ORPC
OCEAN RENEWABLE
POWER COMPANY

Herbert C. Scribner
DIRECTOR - ENVIRONMENTAL AFFAIRS

120 Exchange St., Suite 508
Portland, ME 04101

DIRECT 207 221 6255
CELL 207 400 9142
OFFICE 207 772 7707

hscribner@oceanrenewablepower.com

December 20, 2011

Michelle Magliocca
National Marine Fisheries Service
Office of Protected Resources
1315 East West Highway
Silver Spring, MD 20910

RE: Marine Mammal Incidental Harassment Authorization for Pile Placement for ORPC's Cobscook Bay Tidal Energy Pilot Project

Dear Ms. Magliocca:

ORPC Maine has revised our application for a Marine Mammal Incidental Harassment Authorization for pile placement for ORPC's Cobscook Bay Tidal Energy Pilot Project in Eastport, Maine from March 1, 2011 through October 1, 2012, to NOAA's Office of Protected Resources.

Using the guidance provided by your office, ORPC has addressed each of the fourteen areas of interest as mandated by Section 7 of the Endangered Species Act and the National Environmental Policy Act (NEPA).

If you have any questions or comments, please reply to Herbert C. Scribner at ORPC.

Thank you.

Sincerely,

Herbert C. Scribner
Director of Environmental Affairs

MARINE MAMMAL INCIDENTAL HARASSMENT AUTHORIZATION FOR PILE PLACEMENT FOR ORPC'S COBSCOOK BAY TIDAL ENERGY PILOT PROJECT

QUESTIONNAIRE TO NOAA'S OFFICE OF PROTECTED RESOURCES

December 19, 2011

Ocean Renewable Power Company, LLC
120 Exchange Street, Suite 508
Portland, ME 04101
Phone: (207) 772-7707
www.orpc.co

MARINE MAMMAL INCIDENTAL HARASSMENT AUTHORIZATION FOR PILE PLACEMENT FOR ORPC'S COBSCOOK BAY TIDAL ENERGY PILOT PROJECT

Questionnaire to NOAA's Office of Protected Resources

1. Description of Activity

Purpose of IHA Application

ORPC Maine, LLC, a wholly owned subsidiary of Ocean Renewable Power Company, LLC (collectively ORPC), filed a FERC final pilot license application on September 1, 2011 for our Cobscook Bay Tidal Energy Pilot Project (Project), a hydrokinetic project to be deployed in Cobscook Bay, Eastport/Lubec, Maine (FERC Project No. 12711). In conjunction with this deployment, ORPC is requesting a Marine Mammal Incidental Harassment Authorization (IHA) for the placement of foundational piles below the mud line at the deployment site.

ORPC is applying for an IHA for pile placement because the vibratory hammer (and possibly a diesel impact hammer) that will be used for pile driving will potentially generate noise levels above NOAA's guidelines (for continuous and impact noise) under the Marine Mammal Protection Act of 1972.

This IHA request does not cover activities proposed for Phase II of the Project. If Phase I monitoring indicates that deployment is generating noise exceeding allowable limits, ORPC will file a second IHA request for Phase II.

Project Overview

The Project will be carried out in two separate phases over an expected eight-year pilot license term. In Phase I, ORPC will build, deploy, monitor and test a single-device TidGen™ Power System for one year. In Phase II, ORPC will add four additional TidGen™ devices to the power system, for a total of five. ORPC will also deploy environmental monitoring equipment within the project boundary. Electricity generated by the pilot project will be delivered by an underwater power cable to the on-shore station in Lubec, Maine, where it will be power-conditioned and connected to the Bangor Hydro Electric Company power grid.

The primary project works include: 1) the TidGen™ Power System (made up of the TGU [turbine generator unit], bottom support frame, and underwater power and data [P&D] cables); 2) the on-shore station; and 3) environmental monitoring equipment. The TGU is approximately 98 ft long, 17 ft high and 17 ft wide. It is attached to a bottom support frame, which holds the TGU in place approximately 15 ft above the sea floor. The TGU weighs approximately 69,000 pounds (lbs). The coupled TGU and bottom support frame comprise the TidGen™ device (Figure 1).

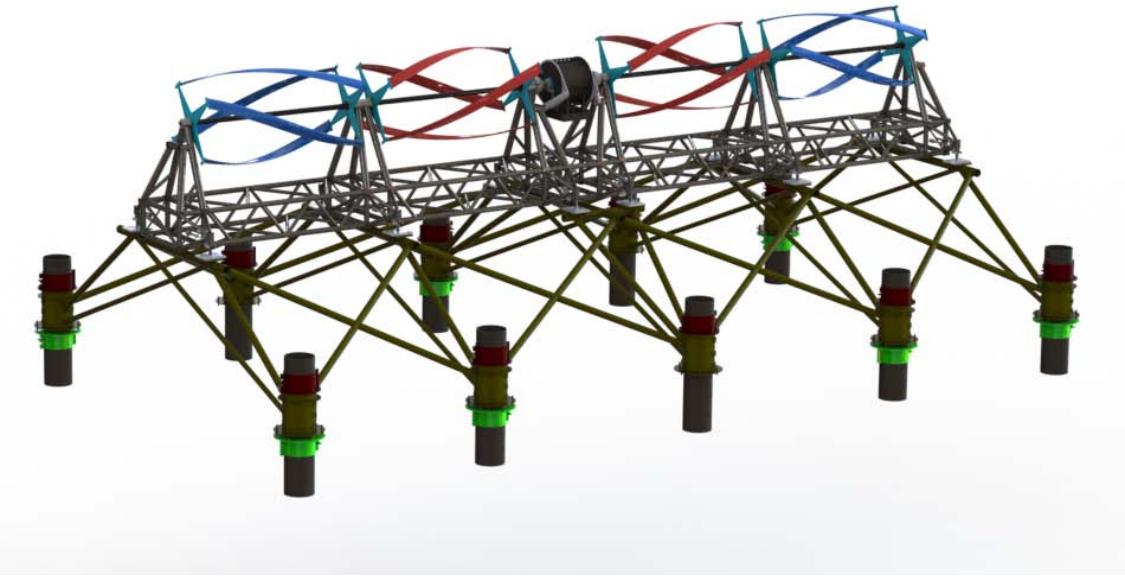

Figure 1. TidGen™ device.

Foundation Requirements

At the interface with the seabed, the bottom support frame requires a site-specific design based on the Project's deployment area conditions (Figure 2). ORPC has conducted bathymetric and geophysical surveys of the deployment area to identify bottom conditions for the design of the bottom support frame and foundation and has completed a geotechnical survey of the deployment. Geotechnical data shows that the TidGen™ devices will be located in areas with up to 40 ft of marine clay and some thin layers of glacial till overlaying bedrock.

At the Project site, the foundation design for the single-device TidGen™ Power System is a pile bent arrangement consisting of ten piles. Each pile will have a three-foot diameter and a one-inch wall thickness, and will rest on bedrock. The piles will vary in length due to bottom sediment depth, but each pile will be driven to the top of the bedrock and will protrude 10+ ft above the seafloor.

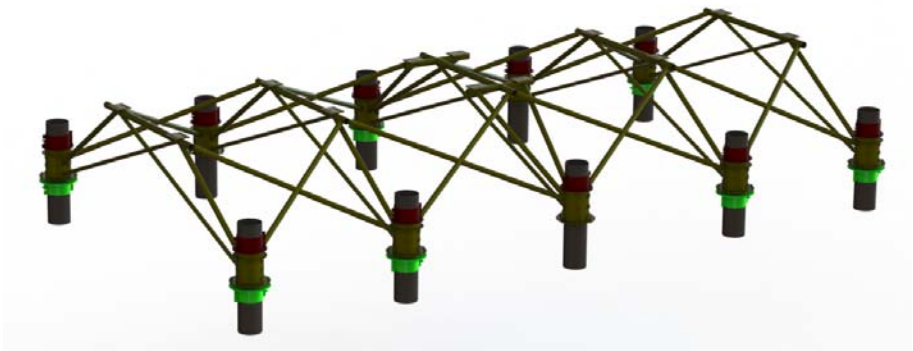

Figure 2. Bottom support frame.

Pile Driving Plan

A total of 11 piles (ten for the foundation and one for mounting environmental monitoring equipment) will be driven for Phase I of the Project. Placing and driving these 11 piles will require the following equipment:

- Deck barge, *Cap't E*, 150 ft long x 54 ft wide x 10 ft high
- 250-ton Linkbelt crane LS 718H with 150 ft of boom or equivalent
- Push boat "Workhorse"
- A second push boat/workboat to assist in setting anchors, moving the barge into position and quick demobilization in the event of a extreme weather event
- Material barge to deliver the bottom support frame to the deployment location. This barge will be configured from sectional barge sections and will be 60 ft long x 40 ft wide x 5 ft high
- Small crane on the small barge to assist in the installation of anchors and deadmen
- Crane mats on top of the *Cap't E* to distribute the crane load
- +/- 100 ton of barge counterweight consisting of +/- 50 concrete Jersey barricades or other similar concrete or granite weights
- Diesel powered vibratory hammer
- Diesel powered impact hammer model Berminghammer B-3505 with a maximum capacity of 46 ft-kips
- 4 deck winches to position and secure the deck barge on location
- 2 additional deck winches to facilitate positioning the bottom support frame
- Hydraulic power pack to power the winches
- Tool crib on the barge with typical tools for marine construction, including welders, torches, hand tools, spare parts, etc.
- Ground tackle, including anchors and lines
- Granite deadmen to assist in positioning the bottom support frame

The steel pipe piles each have a 30 in diameter and a ½-inch wall thickness with an open shoe of hardened steel attached to the bottom for seating itself into bedrock without deformation. The piles will be delivered with the hardened shoes attached and will be uncoated. The piles will be configured in two rows of five piles each, as illustrated in Figure 2.

The individual piles will be approximately 20 ft apart in each row, and the rows will be approximately 50 ft from each other. The piles will be approximately 60 ft long; 10 ft to 15 ft will be above the mud line when driven to refusal. Prior to driving the pile, a follower will be attached to the pile, which will enable the pile to be driven from the surface. Based on extensive soil studies of the area, the piles will sink in the soft bottom under its own weight plus the weight of the follower and vibratory hammer for most of the 40 ft of marine clay. The piles will then be driven the remaining depth using vibratory and impact pile driving procedures from barge-based pile driving equipment.

During the pile driving, a pile for mounting environmental monitoring equipment will be installed with the same pile-driving equipment used for the foundation. This monitoring pile will

have a 30 in diameter and a ½-inch wall thickness, and will protrude approximately 20 ft above the sea floor. As with the other 10 other piles, the monitoring pile will be driven to refusal into bedrock.

The vibratory hammer, an H&M model H-1700, will drive the pile by applying a rapidly alternating force to the pile by rotating eccentric weights about the shaft, resulting in a downward vibratory force on the pile. The vibratory hammer will be attached to the pile head with a clamp. The vertical vibration in the pile functions by disturbing or liquefying the soil next to the pile, causing the soil particles to lose their frictional grip on the pile. The pile moves downward under its own weight, plus the weight of the hammer. It takes approximately one to three minutes to drive one pile.

