

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Ocean Energy Management
Office of Renewable Energy Programs

July 1, 2013

Guidelines for Providing Information on Marine Mammals and Sea Turtles
for Renewable Energy Development on the Atlantic Outer Continental Shelf
Pursuant to 30 CFR Part 585 Subpart F

I. Introduction to Guidelines

Before the U.S. Department of the Interior, Bureau of Ocean Energy Management, (BOEM) will approve the siting of a facility, structure or cable proposed for a renewable energy project on the Outer Continental Shelf (OCS), an applicant must submit with its Site Assessment Plan (SAP), Construction and Operations Plan (COP), or General Activities Plan (GAP), as applicable, the results of its site characterization surveys, with supporting data, to BOEM.

BOEM requires the results of site characterization studies to evaluate the impact of proposed activities on physical, biological, and socioeconomic resources as well as the seafloor and sub-seafloor conditions that could be affected by the construction, installation, and operation of meteorological towers, buoys, cables, wind turbines, and supporting structures. The information will be used by BOEM, other Federal agencies, and potentially affected states in the preparation of National Environmental Policy Act (NEPA) documents, for consultations and other regulatory requirements. Early communication with BOEM as well as adhering to these guidelines should ensure that BOEM's information needs are met. BOEM recommends that early communication take the form of the submission of a marine mammal and sea turtle survey plan, and a pre-survey meeting to discuss the survey plan. BOEM is confident that survey results obtained through procedures consistent with these guidelines and guidance received as a result of the recommended pre-survey meeting will be sufficient for BOEM's decision-making process. Please note that BOEM may require, through lease or grant terms, that lessees and grantees submit a SAP, COP, or GAP survey plan and schedule a pre-survey meeting with BOEM to discuss the survey plan prior to conducting survey activities in the lease or grant area.

These guidelines provide recommendations for complying with information requirements of BOEM's renewable energy regulations outlined within 30 CFR Part 585 Subpart F. Site characterization activities in these guidelines refer only to marine mammals and sea turtles. An applicant may use an alternate approach for compliance, however, early and frequent coordination with BOEM will be critical in this case to ensure that the work conducted meets BOEM's regulatory requirements.

BOEM provides recommendations for conducting and reporting the results of other baseline collection studies in separate guidelines (http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx#Notices_to_Lessees,_Operators_and_Applicants).

These guidelines may be updated periodically, as new information or methodologies become available. This version of the guidelines supersedes any previous versions.

II. Authority and Regulations

BOEM has statutory obligations under the Outer Continental Shelf Lands Act (43 USC 1337) as amended by the Energy Policy Act of 2005 to protect the environment and conserve the natural resources of the Outer Continental Shelf. This includes the evaluation of impacts to marine mammals and sea turtles. Additionally, BOEM has statutory obligations under the National Environmental Policy Act (NEPA, 42 U.S.C. § 4321), and the Endangered Species Act (ESA, 16 U.S.C. 1531-1544), as well as a need to ensure any activities BOEM authorizes comply with the Marine Mammal Protection Act (MMPA, 16 U.S.C. Chapter 31). Under BOEM's regulations, SAPs, COPs and GAPs must describe protected resources, conditions, and activities that could be affected by the applicant's proposed activities (30 CFR 585.611(b)(3) and (4); 30 CFR 585.627(a)(3) and (4); and 30 CFR 585.646(c) and (d)), as well as describe the results of biological surveys (30 CFR 585.610(b)(5); 30 CFR 585.626(a)(3); 30 CFR 585.645 (a)(5)).

Any SAP, COP, or GAP must also demonstrate that activities proposed in the plan will be conducted in a manner that does not cause undue harm or damage to natural resources, human and wildlife, property, the marine, coastal, or human environment (30 CFR 585.606(a)(4) (SAP); 585.621(d) (COP); 585.641(d) (GAP)). Special attention is given to ESA-listed species, designated ESA-critical habitat, and marine mammals (see 30 CFR 585.626(b)(15), 30 CFR 585.801 and 30 CFR 585.803). In addition, according to 30 CFR 585.610(a)(8) (SAP) and 30 CFR 585.626(b)(15) (COP) applicants must submit with SAPs and COPs "proposed measures for avoiding, minimizing, reducing, eliminating, and monitoring environmental impacts." Lessees and grantees should consider these future monitoring and mitigation measures when developing a survey plan for marine mammals and sea turtles.

