Bureau of Ocean Energy Management, Regulation and Enforcement

Environmental Studies Program

Studies Development Plan FY 2012-2014

Offshore Environmental Studies Program

Fiscal Years 2012-2014 Studies Development Plan

Gulf of Mexico OCS Region

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SECTION 1.0 PROGRAMMATIC OVERVIEW

1.1 Introduction to the Region

In managing Outer Continental Shelf (OCS) activity, the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), formerly Minerals Management Service (MMS), has two core responsibilities: safe offshore operations and environmental protection. Our safety goal is to ensure incident free energy exploration and development on Federal offshore leases. Our environmental responsibilities are to ensure that all activities on the OCS are conducted with appropriate environmental protection and impact mitigation.

The BOEMRE New Orleans Regional Office conducts all leasing and resource management functions on the OCS for the Gulf of Mexico Region (GOMR) and the Atlantic Region OCS areas, a total of 430 million acres in seven planning areas (see map in Section 1.2). Currently there are 6,641 active leases in the Gulf of Mexico and 4,000 active platforms making significant contributions to the Nation's energy supply.

The BOEMRE's Environmental Studies Program (ESP) was established in 1973 as a means to gather information to support decision making for offshore oil and gas leasing. The program (then under the Bureau of Land Management (BLM)) evolved with changes in the geographic areas of concern, in environmental issues, and in study priorities and policies. In 1994, the BOEMRE Atlantic OCS Regional Office was closed and its responsibilities transferred to the GOMR. In the GOMR, the ESP addresses issues from prelease through postlease operations. In the Atlantic Region, the ESP has been limited to prelease descriptive and process-type investigations since there has been no recent production in that area.

The Gulf of Mexico (GOM) is anticipated to remain the Nation's primary offshore source of oil and gas. Initiatives to emphasize the use of "environmentally friendly" natural gas further promote the production from the Gulf's gas fields. Advances in offshore technologies (e.g., directional drilling; deepwater structures such as sub-sea completions, spar, and tension-leg platforms; sub-salt prospecting; three-dimensional geophysical profiling; and down-hole instrumentation) ensure that exploration and development will continue in the Gulf for decades to come.

In 1992, BOEMRE entered into a partnership with the Louisiana State University (LSU) to establish the first Coastal Marine Institute (CMI). This partnership, which continues today between BOEMRE and LSU, was developed as part of an initiative to cultivate new State-Federal cooperative agreements on environmental and socioeconomic issues of mutual concern. These projects are designed to help answer questions regarding the potential impacts from oil and gas and marine minerals activities.

The establishment of the Biological Resources Division (BRD), a division of the U.S. Geological Survey (USGS), in 1996, provided new opportunities for partnership in biological research. The BRD has procured and is conducting several studies for the GOMR.

Because there was an increase in deepwater oil and gas activity in the GOM, BOEMRE sponsored a deepwater workshop in April 1997. Conducted under a cooperative agreement with LSU, the workshop focused on physical oceanography and the environmental and sociological sciences. The recommendations and issues identified in the workshop proceedings (Carney, 1997) are being used to design the studies needed by BOEMRE for the preparation of environmental assessments (EA), other National Environmental Policy Act (NEPA) documents, and deepwater regulations to oversee oil and gas activities. A follow-up workshop to discuss the results of these studies was held in May of 2002 (Schroeder and Wood, 2003). The information that was gathered since the first workshop was presented in 2002.

In April 2010, the Deepwater Horizon incident (DWH) caused a massive oil spill that released millions of gallons of crude oil into the Gulf of Mexico. Efforts to stop the flow and mitigate potential landfalls of oil along the coastline included the use of various containment devices and siphons, dispersants used on the surface and at the wellhead, controlled burns, oil skimming, a network of booms established along the coastline to protect sensitive marshlands, and construction of a series of protective sand berms between Louisiana's barrier islands to prevent oil intrusion into sensitive marshlands. Two relief wells were drilled, one of which intercepted the well at a depth of several thousand feet below the mudline to ultimately kill the well.

The degree and extent of offshore and onshore environmental impacts to natural and cultural resources as well as socioeconomic impacts from this spill are currently unknown. While other damaging oil spills have occurred (e.g. 1989 Exxon Valdez, 1979 Santa Barbara oil spill, 2009 Timor Sea spill, etc.), the Deepwater Horizon incident has become the largest and most devastating oil spill in American history whose environmental and social impacts may exceed those of all previous spills in U.S. waters. Because of this spill, new environmental studies are necessary to assess the impacts and long-term recovery of the Gulf region and its natural and cultural resources.

In 2010, BOEMRE joined the Gulf Coast Cooperative Ecosystem Studies Unit (GCCESU) as a Federal partner. Membership in the GCCESU creates additional opportunities for interdisciplinary and multi-agency research, technical assistance, and education through collaborations within a network of member Federal and State agencies, universities, and research and environmental groups.

1.2 Map of the Planning Areas

Figure 1. Map of the Planning Area

1.3 Projected OCS Activities

1.3.1 Gulf of Mexico Region

Since the GOMR is the most active U.S. OCS area, most activities associated with energy exploration and production are occurring here. These activities include leasing, exploration, development, removal of platforms, and installation of pipelines. The current five-year program (2007-2012) proposed one lease sale per year in each of the central (2007-2012) and western (2007-2011) planning areas. Lease sales in the eastern planning area were held in December 2001, 2003, 2005 and 2008. On December 1, 2010, Secretary Salazar announced an updated oil and gas leasing strategy for the period 2012-2017. The Central Planning Area and Western Planning Area and a portion of the Eastern Planning Area not under

Congressional moratorium will continue to be considered for potential leasing before 2017. Large portions of the Eastern Planning Area are under Congressional moratorium and are not under consideration.

1.3.2 Atlantic Region

The last oil and gas lease sale within the Atlantic Region occurred in 1983. On November 17, 2000, the interests in the last remaining eight natural gas and oil leases active in the Federal waters offshore North Carolina were relinquished. At present, no active OCS oil and gas leases exist in any of the four Atlantic OCS Planning Areas. While more leases were originally issued offshore North Carolina, the primary focus had always been on the 21 leases comprising the Manteo Exploration Unit.

The current 5-year Program (2007-2012) proposed a lease sale offshore Virginia for no earlier than 2011. The BOEMRE published a Call for Information and Interest/Nominations and Notice of Intent to Prepare an EIS (Call/NOI) for Lease Sale 220 in the Federal Register on November 13, 2008. The area covered by the Call/NOI is about 2.9 million acres offshore Virginia in the Mid-Atlantic Planning Area, and is at least 50 miles offshore. On January 16, 2009, BOEMRE (then MMS) announced the release of the Draft Proposed Program (DPP). The DPP sought public comment on all aspects of the new program for 2010-2015 including energy development and economic and environmental issues in the OCS areas. On February 10, 2009, DOI Secretary Salazar announced that he would extend the comment period on the Draft Proposed Program by 180 days. On December 1, 2010, Secretary Salazar announced an updated oil and gas leasing strategy. The Mid and South Atlantic Planning Areas are no longer under consideration for potential development through 2017.

The Energy Policy Act of 2005 gives BOEMRE the authority for permitting and regulating alternative energy projects and the conversion of existing oil and gas structures for alternative uses on the OCS. On November 6, 2007, the BOEMRE announced in the Federal Register an interim policy for authorization of the installation of offshore data collection and technology testing facilities in Federal waters. The BOEMRE accepted comments and nominations until January 7, 2008 regarding the authorization of OCS activities involving the installation of meteorological or marine data collection facilities to assess alternative energy resources or to test alternative energy technology. Potential alternative energy projects include, but are not limited to: wind energy, wave energy, ocean current energy, solar energy, and hydrogen production. There is also interest in OCS projects that make alternate use of existing OCS facilities for "energy-related purposes or for other authorized marine-related purposes," such as: offshore aquaculture, research, education, recreation, and support for offshore operations and facilities. The interim policy has been replaced by the publication of final regulations at 30 CFR 250, 285, and 290.

There is also interest in non-energy OCS resources (sand) for beach renourishment projects. BOEMRE's Marine Minerals Program provides policy direction and guidance for the development of marine mineral resources on the OCS. To date, BOEMRE has conveyed rights to about 30 million cubic yards of OCS sand for 23 coastal restoration projects in 5 states.

Environmental information from the Atlantic will be needed to enable BOEMRE to make permitting decisions and carry out environmental reviews under NEPA for a new program along the Atlantic coast, one that uses new technologies and different expertise now resident in the agency.

BOEMRE is conducting the Atlantic data synthesis study that will provide BOEMRE with updated and synthesized Atlantic OCS information on human and environmental aspects of the region. These data are required for BOEMRE to meet its responsibility of ensuring that all OCS activities are conducted in an environmentally responsible manner. The recent surge in energy prices and alternative energy initiatives may result in future alternative energy leasing activity in the Atlantic Region.

The purpose of the Atlantic G&G PEIS is to gather state-of-the-art data required to prospect in an orderly manner for oil, gas, or other mineral resources, and for site assessment and installation of renewable energy facilities by potentially permitting OCS blocks located in the Mid-Atlantic and South Atlantic Planning Areas for geological and geophysical surveying. Preparation of this PEIS would also be used by BOEMRE to support ESA Section 7 consultation and incidental take authorization under the MMPA. The need for the proposed actions is to further the orderly development of domestic OCS oil, gas, mineral, and renewable energy resources. The proposed action for G&G surveys are important precursor activities for operators to make leasing decisions and for management of leases after leasing. The draft PEIS should be completed by February 2012 and the final PEIS should be completed by October 2012.

1.4 Identification of Information Needs

With the extent of offshore oil and gas activities in the deepwater GOM and the Deepwater Horizon oil spill in 2010, environmental and socioeconomic information needs have increased. The GOMR has approximately 100 ongoing studies divided among all areas of interest. We are proposing studies in the following topics to meet our information needs to aid in future analysis within environmental impact statements (EIS's), EA's, mitigations, and other requirements from the NEPA as well as assess the recovery and long-term impacts of the oil spill on the Gulf of Mexico's coastal, marine, and human environments.

1.4.1 Physical Oceanography

The Region has funded numerous studies along the continental shelves of the northwest and northeast Gulf, which resulted in an improved understanding of the circulation in these coastal areas. Presently, the GOMR has focused its energies and efforts in the planning and acquisition of information in deepwaters of the Gulf, both in U.S. and Mexican territories. Continued expansion of industry deepwater development during 2008 and in the near future reinforces our need to gather additional deepwater current observations that when integrated with datasets in Mexican waters can be use to validate a basin wide numerical model. Such a model is needed to provide spatial and temporal current information to use in oil spill trajectory and dispersion modeling. After completing five deepwater studies, BOEMRE is

conducting studies of the Loop Current, which include the dynamics of the Loop Current in U.S. waters and its complementary study in Mexican waters and the Lagrangian study of the deep circulation. Upon completion of these ongoing studies, BOEMRE will update the historical synthesis of oceanographic data in the Gulf. Physical oceanographic processes do not stop at the Exclusive Economic Zone (EEZ) and a full understanding requires inclusion of information from Mexican waters. We continue working with Mexican researchers to collect information in Mexican waters and coordinate as they have embarked on a massive study of the Campeche region. Data from a set of moorings deployed in the western Gulf are analyzed in a report soon to be published. After the Deepwater Horizon incident, BOEMRE is planning to award a modeling effort to hindcast the oil spill plume in the vertical and horizontal directions and validate these results using available observations.

1.4.2 Atmospheric Sciences

BOEMRE has several ongoing or recently completed air quality studies to determine if offshore OCS sources impact the air quality of Gulf of Mexico onshore coastal areas. BOEMRE has completed a calendar year 2008 Gulfwide emissions inventory study, which estimated emissions for all OCS oil and gas production-related sources in the Gulf of Mexico, including non-platform sources, as well as other non-OCS related emissions. Emissions were calculated for: carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), particulate matter-10 (PM_{10}), $PM_{2.5}$, and volatile organic compounds (VOC); as well as greenhouse gases- carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). This 2008 emissions inventory study built upon several past emissions studies, including one for the Breton Sound area and two Gulfwide studies. Emissions inventories are used in air quality modeling to determine potential impacts of offshore sources to onshore areas.

BOEMRE finalized an air quality study that synthesized and integrated all meteorology, air quality, and emissions inventory data from previous BOEMRE studies and oil/gas and industry related studies accomplished in the Gulf since 1988. The database created from the study allows for analysis of important relationships between the meteorological, air quality, and emissions variables for Gulf coastal areas and the Breton National Wilderness Area.

BOEMRE has also finalized and is awaiting a final report for a study to determine if the data collected from the NASA Aura Satellite could improve air quality modeling for potential onshore OCS impacts in areas adjacent to the Gulf of Mexico. The data will provide vertical profiles of ozone and its photochemical precursors for use in air quality models.

The study, *Meteorological and Wave Measurements for Improving Meteorological and Air Quality Modeling* has recently been awarded. This study objective is to characterize the atmospheric boundary layer structure and air-sea interaction to improve meteorological and air quality modeling over coastal transition zone, in shallow and deepwater areas. This study focuses on the data gaps between 10 m to 100 m above the sea surface and the transition zone between land and ocean.

On March 12, 2008, the Environmental Protection Agency (EPA) significantly strengthened its National Ambient Air Quality Standards (NAAQS) for ground-level ozone. EPA revised

the 8-hour "primary" ozone standard to a level of 75 parts per billion (ppb) and strengthened the "secondary" standard to the same level of 75 ppb. Then in early January 2010, the EPA proposed another revision to the ozone standard, this time to a lower concentration, 0.060 to 0.070 parts per million (ppm). Should the ozone standard be lowered further, additional Gulf Coast counties/parishes would become non-attainment for ozone, which will likely generate renewed interest in mitigating OCS sources contribution to ozone non-attainment areas. EPA also signed two one hour standards into law in 2010. Effective January 2010, EPA enacted a one-hour NO_x standard of 100 ppb. EPA also signed a one-hour SO_2 standard of 75 ppb in June 2010. These new regulations will likely require BOEMRE to conduct additional air quality studies to more accurately determine OCS contribution.

A 2011 Gulfwide emissions inventory study has been awarded to address the new EPA standards, to coordinate the offshore with the onshore inventories, to aid the operators with reporting to EPA under the EPA's Mandatory Greenhouse Gas Reporting Rule, and to aid in future BOEMRE NEPA documents. This study will build upon past emissions studies. Once it is completed in 2013, this emissions inventory will be used for air quality modeling to determine potential impacts of offshore sources to onshore areas.

1.4.3 Fates and Effects

In the mid-1970s, the first major offshore environmental survey in the GOM was conducted in response to questions about the effects of oil and gas activities on the continental shelf. This study, Mississippi, Alabama, and Florida (MAFLA) examined physical, chemical, and biological parameters along the MAFLA shelf. Portions of the study area were revisited in the late 1980s for similar analyses as part of Mississippi-Alabama Marine Ecosystem (MAMES). MAFLA and MAMES are just a few examples of BOEMRE studies that collected baseline information or examined the fates and effects of oil and gas activities in the OCS of the GOM; BOEMRE's ESP has conducted numerous studies over the years and the sum of past, current, and future studies forms a strong environmental monitoring framework that guides BOEMRE's management decisions.

Before the Deepwater Horizon event, BOEMRE considered revisiting the areas examined in past studies to determine typical parameters and possibly compare these measurements to the results of past studies. BOEMRE was also interested in focusing on new issues that have arisen since past studies, such as ocean acidification, and considering new methodologies and techniques for characterization. Since the Deepwater Horizon event, revising baseline conditions and answering fundamental (bio)geochemical questions is more important than ever. The region should be recharacterized to collect baseline data and to employ new technologies. Collecting baseline data for areas where future oil and gas activities may occur should also be considered. Furthermore, any studies as a result of the oil spill should also be considered. However, before the Deepwater Horizon event, debate over the objectives and methodology of such a study resulted in its postponement. One example of a debated component of the study is whether to compare relatively 'pristine' Eastern GOM locations with previously drilled Central GOM locations, despite natural differences in samples from these locations, or to apply new techniques and methodologies to compare original sampling results to current conditions at the same locations. To better target the most efficient

approach of such a study and to sum up the current known baseline of the GOM, we propose a multi-day workshop in which BOEMRE will solicit expert advice from a diverse group of scientists on the best ways to utilize past GOM studies, current Deepwater Horizon-related studies, and develop the request for the next study to further build upon this framework. Special consideration should be given to new tools and techniques that might be applied to past data or future research.

The relationship between BOEMRE OCS activity and coastal oil spills is regularly questioned. The topic is addressed in a general way in NEPA documents. A better grasp of the percent of crude oil spilled in coastal waters that originated on the OCS and the amount of fuel spilled in support of OCS activities would benefit state and other federal agencies that review or participate in our NEPA activities. The USCG maintains an extensive database on oil spills. Through analysis of these data, BOEMRE could provide a clearer description of the geographical locations of spills and the causes and volumes of spills. This publication would engender a more fact-based discussion of coastal oil spill risk.

The Scientific Committee recommended in 2010 that the discovery and cataloging of natural oil seeps in the GOM be an agency priority. BOEMRE has proposed that a study be conducted in order to determine an updated volume of oil and natural gas that seeps into the GOM, the seepage rate of the oil and natural gas into the GOM, how seepage varies with time/season, background concentrations of oil and gas in the GOM considering the presence of seeps, and the fate of the oil and gas from seepage. Comparisons to estimations of the amount of hydrocarbons introduced to the GOM by runoff, State oil and gas activities, federal oil and gas activities, and other anthropogenic inputs are also pertinent depending on the approach and final cost of the study.

Oil in the Sea (National Research Council 2003) notes that "Much more needs to be learned about how petroleum interacts with marine sediment…" (pg. 4) and "Much more needs to be learned about oil-sediment interaction..." (pg. 59). Thus BOEMRE is interested in studying the interactions of oil and sediment particles in a deepwater and to explore sedimentation of the oil. The Deepwater Horizon incident is the first such incident in deepwater and the first time that dispersants have been injected near the seafloor for remediation purposes. Thus, more must be learned about the behavior of spilled oil, especially dispersed oil, under these specific conditions. Of particular interest is how oil and dispersed oil might interact with sediment particles or undergo sedimentation in deepwater environments. Thus, BOEMRE is also interested in gleaning more information about the interaction of dispersed oil with sediments in a deepwater environment. Studies have focused on the existence and persistence of dispersed oil plumes in the GOM, but little attention has focused on how the oil has interacted with sediments.

The Deepwater Horizon incident is the first time that dispersants have been injected near the sea floor for remediation purposes. The use of dispersants in addition to the unplanned release of oil and natural gas, both carbon sources, into the deepwater environment led to concerns as to whether dissolved oxygen levels in the GOM would drop drastically as a result of microbial degradation. In 2005, the BOEMRE released a report titled "Understanding the Processes that Maintain the Oxygen Levels in the Deep Gulf of Mexico" (MMS 2005-032).

Though the study gleaned much information on the oxygen budget for the GOM, it noted that "the mechanisms that transport oxygen-rich water masses from the Yucatan Channel into the Gulf interior at depths greater than ~1,000 m are not well-understood, and a study to determine these Gulf-wide processes would be useful for studies of pollutant transports at depth." Thus, there is a need to both reassess and build on what is known about oxygen variability in deep waters of the GOM in light of the impacts the Deepwater Horizon incident may have had on oxygen consumption. A better understanding of the oxygen budget for the GOM needs to be determined, especially at depths of about 1,200 m where dispersed oil plumes have been reported, in order to understand what happened when oil, natural gas, and dispersant were released in deep waters.

1.4.4 Biology

The management needs of BOEMRE continue to demand information on all aspects of ecology in every habitat of U.S. waters. New and ongoing oil and gas activities touch upon every ocean province from our coastal marshes to the abyss. New emphasis is placed on eastern Gulf of Mexico (EGOM) resources following Congressional requirements to offer leases within 125 miles of the west coast of Florida. New technology ushers exploration into deeper waters down the continental slope and onto the abyssal plains. At the same time, new technology prompts renewed interest in hydrocarbon resources under the thick salt layers beneath the outer continental shelf (OCS). Therefore, while BOEMRE needs continue to push into new frontiers where biological information is sparse, outdated information on shelf communities also needs to be renewed. In addition to these GOM needs, new possibilities are opening on the U.S. Atlantic coast. Much work is needed to gather and to update knowledge for Atlantic ecosystems.

The BOEMRE needs to renew its knowledge of GOM habitats periodically to continue to ensure that protective measures are adequate and to adapt management practices to changing conditions. A long-range systematic program is needed to apply new technologies and methods to studies of shelf ecosystems and related topics. The program should cover a wide range of habitats and topical studies such as habitats the BOEMRE protects with stipulations, other shelf habitats, *Sargassum* communities, coastal studies, protected species, invasive species, and climate effects. Information on the 37 topographic features the BOEMRE protects around the GOM should be updated. Seagrass data should be renewed. Live bottoms (low relief) and live bottoms (Pinnacle Trend) will need updating near the end of the long range cycle. Baseline data will be gathered for the first time for the new category, Potentially Sensitive Biological Features (i.e., live bottoms of moderate relief [about 8 ft or higher]). Long-term monitoring at the Flower Garden Banks continues to be a centerpiece of BOEMRE responsible management. Renewed interest in oil reserves under deep salt layers near the shelf edge make this region a good starting point for a program of studies to update BOEMRE information on shelf habitats.

Delineation of the long-term effects of oil and gas activities on the outer continental shelf is beneficial to assess the effectiveness of BOEMRE protection of the coastal, marine, and human environments. The state of benthic communities near oil and gas activities is a robust

indicator that BOEMRE can use to define the effectiveness of their regulations and to apply adaptive management. A workshop to explore a thorough scientific approach to assessing the long-term effects of oil and gas activities would be beneficial to the program.

Pelagic *Sargassum* algae is a valuable essential fish habitat. This remarkable community is vulnerable to contamination from spills because it floats at the surface of the sea. This is particularly relevant to BOEMRE because the pelagic *Sargassum* ecosystem shares the offshore waters with BOEMRE permitted activities. Recent analyses of satellite imagery suggest that *Sargassum* biomass in the Gulf of Mexico (GOM) is greater than previously estimated and that the algae is entrained in the GOM Loop current to feed into the Gulf Stream current, thus traveling up the east coast and into the Atlantic gyre. This theory bears further investigation and ground-truthing studies.

Seagrasses are rapidly declining worldwide. The Big Bend region of Florida is one of the most favorable seagrass habitats in the U.S., with seagrass extending well into Federal waters. A BOEMRE study by Continental Shelf Associates (1985) mapped seagrass habitat in the Big Bend area as far offshore as 110 km (70 mi). With oil and gas activity moving closer to this sensitive habitat, an updated characterization would be valuable for BOEMRE management.

The BOEMRE has an immediate need for comprehensive information on ecosystems of the Atlantic OCS. The onset of offshore renewable energy activities demands assessments of potential impacts. The Atlantic OCS boasts a profusion of hard bottom habitat ranging from coral reefs in the southern part of the Florida Straits to coral/sponge communities, worm reefs, fishing banks, canyons, coldwater reefs, and deepwater *Oculina* and *Lophelia* communities. The BOEMRE needs to be prepared to assess potential impacts to all these habitats and more. Accurate mapping of seafloor features and archaeological resources is a foundation requirement. Literature search and synthesis of existing information will be combined with new studies to provide a thorough understanding of Atlantic OCS habitats and promote proper ecosystem-based management.

Deep waters continue to be a primary field of industry activity and an imminent need for environmental information. Continued studies will be needed into the future to better understand the ecology of sensitive deepwater habitats in both the GOM and Atlantic. As oil and gas activities move to within 125 miles of the west coast of Florida, further investigations of habitats along the West Florida Escarpment may be needed.

The BOEMRE has environmental stewardship over seabirds, and must mitigate any serious impacts to populations. Practically no data are available on the distribution and abundance of populations except for anecdotal observations, data collected on research cruises not primarily focusing on seabirds, and locations of colonies of seabirds on the Gulf coast. Serious population declines can come from many sources including climate change, oil spills, and West Nile virus. The BOEMRE is responsible for mitigating any potential oil and gas impacts that would exacerbate such declines. Impacts that are most serious are oil spills, but large oil spills are infrequent. The exact size of a spill is not a good measure of relative impacts on seabirds; rather oil spill impacts are contingent on context. The BOEMRE needs

information on Atlantic coast seabird populations to evaluate their vulnerability to potential oil and gas impacts.

1.4.5 Protected Species

The BOEMRE has undertaken a variety of protected species research in the GOM region. Section 7 Endangered Species Act (ESA) consultations for protected species frequently identify information gaps and make recommendations for areas of research either as part of the "terms and conditions" or as part of the "conservation recommendations." These directives often dictate the types of research necessary to fill information gaps and allow BOEMRE to meet our protected species information needs for OCS activities. Recent (and upcoming) GOM programmatic consultations that may result in new protected species studies include geological and geophysical (G&G) activities and explosive removals of platforms.

Following the Deepwater Horizon event, BOEMRE requested reinitiation of ESA consultation with both NMFS and FWS (July 30, 2010). NMFS responded with a letter to BOEMRE on September 24, 2010. FWS responded with a letter to BOEMRE on September 27, 2010. The reinitiated consultations are not complete at this time although BOEMRE is in discussions with both agencies.

The most recently completed study, the Sperm Whale Seismic Study (SWSS), resulted in a large amount of data on the potential impacts of seismic activity on the sperm whale in the GOM. Recommendations for future research from this report directly influence the current studies program and in this case resulted in a study to identify sperm whale prey resources in the GOM (GM-09-05).

1.4.6 Social Sciences and Economics

Generally, social impact assessment (SIA) projects the effects of new actions on unaffected baselines. In the GOMR, SIA evaluates the effects of a "new" action on a baseline that has experienced 70 plus years of past and ongoing consequences of similar "new actions." Because the modern offshore petroleum industry was born and evolved in the Gulf, SIA faces unique challenges. On one hand, while much SIA is "what if" stories, any effects that offshore oil activity has had are likely to have actually occurred somewhere in the GOMR (National Research Council, (NRC) 1992). On the other, finding them proves difficult since they must be disentangled from other social and economic changes and trends that are occurring, since current industry effects must be disentangled from those past, and past ones that continue to affect the present. In addition, the offshore petroleum industry is a massive assemblage of many and varied enterprises, each with its own needs for capital, goods and services, its own labor conditions and community relationships, its own technological and organizational dynamics, and its own past, current and future impacts.

No single research strategy could address all these complexities, and the ESP in the Gulf approaches this puzzle from three basic directions and with multiple methodologies. First, the ESP emphasizes the industry itself. The industry's size, variability, and longevity mean that characteristics and distributions of its various sectors shape the socioeconomic baseline that

changes in its sectors generate its future effects, and that data on these sectors is needed to calibrate the models used to estimate its consequences and future effects. Much ESP effort describes and measures key industry sectors (e.g., drilling, production, fabrication, transportation) and uses this information to assess local and regional impacts. The move into deepwater, growing interest in alternative energy, and the push to address local-level effects are significant concerns in the Gulf. The second strategy focuses on developing a "dynamic baseline." All SIA begins with the baseline but, in the Gulf, the need to disentangle industry effects from other trends and events turns this into a substantial and iterative task. Much past ESP research aimed at developing this baseline and the growing State and stakeholder emphasis on local-level impacts has sharpened this focus. A third strategy focuses on standard SIA social and cultural issues.

In terms of number, if not budget, the majority of ongoing Gulf socioeconomic studies are cooperative agreements conducted under the LSU Coastal Marine Institute (CMI) (see studies beginning with GM-92-42 at http://www.gomr.boemre.gov/homepg/regulate/environ/ongoing_studies/gom-se.html). Under the CMI, the GOMR provides an annual announcement that identifies areas of particular interest. The GOMR then receives, selects, and negotiates CMI research proposals that may address some or all of these areas and others. Because the CMI annual planning cycle conflicts with the timing of SC reviews, CMI proposals cannot be provided in this document even though they address a wide range of critical information needs related to such topics as industry strategy, localized socioeconomic effects, infrastructure use, hurricane effects, environmental justice, and assessment methodology.

1.4.7 Submerged Cultural Resources

Submerged cultural resources are both non-adaptive and non-renewable and are protected by a well-established body of laws and regulations at both the Federal and State level. Shipwrecks, ship strandings and groundings, airplane wrecks, submerged terrestrial sites such as shell middens and coastal campsites, docks, wharves, and other maritime facilities are but a small sample of the types of cultural resources likely to be affected by energy development. BOEMRE, as a Federal agency, is required to consider the effects of its permitted actions on sites listed or eligible for the National Register of Historic Places.

The BOEMRE has several ongoing studies to expand our knowledge of the types of resources that are likely to be encountered on the OCS. One current study is testing the hypothesis that prehistoric sites can be recognized in the remote sensing record by attempting to positively correlate physical remains with suspected sites identified through sub-bottom profiler records. A second study, *Archaeological Analysis of Submerged Sites on the Gulf of Mexico Outer Continental Shelf*, procured in 2009, will assist BOEMRE in determining if targets identified for avoidance are actually associated with archaeological resources and provide information on the extent of debris fields associated with historic shipwreck sites. These data will aid in analyzing the effectiveness of BOEMRE's permit mitigations. The BOEMRE continues to seek to understand the nature of cultural resources on the seafloor in various types of environments in order to effectively avoid harming them as a result of its permitted actions. Another study procured in 2009 expanded our knowledge of shipwrecks that were lost in the

GOM by conducting research in a rich, previously untapped, resource - the New Orleans Notarial Archives.

As part of BOEMRE's NHPA responsibilities to understand the full range of impacts from its undertakings, a future need addresses an issue raised by the State of Louisiana, namely the effects of OCS-related traffic on coastal prehistoric sites. The BOEMRE's mission expands under new legislative mandates into areas in the Atlantic for both oil and gas and alternative energy projects, information needs regarding the potential for encountering submerged cultural resources expand as well. One recently awarded study *Inventory and Analysis of Archaeological Site Occurrence on the Atlantic* seeks to establish a baseline of documented sites in the Atlantic Planning Region similar to what currently exists for the Central and Western Gulf. Current information needs include understanding how to apply National Register criteria to Atlantic shipwrecks, their appearance in the remote sensing record, and the extent and condition of sites in the Atlantic environment. In order to further this understanding BOEMRE archaeologists have joined with our benthic biologists and NOAA/OER to conduct a study off the Virginia coast similar in scope to the award winning collaborations *Deepwater Program: The Archaeological and Biological Analysis of World War II Shipwrecks in the Gulf of Mexico: A Pilot Study of the Artificial Reef Effect in Deepwater* and *Lophelia II*. The BOEMRE is also joining with NOAA's USS Monitor National Marine Sanctuary to continue the study, *Battle of the Atlantic*, investigating World War II losses off the coast of North Carolina. The first season of this study won the Department of the Interior's Cooperative Conservation Award in 2009.

Future needs focus on the impacts of the Deepwater Horizon oil spill and subsequent spill response activities on submerged cultural resources. The first study, reviewed by the Committee in 2010, intends to conduct sampling and analysis of biota on several shallow water and deepwater shipwrecks in the GOM that may have been impacted by intrusive oil and compare this data with previously collected baseline data. A second study intends to investigate and record impacts to shipwrecks discovered as a result of dredging activities associated with Louisiana's sand berm. Dredging activities on the OCS are by far the most damaging to submerged cultural resources.

1.5 New Starts for Fiscal Year 2011 and Ongoing Studies Table

Table 1. BOEMRE Gulf of Mexico Region New Starts for FY 2011 and Ongoing Studies

New Starts				
Program Lead	**Planning Area**	**Start FY**	**Discipline**	**Study Title**
	GW	12	IM	Administration of the LSU Coastal Marine Institute
	C & W	12	HE	Characterization of Potentially Sensitive Biological Features Surrounding Shelf-Edge Topographic Banks in the Northern Gulf of Mexico with Analyses of Impacts and Recovery
	C & E	12	PO	Hindcasting of the Deepwater Horizon Oil Spill using an Ocean Circulation Model
	GW	12	MM	Effects of Oil & Gas Exploration on Estuarine Bottlenose Dolphin Stocks
	EG	12	MM	Sperm Whales in the Eastern Gulf
CMI	C	12	SS	Subsistence in Coastal Louisiana: An Exploratory Study
Note: The procurement of any study is contingent upon availability of funding				

ONGOING STUDIES				
Program Lead	**Planning Area**	**Start FY**	**Discipline**	**Study Title**
Air Quality				
CMI	C & W	07	AQ	Deployment and Operational of Radar Profiler
	C & W	06	AQ	Operations of the BOEMRE's Radar Wind Profiler/at the Houston Coastal Center
	GW	08	AQ	Meteorological and Wave Measurements for Improving Meteorological and Air Quality Modeling
	GW	10	AQ	Year 2011 Gulfwide Emissions Inventory Study
Fates & Effects				

CMI	C	06	FE	A Study of Long-Term Trends in Environmental Parameters Along the Louisiana/Mississippi Outer Continental Shelf Using Ocean Color Remote Sensing Data
	GW	10	FE	Characterization and Potential Impacts of Noise Producing Construction and Operation Activities on the OCS
CMI	C	00	FE	Improving the Predictive Capability of 3D Seismic Surface Amplitude Data for Identifying Chemosynthetic Community Sites
Habitat and Ecology				
CMI	C	03	HE	Assessing Trophic Linkages Between Platforms and Pelagic Fishes Using Ultrasonic Telemetry and Active Acoustics
CMI	C	10	HE	Biomass and Mass-Balance Isotope Content of Seep Populations on the Upper Slope Gulf of Mexico Determined from Archived Samples
	GW	10	HE	Characterization and Potential Impacts of Noise Producing Construction and Operation Activities on the OCS
CMI	C & W	06	HE	Deep-Water Coral Distribution and Abundance on Active Offshore Oil and Gas Platforms and Decommissioned "Rigs-to-Reefs" Platforms
CMI	C & W	04	HE	Determining the Geographic Distribution, Maximum. Depth, and Genetic Affinities of Corals on Offshore Platforms, Northern Gulf of Mexico
CMI	C & W	04	HE	Digital Conversion and Selected Analysis of Dive Video From Fifteen Dive Seasons
CMI	GW	08	HE	Digitization and Reanalysis of Northern Gulf of Mexico Continental Slope Study Seafloor Photographs
	C & W	08	HE	Exploration and Research of Northern Gulf of Mexico Deepwater Natural and Artificial Hard Bottom Habitats with Emphasis on Coral Communities: Reefs, Rigs and Wrecks

	C	10	HE	Forcing Functions Governing Salt Transport Processes in OCS Navigation Canals and the Surrounding Wetland Landscape Utilizing Houma Navigation Canal (HNC) as a Surrogate Canal
CMI	GW	07	HE	Gulf SERPENT: Establishing a Deepwater Plankton Observation System Using Industrial ROVs
	C & W	05	HE	Investigations of Chemosynthetic Communities on the Lower Continental Slope of the Gulf of Mexico
	C	09	HE	Long-Term Monitoring at the East and West Flower Garden Banks
	C	05	HE	Multi-Component and Multi-Frequency Seismic for Assessment of Fluid-Gas Expulsion Geology and Gas Hydrate Deposits: Gulf of Mexico
CMI	C	10	HE	New Invasive Marine Species Colonizing Oil/Gas Platforms in the northern Gulf of Mexico: Verification and Examination of Spread
CMI	GW	06	HE	Platform Recruited Reef Fish, Phase II: Do Platforms Provide Habitat that Increases the Survival of Reef Fishes?
CMI	C	03	HE	Short-term Movement, Home Range, and Behavior of Red Snapper Around Petroleum Platforms in the Northern Gulf of Mexico as Determined by High Resolution Acoustic Telemetry
Information Management				
CMI	GW	10	IM	Administration of CMI
	AW	09	IM	**E**co**S**patial **I**nformation **D**atabase – U.S. Atlantic Region
CMI	GW	10	IM	Gulf Coast CESU Membership
	GW	06	IM	Information Transfer Meetings and Other Workshops (GM-04-03)
	C & W	05	IM	Literature Search and Data Synthesis of Biological Information for use in Management Decisions Concerning Decommissioning
	ATL	09	IM	Marine Mammal and Sea Turtle Literature Search and Data Synthesis Including Strandings and Nesting Sites
	S-ATL	09	IM	South Atlantic Information Resources: Data Search and Literature Synthesis

Marine Mammals and Protected Species				
	GW	10	MM	Atlantic Marine Assessment Program for Protected Species (AMAPPS)
	GW	10	MM	The Movement and Habitat Associations of Sea Turtles in the Gulf of Mexico
	GW	08	MM	Seismic Survey Mitigation Measures and Marine Mammal Observer Reports
	GW	09	MM	Sperm Whale Acoustic Prey Study (SWAPS)
Physical Oceanography				
	GW	10	PO	Climate and Simulation of Eddies/Eddy Joint Industry Project (CASE/EJIP)
	E	09	PO	Current Measurements in the Yucatan-Campeche Area in Support of Loop Current Dynamics Study
	W	10	PO	Current-Topography Interaction and Its Influence on Water Quality and Contaminant Transport Over Shelf-Edge Banks
	E	04	PO	Deepwater Program: Survey of Deepwater Currents in the Eastern Gulf of Mexico
	E	08	PO	Dynamics of the Loop Current in U.S. Waters
CMI	GW	06	PO	Effects of Loop Current and Loop Current Eddies - Analysis Using the Real-time BOEMRE ADCPs from Oil Platforms
	C & W	07	PO	Integrated Bio-Physical Modeling of the Louisiana-Texas (LATEX)
	GW	10	PO	Lagrangian Study of the Deep Circulation in the Gulf of Mexico
CMI	C	05	PO	New Wave Current Information System (WAVCIS) Ocean Observing Station on Ship Shoal
	GW	08	PO	Ultra-Deepwater Circulation Processes in the Gulf of Mexico (GM-07-05)
CMI	C & W	02	PO	Wave-Bottom Interaction and Bottom Boundary Layer Dynamics in Evaluating Sand Mining at Sabine Bank for Coastal Restoration, Southwest Louisiana
Social Sciences & Economics				
CMI	GW	10	SS	A Prospectus for Historical Social and Economic Analysis of the Oil and Gas Industry for the Gulf of Mexico Region

CMI	GW	05	SS	An Assessment of the Opportunities for Alternative Uses of the Hydrocarbon Infrastructure in the Gulf of Mexico
	C & W	08	SS	Analysis of the Oil Services Contract Industry in the Gulf of Mexico Region
	GW	07	SS	Assessing Impacts of OCS Activities on Public Infrastructure, Services, and Population in Coastal Communities Following Hurricanes Rita and Katrina
CMI	GW	09	SS	Characteristics and Possible Impacts of the Aging Workforce Transition on the Outer Continental Shelf Oil and Gas Industry in the Gulf of Mexico Region
CMI	GW	09	SS	Developing Indicators to Measure Socioeconomic Impacts of OCS Activities: A Temporal Analysis of Counties within the Gulf of Mexico Region
CMI	GW	06	SS	Diversifying Energy Industry Risk in the Gulf of Mexico
	ATL & PAC	08	SS	Energy Market and Infrastructure Information for Evaluating Alternative Energy Projects for OCS Atlantic and Pacific Regions
CMI	C	03	SS	Environmental Justice: A Comparative Perspective in Louisiana
	GW	10	SS	Ethnic Groups and Enclaves Affected by OCS Activities
CMI	GW	05	SS	Factors Affecting Global Petroleum Exploration and Development and Impacts on the Attractiveness and Prospectivity of the U.S. Gulf of Mexico Deepwater
CMI	GW	07	SS	Forecasting Service Vessel and Helicopter Trips Related to OCS Development
CMI	GW	09	SS	Geographic Units for Socioeconomic Impact Analysis in the Gulf of Mexico Region
	GW	06	SS	Gulf Coast Communities and the Fabrication and Shipbuilding Industry: A Comparative Community Study
CMI	GW	06	SS	Gulf Coast Subsidence and Wetland Loss: A Synthesis of Recent Research

	GW	08	SS	History of Gulf of Mexico Offshore Petroleum Industry, Phase III: Deepwater Developments
CMI	GW	09	SS	Improving Capacity for Institutional Analysis of the Oil and Gas Industry for the Gulf of Mexico Region
	GW	09	SS	MAG-PLAN Modification: New Gulf of Mexico Data Collection, Testing and Streamlining of OCS Economic Impact Model
CMI	C & W	08	SS	OCS Studies Review: (1) Geographical Units for Observing and Modeling Socioeconomic Impact of Offshore Activity; (2) LA and TX Oil and Gas Activity Review and Production Forecast: and (3) Pipeline Paper
	M-ATL	09	SS	Oil and Gas Infrastructure in the Mid-Atlantic Region
CMI	GW	06	SS	Post Hurricane Assessment of OCS-Related Infrastructure and Communities in the Gulf of Mexico Region
CMI	GW	04	SS	Social Capital and Offshore Oil Development in St. Mary Parish
CMI	C & W	07	SS	Socio-Economic Responses to Coastal Land Loss and Hurricanes: Measuring Resilience among Outer Continental Shelf Related Coastal Communities in Louisiana
CMI	C & W	06	SS	Spatial Restructuring and Fiscal Impacts in the Wake of Disaster: The Case of the Oil and Gas Industry Following Hurricanes Katrina and Rita
	GW	07	SS	State and Local-Level Fiscal Effects of the Offshore Petroleum Industry
CMI	C & W	07	SS	Structural Shifts and Concentration of Regional Economic Activity Supporting GOM Offshore Oil and Gas Activities
CMI	C & W	08	SS	The Offshore Drilling Industry and Rig Construction Market in the Gulf of Mexico
CMI	C	00	SS	The Relationship of Crime to Oil Development in the Coastal Regions of Louisiana
CMI	GW	07	SS	Understanding Current and Projected Gulf OCS Labor and Port Infrastructure Needs

Social & Economic (Marine Archaeology)				
	C & W	09	SS	Archaeological Analysis of Submerged Sites on the Gulf of Mexico Outer Continental Shelf
	M-ATL	10	SS	Battle of the Atlantic Expedition 2009
	AW	08	SS	Evaluation of Visual Impacts on Historic Properties
CMI	C & W	07	SS	Examining and Testing Potential Prehistoric Archaeological Features on the Gulf of Mexico, Offshore Continental Shelf
	C & W	07	SS	Impacts of Recent Hurricane Activity on Historic Shipwrecks in the Gulf of Mexico
	AW	09	SS	Inventory and Analysis of Archaeological Site Occurrence on the Atlantic OCS
	GW	08	SS	Investigation for Potential Spanish Shipwrecks in Ultra-Deepwater
	C & E	09	SS	Shipwreck Research in the New Orleans Notarial Archives

Other (Research Partnerships)
BOEMRE Technology Assessment and Research Program (TAR)
BOEMRE-Louisiana State University, Coastal Marine Institute (CMI)
USGS/Biological Resources Division (BRD)
NOAA-National Marine Fisheries Service (NMFS)/National Marine Mammal Laboratory (NMML)
National Science Foundation (NSF)
National Aeronautics and Space Administration (NASA)

Discipline Codes	**Planning Area Codes**	
AQ = Air Quality IM = Information Management PO = Physical Oceanography FE = Fates & Effects HE = Habitat & Ecology MM = Marine Mammals & Protected Species SS = Social Sciences & Marine Archaeology	**Gulf of Mexico** Central = C Nationwide = N Eastern = E Gulfwide = GW Western = W	**Atlantic** Mid Atlantic = M-ATL North Atlantic = N-ATL South Atlantic = S-ATL Straits of Florida = SF Atlantic Wide = AW
	Pacific Pacific = PAC	

1.6 Studies Approved for Fiscal Year 2011 On Hold Pending Available Funding

With the expectation of increased funding to support studies related to the Deepwater Horizon oil spill, renewable energy, and expanding information needs, the 2011-2013 SDP as distributed to the Committee included many more studies than usual. By the time the 2011 NSL was ready for managerial approval, the funding increase remained undecided. To prepare for all funding eventualities and to streamline the approval process, the approved FY 2011 NSL included two basic tiers of studies: 1) new starts with funding allocated that could be moved into the procurement queue with the money available (shown in Table 1 above), and 2) new studies on hold, pending the addition of financial resources (shown in Table 2 below). As of this writing, no additional funds have been approved to advance the studies on hold. The studies on hold will be considered for funding in FY 2012 along with the new studies proposed in this plan. There are ten studies on hold in the Gulf of Mexico Region.

Table 2. BOEMRE Gulf of Mexico Region Studies Approved for Fiscal Year 2011 on Hold Pending Funding Availability

NSL #	Title
GM-11-05	Assessing an Oxygen Budget for the Gulf of Mexico after the *Deepwater Horizon* Incident
GM-11-06	Synthesis of Current Information on the Effects of the *Deepwater Horizon* Oil Spill on Recreation, Tourism, and Commercial and Recreational Fisheries
GM-11-07	MAG-PLAN Post-Deepwater Horizon Modifications
GM-11-08	Assessing Vulnerability of Sectors and Regions to OCS Oil and Gas Industry Volatility
GM-11-09	Air Quality Impacts Assessment of the *Deepwater Horizon* Oil Spill
GM-11-10	Documenting Impacts of the Deepwater Horizon Oil Spill on Coastal Avian Communities
GM-11-11	Socioeconomic Analysis of the Deepwater Horizon Oil Spill on GOMR Families and Communities
GM-11-12	Detailed Gulf of Mexico Vessel Trip Data to Support Environmental, Socioeconomic, and Archaeological Impact Analyses of OCS Activity
GM-11-13	Oil/Dispersed Oil-Sediment Interactions in Deepwater Environments
GM-11-14	Natural Seep Inputs and Their Relation to the Hydrocarbon Inventory of the Gulf of Mexico

SECTION 2.0 PROPOSED STUDY PROFILES

2.1 Introduction

A blowout, explosion, and fire occurred on April 20, 2010 aboard the Transocean-owned *Deepwater Horizon* Mobile Offshore Drilling Unit (MODU) during cementing of the well more than 50 miles offshore, located at a depth of 5,000 feet, and operated by the BP Corporation. The *Deepwater Horizon* rig sank on April 22, 2010 causing damage to the well riser and a massive oil spill that spewed millions of gallons of crude oil into the Gulf of Mexico. Efforts to stop the flow and mitigate potential landfalls of oil along the coastline included the use of various containment devices and siphons, dispersants used on the surface and at the wellhead, controlled burns, oil skimming, a network of booms established along the coastline to protect sensitive marshlands, and construction of a series of protective sand berms between Louisiana's barrier islands to prevent oil intrusion into sensitive marshlands. Two relief wells were drilled, one of which intercepted the well at a depth of more than 17,000 feet below the mudline to ultimately kill the well.

The degree and extent of offshore and onshore environmental impacts to natural and cultural resources as well as socioeconomic impacts from this spill are currently unknown. While other damaging oil spills have occurred (e.g. 1989 *Exxon Valdez*, 1979 Santa Barbara oil spill, 2009 Timor Sea spill, etc.), the Deepwater Horizon oil spill has become the largest and most devastating oil spill in American history whose environmental and social impacts may exceed those of all previous spills in U.S. waters. Since the spill, the GOMR Environmental Studies Program has continually modified its Studies Plan to reflect the bureau's current information needs for studies that address impacts and recovery from the oil spill. The proposed studies attempt to avoid duplication of study efforts yet fill information gaps where Natural Resource Damage Assessment (NRDA) studies may not address particular resources and their impacts from the oil spill. Because BOEMRE is not a NRDA trustee, we are participating in a limited capacity on only a few of the NRDA Technical Working Groups (TWG). We are currently participating on the following TWGs: Deepwater Corals, Marine Mammals, Sea Turtles, Water Column, Marsh Birds, and Shorebirds. BOEMRE has not been invited to participate in the Fish, Intertidal Sediment and Water, Oysters, Shoreline, Shrimp/Crabs, or Submerged Aquatic Vegetation TWGs. We are currently working with NRDA to avoid duplicative studies.

The FY 2012-2014 Studies Development Plan includes profiles for new studies related to the oil spill within the disciplines of habitat and ecology, physical oceanography, and social sciences. The profiles represent studies to assess and monitor the recovery of the physical and social environment over the long term as well as examine seismic survey effects on fish behavior and test avian response to light color on offshore oil and gas platforms. Several proposed studies represent multiyear, multidisciplinary efforts aimed at studying a variety of resources that may have been impacted by the oil spill. Some studies also envision coordinated efforts through interagency agreements and cooperative agreements with other Federal and State agencies and universities.

The following section focuses on the proposed studies for FY 2012 and beyond. However, most of the ongoing studies in the GOMR can be found on the web at: http://www.gomr.boemre.gov/homepg/regulate/environ/ongoing_studies/gom.html Study profiles that were reviewed by the Scientific Committee in September 2010 are not included in this Studies Development Plan for FY 2012-2104 to avoid redundancy. Table 3 lists those profiles presented in the FY 2011-2013 SDP that were reviewed by the Committee. Though these previously reviewed studies have not been approved on the NSL, the requirements for the information remain and they will be considered for the FY 2012 NSL.

Additional information about recent BOEMRE funded deepwater research, in particular research cruises, can be found at: http://www.gomr.boemre.gov/homepg/regulate/environ/deepenv.html

Table 3. Previous Reviewed Studies Pending Consideration for Fiscal Year 2012 NSL

Discipline	Title
AQ	A Coupled Atmosphere and Ocean Model in the Gulf of Mexico
AQ	Enhancing the Capability of a New Meteorological Model for Air Quality and Other BOEMRE Applications in the Gulf of Mexico
FE	Baseline Coastal Oil Spill Characterization
HE	Long-term Monitoring Effects of an Oil Spill on Pelagic *Sargassum*, Associated Communities, Distribution and Movement in the Gulf of Mexico and Atlantic
HE	Recovery, Restoration, and Remediation following the Deepwater Horizon Oil Spill: Florida Big Bend Seagrass Community Characterization and Recovery
IM	Workshop on Monitoring the Long-term Effects of Offshore Oil and Gas Activities in Gulf of Mexico
SS	A Comparative Analysis of the Effects of an Oil Spill on the Biota Inhabiting Six World War II Shipwrecks and Shipwrecks Spanning the 16^{th}-20^{th} Centuries in the Gulf of Mexico
AQ = Air Quality	FE = Fates & Effects HE = Habitat & Ecology
IM = Information Management	MM = Marine Mammals & Protected Species
PO = Physical Oceanography	SS = Social Sciences & Marine Archaeology

2.2 Profiles of Studies Proposed for the FY 2012 NSL

Table 4. BOEMRE Gulf of Mexico Studies Proposed for the FY 2012 NSL

Page #	Discipline	Title	Rank #
27	HE	Assessment of Coastal Vegetation Recovery from An Oil Spill in the Gulf of Mexico	1
29	SS	A Statistical Analysis of the Causes of the Tourism Impacts of an Oil Spill	2
21	PO	Remote Sensing Assessment of Surface Oil Transport and Fate During Spills in the Gulf of Mexico	3
33	HE	Abundance and Distribution of Commercially Important Estuarine Dependent Species Populations within the Gulf of Mexico – Implications of an Oil Spill on Spawning, Recruitment, Settlement and Vitality	4
35	IM	Information Transfer Meetings and Other Workshops	5

AQ = Air Quality
FE = Fates & Effects
HE = Habitat & Ecology
IM = Information Management
MM = Marine Mammals & Protected Species
PO = Physical Oceanography
SS = Social Sciences & Marine Archaeology

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Area: Central

Title: Assessment of Coastal Vegetation Recovery from An Oil Spill in the Gulf of Mexico

BOEMRE Information Needs to be Addressed: Since the 2010 oil spill in the Gulf of Mexico, there have been measured amounts of oil contact on the northern Gulf of Mexico coast, which can affect multiple local communities (floral and faunal). There is a need to determine efficient ways to assess wetland recovery after a spill event. Spills will continue to affect the coast and could be from a large-scale event like the Deepwater Horizon oil spill, a storm event, or a small-scale accidental release. This information will allow BOEMRE to best evaluate recovery times for important wetland resources after an oiling event, and these conclusions will be incorporated by subject matter experts into the NEPA documents. Even though some time has passed since the initial contact of the oil spill on the coast, there is still the possibility for buried oil to resurface. This causes the potential for a re-oiling event and a "lag time" before impacts from an oil spill on coastal wetlands are observed. A more thorough estimate of vegetation loss would be after a full growing season (late summer 2011), and recovery would be best estimated after that. This study will examine local vegetation health when contacted with oil and dispersants to understand species sensitivity and document recovery of vegetation in an impacted area. This study is proposed for USGS OCS studies funding.

Cost Range: (in thousands) $260-$390 **Period of Performance:** FY 2012-2015

Description:

Background: Wetland plants are a large primary producer in coastal ecosystems, and these marshes create invaluable habitat for multiple species and life history stages. Vegetation structure is also a large factor in coastal stabilization and attributes to sediment accretion. Because marsh vascular vegetation does not move, it could be a useful indicator of the impacts from crude oil in the area. Researchers can hypothesize on potential effects from a disturbance on marsh nekton communities by the status/health of the vegetation, because of the ecological functions wetland vegetation serve for the local faunal community. Most of the coastal wetlands in the northern Gulf of Mexico are salt marshes and are dominated by *Spartina alterniflora*. In Louisiana, the Mississippi River Delta region had contact with the oil from the Deepwater Horizon spill. This area contains coastal salt marshes and a *Phragmites* dominated marsh on the delta shoreline. Local researchers have studied this area for decades, therefore historical information is available.

The oil spill in 2010 impacted much of the wetlands in the Central Planning Area, including the Mississippi River Delta region. Prior to the spill, northern Gulf of Mexico wetland plants had been studied for composition, abundance/biomass, and physiological stress. Because some coastal wetland communities are subjected to continuous anthropogenic perturbation of

differing degrees, there have been field and laboratory experiments on wetland vegetation to assess crude oil and dispersant effects on plant health. Both the vegetation and the associated nekton communities have shown some resilience to these stresses, but these studies were on either small-scale (temporal and spatial) or controlled oiling events. Though there has been work on salt tolerant species, there has not been equivalent work on fresh/oligohaline (*Phragmites*) species. If there are long-term issues causing the vegetation to become unhealthy or undesirable to the fauna, this could impact populations on a larger scale than the current presence of oil.

Objectives: The objectives of this study are to determine if dominant vegetation is sensitive to oil and dispersants, to document recovery of local wetlands, and to examine whether or not effects and recovery are different for salt tolerant and freshwater species.

Methods: To examine local vegetation sensitivity and recovery, the Mississippi River Delta region should be studied. This area had documented contact with oil and there is considerable baseline information on the vegetation (both salt and freshwater). To determine plant sensitivity (*Spartina* has been studied, so this may be more for *Phragmites*), there would be a year-long growing season greenhouse experiment. Species would be planted in oil and dispersant laden sediments of different levels of contamination. The species/sediments would also have the appropriate salinity regimes. Stem densities would be continually measured through the growing season, and aboveground and belowground biomass would be assessed at the end of the year.

Recovery will be monitored in the field by measuring different parameters. The historical data sets can be used to compare the current and future conditions of the wetland plants over the next 3 years to the pre-spill conditions. Parameters measured in the field can include percent cover and biomass, species richness, and elevation (this may be determined by what data are available from before the spill). Samples collected from plants, sediment, and water would have toxicity testing. There also may be some data from 2010 that could provide immediate effect information for the study.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Areas: Gulfwide

Title: A Statistical Analysis of the Causes of the Tourism Impacts of an Oil Spill

BOEMRE Information Needs to be Addressed: This study addresses one of the more fundamental issues raised by DWH oil spill. As would be expected, this catastrophic oil spill had substantial impacts on tourism activity in the Gulf of Mexico. However, these tourism effects appear to have been determined by factors other than the extent of the physical damage to recreational resources in a particular region. For example, some communities in areas that received little to no oil damage reported noticeable declines in tourism activity. The research and anecdotal reporting that has arisen in the immediate aftermath of the spill has been concerned with describing, documenting, and assessing spill damages and, in some cases, with assigning a dollar value to these damages. This study will use statistical and econometric analysis to examine the underlying causes of the differential effects of the oil spill on tourism in certain areas. This will allow for the development of local (or regional) sensitivity indexes of tourism to oil spills. The results of this study will be relevant to analyses of the economic effects of catastrophic oil spills that will likely appear in a number of future NEPA documents.

Cost Range: (in thousands) $100-$200 **Period of Performance:** FY 2012-2013

Description:

Background: The Deepwater Horizon spill was a major event that will shape our understanding of the impacts of oil spills for some time. The spill caused a number of direct impacts to beach going, recreational fishing, and some other recreational uses in the areas directly impacted by the spill. However, one of the most notable features of the spill was that there were a number of reports of tourism being affected in areas outside the direct damage path of the spill. These effects could have been due to misperceptions about the spill, uncertainty about the nature of the spill, or concerns about the tourism experience in a region in close proximity to the spill. Information regarding these effects has been largely qualitative, although there have been some efforts to estimate the significance of these effects in certain areas. However, to date, research efforts geared toward clarifying the underlying causes of these effects has been limited.

Objectives: The primary goal of this study will be to estimate what factors caused some counties to feel greater tourism impacts than others as a result of the oil spill. The extent to which these effects depended on the structure of the recreation economy in the county (and in surrounding counties) will be of particular interest. Issues such as the distance from spill damage, extent of media coverage, and the geographic characteristics of a particular county will also be examined. The study will isolate these issues by controlling for things such as the

extent of actual spill damage, the role of relief workers, and the extent to which a county was impacted by the major recession that had recently occurred.

Methods: This study will use an econometric framework to isolate the underlying causes of the tourism impacts from the oil spill. The exact modeling framework used will evolve as the variables of interest are chosen. The effects of the oil spill on a particular county will be measured using existing datasets. This should prevent this study from conflicting with some of the legal processes for determining damages due to the oil spill. The use of existing datasets should also keep the cost of this study reasonably low. Examples of datasets that can be used to measure direct spill impacts include data on sales tax revenue, hotel tax revenue, jobless claims, overall employment, internet traffic, official damage claims, and overall tourism spending. This study will also create a methodology to characterize the structure of the recreation economy in each county that was impacted by the spill. For example, the dependence of a particular county on beach recreation and on recreational fishing should be estimated. This study will also develop measures of other dependent variables that will be analyzed for potential significance.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Area: Central, Eastern, and Western

Title: Remote Sensing Assessment of Surface Oil Transport and Fate during Spills in the Gulf of Mexico

BOEMRE Information Needs to be Addressed: This study will assess the movement, properties, and fate of surface oil from spills using remote sensing and physical oceanographic fields. The study will provide information on the primary physical mechanisms that have controlled the transport of spilled oil during past spill events (e.g., advection, wind forcing, flow boundaries, etc.) for use in NEPA documents and future oil spill response planning.