If additional energy is required to reach bedrock, the vibratory hammer will be removed and a diesel impact hammer (Berminghammer model B-3505 diesel, 34,500 lb hammer with maximum rated impact energy of 21,533 ft-lb) will be rigged to the crane and used to seat the pile to bedrock or "proof" the pile. Pile driving with a diesel impact hammer takes approximately one to five minutes. Although driving piles with an impact hammer generally results in the greatest noise production, this noise is not constant. It is expected that the need for an impact hammer will be minimal and for very short durations (less than five minutes per pile).

To ensure alignment of the pile array, a driving template, which is a semi-permanent base structure, will be set into place prior to the pile driving operation to help guide the piles to the required location. This template will later be raised to become the support structure for the single-device TidGen™ Power System. It is expected that divers will be required to help guide the piles to the structure to get them started into the template.

Due to the presence of strong currents during tide changes, pile driving will occur during slack tides only. Due to the short window of slack tide, it is expected that only one pile will be driven per tide cycle. The total time spent at the mooring is anticipated to be between 7 and 12 days.

Cold weather will not have an effect on pile driving activities. Only foul weather such as high winds/seas, icy conditions, and conditions limiting visibility would prohibit pile-driving operations. Prior to commencing work, there the long-term weather forecast will be consulted to pinpoint a likely stretch of favorable weather.

A detailed pile placement plan submitted by the contractor is included in Attachment 1.

Foundation Installation

The foundation will be installed before any other power system component, with the exception of the P&D cable. For foundation installation, ten piles will be placed into the seabed using a driving template as well as pile driving equipment located on a moored barge. Temporary moorings will be used to hold the position in position for these operations. Subsea construction will begin with the setting of the template, followed by the placing and driving of the individual piles. After the piles are driven, they will be surveyed for elevation from the surface to allow for

positioning and installation of subsequent fixtures and components, and will be cut to final dimension if necessary.

Once the foundation is installed, the template will be removed, and receiving fixtures for the bottom support frame will be installed. Next, the bottom support frame will be installed by aligning it with the foundation piles and lowering it into place on top of them. When it is positioned on the lower receiving fixtures, the bottom support frame must be able to withstand the force of the maximum tidal current experienced at the site. To accomplish this, a set number of supporting piles will need to be immediately engaged with the bottom support frame in order to provide the necessary uplift resistance. Once the bottom support frame has been initially stabilized, it will be thoroughly affixed to the foundation during subsequent operations.

2. Date, Duration and Location of Activity

Date of Activity
Piling driving will begin as soon as ORPC receives a FERC pilot license. We therefore anticipate that the start date will be no sooner than March 1, 2012.

ORPC plans to extend pile driving activities into the NMFS suggested restriction window if we can demonstrate that noise levels from this activity are below NOAA/NMFS guidelines. To bring down the level of noise caused by the diesel impact hammer, mitigative measures, such as the use of wooden sound absorption cushions and bubble curtains, will be applied (see above for details).

Duration of Activity
It is estimated that pile driving will take approximately one to three minutes and that seating each pile will take approximately five minutes. It is expected that only one pile will be driven per tide cycle due to the short window of slack tide. It is anticipated that placement of all eleven piles will occur over a period of seven to twelve days.

ORPC understands that an IHA can only have a one-year duration, and since there are several other permits also pending for Phase I of the Project, ORPC requests an IHA for the period of March 1, 2012 to November 30, 2012. ORPC believes that this time period will provide ample opportunity for permitting delays, weather events, and other unforeseen delays. Pile driving will only occur during daylight hours and in weather that provides adequate visibility for marine mammal monitoring activities.

Geographical Region of Activity
The foundation installation will take place in Cobscook Bay off of Lubec/Eastport, Maine (Figure 3). The piles and other deployment materials will be brought by barge from an on-shore staging area at the Eastport Boat School and/or other access points in the vicinity.

Specific Activities that ORPC Anticipates Could Result in Marine Mammal Takes
Pile driving activities have the potential to harass marine mammals by temporarily elevating sound levels around the proposed project location.

Figure 3. Cobscook Bay Tidal Energy Project site location and project area map.

3. Species and Number of Marine Mammals in Area of Activity

ORPC has been conducting incidental visual observations of marine mammals in the Cobscook Bay since 2007, during turbine testing, travel to and from ORPC's research vessel *Energy Tide 2*, and acoustic, fisheries, subtidal, and avian surveys (Table 1). During this time, ORPC personnel and contractors, who have received specialized training in marine mammal observation and documentation, have recorded approximately 252 observational periods over 222 days. During these periods, ORPC observed two dolphins, 47 harbor porpoises, and 57 seals. The most intensive effort was conducted in 2010, when approximately 71 marine mammals were observed over the course of 132 observation days between March 8 and December 31. Of these, there were two dolphins, 27 harbor porpoises, and 42 harbor seals. This information is documented in ORPC's Marine Mammal Monitoring Plan for the Cobscook Bay Tidal Power Project (FPLA Appendix C) and submitted to NOAA separately (Attachment 2).

All 2010 marine mammal observations were made near the Cobscook Bay deployment area. No observations of any whale species have been made in Cobscook Bay by ORPC personnel or those contracted to work for ORPC since the observation program began in 2007. Table 1 presents the number of each species observed and the months in which the observations were made.

Table 1. *Marine Mammal Observations in Cobscook Bay and Western Passage between December 2007 and December 2010.*

Month	**Number of 4-hour Observation Periods Over 3 yrs**	**Number of Observed Harbor and Grey Seals (3yrs)**	**Number of Observed Harbor Porpoise (3yrs)**	**Number of Observed Atlantic White-Dolphins (3 yrs)**
January	4	0	0	0
February	9	0	1	0
March	17	1	0	0
April	40	4	3	0
May	17	1	3	0
June	21	8	1	0
July	21	4	10	0
August	30	16	24	2
September	25	9	5	0
October	24	8	0	0
November	18	4	0	0
December	26	2	0	0
Total Number Observed		**57**	**47**	**2**

4. Description of Status, Distribution, and Season Distribution of Affected Species or Stocks of Marine Mammals Likely to be Affected by Such Activities

Gray seal (*Halichoerus grypus*), harbor porpoise (*Phocoena phocoena*), harbor seal (*Phoca vitulina*), and Atlantic white-sided dolphin (*Lagenorhynchus acutus*) are commonly observed in Cobscook Bay (NMFS, 2009). Other species that could theoretically occur in the Project vicinity include North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaengliae*), fin whale (*Balaenoptera physalus*), minke whale (*Balaenoptera acutorostrata*), and sei whale (*Balenoptera borealis*). However, because these marine mammal species are generally associated with opean ocean habitats in more offshore locations, they are unlikely to occur in Cobscook Bay (NMFS letter to FERC dated November 24, 2010).

Table 2. *Marine mammals likely to be affected.*

SPECIES	STATUS OF STOCK	DISTRIBUTION	POPULATION SIZE	TYPICAL HABITATS
Gray seal (*Halichoerus grypus*)	MMPA	Western North Atlantic stock located in eastern Canada and the northeastern United States	Over 250,000 in western North Atlantic	Coastal waters, islands, sandbars, ice shelves and icebergs. When hunting, they use the entire water column--from the surface to the sea floor.
Harbor porpoise (*Phocoena phocoena*)	MMPA	In the North Atlantic, range from West Greenland to Cape Hatteras, NC	89,054 in Gulf of Maine/Bay of Fundy area	Northern temperate and subarctic coastal and offshore waters: bays, estuaries, harbors, and fjords less than 650 ft deep.
Harbor seal (*Phoca vitulina*)	MMPA	On the East Coast, found from the Canadian Arctic to southern New England, New York and occasionally the Carolinas	91,000 in New England	Temperate coastal habitats and use rocks, reefs, beach, and drifting glacial ice as haul out and pupping sites
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	MMPA	Found in the western North Atlantic from 35°-80° N, from North Carolina to Greenland. Exhibits seasonal movements, moving closer inshore and north in the summers and offshore and south in the winters	63,000 in the western North Atlantic	Found only in temperate waters of the North Atlantic Ocean. Inhabit the oceanic waters of the continental shelf and slope.

Source: http://www.nmfs.noaa.gov/pr/species/mammals/
MMPA = Protected under the Marine Mammal Protection Act

5. Type of Incidental Taking Authorization Requested

ORPC requests an IHA for incidental takes by harassment of the four species of marine mammals identified in Table 2 that may occur during pile placement activities (the harbor seal, the grey seal, the harbor porpoise and the Atlantic white sided dolphin). There is a potential for noise generated by the pile placement activities to exceed the harassment levels for both continuous and impact levels. ORPC's Pile Placement Plan identifies the types of pile driving equipment that our contractor proposes for installation activities; Attachment 3 provides the equipment nameplate noise levels from the manufacturer.

ORPC contracted with Dr. Peter Stein of Scientific Solutions, Inc. to analyze this data and provide ORPC with guidance on the need for an IHA. Dr. Stein's recommendation for an IHA and the area of influence is attached (see Attachment 4).

6. Marine Mammals That May Be Taken

Species for which authorization is sought include the four species cited in Question 4 that have the highest likelihood of occurring in the project area: gray seal, harbor porpoise, harbor seal, and Atlantic white-sided dolphin. As Table 3 below indicates, in the worst case, we may harass four seals and two porpoise during the pile driving phase of this project. Cobscook Bay is characterized by the substantial mixing and redistribution of water resulting from strong tidal currents. Marine mammal critical habitats, as designated by the resource agencies, have not been identified for Cobscook Bay.

ORPC's Marine Mammal Monitoring Plan (Attachment 2) includes a mitigation action plan based upon trained observers and deployment activity curtailment. This plan was developed to minimize loud noise-generating activities if marine mammals are observed in Cobscook Bay, and to cease such noises if the animals come within 500 ft of the project area. ORPC does not expect to create noise at levels that harasses marine mammals for prolonged periods of time. There may be some limited peripheral harassment if a marine mammal comes into the work area underwater and is not spotted by our observers.

Based upon the history of marine mammal sightings summarized in Table 1 above, there is only a very small chance of such an interaction. Based on our marine mammal observations in the area, it is possible that seals or porpoises could enter the deployment area during the pile placement, but would probably focus on the salmon aquaculture operation several thousand feet from the deployment area.

Table 3. *Calculated Incidental Harassment Incidents by Species and by Month of the IHA.*

Month	Total Number of 4 Hour Observation Periods (3yrs)	Calculated # of hours of Observations Per Month/ year	Estimated Hrs of Pile Driving per month	Total Observed Harbor and Grey Seals (3yrs)	Calcu Takes Seals	Total Observed Harbor Porpoise (3yrs)	Calcu Takes Porpoise	Total Observed Atlantic White-Dolphins (3 yrs)	Calcu Takes White Dolphins
			(11 piles total)						
March	17	31.4	10	1	0	0	0	0	0
April	40	53.2	4	4	0	3	0	0	0
May	17	22.4	4	1	0	3	0	0	0
June	21	28.0	4	8	1	1	0	0	0
July	21	28.0	2	4	0	10	1	0	0
August	30	40	1	16	1	24	2	2	0
September	25	33.2	1	9	1	5	0	0	0
October	24	32.0	1	8	1	0	0	0	0
November	18	24.0	1	4	0	0	0	0	0
			Total 28 hrs						
Observation Periods =4 hours average				**TOTAL TAKES**	**4**		**2**		**0**

Note: These are very conservative numbers, based on the low number of hours of pile driving during high-observation months. The mitigation measures committed to by ORPC should lower these incidents even further.