In addition to planning for future environmental monitoring on the lease, the survey activity itself may require mitigation measures. Thus, the lessee should include in their survey plan a description of the mitigation measures that will be followed to avoid or minimize adverse effects, including any potential incidental take, and environmental impacts to critical habitat as designated under the ESA (see for example information requirements in 30 CFR 585.626(b)(15), 30 CFR 585.801 and 30 CFR 585.803).

For BOEM to evaluate impacts to these protected species, BOEM, and its Federal consulting partners under the aforementioned statutes (U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS)) require sufficient baseline information on the area of potential effect (APE) of the proposed activity. BOEM

will review submitted SAPs, COPs and GAPS, and additional information, such as publicly available data or reports, to determine whether they contain the information necessary to conduct BOEM's technical and environmental reviews. Upon completion of BOEM's technical and environmental reviews, and other reviews required by Federal laws, these plans may be approved, disapproved, or approved with modifications, by BOEM.

These guidelines are meant to clarify and provide a general understanding of the information that BOEM, in consultation with USFWS and NMFS, requires to adequately address the impacts of offshore renewable energy projects on marine mammals and sea turtles. Elements of these guidelines may be required under the terms and conditions of a specific lease or grant. However, a lease or grant may also have requirements that are different than those discussed in these guidelines. Under those circumstances, lessees and grantees must comply with the terms of their lease(s) or grant(s).

III. Survey Information

The overall purpose of the required information is to describe the key species and habitat within the project area that may be affected by the proposed operations. The marine mammal and sea turtle survey plan should aim to provide data that will assist in:

- Identifying and confirming which protected species use the project site where development is proposed. Special consideration should be given to identifying threatened and endangered species;
- Establishing a pre-construction baseline and approach that may be used to assess whether detectable changes occurred in post-construction abundance and distribution of protected species, in association with proposed operations; and
- Reducing uncertainty associated with baseline abundance and distribution estimates and/or informing the interpretation of survey results.

The marine mammal and sea turtle survey plan should describe a program to collect sufficient information on the biology of the survey area that will allow BOEM, and other agencies with jurisdiction, to make well-founded decisions in context with the regional biology. The survey should be designed to address key science questions specific to the scale and location of the proposed construction and operation activities. BOEM encourages the applicant to refer to the publication by McCann (2012) entitled "Developing Environmental Protocols and Modeling Tools to Support Renewable Energy and Stewardship" to assist in determining the most appropriate protocols for the proposed project: <http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5208.pdf>.

IV. Pre-Survey Coordination with BOEM

BOEM has found that pre-survey coordination with an applicant allows for the identification of common goals and expectations before the applicant mobilizes for a biological survey. BOEM firmly believes that maintaining an early and open dialogue with the applicant is critical to the timely, comprehensive execution of a biological

survey. BOEM recommends that the applicant work closely with BOEM staff to arrive at a strategy that meets overall requirements and tailors the marine mammal and sea turtle survey to site- and species-specific needs of the area. Additionally, engaging in discussions with other appropriate agencies (e.g., USFWS, NMFS, National Park Service [NPS]) and concerned parties will help identify whether sufficient information exists from previous study efforts and help resolve any issues that may arise, as early as possible. In the event the applicant and an agency disagree with respect to the survey plan, it is the applicant's obligation to resolve any items and issues that may arise. Ultimately, BOEM may require the applicant to re-survey some part of the area in the event that surveys fail to meet the regulatory information requirements described herein.

A marine mammal and sea turtle survey plan that meets all parties' reasonable needs is thus an important first step toward a successful biological survey. In developing a marine mammal and sea turtle survey plan, a review of previous investigations can be helpful in selecting equipment and in choosing the sampling and analytic approaches. The marine mammal and sea turtle survey plan should include, but is not limited to, a description of the geographic area to be surveyed, issues to be investigated, hypotheses, assumptions, data collection techniques, standards, résumés of Protected Species Observers (PSOs) (to be forwarded for NMFS approval), analytical and statistical techniques, and measures to ensure quality control.

BOEM strongly recommends that the applicant hold a pre-survey meeting with the Bureau to discuss the survey plan. This meeting may include, but is not limited to, discussions regarding:

- survey logistics (proposed survey area, dates, times, survey period length, weather limitations, etc.);
- species in the APE that may be affected by proposed SAP, COP, or GAP activities;
- field techniques and equipment to be utilized/specifications of data acquisition systems;
- data to be acquired;
- data processing and analysis; and
- data and information to be submitted to BOEM.