Cost Range: (in thousands) $500-$600 **Period of Performance:** FY 2012-2014

Description:

Background: Important gaps remain in our understanding of the mechanisms controlling surface oil movement during spills. Surface oil spill motion and fate is affected by a variety of physical and chemical processes, including spreading, currents and advection, turbulent diffusion, winds, wave-induced mixing, and oil weathering such as through emulsification and evaporation. However, understanding the roles of these processes under different ocean states relies on the analysis of data from individual events. The spread and advection of surface oil depends on the type of oil present and oceanographic conditions. Weathering also contributes to formation of a non-uniform surface slick which often has a thicker part, surrounded by thinner sheen and emulsified oil. As well, different results for oil transport can be obtained through modifications in simple methods of parameterizing the wind effects. Appropriate values for the weights needed to estimate wind-induced surface oil spill speed and the deflection angle suitable for the Gulf of Mexico deserve further analysis. These wind parameterizations would be of particular importance during high-wind events. Various types of boundaries exist in the Gulf of Mexico which may or not be crossed by oil depending on winds and boundary strength, including convergence zones, freshwater-saltwater interfaces, and velocity shear. For example, oil from the Deepwater Horizon spill was never observed to cross into the Loop Current, presumably because of an impenetrable material boundary. Similarly, DWH oil movement was partially impeded by the freshwater lens around the Mississippi River delta.

Remote sensing products and ocean circulation models together can provide crucial information on the oceanographic processes determining the location and spread of surface oil. For example, during the DWH incident, imagery and hydrodynamic models were used by government agencies for mapping the extent of the surface spill and describing the impact of oceanographic features on spill movement. A variety of satellite and overflight products contributed to these analyses, including infrared sea-surface temperature (SST), ocean color, high resolution visible RGB, altimetric (sea surface height, SSH), Synthetic Aperture Radar

(SAR), and Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) imagery. Movement of surface oil during the DWH event was heavily impacted by currents, winds, waves, and the location of the Loop Current and its associated eddies. The presence and effects of the cyclonic, anticyclonic, and frontal eddies associated with the Loop Current were closely monitored during the spill, as well as the separation of a meso-scale Loop Current "cut-off" eddy. Although oil was entrained by Loop Current frontal eddies, it was never observed to cross into the Loop Current itself, demonstrating that flow boundaries exist and need to be better quantified to improve future predictions of spill events. Although a wealth of remote sensing and overflight products have been collected during past spill events, these products have not been analyzed to the extent necessary to be cited in BOEMRE's NEPA documents or to inform future spill response efforts.

Objectives: The purpose of this 3-year study is to develop a better understanding of the movement, properties, and fate of surface oil from past spills in the Gulf of Mexico. Because the physical and chemical processes affecting oil movement can be unique to each spill, this study will address several historical spills. This study will elucidate the most likely mechanisms responsible for oil movement in surface waters through developing and applying satellite-based algorithms for quantifying properties of the oil.

Methods: Collaboration with NASA will be sought in order to develop products of mutual interest to both agencies and to share costs. The objectives of this study will be met through utilization of remote sensing products which describe the location and characteristics of surface oil during spill events. The first task will be to further develop satellite-based algorithms (such as reflectance-based and transmittance-based approaches) for estimating the extent and properties of the oil, including thickness and type (e.g., oil slick, thinner oil sheen, and emulsified oil). Existing in situ measurements of the oil collected during the spills will be critical for ground-truthing the remote sensing algorithms. The second task will be application of the satellite-based algorithms to determining a time series of oil extent and properties through the duration of several oil spills. The analysis of several spills should help elucidate the mechanisms unique to each event in determining oil movement, as well as those mechanisms which are similar between events. The third task will be comparison of image products to various physical oceanographic fields (e.g., SSH, SST, winds, and currents) to determine the primary physical mechanisms responsible for oil transport. This will include determination of the relative contributions of spreading, advection by currents, advection by winds, turbulent mixing, and diffusion. Quantification will be made of the relationship between ocean material boundaries and spill movement. Consideration will also be given to weathering processes which attenuate the oil with distance from the spill site. This research will contribute to forecasting, responding, and studying abilities in the event of a future spill.

Revised Date: May 2, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Areas: Central and Eastern

Title: Abundance and Distribution of Commercially Important Estuarine Dependent Species Populations within the Gulf of Mexico – Implications of an Oil Spill on Spawning, Recruitment, Settlement and Vitality

BOEMRE Information Needs to be Addressed: Exploration and development of oil and gas resources in the Gulf of Mexico requires BOEMRE to produce a variety of (NEPA) and other environmental documents. BOEMRE should gather data and other information on commercially and ecologically important estuarine dependent species within the Central and Eastern Planning Areas of the Gulf of Mexico to better understand the role (OCS) activities may play in shaping estuarine dependent species populations along the Gulf Coast. This study will assess Gulf of Mexico blue crab (*Callinectes sapidus*), white shrimp (*Litopenaeus setiferus*) and brown shrimp (*Farfantepenaeus aztecus*) population abundance and distribution. Understanding the abundance and distribution of these three commercially and ecologically important species would not only aid in future impact analyses of the species, but could also demonstrate the overall ecological health within the Northern Gulf of Mexico estuaries and possibly indicate long-term impacts to a lucrative commercial fisheries industry. BOEMRE would need these abundance and distribution data for NEPA impact and mitigation requirement analyses prior to consultations with associated regulatory agencies.

Cost Range: (in thousands) $2,225-$2,625 **Period of Performance:** FY 2012-2017

Description:

Background: These estuarine dependent species move through and use multiple, spatially distinct estuarine habitats throughout their life cycle. Dispersal throughout the entire estuary via wind and tidally driven currents is imperative to this life history strategy. Following insemination, mature females migrate with ebb tides to lower estuarine, higher saline waters to release eggs. The eggs are tidally transported farther offshore, out over the continental shelf to higher saline waters to undergo various stages of metamorphosis. The post-larval life stage is then tidally transported back into the lower estuary and settles within some type of complex nursery habitat (sea grass, marsh edge, oyster bed, etc.). As the individuals grow and mature, they will continue to migrate further up the estuary for additional resources. Throughout this large-scale, estuarine-wide migration, the species play significant ecological roles as both predator and prey. Juveniles and adults are preyed upon by coastal birds such as the Whooping Crane (*Grus americana*), American Oystercatcher (*Haematopus palliatus*), White Ibis (*Eudocimus albus*), and Roseate Spoonbill (*Platalea ajaja or Ajaia ajaja*), etc., and other commercially and recreationally important species such as the Spotted Sea Trout (*Cynoscion nebulosus*), Red Drum (*Sciaenops ocellatus*), Black Drum (*Pogonias cromis*), Sheepshead (*Archosargus probatocephalus*), etc. A dramatic decrease in blue crab and

shrimp abundance would impact the estuarine communities within the affected area, and those adverse impacts would likely resonate throughout the entire food web.

With the species' extensive use of the estuary, including offshore habitat that would directly expose this vulnerable life stage to oil and dispersants; oil coating important lower estuarine, nursery habitat; potentially altered adult migration patterns; potentially altered physiology for all life stages; potentially increased susceptibility to parasites, lesions, viruses, or other abnormalities, along with the species ecological and commercial importance within the estuary, a study of this nature would assess and better understand the population dynamics following this incident. This study will allow BOEMRE to gain an accurate perspective for short and long-term adverse impacts to the ecology and commercial fishing of these species within the northern GOM.

Objectives:

- Assess short (2 yr) and long (5-10yr) term adverse impacts to blue crab and white and brown shrimp population distribution and abundance due to direct exposure to oil and dispersants [changes in population density in various life stages; immediate population or species decline due to mortality, resource limitations, increased competition, physiological changes (sterility, growth rate changes), toxins in tissues, etc.
- Assess changes in larval, post-larval and early life stage community assemblages in coastal habitat that may offer insight into reduction of crab and shrimp populations (predator/prey interactions, changes in geographic range, resource limitations etc.)
- Determine if there is an increase in crab and shrimp parasites, lesions, viruses or other abnormalities due to an increase of susceptibility to disease.

Methods:

1. Quantify abundance and distribution of early life stage blue crab, white shrimp, and brown shrimp using passive samplers, enclosure traps, beach seines, trawls, plankton pulls, cast nets, and dip nets across the north GOM in the affected areas (LA, MS and AL) to assess short and long term adverse impacts to the species (standardized sampling methods across affected area).
2. Partner with UNO, GCRL, DISL, etc. within affected area to compare pre- and post-oil spill data sets (seine, trawl, plankton pull, dip net, passive sampler, enclosure trap data).
3. Analyze planktonic data collected via passive samplers (platforms in the GOM).
4. Examine crabs and shrimp for parasites, lesions, viruses, or other abnormalities. Weigh, measure, sex, and determine species for crabs and shrimp collected. Run toxicology tests on all specimens collected. Conduct PCR tests for the most common shrimp viruses.
5. Assess water quality and other abiotic factors (DO, salinity, etc.) with standard techniques at each sampling site throughout the affected area.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Area: Gulfwide

Title: Information Transfer Meetings and Other Workshops

BOEMRE Information Needs to be Addressed: The BOEMRE uses meetings and workshops to foster the exchange of information and to plan future study endeavors. These meetings and workshops are critical to the planning and executing of the studies program. The Information Transfer Meeting (ITM) is held by the Gulf of Mexico Region to share results of BOEMRE-funded environmental studies. Beginning in 2012, the GOMR intends to hold annual ITM meetings in New Orleans.

Cost Range: (in thousands) $853-$1,280 **Period of Performance:** FY 2012-2016

Description:

Background: The purpose of the Information Transfer Meeting is to foster sharing of information among participants about current research, accomplishments, or issues of concern to the BOEMRE. Presentations at the ITM pertain to the BOEMRE Gulf of Mexico OCS oil and gas program, as well as regional environmental, social, or economic concerns, or current OCS industry activities or technologies. The BOEMRE has held 26 meetings to date and the resultant proceedings are used as information sources for ongoing studies. The meetings were originally held annually, however a decision was made to hold the meetings every other year to reduce replication of information and focus on results of studies. Beginning in 2012, BOEMRE will resume holding annual meetings. The meetings draw between 200 and 450 attendees comprised of BOEMRE scientists, other Federal and State agency partners, industry, academia, contractors, media, and the general public. The BOEMRE occasionally sponsors workshops with specific topics. These workshops are used to discuss the state of knowledge of the specific topic and to plan future directions within the studies program for those specific topics. The workshops are conducted over a three day period. Examples of past workshops include the topics of marine mammals, fisheries, and deepwater physical oceanography. These workshops are most productive when handled by a contractor, in a location separate from the BOEMRE offices, and with the production of proceedings from the workshop.

Objectives: The objective of this study is to conduct meetings for exchange of information, either through broad, general topics or specific topics.

Methods: Information Transfer Meetings will be held annually beginning in 2012 through 2016. Other topics specific meetings and small-scale workshops would be held according to need and priority.

Revised Date: April 25, 2011

2.3 Profiles of Studies Proposed for the FY 2013 NSL

Table 5. BOEMRE Gulf of Mexico Region Studies Proposed for the FY 2013 NSL

Page #	Discipline	Title
39	HE	An Experimental Test of Avian Response to Light Color and Intensity on Offshore Oil Platforms in the Gulf of Mexico
41	HE	Effects of Seismic Surveys on Fish Health and Behavior: *In Situ* Monitoring
43	HE	Monitoring Recovery of the Ecological Function of Estuarine Habitat for Nekton Health
45	HE	Movements, Site Fidelity, and Monitoring of PAHs and Other Oil Contaminants in Wintering Lesser Scaup in the Northern Gulf of Mexico
47	HE, IM & PO	Workshop on Future Directions in Understanding Physical-Biological Oceanographic Interactions in Mid- to Deep Waters of the Gulf of Mexico
49	HE	Eastern Brown Pelicans: Dispersal, Seasonal Movements, and Monitoring of PAHs and Other Oil Contaminants among Breeding Colonies in the Northern Gulf of Mexico
51	HE	Monitoring of Breeding Least Terns and Wintering Piping Plovers in the Northern Gulf of Mexico
55	SS	Impacts to Shipwrecks From Dredging Activities Associated with the Louisiana Sand Berm
57	SS	Post-Oil Spill Assessment of OCS-Related Infrastructure and Communities in the Gulf of Mexico Region

AQ = Air Quality
IM = Information Management
PO = Physical Oceanography
FE = Fates & Effects
HE = Habitat & Ecology
MM = Marine Mammals & Protected Species
SS = Social Sciences

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Areas: Central and Western

Title: An Experimental Test of Avian Response to Light Color and Intensity on Offshore Oil Platforms in the Gulf of Mexico

BOEMRE Information Needs to be Addressed: Additional information is needed to assess the potential for reducing avian mortality due to collisions with offshore platforms, particularly during the spring and fall migrations of neotropical migrants. Russell (2005) estimated 200,000 avian deaths/yr over the entire platform archipelago, of which 34% (spring) and 48% (fall) were attributed just to collisions. This study could also provide additional data on seasonal abundance and distribution of both neoptropical migrants and marine birds needed for NEPA analyses, DPPs, and other documentation. The information obtained from this study will assist in development of mitigation measures and strategies to reduce potential impacts at offshore oil platforms in the Gulf of Mexico.

Cost Range: (in thousands) $950-$1,250 **Period of Performance:** FY 2012-2014

Description:

Background: This study addresses information needs primarily for neotropical migrants and seabirds known to occur at relatively high densities, at least seasonally. The 3000 plus oil platforms located on the continental shelf of the northern Gulf of Mexico represents the largest artificial island system in the world. It is well known that offshore oil platforms attract various species of seabirds (Tasker et al. 1986, Baird 1990). A number of potential mechanisms for avian attraction have been posited: (1) the presence of underwater structures which increases local fish diversity and abundance (potential prey), (2) disposal of effluent and other discharges that create locally enriched environments, (3) change in currents and upwellings associated with the structure itself, (4) debris and food items discarded overboard, and (5) the presence of light itself, in the form of platform lighting and flaring (Wiese et al. 2001, Russell 2005). The increase in seabird densities in proximity to oil platforms ultimately increases the potential for collision-related mortality, as well as increases the risk of seabirds to pollutants from discharges (Fraser et al 2006). Russell (2005) studied neotropical migrant use of platforms (n = 10) and associated migratory behavior in the Gulf of Mexico during the spring and fall migration period, 1998-2000. From this research, Russell (2005) estimated that roughly 200,000 mortalities/yr could occur over the entire archipelago and that deaths due to collisions was one of the largest sources of mortality, recognizing this estimate was likely biased low. During noctural migrations, Russell (2005) documenting circulations, whereby flocks of birds (up to several hundred) attracted to the platform lights initiated a pattern of circling which sometimes lasted >8hrs. Individuals within these flocks likely incur significant, additional energetic costs which may result in additional, undocumented mortality.

The addition of anthropogenic light sources into the environment has well documented unintended negative consequences to a variety of species, e.g., sea turtle hatchlings, insects, birds, and fish (Longcore and Rich 2004, Depledge et al. 2010). For instance, Jones and Francis (2003) documented as many as 2000 dead birds at a single lighthouse at Long Point, Lake Erie, Ontario. In 1989, the lighthouse went to an automated system with less intense light and a narrower beam resulting in a drastic reduction in avian mortality. On the island Kauai, Hawaii, Reed et al. (1985) documented considerable mortality for fall-fledging shearwaters and petrels associated with the upward lighting on several large resorts. By simply shielding the upward lighting on one of the largest resorts, they documented a 40% reduction in attraction by fledglings of these threatened and endangered avian species. In an experiment by Poole et al. (2008), the authors tested several colors (white, red, blue, green) of light on the attraction of migrating birds at a single natural gas facility on a barrier island in the North Sea. White light attracted birds, red light appeared to disorient birds, and blue and green light had little effect with birds following predicted migratory routes. During the fall 2007, the authors were allowed to replace most of the white lights with a bird-friendly light source (greenish and low in red) developed by Phillips™ on a single offshore platform in the North Sea (Poole et al. 2008:fig. 6). Preliminary results suggest that far fewer birds were attracted to the platform and that many of the workers thought the new lighting less blinding. Given the number of oil platforms, number of lights/platform, and the geographical extent of the archipelago, there is high potential for light pollution in the Gulf of Mexico.

Objectives: The proposed study will determine (1) if different light colors (white, red, blue, green) in an offshore environment would decrease annual avian mortality at oil platforms, (2) document spatial and temporal patterns in avian species composition and abundance during the spring and fall, (3) the feasibility of modifying lighting systems on oil platforms to a more bird-friendly system without compromising safety (see Poole et al. 2008), and (4) if such a strategy could be implemented as a mitigation measure to reduce overall avian mortality risk around oil platforms.

Methods: Researchers will be placed on 10 different oil platforms at varying distances from shore across the Central and Western Planning Areas, 2012-2014. Two Thermal Animal Detection Systems (TADS) will be used in conjunction with an additional 8 observers equipped with night-vision imaging equipment to monitor nocturnal patterns of migration during the spring and fall (Desholm et al. 2006, Kunz et al. 2007). This equipment will be used to test different light colors on behavior and movements of migratory birds following methods described by Poole et al. (2008). Observers would begin nocturnal monitoring at ca. 2000 CST and terminate observations at ca. 0400 CST. The order in which colors will be tested would be randomly assigned each day with a test period of 1hr followed by a 15min darkness period. After the experiments have been completed, observers would resume normal avian monitoring. If feasible, observers would monitor migration activity, as well as conducting focal seabird surveys during 1hr time blocks at randomly allocated times beginning at 0800 CST to determine species composition, abundance, flock size, and distances to individuals and flocks.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Areas: Central and Western GOM and/or Mid- and South Atlantic

Title: Effects of Seismic Surveys on Fish Health and Behavior: In Situ Monitoring

BOEMRE Information Needs to be Addressed: One purpose of BOEMRE's regulatory program is to ensure that the Geological and Geophysical (G&G) data needed by industry and government are obtained in a technically safe and environmentally sound manner. Acoustic energy from the airguns under proposed actions could result in acute injury and mortality to some fish species in close proximity (within a few meters) to a high-energy acoustic source, while noise may affect behavior and movement of fish out to several kilometers from the sound source. Studies have been inconclusive and have concentrated on specific species, shallow areas, or caged animals. It is important to consider the following effects (acute and chronic) on fish from seismic surveys: death; physical injuries; and effects on movements, behavior, and life history. It would be beneficial for BOEMRE to fund a study that considered fish species found within the survey areas and study the behavioral response *in situ*, not in areas where surveys are unlikely to occur. This information will also be incorporated into BOEMRE's G&G NEPA-related documents. A study that will look at long-term behavioral changes of local species with known site fidelity would start filling in these information gaps.

Cost Range: (in thousands) $560-$840 **Period of Performance:** FY 2013-2015

Description:

Background: G&G surveys provide information used by industry and government to evaluate the potential for offshore oil and gas resources and geologic hazards in a particular area. Industry needs accurate data to determine the location, extent, and properties of hydrocarbon resources. They also need information on shallow geologic hazards and seafloor geotechnical properties to assist in the safe and economical exploration, development, production, and transportation of hydrocarbons. These surveys are usually conducted using airguns. Distinctive fish assemblages are recognized within broad habitat classes including demersal (soft bottom and hard bottom), coastal pelagic, and oceanic pelagic (epipelagic and midwater) species. Fish are also classified by their movement patterns. Highly migratory species move vertically in the water column to feed, usually on a daily basis, and move great geographic distances for feeding or reproduction (U.S. DOC, NMFS, 2006).

Anthropogenic (human-generated) sounds affect fish hearing or other sensory systems and may have reproduction and survival consequences. Potential negative effects include mortality, masking of important environmental sounds or social signals, displacement or interference with sensory orientation, navigation, increased stress, and fright response or displacement. These effects depend upon the type of sound, duration of sound, distance of

sound, and fish species (Popper and Hastings, 2009). Behavioral responses (e.g. displacement) could also affect commercial and recreational fisheries catches.

The specific received-sound levels at which permanent, adverse effects could potentially occur to most fish species has rarely been studied and are therefore largely unknown. Information on the impacts of seismic surveys on marine fish populations is also limited. Studies include a limited number of species and individuals, thus only include portions of a population and none at the population scale (McCauley et al., 2003; Popper et al., 2005; NSF, 2010). These studies also have differing/opposing results. Other studies examine different life history stages and found either lethal or no effects from sounds (Dalen et al., 1996; Payne et al., 2009). Many studies are also either in enclosed, shallow, or freshwater habitats and only look at very acute, obvious physical damage. There has been less work on more subtle impacts and longer-term impacts in a large-scale setting like the Gulf of Mexico or the Atlantic.

Objectives: The objective is to examine local fish species' long-term behavioral response to airgun arrays in the general vicinity of where these activities occur, and document any broad behavior changes (moving from an area after airgun arrays).
H_0: The noise from airguns used in seismic surveys in the OCS does not cause local fish populations to have a negative behavioral response (leave the area).
H_1: The noise from airguns used in seismic surveys in the OCS cause local fish populations to have a negative behavioral response (leave the area).

Methods: The following methods would be conducted on a research vessel that is deployed in the vicinity where a seismic survey will occur. Species known for site fidelity like red snapper (*Lutjanus campechanus*), gag (*Mycteroperca microlepis*), scamp (*Mycteroperca phenax*), and red grouper (*Epinephelus morio*) will be tagged and actively acoustically monitored to detect large-scale responses from airguns. The BOEMRE has funded past studies looking at site fidelity of the red snapper in the Gulf of Mexico and researchers should have baseline data on their normal behavior. If no baseline data exists, there would need to be a tagging exercise in the area of interest to determine the normal behavior of the species. Another tagging event should occur just prior to a seismic survey so any changes in long-term behavior would be detected. Fish would be tagged with a transmitter and acoustically monitored for a year (or as long as the tags are viable). The tagging events could take up to 15 days of field work and the monitoring could be done remotely after that point.
This objective and the methods can be altered/updated with new information after the acoustic workshop.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Area: Central

Title: Monitoring Recovery of Estuarine Dependent Nekton after a Large-scale Oil Spill

BOEMRE Information Needs to be Addressed: BOEMRE needs to determine long-term impacts and recovery of estuarine ecosystems from a large-scale oil spill. A way to measure recovery of an estuarine system is through nekton health. Recovery would be best evaluated at least a year or two after a large-scale oiling event, especially with the possibility of buried oil resurfacing. These new data will assist with environmental analyses of accidental and cumulative effects from oil and gas activities on fish and invertebrates, and BOEMRE can use this information for NEPA environmental documents related to OCS activities.

Cost Range: (in thousands) $520-$780 **Period of Performance:** FY 2012-2015

Description:

Background: The northern Gulf of Mexico coastline has dense salt marshes that contain many estuarine dependent nekton. These salt marsh/estuarine associated fauna are not only most important fisheries species (blue crabs, penaeid shrimp, gulf menhaden, and mullet) but serve as prey items for multiple species and life history stages. Many of these interconnected coastal habitats are linked to the oil and gas industry, because they serve as a connection from offshore activities to inshore facilities. In the past there has not been a large, long-term impacting event from the petroleum industry, but in April 2010 the Deepwater Horizon oil spill began impacting the area. It will take some time for certain effects to surface and recovery from this large-scale event will take even longer to assess.

The Deepwater Horizon oil spill originated 50 miles southeast of Venice, Louisiana in lease block MC 252. Millions of gallons of crude oil were released into the Gulf of Mexico. This spill may have significant impacts on the ecologically important and expansive wetlands of each state whose coast was oiled (mainly Louisiana, Mississippi, and Alabama). Nekton could experience acute larval mortality or changes to spawning and migration activities that can decrease reproduction success. This oil spill has created an opportunity to conduct studies that examine long-term ecosystem impacts from a large-scale oiling event with equally large-scale prevention measures (freshwater diversion, booms, berms, and dispersants). Several short-term, small-scale spill effect studies in Louisiana have been conducted, though few evaluated the health condition of multiple species.

Past and current “baseline” data can be used to document short-term recovery of certain species and monitor long-term recovery of the system. Nearshore nekton often include different life history stages of multiple species that may have a “lag time” in effects from this spill. Information on nekton recovery would help in assessing the recovery of the ecosystem. Depending on the species studied and the results, this information could also be used to

hypothesize about long-term effects on long-lived animals. Louisiana is a good potential candidate for this study because there are known baseline nekton data in impacted coastal areas. These wetlands were not only impacted by oil, but different prevention methods were executed in those waters.

Objectives: The objective of this study is to monitor long-term ecological impacts and recovery rates of the estuarine nekton community from a large-scale oil spill and its associated activities.

Methods: Past data and ongoing studies available from local universities, and agency monitoring programs could be used to develop the baseline data set to document pre-spill conditions. Some of the possible methods and hypotheses would depend on what was measured in the previous studies used as baseline.

Water and sediment quality will be evaluated through measurements and testing to monitor environmental condition at each site. Distance to marsh edge estimates will determine changes to edge slope from altered hydrology. Vegetation will be surveyed by percent cover estimated at the sites to help understand overall system health. Nekton will be sampled by the most appropriate gear for habitat type (throw traps, plankton nets, and drop samplers), and individuals identified to lowest taxa and counted. Tissue samples from collected nekton will be used for physiological condition assessment. Detailed nekton and trophic level condition analyses (e.g., stable isotopes or condition experiments) will be beneficial and implemented if it is practicable due to time, equipment, and expertise. These methods would be repeated over 3 years and during the same seasons to decrease the probability of differences detected being from natural variation of time of year.

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ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Areas: Central and Western

Title: Movements, Site Fidelity, and Monitoring of Pahs and Other Oil Contaminants in Wintering Lesser Scaup in the Northern Gulf of Mexico

BOEMRE Information Needs to be Addressed: Additional information is needed to assess the potential impacts of the Deepwater Horizon oil spill on the wintering population of lesser scaup in the northern Gulf of Mexico. The lesser scaup population appears to be declining for ~20 years, but the cause(s) for the declines are currently unknown. Several hypotheses have been posited. Negative effects of contaminants on adult female body condition, survival, and reproductive behavior are considered potential reasons for the population decline. For this study, adult females will be marked on a major spring staging area (Pool 19 on the Mississippi River) and followed during spring and fall migration, as well as during the wintering period to determine seasonal movements and site fidelity. In addition, this study will also monitor PAHs (and other contaminants; PCBs, PBDEs) in an effort to determine proportion of the population impacted, and its potential influence on migration behavior, female survival, and reproduction. This information is needed for NEPA analyses, DPPs, and other documentation.

Cost Range: (in thousands) $904-$1,084 **Period of Performance:** FY 2012-2016

Description:

Background: This study addresses information needs for the continental lesser scaup population, which appears to be declining since at least 1975 (Austin et al. 1998: 18-19; Afton and Anderson 2001:fig. 2). Reasons for this decline are not clear, but several hypotheses have been proposed (Austin et al. 2000). Declines in the body condition (i.e., lipid reserves; Anteau and Afton 2004) of adult females seem like one of the most tenable hypotheses to account for declines in nesting propensity and/or nest initiation date (Anteau and Afton 2008a, b, c; Anteau and Afton 2009). Lesser scaup remain the most abundant diving duck in North America and the continental population appears to be most influences by variation in recruitment rates (Austin et al. 1998). Roughly 86% of the scaup population winters in states bordering the Gulf of Mexico with Louisiana and Texas accounting for 91% and 97%, respectively, of scaup counted during the Midwinter Waterfowl Survey in their respective flyways. During the winters of 2000-2002, Kinney (2004) estimated between 250,000 – 1 million scaup just in offshore waters (not including inland lakes like Lake Ponchartrain) of Louisiana with the highest densities of found in bays off the central Louisiana coast followed by the southwest and southeast coasts. Clearly, the offshore waters of coastal Louisiana are important to a significant segment of the continental lesser scaup population during winter (see also Bellrose 1980; Afton and Anderson 2001).

As of 14 December 2010, only 1 lesser scaup had been collected as part of monitoring efforts related to the Deepwater Horizon oil spill. Of course, lesser scaup probably do not start

arriving on the offshore wintering areas until sometime in late October – early November, and therefore, the fact that only a single bird has been collected is not surprising. In addition, avian mortality search efforts have likely declined dramatically since the well was plugged. Also, the NRDA Waterfowl Workplan, the 10th in a series of avian monitoring plans post-spill, was finalized in January 2011. Therefore, we should not conclude from information to date that lesser scaup and their offshore wintering habitats have not been impacted by the spill. Rather, impacts by the spill on the wintering population of lesser scaup are presently unknown. It is important that we recognize the potential long-term, sub-lethal effects of oiling on lesser scaup could result in carry-over effects on the breeding grounds including reduced adult female survival and changes in female body condition with the latter potentially resulting in reduced breeding propensity and delayed nest initiation, declines in clutch size and egg survival, as well as declines in brood size and fledging success (Austin et al. 1998; Afton and Anderson 2001; Anteau et al. 2007; DeVink et al. 2008).

Objectives: The proposed study will identify key offshore wintering areas in the northern Gulf of Mexico, and also determine (1) the number and proportion of marked birds inhabiting the offshore environment, (2) proportion of time spent in the offshore environment (as compared to state-owned water), (3) daily and seasonal movements in the Gulf of Mexico, (4) the proportion of time spent in specific planning area, and (5) if marked birds are using the offshore environment as roosting or feeding habitats. Also, captured adult female lesser scaup will be monitored for oiling (PAHs; Fritcher et al. 2002, Perez et al. 2008) and other contaminants such as aspirate aminotrasferase (AST) and gamma-glutamyl transferase (GGT) (Alonso-Alvarez 2007a, b; Perez et al. 2010).

Methods: Researchers will capture and mark 100 adult female lesser scaup staging on Pool 19 Mississippi River during spring migration (March-April). Satellite transmitters (n = 100; 38g) will be surgically implanted in adult females weighing $\geq$750g. In addition, researchers will mark an additional sample of staging lesser scaup (~2,000/yr x 5yrs) with USFWS aluminum leg-bands and auxiliary bands to document survival, movements, and fidelity. All marked birds will be visually evaluated for oiling and 1 feather will be collected from the axillary region of each banded bird. Program MARK (White et al 1999, 2006) will be used to evaluate effects of oiling and other biologically important covariates on estimates of annual survival for each age-sex class. Since we are primarily interested in obtaining information during the wintering period, transmitters will be set to maximize information during satellite link-ups during this timeframe; arrival to departure. To our knowledge, this study represents one of the largest marking and monitoring efforts ever conducted for lesser scaup. Data collected during this project will be invaluable in addressing concerns over potential effects of the Deepwater Horizon oil spill. In addition, data obtained should be extremely beneficial in addressing some of the hypotheses concerning the declining continental population of lesser scaup. This collaborative project will potentially involve a number of partners including the USFWS, USGS, LSU COOP Unit, CMI, Gulf Coast Joint Venture, Iowa Department of Natural Resources, Minnesota Department of Natural Resources, Mississippi Flyway Technical Committee, and the Louisiana Department of Wildlife and Fisheries.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Areas: Western, Central, and Eastern

Title: Workshop on Future Directions in Understanding Physical-Biological Oceanographic Interactions in Mid- to Deep Waters of the Gulf of Mexico

BOEMRE Information Needs to be Addressed: The results of this workshop will help BOEMRE plan future directions in physical-biological oceanographic studies in the Gulf of Mexico. A more thorough understanding is needed of the role that physical processes play in structuring biological communities in mid- to deep waters, in order to inform BOEMRE of the current state of the ecosystem and how it might be impacted by perturbations (e.g., storm events, oil spills, climatic variability, etc.). This supports BOEMRE's mission of sponsoring scientific research to effectively manage and protect the environment, particularly as oil and gas operations move toward deeper waters. Major information gaps identified by this workshop and the resulting research will contribute to BOEMRE studies planning and preparation of NEPA documents.

Cost Range: (in thousands) $200-$300 **Period of Performance:** FY 2012-2013

Description:

Background: Recently completed, and ongoing, BOEMRE studies in the Gulf of Mexico recommend that more integration is needed between the physical and biological oceanographic disciplines. Physical processes impact the biotic components of the oceanic ecosystem through changes in oceanographic processes (e.g., transport, turbulence, fronts, and mixing), environmental and climatic factors, nutrient availability, and physical habitat type. Over 10 years ago, in 1999, BOEMRE held a physical/biological oceanographic interaction workshop for the DeSoto Canyon and the adjacent shelf (MMS 2000-074). The workshop suggested a number of data gaps that needed investigating, including understanding of circulation patterns and linkages with primary and secondary productivity, factors impacting the distribution of nutrients and sediments, physical drivers of larval dispersal, and the impacts of extreme or occasional events such as eddy intrusions, upwelling, floods, and hurricanes on the ecosystem.

A broader perspective workshop is now needed to address processes bridging regions within the Gulf of Mexico, including between U.S. and Mexican waters, and to contribute to an understanding of larger-scale connectivity with other ocean basins. Given the increased importance of oil and gas activities in deeper waters, and in light of the recent Deepwater Horizon spill, this workshop is focused on mid- to deep waters. Topics previously addressed at the DeSoto Canyon workshop are also relevant to the current workshop, including the impacts of currents and circulation patterns on productivity, larval dispersal, and sedimentation, as well as the impacts of perturbations on the ecosystem. Additionally, there is a recognized need in the ocean science community to incorporate ocean observations into

ecosystem models, in order to improve understanding of processes which bridge disciplines (physical, biological, chemical, etc.). Trends in ocean ecosystem modeling and its application to the Gulf of Mexico will also be considered in this workshop. The goals of this workshop are in support of BOEMRE's mission to sponsor scientific research to effectively manage and protect the environment.

Objectives: The objectives of this workshop are as follows:

- To review the current state-of-knowledge related to physical-biological interactions and ecological/mathematical modeling in mid- to deep waters of the Gulf of Mexico (>100 meters).
- To identify significant data gaps in our use of physical data/information and their implications to biology in these waters.
- To develop a plan to conduct integrated studies addressing the identified data needs.
- To identify collaborating partners for performing this research both from the U.S. and Mexico.
- To evaluate the science of ecological modeling on long-term time scales, with relevance to climatic impacts.

Methods: Support will be sought from other affected agencies (such as NOAA) to help share costs and explore common research directions. The workshop will consist of invited technical presentations, workgroup sessions, and a final plenary session. A planning group will be formed to select the Chair(s) and finalize the structure of the workshop, with participation from both U.S. and Mexican scientists. Topics to be addressed include, but are not limited to, upwelling and productivity, aggregation along physical gradients, biological-physical processes in eddies and eddy pairs, mixing and bio-optics, and larval dispersal. As well, modeling and mathematical approaches to integrated studies will be explored, including evaluating the science of ecological modeling on long-term time scales, with relevance to climatic impacts. Keynote speakers will be chosen to address selected topics and to stimulate further discussion in workgroups. A final synthesis report will detail major workshop findings.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Areas: Central and Western

Title: Eastern Brown Pelicans: Dispersal, Seasonal Movements, and Monitoring of PAHs and Other Oil Contaminants among Breeding Colonies in the Northern Gulf of Mexico

BOEMRE Information Needs to be Addressed: Additional information is needed to assess the potential impacts of the Deepwater Horizon oil spill on the breeding population of eastern brown pelicans in the northern Gulf of Mexico. USFWS bird-impact data indicate the brown pelican was second only to the laughing gull in number of birds collected post-spill. Losses due to the Deepwater Horizon oil spill may be problematic considering the brown pelican was just recently delisted (17 Nov 2009; 74 FR 59443 59472). In addition, to monitoring spatial variation in PAHs (and other contaminants; PCBs, PBDEs) from brown pelicans, this study would also provide information on seasonal movements and distribution of marked birds needed for NEPA analyses, DPPs, and other documentation.

Cost Range: (in thousands) $955-$1,200 **Period of Performance:** FY 2012-2015

Description:

Background: This study addresses information needs for the recently delisted eastern brown pelican with known breeding colonies along the coast and on barrier islands in the Western, Central, and Eastern Planning Areas. A conservative combined estimate of 50,000 brown pelicans was documented for Texas and Louisiana, prior to its extirpation in Louisiana in the early 1960s (Holm et al. 2003). Pesticide contamination was largely responsible for major pelican declines in Texas (King et al. 1985), whereas endrin contamination of prey fish was considered the cause of its extirpation in Louisiana (Nesbitt et al. 1978, Blus et al. 1979). Beginning in 1968, the Louisiana Department of Wildlife and Fisheries (LDWF) and the Florida Fish and Wildlife Conservation Commission began a reintroduction program with release of 1,276 nestlings from Florida to three sites in Lousiana (Nesbitt et al. 1978, McNease et al. 1984). During the spring of 1975, ~40% of the restoration population in Louisiana died as a result of endrin pollution. Using data from fixed-wing aerial surveys conducted by LDWF, Holm et al. (2003) estimated an intrinsic growth rate of 0.25 (1971-2001) with a peak in number of nests (n = 16,405) during 2001. Peak number of nesting colonies occurred in 2000 when 11 colonies were documented. The population in Louisiana appears to have stabilized at around 15,000 nests (Visser et al. 2005). Coastal erosion appears to be reducing available nesting habitat for brown pelicans in Louisiana even though the state contains the largest area of undeveloped coastal barriers in the U.S. (Visser et al. 2005).

The eastern brown pelican was listed as endangered under the Endangered Species Act on 2 June 1970 (35 FR 84960), and was delisted on 17 November 2009 (74 FR 59443 59472). No Critical Habitat rules have been published for this species. Even though the brown pelican was delisted, all coastal states in the Gulf of Mexico, except Alabama, consider it as a state

Species of Conservation Concern. The brown pelican is extremely susceptible to environmental contaminants, which was the original reason for its listing (i.e., DDT). In addition, this species seems fairly susceptible to negative effects from oiling (Shields 2002). As of 3 November 2010, 871 brown pelicans had been collected as part of monitoring efforts related to the Deepwater Horizon oil spill. Of the 871 birds collected, 330 were visibly oiled (38% oiling rate); 136 visibly-oiled birds were dead (USFWS 2010). Though efforts at rehabilitation and release were highly publicized, the post-release survival of previously oiled and handled brown pelicans tends to be fairly low with subsequent reductions in reproductive effort (Anderson et al. 1996). Although no numeric population goals were established in the post-delisting monitoring plan (USFWS 2009), it is important that we recognize the potential long-term, sub-lethal effects of oiling on brown pelican populations and their recovery in the northern Gulf of Mexico.

Objectives: The proposed study will determine (1) if captured adult female brown pelicans and nestlings/immatures show indications of oiling (PAHs; Fritcher et al. 2002, Perez et al. 2008) and other contaminants (Mallory et al. 2010) such as aspirate aminotrasferase (AST) and gamma-glutamyl transferase (GGT) (Alonso-Alvarez 2007a, b; Perez et al. 2010) , (2) dispersal, movements, seasonal home range, site fidelity, and short-term survival of marked adult female and immature brown pelicans.

Methods: Researchers will capture and mark 7-10 adult female brown pelicans/nesting island along the Louisiana coast at known breeding colonies. Satellite transmitters (n = 100; 40-45g) will be placed on individual adult females weighing $\geq$2824g. In addition, researchers will mark nestling brown pelicans (~500/yr x 3yrs) with USFWS aluminum leg-bands and colored leg-bands to document juvenile dispersal, movements, fidelity, and survival. If possible, researchers will only select 1 individual/nest ensuring that a representative sex ratio is obtained. In addition, researchers will also consider obtaining spatially representative samples. Additional effort each fall/winter/spring will be expended conducting observations by researchers, collaborators, and volunteers along the coast to document locations of color-banded juvenile brown pelicans. To our knowledge, this study represents one of the largest marking and monitoring efforts ever conducted for the eastern brown pelicans. Data collected during this project will be invaluable in addressing concerns over potential effects of the Deepwater Horizon oil spill. Also, data obtained from this study will be instrumental in addressing some of the needs identified by the USFWS relative to the recent de-listing of the brown pelican (USFWS 2009). This project will potentially involve the USFWS, USGS, USDA-APHIS, the LDWF, universities, and numerous volunteers.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Areas: Central and Western

Title: Monitoring of Breeding Least Terns and Wintering Piping Plovers in the Northern Gulf of Mexico

BOEMRE Information Needs to be Addressed: Additional information is needed to assess the potential impacts of the Deepwater Horizon oil spill and routine oil and gas activities on breeding/wintering Least Terns and wintering Piping Plovers. The Interior population of Least Tern was listed as endangered on 28 May 1985 (50 FR 21784 21792) and in the southeastern US can be found nesting primarily on sandbar habitats along major river systems in Texas, Mississippi, and Louisiana. The Great Lakes Piping Plover is listed as endangered (11 Dec 1985), and the Great Plains and Atlantic populations are considered threatened (50 FR 50726 50734). A large segment of the Piping Plovers breeding in the interior of the US and Canada winter along the Gulf Coast. Results from this study will be invaluable for Section 7 consultations, NEPA analyses, EPs, DOCDs, and other documentation.

Cost Range: (in thousands) $1,263-$1,516 **Period of Performance:** FY 2012-2015

Description:

Background: This study addresses information needs for two listed species; the endangered Interior Least Tern and endangered (Great Lakes population) and threatened (rest of range) Piping Plover. Both species are known to occur along the coast and on barrier islands in the Western, Central, and Eastern Planning Areas of the northern Gulf of Mexico. Reasons for the listing of both species (Thompson et al. 1997, Elliott-Smith and Haig 2004) include, but are not limited to, loss and degradation of breeding and wintering habitats. On the wintering grounds, beachfront development and human disturbance associated with beach-based recreation are negatively influencing recovery (Jackson and Jackson 1985, LeDee et al. 2008, Hecht and Melvin 2009). Least Terns are known to breed at inland lakes and riverine habitats in TX, LA, MS, but also in coastal areas in LA, MS, and FL (Jackson and Jackson 1985, Sidle and Harrison 1990, Szell and Woodrey 2002, Mazzocchi and Forys 2005). Though the majority of inland breeding Least Terns are thought to depart the continental US to winter along the coasts of Mexico, Central and South America, Argentina, and Brazil, some unknown segment or proportion winters along coastal beaches and offshore barrier islands along the northern Gulf of Mexico (Thompson et al. 1997). The Interior Least Tern population considered here appears to be relatively stable, largely owing to productivity along a 901km stretch of the lower Mississippi River (Kirsch and Sidle 1999, Szell and Woodrey 2002). No Critical Habitat rules have been published for the Least Tern. The most recent (17 Sept 2007) Biological Assessment conducted by the USFWS relative to OCS activities indicated that Least Terns were “not likely to be impacted by the proposed action,” and therefore were “not analyzed.” As of 11 December 2010, 111 (53 oiled) Least Terns had been collected and reported as part of monitoring efforts related to the Deepwater Horizon event.

Three populations of Piping Plovers are recognized under ESA; Great Lakes (endangered), Great Plains (threatened), and the Atlantic (threatened) (1985 December 11; 50 FR 50726-50734). The Great Plains population breeds primarily along the Missouri River system and its tributaries, as well as alkali wetlands and lakes in the Dakotas, Montana, and in prairie Canada; winters primarily along the Gulf of Mexico (Elliott-Smith and Haig 2004, Haig et al. 2005, Roche et al. 2010). The Great Lakes population breeds primarily along the shores and cobble beaches and associated islands with similar substrate in the Great Lake states and Canadian provinces (Elliott-Smith and Haig 2004, Haig et al. 2005, Stucker et al. 2010); winters primarily along the south Atlantic coast with the highest densities between St. Catherine's Island, GA to Jacksonville, FL, but as far west as the Laguna Madre, TX (Stucker and Cuthbert 2005, Stucker et al. 2010). The Atlantic Population breeds from on beaches and barrier islands from Atlantic Canada south to NC; winters primarily along the Atlantic coast (Elliott-Smith and Haig 2004, Haig et al. 2005, Hecht and Melvin 2009). Possibly as high as 75% of all breeding piping plovers regardless of population affiliation may winter in the Gulf of Mexico spending up to 8mo on the wintering grounds (Elliott-Smith and Haig 2004, Haig et al. 2005). Unlike the more optimistic population trajectory for the Interior Least Tern, that of the Piping Plover suggests declines, at least for 2 of the 3 breeding populations (Great Lakes and Atlantic) (Haig et al. 2005, Hecht and Melvin 2009, Roche et al. 2010). Twelve different Critical Habitat rules have been published for Piping Plovers including designations for coastal wintering areas of the following states; NC, SC, GA, FL, AL, MS, LA, and TX (10 July 2001; 66 FR 36038 36086). The Biological Assessment (17 Sept 2007) relative to Gulf of Mexico OCS Oil and Gas Lease Sales, 2007-2012 did analyze the scenario for the Piping Plover and USFWS concluded "that the proposed action is not likely to adversely affect the Piping Plover or its Critical Habitat". As of 14 December 2010, only a single Piping Plover (not oiled) had been collected and reported as part of monitoring efforts related to the Deepwater Horizon event.

Objectives: For Least Terns, objectives include monitoring nests and deriving productivity information among years and sites, as well as a transmittered sample of adult females to derive information on foraging bout duration and frequency, foraging distance, and dispersal, movements, seasonal home range, site fidelity, and short-term survival. For Piping Plovers during winter, estimates of dispersal, movements, seasonal home range, site fidelity, and short-term survival will be obtained for a sample of transmittered adult females, and for color-banded individuals.

Methods: Researchers will capture and mark 5-10 adult female Least Terns/yr/site at known nesting areas within TX, LA, and MS. VHF transmitters (Holohil Model BD2; n = 50; ~1g) will be placed on individual adult females weighing $\geq$47g. In addition, researchers will mark nestling terns with USFWS aluminum leg-bands and colored leg-bands to document juvenile dispersal, movements, fidelity, and survival. For wintering Piping Plovers, researchers will capture and mark 5-10 adult females yr/site at known wintering areas in TX, LA, and FL. VHF transmitters (Holohil Model BD2G; n = 50; ~1.2g) will be placed on individual adult females weighing $\geq$53g. Researchers will also capture and mark (USFWS band and color leg-bands) 100 wintering Piping Plovers per year east and west of the Mississippi River to document dispersal, movements, fidelity, and survival. Significant observation effort will be expended each fall/winter/spring conducting observations for color-banded individuals along

the coast. To our knowledge, this study represents one of the largest marking and monitoring efforts ever conducted for these species. This project is collaborative in nature potentially involving the USFWS, USGS, ACOE, LA Department of Wildlife and Fisheries, TX Parks and Wildlife Department, MS Wildlife and Fisheries Department, FL Fish and Wildlife Conservation Commission, universities, and numerous volunteers.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Area: Central

Title: Impacts to Shipwrecks from Dredging Activities Associated with the Louisiana Sand Berm

BOEMRE Information Needs to be Addressed: The BOEMRE is required under Section 106 of the National Historic Preservation Act to consider the effects of its permitted actions on significant historic properties. Dredging activities along the Louisiana coastline, in an effort to stave off oil entering into the fragile wetlands, may have adversely impacted and possibly destroyed unidentified cultural resources that may be significant under any or all four criteria of the National Register of Historic Places. Dredging of the sand sources to construct this emergency berm occurred in high-energy, shallow-water environments near the Chandeleur Islands where shipwrecks have been reported in historical accounts. This study will provide BOEMRE with baseline information on the location, preservation, site size, and the size of debris fields associated with cultural resources discovered as a result of the dredging activities and berm construction. Though the dredging activities for the emergency berm occurred in State waters, the results of this study will have broader-scale implications for BOEMRE's Marine Minerals Program and the impacts of OCS dredging for extracting valuable sand sources on submerged cultural resources. Information obtained will assist BOEMRE with complying with its Section 106 responsibilities under the NHPA by providing data about sites encountered and possibly impacted during these proposed activities. These data will also provide BOEMRE information about what appropriate mitigation measures for these sites as well as the level of damage (if any) has resulted.

Cost Range: (in thousands) $600-$900 **Period of Performance:** FY 2013-2015

Description:

Background: In 2010, under an emergency sand agreement between the State of Louisiana and BOEMRE, the State of Louisiana constructed a large sand berm to protect fragile wetlands from the impacts of the Deepwater Horizon oil spill. In order to construct this berm, the State dredged from sand sources within state waters and deposited these sediments in an effort to create a six foot high berm along the Chandeleur Islands. At the time of the agreement, the State intended to utilize sand sources on the OCS though ultimately a sand lease was not granted to the State for access to those OCS sources. Unfortunately, sufficient time was not available to conduct an extensive remote sensing survey of the borrow areas or of the berm construction in an effort to identify historic shipwrecks. Additionally, conditions during the time of dredging and berm construction did not permit archaeologists to conduct diver investigations to assess the age, cultural affiliation, or nationality of shipwrecks prior to the removal of sediments. In an effort to understand what impacts occurred to shipwrecks found as a result of the sediment removal process, this study will provide BOEMRE with information on the location, preservation, and the size of debris fields associated with shipwrecks discovered as a result of the dredging activities and berm construction.

Information obtained will assist BOEMRE with complying with its Section 106 responsibilities under the NHPA by providing data about sites encountered and possibly impacted during dredging and berm construction activities. These data will also provide BOEMRE information about appropriate mitigation measures for these sites as well as the level of damage (if any) that has occurred.

Objectives: The objectives of the study are to identify and ground-truth up to ten potential shipwreck sites that may have been impacted during the sediment removal process/berm construction. The study will then focus attention at each site individually, positively identifying and assessing the size, distribution, and characteristic of the shipwreck remains. Data recovered from the sites will be used to fulfill the Section 106 process by determining if each site is eligible for inclusion on the National Register of Historic Places as well as providing information to the general public about Louisiana's maritime heritage and archaeological resources.

Methods: The objectives of the study will be achieved through an investigation of the physical remains of each shipwreck site identified as a result of the dredging activities associated with the construction of the berm. Extensive remote sensing of each site will be conducted using magnetometer, side-scan sonar, sub-bottom profiler, and sector scanning sonar devices in order to assess the condition and location of each site. This will be followed by diver visual investigations of each site if conditions are safe. Diver investigations will include diver visual surveys, mapping, and potentially additional hand dredging and probing in order to determine the age, cultural affiliation, and nationality of each identified shipwreck. Test units will be excavated in areas determined from both the remote sensing data as well as visual surveys (should diving conditions allow) as a means to identify intact areas of the site or if these are secondary deposits made as a result of the larger berm dredging activities. The project will also conduct extensive photographic documentation and mapping of each site. Limited artifact collection for identification purposes is also expected and all artifacts collected during the investigation are to undergo conservation and curation in conjunction with State of Louisiana protocols. Additionally, other analysis such as wood analysis will be conducted to provide further information about these sites. The study will provide an archaeological assessment of each site including site maps, site descriptions, damage assessments, and eligibility determinations to the National Register of Historic Places. Analysis of the archaeological data will be augmented by additional historic research of primary and secondary sources to provide as much information as possible for the sites located during the dredging of the borrow material. The end product of this study will be two fold; first, it will provide information on the types of impacts that could be expected from the removal of sand and gravel from borrow areas on the OCS, and, second, provide a public outreach component including posters and booklets detailing the project's history, impacts of these types of operations on historic resources, and discoveries made that showcase Louisiana's rich maritime heritage.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Gulf of Mexico

Planning Areas: Gulfwide

Title: Post-Oil Spill Assessment of OCS-Related Infrastructure and Communities in the Gulf of Mexico Region

BOEMRE Information Needs to be Addressed: The information derived from all phases of this investigation can be used by both Federal and State decision-makers in evaluating the importance of onshore infrastructure in supporting offshore activities. Activities associated with ongoing operations, expansions, and most importantly new investments, is a source of considerable economic activity. The tropical activity of 2005 and the Deepwater Horizon oil spill of 2010 have the potential to considerably impact future GOM production activities. The BOEMRE needs current, up-to-date information about OCS-related infrastructure in the region, and an understanding of how current and future development has been impacted. Updating the GIS and other data associated with this infrastructure can also assist in highlighting future challenges in safety and prevention protocols, both in regards to tropical events and accidents.

Cost Range: (in thousands) $140-$210 **Period of Performance:** FY 2012-2013

Description:

Background: The backbone of offshore oil and gas activities is the infrastructure in coastal areas supporting a wide range of activities that occur offshore in the Gulf of Mexico. An earlier study sponsored by BOEMRE (The Louis Berger Group, 2004) surveyed a wide range of existing onshore infrastructure supporting offshore activities, including: platform fabrication yards; shipbuilding & shipyards; ports; support & transport facilities; waste management facilities; pipelines; pipecoating yards; natural gas processing plants; natural gas storage facilities; refineries; and petrochemical facilities. A standardized set of topics was covered for each facility type including a description of a typical facility and a survey of industry characteristics, important regulations governing operations, and of industry trends and outlooks.

A number of recent changes have occurred in the industry necessitating an update, including a considerable increase in energy prices, significant financing challenges and ownership shifts, increased interest in the GOM prospects, exceptionally damaging tropical activity in 2004 and 2005, and, most recently, the Deepwater Horizon oil spill and its aftermath. This spill is having, and will continue to have, substantial impacts on industry operations in the Gulf. An ongoing BOEMRE-supported research effort notes that the tropical activity of 2005 underscored both the importance of, and unique interrelationships between, offshore activities and its associated onshore infrastructure. This tropical activity created significant destruction throughout the Gulf Coast energy corridor which raised questions about which types of infrastructure will be rehabilitated, which will be expanded, and which will be moved to other regions in the Gulf, or even out of region. Such consequences have important impacts on the

economies and communities of the region. The 2010 oil spill has further underscored the importance of interrelationships between offshore activities, onshore infrastructure, and the industry's local socioeconomic consequences. Spill impacts have also brought to the fore factors that were not addressed by earlier studies, most notably spill response and remediation infrastructure and waste disposal and treatment locations. As post-spill events unfold, additional factors will doubtlessly be raised as well. The Infrastructure Fact Book structure provides BOEMRE with a systematic description and assessment of the OCS industry's onshore physical and operational characteristics. This Fact Book should be updated to addressing the new factors raised by the oil spill.

Objectives: The ongoing Infrastructure Fact Book update is incorporating information on recent changes to the industry and region including a matured understanding of the influence of the 2005 tropical activity on onshore infrastructure development trends and outlooks. It is also reorganizing and supplementing information to better support EIS development and updating the underlying data set and documentation to ensure that project metadata meets BOEMRE data standards. These efforts will conclude in 2011.

The overall goal of this "Post-Oil Spill Assessment of OCS-Related Infrastructure" project incorporate into this newly updated Fact Book system salient information and data related to oil spills. This effort will address the following new objectives:

- To develop a supplemental chapter that will characterize the oil spill response and remediation infrastructure and facilities in the GOM, including a discussion of disposal and treatment locations of recovered oil and cleanup materials;

- To collect GIS data associated with these facilities to supplement the existing infrastructure database; and,

- To provide an analysis of the impact of events such as the Deepwater Horizon spill on the land use and infrastructure in the GOMR.

Methods: The methods will include a detailed literature review and synthesis of existing information, including: government reports, trade journal articles, government data series, filings before various regulatory agencies, and trade association reports.

Revised Date: April 25, 2011

SECTION 3.0 TOPICAL AREAS FOR FISCAL YEAR 2014

The GOMR is expecting a continuation of offshore oil and gas activities; however, future activities in the Atlantic region are uncertain. With a new Administration and a draft proposed plan under review, our responsibilities could increase as we move into new alternative energy projects and new OCS areas. If leasing occurs in new areas, many of the same issues will need to be addressed though modifications depending on the planning area. In some cases, there is little or no information existing, in other cases there are data available which could be used to support the OCS program. More significantly, the Deepwater Horizon incident and subsequent oil spill in 2010 created many new information needs that relate to the recovery and long-term impacts to the Gulf's natural and cultural resources. These information needs will continue beyond FY 2012.

3.1 Deepwater

Deepwater habitats including the mid-water pelagic realm are the least understood marine environments of the GOM. Three major deepwater studies are ongoing to broaden our limited knowledge base of deepwater benthic ecology. The results from these studies will lead to new areas for further investigation.

Recent congressional mandates require BOEMRE to lease areas in the GOM within 125 miles (200 km) of Florida. As oil and gas activities move closer to the west coast of Florida, BOEMRE will need to further investigate habitats along the West Florida Escarpment. In addition, ecosystems east of the escarpment, such as seagrass in Federal waters (up to 70 mi (110 km) offshore), low relief live bottoms, and topographic features (Sticky Mounds, Madison-Swanson, Steamboat Lumps, etc) will warrant future assessment.

Recent archaeological discoveries made in deep and ultra-deep water suggest a greater population of historic shipwrecks far from land off the continental slope than was previously suspected from prior BOEMRE studies. One current study is investigating the potential for losses along the Vera Cruz-to-Havana route routinely followed by Spanish vessels, which would have taken them through the southern boundary of the EEZ. Another study in the Gulf and one planned study in deep water off Virginia, combine archaeological investigation of deepwater wrecks with biological characterization of the organisms that have colonized them. Understanding the diversity of resources, site formation processes, and their potential eligibility to the National Register of Historic Places is a concern for designing appropriate mitigation strategies to fulfill agency obligations under Section 106 of the National Historic Preservation Act.

Several major studies have recently completed measurements of currents in deepwater. This dataset spans the GOM from 87°W to 97°W and down to 24°N in Mexican waters. New studies are examining the Loop Current and making Lagrangian observations of deep currents over the entire Gulf basin. The next step will include modeling of the data and incorporation of the information into oil spill assessments and cross referencing with pelagic biology studies.

3.2 Need for Monitoring

The development of long-term monitoring programs is of international interest for measuring trends in ecosystem indicators and assessing the vulnerability and resiliency of human and natural systems. Given its broad scope, the design and implementation of monitoring efforts are expected to engage multiple interested partners, including Federal and State agencies, academia, and industry, drawing from expertise in both the U.S. and Mexico. Monitoring programs would provide BOEMRE the long-term data sets necessary to evaluate the effectiveness of mitigations and stipulations placed on developers to ensure the protection of natural resources. The analysis of long-term data collected from monitoring programs also reveals trends as biological populations and oceanographic conditions shift in response to perturbations, such as hurricanes, oil spills, periodic climate events, ocean acidification, and/or climate change. With these data available, mitigation requirements can be adjusted to be more effective, analysis of cumulative effects in NEPA documents will be more robust, and approaches to addressing climate change may be uncovered.

Operationally, we define an integrated observing (or monitoring) system as the observing and reporting of a set of variables that can be used to assess the state of the Gulf of Mexico ecosystem. When viewed over time, indices can be developed as measures of changing states or trends in the Gulf ecosystem or in system components. The variables to be observed and reported will include both the biotic and abiotic aspects of the ecosystem. These ecosystem parameters include some variables for which the data will be gathered and served, others for which specific new products will be developed, and finally parameters for which new measurements will need to be obtained. Under this broad definition, monitoring may include such activities as collecting new oceanographic and water quality measurements from a moored array, compiling a multi-decadal, climate-quality time series from multiple satellite sensors, or numerical modeling to synthesize observations and produce new products.