7. Anticipated Impact upon the Species and Subsistence Uses

Any takes would be temporary and it is anticipated that no effect on the reproduction, survival, or recovery of the identified species would occur.

ORPC contracted with Dr. Peter Stein of Scientific Solutions Inc. to help define the zones of influence that will be potentially be created by the pile driving noise. According to Dr. Stein, a 112 dB in-air vibratory source level at the operator (presuming 1 m away) equates to roughly 174 dB re µPa2 @ 1 m in water. The 131 dBA from the plate on the impact hammer would equate to 193 dB re µPa2 @ 1 m in water. Tables in Appendix 4 show source levels (rms) averaging about 190 dB re µPa2 @ 1 m for impact measurements (190 dB for a 1-meter diameter pipe) and 175 dB re µPa2 @ 1 m for the vibratory hammer. Presuming Level A harassment is above 180 dB for the impact hammer, Dr. Stein has calculated ORPC's zone of influence for Level A harassment to be roughly 30-100 m. Presuming Level B harassment levels for the continuous vibratory source is 120 dB, and assuming 15logR propagation loss in shallow waters (cylindrical spreading would be 10logR and spherical spreading would be 20logR), Dr. Stein has calculated that the

175 dB vibratory levels do not attenuate to 120 dB until one is 4600 meters, or roughly 2.5 miles, from the source. Since this covers virtually the entire bay, ORPC will require an IHA for Level B harassment for the bay area.

8. Anticipated Impact on the Availability of Marine Mammals for Subsistence Uses

There are no traditional subsistence hunting areas in the project area.

9. Anticipated Impact on the Habitat of Marine Mammal Populations, and the Likelihood of Restoration of the Affected Habitat

ORPC proposes driving 11 piles. The benthic impact of the foundation for Phase I of the Project will be approximately 113 square ft. There should therefore be no adverse impacts to the marine mammal habitat after the pile placement is complete.

ORPC has filed a Biological Assessment with our FPLA that covers in detail the overall benthic impacts of the Project, which we anticipate to be minimal. In addition, ORPC has developed a benthic monitoring plan to assess benthic disturbance based upon a pre-deployment investigation and follow-up assessments through the duration of the Project.

10. Anticipated Impacts of the Loss or Modification of Habitat

ORPC does not anticipate any loss to or modification of the habitat for the marine mammal populations involved.

11. Availability and Feasibility of Alternative Methods

To mitigate the effects of noise from pile placement, energy applied to the hammers will be slowly ramped up. ORPC will also evaluate the use of wooden sound absorption cushions and/or bubble curtains to ensure noise levels are below the impact noise criteria suggested by NMFS. ORPC plans to initiate pile driving with a trial procedure that monitors ambient and sub-surface noise levels for the three different pile driving methods (vibratory, diesel impact, and drop-weight or “close-pin” hammers) and the two mitigation methods (sound suppression block and bubble curtains). The purpose of this trial procedure is to identify which combination of driving method and sound mitigation best assures that ORPC will not generate impact noise at the acute levels identified by NMFS (203dB). It is not anticipated that this trial will bring the pile driving noise above the continuous or impulse levels set by NOAA/Office of Protected Resources but if we find that it does, we will promptly notify the Office of Projected Resources. ORPC also plans to visually monitor the Level A harassment zone (out to 180 dB) for half an hour before, during, and for half an hour after impact pile driving (see Question 13 for more information). Acoustic monitoring will also be carried out during the pile driving trial to verify estimated sound levels and sound propagation.

Hydrokinetic power systems are an evolving technology that still holds numerous technical challenges. Foundation requirements and bottom fixity are foremost among these challenges.

Although ORPC has been closely following the development of international hydrokinetic projects to learn from their advances and disappointments, there are currently only a small number of deployed hydrokinetic devices around the world with which to compare.

This will be ORPC's first deployment of a full-scale hydrokinetic device. We have no previous experience or field data regarding the optimal foundational structure for such devices below the mud line. ORPC has therefore contracted several experts in marine structures for foundation designs and deployment strategies. These experts have evaluated gravity bases, suction caissons, rock anchors, cable and anchor systems and other oil-industry-developed methods, and have chosen this pile approach as the most cost-effective, low-failure risk, locally familiar, local infrastructure supportable, and safest path forward for our pilot project. We also believe that this design will have the least practicable adverse impact on marine mammals and their habitats.

12. Arctic Subsistence Evaluation

There are no Arctic subsistence marine mammals to consider at the Project site.

13. Monitoring Plans and Observation Data

ORPC has provided NOAA/Office of Protected Resources with our Marine Mammal Monitoring Plan (Attachment 2), which we will implement prior to and during the pile placement. During pile driving activities, ORPC will employ two dedicated marine mammal observers whose credentials will be approved by NOAA/Office of Protected Resources. Observations will commence a half-hour prior to pile driving, will continue through the work period, and will extend for a half-hour after pile driving has ceased. The watch will cover 180 degrees fore and 180 degrees aft of the area of activity. The fore and aft watches may take place on two different vessels to assure a full view for each. All watchers will use binoculars and record number, type, activity, and location of all sightings. Each watcher will carry a hand held radio for immediate communication to the ORPC project lead. The project lead will responsible for communicating to all aspects of the Project that a marine mammal has been spotted within the vicinity of the Project. The watchers will continue to observe the marine mammal and report to the project lead if the marine mammal is moving towards the Project area. The project lead will alert work crews of the marine mammal's activities and determine whether pile driving has to be suspended if the animal continues to approach the Deployment Area. All pile driving will cease if and when a marine mammal comes within 500 ft of the work area, and may not recommence until the marine mammal is outbound and more than 1000 ft from the work area.

We have further committed to NOAA/Office of Protected Resources that we will initiate a sub surface and ambient air acoustic monitoring study to monitor the actual noise levels during pile placement.

The data from our observers and our acoustic monitoring efforts will be provided to NOAA as a summary report after pile placement is complete.

14. Learning and Further Research

Over the past several years, ORPC has demonstrated our commitment to advancing hydrokinetic technology and studying the interaction of our devices with the marine environment. We have funded the innovative environmental and biological research needed to assess this new technology. ORPC has secured DOE funding and Congressional appropriations for marine mammals and fisheries studies in Maine and Alaska, through the University of Maine, Maine Maritime Academy, University of Alaska Fairbanks, Denali Commission, and several state funding organizations. We jointly support several professors and graduate students, as well as leaders in acoustic research and developments in environmental monitoring.

ORPC has successfully developed a drifting noise measurement system for assessing acoustic impacts of hydrokinetic power systems. With continued guidance and input from NOAA, we have been able to develop alternative methods for monitoring subsurface sites where hydrokinetic devices might be deployed. These sites are complicated by very high currents, deep and unforgiving bottom bathymetry, and other industrial and commercial source acoustic impacts.

This science-based approach to development has also been at the forefront of the fisheries studies with which ORPC has been involved. Rather than employing the past practices of large trawls and extensive netting studies needed for surface impoundment dams, we have been utilizing a much less invasive approach. Dr. Gayle Zydlewski at the University of Maine has utilized active acoustic echosounders in the deployment area and at a control site to identify fish population distribution and interaction. This work uses some limited netting for speciation and calibration, but provides the interaction data needed to best assess the environmental interaction and impacts of this technology.

As we move forward with Phase I of the Project, we will deploy a single-device TidGen™ Power System on a pile foundation. This power system will be instrumented with strain and load measuring devices—the data from which ORPC and its consultants will use to refine and modify the current foundation design. ORPC believes this approach will allow us to optimize future foundation designs, while reducing deployment costs and minimizing environmental impacts. ORPC has applied for a FERC pilot project license for this first-of-a-kind hydrokinetic device, and it will be from these efforts that we and others within the emerging hydrokinetic industry will achieve commercialization. ORPC has provided our approaches, our collected data, and our lessons learned to all interested parties worldwide.

The results of the pile testing trials and noise measurements will be provided to the regulatory agencies as a Report from our acoustics consultant, Scientific Solutions Inc. This Report will be utilized as baseline data to support an IHA for Phase 2 of OPRC's TidGen™ project if it is deemed necessary.

References

National Oceanic and Atmospheric Association. 2009. NOAA Fisheries, Office of Protected Resources – Harbor porpoise (*Phocoena phocoena*). [Online] URL: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/harborporpoise.htm. (Accessed June 3, 2009).

National Oceanic and Atmospheric Association. 2011. Comments, Recommendations, Terms and Conditions, and Intervention Notice for Ocean Renewable Power Company, LL's Final Hydrokinetic Hydropower Pilot License Application for the Cobscook Bay Tidal Energy Proejct (FERC No. P-12711), November 4, 2011.

Attachments

1. Pile Placement Plan
2. Marine Mammal Monitoring Plan
3. Pile Hammer Manufacturer Correspondence
4. Stein, Peter. Calculation of Noise Levels due to Pile Driving.

30 Bonney Street
P.O. Box B
Freeport, Maine 04032
Phone: 207.865.0000
Fax: 207.865.4836

August 18, 2011

Herb Scribner
ORPC
120 Exchange Street
Portland, Maine 04101

Cobscook Bay Tidal Energy Project
TidGen™ Foundation Placement Plan

Pile Driving
The Cobscook Bay Tidal Energy Project will require the placement of a series of steel pilings for the purpose of providing a stable foundation for the TidGen™ power system. The surface vessels and equipment required for the placement and driving of the 10 piles for each TidGen™ will consist of 1ea 50'X130' deck barge; 1ea push boat 25'loa manufactured by 'Work Horse' powered by 2 ea 225HP John Deere 6068 inboard motors; 1ea Linkbelt LB 518 150-ton crane; deck winches with power pack and 1ea 185cfm air compressor.

The barge will be held in position with 4 large anchors positioned at the four corners located somewhere between 500' and 800' from the barge. The barge will be attached to the four anchors with 1000' of line each, running through a fairlead and spooled onto a deck-mounted winch. The winches will be used to position and move the barge to its proper location. This is similar to the mooring design that was successfully used for ORPC's geotechnical investigation in Cobscook Bay.

Steel pipe piles will be used for the foundation for the TidGen™ devices, which will be 36" diameter and have a 1"inch wall with an open shoe of hardened steel attached to the bottom for seating itself into bedrock without deformation. The piles will be delivered with the hardened shoes attached and will be uncoated.