V. Potential Effects

To date, renewable energy development in offshore waters of the United States is a relatively new venture, therefore only a few studies have been conducted to assess environmental and ecological effects. In particular, there are very few studies that assess the medium to long-term effects of offshore renewable energy projects, or the effects of large offshore renewable energy projects (Boehlert and Gill, 2010).

“Potential effects” is loosely defined as, “the anticipated effects from all phases of the proposed action,” and the APE is loosely defined as “the geographic area or areas within which such activity may cause changes in the character or use of any resources

present.” In practice, the applicant should identify the reasonably foreseeable effects associated with the activities to be proposed in the SAP, COP, or GAP, and ensure that the habitats that could be affected by those activities are included in their surveys, for example, beaches to offshore habitats. At a minimum, the applicant should consider the following major to moderate direct effects to marine mammals and sea turtles that have been identified for offshore wind facility construction: acoustic disturbance from pile driving, entanglement with mooring lines or cables, ship strikes from installation and support vessels, operational/vessel noise and disturbance of turtle nesting beaches, pinniped rookeries or haul-outs due to onshore cable operations (Boehlert and Gill, 2010).

VI. Survey Results and Supporting Data

Data elements that support the following objectives should be included in the marine mammal and sea turtle survey results submitted with a SAP, COP or GAP. However, not all of the following objectives may be applicable to a particular site, and these items can be discussed with BOEM on a case-by-case basis:

- Characterization of marine mammal and sea turtle local and regional distribution and density/abundance;
- Establishment of baseline ambient and project-associated sound levels, including, when possible, in the presence of vocalizing marine mammals; and
- Comprehensive characterization of habitat use by marine mammals and sea turtles.

Additionally, BOEM strongly encourages the applicant to provide the following reports to assist BOEM in tracking the progress and implementation of surveys and, most importantly, to evaluate the quality of environmental information collected. By providing the following reports, BOEM can ensure that the survey data and information is sufficient to meet the requirements of BOEM’s renewable energy regulations outlined within 30 CFR Part 585 Subpart F. The data gathered may also be used by BOEM to develop appropriate avoidance, minimization, and mitigation measures for marine mammal and sea turtles species for incorporation into terms and conditions of plan approval. BOEM may share these reports with other appropriate agencies (e.g., USFWS, NMFS, NPS).

Progress Reports

BOEM strongly encourages the submission of progress reports to BOEM 180 days after the start of marine mammal and sea turtle survey activities in each survey year. These reports should highlight the survey findings to include, but are not limited to:

- the number of surveys conducted, dates, start and end times, weather conditions;
- the number of marine mammals and sea turtles sighted, by species/taxonomic group;
- any preliminary maps and spatial data showing the locations of sighted marine mammals and sea turtles (see Spatial Data Submission Guidelines at <http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx>);

- the status of data processing, error checking, and analysis; and
- plans for upcoming marine mammal and sea turtle surveys and related study efforts.

Comprehensive Annual Reports

BOEM strongly encourages that annual reports be submitted to BOEM no later than 90 days after the completion of each year's surveys. The purpose of the annual report is to present the results (e.g., trends and patterns) of survey efforts from the prior year and any previous years' efforts. The annual reports should highlight the survey findings to include (but are not limited to):

- the number of surveys conducted, dates, start and end times, weather conditions;
- the number of marine mammals and sea turtles sighted, by species/taxonomic group;
- maps and spatial data showing the locations of marine mammals and sea turtles sighted (see Spatial Data Submission Guidelines at <http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx>);
- discussion of the results of other efforts (previous and current) and how they relate to, and inform, the findings;
- evaluation of the effectiveness of survey techniques including any refinements for the coming year; and
- plans for upcoming marine mammal and sea turtle surveys and related study efforts.

Data Management

BOEM requires the results from biological survey with supporting data (30 CFR Part 585.610(b)(5); 30 CFR 585.626(a)(3); 30 CFR 585.645 (a)(5)). In order to comply with these requirements, all biological survey results and supporting data submitted to BOEM must be processed and validated by the applicant. BOEM also encourages uploading survey data into an online archive such as the Ocean Biogeographic Information System (OBIS) Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP; <http://seamap.env.duke.edu/>) or to existing managed databases, for example, the North Atlantic Right Whale Consortium's database: (<http://www.narwc.org/index.php?mc=3&p=3>), and North Atlantic Right Whale Catalog (<http://www.narwc.org/pdf/photosubmissionguide.pdf>); or other archives for future study.