3.3 Fates and Effects

The OCS supports large and valuable commercial and recreational fisheries, various threatened or endangered species including sea turtles and marine mammals, and unique benthic communities. Concern has been expressed that the oil and gas industry may contaminate these resources or alter the supporting ecosystem. Understanding the chronic, sublethal impacts that may be associated with offshore oil and gas activities is a concern to many. Questions continually arise as industry moves into deeper water and new technology is applied; the Deepwater Horizon incident further served as a reminder of this. The studies program is continuously addressing the information needs in this constantly evolving area and will develop new studies as the need arises.

3.4 Decommissioning

There are nearly 4,000 oil and gas platforms currently in the Gulf of Mexico. Over the next decade, it is expected that a large number of these structures will be removed. These structures have supplied a hard surface for organisms to flourish, creating an artificial ecosystem and affecting the distribution of species. Since the 1980s, Gulf states have

requested and been granted permits to reef decommissioned oil and gas platforms through the Rigs-to-Reefs Program. Historically, the annual percent of decommissioned platforms used as artificial reef material has increased each year; an estimated 8 percent through 2000 to 2004, to over 10 percent in 2009-2010. Over the last decade, structure removals have begun to outpace new structure emplacements. Will the Gulf States continue to request the decommissioned oil and gas platforms for artificial reef material? Will the percent of decommissioned platforms used continue to increase? How will the removal of large numbers of oil and gas structures affect the ecosystem of the Gulf of Mexico? Planned and ongoing studies will identify additional research gaps.

3.5 Renewable Energy

On August 8, 2005, President Bush signed into law the Energy Policy Act of 2005 (EPAct). EPAct amended the Outer Continental Shelf (OCS) Lands Act to grant the Secretary of the U.S. Department of the Interior discretionary authority to issue leases, easements, or rights-of-way (ROW) for previously unauthorized activities that: (i) produce or support production, transportation, or transmission of energy from sources other than oil and gas; or (ii) use, for energy-related or other authorized marine related purposes, facilities currently or previously used for activities authorized under the OCS Lands Act. EPAct requires the Secretary to share with nearby coastal States a portion of the revenues received by the Federal Government from authorized renewable energy and alternate use projects on certain areas of the OCS. EPAct also included a requirement that the Secretary develop any necessary regulations to implement the new authority.

On March 20, 2006, the Secretary delegated to the BOEMRE the new authority that was conferred by the EPAct. Under this authority, BOEMRE becomes the lead Federal agency of permitting and regulatory oversight of the Cape Wind Project and any other projects already submitted to the US Army Corps of Engineers. On November 6, 2007, the BOEMRE announced in the Federal Register an interim policy for authorization of the installation of offshore data collection and technology testing facilities in Federal waters. The BOEMRE accepted comments and nominations until January 7, 2008 regarding the authorization of OCS activities involving the installation of meteorological or marine data collection facilities to assess renewable energy resources (e.g., wind, wave, and ocean current) or to test renewable energy technology. The interim policy is in effect until BOEMRE promulgates final rules. In light of this new responsibility, BOEMRE has begun collecting the data and information necessary to analyze the impacts of these new types of projects on natural and cultural resources. Several studies are being developed and will examine future renewable energy planning scenarios and infrastructure.

The BOEMRE published the final rule: Renewable Energy and Alternative Uses of Existing Facilities on the OCS (REAU). The rule was published in the Federal Register on April 29, 2009 (74 FR 81, pp. 19638-19871) establishing a program to grant leases, easements, and ROWs for renewable energy project activities on the OCS, as well as certain previously unauthorized activities that involve the alternate use of existing facilities located on the OCS; and establishing the methods for sharing revenues generated by this program with nearby coastal States. The REAU regulations ensure the orderly, safe, and environmentally

responsible development of renewable energy sources on the OCS. The Program embraces a "cradle-to-grave" approach.

On April 9, 2009, the Department and the Federal Energy Regulatory Commission (FERC) cleared the way for the publication of the REAU regulations by signing an agreement that clarifies each agency's jurisdictional responsibilities for leasing and licensing renewable energy projects on the OCS. Under the agreement, BOEMRE has exclusive jurisdiction with regard to the production, transportation, or transmission of energy from non-hydrokinetic renewable energy projects, including wind and solar. FERC has exclusive jurisdiction to issue licenses for the construction and operation of hydrokinetic projects, including wave and current, but applicants will be required to first obtain a lease through BOEMRE.

The Renewable Energy Program is administered by BOEMRE. This new activity in the marine environment requires an assessment of the potential environmental impacts to resources on the OCS. Some present studies at BOEMRE are Comparative Study of Offshore Wind Turbine Generators (OWTG) Standards; Determining Night Time Distribution of Long-Tailed Ducks Using Radio Telemetry; Effects of Pile Driving Sounds on Auditory and Non-Auditory Tissues of Fish; North and Central Atlantic Information Resources: Data Search and Literature Synthesis; South Atlantic Information Resources: Data Search And Literature Synthesis; Update of Summary of Knowledge: Selected Areas of the Pacific Coast; Compendium of Avian Information and Comprehensive GIS Geodatabase; Energy Market and Infrastructure Information for Evaluating Alternative Energy Projects for OCS Atlantic and Pacific Regions; Evaluation of Visual Impacts on Historic Properties; Meteorological and Wave Measurements for Improving Meteorological and Air Quality Modeling; Characterization and Potential Impacts of Noise Producing Construction and Operation Activities on the OCS; EcoSpatial Information Database – U.S. Atlantic Region; and Potential for Interactions between Endangered and Candidate Bird Species with Wind Facility Operations on the Atlantic OCS.

A completed study through the Environmental Studies Program (ESP), required by the Outer Continental Shelf Lands Act, as amended in 1978 (OCSLAA), is a Worldwide Synthesis and Analysis of Existing Information Regarding Environmental Effects of Alternative Energy on the Outer Continental Shelf Report (OCS Report MMS 2007-038). The BOEMRE will continue to meet information needs as they arise and exceed expectations for the Renewable Energy Program.

3.6 Physical Oceanography

If renewed oil and gas interest in the Atlantic Region should develop in the future, additional BOEMRE oceanographic studies are highly recommended. Only a few past BOEMRE oceanographic studies have focused on the Mid-Atlantic offshore waters, for example, and most of these studies were conducted more than a decade ago. Information from new BOEMRE oceanographic studies would be used by BOEMRE to improve the accuracy of oil spill trajectories and error estimation, as well as for producing EIS's and other NEPA documents and for management decisions. A new study to be completed in the very near

future, *Literature Synthesis for North and Central Atlantic*, will provide a review of state of knowledge that will help guide any future studies planning and EIS's in this Region.

3.7 Social Science and Economics

Section 1.4.6 describes challenges facing Gulf Region social impact assessment (SIA), the three basic approaches taken to address them, and the FY 2012-2014 study profiles. This section discusses Gulf social and economic information needs more long-term.

Industry focus: As the world's most developed offshore oil province, the intensity and variability of OCS activities respond to worldwide trends in the petroleum industry, energy markets, and business practices. Much BOEMRE research taking this wider view was addressing industry responses to the falling and low oil prices of the 1980s-1990s. Given the pace of change in the industry and energy markets, this research may need updating.
The GOMR will continue efforts to define, describe, and measure OCS industry sectors that drive its onshore impacts. A study of the fabrication industry and port communities is near completion. The BOEMRE needs fuller analyses of other sectors including the service boat, drilling, pipe-coating, pipe-laying, and workover industries. Complexity and changeability make these efforts iterative. An updated industry infrastructure factbook is in process; future versions may include selected industry sectors. Service ports are vectors for many industry impacts but have proven particularly difficult to address. Currently, BOEMRE is engaged in limited efforts to address this issue, and plans an annual purchase of GOM vessel movement data beginning in 2010.

The BOEMRE estimates of future OCS-related economic activity are based on past industry behavior. Developing and updating these data is an ongoing need. Past experience has led BOEMRE to a strategy that emphasizes public, commercial, and expert information sources. The approach is iterative, progressive, and assumes that most data will be pieced together or extrapolated and that each study will build on the last. The Gulf expects that it will eventually include a limited use of more burdensome collection methods (e.g., workshops, industry surveys) for data deemed critical and "good enough" estimates are unavailable.

Baseline focus: Currently, the GOMR is reexamining questions of geographic focus. The onshore analysis area consists of the 132 counties/parishes included in Labor Market Areas (LMA) that fall in whole or part within the coastal zones of Texas, Louisiana, Mississippi, and Alabama or the Florida Panhandle. The BOEMRE aggregates these into 13 Economic Impact Areas. Substantial CMI efforts are being directed toward refining these aggregations to better reflect onshore industry distributions and activities and, hence to provide stronger support to BOEMRE economic modeling and SIA. Results of these efforts will help define longer-term information needs regarding baseline description. For example, past research will need to be updated and synthesized to reflect the modified focal areas. Also, SIA emphasizes rural issues but many of these will be metropolitan, hence a methodology for identifying OCS-related effects in metropolitan areas may be needed.

Topical Focus: Links between OCS industry dynamics, the baseline industry distributions and activities, and socioeconomic effects are apparent in the fabrication industry's growing use of foreign blue-collar labor. An ongoing study addresses this high-profile issue may need updating or expansion if local and national conditions change. Not all scoping issues can be anticipated, but the Gulf is developing research-based "whitepapers" on many that can, particularly those related to infrastructure and development scenarios. "Whitepapers" permit more detailed and data-rich considerations of issues than are appropriate for an EIS, and the approach will be extended to other social and economic issues. The Gulf will also continue to pursue its systematic reexamination of standard and OCS-specific SIA topics (see, NRC 1992). The BOEMRE has concluded studies of crime and work scheduling. Current studies address Louisiana fiscal systems, coastal recreation and tourism, and land loss, and BOEMRE is considering additional efforts in these areas and in others. These broader studies may identify more focused needs, such as the assessment of local-level fiscal impacts on education or health systems. Over decades of OCS operations, the Region's economy and society have largely adjusted to its demands and opportunities, and many typical SIA effects occur only under unusual circumstances, or not at all, or are difficult to separate from the "background noise." After baseline focus areas are defined, a comparative study will be needed to identify, for at that local level, which SIA do or do not occur, and under what conditions.

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Offshore Environmental Studies Program

Fiscal Years 2012-2014 Studies Development Plan

Atlantic OCS Region

U.S. Department of the Interior
Bureau of Ocean Energy, Management, Regulation and Enforcement
Atlantic OCS Region
Herndon, VA
2011

TABLE OF CONTENTS

Abbreviations and Acronyms

AIS	Automatic Identification System
AMBP	Avian and Bat Monitoring Plan
AMI	Area of Mutual Interest
AOWEC	Atlantic Offshore Wind Energy Consortium
AWC	Atlantic Wind Connection
BAA	Broad Agency Announcement
BOEMRE	Bureau of Ocean Energy Management Regulation and Enforcement
Call	Call for Information and Nominations
CEQ	Council on Environmental Quality
COP	construction and operations plan
CMSP	Coastal and Marine Spatial Planning
CWA	Cape Wind Associates, LLC
DOD	Department of Defense
DOE	Department of Energy
EA	environmental assessment
EERE	Office of Energy Efficiency and Renewable Energy
EIS	environmental impact statement
ERB	Environmental Review Branch
FERC	Federal Energy Regulatory Commission
FOA	Funding Opportunity Announcement
FWS	U.S. Fish and Wildlife Service
FY	Fiscal Year
GHG	greenhouse gas
GOADS	Gulfwide Offshore Activity Data System
MMC	Multipurpose Marine Cadastre
MMS	Minerals Management Service
MOU	memorandum of understanding
MREC	Marine Renewable Energy Center
MSDS	Material Safety Data Sheet
MTB	mooring and telemetry buoy
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMSP	National Marine Sanctuary Program
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOMAD	Navy Oceanographic Meteorological Automatic Device
NOPP	National Oceanographic Partnership Program
NREL	National Renewable Energy Laboratories
NSL	National Studies List
OAEP	Office of Offshore Alternative Energy Programs
OCS	Outer Continental Shelf
OER	Office of Ocean Exploration and Research
RFI	Request of Interest

ROW	right-of-way
SAP	site assessment plan
SHPO	State Historic Preservation Officer
TA&R	Technology Assessment and Research Program
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USGS	U.S. Geological Survey
USEPA	U.S. Environmental Protection Agency
VMS	Vessel Management System
WEA	Wind Energy Area

SECTION 1.0 PROGRAMMATIC OVERVIEW

1.1 Introduction to the Region

The Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) Office of Offshore Alternative Energy Programs (OAEP) is responsible for implementing and managing the offshore renewable energy program, including leasing, environmental programs, and the formation of task forces, State consultation, and post-lease permitting in Federal waters off the East Coast (Figure 1). Within OAEP, the Environmental Review Branch (ERB) is responsible for coordinating the studies program for the Atlantic OCS Region, in addition to compliance with the National Environmental Policy Act (NEPA) and other environmental laws.

1.1.1 Renewable Energy Framework

On August 8, 2005, President George Bush signed the Energy Policy Act of 2005 (P.L. 109-58). Section 388 – Alternative Energy-Related Uses on the Outer Continental Shelf, of the Act granted the Minerals Management Service (MMS), now BOEMRE, authority to regulate energy uses on the OCS. President Barack Obama announced on April 22, 2009 that the Department of the Interior (DOI) completed the Final Renewable Energy Framework or rulemaking process to govern management of the Renewable Energy Program. The final rule establishes a program to grant leases, easements, and rights-of-way (ROWs) for orderly, safe, and environmentally responsible renewable energy development activities, such as the siting and construction of offshore wind farms on the OCS as well as other forms of renewable energy such as marine hydrokinetic (i.e., wave and current).

1.1.2 Interim Policy

The Interim Policy was announced in November 2007 before the issuance of the final regulations in April 2009. The Interim Policy allowed for limited leasing and was designed for resource data collection and technology testing activities. The Interim Policy leases have a 5-year term and provide no subsequent commercial rights. In June 2009, MMS published the "Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey, Environmental Assessment" (USDOI, MMS, 2009). On November 1, 2009, three leases offshore New Jersey and one offshore Delaware were executed. BOEMRE is currently processing project plans for the installation and operation of meteorological towers and buoys under those leases. Additional nominations under the Interim Policy leases are pending offshore Georgia and Florida (see Section 1.3.1).

1.1.3 Inter-governmental Task Forces

OAEP has established inter-governmental task forces to coordinate and collaborate with affected state, local, and tribal governments and relevant Federal agencies, as mandated by the Energy Policy Act of 2005, concerning renewable energy commercial development activities along the Atlantic coast. These efforts enable BOEMRE to further identify and address any major challenges to issuing commercial leases for generation of renewable energy

by increasing its visibility and accessibility to major stakeholders. By January 2011, task force meetings have been held in nine Atlantic states. These task force meetings allow stakeholders early input into the planning process by identifying potential areas of space-use or environmental conflicts and to share their own research efforts related to renewable energy activities on the OCS (see Section 1.3.2).

1.1.4 Memoranda of Understanding

BOEMRE also is coordinating with other Federal agencies responsible for permitting or authorizing portions of offshore renewable energy projects. Part of these efforts include identifying information needs from these agencies for integration into the BOEMRE Environmental Studies Program.

DOI has established memoranda of understanding (MOUs) with other Federal agencies to facilitate coordination on OCS renewable energy development, including MOUs with the Department of Energy (DOE), U.S. Fish and Wildlife Service (FWS), and Federal Energy Regulatory Commission (FERC). The existing MOU with the U.S. Coast Guard (USCG) is currently being updated and additional MOUs are in the process of being established with Department of Defense (DOD), U.S. Army Corps of Engineers (USACE), and National Oceanic and Atmospheric Administration (NOAA).

In June 2010, Secretary Salazar and eleven Atlantic Coast Governors signed an MOU that promotes Federal-state cooperation and coordination for the efficient and responsible development of OCS wind resources. The Atlantic Offshore Wind Energy Consortium's (AOWEC) three working groups drafted action plans to implement the objectives of the MOU: permitting and regulatory processes; data and science; and investment and infrastructure. Through the AOWEC Investment and Infrastructure Work Group, DOI will work with DOE to make sure both agencies and AOWEC play an appropriate role in important policy dialogue. DOE research efforts will address infrastructure challenges that, if not adequately resolved on a national level, could pose significant restriction to offshore wind market growth and deployment. Priority will be given to efforts leveraging DOE investment with initiatives funded by other Federal agencies, state and local governments, and private sector, including utilities.

1.1.5 Coastal and Marine Spatial Planning

Executive Order 13547 established a National Ocean Policy. Under that policy, Coastal and Marine Spatial Planning (CMSP) is a comprehensive, adaptive, integrated, ecosystem-based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean and coastal areas. CMSP identifies areas most suitable for various types or classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives. Identification of Wind Energy Areas (WEAs) under the "Smart from the Start" initiative is an example of CMSP (see Fig. 1).

The Energy Policy Act of 2005 directed the Secretary of the Interior, in cooperation with the Secretary of Commerce, the Commandant of the Coast Guard, and the Secretary of Defense, to establish an OCS Mapping Initiative to assist in decision making related to renewable energy uses on the OCS. The goal of the initiative is the identification of OCS locations of Federally permitted activities; obstructions to navigation; submerged cultural resources; undersea cables; offshore aquaculture projects; and any area designated for the purpose of safety, national security, environmental protection, or conservation and management of living marine resources. The repository of these data is the Multipurpose Marine Cadastre (MMC), OAEP's primary CMSP tool.

1.1.6 Wind Energy Activities

More than half of the country's identified offshore wind potential is located off the New England and Mid-Atlantic Coasts, where water depths generally deepen gradually with distance from the shore. On November 23, 2010, Secretary of the Interior Ken Salazar announced the "Smart from the Start" renewable energy initiative to accelerate responsible renewable wind energy development on the Atlantic OCS by using appropriately identified areas, coordinated environmental studies, large-scale planning and expedited approval processes.

One of the key aspects of the "Smart from the Start" initiative (decoupling the renewable energy leasing and development process) is changing how studies are developed and used. There are generally three phases of renewable energy development on the OCS: lease issuance; site assessment; and construction, operation, and decommissioning of a renewable energy facility. A renewable energy lease gives the lessee an exclusive right to apply for subsequent approvals that are necessary to advance to the next stage of the renewable energy development process. The second phase is BOEMRE review and approval of a site assessment plan (SAP) that allows the construction and installation of a meteorological tower and buoys (see 30 CFR 285.600-.601; .605-.618). After the lessee has collected sufficient site characterization and assessment data the lessee may submit a construction and operations plan (COP), approval of which would authorize the actual construction and operation of a renewable energy facility (see 30 CFR 285.620-.629). Although BOEMRE does not authorize site characterization activities (i.e., geological and geophysical surveys and core samples) associated with renewable energy activities, a lessee must submit the results of such surveys before BOEMRE can consider approving its COP (see 30 CFR 285.626).

On February 7, 2011, Secretary of the Interior Ken Salazar and Secretary of Energy Steven Chu unveiled a coordinated strategic plan to accelerate the development of offshore wind energy, including major steps forward in support of offshore wind energy, including new funding opportunities for up to $50.5 million for projects (see Section 1.3.9) that support offshore wind energy deployment and several high priority WEAs in the Mid-Atlantic that will spur rapid, responsible development of this abundant renewable resource. BOEMRE has found these areas, in consultation with other Federal agencies and task forces, to be suitable for consideration for wind energy development.

On February 9, 2011, BOEMRE issued a Notice of Intent (NOI) to Prepare an Environmental Assessment (EA) for lease issuance and approval of site assessment in WEAs offshore New Jersey, Delaware, Maryland, and Virginia. This spring, DOI expects to identify WEAs offshore North Atlantic states, including Massachusetts and Rhode Island, and launch additional NEPA environmental reviews for those areas. A similar process will follow shortly after for the South Atlantic region, namely North Carolina.

1.1.7 Transmission

BOEMRE also has the authority to issue ROW grants, which would authorize the use of portions of the OCS for the construction and use of a cable or pipeline for the purpose of gathering, transmitting, distributing, or otherwise transporting electricity or other energy product generated or produced from renewable energy (see Section 1.3.7).

1.1.8 Marine Hydrokinetic Activities

Over the next few years, we are likely to see testing of marine hydrokinetic (MHK) devices offshore Florida under the Interim Policy (see Section 1.3.1) and offshore Massachusetts under a research lease (see Section 1.3.5). At this stage of development, commercial activity is not envisioned within the next few years. BOEMRE is continuing to work with FERC to refine procedures relating to MHK projects under the existing MOU.

1.1.9 Mineral Activities

Many studies were conducted in support of the Sand and Gravel, and Oil and Gas Programs on the Atlantic OCS and provide information useful for the review of renewable energy activities and roadmap for future studies. While these programs are not managed by OAEP, they are Atlantic activities and a summary and status of those programs are provided below.

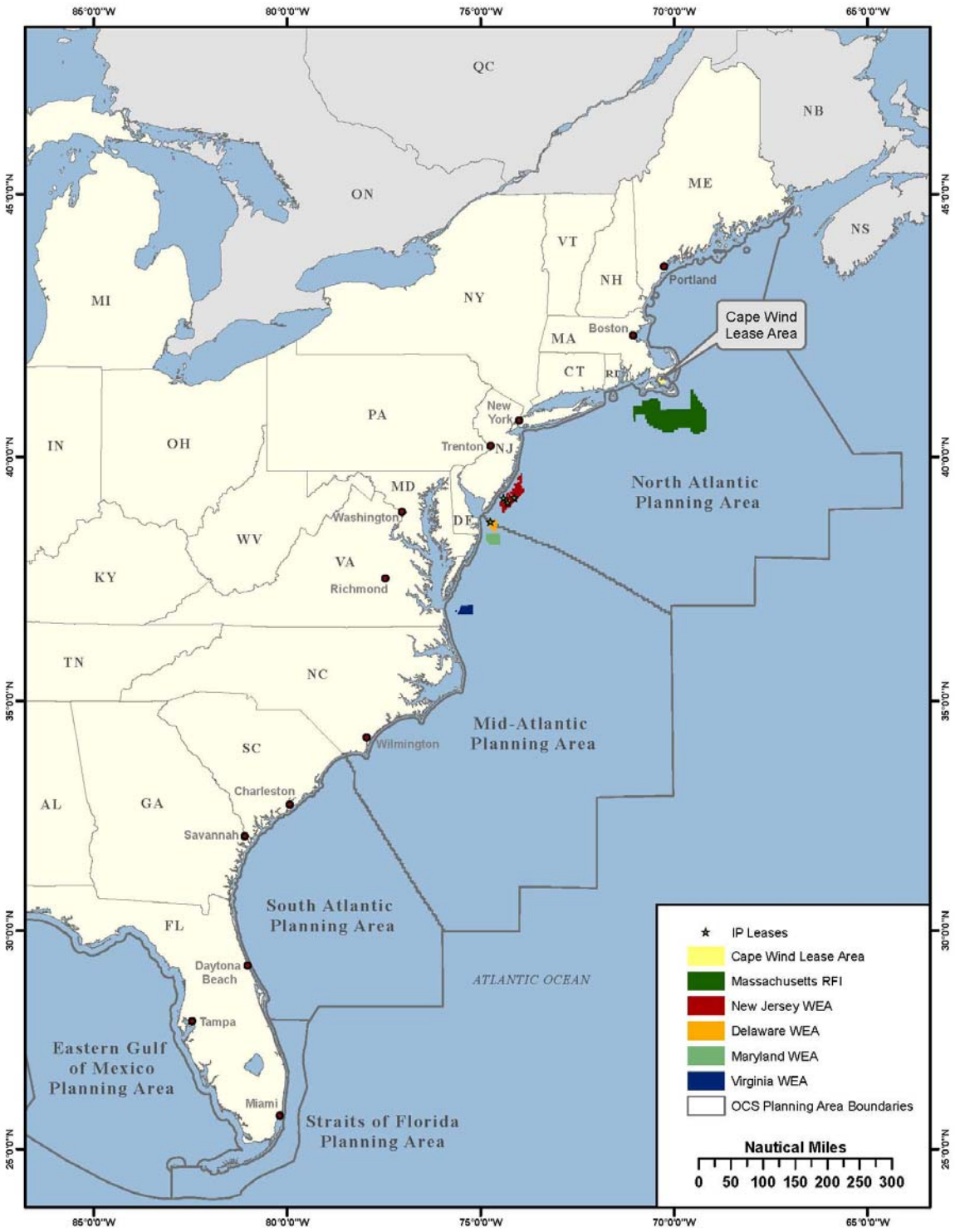
Sand and Gravel Activities: Loss of sand from the Nation's beaches, dunes, and barrier islands is a serious problem that affects both the coastal environment and the economy. Beach nourishment and other coastal restoration projects are addressing this problem, and sand from the OCS is often used to stem this erosion. To date, BOEMRE has conveyed rights to about 30 million cubic yards of OCS sand for 23 coastal restoration projects in five states. These projects have resulted in the restoration of 125 miles of the Nation's coastline, protecting billions of dollars of infrastructure as well as important ecological habitat. Some of these projects were done on an emergency basis, where imminent breaching of barrier islands was prevented by the rapid placement of OCS sand. Most of these projects used sand that was identified previously by the BOEMRE through its cooperative sand evaluation program with coastal states. Several Negotiated Noncompetitive Agreements have been completed on the Atlantic OCS offshore Virginia, Maryland, South Carolina and Florida. A number of completed and ongoing studies to support BOEMRE's Sand and Gravel Program also provide information that can be used for the assessment of renewable energy leasing and development.

Oil and Gas Activities: No areas on the Atlantic OCS will be included in the 2012-2017 OCS Oil and Gas Leasing Program. BOEMRE is moving forward with an environmental impact statement (EIS) for potential seismic studies in the Mid- and South Atlantic Planning Areas. This EIS will also include surveys necessary for the siting of renewable energy facilities.

In September 2010, BOEMRE announced the award of "Exploration and Research of Mid-Atlantic Deepwater Hard Bottom Habitats and Shipwrecks with Emphasis on Canyons and Coral Communities" (AT-10-03), an environmental and archaeological study on mid-Atlantic deepwater hard bottom habitats and shipwrecks. The study will explore and examine selected habitats that will refine and extend the understanding of the distribution and complexity of hard bottom communities in the mid-Atlantic area. One objective of the study is to determine environmental conditions that influence distribution of sensitive communities, especially regarding communities that are sensitive to oil and natural gas development. The exploration and research effort will also be directed toward archaeological artifacts such as shipwrecks. Surveys and site-specific studies will be conducted to obtain necessary information for the avoidance of such artifacts if energy development operations were to one day be permitted in the area. BOEMRE will contribute $3 million towards the study, while the U.S. Geological Survey (USGS) and NOAA's Office of Ocean Exploration and Research (OER) will contribute $3.4 and $3 million, respectively.

1.2 Map of the Planning Area

Figure 1. Atlantic OCS Region Planning Areas



1.3 Projected OCS Renewable Energy Activities

1.3.1 Interim Policy Leases

On November 1, 2009, three Interim Policy leases offshore NJ and one offshore Delaware were executed that authorize site assessment activities (Figure 1). As a requirement of these Interim Policy leases, a project plan must be submitted, which provides details on fabrication methods, engineering specification, inspections, archeological resources and safety systems for BOEMRE review. Once a project plan is received and deemed complete, BOEMRE has 60 days to raise objections and perform a determination of NEPA adequacy. Currently, BOEMRE has received two final project plans for meteorological buoys offshore New Jersey. Project plans for either meteorological towers or buoys have not been submitted for the remaining New Jersey Interim Policy lease or the lease offshore Delaware.

On February 9, 2011, the Florida Atlantic University (FAU) submitted a project application for technology testing for three OCS lease blocks offshore Florida. Within these blocks, FAU is seeking to deploy a single-anchor mooring, with a mooring and telemetry buoy (MTB) (similar to the Navy Oceanographic Meteorological Automatic Device (NOMAD) weather buoys) for the purpose of testing for limited periods equipment designed to use the Florida Current to generate electricity. BOEMRE will prepare an EA to analyze the potential impacts of proposed lease issuance, site characterization surveys, and technology testing activities.

A project application is expected soon under an existing nomination offshore Georgia.

1.3.2 Inter-governmental Task Forces

As of April 1, 2011, 25 task force meetings have been held in nine Atlantic states. Additional meetings in Massachusetts, North Carolina and Rhode Island are scheduled in May 2011.

1.3.3 Cape Wind Project

In October 2010, Secretary of the Interior Ken Salazar and Cape Wind Associates, LLC (CWA) signed the nation's first lease for commercial wind energy development on the OCS. On February 22, BOEMRE posted a Notice of Preparation of an EA for the CWA COP. Approximately 160 comments were received in response to the notice. Several new issues were identified, such as microclimate effects which are presented as a studies profile in this plan. The EA will be used for the purpose of determining whether a supplemental EIS is necessary before BOEMRE decides to approve, approve with modification, or deny CWA's COP. BOEMRE and FWS are working cooperatively to review CWA's Avian and Bat Monitoring Plan (AMBP), which must be approved by both agencies prior to construction. Through this effort BOEMRE and FWS identified to study profiles, which are also presented in this plan.

1.3.4 Planning Notices

Planning notices include Request of Interest (RFI) to assess interest in leasing all or part of the OCS for renewable energy activities and Call for Information and Nomination (Call) to initiate the competitive leasing process. BOEMRE can choose to proceed straight to a Call when competitive interest is anticipated. Following these notices, BOEMRE reviews comments and submissions of interest, and determines qualification of companies. After a Call, BOEMRE determines if there is competitive interest. The current status by state is shown in Table 1.

Table 1. Status of Renewable Energy Planning Notices by State

State	RFI	Call	Status
Delaware	April 26, 2010		In March 2011, BOEMRE determined there was not competitive interest and is proceeding with the non-competitive leasing process.
Massachusetts	December 29, 2010		Due to fishing and state concerns, the comment period was reopened on March 17, 2011.
Maryland	November 9, 2010	Spring 2011*	Nine individual expressions of interest were received from eight entities
New Jersey		April 2011	Call will be published mid-April.
Rhode Island		Spring 2011*	Draft Call will be reviewed by the task force.
Virginia		April 2011*	Call is currently in surnaming.
North Carolina		Spring 2011*	Task force will meet on April 12, 2011 to develop the Call area.

* Tentative

1.3.5 Unsolicited Applications

In addition to responses to the RFIs and Calls listed above, nine unsolicited applications for commercial wind energy leases have been received on the Atlantic OCS. One application was received for a lease offshore North Carolina and each of the following states has received two applications: New Jersey, Rhode Island, and Virginia. These unsolicited proposals are being reviewed or the companies have not been found to be qualified.

On December 17, 2010, BOEMRE received a request from the Massachusetts Executive Office of Energy and Environmental Affairs and the University of Massachusetts Dartmouth Marine Renewable Energy Center (MREC) for a research lease for three OCS blocks south of Nantucket. BOEMRE received supplemental information on January 26, 2011 and requested additional information for legal qualifications on February 11, 2011. MREC is proposing research related to marine-based renewable energy generation, including offshore wind, tidal, and wave energy.

1.3.6 "Smart from the Start" Environmental Assessment

The Secretary of the Interior's "Smart from the Start" wind energy initiative for the Atlantic OCS is aimed at facilitating the prioritization, rapid siting and leasing of new projects. BOEMRE is preparing an EA to analyze the impacts of leasing and associated site characterization surveys and site assessment activities in prospective areas identified for priority commercial wind development off several states along the mid-Atlantic coast. As part of this process, an EA and consultations have been initiated for designated WEAs offshore Delaware, Maryland, New Jersey and Virginia. By late spring or early summer BOEMRE will initiate EAs for an area offshore Rhode Island and Massachusetts located with the Area of Mutual Interest, and for an area offshore North Carolina currently being defined by the task force.

1.3.7 Transmission

Private companies have approached BOEMRE with wind power cable project proposals. On March 31, 2011, BOEMRE received an unsolicited ROW grant application from Atlantic Wind Connection (AWC) for a subsea backbone transmission system offshore New York, New Jersey, Delaware, Maryland, and Virginia. The application is currently being reviewed by BOEMRE to determine if it is complete. Afterwards, a notice will be issued to determine whether there is competition.

1.3.8 Guidelines for Lessees and Developers

In December 2010, BOEMRE posted guidelines for submittal of a COP. In response to developer requests, BOEMRE is preparing additional guidelines to provide explanation and suggest methods for collecting survey results required to be submitted with plans under the renewable energy regulations. Early in April 2011, BOEMRE will post on its website guidelines for geological, geophysical, and archaeological surveys. BOEMRE is currently addressing FWS and National Marine Fisheries Service (NMFS) comments on biological survey guidelines (i.e., protected species, benthic habitats, and avian species), which it intends to post in May 2011.

1.3.9 Other Funding Initiatives

National Oceanographic Partnership Program (NOPP) Broad Agency Announcement (BAA): On October 26, 2010, BOEMRE, DOE, and NOAA announced the following joint environmental research project awards, totaling nearly $5 million, to advance ocean renewable energy.

1. Bayesian Integration for Marine Spatial Planning and Renewable Energy Siting (Pacific Region);
2. Characterization & Potential Impacts of Noise Producing Construction & Operation Activities on the Outer Continental Shelf (Atlantic Region);
3. Developing Environmental Protocols and Modeling Tools to Support Ocean Renewable Energy and Stewardship (Atlantic Region);

4. Evaluating Acoustic Technologies to Monitor Aquatic Organisms at Renewable Sites (Atlantic Region);
5. Protocols for Baseline Studies and Monitoring for Ocean Renewable Energy (Atlantic Region);
6. Renewable Energy Visual Evaluations (Pacific Region);
7. Sub-Seabed Geologic Carbon Dioxide Sequestration Best Management Practices (Headquarters); and
8. Technology Roadmap for Cost Effective, Spatial Resource Assessments for Offshore Renewable Energy (Atlantic Region).

Projects 2-5 and 8 are included in Table 2. For more information on the NOPP BAA see http://www.nopp.org/2010/joint-environmental-research-projects-to-advance-ocean-renewable-energy/.

DOE Funding Opportunity Announcement (FOA): On February 7, 2011, DOE's Energy Efficiency and Renewable Energy (EERE) Program issued the "U.S. Offshore Wind: Removing Market Barriers" FOA to fund research activities addressing market barriers limiting the deployment of offshore wind energy projects. These activities will fall within the following Topic Areas:

1. Offshore Wind Market and Economic Analysis;
2. Environmental Risk Reduction;
3. Manufacturing and Supply Chain Development;
4. Transmission Planning and Interconnection Studies;
5. Optimized Infrastructure and Operations;
6. Resource Characterization and Design Conditions; and
7. Impact on Electronic Equipment in the Marine Environment.

OAEP worked jointly with DOE in the development of Topic Area 2: Environmental Risk Reduction. The first subtopic is titled "Mid-Atlantic Ecological Baseline Studies and Modeling" in the WEAs, and it is anticipated that there will be a single award for $4,500,000. The second subtopic is titled the "Assessment and Validation of Innovative Offshore Avian and Bat Monitoring Technologies," and it is anticipated that there will be two $600,000 awards. The maximum duration for each project is three years. Preliminary applications were due on March 25, 2011 and final applications are due on June 10, 2011. For more information on DOE's FOA see http://www.energy.gov/10053.htm.

1.4 Identification of Information Needs

The 2007 Worldwide Synthesis and Analysis of Existing Information Regarding Environmental Effects of Alternative Energy Uses on the OCS and Workshop (Michel et al. 2007; Michel and Burkhard, 2007) formed the basis of BOEMRE's renewable energy research program. Many of the information categories identified in 2007 remain key needs for FY 2012 and 2013.

1.4.1 Baseline Data

Of critical importance continues to be the collection of baseline data prior to development. According to the Council on Environmental Quality's (CEQ) NEPA implementing regulations at 40 CFR 1502.15, the affected environment component of a NEPA document must describe the environment of the areas to be affected by the alternatives under consideration and establish a basis for the comparison and selection of the alternatives.

Many baseline studies have been completed or are ongoing under federal and state initiatives. Multiple East Coast States have conducted baseline studies and developed ocean management plans in support of offshore renewable energy.

- Massachusetts Ocean Management Plan (2009) (see http://www.mass.gov/?pageID=eoeeaterminal&L=3&L0=Home&L1=Ocean+%26+Coastal+Management&L2=Massachusetts+Ocean+Plan&sid=Eoeea&b=terminalcontent&f=eea_oceans_mop&csid=Eoeea)
- New Jersey Ocean Wind Power Ecological Baseline Studies (2010) (see http://www.nj.gov/dep/dsr/ocean-wind/)
- Rhode Island Ocean Special Area Management Plan (2010) (see http://seagrant.gso.uri.edu/oceansamp/)

To expand these baseline studies, OAEP worked jointly with DOE in the development of DOE's FOA "U.S. Offshore Wind: Removing Market Barriers" Topic Area 2: Environmental Risk Reduction (see Section 1.3.9).

1.4.2 Movements of Migratory Birds

Michel et al. (2007) previously identified the need to collect "Finer-grained data on the distribution and life history for key species in each regional ecosystem; environmental assessments for specific projects need more detailed data on benthic habitats and multiyear studies of seasonal abundance and distribution of key species of each resource." Specifically the movement of migratory birds, including identifying primary migration corridors, was identified as an information need in the 2007 Worldwide Synthesis and Workshop. While work in these areas is proceeding under several ongoing efforts, additional work is needed.

Migratory birds are protected under The Migratory Bird Treaty Act of 1918 (MBTA) and Executive Order 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" (66 FR 3853). The MBTA made it illegal for people to "take" migratory birds, their eggs, feathers or nests. "Take" is defined in the MBTA to include by any means or in any manner,

any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof. Executive Order 13186 directs departments and agencies to take certain actions to further implement the MBTA. Under section 3 of the executive order, BOEMRE and FWS established an MOU in 2009, which identifies specific areas in which cooperation between the agencies will contribute substantially to the conservation and management of migratory birds and their habitats. The purpose of this MOU is to strengthen migratory bird conservation through enhanced collaboration between the BOEMRE and the FWS.

As part of this MOU, BOEMRE and FWS work collaboratively to review analyses and mitigation measures. As a result of BOEMRE and FWS's work on the Cape Wind EA and Avian and Bat Monitoring Plan (ABMP), two study profiles were developed and included in this plan.

1.4.3 Space-Use Conflicts

As part of the "Smart from the Start" initiative, WEAs are being identified. These are offshore locations that appear most suitable for wind energy development. Data will continue to be collected for these high priority areas to inform government and industry assessments and planning, allowing a more efficient process for permitting and siting responsible development.

Space-use conflict is the most frequent issue-specific comment BOEMRE has received in response to recent planning and NEPA notices. The most frequent space-use conflict expressed in response to the NOI for the Mid-Atlantic EA is potential conflict with shipping and potential risk of allisions.

1.4.4 Information Sharing

One of the conclusions from the 2007 Workshop was that "Coordination and collaboration with stakeholders and potential partners are key to the success of alternative energy studies. Tapping into existing resources will minimize duplication of effort, ensure that all concerns are addressed, and result in better scientific products. Drawing upon expertise in the international community will be important to continue, and that dialog will enhance study designs" (Michel and Burkhard, 2007). Since the 2007 Worldwide Synthesis and Workshop, numerous renewable energy studies have been conducted through federal and state initiatives. For this reason, BOEMRE will conduct a similar workshop in the summer of 2011, and is proposing another workshop two years later in FY 2013.

1.4.5 Impacts Associated with Commercial Activities

Commercial wind energy leases could be issued offshore Delaware in 2011, offshore Maryland as early as late 2011, followed by other states in 2012. A COP could be submitted with a lease application or soon after lease issuance. BOEMRE likely will prepare an EIS for COP approval. Therefore, BOEMRE also must continue to study potential impacts associated with commercial facilities.

Two studies are proposed to aide in the analysis of air quality impacts of in future EISs. One study would aide in the General Conformity determination process as required by 40 CFR 93 and include the consideration of the effects of climate change and greenhouse gas (GHG) emissions. The other would study the potential creation of microclimates, such as fog within a wind turbine array, which was identified as an issue during public comment periods for the Cape Wind Project.

Also identified as a concern during the most recent comment period for the Cape Wind Project were the chemicals present in individual wind turbines. It is anticipated that between 500-1,000 gallons of coolants, lubricants, and other mechanical fluids will be present in offshore wind turbines. Future COP EISs will have to analyze the impacts on the benthic habitats and marine life of releases these chemicals alone or in combination.

The CEQ's NEPA implementing regulations at 40 CFR 1508.8(b) state that effects to be analyzed in an EIS include "indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems." Not all ports on the East Coast are equipped currently to handle the needs of offshore commercial wind development, thus one or more ports may become hubs. Due to the substantial role a single project could play in a port operations and expansion, an EIS will need to evaluate the potential indirect impacts of port operations and expansion.

1.5 New Starts for FY 2011 and Ongoing Studies Table

Table 2 lists new studies planned to start in FY 2011 and ongoing studies, categorized by discipline. Profiles for these studies can be found at: http://www.boemre.gov/eppd/sciences/esp/AtlanticOngoingStudies.htm. Studies specific to renewable energy can be found at: http://www.boemre.gov/eppd/sciences/esp/RenewableEnergyResearch.htm.

Table 2. BOEMRE Atlantic OCS Region New Starts for FY 2011 and Ongoing Studies

Program Lead	Planning Area	Start FY	Discipline	Study Title
NEW STARTS				
	ATL	11	AQ	Synthesis, Analysis, & Integration of Air Quality and Meteorological Data for the Atlantic Region
	ATL	11	IM	Information Synthesis on the Potential for Bat Interactions with Offshore Wind Facilities
	ATL	11	IM	Atlantic Wind Energy Science and Technology Workshop

	ATL	11	SS	The Impact and Attitudes of OCS Wind Development on Recreation and Tourism in the Atlantic Region
	ATL	11	HE	Evaluation of Lighting Schemes for Offshore Wind Facilities & Impacts to Local Environments
	ATL	12	SS	The Economic Impact of OCS Wind Development on Fishing
ONGOING STUDIES				
Social Sciences and Economics				
	MA	10	SS	Battle of the Atlantic Expedition 2010-2015
Fates & Effects				
NOPP	ATL	10	FE	Characterization & Potential Impacts of Noise Producing Construction & Operation Activities on the Outer Continental Shelf (OCS) (II)
Information Management				
	ATL	11	IM	Atlantic Wind Energy Science and Technology Workshop
Marine Mammals and Protected Species				
NOPP	PAC	10	MM	Evaluating Acoustic Technologies to Monitor Aquatic Organisms at Renewable Energy Sites
Habitat & Ecology				
NOPP	NA	10	HE	Developing Environmental Protocols and Modeling Tools to Support Ocean Renewable Energy and Stewardship
NOPP	MA	10	HE	Exploration and Research of Mid-Atlantic Deepwater Hard Bottom Habitats and Shipwrecks with Emphasis on Canyons and Coral Communities
NOPP	ATL	11	HE	Roadmap: Technologies for Cost Effective, Spatial Resource Assessments for Offshore Renewable Energy
Other (Research Partnerships)				
BOEMRE Technology Assessment and Research Program (TAR) DOE NOAA NOPP National Renewable Energy Laboratories (NREL)				
Discipline Codes AQ = Air Quality FE = Fates & Effects HE = Habitat & Ecology IM = Information Management MM = Marine Mammals and Protected Species SS = Social Sciences				
Planning Area Codes North Atlantic = NA Mid-Atlantic = MA All = ATL Pacific = PAC				

1.6 Previous Reviewed Studies Pending Consideration for Fiscal Year 2012 NSL

Table 3 lists profiles presented in a prior SDP and reviewed by the Committee during an earlier cycle. Though this previously reviewed study has not been approved on the NSL, the requirements for the information remain and they will be considered for the FY 2012 NSL.

Table 3. Previous Reviewed Studies Pending Consideration for Fiscal Year 2012 NSL

Discipline	**Title**
FE	Potential Artificial Reef Effects of Offshore Wind Facilities
FE = Fates & Effects	

SECTION 2.0 PROPOSED STUDY PROFILES

2.1 Introduction

The following sections focus on the proposed studies for FY 2012 and FY 2013.

2.2 Profiles of Studies Proposed for FY 2012 NSL

Table 4. Atlantic OCS Region Studies Proposed for the FY 2012 NSL

Page #	Discipline	Title	Rank #
19	HE	Pilot Study: Tracking Offshore Occurrence of Common Terns and American Oystercatchers with VHF Arrays	1
21	HE	Determining Offshore Use by Diving Marine Birds Using Satellite Telemetry	2
23	SS	Potential Space-Use Conflicts between Commercial Shipping and Wind Facilities on the Atlantic OCS	3
AQ = Air Quality HE = Habitat & Ecology SS = Social Sciences IM = Information Management			

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Atlantic

Planning Area: North Atlantic

Title: Pilot Study: Tracking Offshore Occurrence of Common Terns and American Oystercatchers with VHF Arrays

BOEMRE Information Needs to be Addressed: The common tern and American oystercatcher are non-listed migratory birds identified by the USFWS as species of high concern. Movements of terns and shorebirds around Nantucket Sound have been poorly documented. Information on movements of terns and shorebirds around this area and especially over Horseshoe Shoals is needed to assess the potential impacts of the Cape Wind Project on these species. Because the common tern in Nantucket Sound is commonly found in mixed flocks with the endangered roseate tern, it is also an excellent surrogate for that species. Movement information on these two species will also enable BOEMRE to assess likely impacts of wind energy development on other species of terns and shorebirds.

Cost Range: (in thousands) $280-420 **Period of Performance:** FY 2012-2013

Description:

Background: Information is needed to document movements of terns and shorebirds along the mid-Atlantic region in general and around Nantucket Sound in particular in order to inform the review process for proposed wind energy development in the mid-Atlantic region. Common terns and American oystercatchers are the FWS recommended high priority, non-listed species around Nantucket Sound and nearby areas, especially to determine their presence or absence over Horseshoe Shoals where the Cape Wind energy development facility will be located. This information will supplement other bird studies in Nantucket Sound aimed at assessing the impacts of wind energy development on birds and determining movements of common terns and American oystercatchers along the mid-Atlantic region.

Objectives: The objectives of this study are to determine the movements of common terns and American oystercatchers around Nantucket Sound and the larger Mid-Atlantic region and to document their presence or absence over Horseshoe Shoals where the Cape Wind energy development will be constructed.

Methods: Up to 15 American oystercatchers and up to 50 common terns will be captured during the breeding season and fitted with VHF transmitters lasting as long as possible given acceptable battery weight (i.e., <5% of body mass). An array of VHF transmitter receiving stations will be strategically deployed around the perimeter of Nantucket Sound and surrounding areas such as Long Island and Block Island to document movement among stations. VHF signals will be logged at receiving stations during breeding and migratory periods when birds occur in the study area.

Revised Date: March 29, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Atlantic

Planning Areas: North and Mid-Atlantic

Title: Determining Offshore Use by Diving Marine Birds Using Satellite Telemetry

BOEMRE Information Needs to be Addressed: The surf scoter, northern gannet and red-throated loon are non-listed migratory birds identified by the U.S. Fish and Wildlife Service as species of high concern. Although all three species winter as far south as Florida, very little information exists concerning migration corridors used by these species south of New England. There is great interest in wind energy development in the region south of Massachusetts to the Outer Banks. Thus BOEMRE has an urgent need to identify the primary migration corridors and winter concentration areas used by these species along the mid-Atlantic coast of the U.S. in order to enable EAs and EISs to adequately assess potential impacts of proposed wind energy development on migratory marine diving birds.

Cost Range: (in thousands) $1,110-1,600[1] **Period of Performance:** FY 2012-2015

Description:

Background: Specific information is needed on migration corridors and winter concentration areas used by surf scoters, northern gannets and red-throated loons during spring and fall migratory flights along the U.S. Atlantic coast and OCS, especially south of New England to the Carolina Outer Banks, where there is great interest in development of wind energy facilities. The Sea Duck Joint Venture and USGS are currently capturing Surf Scoters and surgically implanting satellite transmitters programmed to send GPS coordinates of birds during their breeding season in northern Canada. It is likely that an Inter-Agency agreement between BOEMRE and these agencies could enable the capture of more scoters, gannets, and red-throated loons and the implantation of satellite transmitters in those birds as well. Transmitters would be programmed to send GPS coordinates during the fall and spring migration periods and during the winter rather than on breeding grounds in northern Canada.

Little information exists on the occurrence and movements of these three species (or any marine diving birds) in the areas from Long Island to the Outer Banks despite great interest in potential construction of wind energy facilities in that region.

Objectives: The primary objectives will be to determine the occurrence and movement patterns south of New England to the Outer Banks of three diving marine bird species with diverse life history strategies: the surf scoter, northern gannet and red-throated loon. This will permit delineation of specific fall and spring migration corridors used by these species and will help to identify winter concentration areas for each species. These species have been identified as high priority species by the U.S. Fish and Wildlife Service because of their

[1] $463,000/year, renewable annually for up to 3 additional years of field seasons, and a 4th year at $90,000 to finish data analysis and report preparation (potential total of $1,380,000 over the three-year period).

population trends, paucity of information on the Atlantic south of New England and/or because of the perceived threat of wind energy development to diving birds.

Methods: Fifteen birds of each species will be captured offshore during fall and winter of each year for three years and fitted with surgically implanted satellite transmitters with a battery life of less than one year. Transmitters will be programmed to send data during winter and migratory periods when birds are most likely to occur in the study areas. To assure that transmittered birds will yield data on movements south of New England, most birds will be captured off the Outer Banks of North Carolina and off the Chesapeake Bay.

Revised Date: March 29, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Atlantic

Planning Areas: North Atlantic, Mid-Atlantic and South Atlantic

Title: Potential Space-Use Conflicts between Commercial Shipping and Wind Facilities on the Atlantic OCS

BOEMRE Information Needs to be Addressed: Stakeholders have raised concerns about the economic and safety impacts between proposed offshore wind facilities and commercial shipping. Information synthesized from this study will assist in the preparation of NEPA documents and stakeholders in the identification of areas of potential conflict. Further, BOEMRE has statutory obligations under the Outer Continental Shelf Lands Act (OCSLA) as amended by the Energy Policy Act of 2005 (EPAct) to protect the environment and conserve the natural resources of the OCS. Specifically, the implementing regulations for the EPAct (see 30 CFR 285.600) specifies information necessary for BOEMRE to evaluate site assessment and construction and operations plans to assist BOEMRE in complying with OCSLA, NEPA, ESA, and other relevant laws.

Cost Range: (in thousands) $250-300 **Period of Performance:** FY 2012-2013

Description:

Background: Stakeholders in the commercial shipping community have raised several major economic and safety issues concerning the development of offshore wind facilities along the Atlantic OCS. These concerns include interference with shipping traffic (tankers, container ships, tugs & barges), longer shipping routes, safety and navigation issues, traffic detoured to other ports, conflicts with harbor plans to accommodate larger vessels following the Expansion of the Panama Canal (completion in 2014) and the American Marine Highways Initiative. Further, there are areas that are used for ship lightering and anchoring (official & unofficial). Unfortunately, the combination of unofficial/unconfirmed shipping routes and the unknown amount of traffic makes it very difficult to assess the true impacts of offshore wind energy development on commercial shipping and ports. Recently, BOEMRE acquired and analyzed geo-referenced Automated Information Systems (AIS) data for ships >300 gross tons which shows where and what type of ships are actually traveling on the Atlantic OCS. This study will build on the ongoing space-use conflict study (M09PC00037), which is in part an ethnographic field study of commercial and recreational fisherman that includes a compilation of GIS maps of shipping lanes, high-use fishing areas, oil and gas infrastructure, military use areas, etc.

Objectives: This study will identify ports and commercial shipping routes that have a potential for space-use conflicts with the Secretary's "Smart from the Start" initiative to accelerate wind energy development on the Atlantic OCS.

Methods: The methodology will consist of a literature review, data collection from public sources, use of AIS data, discussions with USCG and representatives from other relevant government agencies, and analysis and synthesis of collected data and information. The

deliverables will consist of a literature review (national & international) and a GIS database comprised of ports and routes that ships actually use. The database will also include routes of different types and amounts of cargo transported (oil, coal, manufactured goods, garbage, etc.) and routes of empty ships. The final report should provide summary information for each port such as percentage of commercial traffic, contact information, links to existing NEPA analyses and USCG studies, and identified conflicts.

Revised Date: April 25, 2011

2.3 Profiles of Studies Proposed for FY 2013 NSL

Table 5. Atlantic OCS Region Studies Proposed for Fiscal Year 2013 NSL

Page #	Discipline	Title
27	IM	Second Atlantic Wind Energy Workshop
29	SS	Offshore Wind Turbine Allision Impact Analysis and Modeling
31	AQ	An Estimation of Criteria Pollutant Emissions on the Atlantic OCS
33	SS/HE	Environmental and Social Consequences of Port Expansion and Operations Associated with Offshore Commercial Wind Energy on the Mid-Atlantic OCS
35	FE	Literature Review: Environmental Risks, Fate and Effects of Chemicals Associated with Wind Turbines on the Atlantic OCS
37	AQ	Microclimatology Modeling near Offshore Wind Energy Facilities
AQ = Air Quality FE = Fates & Effects SS = Social Sciences IM = Information Management		

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Atlantic

Planning Areas: North, Mid and South Atlantic

Title: Second Atlantic Wind Energy Workshop

BOEMRE Information Needs to be Addressed: The launching of the Secretary's "Smart from the Start" wind energy initiative for the Atlantic OCS is aimed at facilitating the prioritization, rapid siting and leasing of new projects. This workshop will assist BOEMRE in the environmental review of WEAs and in the evaluation of sites for new offshore projects. Participation is expected from other Federal agencies based on existing MOU's, regulatory requirements and leveraging partnerships to identify data needs and reduce overlap. This workshop will be attended by experts and project leaders that will report on current and relevant studies to the siting of offshore wind projects. In addition, breakout-groups will be tasked to identify information gaps and to develop partnerships for future studies.

Cost Range: (in thousands) $180-270 **Period of Performance:** FY 2013

Description:

Background: On November 23, 2010, Secretary of the Interior Ken Salazar launched a 'Smart from the Start' wind energy initiative for the Atlantic OCS to facilitate siting, leasing and construction of new projects, spurring the rapid and responsible development of this abundant renewable resource. In February 2011, BOEMRE initiated an EA to evaluate the potential impacts associated with lease issuance and site assessment activities on the Mid-Atlantic OCS. In addition, there will be rapid and close coordination with other federal agencies to compile existing site assessment data.

Objectives: The objective of this workshop is to:

- provide a summary of ongoing and completed environmental, socio-economic and technology/safety studies since the 2011 workshop that are relevant to offshore wind energy development on the Atlantic OCS;
- identify information needs and gaps; and
- develop partnerships and identify potential synergies for future studies.

Methods: This workshop will focus on efforts in the Atlantic since the previous Atlantic Wind Environmental Workshop, scheduled for July 2011. Prior to the workshop, a technical summary of studies conducted and partnerships formed since the previous workshop will be prepared to assist the workshop participants. The workshop would be attended by experts conducting studies relevant to the Atlantic wind energy development and representatives of state and federal agencies. The environmental studies, social and economic studies and technology and safety assessments will cover a range of topics pertaining to the known environmental impacts and development requirements. This workshop will result in a

synthesis report containing: 1) a glossary of Federal and State Agencies involved in offshore wind energy development that includes their roles and responsibilities; 2) abstracts and presentations; 3) information gaps identified during breakout sessions; 4) recommended studies; and 5) list of partnerships and potential synergies for future studies.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Atlantic

Planning Areas: North, Mid, and South Atlantic

Title: Offshore Wind Turbine Allision Impact Analysis and Modeling

BOEMRE Information Needs to be Addressed: Allision, the maritime term for a vessel striking a fixed object versus a moving object, is a serious concern for offshore wind facilities sited around major and minor ports along the Atlantic coast. There is little known regarding the consequences of allision for different vessel classes and different sea states. It is important to understand the potential range of consequences not only for the purposes of environmental impact analysis, but also in regards to potential design standards for wind facilities sited in areas of higher allision risk.

Cost Range: (in thousands) $175-200 **Period of Performance:** FY 2013

Description:

Background: Due to the access and proximity to certain infrastructure, offshore wind facilities are often sited near port facilities. Vessel traffic around the ports may be heavy and not necessarily constrained to established traffic lanes. As with any structure placed the ocean, there is a chance that a vessel, other than a maintenance or construction vessel, could allide with the structure causing catastrophic damage to the vessel, fixed structure or both. This type of allision is unanticipated since it would require a loss of vessel power or steerage, high winds or a sea state that would drive the vessel toward the structure, and failure of the vessel's and/or structure's design to withstand the impact. In the absence of these factors the current mitigation measures for placement of wind turbines outside of traffic lanes, lighting, and mariner notifications of structures should prevent allisions of this type from occurring. If an unanticipated allision were to occur, and a vessel's cargo was discharged, the impacts would depend upon the type and amount of cargo discharged, whether oil, liquefied natural gas, chemicals, or other commodities. Thus, although the potential for allision is considered minor under normal circumstances, the U.S. Coast Guard (USCG) has raised concerns for allision during severe weather and in the event of vessel navigation failure.

Little is known about the consequences of allision between a vessel and a wind turbine. Various factors such as vessel size/tonnage, sea state, and turbine design can all influence what the consequences of an allision would be. The BOEMRE intends to partner with USCG, through an interagency agreement, to evaluate the risk of vessel strikes with wind turbines along certain routes, but is not expected to evaluate the consequences of such an allision. This proposed study would supplement the BOEMRE/USCG study.

Understanding allision consequences will inform BOEMRE of possible risks associated allisions especially in cases where the consequence may include the discharge of pollutants into the environment (e.g., oil). Additionally, allision analysis may inform the necessity of certain wind turbine design standards for wind turbines located near areas at higher risk of

vessel allision as determined by the USCG. An example of such a design standard could be requiring induced structure failure at the mudline during an allision in high risk areas.

Objectives: The objective of the study is to establish a range of consequences associated with wind turbine allision under multiple scenarios.

Methods: This study will include a synthesis of current information regarding vessel allisions with offshore wind facilities and the development of a model to evaluate allision consequences under various scenarios. The deliverables will consist of a literature review (national and international), model development and analysis, and a final report summarizing the findings. It is envisioned that the model scenarios would be informed by the literature review and consultation with appropriate Federal agencies including the U.S. Coast Guard and NOAA's National Weather Service for vessel characteristics and sea state information, respectively. Since direct measurement of allision is highly impracticable the model would be a conceptual simulation utilizing impulse and momentum principles under appropriate durations. It is expected that model impact outputs would include ranges of structural failures for the identified vessel classes and designs, and wind energy structure designs, under likely sea states including 25, 50, and 100-year storm events. The model analyses would include the ultimate physical fate of the vessels and wind turbines (e.g. vessel cargo discharge, failure of wind turbine support structure) as well as other impacts as informed by the model.