The piles will be transferred from the delivery truck to the barge with either the crane on the barge or one on shore at either the Staniels Road launch facility or the boat school property. Both of these sites are less than two miles by water from the Project area. Ten piles will be required to provide a stable foundation for each TidGen™ device. These

piles will be configured in two rows of 5 piles in each row. The individual piles will be approximately 20 feet apart in each row and the rows will be approximately 50 feet from each other. The piles will be in the order of 50' to 60' long and 10' to 15' will be above the mud line when driven to refusal. Prior to driving the pile a follower will be attached to the pile, which will enable the pile to be driven from the surface. This follower will be an H-pile section, approximately 100' long and its size will be in the order of an HP 12X53. Based on extensive soils study of the area the piles will sink in the soft bottom under its own weight plus the weight of the follower and vibratory hammer, for most of the 40' of marine clay, then will be driven the remaining depth using vibratory and impact pile driving procedures from barge-based pile driving equipment.

The TidGen™ device foundation(s) will be constructed in an area that is completely submerged (below low tide). Two main methods used to install piles are impact and vibratory pile driving. An impact hammer is a large metal ram that is attached to a crane. A vertical support (leads) holds the pile in place and the ram is dropped or forced downward. The energy is then transferred to the pile that is driven into the seabed. The ram is typically lifted by mechanical, air steam, diesel, or hydraulic power sources. A Berminghammer model B-3505 diesel, 34,500 lb hammer with maximum rated impact energy of 21,533 ft-lb will be used (*See attachment for vendor specifications*). Driving piles using an impact hammer generally results in the greatest noise production, however this noise is not constant and is considered as a multiple pulse source by NMFS. NMFS current acoustic threshold for pulsed sounds (*e.g., impact pile driving*) is 180 and 190dB re 1 microPa for Level A harassment of cetaceans and pinnipeds, respectively, and 160 dB re 1 microPa for Level B harassment. As mentioned prior, this noise is not constant and it is expected that the need for a diesel hammer will be minimal and for very short durations (less than 5 minutes per pile). Information provided by the manufacturer was provided as follows; "We did testing on a similar hammer back in 2005 and the actual sound levels were read to be: 109.5 dBAI @ 50 BPM; 110.5 dBAI @ 45BPM; 112.3 dBAI @ 40 BPM; and 112.6 dBAI @ 36.5 BPM. These actual readings were taken 30 feet away from the hammer when the hammer was at around ground level and the pile was at refusal. I would use those values for the 3505. These readings were taken without any cushioning (using our direct drive system). I do have readings with the use of a cushion also, which is less then the ones stated above."(*See attachments for vendor correspondence*)

Vibratory hammers install piles by applying a rapidly alternating force to the pile by rotating eccentric weights about shafts, resulting in a downward vibratory force on the pile. The vibratory hammer to be used will be an H&M model H-1700(*See attachments for manufacturer's specification sheet*), hydraulically powered using an environmentally sensitive product, AMERIgreen AW hydraulic oil to minimize environmental impacts in the event of a ruptured hose or other spill. (*See attachments for Hydraulic oil Specification*).The CPM spill plan provides that containment booms and other clean-up devices will be onboard in a 'spill-kit' if such an event should occur.

The vibratory hammer attaches to the pile head with a clamp and the vertical vibration in the pile disturbs or liquefies the soil next to the pile causing the soil particles to lose their frictional grip on the pile. The pile moves downward under its own weight plus the

weight of the hammer. This method is very effective for non-displacement piles such as sheet piles, H-beams, and open-end pile or caissons. The noise source of this hammer is from the power pack, which drives the hydraulic pump. It consists of a John Deere 6068HE 225 HP engine. There is no manufacturer information on the noise output of this power pack, but field measurements may be a possibility. Correspondence with the vibratory hammer manufacturer provided in-air noise levels (*see attachments for correspondence*) which have been used by ORPC's acoustic expert SSI, (Scientific Solutions Inc), to calculate the in-water noise levels (*see Attachments for SSI correspondence*) and the calculated zone of acoustic influence.

The type of hammer used depends on subsurface conditions and the effort required to advance the pipe pile to final elevation. The soils study performed by Haley and Aldrich has found the marine deposits in the area where the TidGen™ device foundation piles will be driven to be very soft clay, indicating that little effort will be required to seat the piles to bedrock.

For the vibratory hammer, driving is in progress from less than 1 to approximately 3 minutes. If it is determined by a member of Haley and Aldrich onboard soils scientist that additional energy is required to seat the pile to bedrock, the vibratory hammer will be removed and the impact hammer will be rigged to the crane and used to seat the pile to bedrock or 'proof' the pile. When the impact hammer is being used, driving takes place from 1 to 5 minutes. All piles will be driven with the vibratory hammer and the impact hammer used only when vibratory methods are not sufficient to reach bedrock. Due to strong currents during tide changes, pile driving will occur during slack tides only and it is expected that only one pile will be driven per tide cycle due to the short window of slack tide. Total anticipated time at mooring is between 7 to 12 days. Lights will be as required by U.S. Coast Guard and local Harbor Master; local fishermen will also be notified prior to operations.

To ensure alignment of the pile array, the semi-permanent base structure, which will later be raised and become the support structure for the TidGen™ device, will be used as a driving template. (*See attached drawing of base*). This structure will have alignment features built into it to help guide the piles to the location required. It is expected that divers will be required to help guide the piles to the structure to get them started into the template. This semi-permanent structure will be set into place prior to the pile driving operation and the setting of it will be included in the section following this pile driving as part of the setting of the base structure plan to follow.

Diesel fuel on deck will be in a double walled storage tank with less than 250 gallons capacity. Every effort will be made to prevent spillage; however in the event of a spill; a spill kit with absorbent pads and containment boom will be present to contain and clean up as needed.

Cold weather will not have an effect on pile driving activities. Only foul weather would prohibit pile-driving operations such as high winds/seas or icy conditions. It is expected that this work will occur during the early spring of 2012 (March 1, 2012), so icing should

not be a problem. A look ahead at the long-term weather forecast for a stretch of favorable weather will be done prior to starting.

Setting, Raising and Securing Bottom Support Frame

The dimensions of the bottom support frame are 50'X100'. It is a three-dimensional truss made of 36" and 8" to 10" steel pipe. This unit shall be hoisted with a single crane (on the order of 150-ton capacity) mounted on a 50' X 120' barge. This crane and barge configuration will be used throughout the pile driving and setting of the TidGen™ device and installing the cable.

The bottom support frame will be manufactured at either the Staniel's Road launch facility or the boat school property. It will be brought to the water by a special trailer and loaded onto a material barge with either a land-based or barge-mounted crane. The bottom support frame will be motored out to the deployment area. With the assistance of divers, the bottom support frame will be lowered to the sea floor with the barge mounted 150-ton crane, aligned and checked for levelness and laid to rest to be used later as a pile-driving template, prior to being raised to the proper elevation and affixed to the pipe piles where it will be utilized as the bottom support frame for the TGU.

Once all ten piles are driven as described above, they will be marked for the bottom or top of bottom support frame. The bottom support frame will then be raised to the proper elevation, and secured to the piles using friction collars. This will be a slack tide operation and divers will be required to perform this work. It is intended to use the 150-ton crane on a 50' X 120' barge to raise the frame. With the assistance of divers, during one slack tide cycle, the frame will be secured to the piles. No additional anchoring will be required for this process and will utilize that which had been installed for the pile-driving phase earlier.

Prepared by:
Guy Wilson
Project Manager PMC

STUDY PLAN 5:
MARINE MAMMAL MONITORING PLAN

FINAL PILOT LICENSE APPLICATION
COBSCOOK BAY TIDAL ENERGY PROJECT
FERC PROJECT No. 12711
ORPC MAINE, LLC

FINAL PILOT LICENSE APPLICATION
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STUDY PLAN 5
MARINE MAMMAL MONITORING PLAN

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1.0 INTRODUCTION

1.1 GENERAL DESCRIPTION OF THE COBSCOOK BAY TIDAL ENERGY PROJECT

ORPC Maine, LLC, a subsidiary of Ocean Renewable Power Company (collectively, ORPC), is applying to the Federal Energy Regulatory Commission (FERC) for a pilot project license for the Cobscook Bay Tidal Energy Project (Project). The Project will evaluate the potential for a new source of clean, renewable energy generation using tidal energy resources in Cobscook Bay, Maine. ORPC obtained an initial preliminary permit for the project area in Cobscook Bay from FERC on July 23, 2007; FERC issued a successive preliminary permit on January 13, 2011. Feasibility studies, including environmental surveys, and pre-filing consultation were conducted, resulting in ORPC's filing of a draft pilot license application (DPLA) with FERC for the Eastport Tidal Energy Project on July 24, 2009. The DPLA included project areas within Cobscook Bay and Western Passage. Since submitting the DPLA, ORPC has conducted extensive consultation with regulatory and resource agencies as well as other stakeholders, has collected additional environmental data, and has continued to refine its proprietary technology. As a result of these additional studies and consultations, ORPC now plans to deploy a commercial-scale hydrokinetic power system in gradual stages, with the Project, a small pilot project, as the first stage. The FERC preliminary permit Project boundary for the Cobscook Bay Tidal Energy Project (FERC Project No. 12711) encompasses the proposed development area.

The Project will be carried out in two separate phases over an expected eight-year pilot license term. In Phase I, ORPC will deploy, monitor and test a single-device TidGen™ Power System for one year. In Phase II, ORPC will add four additional TidGen™ devices to the power system, for a total of five. During both phases, ORPC will deploy environmental monitoring equipment on the TidGen™ Power System and within the Project boundary (Figure 1).

The core component of the TidGen™ Power System is ORPC's proprietary turbine generator unit (TGU). The TGU utilizes four advanced design cross flow (ADCF) turbines to drive a permanent magnet generator mounted between the turbines on a common driveshaft. The ADCF turbines rotate in the same direction regardless of tidal flow direction; rotational speed of the turbines is directly related to water flow speed. The TGU is 98 feet in length, 17 feet high and 17 feet wide. It is attached to a bottom support frame, which holds the TGU in place approximately 15 feet above the sea floor. The bottom support frame is 98 feet long by 50 feet wide by 15 feet high. The bottom support frame is constructed of steel and the TGU is constructed of steel and composite material. Together, the coupled TGU and bottom support frame comprise the TidGen™ device (Figure 2 shows the conceptual design for the TidGen™ device). The depth at the proposed Deployment Area is 85 feet at Mean Lower Low Water (MLLW); the TidGen™ devices will thus be placed 49 feet below the surface at MLLW. Each TGU will have a maximum design capacity of 180 kilowatts (kW). During the Project each TGU will operate at a rated capacity of 60 kW. The five-device TidGen™ Power System will have a maximum design capacity of 900 kW and a rated capacity of 300 kW. The power generated will be connected to the grid using a single subsea transmission cable with a line voltage of 13 kilovolts (kV) DC. The total cable length is approximately 4,200 feet (3,700 feet from the TidGen™ Power System to the shore in Lubec, Maine and approximately 500 feet from shore to the on-shore station). ORPC has chosen an underwater cable route that avoids abrupt changes in bottom topography. Based on consideration of environmental concerns, ORPC proposes to bury the cable at all feasible locations along the cable route. The power generated by the TidGen™ Power System will be conditioned at the on-shore station and delivered to the Bangor Hydro Electric Company power grid.

Figure 1. Cobscook Bay Tidal Energy Project location map.