VII. Survey Methodology

Applicants are encouraged to collaborate with other developers, research institutions, and state and Federal natural resource agencies to accomplish their site characterization objectives for SAP, COP, or GAP submittal to BOEM.

Given that the distribution and abundance of many marine species are known to change under ambient conditions, multiple survey visits are often needed to establish a baseline that characterizes the species distribution in space and time. In some cases, information about the area of interest may have been collected during previous study efforts, and therefore an applicant may need to conduct fewer (if any) additional surveys to

establish a baseline. The results of any previous study efforts can be discussed during the pre-survey planning and coordination phase. In accordance with the requirements to monitor environmental impacts (see 30 CFR 585.610(a)(8) (SAP) and 30 CFR 585.626(b)(15) (COP)), BOEM may require a lessee to conduct post-construction surveys to assess impacts of operations on a species as a condition of SAP or COP approval.

To date, all commercial wind leases issued by BOEM require that the lessee's protected species observers (PSO) have been (1) trained in the shipboard identification and behavior of protected species, and (2) approved by NMFS. Generally accepted techniques for data collection on marine mammals and sea turtles are available in the literature (for example, Boyd, Bowen and Iverson, 2010; Belskis, Epperly and Stokes, 2009). There are a number of methods used to characterize the spatial distribution and abundance of marine mammals and sea turtles on the OCS. Line-transect surveys, using vessels and aircraft, are examples of commonly used methods (Buckland, Anderson, Burnham, Laake, Borchers and Thomas, 2001; 2008; Kenney and Shoop, 2012). Appropriate methodologies need to be identified in the survey design, based on, for example, the geographic area to be surveyed, the species to be surveyed, and the survey objectives. Tables 1 through 3 outline general guidance for the types of recommended marine mammal and sea turtle surveys commonly used.

In order to efficiently utilize vessel time, some vessel-based surveys could be conducted simultaneously. However, this may not always be appropriate and the survey design should be tailored to the specific objectives of the survey. The layout of the survey will likely depend on the site to be assessed. It is highly recommended that the applicant work with BOEM to coordinate their survey design with the appropriate natural resource agencies, as mentioned above. Permits may be required by the NMFS and/or USFWS for certain aerial and vessel-based surveys, and it is the applicant's responsibility to obtain any required permits (e.g., MMPA Incidental Harassment Authorization (50 CFR Part 216 Subpart I)).

BOEM recommends that survey specifications be submitted to BOEM prior to the pre-survey meeting in the form of a pre-survey plan. BOEM may seek advice from the appropriate natural resource agencies to ensure that data and analyses are adequate to meet regulatory requirements. Although BOEM provides guidance, it is not the responsibility of BOEM to design the survey. BOEM recommends that an applicant submit a marine mammal and sea turtle survey plan at least 90 days in advance of the survey taking place.

Table 1. Recommendations for vessel-based surveys for marine mammal and sea turtle species on the OCS.

