority on updating nautical charts needed by the ever-increasing number of commercial shippers, tankers, passenger vessels, and fishing fleets transiting the Alaskan coastline. NOAA's Arctic Nautical Charting Plan, issued in June 2011, provides a strategy for additions and improvements to nautical chart coverage in U.S. Arctic waters and describes the activities necessary to produce and maintain charts suitable for safe navigation. The plan identified 17,000 miles of Alaskan coastline, and 240,000 square nautical miles of navigationally significant waters in need of new or updated surveying. Since 2007, NOAA has acquired approximately 2,950 square nautical miles of hydrographic data with modern survey methods (multibeam sonar) in the U.S. Arctic. In 2011, NOAA completed surveys in Kotzebue Sound, Kuskokwim River, and the Krenitzin Islands. In addition to updating existing charts, NOAA created a new chart of Kotzebue Sound.

In order to leverage NOAA's resources, NOAA is building on both public and private sector partnerships, domestically and internationally, to find complementary sources of data that strengthen our knowledge of the Arctic environment and improve science-based decision making. For example, NOAA signed an innovative data sharing MOA with oil companies doing work in the Arctic and has a growing relationship with USCG aimed at most effectively utilizing bathymetric data collected by USCG ships in the Arctic.

NOAA has expanded efforts to foster international collaboration on hydrographic surveying, nautical charting, and other mapping activities through our role as U.S. representative to the International Hydrographic Organization. In this capacity, we worked to establish an Arctic Regional Hydrographic Commission with Denmark, Canada, Norway, and Russia to facilitate coordination and data exchange in the region.

U.S. collaboration with Canada has resulted in several years of an effective partnership to conduct joint seafloor mapping missions of the Arctic extended continental shelf (ECS). Per criteria set forth in Article 76 of the Law of the Sea Convention to define ECS and in

preparation for determining and submitting limits of the U.S. ECS in the Arctic, NOAA and the U.S. Geological Survey worked with Canada to acquire hydrographic and geological data using the USCG Cutter *Healy* and the Canadian icebreaker *Louis St. Laurent*. As of September 2012, the U.S. ECS project has mapped 106,710 square nautical miles of offshore seafloor bathymetry in the Arctic Ocean to support this effort. In fact, USCG Cutter *Healy* just completed a five-week mapping cruise in the Arctic, collecting 20,000 square nautical miles of additional bathymetric and geologic data necessary to delimit the U.S. ECS in the high Arctic. Ancillary partnership projects leveraged aboard the *Healy*, such as an Arctic ocean acidification study and an ice buoy study, are also amassing data that will provide a better scientific understanding of the ecological processes on our continental margins, and new insights into climate variability, marine ecosystems, undiscovered or unconventional energy, mineral resources, and environmental triggers for extreme events, such as earthquakes and tsunamis. The U.S. could significantly advance our economic interests in the Arctic with respect to ECS and other activities by ratifying the Law of the Sea Convention.

To provide the foundational positioning framework supporting the above activities, NOAA is building on existing partnerships to acquire gravity data in Alaska. NOAA aims to achieve 80 percent coverage north of the Arctic Circle by the end of FY 2013. This project, Gravity for the Redefinition of the American Vertical Datum, will reduce elevation measurement positioning errors from multiple meters to two centimeters or less. The improved accuracy will help coastal communities and the private sector develop climate change adaptation strategies and make better informed decisions on infrastructure hardening, erosion and flood controls. NOAA is utilizing the Continuously Operating Reference Station (CORS) program and its partners to fill critical gaps in CORS coverage for Alaska. Although there are almost 100 active CORS in Alaska's CORS Network, less than two dozen CORS stations are in the Alaskan Arctic: nine sites along the Aleutian Chain, six in Arctic coastal areas of the Bering Sea, and seven along the North Slope.

In addition to new partnerships, NOAA is also looking at new technologies, such as sonars and autonomous vehicles that can be force multipliers for our existing resources. We are taking innovative steps to prioritize the charting of unsurveyed areas to minimize risk to shipping. In late September, the NOAA Ship *Fairweather* completed a 30-day reconnaissance survey to evaluate a sparsely surveyed 1,500-nautical mile coastal corridor (last measured by Captain James Cook in 1778) from Dutch Harbor through the Bering Strait and extending east through the Chukchi and Beaufort Seas to the U.S. - Canadian maritime boundary. Analysis of this mission will help NOAA define the highest priority survey projects in the Arctic.