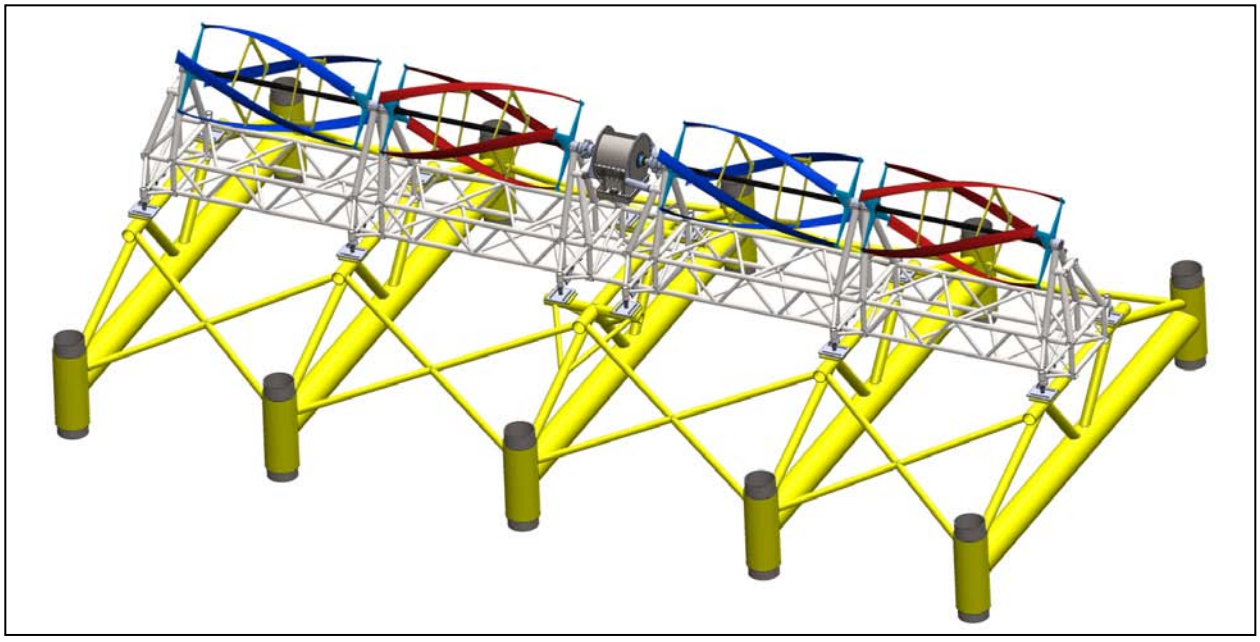


Figure 2. TidGen™ device.

In preparation for the Project, ORPC designed, built, deployed and tested a beta pre-commercial TidGen™ Power System (Beta TidGen™ System) in Cobscook Bay in 2010 (see Figure 3). The Beta TidGen™ System was comprised of a beta pre-commercial TGU (Beta TGU); ORPC's *Energy Tide 2* research, testing and deployment vessel; a mooring system for the *Energy Tide* 2; and data acquisition and environmental monitoring equipment. Rather than being mounted on a bottom support frame, the Beta TGU was deployed top-down from the *Energy Tide 2* and suspended 21 feet below the water surface.

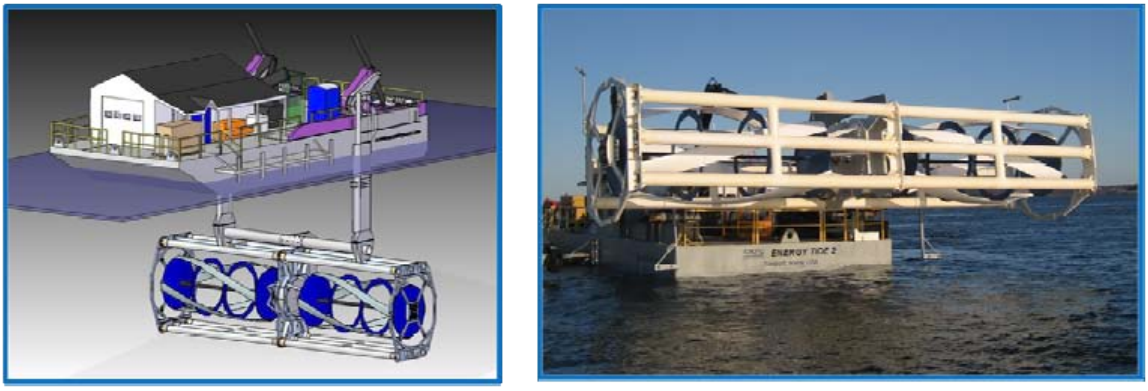


Figure 3. Beta TidGen™ System.

1.2 PILOT LICENSING PROCESS

ORPC's proposed Project is intended to study the short-term installation of ORPC's TidGen™ Power System and its effect on the marine environment. FERC's pilot licensing program has been designed to support the advancement and orderly development of innovative hydrokinetic technologies for projects that are small, short-term, removable and carefully monitored. The purposes of FERC's pilot license program are to test new hydrokinetic technologies, to determine the appropriate sites for hydrokinetic projects, and to collect information on the environmental and other effects of these new generating devices.

ORPC filed its DPLA for review and comment on July 24, 2009. Federal and state resource agencies and other stakeholders submitted comments on the DPLA. FERC also issued an additional information request (AIR) on September 23, 2009 in response to the DPLA. FERC's AIR Item #24 requested that the mandatory monitoring and safeguard plans required for hydrokinetic pilot licenses be reformatted in compliance with the Integrated Licensing Process study plan criteria at 18 CFR 5.11. Accordingly, this study plan has been revised to conform to the Integrated Licensing Plan study plan requirements.

Since filing the DPLA, ORPC has continued discussions on its pilot license proposal with the Cobscook Bay fishing community and the resource agencies to resolve potential conflicts in the marine environment, and to revise the proposed studies to address comments submitted on the DPLA. As a result of this continuing consultation, ORPC has modified the Project and updated this study plan to reflect the updated Project.

The concept of adaptive management is foundational to ORPC's Project study plans. As stated by FERC (2006), "adjustments to measures required during the license term will be based on information gleaned from ongoing monitoring or other post-license studies." ORPC believes that given the uncertainty associated with the relatively new pilot project process, being able to adjust the monitoring studies through adaptive management, based on experienced gained through the Project, allows for more effective studies. ORPC is proposing the adaptive management approach as the most responsible path forward, considering the available ecological and environmental data. This approach is also more appropriate to the pilot license program's goals and objectives than attempting to finalize each study plan prior to deploying the Project's first phase.

ORPC's proposed environmental study plans include this Marine Mammal Monitoring Plan. As described in the study methodology below, ORPC plans to conduct marine mammal observations in the deployment area for the eight-year term of the Project, beginning with the deployment of the single-device TidGen™ Power System. This will allow the monitoring to occur: during Phase I of the Project, with the installation of a single TidGen™ device; during the first two years of Phase II, with the installation of a five-device TidGen™ Power System; and during any major on-water activities. Based on the results of these observations, ORPC and its marine mammal scientific advisor, Dr. Brandon Southall of Southall Environmental Associates, in consultation with the appropriate resource agencies, will review and, if appropriate, modify the Marine Mammal Monitoring Plan at regular reporting intervals.

2.0 GOALS AND OBJECTIVES

The primary goal of the proposed Marine Mammal Monitoring Plan is to characterize changes in marine mammal use in and around the deployment area (Figure 1) due to the deployment of hydrokinetic devices. This will be accomplished by ORPC personnel and contractors: 1) conducting multi-season marine mammal observations to characterize the species presence, relative frequency of occurrence, and habitat use prior to the deployment of a single-device TidGen™ Power System; 2) conducting multi-season marine mammal observations around the single-device TidGen™ Power System after its Phase I deployment; and 3) conducting multi-season marine mammal observations on the five-device TidGen™ Power System after its Phase II deployment. In addition, dedicated and trained marine mammal observers will 4) conduct marine mammal watch prior to and during major deployment, maintenance and retrieval activities. The Marine Mammal Monitoring Plan will use the data gathered to characterize marine mammal presence in Cobscook Bay and the effects (if any) of the TidGen™ Power System on marine mammals, in accordance with the requirements of the FERC pilot license process.

Since marine mammals are known to utilize the Cobscook Bay area, ORPC will provide a dedicated marine mammal watch, by qualified personnel, before and during major on-water deployment, maintenance and/or retrieval activities. This independent service will provide ORPC and its contractors with advance notification of the approach, presence and all-clear for marine mammals. ORPC will take all precautions to minimize harassment of and/or contact with marine mammals during these periods of higher risk. ORPC will consult with National Oceanic and Atmospheric Association (NOAA)/National Marine Fisheries Service (NMFS) regarding the credentials of the persons to be assigned to this task. ORPC will also follow work stop and avoidance procedures to be approved by NOAA/NMFS (Office of Protected Resources) to assure minimal harassment and risk to marine mammals.

Additional information on potential direct interactions between marine mammals and the TidGen™ Power System will be monitored as outlined in the Fisheries and Marine Life Interaction Monitoring Plans. The effect of noise produced by the installation and operation of the TidGen™ Power System on marine mammals is addressed in the Acoustic Monitoring Plan. Separate from these study plans, ORPC is working with Scientific Solutions, Inc. (SSI) under a grant from the Department of Energy (DOE) to develop an active acoustic monitoring (AAM) system, a real-time, automated system capable of tracking the movements of fish and mammals in the vicinity of the TidGen™ Power System. ORPC has chosen not to include the AAM system in the pilot license application because it is still in the research and development phase.

3.0 STUDY AREA

The geographic scope of the study will generally include the Cobscook Bay deployment area (Figure 1). Additional information regarding the study area is provided below in Section 6.0.

4.0 BACKGROUND AND RELEVENT INFORMATION

4.1 RESOURCE DISCUSSION

Gray seal (*Halichoerus grypus*), harbor seal (*Phoca vitulina*) and harbor porpoise (*Phocoena phocoena*) are commonly observed in Cobscook Bay. Other species that may occur in the vicinity of the Project include Atlantic white-sided dolphin (*Lagenorhynchus acutus*), North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaengliae*), fin whale (*Balaenoptera physalus*), minke whale (*Balaenoptera acutorostrata*), and sei whale (*Balenoptera borealis*); however, NMFS has stated that none of these species is expected in the proposed deployment area (NMFS 2010).

ORPC has been conducting incidental visual observations of marine mammals in the Cobscook Bay and Western Passage areas since 2007, during turbine testing, travel to and from ORPC's research vessel, and acoustic, fisheries, subtidal, and avian surveys (Table 1). During this time, ORPC personnel and contractors, who have received specialized training in marine mammal observation and documentation, have recorded approximately 252 observational periods over 222 days. During these periods, ORPC observed two dolphins, 47 harbor porpoises, and 57 seals. The most intensive effort was conducted in 2010, when approximately 71 marine mammals were observed over the course of 132 observation days between March 8 and December 31. Of these, there were two dolphins, 27 harbor porpoises, and 42 harbor seals. All 2010 marine mammal observations were made near the Cobscook Bay deployment area. No observations of any whale species have been made in Cobscook Bay by ORPC personnel or those contracted to work for ORPC since the observation program began in 2007. Table 1 presents the number of each species observed and the months in which the observations were made.