Revised Date: April 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Atlantic

Planning Areas: North, Mid and South Atlantic

Title: An Estimation of Criteria Pollutant Emissions on the Atlantic OCS

BOEMRE Information Needs to be Addressed: This study will aide in the General Conformity determination process as required by 40 CFR 93 and in preparing NEPA documents to include the consideration of the effects of Climate Change and Green House Gas Emissions.

This information will be helpful when conducting an environmental review by first establishing the baseline of current activities contributing to offshore air quality. After first establishing offshore air quality, then BOEMRE can properly analyze how offshore renewable energy development may further contribute to offshore air quality.

Cost Range: (in thousands) $220-330 **Period of Performance:** FY 2013-2014

Description:
Background: The Atlantic Outer Continental Shelf lacks pollutant emission data from vessel traffic. The John A. Volpe Transportation Systems Center is part of the U.S. Department of Transportation's Research and Innovative Technology Administration. It is a federal fee-for-service organization. This organization has an Automatic Identification System (AIS) for vessel traffic. NOAA also maintains a Vessel Management System (VMS) which is a satellite-based vessel monitoring program. Based on these vessel data sources an annual estimation of criteria pollutant emissions can be accomplished. This study will provide additional information to input to Atlantic Region study AT-11-03 which is to be similar to GOMR studies; 2009-055, 2009-056, 2009-057 and 2009-058. See also Gulfwide Offshore Activity Data System (GOADS) 2005 and 2008 (when complete).

Objectives: The study will provide an estimation of criteria pollutant emissions for the Atlantic OCS for one calendar year based upon a 3 year average.

Methods: Vessels that meet certain requirements provide an AIS or VMS signal. Through this signal the vessel type and engine run time are recorded. The contractor shall obtain three calendar years (2008-2010) of AIS vessel type and engine run time for the Atlantic OCS. The contractor shall supplement the AIS data, which only maintains a record of large vessels with VMS data from NOAA for vessels not included in the AIS dataset. After determining the engine type based upon the vessel type the contractor shall input that information into the Air Quality Spreadsheets used by BOEMRE to estimate criteria pollutant emissions for each calendar year. These spreadsheets include emissions factors for each criteria pollutant based on engine type and hours of operation per day. The contractor shall provide spreadsheets modeled after BOEMRE's that include monthly, seasonal and annual estimates. The contractor shall also provide a document describing the vessel types included in this study as

well as an estimation of the number and types of vessels omitted from this study due to the unavailability of that data. Some statistical analysis is also required to determine the margin of error.

Revised Date: April 26, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Atlantic

Planning Areas: North and Mid-Atlantic

Title: Environmental and Social Consequences of Port Expansion and Operations Associated with Offshore Commercial Wind Energy on the Mid-Atlantic OCS

BOEMRE Information Needs to be Addressed: As a result of the U.S. Department of Interior's "Smart from the Start" initiative there is an urgent need to understand the infrastructural needs for OCS wind energy development and the potential social and environmental impacts associated with this effort. Commercial wind energy leases could be issued in 2011 for development off the coast of Delaware and Maryland, followed by New Jersey and Virginia in 2012. Onshore facilities to support development and operational activities on these leases would likely be located at existing ports. Not all ports on the East Coast are currently equipped to handle the needs of offshore commercial wind development. This study will identify those ports that are most suited to handle the demands of supporting OCS wind energy development and operations, and the associated social and environmental impacts supporting BOEMRE's mandated mission to oversee renewable energy development on the OCS (Energy Policy Act of 2005).

Cost Range: (in thousands) $240-360 **Period of Performance:** FY 2013-2014

Description:

Background: Offshore wind energy development on the OCS will eventually lead to the expansion of ports to accommodate the size of construction vessels, space required for staging and maneuvering turbine components, and cranes capable of handling the weight of the nacelles and other components. These requirements may lead to select ports becoming hubs. The expansion and operation of such facilities can produce a variety of environmental impacts, such as impacts of emissions, vessel induced wake erosion, and discharges on air and water quality and coastal habitats. In order to fully understand, as well as to plan for, the broad spectrum of potential impacts of proposed offshore development associated with future commercial proposals, it is necessary to identify the likely 'hubs' (i.e., major ports) related facilities and the associated environmental and social effects. This effort will build upon the following ongoing studies: "Energy Market and Infrastructure Information for Evaluating Alternative Energy Projects for OCS Atlantic and Pacific Regions" (GM-08-x14), which is projected to be completed by September 2011; and "OCS Renewable Energy and Space-Use Conflicts and Related Mitigation" (NT-08-x12). While USACE will have environmental analysis of specific port improvements, the environmental and social consequences of large scale improvements necessary for a port to become a hub has not yet been determined.

Objectives: The objectives of this study are to identify:

- Deep-draft ports that have the potential to become hubs for the fabrication, staging and transportation of offshore wind foundations and other structures on the Mid-Atlantic OCS;
- The improvements necessary to make the identified ports viable hubs for offshore wind energy development; and
- Potential environmental and social impacts associated with expansion and operation activities at these hubs.

Methods: This study will use a set of criteria to identify the most appropriate ports to support OCS Wind Energy development and operations in the four WEAs offshore New Jersey, Delaware, Maryland and Virginia. The criteria would include (but not be limited to) the following characteristics: the depth of ports (i.e., draft), evidence of local/regional initiative (e.g., plans to expand for accommodating wind energy development – Port of Wilmington) the distance from the associated WEA(s), regional expertise, reinforced quaysides; size, number and condition of staging areas, ease of access, and heavy lifting equipment (see Kaiser and Snyder, 2010), existing proposals, and state initiatives. The end result of this process will be a tiered (e.g. highest potential, intermediate…) and/or ranked list of ports according to suitability as determined by the objective criteria outlined above.

For those ports identified as being of the highest potential and as being associated with promising WEAs these will be recognized as the likely hubs. The study will then identify the additional infrastructural components needed to support OCS wind energy development and operations, such as additional amenities, enhancements or enlargements to existing structures. Environmental (e.g., air and water quality, and coastal habitats) and social (e.g., land use changes, environmental justice issues, population changes, and strain on existing infrastructure, such as traffic congestion) consequences of individual improvements could then be extrapolated from analysis of similar port improvements previously conducted by USACE. The cumulative impacts of improvements and operations at each port will then be assessed and described.

In addition, this study should take into account any previous or current studies related to the topic. For example, the DOE's current research on market barriers to OCS wind development may provide additional criteria for the port/hub selection process and information on needed infrastructure improvements.
(See http://www1.eere.energy.gov/windandhydro/pdfs/national_offshore_wind_strategy.pdf.)

Revised Date: April 26, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Atlantic

Planning Areas: North and Mid-Atlantic

Title: Literature Review: Environmental Risks, Fate and Effects of Chemicals Associated with Wind Turbines on the Atlantic OCS

BOEMRE Information Needs to be Addressed: It is anticipated that between 500-1,000 gallons of coolants, lubricants, and other mechanical fluids will be present in each offshore wind turbine. Future EISs for wind energy proposals will have to analyze the impacts of releases these chemicals, alone, or in combination, may have on the benthic habitats and marine life. A literature review of risks, fate and effects of chemicals associated with offshore wind turbines would be summarized and incorporated by reference in future EISs, and also assist BOEMRE in identifying potential mitigation measures.

Cost Range: (in thousands) $100-120 **Period of Performance:** FY 2013

Description:

Background: A commercial wind energy lease could be issued in 2011 offshore Delaware, in late 2011 off Maryland followed by other states in 2012. A construction and operations plan (COP) could be submitted with a lease application or soon after lease issuance. BOEMRE will likely prepare an EIS for COP approval. It is anticipated that between 500-1,000 gallons of coolants, lubricants, and other mechanical fluids will be present in offshore wind turbines. A comprehensive listing and analysis of these chemicals is needed. If an accident occurs, these chemicals would likely be released simultaneously; therefore, their synergistic effects need to be determined. Factors such as solubility and volatility, and potential impacts to water column and benthic marine life should be considered.

Many of these chemicals are commonly used mechanical fluids for which fates and effects have already been determined in terrestrial environments. For example, the question of toxicity of ethylene glycol was identified during the recent comment period on the Cape Wind project. The COP stated over 400 gallons of this sloshing dampener would be used in each individual turbine. Material Safety Data Sheets (MSDSs) should be compiled for all materials likely to be stored and used on offshore wind turbines. Comprehensive descriptions of the products and compounds should include physical and chemical properties, air, sediment, and water pollution factors, aquatic and sediment toxicities, and known biological effects.

Objectives: The primary objectives of this study are to:

- Identify the chemicals and quantities that could be present in different types of commercial wind turbines that are designed for offshore use (direct drive, 3.5 MW, 5 MW, 10 MW, etc.);
- Evaluate the risk of spill occurrence; and
- Alone and in combination, describe their fate and toxicity if spilled in the marine environment.

Methods: Anticipated methods include incorporation of domestic and international knowledge, discussions with turbine manufacturers, and discussions with relevant government agencies like the U.S. Environmental Protection Agency (USEPA). TA&R Study 633, "Wind Farm/Turbine Accidents and the Applicability to Risks to Personnel and Property on the OCS, and Design Standards to Ensure Structural Safety/Reliability/Survivability of Offshore Wind Farms on the OCS," identifies accidents that could result in a release of these chemicals. A literature review would be prepared which describes the fates and effects of the identified chemicals on benthic habitats and marine life.

Revised Date: April 26, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Atlantic

Planning Areas: North, Mid and South Atlantic

Title: Microclimatology Modeling near Offshore Wind Energy Facilities

BOEMRE Information Needs to be Addressed: Offshore wind energy developers must submit a Construction and Operations Plan (COP) prior to the construction of a wind facility. BOEMRE must conduct an environmental review (likely an EIS) for COP approval. This study will aide in the impacts analysis of a COP in an EIS.

Cost Range: (in thousands) $375-450 **Period of Performance:** FY 2013-2014

Description:

Background: During the public comment periods of the Cape Wind Energy Project, the public expressed concerns that Wind Turbine Generators (WTGs) can create their own microclimate in Nantucket Sound. A microclimate is a small, local area having distinct weather or weather effects. Studies have been submitted that support this concern. The studies conclude that when local meteorological conditions are favorable a microclimate can occur, most likely of fog or "sea smoke," within a wind turbine array.

Objectives: The objective of this study is to determine local meteorological conditions conducive to creating a microclimate within a wind energy facility and/or conducive to altering weather downstream of the facility.

Methods: The contractor will model the Atlantic OCS climate and meteorological conditions for each of the North, Mid and South Atlantic Planning Areas for different times of the year. The contractor will then insert a wind turbine array consisting of approximately 100 turbines to simulate what will likely happen with respect to microclimatology at the different locations during the different times of the year. The model will also output the likelihood/frequency of such an event taking place. (See Baidya Roy and Traiteur, 2010; Baidya Roy, 2011; and Emeis 2010 for methodology used in other scenarios.)

Revised Date: April 26, 2011

SECTION 3.0 TOPICAL AREAS FOR FISCAL YEAR 2014

BOEMRE's immediate information needs for the Atlantic OCS are related to renewable energy, including to the impacts of site characterization and assessment activities, collecting and compiling broad scale baseline information for identification of WEAs, and developing pre-construction monitoring protocols. Over the next few years, those needs will shift to gathering baseline information at a finer scale and for new areas, studying the potential impacts of commercial wind and ocean energy facilities, and incorporating lessons learned regarding mitigation measures and post-construction survey protocols.

3.1 Wind Energy on the OCS

3.1.1 Baseline Data

Of critical importance will continue to be the collection of baseline data prior to COP submittal. According to CEQ's NEPA implementing regulations at 40 CFR 1502.15, the affected environment component of a NEPA document must describe the environment of the areas to be affected by the alternatives under consideration, and establish a basis for the comparison and selection of the alternatives. Until now, most of BOEMRE's planning notices and applications received related to wind energy have focused on shallow water from North Carolina to Maine. As offshore wind energy continues to develop, baseline studies will need to expand to deeper water and farther south. This will include collecting "finer-grained data on the distribution and life history for key species in each regional ecosystem; environmental assessments for specific projects need more detailed data on benthic habitats and multiyear studies of seasonal abundance and distribution of key species of each resource" as previously identified by Michel et al. 2007.

3.1.2 Post Construction Monitoring

BOEMRE is in the process of developing standardized monitoring protocols, including protocols for monitoring fish, turtles, marine mammals, birds, benthos, etc. As the technology is being developed, deployed, and operated, additional opportunities will be available to monitor the interactions between the technology and the environment. Incorporation of lessons learned will allow BOEMRE to determine the best monitoring technologies to use in order to assess best the interaction of technology with the environment. How is the impact of facilities on these resources best measured? This type of information will assist BOEMRE in assessing what levels of impacts are significant and if impacts are significant, how are they would best be mitigated.

3.1.3 Technology Issues

While wind technology is the most advanced and significant research has been conducted in Europe, there are still many questions to be answered as development moves forward along the U.S. coasts. European offshore wind energy efforts are focused mainly in the North Sea, where wind speeds are high and water depths are relatively shallow. Wind turbine spacing within the array as well as spacing between wind facilities is a consideration in terms of the

environmental footprint. The public has commented that a condensed configuration of wind turbine generators may mitigate visual impacts. However, there are questions as to how a condensed configuration may impact commercial fishing as well as reef effects. In addition, consideration must be given to economic impacts in terms of a reduction in property values of coastal residents.

3.1.4 Impacts

BOEMRE Headquarters and OAEP archeologists are discussing a multi-agency collaboration, including private, Federal (NOAA National Marine Sanctuary Program (NMSP), and maybe OE), state (Massachusetts Board of Underwater Archaeological Resources (BUAR) and State Historic Preservation Officer (SHPO)), and tribal (Mashpee Wampanoag, Wampanoag Tribe of the Gay Head-Aquinnah, and Narragansett) participation, to conduct a study identifying potential relic landforms within the Stellwagen Bank National Marine Sanctuary (SBNMS). The phased-approach would use existing data to develop a predictive model for the identification of surviving relic paleolandforms, followed by a remote-sensing survey to test the model (using some new techniques), and then ground-truthing those targets, if found. In-kind contributions might be generated from the NMSP and OE for the vessels and some of the remote-sensing technology. BOEMRE's scientific diving program and GOMR archaeological program have additional equipment that could be used. This collaborative study would serve to produce sound science while potentially easing the tensions between BOEMRE and the New England tribes. The National Marine Sanctuary Foundation could potentially serve as a conduit to involve and engage the tribes.

Scour effects and stability of shoals where development occurs could impact several species, benthic habitats and offshore cultural resources. Therefore, near-field and far-field environmental impacts of various physical structures need to be understood or assessed.

The cumulative effects of multiple projects along the coast are a concern. What are the cumulative effects of multiple projects to ecosystems and migratory species? What will be the acceptance of communities to multiple facilities including aesthetics and recreational impacts?

3.1.5 Transmission

In the face of applications for ROW grants, BOEMRE needs to collect environmental information, particularly on benthic habitats, to inform the assessment of installation of multi-state transmission cables. CEQ requires agencies to consider connected actions (40 CFR 1508.25(a)(1)). This type of information will allow BOEMRE to assess whether these types of systems would make commercial wind energy projects more feasible, potentially increasing the total number of facilities.

3.2 Marine Hydrokinetic Projects on the OCS

The extraction of energy from ocean currents requires a location that has strong, steady currents. The only known ocean current that has these characteristics on the OCS is the

Florida Current, located off the eastern coast of North America. Ocean currents are relatively constant and flow in one direction only, in contrast to the tidal currents closer to shore where the varying gravitational pulls of the sun and moon result in diurnal high tides. Only a small number of prototypes and demonstration units have been tested to date. One such technology involves submerged turbines. Energy can be extracted from the ocean currents by using submerged turbines that are similar in function to wind turbines, capturing energy through the processes of hydrodynamic, rather than aerodynamic, lift or drag.

Mechanisms such as posts, cables, or anchors are required to keep the turbines stationary relative to the currents with which they interact. Turbines may be suspended from a floating structure or fixed to the seabed. Turbines may be anchored to the ocean floor in a variety of ways. They may be tethered with cables, with the relatively constant current interacting with the turbine used to maintain location and stability. In large areas with powerful currents, it would be possible to install turbines in groups or clusters to create marine current facilities. One or more turbines would require cable interconnections and a central transformer to synchronize the electricity for compatibility with the onshore grid.

For the immediate future, MHK projects on the Atlantic OCS are projected to be limited to technology testing offshore Florida and Massachusetts. As a result of those activities, BOEMRE will have a better idea of study needs associated with MHK projects for the next plan. Many of the environmental concerns are similar as for any development offshore, including space-use conflicts and alteration of habitat. The interactions of fish, turtles, and marine mammals with underwater turbines are a key concern.

3.3 Cross-Cutting Issues

An important cross-cutting issue is global climate change and the benefits of OCS renewable energy development on the environment and human communities. Many questions arise when considering the effects of renewable energy on global climate change. What are the greenhouse gas emission impacts from construction, maintenance, and removal? Will development of renewable energy make a difference in global climate change by decreasing greenhouse gases? Skeptics suggest that it would take many years and significant developments to reverse the trends. However, others suggest that these steps towards renewable ocean energy are critical for the U.S. to take.

On February 18, 2010, CEQ released draft guidance on the consideration of the effects of climate change and GHG emissions in NEPA documents (CEQ, 2010). “CEQ proposes that the NEPA process should incorporate consideration of both the impact of an agency action on the environment through the mechanism of GHG emissions and the impact of changing climate on that agency action. This is not intended as a “new” component of NEPA analysis, but rather as a potentially important factor to be considered within the existing NEPA framework.”

A worldwide analysis of manufacturing of OCS renewable energy technologies is needed to trace the most likely manufacturing aspects of commercial and non-commercial OCS renewable energy proposals. Manufacturing of wind turbines and current technologies are

limited within the world. Indeed, the U.S. could become a leader in manufacturing for offshore renewable energy, but first it is important to understand the current state of manufacturing before determining the possibilities. An analysis of the manufacturing OCS renewable energy technologies would allow BOEMRE to predict the economic and employment impacts of future development.

Eventually, decommissioning impacts will need to be considered including the methods of removal and potential effects of leaving structures in place.

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Offshore Environmental Studies Program

Fiscal Years 2012-2014 Studies Development Plan

Pacific OCS Region

U.S. Department of the Interior
Bureau of Ocean Energy Management, Regulation and Enforcement
Pacific OCS Region
Camarillo, CA
2011

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SECTION 1.0 PROGRAMMATIC OVERVIEW

1.1 Introduction to the Region

The Environmental Studies Program in the Pacific Outer Continental Shelf (OCS) Region started in 1974. The Program has evolved with change in the geographic areas of concern and study, in the emphasis of disciplines highlighted for research, with change in the status of the Region from a frontier to a mature oil and gas producing area (prelease to postlease emphasis), with the implementation of the Energy Policy Act of 2005 and the responsibility for the OCS renewable energy program, and finally, with the formation of the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) and State of Oregon OCS Renewable Energy Task Force.

Existing production and development activities on 43 producing oil and gas leases offshore southern California will continue. Annual production from these leases is currently over 60,000 bbls of oil per day and 128 MMCF of natural gas per day. It is expected that production from the majority of these facilities will continue for many years. The projected OCS activities section of this report discusses the activities anticipated on producing leases.

The need for information to regulate future renewable energy projects that may be proposed and implemented in the Pacific OCS Region is reflected in this plan. These energy projects will require studying areas outside southern California as interest and resource potential for deepwater wind and wave energy facilities exist all along the Pacific Coast and offshore Hawaii. For example, the Federal Energy Regulatory Commission has issued several permits for pilot projects within State waters of Washington, Oregon, and northern California. Hydrokinetic wave energy conversion devices are being tested offshore Oregon.

Alternate uses of existing platforms continue to be discussed. As the Region has matured, and as developed oil and gas field production has peaked and entered declines, new and innovative ideas for the use of traditional oil and gas platforms have emerged. New uses previously proposed for oil and gas platforms have included marine aquaculture and Liquefied Natural Gas (LNG) facilities. When needed, new or updated environmental studies will support BOEMRE decisions with regard to non-traditional uses of offshore facilities. The plan complements and reinforces the Environmental Studies National Strategic Plan.

This document presents a strategy for the Pacific OCS Region. It applies to the entire Region, which stretches from the United States-Mexico border to the U.S. border with Canada. It includes Hawaii in regards to early planning for possible environmental studies related to renewable energy projects that may occur in that area. For renewable energy studies, this plan focuses on all Pacific OCS Planning Areas offshore Washington, Oregon, and California, and includes the Hawaii OCS that might experience renewable energy projects. Studies related to oil and gas in the Southern California Planning Area support decisions for activities on existing producing leases.

The information obtained through these studies is important and relevant to decision making. This information fulfills the following criteria:

- The study provides significant new or additional information beyond what is already known.

- The identified study is within the time frames of the Offshore Program.

- The information provides insight into significant processes critical for understanding both natural and anthropogenic changes.

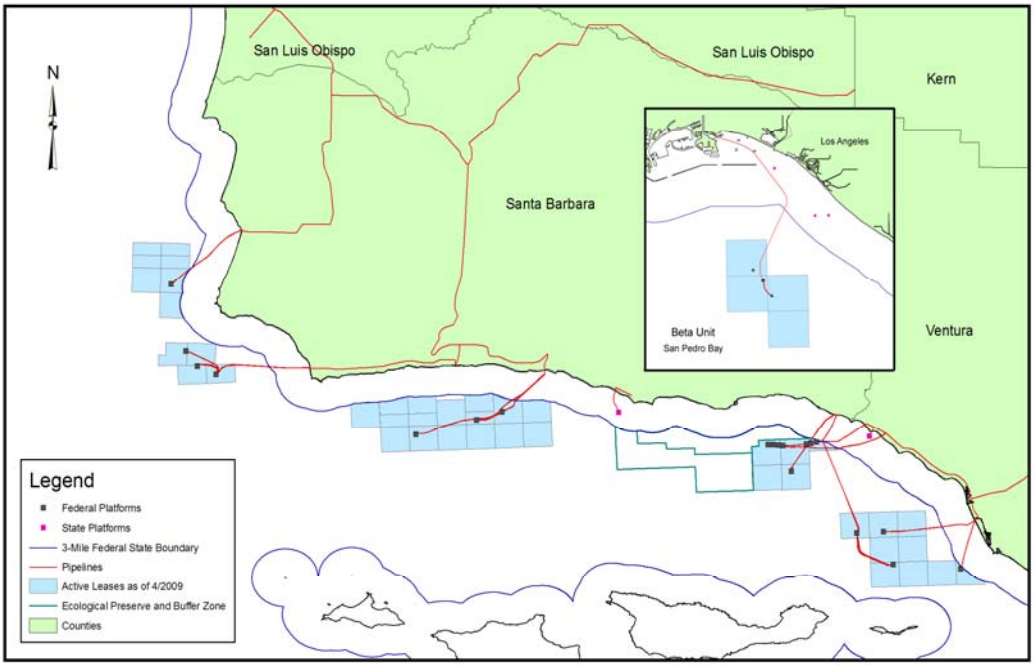
- The issue can be studied within science's present abilities or understanding of experimental methods to acquire the information.

The introduction of renewable energy projects and the level of future oil and gas activities offshore the Pacific OCS Region will dictate changes in the strategy. Findings from current or future research may also affect the strategy and cause other avenues of research to be incorporated.

If you have any questions regarding this Pacific OCS Region Environmental Studies Development Plan, please contact Dr. Ann Scarborough Bull, Pacific OCS Region, at (805) 389-7820. You can also view the BOEMRE and Pacific OCS Region home pages at www.boemre.gov and http://www.boemre.gov/omm/pacific/index.htm, respectively, for additional information.

1.2 Maps of the Pacific OCS Region - Active Leases and Resource Potential for Renewable Energy

Figure 1. Active Leases in Southern California



Pacific OCS Region Leases and Facilities

Figure 2. Resource Potential for Renewable Energy from Wave Power

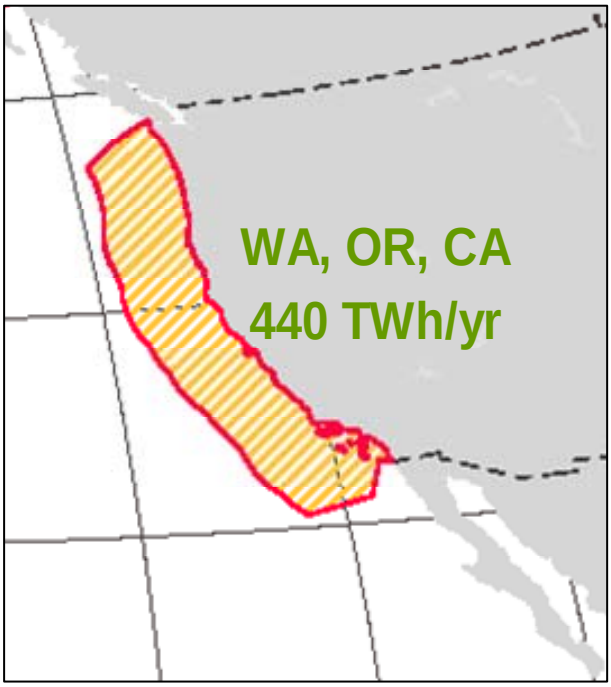


Figure 3. Resource Potential for Renewable Energy from Wind Power

1.3 Projected OCS Activities

The BOEMRE Environmental Studies Program supports BOEMRE decisions associated with leasing, exploration and development of oil and natural gas, marine minerals, and renewable energy. Often, studies serves needs associated with all three programs.

1.3.1 Renewable Energy Activities and Alternate Use of OCS Facilities

The BOEMRE was delegated the responsibility for implementing an OCS renewable energy program with the passage of the Energy Policy Act of 2005. Alternative use of existing OCS facilities is also authorized by this Act. Regulations implementing the Act were published in April 2009, and prospective developers of offshore deepwater wind and wave energy conversion devices have started to develop project proposals on the Pacific OCS. Leasing and permitting OCS renewable energy development, permitting power cables on the OCS associated with renewable energy, and permitting repurposing of OCS facilities will involve new environmental considerations and, consequently, additional environmental studies. Several renewable energy developments for the Pacific Region occurred in Fiscal Year 2010.

The Governor of Oregon, in a letter dated December 1, 2010, requested the formation of a BOEMRE-sponsored Federal-State task force with the State of Oregon to address the use of the ocean for renewable energy development. The Oregon-focused task force will support and enhance the regional planning that is taking place through the partnership that the three west coast states have with BOEMRE; this partnership is called the West Coast Governors' Agreement on Ocean Health. Secretary Salazar accepted the request on December 30, 2010, and the Pacific Region is finalizing a charter outlining the purpose, membership, and planned functions of the task force. The first task force meeting was held in Portland, OR, March 31, 2011.

The City and County of San Francisco informed the Pacific Region on December 9, 2010, that they will submit a request for an OCS wave energy lease offshore San Francisco in early-to-mid 2011. The City and County have completed a few site-specific environmental studies that will assist them in planning the project and a preliminary technical design study is underway. They have a goal to generate 100 percent of the City's electricity from renewable sources by 2020.

In a letter dated July 7, 2010, researchers at the University of Hawaii, through the U.S. Department of Energy, Hawaii National Marine Renewable Energy Center, expressed an interest in obtaining an OCS research lease or grant to support renewable energy research at the Makai Pier test site on the Island of Oahu. They have a strong interest in conducting marine renewable energy research at the test site where they plan to deploy a series of wind, wave and tidal current devices. The establishment of a consolidated Federal/State marine technology testing site could foster collaborative research endeavors by government agencies and attract funding from private sector firms seeking to test innovative systems and prototype wave and wind energy equipment in shallow and deepwater environments.

In a letter dated July 26, 2010, the Natural Energy Laboratory of Hawaii Authority (NELHA) expressed interest in obtaining an OCS research lease or grant to support the establishment of a continuous Federal/State marine science and technology research corridor offshore of their Keahole Point facility on the Island of Hawaii. The NELHA intends to request that the State of Hawaii extend NELHA's ocean use corridor to the 3-mile limit. Obtaining an OCS lease contiguous with their existing use corridor would establish a consolidated ocean test area and encourage collaborative research endeavors by both Federal and State government entities. They hope the consolidated offshore test area would attract funding and investment opportunities to test wind, wave, current, and ocean thermal energy conversion plants and prototypes in shallow and deep seawater environments.

1.3.2 Oil and Natural Gas

Typically, the OCS oil and gas management program is addressed as prelease and postlease. Prelease activities include development of a 5-year program in which oil and gas lease sales are scheduled. The Pacific Region has not been included in a 5-Year Oil and Natural Gas Leasing Program since 1987 as a result of repeated moratoria. On July 14, 2008, President George W. Bush lifted the executive withdrawal of OCS lands from consideration for oil and gas leasing. The President also called for Congress to lift the annual moratorium and enact legislation to allow states to determine what happens off their coast and provide for sharing of revenues with those states that want to proceed with development. On September 30, 2008, the long-running leasing moratoria enacted annually as part of the Department of the Interior's (DOI) appropriations legislation was discontinued by Congress. However, the Pacific OCS Region was not included for leasing in the Preliminary Revised Program for 2012-2017, which was announced by the President and the Secretary on March 31, 2010.

Postlease oil and gas activities are those associated with the development of the 43 producing leases in the Southern California Planning Area. Currently, 23 Federal oil and gas platforms produce over 60,000 barrels of oil and 128 MMCF of natural gas per day. This rate could be sustained for the next several years, as Federal lessees continue to focus on the recovery of approximately 400 million barrels of oil in proved reserves. Studies identified in this regional plan highlight information gaps and are geared to allow BOEMRE to conduct analyses that support permitting and regulation of the oil and gas industry's ongoing production projects. Continued production at these facilities may present new information needs during the coming decades in order to maintain environmentally safe operations with the existing infrastructure.

Studies are needed to address and monitor the environment adjacent to the existing facilities. For example, information from environmental studies was used in the assessment of the environmental effects of power cable repairs in FY 2010 within the Santa Ynez Unit in the Santa Barbara Channel, and future installation of a power cable and pipeline within the Beta Unit off Long Beach, California. Many platforms in the Pacific Region are electrically powered from onshore sources via a cable, and BOEMRE is using recent data from environmental studies in preparing environmental assessments for that postlease activity. Environmental studies information was crucial to completion of these National Environmental Policy Act documents.

1.3.3 Marine Minerals Other than Oil and Gas

Opportunities to explore for and develop OCS mineral resources other than oil and gas become increasingly attractive to developers as economic conditions improve. In the future, there may be a need to collect and analyze information in support of potential leasing and development of a marine mining program on the Pacific OCS.

1.4 Identification of Information Needs

The main areas of information needs for FY 2012-2014 fall into the following categories:

1.4.1 Supporting potential renewable energy leasing and existing oil and gas production activities:

Biology

The erection and operation of offshore deepwater wind turbines and other renewable energy devices may have a variety of effects on seabirds, most of which will vary by species based on their behavior at sea. Since its inception, the Pacific Region has gathered a large amount of information on Pacific seabirds. The study "Developing and Applying a Vulnerability Index for Scaling the Possible Adverse Effects of Offshore Renewable Energy Projects on Seabirds on the Pacific OCS" will provide a means to rank and assess the vulnerability of specific seabird species on the Pacific OCS based on the habits and activities of birds at sea. The proposed study will increase the understanding of the flight behavior of seabirds and provide a means to rank and assess the vulnerability of specific seabird species on the Pacific OCS based on these habits and activities. This information coupled with existing information on distribution and abundance can provide a means to assess and advise site selection for offshore renewable energy projects in a manner that minimizes adverse effects to seabirds.

Offshore oil and gas production platforms provide underwater habitat for a variety of fishes in the waters off southern California. With the recent passing of the 2010 Marine Resources Legacy Act artificial reef program in California, it has become critical to understand the environmental benefits of a partial removal of decommissioned platforms because specific ecological criteria must be satisfied to utilize the program. The study "Biological Productivity of Fish Associated with Offshore Oil and Gas Structures in the Pacific OCS" will determine the patterns of fish standing stock and productivity associated with oil and gas production platforms so that BOEMRE can specify any site-specific survey requirements to industry or other interested parties when they propose decommissioning.

Ultimately, offshore oil and gas platforms will be removed; however, California sea lions and Pacific harbor seals use these platforms as resting and foraging areas. The study "Characterizing and Quantifying Sea Lion and Seal Use of Offshore Man-made Structures in California" will gather information on these species that BOEMRE will use for environmental review and permitting associated with facility decommissioning. The study will provide initial information on the species interactions with these structures that should contribute to

our understanding of how they may interact with renewable energy facilities being considered for the Pacific coast.

Fates and Effects

The OCS platforms offshore of California are located in close proximity to the shoreline where important biological resources are present. Activities from offshore oil and gas drilling have the potential to directly affect these shoreline habitats, especially in the event of an accidental oil spill. The "Pacific Region Intertidal Sampling and Monitoring (PRISM) Study" will monitor shorelines across the four counties that border producing OCS oil and gas facilities. Long-term data about natural and anthropogenic perturbations in the rocky intertidal habitat will be collected in a manner that enables BOEMRE to determine effects from OCS operations and accidental oil spills.

The study "Nocturnal Surveys for Ashy Storm-Petrels and Xantus's Murrelets at Offshore Oil Production Platforms, Southern California" will help to determine how artificial lighting on oil and gas platforms in the Santa Barbara Channel is affecting these two special-status seabird species. The BOEMRE will use the data generated for environmental review of oil and gas and renewable energy projects proposed in the area and, if needed, will identify mitigation to minimize impacts to seabirds from artificial lighting.

The BOEMRE needs to evaluate cumulative impacts from OCS operations on affected key biological communities and be able to assess impacts from accidents such as oil spills. The BOEMRE has collected several decades of long-term monitoring data but BOEMRE managers need the long-term monitoring data brought into a framework conducive to making program-wide decisions. Indices for rocky intertidal habitat condition would help achieve this goal, but none have been produced. The goal of the study "Condition of the Rocky Shoreline" is to develop these indices and produce a report that ranks the condition of rocky intertidal areas in a way that is predictable and comparable.

1.5 New Starts for Fiscal Year 2011 and Ongoing Studies Table

The following table contains the list of New Starts and Ongoing Studies managed by the Pacific OCS Region. Descriptions of Ongoing Studies may be found on the web at http://www.boemre.gov/omm/pacific/enviro/Enviro-Studies/Current-Environmental-Studies.pdf. A list of significant completed studies by the Pacific OCS Region may be found at http://www.boemre.gov/omm/pacific/enviro/Enviro-Studies/completed-environmental-studies.htm and a discussion of highlights and accomplishments of the Pacific Environmental Studies Program is available at http://www.boemre.gov/omm/pacific/enviro/studies-accomplishments-2009.htm.

Table 1. BOEMRE Pacific Region New Starts for FY 2011 and Ongoing Studies

Program Lead	Planning Area	Start FY	Discipline	Study Title
NEW STARTS				
	All	11	SS	Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence on the Pacific OCS
NPS, USGS	SC	11	HE	DOI Partnership: Distinguishing Between Human and Natural Causes of Changes in Nearshore Ecosystems Using Long-term Data from DOI Monitoring Programs
BRD	SC	11	MM	Southern Sea Otter Range Expansion and Habitat Use and Interaction with Manmade Structures (BOEMRE/USGS OCS funded)
	NC/CC/SC	11	All	Membership in California Cooperative Ecosystem Studies Unit
***Note: The procurement of any study is contingent upon availability of funding**				
ONGOING STUDIES				
Fates & Effects				
	All	09	FE	Effects of EMF from Transmission Lines on Elasmobranchs and Other Marine Species
	SC	06	FE	Investigation of PCB and PAH Contaminants in Samples of Platform Resident Fish
USGS	SC	06	FE	Fate Volume and Chemistry of Natural Seeps
USGS	SC	06	FE	Volume and Chemistry of Natural Seeps in the Santa Barbara Channel
Habitat and Ecology				
	SC	10	HE	Regional Importance of Manmade Structures as Rockfish Nurseries
	NC/CC/SC	10	HE	MMS MARINe–Multiagency Rocky

				Intertidal Network
	SC	10	HE	Completion of Fish Assemblage Surveys around Manmade Structures and Natural Reefs off California
BRD	SC	10	HE	Habitat Mapping in the Santa Barbara Channel
CESU	O/WA	10	HE	Survey of Benthic Communities near Potential Renewable Energy sites Offshore Oregon and Washington
	SC	09	HE	MINT – MMS Intertidal Team
	SC	08	HE	Spatial and Seasonal Variation in Biomass and Size Distribution of Juvenile Fishes Associated with a Petroleum Platform
Information Management				
NOPP	WA/O/NC	11	IM	Bayesian Integration for Marine Spatial Planning and Renewable Energy Siting
Marine Mammals and Protected Species				
USGS	NC/O/WA	10	MM	Seabird and Marine Mammal Surveys off the Northern California, Oregon, and Washington Coasts
	SC	07	MM	Shorebird Survey of Ventura County
Physical Oceanography				
Social Sciences & Economics				
NOPP	All	10	SS	Renewable Energy Visual Impacts
Multidisciplinary				
	SC	07		Environmental Mitigation Monitoring
NOPP	WA/O/NC	11	All	Protocols for Baseline Studies and Monitoring for Ocean Renewable Energy
Other (Research Partnerships)				
Cooperative Ecosystem Studies Unit (CESU); Oregon State University (OSU); National Oceanographic Partnership Program (NOPP)				
Federal Interagency Agreements: e.g., U.S. Geological Survey/ Biological Resources Division (BRD), Columbia Environmental Research Center, Western Fisheries Research Center, Menlo Park Coastal and Marine Geology Center, National Park Service (NPS) Channel Islands National Park				
Discipline Codes AQ = Air Quality FE = Fates & Effects HE = Habitat & Ecology IM = Information Management MM = Marine Mammals and Protected Species PO = Physical Oceanography SS = Social Sciences				
Planning Area Codes Southern California = SC Central California = CC Northern California = NC Oregon = O Washington = WA All = NC/CC/SC/O/WA/Hawaii http://www.boemre.gov/omm/pacific/enviro/enviro_studies.htm				

1.6 Approved Studies for FY 2011 on Hold Pending Funding Availability

With the expectation of increased funding to support studies related to the Deepwater Horizon Oil Spill, renewable energy and expanding information needs, the 2011-2013 SDP as distributed to the Committee included many more studies than usual. By the time the 2011 NSL was ready for managerial approval, the funding increase still was undecided. To prepare for all funding eventualities and to streamline the approval process, the approved FY 2011 NSL included two basic tiers of studies: 1) new starts with funding allocated that could be moved into the procurement queue with the money available (shown in Table 1 above), and 2) new studies on hold, pending the addition of financial resources (shown in Table 2 below). As of this writing, no additional funds have been provided to advance the studies on hold. The studies on hold will be considered for funding in FY 2012 along with the new studies proposed in this plan. There is one study on hold in the Pacific Region.

Table 2. BOEMRE Pacific Region Studies Approved for FY 2011 on Hold Pending Funding Availability

NSL #	Title
PC-11-03	Renewable Energy in situ Power Cable Observation

SECTION 2.0 PROPOSED STUDY PROFILES

2.1 Introduction

A list of significant recently completed studies by the Pacific OCS Region may be found at http://www.boemre.gov/omm/pacific/enviro/Enviro-Studies/completed-environmental-studies.htm and a discussion of highlights and accomplishments of the Pacific Environmental Studies Program is available at http://www.boemre.gov/omm/pacific/enviro/studies-accomplishments-2009.htm.

2.1.1 Renewable Energy and Oil and Gas Operations Support Studies:

Six new studies supporting potential and ongoing activities are proposed for FY 2012. These studies are:

- Developing and Applying a Vulnerability Index for Scaling the Possible Adverse Effects of Offshore Renewable Energy Projects on Seabirds on the Pacific OCS
- Biological Productivity of Fish Associated with Offshore Oil and Gas Structures on the Pacific OCS
- Pacific Region Intertidal Sampling and Monitoring (PRISM) Study
- Nocturnal Surveys for Ashy Storm-Petrels and Xantus's Murrelets at Offshore Oil Production Platforms, Southern California
- Condition of the Rocky Shoreline
- Characterizing and Quantifying Sea Lion and Seal Use of Offshore Man-made Structures in California

2.2 Profiles of Studies Proposed for the 2012 NSL

Table 3. BOEMRE Pacific OCS Region Studies Proposed for the FY 2012 NSL

Page #	Discipline	Title	Rank
15	MM	Developing and Applying a Vulnerability Index for Scaling the Possible Adverse Effects of Offshore Renewable Energy Projects on Seabirds on the Pacific OCS	1
17	HE	Biological Productivity of Fish Associated with Offshore Oil and Gas Structures on the Pacific OCS	2
19	HE	Pacific Region Intertidal Sampling and Monitoring (PRISM) Study	3

21	HE	Nocturnal Surveys for Ashy Storm-Petrels and Xantus's Murrelets at Offshore Oil Production Platforms, Southern California	4
23	HE	Condition of the Rocky Shoreline	5
25	MM	Characterizing and Quantifying Sea Lion and Seal Use of Offshore Man-made Structures in California	6

AQ = Air Quality
FE = Fates and Effects
HE = Habitat and Ecology
SS = Social Science
IM = Information Management
PO = Physical Oceanography
MM = Marine Mammals and Protected Species

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Pacific OCS Region

Planning Areas: All

Title: Developing and Applying a Vulnerability Index for Scaling the Possible Adverse Effects of Offshore Renewable Energy Projects on Seabirds on the Pacific OCS

BOEMRE Information Needs to be Addressed: The BOEMRE will likely receive proposals to develop offshore renewable energy projects on the Pacific OCS. While data exist on the distribution of seabirds on the Pacific OCS, there is little information regarding the effects that offshore Pacific coast renewable energy development will have. The proposed study increases the understanding of the flight behavior of seabirds and provides a means to rank and assess the vulnerability of specific seabird species on the Pacific OCS based on the habits and activities of birds at sea. This information coupled with existing information on distribution and abundance can provide a means to assess and advise site selection for renewable energy project in a manner that minimizes adverse effects to seabirds.

Cost Range: (in thousands) $400-$600 **Period of Performance:** FY 2012-2015

Description:

Background: One of the most pressing issues in marine and coastal research is determining the likely impact of offshore renewable energy projects on marine resources. The eastern Pacific near the coast of the western United States, and Hawaii and its surrounding waters, support many breeding seabirds and a variety of other bird species that migrate to or through these regions. A number of species of conservation concern occur in the Pacific Region, including several listed as threatened or endangered under the Endangered Species Act. The erection of offshore wind turbines or installation of wave hydrokinetic arrays may affect birds in several ways, including the risk of collision with the blades and other parts of the structure, and the displacement of individuals from otherwise suitable habitat. While data on the distribution and abundance of seabirds can advise the selection of locations for renewable energy projects, the habits and activities of birds at sea should be taken into account because vulnerability to effects will vary between species.

Understanding seabird flight characteristics is critical to evaluating the risk of collisions with blades and other parts of structures. While the design aspects of seabird flight have been investigated in detail, we still lack basic information about the height at which seabirds fly, as well as their flight directions with respect to prevailing wind directions. H. T. Harvey & Associates possess data on the flying behavior of seabirds gathered over approximately 50 cruises during 20 years of at-sea surveys conducted along the west coast of the US, spanning the Pacific Ocean from pole to pole, and from the coast to Hawaii (1976-2006), with the major portion of data from the California Current (1985-2006). While some of these data have been analyzed, data on flight height as a function of wind speed and species of bird have not. Once the flight behavior data is analyzed, developing a sensitivity index for seabirds for the Pacific Region of BOEMRE will aid in evaluating the risks of offshore renewable energy development to the diversity of seabirds occupying this region.

Objectives: 1) Support the analysis of seabird flight behavior to inform the design, operations, and siting of offshore renewable energy projects; 2) develop a wind farm and wave array sensitivity index for seabirds on the Pacific OCS and off Hawaii; 3) apply the index to areas where offshore renewable energy development is most likely to occur; 4) summarize seabird vulnerability on digital maps with a grid size that matches offshore survey data; 5) develop levels of concerns that could act as a basis for selection of offshore renewable energy sites; 6) prepare a synthesis report that summarizes the analyses and findings; and 7) submit a modified version of the report to a peer-reviewed publication.

Methods: Generalized linear models will be used, including logistic regression, to test hypotheses regarding the flight height of seabird species and the potential effects of environmental variables (e.g., wind velocity, sea state). Indirect gradient analysis using non-metric multidimensional scaling and cluster analysis may aid in initially identifying patterns of behavior, and suggest options for constrained ordination techniques. Data on bird and wind velocities will be explored using statistical methods for circular distributions.

The index will be developed by ranking key vulnerability factors as Garthe and Hüppop (2004) did when scaling the possible effects of offshore renewable energy on seabirds in Europe. The factors they chose included flight maneuverability, flight altitude, percentage of time flying, nocturnal flight activity, disturbance by ship and helicopter traffic, flexibility in habitat use, biogeographical population size, adult survival rate, and threat and conservation status. These factors should be evaluated for relevance to evaluating seabirds in the Pacific Region and can be supplemented with others that would help refine the index (e.g., attraction to artificial lights; likelihood of resting on artificial structures rather than avoiding them).

Species evaluated in the index will include all seabirds expected to regularly occur on the Pacific OCS or off Hawaii. At a minimum, these will include species of waterfowl (7), loons (4), grebes (6), albatrosses (3), petrels (6), shearwaters (9), storm-petrels (8), tropicbirds (3), boobies (4), pelicans (1), cormorants (3), frigatebirds (3), phalaropes (2), gulls (11), terns (15), skuas (1), jaegers (3), and alcids (11).

The ranking of each factor for all species will be independently evaluated by a selected group of experts per factor. The experts would be chosen based on their experience with the species in the targeted regions or other areas where the species occur. The sensitivity index calculation would be similar to that identified by Garthe and Hüppop (2004), but may need to be adjusted if factors that were not considered in their index are incorporated. Once species-specific sensitivity indexes are developed, the scores will be integrated with existing distributional data to develop vulnerability maps for areas of potential offshore renewable energy development. An index will be developed based on species density and sensitivity to offshore renewable energy development that will provide sensitivity values for surveyed grid cells at sea.

Revised date: March 29, 2011

ENVIRONMENTAL STUDIES PROIGRAM: Studies Development Plan 2012-2014

Region: Pacific OCS Region

Planning Area: Southern California

Title: Biological Productivity of Fish Associated with Offshore Oil and Gas Structures on the Pacific OCS

BOEMRE Information Needs to be Addressed: Fish standing stock (biomass) and productivity estimates associated with oil and gas production platforms will provide needed information so that BOEMRE can specify any site-specific survey requirements to industry or other interested parties when they propose decommissioning.

Cost Range: (in thousands) $75-$100 **Period of Performance:** FY 2012-2013

Description:

Background: In September of 2010, the Governor of California signed into law the California Marine Resources Legacy Act (CMRL Act) which, for the first time on the Pacific Coast, enables a "rigs-to-reefs" program that allows for reefing partially removed, decommissioned OCS oil and gas production platforms, as long as specific ecological criteria are satisfied. Partial removal means cutting the platform off 85 feet (~26 meters (m)) below the sea surface. One pivotal requirement for a proposed reefing project is that a net environmental benefit must be demonstrated for partial removal when compared to full removal. The CMRL Act specifies that the proposed reefed structure must provide for the protection and productivity of fish and other marine life. The State of California provided funding for an independent scientific team to produce a preliminary theoretical framework that estimates the standing stock and annual production of fishes on platforms in the Southern California Bight. Using this theoretical model, estimates for productivity have begun for a few platforms on the OCS. This study requires no field work as the data were acquired via previous BOEMRE studies.

Objectives: Using empirical data from completed and ongoing BOEMRE studies, and building upon the preliminary model approved by the State of California and by BOEMRE as a member of a 15-member Expert Advisory Committee, the goal of this study is to determine the patterns of total standing stock (fish biomass) and fish production at as many Pacific OCS Region platforms as the data will support. Model results will be interpreted to examine the effects of decommissioning options (complete or partial removal). Additionally, platform fish (all species) productivity estimates will be compared to nearby natural reefs for which similar production estimates are available, and will also be compared to production estimates in the literature of other marine and terrestrial ecosystems. Once completed, study results will be published as a BOEMRE OCS Study Report and in a peer-reviewed journal(s).

Methods: A biological model will be further developed based upon existing empirical studies of these platforms to determine for all fish species (1) the standing stock, and (2) the larval production of fishes. This model starts with the current standing stock defined as the total biomass (B) of each species per platform. It then calculates the future production and

standing stocks for all fish species based upon the two platform decommissioning options (complete or partial). The data used for this model were collected during scientific surveys by observers using either submarines or SCUBA to record the frequency and size class of fishes along fixed transect lengths based upon the dimensions of the platform (Love et al. 2003).

Stock Assessment
The stock is the amount of biomass for all fish species observed on each platform. The mean biomass density will be calculated for each platform and for each of three depth strata (i.e., lowest 2 m of a platform, 2 m off the bottom to 26 m from the surface, and from 26 m to the surface). The total stock estimate will multiply these depth-zone specific biomass densities by an estimate of the surface area of each depth zone, and summing those estimates for each platform.

Production Estimate
Production is the change in biomass over time (Clarke et al. 1946). The total yield (*Y*) is a function of two factors: the standing stock biomass (B), plus the surplus production (*Y'*). Surplus production is the annual growth (G) in the adult stock (i.e., gonadal and somatic growth) plus recruitment (*R*), such that for any production component (Ricker 1975):

$$Y = B + Y' \text{ and } Y' = G + R$$

The model will then estimate annual rates of somatic fish production ($g/m^2/yr$) for each platform for each decommissioning scenario (partial or complete removal). Somatic growth for each species will be estimated based on its standing stock and the species-specific von Bertalanffy growth function. As there are no available estimates of immigration (I) and emigration (E) rates of platform fishes, the model will assume I = E for subadult and adult life history stages. Larval/pelagic juvenile emigration is measured by recruitment to the platform and larval immigration rates can be calculated by fecundity and adult density and size distribution. The standing stock is also a factor of fishing and natural mortality. Fishing mortality is considered negligible as most platforms are currently acting as de facto closures due to security. Natural mortality is incorporated using mortality rate estimates from the literature. Currently only recruitment (*R*) for young-of-year (YOY) bocaccio is incorporated into the model based on available data for which recruit density and depth were reported (Love & York 2006). No other fishes were added to the recruitment component of the production model, which results in a conservative juvenile production estimate. The model will estimate productivity levels over a time frame of 5 years. A standing stock and production estimate for all fish species will be produced for as many Pacific OCS Region platforms as the data will support.

Revised date: April 19, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Pacific Region

Planning Area: Southern California

Title: Pacific Region Intertidal Sampling and Monitoring

BOEMRE Information Need(s) to be Addressed: The BOEMRE needs to understand the ecology and variability of rocky intertidal systems in order to evaluate oil and gas activities and effectively mitigate potential impacts on these natural resources. Direct monitoring of shoreline habitats by BOEMRE staff over the last 20 years has proven to be an effective way to gather this information and determine the effects of OCS oil and gas operations, especially those from accidental oil spills. This long-term research project has also enabled BOEMRE scientists to address bureau and departmental climate change objectives.

Cost Range: (in thousands) $60-$100 **Period of Performance:** FY 2012-2016

Description:

Background: The OCS platforms offshore of California are located in close proximity to the shoreline where important biological resources are present. Activities from offshore oil and gas drilling have the potential to directly affect these shoreline habitats, especially in the event of an accidental oil spill. This study is designed to monitor shorelines across the four counties that border producing OCS oil and gas facilities. The BOEMRE funds a separate study that supports scientists to perform monitoring, analysis, and management of the Multi-Agency Rocky Intertidal Network (MARINe), which conducts biannual rocky intertidal monitoring at over 120 established sites. The BOEMRE PRISM team, comprised of BOEMRE scientists, is currently one of 12 monitoring teams that collect data for the MARINe network. Federal participation is a requirement of the MARINe network Cooperative Agreement and funding of this study is the mechanism which supports that Federal participation and also offers multiple benefits to the bureau. The monitoring work in this study, which was initiated in 1991 and now spans two decades, allows PRISM staff to design and implement studies answering questions identified during monitoring and supporting the overall BOEMRE mission (e.g., climate change objectives). The PRISM team presence in the field has the added benefit of interacting with the public during monitoring and provides BOEMRE with the opportunity to demonstrate our commitment to the environment in a visible manner.

Objectives: 1) Monitor the shoreline adjacent to existing oil and gas operations by collecting long-term data about natural and anthropogenic perturbations in the rocky intertidal habitat in a manner that enables BOEMRE to determine effects from OCS operations and accidental oil spills; 2) conduct short, focused examinations in the field that improve our understanding of rocky intertidal ecology as it relates to the impact, response, and recovery from oil spills; and 3) fulfill our commitment to participate in the Cooperative Agreement with the University of California for MARINe.

Methods: The first task is for the PRISM team to jointly monitor rocky intertidal shores in San Luis Obispo, Santa Barbara, Ventura, and Los Angeles Counties with scientists from the University of California, Los Angeles and Santa Cruz. Monitoring will be conducted twice a year and includes photo documentation of fixed mussel, barnacle, and algae plots; counts and measurements of invertebrates such as owl limpets, sea stars, and abalone; and point intercept measurements of surf grass line transects. In the spring, counts of motile invertebrates are conducted in each photo quadrat. The BOEMRE funds these university scientists through the BOEMRE-MARINe Cooperative Agreement. To share the responsibility of conducting field monitoring, the proposed PRISM study supports BOEMRE scientists to provide man-power, equipment, and expertise.

An additional four to six tasks will be identified at the beginning of the fiscal year in an annual plan, which is reviewed and approved by the Pacific Region and headquarters. These additional tasks are either special short-term studies designed by staff to answer specific questions, or efforts which support the monitoring task. The PRISM tasks that provide examples of the range of topics pursued by the PRISM team currently or in the past include:

- Climate Change Research – PRISM biologists are examining shifts in rocky intertidal communities as a response to climate change and associated sea level rise.

- Mussel Recovery Study – PRISM biologists conducted an experimental study of mussel recovery by establishing clearings and monitoring them over time. Currently, the team is analyzing data.

- Host MARINe Meetings – PRISM hosts meetings of MARINe scientists including the Annual Taxonomic Workshop, committee webinars and follow-up task force meetings. Our support includes creating the agenda, providing the forum, leading sessions, and taking notes.

- Protocol Videos – PRISM team biologists are videotaping the field sampling protocols for archival and training purposes.

- Go-Kit Equipment – PRISM developed the GO-Kits as a rapid assessment tool in the event of an oil spill for all shoreline habitats (wetlands, sandy beaches and rocky intertidal); these kits have been adopted by response groups and used in recent spills.

- Updating Field Guide – The hand-drawn field maps for PRISM sites have not been updated in many years. These maps are being redrawn and the PRISM team is collecting the key site measurements for this effort.

Revised Date: March 29, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Pacific OCS Region

Planning Area: Southern California

Title: Nocturnal Surveys for Ashy Storm-Petrels and Xantus's Murrelets at Offshore Oil Production Platforms, Southern California

BOEMRE Information Needs to be Addressed: The BOEMRE regulates oil and gas activities on platforms off the southern California coast. In addition, BOEMRE will likely receive renewable energy proposals within this area. A variety of birds may be attracted to artificial lights on these structures, including several species of conservation concern. Using existing facilities, this study will determine if artificial lighting on oil platforms in the Santa Barbara Channel is affecting two special-status seabird species; the Xantus's Murrelet (*Synthliboramphus hypoleucus*) and Ashy Storm-Petrel (*Oceanodroma homochroa*). The BOEMRE will use the data generated for environmental review of offshore energy projects.

Cost Range: (in thousands) $100-$150 **Period of Performance:** FY 2012-2013

Description:

Background: The attraction of seabirds to bright lights and associated light-induced mortality of seabirds has been well-documented (Imber 1975, Reed et al. 1985, Le Corre et al. 2002). The presence of bright lights in the marine environment is recognized as a potential threat to two special-status California seabird species, the Xantus's Murrelet and Ashy Storm-Petrel, although the magnitude and severity of this threat is not known (Carter et al. 2000, U.S. Fish and Wildlife Service (USFWS) 2009, USFWS 2010). Ashy Storm-Petrels have been recovered dead at Platform Hondo, Santa Barbara County, California, and at brightly lit coastal locations in southern California, and light attraction has been reported for Xantus's Murrelet at a coastal location in central California (Carter et al. 2000). In addition, both species have been observed landing on or colliding with brightly lit boats at night off southern California (D. Pereksta, personal observation). Incidental observations like these are the only existing information regarding the effects of artificial lighting on these two species and no directed studies have been conducted to date. The Xantus's Murrelet Technical Committee of the Pacific Seabird Group has identified lighting studies as a need to fill information gaps for that species. Lighting studies were also recommended for the Ashy Storm-Petrel in a recent summary of its status and threats (Carter et al. in Shuford and Gardali 2008).

The Xantus's Murrelet is a candidate for addition to the Lists of Endangered and Threatened Wildlife and Plants under the Endangered Species Act of 1973, as amended (USFWS 2004, 2010). The USFWS determined that listing of the Ashy Storm-Petrel was not warranted, but this decision is currently being legally challenged by the Center for Biological Diversity (USFWS 2009, Center for Biological Diversity 2010).

Offshore oil operations in California are conducted from 24 platforms along the southern coast of the state, well within the marine range of both species (Briggs et al. 1987, McCrary et

al. 2003). Lights are present on the platforms to illuminate working areas and make the platforms visible to passing ocean vessel traffic. In addition, offshore renewable energy production will likely be proposed at various locations on the Pacific OCS including the coast of California (USFWS 2009). Marine radar has been used to detect seabirds, including Xantus's Murrelets and Ashy Storm-Petrels, near their breeding locations, generally in low-light situations where the seabirds cannot be easily seen (Hamer et al. 1995, 2005). Hamer et al. (2005) refined species identification of seabirds on radar off southern California using flight speeds and echo sizes while monitoring Xantus's Murrelets. For these reasons, marine radar is a feasible method to use to detect seabirds that may be attracted to bright lights on offshore energy production platforms.

Objectives: The primary objectives of this study are to: 1) Evaluate the extent to which Xantus's Murrelets and Ashy Storm-Petrels interact with bright lights of offshore oil platforms off the coast of southern California; 2) prepare a synthesis report that summarizes the analyses and findings; and 3) submit a modified version of the report to a peer-reviewed publication.