Focus	Determine spatial temporal distribution and abundance of marine mammal and sea turtle species.	
Timing	Two annual cycles of surveys to capture inter-annual variation in counts.	Additional surveys may be needed to fill in temporal or spatial gaps from preliminary investigation (e.g., to complete an annual cycle, to increase spatial certainty, to capture a specific migration period or to cover environmental phenomena (for example, El Niño)). Additional surveys may be needed if initial surveys were poorly executed.
Scope	<ul style="list-style-type: none"> • Surveys should be collected in a manner to be presented in a geo-spatial database. • Surveys should be conducted in all seasons, when practicable, but especially in seasons in which the species of interest are expected to be present. • Surveys should be conducted monthly in an effort to capture the peak annual abundance. However, surveys may be conducted more frequently if expected use times are known. • <u>Minimum</u> survey area is the APE plus 10% of the total APE. 	
Technical Suggestions	<ul style="list-style-type: none"> • Obtain all necessary permits prior to conducting surveys (e.g., Marine Mammal Protection Act and Endangered Species Act). • Design line-transect surveys to ensure that the data obtained are of sufficient quality so as to facilitate detection of marine mammals and sea turtles and to minimize bias associated with abundance and density estimates (i.e., Buckland <i>et al.</i>, 2001; 2008). • During the survey, the ship's speed should be a constant speed of 10 knots. • Surveys should start after sunrise when there is enough light to identify protected species. Night-time operation plans, describing methodologies for effective monitoring of the exclusion zone (for example, passive acoustic monitoring), will be considered by BOEM on a case-by-case basis. • Record weather conditions at the start of each transect line (i.e., Beaufort Sea State, wind direction, visibility, % cloud cover, glare, temperature) as well as the time of day and names of observers. • Use at least two qualified, experienced, NMFS-approved PSOs with reticle binoculars, to identify marine mammal and sea turtle species. In addition, high-definition photography and videography may be used. • Record the time of each marine mammal and sea turtle sighting, record the GPS position of each observation along transect line, record the number of marine mammals and sea turtles seen and record their behavior (resting, foraging, traveling, evading, etc.). • Identify all marine mammal and sea turtle species observed; if this cannot be done, then identify to closest taxonomic level (e.g., Jefferson, Webber and Pitman, 2007; Reeves, Clapham, Stewart, Powell and Folkens, 2002; Belskis, Epperly and Stokes, 2009). • Estimate the actual distance and bearing for all detections so that Distance Sampling techniques can be used to correct for species missed at greater distances from the ship (Buckland <i>et al.</i>, 2001). Before each survey, surveyors should calibrate distance estimation using a laser rangefinder on objects (e.g., buoys) at a variety of distances. • Note any injured or dead protected species and immediately report these to BOEM and regional NMFS stranding hotline and record all details surrounding these events. 	

<p>Presentation of Results</p>	<ul style="list-style-type: none"> • Provide geo-referenced, species-specific/taxonomic group digital maps and density estimates and associated variance (95% confidence Intervals), as well as raw sighting and effort data (see BOEM Spatial Data Submission Guidelines for details (http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx)). • If species-specific density estimates are not possible, provide species-specific/taxonomic group abundance estimates, as well as associated raw data. • Account for detectability. To estimate the density and abundance for each species viewed on the water, use distance data collected from line transect sampling to model a distance function (Buckland <i>et al.</i>, 2001). Analyses should use recent versions of Distance software which allows covariates (observer, sea state, etc.) to be incorporated into the estimation of detection functions (Thomas, Laake, Rexstad, Strindberg, Marques, Buckland, Borchers, Anderson, Burnham, Burt, Hedley, Pollard, Bishop and Marques, 2009), and the Akaike Information Criterion values should be used to determine whether it is advantageous to use these covariates (Maclean, Wright, Showler and Rehfisch, 2009). Report density estimates, standard errors, and 95% confidence intervals.
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Table 2. Recommendations for aerial surveys for marine mammal and sea turtle species on the OCS.

Focus	Determine spatial temporal distribution and abundance of marine mammal and sea turtle species.	
Timing	Two annual cycles of surveys to capture inter-annual and seasonal variation in counts.	Additional surveys may be needed to fill in temporal or spatial gaps from preliminary investigation (e.g., to complete an annual cycle, to increase spatial certainty, to capture a specific migration period or to cover environmental phenomena (for example, El Niño)). Additional surveys may be needed if initial surveys were poorly executed.
Scope	<ul style="list-style-type: none"> • Surveys should be collected in a manner to be presented in a geo-spatial database. • Surveys should be conducted in all seasons, when practicable. Surveys should be conducted monthly in an effort to capture the peak annual abundance. However, surveys may be conducted more frequently if expected use times are known. • <u>Minimum</u> survey area is the APE plus 10% of the total APE. 	
Technical Suggestions	<ul style="list-style-type: none"> • Completion of any necessary permit requirements (e.g. Marine Mammal Protection Act and Endangered Species Act). • Use twin engine aircraft, for safety and endurance (e.g., Skymaster). • Use high winged aircraft with excellent all-around visibility. • Use strip-transect sampling method. • Transects should be orientated perpendicular to the coast and spaced approximately 3 km (2 nmi) apart. • Weather conditions before take-off and at start of survey should be: sea state \leq Beaufort 4, absence of rain or fog, visibility $>$ 3 km (2 nmi). • Surveys should be flown at an altitude of 305 m (1,000 ft) at a speed of 185 km/h (100 kt). • Collect the appropriate data so that Distance Sampling techniques can be used to correct for marine mammals and sea turtles missed at greater distances from the plane (Buckland <i>et al.</i>, 2001; 2008). • Record altitude, cloud cover, and sea state every 10 minutes during survey. • At least two qualified, NMFS-approved, aerial PSOs to follow standard aerial observation protocols for large whales, scanning out to approximately 3 km (2 nmi) from the transect line, repeatedly sweeping forward and aft of the perpendicular. • Hiby (1999) circle-back method is recommended to verify species identification and record behavior, adapted as necessary to minimize disturbance of marine mammals and for other technical or environmental reasons. • At each new sighting within the strip transect, record GPS position, time, and number of marine mammal and/or sea turtle species. • Identify all species, but if this cannot be done, then identify to closest taxonomic level (e.g., Goodman Hall and Belskis, 2012; Jefferson, Webber and Pitman, 2007; Reeves, Clapham, Stewart, Powell and Folkens, 2002). • Different leg types must be recorded (e.g. off watch, in transit, on transect line, circling), as well as particular leg stages (not on transect line, start, continue, break, resume, end) to differentiate those sightings to be included in density estimates (Kenney, 2011). 	
Presentation of Results	<ul style="list-style-type: none"> • Provide geo-referenced, species-specific/taxonomic group digital maps and density estimates, associated variance (95% confidence Intervals), as well as raw sighting and effort data (see BOEM Spatial Data Submission Guidelines for details (http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx)). 	