Table 1. *Marine Mammal Observations in Cobscook Bay and Western Passage between December 2007 and December 2010.*

Month	Number of Observation Periods	Harbor and Grey Seals	Harbor Porpoise	Atlantic White-Dolphins
January	4	0	0	0
February	9	0	1	0
March	17	1	0	0
April	40	4	3	0
May	17	1	3	0
June	21	8	1	0
July	21	4	10	0
August	30	16	24	2
September	25	9	5	0
October	24	8	0	0
November	18	4	0	0
December	26	2	0	0
Total Observed		**57**	**47**	**2**

5.0 PROJECT NEXUS

The direct and in-direct interaction of tidal turbines and aquatic resources, including marine mammals, has not been fully characterized. There is also limited information on marine mammal use of the deployment area. The purpose of conducting small demonstration testing activities through a pilot project is to collect the environmental information needed to more completely evaluate the potential effects of these technologies. Post-deployment monitoring plans are also a mandatory requirement of pilot license applications under FERC's current hydrokinetic pilot license policy. Information collected by this monitoring plan can provide some essential information on how marine mammals use the deployment area.

The Project poses the greatest risk to marine mammals in Cobscook Bay when the TidGen™ Power System's project components are being placed, partially removed for maintenance, or fully removed. Other Project activities, such as cable laying, foundation setting, or subsurface drilling have the potential to present risks to marine mammals in Cobscook Bay.

6.0 METHODOLOGY

6.1 MONITORING BY ORPC PERSONNEL AND CONTRACTORS

ORPC proposes to conduct visual observations of marine mammals in and around the proposed deployment area in Cobscook Bay (Figure 1). These observations will be carried out by ORPC personnel and contractors concurrently with other project-related tasks. ORPC has developed a comprehensive Marine Mammal Observation Training document for use by personnel and contractors conducting work in Cobscook Bay (Attachment A). This document provides education and identification instructions on the different marine mammal species that may occur in Cobscook Bay (including all species noted in Section 4.1 above), to ensure consistency among all staff in recording marine mammal sightings.

Surveys will be conducted from both onshore areas and from the water in and around the deployment area. Marine mammal species visible from the water's surface will be recorded and logged as part of this monitoring effort. Observers will use binoculars, spotting scopes, and telescopes where practical to identify and observe marine mammals while performing other scheduled activities for the Project. If a marine mammal is observed, the observer will document the location where the observation was made, using latitude and longitude or a place name in order to provide perspective of the marine mammal sighting in relation to the TidGen™ Power System location, species identification and count, observed behavior (e.g., apparent foraging; floating with tide), weather conditions, and estimated distance from observation point (see Attachment A for a sample Marine Mammal Species Observation log sheet).

ORPC personnel and contractors are currently conducting numerous pre-deployment testing activities in Cobscook Bay in addition to performing environmental resource surveys. These activities occur throughout the year, during all seasons, and will continue through Phase I and into Phase II of the Project. ORPC personnel will continue to conduct marine mammal observations during these activities. In addition, other contractors such as the Center for Ecological Research (CER), the University of Maine (UMaine) School of Marine Sciences, UMaine Cooperative Extension, and SSI have been and will continue to be responsible for recording marine mammal observations in Cobscook Bay while conducting fisheries studies, bird observations, AAM system testing, and drift noise measurement system studies.

CER is proposing to conduct sea and shore bird surveys in Cobscook Bay as described in the Sea and Shore Bird Monitoring Plan. During these surveys, CER personnel will conduct incidental visual marine mammal observations. The avian surveys will have an expected frequency of eight 8-hour on-site surveys in years 2011 through 2014. These surveys are scheduled to be conducted during expected peak bird

occurrence. Peak bird densities are likely to also be coincident with increased marine mammal activity during feeding activities.

UMaine is proposing to conduct hydroacoustic fish surveys in Cobscook Bay as described in the Fisheries Monitoring Plan. During these surveys, UMaine personnel will conduct incidental visual marine mammal observations. The fisheries surveys will have an expected frequency of 16 full 24-hour on-site surveys in 2011, 16 survey days in 2012, 8 survey days in 2013, and 6 survey days in 2014. These surveys are scheduled to be conducted during expected peak fish occurrence. Peak fish densities are likely to also be coincident with increased marine mammal activity, as marine mammals follow prey fish.

SSI is proposing to conduct radiated noise monitoring as well as testing of its AAM system in Cobscook Bay. The activities proposed under the radiated noise monitoring studies are described in the Acoustic Monitoring Plan. During testing of the AMM system, SSI will employ two dedicated marine mammal observers to conduct marine mammal observations concurrently with the radiated noise work. The frequency of the acoustic measurements will be driven by the changing environmental and mechanical conditions. The frequency of AAM system testing will be driven by progress made in the development of that system. The following is the proposed schedule for activities in Cobscook Bay during which SSI will conduct marine mammal observations. SSI will be performing pre-deployment acoustic ambient noise study work and testing of its AAM system in May 2011 for a period of five days. In July 2011, radiated noise monitoring will be performed around the Beta TidGen™ System and additional AAM testing will be conducted for a period of five days. After the deployment of the single-device TidGen™ Power System radiated noise monitoring will be performed in the deployment area and additional AAM testing will be conducted for a period of five days. After the deployment of the single-device TidGen™ Power System, AAM system testing will be conducted quarterly for periods of five days. In October 2012, radiated noise monitoring will be performed around the five-device TidGen™ Power System for a period of three days. After the deployment of the five-device TidGen™ Power System, AAM system testing will be conducted quarterly for periods of five days.

6.2 MONITORING BY DEDICATED MARINE MAMMAL OBSERVERS

ORPC understands that some of the greatest risks to marine mammals can occur during the deployment, maintenance, and retrieval of large, heavy structures using moored vessels. ORPC has included Section 6.2 in this Marine Mammal Monitoring Plan specifically to address monitoring efforts during these high-risk portions of the Project. ORPC will employ two dedicated marine mammal observers during the deployment and retrieval of the TGUs and bottom support frames. NOAA/NMFS will approve the credentials of all dedicated marine mammal observers. Observations will commence a half-hour prior to construction or maintenance activities and will continue through the work period. Observations will cover 180 degrees fore and aft of the area of activity. The fore and aft observations may take place on two different vessels to assure a full view for each. All observers will use binoculars and record number, type, activity, and location of all sightings. Each observer will carry a hand held radio for immediate communication to the ORPC project lead. The project lead will responsible for communicating to the operations leader that a marine mammal has been spotted within the vicinity of the Project. The observers will continue to monior the marine mammal and report to the operations leader if the marine mammal is moving towards the Project area. The operations leader will alert work crews of the marine mammal's activities and determine if construction activities will be suspended if the animal continues to approach the deployment area. All construction activities will cease if a marine mammal comes within 500 feet of the work area, and may not recommence until the marine mammal is outbound and 1000 feet from the work area.

For small-scale, on-water work such as subsurface drilling, and light maintenance utilizing a single work boat (like work from the *Energy Tide 2*), ORPC will utilize one dedicated marine mammal observer at the

work site. The physical location of the deployment area allows one dedicated observer to view it from either end of Cobscook Bay. The observer will follow the procedures described in Section 7.0 for communicating the presence and location of marine mammals in the vicinity of the Project so that the ORPC operations leader can prepare for a possible cessation of work activity.

7.0 REPORTING

All marine mammal observations will be recorded on a daily log sheet (Attachment A).

The daily observation log will include:

- Name of Observer
- Observation period (date and time)
- Location from which observations are made
- Estimated bearing and distance from observation location to marine mammal
- Weather conditions
- Number and species of marine mammal
- Notes on behavior (floating, actively foraging, diving activities, direction of travel, etc.)

ORPC will file full summary reports with the regulatory agencies on a biannual basis for the duration of Project operations, beginning six months after the deployment of the single-device TidGen™ Power System. Should altered marine mammal activity be noted at any time during the observations, the appropriate federal and state resource agencies will be notified for immediate consultation.

8.0 SCHEDULE

ORPC proposes to conduct visual marine mammal observations in and around the deployment area. ORPC and its contractors will be in the vicinity of the Project for fishery and bird surveys, and equipment testing frequently during and after deployment. Marine mammal observations are expected to occur incidentally while other activities are being performed, except during periods of deployment, maintenance, and retrieval activities, when dedicated marine mammal observers will be employed.

9.0 BUDGET

The total cost of this monitoring effort will be $184,000 over eight years. ORPC will be performing marine mammal observations in the vicinity of the Project incidentally, as other activities are conducted in support of the Project. A staff dedicated uniquely to marine mammal observation will not be employed, except during deployment, maintenance and retrieval activities. OPRC estimates the cost of dedicated marine mammal observers during deployment, maintenance, and retrieval to be $15,000 per year for eight years. ORPC estimates the cost of compiling the marine mammal observation logs and issuing biannual reports to be approximately $8,000 for each year of the Project.

10.0 DISCUSSION OF ALTERNATIVE APPROACHES

ORPC believes the Project has little potential to affect marine mammal species. ORPC has been testing tidal power devices in Cobscook Bay since 2007 and during this time period has not observed any negative environmental effects of these devices. In addition, the pilot Project is small relative to the available habitat in Cobscook Bay and will be monitored for direct interaction with aquatic life. Marine mammals are known to avoid structures in the ocean environment and it is expected they will similarly avoid direct contact with the proposed power system. In addition to this plan, Fisheries and Marine Life

Interaction Monitoring Plans have been developed to confirm no direct effects based on in-situ data collection. Potential indirect effects associated with underwater radiated noise are being addressed in the Acoustic Monitoring Plan. ORPC believes that the Marine Mammal Monitoring Plan, in conjunction with additional proposed monitoring plans, is sufficient to inform licensing decisions, that it is appropriate to the size and scope of the pilot Project, and that the approaches proposed in the study are in general accordance with those recommended by the resource agencies.

11.0 REFERENCES

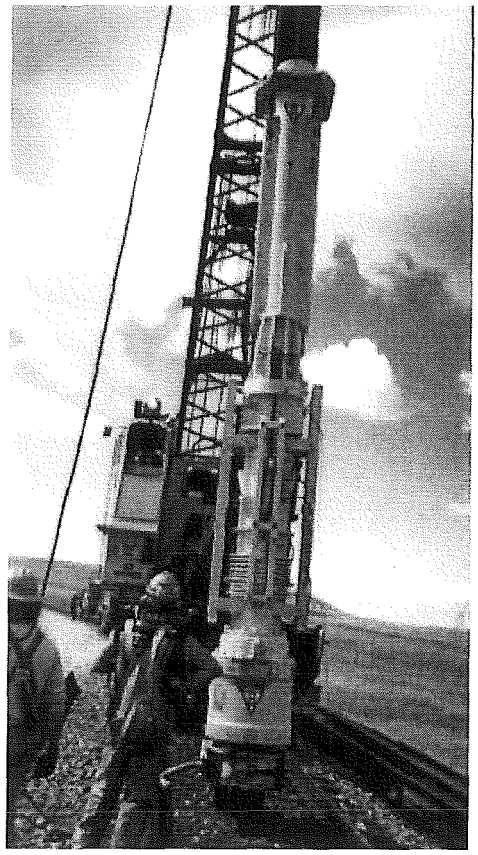
Federal Energy Regulatory Commission (2006). Policy Statement on Hydropower Licensing Settlements. September 21, 2006. Retrieved from http://www.ferc.gov/whats-new/comm-meet/092106/H-1.pdf.