Methods: Radar and visual surveys will be conducted during spring and fall of 2012 (preferred) or 2013. Radar/visual surveys for Xantus's Murrelets will occur on one of the oil platforms nearest to Anacapa Island (platforms, from west to east: C, B, A, Hillhouse, Habitat, Henry, Houchin, Hogan, Grace, Gilda, Gail, or Gina). Two surveys will be conducted during 10 days around new moons in the spring (March and April), to coincide with peak breeding activities of adult Xantus's Murrelets at Anacapa Island. Two radar/visual surveys for Ashy Storm-Petrels will occur on one of the oil platforms nearest to both San Miguel and Santa Cruz Islands (platforms, from west to east: Heritage, Harmony, or Hondo) during 10 days around new moons in the fall (September and October), to coincide with breeding activities of adult Ashy Storm-Petrels and peak fledging period of Ashy Storm-Petrel chicks at San Miguel and Santa Cruz Islands.

During each 10-day survey period, a marine radar unit will be mounted on the oil platform in a manner that allows at least one full vertical side of the platform to be adequately surveyed. The radar unit will be removed after each 10-day survey period for maintenance, and to protect the unit from weather during non-survey periods. A biologist experienced in interpretation of radar echoes will monitor the radar screen and record murrelet and storm-petrel detections on a data sheet. Echoes on the radar screen will also be recorded for the duration of each survey using a video camera so that biologists can review survey sessions at a later date. For each radar detection of a murrelet and storm-petrel, the technician will record: species, time, flight behavior, distance between echoes on the radar screen, flight speed, persistence of radar echoes on screen, and the number of radar echoes. The bird surveyor will visually scan the air and sea adjacent to the platform and lights and record all species observed, including time and flight behavior (e.g., circling around or aggregating at lights, disorientation, etc.), number of individuals, and weather conditions (e.g., wind speed and cloud cover).

Revised Date: March 29, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Pacific OCS Region

Planning Areas: All

Title: Condition of the Rocky Shoreline

BOEMRE Information Needs to be Addressed: The BOEMRE needs to evaluate cumulative impacts from OCS operations on affected key biological communities and be able to assess impacts from accidents from the offshore program. The BOEMRE has collected several decades of long-term monitoring data but BOEMRE managers need the long-term monitoring data brought into a framework conducive to making program-wide decisions. Creating a bio-index will also allow BOEMRE to determine impacts of climate change, supporting bureau and departmental priority climate change objectives.

Cost Range: (in thousands) $175-$225 **Period of Performance:** FY 2012-2014

Description:

Background: The BOEMRE has been monitoring the rocky coastline adjacent to OCS oil and gas activities since 1991 and managing the Multi-Agency Rocky Intertidal Network (MARINe), a long-term monitoring program established in 1997 for a large network of sites across the Pacific and Atlantic coastlines (www.MARINe.gov). MARINe's Mission Statement is "to determine the health of the rocky intertidal and make this information available to the public." The BOEMRE is interested in analyzing the information from this study in the context of the condition of the communities in order to provide the type of information managers need to assess the condition of the rocky shoreline adjacent to our operations and the contribution that impacts from OCS projects make to the overall status of this resource. Furthermore, this work supports bureau and departmental climate change objectives by aiding in the determination of climate change impacts in the rocky intertidal. This project provides multiple benefits to multiple agencies for their management directives; such as the National Park Service, National Oceanic Atmospheric Administration Marine Sanctuary Program, California Department of Fish and Game, State Water Quality Control Board, and U.S. Fish and Wildlife Service. In addition, this information will be used to monitor newly established marine protected areas along the coast.

Because of the complexity of the rocky intertidal resource, many years of monitoring data collected at numerous locations were needed in order to initiate examination of this question. For the past 2 years, a Rocky Intertidal Health Experts Workgroup met to determine if it is possible, based on the data, to develop bioindices of rocky intertidal populations. Raw data sets from 22 central California MARINe sites were analyzed individually by each of 20 experts to determine if experts can agree on factors that can be associated with a disturbed or undisturbed system and in a disturbed system was the disturbance anthropogenic or natural. This effort culminated in a three day focused workshop where the experts agreed that establishing an index is feasible and worth pursuing. This portion of the effort is primarily funded by USC Sea Grant.

The next step is to develop the indices for rocky intertidal habitats, which has not been done before. The Experts Workgroup expects to publish this important work once it is completed. The goal is to use these indices to report on the condition of the rocky intertidal shoreline in a way that is predictable and comparable.

Objectives: 1) Develop bio indices for the rocky intertidal habitat; and 2) using these indices, publish a report on the state of rocky intertidal sites along the California mainland.

Methods:

1. Conduct a literature review and analysis of rocky intertidal disturbances and indices in other habitats.

2. Use scientific measurements of biodiversity and robustness of the resources, and known natural variables such as exposure, slope, substrate, predation, sand intrusion and other parameters determined by the experts.

3. Incorporate additional sites to provide a broader scope of anthropogenic disturbance.

4. Clarify the scale of scoring disturbance. Once "natural" environmental characteristics are accounted for, the expected condition can be described and deviations from the expected can be used to explain site condition.

5. Develop bioindices at a Rocky Intertidal Health Experts Workshop.

6. Analyze data from the California long-term monitoring program MARINe sites in accordance with the indices and "rank" sites form first to last using a more clearly defined disturbance scale.

7. Publish a scientific paper delineating the assumptions and ranks and a shortened public version. Peer-reviewed papers on the approach used will be encouraged as this is ground-breaking work.

8. Extensive peer review will be built into the development of this report to ensure there is a consensus among experts as to the validity of the rankings. The report will strike a balance between scientific and management goals to maximize its use in coastal management programs.

9. A bio-index for the rocky intertidal will assist BOEMRE in determining climate change impacts to this important resource.

Revised date: March 29, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan 2012–2014

Region: Pacific OCS Region

Planning Area: Southern California

Title: Characterizing and Quantifying Sea Lion and Seal Use of Offshore Man-made Structures in California

BOEMRE Information Needs to be Addressed: Ultimately, offshore oil and gas platforms in California will be removed. California sea lions (*Zalophus californianus*) and, to a lesser extent, Pacific harbor seals (*Phoca vitulina*) use these platforms as resting and foraging areas. Both species are protected by the Marine Mammal Protection Act (MMPA). The BOEMRE needs to characterize and quantify the use of these areas by sea lions and seals for environmental review and permitting associated with decommissioning of facilities. This study will also contribute to our understanding of sea lion and seal interactions with other offshore structures including renewable energy facilities being considered for the Pacific coast.

Cost Range: (in thousands) $150-$250 **Period of Performance:** FY 2012-2014

Description:

Background: Hundreds of sea lions and seals routinely use offshore oil and gas production facilities in California for resting and foraging. Removal of platforms will displace these animals but, perhaps more importantly, decommissioning activities could result in their injury or death. Characterizing and quantifying sea lion and seal use of offshore platforms is a critical component of our environmental analyses and consultations under the National Environmental Policy Act (NEPA) and the MMPA. Although there have been studies of pinniped haul out areas, we are not aware of any studies that have assessed pinniped use of offshore oil and gas platforms. The data to be collected in this study are unique to the Pacific Region and we suspect that individual platforms will have significantly different patterns of pinniped use.

Objectives: Characterize sea lion and seal use of the platforms, including the number of animals present, seasonal use patterns, and age and gender animals in the immediate vicinity of platforms. This information will be used to satisfy information needs for NEPA and MMPA reviews for platform decommissioning activities.

Methods: This study will count sea lions and seals using all 23 Pacific OCS oil and gas platforms under a variety of daylight conditions such as differing weather states and seasons. Activity, sleeping, roosting, displays, etc., and trends will also be documented.

Sea lions resting on platform decks and buoys are relatively easy to count. Monthly observations conducted by boat for example from the regularly schedule service vessels and/or from the platforms will be made over a 2-year period. Swimming sea lions will also be counted when they are on the surface.

Surveys documenting daily activity patterns of sea lions will be developed through consultations with BOEMRE, the National Marine Fisheries Service, offshore operators, and prospective researchers, and may involve tagging or development of photo ID catalogs of individual animals.

Harbor seal use of platforms will be more difficult to document as this species typically does not haul-out on offshore structures and may sleep for extended periods of time under the platform. Observations may be limited to occasional sightings on the surface or opportunistic observations by SCUBA divers.

Survey methods will be developed, refined, and documented for future assessment of sea lion and seal activity associated with platform decommissioning activities.

Revised date: March 29, 2011

2.3 Profiles of Studies Proposed for the FY 2013 NSL

Table 4. BOEMRE Pacific OCS Region Studies Proposed for the FY 2013 NSL

Page #	Discipline	Title
29	HE	Influence of Pacific Offshore Platforms on Marine Fish Ecology
31	MM	Nearshore Marine Bird Surveys from Southern California Points and Beaches: Baseline for Offshore Renewable Energy and Post-lease Oil and Gas Projects

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan 2012-2014

Region: Pacific OCS Region

Planning Areas: Southern California

Title: Influence of Pacific Offshore Platforms on Marine Fish Ecology

BOEMRE Information Needs to be Addressed: The long-term fate of offshore platforms off California continues to be a subject of considerable debate and 15 years of scientific surveys funded by BOEMRE. Much of this work has been focused on the potential importance of the fish populations at offshore platforms. All 23 Federal and one State platform have been surveyed at least once, and many over 10 times. In addition, site-fidelity and transplantation acoustic studies have been completed for fish at several Federal platforms. The BOEMRE needs to have the resulting peer-reviewed BOEMRE OCS reports, various USGS reports, and scientific literature material compiled in a single source, professionally published reference, to support environmental reviews associated with decommissioning and for public outreach purposes.

Cost Range: (in thousands) $150-$200 **Period of Performance:** FY 2013-2015

Description:

Background: Since 1995, USGS, BOEMRE, and the California Artificial Reef Enhancement Program (CARE) have provided funding to conduct research on the fishes that live around the platforms and on natural rock outcrops of central and southern California. To our knowledge, over the past 15 years, DOI is the only public agency (Federal or State) that has funded research at the offshore platforms. The study proposed for FY 2012, *Biological Productivity of Offshore Oil and Gas Structures in the Pacific OCS*, if approved and funded, will be completed before the start of this project and from that study we expect a manuscript submittal and work *in press* to a scientific journal well within time to be included in this present effort. The BOEMRE needs to have the resulting peer-reviewed BOEMRE OCS reports, various USGS reports, and scientific literature material compiled into a single, professionally published reference to support environmental reviews associated with decommissioning and for public outreach purposes. There are many peer-reviewed papers and reports. The goal is to publish a book or special issue of a respected peer-reviewed journal on the influence of Pacific offshore platforms on marine fish ecology based on information obtained through these studies. An identical effort in the Gulf of Mexico resulted in a 2003 special publication from the American Fisheries Society titled "Fisheries, Reefs, and Offshore Development," which addressed the influence of Gulf of Mexico platforms on marine fish (see http://www.afsbooks.org/x54036xm). Permission was requested and received from multiple sources to reprint and compile published peer-reviewed literature.

Objectives: Collect and compile the peer-reviewed reports and literature into a single reference book.

Methods: Methods include forming an editorial review board, collecting and compiling the peer-reviewed papers and BOEMRE and USGS reports, as appropriate, and choosing and working with a publisher such as the California University Press, the American Fisheries Society, or a journal such as the Bulletin of Marine Science.

Revised date: March 29, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Pacific OCS Region

Planning Area: Southern California

Title: Nearshore Marine Bird Surveys from Southern California Points and Beaches: Baseline for Offshore Renewable Energy and Post-lease Oil and Gas Projects

BOEMRE Information Needs to be Addressed: The BOEMRE regulates post-lease oil and gas activities on platforms off the southern California coast. In addition, BOEMRE will likely receive renewable energy proposals within this area. The proposed study will provide up-to-date information on species composition, distribution, abundance, and seasonal variation of nearshore marine birds along this section of coast. The data generated will be used for environmental review of both renewable energy and oil and gas projects proposed in the area.

Cost Range: (in thousands) $200-$300 **Period of Performance:** FY 2013-2015

Description:

Background: The BOEMRE funded aerial seabird surveys offshore southern California from 1999-2002. The results of that study were published (Mason et al. 2007), comparing the results to those obtained 20 years earlier by Briggs et al. (1987). In addition, BOEMRE funded shorebird surveys on Ventura County beaches from 1994-1997 (McCrary and Pierson 2002) and again from 2007-2010, report pending. While these surveys provide valuable information regarding the status and distribution of birds at-sea and on local beaches, little information has been collected regarding species composition and abundance of marine birds in the nearshore environment where platforms exist and renewable energy facilities will be installed.

The shoreline of Los Angeles, Ventura, and Santa Barbara Counties in California is closest to the oil platforms off southern California and most likely to be affected by a spill. In addition, these waters are expected to attract renewable energy proposals due to their proximity to urban centers. The birds found in nearshore areas (including loons, grebes, scoters, pelicans, cormorants, etc.) are among the birds most affected by oil spills in California and species that could be affected by offshore renewable energy development. There are anecdotal indications that the distribution and abundance of some of these species has changed over the past decade.

The proposed study will provide up-to-date information and establish a more robust data set from which to draw on for marine spatial planning, environmental analyses, and oil spill responses. Shore-based surveys, with the possibility of being supplemented by small-boat surveys, will provide a more thorough assessment of bird distribution and abundance than previous aerial surveys including the ability to detect migrational movements along the coast. The latter will be valuable for assessing the placement of offshore wind turbines and

hydrokinetic devices. Marbled Murrelets have been observed off the Ventura County coast during recent National Audubon Society Christmas Bird Counts and the proposed surveys may help refine the status of this federally threatened species where it is poorly known south of its regular range.

Objectives: 1) To observe and characterize the distribution, abundance, and migratory passage of nearshore marine birds along the mainland coast of Los Angeles, Ventura, and Santa Barbara Counties in California; 2) to characterize the current marine bird diversity, distribution, abundance, and migratory movements within the study area; 3) to refine the status of the Marbled Murrelet in the study area; and 4) publish report(s) on the findings of the surveys and data analysis.

Methods: Monthly surveys will be conducted over a 3-year period. Surveys will be taken from shore-based observation sites using binoculars and spotting scopes, and possibly supplemented with some small-boat surveys. Survey sites will include coastal promontories and other areas that provide sufficient visibility to survey areas up to 500 m from shore. Known shore-based seabird watching locations will be used for the surveys including Point Fermin, Point Dume, Mugu Rock, Pitas Point, and Goleta Point.

To ensure that the coast is adequately surveyed, additional survey sites will be established by reviewing historical information and consulting with local experts on nearshore bird distribution, migratory pathways, and sites that provide an elevated and wide view of the coast. Access to Naval Base Ventura County and Vandenberg Air Force Base may be necessary to survey key points along large expanses of coastline under military ownership.

Survey methodologies from similar studies will be reviewed and modified, as necessary, to account for site-specific considerations and equipment availability. The exact methodology will be determined later, but will be similar to other land-based survey methodologies and incorporate the most applicable protocol. Examples of applicable protocols include:

The Puget Sound Seabird Survey protocol:
http://www.seattleaudubon.org/sas/Portals/0/Science/Puget_Sound_Seabird_Survey/PSSS_Protocol_10-11.pdf

The nearshore distribution of terns and other seabirds in relation to EnCana's Deep Panuke natural gas pipeline construction in Stormont Bay, Nova Scotia:
http://www.bsc-eoc.org/organization/images/news/ternrpt.pdf

Revised date: March 29, 2011

SECTION 3.0 TOPICAL AREAS for FISCAL YEAR 2014

3.1 Renewable Energy and Alternate Use

Implementation of the BOEMRE Renewable Energy and Alternate Use Program from offshore wind and wave facilities remains a priority for the Pacific Region. Each of the Pacific Coast States has adopted renewable portfolio standards, and the OCS may be one area that will be tagged for contributing to the States' renewable energy goals. Studies are currently being performed to gather information for future projects along the Pacific Coast – to assess new technology opportunities for offshore California, Oregon, and Washington; identify suitable areas and conditions; and examine regional environmental effects. These include marine mammal and seabird surveys, benthic surveys offshore potential renewable energy sites, and updated marine archaeological and cultural sites digitized databases. Additional studies will be needed as renewable energy and alternate use activities increase. In any event, future studies will be needed to consider the impacting agents of proposed wind and wave energy devices, to identify suitable areas and conditions, and to examine environmental effects for the entire Pacific OCS Region of Washington, Oregon, California, and Hawaii.

3.2 Shorebird Surveys of the Channel Islands off Ventura and Santa Barbara Counties

The Pacific OCS Region presently funds a cooperative agreement with California State University Channel Islands to survey shorebirds along the Ventura County coastline. This study provides a long-term data set of shorebird populations and allows BOEMRE to assess real or potential effects of adjacent existing or potential offshore energy operations on sensitive shorebird species and to better assess the effects of long-term climate change in the region. Similar information for the Channel Islands would be beneficial in the event of an oil spill, and the National Park Service has indicated an interest in partnering with BOEMRE on this effort.

3.3 Comprehensive Geodatabase and Geospatial Mapping of Seabird Data for the Pacific OCS

The Pacific Region has sponsored the collection of data on seabirds on the OCS for several decades. Recently, major strides have been made towards collecting seabird survey data in additional areas and in the form of improved survey design (e.g., Seabird and Marine Mammal Surveys off the Northern California, Oregon, and Washington Coasts) with USGS and USFWS. As a result, we have a large collection of knowledge about seabirds and it continues to grow. Some projects are near completion (e.g., Shorebird Survey of Ventura County), or will complete field collection in about 2 years (e.g., Seabird and Marine Mammal Surveys off the Northern California, Oregon, and Washington Coasts). A final compendium of information in the form of geodatabase expressed as geospatial mapping will augment our understanding of the seabird and shorebird species that are potentially at risk from offshore energy development and provide maps that illustrate the results in a way that is understandable to decisionmakers and the public. As new information becomes available, the data can be folded into the existing database once work is completed.

3.4 Decommissioning

The Pacific Region faces a variety of environmental information needs related to decommissioning and probable creation of artificial reefs from some oil and gas platforms. The focus of this topical area continues to be the study of potential environmental impacts due to decommissioning OCS facilities off California, many of which are in exceptional water depths. Review of the 2004 Proceedings of the Decommissioning Workshop (http://www.boemre.gov/omm/pacific/lease/Decommissioning/Summary_Recommendations_to_MMS.htm) and comparison to studies that have been accomplished since that time, show that most of the recommendations have been completed or are underway. The present 2012 Studies Development Plan includes two recommended studies from the workshop; one on productivity of platforms under two decommissioning options and one on sea lion use of offshore structures. However, a few issues related to marine mammals and onshore dismantlement, disposal, and recycling remain. Specific areas of potential future studies may include assessment of removal and disposal of marine growth, development of criteria/factors in assessing potential onshore processing sites, and a review of the effects from the most current methods of severing platform legs applicable to Pacific Region platforms.

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Offshore Environmental Studies Program

Fiscal Years 2012-2014 Studies Development Plan

Alaska OCS Region

U.S. Department of the Interior
Bureau of Ocean Energy Management,
Regulation and Enforcement
Alaska OCS Region
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The inclusion of studies proposed in this document does not constitute a commitment by the U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement to conduct or fund any or all of the studies. The scope of the studies is subject to change prior to initiation of any work.

Any use of trade names is for description purposes only and does not constitute endorsement of these products by the Bureau of Ocean Energy Management, Regulation and Enforcement.

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ACRONYMS

ACC	Alaska Coastal Current
ADCP	Acoustic Doppler Current Profiler
ADF&G	Alaska Department of Fish and Game
AEWC	Alaska Eskimo Whaling Commission
ANIMIDA	Arctic Nearshore Impact Monitoring in Development Area
AOOS	Alaska Ocean Observing System
AUV	Autonomous Underwater Vehicle
BLM	Bureau of Land Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BOWFEST	Bowhead Whale Feeding Ecology Study
BPXA	British Petroleum Exploration Alaska
BRD	Biological Resources Division (USGS)
BSMP	Beaufort Sea Monitoring Program
BWASP	Bowhead Whale Aerial Survey Project
CAB	Chemistry and Benthos
cANIMIDA	Continuation of Arctic Nearshore Impact Monitoring in Development Area
CESU	Cooperative Ecosystem Studies Unit
CIAP	Coastal Impact Assistance Program
CMI	Coastal Marine Institute
COMIDA	Chukchi Offshore Monitoring in Drilling Area
DFO	Canadian Department of Fisheries and Oceans
DPP	Development and Production Plan
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EP	Exploration Plan
ESA	Endangered Species Act
ESP	Environmental Studies Program
FY	Fiscal Year
GIS	Geographic Information Systems
GPS	Global Positioning System
HF	High Frequency
HHIA	Human Health Impact Assessment
IFO	Intermediate Fuel Oil
ITM	Information Transfer Meeting
IUM	Information Update Meeting

JIP	Joint Industry Project
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Laboratory
NOAA	National Oceanic and Atmospheric Administration
NOPP	National Oceanographic Partnership Program
NPRB	North Pacific Research Board
NSB	North Slope Borough
NSSI	North Slope Science Initiative
NSF	National Science Foundation
NSL	National Studies List
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OSRA	Oil-Spill-Risk Analysis
OSU	Oregon State University
OWM	Oil Weathering Model
RFP	Request for Proposals
RPM	Remote Power Module
SDI	Satellite Drilling Island
TAR	Technology Assessment and Research Program
UAA	University of Alaska Anchorage
UAF	University of Alaska Fairbanks
UAS	Unmanned Aircraft System
uERD	ultra Extended Reach Drilling
URI	University of Rhode Island
USDOI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UW	University of Washington
WHOI	Woods Hole Oceanographic Institution

SECTION 1.0 PROGRAMMATIC OVERVIEW

1.1 Introduction to the Region

1.1.1 Background

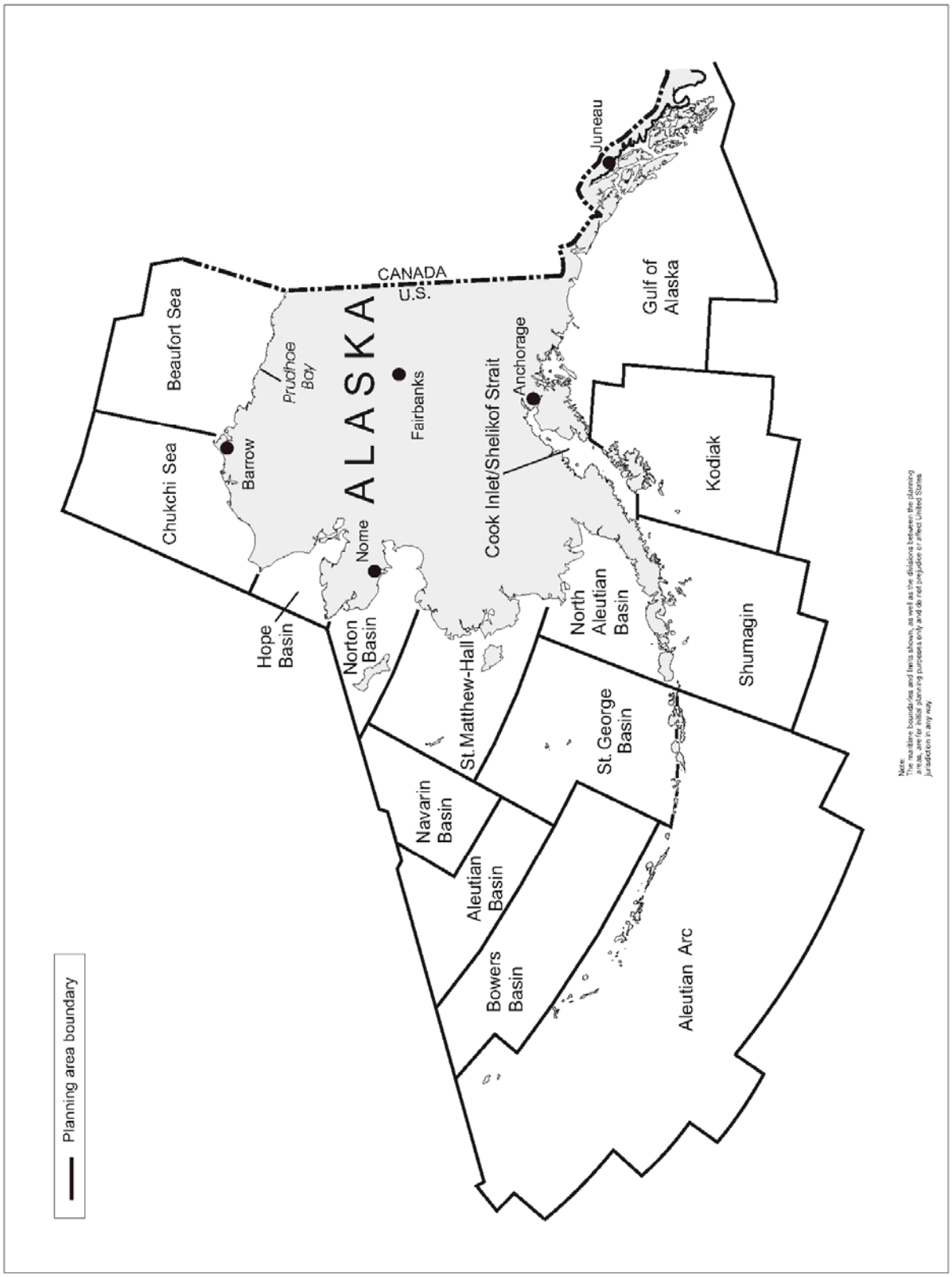
The Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) Environmental Studies Program was established and funded by the United States Congress to support the offshore oil and gas leasing program of the U.S. Department of the Interior (USDOI) in pursuit of national energy policies. The Environmental Studies Program (ESP) was administered originally by the Bureau of Land Management from 1973 until 1982, then by the Minerals Management Service (MMS), recently renamed as the Bureau of Ocean Energy Management, Regulation and Enforcement. The consistent mandate of the ESP since its inception has been to establish the information needed for assessment and management of potential impacts from oil and gas development on the Outer Continental Shelf (OCS) and coastal environments. The OCS refers to 1.7 billion acres of Federal jurisdiction lands submerged under the ocean seaward of State boundaries, generally beginning three statute miles off the coastline (for most states) and extending for 200 miles. The Alaska OCS Region alone contains approximately 1 billion acres.

The Outer Continental Shelf Lands Act (OCSLA) of 1953, as amended (43 U.S.C. 1331 et seq.), provides guidelines for implementing an OCS oil and gas exploration and development program based on the need to balance orderly energy resource development with protection of the human, marine, and coastal environments. The basic mission of BOEMRE is to expedite mineral resource exploration and development at fair market value in an environmentally safe and responsible manner. Also, the National Environmental Policy Act (NEPA) of 1969 requires that all Federal Agencies use a systematic, interdisciplinary approach that will ensure the integrated use of the natural and social sciences in any planning and decision-making that may have effects on the environment. Federal laws impose additional requirements on the offshore leasing process, including the Coastal Zone Management Act; Federal Water Pollution Control Act Amendments; Marine Mammal Protection Act (MMPA); Endangered Species Act (ESA); and Marine Protection, Research and Sanctuaries Act.

The ESP operates on a national scale to assist in predicting, projecting, assessing and managing potential effects on the human, marine and coastal environments of the OCS that may be affected by oil and gas development. Lease-management decisions are enhanced when current, pertinent and timely information is available. Final reports from the ESP are most directly utilized by teams of NEPA analysts within the BOEMRE Environmental Analysis Sections when they prepare and/or review Environmental Impact Statements (EISs), Environmental Assessments (EAs), Exploration Permits (EPs), and Development and Production Plans (DPPs). Of course, a wide range of arctic scientists, stakeholders and decision-makers also make use of our study products.

Since the ESP began, the USDOI and the MMS/BOEMRE have funded nationally more than $875 million for environmental studies through fiscal year (FY) 2010. More than $350

Figure 1 Alaska OCS Region Planning Areas



million of that amount has funded studies in Alaska across 15 planning areas in the Arctic, Bering Sea and Gulf of Alaska sub-regions (see Figure 1) to produce more than 400 different study reports and more than 300 peer-reviewed publications. The ESP manages ongoing study projects in Alaska (currently about 45) in disciplines such as physical oceanography, fate and effects of pollutants, protected and endangered species, wildlife biology, and the social sciences. Completed study reports are posted on our website at http://alaska.boemre.gov/ref/AKPUBS.HTM.

Early in the development of the program, the focus was on obtaining baseline information on the vast biological resources and physical characteristics of the Alaskan environment for pre-lease decision-making. These studies included biological surveys of marine species, basic oceanography and meteorology, and geologic and sea ice phenomena. As a broader base of information was established, it became possible to focus on more topical studies in smaller areas to answer specific questions and fill identified information needs. In addition, generic studies were initiated to examine the potential effects of oil spills on biological resources and different oil development scenarios were modeled to determine the most likely routes of transport and dispersion of oil that might affect the marine environment. The use of computer modeling techniques has been implemented to aid in the assessment of potential oil spill and other pollutant risks to the environment and to key species such as fur seals, sea otters and endangered whales. Modeling has also been used in ecosystem studies, especially where extrapolation to other areas provided valid analysis.

As study efforts collected and analyzed more disciplinary data, the importance of taking an integrated, interdisciplinary look at complete ecosystems in sensitive areas became apparent. During this time, the offshore leasing program was maturing. As a number of sales were held and exploration activities began, post-lease studies to monitor some of the possible effects of oil and gas activities on the environment and resources of these areas were initiated.

As studies information has been amassed, improved focus has required greater integration of various scientific disciplines. The ESP has initiated Synthesis Meetings, Information Transfer Meetings (ITMs) and Information Update Meetings (IUMs) to gather maximum expertise and assess the status of existing information, as well as to plan the best possible approach to a study within the constraints of time and resources. As the BOEMRE and other Federal and State agencies collect more pertinent information, the BOEMRE funds studies to search and evaluate existing literature and data prior to initiation of field efforts. This prevents duplication of effort and saves valuable resources by focusing study efforts on the areas of greatest information need and highest usefulness to BOEMRE decision needs. Of course, additional research coordination with groups external to BOEMRE occurs continuously through a variety of institutional mechanisms, as discussed in the following section.

1.1.2 Scientific Studies are Conducted in Partnership

The Alaska ESP, through its day-to-day operations and studies planning process, works to:

- Coordinate plans and studies with other ongoing programs and research projects, both internal and external to BOEMRE, to assure optimal studies management and efficient use of funding resources.
- Enhance utilization of existing information.
- Enhance interdisciplinary approaches to project planning, data collection and data interpretation.

Currently, a major portion of the Alaska ESP is conducted on a collaborative basis with an extensive range of bilateral and multilateral partnerships. The Alaska ESP coordinates routinely on major projects with numerous federal entities, including: National Oceanographic Partnership Program (NOPP); National Oceanic and Atmospheric Administration (NOAA) and the National Marine Fisheries Service (NMFS) Alaska Fisheries Science Center; NOAA's National Marine Mammal Laboratory (NMML); U.S. Geological Survey (USGS)-Alaska Science Center; U.S. Fish and Wildlife Service (USFWS); Bureau of Land Management (BLM) and the North Slope Science Initiative (NSSI); National Aeronautics and Space Administration (NASA); National Science Foundation (NSF); Arctic Research Commission; and the Polar Research Board.

The ESP also works directly on specific projects with the Alaska Ocean Observing System (AOOS); the North Pacific Research Board (NPRB); Alaska Department of Fish and Game (ADF&G); the North Slope Borough (NSB) Department of Wildlife Management; the Alaska Eskimo Whaling Commission (AEWC); and academic institutions including the University of Alaska Anchorage (UAA), University of Alaska Fairbanks (UAF), Woods Hole Oceanographic Institution (WHOI), Oregon State University (OSU), University of Washington (UW), Idaho State University and University of Rhode Island (URI). The ESP also coordinates closely with active industry research and monitoring programs in Alaska conducted by British Petroleum, Shell Offshore Inc., ConocoPhillips, and others.

In 1993, the University of Alaska Coastal Marine Institute (CMI) was created by a cooperative agreement between the University of Alaska and the Alaska OCS Region to study coastal topics associated with the development of natural gas, oil and minerals in Alaska's OCS. Under this arrangement, the ESP taps the scientific expertise of regional and local experts through UAF/UAA to collect and disseminate environmental information about resource issues of mutual interest. Through the CMI, the ESP stimulates important studies in a cost-saving one-to-one match structure. In its first 16 years of operation, the CMI match has come from more than 50 different organizations and has leveraged over $15 million of agency funds into $30 million worth of relevant marine-based research. During that time, the CMI program has also provided roughly 120 years of graduate student support and completed over 60 studies. In 2008, the cooperative agreement was extended until April 2013. Under the current 5-year agreement with the CMI, the Alaska OCS Region has committed $750,000 per year with a dollar-for-dollar match arrangement. More information can be found at http://www.sfos.uaf.edu/cmi.

The Alaska Region ESP also conducts cooperative research with universities through the Cooperative Ecosystem Studies Units (CESUs). The CESUs are working partnerships among leading academic institutions, federal, state, and non-governmental organizations. A national network of seventeen CESUs has been established, with each unit focusing a separate biogeographic region. The goal of the CESU network is to facilitate collaboration through the working partnerships to provide high quality research, education and technical assistance for stewardship of cultural and natural resources. The BOEMRE currently participates in four CESUs that encompass the state of Alaska, the Pacific Northwest, the North Atlantic Coast and the Gulf of Mexico.

Additional linkages have been established at an international level with other arctic nations' research and regulatory entities. The U.S. and seven other arctic nations voluntarily agreed to cooperate on an Arctic Environmental Protection Strategy, which evolved into the formation of the Arctic Council in 1996. The Alaska ESP has coordinated with Arctic Council activities, such as the Arctic Monitoring and Assessment Program, Conservation of Arctic Flora and Fauna, Arctic Climate Impact Assessment and others. The ESP provides information to these working groups through review of reports and plans and helps to inform participants of available information sponsored by BOEMRE. Further, the ESP identifies and facilitates specific studies that can coordinate and integrate with working group activities.

Studies also address recommendations from programmatic reviews. For example, the National Ocean Council established by Executive Order 13547 has adopted a list of nine National Priority Objectives as recommended by the Interagency Ocean Policy Task Force. Objectives that are particularly relevant to the ESP include: adopting a system of ecosystem-based management for the ocean and coasts; implementing comprehensive, integrated, ecosystem-based coastal and marine spatial planning and management; and addressing environmental stewardship needs in the Arctic Ocean and adjacent coastal areas in the face of climate-induced and other environmental changes.

Another key source of input derives from discussion and advice generated through the OCS Scientific Advisory Committee, an external peer review body that meets on an annual basis. Other involvement of external scientists occurs through forums such as participation on project-management review boards, which greatly facilitates BOEMRE collaboration and coordination. Significantly, the BOEMRE ESP also systematically seeks out and includes the knowledge of coastal community residents in planning (see Section 1.3).

Since the people of Alaska's remote arctic and subarctic communities rely so heavily on subsistence resources of the marine environment, they are especially concerned about industrial activities that may directly or indirectly affect hunting success or the habitats of the species important to subsistence. The people of Cook Inlet also have concerns about potential effects of OCS activities on commercial fishing, sport fishing and tourism. Many other related issues potentially could be affected by OCS activities, such as the well-being of marine mammals and threatened and endangered species. Coastal residents of Alaska have concerns about these resources, as do State and Federal agencies responsible for their management by law.

In BOEMRE field oriented studies, researchers typically coordinate directly with local communities to discuss their plans, seek advice and ensure that interested individuals learn about the project and its results. The BOEMRE strives to assimilate local and traditional knowledge of Alaskan residents directly in the preparation of its study products and interpretation of results. The process of melding local and traditional knowledge varies from project to project, but the outcome of better information for decision making is a common goal.

1.1.3 Issues To Be Addressed

The *Alaska Studies Development Plan FY 2012-2014* complements and reinforces the goals of the Environmental Studies Program. The ESP is guided by several broad themes, which include:

- Monitoring Marine Environments
- Conducting Oil-Spill Fate and Effects Research
- Minimizing Seismic and Acoustic Impacts
- Understanding Social and Economic Impacts
- Maintaining Efficient and Effective Information Management

To be responsive to ongoing leasing plans and changing offshore technologies, the Alaska OCS Region continually proposes new studies and pursues information needs in conjunction with ESP goals. Due to the great differences that exist between Alaskan environments and other OCS areas, the Alaska ESP remains especially flexible in planning and implementing needed studies.

At each step of the offshore leasing and development process, a variety of potential issues or resource-use conflicts may be encountered. Two questions are fundamental:

- What is the expected change in the human, marine and coastal environment due to offshore activity?

- Can undesirable change be minimized by mitigating measures?

Environmental studies are the primary means to provide information on these questions for use by decision-makers. Currently the Alaska ESP has primary focus on upcoming developments, exploration activities and existing leases, as well as potential future lease sales, in the Beaufort Sea and Chukchi Sea Planning Areas.

Current offshore oil and gas-related issues addressed by ongoing and proposed studies in the Beaufort Sea and the Chukchi Sea include, but are not limited to:

- What refinements are there to our knowledge of major oceanographic and meteorological processes and how they influence the human, marine and coastal environment?

- What role will currents play in distribution of anthropogenic pollutants near development prospects?

- What long-term changes in heavy metal and hydrocarbon levels may occur near Beaufort Sea development prospects, such as Liberty, or regionally along the Beaufort Sea coast?

- How do we improve our model predictions of the fate of potential oil spills?

- If oil is spilled in broken ice, what will its fate be?

- What effects might pipeline construction have on nearby marine communities or organisms?

- What changes might occur in sensitive benthic communities such as the Stefansson Sound "Boulder Patch," and other Beaufort Sea kelp communities or fish habitats?

- What are the current spatial and temporal use patterns of these planning areas by species that are potentially sensitive, such as bowhead whales, polar bears, other marine mammals, seabirds and other birds, or fish?

- What is the extent of endangered whale feeding in future proposed or potential lease sale areas?

- What changes might occur in habitat use, distribution, abundance, movement or health of potentially sensitive key species such as bowhead whales, polar bears, other marine mammals, seabirds and other birds, or fish?

- What interactions between human activities and the physical environment have affected potentially sensitive species?

- What changes might occur in socioeconomics and subsistence lifestyles of coastal Alaska communities?

- What are current patterns of subsistence harvest, distribution and consumption and what changes might occur in key social indicators as a result of offshore exploration and development?

- How can we continue to integrate local and/or traditional knowledge into studies related to the Alaska ESP?

1.2 Projected OCS Activities

The BOEMRE ESP funds studies that have strong applicability to pending pre- and post-lease decisions under the current (and previous) 5-Year OCS Program(s). The most important considerations for establishing priorities within the national needs context include:

- Mission/OCS 5-Year Program relevance
- Timing in relation to decision/environmental assessment needs
- Study design/scientific methodology
- Availability of needed information from other sources

1.2.1 Pre-lease Considerations

This *Alaska Studies Development Plan* reflects consideration of the many changes occurring in the Alaska OCS Region, as well as anticipated needs for the future. In a frontier region such as the Alaskan Arctic, planning lead-time is necessary to conduct adequate environmental studies. Challenges include: large and remote planning areas, diverse and extreme environmental conditions, still-evolving hydrocarbon extraction technology, and potential environmental hazards associated with offshore activities.

Preparation of an EIS is an essential part of the pre-lease process that requires environmental information. In particular, information is needed in time to prepare draft EISs for proposed lease sales. Although much information exists for certain Alaska OCS lease areas, data are sparse in other areas. In addition, changing conditions and environments often lead to the need to update past studies so that EIS information is current and accurate.

Three lease sales were held under the *Final Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* (USDOI, MMS, 2002), all of them in the Beaufort Sea Planning Area (see Figure 2). Other lease sales in that *Program* were postponed or were cancelled due to a lack of industry interest. The MMS issued the *Final Outer Continental Shelf Oil and Gas Leasing Program 2007-2012* (USDOI, MMS, 2007) in April 2007. The first lease sale under this *Final Program* was held in February 2008 in the Chukchi Sea Planning Area (see Figure 3). This *Final Program* also proposed lease sales in the Beaufort Sea, the Chukchi Sea, the North Aleutian Basin, and a special interest sale in Cook Inlet. In March 2010, the President issued a memorandum withdrawing the North Aleutian Basin from consideration for leasing through June 2017. In addition, in December 2010, the BOEMRE released a *Revised Program Outer Continental Shelf Oil and Gas Leasing Program 2007-2012* (USDOI, BOEMRE, 2010) that cancelled the lease sales planned for the Beaufort and Chukchi seas. Cook Inlet Sales 211 and 219 were cancelled due to lack of industry interest.

The *Revised Program* cited the need for additional exploration and scientific, environmental and oil spill risk analysis before more area in the Arctic is considered for leasing. The Beaufort Sea and Chukchi Sea planning areas, as well as Cook Inlet (see Figure 4), are being evaluated for possible leasing under the upcoming *Outer Continental Shelf Oil and Gas Leasing Program 2012-2017*.

Figure 2 Beaufort Sea Oil and Gas Leasing Activity

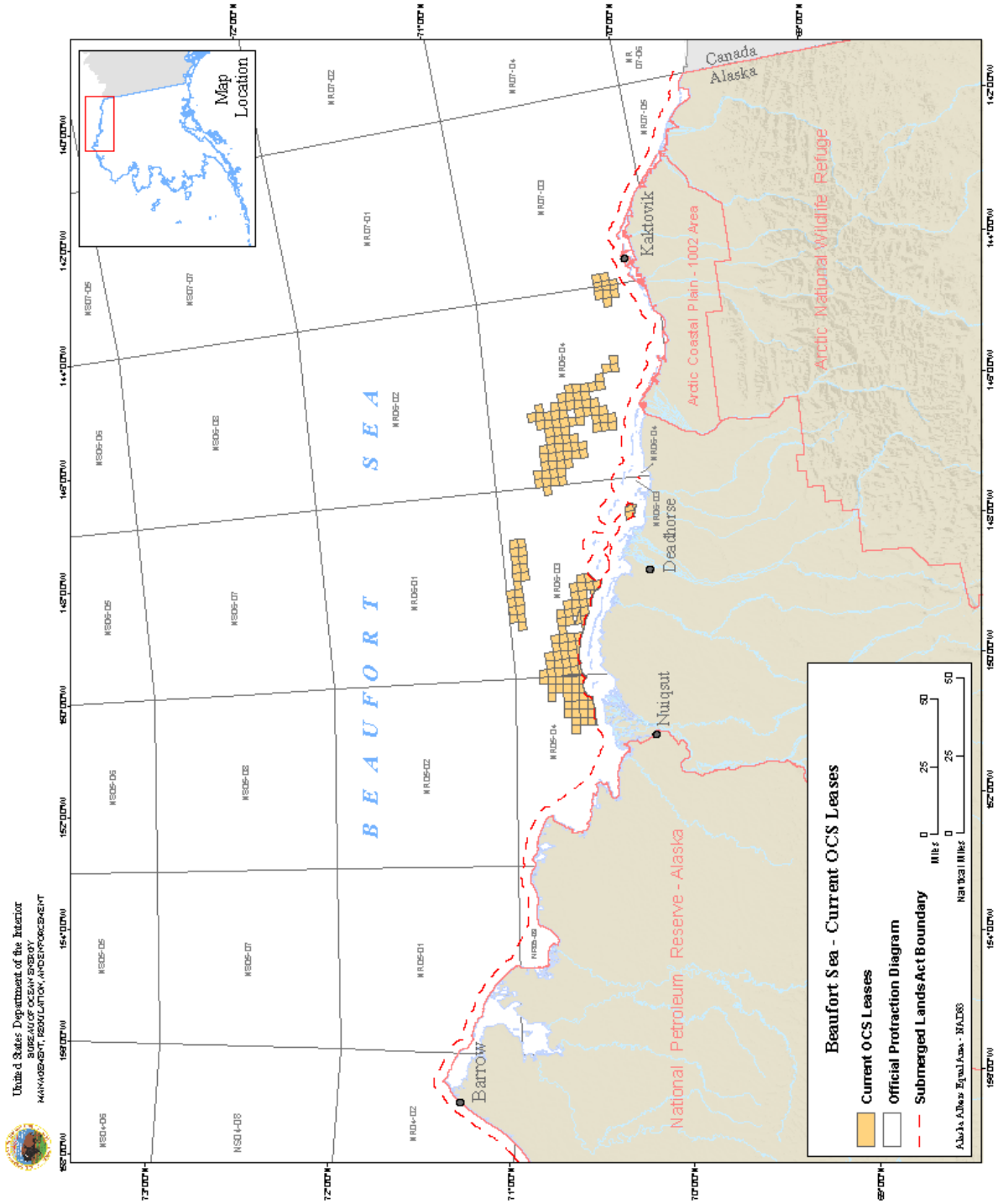


Figure 3 Chukchi Sea Oil and Gas Leasing Activity

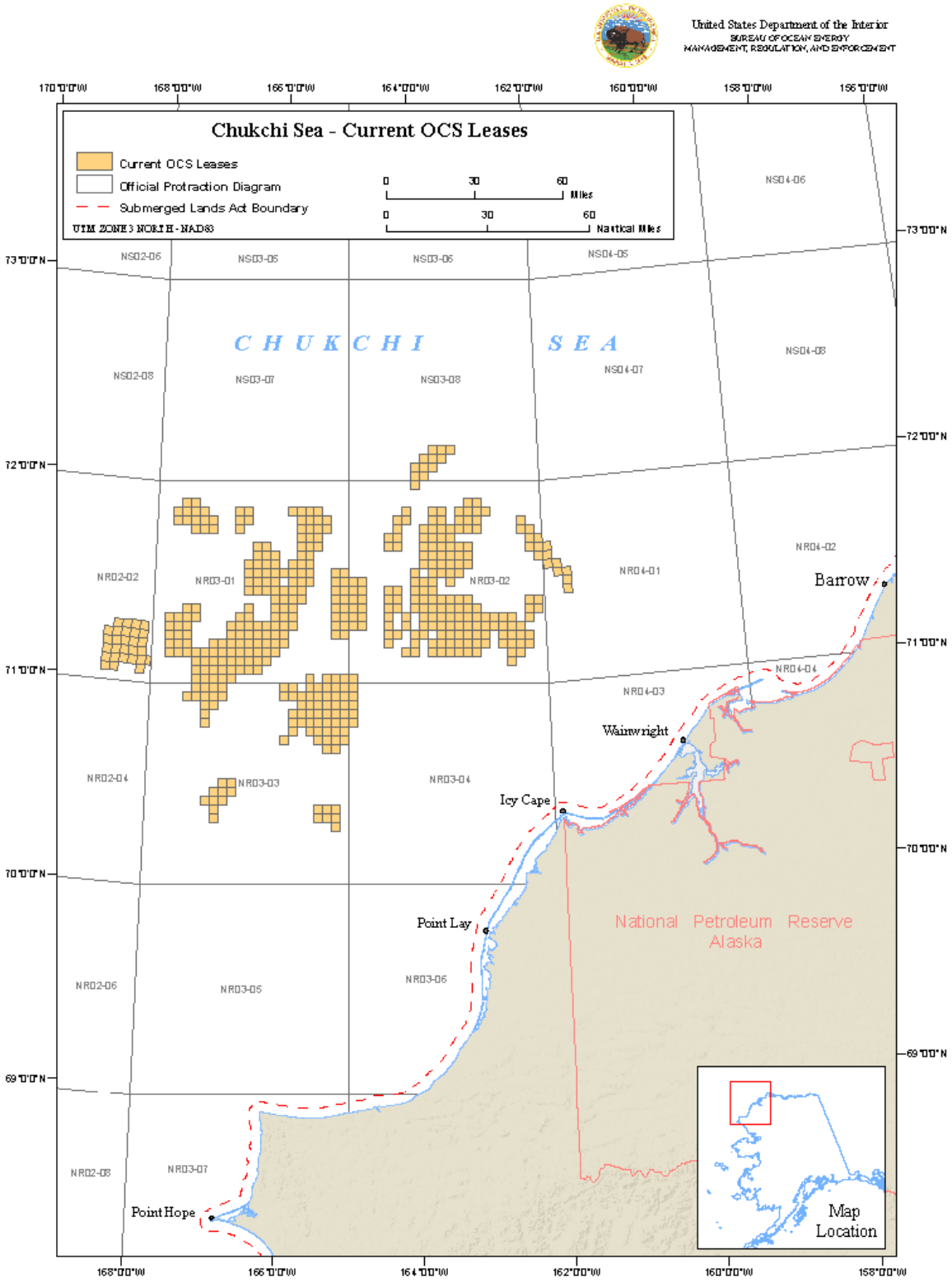
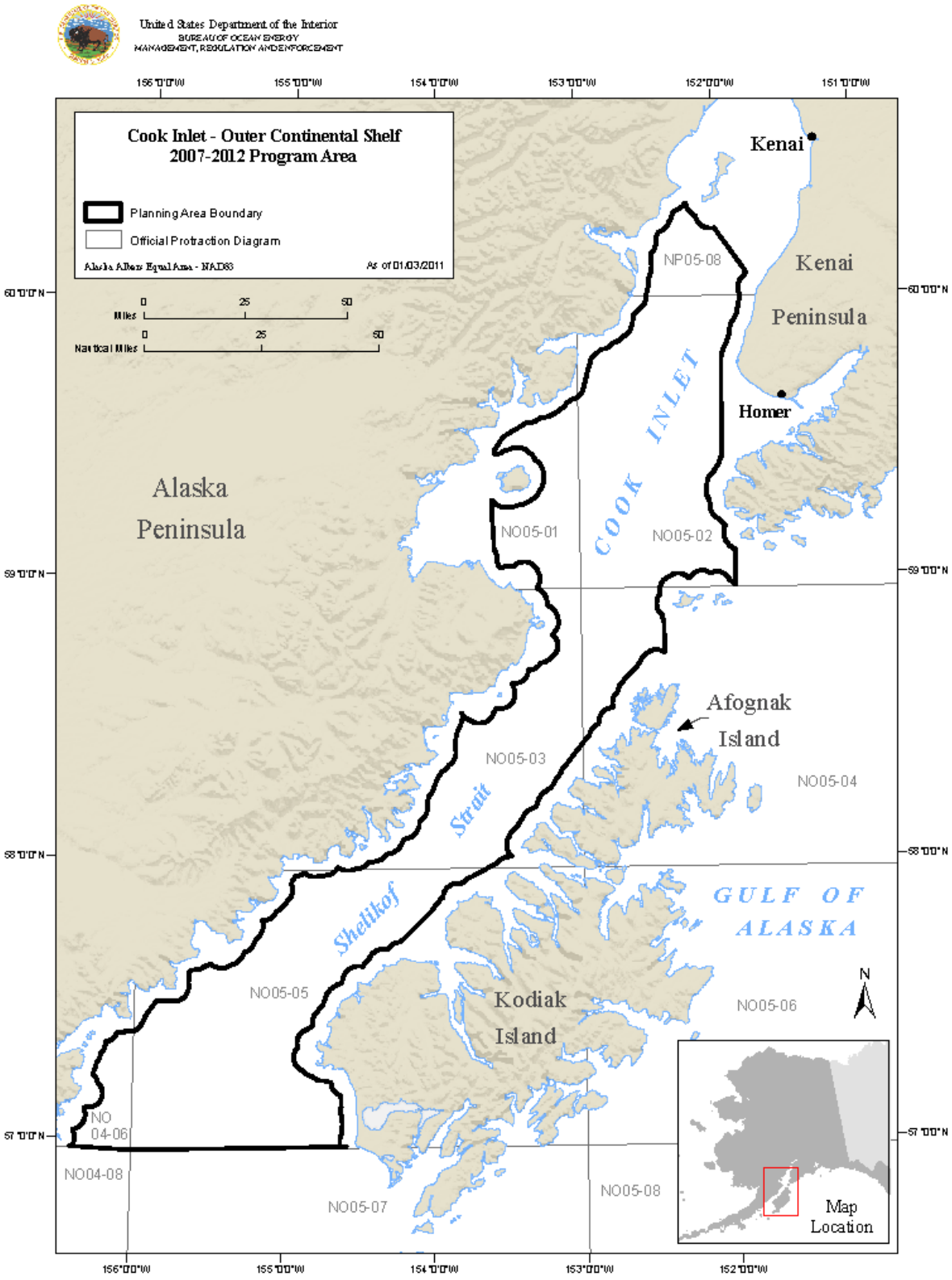


Figure 4 Cook Inlet Planning Area



1.2.2 Post-lease Considerations

Prior to FY 1982, most studies of the Alaskan offshore were planned, conducted, and concluded before a sale was held in order to provide information for decision making and EISs. However, not all needed information can be obtained prior to a sale. In accordance with mandates of Section 20 of the OCS Lands Act, the need for studies continues into the post-lease period to address environmental concerns and monitoring related to specific developments. The BOEMRE acquires additional information for environmental analyses related to development and production in the post-lease phase. Thus, an increasing number of studies have become more closely related to development schedules and monitoring and evaluation in addition to those broader studies related to the pre-lease phase. As with the pre-lease phase, the wide range of environmental conditions from Cook Inlet to the Arctic is considered during the process of formulating new studies. Post-lease activities that require environmental data and assessment include:

- Geophysical surveys
- Preparation of Exploration Plans (EPs)
- Exploration drilling
- Preparation of Development and Production Plans (DPPs)
- Development, construction and production activities
- Oil transportation, including pipelines and tankers
- Lease termination or expiration (platform decommissioning)
- Oil spill detection, containment, clean-up and damage assessment

In the Beaufort Sea Planning Area, there have been 929 tracts leased in ten OCS Lease Sales. Industry has drilled 31 exploratory wells and determined 11 to be producible. As of January, 2011, there are more than 180 active leases in the Beaufort federal offshore area. Lease Sale 193 in February 2008 resulted in 487 leases being issued in the Chukchi Sea Planning Area. There are no active leases from previous lease sales in the Chukchi Sea or Hope Basin portions of the Arctic Subregion or in the Bering Sea, Cook Inlet or Gulf of Alaska Subregions.

Legal Challenges: Litigation remains a factor for Alaska OCS activities. Currently, there is one active case.

Native Village of Point Hope v. Salazar, No. 1:08-cv-00004-RRB (D. Alaska) (Sale 193). In January 2008, a coalition of environmental groups, a local government, a Federal recognized tribe, and an Alaska Native organization challenged the Chukchi Sea Sale 193 regarding compliance with the National Environmental Policy Act. On July 21, 2010, the U.S. District Court of Alaska remanded to the BOEMRE the Chukchi Sea Sale 193 Final EIS to satisfy its obligations under NEPA in accordance with the Court's opinion. Specifically, BOEMRE was instructed to address three concerns, as follows: (1) analyze the environmental impact of natural gas development; (2) determine whether missing information identified by BOEMRE in the Sale 193 Final EIS was essential or relevant under 40 CFR 1502.22; and (3) determine whether the cost of obtaining the missing information was exorbitant, or the means of doing so unknown. BOEMRE released a draft Supplemental EIS (SEIS) in October 2010. In

November 2010 BOEMRE held public meetings and government-to-government meetings with federally recognized tribes. During the public comment period, BOEMRE received more than 150,000 comments. Due to the Deepwater Horizon oil spill, many commenters requested an analysis that takes into account the possibility of a blowout during exploration. After reviewing those comments, BOEMRE has determined that it is appropriate to updates its spill risk assessment and provide a very large oil spill analysis from an exploration well blowout as part of this SEIS. This analysis will be contained in a revised draft SEIS, which will be circulated for review and public comment. BOEMRE presently anticipates releasing the revised draft SEIS by late May 2011 and will provide 45 days for public comment. BOEMRE expects the SEIS to issue in late September 2001, and the Record of Decision should issue in late October 2011. BOEMRE has issued Suspension of Operations on all Sale 193 Chukchi Sea leases, as no exploration activities can be conducted until resolution of this litigation.

Development:
Liberty – The Liberty prospect is located in the central Beaufort Sea about 5-8 miles east of the existing Endicott Satellite Drilling Island (SDI). British Petroleum Exploration Alaska (BPXA) will use ultra Extended Reach Drilling (uERD) technologies to lengths of 5-8 miles, allowing the Liberty unit to be developed from an expansion of the existing Endicott Satellite Drilling Island. All drilling activity will be from surface locations on State lands using a land-based rig and surface blowout preventer. The State of Alaska and the BOEMRE will both have to approve applications for permit to drill. BPXA has delayed the initial wells pending better understanding of Federal and State requirements, due to changes from the Deepwater Horizon incident. Both the BOEMRE and the State are reviewing requirements for blowout preventers and relief wells for projects. The BOEMRE will be coordinating with the State to review respective requirements to provide BPXA with clear and consistent direction. BPXA estimates that the reserves for the Liberty project are 105 million barrels of oil.

Production:
Northstar – Northstar (see Figure 5) is a joint Federal/State of Alaska unit located in the Beaufort Sea about 12 miles northwest of Prudhoe Bay. BP Exploration Alaska, Inc. (BPXA) is the lessee and operator of Northstar. The six producing Federal wells fall under BOEMRE regulatory authority, the State wells fall under the State's oversight. Since 2001, total production through June 2010 is near 145 million barrels; with the Federal portion about 26 million barrels. All the wells have been drilled and the rig has been demobilized.

1.3 Identification of Information Needs

The Alaska OCS Region assesses its mission information needs continuously, and systematically develops new study profiles on an annual basis. The Alaska ESP distributes the *Alaska Annual Studies Plan* to more than 200 Federal, State, local, environmental, Native, industry, international and other stakeholders each September. We also distribute a letter to the same stakeholders requesting suggestions for new studies for the next cycle. We consider comments in response to that request and previous program reviews. In addition, we request

Figure 5 Northstar Island, August 2000

suggestions for new studies from all components of the Alaska OCS Region staff and actively seek their input throughout the profile development process.

The ESP also relies heavily on information needs identified through solicitation of public comment and suggestions on how to enhance our information base at scientific and information meetings. For example, the BOEMRE, along with numerous organizations and agencies, sponsors the Alaska Marine Science Symposium held in Anchorage, Alaska each year. The Alaska OCS Region also has conducted eleven Information Transfer Meetings (ITMs). In addition, Alaska OCS Region has sponsored a number of workshops and conferences over the years with topics that include: using high frequency radar to map surface currents; various aspects of physical oceanography; arctic cisco in the Beaufort Sea; and social and economic impacts associated with oil and gas development. The meetings, which were attended by experts in the respective fields and other interested stakeholders, identified information needs and recommended studies to support the BOEMRE mission.

In preparation for possible oil and gas exploration in the Chukchi Sea (see Figure 3), the Alaska OCS Region conducted a three day *Chukchi Offshore Monitoring in Drilling Area* (COMIDA) planning workshop November 1-3, 2006, in Anchorage. The purpose of the workshop was to identify potential monitoring tasks for a COMIDA field effort to meet MMS needs. Invitations were sent to over 150 scientists and stakeholders, including local and regional governments, tribes, native associations, oil industry and environmental groups. Over 100 scientists and stakeholders attended. Thirteen monitoring study profiles were developed by four working groups, discussed by the workshop participants, and submitted to the agency for prioritization and inclusion in the COMIDA field effort. The workshop report was published in April 2007 (USDOI, MMS, Alaska OCS Region, 2007) and has become a useful planning tool that continues to influence our study priorities.