	<ul style="list-style-type: none">• If species-specific density estimates are not possible, provide species-specific/taxonomic group abundance estimates, as well as associated raw data.• Account for detectability. To estimate the density and abundance for each species viewed on the water, use distance data collected from line transect sampling to model a distance function (Buckland <i>et al.</i>, 2001). Analyses should use recent versions of Distance software which allows covariates (observer, sea state, etc.) to be incorporated into the estimation of detection functions (Thomas <i>et al.</i>, 2009), and the Akaike Information Criterion values should be used to determine whether it is advantageous to use these covariates (Maclean <i>et al.</i>, 2009). Report density estimates, standard errors, and 95% confidence intervals.
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Table 3. Recommendations for Passive Acoustic Monitoring (PAM): Ambient Sound and Presence of Vocalizing Marine Mammals.

Focus	Establishment of baseline ambient sound levels and presence of vocalizing marine mammals.	
Timing	Two annual cycles of surveys to capture inter-annual and seasonal variation in counts.	30 consecutive days of survey each season with random sampling within 30-day period. The exact duration/timing may be site-specific depending on the extent of prior sampling and location.
Scope	<ul style="list-style-type: none"> • Surveys should be collected in a manner to be presented in a geo-spatial database. • Surveys should be conducted in all seasons but especially in seasons in which the species of interest are expected to be present. • Surveys should be conducted monthly in an effort to capture the peak annual abundance. However, surveys may be conducted more frequently if expected use times are known. • <u>Minimum</u> survey area is the APE plus 10% of the total APE. 	
Technical Requirements	<ul style="list-style-type: none"> • Recording equipment/devices are not endorsed by BOEM, and it is essential that the appropriate equipment is selected based on the specifics of the project area, species of interest and project objectives. BOEM highly recommends that applicants review current scientific literature for standard PAM practices. • Currently deployed PAM equipment includes bottom-mounted hydrophone arrays, anchored moorings, hydrophones or hydrophone arrays towed behind vessels, expendable, Directional Frequency Analysis and Ranging [DIFAR] buoys, and autonomous underwater vehicles (AUVs). • Hydrophones must be able to record a large bandwidth or several band widths (using multiple receivers) and should be calibrated to sample at various times of the day and night and at different frequency ranges to ensure sampling of various sound sources and vocalizations from large whales and small cetaceans. • The number of hydrophones necessary will be dependent on the size of the project area, with a minimum of two hydrophones placed approximately six (6) miles apart. • PAM methodologies that facilitate localization of vocalizing animals are highly encouraged. 	
Presentation of Results	<ul style="list-style-type: none"> • The data output from passive-acoustic monitoring will depend heavily on the sensors and sampling methodology employed. • Reports must include identification of all vocalizing species, if possible, but especially species of interest; descriptions of monthly and/or seasonal presence of all species; any trends in vocalization patterns; spatial presence of species; ambient noise analysis. • BOEM recommends that PAM data be provided to the National Oceanographic Data Center or other appropriate Federal data archive. 	