Tides and Currents

NOAA is evaluating the technology and strategies needed for long-term monitoring of tides, water levels, and currents under harsh Arctic conditions. In 2008, NOAA developed an innovative system to collect water level data in remote, cold climate regions where winter sea ice precludes traditional tide station installations. In August 2008, two specially designed bottom-mounted water level gauges were deployed approximately two

miles off the coast of Barrow, Alaska, in 100 feet of water. The systems were equipped with a high-stability pressure sensor, conductivity sensor, and acoustic, modern, disposable ballast, and a pop-up buoy for recovery. Both systems were recovered one year later, in August 2009, and re-deployed to collect a second year of water level, water temperature, and salinity data with recovery in August 2010. The data obtained represent unique data sets collected by NOAA on the North Slope of Alaska, and the results have already contributed to an improved vertical reference system for the region.

Existing tidal observations, along with many others, are available through the NOAA Integrated Ocean Observing System (IOOS) regional partner in Alaska, the Alaska Ocean Observing System (AOOS). IOOS, along with AOOS and other regional partners, addresses regional and national needs for ocean information, gathers specific data on key coastal and ocean variables, and ensures timely and sustained dissemination and availability of these data. AOOS released a new Arctic data portal in September 2012 that provides access to several thousand information layers ranging from habitat type to climatic regimes to research instruments. The Arctic data portal will be the foundation for a new set of tools focused on the northern Bering and Chukchi Seas region. These tools will assist with future conversations including shipping, local planning, climate change strategies, and oil and gas development.

Spill Response

As Arctic sea ice continues to melt and thin, energy exploration and transportation activities will be increasing in the region, escalating the risk of oil spills and accidents. In anticipation, NOAA and interagency partners are actively preparing for possible emergencies. As the lead agency for scientific support to the USCG during an offshore oil spill response or pollution threat, NOAA's expertise in pollution response and impact science will be critical in the event of an Arctic oil spill and subsequent Natural Resource Damage Assessment (NRDA) preparedness. Currently, NOAA has one permanent Scientific Support Coordinator located in Anchorage, who actively participates in spill readiness exercises, and is working to improve data on the Artic environment and toxicity of hazardous materials. Over the last 25 years NOAA has assisted in over 100 oil spill drills and over 200 spill responses in Alaska, advising the USCG on oil trajectories, oil fate and weathering, use of spill countermeasures such as *in situ* burning and dispersants, and consideration of environmental impacts. NOAA also established the Alaska Joint Assessment Team in 2011 to build relationships between agencies and industry parties and reach consensus on protocols to facilitate implementation of NRDA, should an assessment become necessary.

In preparation for a potential Arctic oil spill, NOAA and its partners have developed an Environmental Response Management Application (ERMA) for the Arctic region, the same interactive online mapping tool used during the *Deepwater Horizon* oil spill response. ERMA is a web-based GIS tool that assists both emergency responders and environmental resource managers in dealing with incidents that may harm the environment. ERMA integrates and synthesizes data into a single interactive map, providing a quick visualization of the situation and improving communication and

coordination among responders and environmental stakeholders. ERMA was selected by the USCG as the Common Operational Picture for the *Deepwater Horizon* spill incident because it allowed data access across responding agencies and provided a simple interface by which to visualize response operations and relevant socio-economic and environmental data. ERMA is a proven operational system and continues to be enhanced through strong Federal, state, and industry partnerships. Arctic ERMA was developed in partnership with NOAA, the Oil Spill Recovery Institute, the University of New Hampshire, and the Department of the Interior's (DOI) Bureau of Safety and Environmental Enforcement (BSEE). On July 31, NOAA and BSEE jointly announced the launch of Arctic ERMA for public access. ERMA, the University of Alaska-Fairbanks, and AOOS are also working together to ingest, share, and make data publicly available.

Monitoring Species and Climate Change

Collecting and integrating biological, physical, and chemical information is essential for managing existing and emerging fisheries, developing models to assess risk of action or inaction, monitoring invasive species and detecting ongoing and future ecosystem changes in the complex Arctic region. To that end, NOAA is partnering with the University of Alaska and the Bureau of Ocean Energy Management (BOEM) to provide baseline information on the abundance and distribution of Arctic marine species and their habitats through an Arctic Ecosystem Integrated Survey. NOAA has also initiated the Distributed Biological Observatory program to provide biological and environmental sampling to track the ongoing shifts in ecosystem structure associated with climate change. NOAA also initiated a two-year survey of ice-associated seals in cooperation with Russian scientists in the western Arctic in 2012. These surveys will provide the first comprehensive estimate of abundance for four species of seals and will serve as a baseline for trend analyses in the future.