National Marine Fisheries Service (2010). Letter to HDR|DTA providing list of rare, threatened, and endangered species near the Project Area.

ATTACHMENT A
ORPC MARINE MAMMAL OBSERVATION TRAINING DOCUMENT

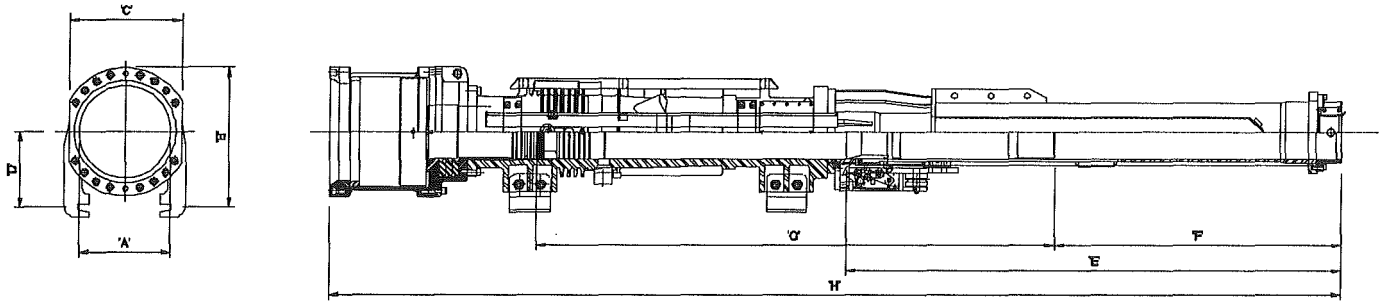
B-3005 General Specifications

Performance		
Ram Weight X Max. Stroke	34,500 ft•lb	47 kN•m
Impact energy	21,533 ft•lb	29 kN•m
Ram weight/mass	3,000 lb	1,400 kg
Maximum ram stroke	11.5 ft	3.5 m
Impact block weight/mass	802 lbs	364 kg
Blows per minute	36-60	36-60
Operating Weight		
Total operating weight/mass	11,000 lb	4,989 kg
Weight of tool box	150 lb	68 kg
Total shipping weight/mass	11,150 lb	5,056 kg
Capacity		
Fuel tank capacity	16 gal (U.S)	62 liters
Fuel consumption	1.4gal/hr.	5.3 liters/hr.
Oil tank capacity	1.9 gal (U.S)	7.3 liters
Oil consumption	0.16 gal/hr.	0.6 liters/hr.



Impact Hammers B-3005

Dimensional Specifications

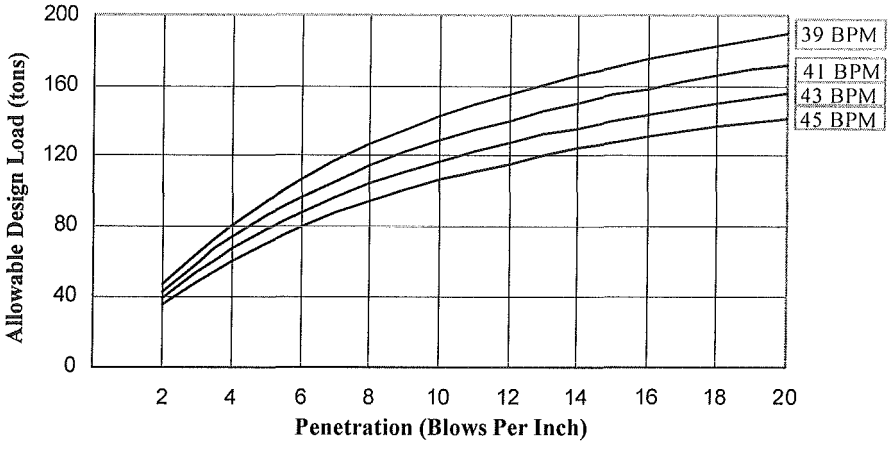


Dimensions	Model-3005							
Units	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Imperial	**21.5 in**	**27.5 in**	**24 in**	**15 in**	**109 in**	**63.7 in**	**114 in**	**222.7 in**
Metric	**546 mm**	**699 mm**	**610 mm**	**380 mm**	**2769 mm**	**1618 mm**	**2896 mm**	**5657 mm**

B-3005	3000 lb Piston				
BPM	Stroke (ft)	Potential Energy (ft.lb)	Velocity (ft/s)	Maximum Impact Force (tons)	Impact Energy (ft.lb)
35	11.8	35,400	22.5	243	24,780
36	11.2	33,600	22.0	238	22,547
37	10.6	31,800	21.5	233	21,533
38	10.0	30,000	21.0	228	20,543
39	9.5	28,500	20.5	222	19,577
40	9.0	27,000	20.0	217	18,633
41	8.6	25,800	19.5	211	17,714
42	8.2	24,600	19.0	206	16817
43	7.8	23,400	18.5	200	15943
44	7.5	22,500	18.0	195	15093
45	7.1	21,300	17.5	190	14266

Stroke height is a function of soil resistance and may not be attainable in certain driving conditions.
Standard Operating Range.

Pile Capacity (from Engineering News Formula)



WEAP Input Data

Ram			Stroke		
Weight	**Length**	**Diameter**	**Minimum**	**Maximum**	**Efficiency**
3.00 Kips	113.80 in	11.70 in	4.00 ft	11.80 ft	0.800

Impact Block Information				
Weight	**Length**	**Diameter**	**C.o.R**	**RoundOut**
0.80 Kips	25.87 in	11.81 in	0.900	0.0100

Diesel Hammer Combustion Chamber Information							
Combustion Chamber Inf.			Combustion			A I Volume	
C-Stroke	**Area**	**Volume**	**Delay**	**Duration**	**ExpCoef**	**Ignition**	**Fin.Comb**
15.75 in	109.61 in^2	141.00 in^3	0.000	0.000	1.250	155.1 in^3	186.7 in^3

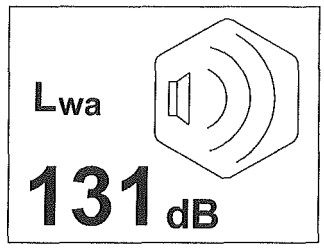
Pressure						
Atmosphere	**FS 1**	**FS 2**	**FS 3**	**FS 4**	**FS 5**	**Coeff. Conf.**
14.7 psi	1400 psi	1300 psi	1200 psi	1100 psi	1000 psi	1.0

Helmet And Hammer Cushion Properties					
Helmet	Hammer Cushion				
Weight	**Material**	**WEAP Input**	**CoR**	**Cushion Area**	**Thickness**
1.60 Kips	Steel	30000 Ksi	0.70	280 in^2	6.00 in

B3505

SINGLE ACTING DIESEL PILE HAMMER

SERIAL NO.
__-____-35



CE

MODEL	**B3505**
RATED ENERGY	**62.4kJ/46,000ftlb**
BARE HAMMER WEIGHT(Mass)	4,809kg/10,602lb
TYPICAL OPERATING WEIGHT(Mass)	5,443kg/12,000lb
RAM WEIGHT(Mass)	1,814kg/4,000lb
RATED STROKE	3.5m/11.5ft
OPERATING FREQUENCY	36–60 BPM
FUEL TANK CAPACITY	59L/15.6gal
OIL TANK CAPACITY	7L/1.9gal

**ADDITIONAL SPECIFICATIONS AT WWW.BERMINGHAMMER.COM*

MANUFACTURE DATE:

Berminghammer

FOUNDATION EQUIPMENT.

HAMILTON ONTARIO CANADA

B3505

SINGLE ACTING DIESEL PILE HAMMER

SERIAL NO.
00-01-35

Lwa
131 dB

CE

MODEL	B3505
BARE HAMMER WEIGHT(Mass)	4,809kg/10,602lb
TYPICAL OPERATING WEIGHT(Mass)	5,443kg/12,000lb
RAM WEIGHT(Mass)	1,814kg/4,000lb
MAX. PHYSICAL STROKE	4.0m/13.0ft
RATED STROKE	3.5m/11.5ft
OPERATING FREQUENCY	36-60 BPM
FUEL TANK CAPACITY	59L/15.6gal
OIL TANK CAPACITY	7L/1.9gal
RATED POTENTIAL ENERGY	62.4kJ/46,000ftlb
MAX. KINETIC ENERGY	46.1kJ/34,000ftlb

MANUFACTURE DATE: 12-2000

Berminghammer

FOUNDATION EQ

HAMILTON ONTARIO CANADA

Midwest Vibro

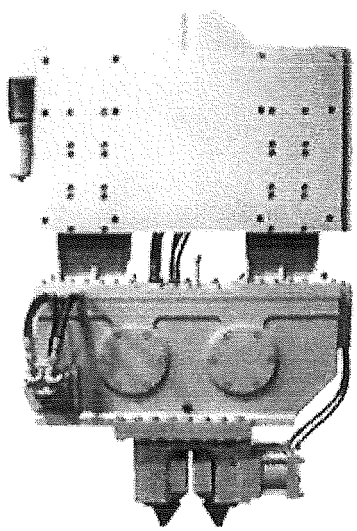
Pile Drivers - Vibratory Hammers - Augers - Air Hammers - Lead Systems - Extractors and Drilling Equipment

- MIDWEST VIBRO /
- DRIVERS / EXTRACTORS /
- Model H-1700 /

H&M Vibro Inc. Vibratory Driver/Extractor

Model H-1700

Vibrator Specifications

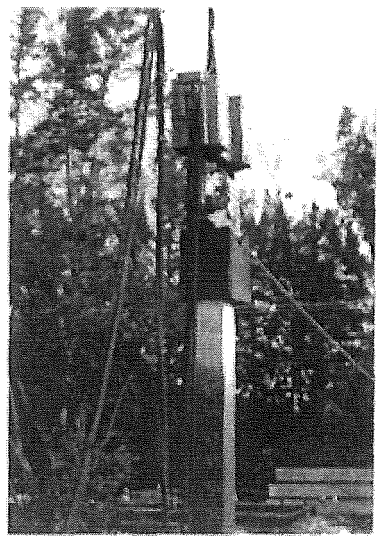


- **Hydraulic** — Type
- **180** — Horsepower
- **1,200** — Frequency
- **7/8 inch** — Amplitude
- **1,740 in. lbs.** — Eccentric Moment
- **30 ton** — Max Line Pull for Extraction
- **75 ton** — Pile Clamping Force
- **107 inches** — Height with Head
- **55 inches** — Length
- **12 inches** — Throat Width
- **7,000 lbs.** — Weight with Standard Clamp
- **3,600 lbs.** — Optional Counterweight

Power Pack Specifications

- **John Deere 6068HE** — Engine
- **225** — Rated HP
- **62 gallons** — Fuel Tank Capacity
- **100 gallons** — Hydraulic Tank Capacity
- **75 gallons** — Eccentric Pump Capacity
- **8 gallons** — Clamp Pump Capacity

- **10 micron** — Hydraulic Filters
- **110 inches** — Length
- **42 inches** — Width
- **55 inches** — Height
- **5,000 lbs.** — Weight



Next Product

Home

Drivers / Extractors
H-65
H-65e
H-75e
H-150
H-150e
H-800
H-1200
H-1700
H-3000
H-3400

Dealers

Contact

Contact Us 800-648-3403
midwestvibro@sbcglobal.net

AMERIgreen AW

Biodegradable Anti-Wear Hydraulic Fluids

DESCRIPTION:

Amerigreen AW Biodegradable Anti-Wear Hydraulic Fluids are formulated from readi biodegradable renewable resources, high lubricity base oils coupled with proprietary nontoxic anti-wear and anticorrosion additives. These high performance products can reduce operating temperatures, friction, and component wear in mobile and industrial hydraulic systems. Excellent thermal and oxidative stability assure superior service life with minimal viscosity change over a broad range of operating temperatures. Amerigreen AW fluids are suitable for use in ecologically sensitive applications. Available in ISO grades 32, 46 and 68.