1.3.1 Beaufort Sea General Information Needs

Monitoring of Interdependent Physical, Biological and Social Processes: Both offshore and onshore oil and gas development and production activities are continuing across Alaska's North Slope. Residents of Nuiqsut, Kaktovik and Barrow are particularly concerned about long-term effects of offshore developments at Northstar and other possible developments, as well as long-term and cumulative effects of any exploration from OCS Beaufort Sea lease sales. Interagency reviews of related EISs, EPs and DPPs are expected to lead to additional recommendations for monitoring impacts of Northstar and other possible developments. Key constituents have identified the need to monitor under-ice currents, sedimentation and potential effects on social systems/subsistence in the vicinity of Northstar and Liberty. Related questions that need to be addressed are the characteristics of major oceanographic and meteorological processes and how they influence the human, marine and coastal environment.

The "Arctic Nearshore Impact Monitoring in Development Area" (ANIMIDA), a program started in 1999, was developed to address these issues. This suite of studies provided baseline data and monitoring results for chemical contamination, turbidity, and subsistence whaling in the vicinity of Northstar and Liberty development sites. The recently concluded continuation of ANIMIDA (cANIMIDA) has gathered long term monitoring data to provide a basis of

continuity and consistency in evaluation of potential effects from site-specific, recently initiated development and upcoming production in the Beaufort Sea OCS. The final study reports from cANIMIDA are available on our website of completed study reports and at the cANIMIDA website: http://www.duxbury.battelle.org/canimida/home/index.cfm.

Much of this work is planned to extend beyond the cANIMIDA project. The five-year "Continuation of Impact Assessment for Cross Island Whaling Activities" is approaching the mid-point. Also, the study "ANIMIDA III: Contaminants, Sources, and Bioaccumulation" is proposed for FY 2011, and comprises a continuation of monitoring of sediment chemistry, turbidity and suspended sediment dispersion, and bioaccumulation of contaminants. This proposed study has been expanded in area to include Camden Bay, where drilling to delineate existing oil discoveries is planned.

A number of currently ongoing studies take an integrated approach to examining the interdependence of physical, biological and social processes and filling identified information needs across the various disciplines. Highlights of these and other important research projects are provided in Section 1.3.4.

Pollutants: North Slope villagers are concerned about potential contamination of their food supply. In the Beaufort Sea such foods include bowhead whales, seals, waterfowl and fish. Of particular concern are environmental effects of development on these biota, including those from potential oil spills. Related to these concerns, additional information is needed regarding currents that might carry oil under ice. Up-to-date information on ocean currents and sea ice is necessary to fully address these concerns. Concern has also been raised over increasing spillage from corroded pipelines on the North Slope. Updated spill data for the Alaska North Slope and Canadian Beaufort Sea coastal areas is needed to estimate oil spill occurrence rates. Information on the fate (weathering) of oil spills is being obtained through participation with a joint industry consortium (Oil in Ice JIP [Joint Industry Project]) doing field experiments on cleanup, behavior, and weathering of oil in broken ice.

Information on Bowhead Whales and Other Wildlife: Iñupiat whale hunters rely heavily on bowhead whales for subsistence. The bowhead whale is central to village cultural and spiritual life. Whale hunters have reported that migrating bowhead whales deflect from their normal migratory route well upstream of active industry vessels and may divert their migration route. A concern is that deflection around oil and gas-industry activity (including drilling activity and associated icebreaker support) makes whales skittish and more difficult to hunt. Bowhead whales also feed along the fall migration route and information about bowhead feeding and habitat use is needed. Noise from industrial activity is a central concern. Additionally, Iñupiat whale hunters and the scientific community have raised concerns about potential cumulative impacts on bowhead whales. It is important to assess the factors that may be affecting the habitat use, health, population status and migration routes of bowhead whales.

The populations of bowhead whales, polar bears, beluga whales, spectacled eiders and other endangered species are an ongoing concern of environmental groups, Federal agencies and others. North Slope villages are also concerned about potential disturbance of ringed seals,

waterfowl and other subsistence-wildlife species by oil industry activities such as helicopter overflights.

Fish and Lower Trophic Communities: Fishes in the Beaufort and Chukchi seas fill an essential role in the Arctic ecosystem by consuming small prey and themselves providing a food resource for larger fishes, birds, marine mammals, and people. In addition, fish assemblages and populations in marine ecosystems off Alaska have undergone observable regime-shifts in diversity and abundance over the last 20-30 years. It is important to assess the distribution and abundance of fishes in these areas and to distinguish between changes due to anthropogenic and natural effects.

Native Culture: The Iñupiat report in public testimony that their culture is vulnerable to short-term, long-term and cumulative effects from OCS activities. There are concerns that OCS activities might lead to:

- Social disruption and a change in cultural values through population shifts (immigration of large numbers of non-Iñupiat to the North Slope)
- Employment changes (potential effects on subsistence lifestyle by a cash economy)
- Cumulative effects of multiple industrial activities, alteration of subsistence-harvest patterns and displacement of hunters and subsistence resources

There is an ongoing need to monitor key indicators of socioeconomic and cultural changes on the North Slope. The Iñupiat rely on a wide variety of marine resources as significant sources of food. In addition, the harvesting, sharing and consuming of subsistence resources form an important part of the traditional Iñupiaq culture and spiritual life. People are concerned that a temporary or permanent elimination of primary subsistence foods would cause North Slope residents either to shift to less desired subsistence resources or to replace subsistence foods with expensive Western foods. The Iñupiat are concerned about mitigation, including compensation for potential losses. An anticipated decline in oil revenues to the NSB is an issue of concern also. Another concern is the use of local and traditional knowledge in analysis of potential environmental effects. We continue to seek and include firsthand knowledge of local subsistence hunters to augment the scientific knowledge base.

1.3.2 Chukchi Sea General Information Needs

Native cultural activities that rely on subsistence, particularly on marine resources, predominate in these regions. The fundamental issues in the Chukchi Sea are very similar to the Beaufort Sea (see Section 1.3.1) although many species that regularly appear within the Chukchi Sea are not typically found within the Beaufort Sea. One major difference is that MMS placed less emphasis on studying the Chukchi Sea than the Beaufort Sea beginning in the mid-1990s in recognition of leasing priorities. Knowledge of the spatial and temporal variability of leads, polynyas and landfast ice is dated. This information is important for determining the fate of spilled oil in this region and the impacts on biota associated with these systems. The status of many animal populations may also have changed since the earlier studies were conducted. Climate change may have triggered many spatial and temporal changes in the distribution of a variety of species.

Since 2007, the Alaska OCS Region has developed a new suite of studies in the Chukchi Sea, leveraging more than $40 million (through FY 10, with another $10 million planned for FY 11) to conduct interim baseline research and monitoring in all the following fields of interest: meteorology, ice dynamics and basic oceanography, benthic fauna and sedimentation, marine mammals (including whales, walrus, seals, and polar bear), fish, birds, and social systems. Most of the projects exhibit complex, multilateral collaborations, with explicit inter-disciplinary linkages between the physical and biological sciences, and many of them also provide a role for active participation by Native residents and input from sources of traditional knowledge. Most of them pursue multi-year data collection efforts on a regional scale, with careful attention to inter-annual variability and ecosystem processes.

1.3.3 Renewable Energy General Information Needs

Section 388 of the Energy Policy Act of 2005 amended the OCSLA to give discretionary authority to the BOEMRE to issue leases, easements or rights-of-way on the OCS for alternative energy projects, such as wind, wave, or ocean current facilities. Under this new authority, the areas that the BOEMRE makes available for alternative energy leasing are likely to be determined through a process that assesses different types of alternative energy resources, anticipated and potential environmental impacts, and other relevant information on a national, regional, or local basis.

The topic "Renewable Energy Capacity Inventory in Coastal Alaska" has been advertised as a Broad-Agency Agreement RFP (request for proposals) under the auspices of the National Oceanographic Partnership Program and the President's Interagency Committee on Ocean Science and Resource Management Integration. The RFP was eventually terminated as premature for the State of Alaska. In that context, we encourage input from regional stakeholders to help us assess the extent of industrial interest to lease and develop renewable resources on the Alaska OCS.

1.3.4 Current Keystone Studies

Physical Oceanography:
Mesoscale Meteorology: Accurate specification of the surface wind and stress field is essential to predict ocean and ice circulation, and to improve oil spill models. In partnership with UAF, this study conducts a long-term hindcast simulation with an optimized data-modeling system to produce a high resolution meteorological dataset and to document climatological features of the Beaufort/Chukchi Seas.

Surface Current Circulation Mapping: In collaboration with UAF, ocean current circulation fields are being mapped and analyzed along the northeastern coast of the Alaskan Chukchi Sea through the deployment of coastal High Frequency radar systems and offshore bottom mounted Acoustic Doppler Current Profilers. Such direct circulation measurements improve understanding of the ocean currents that drive oceanographic processes and influence the transport and fate of spilled oil.

Polynyas and Landfast Ice: In collaboration with CMI, this study extends previous research along the Beaufort/Chukchi coast to quantify through high resolution satellite imagery the spatial and temporal extent of the leads, polynyas and landfast ice, including any recent changes in their extent south of Icy Cape. The analysis also provides mean, minimum, and maximum measurements and examines the effects of climate state on ice characteristics.

Ecosystem Observations in the Chukchi Sea: The oceanographic component of a new passive acoustic monitoring study utilizes biophysical moorings, hydrographic measurements, and numerical climate models to monitor the changing ecosystem of the Chukchi Sea. The moorings measure ocean temperature, salinity, nutrients, chlorophyll (a measure of phytoplankton abundance), oxygen, photosynthetic radiation, ice thickness, ocean circulation, and zooplankton abundance (volume). The study partners BOEMRE with NOAA-Pacific Marine Environmental Lab and the Alaska Fisheries Science Center, National Marine Mammal Laboratory.

Chukchi Sea Offshore Monitoring in Drilling Area: Chemistry and Benthos: This study establishes a baseline for benthic biomass, species composition, and oil industry anthropogenic chemicals to detect changes as a result of future oil and gas activities. It initiates past and future time-trend analyses for benthic populations and anthropogenic chemicals and seeks to distinguish among changes due to development, climate, and food web structure.

Hanna Shoal Ecosystem Study: This study will continue the ecological monitoring of COMIDA CAB and extend it to the region of Hanna Shoal. The study also will document the circulation and density fields, as well as ice conditions, at Hanna Shoal and examine important chemical, physical and biological interactions with the unique ecological regime in this highly productive area.

Arctic Research Synthesis: Between the years 2005 and 2015 MMS/BOEMRE will invest approximately $50,000,000 in marine mammal and related oceanographic studies in the western Arctic. These data will increase our body of knowledge about the region considerably, but interpretation will be complicated by concurrent environmental changes. This study proposes a synthesis of research from the ongoing studies in the Region.

Marine Mammals:

Monitoring the Distribution of Arctic Whales: The MMS/BOEMRE has conducted aerial surveys of the fall migration of bowhead whales each year since 1987. Methods are comparable from year to year and based on similar monitoring dating to 1979. In partnership with the NMML, the Bowhead Whale Aerial Survey Project (BWASP) extends a long-term database of the distribution, relative abundance, habitat, and behaviors (especially feeding) of endangered bowhead whales through the bowhead-migration corridor across the Alaskan Beaufort Sea.

Distribution and Relative Abundance of Marine Mammals: Aerial Surveys: In collaboration with the National Marine Fisheries Service (NMFS), this study collects aerial survey data on seasonal distribution, relative abundance, and habitat use of marine mammals in the Chukchi

Sea. Observations from June to October are focused on bowhead whales, but also help to monitor gray whales, beluga whales, Pacific walrus, polar bears, bearded seals, and several other species of ice seals. All of these species are subject to changes in environmental variables such as oceanographic currents, sea temperature, sea ice cover, prey availability, and anthropogenic impacts.

Passive Acoustic Detection and Monitoring of Endangered Whales in the Arctic: A collaboration with NMFS, this study documents the general presence of bowhead, right, fin, gray, and other baleen whales in areas of potential seismic, drilling, construction, and production activities. Data will be useful for estimating temporal limits and formulating designs of mitigation for such activities. The study will fund the fabrication and deployment of arrays of long-term acoustic recorders that are capable of continuous year-round recording.

Bowhead Whale Feeding Variability: In collaboration with NMFS, WHOI, ADF&G, and the AEWC, BOEMRE combines targeted oceanographic sampling with biological sampling and satellite tracking of individual whales (involving Alaska Native whalers and traditional knowledge) to expand scientific understanding of whale behavior and to improve predictions about where and when aggregations of feeding whales are likely to occur. This study (also known as BOWFEST) was extended for two additional field seasons in FY 2010. When recommending added field seasons for this study, NMFS cited the importance of continued data collection for the purpose of informing management decisions. The North Slope Borough has also urged BOEMRE to continue ongoing, long-term studies such as this.

The study "Use of the Chukchi Sea by Endangered Baleen and Other Whales" proposed for FY 2012 will extend this research into the Chukchi Sea and expand the scope to include other cetacean species.

Demography and Behavior of Polar Bears: In partnership with the USGS Alaska Science Center and USFWS Marine Mammals Management, this study collects data to estimate the demographic composition and inter-annual patterns of use of coastal areas by the sub-population of polar bears summering on land in Alaska. The project will also evaluate the implications of extended summer use of land on polar bear health and nutrition, behavior, and population status.

Pinniped Movements and Foraging: Bearded Seals: Large numbers of pinnipeds migrate through and potentially occupy prospective oil and gas areas in the Chukchi Sea, including habitat near the Burger Prospect. Pinnipeds may be affected in a variety of ways during all stages of oil and gas exploration, development, and production. In collaboration with NMFS, this study develops a phased cooperative project with Native subsistence hunters to track the movements and habitat use of bearded seal in the western Chukchi Sea.

Pinniped Movements and Foraging: Walrus: In collaboration with the Alaska Department of Fish and Game, this study develops a phased cooperative project with Native subsistence hunters to track the movements and habitat use of walruses in the Chukchi Sea. The project trains Native hunters to deploy satellite transmitters on walruses in the vicinity of coastal

villages and to conduct shore-based monitoring of tagged-walrus behaviors and general haul-out use patterns.

Monitoring Marine Birds of Concern in the Eastern Chukchi Nearshore Area (Loons): This collaboration with USGS-Biological Resources Division (BRD) provides updated information on marine bird distribution, species composition, molting, staging and timing of use in the vicinity of Peard Bay, Ledyard Bay, and Kasegaluk Lagoon of the eastern Chukchi nearshore environment.

Migration and Habitat Use by Threatened Spectacled Eiders: This study in collaboration with USGS estimates the spatial distribution, demographic composition, timing of use, and residence times of male and female spectacled eiders in the Chukchi and Beaufort Seas.

Habitat and Ecology:
Beaufort Sea Marine Fish Monitoring: In collaboration with UAF, this study designs a long-term fish monitoring plan for the central Beaufort Sea and implements a survey to establish baseline knowledge of fish species, distribution and relative abundance in the region.

Current and Historic Distribution and Ecology of Demersal Fishes: In partnership with CMI, this study provides information on fish presence, abundance, distribution, geographic range, species assemblages, and habitat diversity that is needed to evaluate and mitigate the effects of offshore development. The project assembles data into a searchable database and analyzes water mass characteristics that define demersal fish habitat.

Arctic Fish Ecology Catalogue: Arctic fish ecological and behavioral information is only available piecemeal from a wide range of peer-reviewed and gray literature. This study, in collaboration with USGS, synthesizes ecological and behavioral information for freshwater, diadromous, and marine fish species occurring in the Beaufort and Chukchi Seas.

Biogeochemical Assessment of the OCS Arctic Waters: In collaboration with the Coastal Marine Institute at UAF, this cooperative study measures ecosystem productivity in the northern Bering Sea and in the Chukchi Sea and evaluates its vulnerability to climate change. The study involves three years of oceanographic sampling focused on measurements of dissolved organic and inorganic nutrients and carbon, total alkalinity, particulate organic matter, and pCO_2.

Subsistence Use of Salmon Populations: In partnership with UAF-CMI, this study will document local observations of increasing numbers of salmon in subsistence fisheries and conduct ethnographic fieldwork among Iñupiat communities about changing salmon populations/ species composition. This data updates information on subsistence harvest and traditional knowledge about salmon and maps the spatial and temporal distribution of salmon species in streams.

Recovery in a High Arctic Kelp Community: In partnership with UAF-CMI, this study monitors rates of vegetative re-growth in the Boulder Patch kelp community to provide a better understanding of how sessile communities recover from disturbances.

Social Systems:

Study of Sharing Networks to Assess the Vulnerabilities of Local Communities to Oil and Gas Development Impacts in Arctic Alaska: In collaboration with UAF, this study investigates contemporary subsistence food distribution and consumption patterns for residents living near offshore oil and gas operations. It identifies key nodes and thresholds in community food distribution networks to assess their relative vulnerabilities and resiliency to change. Study areas include Wainwright, Kaktovik and Venetie.

Continuation of Impact Assessment for Cross Island Whaling Activities: This study extends the long-term ethnographic monitoring effort for subsistence whaling activities that occur from the base camp at Cross Island. This data aids understanding of Cross Island subsistence whaling variation over time and supports evaluation of the relationship of offshore oil and gas industrial activities to whaling variability.

Aggregate Effects Research and Environmental Mitigation Monitoring of Oil Operations in the Vicinity of Nuiqsut: This study investigates and documents the history of negotiated mitigation measures for select oil related exploration and development activities near Nuiqsut. It identifies and analyzes both the formal and informal mitigation mechanisms that have emerged over time.

Impact Monitoring for Offshore Subsistence Hunting: There is acute need for more information about offshore subsistence activities along the Chukchi coast, especially in the vicinity of Wainwright and Point Lay, where future offshore development might make landfall. This study gathers long-term monitoring data to allow the BOEMRE to assess whether OCS activities in the Chukchi Sea will result in changes to offshore subsistence hunting practices.

OCS Economic Impact Model for Alaska: This project updates and refines agency procedures for estimating the onshore economic effects of OCS activities, such as forecasts of employment and personal income, by improving data inputs and model structure for frontier planning areas.

The BOEMRE also funds research in collaboration with other federal agencies through the National Oceanographic Partnership Program. Current research in the Beaufort Sea conducted through NOPP, includes:

- Circulation, Cross-Shelf Exchange, Sea Ice, and Marine Mammal Habitats on the Alaskan Beaufort Sea Shelf
- Toward a predictive model of Arctic coastal retreat in a warming climate, Beaufort Sea, Alaska

1.4 New Starts for FY 2011 and Ongoing Studies

Table 1 lists new studies planned to start in FY 2011 and ongoing studies, categorized by discipline. Profiles for these studies can be found at: http://alaska.boemre.gov/ess/ongoing_studies/ongoing_studies/Ongoing_studies.pdf

Table 1 Alaska OCS Region New Starts for FY 2011 and Ongoing Studies

Planning Area	NSL #	Partners	Project Contact	TITLE
**** PLANNED NEW STARTS (FY 2011)***				
Beaufort Chukchi	AK-11-01		Prentki	Updates to the Fault Tree for Oil-Spill Occurrence Estimators needed under the forthcoming BOEMRE 2012-2017, 5-Year Program [Fates and Effects]
Beaufort Chukchi	AK-11-02		Prentki	Oil Spill Occurrence Estimators for Onshore Alaska North Slope Crude and Refined Oil Spills [Fates and Effects]
Chukchi	AK-11-03	CESU-UT	Crowley	Hanna Shoal Ecosystem Study [Habitat and Ecology / Physical Oceanography]
Beaufort Chukchi	AK-11-05		Monnett	Marine Mammal/Physical Oceanography Synthesis [Protected Species / Physical Oceanography]
Beaufort Chukchi	AK-11-06	NMML	Monnett	Distribution and Relative Abundance of Marine Mammals in the Chukchi Sea and the Fall Migration of Bowhead Whales in the Beaufort Sea [Protected Species]
Beaufort	AK-11-10		Coon	Shorebirds and Infaunal Abundance and Distribution on Delta Mudflats along the Beaufort Sea [Habitat and Ecology]
Beaufort Chukchi	AK-11-13a	BRD	Wedemeyer	Arctic Cod Genetics Study [Habitat and Ecology]
Beaufort Chukchi	AK-11-15		Horowitz	Alaska State-Wide Oceans Research and Studies Project Browser Covering the Alaska Offshore and Coastal Areas [Information Management]
**Note: The procurement of any study is contingent upon availability of funding*				
ONGOING STUDIES				
Physical Oceanography				
Beaufort	AK-06-x13	UAF	Horowitz	Support of the Collection of Meteorological Data on the North Slope and Beaufort Sea, Alaska
Beaufort	NOPP	NOPP	Price	Circulation, Cross-Shelf Exchange, Sea Ice, & Marine Mammal Habitats on the AK Beaufort Sea Shelf

Planning Area	NSL #	Partners	Project Contact	TITLE
Chukchi	AK-09-04	CMI	Horowitz	Mapping and Characterization of Recurring Polynyas and Landfast Ice in the Chukchi Sea
Chukchi	AK-09-06	CMI	Horowitz	Surface Current Circulation High Frequency (HF) Radar Mapping in the Chukchi Sea
Chukchi	AK-08-12-08	CMI	Horowitz	Satellite-Tracked Drifter Measurements in the Northeast Chukchi Sea
Chukchi	AK-09-02	PMEL	Monnett	COMIDA: Factors Affecting the Distribution and Relative Abundance of Endangered Whales: Biophysical Moorings and Climate Modeling
Beaufort Chukchi	AK-06-05		Horowitz	Beaufort/Chukchi Seas Mesoscale Meteorology Modeling Study Phase II
Beaufort Chukchi	NT-08-02		Johnson	Adaptation of Arctic Circulation Model
Beaufort Chukchi	AK-10-07		Crowley	Evaluation of the Use of Hindcast Model Data for OSRA in a Period of Rapidly Changing Conditions
Fates and Effects				
Beaufort	NOPP	NOPP	Price	Toward a Predictive Model of Arctic Coastal Retreat in a Warming Climate, Beaufort Sea, Alaska
Chukchi	AK-08-03		Prentki	COMIDA: Chemistry and Benthos (CAB)
Habitat and Ecology				
Beaufort	AK-08-12-02	CMI	Wedemeyer	Recovery in a High Arctic Kelp Community
Beaufort	AK-10-06	NMFS	Wedemeyer	Beaufort Sea Marine Fish Monitoring Survey in the Central Beaufort Sea
Beaufort	AK-08-12-07	CMI	Wedemeyer	Epifaunal Communities in the Central Beaufort Sea
Chukchi	AK-93-48-67	CMI	Coon	Current & Historic Distribution & Ecology of Demersal Fishes in the Chukchi Sea Lease Area
Chukchi	AK-08-12-05	CMI	Wedemeyer	Trophic Links: Forage Fish, Their Prey, and Ice Seals in the Northeast Chukchi Sea
Chukchi	AK-08-12-03	CMI	Prentki	Biogeochemical Assessment of the OCS Arctic Waters: Current Status and Vulnerability to Climate Change
Beaufort Chukchi	AK-10-09		Wedemeyer	Joint Funding Opportunities in Existing Marine Fish Studies
Beaufort Chukchi	AK-10-10	FWS	Coon	Seabird Distribution and Abundance in the Offshore Environment
Beaufort Chukchi	AK-07-05	BRD	Wedemeyer	Arctic Fish Ecology Catalogue

Planning Area	NSL #	Partners	Project Contact	TITLE
Beaufort Chukchi	AK-08-12-06	CMI	Coon	Population Connectivity and Larval Dispersal in Bering, Chukchi, & Beaufort Sea Snow Crab Populations: Estimating Spatial Scales of Disturbance Impacts
Beaufort Chukchi	AK-08-12-09	CMI	Coon	Population Assessment of Snow Crab, *Chionoecetes opilio*, in the Chukchi and Beaufort Seas Including Oil and Gas Lease Areas
Marine Mammals and Protected Species				
Chukchi	AK-08-02; AK-10-05	NMML	Monnett	COMIDA: Distribution and Relative Abundance of Marine Mammals: Aerial Survey
Chukchi	AK-07-04a	BRD	Coon	Monitoring Marine Birds of Concern in the Eastern Chukchi Nearshore Area (Loons)
Chukchi	AK-07-08	NMML	Monnett	Pinniped Movements and Foraging: Bearded Seals
Chukchi	AK-09-01	ADFG	Monnett	Pinniped Movements and Foraging: Walrus Habitat Use in the Potential Drilling Area (Chukchi)
Beaufort Chukchi	AK-06-01; AK-10-01	ADFG, DFO	Monnett	Bowhead Feeding Variability in the Western Alaska Beaufort Sea: Satellite Tracking of Bowhead Whales
Beaufort Chukchi	AK-06-01; AK-10-02	NMML	Monnett	Bowhead Feeding Variability in the Western Alaska Beaufort Sea: Oceanography and Feeding
Beaufort Chukchi	AK-07-01	NMML	Monnett	Monitoring the Distribution of Arctic Whales (BWASP)
Beaufort Chukchi	AK-09-05	BRD, FWS	Monnett	Demography and Behavior of Polar Bears Summering on Shore in Alaska
Beaufort Chukchi	AK-05-02	DFO	Monnett	Populations and Sources of Recruitment in Polar Bears
Beaufort Chukchi	AK-09-03	BRD	Coon	Migration and Habitat Use by Threatened Spectacled Eiders in the Eastern Chukchi Near and Offshore Environment
Beaufort Chukchi	AK-09-02	NMML	Monnett	COMIDA: Passive Acoustic Detection and Monitoring of Endangered Whales in the Arctic
N. Aleutian	AK-07-x13	NMML	Monnett	Distribution, Abundance, and Habitat Use of North Pacific Right Whales

Planning Area	NSL #	Partners	Project Contact	TITLE
Social Systems				
Beaufort	AK-08-09	NSSI	Campbell	Aggregate Effects Research & Environmental Mitigation Monitoring of Oil Operations in the Vicinity of Nuiqsut
Beaufort	AK-08-01	NMML	Campbell	Continuation of Impact Assessment for Cross Island Whaling Activities-Beaufort Sea
Beaufort	AK-08-12-04	CMI	Campbell	Subsistence Use and Knowledge of Beaufort Salmon Populations
Chukchi	AK-08-04		Campbell	COMIDA: Impact Monitoring for Offshore Subsistence Hunting
Beaufort Chukchi	AK-05-04a	CESU-UAF. NSF	Campbell	Study of Sharing Networks to Assess the Vulnerabilities of Local Communities to O&G Development Impacts in Arctic Alaska
Beaufort Chukchi	AK-08-10		Brian	Testing, Improvement, and New Alaska Data for MAG-PLAN
Beaufort Chukchi	AK-03-12		Campbell	Social and Economic Assessment of Major Oil Spill Litigation Settlement for the Alaska OCS Region
N. Aleutian	AK-08-06		Campbell	Subsistence Study for North Aleutian Basin
Information Management				
Beaufort Chukchi	AK-08-12-01	CMI	Wedemeyer	BOEMRE-University of Alaska Fairbanks-State of Alaska Coastal Marine Institute Management
Beaufort Chukchi	AK-10-03	NPRB	Horowitz	Alaska Marine Science Symposium (co-sponsor)
Beaufort Chukchi	AK-10-04		Coon	Management, Logistics, and Warehouse Storage of Oceanographic Equipment
Beaufort Chukchi	AK-07-06		Raymond	Conference Management and Reports on BOEMRE Results
INTEGRATED STUDIES				
Beaufort Chukchi	AK-06-01; AK-10-02	NMML	Monnett	Bowhead Feeding Variability in the Western Alaska Beaufort Sea: Oceanography and Feeding
Beaufort Chukchi	AK-08-09	CMI	Campbell	Aggregate Effects Research & Environmental Mitigation Monitoring of Oil Operations in the Vicinity of Nuiqsut
Beaufort Chukchi	AK-05-04a	CESU-UAF, NSF	Campbell	Study of Sharing Networks to Assess the Vulnerabilities of Local Communities to O&G Development Impacts in Arctic Alaska
Beaufort Chukchi	AK-09-02	NMML	Monnett	COMIDA: Passive Acoustic Detection and Monitoring of Endangered Whales in the Arctic

Planning Area	NSL #	Partners	Project Contact	TITLE
Chukchi	AK-09-02	PMEL	Monnett	COMIDA: Factors Affecting the Distribution and Relative Abundance of Endangered Whales: Biophysical Moorings and Climate Modeling
Chukchi	AK-08-04		Campbell	COMIDA: Impact Monitoring for Offshore Subsistence Hunting
Chukchi	AK-08-03		Prentki	COMIDA: Chemistry and Benthos (CAB)
Chukchi	AK-08-12-03	CMI	Prentki	Biogeochemical Assessment of the OCS Arctic Waters: Current Status and Vulnerability to Climate Change

Research Partnerships

BOEMRE Technology Assessment and Research Program (TAR)	Alaska Department of Fish and Game (ADFG)
BOEMRE-University of Alaska Fairbanks-State of Alaska Coastal Marine Institute (CMI)	Cooperative Ecosystem Studies Unit (CESU); University of Alaska Fairbanks (UAF); University of Washington (UW)
North Slope Science Initiative (NSSI)	North Pacific Research Board (NPRB)
USGS/Biological Resources Division (BRD)	Arctic Landscape Conservation Cooperative
Canadian Department of Fisheries/Oceans (DFO)	Arctic Council / Arctic Monitoring and Assessment Programme (AMAP)
National Science Foundation (NSF)	National Oceanographic Partnership Program
National Fish and Wildlife Foundation	Alaska Ocean Observing System (AOOS)
Federal Inter-agency Agreements: e.g. NOAA-National Marine Fisheries Service (NMFS) / National Marine Mammal Laboratory (NMML) / PMEL (Pacific Marine Environmental Laboratory) / U.S. Fish and Wildlife Service (FWS)	Industry Studies

1.5 Approved Studies for FY 2011 on Hold Pending Funding Availability

With the expectation of increased funding to support studies related to the Deepwater Horizon Oil Spill, renewable energy and expanding information needs, the 2011-2013 SDP included many more studies than usual. By the time the 2011 NSL was ready for managerial approval, the funding increase still was undecided. To prepare for all funding eventualities and to streamline the approval process, the approved FY 2011 NSL included two basic tiers of studies: 1) new starts with funding allocated that could be moved into the procurement queue with the money available (see Table 1), and 2) new studies on hold, pending the addition of financial resources (see Table 2). The studies on hold will be considered for funding in FY 2012 along with the new studies proposed in this plan.

Table 2 Alaska Studies Approved for FY 2011 on Hold Pending Funding Availability

NSL #	TITLE
AK-11-04	Synthesis Report Generation: Technical Support for Environmental Analyses on Select Regional Topics
AK-11-07	ShoreZone Mapping of the North Slope of Alaska
AK-11-08	Distribution of Fish, Crab and Lower Trophic Communities in the Chukchi Sea Lease Area
AK-11-09	Social Indicators in Coastal Alaska: Arctic Communities
AK-11-11	Workshop—Interagency Protocols for Immediate On-the-Scene Oil Spill Impact Science
AK-11-12	Maximum Credible Blowout Occurrence and Size Estimators for the Alaska OCS
AK-11-13b	Arctic Cod Genetics and Toxicity Study
AK-11-14	ANIMIDA III: Contaminants, Sources, Bioaccumulation

SECTION 2.0 PROPOSED STUDY PROFILES

2.1 Introduction

The BOEMRE Alaska OCS Region proposes ten new studies for FY 2012. The proposed studies focus on the Beaufort and Chukchi seas.

The Alaska Region actively seeks cost-sharing opportunities with other study partners, both federal and non-federal. These ongoing cost-sharing opportunities may affect the budget estimates for FY 2012 proposed new starts.

Profiles of ongoing studies can be found at:
http://alaska.boemre.gov/ess/ongoingStudies/Ongoing_studies.pdf

This website is updated two times each year and includes:
1. An updated status of each study.
2. Report due dates.
3. Related publications.
4. Affiliated websites.

For completed Alaska OCS Region Studies, go to:
http://alaska.boemre.gov/ref/AKPUBS.HTM

Table 3 lists profiles presented in a prior SDP and reviewed by the Scientific Committee during an earlier cycle. Though these previously reviewed studies have not been approved on the NSL, the requirements for the information remain.

Table 3 Previously Reviewed Studies Pending Consideration for the FY 2012-2013 NSL

Discipline	Title
SS	Baseline Nutritional Survey: Inventory and Content Analysis of Subsistence and Market Foods as Consumed by North Slope Communities
SS	Enclave Development: Alternative Approaches for Housing Transient Workers in Rural Alaska
MM	Pacific Walrus Foraging Habitat and Prey Identification from Seasonal Haulouts along the Chukchi Sea coastline

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2.2 Profiles of Studies Proposed for FY 2012 NSL

Table 4 Alaska OCS Region Studies Proposed for the FY 2012 NSL

Page No.	Discipline	Title	Ranking
33	MM	Satellite Tracking of Bowhead Whales: Habitat Use, Passive Acoustic and Environmental Monitoring	1
35	PO	Characterization of the Circulation on the Continental Shelf Areas of the Northeast Chukchi and Western Beaufort Seas	2
37	FE	Physical and Chemical Analysis of Crude and Refined Oils: Lab and Mesoscale Oil Weathering	3
39	SS	Baseline Nutritional Survey: Inventory and Content Analysis of Subsistence and Market Foods as Consumed by North Slope Communities*	4
41	HE / PO	U.S.-Canada Transboundary Fish and Lower Trophic Communities	5
43	MM	Ice Seal Movements and Foraging: Village-based Satellite Tracking and Acoustic Monitoring of Ringed, Bearded, and Spotted Seals	6
45	HE	Distribution and Habitat Use of Fish in the Nearshore Ecosystem of the Beaufort and Chukchi Seas	7
47	PO	High-Resolution Digital Bathymetry Dataset	8
49	MM	Use of the Chukchi Sea by Endangered Baleen and Other Whales (Westward Extension of BOWFEST)	9
53	IM	Conference Management and Reports on BOEMRE Results	10

AQ = Air Quality
IM = Information Management
PO = Physical Oceanography
FE = Fates & Effects
SS = Social Systems
HE = Habitat & Ecology
MM = Marine Mammals and Protected Species
REN = Renewable Energy

* This study profile was previously reviewed by the Scientific Committee.

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ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Beaufort Sea, Chukchi Sea, Bering Sea

Title: Satellite Tracking of Bowhead Whales: Habitat Use, Passive Acoustic and Environmental Monitoring

BOEMRE Information Need(s) to be Addressed: This project will extend ongoing research to provide more information on the locations and use of bowhead whale feeding areas, the variability of those locations from year to year, and the environmental factors that can be used to predict where bowhead whales will concentrate. This information is used for developing mitigation options for Beaufort and Chukchi Lease sales and exploration and development activities. Information on the vocal behavior of bowhead whales under various environmental conditions is needed to interpret the habitat use and call behavior being collected on many passive acoustic recorders currently in use. Information from this study will be used for ESA Section 7 consultations and NEPA documentation.

Cost Range: (in thousands) $2,160-$3,240 **Period of Performance:** FY 2012-2016

Description:

Background: A previous MMS study using satellite telemetry has greatly added to the knowledge of bowhead whale movements, concentration areas, and the timing of both. Multiple years of tracking during this study has begun to provide information regarding the inter-annual variability in movements and concentration areas. Continued tracking will provide a better understanding of this variability and will allow us to predict the timing and location of bowhead concentration areas making mitigation measures more directly applicable and useful.

Satellite-linked transmitters are a valuable tool for tracking bowhead whales and they have been effective at documenting movements of large and small whales of both sexes, and the timing and locations of concentration areas. Another tool, of increasing use, is the passive acoustic recorder deployed near areas of interest to record marine mammal vocalizations. Recorded bowhead vocalizations indicate that a bowhead was present at the time of vocalization, but an absence of calls could mean bowheads are present but not vocalizing. Bowhead whale vocalization rates related to various behaviors (e.g., feeding and travelling) or potential disturbances (e.g., boat traffic, seismic operations, and drilling) are needed to interpret the information being collected by passive acoustic recorders. Sensors for monitoring environmental conditions such as temperature and salinity have been developed and are in use on large whales, including bowheads in Greenland.

Objectives: To better understand inter-annual variation in bowhead whale feeding concentrations and to interpret call counts and calling rates collected by passive acoustic recorders.

Methods: This study will track the movements and document the behavior of bowhead whales using satellite telemetry to compare among years emphasizing new tagging locations such as St. Lawrence, Island, Pt. Hope and Canada. Bowhead whale vocalization rates and ambient noise levels will be documented using an acoustic tag to develop analysis of call rates relative to behavior and disturbance. Tags equipped with environmental sensors will be deployed to monitor, summarize, and transmit ambient oceanographic conditions as bowheads migrate. Limited numbers of individuals of other species of large whales (Gray, Humpback, Fin) may be tagged and tracked as opportunities arise as a pilot study for future work.

This study also will continue collaborations between whaling captains, AEWC, NSB, ADF&G, NMFS, BOEMRE, DFO-Canada, and Natural Resources Greenland and develop additional collaborations with oil companies and consultants collecting acoustic data to accomplish this project. Satellite transmitters with environmental and passive acoustic monitoring capabilities will be deployed on bowhead whales near Native villages in the Beaufort, Chukchi, and Bering seas. Plots of whale tracks will be made available weekly and location data compared among years to determine inter-annual variability of movements and concentrations. Acoustic data will be analyzed to determine individual whale calling rates relative to whale behavior and disturbance factors. This study will be coordinated with AEWC and local whaling captains' associations go prevent any interference with subsistence whaling and hunting. All necessary research and access permits will be obtained by the PI.

Revised Date: March 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Beaufort Sea\Chukchi Sea

Title:
Characterization of the Circulation on the Continental Shelf Areas of the Northeast Chukchi and Western Beaufort Seas

BOEMRE Information Need(s) to be Addressed: BOEMRE needs information on several aspects of the temporal and spatial structure of ocean currents in the northeastern Chukchi and western Beaufort seas. This needed characterization encompasses a description of the mean circulation under different wind and sea ice coverage conditions. This knowledge will be valuable for (a) improving the quality of the Oil Spill Risk Analysis that BOEMRE conducts, (b) inferring the transport of zooplankton, contaminants and other quantities in key areas, (c) providing insight into the flow-related feeding aggregations of bowhead whales near Barrow, (d) providing important information for the preparation of NEPA documents, (e) providing information for ocean modeling efforts (including validation and skill assessment), and (f) complementing ongoing social research on offshore subsistence hunting.

Cost Range: (in thousands) $3,600-$5,400 plus Joint Funding **Period of Performance:** FY 2012-2017

Description:
Background: The circulation in the region of the junction between the Chukchi and Beaufort continental shelves is likely complex given the abrupt change in the orientation of the isobaths, change in shelf width, and the convergence of the mean westward wind-driven flow over the Alaskan Beaufort Sea with the mean northeastward flow along the eastern flank of Barrow Canyon. The nature of this junction varies with the winds and ice environment. The regional circulation is such that contaminants introduced on either the Chukchi or Beaufort shelf will likely have a variety of fates. These include being advected from one shelf to the other, being flushed offshore into the Arctic basin, or perhaps accumulating within the vicinity of the western Beaufort Sea due to flow convergence from currents on both shelves. The conditions under which these various scenarios occur are not well known.

This proposed study is a continuation and expansion of the existing surface circulation study within the northeast Chukchi Sea. Prior to 2009, surface current observations on the Chukchi shelf were extremely limited. Through a joint Industry/BOEMRE supported study, the University of Alaska Fairbanks (UAF), Coastal Marine Institute began measuring surface currents during the open water period on the Chukchi shelf beginning in September 2009 with the deployment of long range (180 km), High Frequency (HF) radar systems located at the villages of Barrow and Wainwright. In 2010, coverage was expanded to the southwest to include additional offshore lease areas. The surface current data was supplemented by water column profile data collected by Slocum Gliders. Acoustic Doppler current profilers (ADCPs) were also deployed across the Alaska Coastal Current at the head of Barrow Canyon to assess the annual flow regime, the connectivity between surface and subsurface currents

during the open water season, and the changes in subsurface currents beneath the mobile pack ice and lead system during the winter months. This new study will expand our present efforts to improve understanding of the flow regime and shelf dynamics between the inner and outer Chukchi shelf, the exchange of waters between the Chukchi Sea and western Beaufort shelf through Barrow Canyon, and the upwelling of Atlantic Waters.

Objectives:

- Characterize the flow regimes and surface water exchange among areas of the inner and outer Chukchi shelf and the western Beaufort shelf under varying conditions of wind forcing and sea ice coverage.
- Describe the oceanic response, at different levels in the vertical, using all available wind observations as well as those generated by atmospheric and/or coupled models.

Methods: The above objectives will be pursued using a suite of state-of-the-art instrumentation including: ADCPs, CTDs, gliders, surface drifters, HF radar and satellites. Moored ADCPs and CTDs will be deployed to collect data year-round on vertically and time dependent currents, temperature and salinity. Moored instrumentation and gliders' navigation paths will be strategically planned to reach the objectives stated above. Data from the ADCPs, CTDs, glider deployments, HF radars, planned drifter measurements and available industry data will be synthesized to acquire a comprehensive characterization of the circulation in the study area. The sea ice extent and thickness will be obtained from satellite information, while drifting buoys will be crucial for computing flow trajectories and diffusivities. This project will coordinate and collaborate with other ongoing programs to the extent possible.

Revised Date: April 19, 2011.

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): All Alaska Planning Areas

Title: Physical and Chemical Analysis of Crude and Refined Oils: Lab and Mesoscale Oil Weathering

BOEMRE Information Need(s) to be Addressed: The Alaska OCS Region uses an oil weathering model (OWM) to provide EIS analysts with a common, quantitative set of spill weathering parameters. The OWM model calculates the area covered by a spill, an important parameter for estimating effects, but the MMS oil-spill-risk-analysis trajectory model (OSRA) does not. The OWM calculates the persistence of the lighter, but most toxic components of the oil slick and the dispersion of oil into the water. These calculations allow analysts to directly estimate persistence of toxicity, rather than assume, as in the OSRA, that these toxic components persist over the first three days of a spill. Because the size of a spill affects its weathering, the model helps distinguish between effects of large (≥1,000 bbl) and small (<1,000 bbl) spills. The in situ viscosity and degree of emulsification provided by the model are used in assessing the mitigation by and effectiveness of oil spill countermeasures such as mechanical recovery, dispersant, and in situ burning.

Cost Range: (in thousands) $360-$520 **Period of Performance:** FY 2012-2014

Description:

Background: The weathering of spilled oil is very dependent on the specific composition and physicochemical properties of each oil. The Alaska OCS Region has helped develop and currently uses the SINTEF OWM to estimate the fate and persistence of spilled oil. The OWM has recently been improved as part of the Oil-in-Ice Joint Industry Program (JIP) to better incorporate Arctic and cold weather conditions. The use of the OWM in Alaska OCS Region NEPA assessment process is limited by having a small subset of lab-analyzed oil samples specific to the Alaska OCS and North Slope to run through an OWM.

Objectives: Expand the existing SINTEF OWM library of oil compositions to cover additional representative Alaskan OCS crude and marine fuel oils through a suite of standard oil composition analyses and mesoscale empirical weathering measurements.

Methods: This study will include a 5-year license for the JIP-updated Sintef OWM. This study will research and compile existing updated weathering data for Alaska State and OCS crude oils within the last 5 years. Existing lab weathering data for Alaskan State and OCS crude and marine fuel oils will be entered into the SINTEF oils library. Conduct lab and mesoscale oil weathering tests on approximately eight Alaskan crude or condensate oils (including: Oooguruk, Nikiakchuq, Northstar, Point Thompson, Alaska North Slope) and 2-4 refined oils (such as low-sulpher marine diesel, IFO and Bunker C).

Revised Date: March 2011

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ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Beaufort Sea, Chukchi Sea

Title: Baseline Nutritional Survey: Inventory and Content Analysis of Subsistence and Market Foods as Consumed by North Slope Communities

BOEMRE Information Need(s) to be Addressed: This study will facilitate scientific understanding and analysis of potential health impacts that could derive from oil and gas industrial activities. It will also address longstanding concerns about potential cumulative effects of oil and gas activities on the North Slope. Additionally, it will provide useful information to decision-makers in Environmental Assessments and Environmental Impact Statements for upcoming and future Beaufort Sea and Chukchi Sea Lease Sales. The study will strengthen BOEMRE compliance with Executive Order 12898 on Environmental Justice and will facilitate BOEMRE research coordination with multi-agency initiatives.

Cost Range: (in thousands) $200-$300 plus Joint Funding **Period of Performance:** FY 2012-2014

Description:

Background: Many previous MMS/BOEMRE studies have documented various aspects of Native subsistence production, distribution, and consumption in coastal Alaskan communities over the last three decades. However, more research is needed on the nutritional composition of representative dietary patterns for various resident groups on the North Slope. This study will involve a nutritional survey and analysis of subsistence and market foods as actually consumed, using standard methods of nutritional epidemiology to characterize the mixed and changing nutritional system of three villages, preferably Wainwright, Point Lay, and Kaktovik. Key sampling variables for each community would likely include ethnicity, gender, age group, and lifestyle attributes, especially level of subsistence effort. The project will remunerate informants to reduce non-response.

The study would seek to establish interim baseline data regarding normative dietary patterns and corresponding nutritional content for a broad range of discrete social groups. The study would thereby contribute toward understanding whether and how incremental changes to subsistence activities on the North Slope might produce substantial impacts on the dietary behaviors and health status of identifiable Native groups. A significant body of research has emerged to indicate that different categories of North Slope residents increasingly manifest serious health problems that are related to changes in diet and consumption patterns, including diabetes, botulism, iron deficiency anemia, caries, heart disease, obesity, and substance abuse. This study would contribute to a better understanding of the social complexities of emergent pathologies and investigate if any are attributable to incremental subsistence sector disruptions that may be reasonably associated with oil and gas activities.

The study is envisioned as a collaborative, inter-agency effort, with a state agency such as Alaska Department of Health and Human Services possibly assuming the lead role. Other cooperative funding institutions may include NSSI, BLM, USFWS, the U.S. Department of Agriculture, Alaska Native Tribal Health Consortium, the North Slope Borough, and private industry. Additionally, potential sources of information and collaborators include U. of North Carolina (Popkin), University of Maine (Ranco), Center for Alaska Native Research at UAF (Bersamin), and ANTHC (Ritter).

Objectives:
This study will investigate if any emergent pathologies are attributable to incremental subsistence sector disruptions that may be reasonably associated with oil and gas activities to assess if there is a direct or indirect causal relationship between oil and gas activities and food choices. The project will:

- Improve understanding of contemporary patterns of food consumption within each sampled community.
- Analyze representative food consumption patterns and portions for nutritional value and potential contaminants.
- Estimate the percentage and dosage of food energy derived from subsistence and market sources for sampled subgroups in each community.
- Link nutritional data to existing subsistence surveys and sharing network studies to enhance analysis of potential health impacts from oil and gas development.

Methods: Investigators will: 1) secure collaborative participation of selected host communities with appropriate input on final study design and methods; 2) conduct a nutritional analysis using standard methods of nutritional epidemiology to characterize the mixed market-subsistence nutritional system of participating communities and provide incentives to ensure participation due to personally invasive nature; 3) create an inventory of market foods by purchase and consumption preference; 4) create a food consumption database of subsistence and market foods for sampled individuals based on a combination of informant journals and empirical observation; 5) assess the nutritional value of foods consumed to establish an estimate of food energy per person per day (grams/person/day) for a variety of resident groups; 6) collaborate with health science data collection activities already initiated among North Slope communities to integrate household subsistence data with dietary questionnaires; 7) compare and assess study findings against other relevant research and traditional knowledge within each community; and 8) report the results to North Slope communities through public meetings or workshops.

Revised Date: March 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Beaufort Sea

Title: U.S.-Canada Transboundary Fish and Lower Trophic Communities

BOEMRE Information Need(s) to be Addressed: Arctic OCS development interests have recently intensified in the eastern Beaufort Sea, accelerating the need to collect ecological baseline data for fish and lower trophic organisms in transboundary marine waters. Information needs include documentation of fish species presence, abundance and distribution in the lease area as well as their ecological interactions with habitat and other trophic levels (prey species and plankton). This project extends recent marine fish and lower trophic surveys in the Beaufort Sea to assess potential effects of offshore development on lower trophic food webs and essential fish habitat (EFH). Study information will be used for NEPA and other environmental analyses for future lease sales, exploration plans, and potential development and production plans in both the U.S. and Canada.

Cost Range: (in thousands) $4,000-$6,000 plus Joint Funding **Period of Performance:** FY 2012-2016

Description:

Background: Information needs in the eastern Beaufort Sea are growing, especially in light of new emphasis on marine spatial planning, EFH consultation, food web modeling and Arctic climate change issues. Currently, NEPA analysts must rely on limited historical data and extrapolation to analyze potential development impacts on eastern Beaufort Sea marine fish and lower trophic communities. A 2008 BOEMRE fish survey in the western Beaufort documented unexpected diversity, including several commercial fish species (cod, pollock, crab) previously unknown in the region. We need better information in the eastern Beaufort about what fish species inhabit the lease area, as well as baseline information about abundance, distribution, habitat, and inter-annual variability of fish and invertebrates in the understudied lower foodweb. An under-ice fish and invertebrate baseline, while challenging to obtain, is needed because Beaufort species live under ice three-fourths of the year. Additional oceanographic information about currents, upwelling, and hydrographic structure through fine-scale CTD resolution is needed to document biological habitats. Data will be used in NEPA documents to meet new NOAA requirements for Essential Fish Habitat (EFH) ecological analyses of fish, their prey and their habitat established for three additional Beaufort fish species (Arctic cod, saffron cod, and snow crab).

This trans-boundary survey effort, jointly-funded with the Canadian Department of Fisheries and Oceans (DFO), Central and Arctic Region, will share a research vessel, as well as expertise and methods. Costs will be shared in proportion to area surveyed. The collaboration will advance our knowledge of the Beaufort Sea shelf ecosystem, trans-boundary fish stocks, essential fish habitat, life stage history, and oceanographic variability. Inclusion of invertebrate and primary production sampling will address lower trophic food webs and

ecological relationships to bird and marine mammal populations. This work will also contribute to other studies including long-term monitoring efforts near Camden Bay and future international Arctic cod studies.

Objectives:

- Document baseline fish and invertebrate species presence, abundance, distribution, biomass and inter-annual variability.
- Analyze dietary habits, age and growth patterns of the most abundant species to support Canadian development of a Beaufort shelf fish and marine mammal food web model.
- Test under-ice methods and provide baseline information for the ice-covered season.
- Estimate seasonal and inter-annual variability of fish and habitats.
- Document the hydrographic structure of the eastern Beaufort shelf.
- Enhance understanding of how habitat variables (such as temperature and salinity) affect distributions under different climate conditions.

Methods: The survey will sample fish, invertebrates, and related biological and oceanographic habitat characteristics between longitudes 141° and 147° in the U.S. and into Canadian waters to ~138° (across the Canadian border to Herschel Island and the Mackenzie canyon). Field surveys will be performed every other year in order to reduce autocorrelation of climate conditions and to refine sampling strategy based on analysis of first year data. Field sampling will occur in years 1 and 3. Additional funds will be sought for a third survey in year 4 to better evaluate inter-annual variability.

This survey will expand the scope and reach of a Beaufort Sea Pilot Fish Survey conducted in 2008. Methodologies will follow those from the 2008 survey and the ongoing BOEMRE Central Beaufort Sea Fish Survey, modified in consideration of lessons learned from the earlier work. Sampling will deploy gear types such as beam trawl (10m wide), otter trawl, Isaacs-kidd, and bongo nets. This study will include additional field surveys in both the under-ice and open water seasons to provide a better understanding of seasonal and inter-annual variability and collect additional habitat characteristics; collect invertebrates in both the water column and benthos; collect CTD data to document hydrographic structure; and collect and analyze ecological (e.g. energetics, isotope, genetic and otolith) samples for a foodweb model. This contemporaneous collection of integrated data over the lower food chain and physical environment supports an ecosystem management approach.

Products will include annual progress reports, final synthesis, databases, and GIS based maps and attribute tables of marine fish and lower trophic communities for inclusion in the in-house fisheries database and use in NEPA analyses.

Revised Date: March 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Beaufort Sea, Chukchi Sea, Northern Bering Sea

Title: Ice Seal Movements and Foraging: Village-based Satellite Tracking and Acoustic Monitoring of Ringed, Bearded, and Spotted seals

BOEMRE Information Need(s) to be Addressed: More information is needed on seal movements and feeding areas relative to areas of interest for oil and gas leasing, exploration and development. Additional information would be particularly useful to evaluate potential interaction between industrial development and anticipated effects of diminished summer sea ice in much of their habitat. Data can be used to help design monitoring and mitigation measures and will provide more information to be used in NEPA environmental analyses. Since ice seals have been petitioned for listing under the ESA, information from this study may be useful for future ESA Section 7 consultations.

Cost Range: (in thousands) $940-$1,410 plus Joint Funding **Period of Performance:** FY 2012-2016

Description:

Background: Considerable effort has been expended since the 1980's to document the distribution, abundance and behavior of ice seals in the Beaufort and Chukchi Seas. However most of that effort involved aircraft surveys and analysis of prey from stomachs collected by biologists or in subsistence harvests. Some satellite telemetry studies of ringed, bearded, and spotted seals movements have been conducted (funded by MMS and others) showing large scale movements by all species and age classes. One highly successful project was conducted from 2004-2010 near Kotzebue in which local hunters were trained for capture and tagging. Seals tagged near Kotzebue ranged farther north than Barrow and south to Bristol Bay. Overall, because of the proximity to the tagging location most of the locations are in the southern Chukchi Sea near Kotzebue. Additional tagging locations are needed to better understand the range of movements and use patterns. Other village-based tagging projects could be developed to expand the tagging locations and increase the knowledge of seal movements. Tagging near Pt. Lay, Wainwright, and Barrow may show a greater use of Lease Sale 193 and the Beaufort Sea than use by seals tagged near Kotzebue. On the other hand, if seals tagged near Kotzebue go to the Yukon-Kuskokwim area and Bristol Bay, seals tagged in the Bering Sea may also use the Chukchi and Beaufort seas.

Adult ringed seals are the most ice adapted and are known to use the heaviest ice concentrations throughout winter and spring and it was assumed that juveniles occupied similar habitats in winter. Movements of adult and juvenile ringed seals tagged near Kotzebue, however, showed juveniles travelling to and wintering near the ice edge in the Bering Sea while adults wintered in heavy ice in the northern Bering and Chukchi seas. It is

likely that other similar patterns of use by species or sex/age classes will be documented during this tagging study.

Objectives: To better understand movements and habitat use of ice seals in the Beaufort, Chukchi, and northern-Bering seas.

Methods: Using the tagging project conducted in Kotzebue Sound by the Native Village of Kotzebue as a model, develop similar collaborations between local Village Councils, seal hunters, the Ice Seal Committee, NSB, ADF&G, NMFS, BOEMRE, to establish seal tagging projects near several Native villages selected for their importance in provided missing seal movement information. Biologists will train hunters in seal capture and tag deployment and provide weekly maps of seal tracks to the hunters and their communities. Movement data will be analyzed relative to ice edge, ice concentration, bathymetry, and residence times. To the extent feasible, passive acoustic recordings of vocalizations from acoustic arrays deployed in other BOEMRE studies such as BOWFEST and CHAOZ will be used to estimate relative local calling-rates for bearded and other ice seals. Native deployed "dipping hydrophones" will be used to document call rates and types near coastal villages.

Revised Date: March 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Beaufort Sea, Chukchi Sea

Title: Distribution and Habitat Use of Fish in the Nearshore Ecosystem of the Beaufort and Chukchi Seas

BOEMRE Information Need(s) to be Addressed: Information is needed on nearshore habitats and fish abundance in the Beaufort and Chukchi Seas to refine the legal definitions of Essential Fish Habitat (EFH) as presented in the Arctic FMP, adopted by NOAA in 2009. Fish in the ecologically fragile nearshore environments are particularly vulnerable to oil spills. The information from this study would be used to better identify and describe EFH in NEPA analyses and in oil spill risk assessments. A better understanding of how fish species respond to habitat variables to improve predictions on distributions under different climate conditions. This project will operate concurrently with other fish sampling efforts (AK-10-06 and AK-11-08) to provide a seamless baseline of forage fish data from the beach to the offshore environment.

Cost Range: (in thousands) $120-$180 plus Joint Funding **Period of Performance:** FY 2012-2014

Description:

Background: The Arctic is one of the most rapidly changing ecosystems in the world, yet a large void exists in information on EFH and what species and life stages use these habitats. Information is nonexistent or sparse for fishes in the Arctic, especially in shallow, nearshore waters (shoreline out to 8 m depth). Nearshore habitats are some of the most productive habitats in Alaska and the most at risk to development and oil spills. Many species included in the Arctic Fisheries Management Plan for the Arctic, such as capelin and rainbow smelt, use nearshore habitats at some time in their life but estimates of their abundance and habitat use are poorly documented. Nearshore habitats differ from offshore (>30 m depth) habitats, as do fish assemblages in each area. Recent nearshore research in the Arctic has been limited to the Barrow area, which represents only a small fraction of the nearly 1,700 km of the U.S. Arctic coastline. Prior to major development or transportation activities in the Arctic, more information is needed on fish distribution and habitat use, life history characteristics, food webs, and species at risk to make informed management decisions regarding potential effects from global climate change and human disturbance. In addition, warming conditions in the Arctic will likely result in a reorganization of community structure; new fish species are expected to migrate to the Arctic with unknown consequences to existing stocks and food webs.

Many Arctic fish species are important in the diet of higher-level predators and in Inupiat subsistence fisheries. For example, in the Bering, Beaufort, and Chukchi seas, Arctic cod and saffron cod occur in the diets of 13 marine mammal species and 20 seabird species. Availability of prey is critical to some Arctic marine mammals such as ice seals, which

themselves are important in the diet of polar bears. Larger predators are already under stress by reduced ice cover. The distribution, diversity, and habitat use of nearshore fishes is largely unknown in other areas of the Arctic, especially in the Chukchi Sea. The proposed study would expand fish distribution and habitat use information to the eastern Beaufort Sea and western Chukchi Sea.