NOAA'S PARTICIPATION IN RECENT OIL AND GAS ACTIVITY

On July 12, 2011, the President issued Executive Order 13580 to establish an Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska (IAWG). The working group's purpose is to coordinate the efforts of Federal agencies responsible for overseeing the safe and responsible development of onshore and offshore energy resources and associated infrastructure in Alaska and the U.S. Arctic Outer Continental Shelf. The IAWG, chaired by DOI, has effectively facilitated interagency coordination and communication among the numerous government agencies charged with permitting activities, as well as State, local, and Alaska Native partners, related to oil and gas development

Over the past eighteen months, the IAWG and its weekly staff meetings have helped to keep federal permitting agencies synchronized and up-to-speed on permitting activities carried out by fellow regulatory agencies, thereby effectively improving the efficiency of the permitting process. NOAA has worked closely with this group since its inception. We

have also strengthened our coordination with industry, Alaska Natives, and other stakeholders to improve our science-based decision-making.

Additionally, working closely with the State of Alaska, Alaska Natives, and local communities, the IAWG will prepare a report to the President by the end of 2012 to address key components of an "Integrated Arctic Management" framework for evaluating potential infrastructure development in the Arctic. NOAA is playing an integral role in this effort.

In May 2011, Dr. Lubchenco signed a Memorandum of Understanding between NOAA and the Bureau of Ocean Energy Management, Regulation, and Enforcement, now the BOEM and the BSEE, to ensure that decision-making relating to the development of outer continental shelf energy resources is based on the relevant scientific information and expertise of both agencies in order to fulfill the stewardship and conservation of living marine resources and ecosystems responsibilities that fall under the agencies' respective authorities. Leveraging relationships such as this to build sustained observations will enable Alaska researchers to study the effects of oil and gas exploration, sea ice loss, ocean acidification, and sea surface temperature warming on Arctic ecosystems over time. This information will also inform NOAA's ecosystem stewardship, private sector economic development, and USCG and U.S. Navy missions.

In May 2011, Shell filed its Marine Mammal Protection Act (MMPA) incidental harassment authorization applications for exploratory drilling programs in the Beaufort and Chukchi Seas. Using the best available information, NOAA conducted careful analyses of potential impacts to marine mammals and published notices of proposed incidental harassment authorizations for public comment in November 2011.

In August 2011, Dr. Lubchenco signed an agreement with Shell Exploration & Production, ConocoPhillips, and Statoil USA E&P Inc. to enhance collaboration on ocean, coastal, and climate science for the Arctic. The agreement calls for sharing a number of scientific data sets for this largely frontier region, including weather and ocean observations, biological information, and sea ice and sea floor mapping studies. In June 2012, all parties signed the first of three Annexes to the agreement. This first annex lays out protocols for sharing meteorological, oceanographic, and sea ice data. Already, NOAA has seen a 50 percent increase in the number of marine weather observations coming in from Arctic waters as a result of this agreement. These data will enhance the Arctic regional climatology analyses and historical, quality-controlled World Ocean Database developed by NOAA scientists. Follow-on annexes are being drafted to address protocols for sharing biological and hydrographic data.

In the fall of 2011, NOAA began working with DOI and partner agencies to review and provide comments on Shell's Chukchi Sea and Beaufort Sea Oil Spill Response Plans. This important dialogue with DOI and industry on the Oil Spill Response Plans led to changes in the plan that addressed NOAA's concerns on oil trajectory modeling and supported a drilling season length that allows for adequate oil spill response. NOAA

looks forward to continuing the ongoing dialogue with our federal partners and industry to support safe offshore development in Alaska.

In January 2012, NOAA convened an independent peer-review panel, including scientists from the North Slope Borough, representatives from the potentially impacted Alaska Native subsistence hunting groups, and academics to review Shell's marine mammal monitoring plans. This review was discussed in detail during the annual Open Water Meeting in March 2012 here in Anchorage. This public meeting, which is sponsored by NOAA and has been held annually since 1994, includes participants from Federal, industry, and local government agencies, potentially impacted Alaska Native organizations and communities, and other interested parties. The Open Water Meeting provides a productive and open forum for the discussion of upcoming industry activities in the Arctic, results of marine mammal mitigation monitoring programs from previous seasons, and methods for minimizing impacts to marine mammals and subsistence uses from upcoming industry activities.