FEATURES:

- Readily biodegradable renewable resource.
- Superior anti wear and extreme pressure protection.
- Advanced rust and corrosion protection.
- High viscosity index/temperature stability.
- Low sustainable operating temperature.
- Ultra-low toxicity.

TECHNICAL DATA:

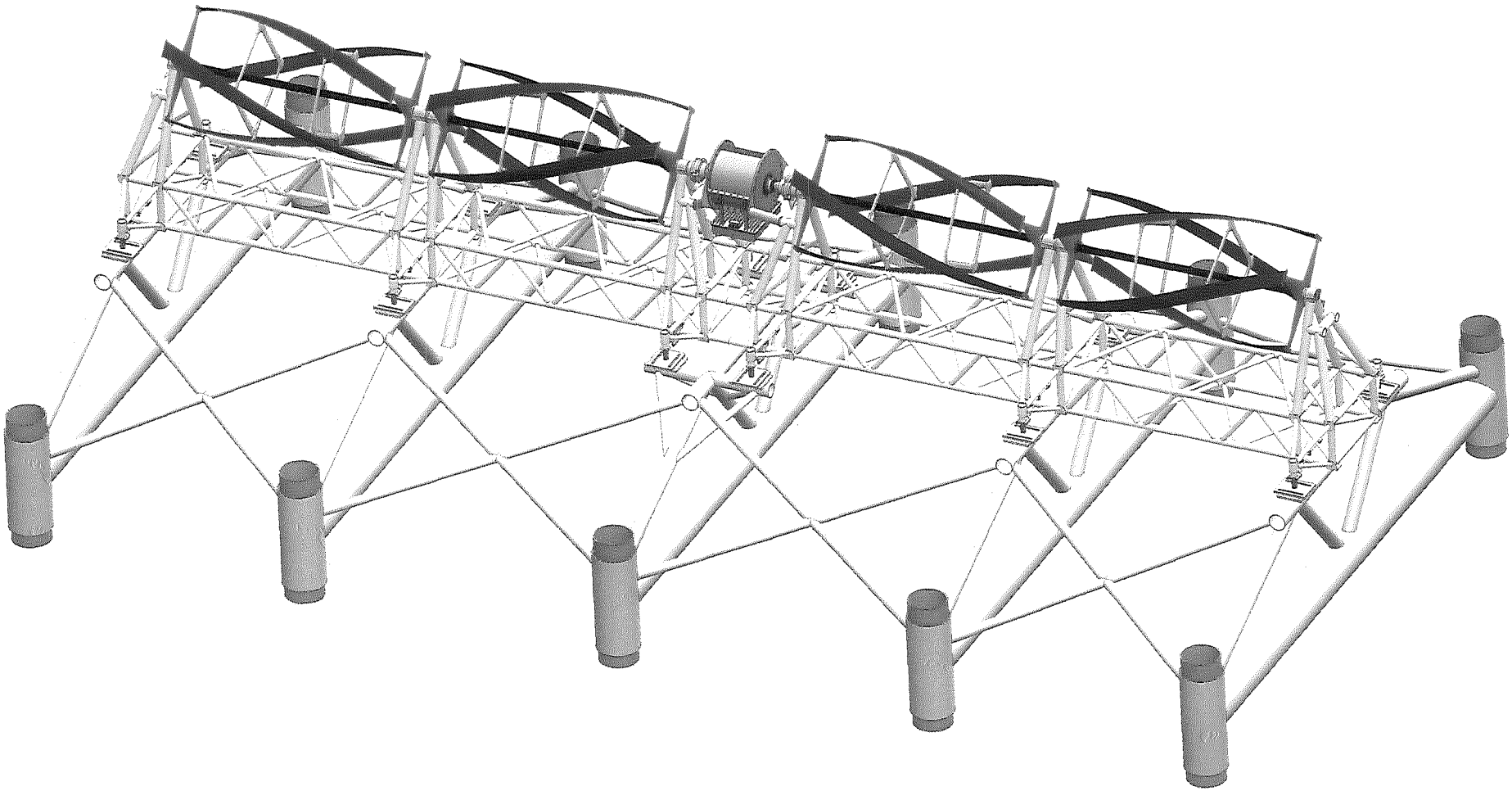
		AW^{32}	AW^{46}	AW^{68}		
ISO Grade:		32	46	68		
Specific Gravity:		.913	.913	.913		
Viscosity	ASTM D445					
@ 40°C, cSt:		32	46	68		
Viscosity Index:	ASTM D2270	>188	>200	>200		
Pour Point °F (°C):	ASTM D97	-20 (-28)	-6 (-21)	-6 (-21)		
Flash Point °F (°C):	ASTM D92	>325(163)	>500 (260)	>500 (260)		
Copper Corrosion:	ASTM D4048	1A	1A	1A		
Rust Test, A & B:	ASTM D665	Pass	Pass	Pass		
Biodegradability, %:	CEC-L-33-A-94	>95	>95	>95		
Suggested Operating Range		Zero to 170F	20F to 170F	20F to 170F		
Dielectric Breakdown Voltage	ASTMD877	>55 kV	>55 kV	>55 kV		
Aquatic Toxicity, Fathead						
Minnow, LC50, 48hrs., ppm	EPA-821-R-02-012	>10,000	>10,000	>10,000		

AVAILABLE PACKAGING:

5 Gallon Pails, 55 Gallon Steel or Plastic Drums, 275 Gallon Totes, and Bulk.

AMERIgreen

Amerigreen
55 Doe Run Road
Manheim, PA 17545 / 888-423-8357 (Bioblend Mfg.)



TID-GEN BASE

Subject: FW: decibel readings

Date: Tuesday, August 23, 2011 9:23:25 AM ET

From: Herb Scribner

To: 'Martha Gray'

The vibratory hammer levels are in the email string
Herb

From: Doug Haverkamp [mailto:doughaverkamp@aol.com]
Sent: Tuesday, August 16, 2011 4:56 PM
To: hscribner@orpc.co
Subject: Fwd: decibel readings

Doug Haverkamp V.P.
Midwest Vibro Inc.
H&M Vibro Inc.
office.800-648-3403
cell.616-822-3651
p.o.box 224 Grandville,M.I.49468-0224
3715 28th sw Grandville,M.I.49418
www.midwestvibro.com

-----Original Message-----
From: Doug Haverkamp <doughaverkamp@aol.com>
To: hsribner <hsribner@orpc.co>
Sent: Tue, Aug 16, 2011 12:23 pm
Subject: Fwd: decibel readings

Herb nice talking with you today,here is the info on the H-1700 vibro that C.P.M. is using.If can help you with anything else please call.

Thanks Doug

Doug Haverkamp V.P.
Midwest Vibro Inc.
H&M Vibro Inc.
office.800-648-3403
cell.616-822-3651
p.o.box 224 Grandville,M.I.49468-0224
3715 28th sw Grandville,M.I.49418
www.midwestvibro.com

-----Original Message-----
From: Doug Haverkamp <doughaverkamp@aol.com>
To: j.zito <j.zito@american-equipment.com>
Sent: Thu, Aug 4, 2011 10:52 am
Subject: decibel readings

John we did a decibel reading on our H-1700 power unit today,the readings are as follows. at the operators position db was 112 ,15' 94 db,at 40' 82 db, at 80' 78 db.The engine was at full throttle position.

John if you need more readings please feel free to contact me.

Thanks Doug

Doug Haverkamp V.P.
Midwest Vibro Inc.
H&M Vibro Inc.
office.800-648-3403
cell.616-822-3651
p.o.box 224 Grandville,M.I.49468-0224
3715 28th sw Grandville,M.I.49418
www.midwestvibro.com

From:	Peter Stein
To:	hscribner@orpc.co; Patrick Edson; "Martha Gray"
Subject:	Pile driving zones of influence
Date:	Thursday, August 18, 2011 6:08:53 PM
Attachments:	pile_driving_snd_comp9_27_07.pdf

Herb,

I have been able to come up with a good estimate of pile driving noise and zones of influence based on the in-air estimates you sent me (112 dB at the operator) and Table 1.2-1 (impact pile driving) and Table 1.2-2 (vibratory pile driving) of the attach report.

On a constant radiated energy level, one can transfer in-air data to in-water data by adding 62 dB to account for differences in reference levels and specific acoustic impedance (ratio of particle velocity to pressure). Thus your 112 dB in-air vibratory source level at the operator (presume 1 m away) equates to roughly 174 dB re μPa^2 @ 1 m in water. The 131 dBA from the plate on the impact hammer would equate to 193 dB re μPa^2 @ 1 m in water.

From the tables in the attached report we are looking at source levels (rms) that average around 190 dB re μPa^2 @ 1 m for impact measurements (190 dB for a 1 meter diameter pipe) and 175 dB re μPa^2 @ 1 m for the vibratory hammer. So this is very consistent with the in-air measurements you passed to me once adjusted for energy conversion into the water. Thus these are good estimates to determine your mitigation requirements.

Presuming Level A harassment is above 180 dB for the impact hammer, your zone of influence for level A harassment is roughly 30-100 m. You will therefore need mitigation measurements to insure that no marine mammals get within 100 m of the pile driving.

Presuming Level B harassment levels for the continuous vibratory source is 120 dB, and we assume 15logR propagation loss in shallow waters (cylindrical spreading would be 10logR and spherical spreading would be 20logR), then the 175 dB vibratory levels do not attenuate to 120 dB until you are 4600 meters, or roughly 2.5 miles from the source. This is basically the entire bay. So you need an IHA for level B harassment for the bay area.

Please give me a call if you need anything further.

Peter

Dr. Peter J. Stein
President
Scientific Solutions, Inc.
99 Perimeter Road
Nashua, NH 03049
603-880-3784