Guidance Document Statement

BOEM issues guidance documents to clarify, supplement, and provide more detail about certain BOEM regulatory requirements and to outline the information required of the applicant to support their various submittals. This guidance document sets forth a policy on, and an interpretation of, a regulatory requirement that endeavors to provide a clear and consistent approach to complying with that requirement. An applicant may use an alternate approach for compliance, however, early and frequent coordination with BOEM will be especially critical in that case to ensure that the work conducted meets BOEM's regulatory requirements.

Paperwork Reduction Act Statement

The information collection provisions of this document are intended to provide clarification, description, or interpretation of requirements contained in 30 CFR 585 Subpart F. The Office of Management and Budget (OMB) has approved the information collection requirements for these regulations and assigned OMB Control Number 1010-0176.

Contact Information

For further information or inquiries regarding these guidelines please contact the Office of Renewable Energy Programs at (703) 787-1340 or renewable_reporting@boem.gov.

References

Belskis, L.C., Sp.P. Epperly, and L.W. Stokes. 2009 (updated Jan 2013). Southeast Fisheries Science Center Sea Turtle Observer Manual. NOAA Technical Memorandum NMFS-SEFSC-589, 30 pp.

Boehlert, G.W., and A.B. Gill. 2010. Environmental and ecological effects of ocean renewable energy development: a current synthesis. *Oceanography* 23(2): 68-81.

Boyd, I.L., W.D. Bowen, and S.J. Iverson (eds.). 2010. Marine Mammal Ecology and Conservation: A Handbook of Techniques. Oxford University Press Inc., New York, 450 pp.

Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers, and L. Thomas. 2001. Introduction to Distance Sampling: Estimating Abundance of Biological Populations. New York (NY): Oxford University Press, 448 pp.

Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers, and L. Thomas (Eds.). 2008. Advanced Distance Sampling: Estimating Abundance of Biological Populations. New York (NY): Oxford University Press, 434 pp.

Goodman Hall A., and L.C. Belskis. 2012. Guide to the aerial identification of sea turtles in the US Atlantic and Gulf of Mexico. NOAA Technical Memorandum NMFS-SEFSC-633, 24 pp. or online at http://www.nefsc.noaa.gov/read/protssp/mainpage/AMAPPS/docs/TM_633_Goodman-Hall_Belskis_Aerial_ID.pdf

Hiby, L. 1999. The objective identification of duplicate sightings in aerial survey for porpoise. Pages 179-189 *in*: Garner *et al.* (eds). Marine Mammal Survey and Assessment Methods. Balkema, Rotterdam.

Jefferson, T.A., M.A. Webber and R. Pitman. 2007. Marine Mammals of the World: A Comprehensive Guide to Their Identification. Elsevier Science, 592 pp.

Kenney, R.D. 2001. The North Atlantic Right Whale Consortium databases. *Maritimes* 43(2):3-5

Kenney, R.D. and C.R. Shoop. 2012. Aerial surveys for marine turtles. Pages 264-271 *in*: McDiarmid *et al.* (eds). Reptile Biodiversity: Standard Methods for Inventory and Monitoring. University of California Press, Berkeley, CA.

Maclean, I. M. D., L.J. Wright, D.A. Showler and M.M. Rehfish. 2009. A Review of Assessment Methodologies for Offshore Windfarms. Report commissioned by Cowrie Ltd., COWRIE-METH-08-08, London.

McCann, J. 2012. Developing Environmental Protocols and Modeling Tools to Support Ocean Renewable Energy and Stewardship. National Oceanographic Partnership Program. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy, Herndon, VA., OCS Study BOEM 2012-082 (<http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5208.pdf>)

Reeves, R.R., P.J. Clapham, B.S. Stewart, J.A. Powell and P.A. Folkens. 2002. National Audubon Society Guide to Marine Mammals of the World. Knopf Doubleday Publishing Group, pp. 528.

Thomas, L., J.L. Laake, E. Rexstad, S. Strindberg, F.F.C. Marques, S.T. Buckland, D.L. Borchers, D.R. Anderson, K.P. Burnham, M.L. Burt, S.L. Hedley, J.H. Pollard, J.R.B. Bishop, and T.A. Marques. 2009. Distance 6.0. Release 2. [Internet]. University of St. Andrews (UK): Research Unit for Wildlife Population Assessment. Available from: <http://www.ruwpa.st-and.ac.uk/distance/>