In the Spring of 2012, NOAA assembled a prioritized list of additional staff training, resources, and research needed to assist the USCG with a smarter, safer and more efficient Arctic oil spill response. This effort resulted in a partnership with DOI's BSEE to expedite and enhance the development of the ERMA, the same interactive online mapping tool used in the Gulf of Mexico during the *Deepwater Horizon* oil spill response. We thank BSEE for their recognition of the need for this important tool and willingness to partner.

As the first Arctic exploratory drilling season since the early 1990's was becoming a reality, May was a very busy month for all federal agencies involved, including NOAA. NOAA issued MMPA incidental harassment authorizations to Shell Offshore Inc. to take small numbers of marine mammals incidental to conducting an offshore drilling program in the Beaufort and Chukchi Seas during the 2012 open water season (July 1, 2012 through October 31, 2012), participated in Shell's tabletop oil spill drill here in Anchorage, Alaska which simulated the worst case discharge scenario for the Chukchi Sea, and conducted a workshop in Kotzebue, Alaska on ERMA and how a natural resource damage assessment would be carried out in the aftermath of an Arctic oil spill. In August 2012, Shell submitted a request to DOI's BOEM to extend their drilling season based on Shell's prediction for sea ice encroachment and freeze-up at their Chukchi Sea prospect. BOEM, in the spirit of coordination, and through the communication lines widened by the creation of the Interagency Alaska Permitting Working Group, sought the expertise of NOAA's climate, sea ice, and weather programs to fully understand and consider the implications of Shell's request. The exercise was a lesson in interagency communication that can be carried into the highly anticipated 2013 season.

LESSONS LEARNED

The work carried out by NOAA staff leading up to and during the 2012 Arctic drilling season has been commendable and thorough. Nonetheless, we would be remiss if we did not reflect on the last 18 months and identify lessons learned.

The primary lessons learned for NOAA at this early after-action phase are:

1. the need to consider the ***variability of the rapidly changing Arctic and shifting historical baseline*** when making forward-looking decisions,

2. the need to recognize and appropriately weigh the ***economic, social, and environmental impact*** that oil and gas development has on the State, especially North Slope communities and Alaskan Natives, and

3. the need to increase existing collaboration and communication to improve ***integrated science-based decision-making*** and process efficiency.

Federal investments are needed as we plan for energy companies to move from exploratory activities into, what is anticipated to be, high-volume production over the coming decades. In short:

1. We need to improve our understanding of how this rapidly changing Arctic environment can sustain industrial pressures through enhanced environmental observations to support the best science-based decisions related to weather and sea ice forecasting, and ecosystem and community stewardship.
2. We need more access to research platforms and ship time, that will improve our observation and knowledge of the increasingly dynamic Arctic environment, and
3. We need to improve our understanding of how oil and potential oil spill response methods, such as dispersants, will behave and impact Arctic species.

The U.S. Arctic is a remote place with harsh conditions. Conducting research in the highly variable Arctic environment poses safety risks and requires specialized equipment, training, and vessels. Continuing to seek innovative partnerships and leveraging existing resources will allow us to carry out our Arctic mission in a manner that is safer, smarter, and more efficient.

CONCLUSION

NOAA is striving to streamline and bring its diverse capabilities to bear on the many cultural, environmental, economic, and national security issues emerging as a result of rapid changes in the Arctic. The breadth and complexity of these impacts require a concerted, systematic and rapid effort with partners from international to local levels. NOAA's scientific capabilities are being deployed to increase understanding of climate and other key environmental trends, to predict the ecosystem response to those trends, and to offer the technical expertise needed to develop policy options and management strategies for mitigation and adaptation to the environmental challenges in the Arctic region. NOAA's service capabilities are supporting safety and security needs for fishing, marine mammal protection, marine and other modes of transportation, energy, infrastructure, and mineral exploration in the unique Arctic environment. The choices we make today will have pivotal impacts on the future state of the Arctic and the well-being

of its coastal communities. There is a great deal of work to be done, and NOAA, in collaboration with our partners, is committed to strengthening Arctic science and stewardship, and providing the information, products, and services needed by our Arctic stakeholders.

Thank you, Mr. Chairman, for the opportunity to appear before you today. I look forward to answering any questions that you or the Committee may have.