Objectives: The objectives of this study are to:

- Inventory the distribution and diversity of nearshore fish, their habitat and prey along high priority sites in the Beaufort and Chukchi Seas
- Assess age and diet of fish important as prey species
- Describe oceanographic features of areas with nearshore fish
- Understand how habitat variables like temperature and salinity affect fish species distributions

Methods: Beach and small otter trawl sampling will occur in areas of high importance, defined as locations near oil and gas production, or close to foraging areas for birds or marine mammals, followed by areas with opportunities for research platforms for three sampling seasons. In the summer and fall 2012 two primary areas will be at sites between Prudhoe Bay and Camden Bay to establish a baseline of fish and habitat use and as reference sites to Camden Bay. Camden Bay has an Exploration plan in place for 2011.

A random sample of key fish species (e.g., Arctic cod, saffron cod, and capelin) will be collected for age and diet analyses. A sample of select fish species will also be collected, frozen, and archived for later fatty acid and genetic analyses. Habitat will be measured at each sampling site. At seine sites each beach will be profiled according to ShoreZone protocols. Intertidal invertebrates and macroalgae will also be recorded. Additionally, a drop camera will be deployed, depending on water visibility, to search for and identify unusual habitat types and other fish species that may not be captured by seine or trawl.

Models will be generated to predict habitat use by fishes according to habitat variables. Maps will be generated to describe species distribution relative to multiple habitat variables. Information that may lead to NOAA's EFH general distribution will be shared. Relational databases will be built that contain data on species presence and abundance that will expand the current BOEMRE fish database, be suitable for use in GIS, and complement ShoreZone mapping efforts.

Revised Date: March 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Beaufort Sea, Chukchi Sea

Title: High-Resolution Digital Bathymetry Dataset

BOEMRE Information Need(s) to be Addressed: A high resolution regional bathymetry data set is a necessary component in the agency's efforts to develop an ocean circulation model for the Beaufort and Chukchi seas. The accuracy of ocean circulation fields are closely linked to the accuracy of the bathymetric grids for the area. Currents steer around topographic features such as Hanna Shoal and Herald Shoal in the Chukchi Sea, and waters are exchanged through deep passageways of Barrow Canyon and Herald Valley. More data is needed to better define the seafloor topography in and around these features. In addition, improved bathymetry data would be extremely useful in analyzing the relationship between changes in seafloor topography and observed currents presently being collected from HF radar, ADCPs and AUVs within the Chukchi Sea Lease Area. A high resolution bathymetry data set would also be used to better define the seafloor linkages to stable landfast ice extent, acoustic models, and critical biological habitat.

Cost Range: (in thousands) $160-$240 **Period of Performance:** FY 2012-2014

Description:

Background: High-resolution regional bathymetric survey data in digital format is required for BOEMRE mapping, analysis, and modeling purposes over the Beaufort and Chukchi Sea Shelf areas. Improved high-resolution bathymetric data on a regional scale would increase our ability to interpret the habitats of invertebrates, fish and marine mammals. Better bathymetry can assist scientists in the study of ice gouges and strudel scour and obtain better information on the modeling of oil spill trajectories, locate potential archeological sites and assist current BOEMRE studies to position oceanographic instruments and conduct sediment sampling. The acquisition of high resolution bathymetric data will provide maps charts and interpretive results that would be extremely beneficial to biologists, oceanographers, geologists, archeologist and managers in multiple agencies (BOEMRE, NOAA, NMFS, USGS/BRD), and would improve the accuracy of our data analysis and model results.

Oceanographic studies that seek to understand the marine environment require accurate depictions of the ocean's bathymetry. Because ocean circulation and the other components of the climate system do not recognize national boundaries, it is necessary to assemble datasets from beyond our national borders and integrate them into a coherent product. Two MMS-sponsored workshops, Small-Scale Sea-Ice and Ocean Modeling (SIOM) in the Nearshore Beaufort and Chukchi Seas (MMS 2003-043) and Physical Oceanography for the Beaufort Sea (MMS 2003-045) have both identified need for better bathymetry data as high priority.

Objectives: The primary objective will be to produce a high-resolution regional bathymetric data set for the Beaufort and Chukchi seas to assist BOEMRE in interpreting physical and

chemical oceanographic conditions, improve the output from our ongoing data collection efforts (Physical and Biological), including improved analysis of our observations of currents within the Chukchi Sea, improvements to ocean circulation models, oil spill trajectory analysis, and better defining critical biological habitats.

Methods: This project will aggregate and combine available bathymetry data for the Beaufort and Chukchi seas in digital format. Data will be aggregated from industry surveys, research programs such as SCICEX, Shelf Basin Initiative (SBI) and JAMSTEC, BOEMRE physical and biological studies, NSF Office of Polar Programs, and vessels of opportunity. Researchers will perform quality control error-checking and then assimilate the information into a single dataset. In addition, researchers will produce a report that describes coverage and accuracy of collected data sets and identifies areas where new surveys are needed to improve coverage.

Revised Date: March 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Beaufort Sea, Chukchi Sea

Title: Use of the Chukchi Sea by Endangered Baleen and Other Whales (Westward Extension of BOWFEST)

BOEMRE Information Need(s) to be Addressed: Whale species listed as threatened and/or endangered are known to, or potentially could, occur in areas that may be affected by oil and gas activities within the Chukchi Sea planning areas. These include, but are not limited to the humpback (*Megaptera novaeangliae*), the fin (*Balaenoptera physalus*), and the bowhead (*Balaena mysticetus*), all of which are listed as endangered. Recent sightings of both humpback and fin whales in the Chukchi and/or Beaufort seas, indicate a range expansion by one or both species. Gray (*Eschrichtius robustus*) and beluga (*Delphinapterus leucas)* whales also use these waters in large numbers. Under NEPA and the ESA, BOEMRE will be required to evaluate if and how federal actions associated with oil and gas development may affect these whales. The occurrence, distribution and habitat use of these species in the areas concerned may play an important role in determining where and when exploration or access to petroleum reserves may be conducted.

Cost Range: (in thousands) $3,600-$5,400 plus Joint Funding **Period of Performance:** FY 2012-2017

Description:

Background: Research underway on the Bowhead Feeding Study indicates that large concentrations of bowhead whales feeding in the Barrow arch (Wainwright to Smith Bay) are attracted by prey and nutrients transported from the Bering Sea through Barrow Canyon and upwelled onto the Beaufort shelf near Barrow. Other large concentrations of whales, pinnipeds and water birds are found in the area and may be attracted by elements of the same mechanism. However, it is not clear exactly how this transport mechanism operates as these resources could be transported through the Chukchi Sea on the Alaska Coastal Current or by other sources of Bering Sea waters. This study will undertake to determine relationships between dominant currents passing through the Chukchi Sea and resources delivered to the Barrow Arch area and will provide information about the dynamic nature of those relationships relative to whale distribution and habitat utilization in the eastern-Chukchi and extreme western-Beaufort seas.

The relationships between Chukchi Sea currents and the transport of nutrients and prey may be more dynamic than formerly appreciated and may be changing as a result of the warming of the surface waters and increasing retreat of summer sea ice in the Chukchi. Recent observations of humpback and fin whales in the Chukchi are likely a climate change-related range expansion that will continue in future years. Even as the range of these cetaceans appears to be expanding, with the exception of the bowhead whale, little is known about the population identities of any of the whales observed there. In the case of the humpback

whales, it is possible that they are part of the relatively small western North Pacific stock. Virtually nothing is known about the extent to which the region is important for humpback or fin whales. Gray whales make extensive use of the Chukchi for feeding and at least some gray whales have been documented in the area during every calendar month. Gray whales potentially could belong to stocks associated with either North America or Asia. Although gray whales have been documented in the Chukchi Sea by surveys over the past three decades, the ecology of the species has not been studied in the area. Over 10% of the Eastern Pacific Stock may use the Chukchi for summer feeding. They are known to make extensive summer use of waters near the Burger Prospect and Peard Bay, areas of significant interest for industrial development. Beluga whales are frequent visitors to lagoons and coastal waters along the eastern Chukchi Sea coast. They are prized as a traditional species taken for subsistence and ceremonial purposes by Natives resident along that coastline. Beluga stock associations are not well known but belugas in the region are probably from a mixture of several stocks inhabiting the Chukchi Sea and Arctic Ocean.

Since all five species winter in, or south of, the Bering Sea, large numbers must pass through the Bering Strait during seasonal migrations to feeding grounds further north. Beginning at the Bering Strait, this research will investigate the currents and nutrient/prey transport process using methods and equipment developed for physical and biological oceanography. Additional work on the distribution, stock identity, and ecological relationships is needed for all five whale species and this all will be accomplished in a cooperative, highly-integrated study involving scientists supported by BOEMRE, the NSB DWM, and the NSF.

Objectives:

- Estimate spatial and temporal patterns of use of the Chukchi Sea by endangered bowhead, fin and humpback whales, and beluga and gray whales.
- Assess population structure and origin of animals.
- Evaluate ecological relationships for the species, including physical and biological oceanography.
- Extend existing studies of bowhead whale foraging ecology into the Chukchi Sea to further understand the transport and advection of krill from the Gulf of Anadyr.

Methods: This study requires technologies including satellite tracking, passive acoustic monitoring, genetic analyses, and oceanographic and biological methodologies and technologies.

Northern Bering Sea. Satellite tags will be attached to humpback and fin whales, and their movements through the Chukchi Sea will be monitored through the Argos system. No fin whales have been satellite tagged in this region. Up to 20 tags per species would be deployed in each of 4 years. Population structure and origin will be assessed by genetic analysis of biopsy samples.

Chukchi Sea/Bering Strait. In the Chukchi, arrays of listening devices will be deployed in the Bering Strait and near Wainwright, Alaska, with the intention of monitoring the occurrence and movements of large whales transiting through the area. The study proposed here will also permit a full visual and acoustic survey to be conducted between Dutch Harbor and the Bering

Strait/Wainwright. In addition, photo-id, biopsy sampling and satellite tagging will be attempted if humpback, fin and gray whales are found en route. Cruises will be organized to extend similar research activities to those areas during years 3-4 of the study. Whales will be tagged in the region as practical. Oceanographic surveys, including prey sampling, will be conducted in association with cruises, and will include studies of foraging ecology of bowheads using similar methods to those employed in the Beaufort Sea. Instrumented moorings may be deployed for year-around monitoring of oceanography and sound. The study will be integrated with other ongoing studies in the regions including aerial surveys, passive acoustic monitoring and oceanography. Analysis of acoustic data from new and existing recording packages will investigate the occurrence of gray, humpback, fin and bowhead whales on a year-round basis.

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ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2015

Region: Alaska

Planning Area(s): All Alaska Planning Areas

Title: Conference Management and Reports on BOEMRE Results

BOEMRE Information Need(s) to be Addressed: Conference management supports formal information transfer meetings (ITMs) to disseminate study results and to resolve environmental and technical issues for BOEMRE program managers. ITMs also increase public confidence in the data used by the OCS program. Workshops may be coordinated with future lease sales and for NEPA analyses and documentation focusing primarily on the Beaufort Sea and Chukchi Sea.

Cost Range: (in thousands) $120-$180 **Period of Performance:** FY 2012-2015

Description:

Background: The transfer of scientific information is continuous and the Alaska Environmental Studies Program (ESP) needs to constantly organize and conduct ITMs and workshops. Conference participants have the opportunity to exchange environmental studies information with experts and interested parties on selected topics oriented to formulating concepts for new research projects and/or to address study needs. During the past decade the Alaska ESP has held information status meetings and planning workshops for the exchange of studies information among scientists, stakeholders and the general public.

To improve the accessibility, use and exchange of study results, the Alaska OCS Regional office conducts public meetings with a variety of formats. Generally, ITMs are 3-day events and workshops of shorter duration (1 to 2 days in length) that may focus on a single discipline or topic. ITM conferences make clear the scope and detail of information-gathering activities relating to the Alaska OCS. They give interested parties an opportunity to participate in discussions of important topics dealing with oil and gas leasing, exploration, and development in the Arctic region. They also serve as opportunities for regional staff to learn about the information that has been gathered and, therefore, help ESP to formulate study plans for future years.

Objectives: The objective of this procurement is to provide the logistical support for small meetings and workshops to highlight the work of the Environmental Studies Program in Alaska and foster sharing of information among researchers and interested parties through small meetings, workshops and publications on OCS environmental studies information.

Methods: The primary method is to manage meetings and workshops and assist with preparation, coordination, logistics, program agenda, and invitation of speakers and participants.

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2.3 Profiles of Studies Proposed for FY 2013 NSL

Table 5 Alaska OCS Region Studies Proposed for the Fiscal Year 2013 NSL

Page No.	Discipline	Title
57	MM	Polar Bear Movement Patterns and Habitat Use in Relation to Oil and Gas Activities in the Chukchi Sea
59	MM	Improving Estimates of Abundance and Distribution of Avian Species during Peak Spring and Fall Migration Pathways through Near Shore Areas of the Eastern Chukchi Sea
61	MM	Ecology of Beluga Whales in the Eastern-Chukchi, Western-Beaufort Seas
63	PO	Applications for Mapping Spilled Oil in Arctic Waters
65	MM	Field Evaluation of an Unmanned Aircraft System (UAS) for Studying Cetacean Distribution, Density, and Habitat Use in the Arctic*
67	SS	Enclave Development: Alternative Approaches for Housing Transient Workers in Rural Alaska*
69	MM	Pacific Walrus Foraging Habitat and Prey Identification from Seasonal Haulouts Along the Chukchi Sea Coastline

AQ = Air Quality
IM = Information Management
PO = Physical Oceanography
FE = Fates & Effects
SS = Social Systems
HE = Habitat & Ecology
MM = Marine Mammals and Protected Species
REN = Renewable Energy

* This study profile was previously reviewed by the Scientific Committee.

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ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Chukchi Sea

Title: Polar Bear Movement Patterns and Habitat Use in Relation to Oil and Gas Activities in the Chukchi Sea

BOEMRE Information Need(s) to be Addressed: This study examines the seasonal distribution and habitat use of polar bears in the Alaska Chukchi Sea in relation to areas of oil and gas exploration and provides information necessary for Marine Mammals Protection Act permitting and development of related mitigation measures. Information would be used to: 1) identify areas and time periods where polar bear ranges overlap with oil- and gas-related activities, and use this information to develop appropriate mitigation measures; 2) understand the movement patterns and habitat use of polar bears in the near-shore Chukchi Sea area; 3) evaluate the body condition and diet of bears in this population in relation to annual variation in sea ice conditions; and 4) evaluate vital rates and population status. Information from this study may be used for NEPA documentation and ESA Section-7 consultations.

Cost Range: (in thousands) $2,000-$3,000 **Period of Performance:** FY 2013-2018

Description:

Background: The MMS has funded considerable research on polar bears and their populations in the Beaufort Sea during the past decade, including methodological studies evaluating RFID and FLIR technologies. Other studies are documenting the movements of satellite-tagged bears in both the U.S. and Canadian Beaufort Sea. However, much less research has been conducted in the Chukchi Sea and there is an urgent need to better understand the distribution, movement patterns and population status of polar bears in that Region. The Chukchi Sea has experienced a significant reduction in sea ice in the past several decades. The response of polar bears to the loss of sea ice as a platform for movement and foraging, and to changes at lower trophic levels is currently unknown. Simultaneous to environmental changes has been increased activity in the region to explore for and potentially develop access to oil reserves within open-water areas of the Chukchi Sea. As a result, information is currently needed on the distribution, seasonal movement patterns, and swimming behavior of polar bears in relation to current and planned oil and gas activities in the Chukchi Sea for analysis and spatial planning purposes. This information would serve to complement on-going studies, funded partially by MMS, to examine bear movement patterns and condition in the fall in the Southern Beaufort Sea. Since seasonal distributions appear to be changing, a better understanding of the distribution and overlap of bear populations along both the Chukchi and Southern Beaufort Sea coasts would aid in mitigating industrial activities occurring in both habitat regions and monitoring the changes since 1995 for spatial planning and assessment of long term changes. Basic information on the status of the Chukchi Sea population is also needed, including body condition, health, vital rates, and population size to better inform management of the population vitality and viability.

Objectives:

- Estimate the seasonal distribution of the polar bear population in the Chukchi Sea and the potential for interactions with oil- and gas-related activities in and near the Chukchi Sea Outer Continental Shelf lease area.
- Estimate habitat use patterns of radio-collared female polar bears through using resource selection functions. These analyses will identify seasonal habitat use patterns and will be compared to pre-1995 habitat use for evaluating climate change effects on polar bear distribution.
- Evaluate the condition and health of polar bears in the Chukchi Sea and identify the best methodology for assessing vital rates and determining population size.

Methods: Capture polar bears in the spring of each year in the eastern Chukchi Sea to collect samples, evaluate diet and body condition, and deploy approximately 25 satellite-radio collars on adult females to study movements and other behaviors. Diet will be estimated using standard laboratory techniques including fatty acid analysis. Body condition will be estimated using morphological measurements taken at capture. Develop resource selection models of contemporary seasonal habitat use to determine the potential overlap between industrial activities and bear habitat use. Use saltwater sensors on satellite radio-collars to determine the amount of open-water use in the fall of each year.

Revised Date: March 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Chukchi Sea

Title: Improving Estimates of Abundance and Distribution of Avian Species during Peak Spring and Fall Migration Pathways through Near Shore Areas of the Eastern Chukchi Sea

BOEMRE Information Need(s) to be Addressed: Information gained from this research will be used in ESA Section 7 Consultations and NEPA reviews for lease sales, EPs, DPPs and other reviews for post-sale and post-exploration decision making and mitigation in the Chukchi Sea Planning Area. In particular, this work will contribute significantly to cumulative impact assessments on marine birds of concern that will be affected by proposed onshore and offshore lease sales throughout their breeding, molting, staging, and wintering habitats in Alaska. Further, results of this work may be evaluated for use to develop mitigation measures and stipulations designed to protect migratory birds, a DOI trust resource.

Cost Range: (in thousands) $348-$522 **Period of Performance:** FY 2013-2014

Description:

Background: Barrier islands, lagoons, bays, and offshore leads along the Alaskan coast of the Eastern Chukchi Sea (ECS) have been identified as important breeding, feeding, staging, and molting areas for large numbers of water birds. Near shore areas of the ECS are important staging sites for several species of waterfowl and loons during migration to and from breeding areas in arctic Alaska and Canada. Waterfowl and loons acquire critical pre-breeding and pre-wintering fat reserves in the ECS with some species using the ECS during periods of flightless molt. Among the species known to use the ECS, Spectacled Eiders (*Somateria fischeri*) are listed as threatened under the U.S. Endangered Species Act, and Yellow-billed Loons (*Gavia adamsii*) are designated as a candidate species. Steller's Eiders (*Polysticta stelleri*), also listed as threatened under the U.S. Endangered Species Act might also migrate through the ECS en route to southern molting and wintering areas. Pacific Brant is a species important to both subsistence users in Alaska and fall hunters throughout the Pacific Flyway. Pacific Brant are listed as a U.S. Fish and Wildlife Service-Migratory Bird Program focal priority species and are currently managed under a "restrictive" harvest regime due to low population size.

Recent satellite telemetry data from marked sea ducks and loons suggest that most birds used areas within 60 km of the northwest coast of Alaska from May through October, with peak use coinciding with spring and fall migration. However, marked birds also used areas as far as 110 km from the coast, within Lease Sale 193. Current understanding of the abundance and distribution of birds using near shore areas of the ECS is based on limited satellite telemetry data, and land and vessel based observations. Additional information is needed to better characterize the abundance and distribution of birds that use the ECS, especially in near shore areas.

In late summer and fall, up to 49% of the world population of Pacific Brant occurs in Kasegaluk Lagoon and directly proximate to leases sold in the Chukchi Sea Planning Area. Habitats and birds using this critical staging area could be impacted by human activities from onshore and nearshore facilities associated with offshore lease sales and by contaminants resulting from potential oil spills.

Objectives: The overall objective of this study is to estimate the abundance and distribution of avian species in near and off-shore areas of the ECS during peak spring and fall migration. Specifically it will:

- Document Pacific Brant spatial distribution, abundance, and timing of use in Kasegaluk Lagoon, landward of the Chukchi Sea Planning Area.
- Document Spectacled Eiders, Yellow-billed Loons, and Steller's Eiders spatial distribution, abundance, and timing of use within the offshore areas between Cape Lisburne and Barrow.

Methods: Aerial surveys will be conducted in spring and fall 2012 to coincide with ongoing Spectacled Eider, Red-throated Loon (*Gavia stellata*), and Yellow-billed Loon satellite telemetry studies. Within each season, surveys will be conducted over a period of 14 to 20 days. Survey areas and transects will be modified daily using near real time satellite telemetry data to optimize flight time. Surveys will be conducted within 110 km of the ECS coast of Alaska between Cape Lisburne and Barrow. The biweekly census will also include geese in following accepted methodologies.

Surveys will be conducted using established methods by 2 observers from a twin-engine, high-wing aircraft like an Aero-Commander model 690. Transects will be followed using on-board GPS and a laptop computer. Species identification and estimates of abundance will be aided by digital photography using a camera capable of producing high quality images (> 12 megapixel) with continuous shutter and image stabilization. The camera will also interface with the on-board laptop computer to georeference images and to check image quality in real time. Visual species identification, estimated abundance, and GPS locations will also be logged on the on-board laptop.

Resulting digital photographs will be used to identify species and count individuals using Adobe Photoshop CS-4 and ArcGIS 9.x. When possible, the sex and age of individual birds will also be identified. Data will be analyzed following accepted methods.

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ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Beaufort Sea, Chukchi Sea

Title: Ecology of Beluga Whales in the Eastern-Chukchi, Western-Beaufort Seas

BOEMRE Information Need(s) to be Addressed: The beluga whale is protected under the Marine Mammal Protection Act (MMPA) and is important for subsistence use by Native Alaskans along the Chukchi Sea coastline. Subsistence use by Natives is also protected under the MMPA and cannot be compromised by other activities such as oil and gas development. This study will provide information on habitat use and selection by beluga whales in the eastern-Chukchi and western-Beaufort Seas, a region currently under intense interest for development. Satellite tracking data provides valuable information about distribution and movements of belugas. Data for assessing prey and habitat use are also needed. Understanding habitat (e.g., bathymetry, ice cover, specific geographic locations) and prey use by belugas will be instrumental in evaluating and mitigating potential impacts on subsistence within lease areas. Information from this study will be used for NEPA documentation.

Cost Range: (in thousands) $2,400-$3,600 **Period of Performance:** FY 2013-2018

Description:

Background: Several stocks of beluga whales use the Chukchi and Beaufort seas. The Beaufort Sea stock migrates through the area in late April and May to summering areas in the Canadian Beaufort Sea. They migrate back through the planning areas during autumn to winter in the Bering Sea. Animals from the eastern Chukchi Sea stock move into the nearshore waters adjacent to Point Lay and Wainwright along the northwest coast of Alaska. A satellite tracking study, jointly funded by the Alaska Beluga Whale Committee, the North Slope Borough and the MMS, showed that belugas from this stock used a large portion of the Alaska Beaufort Sea during the summer and migrated back south through the Chukchi Sea during autumn.

Belugas in the Beaufort and Chukchi Seas have be subject to seasonal survey effort by the MMS BWASP and recent surveys in the Chukchi Sea. Limited other research has been conducted in recent years including a study of 26 belugas that were live-captured, fitted with satellite transmitters and tracked. Transmitters lasted from less than a week to up to 16.5 months and provided a great deal of information about where belugas spent the summer, portions of the autumn, and one transmitter last long enough to provide the first information about the wintering area. Transmitters also collected information about diving behavior.

With increasing oil and gas activities in the Beaufort and Chukchi seas, there is a need to better understand distribution and movements of belugas, and prey and habitat use and selection. Analysis of summer and fall habitat use of satellite-tracked belugas from the

eastern Beaufort Sea has already occurred. A similar analysis for eastern Chukchi Sea belugas is needed.

This research project will be a broad collaboration including the Alaska Beluga Whale Committee, the North Slope Borough, Alaska Department of Fish and Game and NMML as well as ChukoTINRO and other Russian marine mammal researchers and hunters. Representatives of Alaska Native communities will participate in all aspects of the work and analysis.

Objectives:

- Evaluate prey and habitat use and selection of eastern-Chukchi and western-Beaufort Sea belugas relative to age and sex and determine winter distribution in the Bering Sea;
- Compare prey and habitat use and selection between whales from the proposed study and those from the eastern-Beaufort Sea;
- Evaluate overlap of beluga habitat use and selection with lease areas in the Beaufort and Chukchi seas.
- Evaluate potential conflicts between subsistence activities and oil and gas development along the Eastern-Chukchi Sea coastline.

Methods: Whales will be satellite tagged in cooperation with Chukchi Sea Native subsistence users at villages such as Pt. Lay. Local Natives will be involved in this study to the maximum extent possible and every attempt will be made to ensure that this study does not interfere with subsistence activities or intrude on life in the isolated coastal communities. Cruises will be conducted as necessary to assemble data on oceanographic conditions, prey and associations among belugas, sea ice and the former factors. This study will develop GIS based models to determine habitat use and selection relative to age and sex of belugas. In addition to data to be collected in this study, data will be used from belugas that were tracked with satellite transmitters in 1998, 1999, 2001, 2002, and 2007. The models will include location data, and attributes of those locations including: bathymetry, ice cover, distance from shore, prey and other oceanographic data. The models will evaluate habitat that is used relative to habitat that is available. Comparisons will be made between belugas of the eastern Chukchi Sea and eastern Beaufort Sea stocks. Aerial survey data of belugas, from BOEMRE's Bowhead Whale Aerial Survey Program and other surveys, will be evaluated for the potential of further understanding of inter-annual and intra-annual differences in distribution, habitat use and selection. A final report will be drafted providing BOEMRE with information about beluga habitat use and selection that will include evaluation and recommendations for mitigation of the potential impacts from oil and gas activities in lease areas on subsistence use of beluga whales by Natives in the Beaufort and Chukchi Seas.

Revised Date: March 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Chukchi Sea

Title: Applications for Mapping Spilled Oil in Arctic Waters

BOEMRE Information Need(s) to be Addressed. The results from this study will benefit BOEMRE Oil Spill Risk Analysis (OSRA) and oil spill fate modeling efforts, and may improve detection and cleanup operations in the event of a large oil spill. Outputs could be used to verify oil spill contingency plans. Results will support decisions associated with environmental assessments and exploration plans. BOEMRE analysts and decision makers will use the results to improve NEPA analysis and documentation for any future Alaska OCS lease sales.

Cost Range: (in thousands) $1000-$1500 plus Joint Funding **Period of Performance:** FY 2013-2017

Description:

Background: Based upon the recent tragic event in the Gulf of Mexico, there is a strong need in the Arctic OCS to test, develop, and implement the observational platforms, mapping software, and oil spill models that could track and assess the fate of spilled hydrocarbons. Such systems are presently being tested in the Gulf of Mexico and preliminary tests have been successful. This study would build and test similar equipment to be used on AUVs for the Arctic. This study will jointly fund and field test environmental response and mapping software in cooperation with Federal, State, and industry parties who would be willing to share costs and incorporate real-time observational data into this tracking and mapping software system. We will develop and test the instrumentation for AUV gliders that can map, sample and analyze potential subsurface hydrocarbon-enriched plumes in order to understand their distributions, transport, aging, and ecosystem consequences, especially with regard to the potential use of dispersants. BOEMRE will jointly work with other interested parties to field test the capability of the environmental response and mapping software to track a planned release of fluorescein dye within the Chukchi Sea. Real time data streams from aerial surveys, ship tracks, gliders, drifters, meteorological buoys, HF radar generated surface currents and possibly satellite tagged marine mammals and birds will be tracked. Protocols will be developed and tested over multiple field experiments to assess applications for tracking a potential spill in the offshore during the open water season.

Objectives:

- Develop a better understanding of small scale transport processes important to fate and effects modeling used in oil impact analysis.
- Assess the effectiveness of HF Radar surface current mapping system and drogue drifters for providing near-surface current input data to oil spill models.
- Develop, test, and deploy instrumentation for Autonomous Underwater Vehicles (AUV) that can be customized for use in the Arctic to detect the spatial and temporal

- Conduct at least two field tests through the dispersal and tracking of non-toxic fluorescein dye off the Chukchi coast.
- Track the dispersed dye plume by incorporating input from the AUVs and other real time data collection sensors in the Chukchi Sea (e.g., surface currents from HF Radar, drifters, real time WRF real time high resolution wind fields, data from meteorological buoys and other offshore instruments) to assess the fate and transport of the dye plume.
- Develop algorithms quantifying small scale transport processes based upon measurable oceanographic and meteorological data (i.e., advection, Langmuir circulation, wind drift, vertical and horizontal dispersion coefficients, etc.)

Methods: The first part of this effort will develop the instrumentation necessary for gliders to map the subsurface movement of a hydrocarbon plume. The second part will develop the field protocols to track the movement of dispersed fluorescein dyes (simulated spill) on the surface and within the water column utilizing shipboard and aerial surveys and real time observation systems within the Chukchi Sea. The researchers will obtain permits to release non-toxic dyes that can be tracked within the Chukchi Sea through the use of shipboard CTDs and fluorometers, aerial surveys or very high resolution satellite imagery, existing coastal radars, drifters and underwater gliders. Researchers will conduct two years of field tests to perfect equipment and produce protocols, work to improve existing or develop new mapping systems for the Chukchi Sea that could be used to incorporate real time data feeds from the deployed AUVs along with other real time surface observations and conduct analysis of the dispersed dyes to achieve a better understanding of the associated transport processes.

Revised Date: March 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Beaufort Sea, Chukchi Sea

Title: Field Evaluation of an Unmanned Aircraft System (UAS) for Studying Cetacean Distribution, Density, and Habitat Use in the Arctic

BOEMRE Information Need(s) to be Addressed: Bowhead whales (*Balaena mysticetus*) and gray whales (*Eschrichtius robustus*) are seasonal residents of the western Beaufort Sea and the Chukchi Sea. These Arctic waters provide important feeding grounds and migration pathways for both species. Bowhead and gray whale distributions overlap spatially with lease sale areas in this region. Their occurrence in Arctic waters coincides with the timing of industrial activities related to oil and natural gas exploration, development, and extraction, which occur mostly in the "open water" season when sea ice is minimal. Both species are protected under the Marine Mammal Protection Act, and the bowhead whale is granted additional protection as an endangered species under the Endangered Species Act (ESA). Under the National Environmental Policy Act (NEPA) and the ESA, BOEMRE is required to evaluate if and how federal actions associated with oil and gas exploration and development may affect these species. The density, spatiotemporal distribution, and habitat use of these species in the areas concerned may play an important role in determining where and when the oil and gas industries may conduct their activities. Standard methodologies for studying these ecological questions include the use of vessel observations, passive acoustics, and aerial surveys conducted from manned aircraft. In recent years, there has been increasing interest in using Unmanned Aircraft Systems (UASs) to survey cetaceans (especially bowheads) in the outer continental shelf region of the Arctic. The performance of UASs relative to human observers in manned aircraft for detecting cetaceans, identifying individuals to species, estimating group size, identifying sensitive age classes, and estimating population density in space and time is unknown, but must be understood prior to the acceptance of the UAS platform as a substitute to manned aircraft for conducting these investigations.

Cost Range: (in thousands) $1,200-$1,800 **Period of Performance:** FY 2013-2015

Description:

Background: Manned aircraft are a common platform for studying wildlife because they are relatively cost-effective for surveying large geographic areas and take advantage of humans' ability to quickly integrate sensory information on the biological and physical environment in order to detect, identify, and count species of interest. In recent years, there has been increasing interest in using UASs to study wildlife populations. In particular, UASs have been suggested as an alternate survey platform for studying the distribution and density of the Bering-Chukchi-Beaufort (BCB) stock of bowhead whales in the western Arctic, which have been investigated using manned aircraft since 1979. The primary advantage of using UASs to survey marine wildlife in the Arctic is that they eliminate the risk of sending humans far from shore in small aircraft in areas with extreme weather conditions. Furthermore, some UASs are relatively low cost, and some have relatively long flight times. Finally, it has been shown

that UASs are less likely to disturb pinnipeds, and, therefore, might invoke less of a response from cetaceans as well.

The UAS technology with the highest probability of successfully surveying cetaceans was developed for military purposes in desert environments and only recently has been applied to the natural sciences. For surveying cetaceans, the UASs' ability to encounter, detect, and identify cetaceans and quantify their abundance must be understood relative to the proven capabilities of human observers in manned aircraft. The effectiveness of UASs in surveying cetaceans has yet to be demonstrated. A small number of limited field tests have been conducted and provided initial insight into the levels of success that may be achieved using UASs. The results from these preliminary studies warrant further investigation into the use of UASs for studying cetaceans. Additional insight will be gained only through direct comparisons of UASs and the human eye in the field, with large whales (bowheads and gray whales) as the primary targets.

Objectives:

- Evaluate detection rates and ability to identify cetaceans in Arctic waters using available UAS technology.
- Compare cetacean encounter rates, detection probabilities, identification abilities, and group size estimates between a UAS and human observers during simultaneous field tests and surveys.
- Describe improvements needed in UAS technology (payloads, cameras, etc.).
- Provide recommendations for the types of monitoring or mitigation requirements that can likely be met by UASs.

Methods: The BOEMRE will pursue joint-funding opportunities for this project. Potential partners include NMFS-NMML, Office of Naval Research, UAF, and industry. Planning and permit application will occur during the first year. Field experiments will occur in the second year in the eastern Chukchi or western Beaufort Sea during the open water season (June – October), a season when both bowhead and gray whales have reliably been found feeding in and migrating through the region. Well-trained marine mammal observers will search from aircraft or vessels either by unaided eye or through binoculars. A UAS will operate concurrently in the same area, with a well-trained marine mammal observer on the team, viewing digital video in real-time to detect, identify, and count cetaceans visible in the video feed. The digital video footage will be saved to enable additional analyses into UAS performance later.

This study will be integrated with other ongoing BOEMRE studies in the region, including aerial surveys studying the distribution, density, and feeding ecology of cetaceans.

Revised Date: March 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Area(s): Chukchi Sea

Title: Enclave Development: Alternative Approaches for Housing Transient Workers in Rural Alaska

BOEMRE Information Need(s) to be Addressed: With the construction of Prudhoe Bay oil facilities, transient industrial workers on the North Slope of Alaska were housed in enclaves separate from existing indigenous communities. Subsequent MMS/BOEMRE social and economic impact models are still based upon this premise of enclave housing, even though more recent economic development opportunities in places like Nuiqsut and Wainwright demonstrate a move toward less segregation. Workers are increasingly based in Alaska Native villages with temporary housing provided by Village Corporations. The situation calls for re-evaluation of assumptions of the enclave model and reanalysis of potential community impacts.

Cost Range: (in thousands) $280-$420 **Period of Performance:** FY 2013-2015

Description:

Background: A defining pattern of North Slope oil production is that oil development historically has taken place in isolated industrial enclaves where most workers are out-of-region residents working in shifts. Because they have little or no direct association with proximate Alaska Native villages, this arrangement has helped to limit direct impacts on local communities. A recent analysis of the Chukchi Exploration Plan disclosed that oil companies have negotiated with the Alaska Native community of Wainwright to construct a shorebase facility for transient workers, at least during the exploration phase. This study intends to analyze available community data to assess and predict more thoroughly the potential consequences from increased community contact with industrial workers.

Nuiqsut could serve as one example from which to process data and draw analytical conclusions. In Nuiqsut, industry has replaced the enclave model with hotel accommodations at nearby Alpine for housing some transient workers. Two more large units are planned for construction, yet little analysis to assess effects on local residents has been undertaken except a Human Health Impact Analysis (HHIA). The HHIA predicted that the demographic change could result in stresses including diminished access to subsistence resources, with potential resulting changes in: a) diet and food security; b) psychosocial/gender effects, such as increased substance/alcohol abuse, violence/homicide, or accelerated assimilation; and c) occupational/community health effects, such as expanded workplace health screening and immunization protocols, STI transmission prevention strategies, and substance abuse enforcement.

The BOEMRE recognizes that there are distinct cultural differences between the Iñupiat Eskimo who live in the North Slope and transient industrial workers. Currently, decision

documents stipulate implementation of mitigation through education, and industry is required to enhance employee cultural sensitivity through educational presentations administered prior to deployment to the region and thereafter on an annual basis. One component of this study would be to assess if this is an effective mitigation measure that will offset potential conflicts and socio-cultural changes resulting from a rotating series of strangers embedded in the community through no personal choice of their own.

Objectives: The purpose of this study is to assess current and trend-line housing practices for transient workers throughout the North Slope of Alaska, to re-evaluate historical assumptions about enclave models of development, and to analyze potential community impacts based on fresh data and analysis in Nuiqsut and Wainwright.

Methods: This study will employ various social science methods, focusing on select communities that have historically provided housing for transient workers. The collection and analysis of data to assess short-term and longer-term effectiveness will be accomplished through the following: 1) compilation of an annotated bibliography with a special emphasis on identification of industrial housing policies in the past in Alaska; 2) ethnographic review of past development activities associated with oil and gas elsewhere to assess effects upon local indigenous populations by transient industrial workers; 3) review and assessment of premises in existing Human Health Impact Assessments and current epidemiological data for the North Slope; 4) synthesis of available social indicator data and broader discussion regarding effects of enclave development in light of local support to engage in profitable contractor services. Draft and final reports will be provided.

Revised Date: March 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Alaska

Planning Areas: Chukchi Sea

Title: Pacific Walrus Foraging Habitat and Prey Identification from Seasonal Haulouts Along the Chukchi Sea Coastline

BOEMRE Information Need(s) to be Addressed: The Marine Mammal Protection Act requires mitigation of potential disturbance of walrus (*Odobenus rosmarus*). Future oil and gas activities on the OCS of the Chukchi Sea and support activities onshore have the potential to disturb resting and foraging walrus. In addition, the Pacific walrus has been proposed for listing under the Endangered Species Act.

Results of this study would be used to support NEPA analysis and potential ESA consultations in relation to geological and geophysical surveys, exploration plans and development and production plans that result from Lease Sale 193 activities in the Chukchi Sea, as well as NEPA analysis for future lease sales in the Chukchi Sea. The Chukchi Sea Lease Sale 193 area overlaps with important walrus foraging habitat. Identifying key foraging and resting areas, and predicting how these may change over time increases our ability to mitigate potential impacts to walrus from the oil and gas industry by situating offshore and onshore facilities and pipelines in areas of less importance to walrus where possible.

Cost Range: (in thousands) $320-$480 **Period of Performance:** FY 2013 - 2017

Description:

Background: Pacific Walrus, particularly females with calves, have traditionally relied on summer sea ice as a foraging platform over the continental shelf in the Chukchi Sea. Summer sea ice in the Arctic has declined by more than 11% per decade between 1979 and 2010. Changing sea ice patterns are forcing walrus ashore along the Chukchi Sea coast in late summer and fall. Terrestrial haulouts made up of thousands of walrus have been forming between Cape Lisburne and Barrow along the Chukchi Sea coastline since 2007. Walrus foraging trips from these terrestrial haulouts may be limited in range, particularly for females accompanied by calves that have a limited ability to remain in cold water for extended periods of time. Over time, walrus may have to choose between less optimal prey items or less optimal haulout locations. This study would advance the analysis of cumulative effects of oil and gas development in conjunction with impacts of climate change to the Pacific walrus population. Results of ongoing walrus tagging studies conducted by USGS/BRD and ADF&G, and haulout studies conducted by FWS combined with the results of this study would greatly increase our understanding of walrus foraging and habitat use in the Chukchi Sea.

Objectives: Determine whether walruses' prey selection or foraging areas change over time, either within seasons or between years, with increased use of nearshore habitats for foraging from terrestrial haulouts.

Methods: Researchers will work with local residents, ADF&G, FWS and BRD to collect walrus feces from terrestrial haul out sites along the Chukchi Sea coastline several times throughout each haulout season. The fecal samples will be analyzed for prey taxa using a molecular approach. The researchers will generate maps of likely foraging areas in the Chukchi Sea based on known distributions of prey taxa and analyze seasonal and annual changes in prey species and foraging locations in relation to haul out locations. The proposed study will be integrated with the tagging and haulout studies mentioned in the background section to differentiate between prey ingested near the fecal collection sites and prey ingested further from them.

Revised Date: March 2011

SECTION 3.0 TOPICAL AREAS FOR FY 2014

This section presents a general forecast of significant topical issues and concerns to be addressed by studies to be proposed for FY 2013 and beyond. In general, these topics conform with the research themes of the ESP. Due to the great differences existing between Alaskan environments and other OCS areas, the uniqueness of issues in Alaska has dictated the need to anticipate new topical areas for implementation within the Alaska ESP. These projects will focus on BOEMRE mission needs within the context of increasing offshore exploration and development and potential trends in a changing climate. Specific geographic emphases are likely to change due to potential changes in leasing or development schedules, as well as the release of the next five-year *Oil and Gas Leasing Program*.

Many of the studies proposed for FY 2012 and FY 2013 address the topical areas described below. These will be re-assessed as part of the FY 2013 planning process.

As noted in Section 1.2.1 of this document, the *Revised Program Outer Continental Shelf Oil and Gas Leasing Program 2007-2012* (USDOI, BOEMRE, 2010) pointed to a need for more environmental research in the Arctic before additional leasing occurs. It will also be important for BOEMRE to continue post-lease monitoring studies and other priority studies of key species and marine communities in the Beaufort and Chukchi seas. Studies of bowhead whales will continue to be a priority for the region. Many studies of other sensitive marine mammals, including cetaceans, polar bears, pinnipeds and other marine mammals are expected to continue into 2012 and beyond. Additional studies may be brought online which address fish and migratory waterfowl. Future studies will include those aimed at determining spatial and temporal habitat use patterns, habitat description and monitoring and evaluations of health over time. Studies aimed at understanding potential impacts to subsistence species and subsistence practices will continue to be important. Additional studies of the physical environment, such as current regimes and ice characteristics, will be proposed to support interpretation of data from living resource investigations and to provide a better understanding of the fate and dispersion of OCS discharges.

3.1 Climate Change

Climate change is accelerating in the Arctic, leading to a rare but true baseline environmental change. In recent years, the extent of summer ice cover is decreasing more rapidly than was predicted by most global change models. The extent, duration, and thickness of summer ice cover in the Arctic region have decreased to record historical lows. The loss of ice cover is causing changes to both physical oceanography and ecosystem productivity and has significant ramifications for marine mammals, bird and fish species that live on, below, or near the ice.

Climate change will also lead to altered water chemistry. In particular, the average pH of the surface ocean is projected to decrease by as much as 0.5 pH units by 2100 due to the uptake of excess carbon dioxide (Sigler et al., 2008). In addition, higher water temperatures can result in increased biological production and decomposition.

Oceanic current patterns in the Arctic, especially in nearshore regions, are strongly influenced by climatological factors such as winds, river runoff and sea ice coverage. The rapid changes in each of these factors that are now occurring could lead to drastic alterations of the surface current fields. Oil-spill trajectory analyses performed by BOEMRE are based on surface current data derived from ocean circulation hindcast models. As climate change continues, oil-spill trajectory modeling may need to incorporate forecast data.

Climate change also entrains many socio-economic issues. Some immediate concerns include: increased shoreline erosion and permafrost melt that threatens arctic villages and infrastructure; changes in distribution and availability of hunted subsistence species; and potential changes in commercial and subsistence fisheries as commercial species such as salmon move north. In consideration of such basic transition, scientists are challenged to project how climate change effects will interact with OCS activities in the Arctic over the next 25-50 years.

3.2 Physical Oceanography

An ongoing challenge in the Alaska OCS Region is the need for better, finer scale circulation and oil-spill models and higher resolution data. This need is underscored by the rapidly changing conditions in the Arctic. Continued development and application of state-of the-art circulation models is important for future OSRA-based EIS analyses.

Improvements are also needed in sea ice aspects of the modeling. The resolution of ice models and ice data needs to be increased to address the propagation of fine scale non-random interactions across hundreds of miles of pack ice in the case of ice leads, as evidenced by recent improvements in satellite oceanography.

The accuracy of surface wind fields, ocean currents, and information regarding the spatial and temporal variability of polynyas, leads, and landfast ice are important for determining the fate of spilled oil in this region and the impacts on biota associated with these systems. Studies conducted by the Alaska OCS Region have demonstrated that landfast ice completely blocks wind forcing of under-ice waters. Thus water moves differently under landfast ice than adjoining open or pack ice waters. It becomes very important to know locations of and seasonal changes in the distribution of landfast ice.

3.3 Fate and Effects

The Region has collected baseline biological and chemical monitoring data in the vicinity of the Liberty Prospect and Northstar since 1999, as part of the studies “Arctic Nearshore Impact Monitoring in the Development Area (ANIMIDA)” and “Continuation of Arctic Nearshore Impact Monitoring in the Development Area (cANIMIDA).” The summer of 2007 was the last field season for the current cANIMIDA project. The cANIMIDA task of monitoring of Cross Island whaling has been continued. A continuation of ANIMIDA/cANIMIDA sediment chemistry monitoring, emphasizing hydrocarbon and priority metal concentrations is also proposed as a new FY 2011 study. The study proposed for FY 2011 has been expanded

to include Camden Bay, where drilling is planned to delineate discoveries in the Sivulliq and Torpedo prospects.

In addition to site-specific monitoring, ANIMIDA and cANIMIDA re-examined the regional sediment quality in the nearshore U.S. Beaufort Sea. The MMS set up the Beaufort Sea Monitoring Project (BSMP) in the 1980s to monitor sediment quality. The BSMP monitored trace metal and hydrocarbon levels in sediments and benthic biota at specific locations on a regional basis. The ANIMIDA and cANIMIDA projects have resampled many of the BSMP stations from Harrison Bay to Camden Bay and Coastal Marine Institute studies resampled BSMP areas further west (Point Barrow) and east (Beaufort Lagoon). The need for additional monitoring will continue to be re-evaluated as oil and gas development in the Alaska Region OCS evolves.

3.4 Endangered and Protected Species

Production at the Northstar site and at other potential sites may lead to risks of oil spills from buried pipelines, other discharges, noise from various industrial and support activities and increased human interaction with arctic offshore species. Species protected under the ESA, MMPA and the Migratory Bird Treaty Act are of particular concern if impacted by such factors. Study of the effects of oil and gas-related activities on protected mammals and the need for continued monitoring of endangered species are expected to be continued—as well as assessment of how any changes in the bowhead whale migration's distance from shore could relate to subsistence success (see below). Future bowhead studies are expected to continue to explore use of satellite tagging for information on bowhead whale residence times in development areas. The BOEMRE anticipates pursuit of new opportunities to obtain and update information on bowhead behavior in response to industrial noise through the use of appropriate research partnerships.

Effects of construction activities on polar bears, especially on denning bears, and concerns about the adequacy of information about all age/sex categories of the bear population will need to be addressed by additional research. Several ongoing studies are expected to lead to recommendations for additional information regarding polar bears and continued study of the bear population's vulnerability to oil spills through improved models.

Other key subsistence species potentially exposed to short-term or cumulative impact factors for which behavioral or monitoring studies may be needed include beluga whales, walrus, ringed seals, ribbon seals and bearded seals.

3.5 Marine Fish Migrations, Recruitment and Essential Fish Habitat

The BOEMRE needs information to assess and manage the potential environmental effects of offshore development on marine fish. More detailed information is needed about the biology and ecology of many marine fish species inhabiting the Alaska lease areas. The highest priority BOEMRE information needs include species presence, distribution, abundance and potential effects of oil spills, particularly during periods when ice is present. As offshore oil

development interest expands to deeper and more widespread areas, additional fisheries information is required.

As a result of the Magnuson Fishery Conservation and Management Act, effects on Essential Fish Habitat must be evaluated in NEPA analyses. In the Bering and Chukchi Seas, more information is needed to evaluate Essential Fish Habitats in the Chukchi Sea as commercial fish species move northward from the Bering Sea. Beaufort waters are also considered Essential Fish Habitat for salmon, and future research on salmonid reproduction in Beaufort Sea drainages is indicated to clarify environmental assessment and mitigation needs.

Seismic exploration and its effects on fish is becoming a high-priority issue for arctic residents. More information regarding the effects of seismic exploration on the health, behavior, distribution, and migration of the numerous important fish species of the Beaufort and Chukchi seas would be valuable for NEPA analyses.

Alaska Native villagers are concerned that OCS activities will affect subsistence fish populations and reduce subsistence utilization. Thus, additional research on arctic fisheries and recruitment to nearshore feeding populations should be considered. Several fish species used for subsistence migrate through, or are found in, the Northstar and Liberty areas of the Beaufort Sea, including arctic and least cisco, Dolly Varden, arctic char, and humpback and broad whitefish. Intermittent occurrences of pink and chum salmon also take place in Beaufort coastal waters.

A need for more information on the forage fish resources and their relation to apex predators in the Bering, Chukchi and Beaufort seas is also indicated. A good understanding of the seasonal distribution, abundance and habitat use of forage fish, including key spawning and migration events that quickly transfer large amounts of energy to upper trophic levels, is fundamentally important to monitoring the potential environmental impacts associated with offshore development.

3.6 Subsistence

Residents of the North Slope coastal communities frequently express concern about cumulative impacts of offshore and onshore developments on their subsistence lifestyle. Relative to existing oil and gas operations, the villages of most pressing concern are Nuiqsut, Kaktovik and Barrow. Consideration of cumulative impacts is an increasingly important issue for BOEMRE in preparing NEPA documents. Some of the concerns of the Iñupiat include diminished access to hunting and fishing areas around oil industry infrastructure, reduced harvests, increased hunter efforts and increased hunter cost. How, and to what degree, subsistence activities have been affected by industry infrastructure and industry activity is a concern that may be further addressed by additional research.

A significant body of research has emerged to indicate that some North Slope residents increasingly manifest serious health problems that are related to changes in diet and consumption patterns, including diabetes, botulism, iron deficiency anemia, caries, heart disease, obesity, and substance abuse. The study “Baseline Nutritional Survey: Inventory

and Content Analysis of Subsistence and Market Foods as Consumed by North Slope Communities" proposed for FY 2012 would contribute to a better understanding of whether and how incremental changes to subsistence activities on the North Slope might produce substantial impacts on the dietary behaviors and health status of identifiable Native groups.

Aggregate effects research also encompasses a broader set of issues concerning how the Iñupiat society has been potentially affected. Relevant issues include a wide range of topics, such as the changing relationship between the cash economy and household subsistence activities, changing sources of anxiety and stress at multiple levels of organization, potential changes in sharing of subsistence resources and potential changes in the recruitment of youth into subsistence activities. Social indicators should be maintained to serve as a basis for estimating long-term aggregate impacts.

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Studies Development Plan

Headquarters

U.S. Department of the Interior
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ABBREVIATIONS AND ACRONYMS

ADCP	Acoustic Doppler Current Profiles
AERMOD	AMS/EPA Regulatory Model
ASLO	American Society of Limnology and Oceanography
BOEMRE	Bureau of Ocean Energy Management, Regulation, and Enforcement
CAMx	Comprehensive Air Quality Model
CMAQ	Community Multi-scale Air Quality model
CMAS	Community Modeling and Analysis System
CMSP	Coastal and Marine Spatial Planning
COARE	Coupled Ocean Atmosphere Response Experiment model
DOI	U.S. Department of the Interior
DWH	Deepwater Horizon
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EMF	Electro-magnetic Fields
EPA	Environmental Protection Agency
ESP	Environmental Studies Program
ESPIS	Environmental Studies Program Information System
ESP-PAT	Environmental Studies Program Performance Assessment Tool
FY	Fiscal Year
GOM	Gulf of Mexico
GIS	Geographic Information System
HPPG	Renewable Energy High Priority Performance Goal
IPCC	Inter-governmental Panel on Climate Change
IWG-OE	Interagency Working Group – Ocean Education
LME	Large Marine Ecosystems
MMC	Multi-purpose Marine Cadastre
MM5	Mesoscale Model version 5
NCEP	National Center for Atmospheric Prediction
NEPA	National Environmental Protection Act
NMEA	National Marine Educators Association
NMFS	National Marine Fisheries Service
NMNH	National Museum of Natural History
NOAA	National Oceanic and Atmospheric Administration
NOP	National Ocean Policy
NOPP	National Oceanographic Partnership Program
NOSB	National Ocean Sciences Bowl
NSL	National Studies List
OCD	Offshore and Coastal Dispersion
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act of 1953
OEMM	Office of Offshore Energy and Minerals Management
OMB	U.S. Office of Management and Budget
OSRA	Oil Spill Risk Assessment
PART	Program Assessment Rating Tool

PROFS	Princeton Regional Ocean Forecast System
RASS	Radio Acoustic Sounding Systems
SDP	Studies Development Plan
WRF	Weather Research and Forecasting model

SECTION 1.0 PROGRAMMATIC OVERVIEW

1.1 Introduction

The Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) serves as the steward for America's offshore energy and mineral resources on the Outer Continental Shelf (OCS). The BOEMRE plays a key role in America's energy supply by managing the mineral resources on 1.7 billion acres of the OCS. The OCS is a significant source of oil and gas for the Nation's energy supply. The approximately 43 million leased OCS acres generally account for about 15 percent of America's domestic natural gas production and about 27 percent of America's domestic oil production. The BOEMRE's oversight and regulatory frameworks ensure that exploration, installation, operations, and decommissioning proceed in an environmentally responsible manner, and proceed safely.

The offshore areas of the United States are estimated to contain significant quantities of resources in yet-to-be-discovered fields. The BOEMRE estimates of technically recoverable oil and gas resources in undiscovered fields on the OCS (2006, mean estimates) total 86 billion barrels of oil and 420 trillion cubic feet of gas. These volumes represent about 60 percent of the oil and 40 percent of the natural gas resources estimated to be contained in remaining undiscovered fields in the United States.

The OCS Lands Act requires the Department of the Interior (DOI) to prepare a 5-year program that specifies the size, timing and location of areas to be assessed for Federal offshore natural gas and oil leasing. It is the role of DOI to ensure that the U.S. government receives fair market value for acreage made available for leasing and that any oil and gas activities conserve resources, operate safely, and take maximum steps to protect the environment.

The OCS oil and gas lease sales currently are held on an area-wide basis with annual sales in the Central and Western Gulf of Mexico with less frequent sales held in the Eastern Gulf of Mexico. Sales in Alaska are focused on the Beaufort and Chukchi Seas and in Cook Inlet. The one sale scheduled in the Mid-Atlantic under the current 5-year program was cancelled. The program operates along all the coasts of the United States – with oil and gas production occurring on the Gulf of Mexico, Pacific, and Alaska OCS.

As established oil- and gas-producing areas mature, America's energy industry is pushing into new frontiers (both in the Gulf of Mexico and in Alaska waters) in its search for hydrocarbon resources. This advance is critical to meeting the Nation's energy needs through production of domestic resources; but it also poses new risks in terms of the high reservoir pressures and temperatures faced during deep drilling operations, the cross-currents that affect deepwater operations, and the logistical challenges of operating in the Arctic environment. The risks associated with deep water high pressure reservoirs became evident during the Deepwater Horizon event in April 2010, creating substantial new baseline and monitoring requirements.

The BOEMRE planning process links BOEMRE activities to the Department of the Interior's Strategic Plan (U.S. DOI, 2007) in two major mission component areas: Sustainably Manage Energy, Water and Natural Resources and Provide a Scientific Foundation for Decision Making. Careful planning ensures that goals and strategies are cascaded throughout the organization.
Within BOEMRE, Offshore Energy and Minerals Management's (OEMM) strategies guide the development of budget documents and are used as input for planning and performance documents in support of ongoing efforts to build a Department-wide strategic plan. The OEMM's ongoing work to oversee offshore energy and marine mineral exploration and development on the OCS, from lease offerings to lease abandonment, also addresses our multiple mandates to ensure safe and sound operations, minimize impact on the environment, achieve fair market value, and foster conservation of mineral resources. This work includes ongoing critical research on the environment and safety-related technologies, and preparation of rigorous environmental assessments for proposed development activities. The environmental research component is conducted through the Environmental Studies Program (ESP).

The ESP was initiated in 1973 as a means to gather and synthesize environmental science and socioeconomic information to support decision-making concerning the offshore oil and gas program. The Outer Continental Shelf Lands Act of 1953, (OCSLA), as amended in 1978 (U.S. Congress, 2000), established policy for the management of the OCS oil and gas leasing program and for the protection of marine and coastal environments. Section 20 of the Act authorizes the ESP and establishes three general goals for the program:

- Provide the information needed for assessment and management of environmental impacts on the human, marine, and coastal environments of the OCS and the potentially affected coastal areas;

- Predict impacts on the marine biota which may result from chronic, low level pollution or large spills associated with OCS production, from drilling fluids and cuttings discharges, pipeline emplacement, or onshore facilities; and,

- Monitor human, marine, and coastal environments to provide time series and data trend information for identification of significant changes in the quality and productivity of these environments, and to identify the causes of these changes.

Early ESP efforts summarized and synthesized available information. Early field studies were designed to provide a statistically valid baseline of the biological, geological, chemical, and physical characteristics of proposed leasing areas. Over the years many changes have occurred. Leasing and development activities now are focused predominantly in the Gulf of Mexico (GOM), with development and promising leasing activity in Alaska's Beaufort and Chukchi Seas, as well as some production in southern California. Studies conducted in these areas are focused on characterizing environmental processes, determining the presence and abundance of important species, and investigating how species use the habitats to address critical OCS information needs.

Additionally, the passage of the Energy Policy Act of 2005 gave BOEMRE new responsibilities in not only new frontier "areas" but also in frontier "technologies." There is significant potential for renewable energy from wind, wave and ocean currents offshore, focused along the Atlantic and Pacific coasts. While these nascent technologies are not producing energy on the OCS yet, efforts to support current and future renewable energy activities are underway. The BOEMRE also is responsible for other mineral production offshore, which currently includes using sand and gravel for coastal restoration projects.

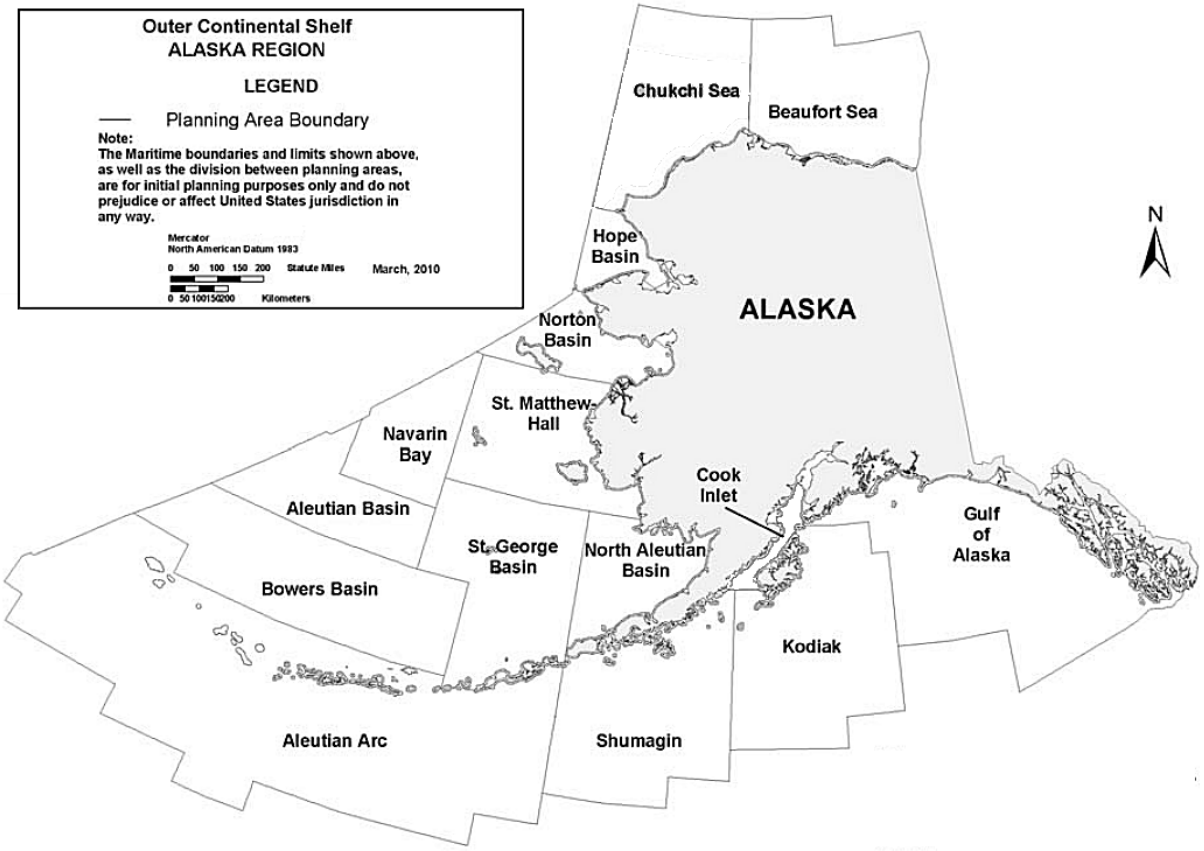
The ESP Headquarters component of the Studies Development Plan (SDP) provides the national "context" of the Program and the linkages between BOEMRE's diverse Regional needs. In contrast to the Plans prepared by our Regional Offices which focus on specific geographic areas or technologies, the Headquarters Office SDP emphasizes issues (and sometimes specific studies) which are more national in scope with program-wide application. ESP Headquarters provides leadership and general program support (quality assurance, peer review planning, information and data management and dissemination), and integration of BOEMRE's physical oceanography studies to support oil spill risk assessment (OSRA).

1.2 Map of the Planning Area

The OCS is divided into 26 planning areas across four geographic regions – Atlantic, Pacific, Gulf of Mexico (Figure 1) and Alaska (Figure 2).

Figure 1. Atlantic, Pacific and Gulf of Mexico Planning Areas

Figure 2. Alaska OCS Region Planning Areas



1.3 Projected OCS Activities

1.3.1 General Program Support

Annual support for the activities of the OCS Scientific Committee continues to be provided as a Headquarters Office function. The Scientific Committee was established to advise the Director of BOEMRE on the feasibility, appropriateness, and scientific value of the proposed studies.

In recognition of the benefits of peer-review and to enhance dissemination of environmental information as widely as possible, and to promote the Bureau as a potential employer, BOEMRE routinely provides support to scientific conferences, workshops and symposia. In some cases, symposia have a dedicated session on OCS research. Sometimes, OCS-sponsored research is presented within the context of a wider scientific discipline. In other cases, BOEMRE supports meetings which have topics with strong relevance to mission related information needs. The conferences to which we provide funding usually also receive funding support from other partners.

Another area of program support sponsored by the Headquarters office is the archiving of biological specimens. The Smithsonian Institution's National Museum of Natural History (NMNH) is the Nation's most reliable and respected repository for biological collections. Since 1979, invertebrate specimens collected through the BOEMRE Environmental Studies Program have been carefully maintained through the NMNH's archiving standards and made available to taxonomists around the world. Nearly 300 new species have been discovered in BOEMRE contributions.

1.3.2 Program Quality Assurance

National attention has been directed towards performance measures and accountability. During the Fiscal Year (FY) 2004 budget cycle, the ESP underwent a program review by the Office of Management and Budget (OMB). Through the use of the OMB's Program Assessment Rating Tool (PART), the ESP received one of the highest scores in government. We are proud of this achievement but there is always room for improvement. To this end, working with guidance provided by OMB, we designed and implemented the Environmental Studies Program Performance Assessment Tool (ESP-PAT), an internal, online system to monitor the effectiveness of ESP products in fulfilling the Bureau's information needs and the efficiency of the program in delivering products on time. While designing performance measures for research programs has always been viewed as problematic at best, the ESP-PAT has accomplished this task ensuring that the ESP fulfills its mission of providing the best possible scientific information for making decisions concerning our offshore resources.

In developing the FY 2011 budget and performance plan, the Department of the Interior's Office of Planning and Performance Management identified a limited number of high priority performance goals to be in focus. The ESP reports on two measures under the Renewable Energy High Priority Performance Goal (HPPG) to "Increase approved capacity for production of renewable energy resources by at least 9,000 MW through 2011." The program's stated milestone is to achieve approval of the upcoming fiscal year's National Studies List (NSL) by the end of August each year. Further, the ESP reports the percentage of environmental studies for renewable energy information needs awarded (including hybrid studies that benefit renewables) in a given fiscal year. The ESP typically meets or exceeds the established targets for ESP-PAT and HPPG metrics.

In February 2011, the Department issued a new policy (U.S. DOI, 2011) meant to ensure and maintain the integrity of scientific and scholarly work used for decision making in the Department. The Policy replaces BOEMRE's earlier 2009 policy and includes the designation of a Departmental Science Integrity Officer and represents the first time scientific integrity guidelines have been adopted Department-wide by a Federal agency. The Policy calls for use of science and scholarship to inform management and public policy decisions and establishes scientific and scholarly ethical standards, including codes of conduct, a process for the initial handling of alleged violations, and clear guidance on how employees can participate as officers or members on the boards of directors of non-Federal organizations and professional societies. This policy applies to all Department employees, including political appointees, when they engage in, supervise, manage, or influence scientific and

scholarly activities, or communicate information about the Department's scientific and scholarly activities, or utilize scientific and scholarly information in making agency policy, management or regulatory decisions. Further, it applies to all contractors, cooperators, partners, permittees, and volunteers who assist with developing or applying the results of scientific and scholarly activities.

1.3.3 General Peer Review Planning

Section V of OMB's Final Information Quality Bulletin for Peer Review (Executive Office of the President, 2004) requires that agencies "begin a systematic process of peer review planning" and publish a "web-accessible listing of forthcoming influential scientific disseminations (i.e., an agenda) that is regularly updated by the agency."

Numerous mechanisms within the ESP identify and fulfill the requirement for scientific peer review. These existing mechanisms include:

- Review and critical input by scientific advisory committees under the Federal Advisory Committee Act
- Internal review of proposals by BOEMRE scientists
- External review of proposals by other Federal and nongovernmental scientists
- Review and critical input by Scientific Review Boards or Modeling Review Boards
- Scientific peer review of final reports, and/or
- Publication in peer-reviewed technical and/or scientific journals.

These measures begin early in the development stages, and continue during the course of projects. These components taken together ensure that the science produced by the ESP is of the highest quality and thus creates a sound basis for decision-making.

1.3.4 Information Management and Dissemination

While the goal of the ESP is to gather and synthesize environmental science and socioeconomic information to support decision-making concerning the offshore program, the information must be available in a usable form and in a timely manner. The ESP recently formally codified its standard operating procedures for the distribution and use of study results to ensure that they are distributed quickly to all relevant parties and users of the information.

This rapid information dissemination is a key information management activity. An important resource for easy access to completed ESP products through the web is the Environmental Studies Program Information System (ESPIS) at http://www.gomr.boemre.gov/homepg/espis/espisfront.asp. Full-text files, abstracts, and relational databases are searchable by the system. This allows users to easily search for, identify, and select sections of text, or bibliographic citations that relate directly to the desired subject.

Planned enhancements of the ESPIS database will make all completed ESP reports available online as full electronic PDF documents. ESPIS will be linked to the Multipurpose Marine Cadastre to create a tool to search geospatially for reports and data from completed

environmental studies. It is envisioned that ESPIS will facilitate information sharing for National Environmental Policy Act (NEPA) assessment, oil and gas and alternative energy leasing, and inform the Coastal Marine Spatial Planning (CMSP) initiative.

Information concerning ongoing research supported through the ESP is accessible at: http://www.boemre.gov/eppd/sciences/esp/HappeningNow.htm. The ongoing research is arranged by BOEMRE OCS Region and discipline (e.g., biology, socioeconomics, physical oceanography, fates and effects, etc.). Information provided for each study includes a complete description, status report, cost, and expected date of its final report. Affiliated web sites and presentation abstracts and papers are provided where applicable.

In some cases, the BOEMRE supports the archiving of data collected as part of a study. Where appropriate, the data are required to be sent to the National Ocean Data Center. Another effort that BOEMRE supports is the Census for Marine Life. Efforts are underway to fill a gap in the archiving of data for marine mammals and other marine life.

1.3.5 Physical Sciences and Oil Spill Risk Analysis

The Headquarters Office's role in coordinating regional physical oceanographic studies focuses on understanding and verifying general physical processes and features common to the OCS. The mechanisms of these processes and features in the ocean and atmosphere control the transport of materials and cause the mixing and redistribution of pollutants. The knowledge and information obtained from the physical oceanography and meteorology studies are used in assessing: 1) the transport of spilled oil, 2) the dispersion of discharge fluids and produced water, 3) the movement and spread of air pollutants, and 4) the effects on the migration of marine mammals, the distribution of fishes, and other biological resources.

The BOEMRE is committed to the continuous improvement of its OSRA estimations, and is using the results of field and modeling studies of ocean circulation to fulfill that commitment. The BOEMRE is currently modernizing the software programs that are used to make the risk estimations. As part of this effort, the additional capability to present results in a geographical format is proposed. The fate of spilled oil is another area of focus. Laboratory analysis is conducted on the various types of oil and computer models predict the behavior of an oil spill in the ocean environment. Furthermore, Headquarters staff members actively seek cooperative efforts with other agencies and private industries in such matters. These efforts leverage BOEMRE's resources, while providing additional needed information and external review.

The BOEMRE is similarly committed to improving air quality models applied to assess air quality impacts. An additional study with two components is proposed to improve numerical air quality models. These studies will investigate the algorithms currently in use and use the information to improve the models in use by BOEMRE now.

1.3.6 OCS Renewable Energy

The Energy Policy Act of 2005 delegated to BOEMRE the responsibility for offshore renewable energy development, including energy derived from offshore wind, waves, and ocean currents. Regulations to govern leasing for these energy types and operations were promulgated in 2009. To ensure that development occurs while protecting the environment, the ESP is funding projects to evaluate the potential effects on the environment including interactions between birds and wind turbines, space/use conflicts, visual effects, and effects from electromagnetic fields (EMF). Renewable energy information needs have been folded into the appropriate regional plans. Additional staff support is provided from the Headquarters office to support renewable energy study procurements as needed.

1.3.7 Global Climate Change

Recognized changes in the global climate are of concern to BOEMRE. The changing environment has resulted in shifts in the distribution of some marine species. These shifts, in turn, change the baseline conditions that are used to evaluate the potential impacts from offshore energy-related activities. Of particular concern are the changes in ice conditions in Alaska and the implications for oil spill projection and response. Ice also provides habitat and changing conditions will alter the distribution of some species. Along the Gulf and Atlantic Coasts, sea level rise and the implications of changing patterns of storm activity are concerns. The BOEMRE is incorporating these effects and their implications in NEPA documents. Our many monitoring efforts to meet other requirements provide excellent time series data useful to the understanding of climate change. While direct research on climate change is outside the purview of the ESP, many studies that are evaluating marine ecosystems assist in the understanding of climate effects and changes that are occurring.

1.3.8 Partnership

The ESP actively coordinates our efforts with programs such as the National Oceanographic Partnership Program (NOPP). NOPP is a collaboration of federal agencies to provide leadership and coordination of national oceanographic research and education initiatives. As a charter member of NOPP, the ESP continues to explore options to increase its participation. Our NOPP investments have grown dramatically in recent years. We have funded research through NOPP focused on chemosynthetic communities, the archaeological and biological effects of shipwrecks, surface circulation radar mapping in Alaska, and in FY 2010 on improving cetacean electronic data loggers and a variety of renewable energy projects. Two of our NOPP-related studies have received awards. The study, Archeological and Biological Analysis of World War II Shipwrecks in the Gulf of Mexico (Church et. al 2007) was awarded the NOPP Excellence in Partnering Award and also the U.S. Department of the Interior Partnership in Conservation Award. The Deepwater Program: Investigations of Chemosynthetic Communities on the Lower Continental Slope of the Gulf of Mexico study also was awarded the DOI Partnership in Conservation Award.

Most recently, the Department of the Interior recognized two ESP projects with the 2010 Partners in Conservation Award. In the first study awarded, History of the Offshore Oil and Gas Industry in Southern Louisiana, the ESP, in collaboration with Louisiana State University, the University of Houston, the University of Arizona, and the people of southern Louisiana gathered a collection of oral histories from the men and women of southern Louisiana whose inventiveness and entrepreneurship contributed to the growth of the offshore oil and gas industry. The oral history project provides a unique historical reference for the energy-producing industry and an enduring source of pride for the State of Louisiana and its people. In the second study receiving the award in 2010, the ESP partnered with the Alaska Department of Fish and Game, the North Slope Borough Department of Wildlife Management, Alaska Eskimo Whaling Commission, the Greenland Institute of Natural Resources (Denmark), the Department of Fisheries and Ocean (Canada), and native groups to undertake the Bowhead Whale Tracking Project. This partnership, which combines traditional, Native hunting practices with state-of-the-art satellite technology, is yielding new levels of insight into bowhead whale biology. The cooperation and skill of Native hunters has resulted in the tagging of 44 whales in U.S. and Canadian waters, allowing scientists to learn more about and help conserve this endangered species.

As just one of many examples, the BOEMRE participates in the Interagency Working Group on Ocean Observations, which is currently supported by the Consortium for Ocean Leadership. The working group promotes interagency activities and is a mechanism for partnership opportunities. As part of the support for this effort, BOEMRE contributes to a fund which is used to provide services for supporting the working group.

1.3.9 Ecosystem-based Management

We continue our efforts to integrate ecosystem management into the studies planning process. BOEMRE has a good track record in this arena. Looking back, early ESP planning in the Gulf of Mexico Region, for example, was by and large ecosystem based. The coastal habitats were studied via U.S. Fish and Wildlife Service's ecologically defined "coastal characterization" studies, and each included a standard suite of reports: habitat descriptions, species profiles, socioeconomics, mapping and GIS information, etc. The marine study areas reflected physiographic units that were either generally distinct, with boundaries where habitats changed (e.g., South Texas Shelf, Texas-Louisiana Shelf, Mississippi-Alabama Shelf, West Florida Shelf, South West Florida Shelf) or were special habitats (Topographic Features, Deepwater). For each of these areas, a standard suite of studies was planned: baseline or benchmark studies (later, "marine ecosystem studies") including some marine ecosystem modeling, to better understand marine ecosystem processes and to clarify information needs for subsequent studies. Later studies efforts included marine ecosystem modeling work and highly integrated interdisciplinary studies which continue today. In light of recent events and changing conditions, more efforts likely will be expended on reassessing baselines and expanding monitoring work.

1.3.10 Marine Minerals Program

Erosion of the Nation's beaches, dunes, barrier islands, and wetlands is a serious problem that affects the quality and sustainability of coastal ecosystems and economies. As relative sea level rise and seasonal storminess increase under the forcing of climate variability, the extent and magnitude of erosion are also increasing along the U.S. coastline. Beach nourishment and ecosystem restoration continue to be preferred methods to curb loss, protect infrastructure, and stall barrier island and wetland ecosystem collapse. The availability of compatible sand from proximal upland or environmentally-suitable borrow areas in state waters continues to decline; in parallel, the demand for sand resources from the OCS is growing.

The BOEMRE has jurisdiction over all marine mineral resources on the OCS. Public Law 103- 426, enacted October 31, 1994 (U.S. Congress), gave the BOEMRE the authority to convey the rights to OCS sand, gravel, or shell resources for shore protection, beach or wetlands restoration projects, or for use in construction projects funded in whole or part or authorized by the Federal government. To date, the BOEMRE has authorized the use of about 30 million cubic yards of sand for 23 coastal restoration projects across five states resulting in the restoration of over 125 miles of coastline. Yet, as the demand for OCS sand has increased, sand management issues and potential environmental conflicts have also become more complex.

The BOEMRE carries out studies in support of the Marine Minerals Program to address three main requirements: (1) to comply with environmental regulations; (2) to support its responsibility to manage these public sand resources in an environmentally-sound manner; and (3) to identify long-term, cumulative impacts that are considered when making management decisions. Since 1993, over 40 environmental studies have been funded along three primary themes of research: (1) biological studies, which address the potential for adverse impacts on marine life as a consequence of dredging sand on the OCS; (2) physical oceanographic studies, which examine the potential for alteration of local wave fields from dredging sand at specific sites; and (3) impact studies, which evaluate the systemic effects of dredging on focused aspects of the physical, chemical, biological, and human environment and develop appropriate mitigation to alleviate or prevent adverse impacts.

Benthic topographical features composed of shoals, ridges and troughs are home to many federally managed fish species and may harbor submerged archaeological resources. These features also are targeted most frequently for sand extraction. Recent marine minerals studies have focused on characterizing the benthic and mobile communities inhabiting borrow areas, understanding how changing the shape of the features affects local and down stream currents and waves and sediment transport, and ascertaining the cumulative impacts of repeated dredging events.

1.3.11 Acoustic Studies

One of the issues of concern is the impacts of noise generated during offshore activities. Some examples are seismic exploration, pile driving during construction, vibration and vessel traffic during operation, and explosive removals during decommissioning. The ESP has several recent studies in all of these areas and continues to expand our knowledge base on the effects of these sounds on aquatic life.

Another aspect of sound regards its use as a means of gathering information about the organisms. We have studies underway to use acoustic detection mechanisms to identify and quantify birds by their calls. These will expand our information about the distribution and abundance of birds during low light conditions and in poor weather, information that is particularly useful in the siting of offshore wind farms. Similarly, we are funding work to acoustically detect, classify and locate marine mammals with our partners through the NOPP.

1.3.12 Education and Youth Initiatives

The ESP supports ocean education in a number of ways. The ESP is an active participant in the Interagency Working Group-Ocean Education (IWG-OE). Building a strong marine workforce is one of the issues addressed by the IWG-OE. The ESP, along with other federal partners, funded a study through NOPP to understand and predict changes in the ocean science, technology, and operations workforce. ESP studies using cooperative agreements with universities often involve financial support to graduate students. Some of the studies result in master theses or PhD dissertations, as well as reports to BOEMRE. To encourage high school students studying ocean sciences, the ESP provides financial support through NOPP to the National Ocean Sciences Bowl (NOSB), a high school academic competition on the ocean sciences. Environmental Sciences Branch staff members also provide questions to the competition, serve on panels to evaluate questions they have not written, and volunteer at the regional and national competitions. One of the goals of the NOSB is to encourage students to major in the ocean sciences in college or university and pursue careers in the ocean sciences.

ESP provides financial support to the National Marine Educators Association and attends their annual conference. The BOEMRE exhibit at the annual NMEA conference focuses on the ESP. Some ESP study results are turned into posters targeted at middle to high school students. An associated teacher's packet is also prepared. These materials are distributed on the BOEMRE website Kids' Page and at various teacher conferences and meetings. The Kids' Page and the ESP-based education materials are currently undergoing updates to reflect the new BOEMRE name and organization.

The ESP promotes the program internally through sharing study results with other parts of the organization. Newly released ESP study results are posted in the Environmental Studies Program Information System (ESPIS). Externally, the ESP promotes the program in a number of ways including participation on interagency working groups on a variety of topics of interest to the program and providing financial support to selected conferences, workshops, and meetings on topics relevant to the program and where ESP science can be highlighted.

1.3.13 Coastal and Marine Spatial Planning

On July 19, 2010, President Obama signed an Executive Order establishing a National Policy for the Stewardship of the Ocean, Coasts, and Great Lakes. The Executive Order strengthens ocean governance and coordination, establishes guiding principles for ocean management, and adopts a flexible framework for effective coastal and marine spatial planning to address conservation, economic activity, user conflict, and sustainable use of the offshore areas.

Coastal and Marine Spatial Planning (CMSP) is one of the nine National Ocean Policy (NOP) priority objectives. It is an ecosystem based spatial planning process for analyzing current and anticipated ocean uses, and identifying areas most suitable for various types or classes of activities. CMS Plans will be prepared and implemented using a regional approach to allow for variability of economic, environmental, and social aspects among different areas of the US. Planning scale for CMSP is the Large Marine Ecosystems (LMEs). The NOP framework document proposes nine planning areas including regions with active BOEMRE presence such as the Gulf of Mexico, West Coast, Alaska and the Mid-Atlantic. It is important to note that the CMSP process is intended to provide a better framework for the application of existing laws and agency authorities, but not intended to supersede them.

1.4 Identification of Information Needs

While ESP work is conducted first to fill BOEMRE's own information needs, it is becoming increasingly important to ensure that the high quality data, results and products generated are available to everyone. To improve our information dissemination capabilities, enhancements to the ESPIS system will expand the range of products available beyond PDF reports to include other file types. In concert with the ESPIS upgrades, efforts to make selected datasets available from within the Multi-purpose Marine Cadastre (MMC) will be made. Additionally, the two systems will be linked.

Oil spill risk analysis models continue to undergo revision and advancement. Improving the methodologies, data inputs, algorithms and statistical analyses improves the accuracy of the models' outputs. High quality analyses are a critical contribution to required NEPA documents and consultations.

BOEMRE and the ESP depend upon the recruitment and retention of qualified young scientific professionals. Our education and outreach efforts along with conference and workshop sponsorship introduce young scientists to the Bureau and the potential employment opportunities available to qualified candidates.

The continuous improvement of our air quality models is an important effort supporting the required evaluation of cumulative effects in our Environmental Impact Statements and consultations. Improving the methodologies behind the models and incorporating new data improves the accuracy of the dispersion simulations.

Improving our understanding of the interconnections between the biological and physical components of ocean systems is essential to managing offshore activities well. Better definition of these relationships will guide observational efforts and improve OSRA models.

To address concerns raised during consultations about the habitat value and function of sandy shoal/ridge/trough complexes, ESP will convene a workshop to gather and assess the state of knowledge about these areas. This is an important first step in identifying the research needed to improve our understanding of the biophysical coupling in these systems.

1.5 New Starts for FY 2011 and Ongoing Studies

This section enumerates the new starts for FY 2011 and ongoing studies in Headquarters. Detailed information about the ongoing Headquarters studies can be found at our website here: http://www.boemre.gov/eppd/sciences/esp/HappeningNow.htm. As always, reports and technical summaries from completed studies in all regions can be found through ESPIS here: http://www.gomr.boemre.gov/homepg/espis/espisfront.asp.

Table 1. BOEMRE Headquarters Region New Starts for FY 2011 and Ongoing Studies

Partners	Planning Area	Start FY	Discipline	Study Title
NEW STARTS				
	NAT	11	IM	Workshop to Develop Methodologies for Studying the Effects of Seismic Survey Air Guns on Commercial, Recreational and Subsistence Fish and Shell Fish in the Atlantic and Alaska
	NAT	11	MM	Support for JIP Controlled Exposure Experiments with Humpback Whales and Seismic Air Gun Arrays and Testing of Effectiveness of Ramp-Up
	NAT	11	FE	Evaluation of the Relative Environmental Sensitivity and Marine Productivity of the Outer Continental Shelf (OCS)
	NAT	11	PO	Update to the BOEMRE Oils Spill Risk Analysis (OSRA) Model
	NAT	11	FE	Workshop on Alternative Technologies to Air Guns (Deep Penetrating) Used in Offshore Seismic Surveys
	NAT	11	MM	Development of Software and Hardware to Acoustically Detect, Classify, and Locate Marine Mammals

	NAT	11	SE	Observation and Validation of Exclusion Zones Designed to Protect Sensitive Archaeological Resources and Benthic Habitats Following Sand Extraction Activities on the OCS
ONGOING STUDIES				
Fates & Effects				
	NAT	03	FE	Sub-Seabed Geologic Carbon Dioxide Sequestration Best Management Practices
	NAT	06	FE	Investigation of Dredging Guidelines to Maintain and Protect the Integrity of Offshore Ridge and Shoal Regimes/Detailed Morphologic Evaluation of Offshore Shoals
	NAT	10	FE	Best Practices for Physical Process and Impact Assessment in Support of Beach Nourishment and Coastal Restoration Activities
	NAT	10	FE	Improving Emission Estimates and Understanding of Pollutant Dispersal for Impact Analysis of Beach Nourishment and Coastal Restoration Projects
Habitat & Ecology				
	NAT	08	HE	Archiving of Outer Continental Shelf Invertebrates by the Smithsonian Institute
FWS, NOAA	NAT	08	HE	Surveying of Marine Birds in the North Atlantic
	NAT	08	HE	Compendium of Avian Information and Comprehensive GIS Geodatabase
	NAT	08	HE	Effects of Pile Driving Sounds on Auditory and Non-auditory Tissues of Fish
	ATL	08	HE	Potential for Interactions between Endangered and Candidate Bird Species with Facility Operations on the Atlantic OCS
	NAT	09	HE	Estimation of Marine Productivity in MMS Planning Areas
	ATL	09	HE	Determining Distributions and Movement s of Long-tailed Ducks Using Satellite Telemetry

	NAT	09	HE	Hearing in Sea Otters (Enhydra lutris): Measurement of Auditory Detection Thresholds for Tonal and Industry Sounds
	ATL	09	HE	Automated Analysis of Bird Vocalization Recordings
Social Sciences & Economics				
	NAT	09	SE	Offshore Environmental Cost Model
	ATL & PAC	09	SE	OCS Renewable Energy and Space-use Conflicts and Related Mitigation
Physical Oceanography				
NAVY	NAT	09	PO	Improving Wind Wave Predictions: Global to Regional Scales
	AK	10	PO	Adaptation of Arctic Circulation Model
Marine Mammals				
NOPP/ONR	NAT	10	MM	Support for NOPP Project on Improving Cetacean Electronic Data Loggers
	NAT	10	MM	Underwater Hearing Sensitivity in the Leatherback Sea Turtle (Dermochelys coriacea): Assessing the Potential Effect of Anthropogenic Noise
Other (Research Partnerships)				
National Oceanic and Space Administration (NOAA)				

Discipline Codes

AQ = Air Quality FE = Fates & Effects HE = Habitat & Ecology
IM = Information Management MM = Marine Mammals and Protected Species
PO = Physical Oceanography SS = Social Sciences

Planning Area Codes

AK = Alaska ATL = Atlantic GOM = Gulf of Mexico
NAT = Nationwide PAC = Pacific

1.6 Approved Studies for FY 2011 on Hold Pending Funding Availability

With the expectation of increased funding to support studies related to the Deepwater Horizon Oil Spill, renewable energy and expanding information needs, the 2011-2013 SDP as distributed to the Committee included many more studies than usual. By the time the 2011 NSL was ready for managerial approval, the funding increase still was undecided. To prepare for all funding eventualities and to streamline the approval process, the approved FY 2011 NSL included two basic tiers of studies: 1) new starts with funding allocated that could be moved into the procurement queue with the money available (shown in Table 1 above), and 2) new studies on hold, pending the addition of financial resources (shown in Table 2 below). As of this writing, no additional funds have been provided to advance the studies on hold. The studies on hold will be considered for funding in FY 2012 along with the new studies proposed in this plan. There are seven studies on hold in Headquarters.

Table 2. Headquarters Studies Approved for FY 2011 on Hold Pending Funding Availability

NSL #	Title
NT-11-03	Source and Propagation Characteristics of High Frequency Sound Used for High Resolution Geophysical Surveys
NT-11-06	Characterization of Bottom Sediment Transport During Extreme Events in the Northern Gulf of Mexico Using State-of-the Art Coupled Modeling
NT-11-09	Synthesis, Legislative Review, and Case Law History Applicable to Cultural Heritage in the Marine Environment
NT-11-11	A Synthesis of the Results and Currency of Research Projects Completed for the Environmental Protection, Leasing, and Extraction of Offshore Sand
NT-11-12	Continued Support for the Development and Maintenance of a Marine Biological Data Archive
NT-11-13	Modeling and Testing of Commercial Fish Hang Data as a Proxy for Historic Shipwreck Sites
NT-11-14	Co-funding the Third International Conference on Acoustic Communication by Animals

SECTION 2.0 PROPOSED STUDY PROFILES

2.1 Introduction

Headquarters proposes eight new studies for FY 2012. Detailed information about the ongoing Headquarters studies can be found at our website here: http://www.boemre.gov/eppd/sciences/esp/HappeningNow.htm. As always, reports and technical summaries from completed studies in all regions can be found through ESPIS here: http://www.gomr.boemre.gov/homepg/espis/espisfront.asp.

2.2 Profiles of Studies Proposed for the FY 2012 NSL

Table 3. BOEMRE Headquarters Studies Proposed for the FY 2012 NSL

Page #	Discipline	Title	Rank
19	IM	Enhancement of the Environmental Studies Program Information System	1
21	IM	Support for Providing Environmental Studies Program Data within the Multipurpose Marine Cadastre	2
23	PO	Improving Oil-spill Risk Analysis in the Gulf of Mexico: a Multi-Model Approach	3
25	AQ	Outer Continental Shelf Air Quality Modeling Update	4
27	IM	Support for the American Society of Limnology and Oceanography Young Professionals Development Workshop	5
29	PO/HE	Impact of Bio-Physical Feedbacks on the Alaskan Arctic Ocean State	6
31	HE	Working Group and Research Planning to Identify the Habitat Value and Function of Shoal/Ridge/Trough Complexes on the Outer Continental Shelf	7
33	PO	Near-Real Time Monitoring of Surface Ocean Currents from Oil Platforms	8

AQ = Air Quality FE = Fates & Effects HE = Habitat & Ecology
IM = Information Management MM = Marine Mammals and Protected Species
PO = Physical Oceanography SS = Social Sciences

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Headquarters

Planning Areas: All

Title: Enhancement of the Environmental Studies Program Information System

BOEMRE Information Needs to be Addressed: BOEMRE needs a more efficient and easily accessible way to provide public access to data and information collected from environmental studies. The Environmental Studies Program Information System (ESPIS) is the portal to all scientific research generated by the program and is the best way for all those interested to understand and use the reports and products of Environmental Studies Program (ESP) projects. Key users of ESPIS include our own scientists, other Federal and State agencies, academicians, non-governmental organizations and the general public.

Cost Range: (in thousands) $800-1000 **Period of Performance:** FY 2012-2014

Description:

Background: The Environmental Studies Program Information System is the primary mechanism by which the BOEMRE Environmental Studies Program shares the results of scientific investigations with the public. Currently ESPIS is designed to provide reports, with limited capability to provide other information such as data files, video, and images. However, there is an increasing demand to provide information besides reports to scientists, local and state government, and regional ocean planning bodies. In addition, recent Executive Order 13366 requires that each Federal agency "be held accountable for managing its own information assets by keeping them current, easily accessible, and consistent with Federal standards." An improved ESPIS system will facilitate sharing results of studies with the public and help BOEMRE meet Federal requirements and standards for data.

The enhancements to ESPIS will work in concert with a related effort to provide support to the Multipurpose Marine Cadastre. ESPIS makes the synthesized products of ESP projects available while the MMC will make selected datasets available within a web-based viewer. Together, the two efforts make all of the information, data and products of ESP research fully available to any users.

Objectives: The objective of this project is to enhance the ability of the ESPIS system to provide improved public access to data and information.

Methods: The ESPIS database will be redesigned to allow greater functionality such as:

- Adding the ability to store, retrieve and search multiple media types such as geospatial data sets, images, video, audio, and other project related files.
- Enhancing the ability to search the database.
- Providing the geospatial location ("footprint") of all studies completed to date.
- Allowing linkages with the Multipurpose Marine Cadastre
- Creating an interface for uploading and maintaining data.

Revised Date: April 8, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Headquarters

Planning Areas: All

Title: Support for Providing Environmental Studies Program Data within the Multipurpose Marine Cadastre

BOEMRE Information Needs to be Addressed: BOEMRE needs a more efficient way to provide access to data and information collected from environmental studies to the public. The Multipurpose Marine Cadastre (MMC) was created to comply with Section 388 of the Energy Policy Act of 2005, but is also providing the geospatial framework needed for the broader coastal and marine spatial planning initiative called for in the President's ocean agenda. The MMC contains the official U.S. marine cadastre, and is the only place where users can see all of the official U.S. boundaries on one map. Key users of the MMC include our own scientists, other Federal and State agencies, regional planning bodies, academicians, non-governmental organizations, and the general public.

Cost Range: (in thousands) $500-800 **Period of Performance:** FY 2012-2014

Description:

Background: The Multipurpose Marine Cadastre is an online data viewer and spatial planning tool led by BOEMRE and NOAA. The MMC is an integrated marine information system that provides legal, physical, ecological, and cultural information in a common geographic information system (GIS) framework. In particular, the MMC is beneficial to those involved in coastal and marine spatial planning efforts that involve finding the best location for renewable energy projects.

Currently the MMC does not contain any Environmental Studies Program (ESP) data. The purpose of this project is to facilitate the inclusion of appropriate ESP datasets into the MMC viewer. In addition, the spatial location ("footprint") of completed studies will be provided within the MMC with a link to reports and data located within the Environmental Studies Program Information System (ESPIS). This will allow the MMC to function as a data discovery tool and facilitate ESP information sharing with the public.

In a related effort, enhancements to ESPIS will provide linkages to the Multipurpose Marine Cadastre. ESPIS makes the synthesized products of ESP projects available while the MMC will make selected datasets available within a web based viewer. Together, the two efforts make all of the information, data and products of ESP research fully available to any users.

Objectives: The objectives of this project are to:

- Provide viewing capability of ESP data sets in the Multipurpose Marine Cadastre,
- Allow access to ESP data located in ESPIS through stable URLs, and
- Develop additional tools to allow greater access to ESP data, such as spatial queries.

Methods: This project will provide support to the NOAA Coastal Services Center to include ESP program information such as:

- Provide representative data layers in the MMC
- Create functionality for searching environmental studies within the viewer.
- Provide appropriate links to the ESPIS database.

Revised Date: April 8, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Headquarters

Planning Areas: Western, Central and Eastern Gulf of Mexico

Title: Improving Oil-spill Risk Analysis in the Gulf of Mexico: a Multi-Model Approach

BOEMRE Information Needs to be Addressed: BOEMRE is responsible for analysis of potential oil-spill impact to the environmental resources prior to a lease sale for oil and gas exploration in the Gulf of Mexico Outer Continental Shelf. It needs the high-resolution gridded surface current and wind products in the Gulf of Mexico to drive the Oil Spill Risk Analysis (OSRA) model. Currently, BOEMRE's OSRA model is based on the surface currents generated by the Princeton Regional Ocean Forecast System (PROFS), and the reanalysis winds used to force the PROFS. This study proposes a multi-model approach by conducting ensemble OSRA model runs that include different sets of surface currents simulated by other well-validated Gulf of Mexico ocean circulation models, and their corresponding wind forcings. The outcome of this study will improve the accuracy of the oil risk analysis in projected areas of OCS operations. The method developed could be employed in other OCS Regions.

Cost Range: (in thousands) $300-$350 **Period of Performance:** FY 2012-2014

Description:

Background: The BOEMRE conducts an oil-spill risk analysis to support the bureau's environmental impact statement (EIS) before a lease sale for oil and gas exploration in the Gulf of Mexico Outer Continental Shelf. It uses the surface currents simulated by the Princeton Regional Ocean Forecast System and the reanalysis winds applied to the PROFS to drive the oil-spill trajectory model for estimating the probability of potential oil spill contacts with environmental resources in the Gulf of Mexico OCS. The deterministic approach with one set of surface current and wind input to the OSRA model could be improved by incorporating several sets of input from different proven ocean models to run the OSRA model, as the ocean model output might be subject to uncertainty in surface winds from various atmospheric re-analysis products. This study will obtain surface current and wind data from several sources that have a high-resolution Gulf of Mexico ocean model (preferably at a spatial scale of less than 3.5km), and use different sets of model-simulated surface currents and its corresponding surface winds to drive the OSRA model. This study will generate an ensemble of statistical analysis to understand the uncertainty in the probability of the potential oil-spill contacts with environmental resources.

Objectives: The objective of this study is to improve the accuracy of the oil risk analysis in the Gulf of Mexico Outer Continental Shelf by conducting ensemble OSRA model runs with different sets of surface currents from several existing Gulf of Mexico ocean circulation models in the scientific community and its corresponding surface winds.

Methods: There are two components to this project: 1) the collection and verification of the surface current and wind data, and 2) the ensemble OSRA model run. The first part will be contracted out, while the second part will be conducted by BOEMRE staff using different sets of the surface current and wind data provided by the contractors. The contractors shall provide the model-simulated surface current along with the surface wind data that drive the ocean model according to the specification of BOEMRE. Besides complying with the data requirements (i.e., coverage and format, period of comparison, spatial and temporal resolutions), the contractors shall write a white paper to describe the model parameterization, forcing functions, data assimilation technique. Additionally, the participants of this study will perform the comparison of their model output with *in-situ* observations in the Gulf of Mexico based on a set of metrics constructed by BOEMRE. As the OSRA model requires the input of the 3 hourly surface currents at a spatial grid resolution less than 3.5km ($<1/25^{o}$), some institutions might need to rerun the hindcast simulations specifically for this study.

After the surface current data from the ocean model runs have been assembled and verified, BOEMRE will use each individual current and wind data set to conduct OSRA model run separately. The OSRA model then initiates hypothetical oil spills from the OCS operations in the lease areas at model resolution. A combined probability of the potential contacts with the shoreline and the environmental resources will be derived based on the probability of the past oil-spill occurrence in the area and the trajectories of the oil spill from the hypothetical spill locations. The multiple OSRA model runs with different sets of surface current and wind inputs will generate an ensemble of the statistical output for BOEMRE to perform case studies with. For example, depending on the location of the hypothetical spill, BOEMRE can estimate the standard deviations in the probability of the potential contacts with the environmental resources, and evaluate the sensitivity of the potential contacts with the environmental resources to model-simulated surface current. The analysis will help BOEMRE staff understand to what extent the uncertainty in the model-simulated surface currents can influence the overall probability of the potential oil spill contacts with environmental resources in the Gulf of Mexico OCS, with the ultimate goal of providing more accurate information for the bureau's oil spill risk management and contingency planning.

Revised Date: March 25, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Headquarters

Planning Areas: All

Title: Outer Continental Shelf Air Quality Modeling Update

BOEMRE Information Needs to be Addressed: Air quality models change with time as more information about atmospheric properties becomes available. New information is now available regarding the marine boundary layer. BOEMRE's official air quality model for use by the operators to analyze air quality impacts from OCS exploration and development/production is the Offshore and Coastal Dispersion (OCD) model. There is a need to update the model to make use of new methodologies and data so that it more correctly simulates dispersion of air pollutants in the marine and coastal environment.

In addition, considerable advances have been made in regional scale meteorological and air quality models. BOEMRE has a need to investigate how these models can be customized to assess air quality impacts from OCS emission sources. This would require investigating means of incorporating marine boundary layer properties and over water dispersion characteristics into the models.

Cost Range: (in thousands) $200-$280 **Period of Performance:** FY 2012-2014

Description:
Background: The OCD model was developed in the early 1980's using observations primarily obtained off California. A number of meteorological monitoring programs have been conducted on platforms in the Gulf of Mexico using wind profilers and radio acoustic sounding (RASS) systems. Currently there is a monitoring study on a platform in the Gulf to obtain wind and temperature profiles, flux measurements, and wave measurements. The monitoring programs have provided data that can be used to better quantify marine boundary layer parameters (such as stability, turbulence, and mixing height) that are used in the OCD model. The American Meteorological Society and the Environmental Protection Agency (EPA) have developed AMS/EPA Regulatory Model (AERMOD) for air quality impact analyses. This model is not designed for offshore use, but it includes methodologies that were not available at the time OCD was developed. There is a need to investigate if any algorithms in AERMOD can be used to update OCD.

The OCD model is a Gaussian, steady-state model and is not appropriate for situations where the receptor points are located at larger (greater than 50 km) distances from the emission source. The model also does not effectively treat atmospheric chemistry and deposition. In order to better address the limitations of steady-state models, air quality modelers have used outputs from meteorological grid models and applied them to a regional air quality model such as CALPUFF or the Comprehensive Air Quality Model with extensions (CAMx). The most commonly used meteorological models are Mesoscale Model version 5 (MM5) and the more recently developed WRF (Weather Research & Forecasting (WRF)) model. These

models use meteorological data generated by the NCEP (National Center for Atmospheric Prediction) and calculate meteorological variables on a more refined scale. The EPA has developed the CMAS (Community Modeling and Analysis System (CMAS). The Community Multi-scale Air Quality Model (CMAQ) is one of the models in this system and is used to evaluate impacts for a number of different air pollutants.

Objectives: The objective of the study is to apply improved methodologies and recently collected data to update air quality models for evaluating air quality impacts from emission sources on the Outer Continental Shelf.

Methods: A review will be conducted of the newer EPA air quality models, such as AERMOD, to determine if certain methodologies can be incorporated into OCD. Meteorological data and analyses from the Gulf of Mexico will be examined to see if the information can be used to improve the OCD model. In particular the Coupled Ocean Atmosphere Response Experiment (COARE) algorithm will be examined for application in the model. Upon completion of these tasks appropriate modifications will be made to the OCD model and the updated model will be tested using existing data. Minor revisions may be made to the model if the testing results indicate that adjustments may be made to improve model performance.

A review will be conducted of algorithms in MM5, WRF, CMAQ and other models to characterize the atmospheric boundary layer and atmospheric transport and dispersion. A set of recommendations will be made regarding improved boundary layer treatment, including COARE that incorporates over water meteorology. BOEMRE will establish a working relationship with developers of MM5, WRF, and CMAQ with the goal of making appropriate changes in the model to better simulate over water conditions. The feasibility of BOEMRE applying these models for air quality impact analyses will be examined.

Revised Date: March 14, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012–2014

Region: Headquarters

Planning Areas: All

Title: Support for the American Society of Limnology and Oceanography Young Professionals Development Workshop

BOEMRE Information Needs to be Addressed: BOEMRE needs a strong workforce to meet our mission of stewardship of the nation's offshore energy and marine minerals resources. BOEMRE also needs to be able to recruit and retain well qualified marine scientists and engineers to fill our expanding and changing workforce needs in the coming years.

Cost Range: (in thousands) $40-$60 **Period of Performance:** FY 2012

Description:

Background: BOEMRE, like many other federal agencies, has an aging workforce and will need to replace many of its marine scientists and engineers as they retire. In addition, BOEMRE is staffing the new Renewable Energy program and is expanding staff in other divisions and in the regions. We must be able to attract well-qualified marine scientists and engineers to meet our expanding and changing workforce needs. Since there is a shortage of marine scientists in general, BOEMRE faces competition from other employers in and out of government. We must find ways to encourage students in their academic training and provide young professionals with opportunities to succeed in careers and select BOEMRE as their employer of choice.

The National Oceanographic Partnership Program (NOPP) is planning a young professionals development workshop prior to the 2012 American Society of Limnology and Oceanography (ASLO) Ocean Sciences Meeting in Salt Lake City, Utah. The workshop will target masters and PhD students. The workshop will have two parts: 1. an introduction to being a professional and 2. "Teach the Trainer," i.e., train trainers to present all of, or parts of, this workshop at their own institutions or organizations. Both parts of the workshop will have materials and handouts for the participants.

Objectives: The objective is to ensure BOEMRE has well-qualified marine scientists and engineers to meet its expanding and changing workforce needs.

Methods: BOEMRE will contribute to the NOPP effort to develop and host a young professionals development workshop prior to the 2012 ASLO Ocean Sciences Meeting in Salt Lake City, Utah.

Revised Date: January 24, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Headquarters

Planning Areas: Chukchi and Beaufort Seas

Title: Impact of Oceanic Bio-Physical Feedbacks on the Alaskan Arctic State

BOEMRE Information Needs to be Addressed: BOEMRE has the need to better understand and quantify the importance of oceanic bio-physical feedbacks in the Alaskan Arctic because of their potential impact on physical variables, e.g., ocean currents, temperature, salinity concentration, sea ice extent and thickness. This information is relevant to BOEMRE's Oil Spill Risk Analysis (OSRA) and to its environmental information needs in the oceanographic (physical and biological) and socioeconomic areas. This study will advance BOEMRE's understanding on key processes that have historically been neglected, but that were recently shown to have a potentially large impact on the amplitude (and direction) of ocean currents, sea ice coverage/thickness, habitat quality (including nutrient distribution) and heat content. Quantifying and better understanding these processes would serve BOEMRE's mission by contributing to: a) improved design and planning of future Alaskan Arctic observational programs; b) better understanding the role of biological activity in Arctic climate variability (which could be affected by BOEMRE regulated OCS activities) and; c) estimating the uncertainty of ocean currents, temperature and sea-ice coverage which is relevant to hindcast and forecast modeling studies.

Cost Range: (in thousands) $650-$800 **Period of Performance**: FY 2012-2015

Description:

Background: One possible explanation as to why Arctic sea ice volume is decreasing faster than predicted is the neglect of bio-physical feedbacks in all of the IPCC forecasts. Recent groundbreaking studies have shown the importance of bio-physical feedbacks in different oceanic environments (Manizza et al., 2008; Zhang et al., 2009; Popova et al., 2010). This has drawn the attention of scientists and funding agencies given that these processes can significantly affect biology and physics, e.g., the rate of change in Arctic sea-ice volume, the variability of highly productive fisheries, and the amplitude of El Niño events among other impacts. The geographical range of these recent studies encompasses nearly all domains, from the tropics (Jochum et al., 2010) to the Arctic Ocean (Lengaigne et al., 2009). However, several aspects remain obscure, especially given the large number of model parameters and processes needed to produce a successful simulation. These recent studies employ state-of-the-art ocean, atmosphere, land, sea-ice and biogeochemical models using intermediate to coarse resolution thus neglecting processes with scales smaller than about 25km. A higher resolution regional study will resolve a number of processes, especially those in connection with sea-ice dynamics and incorporate information from outside the model domain through its lateral boundaries using existing global simulations. This study will yield information on: a) current oceanic state and trends of the Chukchi and Beaufort seas, b) a clearer and deeper understanding of the role played by bio-physical feedbacks in the coupled Arctic system (ocean, atmosphere, ice, biology, land), e.g., it will shed light on the recently evidenced

simultaneity between maximum (minimum) error in sea-ice predictions and maximum (minimum) intensity in bio-physical feedbacks.

Objectives: This effort has four objectives:

1. Provide BOEMRE with quantitative and qualitative information on the sensitivity of oceanic variables (e.g., currents, sea ice, temperature, nutrients) to bio-physical feedbacks when high spatial resolution is used.
2. Provide BOEMRE with a) climatologies (2005 -2011) and b) trends (1990-2011) of ocean currents, sea ice thickness /coverage, hydrography and sea level as well as biological information in the Chukchi and Beaufort seas.
3. Quantify the different physical and biological contributions to the total depth-dependent heat budget with emphasis on shelf waters.
4. Issue a recommendation to BOEMRE for a geographically focused and process oriented observational study that builds on the conclusions of this modeling study.

Methods**:** A suite of coupled models, ocean-atmosphere-seaice-ecosystem (and possibly land), shall be used to reach the objectives stated above. The model grid shall be constructed with a horizontal resolution of at least 10-12km. The extensive sensitivity/calibration study stage will be followed by hindcast experiments. All available observational data (biological and physical) shall be used to calibrate, validate and evaluate the coupled model results during the sensitivity and hindcast stages and to obtain initial conditions for the ensemble forecast runs.

Revised Date: March 10, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012 – 2014

Region: Headquarters

Planning Areas: Atlantic and Gulf of Mexico

Title: Working Group and Research Planning to Identify the Habitat Value and Function of Shoal/Ridge/Trough Complexes on the Outer Continental Shelf

MMS Information Needs to be Addressed: The Magnuson-Stevens Fishery Conservation and Management Act requires that any federal agency undertaking or authorizing an action that may adversely affect Essential Fish Habitat (EFH) or federally-managed fish species consult with the National Marine Fisheries Service (NMFS). In several recent EFH consultations, NMFS has expressed concern about effects to fisheries habitat and federally-managed fishes resulting from repeat dredging of sand ridge and shoal complexes. It is anticipated that NMFS will have similar concerns over wind development projects sited on shoal systems offshore the mid-Atlantic Bight, where such features are the dominant geomorphology. The BOEMRE needs to improve the scientific understanding of biophysical coupling in these systems in order to better predict cumulative effects and design targeted mitigation strategies. A critical step is to develop a strategic scientific approach to this complex, understudied problem.

Cost Range: (in thousands) $75-$150 **Period of Performance:** FY 2012

Description:

Background: There is a growing consensus about the habitat value and function of physically-dominated, ridge-swale and cape-associated shoal complexes for demersal, demersal-foraging, and pelagic fishes; however, the means of biophysical coupling remain poorly understood (*e.g.*, Vasslides and Able, 2008 ; Geomarine, 2010; Slacum et al., 2010). Differences in geomorphology and microhabitat, including factors such as sediment texture, roughness elements, and bottom-boundary conditions, have been linked to diversity in benthic and fish communities. Fish utilization has also been shown to vary on both daily and seasonal scales, but the most important habitat is consistently the finer-grained, prey rich deeper troughs adjacent to higher-relief shoals (Slacum et al., 2010). It is surmised that strong benthic prey segregation across habitat may have implications for trophic structure and bioenergetics (Michel et al., 2007).

Various shallow-water OCS activities, including dredging and wind energy development, may disturb benthic habitat and infaunal/epifaunal communities, such that there are cascading effects on keystone demersal and pelagic fishes. In the case of offshore dredging, beach fill is often derived from the same borrow area, equating to frequent dredging of the same or adjacent seafloor over 50 year, to occasionally longer, period. Similarly, scour protection and scour around structures sited on shoals may destroy or enhance habitat, affecting species abundance and diversity in unpredictable ways (Blyth-Skyrme, 2010). Because most shoal features on the OCS are self-maintaining, perturbations in the footprint or profile of a sand

ridge crest, flank, or adjacent swale, potentially affects local and residual flow, inducing sediment composition or morphologic responses, *etc*. When a system exhibits tight biophysical coupling, the ecosystem function of sensitive biological habitat and resources may be disturbed or enhanced. If monopiles, jacketed structures, and associated foundations and scour protection systems are erected along shoal systems, marine fouling may serve to attract species and communities that may not otherwise use such habitat (e.g., Wilhelmsson and Malm, 2008) and those communities may not be adapted to physical dynamics of shoal environments.

Benthic surveys and characterizations prepared for project-specific site assessment, because of their relative expense, often under-sample and describe a system in a single, particular state (Brooks et al., 2006). To accurately characterize habitat function and value, it is important to understand the temporal and spatial variability of habitat distribution, as well as status and trends in community structure and productivity. Additional research is needed to illuminate how the dynamics of and gradients in bottom topography, sedimentology, roughness elements, and bottom boundary conditions influence the distribution and abundance of infauna, epifauna, other invertebrates, and fishes. Relatively long-term monitoring datasets, collected in different inner shelf ridge-swale settings accounting for environmental differences over daily, seasonal, and inter-annual time scales, are needed to assess habitat function pre-disturbance and then through disturbance and recovery (Michel et al., 2007).

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Objectives: This effort has two objectives:

1. Synthesize current scientific understanding of biophysical linkages regarding habitat value and function of ridge/swale and shoal complexes, identifying critical gaps in understanding.
2. Identify relevant areas, space, and time scales for study, cost-effective research methods, costs, and cost-leveraged study opportunities to develop appropriate duration datasets to address the critical gaps in understanding.

Methods: The contractor, working with BOEMRE and NMFS, will identify potential members for, then organize and facilitate a working group of governmental, non-governmental, academic, and industry professionals, representing geological sciences, physical and biological oceanography, and fisheries biology. The working group will develop a white paper that explains current scientific understanding, identifies the critical gaps in understanding, identifies data and methodology needs, and offers a strategic research plan identifying study areas, methods, costs, and cost-leveraging opportunities. Methods proposed for this study include literature research, data mining, surveying, and synthesis, comparative analysis, and stakeholder coordination.

Revised Date: April 6, 2011

ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2012-2014

Region: Headquarters

Planning Areas: Gulf of Mexico

Title: Near-Real Time Monitoring of Surface Ocean Currents from Oil Platforms

BOEMRE Information Needs to be Addressed: The speed and direction of ocean currents are key variables for environmental studies in the areas of physical oceanography, marine biology and oil fate analysis. BOEMRE needs direct, reliable measurements of surface currents to further improve its statistical estimations of spill trajectories (OSRA program). Additionally this information is relevant and will be available for current and upcoming studies on larvae transport and water quality.

Cost Range: (in thousands) $400-$500 **Period of Performance**: FY 2012-2016

Description:

Background:

The need of having instruments "in the water" measuring oceanic conditions, while having them available for analysis and decision making in near-real time, is one of the lessons learned from recent oil spills. The Acoustic Doppler Current Profilers (ADCP) that BOEMRE required oil companies to mount on their platforms in 2008 provided crucial information during the DWH spill. ADCPs provide current speed and direction at different depths but only at the location of each platform, i.e., no horizontal coverage. This study proposes to measure surface ocean currents around each selected platform using High Frequency Radars (HFR) to complement the information being currently gathered by ADCPs. In addition to the information needs (that BOEMRE has) mentioned above, BOEMRE will seek financial leveraging from other federal agencies and industry as near-real time information on currents and waves may be of interest for a) Oil Spill response (USCG/NOAA) b) search and rescue operations (SAR-OPS, US Coast Guard) , c) scientific research (Academia), and d) chlorophyll/plankton spatial distribution (Fish Industry). This study aims to monitor surface ocean currents from two to-be-selected oil platforms and expand and build on the current BP/SIO effort (1 HF radar on BP platform Atlantis). The long term goal is to build on the experience to be gained from this study (two HF radars plus two existing ones) in order to cover the entire area occupied by all oil platforms that sit in the Gulf of Mexico and other regions in the OCS. Wave height, wave length and wave frequency information could also be obtained and archived if requested/needed by co-funding partners.

Objectives: This effort has two objectives:

1. Improve the statistical estimations of oil spill trajectories by measuring the speed and direction of surface ocean currents around two oil platforms in a radius ranging from 70 to 200 km around each platform, and with associated spatial resolutions of 3 to 12 km, respectively.

2. Better understand the statistical properties of the surface velocity field and its potential for displacing spilled oil in space and time.

Methods**:** HFRs will be used to obtain the above listed information. After long enough time series are archived, these surface ocean velocity data, if accurate enough, would be assimilated into ocean models that currently provide the OSRA statistical model with surface velocities. From these data it will be possible to identify ocean states/scenarios associated with specific mass source/sink situations by constructing climatological maps of these fields and by calculating surface diffusion coefficients and divergence/convergence fields. In consultation with potential partners we will decide which of the available HFR type/model best suits the needs of all/most funding partners. Different HFR models use different transmit/receive frequencies and thus measure surface ocean currents with different ranges (distance from the antenna) and horizontal resolution (distance between different simultaneous measurements). The location of these two radars will be decided in consultation with an existing BP funded project and building on their current effort and already acquired experience. The data will be transmitted to the National Data Buoy Center (NOAA) in near real time following a similar protocol to that currently being used for ADCP data transmission. Technically, the back signal from the radar is processed to extract current and/or wave information. For this study, the decision of whether current or current and wave data are saved, will be made at a later stage since either choice will not affect the overall requested funds for this study. This pilot study, if successful, would be progressively extended to all active lease areas in the OCS where offshore facilities operate. In the long term, the ultimate goal would be to have surface ocean currents measured in near-real time and around each platform in the OCS.

Revised Date: March 15, 2011

SECTION 3.0 TOPICAL AREAS FOR FISCAL YEAR 2014

3.1 Shifting Baselines

As climate patterns shift, so do the ecosystems and their biological assemblages. These natural shifts along with major man-made events such as the Deepwater Horizon oil spill result in altered baselines. Future ESP work is likely to concentrate efforts on reestablishing baselines and assessing the changes from previous states. To cover large areas with the highest resolution, the ESP will engage new technologies. Efforts already underway to use high definition aerial surveys could be expanded along with undertaking new surveys using autonomous vehicles. An understanding of the new ecological and oceanographic baselines will be critical to making sensible decisions about what mitigations and stipulations to emplace.

3.2 Monitoring

In conjunction with the research on changing baselines, increased emphasis will be needed on monitoring environments in areas where development is occurring or may occur. This monitoring would be needed across all seasons and would need to extend across many years to account for natural variability. Monitoring would address changes in the biological, oceanographic and atmospheric regimes. Data collected during monitoring efforts would support NEPA analyses, OSRA and air quality modeling efforts, and feed assessments of climate change. Data would also be useful in evaluating the efficacy of mitigations and stipulations in place.

3.3 OSRA Model Improvement

Future physical oceanographic studies are expected to be directed towards improving the oil spill risk analysis process by incorporating and assimilating observational data into the risk assessment methods and by improving ocean circulation current modeling. The ESP will continue to support programs that provide a better understanding of transporting spilled oil and other materials by ocean currents via simulation modeling and surface drifter observations. The ESP will also continue to develop integrated programs among physical, biological and chemical oceanography disciplines. Areas of study will include the western, central, and eastern Gulf of Mexico; the Santa Maria Basin/Santa Barbara Channel, California; near-shore Beaufort and Chukchi Seas, Cook Inlet, Alaska; and possibly areas off of the east coast, specifically the north and mid-Atlantic Areas.

3.4 Coastal and Marine Spatial Planning

Regional CMSP plans in the long-run will inform the Bureau's regulatory and leasing functions. It is anticipated that these plans will reduce multi-use conflicts, facilitate environmental stewardship and enhance regulatory certainty. The Bureau's environmental science and assessment functions will assist the planning exercise in multiple ways. Many ongoing scientific studies will provide important anthropogenic and environmental baseline data, thereby enhancing the quality of regional plans. As the planning process evolves and

new data needs identified, the ESP will design studies to serve these needs. The Bureau's stakeholder engagement process for conventional and renewable energy leasing in many ways imitates the stakeholder process that is at the heart of CMSP. These outreach efforts will provide valuable input to the regional planning process. Currently ESP is coordinating the CMSP initiative within BOEMRE and across various DOI Bureaus. The program also is actively engaged with the preparation of the National CMSP workshop, a multi-day event that will kick-off the initiative.

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